

DIN EN 13384-1:2015-06 (E)

Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one heating appliance

Contents		Page
Foreword		5
1	Scope	6
2	Normative references	6
3	Terms and definitions	6
4	Symbols and abbreviations	10
5	Calculation method for non-balanced flue chimneys	14
5.1	General principles	14
5.2	Pressure requirements	15
5.2.1	Negative pressure chimneys	15
5.2.2	Positive pressure chimneys	16
5.3	Temperature requirement	16
5.4	Calculation procedure	17
5.5	Flue gas data characterising the heating appliance	18
5.5.1	General	18
5.5.2	Flue gas mass flow	18
5.5.3	Flue gas temperature	19
5.5.4	Minimum draught for the heating appliance (PW) for negative pressure chimney	19
5.5.5	Maximum draught for the heating appliance (PW _{max}) for negative pressure chimney	20
5.5.6	Maximum differential pressure of the heating appliance (PWO) for positive pressure chimney	20
5.5.7	Minimum differential pressure of the heating appliance (PWO _{min}) for positive pressure chimney	20
5.6	Characteristic data for the calculation	20
5.6.1	General	20
5.6.2	Mean value for roughness (r)	20
5.6.3	Thermal resistance (1/)	20
5.7	Basic values for the calculation	21
5.7.1	Air temperatures	21
5.7.2	External air pressure (p _L)	23
5.7.3	Gas constant	23
5.7.4	Density of the external air (L)	24
5.7.5	Specific heat capacity of the flue gas (cp)	24
5.7.6	Condensing temperature (T _{sp})	24
5.7.7	Correction factor for temperature instability (SH)	24
5.7.8	Flow safety coefficient (SE)	24
5.8	Determination of the temperatures	25
5.8.1	General	25
5.8.2	Calculation of the coefficient of cooling (K)	25
5.8.3	Coefficient of heat transmission (kb)	26
5.9	Determination of the density of the flue gas and the velocity of the flue gas	28
5.9.1	Density of the flue gas (m)	28
5.9.2	Velocity of the flue gas (wm)	28
5.10	Determination of the pressures	29
5.10.1	Pressure at the flue gas inlet into the chimney	29
5.10.2	Theoretical draught available due to chimney effect (PH)	30
5.10.3	Pressure resistance of the chimney (PR)	30

5.10.4	Wind velocity pressure (PL)	31
5.11	Minimum draught required at the flue gas inlet into the chimney and maximum allowed draught (PZe and PZemax) and maximum and minimum differential pressure at the flue gas inlet into the chimney (PZOe and PZOemin)	32
5.11.1	General	32
5.11.2	Minimum and maximum draught for the heating appliance (PW and PWmax) and maximum and minimum differential pressure of the heating appliance (PWO and PWOmin)	33
5.11.3	Effective pressure resistance of the connecting flue pipe (PFV)	33
5.11.4	Pressure resistance of the air supply (PB)	34
5.12	Calculation of the inner wall temperature at the chimney outlet (Tiob)	35
6	Secondary air for negative pressure chimneys	37
6.1	General	37
6.2	Calculation method	37
6.3	Basic values for the calculation of secondary air	37
6.3.1	General	37
6.3.2	Mixing calculations	37
6.4	Pressures	38
6.4.1	Pressure resistance for the air supply with secondary air (PBNL)	38
6.4.2	Draught required for the secondary air devices (PNL)	39
6.4.3	Pressure resistance for that part of the connecting flue pipe before the secondary air device (PFV1)	40
6.4.4	Pressure requirement with secondary air	41
6.5	Temperature requirement with secondary air	41
7	Calculation method for balanced flue chimneys	41
7.1	General principles	41
7.2	Pressure requirements	42
7.3	Temperature requirements	43
7.4	Calculation procedure	43
7.5	Flue gas data characterizing the heating appliance	43
7.6	Characteristic data for the calculation	44
7.7	Basic values for the calculation	44
7.7.1	Air temperatures	44
7.7.2	Other basic values	45
7.8	Determination of the temperatures	45
7.8.1	Non-concentric (separate) ducts	45
7.8.2	Concentric ducts - calculation based on a correction factor for heat radiation	45
7.8.3	Concentric ducts - calculation based on calculated heat radiation	60
7.8.4	Mean temperatures for pressure calculation	64
7.9	Determination of densities and velocities	65
7.9.1	Density and velocity of the flue gas	65
7.9.2	Density and velocity of the supply air	65
7.10	Determination of pressures	66
7.10.1	Pressure at the flue gas inlet into the chimney	66
7.10.2	Theoretical draught due to chimney effect in the chimney segment (PH)	66
7.10.3	Pressure resistance in the chimney segment (PR)	66
7.10.4	Wind velocity pressure (PL)	66
7.11	Minimum draught required at the flue gas inlet into the chimney and maximum allowed draught (PZe and PZemax) and maximum and minimum differential pressure at the flue gas inlet into the chimney (PZOe and PZOemin)	66
7.11.1	General	66
7.11.2	Minimum and maximum draught for the heating appliance (PW and PWmax) and maximum and minimum differential pressure of the heating appliance (PWO and PWOmin)	67
7.11.3	Effective pressure resistance of the connection pipe (PFV)	67
7.11.4	Pressure resistance of the air supply	67
7.12	Calculation of the inner wall temperature at the chimney outlet (Tiob)	70
8	Consideration of the condensation heat of the flue gas water vapour	70
8.1	General	70

8.2	Onset of condensation	71
8.3	Calculation of the flue gas temperature at the outlet of a chimney segment with condensation (j NsegK)	73
9	Consideration of chimney fans	78
9.1	General	78
9.2	Inline fans	79
9.3	Exhaust fans	80
Annex A (informative) Calculation of thermal resistance		82
Annex B (informative) Tables		83
Annex C (informative) Chimney outlet with regard to adjacent buildings		98
Annex D (informative) Determination of the gas constant R considering the condensation		99