
Ogrevalni sistemi v stavbah - Metoda za preračun energijskih zahtev in učinkovitosti sistema - 4-8. del: Sistemi za ogrevanje prostora in zraka ter sistemi stropnih seval, vključno s pečmi

Heating systems and water based cooling systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-8: Space heating generation systems, air heating and overhead radiant heating systems, including stoves (local)

Heizungsanlagen und wasserbasierte Kühlanlagen in Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen - Teil 4-8: Wärmeerzeugung von Warmluft- und Strahlungsheizsystemen einschließlich Öfen (lokal)

Systèmes de chauffage et systèmes de refroidissement à eau dans les bâtiments - Méthode de calcul des besoins énergétiques et des rendements des systèmes - Partie 4-8: Systèmes de génération de chauffage des locaux, systèmes de chauffage par air chaud et par rayonnement, y compris les poêles (local)

Ta slovenski standard je istoveten z: prEN 15316-4-8

ICS:

| | | |
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| 91.140.10 | Sistemi centralnega ogrevanja | Central heating systems |
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English Version

**Heating systems and water based cooling systems in buildings -
Method for calculation of system energy requirements and
system efficiencies - Part 4-8: Space heating generation
systems, air heating and overhead radiant heating systems,
including stoves (local)**

Systèmes de chauffage et systèmes de refroidissement à
eau dans les bâtiments - Méthode de calcul des besoins
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Gebäuden - Verfahren zur Berechnung der
Energieanforderungen und Nutzungsgrade der Anlagen -
Teil 4-8: Wärmeerzeugung von Warmluft- und
Strahlungsheizsystemen einschließlich Öfen (lokal)

STANDARD PREVIEW

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 228.

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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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 15316-4-8:2014) has been prepared by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15316-4-8:2011.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The main changes compared to EN 15316-4-8:2011 are:

- a) Support of hourly methods;
- b) Compliance with specifications given by CEN/TS 16629;
- c) Scope extended to stoves.

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<https://standards.iteh.ai/catalog/standards/sist/fa97417c-c260-4c5a-b762-3895612f4116/sist-en-15316-4-8-2018>

Introduction

This standard is part of a package developed to support EPBD¹⁾ implementation, hereafter called "EPB standards".

EPB standards deal with energy performance calculation and other related aspects (like system sizing) to provide the building services considered in the EPBD.

The subjects covered by CEN/TC 228 are the following:

- design of heating systems (water based, electrical etc.);
- installation of heating systems;
- commissioning of heating systems;
- instructions for operation, maintenance and use of heating systems;
- methods for calculation of the design heat loss and heat loads;
- methods for calculation of the energy performance of heating systems.

Heating systems also include the effect of attached systems such as hot water production systems.

All these standards are systems standards, i.e. they are based on requirements addressed to the system as a whole and not dealing with requirements to the products within the system.

Where possible, reference is made to other European or International Standards, a. o. product standards. However, use of products complying with relevant product standards is no guarantee of compliance with the system requirements.

The requirements are mainly expressed as functional requirements, i.e. requirements dealing with the function of the system and not specifying shape, material, dimensions or the like.

The guidelines describe ways to meet the requirements, but other ways to fulfil the functional requirements might be used if fulfilment can be proved.

Heating systems differ among the member countries due to climate, traditions and national regulations. In some cases requirements are given as classes so national or individual needs may be accommodated.

In cases where the standards contradict with national regulations, the latter should be followed.

This standard presents methods to take into account the energy performance of heat generation systems based on local air heaters, radiant heaters and stoves. The calculation is based on the performance characteristics of the products given in product standards and on other characteristics required to evaluate the performance of the products as included in the system.

This standard is meant to be used as a module within the EN EPB package of standards. Specification of the connection of this standard with other calculation modules are given in prEN 15316-1:2013 and prEN 15603:2013. Figure 1 shows the relative position of this standard within the EPB standards.

1) Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

prEN 15316-4-8:2014 (E)

| Overarching | | | Building (as such) | | Technical Building Systems | | | | | | | | | | |
|-------------|---|---------|--------------------|---|----------------------------|---|-----------|-----------|-------------|----------------|------------------|----------------------|----------|-------------------------------|------------------------|
| | Descriptions | | | Descriptions | | Descriptions | Heating | Cooling | Ventilation | Humidification | Dehumidification | Domestic Hot water | Lighting | Building automation & control | Electricity production |
| sub 1 | | M1 | sub1 | M2 | sub 1 | | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | M11 |
| 1 | General | | 1 | General | 1 | General | 15316-1 | | | | | 15316-1 | | | |
| 2 | Common terms and definitions; symbols, units and subscripts | | 2 | Building Energy Needs | 2 | Needs | | | | | | 12831-3 ? | | | |
| 3 | Applications | | 3 | (Free) Indoor Conditions without Systems | 3 | Maximum Load and Power | 12831-1 | | | | | 12831-3 | | | |
| 4 | Ways to Express Energy Performance | | 4 | Ways to Express Energy Performance | 4 | Ways to Express Energy Performance | 15316-1 | | | | | 15316-1 | | | |
| 5 | Building Functions and Building Boundaries | | 5 | Heat Transfer by Transmission | 5 | Emission & control | 15316-2 | 15316-2 | | | | | | | |
| 6 | Building Occupancy and Operating Conditions | | 6 | Heat Transfer by Infiltration and Ventilation | 6 | Distribution & control | 15316-3 | 15316-3 | | | | 15316-3 | | | |
| 7 | Aggregation of Energy Services and Energy Carriers | | 7 | Internal Heat Gains | 7 | Storage & control | 15316-5 | | | | | 15316-5 15316-4-3 | | | |
| 8 | Building Partitioning | | 8 | Solar Heat Gains | 8 | Generation | | | | | | | | | |
| | | | | | 8-1 | Combustion boilers | 15316-4-1 | | | | | 15316-4-1 | | | |
| | | | | | 8-2 | Heat pumps | 15316-4-2 | 15316-4-2 | | | | 15316-4-2 | | | |
| | | | | | 8-3 | Thermal solar Photovoltaics | 15316-4-3 | | | | | 15316-4-3 | | | 15316-4-3 |
| | | | | | 8-4 | On-site cogeneration | 15316-4-4 | | | | | 15316-4-4 | | | 15316-4-4 |
| | | | | | 8-5 | District heating and cooling | 15316-4-5 | 15316-4-5 | | | | 15316-4-5 | | | 15316-4-5 |
| | | | | | 8-6 | Direct electrical heater | 15316-4-6 | | | | | 15316-4-6 | | | |
| | | | | | 8-7 | Wind turbines | | | | | | | | | 15316-4-7 |
| | | | | | 8-8 | Radiant heating, stoves | 15316-4-8 | | | | | | | | |
| 9 | Calculated Energy Performance | | 9 | Building Dynamics (thermal mass) | 9 | Load dispatching and operating conditions | | | | | | | | | |
| 10 | Measured Energy Performance | | 10 | Measured Energy Performance | 10 | Measured Energy Performance | 15378-3 | | | | | 15378-3 | | | |
| 11 | Inspection | | 11 | Inspection | 11 | Inspection | 15378-1 | | | | | 15378-1 | | | |
| 12 | Ways to Express Indoor Comfort | | 12 | -- | 12 | BMS | | | | | | | | | |
| 13 | External Environment Conditions | | | | | | | | | | | | | | |
| 14 | Economic Calculation | 15459-1 | | | | | | | | | | | | | |

Figure 1 — Position of EN 15316-4-8 within the modular structure

1 Scope

This standard is part of a series of standards on the method for calculation of system energy requirements and system efficiencies.

The scope of this specific part is to standardise the:

- required inputs;
- calculation method;
- resulting outputs,

for space heating generation by:

- air heating systems, including control;
- overhead radiant heating systems for non-domestic use, including control; and
- stoves.

This standard does not apply to heating systems that utilise water as a heat transfer medium.

Other heat generation systems such as boilers, heat pumps and others are covered in other sub modules of part M3-8.

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.

prEN 15316-1:2014, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 1*.

prEN 15603:2013, *Energy performance of buildings — Overarching standard EPBD*.

prEN 15316-2-1:2014, *Heating systems in building — Method for calculation of system energy requirements and system efficiencies — Part 2-1: Space heating emission systems*.

EN 13410, *Gas-fired overhead radiant heaters — Ventilation requirements for non domestic premises*.

EN 13240, *Roomheaters fired by solid fuel — Requirements and test methods*.

EN 13229, *Inset appliances including open fires fired by solid fuels — Requirements and test methods*.

EN 14785, *Residential space heating appliances fired by wood pellets — Requirements and test methods*.

EN 15250, *Slow release appliances fired by solid fuel — Requirements and test methods*.

EN 12815, *Residential cookers fired by solid fuel — Requirements and test methods*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, prEN 15603:2013 and the following specific definitions apply.

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3.1

air heating system

heating system composed of one or more individual forced convection air heating appliances

3.2

combustion power

product of the fuel flow rate and the net caloric value of the fuel

3.3

condensing air heater

air heater designed to make use of the latent heat released by condensation of water vapour in the combustion flue products. The heater must allow the condensate to leave the heat exchanger in liquid form by way of a condensate drain

3.4

forced convection air heater

appliance designed to provide space heating from a central source by distributing heated air, by means of an air moving device, either through ducting or directly into the heated space

3.5

flued heater

heating appliance of type B or C, connected to a flue or a device for evacuating the products of combustion to the outside of the room in which the appliance is installed

3.6

gross calorific value

quantity of heat released by a unit quantity of fuel, when it is burned completely with oxygen at a constant pressure equal to 101 320 Pa, and when the products of combustion are returned to ambient temperature

Note 1 to entry: This quantity includes the latent heat of condensation of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel.

3.7

high-low appliance

appliance capable of operating either at its nominal fuel heat input or at a fixed reduced heat input

3.8

heating system thermal loss

thermal loss from a technical building system for heating that does not contribute to the useful output of the system

Note 1 to entry: Thermal energy recovered directly in the subsystem is not considered as a system thermal loss but as heat recovery and directly treated in the related system standard.

3.9

load factor

ratio between the time the burner is on and the total time the generation system is available to supply heat as demanded by system controls

3.10

modulating appliance

appliance capable of varying its heat input in a continuous manner between the nominal fuel heat input and a minimum value, whilst maintaining continuous burner firing

3.11

multi-burner overhead radiant tube system

radiant tube heater system which employs two or more burner units with each unit incorporating independent flame monitoring. The units may be located in one or more sections of tubing. One or more fans may be used to assist in the evacuation of products of combustion or the supply of combustion air

3.12**net calorific value**

gross calorific value minus condensation latent heat of the water vapour in the products of combustion at ambient temperature

3.13**on/off appliance**

appliance without the capability to vary the fuel burning rate whilst maintaining continuous burner firing. This includes appliances with alternative burning rates set once only at the time of installation, referred to as range rating

3.14**overhead radiant heating system**

heating system composed of one or more individual overhead radiant heating appliances

3.15**overhead radiant luminous heater**

appliance intended for installation at a height above head level which is designed to heat the space beneath by radiation and in which the heat is produced by means of burning the fuel at or near the outer surface of a material such as a ceramic plaque or gauze, or by means of an atmospheric burner heating a gauze or similar material

3.16**overhead radiant tube heater**

appliance intended for installation above head level which is designed to heat the space beneath by radiation by means of a tube or tubes, heated by the internal passage of combustion products

3.17**stove**

appliance designed to provide heating in the installation through combustion of a fuel and direct emission of heat to surrounding air

3.18**type A appliance**

appliance not intended for connection to a flue or to a device for evacuation the products of combustion directly to the outside of the room in which the appliance is installed

3.19**unflued heater**

heating appliance of type A, not connected to a flue

4 Symbols and abbreviations**4.1 Symbols**

For the purposes of this document, the symbols given in prEN 15603:2013 and the specific symbols listed in Table 1 apply.

Table 1 — Symbols and units

| Symbol | Name of quantity | Unit |
|----------------|---|---------|
| α | Heat loss factor | % |
| β | Load factor, power factor | - |
| c | Correlation parameter | various |
| k | Factor, part of recoverable auxiliary energy, part of envelope losses | - |
| f | Burner multistage or modulation ratio | - |
| n | Exponent | |
| $\nabla\theta$ | Temperature gradient | K/m |
| Q | Energy | J, kWh |
| Φ | Thermal power | W |
| H | Calorific value | kWh/kg |
| m' | Mass flow rate | |
| H | Heigh | m |

4.2 Subscripts

For the purposes of this document, the subscripts given in prEN 15603:2013, and the specific subscripts listed in Table 2 apply.

Table 2 — Subscripts

| | | | | | |
|------|--------------|----------|-----------------------|------|----------------------|
| air | air | env | envelope | ON | on |
| blw | blower | exh | exiting the building | p | at constant pressure |
| br | burner | fuel | fuel | plt | pilot flame |
| ch | chimney | h | heigh | Pn | at nominal load |
| cmb | combustion | i | net (calorific value) | Pmax | at maximum power |
| cond | condensation | lrhlocal | or radiatn heater | Pmin | at minimum power |
| corr | corrected | mass | mass, specific weight | rad | radiant |
| gen | generator | mod | modulating | test | test conditions |
| gnr | generator | OFF | off | w | heating system water |
| | | | | vent | ventilation |
| aux | auxiliary | rh | recovered | ci | calculation interval |
| ext | external | out | output | H | heating |
| gen | generation | rbl | recoverable | avg | average |
| max | maximum | | | | |

5 Description of the methods

5.1 Output of the method

The following output data are calculated by this standard for each calculation step:

- fuel input to the heater or stove, $E_{H;gen;in}$;
- recoverable generation heat losses, $Q_{H;gen;ls;rbl}$;
- auxiliary energy use, $W_{H;gen;aux}$;
- maximum energy output during calculation time step, $Q_{H;gen;out;max}$;
- actual output to installation room $Q_{H;gen;out}$.

For stoves with a connection to a water based system, the following additional data are calculated:

- actual output to a connected water based heating system $Q_{H;gen;out;w}$.

The time step of the output can be:

- yearly;
- monthly;
- hourly;
- bin;

and is the same time-step of the input.

5.2 Alternative methods

The following calculation procedures are given in this standard:

- on/off heaters: see clause 6;
- multistage or modulating heaters: see clause 7;
- stoves with or without water based connection to a heating system: see clause 8.

For heaters, which procedure to apply depends on the power control type, according to the identifier LRH_CTRL_POW.

For stoves, which procedure to apply depends on the availability of heat for a water based connection, according to the identifier LRH_WCONN.

The default selection criteria are given in Table B.21 and B.22.

5.3 Connection with building needs and zoning

The space heated by the heater or stove shall be determined as follows:

- if the heater or stove is the only heating appliance in a room, the entire room heating energy demand;
- if there are several local heaters in a room, consider a fraction of load proportional to rated power of the appliance (distribution rule);
- a local heater or stove cannot supply heat to another room unless there is a dedicated system to transfer heat to neighboring rooms. This can be taken into account only if the connection covers the capacity for the additional room.

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EXAMPLE fireplace with dedicated air ducts and fan.

5.4 Application data

To guarantee consistency with the calculation procedure, application data shall be specified according to the template given in normative Annex A.

Default data for the application of this standard is given in informative Annex B.

6 Single stage heaters**6.1 Output data**

The output data of this method are listed in Table 3.

Table 3 — Output data of this method

| Description | Symbol | Unit | Validity interval | Intended destination module |
|---|---------------------|------|-------------------|-----------------------------|
| Generation input | $E_{H;gen;in}$ | kWh | $0 \dots \infty$ | M3-1 M1-9 |
| Recoverable heat losses | $Q_{H;gen;ls;rbt}$ | kWh | $0 \dots \infty$ | M2-2 |
| Total auxiliary energy | $W_{H;gen;aux}$ | kWh | $0 \dots \infty$ | M3-1 |
| Maximum energy output during calculation interval | $Q_{H;gen;out;max}$ | kWh | $0 \dots \infty$ | M3-1 |
| Actual energy output during calculation interval | $Q_{H;gen;out}$ | kWh | $0 \dots \infty$ | M3-1 |
| Fuel type | BLR_FUEL | List | List | M1-9 |

Generation input $E_{H;gen;in}$ is the fuel required by the heater in the calculation time step.

Recoverable heat $Q_{H;gen;ls;rbt}$ is the recoverable heat for heating in the calculation time step.

Total auxiliary energy $W_{H;gen;aux}$ is the auxiliary energy use during the calculation time step.

Maximum energy output during time step $Q_{H;gen;out;max}$ is the maximum output during the calculation time step.

Actual energy output $Q_{H;gen;out}$ is the heat released to the installation room in the calculation time step.

Fuel type is the fuel used by the heater.

6.2 Calculation time steps

The calculation methods described in clause 6 are suitable for the following calculation time steps:

- yearly (seasonal);
- monthly;
- hourly;
- bin.

For this method, the output time step is the same as the input time-step.

This method does not take into account any dynamic effect.

This method can be used within a dynamic calculation scheme.

If all input data are available with a shorter time step than the desired output:

- the calculation is performed according to the input data time step;
- the output values are combined taking:
 - the sum for extensive properties like required energy output;
 - the time averaged value for intensive properties like temperature.

If only part of the input data are available with a shorter time step than the desired output:

- the input values are combined taking:
 - the sum for extensive properties like required energy output;
 - the time averaged value for intensive properties like temperature;
- the calculation is performed according to the output data time step.

6.3 Input data

6.3.1 Product data

6.3.1.1 Product description data (qualitative)

The product description data of local heaters is given by

- LRH_TYPE: heater or stove type;
- LRH_USE: heater use;
- LRH_FUEL: fuel type (natural gas, LPG, oil, etc.);
- LRH_CTRL_POW: type of power control;
- LRH_COND: condensing or non-condensing heater;
- LRH_PILOT: pilot flame;
- LRH_VENT: ventilation requirements;
- LRH_WCONN: connection to a water based heating system,

and are identified by the strings defined in Tables B1 through B6 in clause B.1.1.

NOTE Air heaters are used for heating only. Parameter LRH_USE is given for consistency with other generators type.