

**SLOVENSKI STANDARD**  
**kSIST-TP FprCEN/TR 15316-6-9:2016**  
**01-december-2016**

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**[Not translated]**

Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 6-9: Explanation and justification of EN 15316-4-8, Module M3-8-8

Heizungsanlagen und Wasserbasierte Kühlanlagen in Gebäuden - Verfahren zur Berechnung der Energieanforderungen und Nutzungsgrade der Anlagen - Teil 6-9: Begleitender TR zur EN 15316-4-8 (Wärmeerzeugung von Warmluft- und Strahlungsheizsystemen)

[SIST-TP CEN/TR 15316-6-9:2018](https://standards.iteh.ai/catalog/standards/sist/d709388b-2786-4396-8454-e2f7f97f74d1/sist-tp-cen-tr-15316-6-9-2018)

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**Ta slovenski standard je istoveten z: FprCEN/TR 15316-6-9**

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**ICS:**

91.120.10	Toplotna izolacija stavb	Thermal insulation of buildings
91.140.10	Sistemi centralnega ogrevanja	Central heating systems

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Energy performance of buildings - Method for calculation  
of system energy requirements and system efficiencies -  
Part 6-9: Explanation and justification of EN 15316-4-8,  
Module M3-8-8

Heizungsanlagen und Wasserbasierte Kühlanlagen in  
Gebäuden - Verfahren zur Berechnung der  
Energieanforderungen und Nutzungsgrade der  
Anlagen - Teil 6-9: Begleitender TR zur EN 15316-4-8  
(Wärmeerzeugung von Warmluft- und  
Strahlungsheizsystemen)

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

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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## Contents

Page

European foreword.....	4
Introduction .....	5
1 Scope .....	7
2 Normative references.....	9
3 Terms and definitions .....	9
4 Symbols and subscripts .....	9
4.1 Symbols.....	9
4.2 Subscripts.....	9
5 Information on the methods .....	10
5.1 Output of the method.....	10
5.2 Alternative methods .....	10
5.3 Connection with building needs and zoning .....	11
5.4 Application data.....	11
5.5 Using net and gross calorific values .....	11
6 Single stage heaters.....	11
6.1 Rationale .....	11
6.1.1 General.....	11
6.1.2 Losses calculation principle .....	12
6.1.3 Auxiliary energy .....	12
6.1.4 Expression of heat losses.....	13
6.1.5 Recoverable, recovered and unrecoverable heat losses .....	13
6.1.6 Input data.....	14
6.1.7 Characterization of a heater.....	14
6.1.8 Characterization of local heaters include into lot 20 of Ecodesign regulation .....	15
6.1.9 Operating conditions characterization .....	15
6.1.10 Energy balance diagram .....	15
6.1.11 Assumptions.....	17
6.2 Calculation intervals .....	17
6.3 Input data.....	17
6.3.1 Product data.....	17
6.3.2 System design data .....	20
6.3.3 Operating conditions .....	20
6.3.4 Constants and physical data.....	20
6.4 Calculation procedure .....	21
6.4.1 Applicable timestep.....	21
6.4.2 Time with burner ON and OFF.....	21
6.4.3 Loss factors calculation.....	21
6.4.4 Recovered auxiliary energy.....	22
6.4.5 Energy calculation .....	22
7 Multistage and modulating heaters.....	23
7.1 Output data.....	23
7.2 Calculation intervals .....	23

7.3	Input data .....	23
7.3.1	Product data .....	23
7.3.2	System design data .....	23
7.3.3	Operating conditions .....	23
7.3.4	Constants and physical data .....	23
7.4	Calculation procedure .....	23
7.4.1	Applicable calculation interval .....	23
7.4.2	Operating conditions calculation .....	23
7.4.3	Time with burner ON and OFF .....	23
7.4.4	Loss factors calculation .....	23
7.4.5	Auxiliary energy at minimum power .....	24
7.4.6	Energy calculation .....	24
8	Stoves and local heaters .....	24
8.1	General .....	24
8.2	Stoves without connection to a water based system .....	25
8.2.1	Output data .....	25
8.2.2	Input data .....	25
8.2.3	Special cases .....	25
8.2.4	Data input for solid fuel local heaters included in Lot 20 of Ecodesign regulation .....	25
8.3	Stoves and local heaters with a connection to a water based heating system .....	25
9	Method selection .....	25
10	Worked out examples .....	26
11	Application range .....	26
12	Regulation use .....	26
13	Information on the accompanying spreadsheet .....	26
14	Results of the validation tests .....	26
15	Quality issues .....	26
Annex A	(informative) Calculation flowchart .....	27
A.1	Single stage heater .....	27
A.2	Multi-stage and modulating heaters .....	28
Annex B	(informative) Balance equations and origin of iteration equations .....	29
B.1	General .....	29
B.2	Energy balance for single stage heaters .....	29
B.3	Multi-stage or modulating .....	30
B.3.1	Expression of losses .....	30
B.3.2	Multi-stage or modulating - on/off attempt .....	31
B.3.3	Multi-stage or modulating - average power calculation .....	31
Annex C	(informative) Calculation examples .....	33
C.1	Example: On-Off heater .....	33
Bibliography	.....	41

## European foreword

This document (FprCEN/TR 15316-6-9:2016) 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 Vote.

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

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## Introduction

The set of EPB standards, technical reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

- a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards [1];
- b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards [2];
- c) the detailed technical rules are the basis for the following tools:
  - 1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses;
  - 2) a common template for each technical report that accompanies an EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses;
  - 3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, prEN ISO 52000-1:2015.

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

### Rationale behind the EPB technical reports

There is a risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally or regionally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [2]):

- to avoid flooding and confusing the actual normative part with informative content,

**FprCEN/TR 15319-6-9 (E)**

- to reduce the page count of the actual standard, and
- to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [5] that laid the foundation for the preparation of the set of EPB standards.

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## 1 Scope

This Technical Report refers to standard prEN 15316-4-8:2014, module M3-8.8.

It contains information to support the correct understanding, use and national adaptation of prEN 15316-4-8:2014.

This Technical Report does not contain any normative provision.

The scope of prEN 15316-4-8:2014 includes three categories of products:

- air heating systems means a system with one or more warm air generators for heating purpose. The hot air may be diffused in the installation space from the generator or distributed via a ductwork.
- overhead radiant heating systems, means systems using gas and designed to provide heat into the installation room. Radiation may be generated directly by the flame (overhead radiant luminous heaters) or by circulation of flue gas in a ductwork installed near the ceiling (overhead radiant tube heaters).
- stoves and local heaters means local devices that provide heat by transferring the heat generated by combustion into the surrounding environment.

The typical devices are shown in Figures 1 to 4.



**Figure 1 – Warm air generator for an air heating system**



Figure 2 – Overhead radiant luminous heater

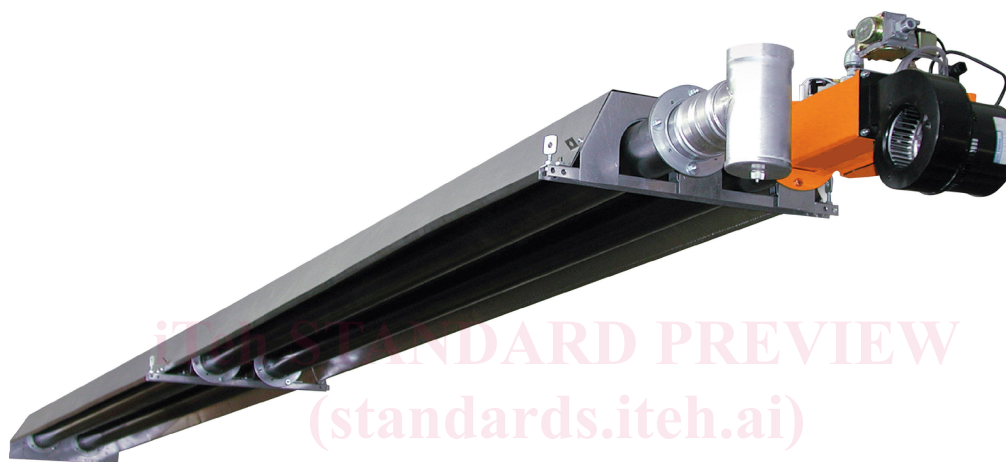


Figure 3 – Overhead radiant tube heater



a)



b)

Figure 4 – Examples of local space heater: pellet stove and inset

## 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 15316-4-8:2014, *Energy performance of buildings — Module M3-8-8 - Space heating generation — Part 4-8: Air and overhead heaters, stoves*

EN ISO 7345:1995, *Thermal insulation - Physical quantities and definitions (ISO 7345:1987)*

prEN ISO 52000-1:2015, *Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures (ISO/DIS 52000-1:2015)*

NOTE References in the text of the standard are given as module codes that are detailed in the annex. This enables flexible references (e.g. to national documents where necessary for local application) and use outside the CEN environment.

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, prEN ISO 52000-1:2015, prEN 15316-4-8:2014 apply.

NOTE 1 No new definition is given in this Technical Report.

NOTE 2 During public enquiry, it was commented that the term “stove” is not appropriate. The correct term, which is used in the product standard is “local heaters”, meaning a heater which is not attached to any distribution system. The term “stove” survived in the title, as a synonym of “local heater” because the title of a standard cannot be changed during the drafting process.

## 4 Symbols and subscripts

### 4.1 Symbols

For the purposes of this document some special symbols are defined prEN 15316-4-8:2014.

- $\alpha$  is used for losses factors. They are expressed as a percentage, so the usual range is 0 to 100. Some negative values or values beyond 100 are expected when dealing with condensing heaters.
- $\beta$  is used for loaf factors. They are expressed in per unit, so the usual range is 0 to 1. Typically  $\beta$  is a value that changes at each calculation interval depending on load.
- $\nabla \theta$  has been used for the vertical temperature gradient.

NOTE:  $\nabla \theta$  is not a temperature difference but a temperature gradient, e.g. a temperature difference per unit length expressed in °C/m

### 4.2 Subscripts

The subscript “lrh” (“Local Radiant Heaters”) has been used to identify all symbols that are exclusive to this standard.

## 5 Information on the methods

### 5.1 Output of the method

The output of this method is the same as any heat generation sub-system and the same time-step of the output. If necessary, it is possible to combine different calculation intervals for the input and the output. This is specified in 6.2 of prEN 15316-4-8:2014.

No significant dynamic effect is taken into account. There is no difference in the calculation for any calculation interval from hourly to seasonal.

A more detailed analysis could be required in future for independent heaters with a high heat capacity (slow release heat stoves).

The heater seasonal efficiency or expenditure factor could be used as a legal requirements. It should be clear if this indicator has to include or not the effect of auxiliaries and, if so, which weighting factors shall be used. More information about extracting specific indicators is available in prEN 15316-1:2014.

The calculated performance of the heater takes into account:

- type and characteristics of the radiant heater;
- heater settings;
- type of the heater control;
- location of the heater (e.g. indoor/outdoor);
- operating conditions;
- heat requirement.

### 5.2 Alternative methods

A separate method is given for:

- on-off heaters (Clause 6 of prEN 15316-4-8:2014);
- multi-stage and modulating heaters (Clause 7 of prEN 15316-4-8:2014).

No distinction is made between multi-stage and modulating heaters. A linear behaviour is assumed between minimum and maximum power continuous operation.

An on/off heater is characterized by 2 possible states:

1. burner off (tON);
2. burner on at maximum power (tOFF).

and the calculation procedure determines the duration of  $t_{lrh;ON}$  (or the load factor  $\beta_{lrh;cmb}$ )

A multistage or modulating generator is characterized by 3 states:

3. burner off;
4. burner on at minimum power;
5. burner on at maximum power.

It is assumed that only two situations are possible:

6. the burner is operating intermittently as a single stage burner at minimum power;
7. the burner is operating at a constant average power between minimum and maximum power.

A separate complementary procedure is given for heaters that include a heat exchanger to provide heat to a water based heating system (8.3).

### 5.3 Connection with building needs and zoning

Since there is no distribution system, a radiant heater or a stove may contribute only to the heating of the spaces where it is installed.

It is relevant to limit the possibility of the heater to supply heat to the building especially in the case of wood stoves and other heaters running with biomass to avoid unreal advantages.

This implies that thermal zones are set up so to isolate the part of the building that might be heated by a local heater. As an alternative, the potential contribution of the local heater or stove to the thermal zone should be limited to a quota given by the ratio between the area or volume heated and the thermal zone area or volume.

### 5.4 Application data

No application data are specified in the normative part of prEN 15316-4-8:2014.

Annex A of prEN 15316-4-8:2014 provides a template to specify the required application data.

Annex B of prEN 15316-4-8:2014 includes informative default application data for immediate use of the standard. Other application data can be specified by national standards and regulations, depending on the purpose of the calculation.

See also A.1 and B.1 of prEN 15316-4-8:2014.

### 5.5 Using net and gross calorific values

The method described in prEN 15316-4-8:2014 is based on the net calorific value, which is the most common reference in the legislation, also for safety issues.

If the input data are given with reference to gross calorific values it has to be converted.

If the output data are desired with reference to gross calorific values it has to be converted.

Net and gross calorific values are given by reference to prEN ISO 52000-1:2015. A different (e.g. national) reference can be specified via a specific table complying with Table A.1.

## 6 Single stage heaters

### 6.1 Rationale

#### 6.1.1 General

The calculation method for air and radiant heaters and stoves is based on the analysis and estimation of losses.

The main input data are the tested efficiencies at full and minimum power and losses factors.

Measured efficiencies are converted into losses factors.