



SLOVENSKI STANDARD SIST EN 15544:2023

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Lončene peči - Dimenzioniranje

One off Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) - Dimensioning

Ortsfest gesetzte Kachelgrundöfen/Putzgrundöfen - Auslegung

Poêles en faïence, poêles en maçonnerie fabriqués in situ - Dimensionnement

Ta slovenski standard je istoveten z: **EN 15544:2023**

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This European Standard was approved by CEN on 2 January 2023.

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

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European foreword

This document (EN 15544:2023) has been prepared by Technical Committee CEN/TC 295 “Residential solid fuel burning appliances”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by August 2023, and conflicting national standards shall be withdrawn at the latest by August 2023.

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 supersedes EN 15544:2009.

The main changes compared to the previous edition are listed below:

- a) correction of editorial mistakes;
- b) correction of mistakes in formulae;
- c) calculation of the fuel load based on a variable efficiency instead of a fixed efficiency of 78 %;
- d) introduction of calculated flue pipe length;
- e) introduction of factors to calculate minimum flue pipe length depending on efficiency (Table 1);
- f) specification of water content and dimensions of the used log wood;
- g) calculation of the minimum load; [SIST EN 15544:2023
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- h) specification how to deal with type tested combustion chambers;
- i) change of the portion of the glass plate compared to the inner surface of the combustion chamber;
- j) definitions of fair fuel ratio and calculated flue pipe length added;
- k) definitions of “construction with air gap” and “construction without air gap” updated;
- l) specification of the relation between nominal heat output and full house as well as partial heating;
- m) specification that in divergence to EN 13384-1 the dew point condition is calculated only for nominal heat output.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

EN 15544:2023 (E)**Introduction**

This document specifies a calculation method for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves).

This calculation method for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) is based on appropriate literature as well as EN 13384-1, and where empirically determined correlations are used in addition to physical and chemical formulas.

In case of a calculation method for different interior materials than fireclay the proof of the compliance of the emission values and the efficiency shall be delivered separately. Also, the empiric data of the combustion chamber dimensions, the minimum flue pipe length, the burning rate as well as the combustion chamber temperature and the decrease of the temperature along the flue pipe shall also be separately determined.

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1 Scope

The application of the calculations of this document enables a verification of the emission values carbon monoxide, nitrogen dioxide, organically bound carbon as well as dust and the energy efficiency.

Complying with the calculations of this document results in emission values less or equal for carbon monoxide $1\,500\text{ mg/m}_n^3$ ($1\,000\text{ mg/MJ}$), nitrogen dioxide 225 mg/m_n^3 (150 mg/MJ), organically bound carbon 120 mg/m_n^3 (80 mg/MJ) and dust 90 mg/m_n^3 (60 mg/MJ). If the calculations of this document are used in combination with suitable combustion chambers that prove lower emission values in a type test, these values are also considered to be complied with.

There might be national or local regulations, which impose stricter legal emissions and/or efficiency requirements.

This document specifies calculations for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) based upon the required nominal heat output of the stove as declared by the producer. The Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) are of individual one-off construction design. The document can be used for log wood fired Kachelgrundöfen/Putzgrundöfen (tiled/plastered stoves) that burn one fuel load per storage period with a maximum load between 10 kg and 40 kg (log wood with water content from 12 % to 20 %, thickness of 5 cm to 10 cm in diameter, length varies usually from 25 cm to 50 cm, and is oriented toward the combustion chamber dimensions) and a storage period (nominal heating time) between 8 h and 24 h.

This document is applicable for Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) equipped with fireclay as interior material, with an apparent density between $1\,750\text{ kg/m}^3$ and $2\,300\text{ kg/m}^3$, a degree of porosity from 17 % up to 33 % by volume and a heat conductivity from $0,90\text{ W/mK}$ up to $1,35\text{ W/mK}$ (temperature range 20 °C to 400 °C).

This document is applicable for Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) with combustion air supply from the side via a firebox door frame or the standing grate of the heating door into the combustion chamber. The document is applicable for an inflow speed of the combustion air between 2 m/s and 4 m/s.

This document also applies to the combination with combustion chambers that are suitable for one-off Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) and for which compliance with the legally required emission values has been verified as part of a type test by an accredited and/or notified body.

The following general conditions apply to such combustion chambers:

- with an air-fuel ratio of between 1,95 and 3,95 according to the type test;
- with a maximum load from 5 kg to 40 kg;
- using other suitable materials as well as fireclay.

With regard to the type test, this document is applicable for combustion chambers which are tested:

- according to EN 15250 (or EN 16510-2-5¹);
- according to EN 13229 (or EN 16510-2-2); or
- according to respective national standards (e.g. ÖNORM B 8303).

¹ Under preparation. Stage at the time of publication: prEN 16510-2-5:2023.

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This document is applicable for type tested combustion chambers designed for batch fired pellet burning if meeting the requirements according to this document (air-fuel ratio between 1,95 and 3,95, the load of the pellets burned in (78 ± 20) min).

This document is not applicable for:

- combinations with water heat exchangers for central heating or other heat absorbing elements like open water tanks, etc.;
- combustion chambers with glass plates greater than 1/5 of the combustion chamber surface;
- mass-produced prefabricated stoves (slow heat release appliances) or partly prefabricated stoves (slow heat release appliances) according to EN 15250 (or EN 16510-2-5¹).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 13384-1, *Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one combustion appliance*

3 Terms and definitions

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

**3.1
air-fuel ratio**

ratio between the amount of air supplied to the combustion and the theoretically required amount of air

**3.2
calculated flue pipe length**

$L_{Z_calculated}$

length which is required to determine the flue gas temperatures in the flue pipe

**3.3
construction with air gap**

construction, with an air gap between the inner and the outer shell

Note 1 to entry: It is a construction with an air gap if the distance between the inner and outer shell is at least 2,5 cm and more than 50 % of the Kachelgrundofen/Putzgrundofen (tiled/mortared stove) is built in this way.

**3.4
construction without air gap**

construction, with no air gap between the inner and the outer shell

Note 1 to entry: It is a construction with no air gap if the distance between the inner and outer shell is less than 2,5 cm and at least 50 % of the Kachelgrundofen/Putzgrundofen (tiled/mortared stove) is built in this way.

3.5**combustion chamber base** A_{BR}

area of a horizontal cut through the combustion chamber at the height of the lower edge of the firebox opening

3.6**combustion chamber height** H_{BR}

mean vertical distance between the combustion chamber base and the combustion chamber ceiling

3.7**combustion chamber surface** O_{BR}

sum of the inner surfaces of the combustion chamber

3.8**mean combustion chamber temperature** t_{BR}

value to calculate the thermal lift in the combustion chamber

3.9**burning rate** m_{BU}

maximum fuel load divided by burning time

3.10**combustion chamber admeasurement** U_{BR}

admeasurement of the combustion chamber base

3.11**gas slot**

permanent small shortcut from the combustion chamber as directly as possible into the chimney

3.12**flue pipe length** L_Z

length of the connecting line of all geometric centres of the flue pipe profiles from the combustion chamber exit to the connecting pipe entrance

3.13**Kachelgrundofen****tiled stove****Kachelofen**

one off slow heat release appliance, which is adapted individually to local conditions and whose visible surface is predominantly made of tiles

3.14**short flue pipe section**

section of the flue pipe, where the length of the section is shorter than the hydraulic diameter

EN 15544:2023 (E)**3.15****minimum flue pipe length** L_{Zmin}

minimal acceptable length of the flue pipe

3.16**maximum load** m_B

load of the fuel at nominal heat output

3.17**minimum load** m_{Bmin}

load of the fuel at the lowest reduced heat output

3.18**nominal heat output**

mean useable heat output of the heating appliance

3.19**Putzgrundofen****mortared stove****Putzofen**

one off slow heat release appliance, which is adapted individually to local conditions and whose visible surface is predominantly plastered

3.20**storage period****nominal heating time**

period of time specified by the producer where the nominal heat output is set free

3.21**energy efficiency**

proportion (in percent) of the nominal heat output multiplied with the storage period to the total heat input

4 Calculations**4.1 Nominal heat output**

The nominal heat output (P_n) of the stove shall be specified by the manufacturer so that the values of the stove can be calculated according to 4.2 to 4.10. When specified to heat a full house or building unit, the nominal heat output (P_n) shall correspond to the design heating load of the room or rooms to be heated. In the case of partial heating, in which only part of the design heating demand of the installation room is covered, the nominal heat output (P_n) can be selected lower.

4.2 Load of fuel

4.2.1 Maximum load

The maximum load shall be at least 5 kg of fuel and shall be calculated as follows:

$$m_B = \frac{P_n \cdot t_n}{\frac{\eta_{\min}}{100} \cdot 4,16} \quad (1)$$

NOTE 1 To calculate, a net calorific value of wood of 4,16 kWh*kg⁻¹ is presumed.

where

- m_B is the maximum load (kg);
- P_n is the specified nominal heat output (kW);
- t_n is the specified storage period (h);
- η_{\min} is the required minimum efficiency in %.

NOTE 2 The storage period can vary between 8 h and 24 h.

If tested combustion chambers are used, the maximum load at nominal heat output shall be the maximum fuel mass according to the type test.

4.2.2 Minimum load

The definition and calculation of the minimum load is only necessary if a reduced heat output is declared by the manufacturer. The minimum load shall be calculated as 50 % of the maximum load as follows:

$$m_{B\min} = 0,5 \cdot m_B \quad (2)$$

where

- m_B is the maximum load (kg);
- $m_{B\min}$ is the minimum load (kg).

If tested combustion chambers are used, the minimum load at reduced heat output shall be the minimum fuel mass according to the type test. The share can deviate from the 50 % according to Formula (2).

4.3 Design of the essential dimensions

4.3.1 Combustion chamber dimensions

4.3.1.1 General

The height of the lowest opening shall be at least 5 cm above the floor of the combustion chamber.

NOTE Designing the dimensions of the combustion chamber serves two main purposes: Firstly, to ensure that sufficient room is available to contain the fuel needed to be charged and secondly, that the requirements for clean combustion are met. 4.3.1 does not apply to tested combustion chambers.