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Zulassungsstelle für Bauprodukte und Bauarten
Bautechnisches Prüfamt
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-13/0445

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	Frey Schornstein HL-Plus, Vitus-Plus, Duotherm-Plus und Focus-Plus *Frey chimney HL-Plus, Vitus-Plus, Duotherm-Plus und Focus-Plus*
Zulassungsinhaber *Holder of approval*	Frey & Sohn Heinkelstraße 23 71384 Weinstadt-Beutelsbach DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck	Bausatz für raumluftabhängige/raumluftunabhängige System-Abgasanlagen mit Keramik-Innenrohr für Gas-, Öl- und Festbrennstoff-Feuerstätten, einschließlich Mehrfachbelegung mit raumluftunabhängigen, scheit-holzbetriebenen Feuerstätten, für Klassifizierung T 400 N1 W 3 G50
Generic type and use of construction product	*Kit for non-roomsealed/roomsealed system chimneys with clay/ceramic flue liner for gas, liquid and solid fuel heating appliances, including serving of more than one heating appliance for split log roomsealed appliances, with classification T 400 N1 W3 G50*
Geltungsdauer: vom *Validity: from*	25 June 2013
bis *to*	25 June 2018
Herstellwerke *Manufacturing plants*	Frey & Sohn Kaminwerk GmbH; Manufactur 1: Heinkelstraße 23, D-71348 Weinstadt-Beutelsbach Manufactur 2: Ziegelfeldstraße 54, D-73563 Möglingen Manufactur 3: Raffineriestraße 105, D-93333 Neustadt a.d. Donau

Diese Zulassung umfasst *This Approval contains*	39 Seiten einschließlich 28 Anhänge *39 pages including 28 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product/ products and intended use

1.1 Definition of the construction product

The Frey chimney HL-Plus, Vitus-Plus, Duotherm-Plus and Focus-Plus is a kit for system chimneys with clay/ceramic flue liner for multiwall sootfire resistant chimneys, working under dry and wet conditions, with corrosion resistance class 3 according to EN 1443, clause 4.5, operating under negative pressure and a working temperature class T 400 according to EN 1443, clause 4.2, whereas the system is erected on site either by assembling of single elements (HL-Plus and Duotherm-Plus) or by assembling of storey height prefabricated units (Vitus-Plus and Focus-Plus). Al mentioned Frey chimneys are able for serving more than one heating appliances. For serving more than one roomsealed heating appliance only the Frey chimneys Duotherm-Plus and Focus-Plus may be used.

Frey chimney consists of the following components:

- clay/ceramic flue liner with internal diameters of 0,12 m, 0,14 m, 0,16 m, 0,18 m, 0,20 m, 0,25 m, 0,30 m, 0,35 m or 0,40 m
- chimney fittings made of clay/ceramic
- outer wall made of concrete
- thermal insulation material made of mineral fibres
- mortar for jointing outer walls
- mortar for jointing flue liners
- grout for storey height design
- reinforcement and related ancillaries for storey height design
- chimney base (consisting of outer wall elements, made of concrete, flue liner, made of clay/ceramic, plate, made of concrete and suspension devices made of metal and the siphon, made of metal or plastics, and cleaning and inspection door)
- upper cleaning and inspection door
- cleaning and inspection doors as closing devices in case of more than one heating appliance

Elastomeric sealings are not part of the kit.

Frey chimney is designed either as a chimney kit composed of the flue liner, the thermal insulation and outer wall without air gap between the thermal insulation and the outer wall (design situation no. 1) or by assembling of the flue liner, the thermal insulation and the outer wall, whereas between the thermal insulation and the outer wall a air gap is situated (design situation no. 2). The design situation no. 2 is normally used for airflue systems. The different design situations and related intended uses are depicted in Annex 1.

For each nominal diameter of the flue liner individual diameters for connections are possible. The dimensioning is to be done based on concerned mass flow requirements.

Drawings of Frey chimney and its components are given in Annex 1.

1.2 Intended use

Frey chimney is intended to be used for following intended uses:

- system chimneys with clay/ceramic flue liner used to convey the products of combustion from appliances to the outside atmosphere under dry and wet conditions, operating under negative pressure;
- system chimneys serving one heating appliance in case of chimneys for non-roomsealed/roomsealed appliances for T400 N1;
- system chimneys serving more than one heating appliance, restricted to fuel type wood, produced as split logs, in case of chimneys for roomsealed appliances for T400 N1 with flue liner with internal diameter of 0,12 m, 0,14 m, 0,16 m, 0,18 m, 0,20 m, 0,25 m, 0,30 m, 0,35 m or 0,40 m.

Note: The applicability of Frey chimney serving more than one heating appliance with fuel type split logs is depending on national regulations in the concerned Member States of destination (e. g. restriction of applicability in respect to possible fuel types and related provisions). Details for this assessment are given in clause 2.1.2.7 in this ETA.

- possible fuel types related to corrosion resistance class 3 (except serving more than one heating appliance) according to EN 1443, clause 4.5, table 2:
  - gas:
    - gas
    - natural gas L + H
  - liquid:
    - oil: sulphur-content > 0,2 mass %
    - kerosene: sulphur-content ≥ 50 mg/m³
  - wood:
    - wood in open fire places
    - wood in closed stoves
  - coal
  - peat

The minimum allowed nominal diameter of the flue liner for Frey chimney for solid fuel types is subject to the individual regulations in the Member State of destination.

The provisions made in this European technical approval are based on an assumed intended working life of Frey chimney for the intended use of 30 years, provided that the kit is subject to appropriate use and maintenance. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the approval body, but are to be regarded only as a means for choosing the appropriate product in relation to the expected, economically reasonable working life of the works.

2 Characteristics of product and methods of verification

2.1 Characteristics of assembled system

2.1.1 Safety in case of fire (ER 2)

2.1.1.1 Resistance to fire resulting from external to external

No performance determined. The resistance to fire resulting form external to external of the assembled system shall be declared in accordance with national provisions, if any, as stated in EN 13063-1, clause 5.2.4.

2.1.1.2 Resistance to fire from internal to external (sootfire resistance and thermal shock resistance)

Resistance to fire from internal to external of the assembled system according to EN 13063-1, clauses 5.2.1.2 and 5.2.1.3 (including sootfire resistance and thermal shock resistance), is G50.

2.1.2 Hygiene, health and environment (ER 3)

2.1.2.1 Gas tightness/leakage

Gas tightness/leakage of the assembled system according to EN 13063-1, clause 5.3.1, is classified as pressure class N1 according to EN 13063-1, clause 5.3.1, table 2.

2.1.2.2 Flow resistance

Flow resistance of the flue liner according to EN 13063-1, clause 5.3.3, and EN 13384-1, table B.4, and EN 13063-3, clause 5.7.1, expressed as mean roughness *r* is 0,0015 m.

The flow resistance of the flue liner and concrete parts (in case of air flue system) according to EN 13216-1, clause 5.11, or according to EN 13384-1, table B.4, expressed as mean roughness *r* is 0,003 m.

The flow resistance of the overflow opening, expressed by the friction coefficient ξ according to EN 13063-3, clause 5.7.1, is covered by using a draught stabiliser [Zugbegrenzer], operating as overflow opening. Its position is depicted in Annex 1 of this ETA.

Flow resistance of the chimney fittings according to EN 13063-1, clause 5.3.3, conforms to the values given in EN 13384-1, table B.8, no. 5, 6 and 7.

2.1.2.3 Thermal resistance

Thermal resistance of the assembled system according to EN 13063-1, clause 5.2.3, has been calculated according to EN 13063-1, Annex C, for the design situations no. 1 and no. 2 given in the tables of Annex 1 of this European Technical Approval as thermal resistance *Ryy* according to EN 13063-1, clause 5.2.3, for each internal diameter of the flue liner, depending on the thickness of thermal insulation.

2.1.4 Durability/Condensate resistance

Condensate resistance of the assembled system has been tested according to EN 13216-1, clause 5.5, except verification of changing in weight of test sample or components according to EN 13216-1, clauses 5.5.3 and 5.5.5, and has been assessed to be adequate for the intended use.

Vapour resistance (condensate resistance in the meaning of EN 13063-2) of the assembled system has been tested according to EN 13216-1, clause 5.6, as stated in EN 13063-2, clause 5.3.2.1, and has been assessed to be adequate for the intended use.

Condensate resistance of the assembled system is classified as condensate resistance class W.

2.1.2.5 Durability of gas tightness/leakage against chemicals/corrosion

Durability of compressive strength against chemicals

Frey chimney is sootfire resistant (G50) as stated in clause 2.1.1.2 and condensate resistant (W) as stated in clause 2.1.2.4.

Mass loss of the flue liner according to EN 1457-2, clauses 10.1 and 16.9, does not exceed 2 %.

Water resistance of the mortar for jointing flue liners according to EN 13063-2, clause 5.1.3.1.3, does not exceed 3 % as stated in Annex 2. Acid resistance of the mortar for jointing flue liners according to EN 13063-2, clause 5.1.3.1.4, does not exceed 2 % as stated in Annex 2.

Corrosion resistance of the assembled is therefore classified as corrosion resistance class 3.

2.1.2.6 Release and/or content of dangerous substances

Frey chimney complies with the provisions of Guidance Paper H[7]/EU data-base about dangerous substances.

A declaration of conformity in this respect was made by the manufacturer.

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the kit falling within its scope (e. g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.1.2.7 Thermal and fluid dynamic characteristics of chimneys serving more than one heating appliance

Calculation and assisting testing of Frey chimney serving more than one heating appliance has been done for the fuel type split logs in relation to corrosion resistance class 3 according to EN 1443, clause 4.5, table 2. The assessment of Frey chimney for serving more than one heating appliance has been done by calculation based on EN 13384-2, assisted by testing for the service situations as stated below:

- Heating appliances are operating by operating negative pressure of 0 Pa and 8 Pa respectively in related testing rooms
- Initial burning of the fuel in the lowest heating appliance when the door of the heating appliance in the middle of the test set is still open; operating negative pressure of 0 Pa, with open overflow opening.

The assessment is based on the assumption that all heating appliances are located in the same unit of use (“Nutzungseinheit”) which means it shall be ensured that the operation of the individual heating appliance will not be carried out independent of the others. This is also referred to as operation instruction in the installation manual. The assessment is related to a maximum allowable performance of heating appliance of 15 kW.

Frey chimney has been assessed for up to three heating appliances with internal diameter of the flue liner of 0,16 m, 0,18 m and 0,20 m with distances between the input of the highest heating appliance and the top of the chimney from 4,0 m to 12,0 m, for combustion gas temperatures of 150 °C, 190 °C, 240 °C, 300 °C and 400 °C and for service pressures of 6,0 Pa, 9,0 Pa, 12,0 Pa.

The possibility of connecting of heating appliances in each individual case of use shall be evaluated on basis of the calculation results given in report “Feuerungstechnische Bemessung von mehrfach belegten Festbrennstoff-LAS”, dated 28.3.2011, issued by Hochschule Zittau/Görlitz; Theodor-Körner-Allee 16, 02763 Zittau, and used for the assessment for this European technical approval.

2.1.3 Safety in use (ER 4)

2.1.3.1 Maximum height

Maximum height of the assembled system is 25 m.

[7)] Guidance Paper H: A harmonised approach relating to dangerous substances under the Construction Products Directive, edition September 2002

Maximum height of the assembled system without verification in accordance with Eurocode in case of use of suspension element made of metal for use of diameters 0,12 m – 0,30 m for the flue liner: 15 m.

2.1.3.2 Freeze thaw resistance

The flue liner is freeze thaw resistant according to EN 13063-1, clause 5.5.

For the outer wall freeze thaw resistance is not assessed. Therefore, in the concerned area the outer wall has to be protected against freeze thaw by proper means.

2.2 Characteristics of the components

The characteristics of the components are given in Annex 2.

2.3 Methods of verification

The assessment of the fitness of Frey chimney for the intended use was undertaken according to the CUAP (Common Understanding of Assessment Procedure) for "Chimney kit with clay/ceramic flue liner", ETA request No 08.02/19bis-2, version March 2010.

The testing of Frey chimney was carried out according to the test sequence stated in Annex 3.

3 Evaluation of conformity and CE marking

3.1 Attestation of conformity system

According to the decision 95/467/EC of the European Commission[8], amended by the Commission Decision 2001/596/EC[9] and 2002/592/EC[10], system 2+ of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer
  (1) Initial type-testing of the product
  (2) Factory production control
  (3) Testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan[11]

(b) Tasks for the approved body
  (4) Certification of factory production control on the basis of:
    – Initial inspection of factory and of factory production control
    – Continuous surveillance, assessment and approval of factory production control

[8] Official Journal of the European Communities L 268/29 of 10.11.1995
[9] Official Journal of the European Communities L 209/33 of 2.8.2001
[10] Official Journal of the European Communities L 192/57 of 20.7.2002
[11] The prescribed test plan is part of the control plan.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer shall only use materials stated in the technical documentation[12] of this European technical approval.

In the framework of factory production control the manufacturer carries out tests and controls in accordance with the control plan[13] which is fixed with this European technical approval.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control correspond to this control plan which is part of the technical documentation of this European technical approval.

The results of factory production control are recorded in checklists signed by the person responsible and are evaluated. The records shall be presented to the approved body involved in continuous surveillance. On request the records must be presented to the Deutsches Institut für Bautechnik.

3.2.1.2 Other tasks of manufacturer

3.2.1.2.1 Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes in the manufacture or manufacturing plant. In such cases the necessary initial type-testing has to be agreed between the Deutsches Institut für Bautechnik and the approved body involved.

3.2.1.2.2 Testing of samples taken at the factory

In the framework of factory production control the manufacturer carries out tests in accordance with the control plan which is fixed with this European technical approval.

Details of the extent, nature and frequency of testing to be performed within the factory production control correspond to this control plan which is part of the technical documentation of this European technical approval.

3.2.1.2.3 Declaration of conformity

When all the criteria of the conformity attestation are satisfied the manufacturer shall make a declaration of conformity.

3.2.2 Tasks of approved bodies

3.2.2.1 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the control plan, the manufacturing plant, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the kit according to the specifications given in clause 2 and in the Annexes of this European technical approval.

[12] The technical documentation of this European technical approval has been deposited at the Österreichisches Institut für Bautechnik and, as far as relevant for the tasks of the approved body involved in the attestation of conformity procedure, is handed over to the approved body.

[13] The control plan, related to the manufacturing plant, has been deposited at the Österreichisches Institut für Bautechnik and is handed over only to the approved body involved in the attestation of conformity procedure.

3.2.2.2 Continuous surveillance, assessment and approval of factory production control

The approved body shall visit the factories at least once a year for surveillance of the manufacturer.

It has to be verified that the system of factory production control and the specified manufacturing process are maintained taking into account the control plan.

Continuous surveillance and assessment of factory production control have to be performed according to the control plan.

The results of continuous surveillance shall be made available on demand by the approved body or the Deutsches Institut für Bautechnik. In cases where the provisions of the European technical approval and the control plan are no longer fulfilled, the certificate of conformity shall be withdrawn.

3.2.2.3 Certification

When all criteria for conformity attestation are fulfilled the approved body shall issue a certification of conformity of the factory production control.

3.3 CE marking

The letters “CE” shall correspond to the Council Directive 93/68/EEC. The CE marking shall be affixed on the chimney plate[14].

The CE marking of the kit for system chimney shall be accompanied by the following information:

- the identification number of the notified certification body
- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- description of the product: type of product and intended use
- appropriated designation including:
  - Temperature class
  - Pressure class
  - Condensate resistance class
  - Corrosion resistance class
  - Sootfire resistance class, followed by a distance to combustible materials
- declaration of the relevant essential characteristics which are:
  - Thermal resistance
  - Compressive strength clay/ceramic flue liners
  - Maximum allowable height
  - Flow resistance (friction coefficient/mean roughness)
  - Resistance to fire resulting from external to external (declaration according to national specification, if any)
  - Freeze thaw resistance
  - Statement on the presence of dangerous substances, including concentration, if any

[14] A permanent form of identification (chimney plate) shall be provided with the system chimney.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The Frey chimney is manufactured in accordance with the provisions of the European technical approval using the manufacturing process as identified in the inspection of the manufacturing plant by the approval body and laid down in the technical documentation of this European technical approval.

4.2 Installation

Provisions for proper installation of the kit form part of the technical documentation of this European technical approval and shall be delivered with each kit.

In case of use of storey height units it shall be ensured, that the connection of the units is done in such a way, that the mechanical stability of the chimney kit is ensured, e. g. by means of tightened connections.

Provisions about wind loads to be taken by the free-standing part of the chimney above the last lateral support are outside of the scope of this European technical approval. They shall be declared in accordance with national provisions, if any.

Specific conditions for serving more than one heating appliance:

- Number of heating appliances: max. 3 (of the same type and performance)
- Maximum allowable performance of heating appliance (kW): 15 kW
- Length of connecting pipes (either without or with thermal insulation): ≤ 1,0 m, whereas the sum of individual ζ-value of the fittings does not exceed 1,0
- Amount of CO-concentration of ≤ 1200 ppm, related to a content of O_2 of 13 %
- Minimum values for service pressure according to EN 13240, cl. 6.4
- Minimum value of efficiency according to EN 13240, cl. 6.3

Additional requirements for more than one heating roomsealed appliance:

- Distance between heating appliances: 2,3 m to 3,0 m
- Overflow opening: Controlled opening according to the installation manual and depicted in Annex 1 in this ETA
- Proper self-closing of opening door of heating appliance
- Leakage rate of ≤ 2m³/h (testing pressure: 10 Pa)

In case of more heating appliances available than in use, all others (including opening in air-ducts) should be closed properly in order to avoid connection of not convenient appliance. Instructions are given in the operational manual.

Combination of the assembled kit Frey chimney with others within one unit can only be done by means of using equivalent systems in order to prevent situations of re-circulation of combustion products. Terminals are not subject of this kit.

5 Recommendations for the manufacturer

5.1 Recommendations on packaging, transport and storage

Materials shall be handled and stored with care, protected from accidental damage.

It is the responsibility of the manufacturer of the product to ensure that the information on these provisions is given to those who are concerned. This includes information how to protect the flue liner unit against damage in case of transport.

For transport of storey height units special provisions, including consideration of loads to be considered in case of transport and mounting, are depending on the used outer wall and related information about allowable length of the units form part of control plan for the ETA.

According to relevant assessment laid down in technical documentation, for the transport of storey height units their production length is restricted to 4 to 6 m, depending on the design and taking into account the used outer walls.

5.2 Recommendations on use, maintenance, repair

It is the responsibility of the manufacturer to ensure that each delivery contains proper information for the use of the kit including general guidance on the basis of the European technical approval.

For components subject to wear (cleaning and inspection doors) the need of replacement is to be considered during use of the kit.

In case of more heating appliances available than in use, all other openings (including opening in air-ducts) should be closed properly in order to avoid connection of not convenient appliance. Details are provided in technical documentation. Furthermore, it shall be ensured that the operation of the individual heating appliance will not be carried out independent of the others.

5.3 Identification of the kit

A permanent form of identification (chimney plate) shall be provided with the system chimney Frey chimney, including the following information:

- Identification of the chimney kit manufacturer
- Number of the European technical approval
- Temperature class
- Pressure class
- Condensate resistance class
- Corrosion resistance class
- Sootfire resistance class, followed by a distance to combustible materials

In addition, for Frey chimney serving more than one appliance:

- Number of heating appliance
- Declaration of restriction to solid fuel split logs
- Maximum allowable performance of heating appliance [kW]

Prof. Gunter Hoppe
Head of Department

beglaubigt:
Sperber

Deutsches Institut für Bautechnik

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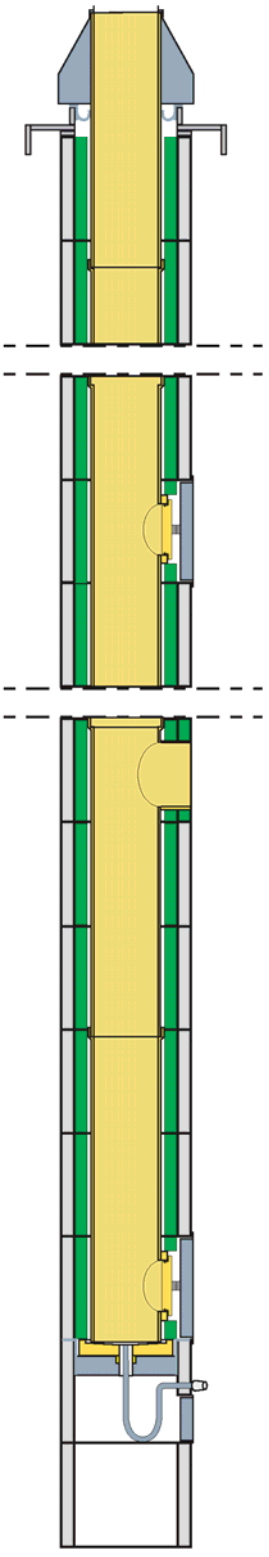

flow cone is not a part of this approval

alternative storey-height units
element length up to max. 6,0 m

Frey chimneys
HL-Plus-system (assembled of single elements on site -Montageschornstein-)
Vitus-Plus-system (assembled of storey height prefabricated units -Systemschornstein)

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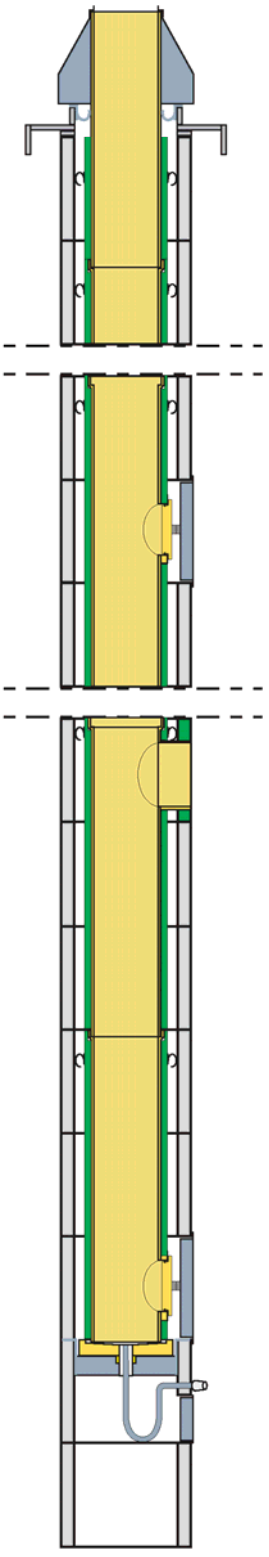
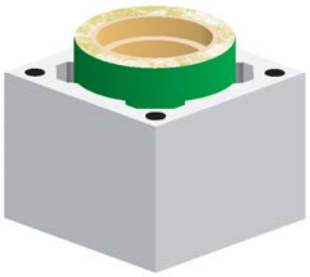


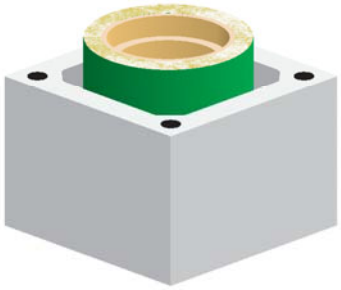
flow cone is not a part of this approval

alternative storey-height units
element length up to max. 6,0 m

Frey chimneys
Duotherm-Plus-system (assembled of sing elements on site -Montageschornstein-)
Focus-Plus-system (assembled of storey height prefabricated units -Systemschornstein)

Deutsches Institut für Bautechnik DIBt





Frey HL-Plus, chimney with single flue for ceramic flue liner, no shaft for ventilation or combustion air supply

type	outer dimension	Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								shaft for air transport
		outer wall		ceramic pipe			thickness of insulati	air gap	Ryy	outer wall		ceramic pipe			thickness of insulat	air gap	Ryy	
		inner width	W	inner diame	outer diameter pipe	outer diameter socket				inner width	W	inner diame	outer diameter pipe	outer diameter socket				
HL 010	340 x 340	250 x 250	45	120	140	159	55		R76									
HL 01 A	340 x 340	250 x 250	45	140	158	178	46		R70									
HL 01	360 x 360	280 x 280	40	160	179	199	50,5		R78									
HL 02	400 x 400	300 x 300	50	180	199	219	50,5		R81									
HL 03	400 x 400	300 x 300	50	200	219	239	40,5		R69									
HL 04	500 x 500	380 x 380	60	250	272	294	54		R92									
HL 05	550 x 550	430 x 430	60	300	328	350	51		R90									
HL 06	620 x 620	480 x 480	70	350	380	406	50		R91									
HL 07	670 x 670	530 x 530	70	400	430	456	50		R93									

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Vitus-Plus, chimney with single flue for ceramic flue liner, no shaft for ventilation or combustion air supply

type	outer dimension	Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								shaft for air transport
		outer wall		ceramic pipe			thickness of insulati	air gap	Ryy	outer wall		ceramic pipe			thickness of insulat	air gap	Ryy	
		inner width	W	inner diame	outer diameter pipe	outer diameter socket				inner width	W	inner diame	outer diameter pipe	outer diameter socket				
VG HL 010	340 x 340	250 x 250	45	120	140	159	55		R76									
VG HL 01 A	340 x 340	250 x 250	45	140	158	178	46		R70									
VG HL 01	360 x 360	280 x 280	40	160	179	199	50,5		R78									
VG HL 02	400 x 400	300 x 300	50	180	199	219	50,5		R80									
VG HL 03	400 x 400	300 x 300	50	200	219	239	40,5		R69									
VG HL 04	500 x 500	380 x 380	60	250	272	294	54		R92									
VG HL 05	550 x 550	430 x 430	60	300	328	350	51		R90									
VG HL 06	620 x 620	480 x 480	70	350	380	406	50		R91									
VG HL 07	670 x 670	530 x 530	70	400	430	456	50		R93									

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus
Frey Vitus-Plus
single duct

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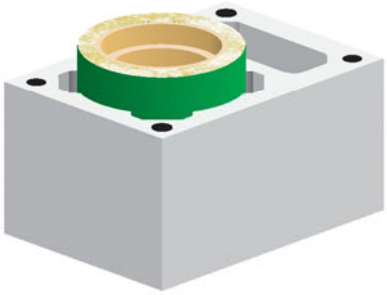
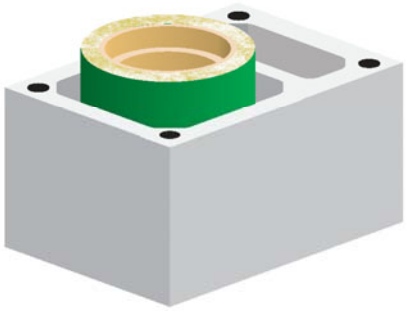




Frey HL-Plus, chimney with single flue for ceramic flue liner , with shaft for ventilation or combustion air supply

		Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								
				ceramic pipe			thickn					ceramic pipe			thickn			
	outer	outer wall		inner	outer diameter		ess of	air		outer wall		inner	outer diameter		ess of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
HL 018	510 x 360	280 x 280	40	120	140	159	70		R90									100x270
HL 019	510 x 360	280 x 280	40	140	158	178	61		R86									100x270
HL 020	510 x 360	280 x 280	40	160	179	199	50,5		R78									100x270
HL 021	560 x 400	320 x 320	40	180	199	219	60,5		R92									120x300
HL 022	560 x 400	320 x 320	40	200	219	239	50,5		R82									120x300
HL 023	660 x 500	380 x 380	50	250	272	294	54		R91									2x130x160
HL 024	710 x 550	430 x 430	55	300	328	350	51		R89									2x120x200
HL 025	800 x 620	480 x 480	70	350	380	406	50		R91									2x130x230
HL 026	900 x 670	530 x 530	70	400	430	456	50		R93									2x150x250

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

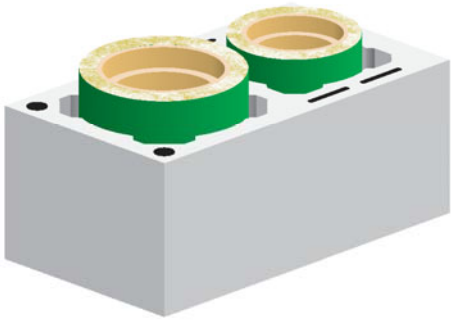
Frey Vitus-Plus, chimney with single flue for ceramic flue liner, with shaft for ventilation or combustion air supply

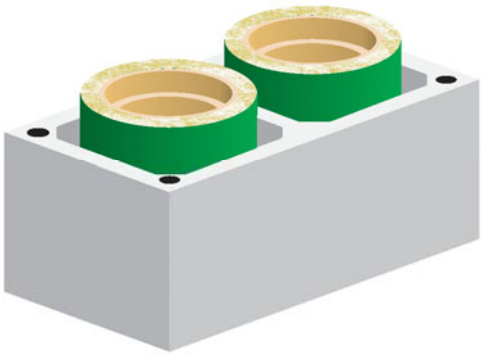
		Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								
				ceramic pipe			thickn					ceramic pipe			thickn			
	outer	outer wall		inner	outer diameter		ess of	air		outer wall		inner	outer diameter		ess of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
VG HL 018	510 x 360	280 x 280	40	120	140	159	70		R90									100x270
VG HL 019	510 x 360	280 x 280	40	140	158	178	61		R86									100x270
VG HL 020	510 x 360	280 x 280	40	160	179	199	50,5		R78									100x270
VG HL 021	560 x 400	320 x 320	40	180	199	219	60,5		R92									120x300
VG HL 022	560 x 400	320 x 320	40	200	219	239	50,5		R82									120x300
VG HL 023	660 x 500	380 x 380	50	250	272	294	54		R65									2x130x160
VG HL 024	710 x 550	430 x 430	55	300	328	350	51		R89									2x120x200
VG HL 025	800 x 620	480 x 480	70	350	380	406	50		R91									2x130x230
VG HL 026	900 x 670	530 x 530	70	400	430	456	50		R93									2x150x250

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus
Frey Vitus-Plus
single duct with ventilation





Frey HL-Plus, chimney with 2 flues for ceramic flue liners, no shaft for ventilation or combustion air supply

type	outer dimension	Flue 1 (full insulation without spacer)										Flue 2 (full insulation without spacer)										shaft for air transport
		outer wall			ceramic pipe			thickness of insulati		air gap	Ryy	outer wall			ceramic pipe			thickness of insulat		air gap	Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket					inner width		W	inner diame	outer diameter pipe	outer diameter socket					
HL 027 B	670 x 360	280	280	40	120	140	159	70			R90	280	280	40	120	140	159	70			R90	
HL 027 A	670 x 360	280	280	40	140	158	178	61			R86	280	280	40	140	158	178	61			R86	
HL 027	670 x 360	280	280	40	160	179	199	50,5			R78	280	280	40	160	179	199	50,5			R78	
HL 028	750 x 400	300	300	50	180	199	219	50,5			R81	300	300	50	180	199	219	50,5			R81	
HL 029	750 x 400	300	300	50	200	219	239	40,5			R69	300	300	50	200	219	239	40,5			R69	
HL 030	900 x 500	380	380	50				190				380	380	50				190				
HL 031	900 x 500	380	380	50	250	272	294	54			R91	380	380	50	250	272	294	54			R91	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

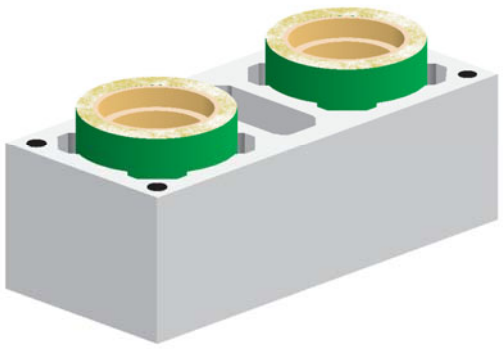
Frey Vitus-Plus, chimney with 2 flues for ceramic flue liners, no shaft for ventilation or combustion air supply

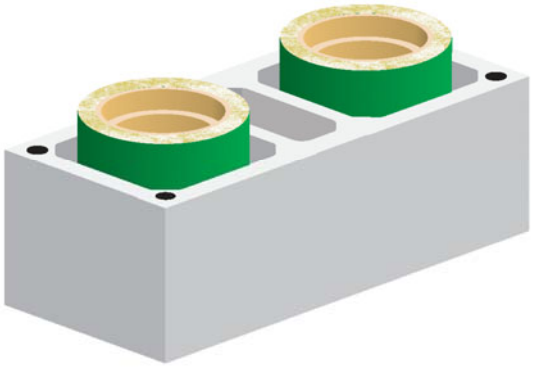
type	outer dimension	Flue 1 (full insulation without spacer)										Flue 2 (full insulation without spacer)										shaft for air transport
		outer wall			ceramic pipe			thickness of insulati		air gap	Ryy	outer wall			ceramic pipe			thickness of insulat		air gap	Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket					inner width		W	inner diame	outer diameter pipe	outer diameter socket					
VG HL 027 B	670 x 360	280	280	40	120	140	159	70			R90	280	280	40	120	140	159	70			R90	
VG HL 027 A	670 x 360	280	280	40	140	158	178	61			R86	280	280	40	140	158	178	61			R86	
VG HL 027	670 x 360	280	280	40	160	179	199	50,5			R78	280	280	40	160	179	199	50,5			R78	
VG HL 028	750 x 400	300	300	50	180	199	219	50,5			R81	300	300	50	180	199	219	50,5			R81	
VG HL 029	750 x 400	300	300	50	200	219	239	40,5			R69	300	300	50	200	219	239	40,5			R69	
VG HL 030	900 x 500	380	380	50				190				380	380	50				190				
VG HL 031	900 x 500	380	380	50	250	272	294	54			R65	380	380	50	250	272	294	54			R65	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus
Frey Vitus-Plus
double duct





Frey HL-Plus, chimney with 2 flues for ceramic flue liners , with shaft for ventilation or combustion air supply

type	outer dimension	Flue 1 (full insulation without spacer)										Flue 2 (full insulation without spacer)										shaft for air transport
		outer wall			ceramic pipe			thickness of insulati	air gap		Ryy	outer wall			ceramic pipe			thickness of insulat	air gap		Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket					inner width		W	inner diame	outer diameter pipe	outer diameter socket					
HL 033 A	830 x 360	280	280	40	120	140	159	70		R90		280	280	40	120	140	159	70		R90		100x240
HL 033	830 x 360	280	280	40	140	158	178	61		R86		280	280	40	140	158	178	61		R86		100x240
HL 034	830 x 360	280	280	40	160	179	199	50,5		R78		280	280	40	160	179	199	50,5		R78		100x240
HL 035 A	880 x 400	280	280	40	140	158	178	61		R86		320	320	40	180	199	219	60,5		R99		120x300
HL 035 A	880 x 400	280	280	40	160	179	199	50,5		R78		320	320	40	180	199	219	60,5		R99		120x300
HL 036 B	880 x 400	280	280	40	180	199	219	40,5		R67		320	320	40	180	199	219	60,5		R99		120x300
HL 036 A	880 x 400	280	280	40	140	158	178	61		R86		320	320	40	200	219	239	50,5		R82		120x300
HL 036 B	880 x 400	280	280	40	160	179	199	50,5		R78		320	320	40	200	219	239	50,5		R82		120x300
HL 037	880 x 400	300	300	40	180	199	219	50,5		R80		300	300	40	200	219	239	40,5		R68		120x300
HL 310 F	880 x 400	300	300	40	200	219	239	40,5		R68		300	300	40	200	219	239	40,5		R68		120x300

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

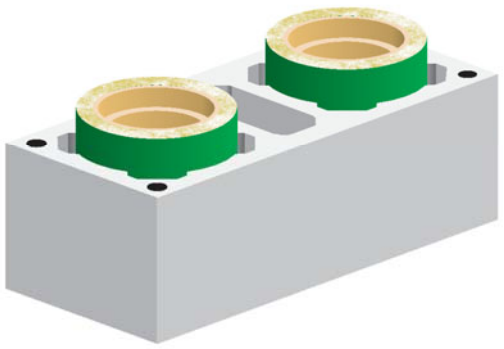
Frey HL-Plus, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

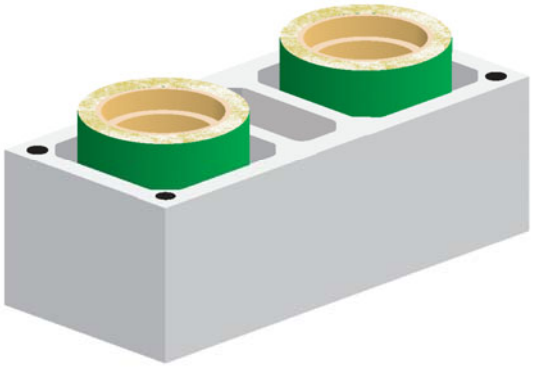
type	outer dimension	Flue 1 (full insulation without spacer)										Flue 2 (full insulation without spacer)										shaft for air transport
		outer wall			ceramic pipe			thickness of insulati	air gap		Ryy	outer wall			ceramic pipe			thickness of insulat	air gap		Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket					inner width		W	inner diame	outer diameter pipe	outer diameter socket					
VG HL 033 A	830 x 360	280	280	40	120	140	159	70		R90		280	280	40	120	140	159	70		R90		100x240
VG HL 033	830 x 360	280	280	40	140	158	178	61		R86		280	280	40	140	158	178	61		R86		100x240
VG HL 034	830 x 360	280	280	40	160	179	199	50,5		R78		280	280	40	160	179	199	50,5		R78		100x240
VG HL 035 A	880 x 400	280	280	40	140	158	178	61		R86		320	320	40	180	199	219	60,5		R92		120x300
VG HL 035 A	880 x 400	280	280	40	160	179	199	50,5		R78		320	320	40	180	199	219	60,5		R92		120x300
VG HL 036 B	880 x 400	280	280	40	180	199	219	40,5		R67		320	320	40	180	199	219	60,5		R92		120x300
VG HL 036 A	880 x 400	280	280	40	140	158	178	61		R86		320	320	40	200	219	239	50,5		R82		120x300
VG HL 036 B	880 x 400	280	280	40	160	179	199	50,5		R78		320	320	40	200	219	239	50,5		R82		120x300
VG HL 037	880 x 400	300	300	40	180	199	219	50,5		R81		300	300	40	200	219	239	40,5		R68		120x300
VG HL 310 F	880 x 400	300	300	40	200	219	239	40,5		R68		300	300	40	200	219	239	40,5		R68		120x300

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus and Frey Vitus-Plus
double duct
combined with ventilation





Frey HL-Plus, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

		Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								
	outer	outer wall		ceramic pipe inner	outer diameter		thickness of	air		outer wall		ceramic pipe inner	outer diameter		thickness of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
HL 041	680 x 400	250 x 250	40	120	140	159	55		R75	320 x 320	40	180	199	219	60,5		R99	120x300
HL 042	680 x 400	250 x 250	40	140	158	178	46		R70	320 x 320	40	180	199	219	60,5		R99	120x300
HL 043	710 x 400	280 x 280	40	160	179	199	50,5		R78	320 x 320	40	180	199	219	60,5		R99	120x300
HL 044	680 x 400	250 x 250	40	120	140	159	55		R75	320 x 320	40	200	219	239	50,5		R82	120x300
HL 045	680 x 400	250 x 250	40	140	158	178	46		R70	320 x 320	40	200	219	239	50,5		R82	120x300
HL 046	710 x 400	280 x 280	40	160	179	199	50,5		R78	320 x 320	40	200	219	239	50,5		R82	120x300

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

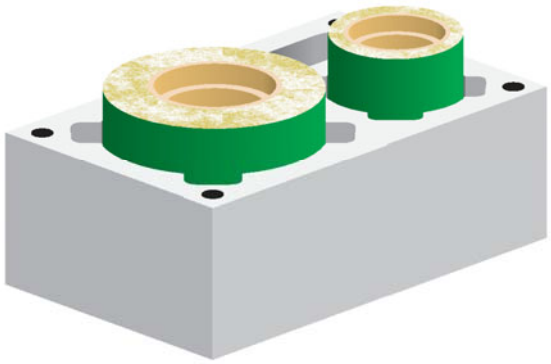
Frey Vitus-Plus Frey HL-Plus, chimney with 2 flues for ceramic flue liners, no shaft for ventilation or combustion air supply

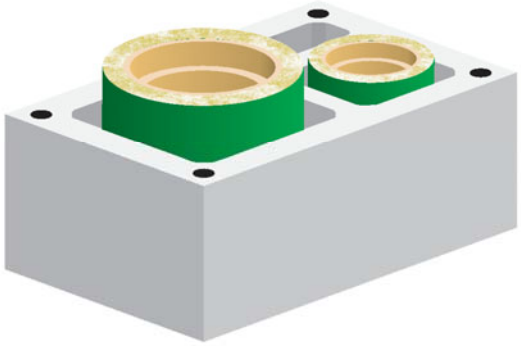
		Flue 1 (full insulation without spacer)								Flue 2 (full insulation without spacer)								
	outer	outer wall		ceramic pipe inner	outer diameter		thickness of	air		outer wall		ceramic pipe inner	outer diameter		thickness of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
VG HL 041	680 x 400	250 x 250	40	120	140	159	55		R75	320 x 320	40	180	199	219	60,5		R92	120x300
VG HL 042	680 x 400	250 x 250	40	140	158	178	46		R70	320 x 320	40	180	199	219	60,5		R92	120x300
VG HL 043	710 x 400	280 x 280	40	160	179	199	50,5		R78	320 x 320	40	180	199	219	60,5		R92	120x300
VG HL 044	680 x 400	250 x 250	40	120	140	159	55		R75	320 x 320	40	200	219	239	50,5		R82	120x300
VG HL 045	680 x 400	250 x 250	40	140	158	178	46		R70	320 x 320	40	200	219	239	50,5		R82	120x300
VG HL 046	710 x 400	280 x 280	40	160	179	199	50,5		R78	320 x 320	40	200	219	239	50,5		R82	120x300

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus and Frey Vitus-Plus
double duct
combined with ventilation





Frey HL-Plus, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

		Flue 1 (full insulation without spacer)									Flue 2 (full insulation without spacer)									
		outer wall			ceramic pipe			thickn			outer wall			ceramic pipe			thickn			
type	outer dimension	inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulati	air gap	Ryy		inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulat	air gap	Ryy	shaft for air transport	
HL 411 CO	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	120	140	159	55		R76	100x270	
HL 411 CO	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	140	158	178	46		R70	100x270	
HL 411 D	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	160	179	199	35,5		R59	100x270	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Vitus-Plus, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

		Flue 1 (full insulation without spacer)									Flue 2 (full insulation without spacer)									
		outer wall			ceramic pipe			thickn			outer wall			ceramic pipe			thickn			
type	outer dimension	inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulati	air gap	Ryy		inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulat	air gap	Ryy	shaft for air transport	
VG HL 411 CO	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	120	140	159	55		R76	100x270	
VG HL 411 CO	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	140	158	178	46		R70	100x270	
VG HL 411 D	800 x 500	380 x 380	60	250	272	294	54		R92		250 x 250	50	160	179	199	35,5		R59	100x270	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey HL-Plus and Frey Vitus-Plus
double duct
combined with ventilation

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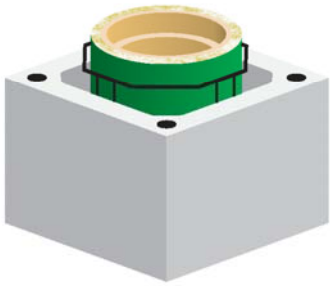

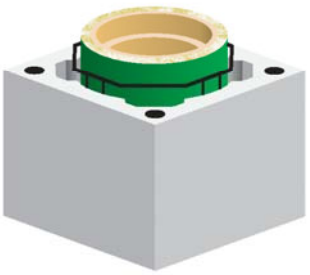

Frey Duotherm-Plus, chimney with sinle flue for ceramic flue liner, no shaft for ventilation or combustion air supply

		Flue 1 (insulation and spacer)								Flue 2 (insulation and spacer)								
				ceramic pipe			thickn					ceramic pipe			thickn			
type	outer dimension	outer wall inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulati	air gap	Ryy	outer wall inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulat	air gap	Ryy	shaft for air transport
LASFP14	400 x 400	300 x 300	50	140	158	178	20	51	R32									
LASFP16	400 x 400	300 x 300	50	160	179	199	20	40,5	R33									
LASFP18	420 x 420	320 x 320	50	180	199	219	20	40,5	R33									
LASFP20	420 x 420	320 x 320	50	200	219	239	20	30,5	R34									

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Focus-Plus, chimney with single flue for ceramic flue liner, no shaft for ventilation or combustion air supply

		Flue 1 (insulation and spacer)								Flue 2 (insulation and spacer)								
				ceramic pipe			thickn					ceramic pipe			thickn			
type	outer dimension	outer wall inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulati	air gap	Ryy	outer wall inner width	W	inner diame	outer diameter pipe	outer diameter socket	ess of insulat	air gap	Ryy	shaft for air transport
VGLASFP14	400 x 400	300 x 300	50	140	158	178	20	51	R32									
VGLASFP16	400 x 400	300 x 300	50	160	179	199	20	40,5	R33									
VGLASFP18	420 x 420	320 x 320	50	180	199	219	20	40,5	R33									
VGLASFP20	420 x 420	320 x 320	50	200	219	239	20	30,5	R34									

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Duotherm-Plus and
Frey Focus-Plus

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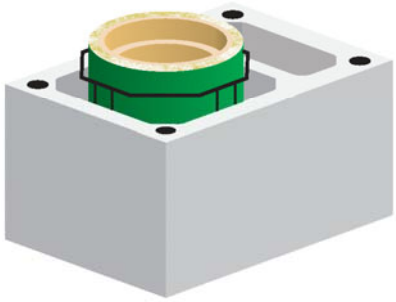
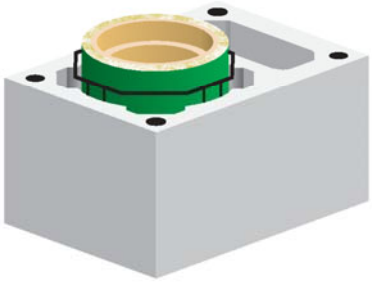




Frey Duotherm-Plus, chimney with single flue for ceramic flue liner, with shaft for ventilation or combustion air supply

		Flue 1 (insulation and spacer)								Flue 2 (insulation and spacer)								
				ceramic pipe								ceramic pipe						
	outer	outer wall		inner	outer diameter		thickness of	air		outer wall		inner	outer diameter		thickness of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
LASFP18L	600 x 430	320 x 320	**50**	180	199	219	20	40,5	R33									130x320
LASFP20L	600 x 430	320 x 320	**50**	200	219	239	20	30,5	R34									130x320

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

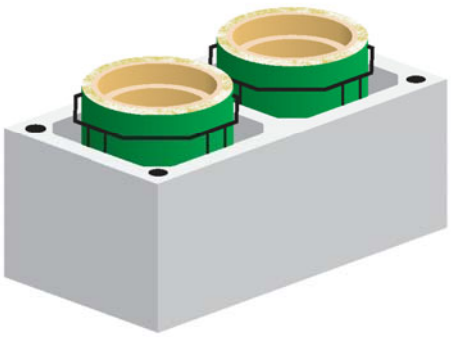
Frey Focus-Plus, chimney with single flue for ceramic flue liner, with shaft for ventilation or combustion air supply

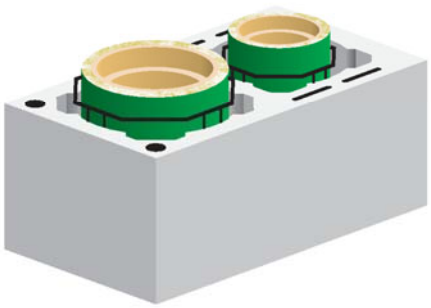
		Flue 1 (insulation and spacer)								Flue 2 (insulation and spacer)								
				ceramic pipe								ceramic pipe						
	outer	outer wall		inner	outer diameter		thickness of	air		outer wall		inner	outer diameter		thickness of	air		shaft for air
type	dimension	inner width	W	diame	pipe	socket	insulati	gap	Ryy	inner width	W	diame	pipe	socket	insulat	gap	Ryy	transport
VGLASFP18L	600 x 430	320 x 320	**50**	180	199	219	20	40,5	R33									130x320
VGLASFP20L	600 x 430	320 x 320	**50**	200	219	239	20	30,5	R34									130x320

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Duotherm-Plus and
Frey Focus-Plus with ventilation





Frey Duotherm-Plus, chimney with 2 flues for ceramic flue liners, no shaft for ventilation or combustion air supply

type	outer dimension	Flue 1 (insulation and spacer)									Flue 2 (insulation and spacer)									shaft for air transport
		outer wall			ceramic pipe			thickness of insulati	air gap	Ryy	outer wall			ceramic pipe			thickness of insulat	air gap	Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket				inner width		W	inner diame	outer diameter pipe	outer diameter socket				
LASFP14/18	730 x 420	260 x	260	**50**	140	158	178	20	31	R32	320 x	320	**50**	180	199	219	20	40,5	R33	
LASFP14/20	730 x 420	260 x	260	**50**	140	158	178	20	31	R32	320 x	320	**50**	200	219	239	20	30,5	R34	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

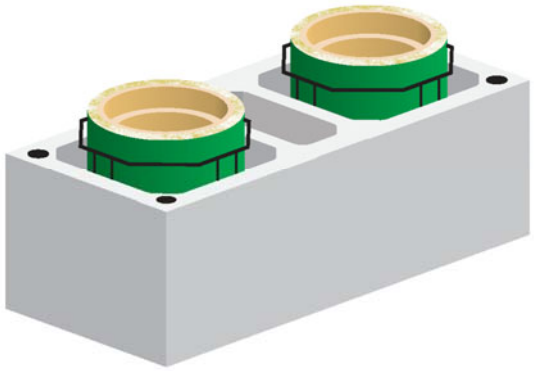
Frey Focus-Plus, chimney with 2 flues for ceramic flue liners, no shaft for ventilation or combustion air supply

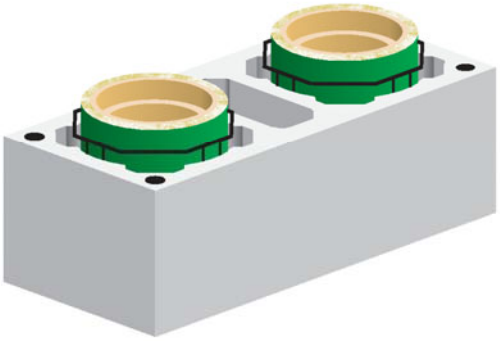
type	outer dimension	Flue 1 (insulation and spacer)									Flue 2 (insulation and spacer)									shaft for air transport
		outer wall			ceramic pipe			thickness of insulati	air gap	Ryy	outer wall			ceramic pipe			thickness of insulat	air gap	Ryy	
		inner width		W	inner diame	outer diameter pipe	outer diameter socket				inner width		W	inner diame	outer diameter pipe	outer diameter socket				
VGLASFP14/18	730 x 420	260 x	260	**50**	140	158	178	20	31	R32	320 x	320	**50**	180	199	219	20	40,5	R33	
VGLASFP14/20	730 x 420	260 x	260	**50**	140	158	178	20	31	R32	320 x	320	**50**	200	219	239	20	30,5	R34	

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Duotherm-Plus and
Frey Focus-Plus
double duct





Frey Duotherm-Pluss, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

		Flue 1 (insulation and spacer)									Flue 2 (insulation and spacer)									
		outer wall			ceramic pipe			thickness of insulati	air gap		outer wall			ceramic pipe			thickness of insulat	air gap		shaft for air transport
type	outer dimension	inner width		W	inner diame	outer diameter pipe	outer diameter socket			Ryy	inner width		W	inner diame	outer diameter pipe	outer diameter socket			Ryy	
LASFP14/16L	860 x 390	240	240	50	140	158	178	20	21	R32	290	290	50	160	179	199	20	35,5	R33	130x290
LASFP14/18L	880 x 400	280	280	50	140	158	178	20	41	R32	300	300	50	180	199	219	20	30,5	R33	100x280
LASFP16/18L	880 x 400	280	280	50	160	179	199	20	30,5	R33	300	300	50	180	199	219	20	30,5	R33	100x280

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Focus-Plus Frey HL-Plus, chimney with 2 flues for ceramic flue liners, with shaft for ventilation or combustion air supply

		Flue 1 (insulation and spacer)									Flue 2 (insulation and spacer)									
		outer wall			ceramic pipe			thickness of insulati	air gap		outer wall			ceramic pipe			thickness of insulat	air gap		shaft for air transport
type	outer dimension	inner width		W	inner diame	outer diameter pipe	outer diameter socket			Ryy	inner width		W	inner diame	outer diameter pipe	outer diameter socket			Ryy	
VGLASFP14/16L	860 x 390	240	240	50	140	158	178	20	21	R32	290	290	50	160	179	199	20	35,5	R33	130x290
VGLASFP14/18L	880 x 400	280	280	50	140	158	178	20	41	R32	300	300	50	180	199	219	20	30,5	R33	100x280
VGLASFP16/18L	880 x 400	280	280	50	160	179	199	20	30,5	R33	300	300	50	180	199	219	20	30,5	R33	100x280

W = minimum thickness of outer wall

Ryy = thermal resistance of flue liner, insulation, air gap and outer wall

Frey Duotherm-Plus and
Frey Focus-Plus
double duct combined with ventilation

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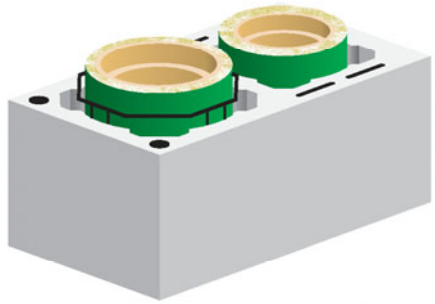
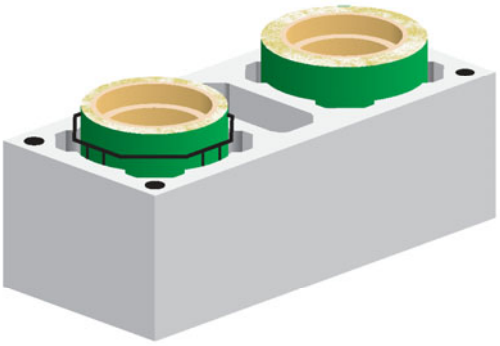
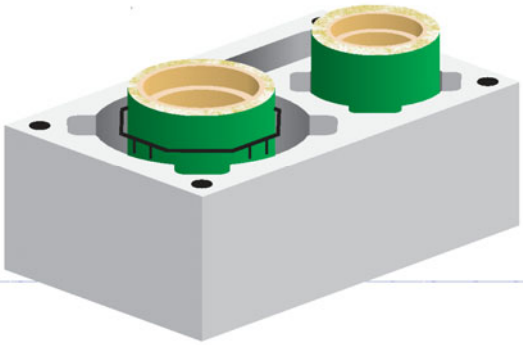
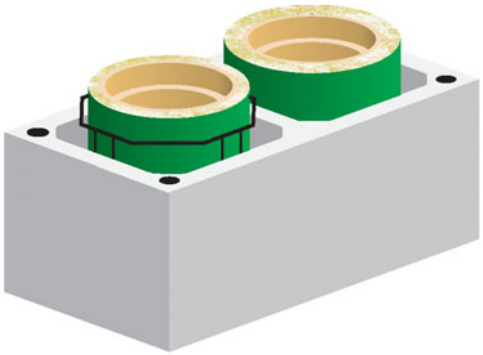
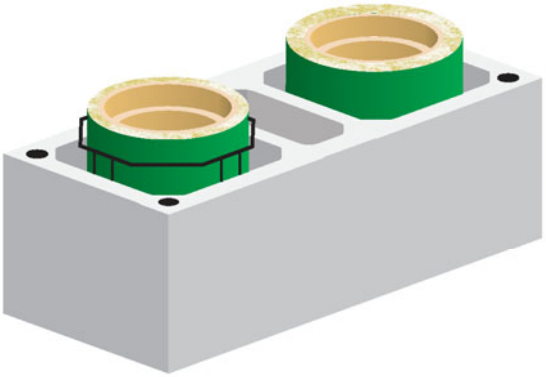
Combinations of double flue liner systems with or without air duct are possible.
Some exemples are given in the following drawings

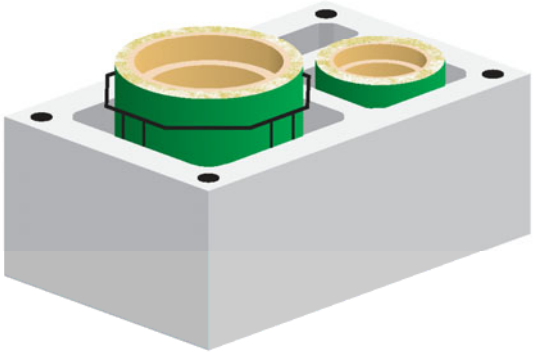




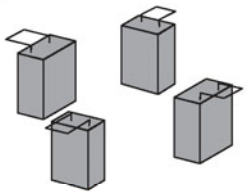








Spacers could be made in combination with b locks of concrete



Frey-HL-Plus with Duotherm-Plus
kombined with ventilation
Vitus-Plus with Focus-Plus
kombined with ventilation

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ceramic flue liner				slave / socket		
Nominal diameter D mm	inner diameter D mm	wall thickness d mm	overall dimension mm	inner diamter D_1 mm	wall thickness d_1 mm	overall dimension mm
120	119	10,5	140	144	7,5	159
140	137	10,5	158	163	7,5	178
160	158	10,5	179	184	7,5	199
180	178	10,5	199	204	7,5	219
200	198	10,5	219	224	7,5	239
250	250	11,0	272	278	8,0	294
300	300	14,0	328	334	8,0	350
350	350	15,0	380	388	9,0	406
400	400	15,0	430	438	9,0	456
zul. Toleranzen gem. DIN EN 1457 ± 3 %						

frey

flue liner

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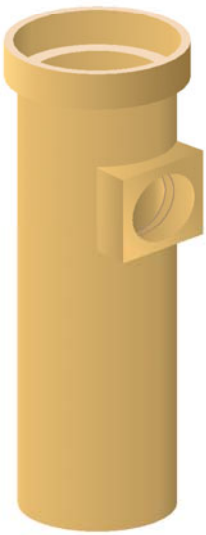
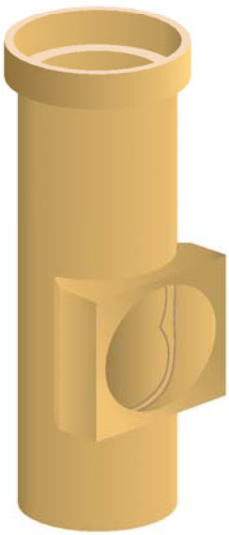
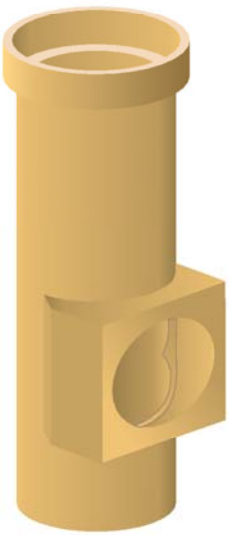


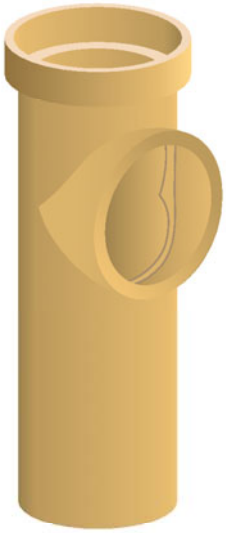
ASA I



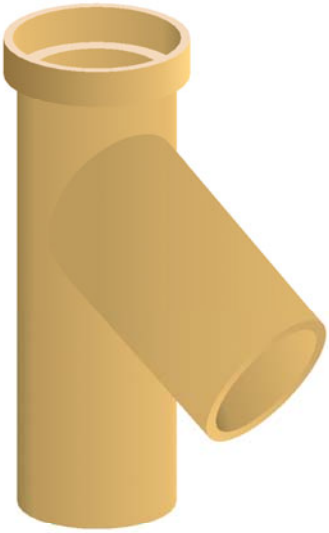
ASA II
bore NW (nominal dimension)
+ 2 cm



ASA II
bore NW



RRÖ 90°



RRÖ 45°

For each nominal diameter of the flue liner individual termination diameters are possible.
The dimensioning is to be done based on concerned mass flow requirements.

chimney fittings for flue gas connection

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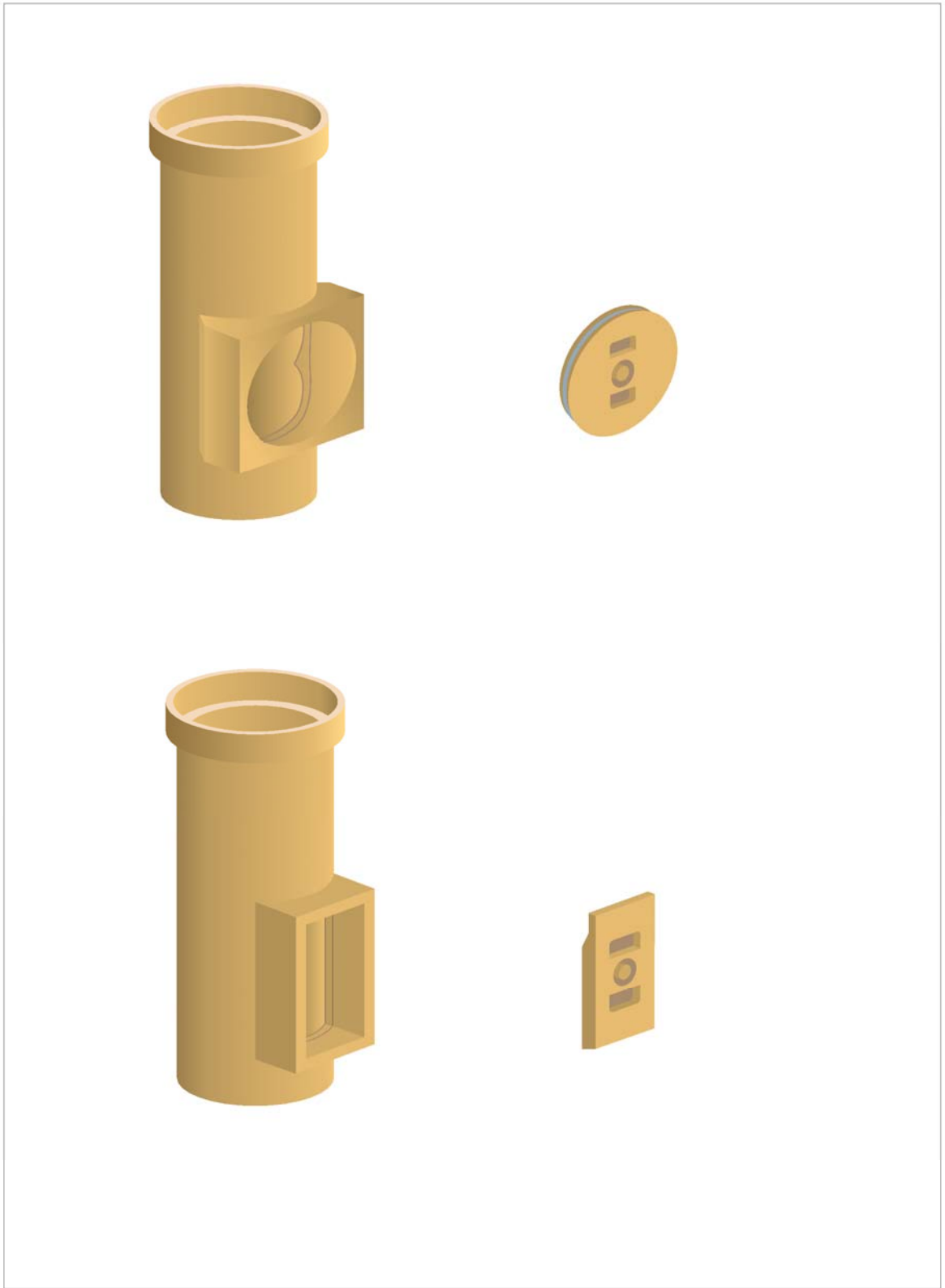

chimney fittings for inspection door with ceramic cover / cap

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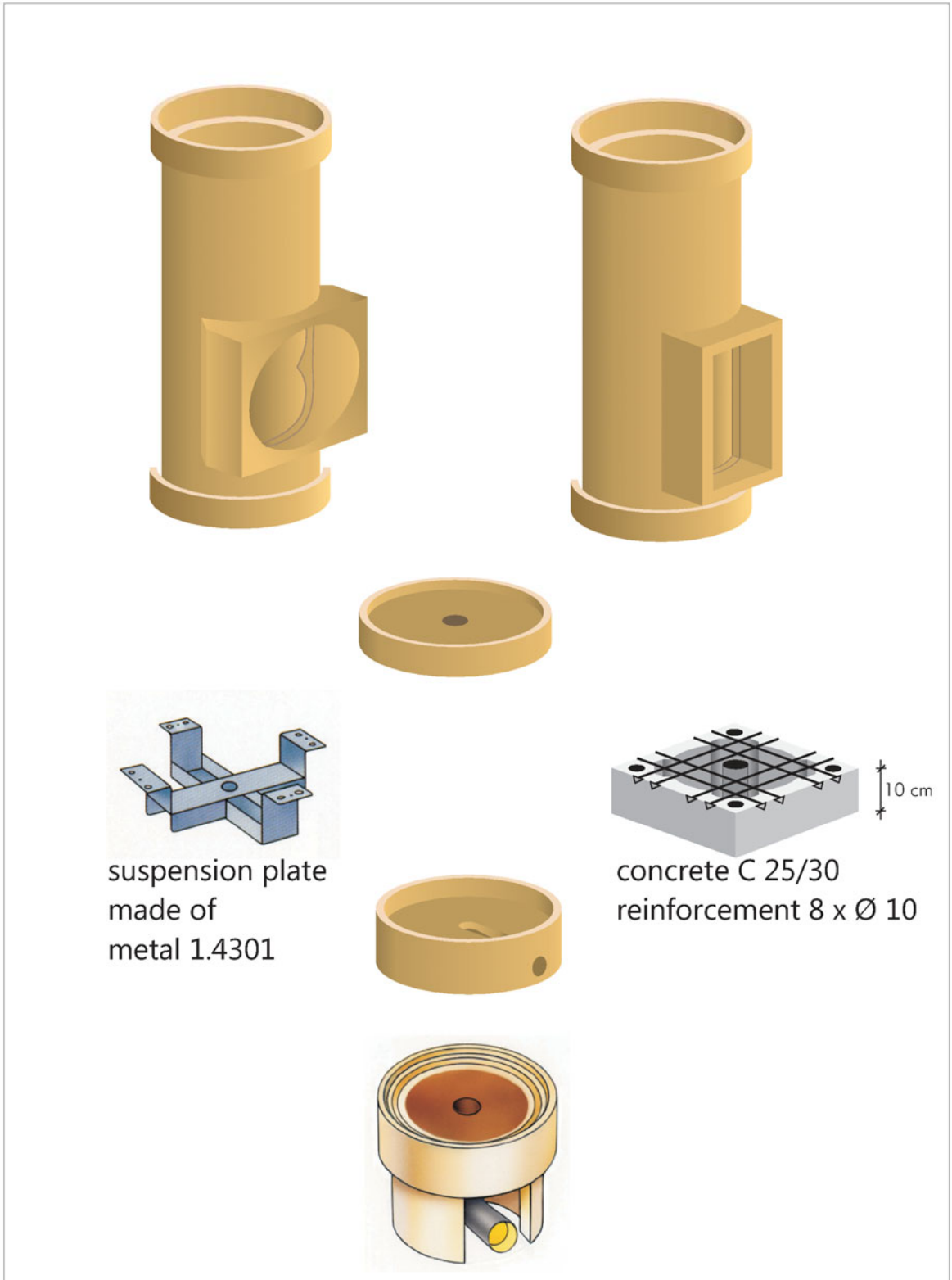

chimney fitting chimney base
condensate bowl, base stone
suspension element made of
metal

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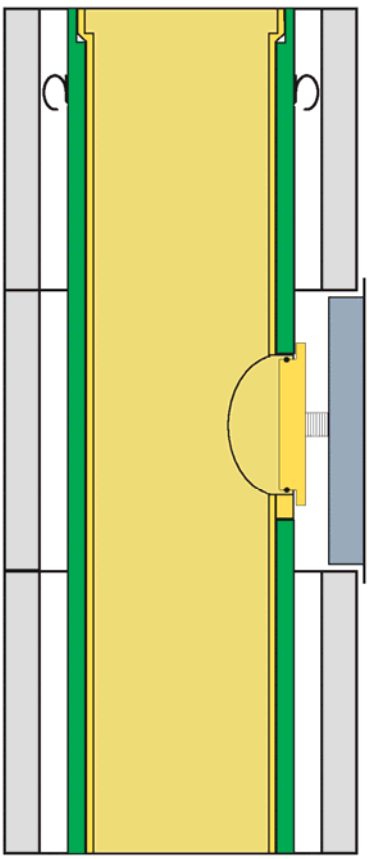

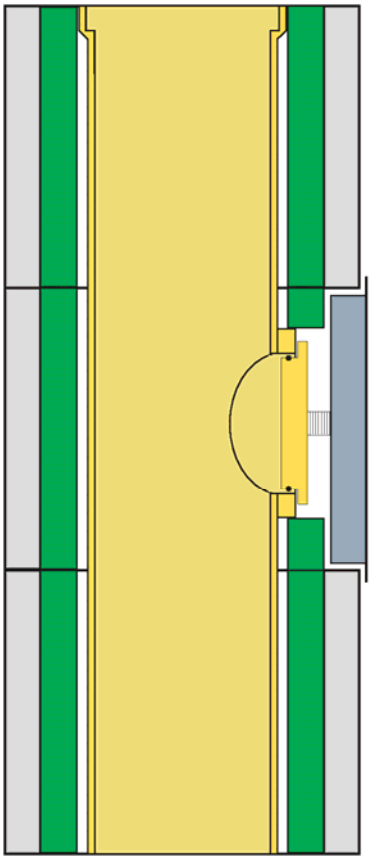

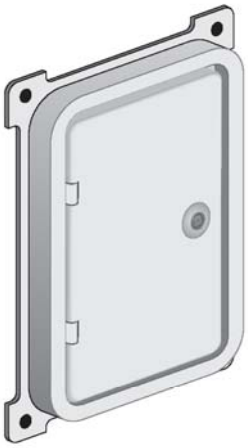

Inspection door

LAS / Kompakt

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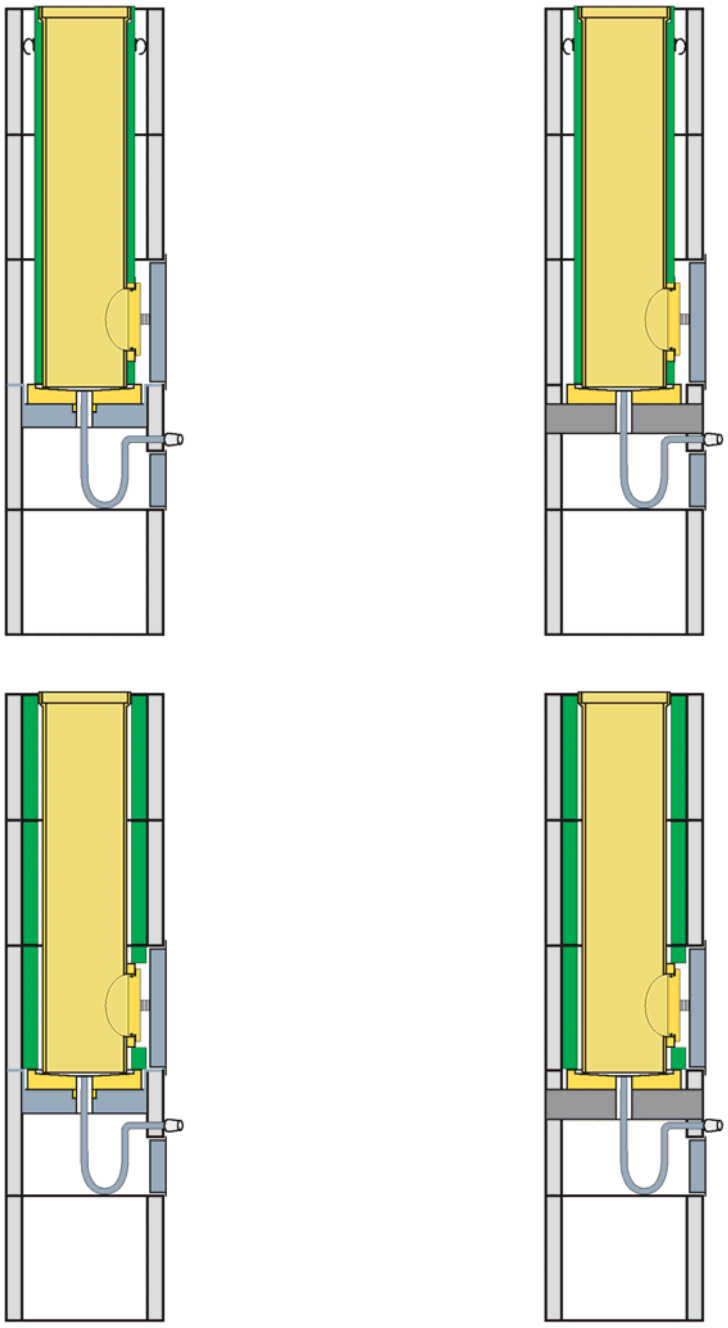
with suspension element made of metal

with concrete slab



Sectional view chimney base

LAS / Kompakt

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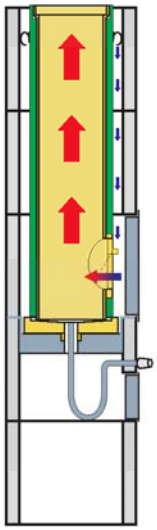
Frey chimney LAS multi-connection

Optional:
controlled overflow opening
with draught stabiliser



principle working

LAS
controlled overflow opening

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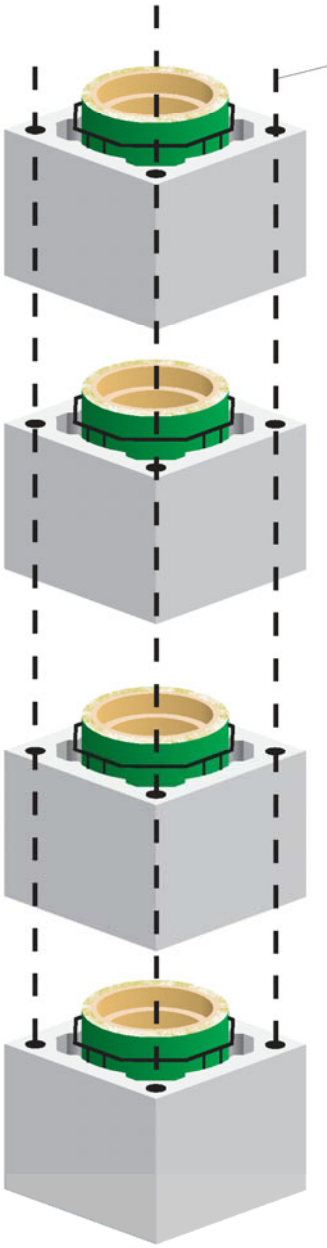
Storey height design



storey height element
element lenght up to 6,0 m

Reinforcement 4-times with graut

storey height design

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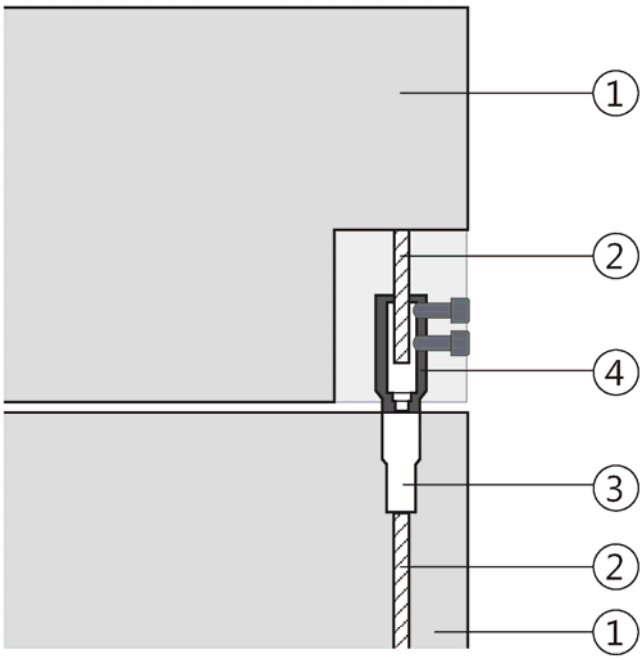
Connection for reinforcement bars in case of storey height



① outer wall made of conrete
② Reinforcement Ø 10 Bst 500
③ grip connector
④ connection for reinforcement bars

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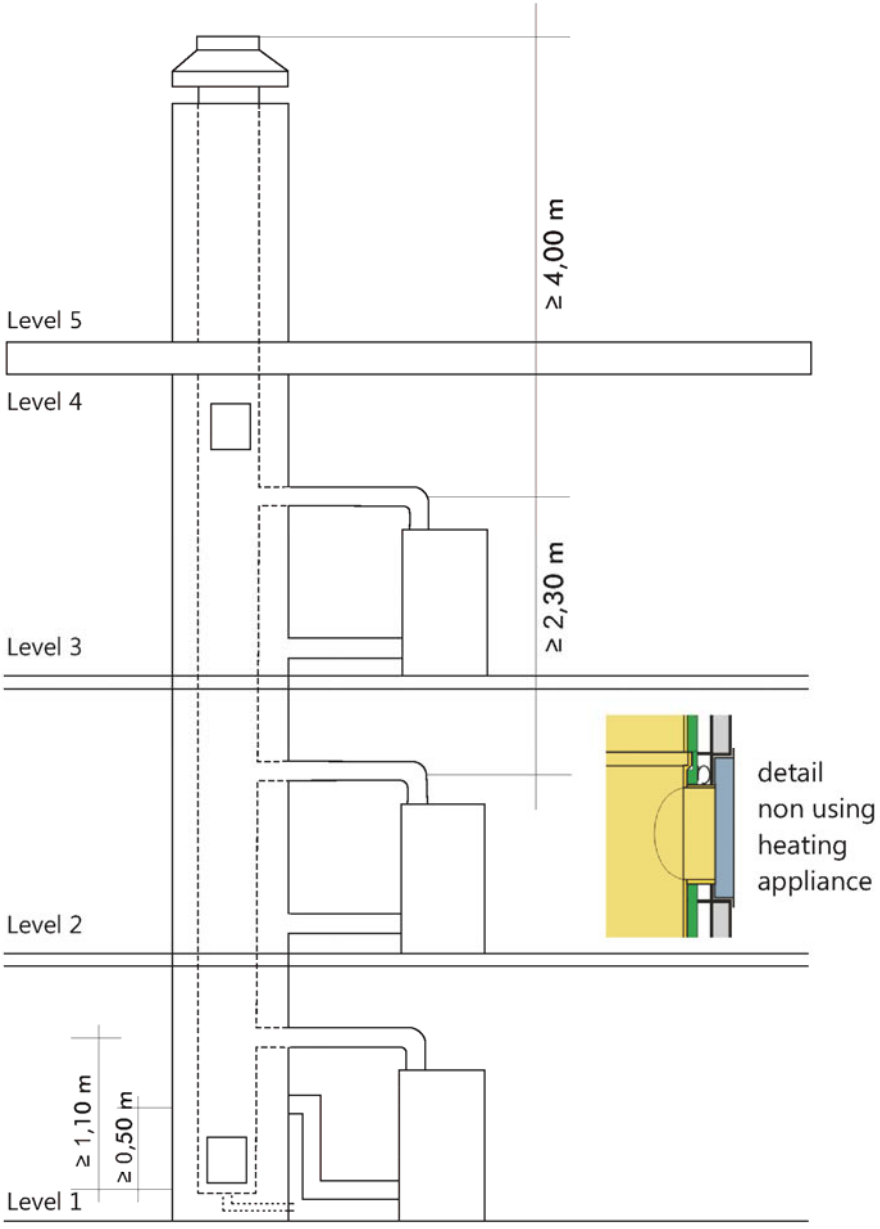
Frey chimney LAS

with up to three fireplaces for solid fuel
firewood without using surrounding air



multi-connection
LAS

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Frey chimney HL-Plus, Vitus-Plus, Duotherm-Plus und Focus-Plus **Anlage X**

Einbauzustand bzw. dargestelltes Bauteil

Characteristics of the components

Table 3: Characteristics of the components

Component	Technical specification	Performance characteristic	Result
Clay/ceramic flue liner	EN 1457-1 EN1457-2	Type	A1N1
			WC, B3N1/B3P1
		Flow resistance (mean roughness)	0,0015 m
		Resistance to fire	G
		Compressive strength	> 10 MN/m²
		Thermal resistance	NPD[1)]
		Durability	
		Freeze thaw resistance	Passed
		Acid resistance	≤ 2%
		Sweeping resistance	≤ 0,03 kg/m²
		Water vapour permeability	< 10 g/(hm²)
Outer wall	EN 12446	Thermal resistance	NPD
		Heat resistance	T400
		Sootfire resistance	G50
		Compressive strength	50 m
		Freeze thaw resistance	NPD[1]
		Dangerous substances	None
		Compressive strength in case of storey height units	≥ 6 N/mm², depending on the type of outer wall
	-	Additional secondary minerals	[2]

[1] No performance determined

[2] For secondary minerals, used in the composition for the outer wall, made of concrete, a declaration has to be provided that the product was tested and complies with threshold values according to the legislation in the concerned Member State of destination, if any

Table 3: Characteristics of the components (continuation)

Component	**Technical specification**	**Performance characteristic**	**Result**
Chimney fittings	EN 1457-1 EN1457-2	Type	A1N1
			WC, B3N1/B3P1
		Resistance to fire	G
		Compressive strength	≥ 50 kN
		Thermal resistance	NPD[1]
		Durability	
		Acid resistance	≤ 2%
		Sweeping resistance	≤ 0,03 kg/m²
	EN 13063-2, clause 5.1.2	Maximum height inner liner (by means of maximum load for opening sections)	50 m
Mortar for jointing outer walls	EN 13063-1, clause 5.1.7, and EN 998-2, table 1	Compressive strength jointing material	M ≥ 5
Mortar for jointing flue liners	EN 13063-2, clause 5.1.3.1.1	Density	2,01 g/cm³
	EN 13063-2, clause 5.1.3.1.2	Compressive strength jointing material	≥ 10 N/mm²
	EN 13063-2, clause 5.1.3.1.3	Water resistance	< 3 %
	EN 13063-2, clause 5.1.3.1.4	Acid resistance	≤ 2 %
Grout in case of storey height design	EN 1015-3	Flow of grout	Category 1
	EN 12617-4	Shrinkage	2,03 %o
	EN 12617-4	Expansion	> 0,0 Vol. %
Reinforcement in case of storey height design [2, 3]	EN 10002-1	Tensile strength	≥ 550 N/mm²
	EN 10002-1	Yield strength	≥ 500 N/mm²
	Type of grip connectors and connections for reinforcement bars [3]		

[1] No performance determined
[2] Type of reinforcements laid down in control plan
[3] Trade name of reinforcement joints/grip connector and related provision for assessment laid down in control plan

Table 3: Characteristics of the components (continuation)

Component	Technical specification	Performance characteristic	Result
Plate of chimney base, made of concrete Suspension device made of metal	Depicted in Annex 1, figure 14, of this ETA		
Chimney base outer wall made of concrete	*Performance characteristics of outer wall made of concrete (see outer wall made of concrete above)*		
Chimney base flue liner	*Performance characteristics of clay/ceramic flue liner (see clay/ceramic flue liner above)*		
Cleaning and inspection door	EN 13063-1 and -2	Leakage	*Performance characteristics of upper cleaning and inspection door are relevant*
	EN 13063-1, clause 5.4, and EN 13063-2, clause 5.4	Surface temperature	
	EN 13063-1	Restriction of relative movement of flue liner	
	EN 13216-1, clause 5.6	Condensate resistance	
Upper cleaning and inspection door[3)]	EN 13063-1 and -2	Leakage	< 2 l/sm²
	EN 13063-1, clause 5.4, and EN 13063-2, clause 5.4	Surface temperature	< 140 K
	EN 13063-1,	Restriction of relative movement of flue liner	Passed (no hindrance of the relative movement of the flue liner by the cleaning and inspection door)
	EN 13216-1, clause 5.6	Condensate resistance	Passed (no water occurred at the outside of the cleaning and inspection door)
Closing devices (in case of more than one heating appliance)	EN 13063-1, table 2	Leakage	*Performance characteristics of upper cleaning and inspection door are relevant*
	EN 13063-1, clause 5.4, and EN 13063-2, clause 5.4	Surface temperature	
Thermal insulation material	EN 13063-1, clause 5.1.5	Increase in temperature	≤ 10%

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Test sequence for the Frey system chimneys

The testing of Frey system chimneys was carried out with the following test sequence:

a) Gas tightness
b) Thermal test on operating conditions
c) Gas tightness
d) *Relative movement*[1]
e) Thermal test under soot fire conditions
f) Gas tightness
g) *Relative movement*[12] and abrasion resistance of the clay/ceramic flue liner (covered by sweeping resistance according to EN 1457)
h) Condensate resistance and water resistance
i) Flow resistance
j) Thermal resistance

12 These characteristics are only noted in the test sequence for Hart MULTIkeram for completion as also listed in the test sequences given in EN 13063-1 and -2, Annex A.1, but are no mandated product characteristics and therefore not specified in this European technical approval.

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Reference documents

EN 998-2:2010	Specification for mortar for masonry - Part 2: Masonry mortar
EN 1443:2003	Chimneys - General requirements
EN 1457:1999+AC:1999 +A1:2002+AC:2006+AC:2007	Chimneys - Clay/Ceramic flue liners - Requirements and test methods
EN 12446:2011	Chimneys - Components - Concrete outer wall elements
EN 13063-1:2005+A1:2007	Chimneys - System chimneys with clay/ceramic flue liners - Part 1: Requirements and test methods for sootfire resistance
EN 13063-2:2005+A1:2007	Chimneys - System chimneys with clay/ceramic flue liners - Part 2: Requirements and test methods under wet conditions
EN 13063-3:2005+A1:2007	Chimneys - System chimneys with clay/ceramic flue liners - Part 3: Requirements and test methods for air flue system chimneys
EN 13216-1:2004	Chimneys - Test methods for system chimneys - Part 1: General test methods
EN 13240:2001	Roomheaters fired by solid fuel - Requirements and test methods
EN 13384-1:2008+A2	Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one appliance
EN 13384-2:2009+A1	Chimneys - Thermal and fluid dynamic calculation methods - Part 2: Chimneys serving more than one heating appliance