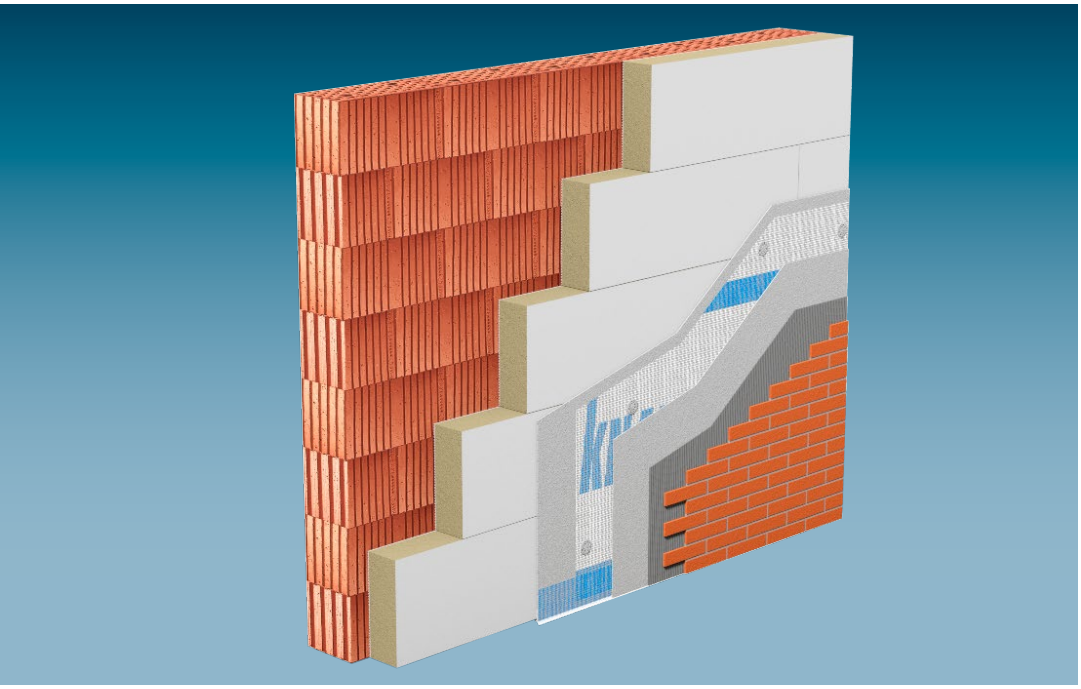


Plaster and Façade Systems

WE101e.de

System Data Sheet 2021-03

Knauf WARM WALL Ceramic and Natural Stone in Solid Construction: ETICS with mineral wool and EPS insulation materials with hard lining

Note on English translation / Hinweise zur englischen Fassung

This is a translation of the System Data Sheet valid in Germany.
All stated details and properties are in compliance with the regulations of the German standards and building regulations. They are only applicable for the specified products, system components, application rules, and construction details in connection with the specifications of the respective certificates and approvals.
Knauf Gips KG denies any liability for applications outside of Germany as this requires changes acc. to the respective national standards and building regulations.

Dies ist eine Übersetzung des in Deutschland gültigen Detailblattes. Alle angegebenen Werte und Eigenschaften entsprechen den in Deutschland gültigen Normen und bauaufsichtlichen Regelungen. Sie gelten nur bei Verwendung der angegebenen Produkte, Systemkomponenten, Anwendungsregeln und Konstruktionsdetails in Verbindung mit den Vorgaben der bauaufsichtlichen Nachweise.
Die Knauf Gips KG lehnt jegliche Haftung für Einsatz und Anwendung außerhalb Deutschlands ab, da in diesem Fall eine Anpassung an nationale Normen und bauaufsichtliche Regelungen notwendig ist.

Contents

Usage instructions

Notes on the document

Knauf system data sheets are the basis for planning and application for planners and professional installers when applying Knauf systems. The contained information and specifications, constructions, details and stated products are based, unless otherwise stated, on the Certificates of Usability (e.g. general national technical approvals abZ and general type approvals aBG) valid at the date they are published as well as on the applicable standards. In addition, design and structural requirements and those regarding building physics (fire protection and sound insulation) are considered.

The details shown are solution suggestions intended for general orientation in the subject matter and must be adapted accordingly to suit the constructional features on site. Ancillary trades are only represented schematically.

References to other documents

Product data sheets

- Observe the product data sheets of the individual Knauf system components

Intended use of Knauf systems

Please observe the following:

Caution	Knauf systems may only be used for the application cases specified in the Knauf documentation. In case third-party products or components are used, they must be recommended or approved by Knauf. Flawless application of products / systems assumes proper transport, storage, assembly, installation and maintenance.

General notes on Knauf systems

Building physics-based requirements (e.g. protection against moisture for ETICS with natural stone work linings) must be examined and tested in detail. The requirements of the respective system approvals must be observed.

Thermal bridges must be avoided, see DIN 4108 amendment 2.

The assessment of the thermal insulation is to be performed in accordance with DIN 4108-2 and if necessary the GEG (German Buildings Energy Act).

The structural stability of the existing wall must be assured before installation of ETICS. The proof must include all load-bearing and associated elements.

Special care must be taken, particularly with the application of the connections and ensuring that the construction is driving-rain proof.

When handing over the site to a different trade, we recommend the use of a hand-over protocol.

Term definitions

Splash water zone

The splash water zone starts with the edge of the ground line or top edge of the covering / lining and has a height of at least 300 mm and generally up to 600 mm (max. 600 mm in case of mineral wool). Water from precipitation must be diverted away from the façade by constructional measures (gravel bed or layer that interrupts capillary action). Paving stone or paving must be installed sloping away from the building and be constructionally separated from the building. Observe the DIN 18533.

Explanation of terms

In this system data sheet, the following terms that diverge from the system approvals are used:

- Hard linings includes ceramic and natural stone work cladding / linings

Abbreviations used in this document

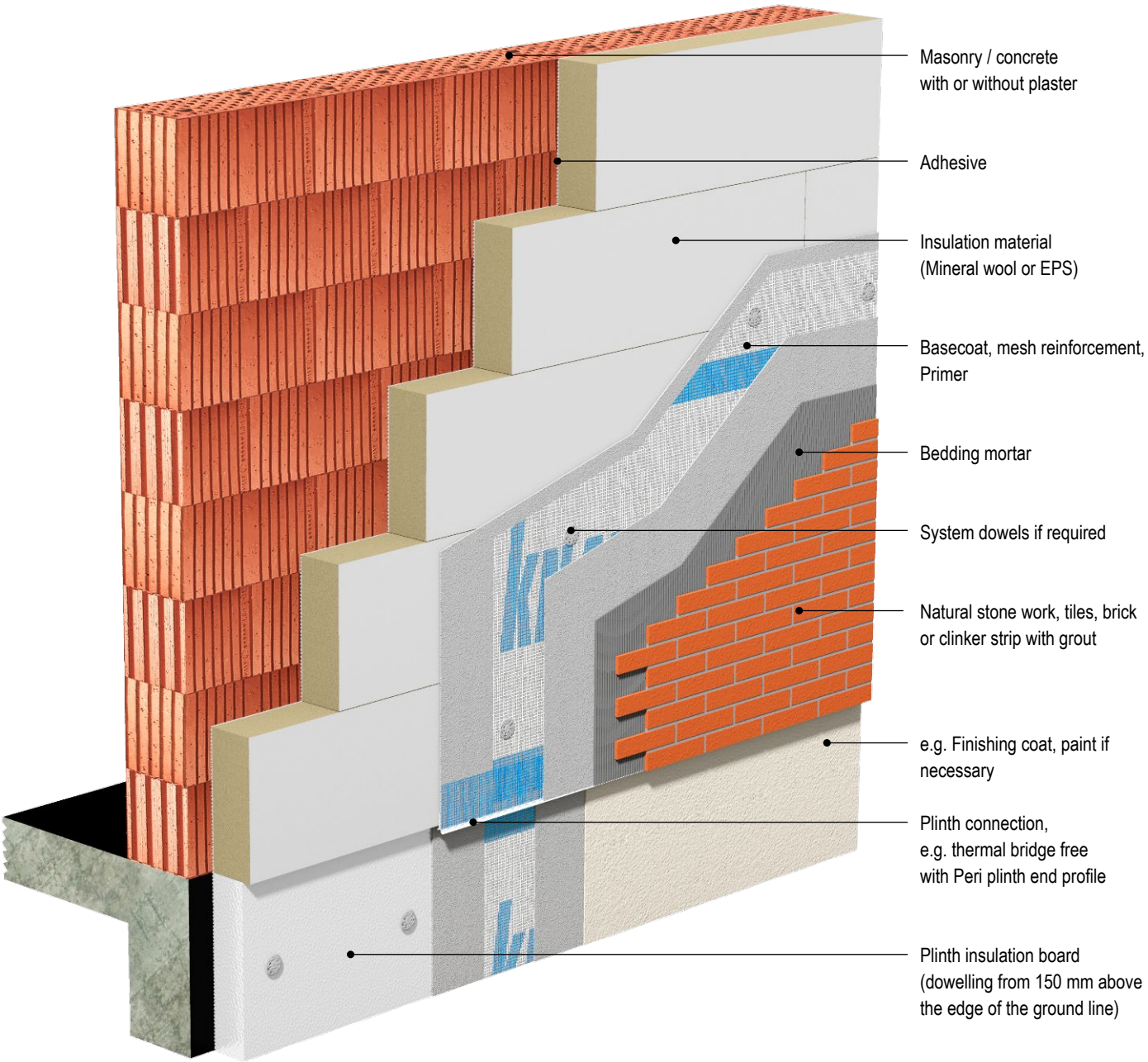
- EPS: Expanded polystyrene
- GEG: German Buildings Energy Act
- GLE: Ground line edge; edge of ground line
- MW: Mineral wool
- ETICS: External thermal insulation composite system

Certificates of Usability

Knauf System	Proofs
WARM WALL Ceramic EPS in Solid Construction WARM WALL Ceramic MW in Solid Construction	Z-33.46-424
WARM WALL Natural Stone EPS in Solid Construction WARM WALL Natural Stone MW in Solid Construction	Z-33.46-1703

Knauf WARM WALL Ceramic and Natural Stone in solid construction with mineral wool and EPS insulation materials

Knauf WARM WALL Ceramic and Knauf WARM WALL Natural Stone are two building authority certified external thermal insulation composite systems (ETICS) each with insulation materials made of mineral wool (MW) and expanded polystyrene (EPS) on masonry and concrete with and without render. The façade insulation panels are adhesively bonded to the substrate using adhesive and additional dowels may be applied. The coating of the façade insulation boards is carried out with a reinforced layer of glass fibre textile mesh and a lining of ceramic or natural stone work glued onto it.
The systems WARM WALL Ceramic and Natural Stone can be applied as flammable (B2), not easily flammable (B1) and non-combustible (A2) systems, see table page 13. The application as dependent on the building height is governed by the respective state building code.
The insulation material thickness is permissible up to maximum 200 mm.



System overview

The overall weight of the system (insulation material, basecoat, bedding mortar and hard lining) is a maximum of 100 kg/m^2.

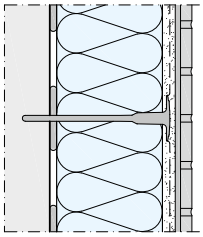
Knauf System	WARM WALL Ceramic and Natural Stone with MW	WARM WALL Ceramic and Natural Stone with EPS	
Reaction to fire/building material class ETICS	Non-combustible, A2	Not easily flammable, B1	Flammable, B2
Maximum total insulating material thickness t	200 mm	200 mm	
Reinforcement layer thickness	5 – 7 mm	5 – 7 mm	
Façade			
Adhesive	SM700 Pro, SM700, SM300, Lustro, Sockel-SM		
Insulation material	MW Volamit 040 MW Wolle 035 plus L MW Wolle 035 plus M2	EPS Nut&Feder EPS Standard EPS SunJa	
System dowel[1)]	Schraubdübel STR U 2G dowel, Schlagdübel CNplus 8 insulation anchor nail, Schraubdübel HTR-P/HTR-M dowel		
Basecoat	SM300		
Reinforcing mesh	5 x 5 mm		
Bedding mortar	Knauf Flex tile adhesive		
Hard lining	According to approval requirements (see page 11)		
Grout	Knauf Flex grout		
Plinth / splash water area			
Adhesive	Sockel-SM Pro or Sockel-SM, SM700 Pro, SM700, SM300		
Insulation material	Sockeldämmplatte 032, Sockeldämmplatte 035		
Plinth connection (with recessed plinth)	Sockel-Abschlussprofil Peri plinth profile (free of thermal bridges), plinth profile and push on plinth profile		
Basecoat	Sockel-SM Pro or Sockel-SM, SM700 Pro, SM700, SM300		
Reinforcing mesh	5 x 5 mm		
Primer (with finish coat)	Quarzgrund pro		
Hard lining / finish coat	As with façade / Butz, Sockel-SM Pro, Sockel-SM, SM700 Pro		
Decorative coat (with finish coat)	Siliconharz-EG-Farbe paint, Autol, Fassadol, MineralAktiv Fassadenfarbe paint		
Moisture protection	Sockel-Dicht (with Sockel-SM Pro as a basecoat and render finish, and in case of a total thickness ≥ 7 mm it will not be required)		

1) *The use of the dowel depends on insulation material, on the system and the covering material weight as well as the wind load. The National Technical Approval must be observed, see page 29.*

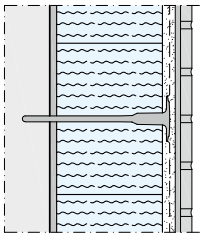
System variants

The maximum system weights (insulating material + reinforcement layer + bedding mortar + lining) for WARM WALL Ceramic and WARM WALL Natural stone can be 100 kg/m², excluding some divergent specifications in the following table.

Mineral wool boards

Scheme drawing	Insulation material	Bonding	Lining	Dowel	Number of dowels	Condition
Adhesively bonded and dowelled through the mesh						
	MW Wolle 035 plus L MW Wolle 035 plus M2	■ Full surface ▪ Insulation material ▪ Substrate ■ Partial surface ≥ 60 % ▪ Insulation material ▪ Substrate	Ceramic and natural stone work	Schraubdübel STR U 2G dowel	≥ 6 St/m², page 28	–
					≥ 5 St/m², page 28	■ System weight ≤ 75 kg/m² ■ Covering weight ≤ 53 kg/m² ■ Substrate bond strength ≥ 0.08 N/mm²

Mineral wool lamella

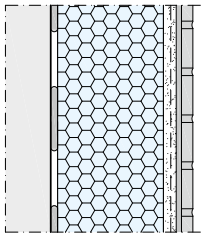
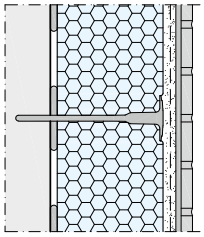
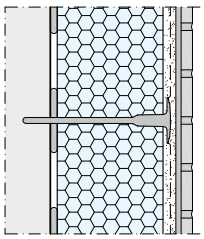
Scheme drawing	Insulation material	Bonding	Lining	Dowel	Number of dowels	Condition
Adhesively bonded and dowelled through the mesh						
	MW Volamit 040	■ Full surface ▪ Insulation material ▪ Substrate ■ Partial surface ≥ 60 % ▪ Substrate	Ceramic	Schraubdübel STR U 2G dowel	≥ 4 St/m², page 27	–
				Page 29	≥ 4 St/m², page 27	System weight ≤ 75 kg/m²
			Natural stone work	Schraubdübel STR U 2G dowel	≥ 4 St/m², page 27	–

Covering weight: Reinforcement layer + bedding mortar + lining.

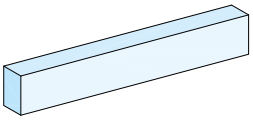
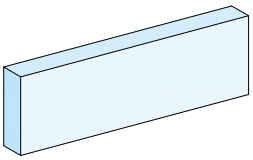
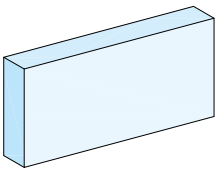
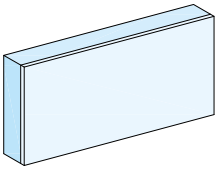
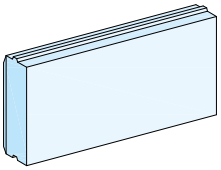
System variants (continued)

The maximum system weights (insulating material + reinforcement layer + bedding mortar + lining) for WARM WALL Ceramic and WARM WALL Natural stone can be 100 kg/m², excluding some divergent specifications in the following table.

EPS insulation materials

Scheme drawing	Insulation material	Bonding	Lining	Dowel	Number of dowels	Condition
Adhesively bonded						
	EPS Standard 031 EPS Standard 032 EPS Standard 034 EPS Standard 035 white EPS SunJa 032 EPS Nut&Feder 032	■ Full surface ▪ Insulation material ▪ Substrate ■ Partial surface ≥ 60 % ▪ Insulation material ▪ Substrate	Ceramic	–	–	■ Building height ≤ 8 m ■ Substrate bond strength ≥ 0.08 N/mm² ■ Wind suction w_{ek} ≤ 1.0 kN/m²
Glued and dowelled under the mesh						
	EPS Standard 031 EPS Standard 032 EPS Standard 034 EPS Standard 035 white EPS SunJa 032 EPS Nut&Feder 032	■ Full surface ▪ Insulation material ▪ Substrate ■ Partial surface ≥ 60 % ▪ Insulation material ▪ Substrate	Ceramic	Page 29	≥ 4 St/m², page 28	■ System weight ≤ 75 kg/m² ■ Wind suction w_{ek} ≤ 1.0 kN/m²
Adhesively bonded and dowelled through the mesh						
	EPS Standard 031 EPS Standard 032 EPS Standard 034 EPS Standard 035 white EPS SunJa 032 EPS Nut&Feder 032	■ Full surface ▪ Insulation material ▪ Substrate ■ Partial surface ≥ 60 % ▪ Insulation material ▪ Substrate	Ceramic	STR U 2G dowel	4 pcs/m²	■ Substrate bond strength ≥ 0.08 N/mm² ■ Wind suction w_{ek} ≤ 1.0 kN/m²
					≥ 4 St/m², page 27	–
				Page 29	4 pcs/m²	■ Substrate bond strength ≥ 0.08 N/mm² ■ System weight ≤ 75 kg/m² ■ Wind suction w_{ek} ≤ 1.0 kN/m²
					≥ 4 St/m², page 27	■ System weight ≤ 75 kg/m² ■ Wind suction w_{ek} > 1.0 kN/m²
			Natural stone work	STR U 2G dowel	≥ 4 St/m², page 27	–

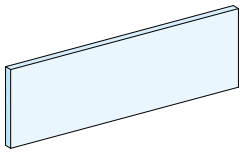
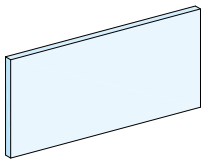
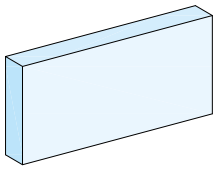
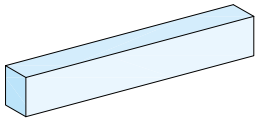
Insulation material

Insulation material	Description	Rated value of thermal conductivity λ W/(m·K)	Dimensions w x l mm	Application type Acc. to DIN 4108-10	Insulation material thickness mm
Façade					
	**MW Volamit 040** *Mineral wool lamella*	0.041	200 x 1200	WAP-zh	60 – 200[1)]
	**MW Wolle 035 plus L** Mineral wool boards	0.035	400 x 1200	WAP-zg	60 – 200[1)]
	MW Wolle 035 plus M2 Mineral wool boards	0.035	400 x 1200	WAP-zg	60 – 200[1)]
	**EPS Standard 035 white**	0.035	500 x 1000	WAP	40 – 200
	EPS Standard 034[2)]	0.034	500 x 1000	WAP	40 – 200
	EPS Standard 032[2)]	0.032	500 x 1000	WAP	40 – 200
	EPS Standard 031[2)]	0.031	500 x 1000	WAP	40 – 200
	**EPS SunJa 032**	0.032	500 x 1000	WAP	80 – 200
	**EPS Nut&Feder 032**[2)]	0.032	500 x 1000	WAP	60 – 200

1) Coated on both sides

2) Elasticized EPS insulation materials may not be used

Insulation material (continued)

Insulation material	Description	Rated value of thermal conductivity λ W/(m·K)	Dimensions w x l mm	Application type Acc. to DIN 4108-10	Insulation material thickness mm
Reveal					
	**MW Wolle 035 reveal** *Mineral wool boards*	0.035	400 x 1200	WAP-zg	20 – 50[1)]
	MW Wolle 035 Laibung plus *Mineral wool boards*	0.036	400 x 1200	WAP-zg	20 – 30[2)]
	**EPS Standard 035 white**	0.035	500 x 1000	WAP	20 – 50
	EPS Standard 032	0.032	500 x 1000	WAP	20 – 50
Plinth					
	**Sockeldämmplatte 035[3)] plinth board** *EPS, white*	0.035	500 x 1000	PW	30 – 200
	Sockeldämmplatte 032[3)] plinth board *EPS, grey*	0.032	500 x 1000	PW	40 – 200
Transoms / fire breaks					
	**MW Volamit 040** *Mineral wool lamella*	0.041	200 x 1200	WAP-zh	60 – 200[2)]
	MW Brandriegel 035 plus fire break *Mineral wool fire break*	0.035	200 x 1200	WAP-zg	100 – 200[2)]

1) *Compacted upper layer*

2) *Coated on both sides*

3) *Fire resistance:*
For A2 system: Maximum height 600 mm above ground line edge (GLE). For with escape balconies and access galleries maximum of up to 300 mm above GLE.
For B1 system: Maximum height 900 mm above GLE.

Insulation material (continued)

Thermal resistance

Examples

Insulation material	Thermal resistance **R** in $(m^2 \cdot K)/W$ Insulation thickness **t** in mm								
	40	**60**	**80**	**100**	**120**	**140**	**160**	**180**	**200**
MW Volamit 040	–	1.46	1.95	2.44	2.93	3.41	3.90	4.39	4.88
MW Wolle 035 plus L / MW Wolle 035 plus M2	–	1.71	2.29	2.86	3.43	4.00	4.57	5.14	5.71
EPS Standard 035 white	1.14	1.71	2.29	2.86	3.43	4.00	4.57	5.14	5.71
EPS Standard 034	1.18	1.76	2.35	2.94	3.53	4.12	4.71	5.29	5.88
EPS Standard 032	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
EPS Nut&Feder 032	–	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
EPS Standard 031	1.29	1.94	2.58	3.23	3.87	4.52	5.16	5.81	6.45

From the table, you can read off the thermal conductivity as well as the total thickness of the insulation material of the thermal resistance R using the rated value. The sum of all thermal resistances (hard lining, masonry, insulation material, etc.) is added to the sum of 0.17 $(m^2 \cdot K)/W$ of both internal and external thermal resistances and results in the thermal resistance. The inverse value of the thermal transmission resistance is the U value.

Dowel

Schraubdübel STR U 2G dowel

Schraubdübel STR U 2G dowel is installed using an installation tool for surface flush or recessed installation and can be combined with the Dübelteller VT 2G dowel plate. The pre-installed screw dowel is made of galvanized steel. The dowel housing is made of a high-quality plastic with a predefined crumple zone for recessed dowel installation. The minimal anchoring depth of just 25 mm (aerated concrete 65 mm) ensures cost-effective dowel lengths. The dowel is secure with the highest characteristic load levels.

Schlagdübel CNplus 8 insulation anchor nail

Schlagdübel CNplus 8 insulation anchor nail is used for surface flush installation. The dowel can be applied by impact or screw-in installation. It is characterized by a very low impact energy. The pre-installed screw nail consists of a combination of fibre glass reinforced polyamide and electro-galvanized steel in the expansion area. The dowel housing is made of a high-quality plastic.

Schraubdübel HTR-P/HTR-M dowels

The Schraubdübel HTR dowel is used together with a setting tool for surface flush installation. The Schraubdübel HTR-P dowel is an anchor with a pre-installed purely plastic screw that functions as an expanding component. The Schraubdübel HTR-M dowel is an anchor with a pre-installed composite screw that functions as an expanding element and which consists of galvanized steel in the expanding area. Both dowels feature a low tightening torque facilitating optimum installation performance with a cordless screwdriver.

Basecoat

SM300 is a mineral adhesive and basecoat mortar of compressive strength category CS III acc. to EN 998-1. It contains an adhesive agent, is open to diffusion, highly water-repellent, features a high adhesive force and can be stored in a silo.

Reinforcing mesh

The reinforcement mesh 5 x 5 mm is high-strength, durable, alkaline-resistant reinforcement mesh made of glass fibres with a mesh size of 5 x 5 mm. It is non-slip and contains blue markings for mesh overlaps.

Bedding mortar

Knauf Flex tile adhesive is a cementitious, synthetically enhanced flexible adhesive C 2TES1 acc. to DIN EN 12004. It features high stability, is flexible, low chromate, dust reduced, hydraulic setting and is compliant with emission class EC 1PLUS (R). The tensile adhesion strength is > 1.0 N/mm^2 acc. to DIN EN 1348. The hard lining can be applied or inserted during the adhesive open time of 30 minutes. Application is according to the floating and buttering method.

Ceramic lining

Properties

Required properties	Dimensions / values	Standard
Material	Groups for ceramic lining: AI_a, AI_b, AII_a, BI_a, BI_b, BII_a	EN 14411
	Brick and clinker strips	Following the DIN 105-100 or alt. the DIN 105-4
Water absorption	AI_a, AI_b, AII_a, BI_a, BI_b, BII_a: ≤ 0.5 – 6 % share by weight	EN ISO 10545-3
	Brick and clinker strips: ≤ 7.4 % share by weight	EN ISO 10545-3
Pore radius r_p with highest frequency	> 0.2 µm	–
Pore volume V_p	≥ 20 mm^3/g	–
Frost resistance	Proof with 50 freeze-thaw cycles	DIN EN ISO 10545-12, DIN 52252-1

Formats

Required properties	Dimensions / values
Thickness	≤ 20 mm
Side lenght	≤ 1.20 m
Surface	≤ 0.72 m^2

Natural stone work lining

Properties

Required properties	Dimensions / values	Standard
Material	Uncoated natural stone	DIN EN 12057
The substrate facing the board side	Rough sawn	–
Water absorption	≤ 7.4 % share by weight	DIN EN 13755
Tolerance of evenness	≤ 0.5 % of the board length	–
Flexural strength	≥ 4.5 N/mm^2 – 38.2 N/mm^2	DIN EN 12372
Frost resistance	Proof after 48 freeze-thaw cycles	DIN EN 12371

Formats

Required properties	Dimensions / values	
	Small format	Large format
Thickness	6 – 20 mm	Up to 20 mm
Side length	≤ 0.61 m	≤ 1.20 m
Surface	≤ 0.19 m^2	≤ 0.72 m^2
Length/width ratio	–	1:1 ≤ l/b ≤ 1:3

Grout

Knauf Flex-Fugenmörtel grout is a cementitious, flexible grout CG 2 W A acc. to DIN EN 13888 made of mineral binders, with pigments when required. It is water-repellent, frost resistant, highly flexible, abrasion resistant, low chromate and hardens crack-free. It is very easy to use due to its pliability. The mortar can be applied in a grouting procedure, with the grouting iron as well as by using a nozzle. This achieves a fine grain fully filled grout application. There are 7 different standard colour shades and a range of custom colours available.

Thermal upgrading of common exiting walls

Overview of common existing walls and the required insulation material thicknesses

Existing walls Exterior walls	Density	Thickness	Rated value of thermal conductivity λ	U value without ETICS system[1]	With WARM WALL Ceramic and Natural Stone Minimum insulation material thickness t in mm			
					At U value[2] ≤ 0.20 W/(m²·K) with support from the German federal government		At U value[2] ≤ 0.24 W/(m²·K) acc. to the GEG (German Buildings Energy Act)	
					Design thermal conductivity λ in W/(m·K)		Design thermal conductivity λ in W/(m·K)	
Construction type	kg/m³	mm	W/(m·K)	W/(m²·K)	0.035	0.031	0.035	0.031
Concrete	2400	200	2.10	3.40	180	160	140	140
		250		3.15	180	160	140	120
Solid brick	1800	240	0.81	2.02	160	140	140	120
	1800	300		1.76	160	140	140	120
	1800	365		1.54	160	140	140	120
Vertical coring bricks	1200	240	0.58	1.63	160	140	140	120
		300		1.40	160	140	140	120
	1000	240	0.45	1.37	160	140	140	120
		300		1.16	160	140	120	120
Light vertical coring brick	800	240	0.33	1.08	160	140	120	120
Lime sandstone KSV	1800	240	0.99	2.27	160	160	140	120
		300		1.99	160	140	140	120
Lime sandstone KSL	1400	240	0.70	1.85	160	140	140	120
		300		1.59	160	140	140	120
Light concrete cavity block	1200	240	0.60	1.67	160	140	140	120
		300		1.43	160	140	140	120
Light concrete solid brick	1000	240	0.46	1.39	160	140	140	120
		300		1.18	160	140	120	120
Normal-weight concrete cavity block	1800	240	0.92	2.18	160	160	140	120
		300		1.91	160	140	140	120
Aerated concrete precision block	800	240	0.27	0.92	140	140	120	100
		300		0.76	140	120	120	100
	500	240	0.17	0.62	120	120	100	80
		300		0.51	120	100	80	80

1) Calculated with all wall constructions including 10 mm plaster (gypsum), λ = 0.39 W/(m·K).

2) Reduction using dowels due to a thermal bridge effect not considered.

Calculation of the required insulation material thickness

According to the GEG, the required U value for the exterior wall with ETICS system of 0.24 W/(m²·K) may not be exceeded.
The required insulation material thickness can be calculated as follows:

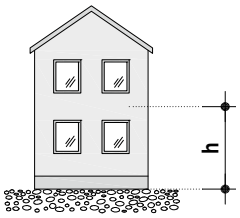
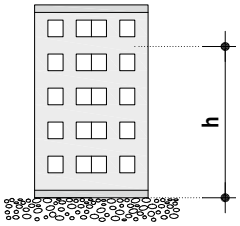
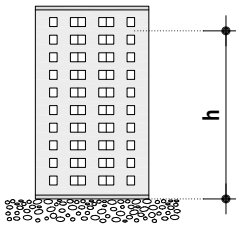
$$\text{Min. insulation material t in mm} = 1000 \cdot \lambda_{\text{Insulation}} \cdot \left[\frac{1}{U_{\text{required}}} - \frac{d_{\text{existing wall}}}{\lambda_{\text{existing wall}}} - \frac{d_{\text{plaster}}}{\lambda_{\text{plaster}}} - 0.17\ (\text{m}^2\cdot\text{K})/\text{W} \right]$$

Legend

$\lambda_{\text{Insulation material}}$	*Design thermal conductivity of the insulating material in W/(m·K)*
U_{required}	*U value for exterior walls ≤ 0.24 W/(m²·K) acc. to GEG*
$t_{\text{Existing wall}}$	*Thickness of the existing wall without ETICS and without plaster in m*
$\lambda_{\text{Existing wall}}$	*Design thermal conductivity of the existing wall without ETICS and without plaster in W/(m·K)*
t_{Plaster}	*Thickness of the plaster in m*
λ_{Plaster}	*Design thermal conductivity of the plaster in W/(m·K)*

Building regulation minimum requirements

The demands on the reaction to fire of the façade lining are defined in the state building codes (LBO) and the corresponding fire prevention regulations of the German states. They are differentiated in dependence on the building height and/or building classes.
Additional special guidelines or regulations must be observed for special constructions and buildings such as hospitals, meeting halls, residential care homes, schools, shopping centres, etc. ETICS in scenarios such as firewalls, building party walls, access galleries, escape routes, fire service passage routes, etc. must be designed as non-combustible according to the state building codes (building material class A according to DIN 4102-1).

Height range		Upper edge of the floor[1)]	Required fire behaviour of ETICS	Building material class of ETICS Acc. to DIN 4102-1
	Building class 1 – 3 (Low height buildings)	**h = 0 – 7 m**	Flammable	**B2**
	Building class 4 - 5 (Medium height buildings)	**h = 7 – 22 m**	Not easily flammable	**B1**
	High-rise buildings	**h > 22 m**	Non-combustible	**A**

1) *The specified heights are defined differently in the individual German states. They can be found in the respective state building codes. The height specifications refer to the dimension of the upper edge of the highest floor on which common rooms can be built, measured from the average terrain height (clause 2, paragraph 3 of the Musterbauordnung [German model building code] as well as the respective state building code).*

Building regulation minimum requirements with other building types: see "Technische Systeminformation – WDVS und Brandschutz - Technical system information - ETICS and fire resistance" of the VDPM (German association for insulation systems, plaster and mortar (German only).

Reaction to fire Knauf WARM WALL Ceramic and Natural Stone

When using Knauf WARM WALL Systems with EPS insulation panels, additional fire protection measures are necessary against exterior fires (plinth fires) and against interior fires (room fires) should the external thermal insulation composite system be configured as a not easily flammable system (B1) according to the building regulation bye-laws.

Insulation material	Insulation material thickness t mm	Reaction to fire/building material class ETICS acc. to DIN 4102-1 without additional measures	Fire protection measures	Resulting reaction to fire ETICS acc. to DIN 4102-1
MW Volamit 040, MW Wolle 035 plus L, MW Wolle 035 plus M2	Up to 200	Non-combustible **A2**	–	Non-combustible **A2**
EPS	Up to 100	Flammable **B2**	Plinth fire + additional fire break[2)]	Not easily flammable **B1**
	> 100 to 200	Flammable **B2**	Plinth fire + room fire + additional fire break[2)]	Not easily flammable **B1**

2) *Additional fire breaks must be arranged in case of flanking, flammable construction products (e.g. roof) maximum 1.0 m underneath these construction products in the insulating level of the ETICS. See design on page 14.*

Fire-safety measures against fire from the exterior (plinth fire) in case of insulation with EPS

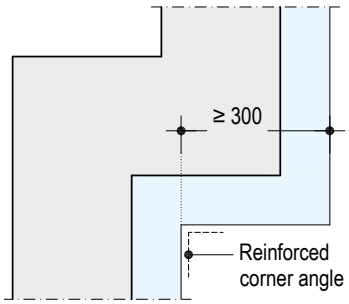
These measures are required for insulation thickness > 40 mm.

Structural fire protection measures

- Above a maximum 90 cm high splash water / plinth area above the edge of the ground line or adjacent horizontal building elements in use (parking roof levels), at the height of the first intermediate ceiling (at least 3 m), the system WARM WALL Ceramic and Natural Stone must be implemented with non-combustible mineral wool insulation material.
- Apply a fire break with full surface adhesive and dowelling on the lower edge of the WARM WALL Ceramic and Natural Stone with EPS. It is possible to omit this fire break, should the ETICS be applied with a non-combustible mineral wool insulating material in at least the first 3 m, and should the reinforced layer continue from this area through into the area with ETICS located above the EPS insulation boards without an offest.
- Apply a fire break with full surface adhesive and dowelling at the height of the ceiling of the 3rd storey above ground level or adjacent, horizontal building elements (parking levels), axial spacing ≤ 8 m to the fire break arranged below it; if the spacing is greater, additional fire breaks must be installed.
- Apply full surface adhesive and constructional dowelling for further fire breaks to transitions to horizontal protruding surfaces (e.g. from openings, passages, arcades) in the area between the 1st and 3rd storey.
- From the bottom edge of the ETICS with EPS up to the fire break at the height of the ceiling of the 3rd storey above ground level or adjacent, horizontal building elements, Panzereckwinkel reinforced corner angles 70/90 are to be used with building inside corners.

Inside corners

Dimensions in mm

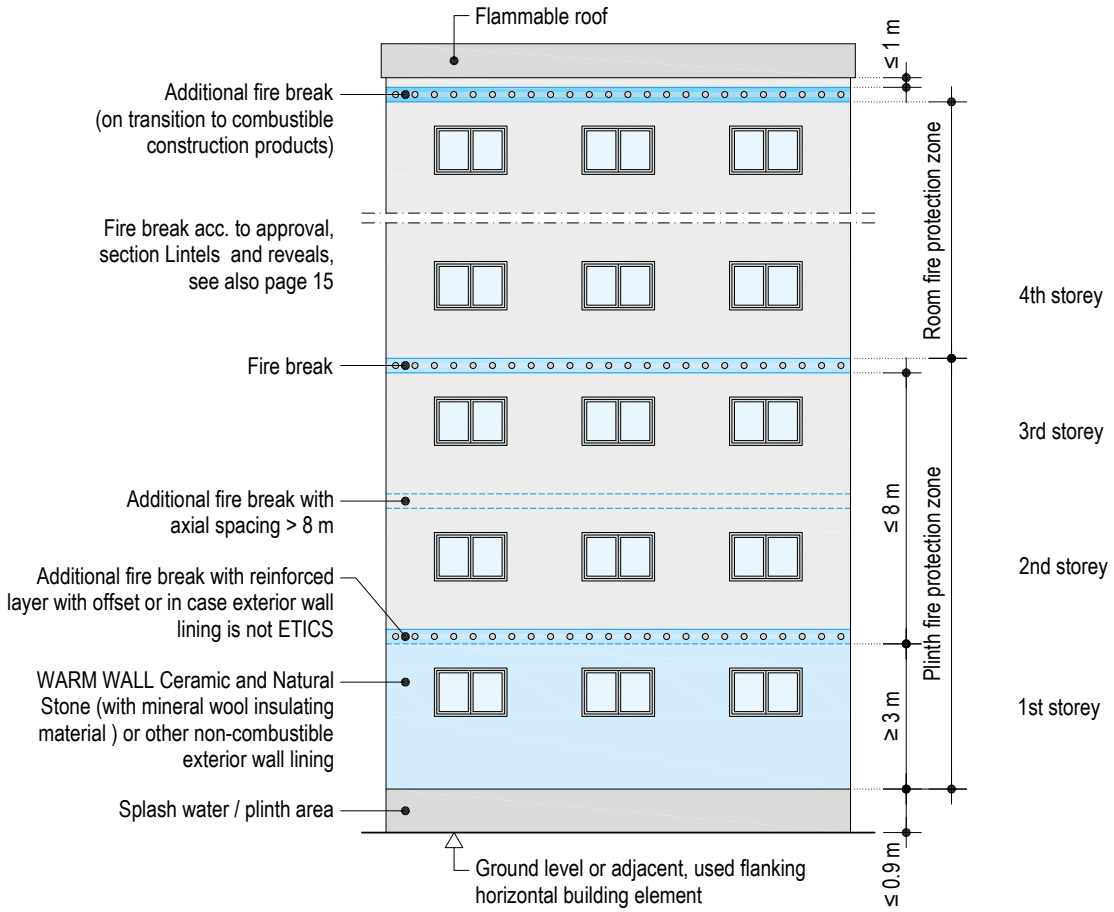


A step or offset of the exterior wall of less than 300 mm does not need to be considered as an inside corner.

Additional fire break

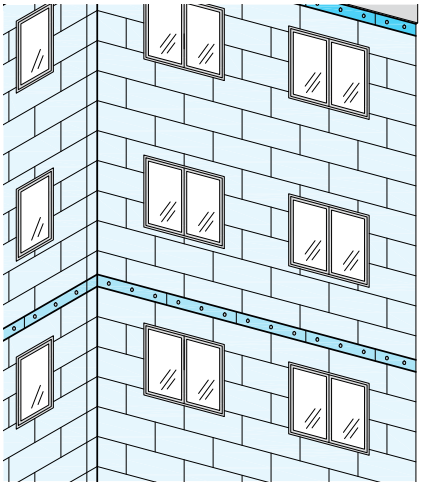
If a combustible constructional product is located above the ETICS, a fire break must be installed with a maximum spacing of 1m to the insulating level of ETICS. The material corresponds with that of a plinth fire break. The fire break is adhesively bonded along the entire surface with a mineral-based adhesive and additionally securely fastened with Schraubdübel STR U 2G dowels, and in case of MW Volamit 040 with Schraubdübel STR U 2G dowels and SBL 140 plus rondelles.

Note	In each case, the maximum respective spacing between the lower edge of the lintels and the lower edge of the fire break of at least 0.5 m must be observed.



Fire safety measures against interior fires (room fire) in case of insulation with EPS

The measures are necessary with an insulation material thickness > 100 mm and must be considered at the height of the ceiling of the 3rd storey above ground level or used, adjacent, horizontal building elements. See approval, section 3.2.5.3: Lintels and reveals. The building area with fire protection measures against exterior fires already has the fire protection measures against indoor fires included.



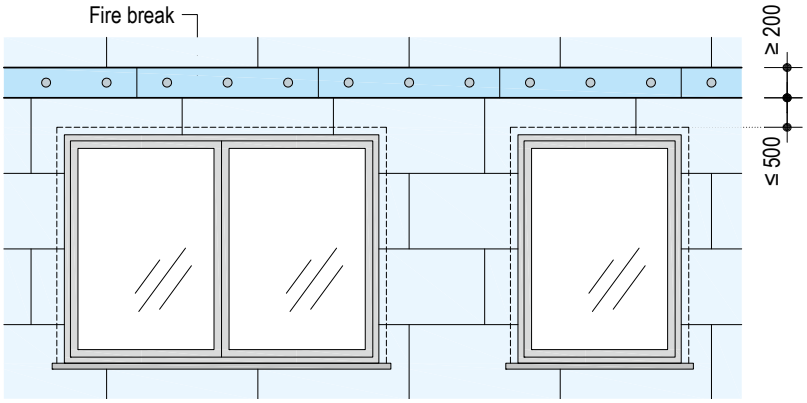
Arrangement of the fire break

- Beginning at the height of the ceiling of the 5th storey above ground level or adjacent, horizontal building elements, at a maximum spacing between the lower edge of the fire break and the lower edge of the window lintel of 500 mm, a fire break is arranged horizontally around the perimeter of at least every second storey.
- Fire breaks made of MW Volamit 040 (mineral wool lamellae) or MW Brandriegel 035 plus should be adhesively bonded on the full surface.
- Dowel fix the fire break per element with 3 screw dowels STR U 2G in the centre and at a spacing of maximum 400 mm under the mesh.
  - MW Volamit 040: with additional Dübelteller SBL 140 plus rondelle.
  - MW Brandriegel 035 plus: with or without Dübelteller VT 2G dowels.
- Edge areas located directly at openings require an additional reinforcement with Gewebeeckwinkel (mesh corner angles).
- Alternatively, the use of a fire break in the area of the lintels or a three-sided enclosure of wall openings with fire breaks in accordance with general type certification / approval section 3.2.5.3 is possible.

Note	In case dowels other than those stated in the approval are used, consult Knauf before use.

View

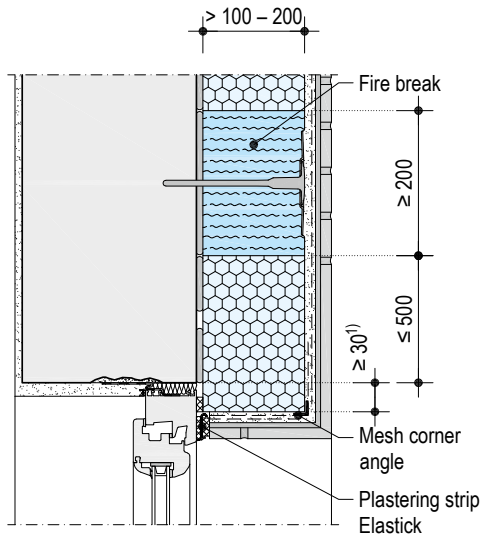
Dimensions in mm



Details

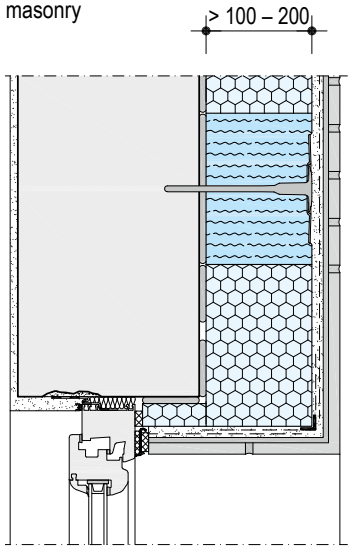
Scale 1:10 I Dimensions in mm

Window frame flush with the masonry

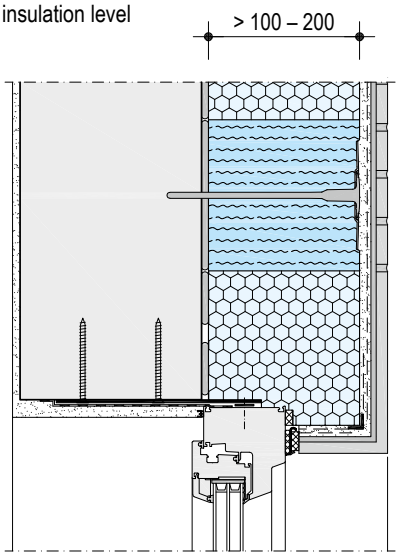


1) See DIN 4108 amendment 2

Window frame in the middle of the masonry



Window frame projected or partly in the insulation level

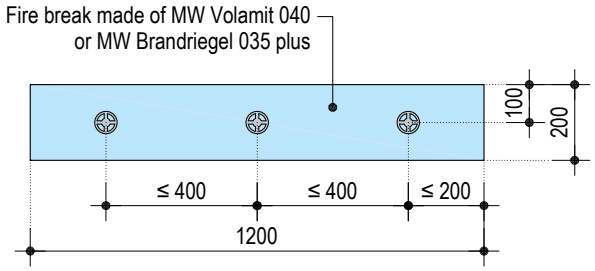


Fire brake

Material, anchoring

- Fire break made of MW Volamit 040 (mineral wool lamellae) or MW fire break 035 plus (mineral wool boards), installed horizontally around the building, fire break height ≥ 200 mm.
- Full surface adhesion with permissible adhesives SM300, SM700 Pro, SM700, Sockel-SM or Lustro.
- Dowelling: per element with at least Schraubdübeln STR U 2G dowels in the center and at a spacing of a maximum 400 mm under the mesh, with MW Volamit 040: with additional Dübelteller SBL 140 plus rondelle; the number of dowels is based on the expected wind load.

Dimensions in mm

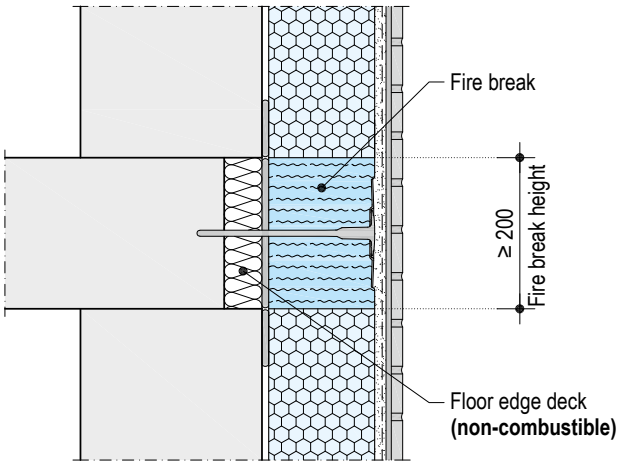


Construction examples and possible divergences are described in detail in the "Technical system information – ETICS and fire resistance" of the VDPM (Fachverband Wärmedämm-Verbundsysteme e. V. - Association for insulation systems, plaster and mortar) (German only).

Position in case of non-combustible floor edge deck

The fire break must not be applied directly to the ceiling head (floor edge deck). It is sufficient to apply it in the ceiling area on a solid substrate.

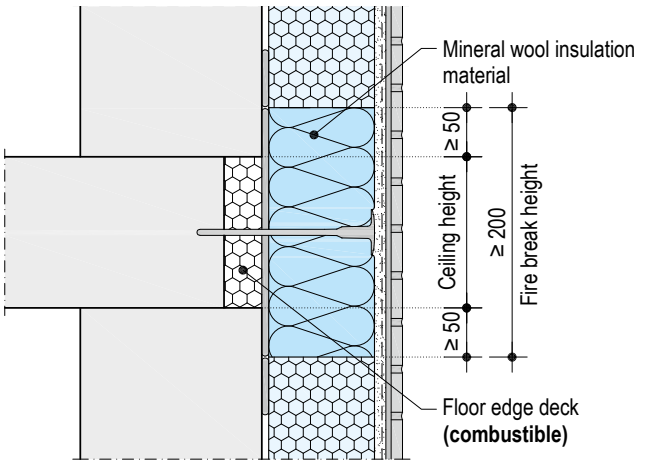
Scale 1:10 I Dimensions in mm

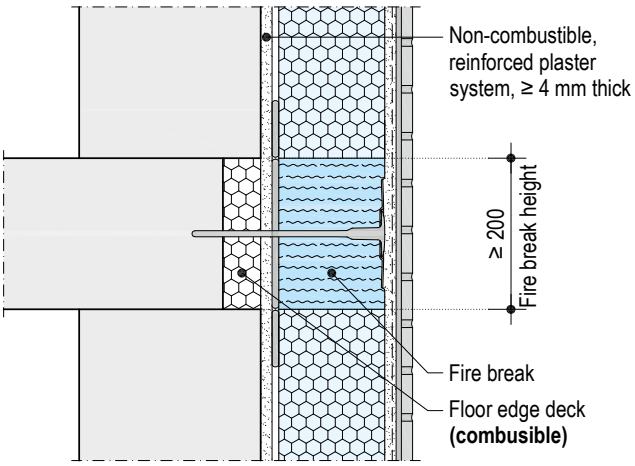


Position in case of combustible floor edge deck

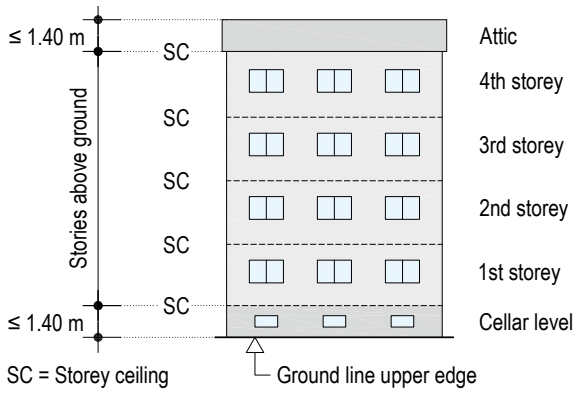
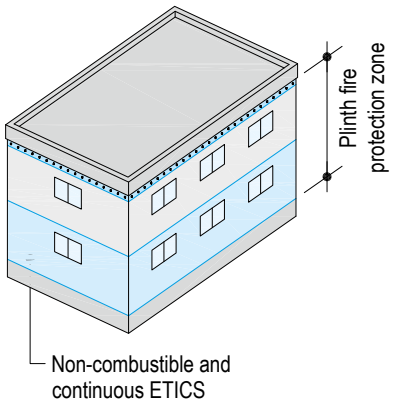
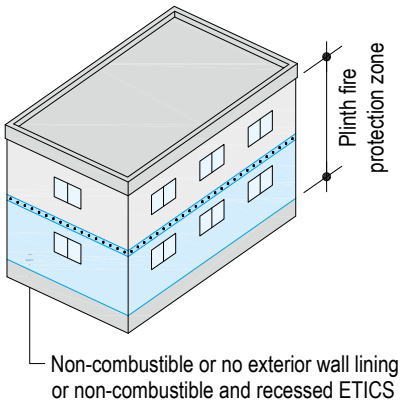
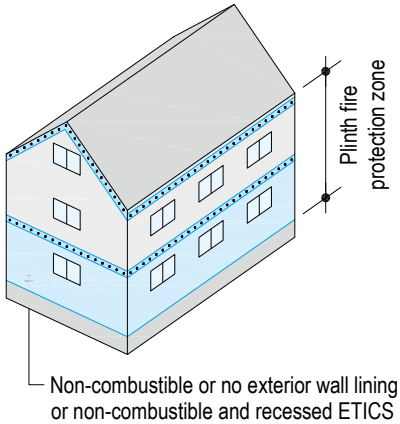
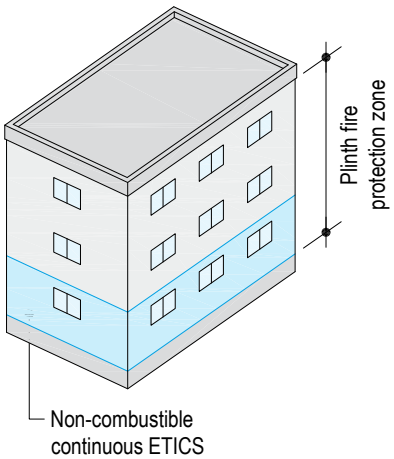
If a floor edge deck made of combustible insulation materials is located in the vicinity of a fire break, it must exceed the height of the floor deck above and below it by at least 50 mm. If this measure is not possible for technical reasons, the floor edge deck must be removed. Edge decks that have a plaster covering of non-combustible, reinforced plaster systems in a thickness of at least 4 mm are treated in the same way as non-combustible floor edge decks.

Scale 1:10 I Dimensions in mm

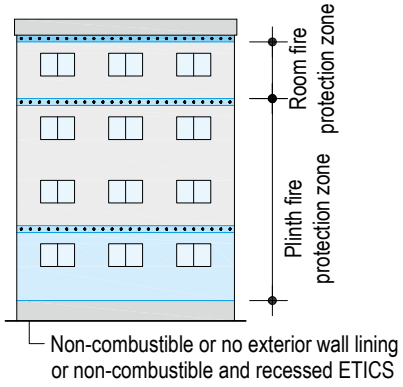
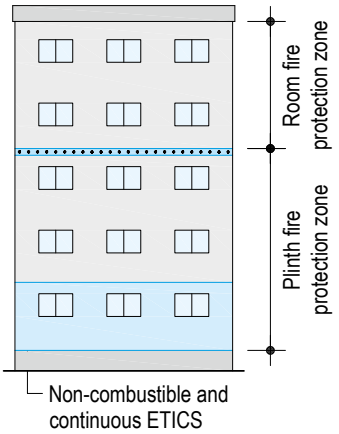
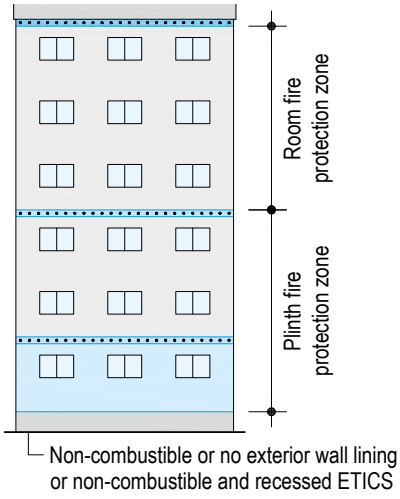
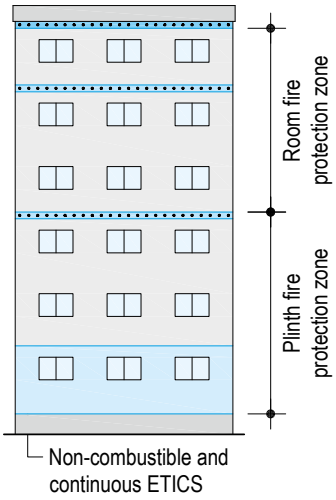
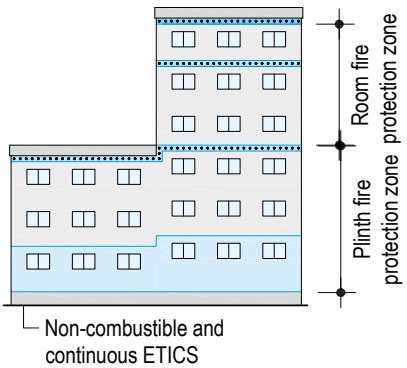
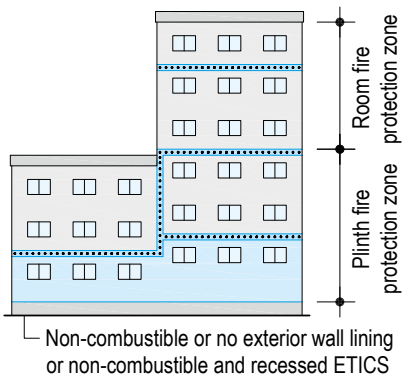




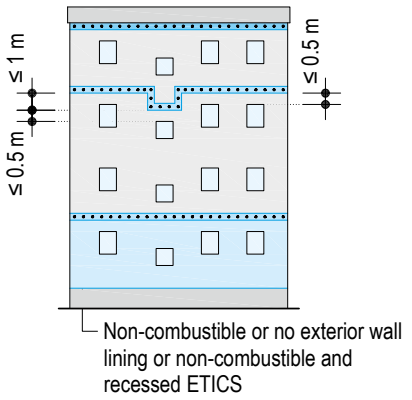
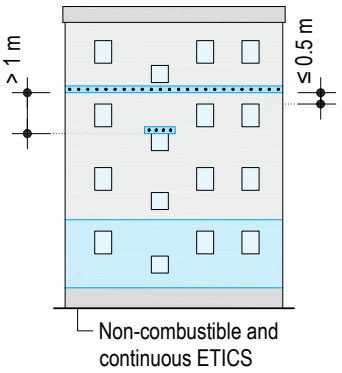
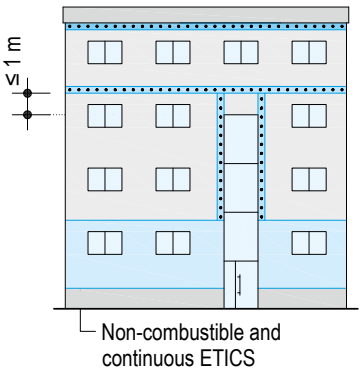
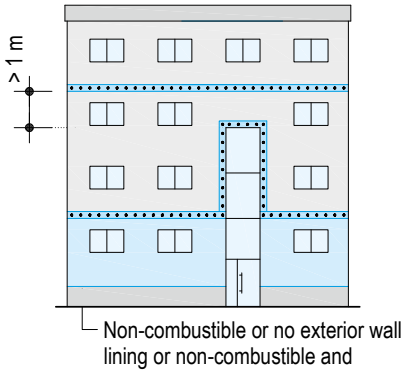
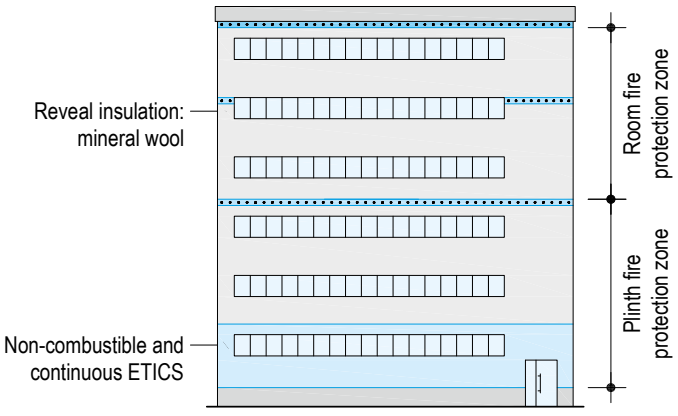
Position of fire break on the building

Remark	Scheme drawings
Definition of stories	
Stories above ground acc. to clause 2 (6) of the German Model Building Code (MBO). Cellar levels, where the mean cellar ceiling does not extend more than 1.40 metres above ground level, shall not be considered as a floor level (storey), as well as hollow areas (jamb walls) between the top floor and the roofing that cannot be used as common rooms. The height specifications can diverge from one another in the different state building codes.	
Two-storey building	
On low height buildings (0 – 7 m, see also page 13), possibly excluding special constructions, no additional fire protection measures are required from the point of view of the building codes. In case the ETICS are still to be not easily flammable in design, additional fire protection measures against exterior fires (plinth fire) as well as an additional fire break on the connection to the combustible construction products (e.g. roof) are required. Fire protection measures against indoor fires (room fire) are already incorporated due to the building height. With continuous ETICS, the transition from mineral wool to EPS does not need a fire break.	With flat roof (Example: flammable)  With flat roof (Example: non-combustible) 
Three-storey building	
It is recommended that ETICS on buildings of classes 1 to 3 that are a maximum of three stories should be not easily flammable in their design. This necessitates the application of fire protection measures against a exterior fires (plinth fire) as well as an additional fire break at the connection to combustible construction products (e.g. roof). These measures already cover fire protection measures against indoor fires (room fire). With continuous ETICS, the transition from mineral wool to EPS does not need a fire break.	With gabled roof (generally flammable)  With flat roof (Example: non-combustible) 

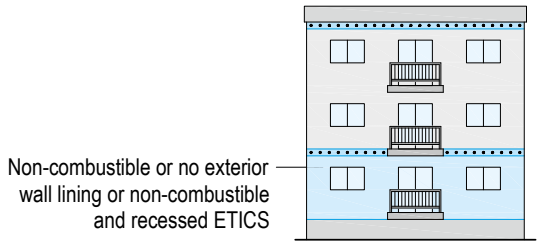
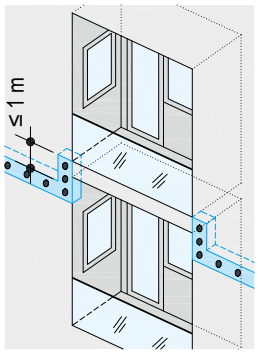
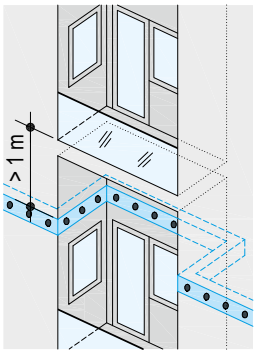
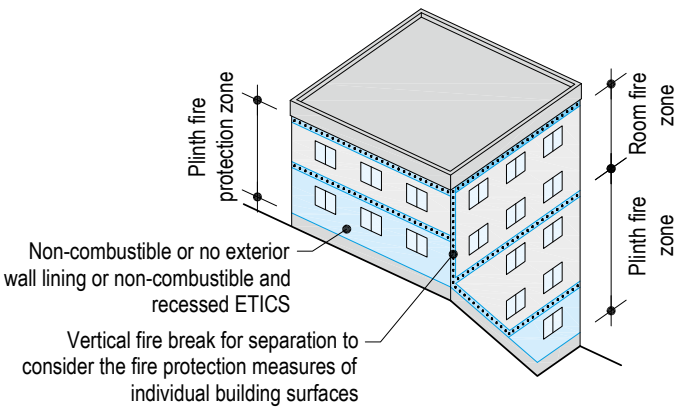
Position of fire break on the building (continued)

Remark	Scheme drawings	
Four and five storey buildings		
With these building heights, there are no fire protection measures against indoor fires (room fire) required above the 3rd storey. An additional fire break on the transition to the combustible roof construction on the upper connection of the ETICS is necessary. With continuous ETICS, the transition from mineral wool to EPS does not need a fire break.	Example: combustible roof 	Example: non-combustible roof 
Six stories and buildings up to the high-rise building limit		
Fire protection measures against indoor fires (room fires) from an insulation thickness > 100 mm above the 5th storey above ground level or adjacent, horizontal building elements are to be taken into consideration. An upper additional fire break is only required at the transition to combustible roof constructions. With continuous ETICS, the transition from mineral wool to EPS does not need a fire break.	Insulation material thickness t ≤ 100 mm, Example: combustible roof 	Insulation material thickness t> 100 mm, Example: combustible roof 
Different building section heights		
On building sections of different heights, the position of the fire break must be planned so that the fire break is at the same height in all building parts. Offsets up to a height of 1 m can be negotiated with an "upward" or "downward" offset. With an offset > 1 m a vertical separation of the ETICS up to the next non-combustible layer must be implemented. With continuous ETICS, the transition from mineral wool to EPS does not need a fire break.	Offset ≤ 1 m, Insulation material thickness > 100 mm, Example: combustible roof 	Offset > 1 m, Insulation material thickness > 100 mm, Example: non-combustible roof 

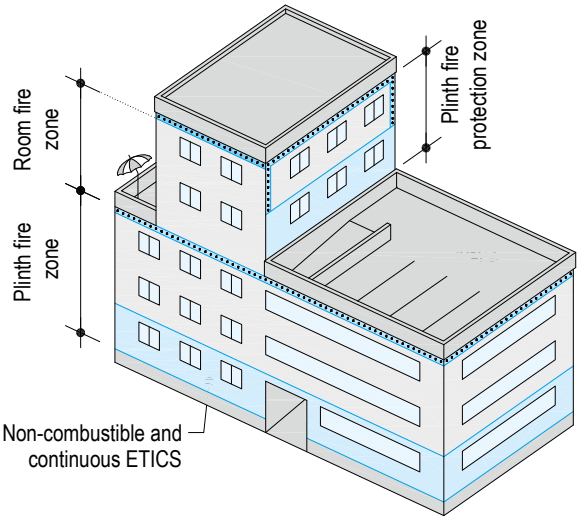
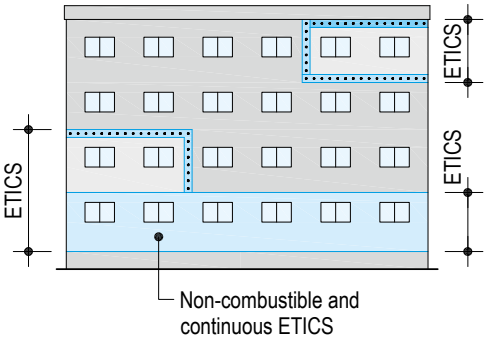
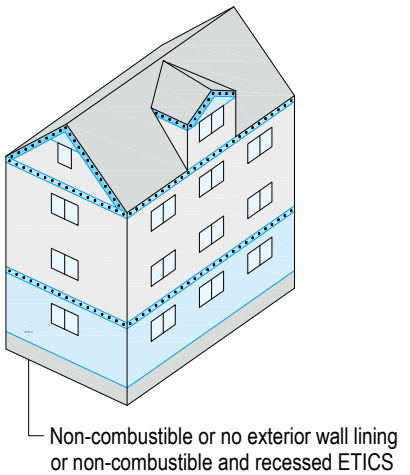
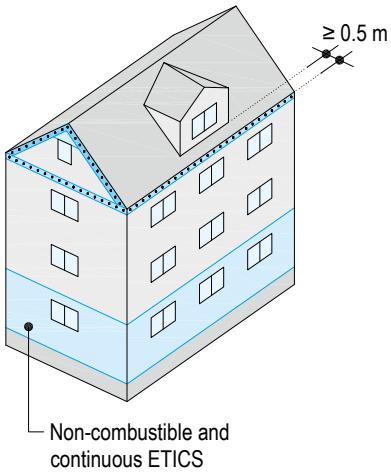
Position of fire break on the building (continued)

Remark	Scheme drawings	
Offset exterior wall openings		
Downward offset A local downward offset of the fire break, e.g. by a window that is lower is possible up to a maximum of 1 m. Here the spacing of 0.5 m between the fire break and the window lintel may nt be exceeded. With an offset > 1 m the window lintel will have a separate fire break applied. **Upward offset** In cases where the openings are in the horizontal path of the fire break, the fire break must be offset upwards around the opening. The height of the offset must be limited to 1 m.	With downward offset, offset ≤ 1 m, Example: combustible roof 	With downward offset, offset > 1 m, Example: non-combustible roof 
Multi-storey, glazed stairwells		
If a building features a fire protection staircase acc. to clause 35 of the German Model Building Code (MBO) with cross-floor, multi-storey glazing, the cross-floor "exterior wall" openings must be fully surrounded along the perimeter with mineral wool strips at a minimum width of 200 mm in the same way as the fire break up into the reveal and lintel. If the distance from the upper edge of the lintel of the stairwell glazing to the fire break located above it is no more than a maximum of 1 m, then the lateral fire break can be connected directly to the continuous fire break.	Spacing of lintel to fire break: ≤ 1 m, Example: combustible roof 	Spacing of lintel to fire break: > 1 m, Example: non-combustible roof 
Continuous strip windows, individual openings		
Continuous strip windows on a building that horizontally interrupt the applied ETICS can assume the function of a fire break only in the **room fire protection zone** (insulation material thickness t > 100 mm). Additional inclusion of fire breaks above the continuous strip windows can be therefore omitted. The vertical reveal to which the fire break is joined must be insulated along the entire height with mineral wool. The opening in the structural element for the strip window must have a minimum height of 1 m. Should openings on each floor, e.g. windows, interrupt the circumferential fire break, a circumferential fire break is not required. Rather, the fire break must first be continued into the reveal and then continued at the same height.	Insulation material thickness t > 100 mm, example: combustible roof 	

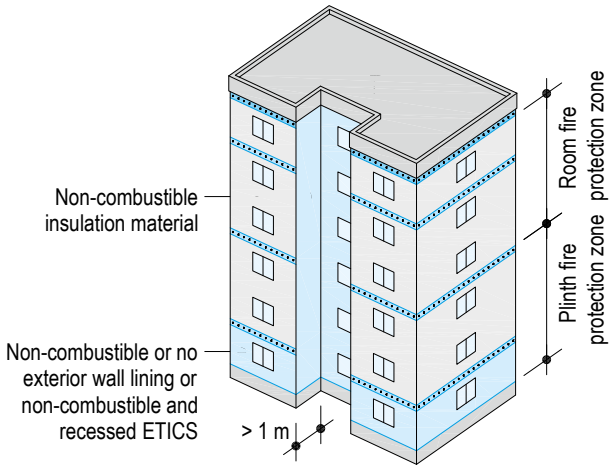
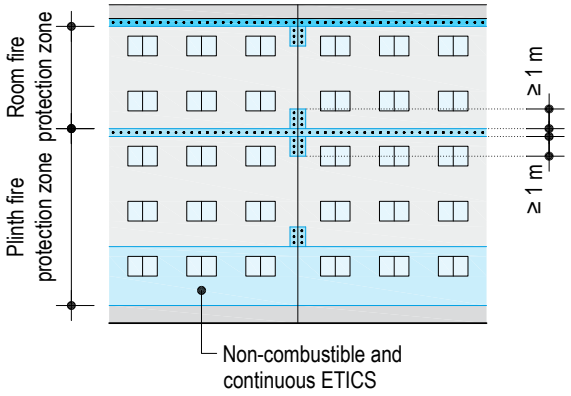
Position of fire break on the building (continued)

Remark	Scheme drawings
Projecting slabs, e.g. of balconies and loggias	
Slabs projecting out from the façade, e.g. from balconies and access galleries and that interrupt the fully horizontal ETICS, can assume the function of a fire stop, so that the additional inclusion of fire breaks in this area is unnecessary. The fire break must connect to the side at the level of the cantilever slab. The cantilever slabs must be solid and mineral-based and at least fire resistant (F30 acc. to DIN 4102-2 or alt. REI 30 acc. to EN 13501-2). The cantilever slabs must connect completely to the exterior wall without a gap or with load bearing thermal insulation elements (e.g. ISO-Korbs), that are fire resistance rated min. F30 acc. to DIN 4102-2 or alt. REI 30 acc. to EN 13501-2, connected with the exterior wall. Otherwise, the fire break should be continued under the cantilever slab.	Example: combustible roof 
Offset of fire break to cantilever slab	
With offset ≤ 1 m The fire breaks can be connected laterally to the cantilever slab through upward or downward offsets. **With offset > 1 m** Connection to the cantilever slab is not possible. The fire break should be continued under the cantilever slab. If continuation of the fire break under the cantilever slab is not possible, e.g. due to an existing roller blind cassette, a non-combustible fire resistant board that is at least 10 mm thick can be adhesively bonded and dowelled to the lower side of the cantilever slab.	With offset ≤ 1 m  With offset > 1 m 
Sloping site	
In case of façade surfaces with differing heights, e.g. on sloped locations, it may be useful to consider each side of the building separately. For this purpose, install a fire break that is applied vertically along the entire height of the building at a spacing of maximum 1 m from the outer corner of the building. The fire protection measures are to be planned and implemented for surfaces separated from one another.	Example: combustible roof 

Position of fire break on the building (continued)

Remark	Scheme drawings
Staggered stories	
Fire protection measures against exterior fires (plinth fires) must be implemented with staggered stories if on an adjacent area comparable fire loads such as on a building plinth can occur, e.g. on parking levels. For balconies, loggias or roof terraces used for residential purposes before staggered stories, fire protection measures must not be considered. The corresponding additional fire break is only required at the transition to combustible roofs.	Example: combustible roof 
Mixed façades	
On mixed façades where different façade systems are applied adjacent to one another (ETICS, back-ventilated curtain walls, facing masonry, etc.), it is possible that the fire can spread to the ETICS with EPS from the adjacent façade system. To prevent the spread of fire to the ETICS, areas of the ETICS must be protected all around by fire breaks and be separated from other façade systems.	Example: combustible roof 
Dormer features and gables	
Dormer windows are part of the roof, when recessed by at least 0.5 m perpendicularly to the façade below them. Fire protection measures such as those for ETICS do not need to be applied. For practical construction reasons it may be prudent to apply non-combustible insulation material to the entire gables and dormer features.	< 0.5 m recessed offset, Example: combustible roof  ≥ 0.5 m recessed offset, Example: combustible roof 

Position of fire break on the building (continued)

Remark	Scheme drawings
Three-sided building recesses	
ETICS in three-sided building recesses, which are deeper than 1 m and do not exceed 4 m in width, should have non-combustible insulation material applied to the full surface. This applies in particular for window openings of stairwells located in these walls.	Insulation material thickness > 100 mm, Example: combustible roof 
Building expansion joint without embedding firewall	
If an expansion joint without embedding firewall interrupts a fire break, this must also be implemented in the ETICS. The expansion joint must be filled fully with mineral wool at a height of at least 1 m above and below the fire break. In the center above this expansion joint in this area, a mineral wool strip in fire break quality at least 200 mm wide must be embedded into the ETICS. For external sealing of expansion joints against driving rain, materials can be used that are classified as flammable (EN ISO 13943).	Example: combustible roof 

Fire protection, transition of integrated fire walls

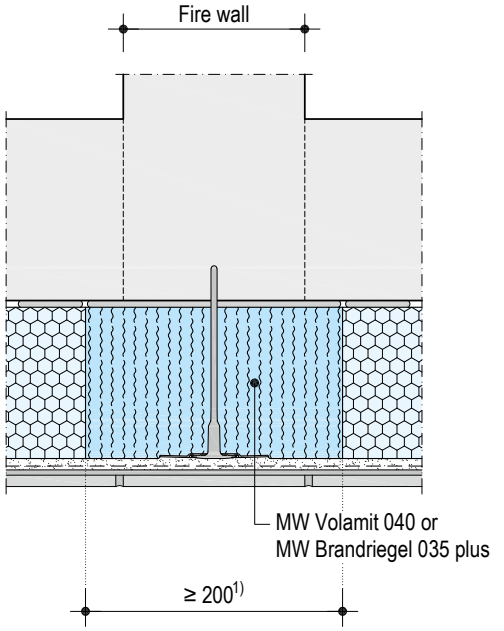
Fire walls must prevent the spread of fire to other buildings or building sections and must always be considered in the ETICS. They can be interior fire walls for partitioning rooms or for subdividing longer buildings (maximum spacing of 40 m acc. to clause 30 of the German Model Building Code) as well as building party walls acc. to clause 30 of the German Model Building Code. The state building codes must be observed and in individual cases the work must be coordinated with the respective building supervisory authorities.

Details

M1:10 I Dimensions in mm

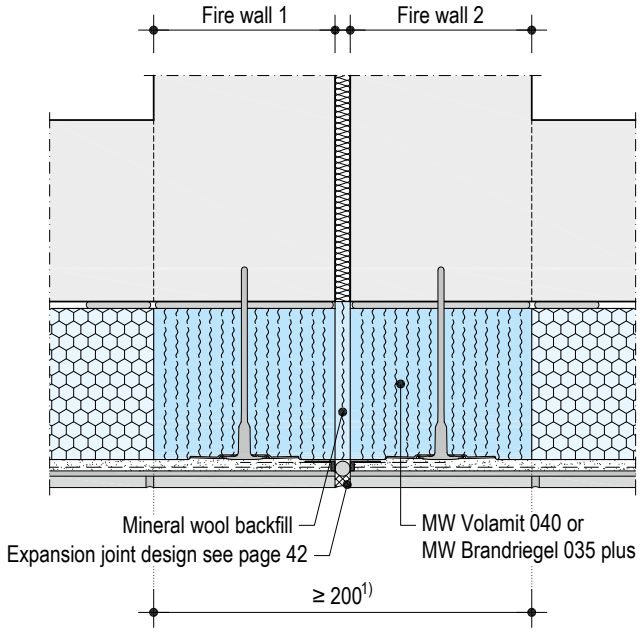
Without expansion joint

MW Brandriegel 035 plus fire break or MW Volamit 040 should be adhesively bonded on the full surface in a width of at least 200 mm and apply 3 Schraubdübeln STR U 2G dowels in the center for each element at a spacing of 400 mm under the mesh. With MW Volamit 040, additional Dübelteller SBL 140 plus rondelles must be used.



With expansion joint

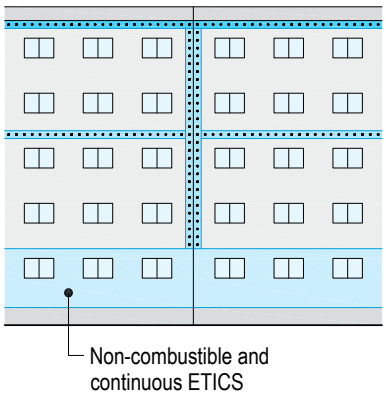
On both sides of the MW Brandriegel 035 plus fire break or MW Volamit 040, it should be adhesively bonded on the full surface at the height of the fire wall and apply 3 STR U 2G dowels for each element fitted in the centre at a spacing of 400 mm under the mesh. With MW Volamit 040, additional Dübelteller SBL 140 plus rondelles must be used. Fill expansion joint cavities completely with mineral wool.

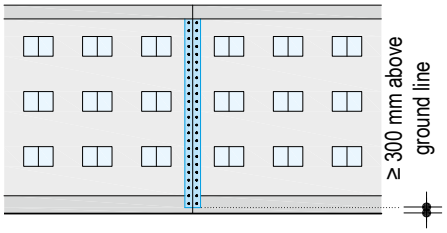


1) Observe regional building authority requirements: Thickness of the vertical fire break ≥ thickness of the entire fire wall.

Position of fire break on the building

Remark	Scheme drawing	
If an expansion joint is located in the middle of a fire wall (usually the case), it must be completely filled with mineral wool. Furthermore, a mineral wool strip in fire break quality must be applied above the fire wall. The total width is at least 200 mm in this case. The mineral wool is glued and dowelled on the full surface like a horizontally arranged fire break. For integrated fire walls in the splash water area, the vertical fire breaks can be guided up to 300 mm over the adjacent horizontal surfaces or ground level. For external sealing of expansion joints against driving rain, materials can be used that are classified as flammable (EN ISO 13943).	ETICS as a not easily flammable system (B1), example combustible roof	ETICS as a flammable system (B2)

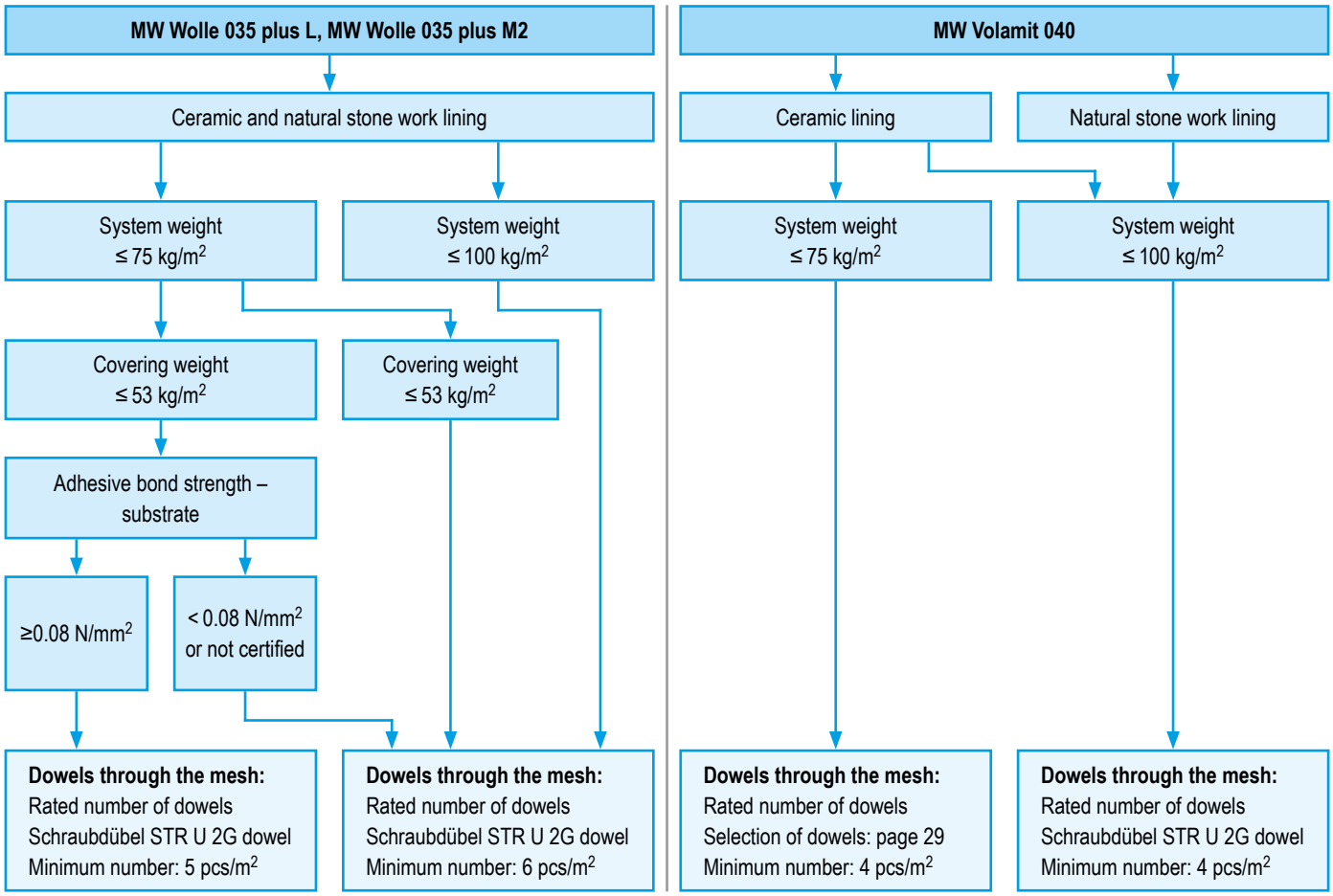




Insulation material – adhesive bonding

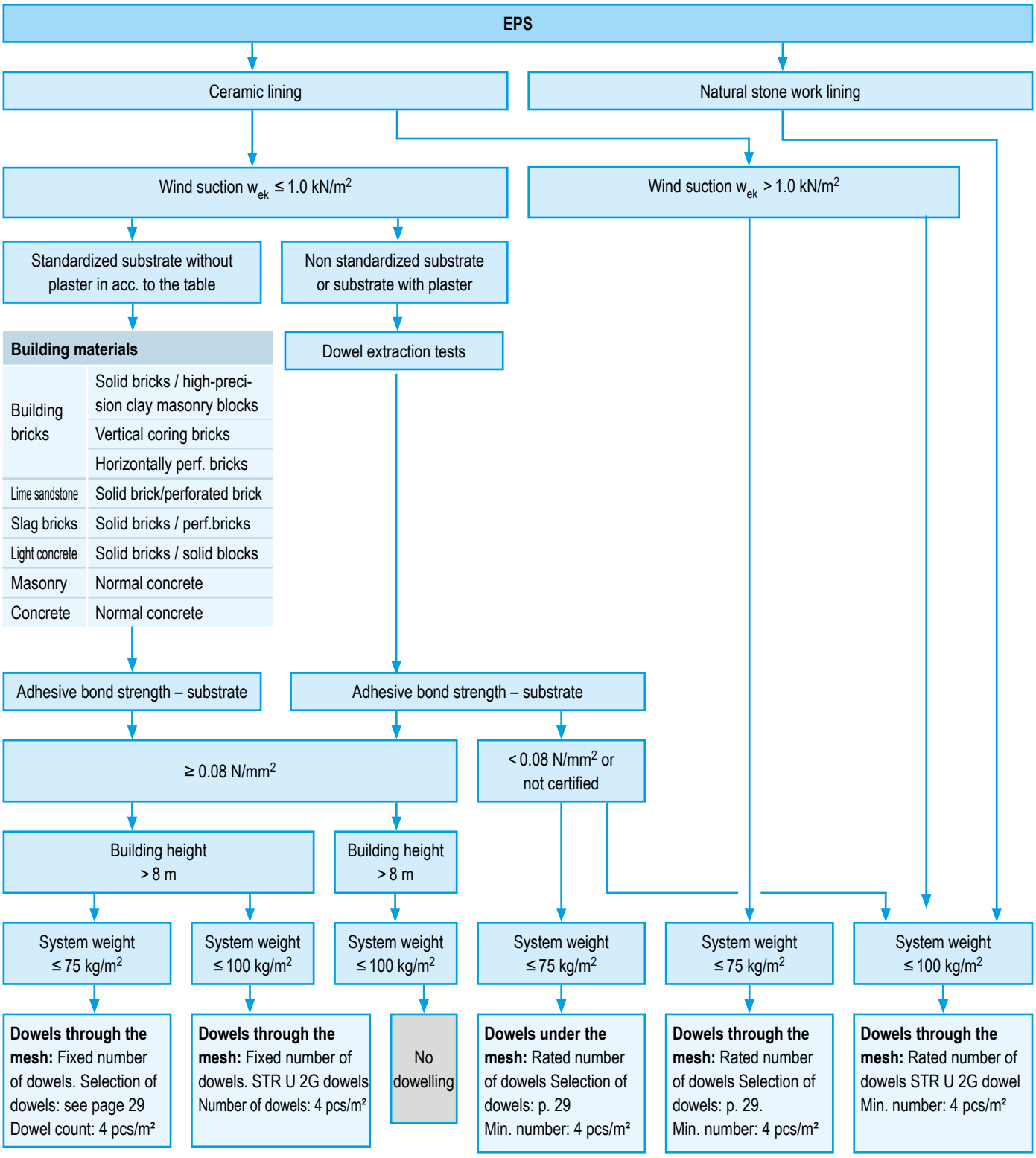
Application method	Adhesive share	Application on	EPS Standard EPS SunJa EPS Nut&Feder	MW Wolle 035 plus L MW Wolle 035 plus M2 Coated on both sides	MW Volamit 040 Coated on both sides
Manual adhesive bonding	Partial surface adhesive bonding ≥ 60 %	Insulation material	•	•	
	Full-surface bonding		•	•	•
Machine applied adhesive bonding	Partial surface adhesive bonding ≥ 60 %	Substrate	•	•	•
	Full-surface bonding		•	•	•

Should adhesive coatings be absent on mineral wool insulation materials, a thin layer of adhesive must be applied first to the insulation board surface as a surface press filling. In a second stage, the adhesive is applied wet on wet to the entire surface on the insulation lamellae using a notched trowel.



Notes	
	System weight: Insulating material + reinforcement layer + bedding mortar + lining.
	Covering weight: Reinforcement layer + bedding mortar + lining.
	Dowel extraction tests will be necessary for dowelling on non-standardized substrates.

Overview dowelling of EPS insulation materials



Notes	
	System weight: Insulating material + reinforcement layer + bedding mortar + lining.
	Dowel extraction tests will be necessary for dowelling on non-standardized substrates.

Method for determination of wind loads

For use with	Practice-based method Acc. to the recommendations of the VDPM[1] and the DIBt[2]	Simplified method Acc. to EN 1991-1-4 and EN 1991-1-4/NA	Standard method Acc. to EN 1991-1-4 and EN 1991-1-4/NA
Building height	≤ 25 m	≤ 25 m	Not specified
Wind zone	1 to 3	1 to 4	1 to 4
Building layout	Rectangular	Rectangular	Any
Height / width ratio	≤ 2	≤ 2	Any
Elevation of site	≤ 800 m above sea level, flat terrain	≤ 800 m above sea level, flat terrain	Any

1) Verband für Dämmsysteme, Putz und Mörtel e.V.

2) Deutsches Institut für Bautechnik

Method for determination of dowel quantity and dowel length

Selection of the wind zone → see page 26

Selection of the insulation material and the dowelling type → see page 24 and 25

Determination of the width of fringe A → see page 27

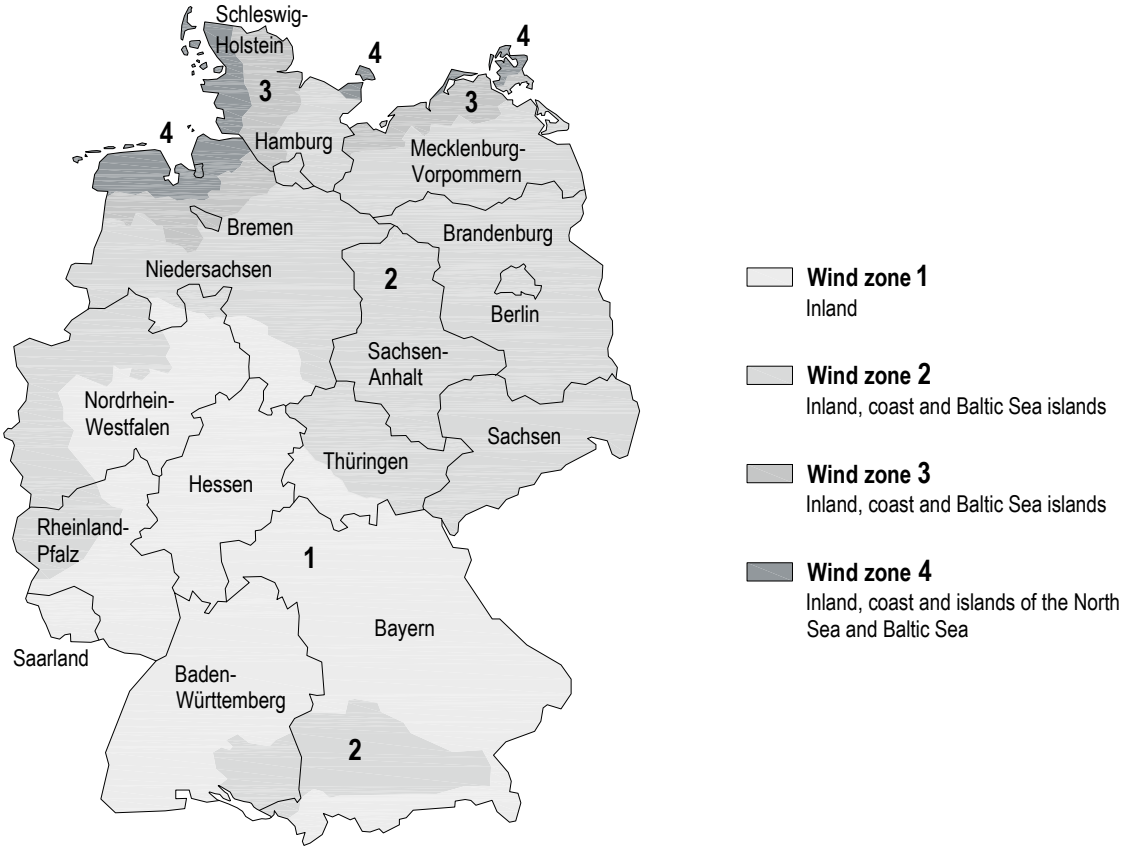
Read off the number of dowels from the table → see page 27 and 28

Selection of the dowel in dependence on the substrate and type of installation → see page 29

Selection of the dowel length in dependence on the insulating material thickness → see page 29

Calculation of the number of dowels: refer also to knauf.de/duebelrechner

Wind zones acc. to EN 1991-1-4/NA



Determination of the wind loads

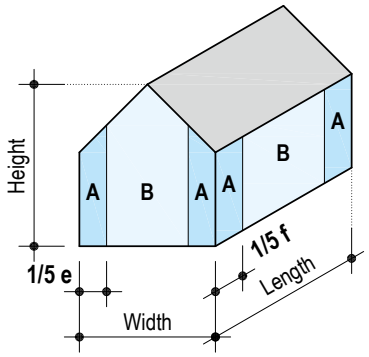
Wind suction forces w_{ek} in kN/m² acc. to EN 1991-1-4 and EN 1991-1-4/NA acc. to the simplified method

Wind zone	Region	Wind suction forces w_{ek} in kN/m²					
		Building height					
		0 to 10 m		0 to 18 m		0 to 25 m	
		Fringe A	Zone B	Fringe A	Zone B	Fringe A	Zone B
1	Inland	0.738	0.550	0.959	0.715	1.106	0.825
2	Inland	0.959	0.715	1.180	0.880	1.328	0.990
	Coast and Baltic Sea islands	1.245	0.935	1.475	1.100	1.623	1.210
3	Inland	1.180	0.880	1.401	1.045	1.623	1.210
	Coast and Baltic Sea islands	1.549	1.155	1.770	1.320	1.918	1.430
4	Inland	1.401	1.045	1.696	1.265	1.918	1.430
	North and Baltic Sea coasts and Baltic Sea islands	1.844	1.375	2.065	1.540	2.286	1.705
	North Sea islands	2.065	1.540	–	–	–	–

Determination of the width of fringe A

Width of fringe A:
1/5 e or 1/5 f

e = 2 x height *or* **e = length**
f = 2 x height *or* **f = width**
The smallest corresponding value is decisive.



Determination of the number of dowels

The number of dowels to be used as listed in the following table applies when the dowels to be used have the required characteristic resistance, see table on page 29. Should the characteristic resistance be lower, an individual rating on the basis of the DIN EN 1991-1-4 and DIN EN 1991-1-4/NA are necessary. The basis for determination of the number of dowels is the wind load according to the simplified method.

Table 1: Dowelling **through** the mesh (EPS insulation materials, MW Volamit 040) Insulation material thickness t ≥ 40 mm

Wind zone	Region	Minimum number for dowels per m² for WARM WALL Ceramic and Natural Stone Dowel characteristic resistance N_{Rk} ≥ 0.60 kN / dowel Maximum ETICS wind load: 2.20 kN/m²					
		Building height					
		0 to 10 m		0 to 18 m		0 to 25 m	
		Fringe A	Zone B	Fringe A	Zone B	Fringe A	Zone B
1	Inland	4 (4)	4 (4)	5 (4)	4 (4)	8	5
2	Inland	5 (4)	4 (4)	8	5	8	5
	Coast and Baltic Sea islands	8	5	8	8	11	8
3	Inland	8	5	8	8	11	8
	Coast and Baltic Sea islands	8	8	11	8	11	8
4	Inland	8	8	11	8	11	8
	North and Baltic Sea coasts and Baltic Sea islands	11	8	11	8	–	–
	North Sea islands	11	8	–	–	–	–

Values in brackets ( ): Dowelling of EPS insulation materials with just 4 dowels per m² through the mesh is possible with wind suction w_{ek} ≤ 1.0 kN/m², proven substrate bond strength ≥ 0.08 N/mm², building height > 8 m.

Notes	
	With a system weight ≤ 100 kg/m² (or > 75 kg/m²) only the Schraubdübel STR U 2G dowel may be used. System weight: Insulating material + reinforcement layer + bedding mortar + lining.

Determination of the number of dowels (continued)

Table 2: Dowelling **through** the mesh (MW Wolle 035 plus L, MW Wolle 035 plus M2) Insulation material thickness t ≥ 60 mm

Wind zone	Region	Minimum number for dowels per m² for WARM WALL Ceramic and Natural Stone Dowel characteristic resistance N_{Rk} ≥ 0.60 kN / dowel Maximum ETICS wind load: 2.20 kN/m²					
		Building height					
		0 to 10 m		**0 to 18 m**		**0 to 25 m**	
		Fringe A	Zone B	Fringe A	Zone B	Fringe A	Zone B
1	Inland	6 (5)	6 (5)	6 (5)	6 (5)	8	6 (5)
2	Inland	6 (5)	6 (5)	8	6 (5)	8	6 (5)
	Coast and Baltic Sea islands	8	6 (5)	8	8	11	8
3	Inland	8	6 (5)	8	8	11	8
	Coast and Baltic Sea islands	8	8	11	8	11	8
4	Inland	8	8	11	8	11	8
	North and Baltic Sea coasts and Baltic Sea islands	11	8	11	8	–	–
	North Sea islands	11	8	–	–	–	–

Values in brackets ( ): System weight ≤ 75 kg/m², covering weight ≤ 53 kg/m² and proven bond strength of adhesive – substrate ≥ 0.08 N/mm².

Table 3: Dowelling **under** the mesh (only for EPS insulation materials) Insulation material thickness t ≥ 60 mm

Wind zone	Region	Minimum number for dowels per m² for WARM WALL Ceramic Dowel characteristic resistance N_{Rk} ≥ 0.45 kN / dowel Maximum ETICS wind load: 1.00 kN/m²					
		Building height					
		0 to 10 m		**0 to 18 m**		**0 to 25 m**	
		Fringe A	Zone B	Fringe A	Zone B	Fringe A	Zone B
1	Inland	6	4 (5)	8	6	–	–
2	Inland	8	6	–	–	–	–
	Coast and Baltic Sea islands	–	–	–	–	–	–
3	Inland	–	–	–	–	–	–
	Coast and Baltic Sea islands	–	–	–	–	–	–
4	Inland	–	–	–	–	–	–
	North and Baltic Sea coasts and Baltic Sea islands	–	–	–	–	–	–
	North Sea islands	–	–	–	–	–	–

Dowelling under the mesh with a system weight ≤ 75 kg/m² is possible.
Values in brackets ( ) with insulation material thickness < 60 mm.

Notes	Only Schraubdübel STR U 2G dowels amy be used with mineral wool boards. System weight: Insulating material + reinforcement layer + bedding mortar + lining. Covering weight: Reinforcement layer + bedding mortar + lining.

Dowel selection

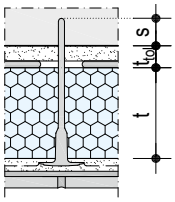
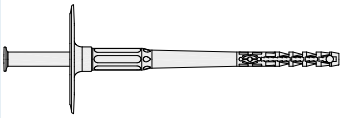
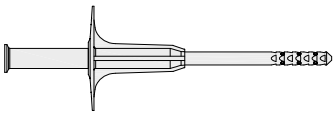
Selection of a suitable dowel

Categories Acc. to EAD 330196-00-0604	Wall material	Dowel tensile strength capacity N_{Rk} in kN/dowel[1)]		
		Can be used for WARM WALL Ceramic with system weight up to 75 kg/m² for EPS and MW Volamit 040		Can be used for WARM WALL Ceramic and Natural Stone
		Schlagdübel CNplus 8 insulation anchor nail	**Schraubdübel HTR-P dowels Schraubdübel HTR-M dowels**	**Schraubdübel STR U 2G dowel**
A	Concrete	0.90	1.00 – 1.50	1.50
B	Solid bricks, limestone blocks, solid brick/blocks made of light concrete	0.75 – 0.90	1.20 – 1.50	0.60 – 1.50
C	Sand-lime perforated bricks, vertical coring bricks, hollow blocks made of light concrete	0.50 – 0.75	0.70 – 1.20	0.60 – 1.50
D	Lightweight aggregate concrete	0.40	0.90	0.90
E	Aerated concrete (P2 – P7)	0.30	0.50 – 0.75	0.75

1) See ETA-18/0366 for CNplus 8 insulation anchor nail or ETA-04/0023 for STR U 2G dowel and ETA-16/0116 for HTR-P/HTR-M dowel.

Note System weight: Insulating material + reinforcement layer + bedding mortar + lining.

Dowel lengths – Application dependent on the insulation material thickness and further non-load-bearing layers

Insulation thickness	Dowel length											
	Dowel installation Surface flush **CNplus 8 insulation anchor nail** Façade equalization 10 mm				Surface flush **Schraubdübel HTR-P/HTR-M dowels** Façade equalization 10 mm				Surface flush **Schraubdübel STR U 2G dowel** Façade equalization 5 mm			
												
	New building A, B, C	Old building[1)] A, B, C	New building D, E	Old building[1)] D, E	New building A, B, C, D	Old building[1)] A, B, C, D	New building E	Old building[1)] E	New building A, B, C, D	Old building[1)] A, B, C, D	New building E	Old building[1)] E
t	**s**	**s**	**s**	**s**	**s**	**s**	**s**	**s**	**s**	**s**	**s**	**s**
mm	≥ 35 mm	≥ 35 mm	≥ 55 mm	≥ 55 mm	≥ 25 mm	≥ 25 mm	≥ 45 mm	≥ 45 mm	≥ 25 mm	≥ 25 mm	≥ 65 mm	≥ 65 mm
60	110	130	130	150	100	120	120	140	115	115	135	155
80	130	150	150	170	120	140	140	160	115	135	155	175
100	150	170	170	190	140	160	160	180	135	155	175	195
120	170	190	190	210	160	180	180	200	155	175	195	215
140	190	210	210	230	180	200	200	220	175	195	215	235
160	210	230	230	250	200	220	220	240	195	215	235	255
180	230	250	250	270	220	240	240	260	215	235	255	275
200	250	270	270	290	240	260	260	280	235	255	275	295

1) Including 20 mm old plaster thickness

t = insulation material thickness

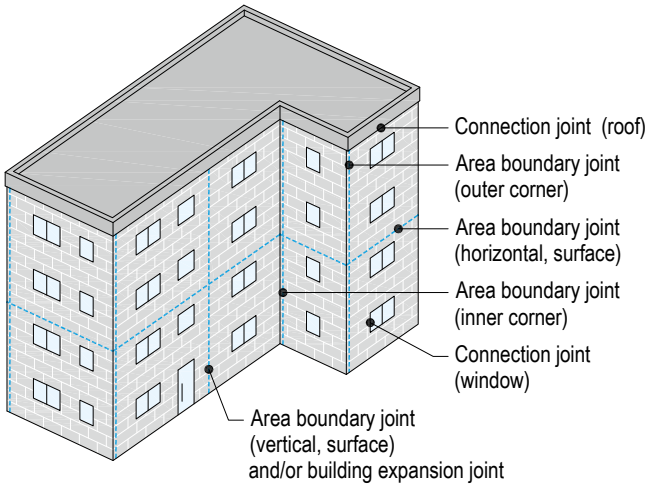
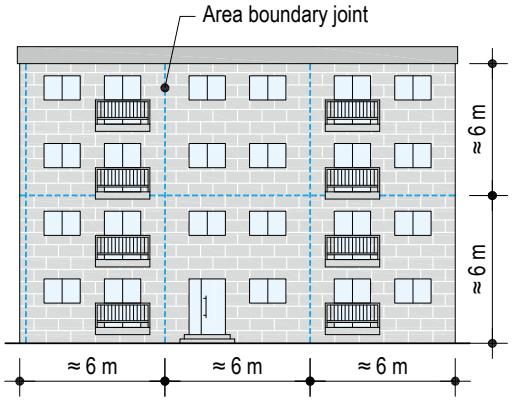
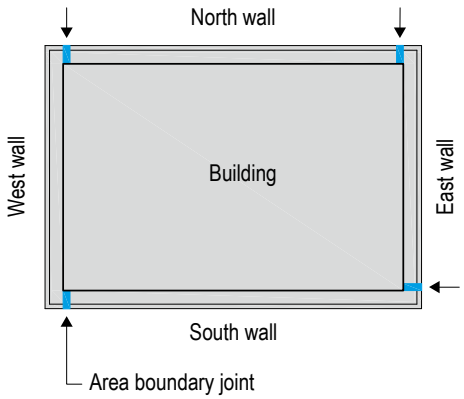
s = anchoring depth

t_{tol} = tolerance equalization = (possible 20 mm old render) + façade equalization + 5 mm adhesive thickness

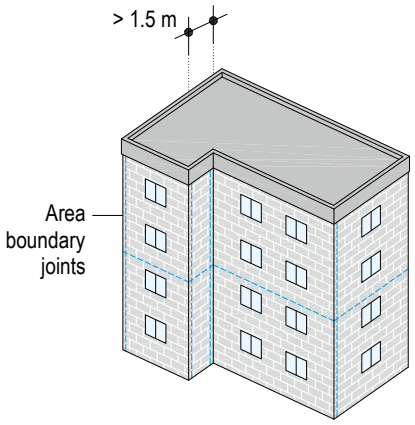
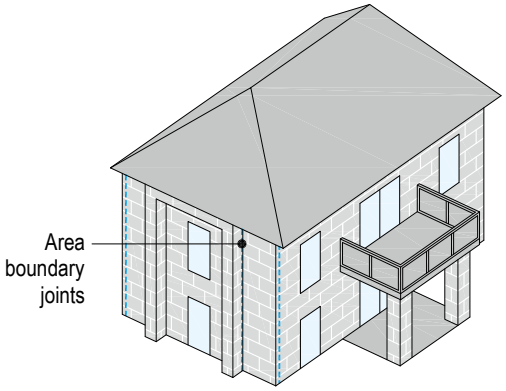
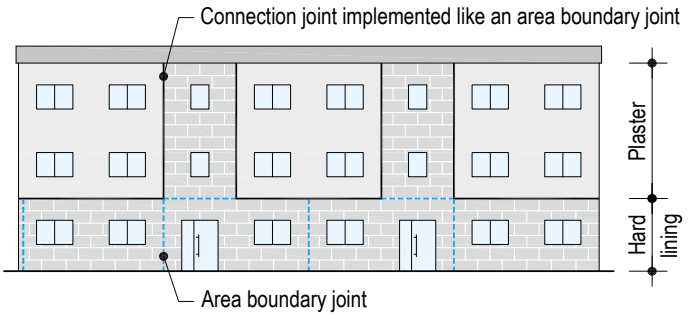
Calculation of the dowel length:

Anchoring depth **s** + (possibly 20 mm old render thickness) + façade equalization + 5 mm adhesive thickness + insulation material thickness **t**

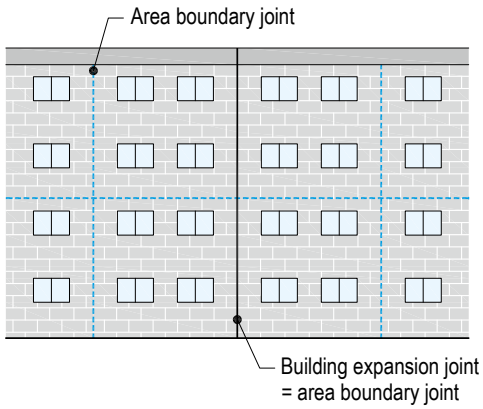
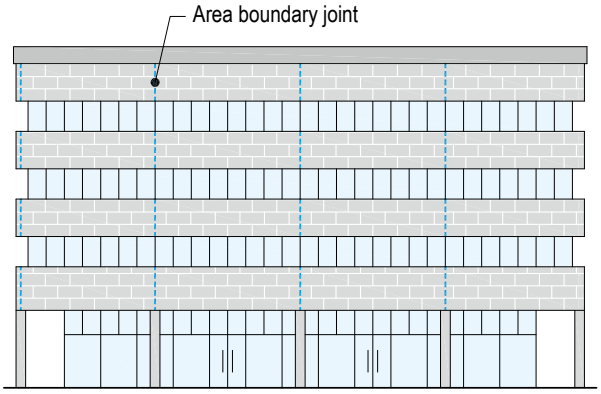
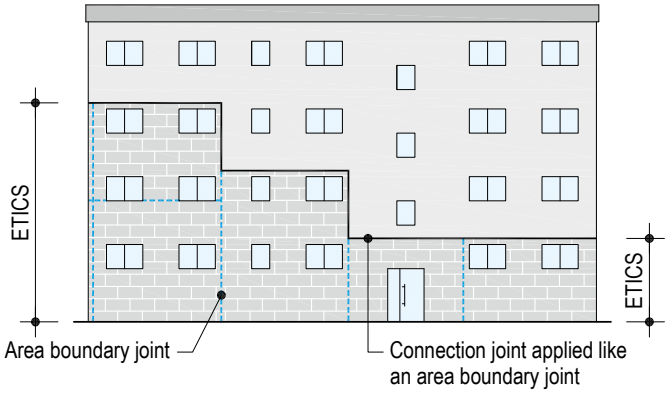
Arrangement of area boundary joints

Remark	Scheme drawings
Joint types	
Area boundary joints provide a separation of the External Thermal Insulation Composite Systems (ETICS) from the surface of the lining to the adhesive surface, and in exceptional cases up to at least half the insulation material thickness. They subdivide the façade surface into façade sections, which are subject to deformation independently of each other and that limit the thermal/hygric stresses in the insulation system. The minimum joint width of the surface of the covering up tp the insulation material is 10 mm, but should be considered in planning regarding the material and format as well as the colour of the clinker. **Connection joints** are joints, that are mainly formed to flanking constructional components, e.g. on windows, exterior doors or plaster surfaces, primarily using connection profiles. They can assume the function of an area boundary joint, when the joint width and separation of the layers correspond with the requirements for an area boundary joint. **Building expansion joints** are continuous between buildings or building sections, and are usually vertical joints. They must be included at the same position and in the same thickness through the entire ETIC system up to the surface of the lining. They can assume the function of an area boundary joint.	
Section / field sizes	
With the application of ETICS, generally the façade surfaces are limited to 6 m x 6 m by horizontal and vertical **area boundary joints**. The arrangement of these larger façade surfaces are to be determined by the planer for each project. On the building outer corners, a vertical area boundary joint is to be arranged for each corner. Planning is required to determine how much openings (windows, doors) are to be integrated.	
Building outer corners	
At every building outer corner, a vertical area boundary joint must be preferably applied are a distance of approx. 20 – 25 cm to the corner. A divergence for positioning of the outer corner must be defined in the planning stage. The side location of the vertical area boundary joint can be undertaken taking architectural aspects into consideration. It is recommended to apply the area boundary joints to consider the compass orientation. As the intensity of the sunlight is not equal on all façade surfaces, differing levels of thermal deformation result.	

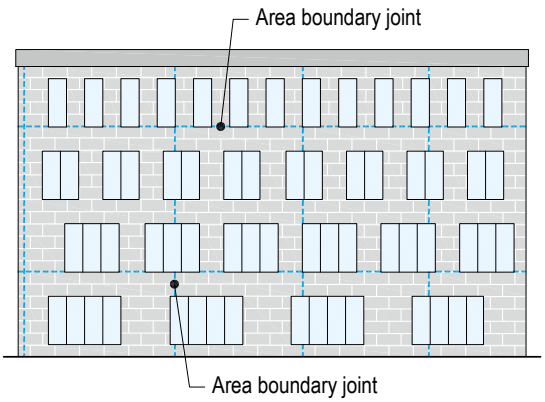
Area boundary joint arrangement (continued)

Remark	Scheme drawings
Building inner corners	
On building interior corners, the area boundary joint lengths are to be planned if an arm length is > 1.5 m. Preferably, the joints should be arranged on the shorter wall side.	
Pillars and pilaster strips	
With pillars and pilaster strips, the vertical area boundary joints can be generally omitted on their outside corners. It is recommended that an area boundary joint is arranged in the inside corner in which a pilaster strip is on the outer wall. Preferably, the joints should be arranged on the shorter wall side. Horizontal area boundary joints should be planned in case of very large section lengths well exceeding 6 m.	
Connection joints in the transition to plaster surfaces	
Transitions in ETICS between differing linings are preferably implemented as area boundary joints with prefabricated joint profiles.	

Area boundary joint arrangement (continued)

Remark	Scheme drawings
Building expansion joints	
Building expansion joints must be included in the entire ETICS across their width and can assume the function of area boundary joints.	
Large façade surfaces	
In case of large, continuous surfaces, a boundary is to be established by vertical area boundary joints as a spacing of approx. 6 m. When planning the joints we recommend that uniformly sized façade surfaces are created. If necessary, the spacings to the joints are to be selected smaller.	
Heterogeneous façade surfaces	
Structuring of the joints is necessary in case of systems with highly heterogeneous distribution of the surfaces to be clad. Arrange horizontal area boundary joints above the lintel area, and vertical area boundary joints with spacing beside the window reveals.	

Area boundary joint arrangement (continued)

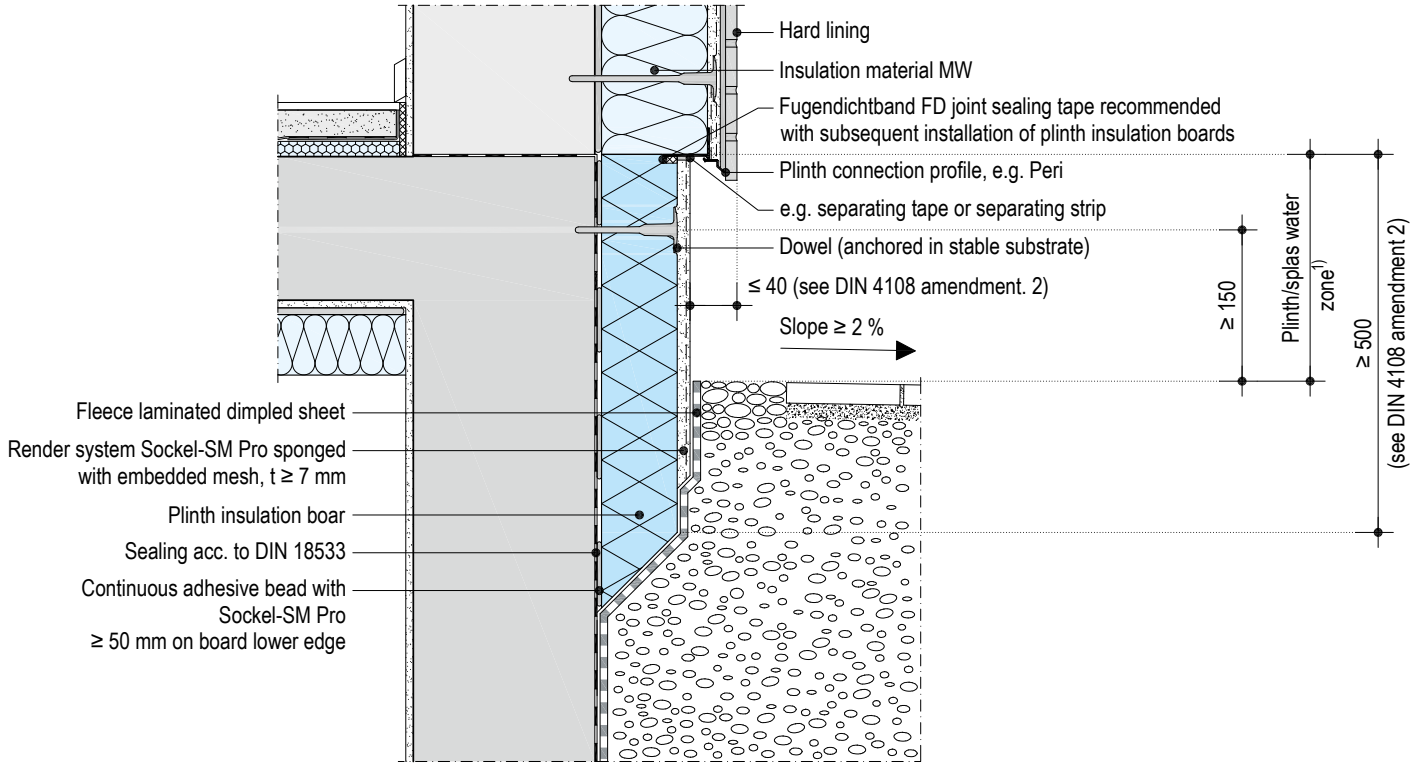
Remark	Scheme drawings
Exterior wall openings	
In case of façade surfaces that are segmented by the openings, engineering planning of the joints is required. Reveal: An area boundary joint can be omitted in the reveal area if the reveal depth of 150 mm is not greatly exceeded. Lintel area: Arrange a continuous horizontal area boundary joint above the lintel area.	

Minimal integration depth in the soil

Scale 1:10 I Dimensions in mm

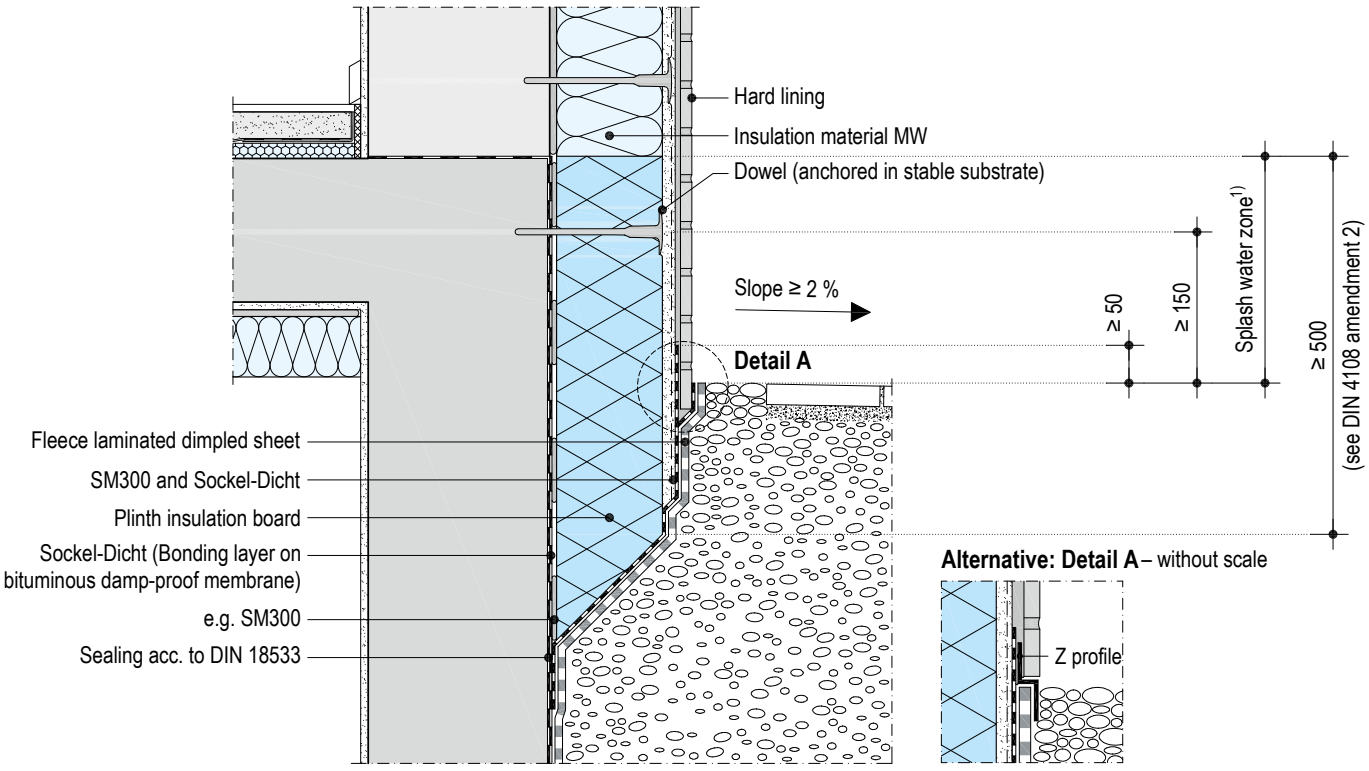
WE101e.de-SO-V5 Recessed plinth application

Application with Sockel-SM Pro



WE101e.de-SO-V2 Flush plinth application

Application without Sockel-SM Pro

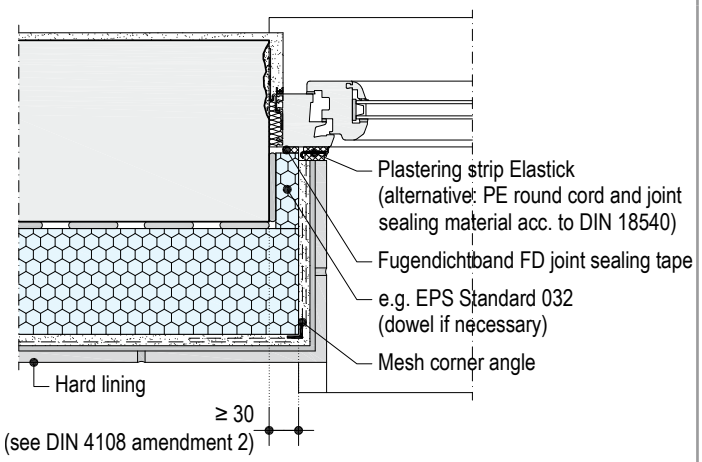


1) *Height ≤ 0.9 m when configured as a not easily flammable ETICS system (B1), height ≥ 0.3 m up to maximum 0.6 m when configured as a non-combustible ETICS system (A2).*

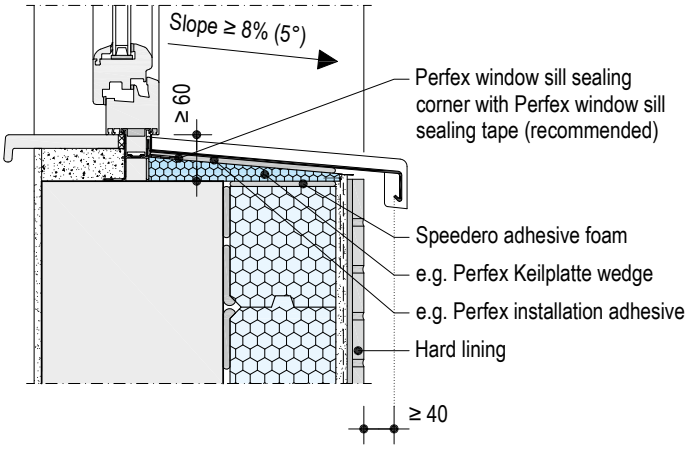
Window in the middle of the masonry

Scale 1:10 I Dimensions in mm

WE101e.de-FE-H1 Horizontal section

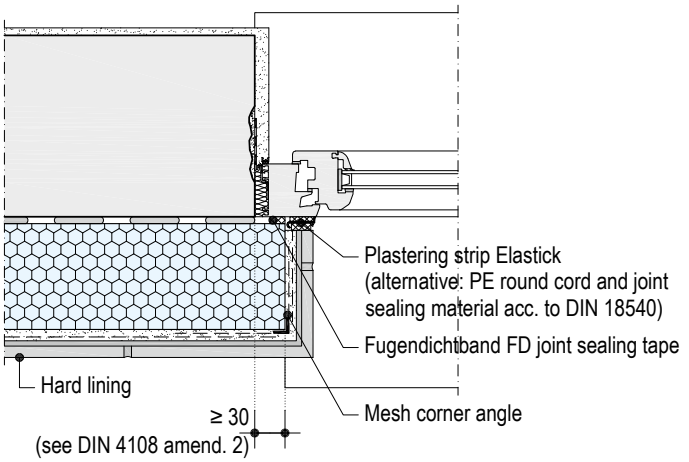


WE101e.de-FE-V1 Vertical section

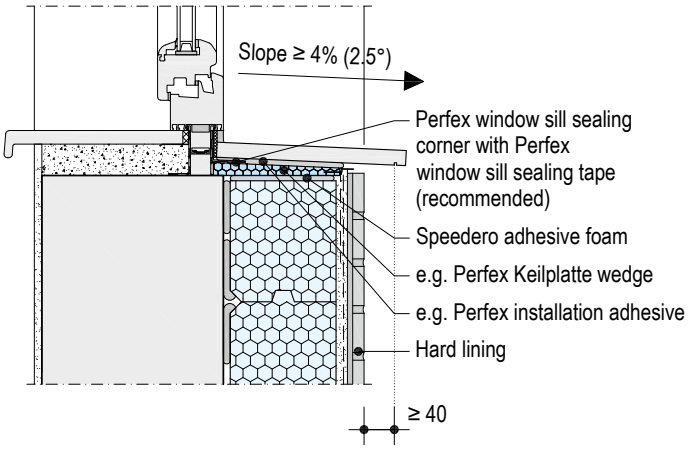


Window exterior flush with masonry

WE101e.de-FE-H2 Horizontal section



WE101e.de-FE-V7 Vertical section



Notes

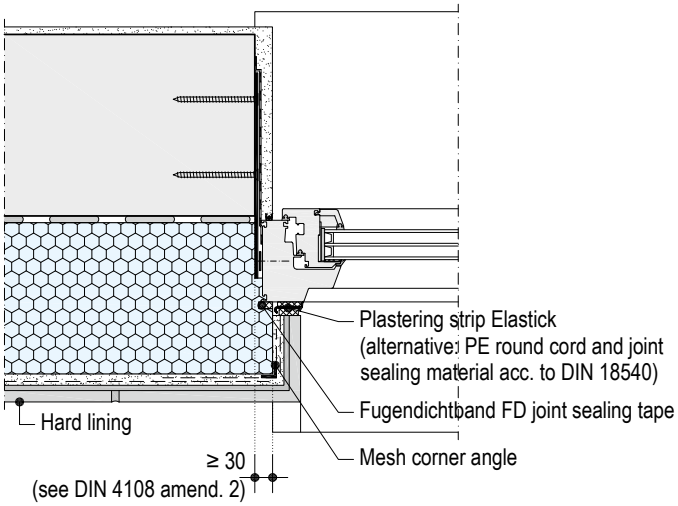
Ensure that all openings (interface gaps) are sealed.

The window installation and seals are represented schematically – refer to “Guideline on the installation of windows and doors” from the RAL-Gütegemeinschaft Fenster und Haustüren e.V. (German Quality Assurance Association Windows and Doors) or the guideline “Connection of windows and roller blinds with plaster, drywall and external thermal insulation composite systems” (German only) from the Fachverband der Stuckateure für Ausbau und Fassade Baden Württemberg, Germany.

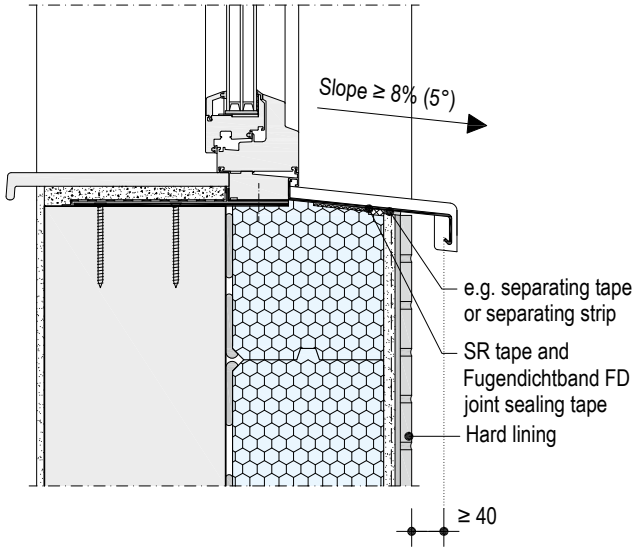
Window before the masonry

Scale 1:10 I Dimensions in mm

WE101e.de-FE-H3 Horizontal section



WE101e.de-FE-V3 Vertical section



Notes

Ensure that all openings (interface gaps) are sealed.

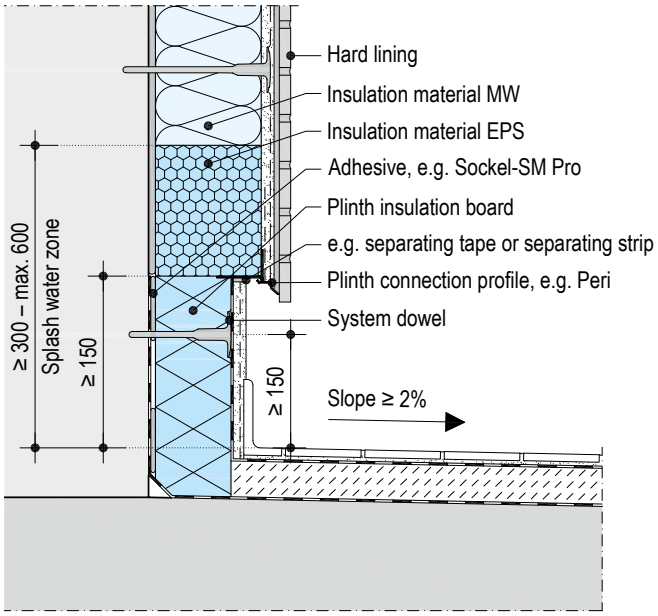
The window installation and seals are represented schematically – refer to “Guideline on the installation of windows and doors” from the RAL-Gütegemeinschaft Fenster und Haustüren e.V. (German Quality Assurance Association Windows and Doors) or the guideline “Connection of windows and roller blinds with plaster, drywall and external thermal insulation composite systems” (German only) from the Fachverband der Stuckateure für Ausbau und Fassade Baden Württemberg, Germany.

Balcony and terrace connections

Scale 1:10 I Dimensions in mm

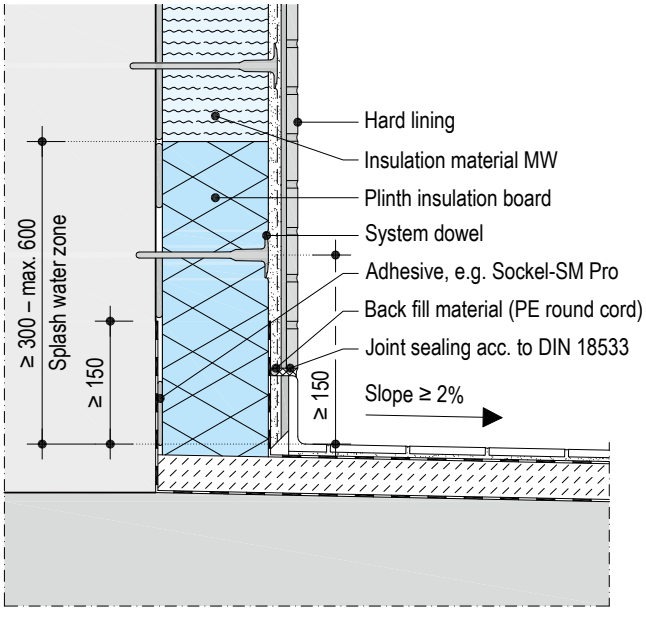
WE101e.de-BA-V3 Projecting balcony slab or terrace

Recessed plinth application



WE101e.de-BA-V2 Projecting balcony slab or terrace

Flush plinth application



Notes

In case of application of WARM WALL Ceramic and WARM WALL Natural Stone with MW insulation, the application of EPS insulation materials in the splash water zone is limited to a maximum height of 0.6 m above solid fire-resistant cantilever slabs. In case of walkways and escape routes, the maximum height of the EPS insulation materials in the splash water zone is limited to 0.3 m.

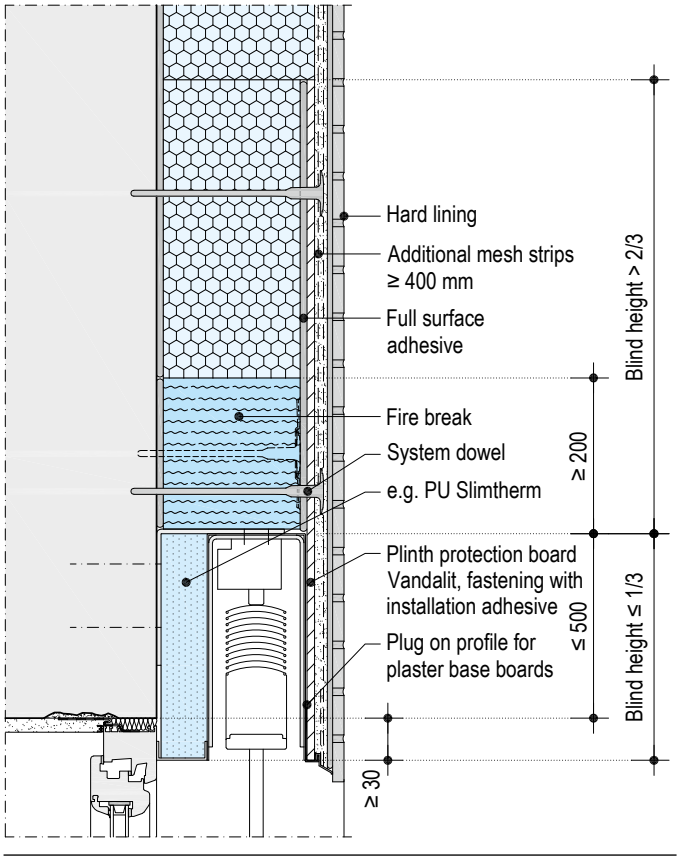
Observe the “Façade plinth render/External components” (German only), issued by Fachverband der Stuckateure für Ausbau und Fassade Baden-Württemberg, as well as the DIN 18531.

Lintel design for sun screening

Scale 1:10 I Dimensions in mm

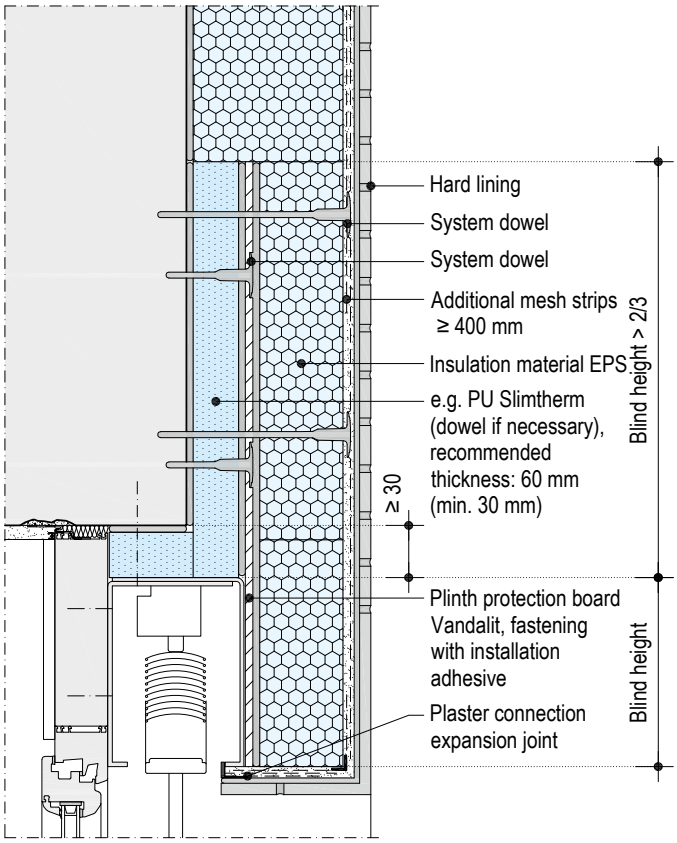
WE101e.de-FE-V4 Roller blind

Without insulation covering – Fire protection measures against room fire



WE101e.de-FE-V6 Roller blind

With insulation covering – ETICS as flammable system (B2)



1) See DIN 4108 amendment 2.

Notes

Rear-side coating of the plinth protection board Vandalit as moisture protection is recommended.

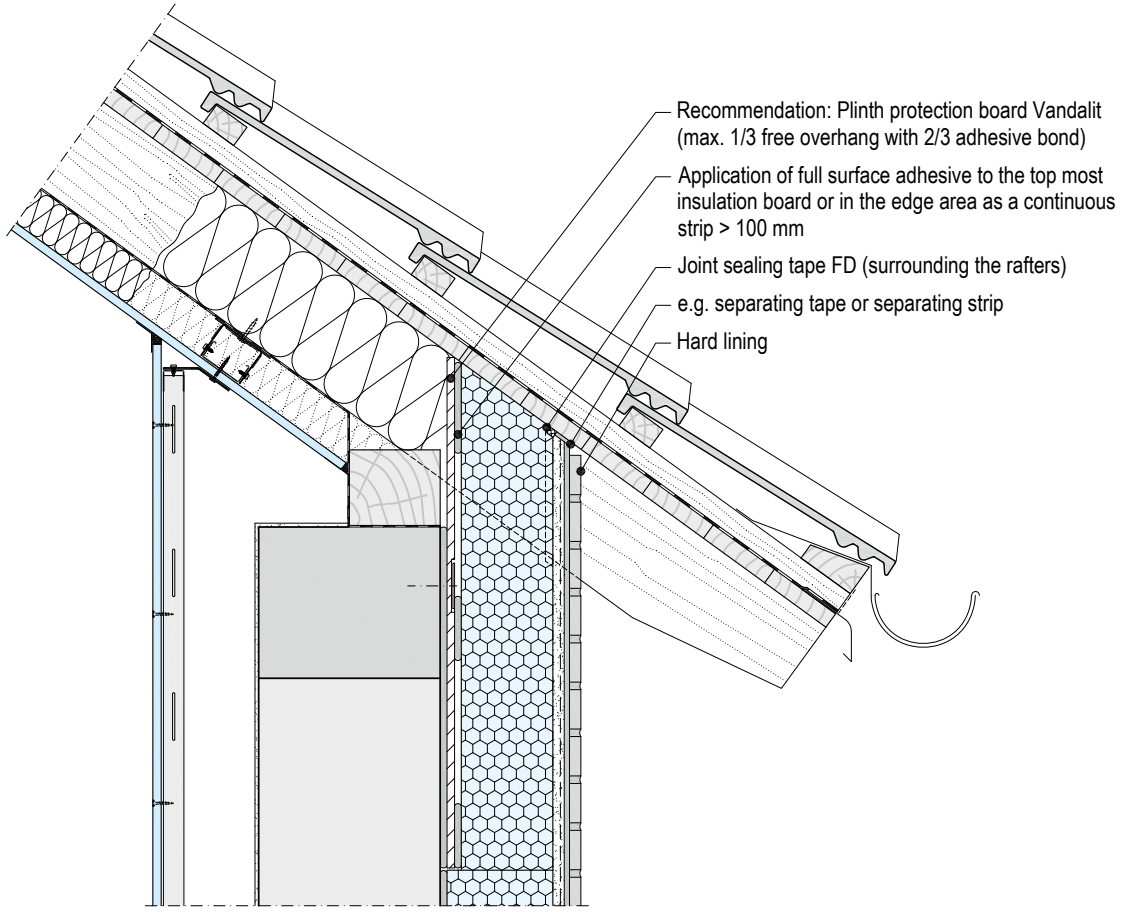
Ensure that all openings (interface gaps) are sealed.

The window installation and seals are represented schematically – refer to “Guideline on the installation of windows and doors” from the RAL-Gütegemeinschaft Fenster und Haustüren e.V. (German Quality Assurance Association Windows and Doors) or the guideline “Connection of windows and roller blinds with plaster, drywall and external thermal insulation composite systems” (German only) from the Fachverband der Stuckateure für Ausbau und Fassade Baden Württemberg, Germany.

Connections to roof

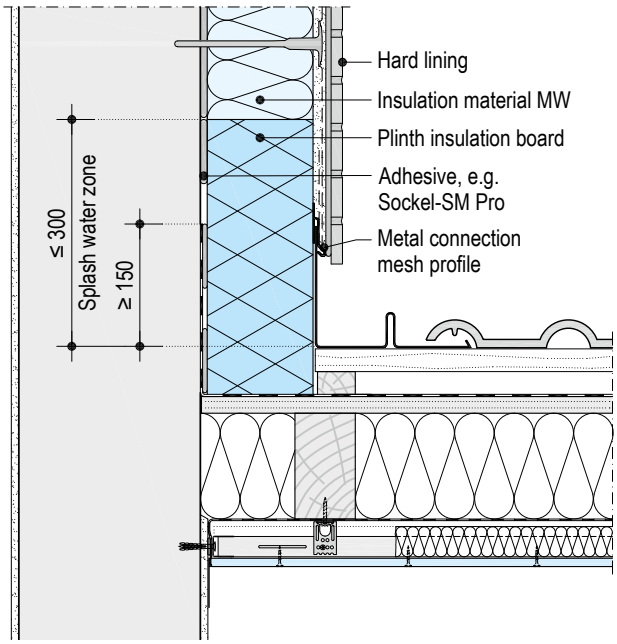
WE101e.de-DA-V1 Eaves connection to roof weatherboarding

Scale 1:10 I Dimensions in mm

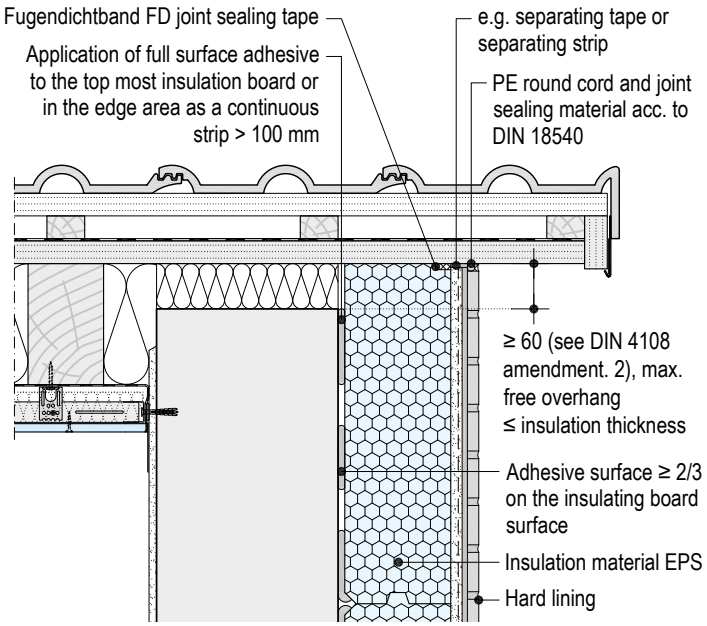


WE101e.de-DA-V3 Steep roof connection to rising wall

With metal connection mesh profile



WE101e.de-DA-V5 Bargeboard connection



1) *Refer to "Ausführung luftdichter Konstruktionen und Anschlüsse - Implementing airtight constructions and connections (German only)" issued by the Fachverband der Stuckateure für Ausbau und Fassade Baden-Württemberg, Germany.*

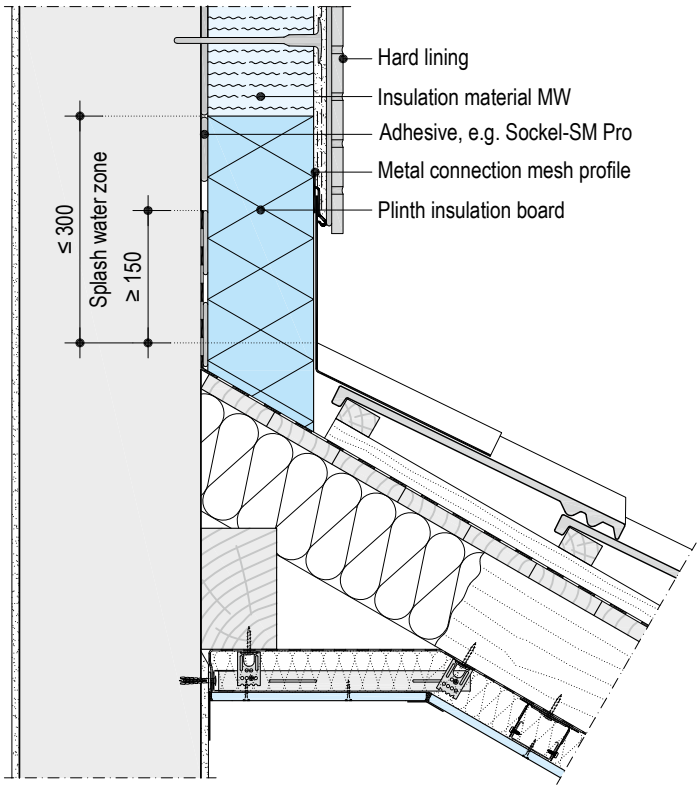
Note	Observe guideline "Metallanschlüsse an Putz und Wärmedämm-Verbundsysteme - *Metal connections to render and external thermal insulation composite systems*", (German only) from the Fachverband der Stuckateure für Ausbau und Fassade Baden Württemberg, Germany as well as the DIN 18531.

Connections to roof (continued)

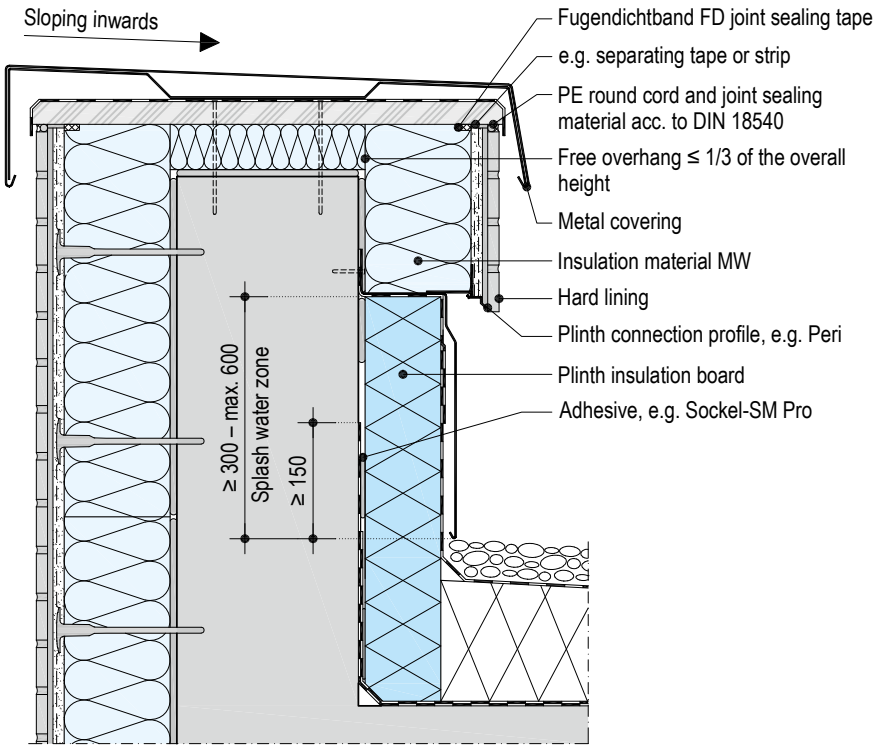
Scale 1:10 I Dimensions in mm

WE101e.de-DA-V10 Pitched roof connection to rising wall

With metal connection mesh profile



WE101e.de-DA-V11 Flat roof connection, attic coverings



1) Spacing and heights of bevelled ends and borders to coverings as well as drip edge spacings are subject to the technical regulations for plumbers and roofers.

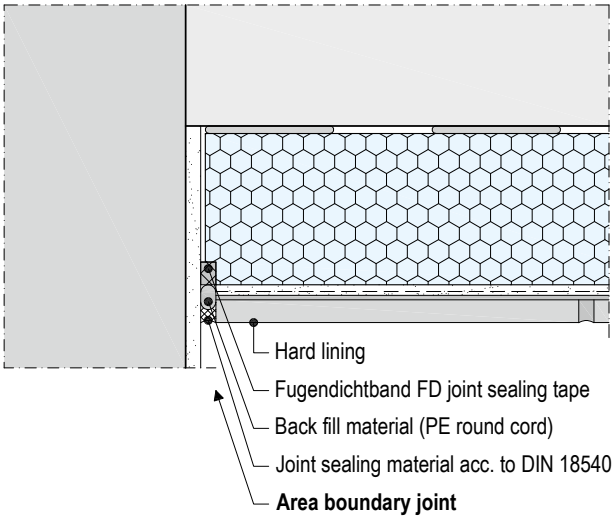
Note	Observe guideline “Metallanschlüsse an Putz und Wärmedämm-Verbundsysteme - *Metal connections to render and external thermal insulation composite systems*”, (German only) from the Fachverband der Stuckateure für Ausbau und Fassade Baden Württemberg, Germany as well as the DIN 18531.

Connection joints

Scale 1:5 I Dimensions in mm

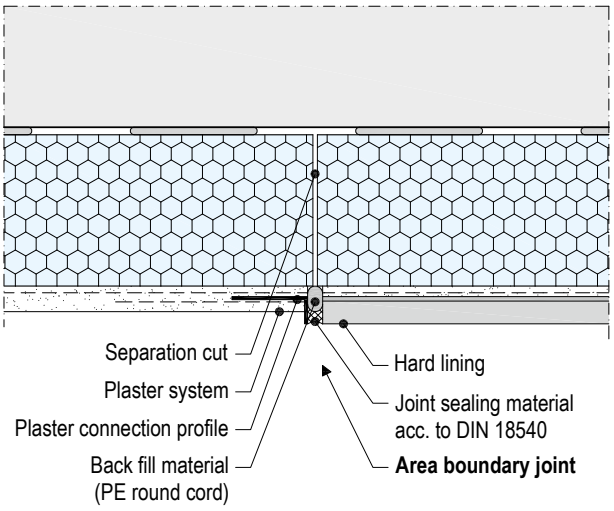
WE101e.de-FU-H3 Connection joint to existing constructional component

With backfill material and joint sealant



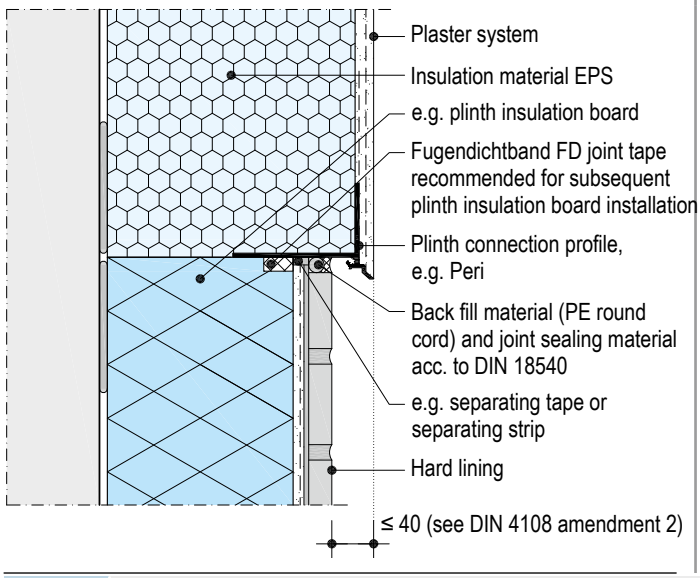
WE101e.de-FU-H6 Transition plaster/ceramic – vertical

With backfill material and joint sealant



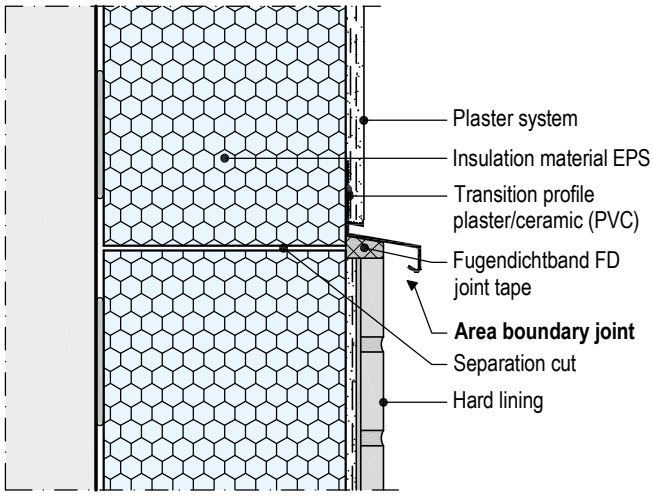
WE101e.de-FU-V3 Transition plaster/ceramic – horizontal

Recessed with Sockel-Abschlussprofil Peri plinth profile



WE101e.de-FU-V4 Transition plaster/ceramic – horizontal

Projecting with transition profile plaster / ceramic



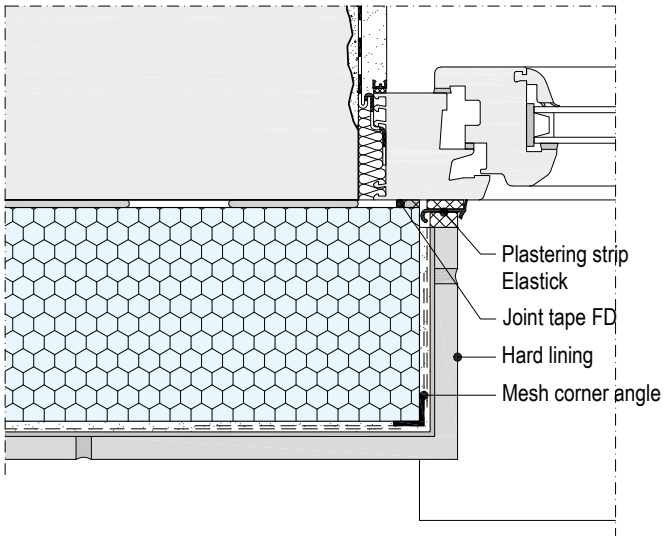
Note	Connection joints acc. to DIN 18515-1 should be at least 10 mm wide and driving rain proof.

Connection joints (continued)

Scale 1:5 I Dimensions in mm

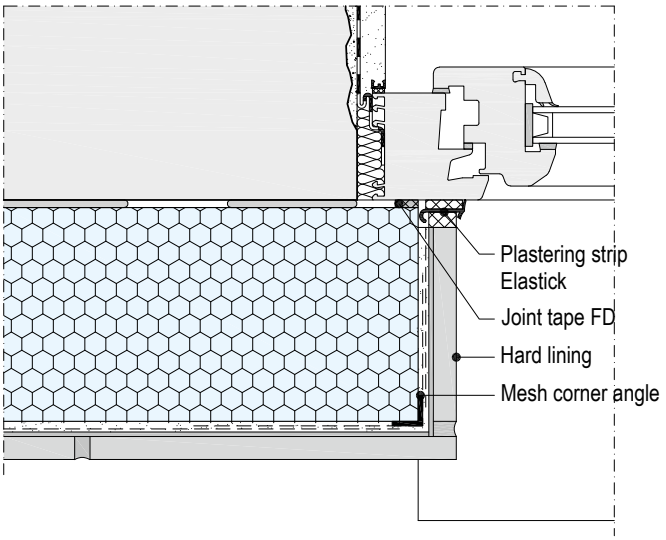
WE101e.de-FU-H7 Reveal with corner facing bricks

No area boundary joint with reveal depth up to approx. 150 mm



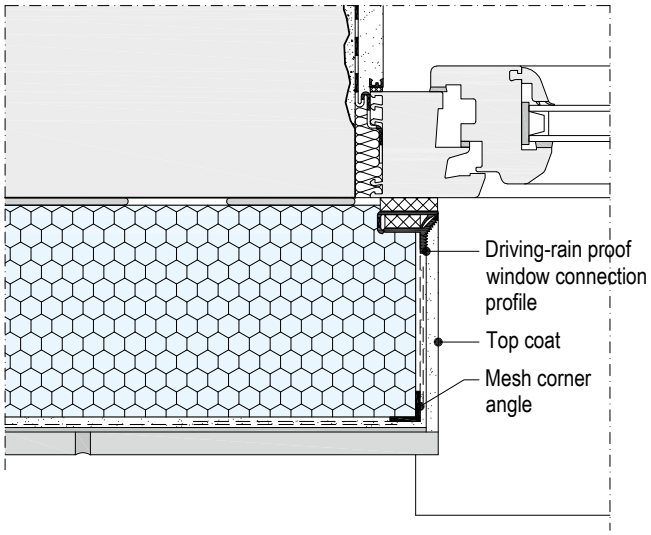
WE101e.de-FU-H8 Reveal with one-quarter tile

Fixed jointing on the reveal corner



WE101e.de-FU-H9 Reveal with plaster

Plaster connection directly on the one-quarter tile



1) In case driving-rain proofing has not been certified, an additional Fugendichtband FD joint sealing tape must be installed.

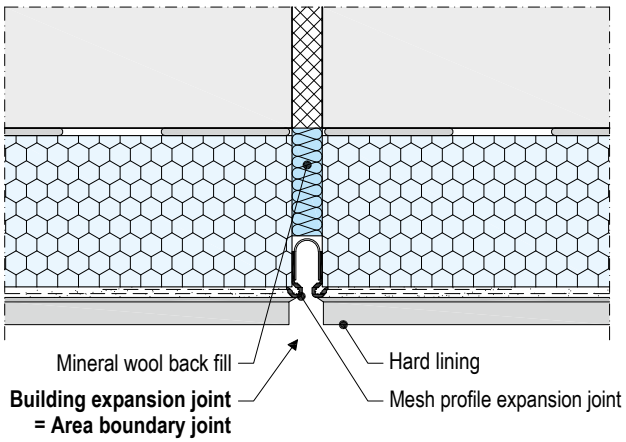
Notes	Connection joints acc. to DIN 18515-1 should be at least 10 mm wide and driving rain proof. Joints in the window reveal or lintel area can also assume the function of an area boundary joint.

Building expansion joints

Scale 1:5 I Dimensions in mm

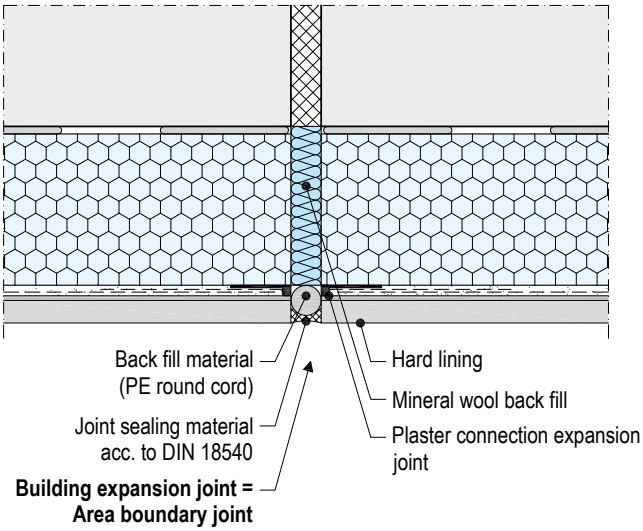
WE101e.de-FU-H5 Building expansion joint (vertical)

With mesh profile expansion joint, not in the firewall area



WE101e.de-FU-H4 Building expansion joint

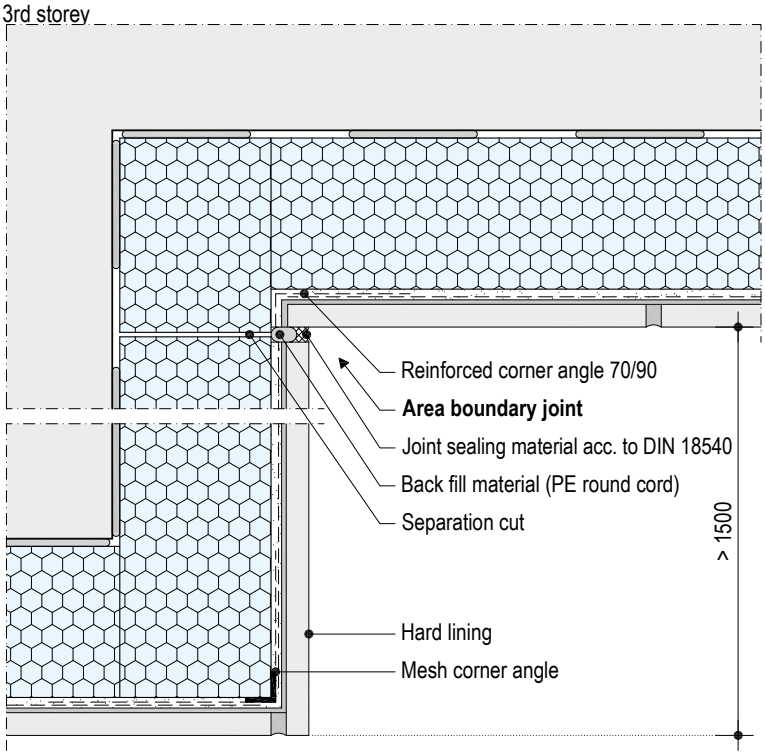
With plaster connection expansion joint, not in the firewall area



Area boundary joints

WE101e.de-FU-H10 Building inner corner

Reinforced corner angle is necessary for fire protection measures up to the 3rd storey



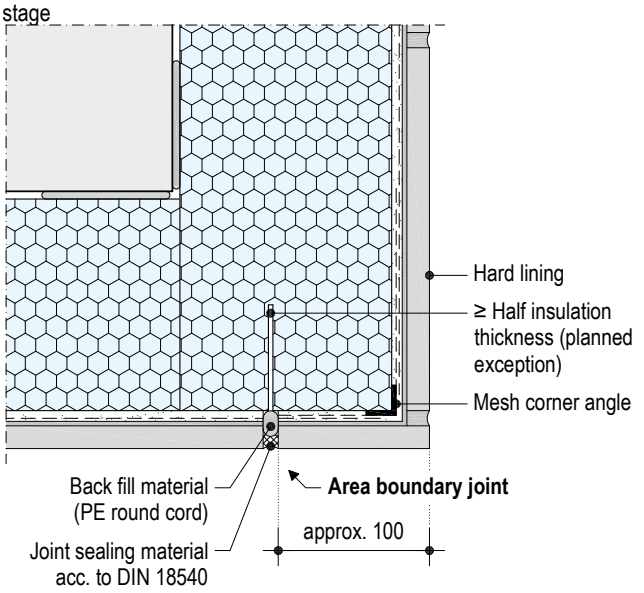
Notes	WARM WALL Ceramic and Natural Stone may not be used to bridge expansion joints in the exterior wall surfaces (e.g. in the exterior wall surfaces of large-panel constructions). Building expansion joints must be included in the entire ETICS in the same width. Joints in the building inside corners are formed as area boundary joints. Divergences must be defined in the planning stage. The joints are arranged preferably on the short wall side, see page 31.

Area boundary joints (continued)

Scale 1:5 I Dimensions in mm

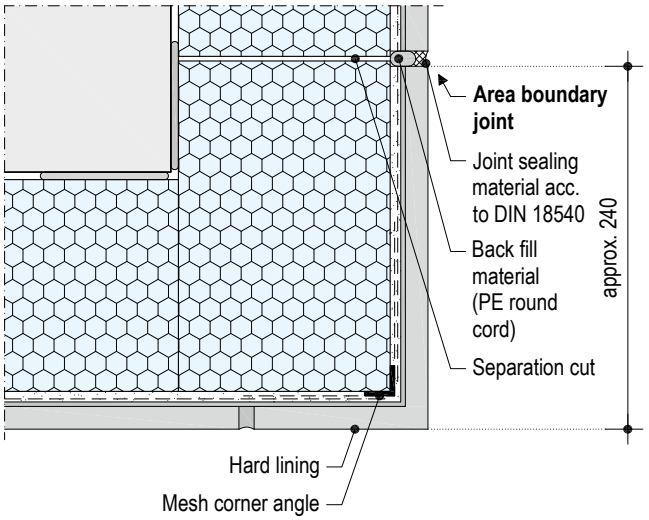
WE101e.de-FU-H1 Joint on building outer corner

Without corner facing brick, spacing to corner to be determined in planning stage



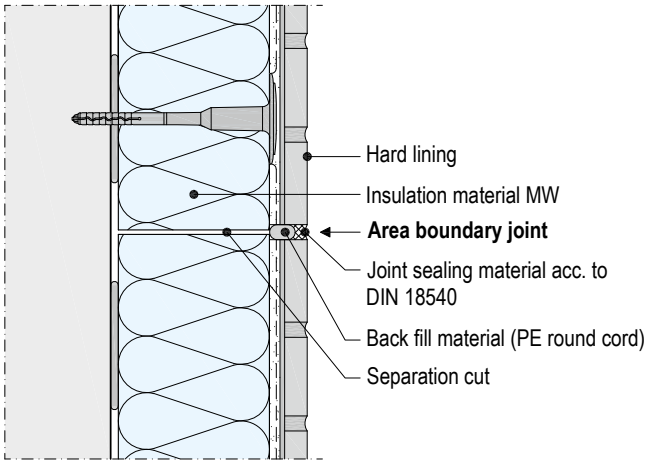
WE101e.de-FU-H11 Joint on building outer corner

With corner facing brick, recommended spacing to corner



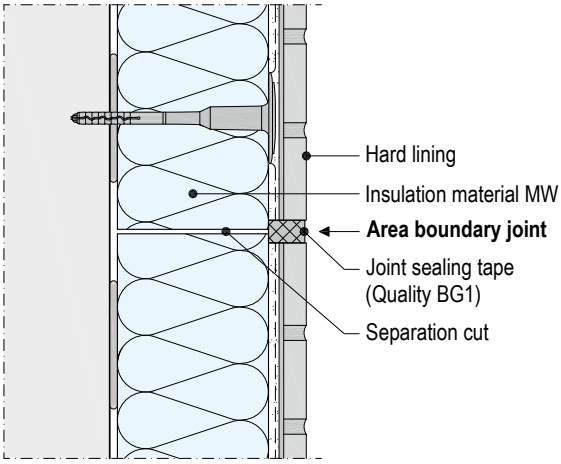
WE101e.de-FU-V1 Horizontal and vertical joint

With backfill material and joint sealant



WE101e.de-FU-V5 Horizontal and vertical joint

With joint sealing tape



Note	Spacings of horizontal and vertical area boundary joints, see page 30.

Preconditions

Protect mineral wool insulation materials against moisture.
All connections and detail features as well as the arrangement of the area boundary joints must be clarified before application.
The necessary substrate preparation must be undertaken on a case-by-case basis and must be described in full detail in the tender specifications.
Substrate tests and possible measures are listed in this system data sheet on page 45.
The surface of the substrate must be dry, even and free of grease and dust as well as free of any residual substances that may reduce the adhesion.
Check the stability of existing coatings (paint coatings and old plasters) and compatibility with adhesive, and remove unstable coatings completely if necessary.
The stability and loadbearing capacity of the dowel must be tested in non-standardized substrates.
Rising damp may not be present.
All applied connections must be planned as driving-rain proof.
Ensure that all openings (interface gaps) are sealed.
The internal plastering and screed works should be completed and the components should be dry enough so that an excessive accumulation of moisture is avoided.
The contractor is solely responsible for inspecting the condition of the substrate and the on-site conditions.
The ambient temperature, substrate and material temperature must be at least +5 °C and may not exceed +30 °C during the entire application, drying and setting phase.
Unfavourable weather influences such as high temperatures, wind or direct sunlight can negatively affect the application conditions. Protect the insulation materials, in particular, grey insulation boards with suitable measures against exposure to direct sunlight and UV exposure as well as moisture during storage and application until the adhesive has fully set.
Only cold, clean water (drinking water quality) may be used as mixing water. Water up to a temperature of +30 °C may be used on building sites in spring and autumn.
Cover or apply a watertight covering to easily-soiled building components (e.g. window sills) prior to application. Observe the Code of Practice "Abklebe- und Abdeckarbeiten für Maler- und Stuckateurarbeiten - *Masking and covering for painting and stucco work*" issued by the German Bundesverband Ausbau und Fassade. Protect surfaces from precipitation and direct sunlight.

Machine technology from Knauf PFT for the application of ETICS

Bonding and reinforcement mortar	Mixing pump/ feed pump	Stator/ rotor	Mortar hoses	Wet mortar pumping distance
SM700 Pro, SM700	G 4	D4-3 with Rotoquirl	Ø 25 mm	Up to 30 m
	RITMO L plus	B4-2L with Rotomix	Ø 25 mm	Up to 20 m
SM300	G 4	D4-3	Ø 25 mm	Up to 30 m
	RITMO L plus	B4-2L	Ø 25 mm	Up to 20 m
	PuMax	Ex-works	Ø 35 + 25 mm	Up to 65 m
Sockel-SM Pro, Sockel-SM	G 4	D4-3 with Rotoquirl	Ø 25 mm	Up to 30 m
	RITMO L plus	B4-2L with Rotomix	Ø 25 mm	Up to 15 m
Lustro	G 4	D4-3	Ø 25 mm	Up to 40 m
	RITMO L plus	B4-2L	Ø 25 mm	Up to 20 m

For further information on machine engineering see: pft.net

Substrate inspection and preparation

Unevenness in the substrate up to a maximum of 20 mm can be covered with the adhesive if dowelling is used additionally. Otherwise, only unevenness up to 10 mm can be equalized with adhesive. Major unevenness should be equalized mechanically using a suitable layer or render or by staggering the insulation panel thickness. The bond strength of the plaster should be tested after it has set.

Substrate inspection and preparation for adhesive application of ETICS

Inspect for	Test method	Indication	Technical instructions and measures
Surface strength	Scratch test with a solid, angular object	Surface is damaged with moderate pressure	Remove loose, crumbling or brittle parts manually or with a machine; soft layers are not a stable substrate for ETICS.
	Rubbing off by hand	Low abrasion	Treat the constructional component surface with a plaster reinforcing priming layer (Grundol – silicone reinforced deep primer E.L.F.).
		With strong abrasion, extensive abrasion	Select additional dowelling for the insulation panels; remove the non-stable plaster / coating.
	Wet until saturation with water and apply scratch test	The surface softens with a wetting capacity spot test	Remove the non-stable plaster / coating.
Stability of existing older layers	Cross-cut test	Coating components splinter with moderate pressure; scratch impression is jagged or bulged	Remove the old coating / plaster, if necessary use additional mechanical fixing
Compatibility with existing old coating	Tear-off test	Detachment[1)]	Remove the old coating / plaster, if necessary use additional mechanical fixing
Moisture[1)]	Visual inspection and scratch test if required	Damp areas, stains, discolouration's are evident	Technical / physical building causes should be remedied on the construction; allow to dry
Blooming (efflorescence)	Visual inspection	Usually white salts or leaching of lime deposits	Technical / physical building causes should be remedied on the construction; then allow to dry off and remove dry salt deposits
Moss, algae, mould[1)]	Visual inspection	Green or dark fouling	Remove mechanically or by using a high pressure hot water cleaning jet, disinfect the affected area if necessary.
Other soiling	Visual inspection, haptic test (touch test)	Colour, smearing, tackiness	Remove soiling.
Absorbency	Wetting capacity spot test with water	With high absorbency, quick absorption of water and quick darkening of the surfaces	Highly absorbent substrates or substrates with varying levels of absorbency should be treated with a primer to balance the rates of absorption.

1) *Observe further details in acc. with Code of Practice No. 21 "Technische Richtlinien für die Planung und Verarbeitung von Wärmedämm-Verbundsystemen - Technical guidelines for planning and application of external thermal insulation composite systems" issued by the Bundesausschuss Farbe und Sachwertschutz (German only).*

Insulation material – adhesive bonding

Mix adhesive with clean water according to the instructions in the current product data sheet.

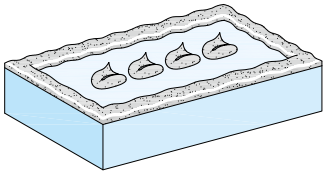
Adhesive side of the insulation panels

- EPS Standard: Side can be freely selected
- EPS Nut&Feder: Side with tapered edges (dabs of mortar)
- EPS SunJa 032: Grey side
- Mineral wool insulation material: marked side

Manual application of mortar on insulation material

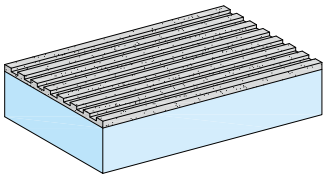
Partial surface adhesive (adhesive area ratio of ≥ 60 %)

Cannot be used for MW Volamit 040. The edge ribbon and dab bonding for EPS insulation materials and mineral wool boards is undertaken manually. The adhesive bonding surface with the substrate is ≥ 60 % after pressing in the insulation panels. Apply an approx. 50 mm wide ribbon of mortar around the perimeter and 4 palm-sized adhesive dabs or strips on the insulation panel.



Full-surface adhesive bonding

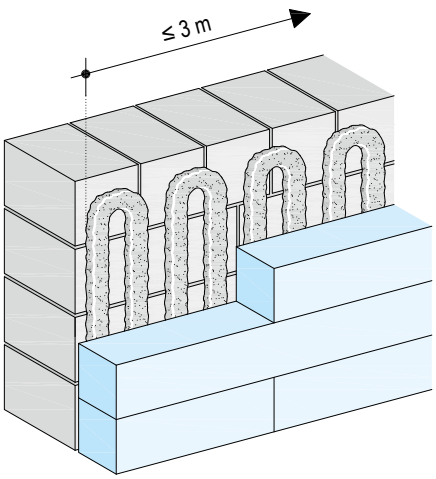
On even substrates it is possible to apply the adhesive mortar on the entire surface of the insulation board elements with a notched trowel.



Machine mortar application on substrate

Partial surface adhesive (adhesive area ratio of ≥ 60 %)

Apply machine applied adhesive in the form of mortar dabs directly on the substrate at spaces of maximum 100 mm using the meandering method and apply the insulation material elements immediately by pushing, floating and pressing. Observe the marked sides with insulation materials made of mineral wool. The required adhesive bonding surface here must be at least 60 % after pressing in the insulation material element. Apply a continuous strip of adhesive in the edge areas. Only apply a maximum of 3 m of adhesive in advance to the surface being worked.



Full-surface bonding

Alternatively, for EPS insulation materials as well as mineral wool boards and mineral wool lamellae with adhesive coating, the adhesive mortar can also be applied over the entire surface on even substrates. Run a notched trowel through the adhesive directly before applying the insulation material elements.

Plinth and splash water zone

Inspect / supplement the building waterproof sealing before insulation work. The splash water zone insulated with plinth insulation boards must be applied up to a height of at least 300 mm above ground level. In case a non-combustible ETICS with mineral wool insulation materials is used, the plinth and splash water area can be insulated with plinth insulation panels (EPS) up to a height of 600 mm above the edge of the ground line and in areas of escape routes up to a height of 300 mm. In the case of a not easily flammable ETICS, plinth insulation boards (EPS) can be installed up to a height of 900 mm above the upper edge of the ground line.

Adhesively bond plinth insulation panels using adhesive mortar on mineral or bituminous waterproofing of buildings. The adhesive application is across the entire surface or using an edge ribbon and dab bonding method with an adhesive surface of at least 60 %. The lower edge of the plinth insulation board must have a continuous strip applied at least 50 mm wide. It is recommended that the lower edge of the plinth insulation board has a slope cut with minimal integration into the soil (up to 500 mm above the ground line), see guideline “Façade plinth render/External components” (German only), issued by Fachverband der Stuckateure für Ausbau und Fassade Baden-Württemberg. Allow a setting time of at least 48 hours before continuing work.

Adhesive bonding on bituminous substrates

In case of mineral adhesives (not necessary with Sockel-SM Pro), apply Sockel-Dicht on two component, bituminous substrates as a bonding layer and roughen the surface with a broom. Allow to dry and set fully before continuing.
Insulation material more than 150 mm above the edge of the ground line must be anchored with dowels.

Notes	For further information on the installation and application of insulation panels and plaster system in the plinth area, see pages 47 to 55. Observe the “Façade plinth render/External components” (German only), issued by Fachverband der Stuckateure für Ausbau und Fassade Baden-Württemberg, as well as the DIN 18533.

ETICS façade surface

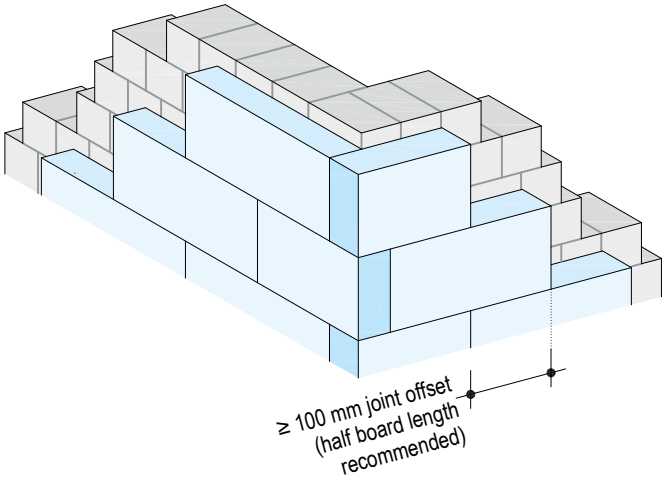
Install the plinth connection end profile horizontally and fix using anchor nails at spacings of approx. 300 mm. Compensate for substrate tolerances with washers. Connect the joints and the plinth connection end profiles with H connectors. Provide the outside corners with the appropriate mitring. Push on plinth profile made of plastic with drip edge and integrated reinforcement mesh strips on the plinth connection end profile ensuring joint offsetting to the insulation material element and plinth connection end profile.

In case of perimeter insulation boards / plinth insulation boards on existing ETICS or if a plinth connection profile is used, insert Fugendichtband FD joint sealing tape between the perimeter insulation board / plinth insulation board and the plinth connection profile. In case of ETICS connected to existing perimeter insulation boards / plinth insulation boards, use of a Peri plinth profile is recommended. Embedding a joint sealing tape is unnecessary (see page 52).

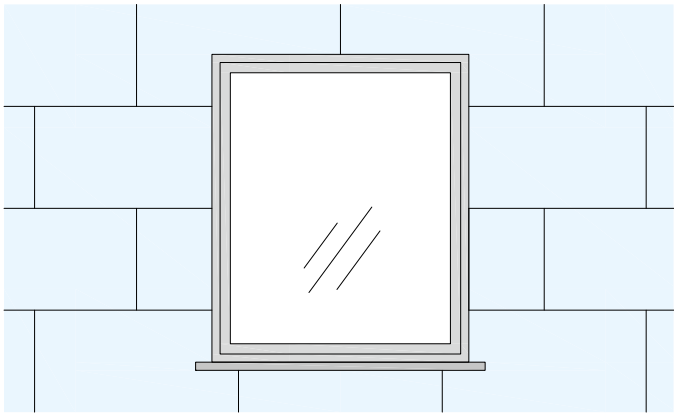
Insulation material – adhesive bonding (continued)

Apply insulation boards immediately to the fresh adhesive by pushing, floating and pressing. Apply the insulation material elements precisely and continuously starting from the bottom with the joints staggered at ≥ 100 mm (half panel length recommended for joint staggering). Avoid cross joints, e.g. on opening corners. At corners of openings (windows, doors), the insulation boards must be applied so that the board joints are preferably not in the direct vicinity of the corners.
Use corner grooving on building corners.
When using mineral wool boards above openings (e.g. lintel area) the minimum board height must be ≥ 2x insulation material thickness.
Adhesive may not be present on the insulation board joints. Open board joints must be filled. Joints up to 5 mm in width can be filled with B1 foam. Board joints > 5 mm or voids should be filled cleanly with equivalent insulation material strips.
Apply the lower, upper and lateral edges of the insulation surface with a continuous strip of adhesive applied to ensure that back ventilation is excluded.
Connections to adjacent constructional components and penetrations should made driving-rain proof with joint sealing tape FD. Install window sills to be driving-rain proof.
Allow a setting time of at least 48 hours before continuing work.

Corner configuration



Window and door openings



Avoid cross joints

Insulation material – Dowelling

The wall must be sufficiently stable to allow the use of dowels.
Insulation materials on the façade surface are to be fastened using certified dowels to ensure structural compliance. The scheme overview on page 24 and 25 indicates the necessity for dowelling, the number of dowels that are required and the installation under or through the mesh.
Dowel extraction tests are to be performed for substrates not stipulated in the respective dowel certifications or whose characteristics are unknown.
The number of dowels can be taken from the tables on pages 27 to 28. The wind loads acc. to the simplified method can read off on page 27. The wind loads can be determined in acc. with DIN EN 1991-1-4 and DIN EN 1991-1-4/NA.
The rated diameter of the drill bit must be 8 mm.
For perforated brick masonry, the bore should only be drilled with no hammer drill action. Drill holes should be arranged so that the concrete reinforcement is not damaged. Drill hole depth from insulation material or basecoat mortar surface = dowel length + 10 mm. Clean the drill holes before the dowels are applied.
Do not use worn drill bits. Resharpening of the drill bit is not permissible.
The substrate temperature must be ≥ 0 °C when placing a dowel. The exposure to UV light with direct exposure to sunlight for the dowel and insulation material elements may not exceed 6 weeks.

Dowels under the mesh

The option for this dowelling can be found on the overview on page 25. Application of the dowels can commence after the adhesive has hardened sufficiently. The dowel patterns on page 48 are to be considered.

Dowels through the mesh

The option for this dowelling can be found on the overview on page 24 and 25. The dowel must be set in the fresh basecoat layer after the application of the basecoat and the embedding of the reinforcing mesh. Then immediately (wet plaster on wet plaster) apply a second layer of basecoat. The dowels should be distributed evenly across the surface. The dowel patterns on page 49 are to be observed.

Installation requirements

The installation method and the number of dowels per m^2 can be found in the tables on page 27 and 28. The dowels to be used, in dependence on the insulation material, the lining and the system weight are described on page 29.
Allow a setting time of at least 48 hours before continuing work.

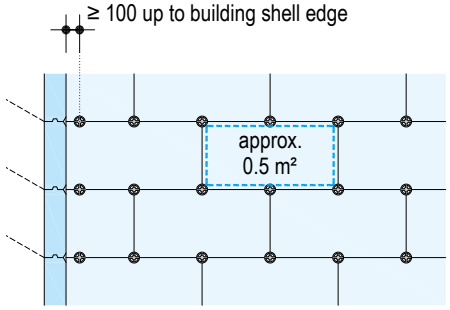
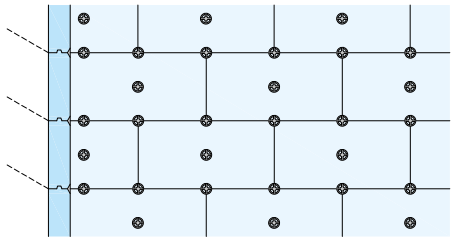
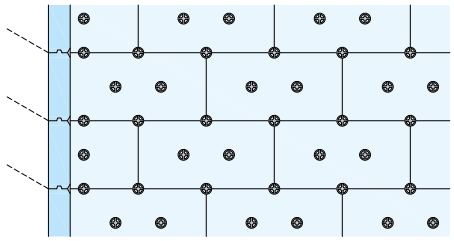
Plinth and splash water zone

Apply additional constructional, mechanical fixing of the insulation boards from a height of 150 mm measured above the edge of the ground line, e.g. for bituminous or painted substrates with general building authority approved dowels (2 dowels per board).

Dowelling under the mesh for EPS with wind suction ≤ 1.0 kN/m² (no natural stone lining)

Dowel arrangement under consideration of DIN 55699:2017-08

Scheme drawings I Dimensions in mm

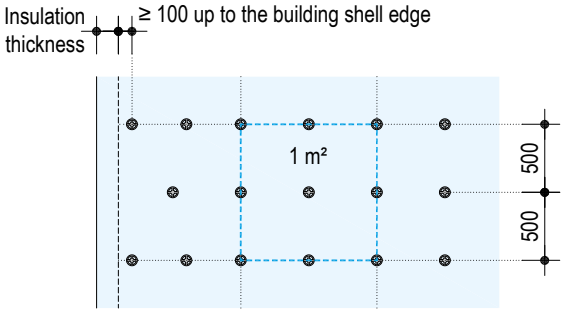
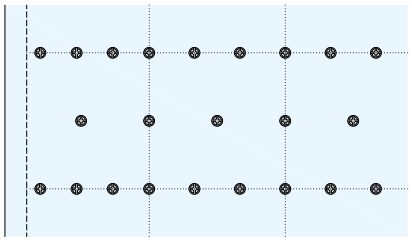
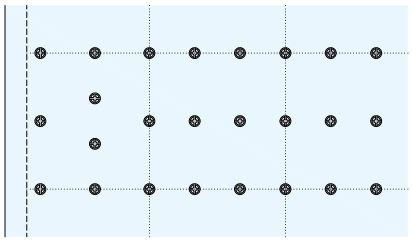
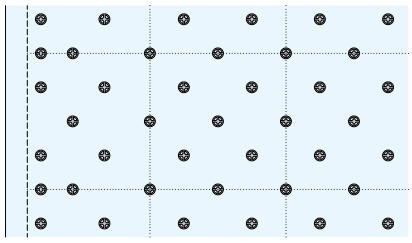
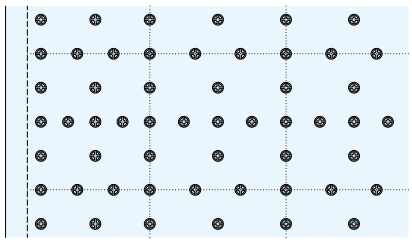
Number of dowels	Dowel arrangement
4 dowels/m²	
6 dowels/m²	
8 dowels/m²	

Dowel rating online see: knauf.de/duebelrechner.

Dowelling through the mesh

Dowel arrangement under consideration of DIN 55699:2017-08

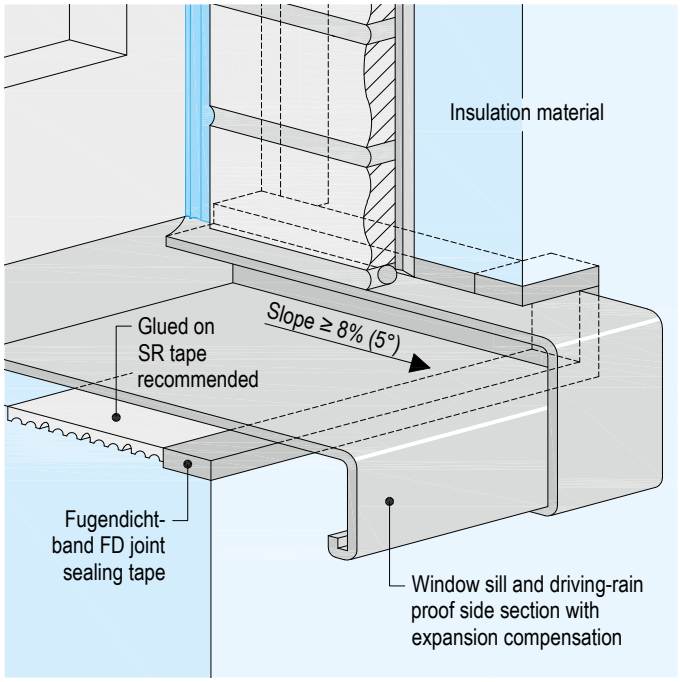
Scheme drawings I Dimensions in mm

Number of dowels	Dowel arrangement
4 dowels/m²	
5 dowels/m²	
6 dowels/m²	
8 dowels/m²	
11 dowels/m²	

Dowel rating online see: knauf.de/duebelrechner.

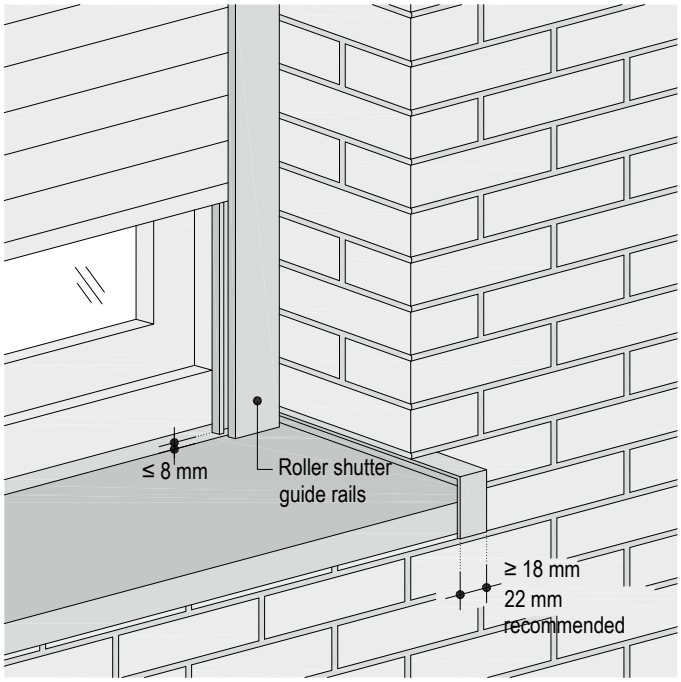
Window connection

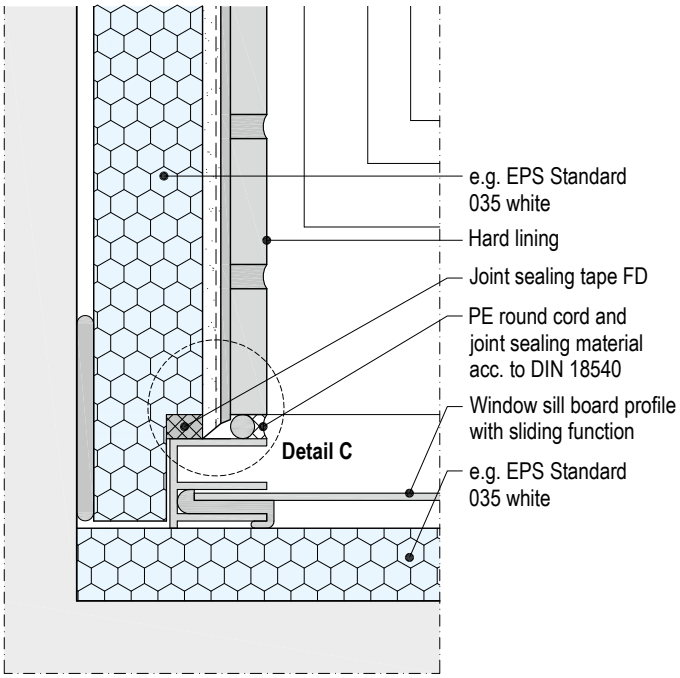
Connection to window sill side section

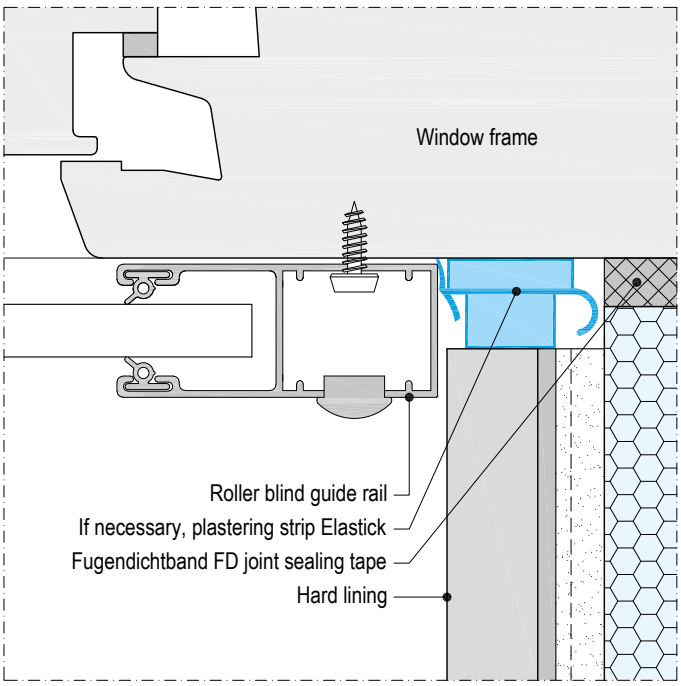


Scheme drawings

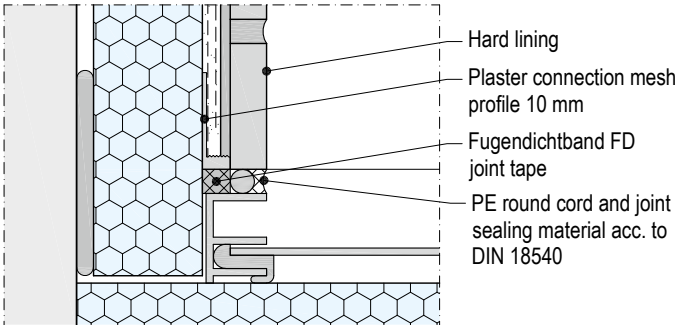
Window connection with roller blind guide rails





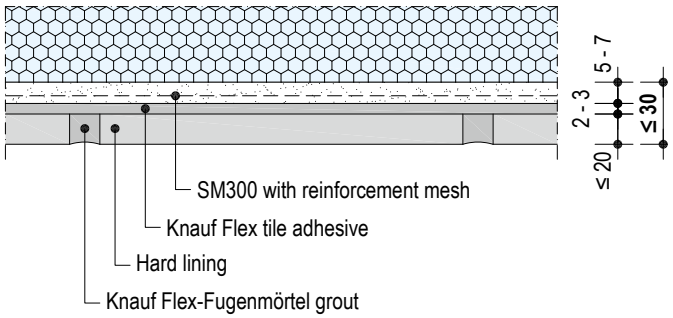


Detail C: Alternative version with plaster connection mesh profile



Design of the reinforcement layer and lining

Dimensions in mm



Reinforcement layer

Façade reinforcement

Basecoat	Layer thickness	Reinforcing mesh	Mesh arrangement in the reinforcement layer	Mesh reinforcement joint overlap
SM300	5 – 7 mm[1)]	Reinforcement mesh 5 x 5 mm	In the upper third	≥ 100 mm

1) For hard linings with a side length ≥ 49 cm, the eveness of the surface of the basecoat may not exceed a value of 2 mm, with respect to the maximum side length of the lining.

Embed strips of reinforcement mesh or Gewebeeckwinkel Sturzecke mesh corner angle for lintel corners at the inner corners of openings (e.g. between the window reveal and window lintel) fully in the basecoat. Subsequently apply Gewebeeckwinkel mesh corner angles perpendicular and flush. Apply a 5 to 7 mm basecoat layer and level it.

Except when using the Gewebeeckwinkel Sturzecke mesh corner angle for lintel corners and extending diagonally from all opening corners, embed Gewebeeckpfeile mesh corner arrows or approx. 300 x 500 mm strips of reinforcement mesh in the fresh mortar.

Subsequently embed Armiergewebe reinforcement mesh on the entire surface with at least a joint overlap of 100 mm fresh-in-fresh in the upper third of the basecoat layer. Apply a full covering of basecoat to the mesh.

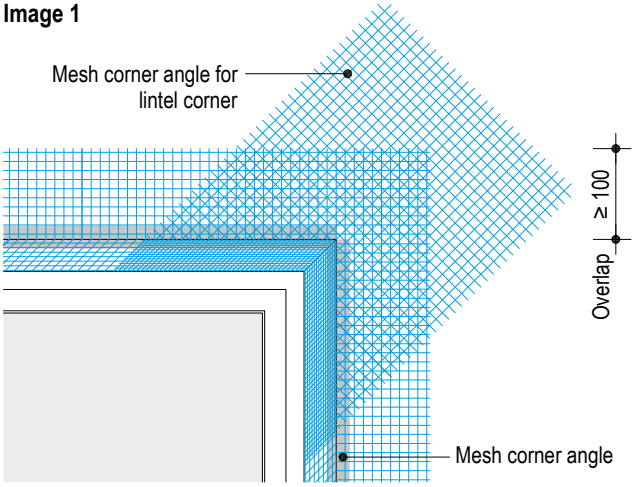
Avoid excessive smoothing of the reinforcement layer to prevent a concentration of fine particles or formation of a sinter layer on the surface. Rub off any burrs that have formed during drying.

Plaster connections should be separated from the constructional components with a separating tape, separation strip, profiles or similar.

Reinforcement of window lintel/reveal

Dimensions in mm

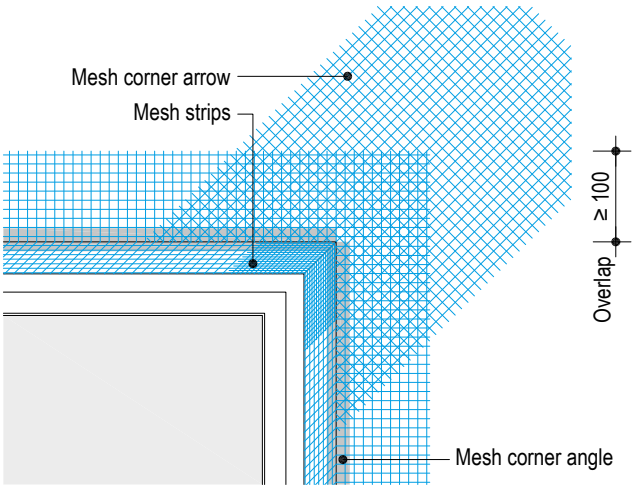
Image 1



The lintel / reveal corner areas require additional Gewebeeckwinkel Sturzecke mesh corner angle reinforcement.

Image 2

Dimensions in mm



Alternatively, the lintel/reveal corner areas can be reinforced with Gewebeeckpfeile mesh corner arrow or reinforcement mesh strips.

Basecoat drying time

Before application of a further coating (e.g. bedding mortar) it is important to ensure that the surface is fully dry. The minimum drying time is generally approx. 1 day/mm layer thickness. With unfavourable weather conditions (e.g. high levels of air humidity or low temperatures) the drying time is extended, e.g. the drying time at +5 °C is around double so long. For further information please refer to the product data sheets of the subsequent coatings.

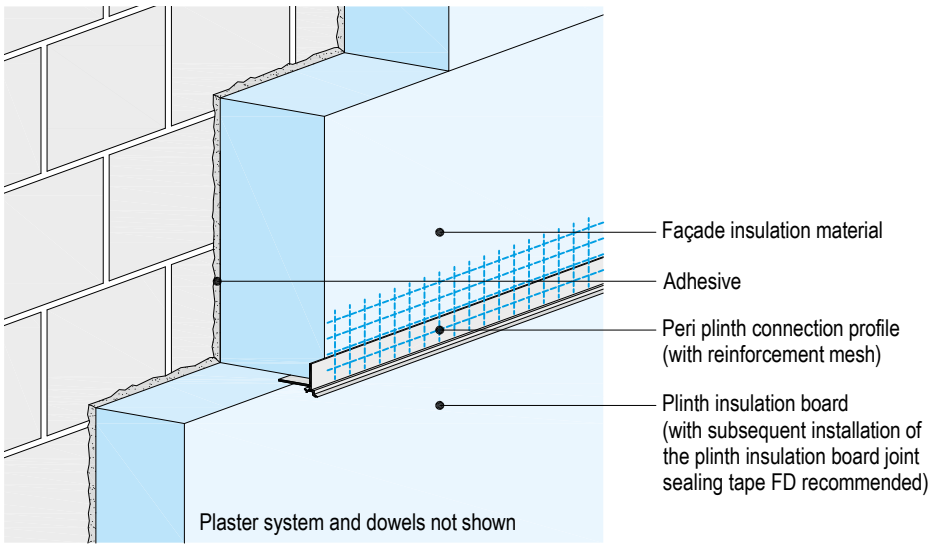
Plinth and splash water zone

Apply at least 5 mm basecoat covering the full surface and embed reinforcement mesh on the entire surface in the upper third of the basecoat. Joint overlap at least 100 mm.

When insulation is applied in areas contacting the soil, the reinforcement layer ends underneath the edge of the future ground line.

Reinforcement layer (continued)

Thermal bridge free Sockel-Abschlussprofil Peri plinth profile



Apply the basecoat on the insulation material, push in the Peri plinth connection profile between the perimeter / plinth insulation and the façade insulation, align flush and embed the reinforcement mesh. Connect the profiles with the supplied connectors. Provide the outside corners with the appropriate mitring. Constructional separation of the plinth plaster, e.g. by using a separating strip, profile or similar. When implementing the transition between the façade insulation and the plinth insulation, driving-rain proofing must be observed. If necessary apply a Fugendichtband FD joint sealing tape.

Ceramic and natural stone work lining

Requirements and properties of the ceramic and natural stone work lining: see page 11.

Ceramic and natural stone work linings must comply with the requirements of the respective system approvals. Even minor divergences require the permission of the system owner.

Connection joints to constructional components and surfaces are to be planned on a case-related basis and must be applied as driving-rain proof. Required area boundary joints or elastic joints should be clarified in advance.

Adhesive bonding using the floating and buttering method acc. to DIN EN 12004

The reinforcement layer must be fully set and dry.

Working the Knauf Flex tile adhesive in a floating and buttering method acc. to the current product data sheet.

First of all the corner facing brick is applied to the outer corners and then the hard lining is applied on the façade surface.

Only apply enough tile adhesive so that the hard lining you can insert and push in can be performed during the open time of the adhesive. Formation of a skin on the mortar considerably reduces the adhesive bond.

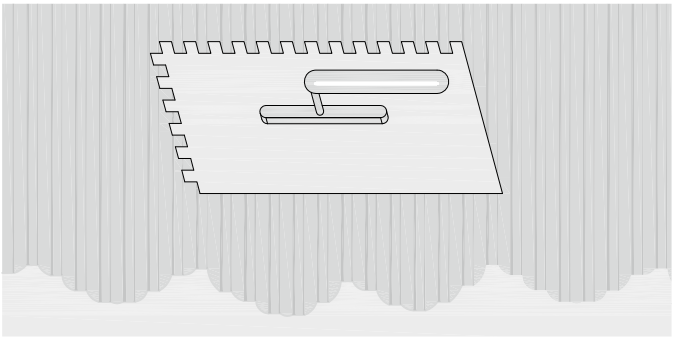
Apply 2 to 3 mm of tile adhesive with an 8 mm notched trowel.

Cover the rear side of the hard lining across the full surface with an approx. 1 to 3 mm thin coat of adhesive, and immediately push it into the fresh bedding mortar and then remove the tile adhesive from the joints.

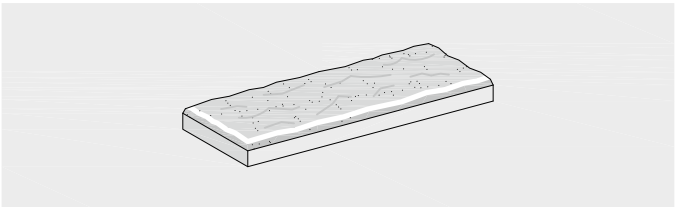
Ensure that a full surface adhesive application has been mainly achieved with the floating and buttering method. The greater the share, the more secure the adhesive bond.

Adhesive bonding sequence

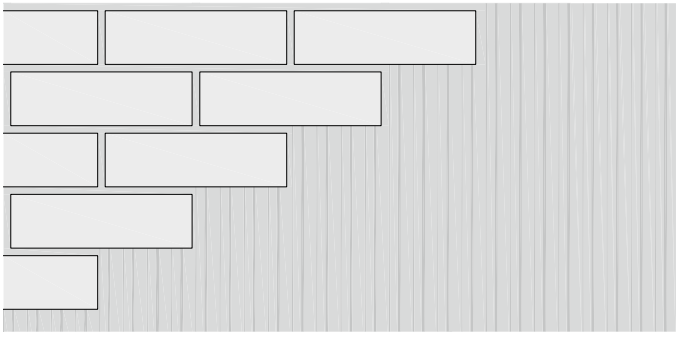
1) Application on the wall surface



2) Application on the rear of the hard lining



3) Pushing on the hard lining



Grouting using a grouting iron or as grout slurry

In case of smooth surfaces, and with the use of natural stone work in large format with a surface of > 0.19 m^2, the grout slurry method must be used. In case of natural stone work in large format, the spray on method in two work steps can also be used. Compressing the mortar must be undertaken after each application. If the grout is applied with a grouting iron from a hard lining thickness of 15 mm, it is necessary to apply the grout in two layers. Ensure that the second layer is applied continuously opposing the first layer, either in the bed joint or in the butt joint.

Grouted joints

Determination of the joint width acc. to approval

Excluded are the adopted joints (building expansion joints) and area boundary joints. These joint widths must be accepted or determined during planning.

- Ceramic linings (acc. to DIN 18515-1):
  - With ceramic tiles: 3 to 8 mm
  - With ceramic split tiles: 4 to 10 mm
  - With lining materials made of brick: 10 to 12 mm
- Natural stone work lining:
  - With small format tiles: minimum 10 mm
  - With large format tiles: 12 mm to 20 mm

Calculation of the joint width in the surface

Calculation of the joint width must be performed by the planner. The following formula can be used to calculate the joint width:

Joint width:

- Board thickness up to 12 mm: 0.8 · Board thickness
- Board thickness up to 20 mm: 0.6 · Board thickness

Example for calculation of the grout required for the joint with board/ lining thickness up to 12 mm

$$\text{Joint grout quantity in kg/m}^2 = \frac{0.8c^2 \cdot (a + b + 0.8c)}{0.8c \cdot (a + b + 0.8c) + ab} \cdot d$$

Legend

a = Board length in m
b = Board width in m
c = Board thickness in m
d = Density of grout in kg/m^3

Area boundary joints

Determination of the joint width

Observe the DIN EN ISO 11600 and DIN 18540 standards.

The expansion coefficient of clinker strips is 6 x 10^{-6} m/K.

The maximum total deformation of the joint sealant may not exceed 25 %, which with a joint of 10 mm width means absorption of a movement of 2.5 mm.

The joint width with natural stone is based on the hygric expansion. Without proofs, a hygro-thermic expansion of 0.2 mm/m is to be assumed.

Example calculation

Temperature differential (ΔT): 70 K
Section length (l): 6 m
Linear expansion coefficient of ceramic (αt): 0.006 mm/mK

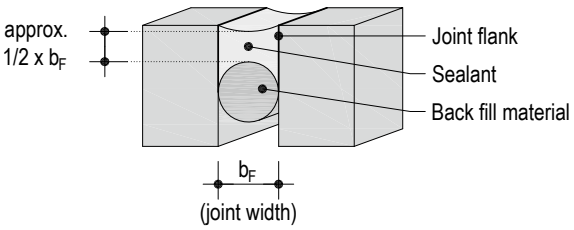
Length expansion (Δl): l x αt x ΔT =
6 m x 0.006 mm/mK x 70 K = 2.52 mm

The joint width with 25 % maximum movement of the joint is:
Δl x total joint width x maximum movement =
2.52 mm x 100 % / 25 % = 10.08 mm

Ceramic and natural stone work lining (continued)

Application

Remove the reinforcement layer along its entire depth and width and cut or separate the insulation. Subsequently seal the joint with a PE round cord and a joint sealant in acc. to DIN 18540, or alternatively with a joint sealing tape (see details on page 42 to 43).



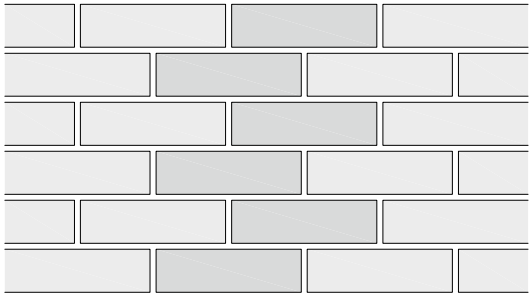
In the building expansion joint area, the width of the joint must be applied across the entire ETICS. Subsequently fill the joint in the insulation area with mineral wool and use a PE round cord and joint sealant acc. to DIN 18540. In case of vertical joints, the use of an expansion joint profile is recommended.

Notes	Divergent requirements for the joints must be planned in line with engineering practice. For application of a permanent joint, refer to the IVD Code of Practice No. 27 “Abdichten von Anschluss- und Bewegungsfugen an der Fassade mit spritzbaren Dichtstoffen - *Sealing and connection of movement joints on the façade with sprayable sealants*” (German only) and the “Planning Movement Joints in Facades” from the Information Script published by the Deutschen Bauchemie.

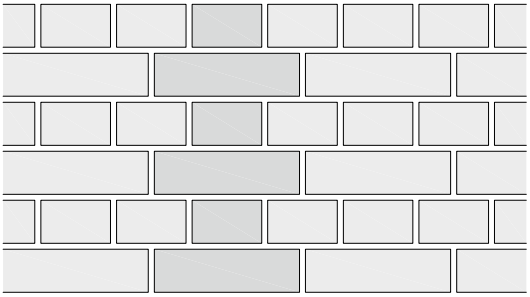
Application

Application examples

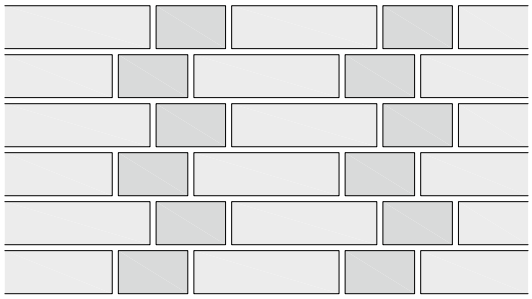
Stretcher bond



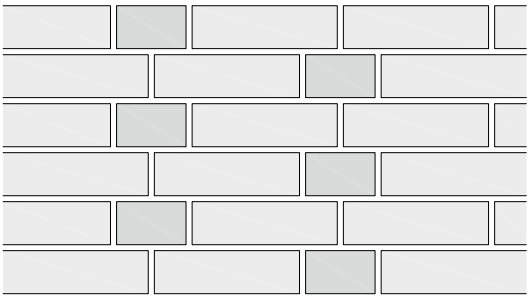
Polish bond



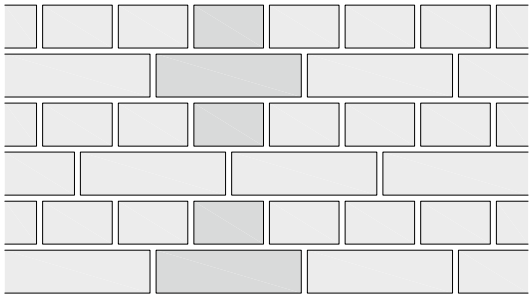
English bond



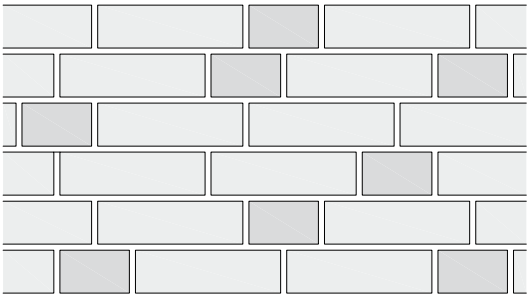
Monk bond



Flemish bond



Wild pattern



Plinth application with hard lining

Plinth and splash water zone

Seal areas contacting soil according to guideline “Facade plinth render/ External components” (German only), issued by Fachverband der Stuckateure für Ausbau und Fassade Baden-Württemberg, DIN 18533. The installation and laying of the hard lining is applied analogue to the surface types, see from page 53.
Apply Sockel-Dicht in two layers up to an overall thickness of at least 2.5 mm in the area at least 100 mm above the existing waterproofing of the building up to at least 50 mm above the upper edge of the ground line on the basecoat. Hard linings extending into the soil are also protected up to the upper edge of the ground line with Sockel-Dicht (see details on page 34).

Plinth design with a sponged surface and a paint coat

Primer

Stir the contents of the container thoroughly and repeat occasionally.
Apply a primer to suit the selected top coat and observe the respective drying times.

Plaster application

Finish coat	Layer thickness in mm
Sockel-SM Pro (sponged)[1] / Sockel-SM (sponged)[2]	2
Butz	2

1) *Only in conjunction with Sockel-SM Pro as a basecoat. Sockel-Dicht is unnecessary in case Sockel-SM Pro is used as a basecoat and finish coat in a total thickness ≥ 7 mm.*
2) *Only in conjunction with Sockel-SM as a basecoat.*

Required water quantity and mixing the mortar in acc. with the current product data sheet.
Check the containers before use to ensure that the colour shades are correct.
Slight differences in colour hues can occur due to the use of natural aggregates. When reordering, always state the consignment number of the previous delivery.
Ensure uniform grain distribution.
The type of tool used influences the surface roughness and it is therefore essential to use the same tool for a consistent finish.
Do not rework hardened surfaces. Avoid interruptions when working on continuous surfaces.
Observe Code of Practice no. 26 “Farbveränderungen von Beschichtungen im Außenbereich - Colour changes in exterior coatings” of the Bundesausschuss Farbe und Sachwertschutz (Federal Paint and Property Protection Committee).
Plaster connections should be separated from the constructional components with a separating tape, separation strip, profiles or similar.

Sockel-SM

After the top coat in the area contacting the soil has dried, apply moisture protection. For this purpose, Sockel-Dicht is applied in two layers at a minimum thickness of 2.5 mm, commencing with the building waterproofing / sealing (overlapping by approx. 50 mm to 100 mm) up to at least 50 mm above the edge of the ground line over the perimeter insulation boards / plinth insulation boards and the subsequent finish coat.

Sockel-SM Pro

When applying the Sockel-SM Pro render system in a total layer thickness (basecoat and finish coat) of at least 7 mm, additional moisture protection with Sockel-Dicht is unnecessary.

Butz

Allow a drying time of at least 2 hours before applying Butz on Quarzgrund Pro. Mix the contents of the container well, apply using a stainless steel trowel slightly thicker than the grain size and level in one direction.

Note	Further plinth designs, see system data sheet P323.de Knauf WARM WALL Plus in Solid Construction.

Decorative coat in plinth and splash water zone

Primer

A coat of Grundol is recommended as a primer before a decorative coat is applied.

Façade paint

Never apply the contents from different buckets together on a common wall. Mix the contents together in a clean bucket beforehand. Stir the contents of the bucket thoroughly.
The application consistence can be modified in acc. with the product data sheet.
Apply a thin and even paint coat crosswise without joints on the fully hardened and dried final coat.
Always complete surfaces that can be viewed together on the same day.

Notes	All the products listed here are formulated, so that a preventative and retarding action against soiling is in effect. Permanent protection against soiling caused by microorganisms such as algae and fungus cannot be guaranteed. The susceptibility depends on the local and environmental conditions. Loss of the technical function of the finish coat and/or the paint coat due to fouling of the surface with mould and mildew is practically excluded. See code of practice “Equalization coats on finishing plasters – colour shade equalization coating” (German only), see also: vdpm.info/services/downloads/broschueren-und-merkblaetter

Mechanical protection in plinth and splash water zone

As protection for the plinth in the area contacting the soil against mechanical influences of the soil or gravel bed, use of a fleece laminated dimpled sheet up to the edge of the ground line is recommended.

Maintenance

Maintenance of the façade surface should be performed at regular intervals taking the size, architecture and location into consideration.
Maintenance is understood to mean cleaning, or if required, renewing of connections (maintenance joints) on the intact External Thermal Insulation Composite Systems (ETICS). It is necessary to undertake corrective measures as quickly as possible if a maintenance issue is identified in order to assure the ETICS service life and protect the visual appearance. We generally recommend consulting experienced and qualified specialist companies if a maintenance issue is identified.

Plaster surfaces (e.g. plinth area)

Limited cracking shall not be classified as a fault, if it does not impair the technical and optical characteristic value of the render (compare to DIN 18550-1). In recesses in the render structure, individual fine shrinkage cracks and pores that have occurred in the render and in the coating / paint coats are permissible. A technical defect has occurred if the driving rain-proofing of the masonry and / or the weathering resistance of the render and coating is no longer assured. Also refer to the WTA Code of Practice "Assessment and Repair of Cracked Rendering on Façades".

Hard lining

Joints that have been sealed with mineral mortar or joint sealing tape are not maintenance joints. Possible cracks on the edges and mortar damage should be repaired to prevent ingress of moisture behind the hard lining. Hard lining elements that exhibit cracks or spalling should be removed or replaced.

Inspect for	Technical instructions and measures
Soiling	Clean using a high-pressure water jet adapted for the substrate (water temperature below +60 °C, observe the regional wastewater discharge regulations)
Microbiological growth (e.g. algae, mould)	Clean using a high-pressure water jet adapted for the substrate (water temperature below +60 °C, observe the regional wastewater discharge regulations), apply Algizid (ready-to-use remediation solution).
Sealing of elastic connections (windows, doors, expansion joints, façade penetrations)	Joints applied with permanently-elastic materials are maintenance joints and should be inspected and replaced at regular intervals, if required, or sealed to repel moisture.

Material requirement without allowance for loss and waste

Plinth	Façade	System components	Remark	Unit	Quantity as average value WE101e.de
Bonding layer per m², e.g. on bituminous damp-proof membrane					
●[1]		Sockel-Dicht	Full surface application	kg	3.8
Adhesive per m²					(60 % – 100 % adhesive area ratio)
●	●	SM300	Max. layer thickness 5 mm	kg	4.6 – 7.7
●	●	SM700 Pro		kg	4.3 – 7.1
●	●	SM700		kg	4.1 – 6.9
●	●	Sockel-SM		kg	5.0 – 8.0
●[2]		Sockel-SM Pro		kg	5.0 – 8.0
	●	Lustro		kg	2.6 – 4.4
Insulation material per m²					
●		Plinth insulation panel	Insulation thickness: Up to 200 mm → Integration into the soil: Up to 3 m	m²	1
	●	MW Volamit 040	Thickness 60 – 200 mm	m²	1
	●	MW Wolle 035 plus L	Thickness 60 – 200 mm	m²	1
	●	MW Wolle 035 plus M2	Thickness 60 – 200 mm	m²	1
	●	EPS Standard 035 white	Thickness 40 – 200 mm	m²	1
	●	EPS Standard 034	Thickness 40 – 200 mm	m²	1
	●	EPS Standard 032	Thickness 40 – 200 mm	m²	1
	●	EPS Standard 031	Thickness 40 – 200 mm	m²	1
	●	EPS SunJa 032	Thickness 80 – 200 mm	m²	1
	●	EPS Nut&Feder 032[3]	Thickness 60 – 200 mm	m²	1
Plinth connection per m					Only with recessed plinth
	●	Plinth connection profile	Projection of 30 to 200 mm	m/m	1
	●	Plinth profile	Plinth profile with drip edge and reinforcement mesh for layer thicknesses 6 mm or 10 mm	m/m	1
	●	Assembly kit plinth end profiles	Fasteners	Set/m	0.04
	●	Peri plinth end profile	For layer thickness 7 mm	m/m	1
Dowels per m² façade insulation[4]					
●	●	Schlagdübel CNplus 8 insulation anchor nail	Anchoring depth s ≥ 35 mm, ≥ 55 mm for categories D and E only for EPS and MW Volamit 040 with WARM WALL Ceramic with a system weight ≤ 75 kg/m²	≥ 4 St/m² [5]	Number of dowels[4] dependent on the wind load, see tables page 27 to 28
●	●	Schraubdübel STR U 2G dowel	Anchoring depth s ≥ 25 mm, ≥ 65 mm for category E		
●	●	Schraubdübel HTR-P/HTR-M dowels	Anchoring depth s ≥ 25 mm, ≥ 45 mm for category E only for EPS and MW Volamit 040 with WARM WALL Ceramic with a system weight ≤ 75 kg/m²		
●		STR Rondelle EPS dowel plate	Rondelle made of EPS for recessed dowel fitting of plinth insulation panels		

1) *When bonding on bituminous waterproofing apply Sockel-Dicht as a bonding layer, in case Sockel-SM Pro is not used.*

2) *When using Sockel-SM Pro as an adhesive, a bonding layer with Sockel-Dicht is not required on bituminous sealants.*

3) *Cover dimension: 485 x 1000 mm*

4) *Plinth insulation boards that are glued onto waterproofing of buildings, are dowelled constructively with 2 dowels / board from a height of 150 mm above the edge of the ground line.*

5) *≥ 5 pcs/m² with the use of mineral wool boards with proven substrate bond strength and system weight ≤ 75 kg/m² with covering weight ≤ 53 kg/m²; ≥ 6 pcs/m² with the use of mineral wool boards without proven substrate bond strength.*

Material requirement without allowance for loss and waste (continued)

Plinth	Façade	System components	Remark	Unit	Quantity as average value WE101e.de
Dowel per m with fire break					
●	●	Schraubdübel STR U 2G dowel	Anchoring depth s ≥ 25 mm, ≥ 65 mm for category E	pcs/m	2.5
●	●	Dübelteller SBL 140 plus dowel plate	In combination with Schraubdübel STR U 2G dowel with surface flush installation under mesh for fixing MW Volamit 040 panels		
Basecoat per m²					
●	●	SM300	Layer thickness 5 – 7 mm	kg	7.6 – 10.5
●		SM700 Pro		kg	7.0 – 10.0
●		SM700		kg	7.0 – 10.0
●		Sockel-SM		kg	7.0 – 10.0
●[1]		Sockel-SM Pro	Layer thickness 5 mm	kg	8.0
Reinforcement mesh per m²					
●	●	Reinforcement mesh 5 x 5 mm	100 mm joint overlap	m²	1.1
Moisture protection per m²					
●		Sockel-Dicht	Layer thickness min. 2.5 mm (two coats)	kg	3.8
Bedding mortar per m² hard lining					
●	●	Knauf Flex tile adhesive	Layer thickness 2 – 3 mm	kg	3.0 – 4.0
Ceramic and natural stone work lining per m²					
●	●	Acc. to approval requirements p. 11	Thickness ≤ 20 mm	m²	≤ 1.0
Grout per m² hard lining					
●	●	Knauf Flex grout	Joint width/depth 10 mm with NF format	kg	3.5
Primer per m² (with finish coat)					
●		Quarzgrund Pro[2]	Undiluted	kg	0.17
Finishing coat per m²					
			Grain size		
●[3]		Sockel SM Pro (sponged)	1.0 mm	kg	3.0
●[4]		Sockel SM (sponged)	1.0 mm	kg	3.0
●		Butz	2.0 mm	kg	4.5
Coat per m²					
●		Siliconharz-EG-Farbe	Single coat[5]	l	0.17 – 0.22
●		Autol	Double coat	l	0.25 – 0.40
●		Fassadol		l	0.30 – 0.45
●		MineralAktiv Fassadenfarbe paint		l	0.28 – 0.40

1) *Only in conjunction with Sockel-SM Pro as a top coat in layer thickness 2 mm. In case of total thickness ≥ 7 mm, moisture protection with Sockel-Dicht is unnecessary.*

2) *With a coloured finishing top coat Quarzgrund Pro in the same colour shade is recommended.*

3) *Only in conjunction with Sockel-SM Pro as a basecoat and with a total layer thickness ≥ 7 mm. Sockel-Dicht is not required.*

4) *Only in conjunction with Sockel-SM as a basecoat.*

5) *Recommendation: Double coat for enhanced weather-proofing (see "Code of Practice No. 9 - Coatings on mineral renders" from the Bundesausschuss Farbe und Sachwertschutz).*

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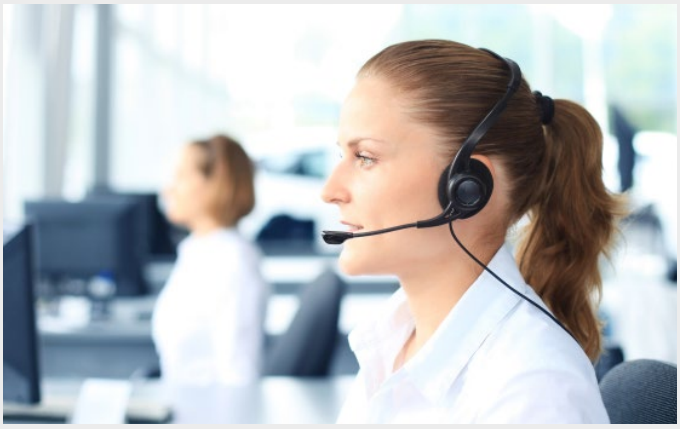
Competent building consultancy advice assures the use of efficient systems and avoids the cost of additional materials or overly complex constructions. Furthermore, the assurance you receive often saves multiples of the avoided building damage and compensation claims.

The Knauf Direkt employees can direct you to a Knauf system consultant for on-site consultation on building projects. They offer you support for your building projects including personal consultation on the building site - quickly, competently and free-of-charge.

How to contact us

knauf-direkt@knauf.com



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Information on Sustainability

Knauf WARM WALL Ceramic and Natural Stone

Information on the sustainability of Knauf WARM WALL Ceramic and Natural Stone

Building assessment systems ensure the sustainable quality of buildings and constructional structures by a detailed assessment of ecological, economic, social, functional and technical aspects.

In Germany, the following certification systems are of particular relevance:

- DGNB system
  Deutsches Gütesiegel Nachhaltiges Bauen der DGNB (*German association for environmentally sustainable building*)
- BNB
  (Quality rating system for environmentally sustainable building)
- LEED
  (Leadership in Energy and Environmental Design).

Knauf WARM WALL systems can positively influence many of these criteria.

DGNB/BNB

Ecological quality

- Criterion: Total primary energy requirement
  Reduction of the building energy requirement over the entire lifecycle due to efficient WARM WALL systems

Economic quality

- Criterion: Building related life-cycle costs
  Reduction of the operating costs due to cost-effective WARM WALL systems

Sociocultural and functional quality

- Criterion: Thermal comfort in summer or winter
  Cozy room climate with WARM WALL systems

Technical quality

- Criterion: Premium quality thermal and moisture protection for the building shell
  With WARM WALL systems significantly exceeding the GEG (German Buildings Energy Act) requirements.

LEED

Materials and resources

- Credit: Regional materials
  Availability depending on location of building. Information on request.

Videos for Knauf systems and products can be found under the following link:
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