
Dimniki - Računske metode termodinamike in dinamike fluidov - 2. del: Dimniki za več kot eno ogrevalno napravo

Chimneys - Thermal and fluid dynamic calculation methods - Part 2: Chimneys serving more than one combustion appliance

Abgasanlagen - Wärme- und strömungstechnische Berechnungsverfahren - Teil 2: Abgasanlagen mit mehreren Verbrennungseinrichtungen

Conduits de fumée - Méthodes de calcul thermo-aéraulique - Partie 2: Conduits de fumée desservant plus d'un appareil à combustion

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Chimneys - Thermal and fluid dynamic calculation methods - Part 2: Chimneys serving more than one combustion appliance

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European foreword

This document (prEN 13384-2:2026) has been prepared by Technical Committee CEN/TC 166 “Chimneys”, the secretariat of which is held by ASI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13384-2:2015+A1:2019.

In comparison to EN 13384-2:2015+A1:2019, the following technical changes have been made:

- editorial mistakes have been corrected;
- the calculation methods were extended to include the O₂ content of the flue gas;
- the pressure requirements for negative pressure chimneys have been modified for a possible connection of a positive pressure combustion appliance with a total or partly positive pressure connection pipe;
- remarks have been added for the temperature requirement;
- for concentric duct the simplified heat transfer calculation method based on S_{rad} has been deleted. Therefore, the detailed calculation method has been added from part 1;
- a new clause has been created for calculation of a common balanced flue chimney with more than one flue pipe;
- a clarification is made for the ζ -values of terminals, linked to static pressure;
- a new Annex C “Example for a report about input and output data of the calculation” has been added.

EN 13384, *Chimneys — Thermal and fluid dynamic calculation methods* consists of three parts:

- *Part 1: Chimneys serving one combustion appliance*
- *Part 2: Chimneys serving more than one combustion appliance*
- *Part 3: Methods for the development of diagrams and tables for chimneys serving one heating appliance*

prEN 13384-2:2026 (E)**Introduction**

The calculation described in this document is complex and is intended to be solved by using a computer program. The general principles of the calculation method of prEN 13384-1:2025 also apply to this document.

This document is in support of the execution standards for a chimney installation serving more than one combustion appliance.

The execution standards in conjunction with installation instructions identify limitations and safety considerations associated with the design, installation, commissioning and maintenance of a chimney serving more than one combustion appliance (not dealt within the calculation method).

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1 Scope

This document specifies methods for calculation of the thermal and fluid dynamic characteristics of chimneys serving more than one combustion appliance.

This part of prEN 13384 covers the following cases:

- a) where the chimney is connected with more than one connecting flue pipe from individual or several combustion appliances in a multi-inlet arrangement;
- b) where the chimney is connected with an individual connecting flue pipe connecting more than one combustion appliance in a cascade arrangement; or
- c) where the balanced flue chimney consists of a collective air supply duct serving the combustion air to more than one combustion appliance. Each combustion appliance is connected to an individual flue duct located inside the collective air supply duct to the outlet. Every individual flue duct has a temperature class not exceeding T120, a pressure class of P1, M1 or H1 and a sootfire class of O.

The case of multiple inlet cascade arrangement is covered by the case a).

This part of prEN 13384 deals with chimneys operating under negative pressure conditions (there can be positive pressure condition in the connecting flue pipe) and with chimneys operating under positive pressure conditions and is valid for chimneys serving combustion appliances for liquid, gaseous and solid fuels.

For positive pressure chimneys (case a), b) and c)) this part only applies if any combustion appliance which is out of action can be positively isolated to prevent flue gas back flow.

This part of EN 13384 does not apply to:

- chimneys with different thermal resistance or different cross-section in the various chimney segments. This part does not apply to calculate energy gain;
- chimneys with open fire places, e.g. open fire chimneys or chimney inlets which are normally intended to operate open to the room;
- chimneys which serve different kinds of combustion appliances regarding natural draught, fan assisted, forced draught or combustion engine. Fan assisted combustion appliances with draught diverter between the fan and the chimney are considered as natural draught combustion appliances;
- chimneys with multiple inlets from more than 5 storeys. (This does not apply to balanced flue chimney.);
- chimneys serving combustion appliances with open air supply through ventilation openings or air supply ducts, which are not installed in the same air supply pressure region (e.g. same side of building).

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 1443:2019, *Chimneys — General requirements*

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prEN 13384-1:2025, *Chimneys — Thermal and fluid dynamic calculation methods — Part 1: Chimneys serving one combustion appliance*

EN 15287-1:2023, *Chimneys — Design, installation and commissioning — Part 1: Chimneys for non-roomsealed combustion appliances*

EN 15287-2:2023, *Chimneys — Design, installation and commissioning — Part 2: Chimneys and connecting flue pipes for roomsealed combustion appliances*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1443:2019, prEN 13384-1:2025, EN 15287-1:2023, EN 15287-2:2023 and the following apply.

3.1**chimney segment**

part of a chimney between two consecutive flue gas connections or between the last flue gas connection and the chimney outlet

3.2**collector segment**

part of a connecting flue pipe between two consecutive flue gas connections or between the last flue gas connection and the chimney inlet

3.3**flue gas mass flow** **\dot{m}**

mass of the flue gas leaving the combustion appliance through the connecting flue pipe per unit of time

Note 1 to entry: In case of a chimney serving more than one combustion appliance, the air being transported through a combustion appliance which is out of action is also given the term flue gas mass flow.

3.3.1**declared flue gas mass flow** **$\dot{m}_{w,j}$**

flue gas mass flow given in the documentation of the combustion appliance j with respect to the heat output used in the calculation

3.3.2**calculated flue gas mass flow** **$\dot{m}_{wc,j}$**

flue gas mass flow calculated with respect to calculated draught and the working conditions of the combustion appliance j

3.4**calculated flue gas temperature** **$T_{wc,j}$**

flue gas temperature at the outlet of the combustion appliance j depending on the calculated flue gas mass flow

3.5**calculated draught of the flue gas of the combustion appliance** $P_{wc,j}$

draught at the flue gas outlet of the combustion appliance j depending on the calculated flue gas mass flow

3.6**flue damper**

device to close or partially close the flue

3.7**balanced flue chimney**

chimney where the point of air entry to the air supply duct is adjacent to the point of discharge of combustion products from the flue, the inlet and outlet being so positioned that wind effects are substantially balanced

3.8**cascade arrangement**

arrangement where two or more combustion appliances situated in the same space are connected by a common connecting flue pipe to the chimney

3.9**multi inlet arrangement**

arrangement where two or more combustion appliances are connected to the chimney by individual connecting flue pipes

3.10**air supply duct**

independent duct in a building or a structural part of a flue terminal conveying combustion air to a room-sealed combustion appliance

3.11**pressure equalizing opening**

opening or duct that directly connects the air supply duct with the flue at its base

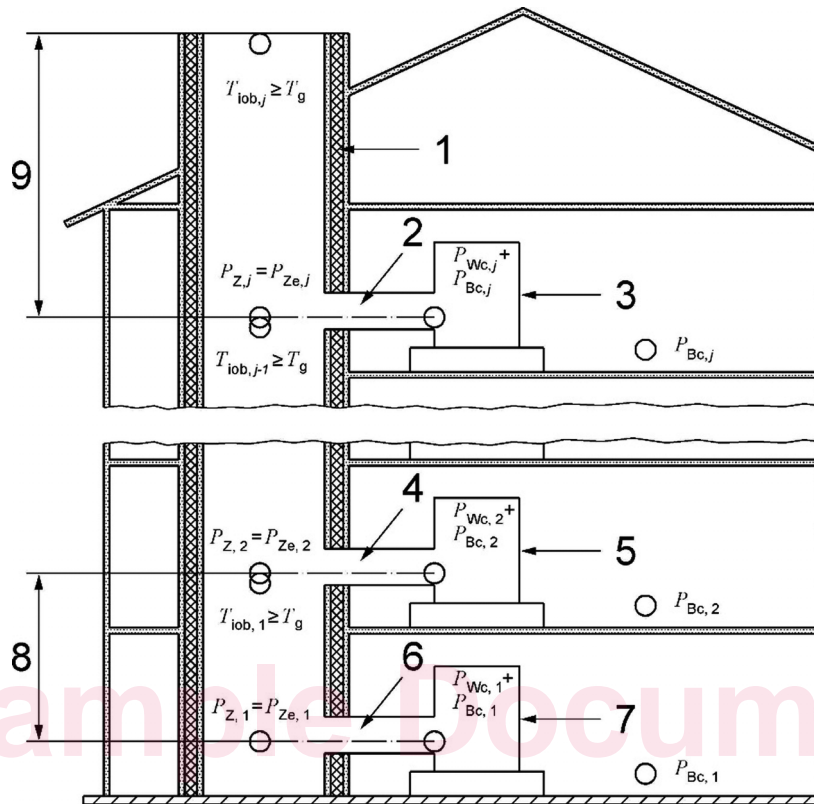
4 Symbols and abbreviations

Symbols, terminology and units are given to make the text of this document understandable. A list of general symbols and abbreviations is given in prEN 13384-1:2025, Clause 4. Indices added to symbols for purposes of the calculation method for chimneys serving more than one combustion appliance relate to one chimney segment and connecting flue pipe section. An example of an indices numbering scheme is given in Figures 1 and 2. Indices numbering begins at the lowest, farthest combustion appliance connection. For more than one cascade system/connection, the indices numbering scheme for the calculation formula should be adopted in a similar manner to that for a single cascade scheme. Symbols assigned to a specific section will be indicated by the number of the section after the comma (e. g. $H_{,1}$ is the effective height of a section of a chimney segment between the outlet of the connecting flue pipe of the combustion appliance in the lowest position and the outlet of the connecting flue pipe of the next combustion appliance).

Each symbol and abbreviation is explained at the formula where it is used.

5 Calculation method

5.1 General principles



Key

- 1 chimney
- 2 connecting flue pipe j
- 3 combustion appliance j
- 4 connecting flue pipe 2
- 5 combustion appliance 2
- 6 connecting flue pipe 1
- 7 combustion appliance 1
- 8 chimney segment 1
- 9 chimney segment j

Figure 1 — Example of multiple inlet arrangement and numbering pressure values and temperature values of a chimney serving more than one combustion appliance

The calculation is based upon determining the mass flow distribution in the chimney which fulfils the pressure equilibrium condition (Formula (1) or (4)) at each flue gas inlet to the chimney (see Figure 1). After such a distribution has been found four requirements shall be verified:

- a) the mass flow requirement (Formulae (7) and (8));
- b) the pressure requirement for minimum draught (Formula (9) and, if appropriate, Formulae (10), (11), (12) or (13)), or for maximum positive pressure (Formulae (15) and (16));
- c) the pressure requirement for maximum draught (Formula (14)) or for minimum positive pressure (Formula (17));

d) the temperature requirement (Formula (18)).

NOTE The calculation is affected by the specific installation design. For recommendations for the installation of combustion appliance and connection flue pipes, see Annex A.

The pressure requirements for maximum draught or minimum positive pressure are only required if there is a limit for the maximum draught for the negative pressure combustion appliance or a minimum differential pressure of the positive pressure combustion appliance.

In order to verify the criteria, two sets of external conditions are used:

- the calculation of the minimum draught and maximum positive pressure is made with conditions for which the capacity of the chimney is minimal (i.e. high outside temperature); and also
- the calculation of the maximum draught and minimum positive pressure and of the inner surface temperature with conditions for which the inside temperature of the chimney is minimal (i.e. low outside temperature).

The validation of the mass flow requirement and pressure requirement shall be done at following working conditions, using the external and ambient air temperatures specified in prEN 13384-1:2025:

- all combustion appliances are simultaneously operating at nominal heat output;
- all combustion appliances are simultaneously operating at minimum heat output;
- a single combustion appliance operating at nominal heat output and all other combustion appliances out of action (all possible cases);
- a single combustion appliance operating at minimum heat output and all other combustion appliances out of action (all possible cases);
- for positive pressure chimneys a single combustion appliance operating at minimum nominal heat output and all other combustion appliances operating at maximum nominal heat output (all possible cases).

If the control of the installation guarantees that not all combustion appliances will be in operation simultaneously, the validation of the mass flow requirement and pressure requirement may be done with the maximum number of combustion appliances which will be in operation under the most adverse condition.

The validation for the mass flow requirement and pressure requirement for working conditions with combustion appliances at minimum heat output is not required in the following cases:

- the combustion appliances do not have any heat output range;
- the combustion appliances have a heat output which is limited to a fixed value as specified on a label on the combustion appliance. In this case the nominal heat output is the given heat output on the label;
- combustion appliances heated with solid fuels without fan and combustion appliances with regulated air supply.

The validation of the mass flow requirement for working conditions with combustion appliances at nominal heat output is not required in the following case:

- the combustion appliances have a flue gas mass flow at minimum heat output higher than or equal to the flue gas mass flow at nominal heat output.

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The temperature requirement shall be validated for the following relevant working condition, using the ambient and external air temperatures as specified in prEN 13384-1:2025:

- combustion appliances for solid fuels without fan and combustion appliances with regulated air supply are in operation at nominal heat output;
- combustion appliances with a draught diverter which provide domestic hot water only are out of action. These combustion appliances operate with a considerable secondary air (these operate only a short time and therefore it can be assumed that condensation will not cause damage or a lack in safety);
- combustion appliances with a fixed output range are in operation at this (nominal) heat output;
- all other combustion appliances are in operation at minimum heat output.

When chimneys suitable for operating under wet conditions are located inside a building, the check of the temperature requirement is necessary only for the top of the chimney.

The validation of the temperature requirement is not necessary when the chimney serves only domestic gas fired water heaters with instantaneous production and domestic gas fired storage water heaters.

If the chimney system includes a draught regulator, the system is handled as a cascade system.

The input data and results of the calculation shall be reported. An example of the content is given in Annex C.

5.2 Pressure equilibrium condition

5.2.1 Negative pressure chimneys

The following formulae shall be fulfilled for each chimney segment j at all relevant working conditions:

$$|P_{Z,j} - P_{Ze,j}| \leq 0,1, \text{ in Pa} \quad (1)$$

$$P_{Z,j} = -P_L + \sum_{k=j}^N (P_{H,k} - P_{R,k}), \text{ in Pa} \quad (2)$$

$$P_{Ze,j} = P_{Wc,j} + P_{V,j} + P_{Bc,j}, \text{ in Pa} \quad (3)$$

where

- $P_{Z,j}$ is the draught at the flue gas inlet to the chimney segment j , in Pa;
- $P_{H,k}$ is the theoretical draught available due to chimney effect in chimney segment k , in Pa;
- $P_{R,k}$ is the pressure resistance of the chimney segment k , in Pa;
- $P_{Wc,j}$ is the calculated draught of the combustion appliance, in Pa;
- $P_{V,j}$ is the calculated pressure resistance of the connecting flue pipe j , in Pa;
- $P_{Bc,j}$ is the calculated pressure resistance of the air supply for the combustion appliance j , in Pa;
- $P_{Ze,j}$ is the required draught at the flue gas inlet to the chimney segment j , in Pa;
- P_L is the wind velocity pressure, in Pa;
- N is the number of combustion appliances.

5.2.2 Positive pressure chimneys

The following formulae shall be fulfilled for each chimney segment j at all relevant working conditions:

$$|P_{Z0e,j} - P_{Z0,j}| \leq 0,1, \text{ in Pa} \quad (4)$$

$$P_{Z0,j} = P_L + \sum_{k=j}^N (P_{R,k} - P_{H,k}), \text{ in Pa} \quad (5)$$

$$P_{Z0e,j} = P_{W0c,j} - P_{V,j} - P_{Bc,j}, \text{ in Pa} \quad (6)$$

where

$P_{Z0,j}$ is the positive pressure at the flue gas inlet to the chimney segment j , in Pa;

$P_{H,k}$ is the theoretical draught available due to chimney effect in chimney segment k , in Pa;

$P_{R,k}$ is the pressure resistance of the chimney segment k , in Pa;

$P_{W0c,j}$ is the calculated positive differential pressure of the combustion appliance j , in Pa;

$P_{V,j}$ is the calculated pressure resistance of the connecting flue pipe j , in Pa;

$P_{Bc,j}$ is the calculated pressure resistance of the air supply for the combustion appliance j , in Pa;

$P_{Z0e,j}$ is the maximum differential pressure at the flue gas inlet to the chimney segment j , in Pa;

P_L is the wind velocity pressure;

N is the number of combustion appliances.

5.3 Mass flow requirement

Formulae (7) and (8) shall be verified for all relevant working conditions (see 5.6).

For each combustion appliance in operation at nominal or minimum heat output:

$$\dot{m}_{Wc,j} \geq \dot{m}_{W,j} \text{ in kg/s} \quad (7)$$

and for each combustion appliance out of action:

$$\dot{m}_{Wc,j} \geq 0, \text{ in kg/s} \quad (8)$$

where

$\dot{m}_{Wc,j}$ is the calculated mass flow of the combustion appliance, in kg/s;

$\dot{m}_{W,j}$ is the declared mass flow of the combustion appliance, in kg/s.

Where a totally closed mechanically driven flue damper (Type 2 in accordance with EN 16475-4) is applied, mass flow of a combustion appliance out of action shall be taken as 0. Otherwise as flow resistance for a flue damper of a combustion appliance out of action shall be taken as 0 unless additional data are available.

5.4 Pressure requirements

5.4.1 Negative pressure chimneys

For negative pressure chimneys, it has to be additionally checked that the minimum draught (negative pressure) in the chimney ($P_{z,j}$) is more than or equal to the negative pressure in the room where the combustion appliance is placed at calculated draught conditions for air supply. The check on this