ENGELHARDT GMBH

A company of jeremias® Group

SES

PLANNING FOLDER

Steel chimneys, ventilation towers, silencer, plumbing installation

www.engelhardt-ses.de

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COMPANY PROFILE

Engelhardt GmbH (SES)
References
Certification

The **Jeremias Group** with its headquarters in Wassertrüdingen (Bavaria) is among the

Worldwide leader

manufacturers of exhaust gas and chimney systems made of stainless steel, steel, plastic and ceramic for private, commercial or industrial use. Powerful, open and international – this is how we have presented ourselves since

Over 40 years

The Jeremias Group has continuously developed its activities since the company was founded. Seven production locations in Germany, Poland, Spain, Russia, the Czech Republic and the USA stand for healthy growth, commercial success and meaningful visions. In addition to production and our own distribution office, we offer our customers over 60 various CE-certified systems for private and commercial uses, as well as steel chimneys up to three meters in size.

We'd like to use our **planning folder** to introduce to the technical details of our products in the industrial segment of **the Jeremias Group**, from the **Engelhardt GmbH SES**company:

ENGELHARDT GMBH SES

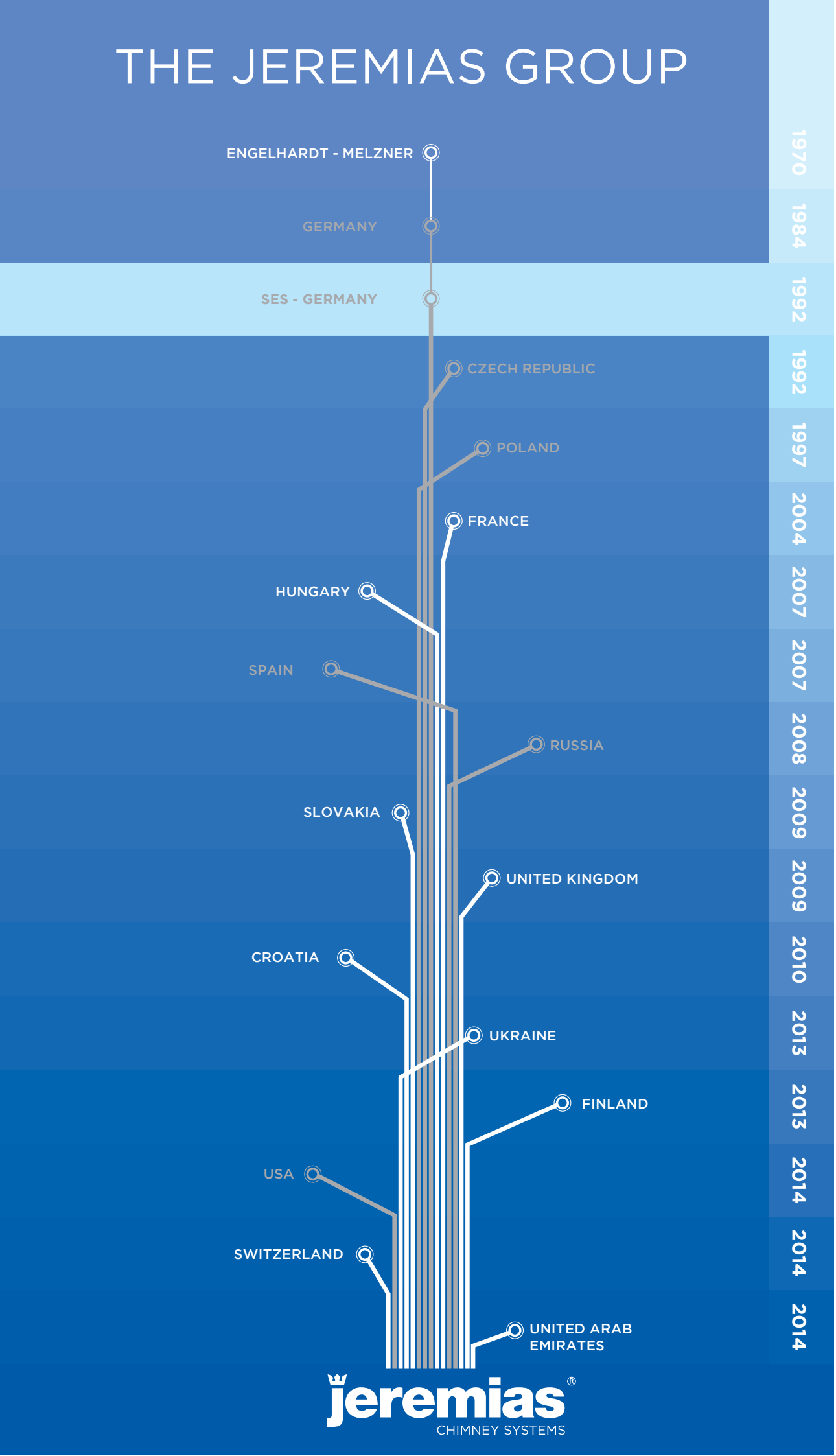
At **SES** (formerly Stefan Engelhardt Stahlschornstein), the focus is on the steel chimney segment and the system components starting after the energy supplier. In addition to the classic chimney, **SES** also produces and assembles flue gas conveyors, silencers, compensators and much more.

Due to increasing industrial demands, steel construction developed to supplement the chimney element, which successively made static construction and special structures possible for our international customers.

Our goal is to ensure the future of our company with **healthy growth, innovative products** and with **highly qualified** and **motivated employees** in a sustainable way.

Customer focus is also priority number one for us. Our relationships to business partners domestic and abroad, which very often last for decades are characterized by a **partnered** and **fair interaction.**

THE JEREMIAS GROUP



Engelhardt & Melzner

jeremias® ABGASSYSTEME

SES

jeremias® KOMÍNOVÉ SYSTÉMY

jeremias® SYSTEMY KOMINOWE

jeremias® CONDUITS DE FUMÉE

jeremias® KÉMÉNYRENDSZEREK

jeremias® CHIMNEY SYSTEMS

jeremias® ДЫМОХОДНЫЕ СИСТЕМЫ

jeremias® KOMÍNOVÉ SYSTÉMY

jeremias® CHIMNEY SYSTEMS

jeremias® SISTEMI DIMNJAKA

jeremias® ДЫМОХОДНЫЕ СИСТЕМЫ

jeremias® CHIMNEY SYSTEMS

jeremias® EXHAUST SYSTEMS

jeremias® ABGASSYSTEME

jeremias® EXHAUST SYSTEMS

Over the course of time, **SES** established itself as the **leader of the industrial chimney segment** and has become one of the **largest manufacturers in the German market.**

OUR SERVICE RANGE INCLUDES:

PREPARATION OF BASIC DATA / REQUIREMENTS

> Exhaust gas data
> Piping
> Assembly situation

PLANNING

> Consulting
> Cost estimation
> Feasibility
> Creation of CRFs

INVOICES

> Static calculation
DIN V 4133 / EN 1993-3-2 /
ASME / CICIND
> Cross-section calculation according to
valid standards (13084-1)
> Foundation sizing
> Determination of the resonance frequency
> Transverse vibration validation
> Design of the chimney construction
> Sonic calculation

SCHEMATIC PLANNING IN 2D AND 3D

> Mega CAD / Solid Works
> Overview drawing
> Individual parts drawing
> Parts lists
> Foundation plans
> Plumbing and piping

PRODUCTION IN INDIVIDUAL PRODUCTION LINE AT WASSERTRÜDINGEN (GERMANY) LOCATION

> At approx. 4800 m²
> 17,000m² general storage for raw materials and finished products
> Black/white manufacture separation
> 2 laser systems
> Coiling system
> Longitudinal welding machine
> Circular bending machine

ORGANISATION LOGISTICS

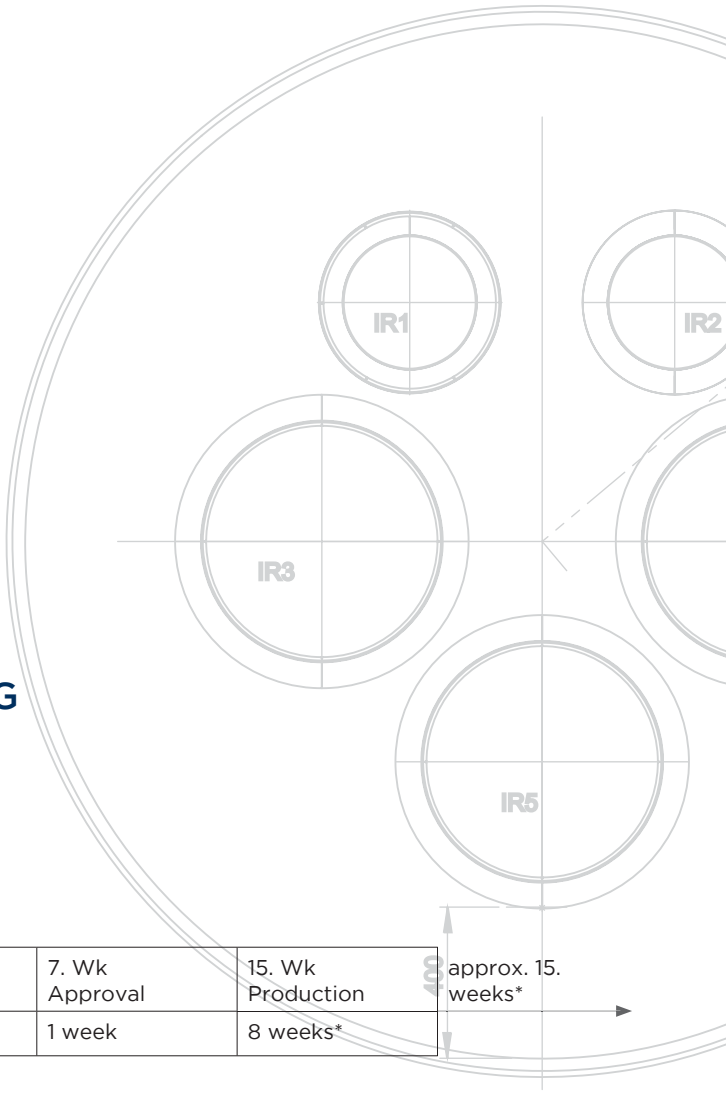
> Transport
> Crane provision
> Scaffolding

ASSEMBLY

> Measurement
> Fixed deadlines
> Supervisor
> Assembly personnel

REGULAR MAINTENANCE IN THE FORM OF CONDITION MONITORING

> Initial analysis
> Yearly monitoring



EXAMPLE TIMELINE

1. Wk Data collection	3. Wk Drawing V1	5. Wk Changes	6. Wk Creation V2	7. Wk Approval	15. Wk Production	approx. 15. weeks*
1 week	2 weeks	2 weeks	1 week	1 week	8 weeks*	

* amount of production time / planning time is variable depending on the project.

OUR REFERENCES:

ENERGY

> Vattenfall
> EnBw
> RWE
> Eon
> Currenta
> Energie AG
> Energie Basel Land
> GDF Suesz
> Dalkia
> Wien Energie
> Viessmann

FOOD

> Hochwald Milch
> Nespresso
> Nestlé
> Paulaner
> Bitburger
> Oettinger
> Molkerei Gropper

INDUSTRY

> BASF Würth
> Voith Heidenheim
> Grob Werke Mindelheim
> Bayer
> DOW
> Osram
> Bosch
> Südzucker
> MAN
> Siemens
> John Deere
> Lufthansa
> Thyssen
> MTU

PUBLIC SERVICES BY LOCATION IN GERMANY

> Gießen
> Rosenheim
> Schäbisch Hall
> Munich
> Neuburg
> Leibzig
> District Heating AG Wien

AUTOMOTIVE

> Audi
> Hörmann
> BMW
> Daimler
> Opel
> Volkswagen
> Continental
> Goodyear
> Schaeffler
> Schaeffer Augsburg

INTERNATIONAL REFERENCES

> USA
> Switzerland
> China
> Egypt
> Luxembuorg
> Malaysia
> Chile
> Check Republic
> Ukraine
> Greece
> Belgium
> Brazil
> Italy
> Austria
> Poland
> Mexico
> France
> Russia
> England
> Romania
> Spain
> Norway
> Turkmenistan
> Hungary
> Finland
> Check Republic
> Portugal
> United Emirates

VIENNA, AUSTRIA

For district heating supply, SES suitably supplies the city of Vienna with 2 x 32 MW hot water heaters per 45 m chimney incl. flue gas conveyor and exhaust gas-damping.

HEIDENHEIM, GERMANY

In Heidenheim, Voith invested in 3 new 6 MW block heat and power plants for its own heat supply.
A 50 m chimney with 3 exhaust lines at Ø 900 mm are connected to this system.

KECZKEMET, HUNGARY:

For energy and heat supply for Daimler lorry production, SES supplies two 40 m high steel chimneys for a total of 5 heat generators. SES manufactured and installed flue gas lines and exhaust gas silencers to complement the steel chimneys.

RHEINBERG, GERMANY

Steel chimney, installed after a MAN 6MW gas turbine with recovery boiler connected downstream. Purpose of the energy supply is to serve the Solvay plant in Rheinberg.

CERTIFICATION

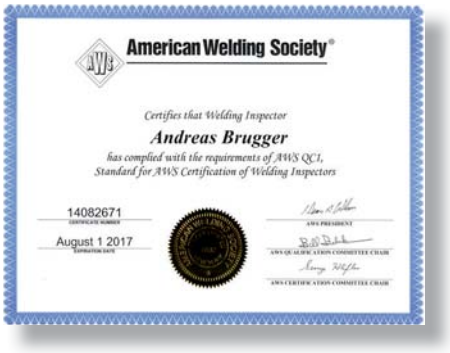
To keep our quality at a high level, and continue to develop, we employ **trades people skilled in metal fabrication** such as our current **25 certified welders WIG/MAG** and our own **welding engineer** and **welding expert**.

At the same time, we **are members of professional societies**, regularly keep our permits up to date and acquire **certificates** to validate **our top-notch product quality** and **production processes**.

Certification conformity
Internal production control
EN 1090-1

Swiss certificate for EN 1090

AWS



ASSOCIATIONS

Certification conformity
Internal production control
EN 13084-7

Certificate EN ISO 3834-2

IVS

2

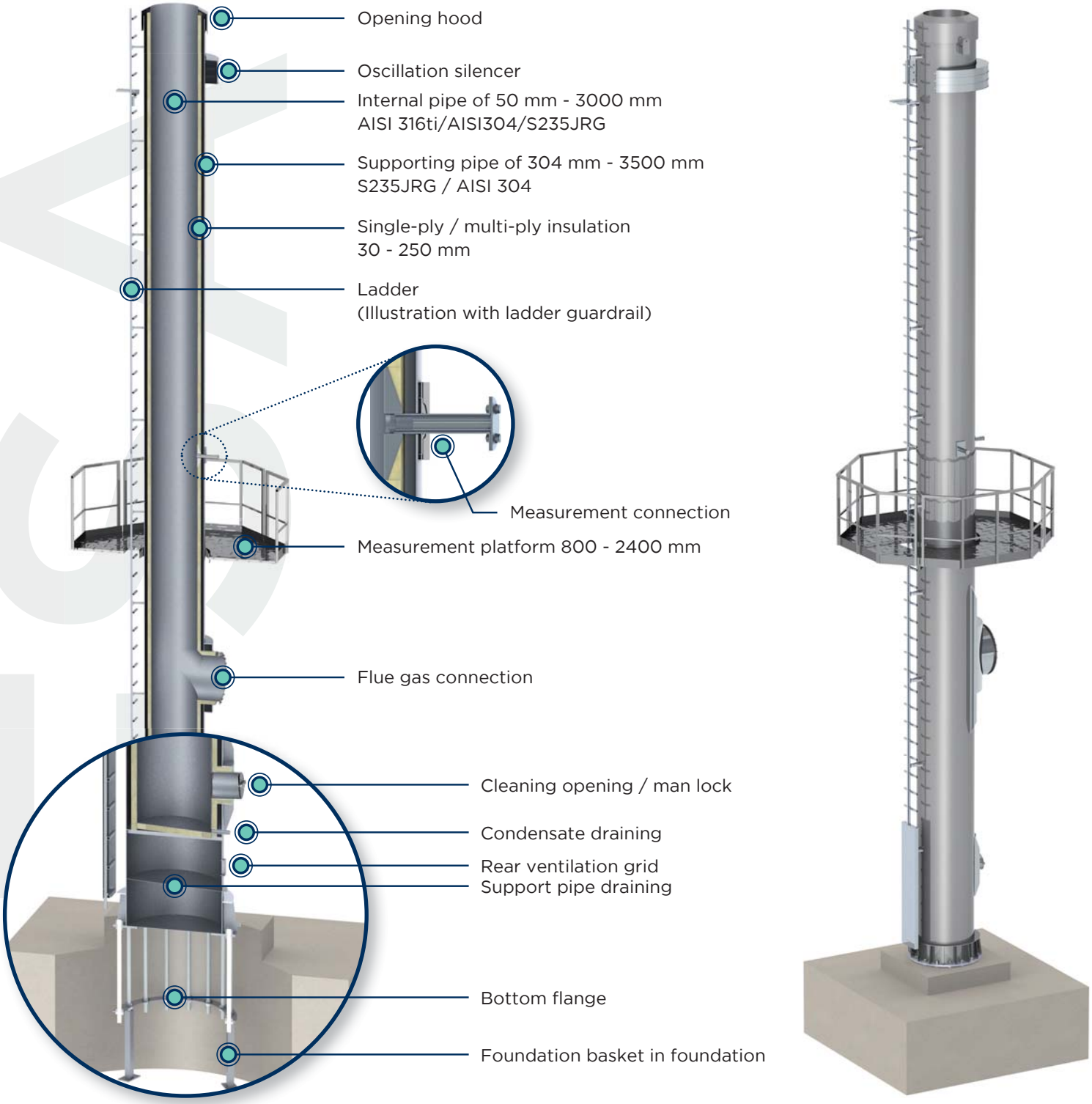
CHIMNEYS

SERIES	FSA	FSA-X	FSB	FSC
FITTING SYSTEM	Foundation basket or building connection	Foundation basket or building connection	However, foundation bas-ked is usually building connection	Foundation basket or building connection
SUPPORTING ELEMENT	External pipe	External pipe	Internal pipe	Single-walled exhaust line
STRUCTURE	Multiple shell	Multiple shell	Multiple shell	Single-shell
EXHAUST LINE	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539	1.4301 (1.4571)
INTERNAL PIPE - DAMPING	A1 as wiring network mat A2 foil laminated Lamination mat	A1 as wiring network mat A2 foil laminated Lamination mat	A1 as wiring network mat A2 foil laminated Lamination mat	Insulation with Armaflex possible
REAR VENTILATION	Yes	Yes	no	-
EXtERNAL PIPE	S235 / S355 / 1.4301	S235 / S355 / 1.4301	-	-
SUPPORTING PIPE				1.4301, 1.4571, St 37-2
QUANTITY INTERNAL PIPES	1	≥ 2	1	Combo-tower possible
SURFACES-VISUAL	coated Steel galvanised Stainless steel, ground Stainless steel, blasted (Stainless steel cladding)	coated Steel galvanised Stainless steel, ground Stainless steel, blasted (Cladding)	Cladding variations Copper, aluminium Stainless steel IIIc or d Stainless steel, brushed	Facet grinding for stainless steel Steel, galvanised Steel, coated (Cladding)
USE	Standard fireplaces Block heat and power plants Emergency power de-vices. Special fireplaces	Standard fireplaces Block heat and power plants Emergency power de-vices. Special fireplaces	Standard fireplaces Exhaust	Exhaust Supply air

SERIES	FS-RM	FSA-RM	FSA-X-RM
FITTING SYSTEM	Foundation basket or building connection	Foundation basket or building connection	Foundation basket or building connection
SUPPORTING ELEMENT	Mast (RM)	FSA	FSA-X
EXHAUST LINE	-	1.4571, 1.4539	1.4571, 1.4539
INTERNAL PIPE - DAMPING	-	A1 as wiring network mat A2 foil laminated Lamination mat	A1 as wiring network mat A2 foil laminated Lamination mat
REAR VENTILATION	-	Yes	Yes
MAST	1.4301 or S235JRG	1.4301 oder S235JRG	1.4301 oder S235JRG
INTERNAL PIPES IN RM	-	1 (single duct)	≥ 2 (multi-duct)
SURFACES-VISUAL RM	coated Steel, galvanised Stainless steel, ground Stainless steel, blasted (Stainless steel cladding)	coated Steel galvanised Stainless steel, ground Stainless steel, blasted (Stainless steel cladding)	coated Steel, galvanised Stainless steel, ground Stainless steel, blasted (Stainless steel cladding)
USE RM / SATELLITE	Standard fireplaces Block heat and power plants Emergency power device Special fireplaces	Standard fireplaces Block heat and power plants Emergency power device Special fireplaces	Standard fireplaces Block heat and power plants Emergency power device Standard fireplaces

FSA

Free-standing, double-wall steel chimney according to SES standard with static supporting external pipe and a bend-resistant internal pipe. The advantage of this system it the separation of temperature and corrosion bearing internal pipe from the static, supporting element. This is how the FSA is a type of chimney that can be used universally and can be a solution for all use cases - regardless of the temperature and structure height.



USE

> The FSA series is a universal and compact solution in the steel chimney and exhaust gas systems service area without required building connection
> Large building heights are possible due to the externally arranged supporting pipe

STRUCTURE

> Internal pipe (over 1.5 mm stainless steel)
> Insulation
> Rear ventilation
> Supporting pipe

INSULATION

> Single or multi-ply, offset, slotted and antislip on internal pipe Fixed
> if necessary with visible lead cladding

REAR VENTILATION

> Annulus between insulated exhaust pipe and supporting external pipe, through which the rear ventilation of the system construction is ensured
> Deflection of heating room ventilation between supporting pipe and insulated internal pipe is possible

PEDESTAL / LADDER

> For existing compulsory sweeping of exhaust system through the opening, a safety ladder is added to the supporting pipe in accordance with the UVV (German Safety Specifications)
> Stand pedestals or work platforms up to 360° can be selected in galvanised steel or stainless steel

SUPPLEMENT

> Where needed, acceleration jets, deflector hoods or opening silencers can be installed

SERIES	FSA
STATIC SYSTEM	Foundation basket or building connection
SUPPORTING ELEMENT	External pipe
STRUCTURE	Multiple shell
INTERNAL PIPE	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539
INTERNAL PIPE DAMPING	A1 as wiring network mat A2 foil laminated Laminated mat
REAR VENTILATION	Yes
EXtERNAL PIPE	S235JRG / S355 / 1.4301
NUMBER OF INTERNAL PIPES	1
SURFACE VISUAL	coated, galvanised steel, ground stainless steel Blasted stainless steel (cladding)
USE	Standard fireplaces, block heating and power plants Emergency power unit, special fireplaces

UNTERFÖHRING, GERMANY

SYSTEM:	FSA
CHIMNEY HEIGHT:	2 x 25 m
EXTERNAL DIAMETER:	1016, 1220 mm
INTERNAL DIAMETER:	800, 900 mm

Stainless steel cladding over the entire length and a 360° platform with staircase from roof.

MADRID, SPAIN

SYSTEM:	**FSA**
CHIMNEY HEIGHT:	25 m
EXTERNAL DIAMETER:	1016 mm
INTERNAL DIAMETER:	640 mm

Kitchen exhaust for 5 star hotels in the centre of Madrid.

CYPRESS, GREECE

SYSTEM:	**FSA**
CHIMNEY HEIGHT:	30 m
EXTERNAL DIAMETER:	1800 mm
INTERNAL DIAMETER:	1250 mm

Three-piece chimney with 2 platforms. Planning, logistics and assembly by staff specialists.

ZEITZ, GERMANY

SYSTEM:	**FSA**
CHIMNEY HEIGHT:	25 m
EXTERNAL DIAMETER:	2420 mm
INTERNAL DIAMETER:	2000 mm

Pipe work and chimney system for four breeze ovens in the steelworks in Zeitz.

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CUSTOMER DATA:

Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:

Installation location _____

Temperature / medium _____ ° C /

Inner diameter _____ mm

Ladder at + _____ mm

Flue gas connection height _____ mm

Flue gas connection diameter _____ mm

Cleaning opening height _____ mm

Supporting pipe
- ☐ S235JRG / S355
- ☐ VA

Surface
- ☐ C3: 160 µm (Standard)
- ☐ C4: 240 µm
- ☐ C5: 320 µm
- ☐ VA clad

Internal pipes material
- ☐ 1.4571 / AISI 316ti
- ☐ 1.4301 / AISI 304
- according to temperature and medium
- ☐ ....

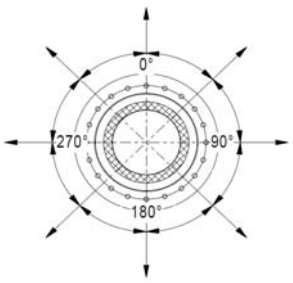
Insulation _____ mm

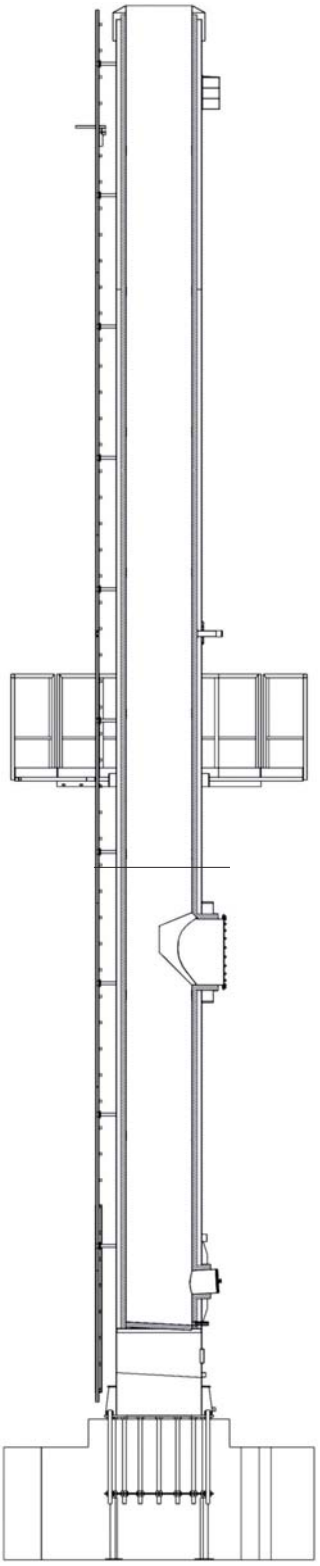
Measurement connection
- Size / Quantity _____
- Size / Quantity _____
- Size / Quantity _____
- Height of the connection _____

Measurement platform
- Height on _____
- solid centre width _____
- Form ☐ 135° ☐ 180° ☐ 360°

Opening platform
- ☐

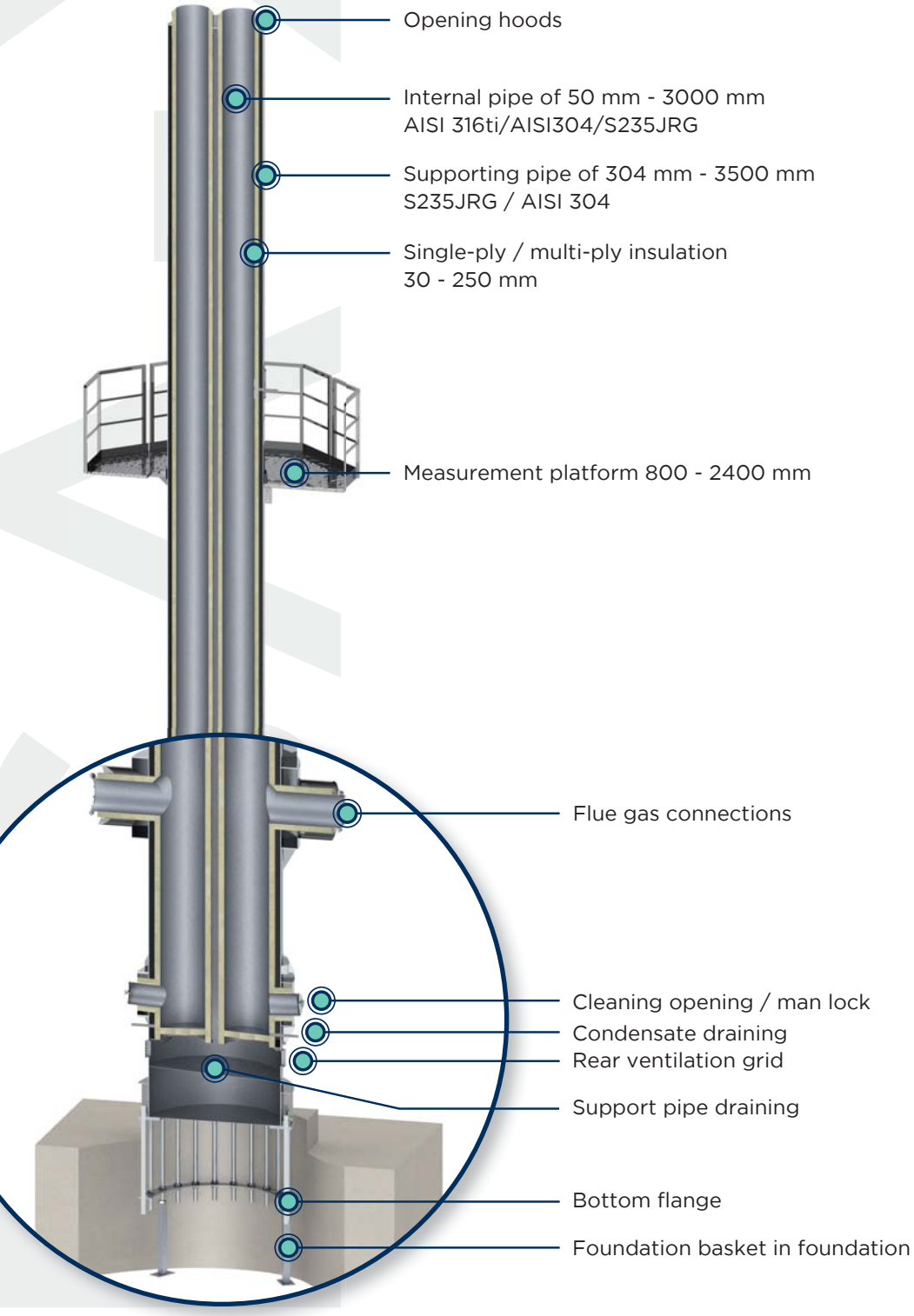
Planned execution time _____





FSA-X

Identical to the construction of the FSA, the "x" stands for the number of different internal pipes. The construction increased in use due to the growing number of energy centres with various heat generators. The separately mounted internal pipes allow any exhaust line to be designed for special use cases, and they can be operated separately from each other.



USE

> FSA-X series is a universal and compact solution in the "steel chimney and exhaust systems without required building connection" service segment
> Large building heights are possible due to the externally arranged supporting pipe

STRUCTURE

> Several internal pipes (over 1.5 mm stainless steel)
> Insulation
> Rear ventilation
> Supporting pipe

INSULATION

> Single or multi-ply, offset, slotted and antislip on supporting internal pipe
> Coated with visible steel cladding

REAR VENTILATION

> Annulus between insulated exhaust pipe and supporting external pipe, through which the rear ventilation of the system construction is ensured
> Deflection of heating room ventilation between supporting pipe and insulated Internal pipe is possible

PODESTE / STEIGEINRICHTUNG

> For existing compulsory sweeping of exhaust system through the opening, a safety ladder is added to the supporting pipe is added (usually on the outside).

SUPPLEMENT

> Where needed, acceleration jets, deflector hoods or opening silencers can be installed

SERIES	FSA-X
STATIC SYSTEM	Foundationbasket or building connection
SUPPORTING ELEMENT	External pipe
STRUCTURE	Multiple shell
INTERNAL PIPE	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539
INTERNAL PIPE DAMPING	A1 as wiring network mat A2 foil laminated Lamination mat
REAR VENTILATION	Yes
EXtERNAL PIPE	S235JRG / S355 / 1.4301
NUMBER OF INTERNAL PIPES	≥ 2
SURFACE VISUAL	coated, galvanised steel, ground stainless steel, blasted stainless steel (cladding)
USE	Standard fireplaces, block heating and power plants, emergency power unit, special fireplaces

BUDAPEST, HUNGARY

SYSTEM:	FSA - 6
CHIMNEY HEIGHT:	28 m
EXTERNAL DIAMETER:	2020 mm
INTERNAL DIAMETER:	3 x 400 mm 3 x 500 mm

6-line FSA-X incl. connecting line with conical, double-wall system from Jeremias.

GARCHING, GERMANY

SYSTEM:	**FSA - 4**
CHIMNEY HEIGHT:	24 m
EXTERNAL DIAMETER:	2400 mm
INTERNAL DIAMETER:	650, 550 mm 2 x 1000 mm

Chimney for auxiliary boiler for geothermal energy with special "indented" coating and multi-coloured opening logo.

LICHTERFELDE, GERMANY

SYSTEM:	**FSA - 3**
CHIMNEY HEIGHT:	38 m
EXTERNAL DIAMETER:	2000 mm
INTERNAL DIAMETER:	1 x 1000 mm 2 x 500 mm

Auxiliary chimney in Lichterfelde power station for two emergency power system and an auxiliary silencer.

TITISEE, GERMANY

SYSTEM:	**FSA - 4**
CHIMNEY HEIGHT:	34 m, all-in-one
EXTERNAL DIAMETER:	2000 mm
INTERNAL DIAMETER:	900, 500, 400, 350 mm

All-in-one, 34 m long, 4-line FSA-X with internal steps and opening platform not visible from the outside.

ENGELHARDT GMBH SES

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CUSTOMER DATA:

Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:

Installation location _____

Temperature / medium IR 1 _____ °C

Temperature / medium IR 2 _____ °C

Temperature / medium IR 3 _____ °C

Temperature / medium IR 4 _____ °C

Internal diameter IR 1 _____

Internal diameter IR 2 _____

Internal diameter IR 3 _____

Internal diameter IR 4 _____

Insulation

☐ ..... mm

Ladder at + _____

Flue gas connection height IR 1 _____

Flue gas connection height IR 2 _____

Flue gas connection height IR 3 _____

Flue gas connection height IR 4 _____

Connection diameter IR 1 _____

Connection diameter IR 2 _____

Connection diameter IR 3 _____

Connection diameter IR 4 _____

Cleaning height

1200 over + 0.00 _____

Connection height _____

Surface

☐ C3: 160 µm (Standard)

☐ C4: 240 µm

☐ C5: 320 µm

☐ VA clad

Internal pipes material

☐ 1.4571 / AISI 316ti

☐ 1.4301 / AISI 304

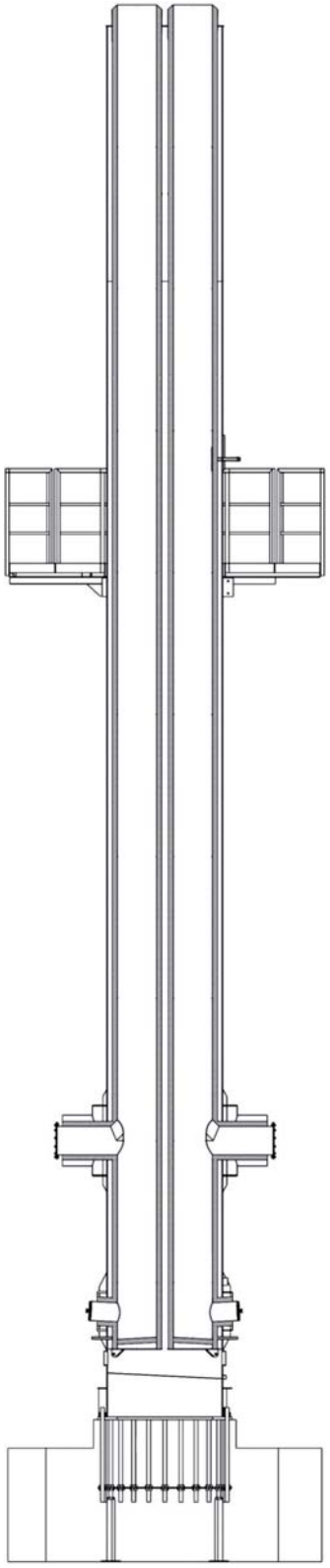
Measurement connection (per line)

Size / Quantity _____ / _____

Size / Quantity _____ / _____

Size / Quantity _____ / _____

Height of the connection _____



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MEASUREMENT PLATFORM:

Height on _____

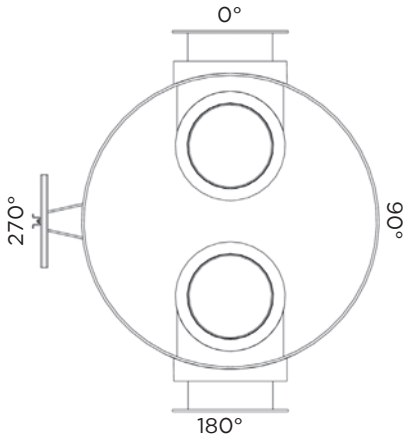
solid centre width _____

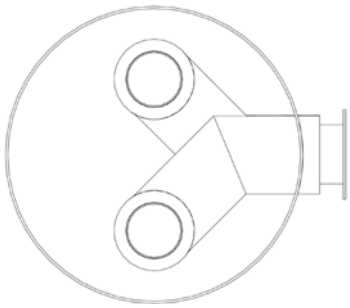
Form ☐ 135° ☐ 180° ☐ 360°

Opening platform
Planned execution time _____

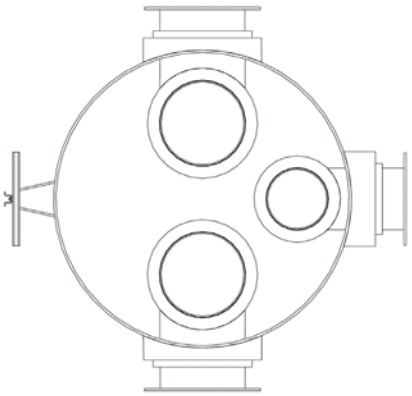
2 - lines

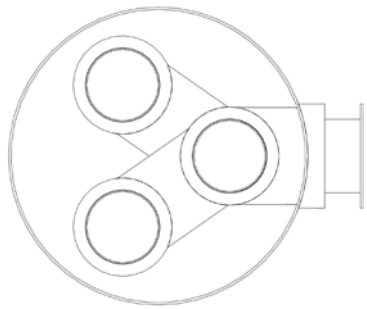
Options for arrangement
of the flue gas connections





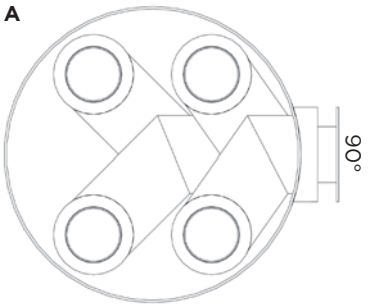
3 - lines





4 - lines

A



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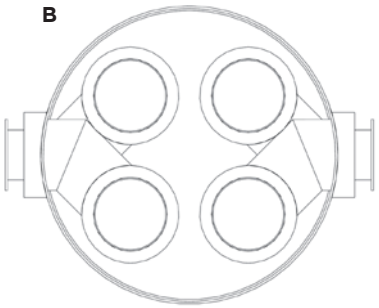

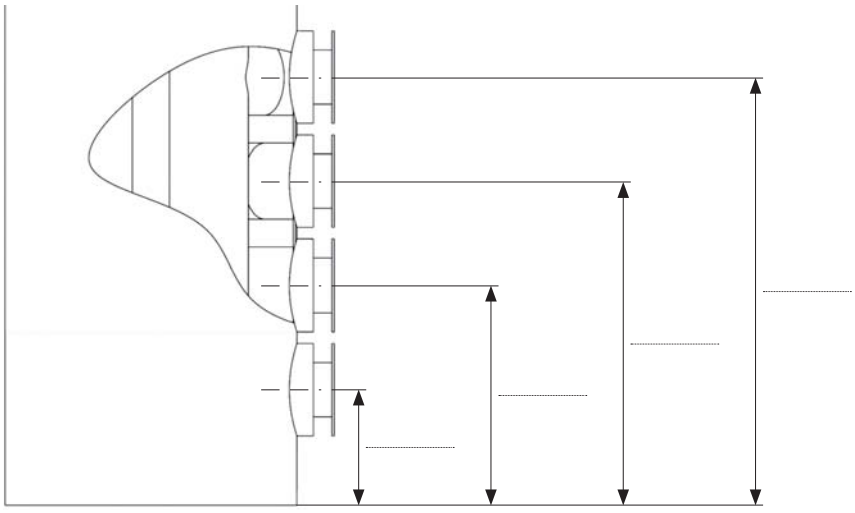

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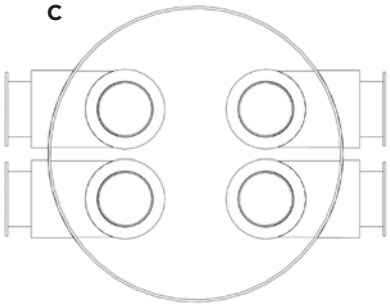
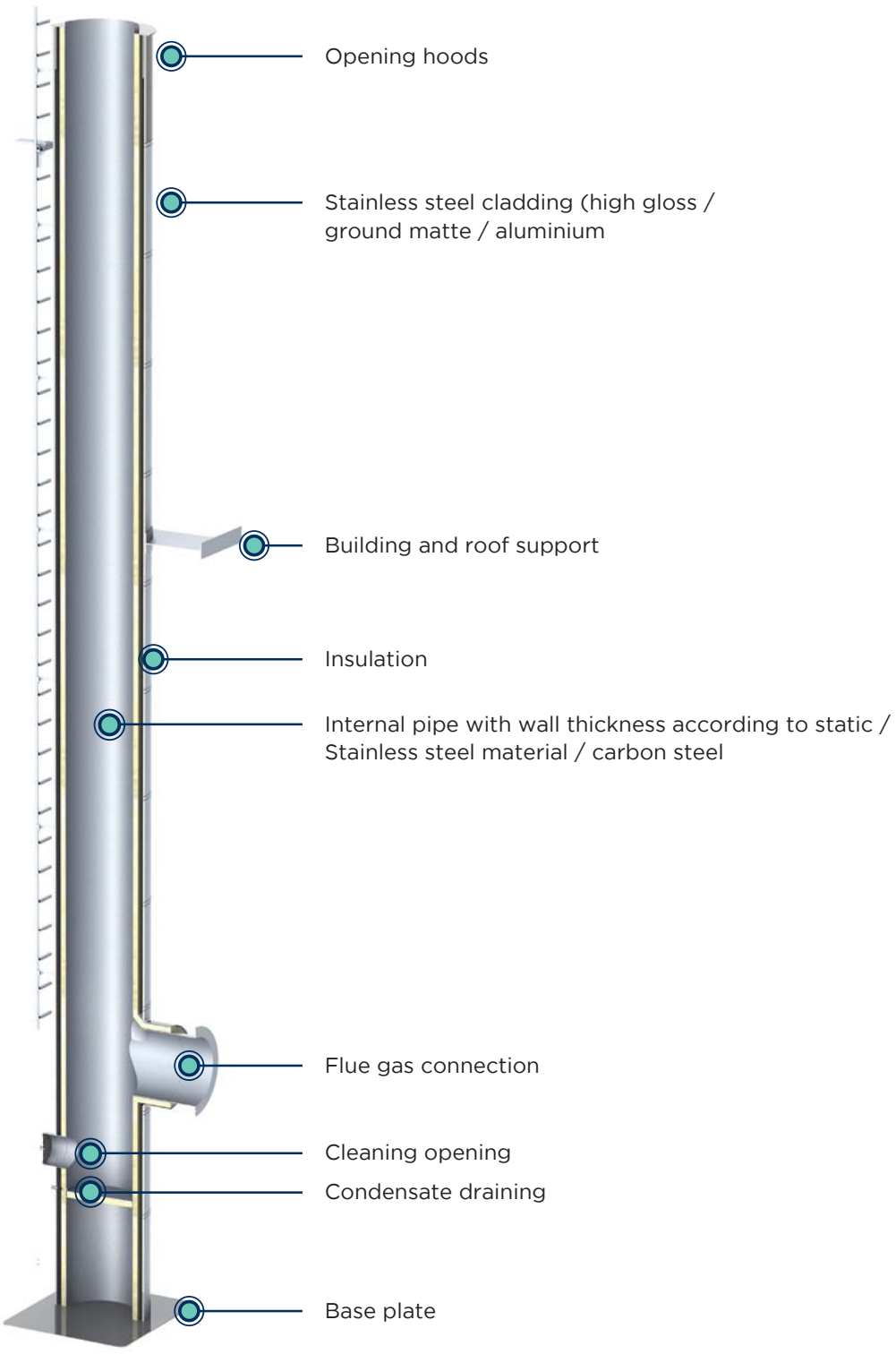
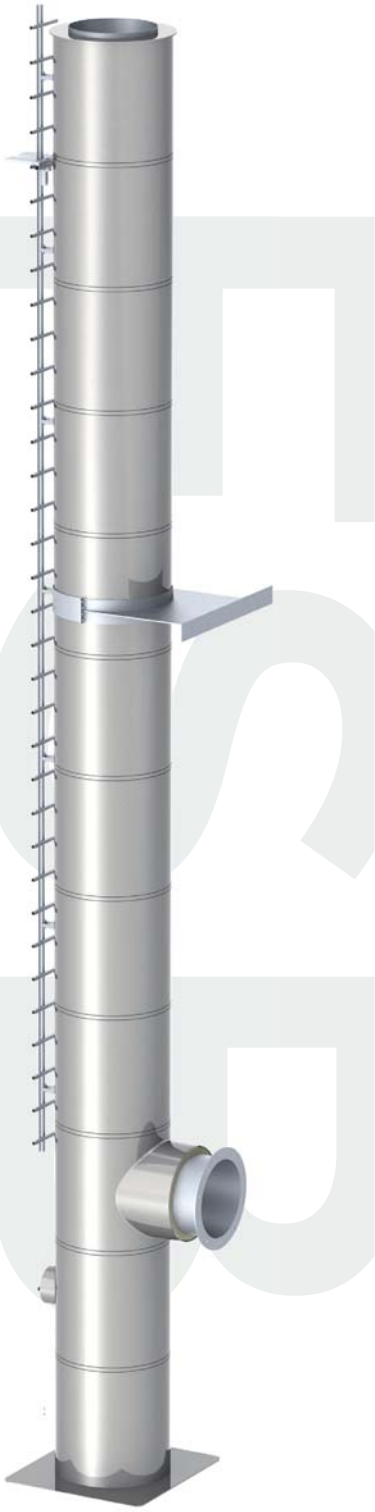


More exhaust gas lines on request

FSB

Free-standing one-line, insulated and cladded steel chimney with static supporting flue gas line.
Here, the media-carrying exhaust gas line also serves as the static supporting element, which is also insulated and cladded. This system relocated between the chimney element (Jeremias) and the classic, free-standing chimney (FSA) and is usually affixed with one or more supports.





WUTÖSCHINGEN, GERMANY

USE

> FSB is a self-supporting chimney that is predominantly realized as a static, adjoining system.
> The construction height is aligned with the number of possible wall connections and the available projections over the uppermost connection point.

STRUCTURE

> Internal pipe (over 1.5 mm stainless steel)
> Insulation
> Cladding

INSULATION

> Single or multi-ply, offset, slotted and antislip on supporting internal pipe
> Coated with visible steel cladding

PODESTE / STEIGEINRICHTUNG

> ladder and stand pedestal can be supplied on request

SUPPLEMENT

> Where needed, acceleration jets, deflector hoods or opening silencers can be installed.

SERIES	FSB
STATIC SYSTEM	Foundation basket or building connection
SUPPORTING ELEMENT	Internal pipe
STRUCTURE	Multiple shell
INTERNAL PIPE	1.4571 / 1.4301 / S235JRG / S355 / 1.4828 / 1.4539
INTERNAL PIPE DAMPING	A1 as wiring network mat A2 foil laminated Lamination mat
REAR VENTILATION	no
EXtERNAL PIPE / SURFACE VISUAL	Cladding variations Copper, aluminium, stainless steel IIIc or stainless steel brushed
SUPPORTING PIPE	-
NUMBER OF INTERNAL PIPES	1
USE	Standard fireplaces

SYSTEM:	**FSB**
CHIMNEY HEIGHT:	25 m
EXTERNAL DIAMETER:	2300 mm
INTERNAL DIAMETER:	700 mm

Internal pipes material P235GH incl. expansion for opening silencer.

ASHGABAT, TURKMENISTAN

SYSTEM:	**FSB**
CHIMNEY HEIGHT:	10 m (235 piece)
EXTERNAL DIAMETER:	300 - 650 mm

Large project in the capitol of Turkmenistan: Delivery of 235 free-standing FSBs for the decentralized heat supply in the city Ashgabat.

BERN, SWITZERLAND

SYSTEM:	**FSB**
CHIMNEY HEIGHT:	45 m
EXTERNAL DIAMETER:	800/ 2300 mm
INTERNAL DIAMETER:	1580 /2100 mm

FSB with internal rubber coating for trash incineration in Bern. A cyclone dust collector on the opening ensures discharge of the condensate on the chimney outlet.

BULLE, SWITZERLAND

SYSTEM:	**FSB**
CHIMNEY HEIGHT:	23,3 m
EXtERNAL DIAMETER:	1470 mm
INTERNAL DIAMETER:	1250 mm

FSB for wood-fired heating plant with flue gas filtering. Stainless steel cladding in matte design without screw connections.

ENGELHARDT GMBH SES
Email: vertrieb@engelhardt-ses.de
Fax: +49 (0) 9832 68 68 - 64

CUSTOMER DATA:

Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:

Installation location _____

Temperature / medium* _____ °C

* max. 400°C / not resistant to soot burns

Inner diameter _____ mm

Flue gas connection height _____ mm

Cleaning opening height _____ mm

Ladder at + _____ mm

Fitting system

☐ **1.** Foundation basket

☐ **2.** Wall mount

Mount height: _____

Wall spacing: _____

Support pipe/internal pipe:

☐ **1.** 1 .4571 ☐ **2.** 1.4301

☐ **3.** S235JRG / S355

Insulation _____ mm

Measurement connection

Size / Quantity _____

Size / Quantity _____

Size / Quantity _____

Measurement platform*

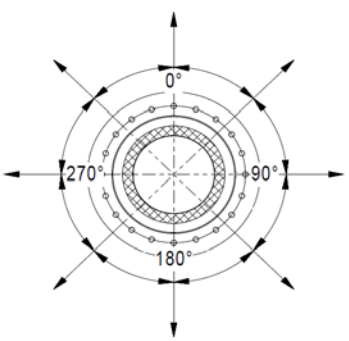
Height on: _____

solid centre width _____

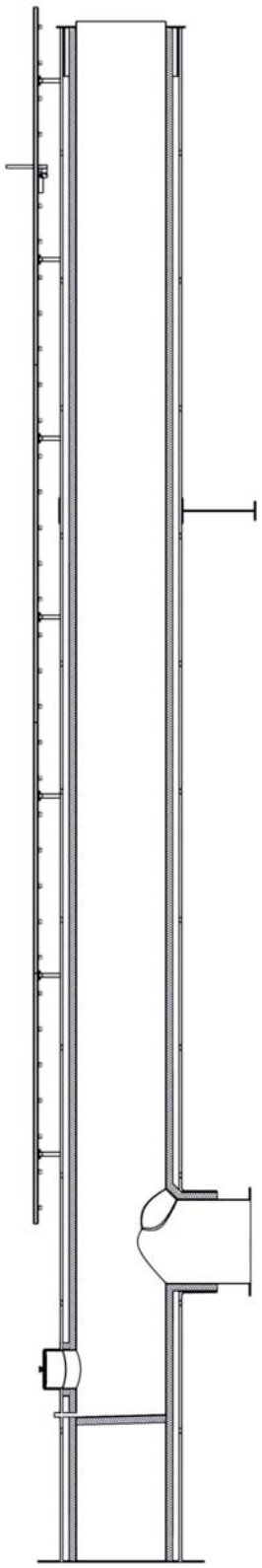
Form ☐ 135° ☐ 180° ☐ 360°

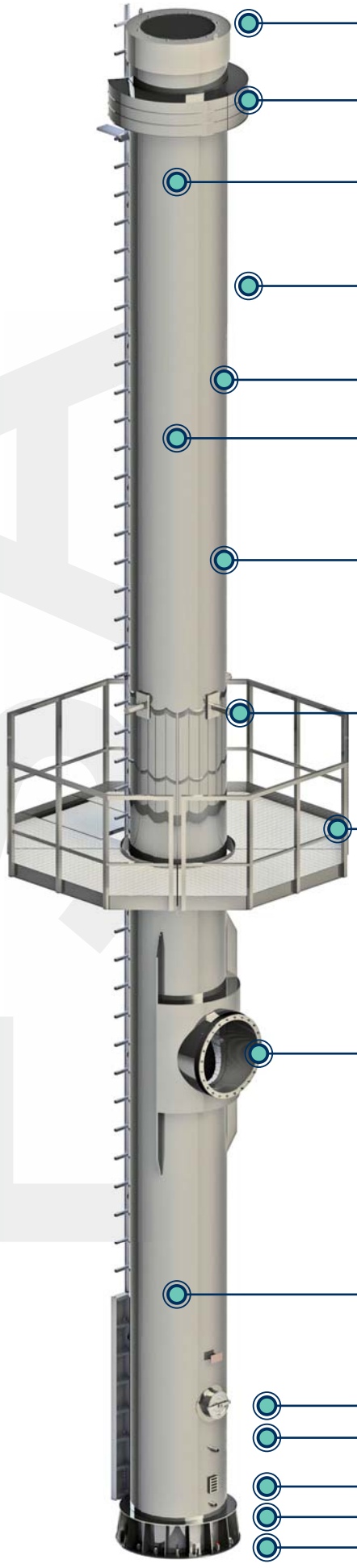
*(feasibility depending on use)

Planned execution time _____



E	Tragrohrentwässerung
H	Tragrohrhinterlüftung
KO	Kondensatablauf
RE	Reinigung
TYP	Typenschild
T	T-Anschluss
SL	Sicherheitssteigleiter
RB	Reinigungsbühne

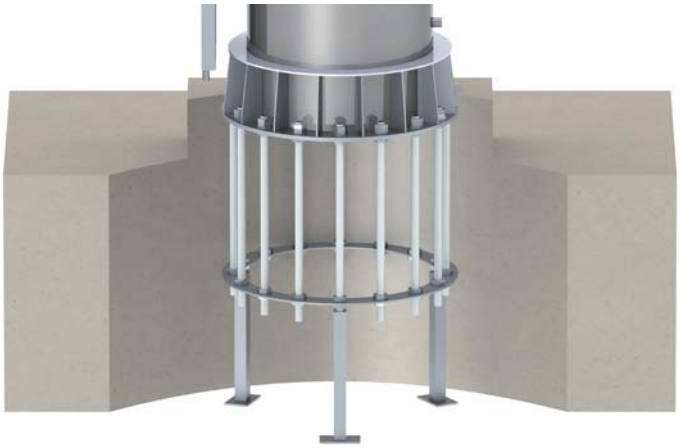




1. FITTING SYSTEMS

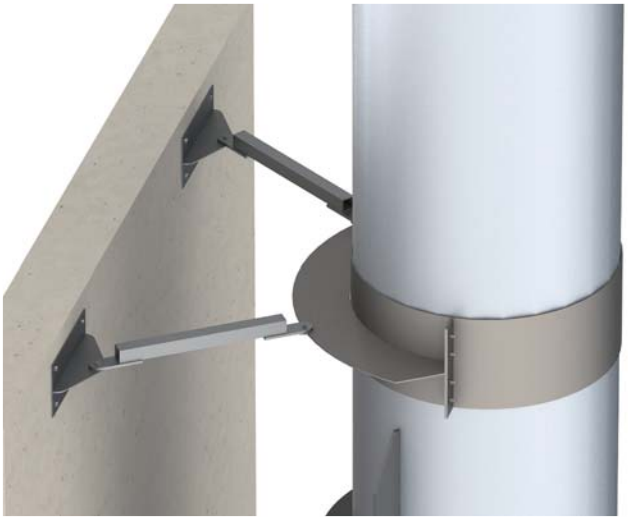
The foundation basket, consisting of upper and lower centering rings, added to the threaded control rod in circular form.
This construction is set in concrete in the chimney foundation so that recurrent forces can be passed into the foundation via the foundation basket.

Positioning of the installation is done with 3 pedestals that balance the height between the foundation floor and the length of the foundation basket.
According to installation instructions, a foundation rod specially marked with color must be set up as a building reference point (example: 90° to the building edge).



Once the foundation is dry (drying time depends on weather, but is usually approx. 30 days), the upper ring is removed and the bottom flange is set up on the lower row of nuts set up in the plumb-line.

When being set up outside a building, the foundation must have corrosion protection elements with a 300 mm base.



Static support:
On a defined location, a steel construction is fitted to the building / steel construction for absorbing horizontal forces, according to static calculation.

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X*	X	-

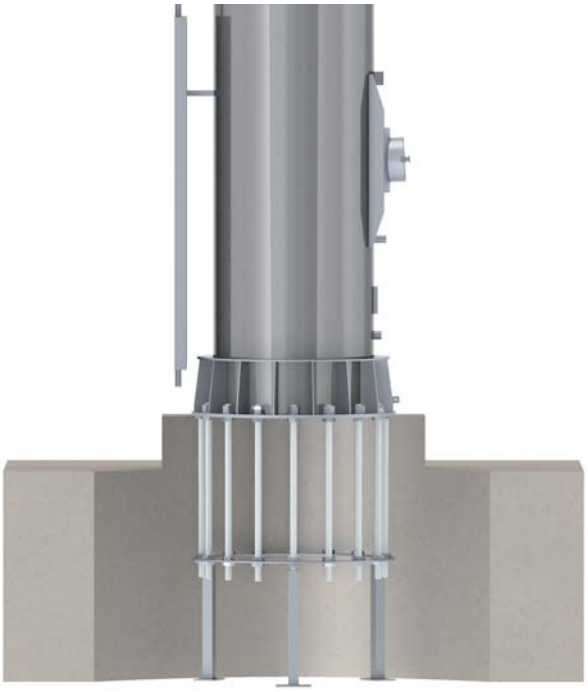
* with foundation basket only to a certain construction height and statically arranged wall thicknesses, classically the mounting is done with wall mounts for FSB.

2. BOTTOM FLANGE / FOUNDATION BASKET

The statically arranged bottom flange, welded onto the external pipe, serves as the fitting on the foundation basket set in concrete. It is positioned on the setting nuts and mounted with to rows of nuts (fixing nuts and counter nuts).

To ensure stability, the bottom flange is usually reinforces with "rubbed steel" and with an upper stabilization ring.

The setting area between the bottom flange and foundation (approx. 50 mm) must be force-fit grouted with non-shrinking mortar after the assembly.



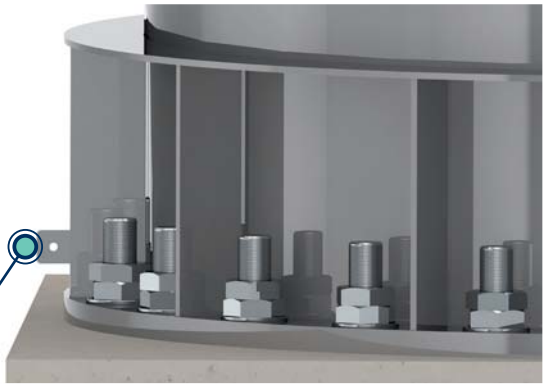
FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X	X	-

* with foundation basket only to a certain construction height and statically arranged wall thicknesses, classically the mounting is done with wall mounts for FSB.

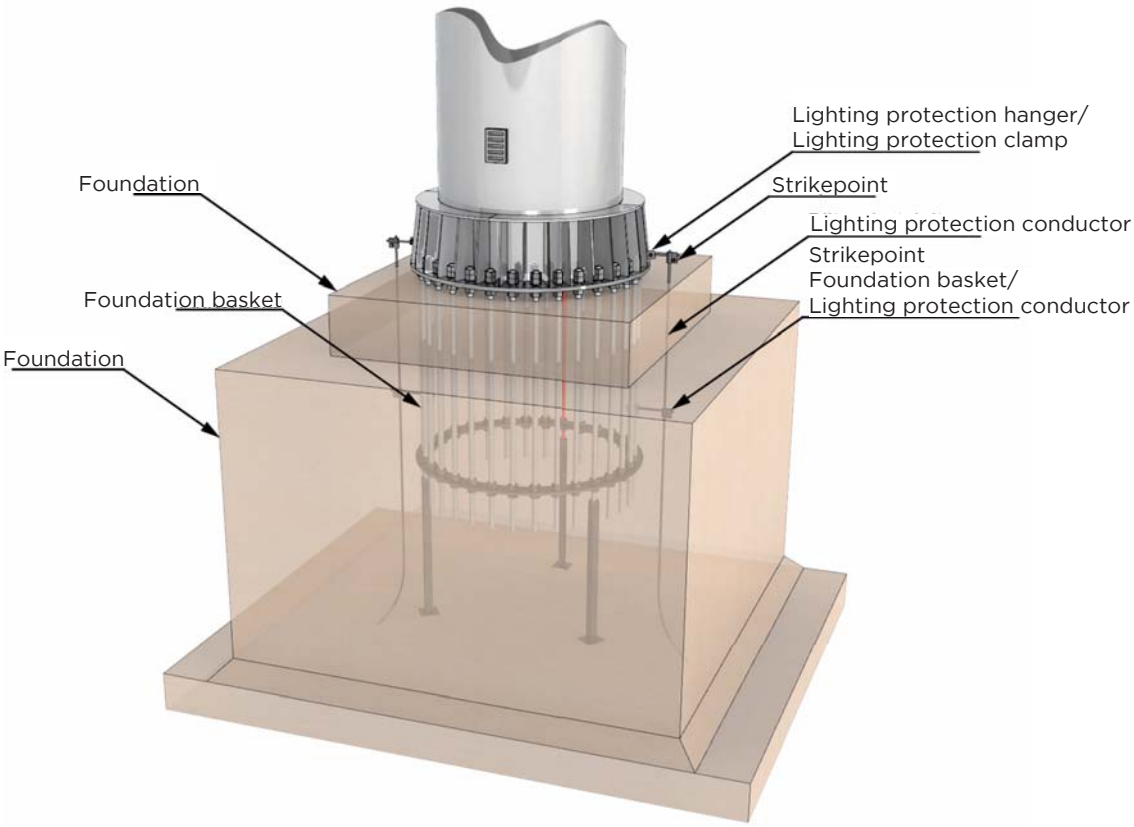
3. LIGHTING PROTECTION CONNECTION

The **lightning protection hanger** that is added to the base point of the chimney is used to deflect lightning strikes to a lightning deflector installed on the building. The lightning protection connection must ensure earthing of the chimney system.

The connection is done on site by an appropriate lightning protection company.



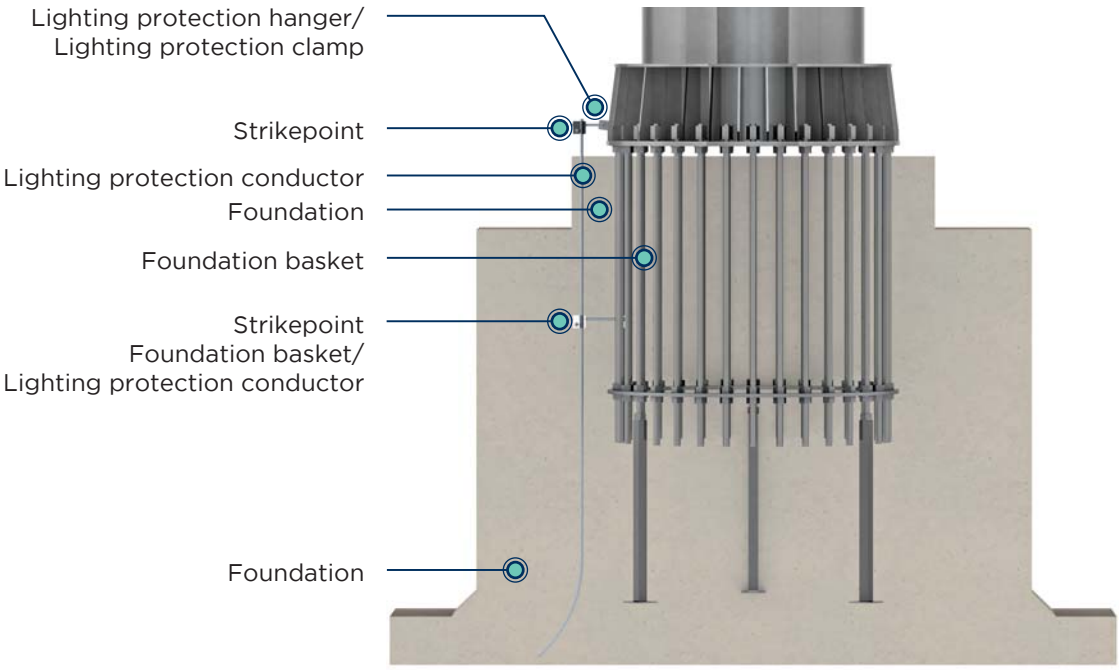
Lighting protection bracket



> Connection of the chimney base to the accompanying earthing system

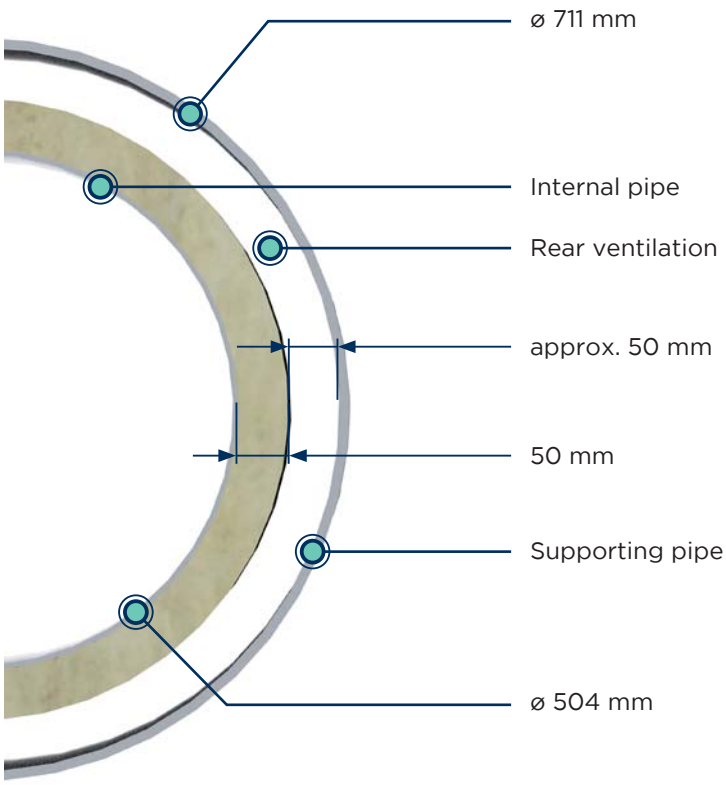
> Over 20m chimney height, 2 earthing connections need to be built in

> If the free-standing chimney is partially inside the building, it must be connected above the roof on the lightning protection of the building.



FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X	X	-

4. SUPPORTING PIPE



The supporting pipe, usually made of carbon steel S235JRG-2 or VA 1.4301, is arranged based on the internal diameter and the static calculation (permanent load, wind force and lateral oscillation). The static supporting external pipe allow for enormously high construction height without wall connections. It is only mounted to a concreted foundation basket with the bottom flange (no cable anchoring required).

On places, such as flue gas connections and cleaning openings, the external pipe is cut out so the flue gas-carrying elements can be directed toward the outside. These areas must be reinforced with plaster panels or bracing struts so the static load-bearing strength is ensured.

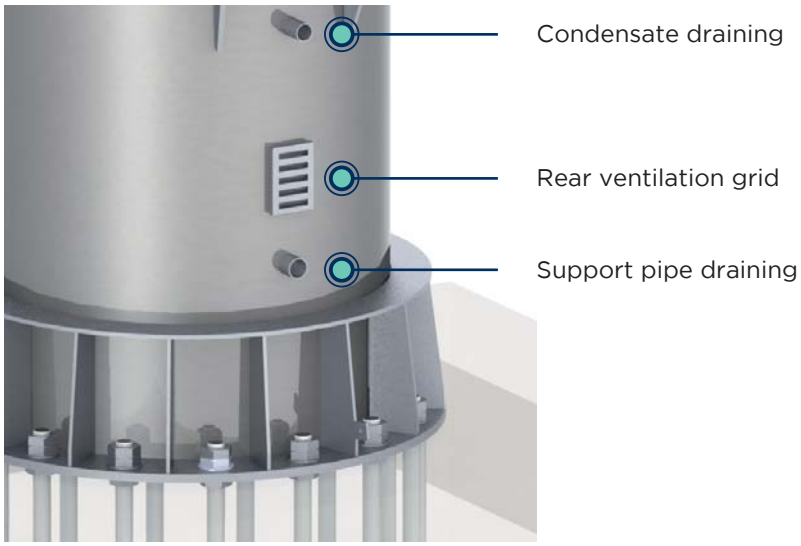
EXAMPLE FOR CALCULATING THE EXTERNAL DIAMETER

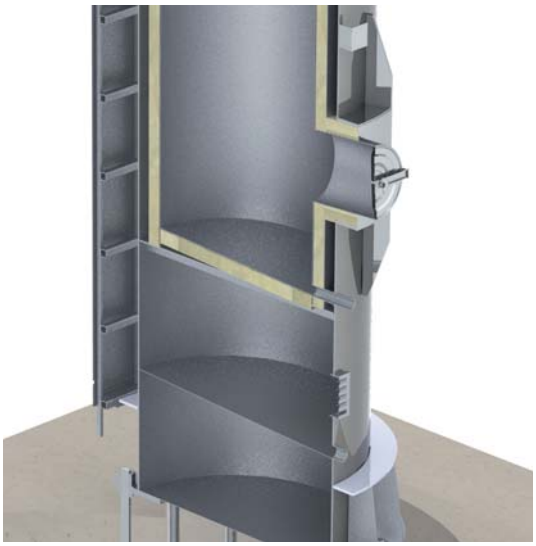
iØ 500 mm / insulation 50 mm circumferential/ rear ventilation 50 mm circumferential = 700 mm (711 mm)

5. CONDENSATE FLOOR/ DISCHARGE/ REAR VENTILATION

The floor inclined below 3° for drainage on the lower end of the internal pipe is used to collect rain and condensate water. This is directed through a drain (condensate draining) through the supporting pipe toward the outside and is disposed of on site.

Using the same principle, the external pipe is provided with supporting pipe drainage that collects recurring condensate on the interior side of the supporting pipe. So rear ventilation is provided between the insulation and the external pipe so the insulation and the interior side of the supporting pipe can dry as quickly as possible from any occurring moisture. This functions with the aid of natural flue effect, which takes in fresh air through the rear ventilation grid at the base point, which can be streamed out again at the opening hood. In addition, the rear ventilation serves as insulation to keep the surface temperature as low as possible.





FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	-	X*	X	-

* The standard is connection through the ceiling opening; for this variation, there is no complete condensate floor, rather a ring that diverts the condensate to the ventilation pipe. When the connection is done with a T-connection, the condensate is also diverted through a floor.

6. INTERNAL PIPE

The internal pipe, made of stainless steel, carbon steel or even GRP, is mounted with rollers and braces. This is how the internal pipe can expand when there is heating in the flue gas channel. The wall thickness depends on the use and required lifecycle, as well as the diameter in relation to the height and temperature. For this, the following corrosion impacts under EN 13084-1 need to be noted:

Tabelle 4 — Korrosionszuschlag für Oberflächen die mit Abgasen in Berührung kommen

Stahlsorten				Korrosionsklassen nach EN 13084-1							
				Für die ersten zehn Jahre				Für (Alle) jede weiteren zehn Jahre			
Kurzname		Werkstoff	FU-Klasse	gering L	mittel M	hoch H	sehr hoch V	gering L	mittel M	hoch H	sehr hoch V
EN 10025-2	S235JR	1.0038	D	1,0	2,5	N	N	1,0	1,5	N	N
	S235J2	1.0117									
	S275JR	1.0044									
	S275J2	1.0145									
	S355JR	1.0045									
	S355J2	1.0577									
EN 10025-5	S235JROW	1.8958	D	1,0	2,5	N	N	1,0	1,5	N	N
	S235J2W	1.8961									
	S355J2WP	1.8946									
	S355JOW	1.8959									
EN 10028-2	P265GH	1.0425	D	1,0	2,5	N	N	1,0	1,5	N	N
	16 Mo 3	1.5415									
	13 CrMo 45	1.7335									
	10 CrMo 9 10	1.7380									
EN 10088-2	X5CrNi 18 10	1.4301	D	0,0	0,75	1,25	N	0,0	0,75	1,25	N
	X2CrNi 18-9	1.4307	D	0,0	0,75	1,25	N	0,0	0,75	1,25	N
	X2CrNiMoN 22-5-3	1.4462	W	0,0	0,25	0,75	N	0,0	0,25	0,75	N
	X2CrTiNb 18	1.4509	D	0,0	1,0	1,5	N	0,0	1,0	1,5	N
	X6CrNiTi 18 10	1.4541	D	0,0	0,75	1,25	N	0,0	0,75	1,25	N
	X6CrNiMoTi17 12 2	1.4571	W	0,0	0,25	0,75	N	0,0	0,25	0,75	N
	X2CrNiMo 17 12 2	1.4404	W	0,0	0,25	0,75	N	0,0	0,25	0,75	N
	X2CrNiMo 18 14 3	1.4435	W	0,0	0,25	0,75	N	0,0	0,25	0,75	N
	X1NiCrMoCu 25 20 5	1.4539	W	0,0	0,25	0,5	1,5	0,0	0,25	0,5	1,5
EN 10095	X8CrNiTi18-10	1.4878	D	0,0	0,75	1,5	N	0,0	0,75	1,5	N
	X15CrNiSi25-2	1.4841									
	X15CrNiSi20-12	1.4828									

N nicht zulässig
D anwendbar im trockenen Zustand (höher als der Wassertaupunkt)
W anwendbar im feuchten Zustand und /oder trockenem Zustand ((unter dem) niedriger als der Wassertaupunkt)
ANMERKUNG Säure-Taupunkt siehe EN 13084-1.

N: Use not allowed
D: Dry (permitted for dry operation)
W: Wet (permitted for wet operation)

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X	X	-

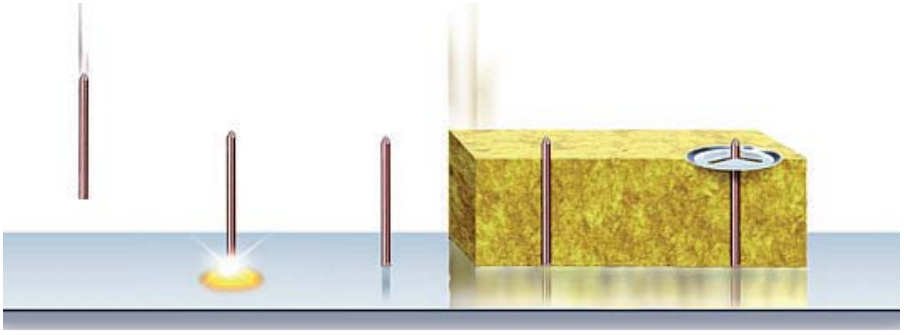
* exception with solid fuel and temperatures > 400° C

7. INSULATION

The insulation is selected depending on the exhaust medium and the temperature. The respective insulation is antislip and placed with butt seams - beginning at the condensate floor up to the opening.

WIRE NETTING - ROCK WOOL A1:

> Permitted at up to 600°C for higher temperatures, the layers are applied with ceramic insulation in advance
> For gas, oil, solid fuel and special exhaust
> External with hexagonal netting (chicken wire) for better stability
> Connection of the joints with brackets in netting
> Application with welding pin and fixing plate



FOIL-LAMINATED MINERAL WOOL A2:

> Permitted up to 160°C
> For gas and oil
> External side made of aluminium prevents absorption of moisture (example, condensate)
> Adhering the joints with temperature-resistant aluminium adhesive band
> Application with plate welding studs

Plate welding studs:

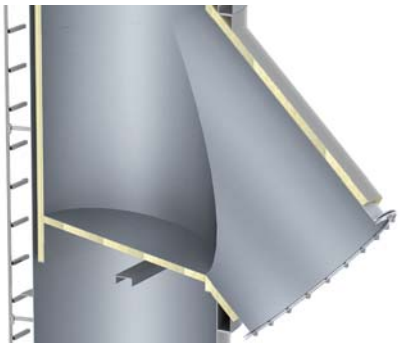
FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X	X	-

* Mounting with plate welding studs not possible due to cladding. Mounting with force-fit cladding elements

8. FLUE GAS CONNECTION

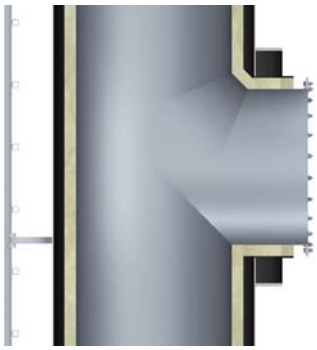
The flue gas connection under various connection angles, usually round or square, is installed with a 45° aerodynamic spandrel as an SES standard. The flange and counter flange are used to connect with suitable screw connections and seals. The length and arrangement of the connections can be planned individually; however, the connection diameter should not be larger than the interior diameter (IVS guideline 103A: Opening on flue gas connection not larger than 120°)

45°



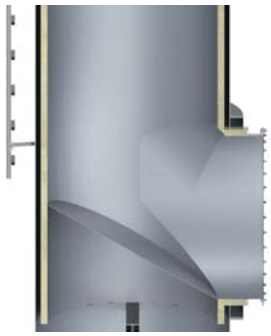
45°

90° / 87°



90° / 87°

with condensate blocker



without condensate blocker

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X*	X	-

* Opening of the connection cannot be more than 120°: IVS guideline 103A

9. CLEANING OPENING

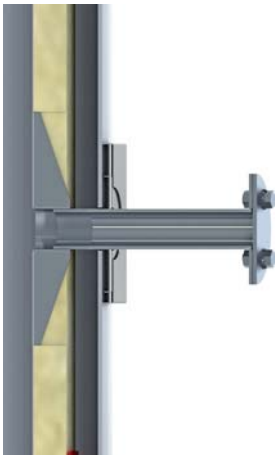
Cleaning is done mostly at the base of the chimney or at the height of the flue gas connection so that the chimney sweeper or operator can access it without trouble. The cleaning is usually done with a pressurised quick-opening device. The sizing and execution depends on the measurement of the internal pipe and the mean temperature. If the chimney is connected to building or has a measurement platform, then a second cleaning opening is installed in all four cases. Thus, there is the option, on consultation with the chimney sweeper, to forego a ladder up to the opening.
Man locks measuring Ø 600 mm, for example, or 600 x 1000 mm are also possible and can be designed according to customer request

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X*	X	X

* Cleaning opening designed as Metu cover in ventilation towers. See details under System FSC.

10. MEASUREMENT CONNECTION

The measurement connections (e.g., for CO^2, temperature, particle matter), arranged according to measurement plan, are used both for timely and continuous measurement of special exhaust values. The standard connections are usually offset 90° from each other and are in a steam chest that absorbs the heat expansion. The arrangement is usually approx. 5x iØ, over the flue gas connection. Therefore, a measurement platform is often required to make it accessible.



FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	-	X	X

11. LADDER

The ladder is added for existing compulsory sweeping of the exhaust system through the opening, in accordance with UVV on the supporting pipe (usually on the outside). There is the option here to use a single-arm ladder in the middle of which a guiderail is incorporated and the person climbing is equipped with a runner and safety belt. This ladder is provided with a fold-out rest platform every 10 meters and there is also a "concluding platform) 1200 mm below the opening. In addition to the single-arm ladder, there is an option to climb using a double-arm ladder with safety cage. In this variation, the integrated safety cage excludes the need for runners and belts. Instead of a fold-out platform, a transfer platform is needed every 6 - 10 meters to ensure safe climbing.

WORK AND MEASUREMENT PLATFORM

The work and measurement platform is manufactured in square and round, circumferential 135°/ 180°/270°/ 360° constructions. Each design has a handrail, knee rail and foot rail. The standing area is made of grating to ensure drainage of rain water and also prevent ice formation. All components are hot-dip galvanised or made of stainless steel and can be coated in chimney colours or special colors on request.

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X	X	-

* Must be used, depending on exhaust temperature and static

12. OPENING CLOSURE

The opening connection, usually made of stainless steel (material the same as internal pipe) is used to cover the insulation and the rear ventilation between the internal and external pipes. With the sole mount on the internal pipe, the hood ensures unrestricted expansion of the inner duct. The height of the hood is determined based on the exhaust temperature and the height of the chimney, as both of these factors are significant for the expansion.

SGS Standard

Special design

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	-	X	-

13. SURFACE CHARACTERISTICS

The coating of the steel supporting pipe is usually done as follows in "C3":

> Sand-blasting of the outer surface according to SA 2½ metallic pure
> 80 µm zinc phosphate base coat 302
> 80 µm DS single-layer laminate (alkyd-PVC-resin base) 347
> Colour in RAL according to request of the client with exception of metallic and fluorescent colours

The norms of the DIN EN ISO 12944 series apply to initial protection and maintenance of corrosion protection of steel constructions made of unalloyed or low-alloyed steel with a thickness of more than 3 mm, for which proof of support safety is required.

Selection of a coating system essentially follows the following criteria:

> Where is the construction that needs to be protected located?
In Lüneburger Heide or in the industrial are - partially or completely on water or soil?
> Which pressures affect the construction?
For this, things like high humidity, industrial gasses, salt (e.g., due to winterisation on bridges), spray water (e.g., harbor systems with wave impact) count
> Which useful life is expected for the construction?
> How should the building look? Is the visual impression less important or should it be appealing in terms of colour?

C3	Moderate	City and industry atmospheres with moderate air pollution, coastal regions with low salt impact, production areas with high humidity and some air pollution (e.g., food manufacturing, laundries, breweries)
C4	High	Industrial areas, coastal regions with moderate salt impact, chemical facilities, swimming pools
C5-I	Very high (industry)	Industrial areas with high humidity and aggressive atmosphere
C5-M	Very high (sea)	Coastal and off-shore areas with high salt impact, buildings with nearly constant condensation and high air pollution

In addition to being painted, there is also the option to clad the supporting pipe with stainless steel elements in matte, high-gloss, ground or brushed surfaces However this serves only for architectonic aesthetic purposes.

The interior of the supporting pipe is raw black. The corrosion protection is ensured with oversizing the wall thickness, but can also be designed with a colour system on customer request.

On customer request, painting in special colours, company logos or lettering is possible.

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X	X	-

RAL COLOUR CARD

The colours printed here are only for information. The exact colour and sheen cannot be conveyed. This overview is not intended as a production example for painted surfaces with RAL colours.

RAL 1000 Green-beige
RAL 1001 Beige
RAL 1002 Sand yellow
RAL 1003 Signal yellow
RAL 1004 Gold yellow
RAL 1005 Honey yellow
RAL 1006 Maize yellow
RAL 1007 Narcissus yellow
RAL 1011 Brown-beige
RAL 1012 Citrus yellow
RAL 1013 Pearl white
RAL 1014 Ivory
RAL 1016 Sulphur yellow
RAL 1017 Saffron yellow
RAL 1018 Zinc yellow
RAL 1019 Grey beige
RAL 1020 Olive yellow
RAL 1021 Rapeseed yellow
RAL 1023 Traffic yellow
RAL 1024 Ochre yellow
RAL 1026 Luminous yellow
RAL 1027 Curry yellow
RAL 1028 Melon yellow
RAL 1032 Broom yellow
RAL 1033 Dahlia yellow
RAL 1034 Pastel yellow
RAL 1035 Pearl beige
RAL 1036 Pearl gold
RAL 1037 Sun yellow
RAL 2000 Yellow orange
RAL 2001 Red orange
RAL 2002 Blood orange
RAL 2003 Pastel orange
RAL 2004 Pure orange
RAL 2005 Light orange
RAL 2007 Luminous light orange
RAL 2008 Light red orange
RAL 2009 Traffic orange
RAL 2010 Signal orange
RAL 2011 Deep orange
RAL 2012 Salmon
RAL 2013 Pearl orange
RAL 3000 Fire red
RAL 3001 Signal red
RAL 3002 Crimson
RAL 3003 Ruby red
RAL 3004 Fuchsia
RAL 3005 Wine red
RAL 3007 Black red
RAL 3009 Oxide red
RAL 3011 Murrey
RAL 3012 Beige red
RAL 3013 Tomato red
RAL 3014 Dusky pink
RAL 3015 Light pink
RAL 3016 Coral red
RAL 3017 Rose
RAL 3018 Strawberry red
RAL 3020 Traffic red
RAL 3022 Salmon pink

RAL 3024 Luminous red
RAL 3026 Luminous light red
RAL 3027 Raspberry red
RAL 3031 Oriental red
RAL 3032 Pearl ruby red
RAL 3033 Pearl pink
RAL 4001 Red lilac
RAL 4002 Red violet
RAL 4003 Erika violet
RAL 4004 Bordeaux-violet
RAL 4005 Blue lavender
RAL 4006 Traffic-purple
RAL 4007 Purple violet
RAL 4008 Signal violet
RAL 4009 Patel violet
RAL 4010 Telemangenta
RAL 4011 Pearl violet
RAL 4012 Perl marble
RAL 5000 Violet blue
RAL 5001 Green blue
RAL 5002 Ultramarine blue
RAL 5003 Sapphire blue
RAL 5004 Blue black
RAL 5005 Signal blue
RAL 5007 Brilliant blue
RAL 5008 Grey blue
RAL 5009 Azure blue
RAL 5010 Gentian blue
RAL 5011 Steel blue
RAL 5012 Luminous blue
RAL 5013 Cobalt blue
RAL 5014 Pigeon blue
RAL 5015 Sky blue
RAL 5017 Traffic blue
RAL 5018 Turquoise blue
RAL 5019 Capri blue
RAL 5020 Ocean blue
RAL 5021 Water blue
RAL 5022 Night blue
RAL 5023 Remote blue
RAL 5024 Pearl violet
RAL 5025 Pearl gentian
RAL 5026 Pearl night blue
RAL 6000 Patina green
RAL 6001 Emerald green
RAL 6002 Leaf green
RAL 6003 Olive green
RAL 6004 Blue green
RAL 6005 Moss green
RAL 6006 Olive grey
RAL 6007 Bottle green
RAL 6008 Brown green
RAL 6009 Fir-tree green
RAL 6010 Grass green
RAL 6011 Reseda green
RAL 6012 Black green
RAL 6013 Reed green
RAL 6014 Olive yellow
RAL 6015 Black olive
RAL 6016 Turquoise green
RAL 6017 Pea green
RAL 6018 Yellow green
RAL 6019 White green
RAL 6020 Chromoxide green
RAL 6021 Pale green
RAL 6022 Olive brown
RAL 6024 Traffic green
RAL 6025 Fern green
RAL 6026 Opal green
RAL 6027 Luminous green
RAL 6028 Pine green
RAL 6029 Mint green
RAL 6032 Signal green
RAL 6033 Mint turquoise
RAL 6034 Pastel turquoise
RAL 6035 Pearl green
RAL 6036 Pearl opal green
RAL 7000 Squirrel grey
RAL 7001 Silver grey
RAL 7002 Olive grey

RAL 7003 Moss grey	**RAL 7004** Signal grey	**RAL 7005** Mouse grey	**RAL 7006** Beige grey
RAL 7008 Khaki grey	**RAL 7009** Green grey	**RAL 7010** Tent grey	**RAL 7011** Iron grey
RAL 7012 Basalt grey	**RAL 7013** Brown grey	**RAL 7015** Slate grey	**RAL 7016** Anthracite grey
RAL 7021 Black grey	**RAL 7022** Umbra grey	**RAL 7023** Concrete grey	**RAL 7024** Graphite grey
RAL 7026 Granite grey	**RAL 7030** Stone grey	**RAL 7031** Blue grey	**RAL 7032** Pebble grey
RAL 7033 Cement grey	**RAL 7034** Yellow grey	**RAL 7035** Luminous grey	**RAL 7036** Platinum grey
RAL 7037 Dust grey	**RAL 7038** Agate grey	**RAL 7039** Quartz grey	**RAL 7040** Window grey
RAL 7042 Traffic grey-a	**RAL 7043** Traffic grey-b	**RAL 7044** Silk grey	**RAL 7045** Telegrey-1
RAL 7046 Telegrey-2	**RAL 7047** Telegrey-4	**RAL 7048** Pearl mouse grey	**RAL 8000** Green brown
RAL 8001 Ochre brown	**RAL 8002** Signal brown	**RAL 8003** Clay brown	**RAL 8004** Copper brown
RAL 8007 Fawn brown	**RAL 8008** Olive brown	**RAL 8011** Nut brown	**RAL 8012** Red brown
RAL 8014 Sepia brown	**RAL 8015** Maroon	**RAL 8016** Mahogany brown	**RAL 8017** Chocolate brown
RAL 8019 Grey brown	**RAL 8022** Black brown	**RAL 8023** Orange brown	**RAL 8024** Beige brown
RAL 8025 Pale brown	**RAL 8028** Terra brown	**RAL 8029** Pearl copper	**RAL 9001** Cream white
RAL 9002 Grey white	**RAL 9003** Signal white	**RAL 9004** Signal black	**RAL 9005** Deep black
RAL 9006* White-aluminium	**RAL 9007*** Grey-aluminium	**RAL 9010** Pure white	**RAL 9011** Graphite black
RAL 9016 Traffic white	**RAL 9017** Traffic black	**RAL 9018** Papyrus white	**RAL 9022** Pearl light grey
RAL 9023 Pearl dark grey			

* Limitations with painting due to cloud formation and extremely problematic re-work.
The reasons are metal particles that arise randomly when drying.

14. INTERIOR LINING

The interior coating protects from corrosion in both single-wall and multi-wall chimneys and ventilation systems. Various base coats, lacquer or coatings are available depending on the respective medium and individual customer specifications (e.g., epoxy resin base coat / varnishing; bitumen paint, etc.)

Instead of interior coating, corrosion protection can also be regulated with wall thickness. In doing so, the wall thickness of the supporting pipe is provided with appropriate material additions to ensure / increase the lifetime.

Norm excerpt:
DIN EN 1993-3-2 / 4.2 Exterior corrosion addition

Protection system	Application duration	
	for the first 10 years	for every other 10 year period
unprotected interior surfaces of the supporting pipe and unprotected exterior surfaces of the internal pipe in a double-walled or multi-walled chimney (in general or weatherproof steel structures)	0.2 mm	0.1 mm

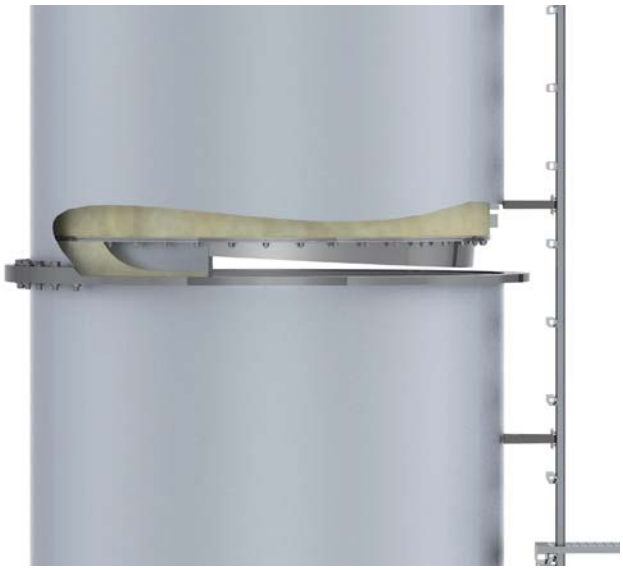
FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X	X	-

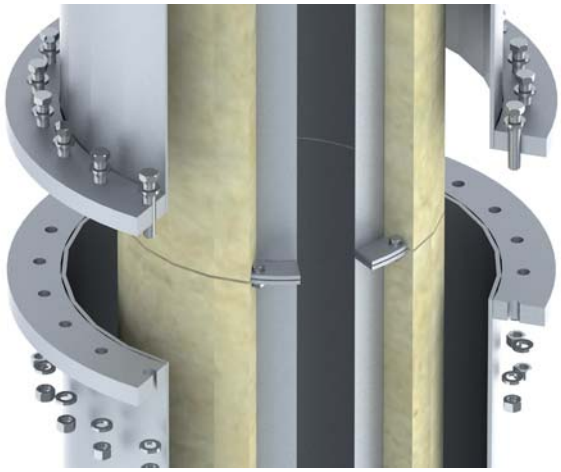
PROTECTION OF SURFACES AGAINST CHEMICAL IMPACTS

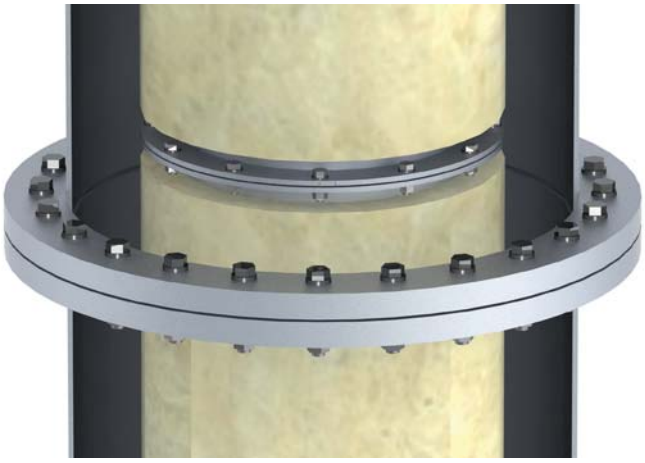
The exterior and interior surfaces of the internal steel pipes can be protected from environmental influences and corrosive gasses with various measures:
Paint, metallic coatings, corrosion addition, masonry, cladding, selection of non-corrosive materials, etc.

15. FLANGE CONNECTION / MULTI-PART OPTION FOR CHIMNEYS

Using flanges is a method for connecting pipe openings and chimney entries tightly but also in a detachable way. These transport and assembly modules are used in chimneys and flanged together on the construction site. The flange design is calculated statically and screwed down with high-tensile screws and with the required torque. Interior seals ensure the gas leak tightness and long life.







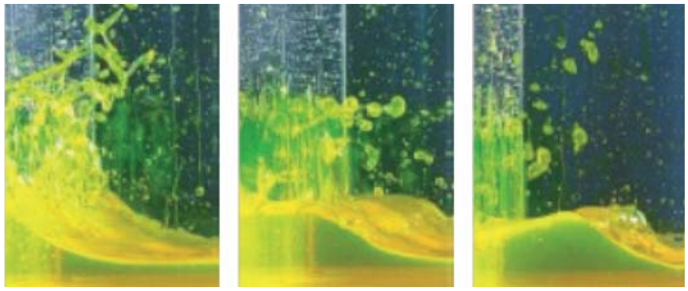
FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X*	X*	X	-

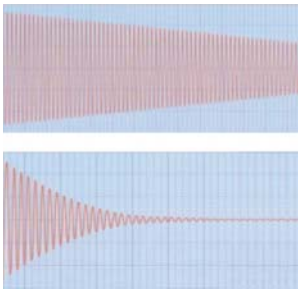
* Flange exclusively for single-walled duct

16. SCRUTON SPIRAL / OSCILLATION SILENCER

The Scruton spiral baffles are added to the outer sheathing of the chimney system. Fluid flow on the inclined spiral edges is inevitably sloughed off and the rotator mechanism constantly agitates as a result of the powerful spatial streaming components. The oscillation silencer is used in especially slim chimneys or even cell towers. This function is about rotator sloughing or aerodynamic instability at right angles to the wind direction. The construction method is based on a "swashing effect," a fluid that is "disperses" the oscillation energy of the chimney into specially sized chambers. The fluid, which consists of a anti-freeze mixture, swashes into the individually arranged chambers in response to the movement of the chimney. This reduces or completely excludes recurring incidences of oscillations. This type of oscillation silencer is nearly maintenance free and does not require extra maintenance equipment.

Illustration of the "swash effect" and its action





Scruton spiral

Oscillation silencer

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X	X	-

17. WEATHER PROTECTIVE COVER / IMPLEMENTATION

In chimney systems that are directed through the roof, the opening is sealed with a roof bushing. The remaining annulus between the chimney and roof opening is provided with a weather protection cover that is clamped directly to the external pipe, and it reaches over the roof opening. This way, movement of the chimney is possible despite the roof opening.

FSA	FSA-X	FSB	FSC	FR-RM	VBL
X	X	X	X	X	-

EXAMPLE ASSEMBLY PROCESS

Csepel (Hungary)
System FSA-6
Weight: 7.6 d
AØ: 2.00 m

Number of internal pipes: 6 piece
øinternal ducts: Ø 400 & Ø 500
Height: 28 m

Auto-crane positioning

Disassembly of the centering ring for the foundation basket

Setting up the anchor nuts 1

Auto-crane ready for transport

Lifting the lower chimney section

Position the lower chimney section on the foundation basket

Affix the lower chimney section

Position the work platform for installing the upper section

Lifting the upper section with main and revision crane

Placing the second section

The 6 internal pipes are connected / flanged

The 6 internal pipes are connected / flanged

Supporting pipe is screwed on

Finished chimney incl. connecting line
Jeremias DW-KL

Finished chimney incl. connecting line
Jeremias DW-KL

Finished chimney incl. connecting line
Jeremias DW-KL

FOUNDATION BASKET ASSEMBLY
(EXAMPLE)

Foundation size is:	**4100**	**mm x**	**4100**	**mm x**	**1000**	**mm**
Foundation mount size is:	**2200**	**mm x**	**2200**	**mm x**	**300**	**mm**

1) The outlet points of the anchor rods should be at least 115 mm over the area if separate corrosion measures were not taken.

THE POSITION OF THE FOUNDATION BASKET / FOUNDATION IN RELATION TO THE BUILDING IS

1) the following diagram should be used as reference: 3425-M.AK.ÜZ.DEU.22.R1

or

2) determined by the construction management, as the SES company does not have building documents

And in the 1st case, the position of the construction management needs to be reviewed!

THE FOUNDATION BASKET MUST BE SET UP SO THAT:

> the anchor rods come out 11.5 cm over the upper edge of planned foundation mount (FSOK)
> The anchor rods are on the plumb-line.

THE COLOURED ANCHOR ROD

1) must be set up according to the aforementioned diagram: 3425-M.AK.ÜZ.DEU.22.R1

or

2) in general, it must be set up in the direction of a foundation axis

ATTENTION

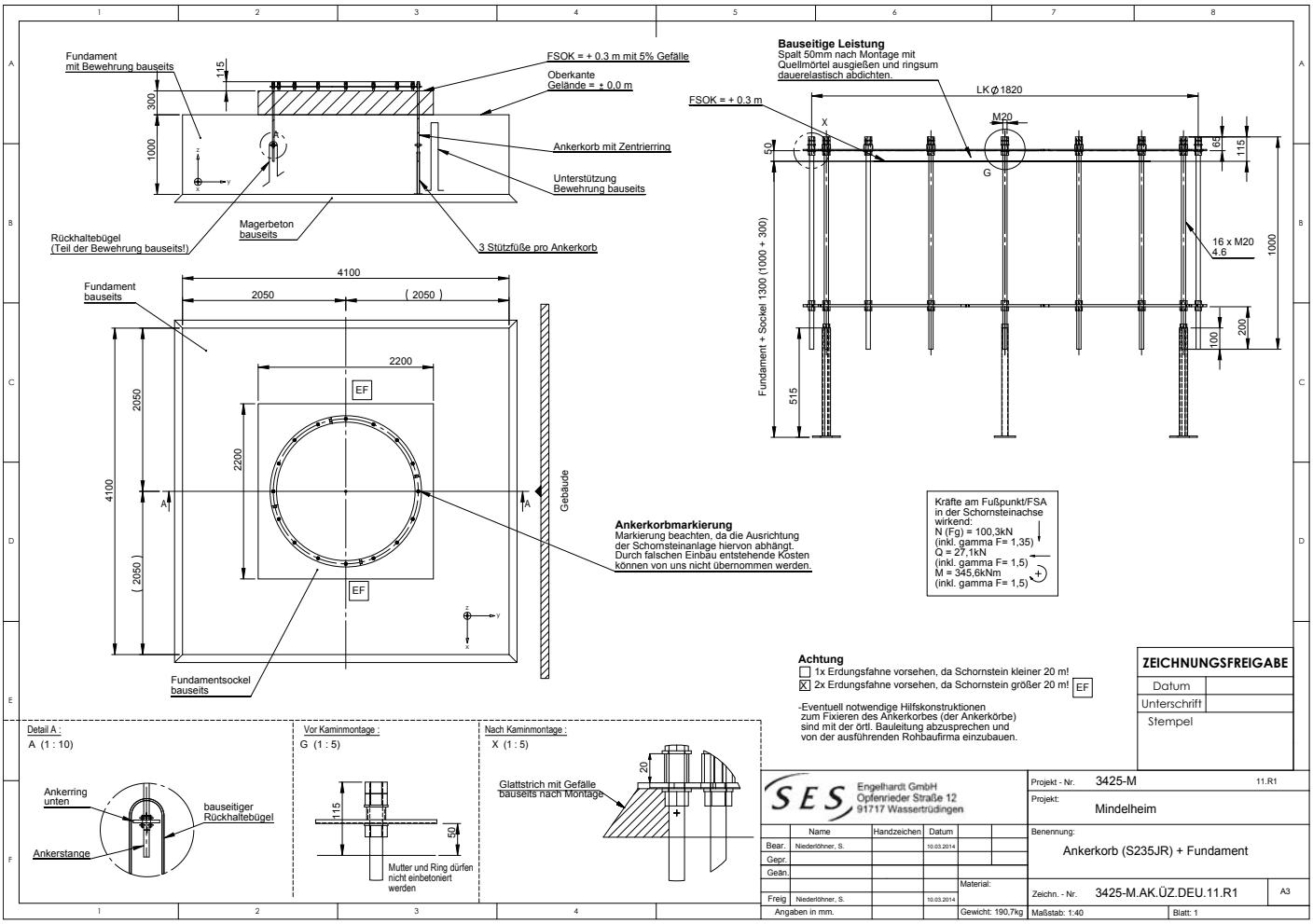
Provide 1x earthing vane for up to 20 m chimney height! Set up for marked anchor rod
Provide 2x earthing vanes for above 20 m chimney height! Set up
1x for marked anchor rod
1x 180° turned

REINFORCEMENT PLAN:

see diagrams:
on-site service, ask construction management

ON-SITE SERVICES:

> Review whether the permitted pressure on underlying soil is >= 200 kN/m²!!!
> The influence of the adjacent foundations must be reviewed!!!
> After the chimney is assembles, the gap between the base plate, chimney and foundation mount (approx. 5 cm) must be filled with non-shrinking mortar (e.g., BETEC Multiflow 120).



FOUNDATION MEASUREMENT

For series FSA / FSA-X free-standing with foundation basket, the following table contains information about foundation measurement with data for:

> **Internal forces on the base of a free-standing chimney or ventilation tower**

> **Foundation measurements**

The abbreviations in the tables mean:

d	Diameter of the supporting pipe	in mm
Height	Height of construction over the foundation	in m
F_g	Vertical load (incl. Coefficient for material parts safety γ_F=1.35)	in kN
Q	Horizontal load (incl. Coefficient for material parts safety γ_F=1.5)	in kN
M	Fixing torque (incl. Coefficient for material parts safety γ_F=1.5)	in kN
Width	Width and length of the square steel concrete foundation	in m
Depth	Foundation depth	in m

For stronger or weaker WZ, do the following:

for W.Z.I:

Loads= table value 0.8
Foundation width= table value*0.9

for W.Z.III:

Loads= table value 1.22
Foundation width= table value*1.07

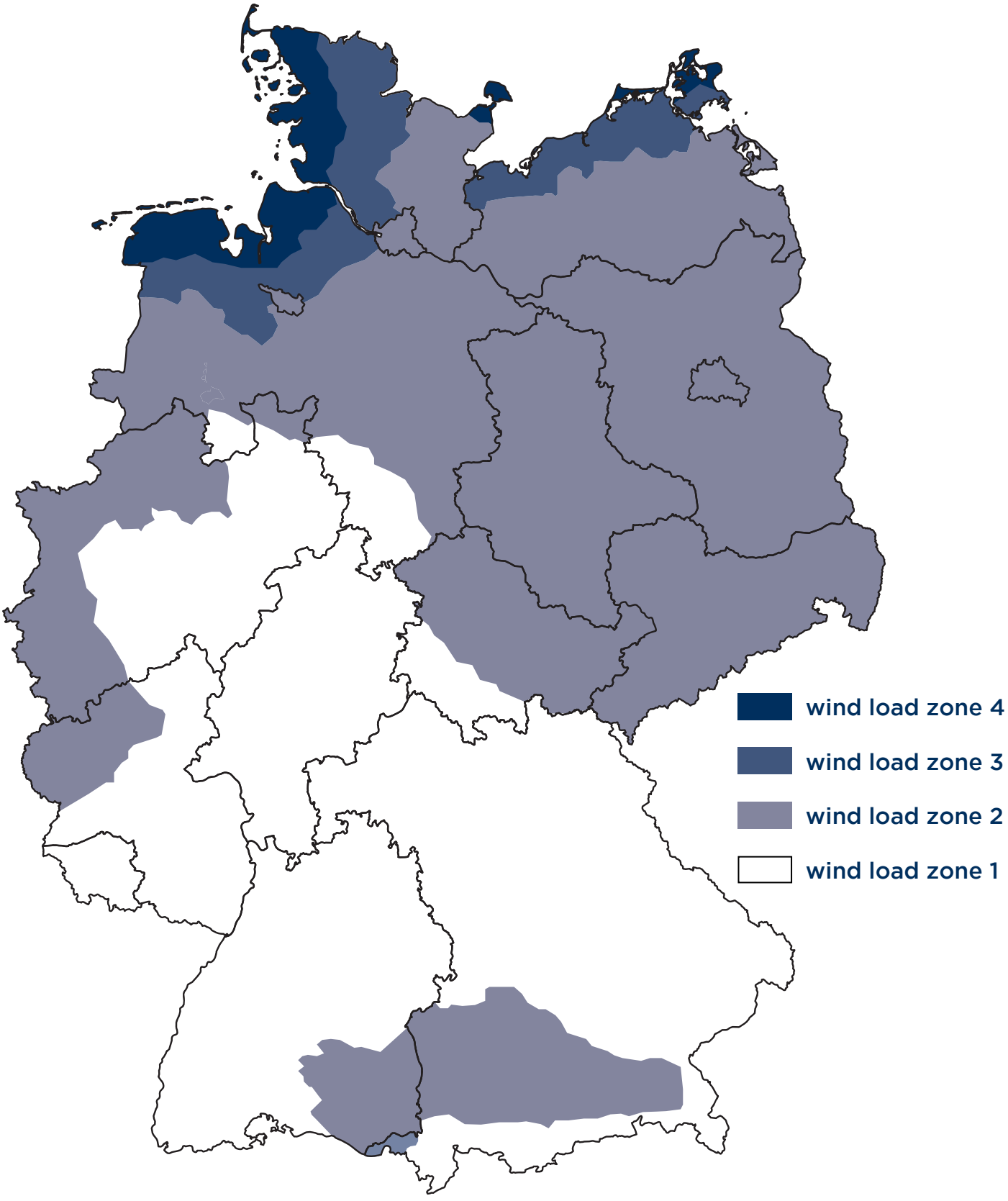
In the following information, there are no in-line configuration or site factors noted.

Height	d	324	406	508	610	711	813	914	1016	1220	1420	1600	1800	2000
6	Fg	4,3	5,2	7,5	9,7	11,5	13,7	15,6	16,8	25,0	29,2	27,0	35,0	41,8
	Q	1,9	2,9	3,4	3,9	4,4	4,9	5,4	6,0	6,9	7,9	9,0	9,8	10,8
	M	5,8	9,6	11,3	13,0	14,7	16,5	18,1	19,8	23,3	26,6	29,9	33,1	36,4
	Width	1,2	1,3	1,4	1,5	1,5	1,5	1,6	1,6	1,7	1,8	1,9	2,0	2,2
	Depth	1,0	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,0	1,0
8	Fg	5,8	6,9	11,4	12,9	15,3	18,3	20,7	23,2	33,3	38,9	36,0	43,0	55,8
	Q	2,7	3,7	2,6	5,0	5,5	6,1	6,7	4,8	8,5	9,6	10,8	12,0	13,0
	M	10,9	16,3	10,3	22,3	24,9	27,6	30,4	19,1	38,8	44,2	49,7	55,0	60,4
	Width	1,4	1,6	1,7	1,7	1,7	1,7	1,8	1,7	1,9	2,0	2,1	2,4	2,4
	Depth	1,0	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,0	1,0
10	Fg	7,2	8,6	12,5	19,1	20,2	22,9	25,8	28,8	48,6	40,4	45,0	50,5	69,6
	Q	4,3	4,7	5,4	6,9	4,5	7,6	8,3	8,9	11,8	8,4	13,1	14,5	15,9
	M	23,6	26,4	30,3	39,6	22,6	43,8	47,8	51,8	68,6	42,2	76,9	85,0	93,3
		1.5 m S.W												
	Width	1,6	1,7	1,8	1,9	1,9	2,0	2,0	2,2	2,1	2,2	2,3	2,4	2,6
	Depth	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,0
12	Fg	8,7	10,3	15,1	19,3	22,9	27,5	31,0	34,6	49,9	58,3	53,9	60,7	83,5
	Q	5,5	6,2	6,4	7,2	8,0	9,4	10,2	10,9	12,6	14,2	15,8	17,5	19,1
	M	37,8	42,6	43,8	50,0	56,0	65,8	71,6	77,4	89,0	101,0	113,0	124,8	136,7
		2 m S.W	2,2 S	I.D	I.D	I.D								
	Width	1,8	2,0	2,0	2,1	2,1	2,2	2,2	2,4	2,4	2,4	2,6	2,6	2,6
	Depth	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
14	Fg	12,8	12,1	17,6	22,5	26,7	32,1	32,2	40,4	58,2	68,1	63,0	70,8	97,5
	Q	3,8	7,5	7,8	8,6	9,4	10,3	12,1	13,1	14,9	16,6	18,5	20,4	22,3
	M	27,2	62,1	62,9	6z9.8	77,4	84,9	100,5	108,3	123,9	139,3	155,4	171,5	187,7
		2.2 m S.W	2,5 S											
	Width	2,0	2,2	2,3	2,4	2,3	2,4	2,4	2,6	2,6	2,6	2,8	2,9	2,9
	Depth	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
16	Fg		13,7	20,1	25,7	30,5	36,6	41,4	46,2	66,6	77,8	71,9	80,9	111,4
	Q		9,0	8,8	9,8	10,8	11,9	13,1	14,1	17,3	19,3	21,3	23,4	25,5
	M		86,1	82,0	92,3	102,0	113,0	124,2	134,8	166,5	186,3	206,3	227,2	248,2
			3S	S.D	S.D	S.D		S.D	S.D					
	Width		2,4	2,5	2,6	2,5	2,6	2,7	2,8	2,8	2,8	3,0	3,1	3,1
	Depth		1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
18	Fg			22,6	28,9	34,4	41,2	46,5	51,9	74,9	87,5	80,9	93,6	125,3
	Q			10,1	11,3	12,5	13,6	14,8	16,2	18,3	22,2	24,4	21,6	29,0
	M			107,0	120,3	133,4	146,5	160,0	174,3	198,9	242,1	266,9	194,3	318,9
										S.D				
	Width			2,7	2,8	2,8	2,9	3,0	3,1	3,1	3,0	3,2	3,3	3,3
	Depth			1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
							S.D							

Height	d	324	406	508	610	711	813	914	1016	1220	1420	1600	1800	2000
20	Fg			25,2	32,2	38,2	45,7	51,7	57,7	83,2	97,2	89,9	101,0	139,2
	Q			11,5	12,8	14,2	15,5	16,8	18,3	20,7	23,3	27,7	30,2	32,7
	M			137,3	153,3	170,4	186,3	202,5	220,6	250,8	283,0	338,1	369,0	401,1
				S.D1+2	S.D1+2						S.D			
	Width			2,9	3,0	3,0	3,2	3,3	3,3	3,5	3,5	3,5	3,5	3,5
	Depth			1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
22	Fg				35,4	42,0	50,3	56,8	63,4	91,5	106,9	98,8	112,0	153,1
	Q				14,5	16,0	17,6	18,9	20,4	23,2	16,8	29,2	33,9	36,6
	M				191,4	212,2	233,4	251,2	271,0	309,9	268,6	391,9	457,3	495,2
												S.D		
	Width				3,0	3,1	3,2	3,5	3,5	3,5	3,7	3,7	3,7	3,8
	Depth				1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
24	Fg				38,6	45,8	54,9	62,0	69,0	99,8	116,6	107,8	121,3	167,1
	Q				16,2	18,0	19,7	21,3	20,4	25,8	29,0	32,4	35,4	40,9
	M				235,1	260,0	285,8	310,3	331,5	377,0	424,2	476,1	522,0	604,0
													S.D	
	Width				3,3	3,3	3,4	3,7	3,8	3,8	3,9	4,0	3,9	4,0
	Depth				1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
														S.D
						S.D1+2	S.D1+2							
26	Fg					49,6	59,5	67,2	75,0	108,2	126,4	116,8	131,4	181,0
	Q					19,9	21,8	23,6	25,2	28,4	32,0	35,8	39,1	42,0
	M					314,4	345,0	374,0	398,8	450,5	508,0	570,4	625,0	672,0
	Width					3,5	3,6	3,7	3,8	4,0	4,1	4,2	4,1	4,2
	Depth					1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
28	Fg					53,4	64,0	72,3	81,3	116,5	136,1	129,3	141,5	195,0
	Q					21,9	24,1	26,0	25,0	31,2	35,0	40,9	43,0	46,0
	M					375,3	411,4	445,5	355,4	534,0	600,0	641,4	739,0	794,0
								S.D1+2						
	Width					3,7	3,8	3,8	3,9	4,2	4,0	4,2	4,3	4,4
	Depth					1,5	1,5	1,5	1,5	1,5	1,8	2,0	2,0	2,1
30	Fg						68,6	77,5	86,6	124,8	145,8	138,6	151,6	208,8
	Q						26,3	28,5	30,7	34,2	38,0	44,9	46,9	50,2
	M						485,0	524,9	564,6	628,3	703,0	755,0	865,9	928,4
									S.D1+2					
	Width						3,6	3,7	4,0	4,1	4,4	4,4	4,5	4,7
	Depth						1,8	1,8	1,8	1,8	1,8	2,0	2,0	2,0
32	Fg							82,7	92,3	133,1	155,5	147,8	161,7	222,8
	Q							31,1	33,5	37,4	41,5	48,9	51,0	54,1
	M							612,5	658,0	734,5	816,0	879,7	1004,6	1067,0
	Width							3,9	4,2	4,3	4,2	4,4	4,5	4,9
	Depth							1,8	1,8	1,8	2,0	2,0	2,0	2,0

The values are calculated for wind load zone II

German map with corresponding wind load zones



3

VENTILATION TOWERS

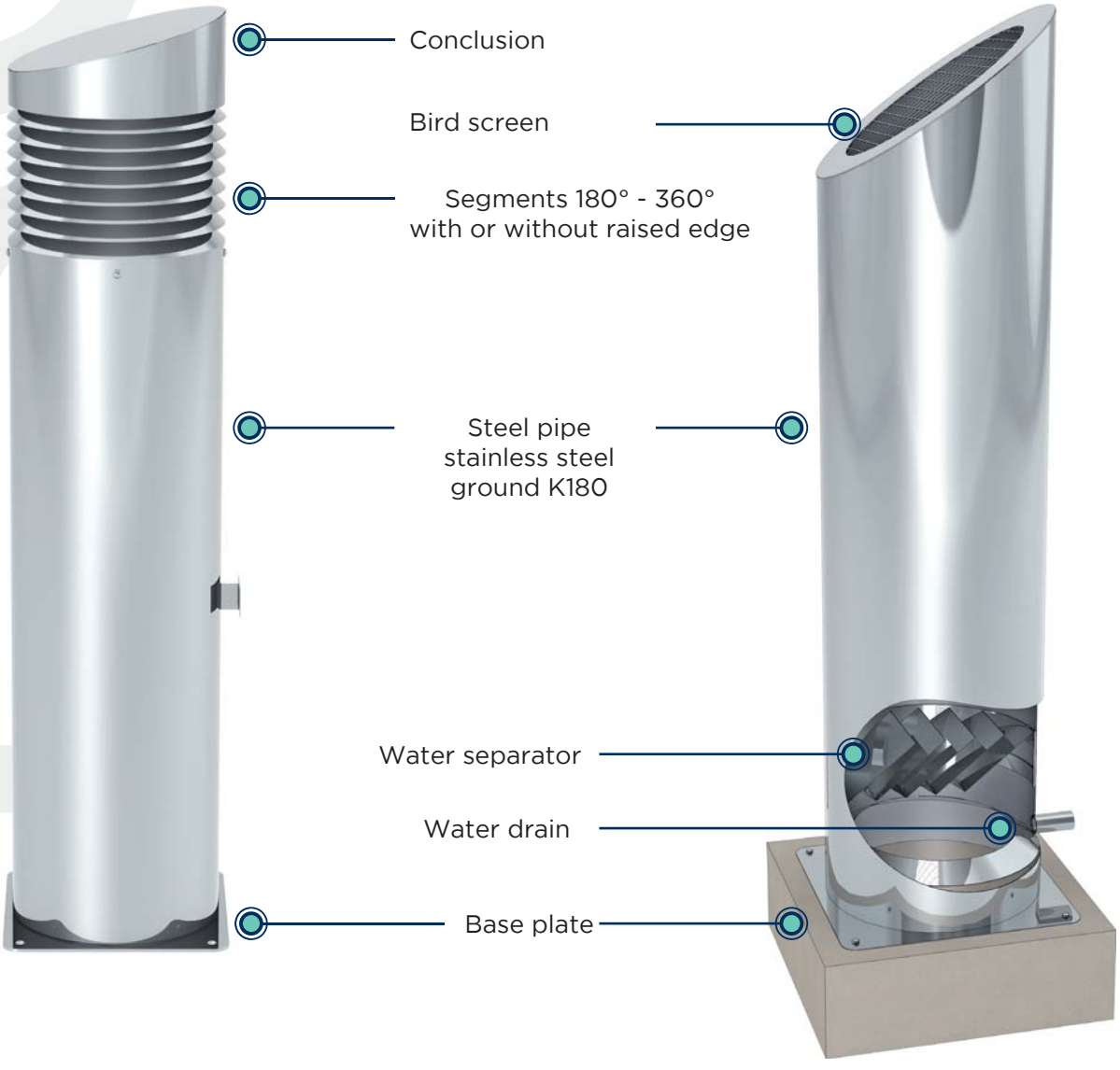
System
Overview
Enquiry form

FSC (VENTILATION TOWERS)

Free-standing, single-walled supply air and discharge air chimney. Corrosion addition or paint coating is also resistant to discharge air. Inexpensive alternatives to the FSA for non-hazardous material discharge air.

INTAKE TOWER

DISCHARGE TOWER



USE

> The FSC series is used in air conditioning and ventilation technology

STRUCTURE

> In FSC, the visible pipe is the static supporting system and also the media-carrying system that is usually not insulated
> Depending on requirement, thicknesses of above 1.5 mm for stainless steel and 4 mm for carbon steel are manufactured

FIXTURES

> Segment hoods, steam arcs, acceleration jets or deflector hood

SUPPLEMENTS

> A water separator that cannot be seen from outside can be built into the supporting pipe. The benefit is that the resistance coefficient for the SES water separator is significantly lower that of a deflector hood; the function is identical

SERIES	FSC
STATIC SYSTEM	Foundation basket or building Connection
SUPPORTING ELEMENT	Single-walled exhaust line
STRUCTURE	Single-shell
INTERNAL PIPE	Possible for discharge air
INTERNAL PIPE DAMPING	Insulation with Armaflex is possible
REAR VENTILATION	-
SUPPORTING PIPE	1.4301, 1.4571, St 37-2
SURFACE VISUAL	Facet grinding for stainless steel Steel, galvanised Steel, coated (Cladding)
USE	Supply air, discharge air

CAMBRILLS, SPAIN

HEIGHT	18 m
DIAMETER	2760 mm
SURFACE:	matte, with ground welded seams

One-piece transport to Spain. Assembly with 3.5 m high segment-hoods.

BÜNDE, GERMANY

HEIGHT	3,2 m
DIAMETER	2 x 1600 / 6 x 20000 mm
SURFACE:	ground

8 FSC for exhaust air and supply of a metal process.

FRANKFURT, GERMANY

HEIGHT	8.2 m/ 4.8 m
DIAMETER	1600/1300 mm
SURFACE:	ground

Discharge air and supply air in the Frankfurt University clinic

KÜNZELSAU, GERMANY

HEIGHT	2 x 11 m
DIAMETER	1000 mm
SURFACE:	glass-pearl blasted

segment hood 360°, flush on supporting pipe. Adjacent to supply air connection from below.

NÜRBURGRING, GERMANY

HEIGHT	5 x 4,3 m
DIAMETER	2250 mm
SURFACE:	ground

MUTLANGEN, GERMANY

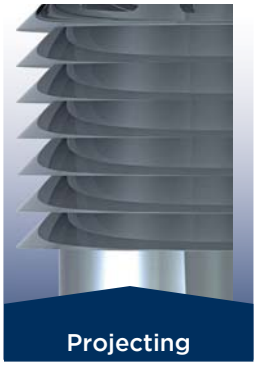
HEIGHT	2 x 11 m
DIAMETER	1000 mm
SURFACE:	ground

Architectonically adapted discharge-/supply air towers with visible, interior water separator

INTAKE TOWERS OVERVIEW

SEGMENT HEAD VARIATIONS

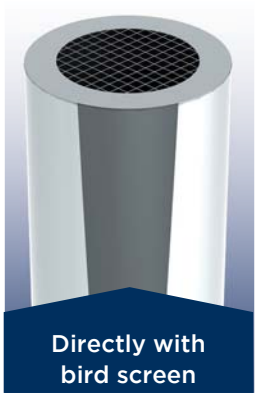
LAMINATE FORM



LAMINATE CONFIGURATION

DISCHARGE TOWER OVERVIEW

CONCLUSION



Directly with bird screen

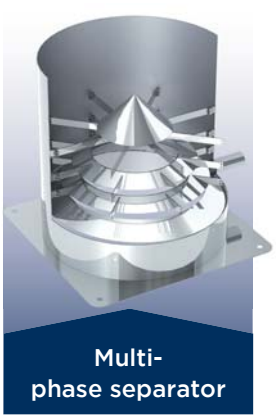
Diagonal cut 3-45° with bird screen

WATER SEPARATOR

Steam arc 90°

Deflector hood

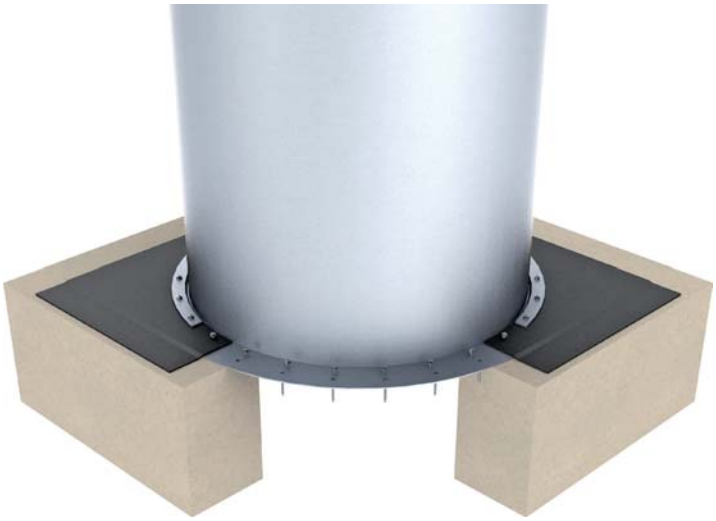
Segment separator on base



Multi-phase separator

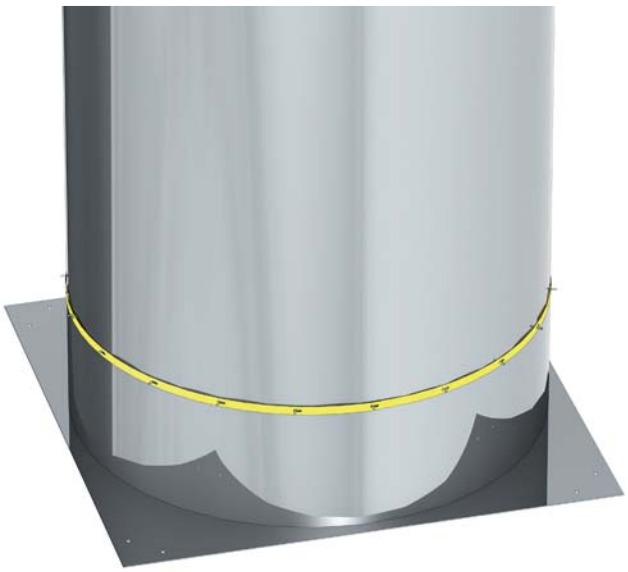
SEALING

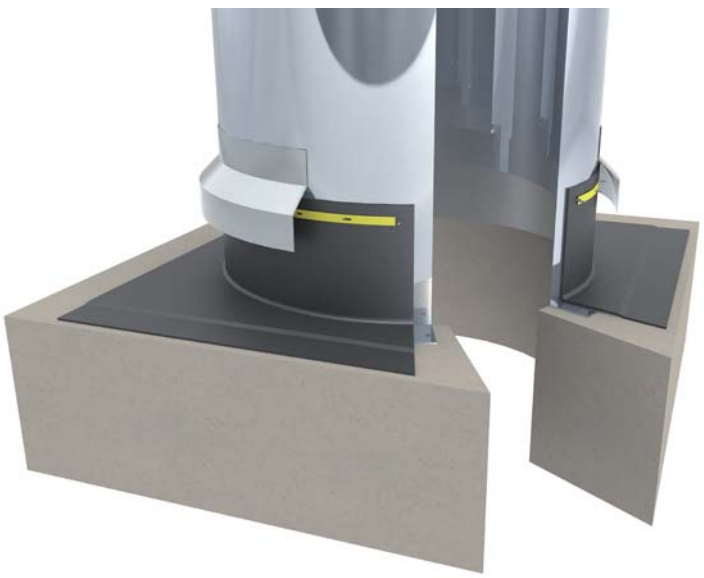
To add the ventilation tower to the substrate and waterproofed it usually needs to be incorporated into the roof cladding. In addition, there are various options that can be designed depending on the substrate / roof construction



Clamp flange for affixing the roof cladding on the bottom flange

Clamp ring for affixing the roof cladding underneath the weather protection cover





ENGELHARDT GMBH SES
Email: vertrieb@engelhardt-ses.de
Fax: +49 (0) 9832 68 68 - 64

INTAKE TOWERS

CUSTOMER DATA:

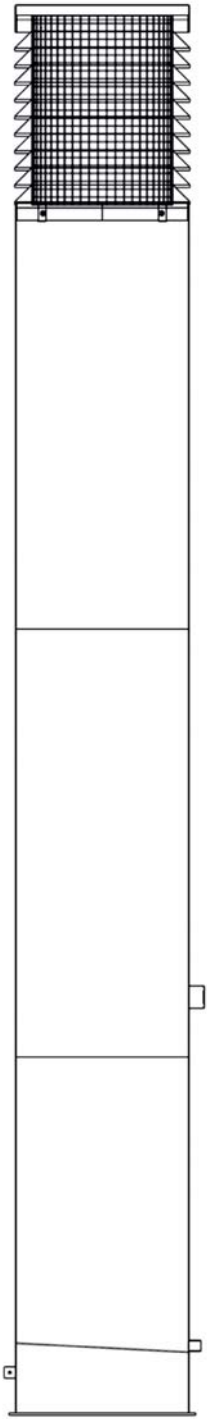
Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:



Installation location _____

Air power _____ m^3/h

Air speed _____ m/s

Sound level _____ dB(A)

Pressure loss max. _____ Pa

Temperature / medium _____ °C

Diameter _____ mm ☐ SES design

Wall thickness _____ mm ☐ SES design

Total height _____ mm

Segment hood height _____ mm ☐ SES design

Standing pipe height _____ mm

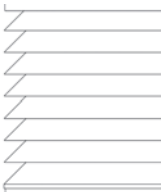
Material ☐ 1.4301 ☐ 1.4571
☐ Other _____

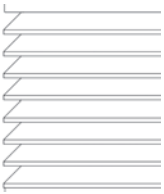
fittings
☐ Foundation basket
☐ Foundation basket with sheathing pipe
☐ Foundation bolts
☐ Mount
☐ according to static

Surface
☐ ground K180
☐ matte
☐ glass-pearl blasted
☐ Other

Segment hood ☐ 180° ☐ 360°

Segment hood design ☐ without raised edge ☐ external raised edge





Tower roof incline ☐ 0° ☐ 15° ☐ 30° ☐ cone roof

Material base point ☐ such as standing pipe (VA) ☐ ground/coated steel

Connection ☐ sideways 45° ☐ sideways 87 - 90° ☐ from below

Cleaning opening ☐ Size corresponding diameter Standard SES ☐ Size _____ mm

☐ Sealing/clamping fitting
☐ Assembly incl. crane
☐ Weather protection cover in stainless steel ☐ Transport
☐ Planned execution time: _____

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COMBINATION TOWERS

CUSTOMER DATA:

Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:

Installation location _____

Air power intake _____ m^3/h

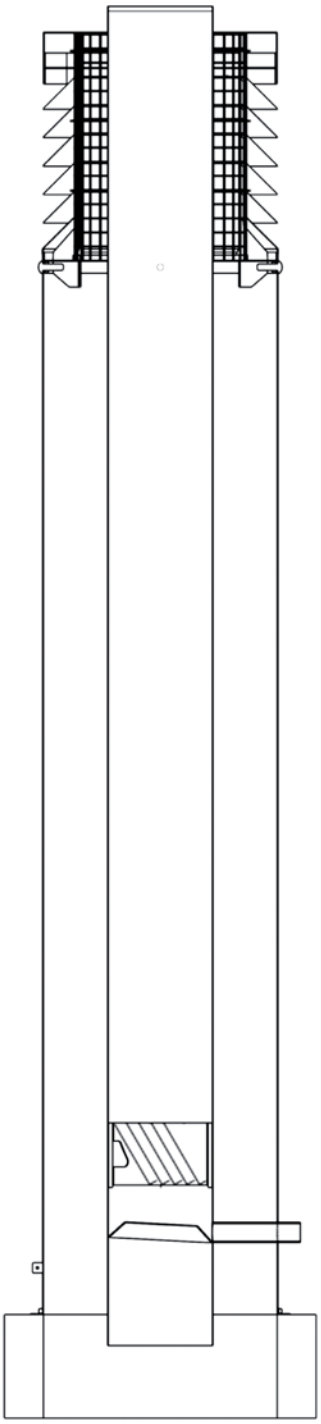
Air power steam off _____

Air speed _____ m/s

Sound level _____ dB(A)

Pressure loss max. _____ Pa

Temperature / medium _____ °C



EXTERNAL PART (INTAKE PIPE WITH SEGMENT HOOD):

Diameter _____ mm ☐ SES design

Wall thickness _____ mm ☐ SES design

Total height _____ mm

Segment hood height _____ mm ☐ SES design

Standing pipe height _____ mm

Material ☐ 1.4301 ☐ 1.4571
☐ Other _____

fittings
☐ Foundation basket
☐ Foundation basket with sheathing pipe
☐ Foundation bolts
☐ Mount
☐ according to static

Surface
☐ ground K180
☐ matte
☐ glass-pearl blasted
☐ Other

Segment hood ☐ 180° ☐ 360°

Segment hood design ☐ without raised edge ☐ external raised edge

Material base point ☐ such as standing pipe (VA) ☐ ground steel

Connection ☐ sideways 45° ☐ sideways 87 - 90° ☐ from below

Cleaning opening ☐ Size corresponding diameter Standard SES ☐ Size _____ mm

☐ Sealing/clamping fixture ☐ Weather protection cover in stainless steel

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COMBINATION TOWERS

INTERIOR PART
(STEAM OFF PIPE WITH SEGMENT SEPARATOR)

Diameter _____ mm SES design

Wall thickness _____ mm SES design

Total height _____ mm

Material ☐ 1.4301 ☐ 1.4571

☐ Other

Steam off opening ☐ open steam off ☐ 90° steam arc

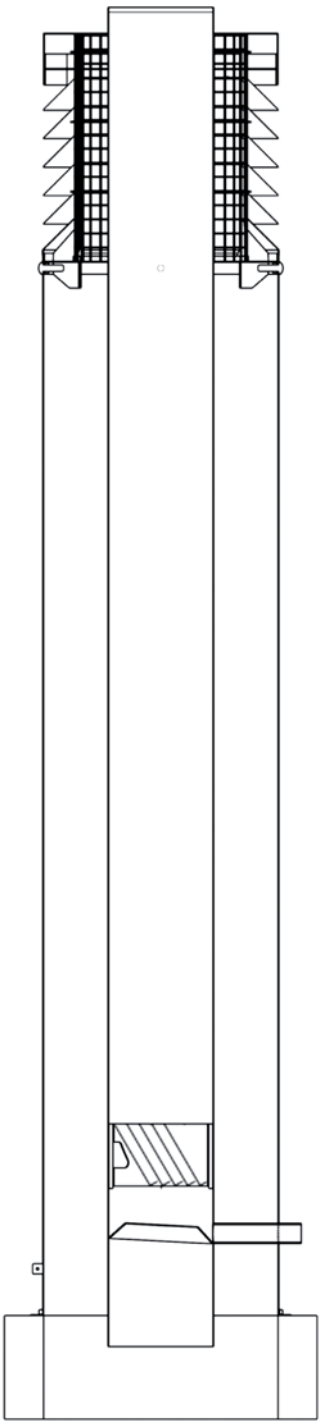
Connection ☐ sideways 45° sideways 87 - 90°

☐ from below

☐ Transport

☐ Assembly incl. crane

Planned execution time: _____



DISCHARGE TOWERS

ENGELHARDT GMBH SES
Email: vertrieb@engelhardt-ses.de
Fax: +49 (0) 9832 68 68 - 64

CUSTOMER DATA:

Customer name _____

Contact person: _____

Phone _____

Email: _____

DATA:

Installation location _____

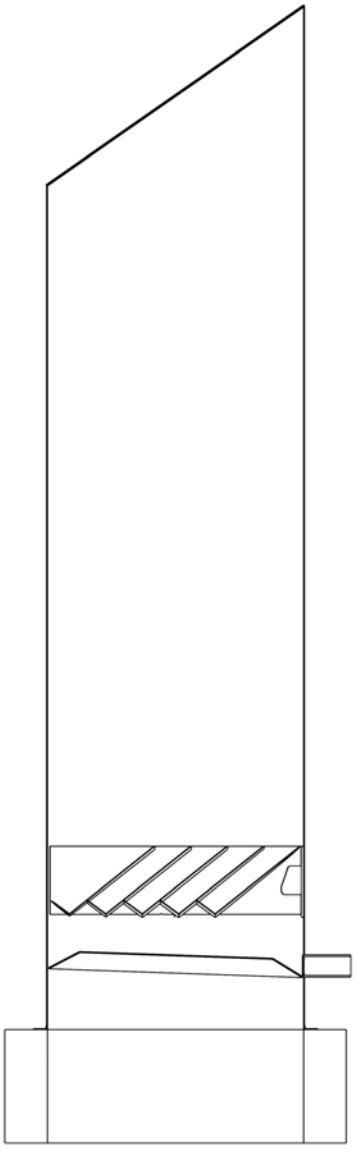
Air power _____ m^3/h

Air speed _____ m/s

Sound level _____ dB(A)

Pressure loss max. _____ Pa

Temperature / medium _____ °C



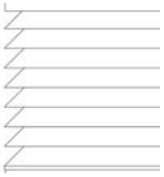
Material
☐ 1.4301 ☐ 1.4571
☐ Other _____

fittings
☐ Foundation basket
☐ Foundation basket with sheathing pipe
☐ Foundation bolts
☐ Mount
☐ according to static

Surface
☐ ground K180
☐ matte
☐ glass-pearl blasted
☐ Other _____

Steam off opening
☐ open steam off
☐ 90° Steam arc
☐ Segment hood without function (blind segment)

Design of blind segment
☐ without raised edge ☐ external raised edg



Segment separator ☐ acc. to SES - Standard

Opening / Diagonal cut ☐ 0° ☐ 15° ☐ 30° ☐ cone roof

Material base point ☐ such as standing pipe (VA) ☐ ground/coated steel

Connection ☐ sideways 45° ☐ sideways 87 - 90° ☐ from below

Cleaning opening ☐ Size corresponding diameter Standard SES Size _____ mm

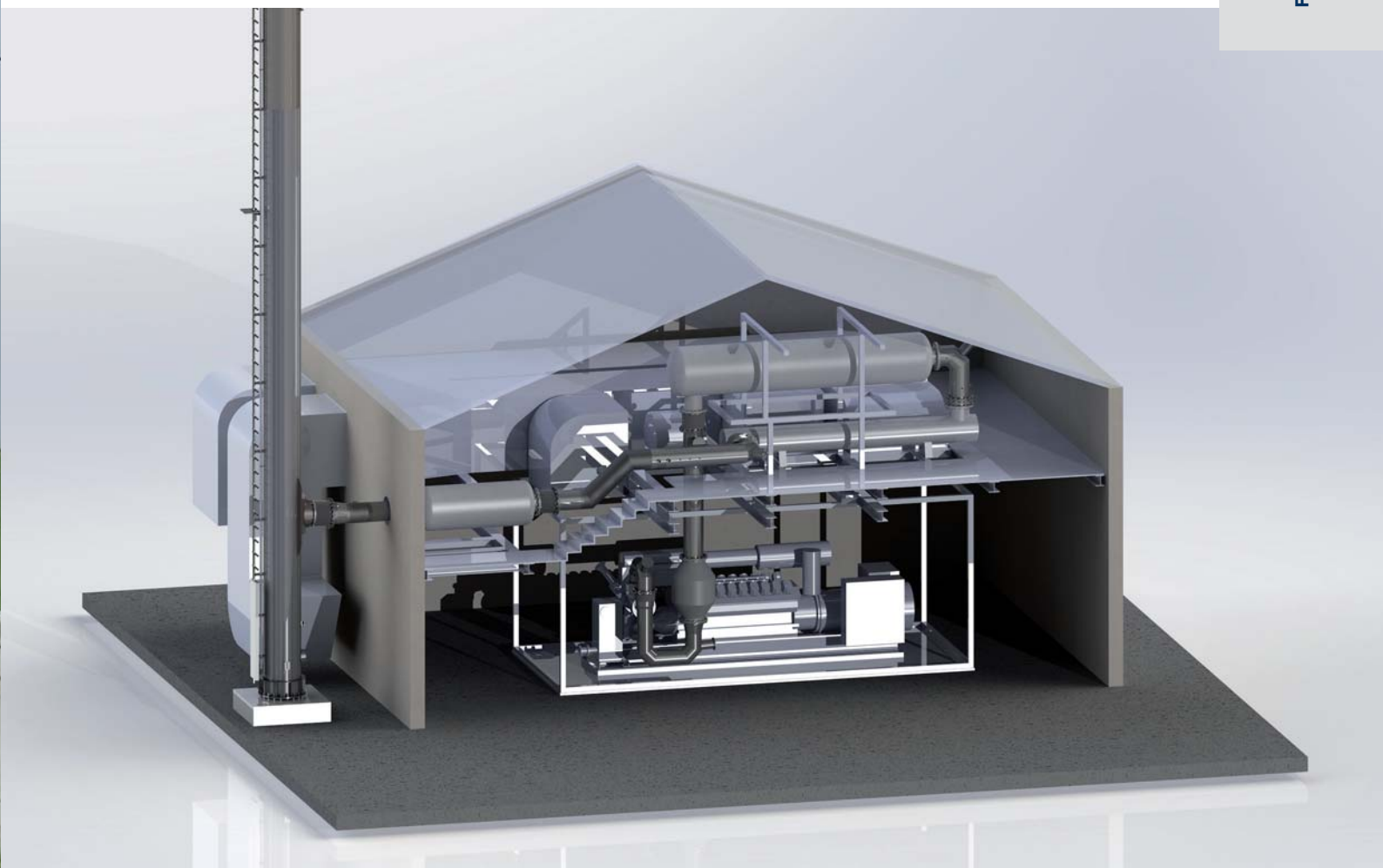
☐ Sealing/clamping fitting ☐ Weather protection cover in stainless steel ☐ Transport

☐ Assembly incl. crane ☐ Planned execution time: ☐ _____

4

FLUE GAS CONVEYORS

Introduction + project example
Detailed explanation



FLUE GAS CONVEYOR

The connecting line (CL / flue gas line) serves as the interface between the heat generator and the actual chimney. . The CL often has to take a lot of detours due to construction conditions and planned components. At the same time, exact planning with the construction management and on-site measuring are often important components of the planning. This CL can be supplied welded (Jeremias product) / flanged (SES product) in element construction, depending on the use and customer request.

BOTH SOLUTIONS CAN BE ADVANTAGEOUS FOR VARIOUS REASONS:

Welded (SES)

> Completely welded gas-sealed (H0)
> Few connection point required
> High pressure possible > 10,000 Pa
> Individually manufactured

Element construction (Jeremias)

> Fast assembly due to plug connections
> Double-walled incl. insulation and cladding
> No compensation required
> Fast delivery time and standard components
> Dimensions up to Ø 2500 mm

The following provides you with details on the **welded connecting line**, which is the largest portion of the industry use.

We will describe in more detail:

> Example cabling
> Expansion absorption by compensators
> Fixed and loose points / couplings / supports / steel construction
> Cleaning
> Exhaust valve
> Flange connections
> Industrial fluee gas Silencerss (treated in more detail in point 5)

THE FOLLOWING PARAMETERS CAN BE FILLED EASILY:

> Temperature of 1000 °C
> Overpressure/underpressure 10000 Pa
> Diameter 2500 mm
> Wall thickness 5 mm
> Stainless steel and carbon steel finishing

EXAMPLE PLANNING AND INFORMATION PROCESS:

> Order issuing
> Actual quantity taken in (plans/data sheets for the components)
> Construction site measurements, if required
> Creation of the initial blueprints V1
> Technical clarifications with customers / planners
> Revision of the blueprints to V2 if necessary
> Approval by the customer
> Creation of the workshop blueprints + production
> Delivery + assembly

EXAMPLE TIMELINE

1. Wk Data collection	3. Wk Drawing V1	5. Wk Changes	6. Wk Creation V2	7. Wk Approval	15. Wk Production	approx. 15* Wk
1 week	2 weeks	2 weeks	1 week	1 week	8* weeks	

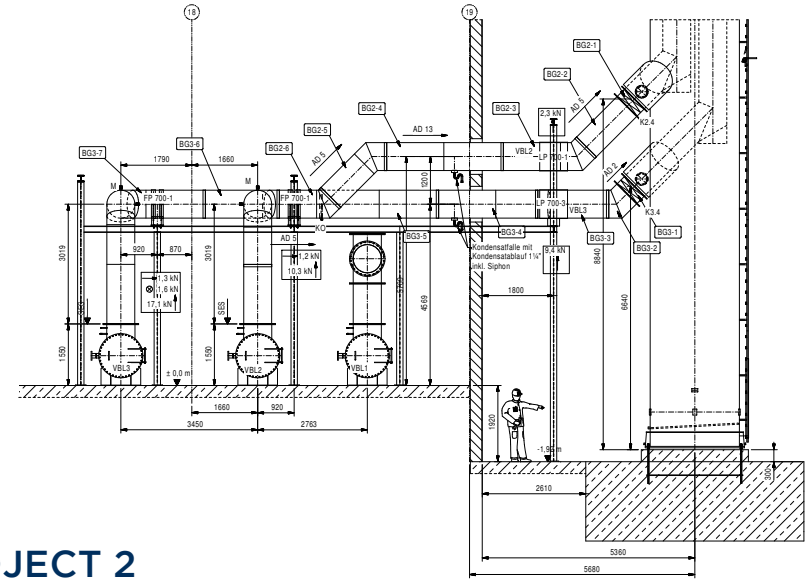
* time is variable depending on project.

EXAMPLE PROJECT 1

Exhaust gas line for three block heating and power plant each with 4MW power and a line for hot water boiler with 6 MW. In the process, SES also planned, produced and assembled the 4-line chimney system, which rounded out the complete package starting at the heat generator.

3 x Block heating and power plant (incl. Assembly of on-site heat exchanger / exhaust gas baffle / valves)
Temperature max. 550 °C

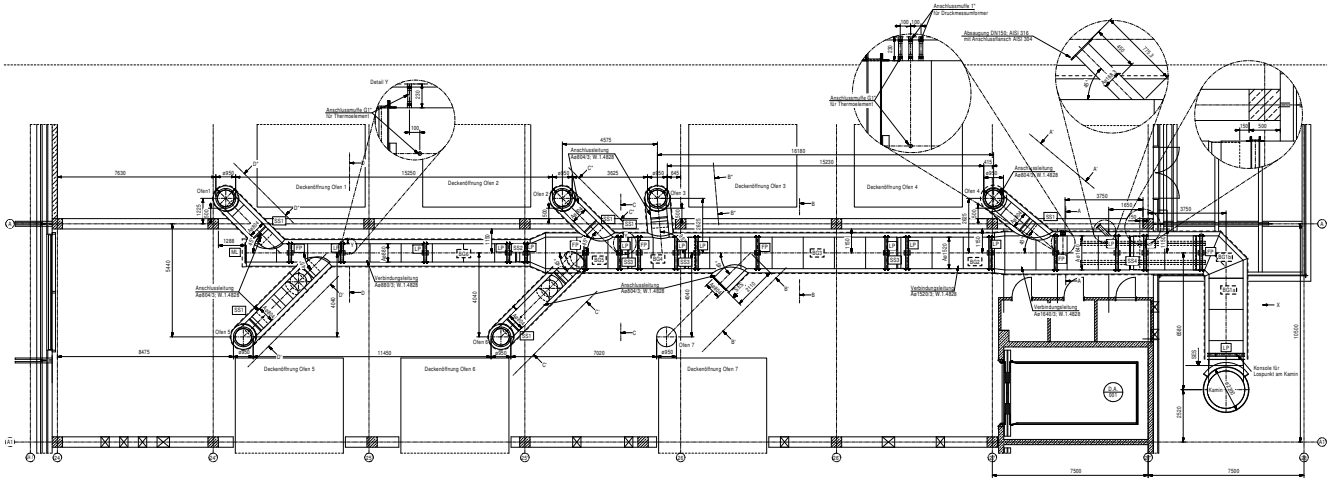
1 x hot water boiler (incl. company-designed and produced exhaust gas baffle) temperature max. 200 °C
Baffle requirement: Damping of 35 dB over the entire spectrum



EXAMPLE PROJECT 2

To allow for in-house melting of aluminium in the BMW Landshut plant, at total of seven melting furnaces were installed in the year 2012. Eduction of the flue gas is done by a flue gas line we produced and installed, which leads in a cascade form to the chimney

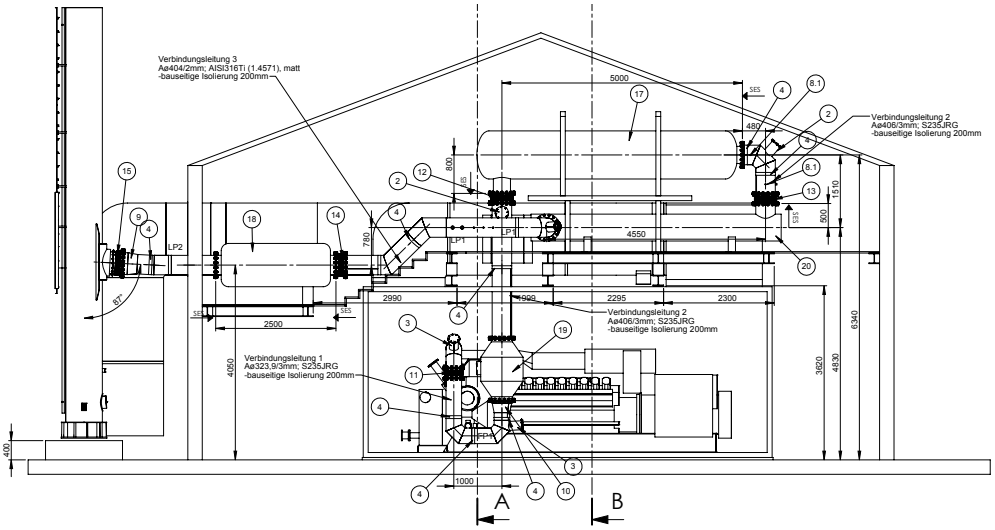
Dimensions: Ø 600 mm to Ø 1600 mm
>Exhaust gas data: 7 x 16.200 Bm³/h at 900 °C
Scope of delivery: Flue gas line production, steel construction, assembly, insulation work

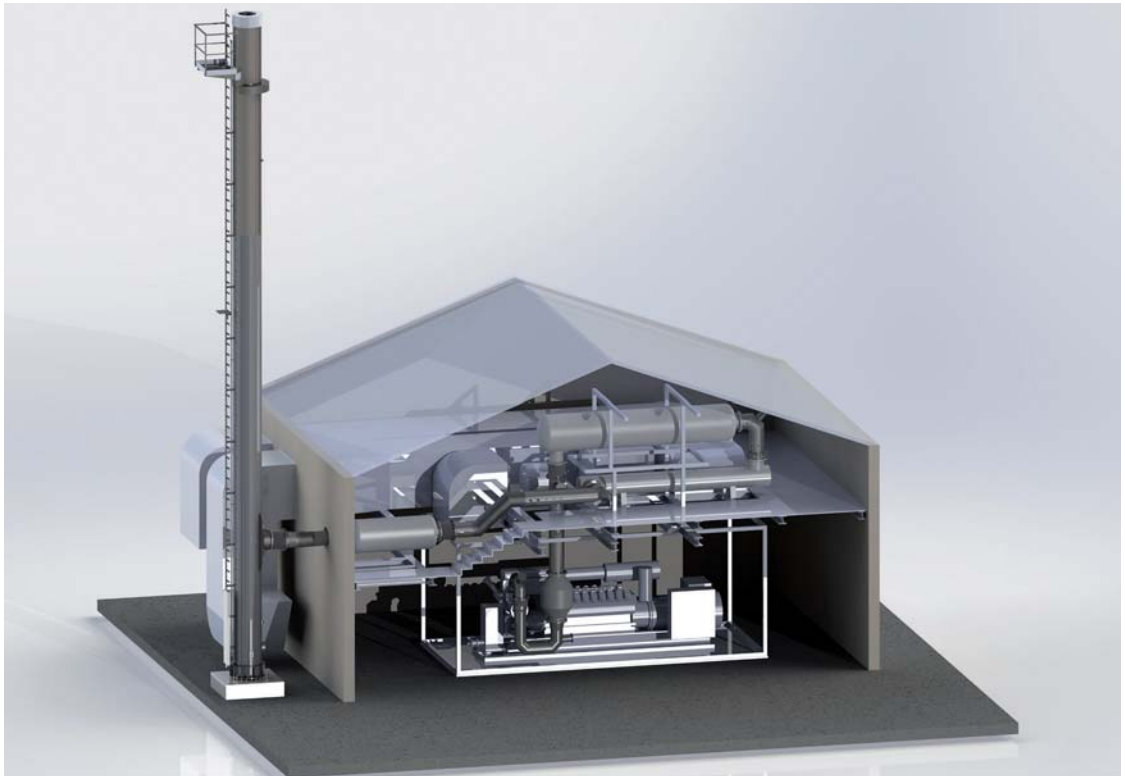


EXAMPLE PROJECT 3

To put the a cogeneration system in to operation in Illesheim, SES supplied exhaust gas connections, the steelconstruction and the chimney

Dimensions:	Ø 300 mm
Power:	MTU 1286 kW electric / 440 °C
Scope of delivery:	Flue gas line production, steel construction, assembly, chimney, Assembly of company-produced components and the components supplied on site.





COMPENSATORS

PURPOSE OF USE

Compensators are an essential element in flue gas lines, even at high temperatures.
They are used to balance length changes that occur due to temperature fluctuations.
In addition, they can absorb the oscillations in boilers / motors or similar devices so that the impact sounds are interrupted.

FUNCTIONALITY

Absorption occurs laterally and on axis, depending on the installation situation and route of the piping.
This absorption results during the course of piping planning and is determined from the fixed points and the deflection.

THE TYPE OF CONSTRUCTION IS SIGNIFICANTLY CHARACTERISED BY:

- Installation behaviour
- Medium
- Temperature
- Pressure behaviour
- Movement requirements
- Occurrence of moisture

THE EXPANSION IS ALSO ESTIMATED IN THE FOLLOWING CALCULATION:

25 meter exhaust gas lines are interrupted at an exhaust gas temperature of 470 °C over the environmental temperature.
1 x 25 x 470/50 = 235 mm
The expansion that needs to be used for this example is 235 mm.

BASIS:

At 50°, the material expands at 1 mm.

ANGULAR

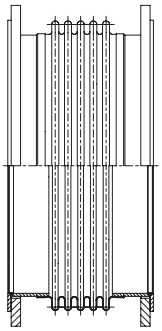
AXIAL

LATERAL

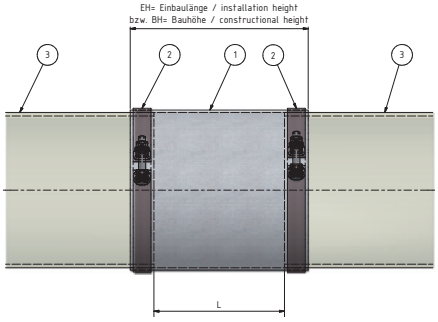
DESIGNS

As mesh or stainless steel compensator

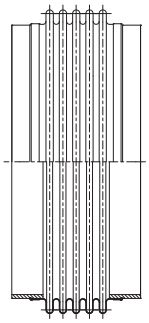
Stainless steel compensators for flanging

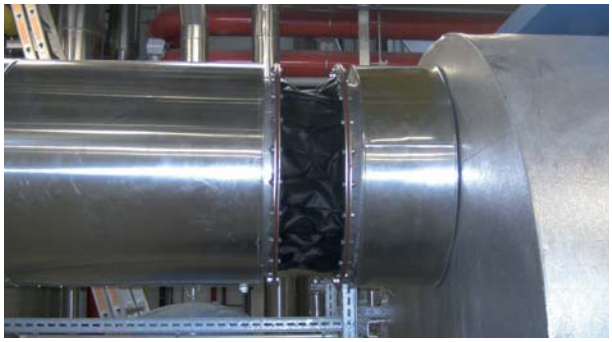


Mesh compensator with clamp

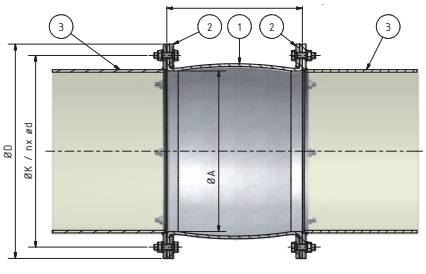


Stainless steel compensators for welding





Mesh compensator for flanging



MOUNTS

Mounts are used to affix flue gas lines and are also fixed/loose points. This flue gas line and construction site situation are planned according to the measurements and blueprints.
Furthermore, the on-site condition are not unimportant, as the great forces can arise due to expansion of the welded lines.

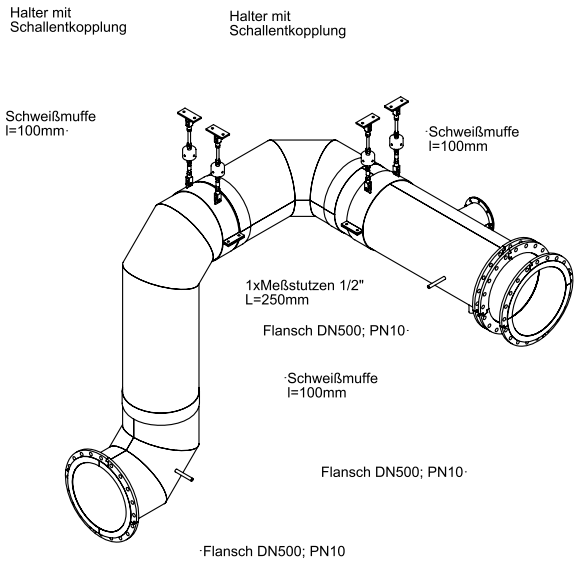
A DIFFERENCE NEEDS TO BE MADE HERE ON WHICH TYPE OF MOUNTING THIS CONCERNS:

Fixed points are used for affixing the lines on deflectors or in long lengths, as a compensation for expansion absorption is usually placed at this point. Expansion causes forces on the fixed points, which can overwhelm the mounts on the building/steel construction.
Loose points, which can be designed as semi-shell or pendulum, are used for guiding/stabilising the line.
In both types of mounts, it needs to be ensured that neither the impact sound nor temperature is transmitted.
In addition, both temperature resistant support bands in the mount shell and de-coupling in the connection to the steel construction or building are required.

Fixed-point in the interior area in S235, ground and coated

Fixed-point in the exterior area in stainless steel 1.4301

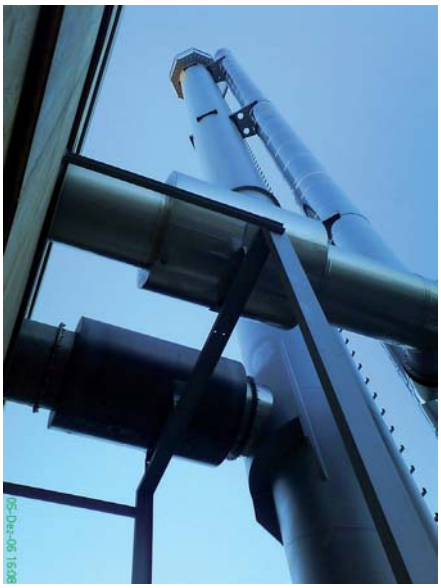
Fixed-point in the exterior area in S235, hot-dip galvnised



STEEL CONSTRUCTION

Steel construction is usually required when the construction conditions cannot absorb any force or weight conduction. The CL often requires high construction heights to make the routes for energy centres possible. During this process, expansion, weight, and conduction routes need to be considered both in terms of static and construction for configuring individual steel constructions.

For reasons of corrosion protection, the surfaces are usually galvanised / ground or painted in the interior area.



INSPECTION / CLEANING OPENING

The corresponding openings are used to view the connecting line.

The arrangement must be agreed upon with the chimney sweeper / system operator depending on the use case, whereby every bend is basically recommended at >45° and there is a possibility for inspection every 4 m. Sealing, insulation and leak tightness result from temperature, pressure and medium.

Cleaning opening for boiler operation of max. 200°C and 200Pa overpressure

Cleaning for max. 600°C and over 500Pa designed with fully insulated blind cover

FLANGE CONNECTIONS

Components are planned with flanged ends so they can be delivered separately and can be connected with little assembly effort.
Additionally, the components, such as baffle, heat exchanger, catalyser, etc. are equipped with flanged ends, so they can be installed and removed for maintenance easily.

Temperature and pressure are especially significant for arranging the flanges. These criteria specify the type and character of the seal, which then specified the flange strength and screws / torque.
Illustrated in the following as a fixed flange for upright components and removable flanges with raised edge, usually for deflection.

IN ADDITION TO FLANGES THEMSELVES, SELECTING THE SCREWS IS VERY IMPORTANT, WHICH FOLLOWS THE FOLLOWING CRITERIA:

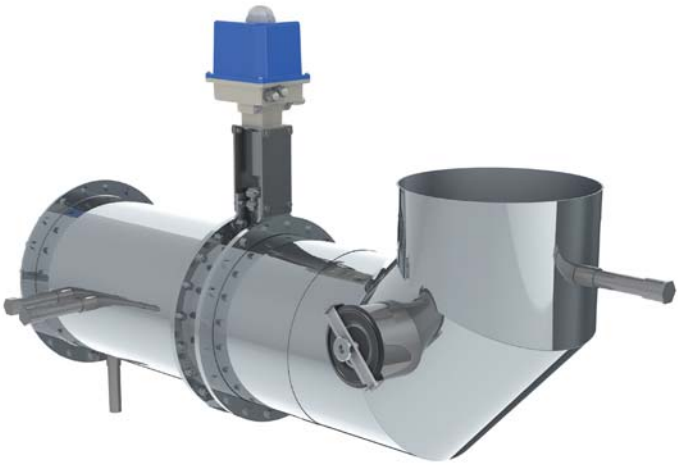
- Torque to be used for tightness
- Temperature load
- Corrosion resistance (interior and exterior areas)

DESIGN OF THE SCREWS BECAUSE THE DESIGN IS PARTICULARLY FOR A USE CASE IN:

- 5.6 Galvnised steel
- 8.8 Galvnised steel
- 1.4301 / 1.4401
- 1.4404 / 1.4571
- 1.7709

EXHAUST VALVE

Shut off valves are used **to close** flue gas lines during overpressure and underpressure operation. Manually operated or motor operated, they are usually placed behind the boiler switch off to delay cooling when there is a shutoff. The motor power is adjusted to the nominal diameter to attain certain closure times.



Exhaust cover (on / of) to protect against the boiler cooling down (material 1.4571 for flanging)

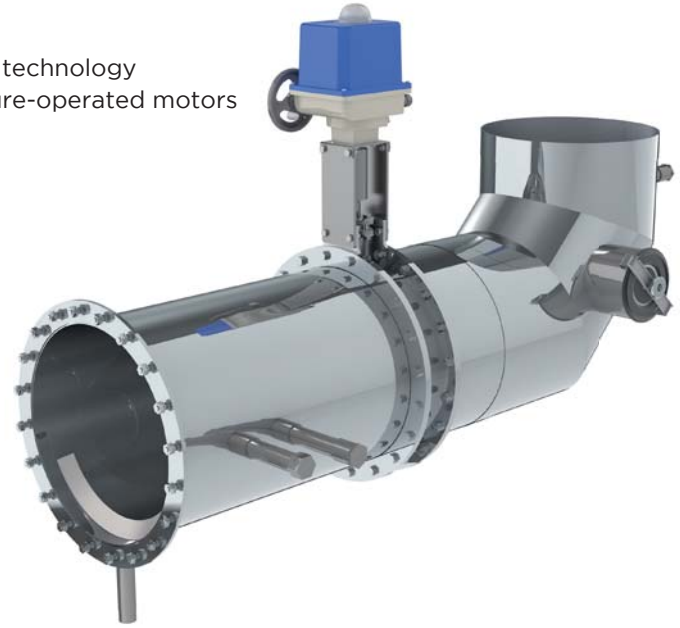
THROTTLE VALVES

are used **to regulate** the open cross-section in the exhaust line and for **closing the all line routes.**Coordinating bypass routes for these tightly sealed valves with powerful motors stating at 90Nm is simple.

AREA OF APPLICATION

Block heating and power plants
Network/auxiliary systems

Ventilation technology
Overpressure-operated motors



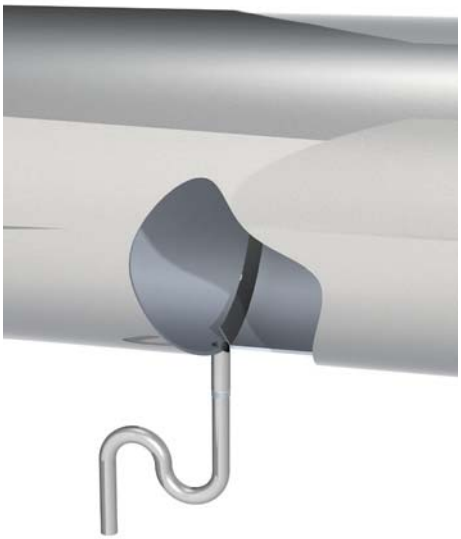
Exhaust regulation valve for blocking the exhaust route

CONDENSATE DRAINING

Especially in wet operation, draining water from the connecting line, a drain must be placed in an appropriate place.

Depending on the piping, this should be installed at the lowest place and, together with other lines, lead to a neutralisation system. Additionally, a drain should be placed in front of every installation component, e.g., in front of compensators, baffles, etc.
A siphon should be placed on every connection to prevent flue gas from leaking. Due standing water column resistance, the siphon prevents flue gases from escaping and lets only condensate / rainwater flow out.

Condensate connections with siphon and interior drip mould



Condensate pan with siphon

MEASUREMENT CONNECTION

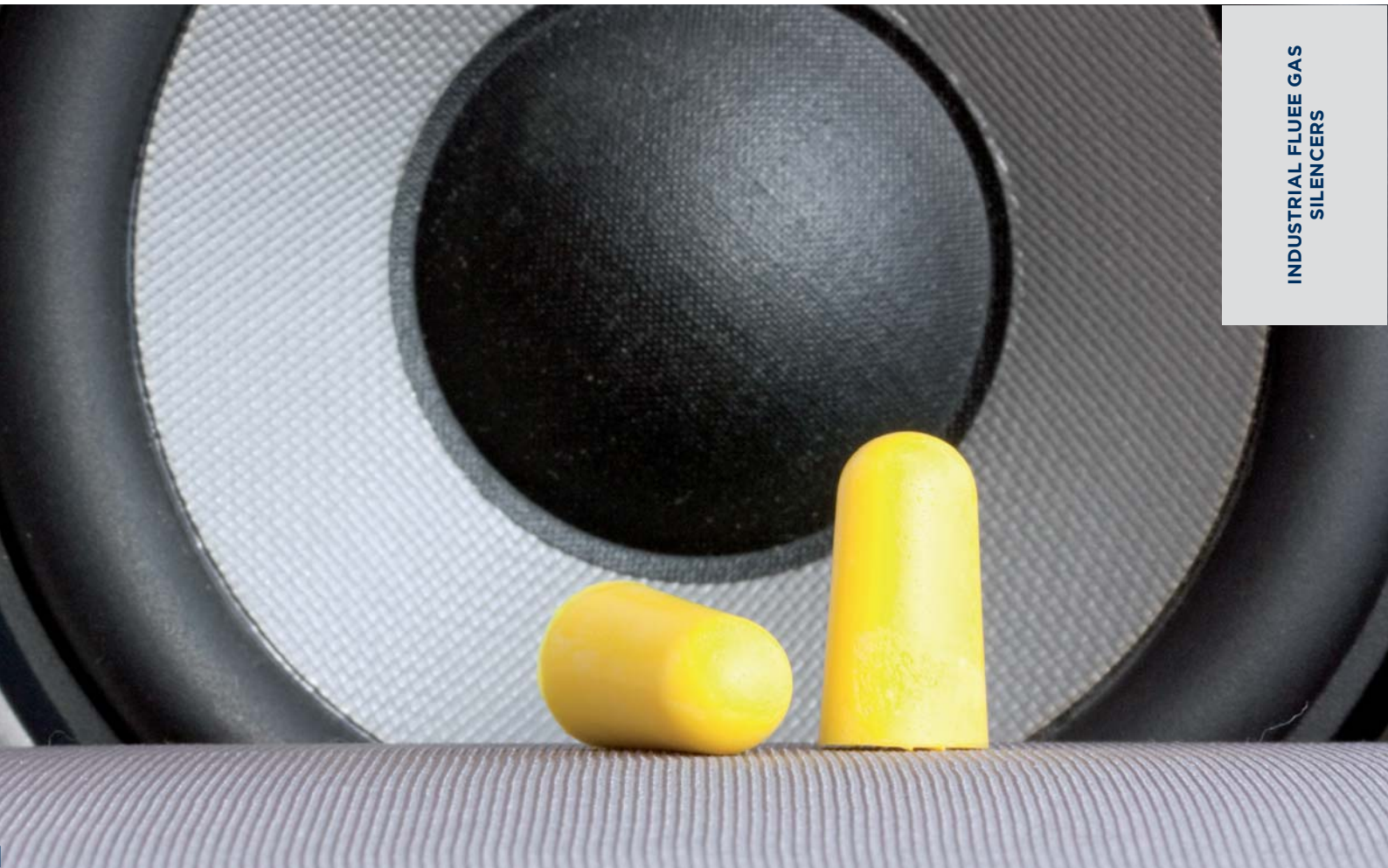
Whether in the chimney or in the flue gas line, appropriate measurements need to be taken, depends on planning. However, a contact length of 5 x Ø in the inlet and 3 x Ø in the outlet needs to be maintained. Depending on consultation with the Technical Inspection Agency, Dekra or others, a special permits for shorter contact lengths can be obtained.

Arrangement of the measurement connections also depends on the measurement plan and the measuring devices, and we can design them 1/2“ up to Ø 200 mm on request.

The flange and the connection diagram on the respective connections complies with the measuring devices and must agree with the respective devices.

5

INDUSTRIAL FLUEE GAS SILENCERS

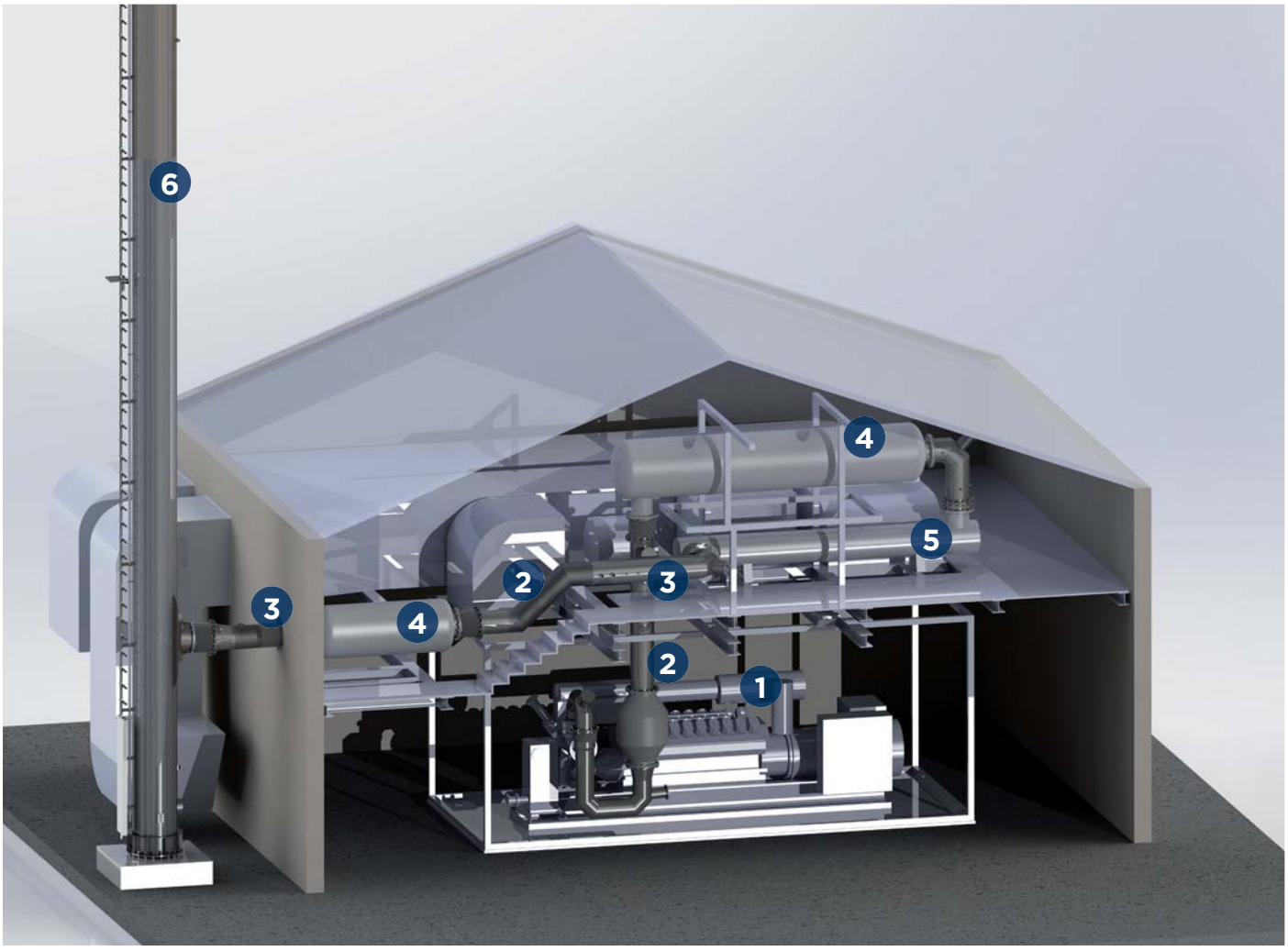


INTRODUCTION

Air and sound impact arises when fireplaces are being operated.
This impact is transmitted from the installation space through the floor, ceiling, and walls, **through the exhaust gas system,** into other rooms and then finally **into the open** . The consequences can be both noise loads in the living area as well as (due to **exhaust noises from the chimney opening)** in the neighborhood.

The exhaust sound predominantly occurs due to the incineration process and is emitted from the blower, boiler and exhaust line. At the same time, the incineration noises can be exacerbated by the resonance in the blower room, boiler and exhaust system.

The sound impact occurs from mechanical oscillation of the energy generation system and is transferred to fixed bodies (foundation, walls, floors) and to the cladding of the exhaust system. Furthermore, it is transformed into airborne noise by emissions from the bounding surfaces.



1) Energy generator
2) Flue gas line (sound impact on the line itself)
3) Ceiling fittings / supports
4) Industrial fluee gas Silencers
5) Heat exchanger
6) Chimney / streaming noises

SONIC FOUNDATIONS

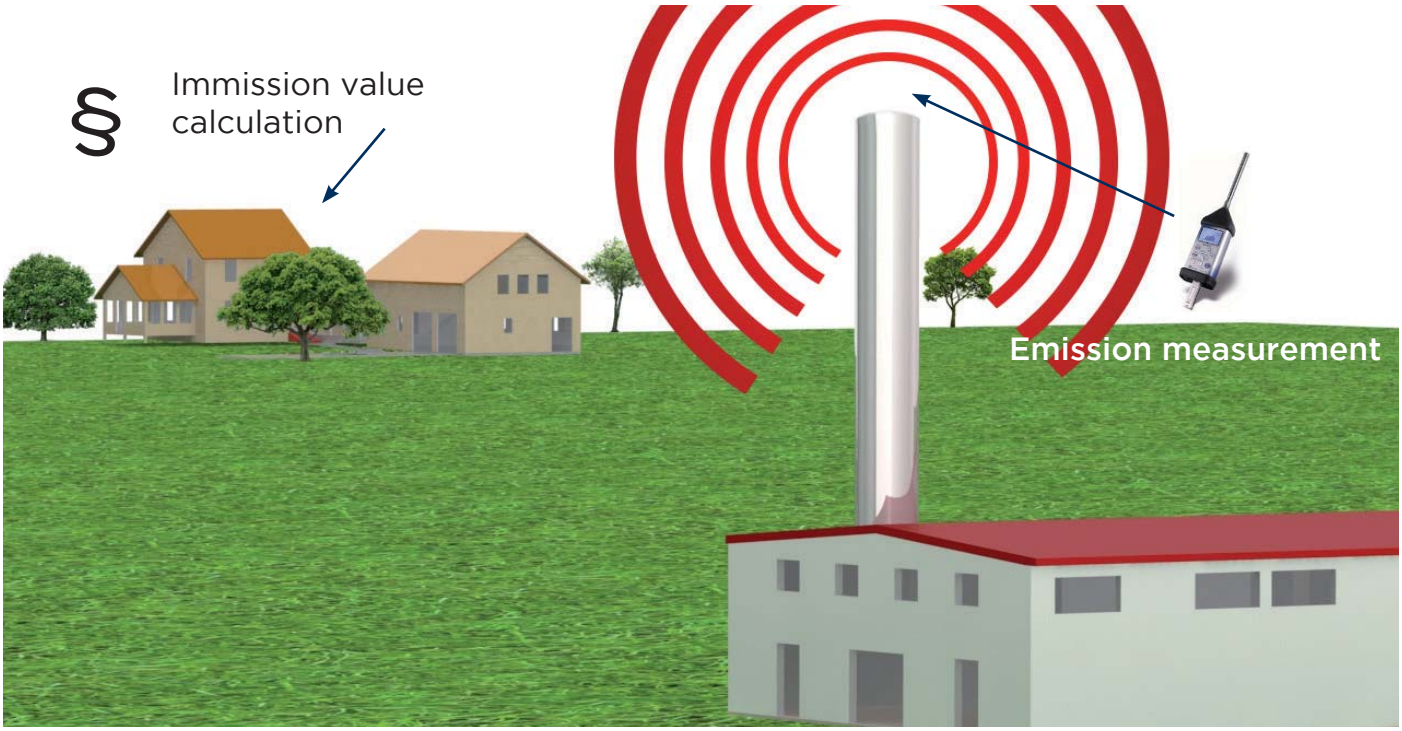
The noise is mechanical oscillations and waves in a medium such as fixed bodies (sound impact), air (airborne noise) and fluid (fluid noise).
Noise spreads in all three directions at the same time and abates with distance (per distance doubling at 6dB).
Every sound that disturbs or bothers humans is called noise.
A noise (sound event) consists of many tones of any frequency.
The frequency is the number of oscillations per second and is specified in the Hz (Hertz) unit.
The human ear can hear oscillations from approx. 16 Hz (lower frequency range) to approx. 16,000 Hz (higher frequency range).

Acoustic pressure concerns fluctuation of the air pressure and, thus, the pressure surges.
The human ear reacts to a very large range of acoustic pressures that are between the hearing threshold ($2x10^{-4}$ µbar) and pain threshold ($2x10^{2}$ bar).
Commonly, the acoustic pressure is not specified in µbar, but in decibels (dB).

The sensitivity of the human ear is not the same at all frequencies.
This is why lower and completely higher tones with the same acoustic pressure are experiences as quieter than median tones. An appropriate representation of the perception of human hearing is obtained through the use of the "A-filter."
The sound levels measured in this way are represented with dB(A)

Sound sources, such as chimney openings, are indicated with their acoustic power.
This corresponds with the indicated acoustic power of the surroundings.
The acoustic power can not be measured directly, rather it can only be calculated with acoustic pressures.
The sound event is called a sound emission from the sound source. The effect of the sound on a particular location, however, is called sound immission.

Two sound sources at the same level lead to a sound level increased by 3 dB.
For human hearing, noises must be around 10 dB higher to be experienced as twice as loud
.



THRESHOLD VALUES FOR SOUND IMMISSIONS

In Germany, the "Technical Guide to Noise Protection" (TA Lärm) regulates determination and evaluation of noise immissions.

The system operator is responsible for adhering to the immissions standard values.

	Full-time	Days	Nights
a) In industrial areas:	70 dB(A)		
b) In commercial areas:		65 dB(A)	50 dB(A)
c) In business zones, village areas and mixed areas:		60 dB(A)	45 dB(A)
d) In general residential areas and small residential areas:		55 dB(A)	40 dB(A)
d) In purely residential areas:		50 dB(A)	35 dB(A)
f) In spa areas, for hospitals and nursing homes:		45 dB(A)	35 dB(A)

Short-term noise peaks for immission standard values may not be more than 30 dB (A) during the day (6 AM to 10 PM), and 20 dB(A) during the night (10 PM to 6 AM).

The relevant noise immissions must be determined 0.5 m before the centre an opened window in the room most affected by noise and in need of protection.

According to DIN 4109, rooms in need of protection are:

> living rooms and bedrooms
> nurseries
> work rooms/offices
> school rooms and seminar rooms

SOUND PROTECTION FOR FLUE GAS SYSTEMS

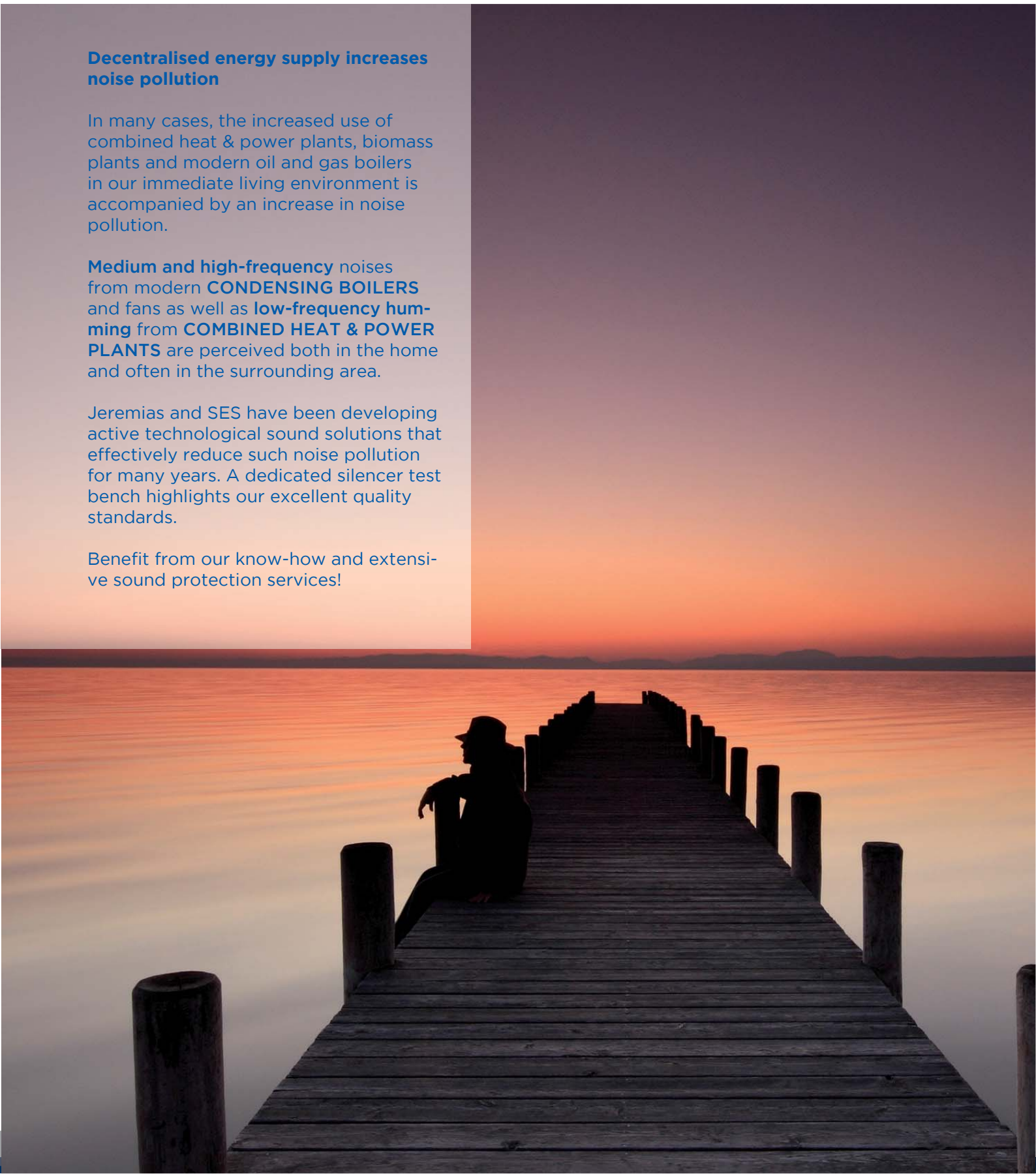
Decentralised energy supply increases noise pollution

In many cases, the increased use of combined heat & power plants, biomass plants and modern oil and gas boilers in our immediate living environment is accompanied by an increase in noise pollution.

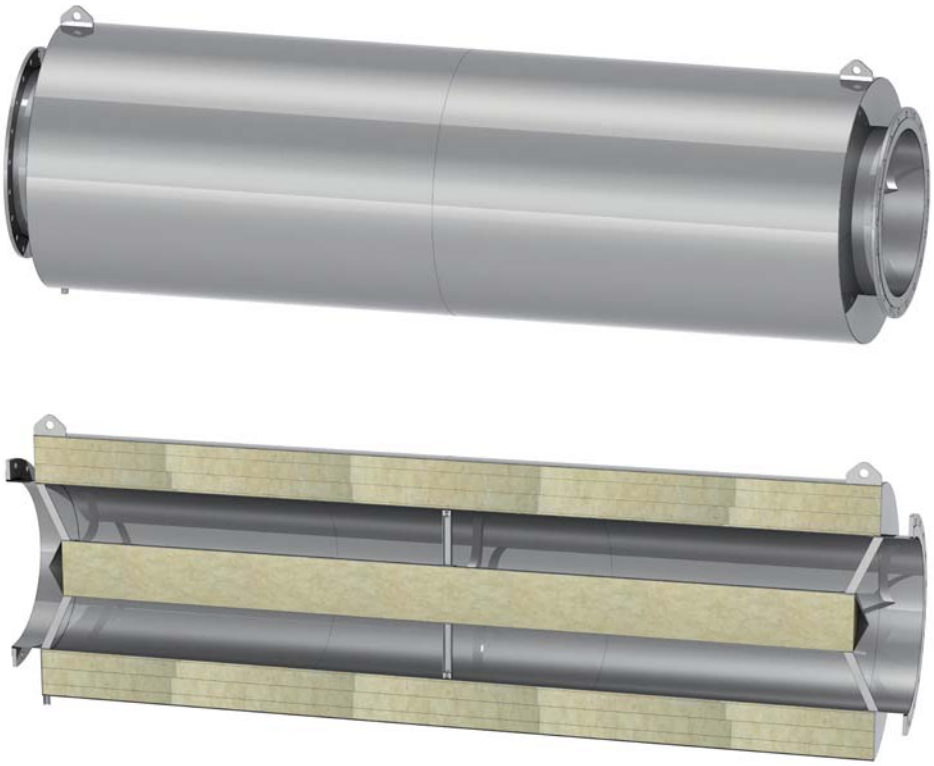
Medium and high-frequency noises from modern **CONDENSING BOILERS** and fans as well as **low-frequency humming** from **COMBINED HEAT & POWER PLANTS** are perceived both in the home and often in the surrounding area.

Jeremias and SES have been developing active technological sound solutions that effectively reduce such noise pollution for many years. A dedicated silencer test bench highlights our excellent quality standards.

Benefit from our know-how and extensive sound protection services!



ABSORPTION SILENCER - ASD



DESCRIPTION

Absorption silencers from the ASD product line are made of thick, cylindrical housing in a durable industrial design. The filling consists of water-resistant, non-flammable mineral wool. This is reinforced with a perforated plate and an additional fabric cover to protect against fibre discharge due to exhaust gas flow. All silencers have a condensate drain according to series. Depending on requirements, the exhaust gas silencer can be equipped with an interior, cylindrical silencer core.

FUNCTIONALITY

The sound waves penetrate through the perforated plate to the porous mineral absorber. Due to the friction effect on the mineral fibres, energy is removed from the sounds waves and they are damped in this way. Interior damping cores are used when needed for a broad-band damping effect and to prevent damping emissions.

AREA OF APPLICATION

Absorption silencers are used to reduce noise levels from exhaust sounds or in chimney systems for the following machines/energy generators:

> Oil / gas boilers
> Ventilators
> Wood furnaces
> Motors

Effective damping range above (≥) 250 Hz
Area of use in exhaust gas temperatures up to 400 °C/600 °C
Pressure range conditioned on connection system up to 5000 Pa />5,000 Pa

NOMINAL DIAMETER AND CONNECTIONS

Available connection nominal diameters of 400 – 1200 mm connections, single-walled or with flange according to company standard or customer specification

DAMPING CLASS

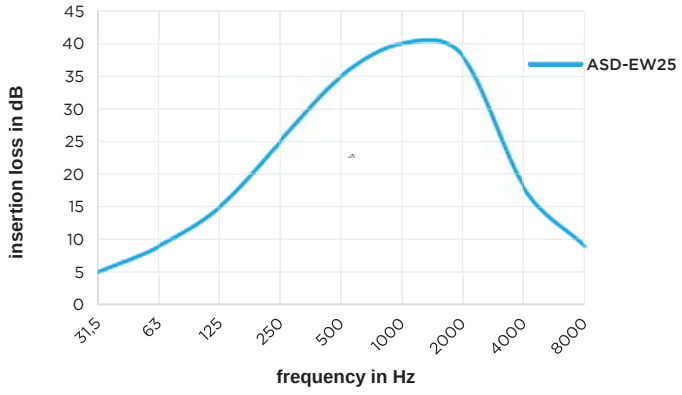
Standard series with 15 dB and 25 dB special design with higher damping characteristics possible

MATERIAL

High-quality stainless steel, raw material 1.4404 / 1.4571 thick carbon steel S235JRG,water resistant mineralwool, drip protection, netting/fibre mat

SPECIAL CHARACTERISTICS

Inexpensive standard series in durable design, wide range of damping properties, variable with silencer cores, lower impedance on exhaust side



Example damping values - Octave

Frequency	ASD-EW25
31,5	5
63	9
125	15
250	25
500	35
1000	40
2000	38
4000	18
8000	9

Comments:
Selected product specifications: Gates KU thickness 400mm (purchasing Müller BBM)
Other information: NW900; housing 1250x1250 length 1850; total 2850mm

COMBINED RESONANCE / ABSORPTION SILENCER - KSD

DESCRIPTION

Combined exhaust gas silencers consist of a row of damping elements. Basically, several resonance and absorption chambers are connected one after the other. The cylindrical stainless steel housing is arranged in an industrial design and all chambers are welded shut. The special, thick-walled star plates ensure sufficient sound wave resistance and strong housing stability. The absorption chamber is filled with water-resistant, non-flammable mineral wool. This is reinforced with a perforated plate and an additional fabric cover to protect against fibre discharge due to exhaust gas flow. Depending on requirements, the exhaust gas silencer can be equipped with an interior, cylindrical silencer core.

FUNCTIONALITY

The low-frequency sound waves are reflected in the resonance chamber, which results in extremely effective exhaust gas channel damping. The narrow-band resonance chambers are later fitted with an absorber to create a silencer that is effective on broad-band. Use of a silencer core prevents silencer emissions and also increases the damping effect. The exhaust gas silencer is especially effective for low-frequency exhaust noises.

AREA OF APPLICATION

Combined exhaust gas silencers are used to reduce noise levels from exhaust sounds or in chimney systems for the following machines/energy generators:

> Oil / gas boilers
> Ventilators
> Wood furnaces
> Motors

Effective damping range above (≥) (63) 125Hz
Area of use in exhaust gas temperatures up to 400 °C/600 °C
Pressure range conditioned on connection system up to 5000 Pa />5,000 Pa

NOMINAL DIAMETER AND CONNECTIONS

Available connection nominal diameters of 400 – 1200 mm connections, single-walled or with flange according to company standard or customer specification

DAMPING CLASS

Standard series with 25 dB and 30 dB
Special design with higher
damping properties possible

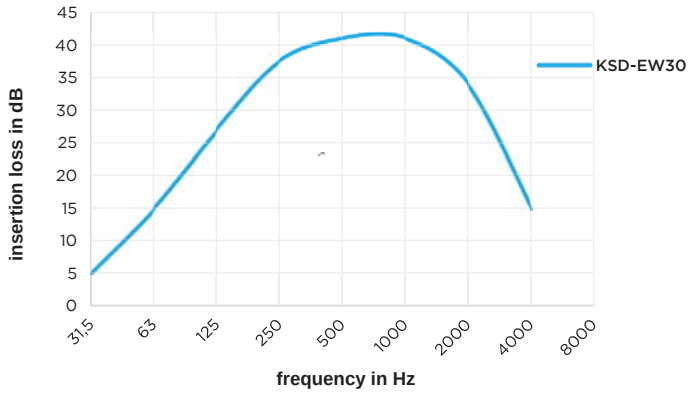
MATERIAL

High-quality stainless steel, raw material 1.4404 / 1.4571 thick carbon steel S235JRG,water-resistant mineral wool, drip protection, netting/fibre mat

SPECIAL CHARACTERISTICS

Inexpensive standard series in durable design, low-frequency damping properties that can be adjusted to frequency spectrum

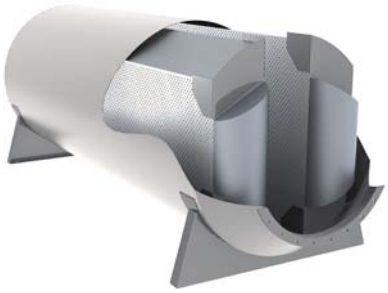
Example damping values - Octave

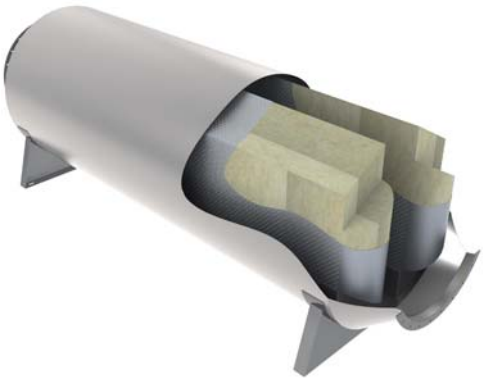


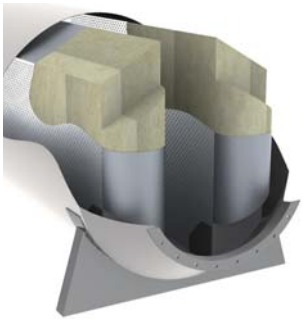
Frequency	KSD-EW30
31,5	5
63	15
125	27
250	38
500	41
1000	41
2000	34
4000	15

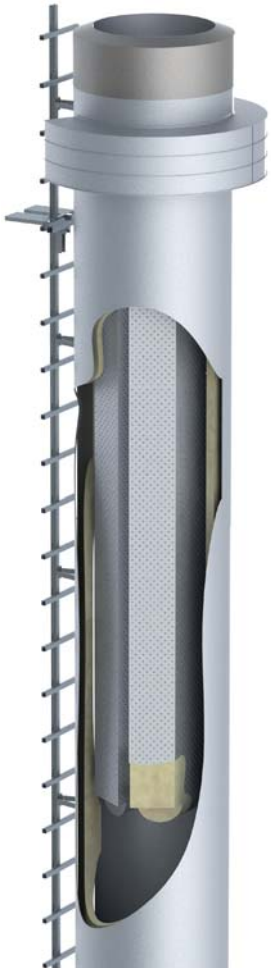
Comments:
Selected product specifications: ASD-EW30 NW800_SDK
Other information: NW800; external diameter 1200mm; length 4470mm, SDK400
Blocking 25%

SPLITTER SILENCER – KU









DESCRIPTION

Damping gates are made of a flat, rectangular housing. A profile frame offers important stability. The large sides consist of acoustically open perforated plates The gates are filled with water-resistant, non-flammable mineral wool. This is reinforced with a fabric cover to protect against fibre discharge. The star sides can be provided with flow profiles.

FUNCTIONALITY

The sound waves penetrate through the perforated plate to the porous mineral absorber. Due to the friction effect on the mineral fibres, energy is removed from the sounds waves and they are damped in this way. The damping effect depends on the width of the gap between the gates and also the gate thickness and length.

AREA OF APPLICATION

Damping gates are used to reduce noise levels from exhaust sounds or in rectangular housing or directly integrated into chimney systems or with the following machines/energy generators:

> Gas turbines
> Ventilators
> Wood furnaces
> Power plant large systems

Area of use in exhaust gas temperatures up to 400 °C/600 °C
Pressure range >5,000Pa

NOMINAL DIAMETER AND CONNECTIONS

Available gate thickness 100 - 400 mm guiderails, support profile

DAMPING CLASS

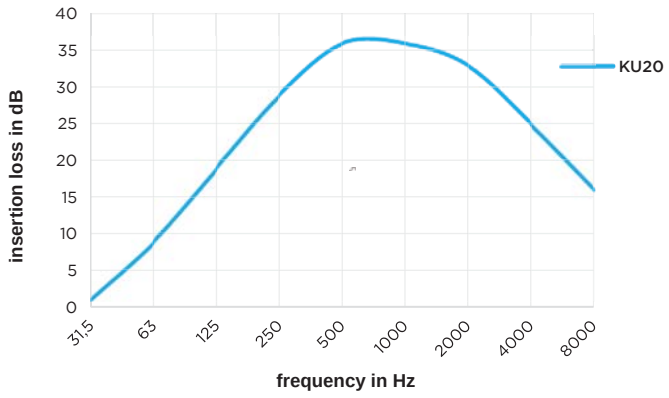
The effect depends on the thickness and length of the gate!

MATERIAL

High-quality stainless steel, raw material 1.4301 / 1.4571, thick carbon steel S235JRG,water-resistant mineral wool, drip protection, netting/fibre mat

SPECIAL CHARACTERISTICS

Rectangular gate profile, flow optimisation with flow profile, replaceable gate, light maintenance and repair, adjustment to damping area

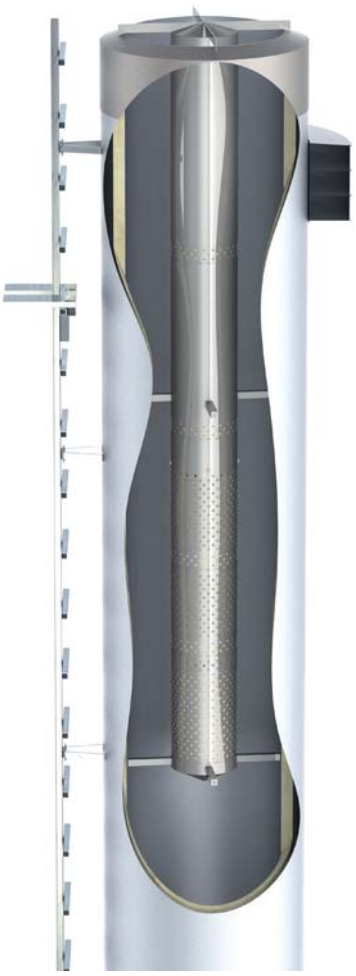


Example damping values - Octave

Frequency	KU20
31,5	1
63	9
125	19
250	29
500	36
1000	36
2000	33
4000	25
8000	16

Comments:
Selected product specifications: Gates KU thickness 400mm (purchasing Müller BBM)
Other information: NW900; housing 1250x1250 length 1850; total 2850mm

NOISE INSULATING SILENCER - SDK / SKK



DESCRIPTION

Noise insulating silencers have a cylindrical housing made of perforated plates with star-sided, flow-optimised closure caps. The filling consists of water-resistant, non-flammable mineral wool. This is reinforced with a fabric cover to protect against fibre discharge due to exhaust gas flow. Spacers and support cross in top area ensure suitable positioning. Noise insulating silencers are hung into the chimney. This can be done later or also right at the factory.

FUNCTIONALITY

The sound waves penetrate through the perforated plate to the porous mineral absorber. Due to the friction effect on the mineral fibres, energy is removed from the sounds waves and they are damped in this way. Interior damping cores are used when needed for a broad-band damping effect and to prevent damping emissions.

AREA OF APPLICATION

Noise insulating silencers are used for sound reduction of exhaust noises in chimneys in the following machines/energy generators:

> Oil- / Gas boilers
> Ventilators
> Wood furnaces
> Motors

Effective damping range above (≥) 250Hz
Area of use in exhaust gas temperatures up to400°C / 600°C
Pressure range >5,000 Pa

NOMINAL DIAMETER AND CONNECTIONS

Available nominal sizes of 100 – 1500 mm support cross and spacer

DAMPING CLASS

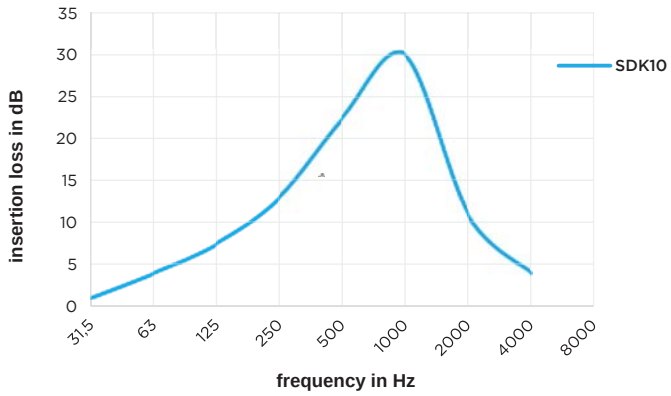
Standard series SDK 1-4 with various length, effect depends on blocking behaviour!

MATERIAL

High-quality stainless steel, raw material 1.4404 / 1.4571, thick carbon steel S235JRG,water-resistant mineral wool, drip protection, netting/fibre mat

SPECIAL CHARACTERISTICS

Uncomplicated retrofitting, no large construction changes, static and calculated verification according to DIN13884, higher exhaust gas resistance



Example damping values - Octave

Frequency	SDK10
31,5	1
63	4
125	8
250	13
500	23
1000	30
2000	11
4000	4

Comments:
Selected product specifications: SDK NG475 - L3000
Other information: NW800
Blocking 35%

INQUIRY FORM SILENCER

The following information is essential for the layout of a silencer customized for a certain sound source:

Information about sound source

☐ Boiler ☐ combined heating and power station / emergency power supply system

Project: _____

Product: _____ Power: _____ [kW]

Type: _____ Mass flow flue gas: _____ [kg/h]

Combustible: ☐ Oil ☐ Gas ☐ Pellets Volume flow flue gas: _____ [m³/h]

☐ Wood chips ☐ Others _____ Flue gas temperature: _____ [°C]

Nominal diameter connection piping or flue pipe ____ [mm] Heat exchanger/Economizer ☐ Yes ☐ No

Please supply us with the technical data sheets, if available.

Required absorption _____ [dB]

Optional: customized layout

Actual sound emission at chimney outlet

☐ Manufacturer's specification (see data sheet)

☐ Sound levels measured

A-rated sound pressure level at 1 m distance from the chimney outlet (DIN 45635-47)

Hz	31,5	63	125	250	500	1000	2000	4000	8000	Summe
LpA dB (A)										

Should you have an expert's report, measuring values or the manufacturer's specifications at your disposal, please supply them together with this inquiry form.

Target sound emission at chimney outlet

Required sound pressure level _____ LpA in dB (A) at 1 m distance or

Required sound power level _____ Lw in dB (A)

Do you have a sound forecast/expert's report? ☐ Yes Report-Nr. _____

☐ No

4. Sketch of the installation situation – information regarding required dimensions

Installation point in flue gas system

☐ Connection piping ☐ integrated in chimney ☐ chimney outlet

max. outer diameter of silencer _____ [mm]

max. length of silencer _____ [mm]

Sketch of installation situation

5. Sound emission at reception location

Area categorization acc. German noise prevention code	Distance from chimney outlet to measuring point (closest location of noise pollution)
☐ Industrial area ☐ Area with mainly industrial buildings ☐ Residential/industrial mixed area ☐ Area with mainly residential buildings ☐ Spa area, hospital, nursing facility	_____ [m]

6. Guarantees

A guarantee for the compliance of the immission values can only be given, when all needed parameters for the layout of the silencer are given, especially the frequency analysis at the chimney outlet (DIN 45635-47).
The accuracy class for noise measurements of machines and chimneys is class 3 (KL3) with +/- 3 dB

Please send your inquires to:
Fax: +49 (0) 9832 68 68 68
E-Mail: siegfried.semsch@jeremias.de

Need more Information?
We will be happy to advise you!
Tel: +49 (0) 9832 68 68 - 998

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STATUS MONITORING

Legal foundation
Check list

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E-Mail: info@engelhardt-ses.de / www.engelhardt-ses.de

Engelhardt GmbH Wassertrüdinge
DIN 18800
DIN V 4133

Baujahr	2014	Ø Tragrohr		1104	mm
Baureihe	FSC	Ø Innenrohr	IR1	-	mm
Bauhöhe	6,6 m	Gesamtgewicht	IR2	-	mm
Projekt-Nr.	2913-W	553 kg	IR3	-	mm

	CE-Zeichen Innenrohr nach EN 13084-7					
IR1	-T50	-HO	-W	-L20	-AISI304	-O
IR2						
IR3						

Ihr nächster Termin zur

Zustands-überwachung

STATUS MONITORING

With the respective technical construction specifications, the legislation defined DIN EN 13084-1 and DIN V 4133 as a legal obligation for treating free-standing chimneys made of steel.
Included therein is also monitoring of new systems and existing chimneys which is described in more detail in the following norm excerpts:

CONDITION MONITORING (excerpt DIN V 4133: 2007-07 part 12)

Chimneys must be inspected by a specialist in regular intervals.
The initial condition monitoring must be done 24 months after commissioning.
During this period, the operating data to determine the degree of chemical stress should be checked.
The time intervals of further condition monitoring shall be determined depending on the detected degree of chemical exposure according to Table 6, see 10.2.

Table 6 — Time intervals of the condition monitoring

Degree of chemical exposure	Low	Medium	High	Very high
Interval of the condition-monitoring in years	4	3	2	1

Degree of chemical exposure, low, medium, high, very high
Interval of the condition monitoring in years 4, 3, 2, 1
If the degree of chemical exposure is not determined, then it is always assumed to be "very high."
For oscillation silencers and ladder equipment, there are also specified, shorter time intervals for inspection and maintenance that need to be noted.
In addition, the walk-in interior room between the supporting pipe and internal pipe must be included in the condition monitoring
.
A log needs to be created for the condition monitoring.
All planned pre-screwed screws must be inspected 3 to 12 months after installation with the test torque in accordance with DIN 18800-7; a log must created for this. These screws must be inspected during further regular condition monitoring.
The European norms also make the following statements about the condition monitoring.
Excerpt (EN 13084-1: "Free-standing chimneys – part 1: General requirements")

INSPECTION AND REPAIR

Chimneys must be inspected by a specialist in regular intervals. The intervals between two inspections should be no more than 2 years apart.

A written log must include recommendations for maintenance and repair. In the introduction adopted in accordance with the state building codes, for technical rules DIN 1056 and DIN 4133, the condition monitoring is also noted and the building authorities made the following demand:

The building authorities must implement the condition monitoring and create a related report as support of the building permit. The reports shall be kept and submitted on request of the building authority.

To identify our chimneys, there is a stamp on each identification stamp on which a recommendation for the next monitoring is indicated.

CONDITION MONITORING (exception DIN EN 1993-3-1 NA:2010-12)

Regular condition monitoring must be done.
These span over visually recognizable changes to the supporting structure.

They should generally take place:

a) once per year
b) after heavy storms
c) after unusually heavy icing
d) after uncommon events

The result must be recorded in a report; defects must be repaired.
Likewise, a main inspection needs to be incorporated.
An expert must be entrusted with the condition monitoring. This expert must also be able to evaluate static and constructive behaviours of the constructions.

The standard excerpts do not say that supervision is required. Therefore the assigning the inspection is the sole responsibility of the operator. Something to note her is that the inspection primarily serves to prevent damage and to determine hazardous areas.

ATTENTION:

In cases of damage, the insurance company can demand the inspection reports. If they cannot be provided then payment for damages can be withdrawn

To allow you to detect damage early on, we offer you these technical inspections in which the following points are regularly recorded and documented.
If repairs are required, we will gladly do them!

Phone: +49 (0) 98 32 6868 - 50

1. INSPECTION OF THE ANCHORS

> Visual inspection for cracks, where applicable
> Inspection of force-fitting of the base anchor s
> Visual inspection of the shimming on the base plate
> Inspection of the corrosion protection in foundation area

2. SUPPORTING PIPE
(USUALLY EXTERNAL PIPE)

> Visual inspection for deformation
> Wall thickness measurement of at least 5 points
> Visual inspection of the welded seams (butt welds)
> Inspection for deformation on the foundation area

3. CORROSION PROTECTION / COATING ON EXTERNAL PIPE

> Measurement of the coating strength on at least 6 points (lower / middle / upper third)
> Review reason for possible corrosion damage
> General visual inspection of the coating
> Visual inspection for chemical exposure

4. FLANGE CONNECTION
(IF THERE)

> Visual inspection of the screws
> Possible inspection of the torque
> Corrosion protection

6. EXTERNAL CLADDING
(IF THERE)

> Inspection for weatherproofing
> Inspection of the screws
> Expansion of the joint overlaps
> Inspect for displacement
> Inspect the openings for leak tightness

7. EXHAUST LINE

> Inspect for condensate sealed flooring
> Inspect corrosion impact
> Inspect open length expansion
> Visual inspection of open cross-section
> Inspection of surfaces that come into contact with exhaust gas (if it can be inspected)
> Inspect the condensate draining

8. INSPECT OPENING

> Inspect the corrosion
> Inspect seals
> Leak tightness inspection for condensate leaks

9. LADDER

> Inspect surface characteristics
> Torque of the fittings on the chimney
> Inspect whether the building norms have been maintained
> Inspect the des arrestor including test certification

10. MEASUREMENT PLATFORM / OPENING PLATFORM (IF THERE)

> Inspection of the total construction
> Inspect site construction height and stability
> Inspect screw and welded connections
> Inspect the bearing surfaces (light grid, etc.)
> Inspect corrosion
> Inspect the static support
> Norm comparison of the accessibility

11. MEASUREMENT EQUIPMENT
(IF THERE)

> Inspect the expansion and accessibility
> Inspect cable guide
> Inspect screws on measuring devices (if installed)

12. VENTILATION OF THE SUPPORTING PIPE

> Inspection of the interior circulation of the supporting pipe (condensation)
> Inspect ventilation openings / outlet

13. CONDENSATION CONVEYOR

> Inspect drainage conveyor / collection conveyor
> Inspect collection container
> Inspect connections and siphon

14. OBSTRUCTION LIGHTING

> Functionality
> Weatherproofing
> Cleanliness of dome glasses
> Cable guides
> Fittings

15. LIGHTING PROTECTION

> Corrosion protection
> Connection / earthing connection
> Fitting

16. COMPARISON OF THE DOCUMENTS

> Compare to see if there are changes
> Create log

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