

## General information and examples for the installation of LINITHERM above-rafter insulation systems

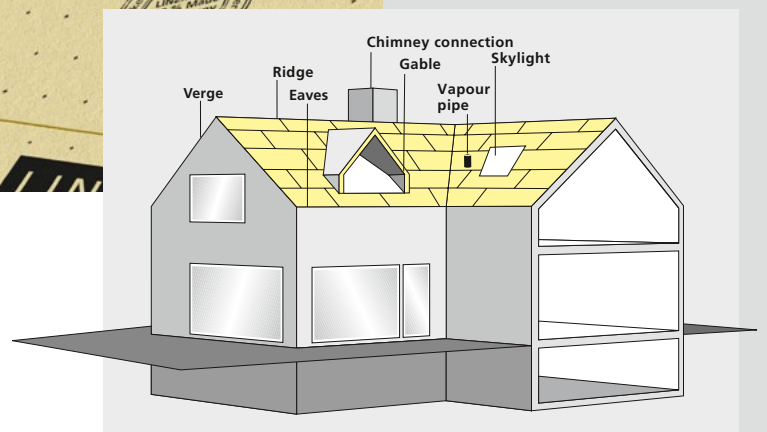


### Over-rafter insulation

## LINITHERM®

### Installation

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**Preliminary remark**

**Delivery**

LINITHERM insulating elements are delivered on pallets. Great care must be taken when unloading and transporting the elements on the building site. During all work (installation of the elements, attachment of the roof slats, etc.) attention must be paid that no damage is done to the elements.

**Safety provision**

The safety provisions for work on the roof must be adhered to as usual.

**Rules of construction technology**

LINITHERM insulation systems are high-quality products for the most various insulation solutions. The elements are manufactured on modern production facilities in top-quality, flawless condition. In order to achieve the benefit of an optimal insulation solution, proper installation of the elements is essential. **Our installation recommendations serve as schematic information for the buyer/user. They are non-binding and do not claim to be fundamentally valid, nor do they substantiate an entitlement to a guarantee. Each building offers different prerequisites; therefore the general procedure is to follow the rules of construction technology for each specific building. For restoration of more than 1/3 of the roof area, a ventilation concept according DIN 1946.6 has to be made. This has to be mentioned to the builder.**

**Accessories**

We offer suitable accessories for proper installation:  
e.g. LINIFIX special screws, LINITHERM adhesive tapes, LINITHERM Dichtfix, compriband, LINITHERM L+D Pro film, LINITHERM spray foam, LINITHERM nail sealing tape etc.

**Tools**

Only a few tools, which are usually available on any building site, are required for the installation of LINITHERM insulation systems. Suitable tools are, e.g.: circular saw, hand saw, hammer, screwdriver.

**Principles**

The following points must generally be observed during and/or before the installation of the LINITHERM elements.

- The elements must be fully pushed together in longitudinal and transverse direction, in order to achieve a full-surface and consistent thermal insulation layer.
- In the case of elements with additional functions e.g. under-roof, attention must be paid to flawless windproofing in particular at all panel joints and construction-related connections.  
For the establishment of air tightness, the LINITHERM L+D Pro film should also be installed.
- Any damage must be properly repaired (e.g. by masking, foaming, etc).
- The elements are usually installed longitudinally, parallel to the eaves, row by row from bottom (eaves) to top (ridge). Accurately aligned installation right from the first row facilitates the installation of the following rows.
- The counter-slats (cross-section acc. to static analysis) must be attached in compliance with static requirements (see also e.g. S 1, S 2 Statics).  
For the reduction of the perforations of the attachment screws/nails, LINITHERM nail sealing tape may be installed below the counter-lathing.
- All preparatory work (e.g. brickwork finished up to top edge of rafters, chimney completed etc.) should be finished by the beginning of the installation of the LINITHERM insulation elements.
- Covering of the roof should take place immediately after installation of the elements.
- In the case of outer wall insulation (e.g. WDVS), water penetration behind the wall insulation must be avoided by means of proper bonding or waterproofing to the brickwork.

**Those installation guides refer to the building part roof. Through restoration of this part, other parts can be affected, e.g. the building physics of the complete building. In case of doubt, an appropriate expert/building physics needs to be consulted on site.**

**Installation options**

Several important detailed points are stated on the following pages. Our suggestions only represent a limited selection. The planning requirements and the specialised regulations, however, must always be adhered to.

LINITHERM insulation systems can be installed in several ways:

- Installation of the LINITHERM insulation systems on plywood boarding, if necessary with sarking membrane:  
The type of installation is suitable if rafters and boarding are to remain visible in the room. A sarking membrane e.g. LINITHERM L+D Pro film, can be installed on the plywood boarding to protect it from weather influences.
- Installation of the LINITHERM insulation systems directly on the rafters (above the LINITHERM L+D Pro film):  
Due to the high compressive strength and rigidity of the LINITHERM insulation systems, the insulating panels can also be installed directly on the rafters. Many of the LINITHERM insulating systems already have several characteristics (e.g. under-roof, vapour barrier, optimal thermal insulation etc). Please also observe the information sheets for the individual types.

Some details are separately listed for the different types of installation.

## Installation of the LINITHERM insulation systems on the boarding with eaves board

V-T 1

The edgings of the LINITHERM N+F elements are air and wind-tight acc. to tests. However, airtightness must be established with a separate layer. For this, the laying of the LINITHERM L+D Pro film is recommended.

Connections must be established as follows:

Application of a LINITHERM spray foam bead (for the avoidance of thermal/cold bridges) and Compriband (for the creation of air and wind tightness), between rising brickwork/rafters and LINITHERM L+D Pro film. After the rafters have been positioned, Compriband must be applied in the area of the eaves under the rafters and on the rafter flanking. The Compriband should be compressed to at least 30 % of its thickness in installed condition. For the establishment of air tightness, the LINITHERM L+D Pro film should be connected to the rising building components e.g. by means of Compriband or adhesive bead (if necessary pressure plate) such that it is permanently airtight. The boarding in this area is separated or cut out. The remaining cavities are filled in or foamed e.g. with mineral fibre.

The eaves board must be properly positioned and attached in the same thickness as the LINITHERM insulation elements parallel to the eaves.

The LINITHERM elements are installed flush and parallel to the eaves row by row from bottom to top. For the individually required waterproofing measures of the LINITHERM elements, please refer to the corresponding installation instructions of the respective element.

The installation of approx. 2 to 3 rows of LINITHERM elements (depending on the roof pitch), is followed by the assembly of the counter-slats (usually cross-sections 40/60 mm or 40/80 mm).

The attachment of the counter-slat for the absorption of the thrust and suction loads takes place using LINIFIX special screws acc. to the static analysis through the counter-slat in the rafters.

The further structure with roof lathing/roof covering takes place as usual.

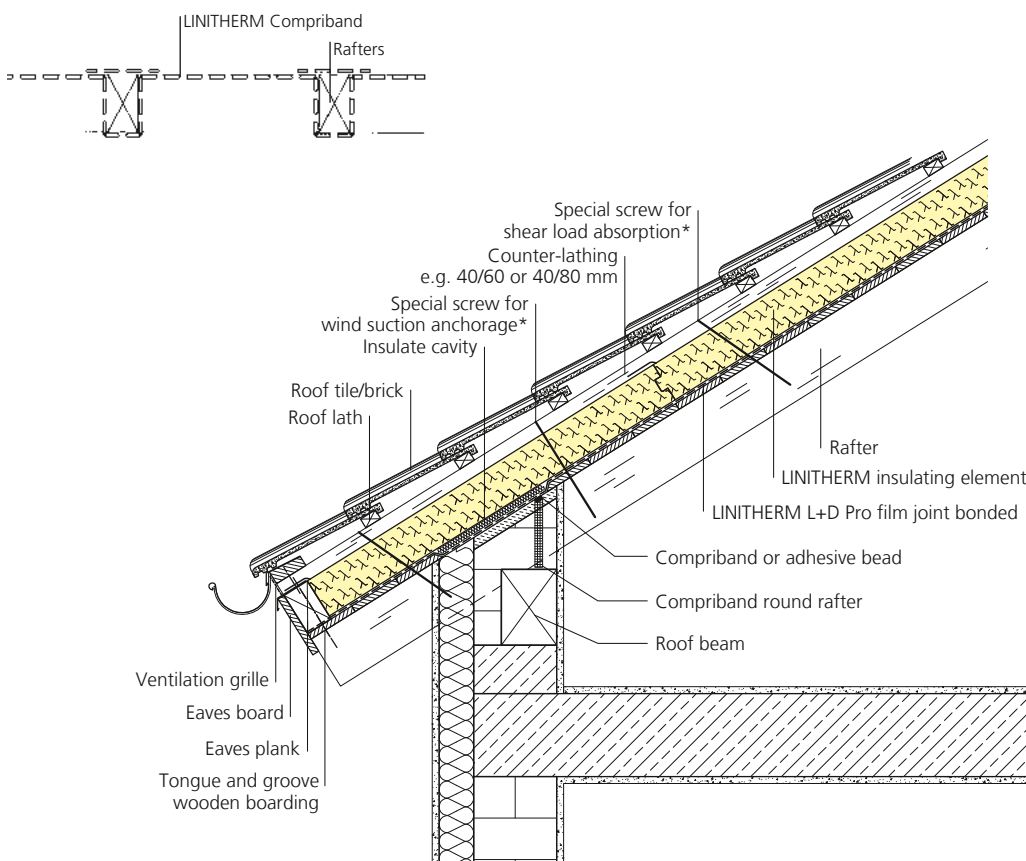
Remark: If outer wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by means of suitable bonding or waterproofing to the brickwork.

Creation of the Air/wind tightness

Attachment of the eaves board

Installation of the LINITHERM elements

Positioning of the counter-lathing



**V-T 1a**

**Installation of the LINITHERM insulation systems on the boarding with cleat**

This solution is mainly recommended for larger roof overhangs. Of course, the variant with the cleat can also be used for structures without full-surface boarding.

**Cleat** The cleat (cleat thickness = insulation thickness) is applied to the boarding sheet (e.g. LINITHERM L+D Pro film).

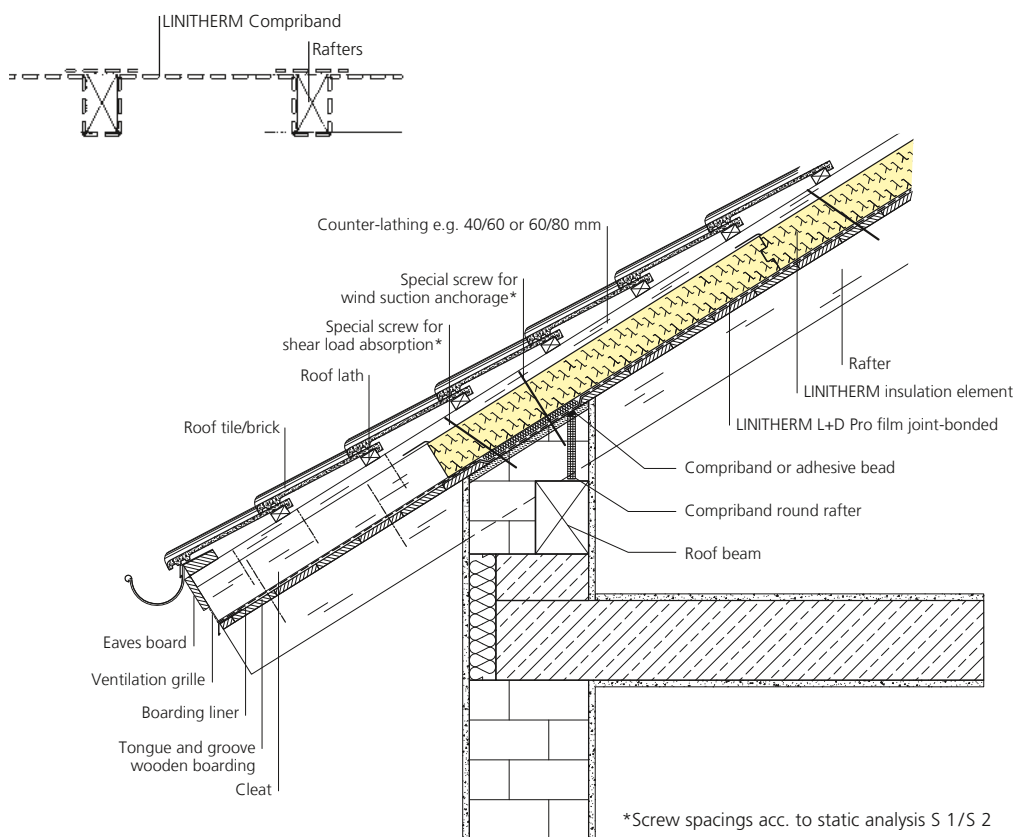
**Creation of the air and wind tightness** Application of a LINITHERM spray foam bead (for the avoidance of thermal/cold bridges) and Compriband (for the establishment of air and wind tightness), between rising brickwork/rafters and LINITHERM L+D Pro film. After the rafters have been positioned, Compriband must be applied in the area of the eaves under the rafters and on the rafter flanking. The Compriband should be compressed to at least 30 % of its thickness in installed condition.

**Sarking membrane** For the establishment of air tightness, the LINITHERM L+D Pro film should be connected to the rising building components e.g. by means of Compriband or adhesive bead (if necessary pressure plate) such that it is permanently airtight. The boarding in this area is separated or cut out. The remaining cavities are filled in or foamed e.g. with mineral fibre.

**Installation of the LINITHERM elements** The LINITHERM elements are installed flush and parallel to the eaves row by row from bottom to top. For the individually required waterproofing measures of the LINITHERM elements, please refer to the corresponding installation instructions of the respective element.

**Positioning of the counter-slat** The installation of approx. 2 to 3 rows of LINITHERM elements (depending on the roof pitch), is followed by the assembly of the counter-slats. The attachment of the counter-slat for the absorption of the thrust and suction loads takes place using LINIFIX special screws acc. to the static analysis through the counter-slat/cleat in the rafters.

The further structure with roof lathing/roof covering takes place as usual.



## Installation of the LINITHERM insulation systems directly on the rafters. LINITHERM PAL SIL T in combination with further LINITHERM insulation systems

V-T 2

LINITHERM PAL SIL T is an additional insulation with integrated building board, which can be combined with most LINITHERM above-rafter insulation systems (except PAL HW and PGV Flex). Connections must be established as follows:

Creation of the air tightness/sarking membrane

After the rafters have been positioned, LINITHERM Compriband must be applied in the area of the eaves (under the rafters and on the rafter flanking, see illustration below) for the establishment of the air and wind tightness. The area between the rafters is subsequently brick lined. When installed, the Compriband should be compressed to at least 30% of its thickness. The LINITHERM connection apron is then installed in this area, such that the integrated Compriband forms a connection with the tapes around the rafters. After this, the connection apron is guided through the separating joint of the elements and bonded air-tight at the top to the sarking membrane of the PAL SIL T insulation.

An eaves board is installed at the height of the two layers of insulation for the alignment of the first row and for covering the bottom edge of the element.

The PUR insulation can be released here, such that the silicate panel reaches up to the rafter head.

The silicate panel is then screwed to the eaves board.

The elements are installed flush and parallel to the eaves row by row from bottom to top.

(See also installation instructions for element type LINITHERM PAL SIL T.) The elements must be separated in the area of the connections, in order to connect the air-tight planes of the exterior wall and the roof to one another by means of the connection apron as described above.

Installation of the LINITHERM elements

After the installation of approx. 2 to 3 rows, the further LINITHERM insulation (see installation instructions for the respective element) are installed, to which the counter-slats are attached in accordance with the static analysis.

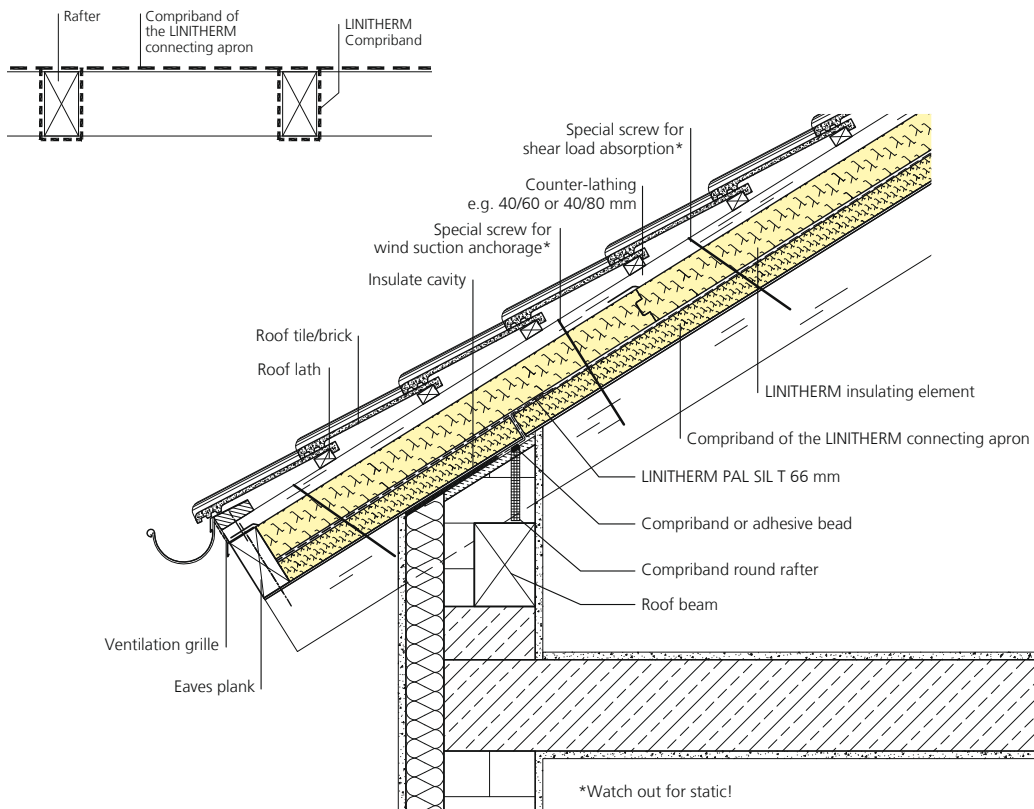
Positioning of the counter-lathing

If LINITHERM insulation elements with noise protection board are used, we recommend the opposing screw connection of the counter-slats with LINIFIX double-thread screws for improved sound insulation.

The roof slats or ancillary slats are immediately mounted as a platform on the counter-slats.

The further structure with roof lathing/roof covering takes place as usual.

Remark: If an exterior wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by suitable bonding or sealing off from the brickwork.



**V-T 3**

**Installation of the LINITHERM insulation systems in old and new buildings**

If a LINITHERM above-rafter insulation is used in old buildings, the existing cladding on the room side can remain unchanged.

The existing rafters are severed at the outer edge of the plastered brickwork.

**Creation of the Air/wind tightness**

LINITHERM L+D Pro film is installed over the rafters for the creation of the air tightness. The L+D Pro film is then glued airtight to the existing exterior plaster and is later covered by the exterior wall insulation.

**Positioning of the eaves board**

The eaves board must be properly positioned and attached in the same thickness as the LINITHERM insulation elements parallel to the eaves.

**Installation of the LINITHERM elements**

The LINITHERM elements are installed flush and parallel to the eaves row by row from bottom to top. For the individually required waterproofing measures of the LINITHERM elements, please refer to the corresponding installation instructions of the respective element.

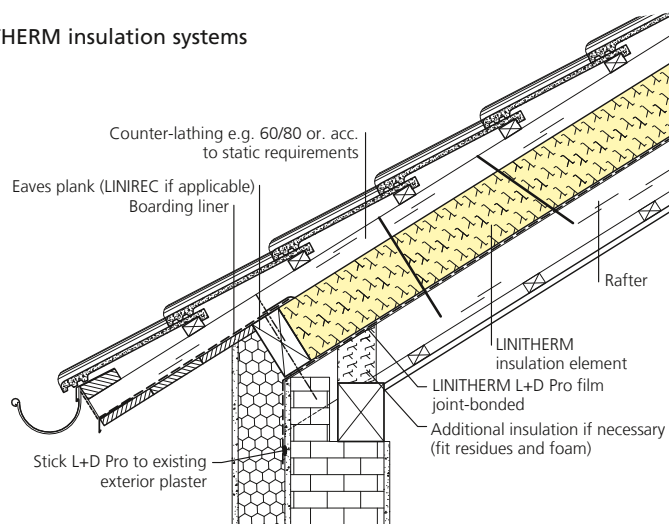
**Positioning of the counter-lathing**

The installation of approx. 2 to 3 rows of LINITHERM elements (depending on the roof pitch), is followed by the assembly of the counter-slats. The attachment of the counter-slat for the absorption of the thrust and suction loads takes place using LINIFIX special screws acc. to the static analysis through the counter-slat in the rafters.

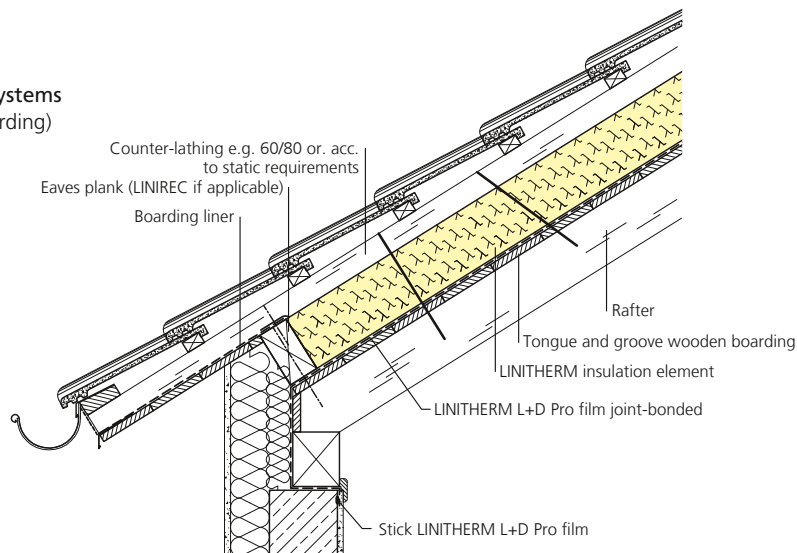
The further roof structure with roof lathing/roof covering takes place as usual.

Remark: If an exterior wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by suitable bonding or sealing off from the brickwork.

**Installation of the LINITHERM insulation systems (rafters clad)**



**Installation of the LINITHERM insulation systems (exposed rafters with boarding)**



## Installation of the LINITHERM insulation systems in old buildings

V-T 4

If a LINITHERM above-rafter insulation is used in old buildings, the existing cladding on the room side can remain unchanged.

To create air-tightness, LINITHERM PAL residues are fitted in between the rafters and connected air-tight with Compriband. Use spray foam to fill the connecting joint and remaining cavities, (e. g. between rafters and roof beams). Larger cavities can be insulated using a soft insulating material (mineral wool). Connect the LINITHERM L+D Pro film permanently airtight to the rising building components by means of Compriband or adhesive bead.

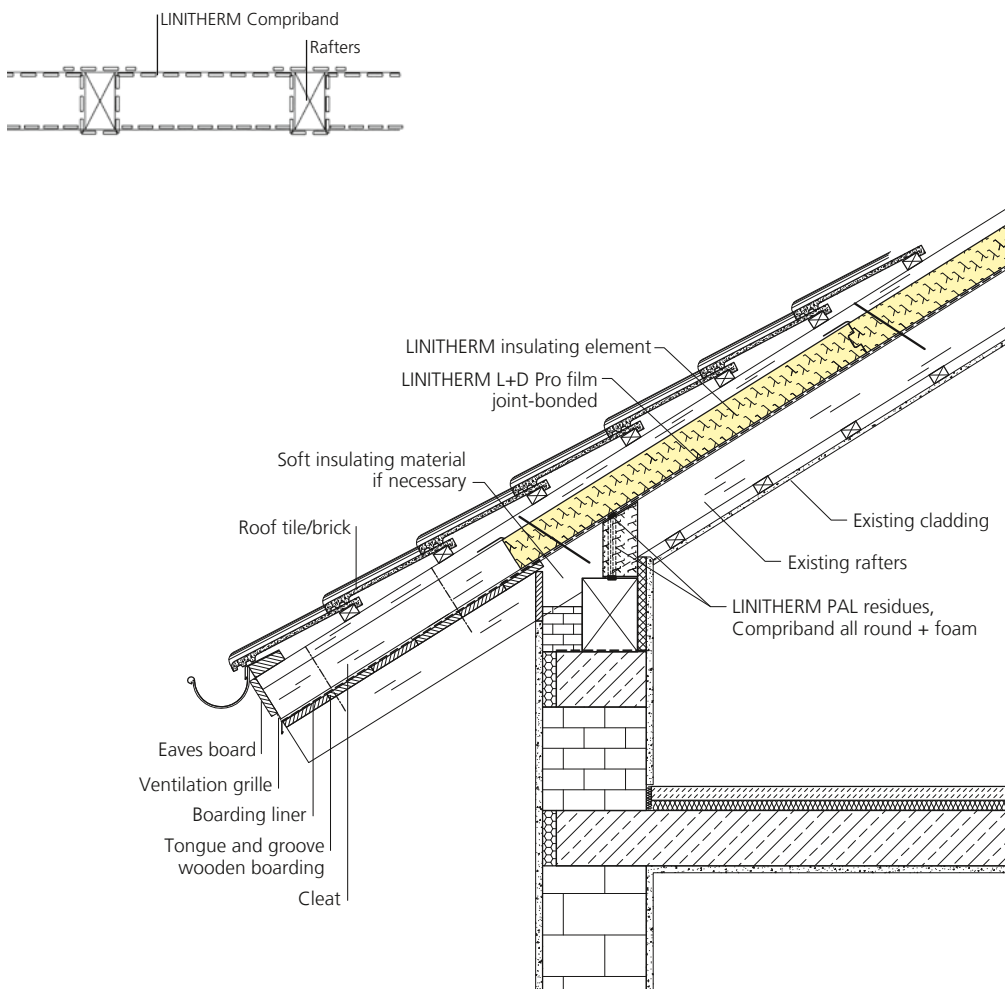
The LINITHERM elements are installed flush and parallel to the eaves row by row from bottom to top. For the individually required waterproofing measures of the LINITHERM elements, please refer to the corresponding installation instructions of the respective element.

The installation of approx. 2 to 3 rows of LINITHERM elements (depending on the roof pitch), is followed by the assembly of the counter-slats (usually cross-sections 40/60 mm or 40/80 mm). The attachment of the counter-slat for the absorption of the thrust and suction loads takes place using special screws acc. to the static analysis through the counter-slat in the rafters.

The further roof structure with roof lathing/roof covering takes place as usual.

Creation of the air/wind tightness

Installation of the LINITHERM elements



**V-O 1**

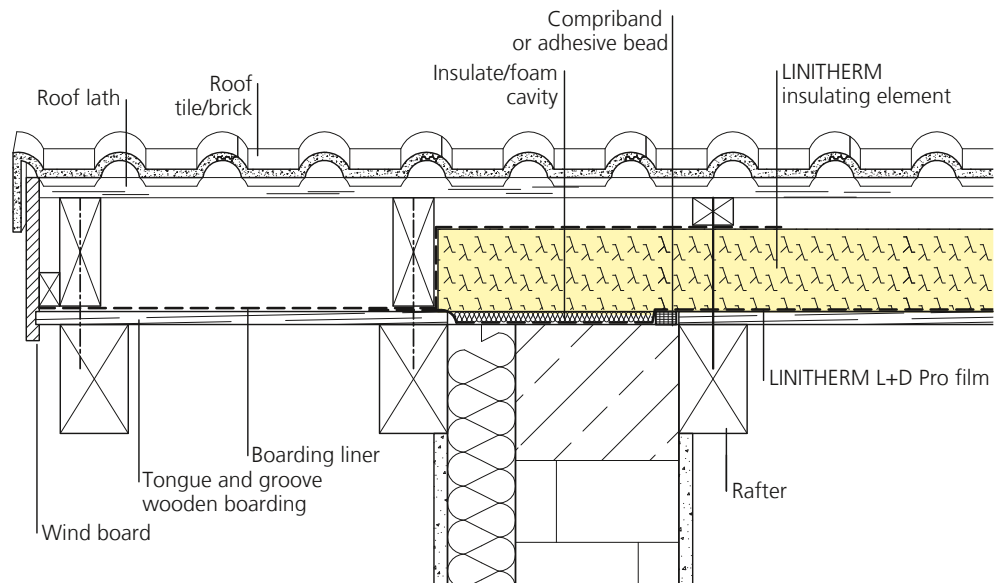
**Verge with externally positioned rafters, installation of the LINITHERM insulation systems on full-surface boarding.**

In order to establish air tightness at the verge, the L+D Pro film on the ring belt/ring beam is connected airtight to the rising building components e.g. by means of Compriband or adhesive bead and pressure plate (casing board) or LINITHERM PGV. The boarding in this area is separated or cut out.

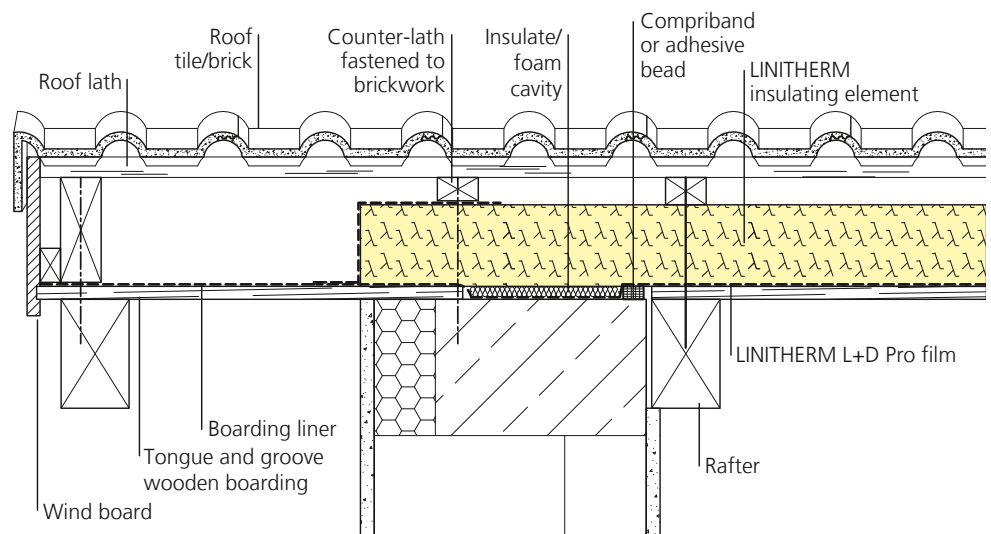
The remaining cavities are filled in or foamed e.g. with a soft insulating material.

The LINITHERM elements are installed at least up to the outer edge of the brickwork/ exterior wall insulation. If external wall insulation is applied, the wall insulation is tight and must be tightly connected to the roof insulation. The further roof structure with roof lathing/roof covering takes place as usual.

Remark: If an exterior wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by suitable bonding or sealing off from the brickwork.



**V-O 1a**



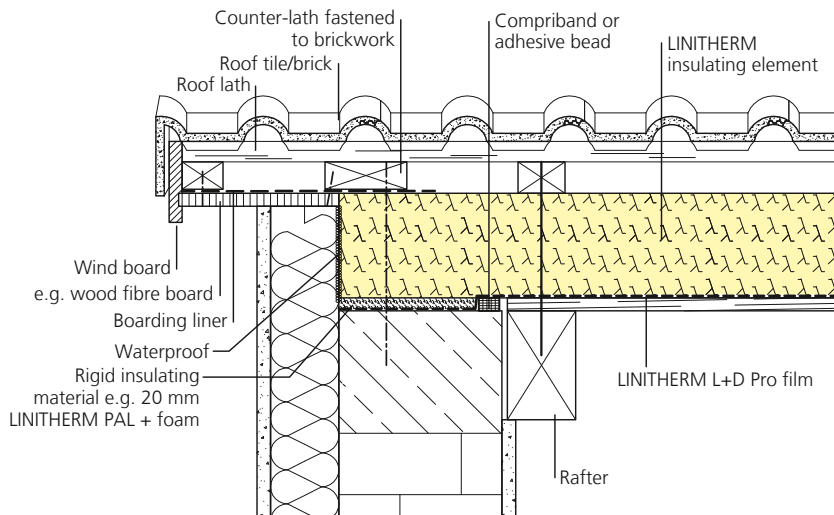


## Verge without externally positioned rafters, installation on boarding

V-O 2

Establishment of air tightness with LINITHERM L+D Pro film (see verge V-O 1).

Remark: If an exterior wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by suitable bonding or sealing off from the brickwork.

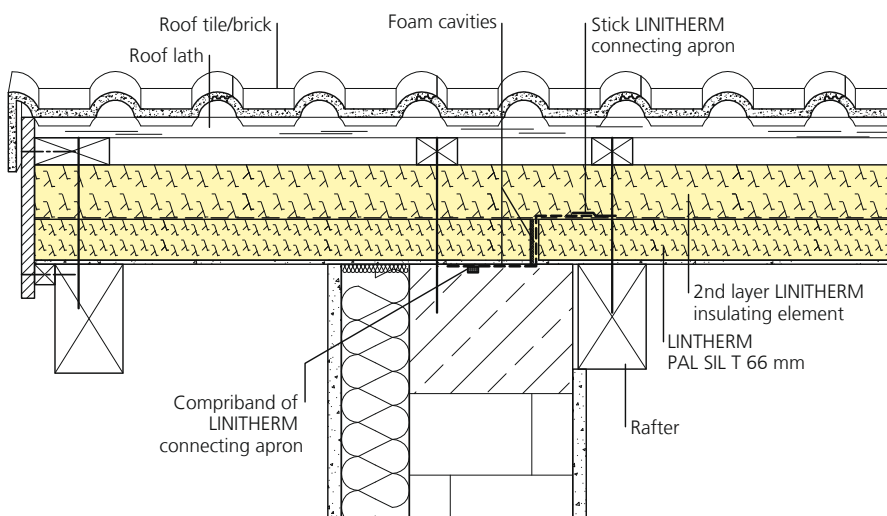


## Verge with externally positioned rafters, installation directly on the rafters LINITHERM PAL SIL T in combination with further LINITHERM insulation systems

V-O 3

Establishment of air tightness with LINITHERM connection apron (see eaves V-T 2).

Remark: If an exterior wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by suitable bonding or sealing off from the brickwork.

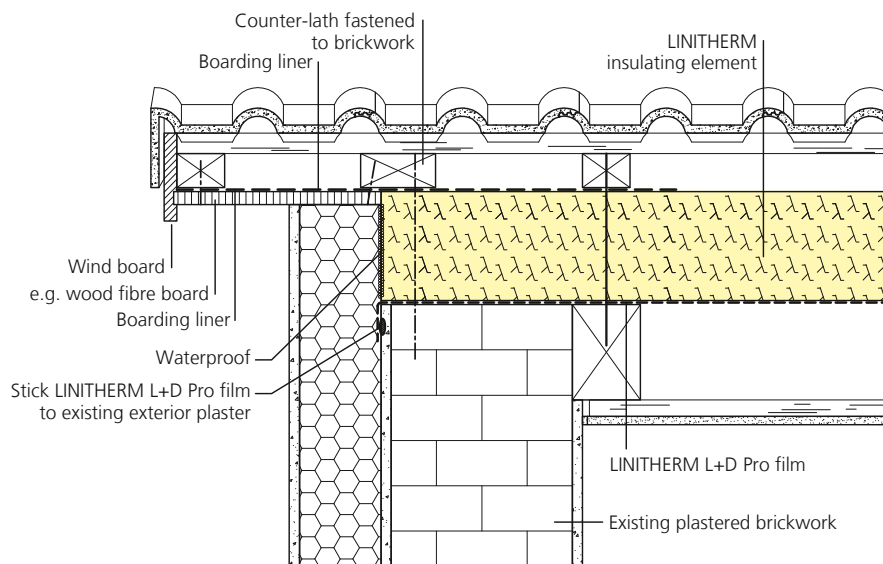


**V-O 4**

**Verge, old building**

Establishment of air tightness with LINITHERM L+D Pro film (see verge V-O 1).  
The L+D Pro film is then glued airtight to the existing exterior plaster and is later covered by the exterior wall insulation.

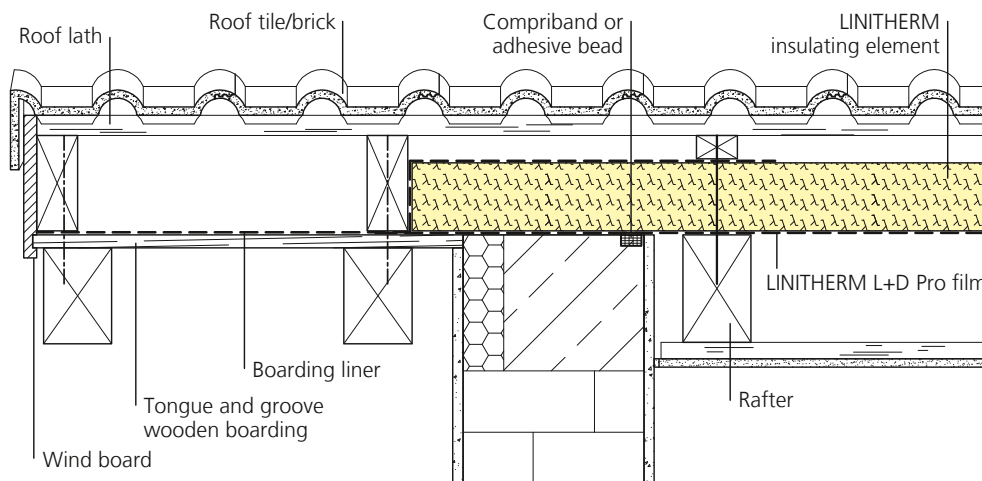
Remark: If outer wall insulation (e.g. WDVS) is used, water penetration behind the wall insulation must be avoided by means of suitable bonding or waterproofing to the brickwork.



**V-O 5**

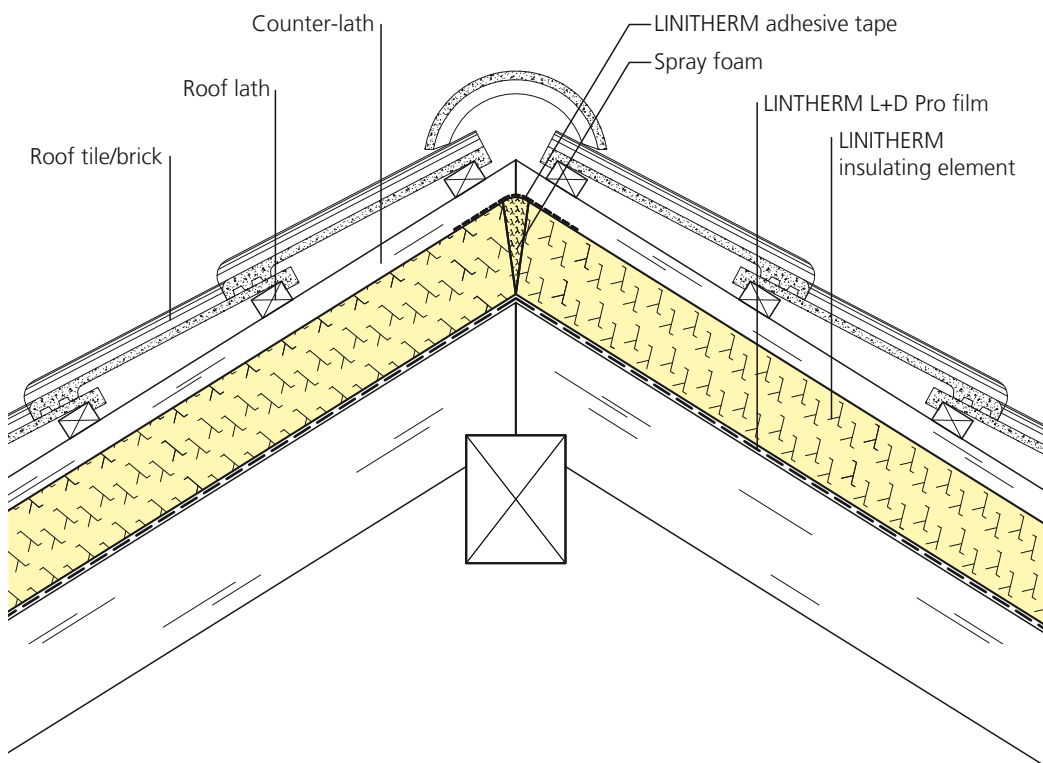
**Verge, old building**

Establishment of air tightness with LINITHERM L+D Pro film (see verge V-O 1).



## Ridge

An absolutely tight connection must also be created on the ridge for homogeneous thermal insulation. The panels should be cut to size in such a way that a narrow groove results. This groove is filled in with LINITHERM spray foam. The overflowed foam can be cut off tidily after hardening. Waterproofing takes place using LINITHERM butyl adhesive tape, except for elements with diffusible sarking membrane. In this case, waterproofing takes place using LINITHERM T adhesive tape.



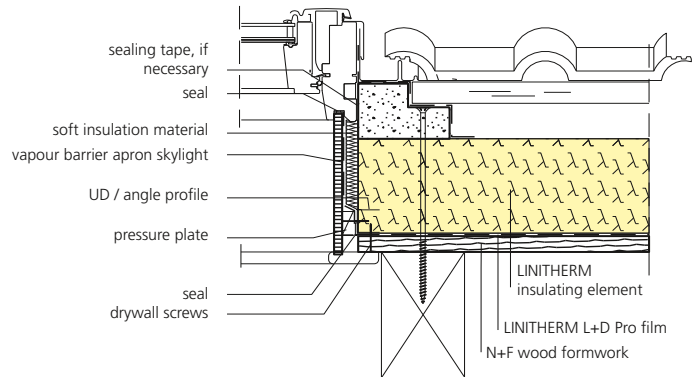
**V-Dff**

**Skylights**

As a rule, follow the window manufacturer's installation instructions. Normally, LINITHERM insulation is applied to the entire surface. Prior to installing the window, use a drywall/hand saw to cut out the insulation approx. 1 cm larger than the outer window dimensions and/or the BDX frame.

**Application without BDX frame**

Then cut the LINITHERM DDZ skylight insulation frame connectors on site to the required skylight size. Around the Velux mounting bracket, notch the LINITHERM skylight insulation frame connector up to the existing groove to achieve a level contact surface for the mounting bracket. Depending on how the skylight will be installed (high or low) you need to notch either the horizontal or vertical insulation frame connectors. For a horizontal insulation frame connector, notch the fold in the corners according to the vertical insulation frame connectors.

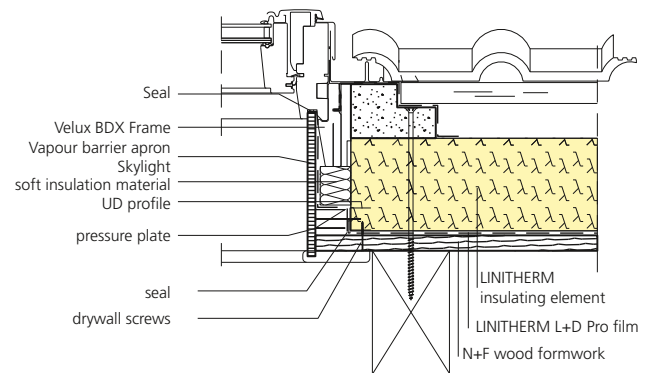


Following this, you can connect the insulation frame connectors with the skylight's window frame. For installations without a BDX frame you can apply a thin piece of sealing/compressed tape between LINITHERM DDZ and the skylight's window frame. Then install the skylight with the LINITHERM DDZ skylight insulation frame connector and screw it into the rafter/trimmer through the LINITHERM elements. Use LINITHERM adhesive tape to connect the skylight (and/or outside skylight connection apron) and the main roof diffusion membrane.

**Application with BDX frame**

Contrary to the description above, if you are insulating with a BDX frame you do not need to notch the LINITHERM DDZ skylight insulation frame connector for the contact surface of the Velux mounting angle. Proceed with the remaining application steps as described above.

Above the skylight, install an angular water drainage channel or a water-repellent board/angle to drain accumulating moisture. Finally, complete the outside boarding, install the roofing frame and finish the roofing.



In the room, expertly and neatly apply the necessary vapour barrier and supplementing thermal insulation (see sectional drawings).

Use adhesive (adhesive tape and/or adhesive cement) and a pressure plate to connect the skylight foil strip with the UD/angle profile (inserted between insulating element and formwork).

Fill the voids with soft insulating material. Finally, install skylight lining.

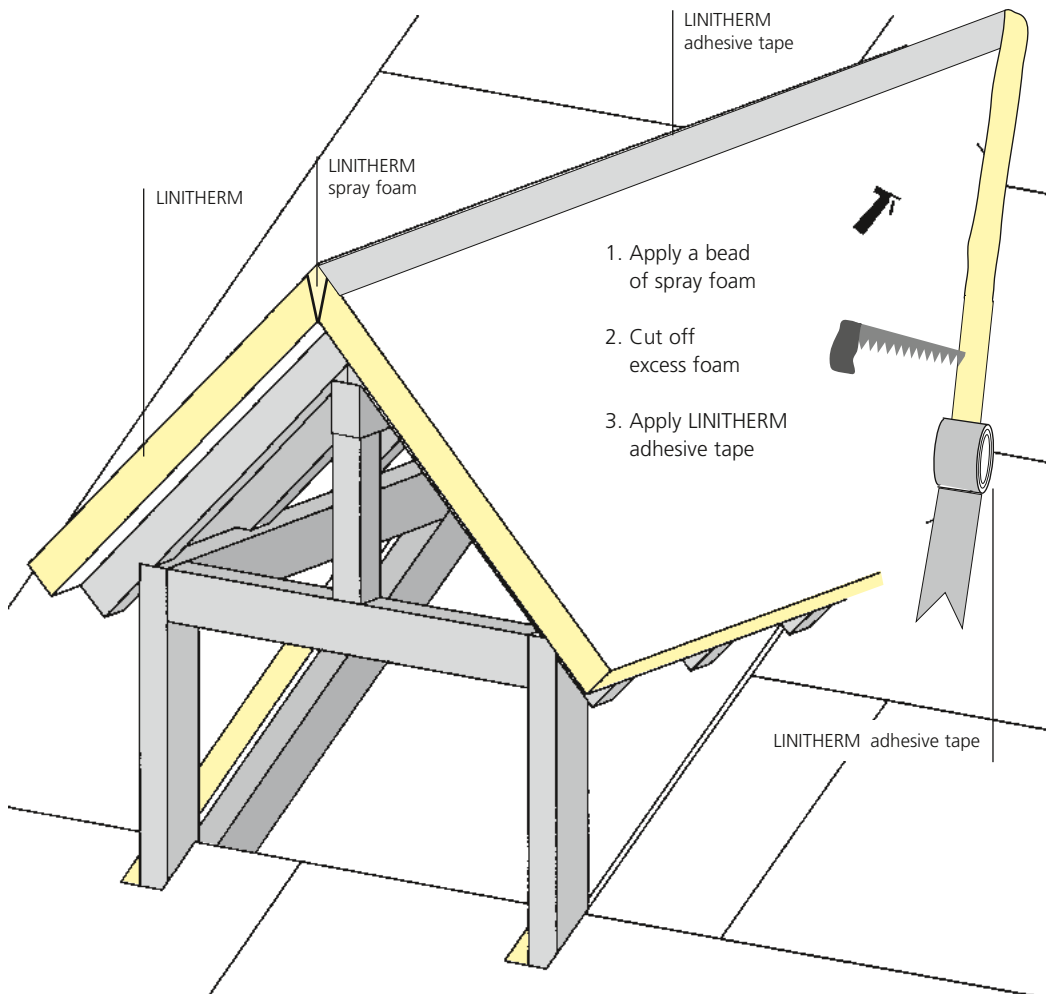
## Gable

The LINITHERM elements are installed on pitched dormers and sloped dormers as on the remaining roof surface.

The connection panels are cut to size with a narrow groove in accordance with the drawing shown below. The resulting cavity is foamed and the excess foam cut off. After this the LINITHERM adhesive tape is applied.

Attachment of the counter-lathing takes place as usual (acc. to static analysis).

The further structure with roof lathing/collar plate/roof covering takes place as usual.



Instead of the conventional wooden-based gables, LITEC GBS offers gable systems.  
(See LITEC GBS gable construction systems »General instructions and examples for assembly«)

**V-K**

**Chimney connection**

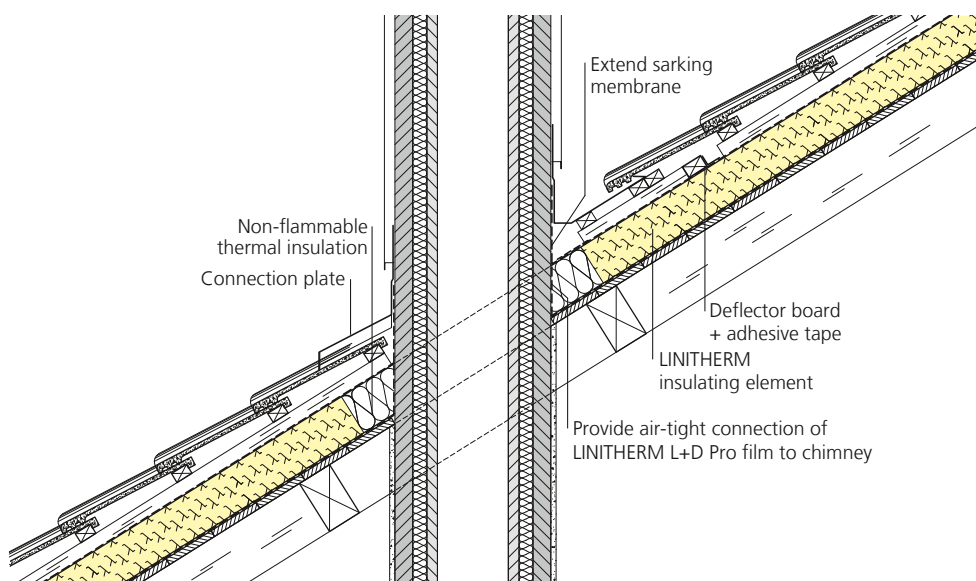
No flammable material may connect directly to the chimney, depending on the exhaust gas temperature. For this purpose, the respective Landesbauordnungen (regional building laws) or the information provided by the local sweep must be observed.

The LINITHERM elements are cut to size and positioned at the specified clearance from the chimney.

The remaining intermediate space to the chimney is filled e.g. with mineral fibre insulation material (building material class A1).

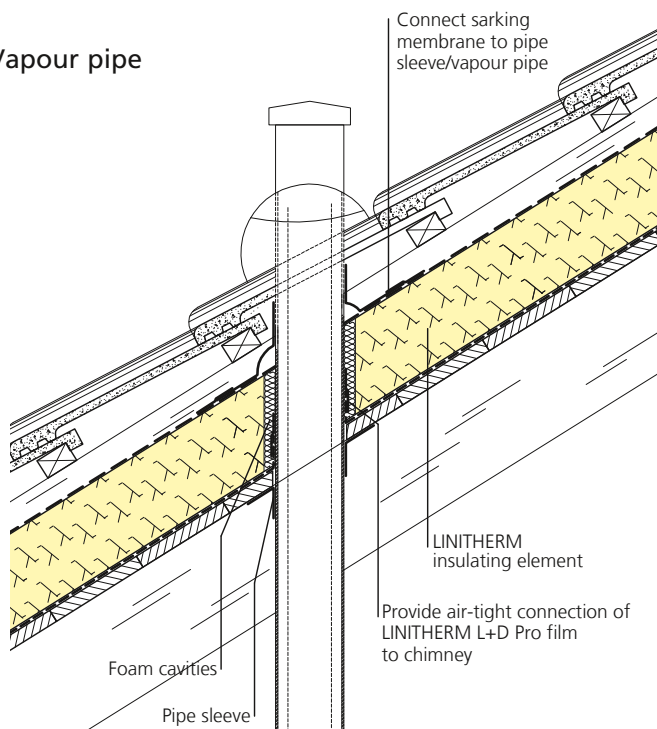
Above this, LINITHERM adhesive tape is to be attached from the chimney through to the LINITHERM insulation.

The further structure with roof lathing/sheet metal coverings/roof covering takes place as usual.



**V-DR**

**Vapour pipe**



**Waterproof under-roof with LINITHERM U-Plus sheeting**

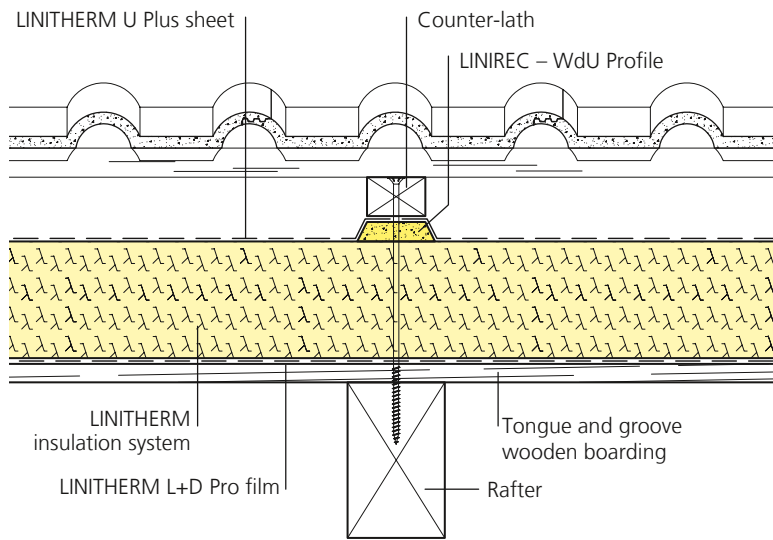
V-WdU

If the rules of the ZVDH (Central Organisation of the German Roofing Trade) require a waterproof under-roof, then bonding or welding of a separate under-roof layer to the overlaps is necessary.

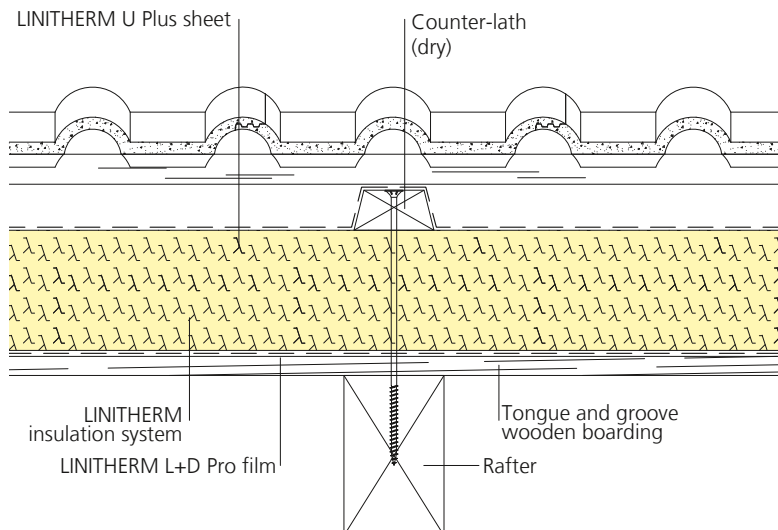
In accordance with the guidelines of the ZVDH, the waterproof under-roof must also be guided over the counter-slat, so that it is not exposed to moisture. As the counter-slats however usually hold a residual wood moisture, this would mean that this moisture is enclosed underneath the under-roof layer and may lead to damage to the counter-lathing. In this case, LINIREC WdU profile has the remedy. It consists of dry, recycled PUR/PIR rigid foam, is pressure-resistant and rot-proof.

The LINIREC WdU profile is attached underneath the under-roof for the fixation of the insulation. The counter-slat can be fastened as usual after installation of the under-roof Conclusion: the counter-slat does not touch the water-draining layer and the enclosed LINIREC WdU-profile cannot rot.

**Waterproof under-roof with WdU profile**



**Waterproof under-roof without WdU profile**



**V-W**

**Residential partition wall**

Longitudinal sound insulation via residential partition walls or sound insulation between various residential units can take place e.g. according to the solution options shown here, depending on local requirements.

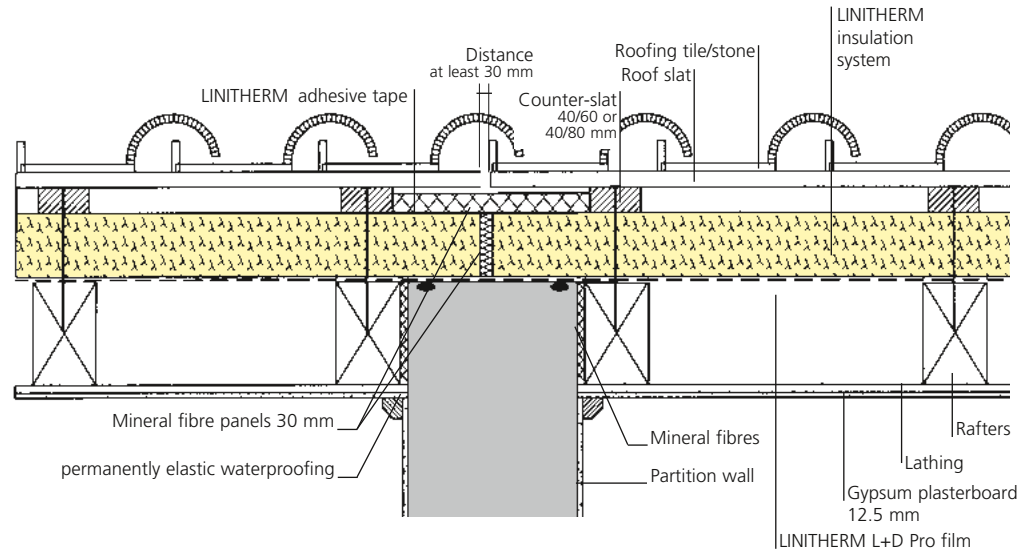
**LINITHERM PAL on rafters**

Evaluated laboratory sound reduction measurement

$R_{LW,P} = 65 \text{ dB}$

Mathematical value

$R_{LW,R} = 63 \text{ dB}$



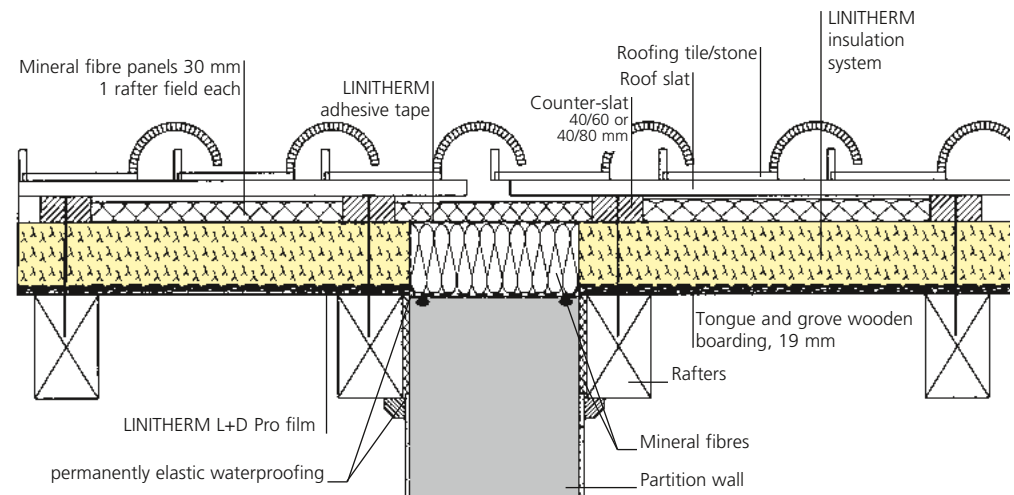
**LINITHERM PAL on boarding**

Evaluated laboratory sound reduction measurement

$R_{LW,P} = 62 \text{ dB}$

Mathematical value

$R_{LW,R} = 60 \text{ dB}$

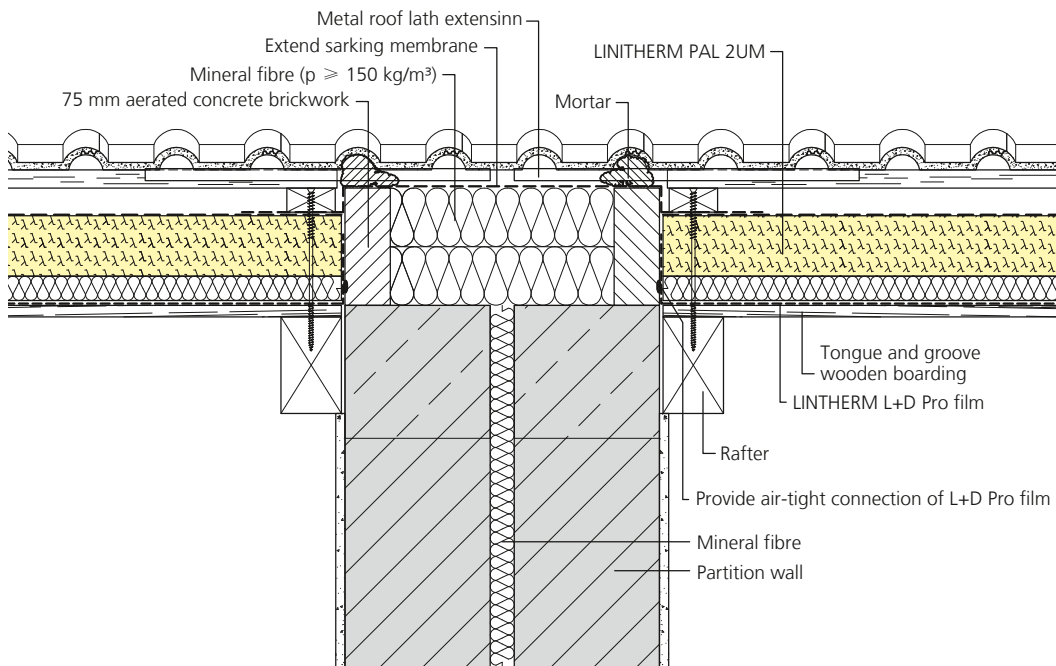




## House partition wall

V-H

Longitudinal sound insulation via partition walls of semi-detached and terraced housing can take place e.g. according to the solution options shown here, depending on local requirements.



### LINITHERM PAL 2UM on rafters

Sound reduction measurement  
 $R_{LW}$  = approx. 70 dB\*

\* Sound reduction measurement results from the following examinations

- Test report 04/06/26.V03, LSW Labor für Schall- und Wärmemesstechnik GmbH, Stephanskirchen, Germany (Determination of the sound reduction measurement of a roof structure with LINITHERM PAL 2UM,  $R_w = 44$  dB)
- Final report 4149, Kurz und Fischer GmbH, Winnenden, Germany (correction term  $K = 26-28$  dB for the depicted version)

**ZVDH guidelines**
**LINITHERM assembly instructions including the ZVDH guidelines**

Classification of the LINITHERM steep roof insulation systems acc. to table 1 of the »Leaflet for under-roofs, sarking membranes and underbracing« and corresponding with table 1.1 of the »Expert regulations for roof tiles and concrete tiles«.

LINITHERM product	Roof pitch (DN) depending on the standard roof pitch (RDN) of the roofing tile	Recommended roof pitch (DN) at least	Maximum number additional increased requirements	Type	Class
PAL N+F, LOOP PAL N+F <i>with U Plus sheeting above area and counter-slat</i>	$DN \geq RDN - 12^\circ$	at least $10^\circ$	3 if $DN \geq (RDN - 12^\circ)$	waterproof under-roof	1
PAL 2U Plus, PAL XXL, PGV XXL <i>with UD masking strip above the counter-slat</i>	$DN \geq RDN - 12^\circ$	at least $12^\circ$	3 if $DN \geq (RDN - 12^\circ)$	waterproof under-roof	1
PAL 2U Plus, PAL XXL, PGV XXL <i>with nail seal</i>	$DN \geq RDN - 12^\circ$	at least $12^\circ$	4 if $DN \geq (RDN - 8^\circ)$ 1 if $DN \geq (RDN - 12^\circ)$	rainproof under-roof	2
PAL N+F, LOOP PAL N+F PAL 2U, PAL 2UM, PGV T <i>with nail seal</i>	$DN \geq RDN - 8^\circ$	at least $20^\circ$	3 if $DN \geq (RDN - 8^\circ)$	seamless and perforation-proof Sarking membrane	3
PAL 2U, PAL 2U Plus, PAL 2UM, PGV T, PAL XXL, PGV XXL <i>without nail seal</i>	$DN \geq RDN$	at least $20^\circ$	3 if $DN \geq RDN$	welded or bonded sarking membrane	4
PAL N+F, LOOP PAL N+F <i>without nail seal</i>	$DN \geq RDN$	at least $20^\circ$	2 if $DN \geq RDN$	overlapped or interlocked Sarking membrane	5

Increased requirements are:

- Roof pitch less inclined than standard gradient
- Special structural features
- Use of the attic storey in particular for residential purposes
- Climatic conditions
- Local provisions

The classifications stated in the table are minimum measures.

Particular climatic conditions, exposed position of the building, great distances from the ridge to the eaves, valleys, roof gables, installations, on-roof or in-roof systems or other special requirements need a higher-level classification. A higher additional measure needs to be chosen in case of particular local provisions.

Higher-level classifications can generally be applied, even instead of the minimum classifications.

## Annex to: LINITHERM assembly instructions including the ZVDH guidelines

### Excerpt from the ZVDH set of rules:

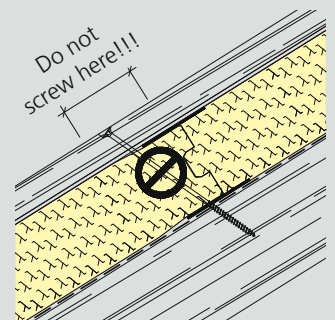
»Temporary roofing may be necessary for roofs used for residential purposes and/or thermally insulated roofs«.

### Recommendations

With regard to the suitability as temporary roofing, the following details must be observed for LINITHERM over-rafter insulation systems with sarking function:

Insulation system	Prerequisites for temporary roofing suitability
LINITHERM PAL N+F, LOOP PAL N+F	Nail seal underneath the counter-lathing
	Do not screw into the longitudinal joint tapering (see illustration on the right)
	Adhesive tape points clean, dust-free, grease-free and dry
	Carefully stick on joint/adhesive tape, use LINITHERM butyl adhesive tape 1.0 mm
	No bonding in standing water
	Max. outdoor exposure to weather 6 weeks
LINITHERM PAL 2U, PAL 2U Plus, PAL 2UM, PGV T PAL XXL PGV XXL	Nail seal underneath the counter-lathing
	Adhesive tape points and overlapped bonding clean, dust-free, grease-free and dry
	Carefully stick on overlap bonding/adhesive tapes
	Use LINITHERM T adhesive tape
	No bonding in standing water
	Max. outdoor exposure to weather 4 weeks

Longitudinal joint from  
LINITHERM PAL N+F  
and LOOP PAL N+F:  
Do not screw into  
tapering



The sarking membranes used comply with class UDB-A of the ZVDH and have been tested for use as temporary roofing by the TU Berlin.

LINITHERM PAL N+F and LINITHERM LOOP PAL N+F was successfully tested at the TU Berlin with longitudinal and transversal joint (T-joint) and therefore fulfils the requirements for suitability as temporary roofing.

LINITHERM accessories are coordinated to the insulation systems and are approved.

Suitable accessories:

- LINITHERM nail seal
- LINITHERM adhesive tape butyl rubber (1.0 mm), processing temperature +5 °C to +40 °C
- LINITHERM joint tape for PAL N+F and LOOP PAL N+F, processing temperature +5 °C to +40 °C
- LINITHERM T-adhesive tape for PAL 2U, PAL 2U Plus, PAL 2UM and PGV T, Processing temperature +5 °C to +40 °C
- LINIFIX special screws/double thread screws
- LINITHERM UD masking strip

We generally recommend, due to the various weather conditions (e.g. heavy rain) the rapid covering with the appropriate roofing material.

We recommend that you even off in rooms requiring particular protection or in case of longer outdoor weather exposure as always.

**T 1  
LINITHERM PAL N+F  
and LOOP PAL N+F**

**Installation instructions for element type LINITHERM PAL N+F and LOOP PAL N+F**

The LINITHERM PAL N+F and LOOP PAL N+F elements are closely fitted together on the longitudinal and transversal sides. The elements are installed row by row from bottom to top parallel to the eaves. When doing so, the longitudinal overlap of the elements always faces downwards, such that any moisture that may be formed is reliably drained off the under-roof.

As soon as a row of elements has been installed, the joints on the transversal side are masked with the already cut LINITHERM joint tape. The surfaces of the elements must be clean, dry and free of grease in the adhesive area. Immediately press joint tape on firmly.

The LINITHERM PAL N+F and LOOP PAL N+F elements can be used both sides. This enables low-waste installation of the thermal insulation and installation from left to tight or right to left.

After installing 2 to 3 rows, the counter-slats are attached immediately according to the static analysis. If necessary, apply LINITHERM mail sealing tape underneath the counter-lathing. The roof slats or ancillary slats are immediately mounted as a platform on the counter-slats.

LINITHERM PAL N+F and LOOP PAL N+F elements fulfil the requirements on a seamless and perforation-proof sarking membrane with a roof pitch less inclined than standard gradient by up to 8° (minimum roof pitch 20°) in accordance with the set of rules of the »Deutschen Dachdeckerhandwerks« (Jan. 2010) in conjunction with the LINITHERM nail sealing tape.

See also: »LINITHERM assembly instructions including the ZVDH guidelines«.

Otherwise the instructions from our sheet »General information and examples regarding the installation of LINITHERM above-rafter insulation systems« must be observed.

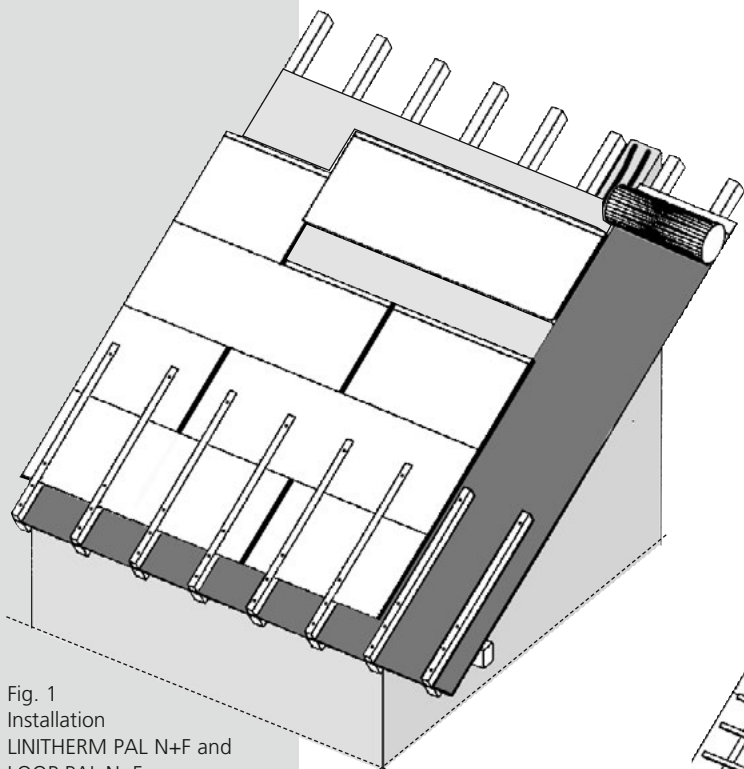


Fig. 1  
Installation  
LINITHERM PAL N+F and  
LOOP PAL N+F  
directly on the rafters  
with LINITHERM L+D Pro film

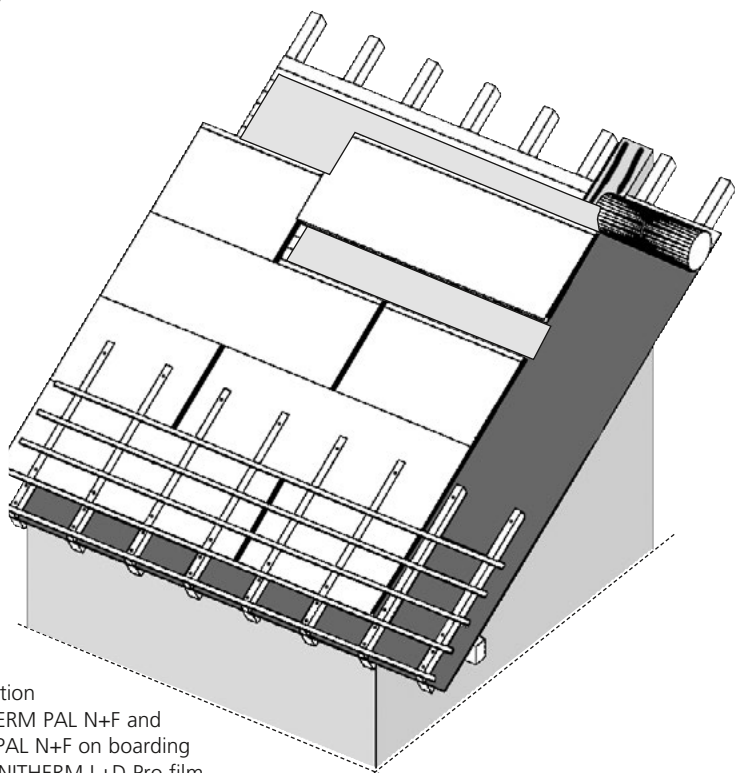
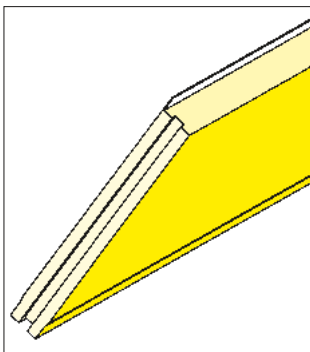
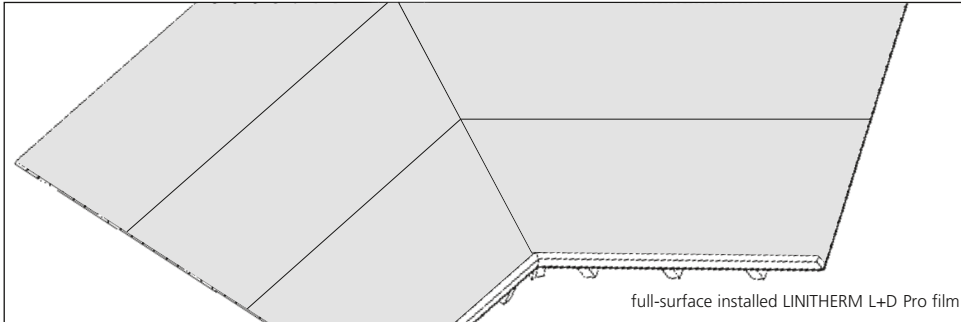


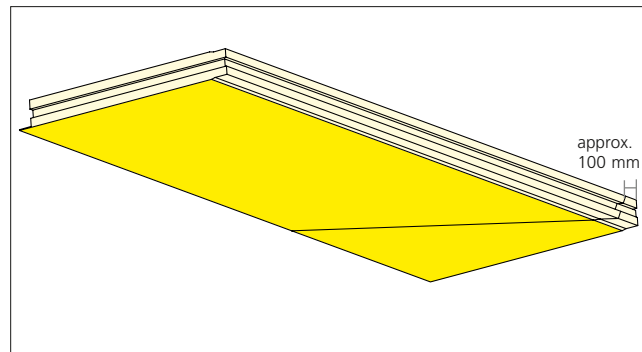
Fig. 2  
Installation  
LINITHERM PAL N+F and  
LOOP PAL N+F on boarding  
with LINITHERM L+D Pro film

Low-waste installation in the valley

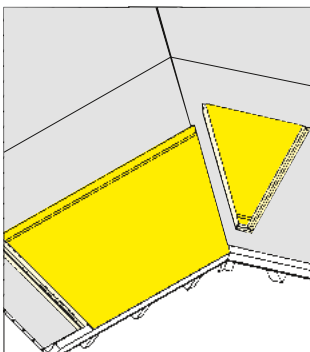
Usually, all elements required for the valley are cut to size and subsequently completely installed.



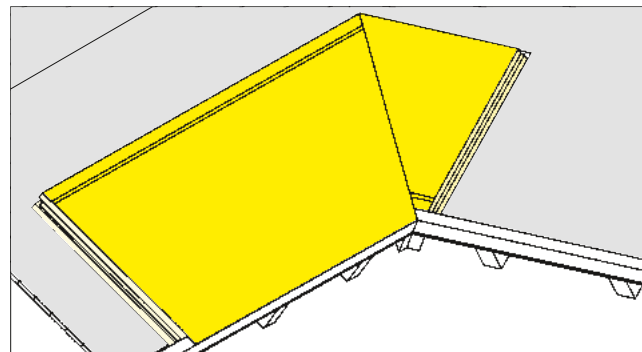
1. Cut off hard fibre strip on one side of the LINITHERM insulating element and PU-tongue ...



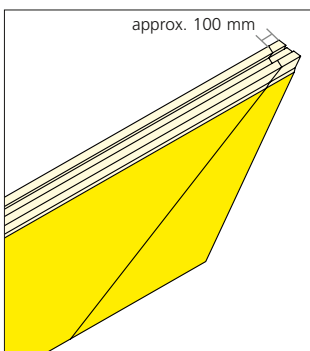
2. ... Saw slanting cut for valley, ...



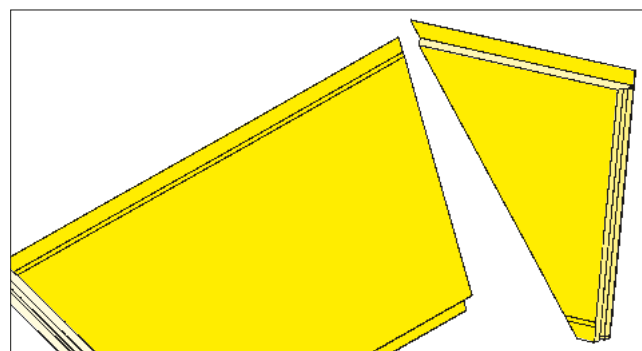
3. ... Place main piece of panel into the valley (overlapping lies of boarding plank), turn residual piece...



4. ... Install remaining piece in the valley with the sawn edge against the main piece ...



5. Saw a slanting cut for the valley on a further insulation element...



6. ... Turn residual piece, cut off top hard fibre strip and PU tongue, place the side with the hard fibre strips onto the wooden boarding ...

1. Representation valley

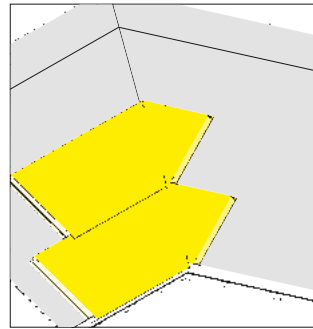
2. Row 1  
Slanting cut for valley

3. Row 1  
Install insulating panel  
beginning in the valley

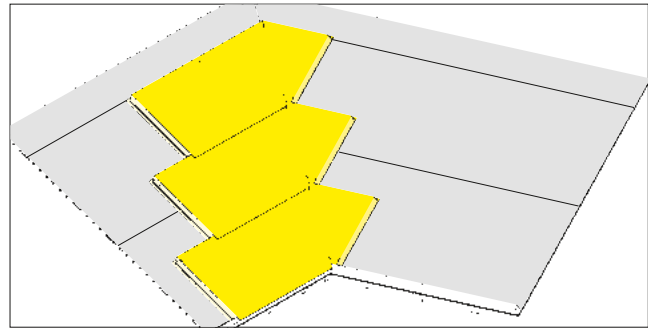
4. Row 2  
and other slanting  
cuts for the valley

**T 1a**  
**LINITHERM PAL N+F**  
**and LOOP PAL N+F**

**5. Install valley**

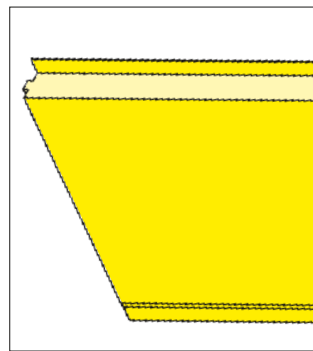


7. ... Install second row of panels ...

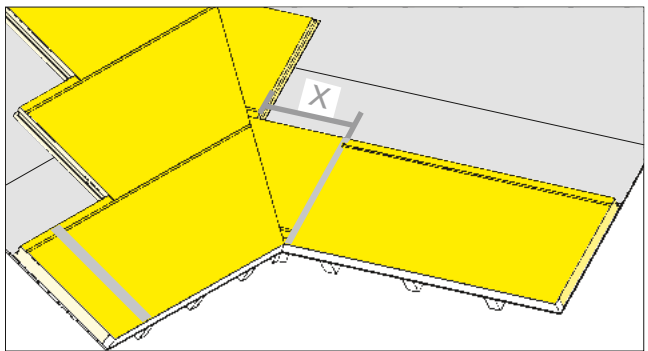


8. ... Install third row of panels etc.

**6. Row 1**  
**Installation of further**  
**insulation elements in**  
**parallel to the eaves**

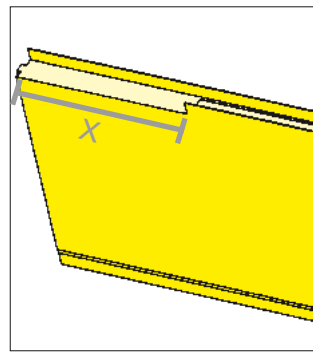


1. Cut off hard fibre strip on one side and PU-tongue ...

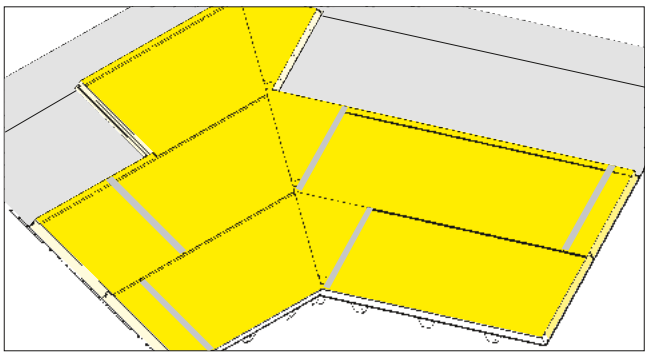


2. ... Firmly press the LINITHERM insulation element with the transverse side tongue into the groove of the wedge, mask the transversal sides with joint tapes... Measure X length ...

**7. Installation of**  
**the other insulation**  
**elements**



3. And tear on the following panel. Release the hard fibre panel and PU tongue at the panel or the second row ...

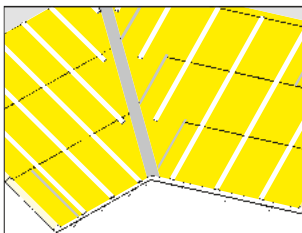


4. ... Install panel and foam butt joint... 5. Install the remaining panels as usual.

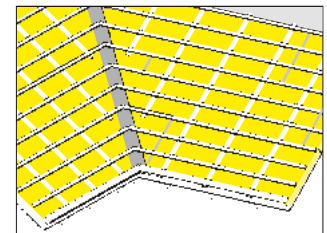
**8. Ready installed**  
**insulation**



Ready-installed roof surface.



Attach the counter-slats, foam collar joint and stick on collar tape...



Insert to counter-slats in the valley area and fix to the roof slats; full-surface support may possibly be necessary for a valley plate.

## Installation instructions for element type LINITHERM PAL SIL T

LINITHERM PAL SIL T is an additional insulation with integrated building board, which can be combined with most LINITHERM above-rafter insulation systems (except PAL HW and PGV Flex).

The elements are usually separated in the connection area for the creation of air tightness to the exterior walls. The airtight connection is established for example by means of LINITHERM connecting apron. This is connected airtight to the exterior walls with the integrated Compriband and then runs through the separating joint onto the element.

The apron is bonded airtight on the top side to the sarking membrane of the PAL SIL T insulation, such that the airtight planes are inter-connected. The coating sarking membrane e.g. is masked/stuck on e.g. with the T-adhesive tape at the butt panel joints (e.g. ridge/burr/valley cuts) and at the continuous components/connections etc.

The LINITHERM PAL PAL SIL T elements are closely fitted together on the longitudinal and transversal sides. The elements are installed row by row from bottom to top parallel to the eaves. The longitudinal overlap of the T-sheeting always faces downwards. If the distance between the rafters is bigger than 827 mm, the transversal joint must be placed on the rafter. Cut the plates to length at the transversal joint and foam the joint with LINITHERM spray foam.

Mask the joint with LINITHERM T-adhesive tape. Cross joints or transversal joints on top of one another within one rafter field must be avoided. Pull the backing off the sealing tape and press the overlap on firmly. The surfaces of the elements must be clean, dry and free of grease in the adhesive area.

After the installation of approx. 2 to 3 rows, the further LINITHERM insulation (see installation instructions for the respective element) are installed, to which the counter-slats are attached in accordance with the static analysis. The roof slats or ancillary slats are immediately mounted as a platform on the counter-slats.

As the rafters or the silicate surfaces of the insulation elements usually remain visible in the room, attention must be paid that the rafters are clean and dry prior to installation. Then smooth the elements with filler. A paper joint tape is incorporated in the groove of the silicate panel before filling.

Caution: As the roof structure or a wooden structure is exposed to certain tensions due to wind/snow loads/ deformations of the rafters, the formation of cracks cannot be completely ruled out. Smoothing should only take place when the moisture has dried out (panel moisture of silicate panel approx. 4%), i.e. the panels are dry and stay dry. Then grind the joints as usual.

In the connection area to the brickwork, a highlighted joint must always be provided e.g. valley cut with adhesive tape or plaster rail. It is recommendable to apply a deep primer as preparation for the decorative design. This also saves material when it comes to painting.

Note: If wind-resistant bracing should become necessary via spiked bands, please request our special instructions.

Otherwise, the information from our leaflet »General information and examples for the installation of LINITHERM insulation systems on the rafters« must be observed.

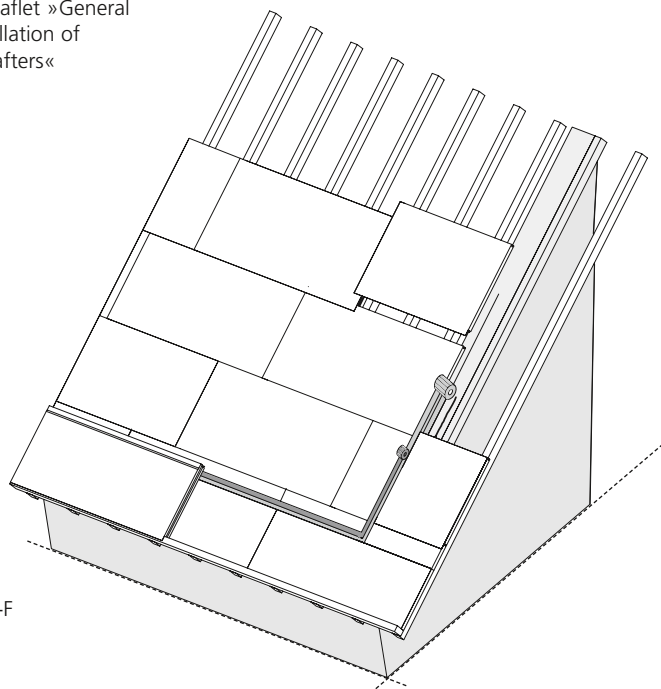


Fig. 1  
 Installation LINITHERM PAL SIL T  
 directly on the rafters e.g.  
 in conjunction with LINITHERM PAL N+F

**T 3**

**LINITHERM PAL 2U  
 LINITHERM PAL 2U Plus  
 LINITHERM PGV T  
 LINITHERM PAL 2UM  
 LINITHERM PAL XXL  
 LINITHERM PGV XXL**

**Installation information for element types**

**LINITHERM PAL 2U, LINITHERM PAL 2U Plus, LINITHERM PGV T,  
 LINITHERM PAL 2UM, LINITHERM PAL XXL, LINITHERM PGV XXL**

The installation of LINITHERM PAL 2U, LINITHERM PAL 2U Plus, LINITHERM PGV T, LINITHERM PAL 2UM, LINITHERM PAL XXL and LINITHERM PGV XXL can take place both on the boarding and directly on the rafters. LINITHERM L+D Pro film must be installed underneath the element. The continuous L+D Pro film is joint-bonded and connected airtight to the rising building components and penetrations.

The elements are closely fitted together on the longitudinal and transversal sides. They are installed row by row from bottom to top parallel to the eaves. The longitudinal overlap always faces downwards.

Pull the backing off the sealing tape and press the overlap on firmly. The surfaces of the elements must be clean, dry and free of grease in the adhesive area. For LINITHERM PAL XXL/PGV XXL, weld the overlap of the U-Plus sheet with hot air (200 °C to 300 °C) or solvent welding. In the case of LINITHERM PAL 2U Plus, weld the overlap in case of increased rain protection requirements, if necessary in addition to the bond.

For improved sound insulation we recommend with LINITHERM insulation elements with noise protection board the opposing screw fastening with LINIFIX double thread screws.

The insulation elements fulfill the requirements on a seamless and perforation-proof sarking membrane with a roof pitch less inclined than standard gradient by up to 8° (recommended minimum roof pitch 20°) in accordance with the set of rules of the »Deutschen Dachdeckerhandwerks« (Jan. 2010) in conjunction with the LINITHERM nail sealing tape.

See also: »LINITHERM assembly instructions including the ZVDH guidelines«.

The elements with U Plus membrane even fulfill in conjunction with a nail sealing tape the requirements on a rainproof under-roof with a roof pitch less inclined than standard gradient by up to 12° (recommended minimum roof pitch 12°)

Otherwise the instructions from our sheet »General information and examples regarding the installation of LINITHERM above-rafter insulation systems« must be observed.

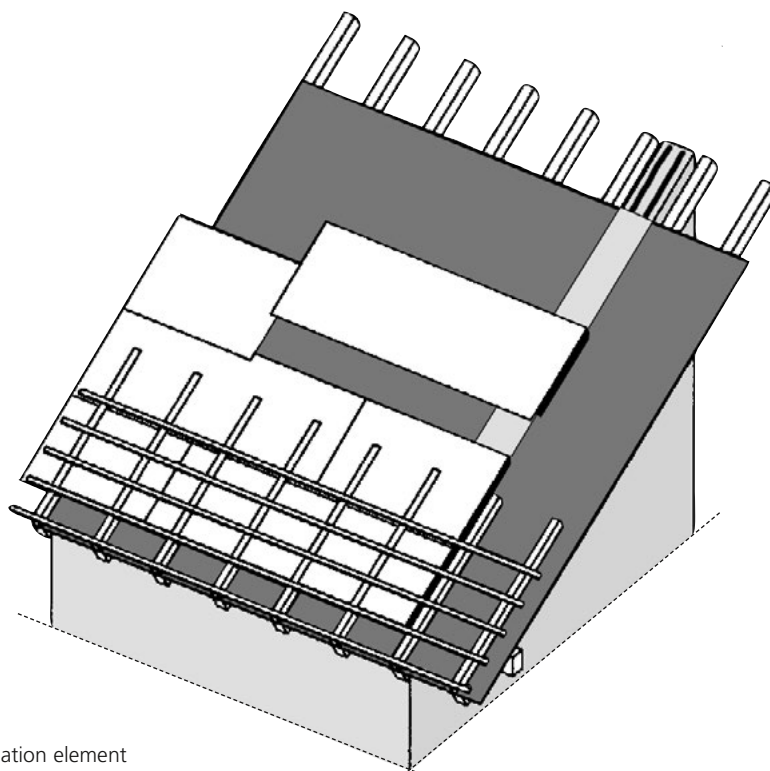


Fig. 1  
 Installation LINITHERM insulation element  
 on boarding with L+D Pro film



## Counter-lathing connection via LINIFIX special screws for continuous screw fastening

The screws for **shear load absorption** must be installed at an **angle of 67°** to the roof surface.

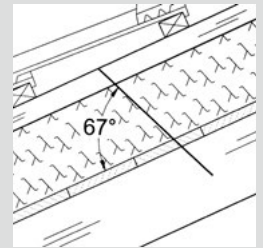
The maximum screw interval for LINITHERM above-rafter insulation systems for shear load absorption can be read off from the tables below.

In accordance with the recommendation in approval ETA-11/0024, the maximum screw intervals are limited to 1.75 m. In case of butt joints of the counter-lathing, the first and/or last screw must be positioned approx. 20 cm from the end of the counter-lathing. At least 2 rafter screws must be applied for each counter-slat, one thrust screw and one suction screw.

In the case of a higher covering weight, low rafter width, snow guards and for LINITHERM PAL 2UM or PAL HW, please ask for the special static information.

### General details:

Roof shape:	Symmetrical gabled roof
Roof covering:	$g = 0.55 \text{ kN/m}^2$ roof surface
Insulation	LINITHERM insulation system made of PU rigid foam 100 mm $\leq$ insulation thickness $\leq$ 240 mm
Boarding:	without boarding <i>*(with 19 mm boarding)</i>
Rafter width:	60 mm
Counter-slat h/w:	40/60 mm
Wind load:	$\leq$ Wind zone 3, inland
Ground height:	$\leq$ 800 m above sea level
Ridge height:	$\leq$ 18 m



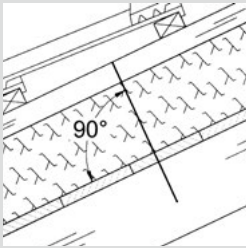
Insulation thickness	Screw length
$\leq 80 \text{ mm}$	on request
100 mm	225 mm
120 mm	250 mm
140 mm	275 mm
160 mm	300 mm
180 mm	325 mm
200 mm	350 mm
220 mm	375 mm
240 mm	400 mm

Rafter spacing 0.75 m	Roof pitch (°) / max. screw spacing (cm)								
	charact. snow load $S_k$	15°	20°	25°	30°	35°	40°	45°	50°
0.75 kN/m <sup>2</sup>	175 *(175)	175 *(175)	175 *(175)	175 *(170)	175 *(165)	175 *(165)	175 *(155)	175 *(145)	175 *(135)
1.00 kN/m <sup>2</sup>	175 *(175)	175 *(175)	175 *(165)	175 *(145)	175 *(145)	175 *(145)	175 *(155)	175 *(145)	175 *(135)
1.50 kN/m <sup>2</sup>	175 *(175)	175 *(155)	175 *(130)	155 *(110)	160 *(115)	175 *(120)	175 *(130)	175 *(145)	175 *(135)
2.00 kN/m <sup>2</sup>	175 *(165)	175 *(125)	145 *(105)	130 *(90)	130 *(95)	140 *(100)	160 *(115)	175 *(130)	175 *(135)
2.50 kN/m <sup>2</sup>	175 *(140)	150 *(105)	125 *(90)	110 *(75)	115 *(80)	125 *(90)	140 *(100)	170 *(120)	175 *(135)
3.00 kN/m <sup>2</sup>	170 *(120)	130 *(90)	105 *(75)	95 *(65)	100 *(70)	110 *(75)	125 *(90)	155 *(110)	175 *(135)
4.00 kN/m <sup>2</sup>	130 *(95)	100 *(70)	85 *(60)	75 *(50)	80 *(55)	90 *(60)	105 *(75)	130 *(95)	175 *(130)

Rafter spacing 1.00 m	Roof pitch (°) / max. screw spacing (cm)								
	charact. snow load $S_k$	15°	20°	25°	30°	35°	40°	45°	50°
0.75 kN/m <sup>2</sup>	175 *(175)	175 *(175)	175 *(145)	175 *(125)	170 *(125)	170 *(125)	165 *(115)	150 *(110)	140 *(100)
1.00 kN/m <sup>2</sup>	175 *(175)	175 *(150)	175 *(125)	150 *(110)	150 *(105)	155 *(110)	160 *(115)	150 *(110)	140 *(100)
1.50 kN/m <sup>2</sup>	175 *(150)	165 *(115)	135 *(95)	120 *(85)	120 *(85)	125 *(90)	135 *(95)	150 *(110)	140 *(100)
2.00 kN/m <sup>2</sup>	175 *(125)	135 *(95)	110 *(80)	95 *(70)	100 *(70)	105 *(75)	120 *(85)	140 *(100)	140 *(100)
2.50 kN/m <sup>2</sup>	145 *(105)	110 *(80)	95 *(65)	80 *(55)	85 *(60)	90 *(65)	105 *(75)	125 *(90)	140 *(100)
3.00 kN/m <sup>2</sup>	125 *(90)	95 *(70)	80 *(55)	70 *(50)	75 *(50)	80 *(55)	95 *(65)	115 *(80)	140 *(100)
4.00 kN/m <sup>2</sup>	100 *(70)	75 *(55)	65 *(45)	55 *(40)	60 *(40)	65 *(45)	80 *(55)	100 *(70)	135 *(95)

See also Statics S2 – Wind suction absorption

**Statics S 2  
Wind suction  
absorption**



**Counter-lathing connection via LINIFIX® special screws for continuous screw fastening**

The screws for **wind suction absorption** must be installed at an **angle of 90°** to the roof surface. The maximum screw spacing for wind suction screw fastening for LINITHERM above-rafter insulation systems can be read off from the tables below. In case of butt joints of the counter-lathing, the first and/or last screw must be positioned approx. 20 cm from the end of the counter-lathing. At least 2 rafter screws must be applied for each counter-slat, one thrust screw and one suction screw.

**General details**

- Roof shape: Symmetrical gabled roof
- Roof covering:  $g = 0.55 \text{ kN/m}^2$  roof surface
- Insulation material: LINITHERM Insulation system made of PU rigid foam  
100 mm ≤ insulation thickness ≤ 240 mm
- Boarding: without boarding *\*(with 19 mm boarding)*
- Rafter width: 60 mm
- Counter-slat h/w: 40/60 mm
- Wind load: ≤ Wind zone 3, inland
- Ground height: ≤ 800 m above sea level
- Ridge height: ≤ 18 m

**Rafter spacing 0.75 m, ridge height ≤ 18 m**

Rafter spacing 0.75 m	Roof pitch (°) / max. screw spacing (cm)								
	15 °	20°	25°	30°	35°	40°	45°	50°	55°
Wind suction area									
H, I, J	345 <i>*(270)</i>	460 <i>*(365)</i>	455 <i>*(360)</i>	450 <i>*(350)</i>	440 <i>*(345)</i>	430 <i>*(340)</i>	420 <i>*(330)</i>	440 <i>*(345)</i>	465 <i>*(365)</i>
F, G	240 <i>*(190)</i>	240 <i>*(185)</i>	235 <i>*(185)</i>	235 <i>*(185)</i>	235 <i>*(185)</i>	230 <i>*(180)</i>	225 <i>*(180)</i>	225 <i>*(175)</i>	220 <i>*(175)</i>

**Rafter spacing 1.00 m, ridge height ≤ 18 m**

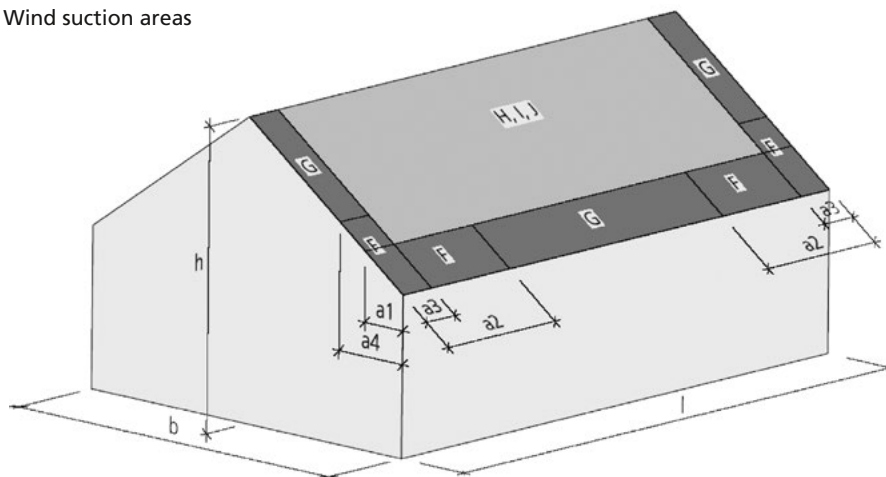
Rafter spacing 1.00 m	Roof pitch (°) / max. screw spacing (cm)								
	15 °	20°	25°	30°	35°	40°	45°	50°	55°
Wind suction area									
H, I, J	260 <i>*(200)</i>	345 <i>*(270)</i>	340 <i>*(260)</i>	335 <i>*(265)</i>	330 <i>*(260)</i>	320 <i>*(255)</i>	315 <i>*(245)</i>	330 <i>*(260)</i>	345 <i>*(270)</i>
F, G	180 <i>*(140)</i>	180 <i>*(140)</i>	175 <i>*(140)</i>	175 <i>*(140)</i>	170 <i>*(135)</i>	170 <i>*(135)</i>	170 <i>*(135)</i>	170 <i>*(130)</i>	165 <i>*(130)</i>

- a1 = l/10 or h/5
- a2 = l/4 or h/2
- a3 = b/10 or h/5
- a4 = b/4 or h/2

The smaller value is decisive respectively!

- l = Building length
- b = Building width
- h = Ridge height

**Wind suction areas**



**Other designs on request**

Our installation recommendations serve as schematic information for the buyer/user. They are non-binding and do not claim to be fundamentally valid, nor do they substantiate an entitlement to a guarantee. Each building offers different prerequisites; therefore the general procedure is to follow the rules of construction technology for each specific building. The tables depicted are a service of Linzmeier Bauelemente GmbH and do not substitute the possibly required verification of a structural engineer/inspecting structural engineer.