

LINITHERM®

insulation systems

LINZMEIER

building elements

Old building renovation
with the over-rafter
insulation system

- PAL N+F
- PAL 2U Plus
- PAL 2U
- PAL Polymer



With the LINITHERM over-rafter insulation system from an old roof to an energy-saving roof

Save energy costs, increase residential quality, protect the environment.

The complete insulation from the outside is the best protection against heat, cold, rain, snow and wind. With a density of approx. 33 kg/m³, these insulation elements are extremely light. Due to this low weight the substructures of old buildings are usually sufficient.

This is the best time to invest in energy saving.

In the case of already planned modernisation work on a residential building, the additional costs for energy-saving measures are often low.

Calculations of the passive house institute verify the amortisation of contemporary above-rafter insulation in less than ten years.

Benefit in three ways:

You reduce your energy costs and become less independent on the gas, oil and electricity price development.

If you decide to sell or rent your house, a low energy consumption is considered as an added value (as for cars).

A sensibly modernised house in terms of energy aspects offers a high level of living comfort and a pleasant room climate.



Creating and maintaining values

Sooner or later, house owners have to perform smaller or larger repairs or modernisation work on their house. Now is the best time to invest in a good thermal insulation:

- You save heating and cooling costs
- A modernised house in terms of energy aspects offers a high level of living comfort and a pleasant room climate: cool in summer, warm in winter.
- You fulfil the requirements of the German Energy Saving Ordinance (EnEV)
- You increase the value of your residential property

Example roof: If the roof needs to be re-tiled anyway, the extra charge for an above-rafter insulation system is comparatively low. A scaffold is needed anyway. Advantage: The insulation from the outside offers the best protection against heat, cold and wind. You gain additional living space.

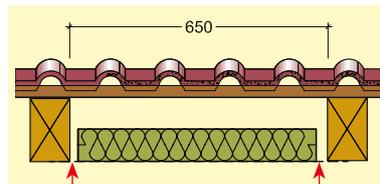
And what is more, most energy-saving measures are supported by government subsidies.

Energy-saving in old buildings: an insulated and air-tight roof

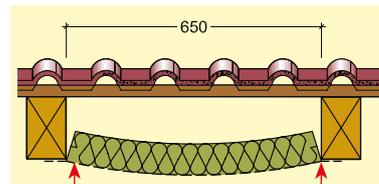
In the past, the roof was normally insulated between the rafters (e.g. edge strip mats). The insulation performance frequently does not fulfil the requirements of the energy saving ordinance that is valid today, was not installed properly and has formed thermal bridges or is damaged, has slipped or been compressed.

First of all the functional capability of the existing insulation between the rafters needs to be examined.

Examples of heat leaks



The insulation is too short. Expensive heating energy escapes.



If the insulation is too wide, this may be the cause of thermal losses.



LINITHERM insulation systems Heat and thermal protection on the rafters

Only the insulation on the rafters or on the boarding fully envelops the roof and guarantees permanent insulation without thermal bridges.

Just as a wet coat cannot protect you against the cold in winter, damp insulation cannot maintain the warmth. Therefore, LINITHERM PAL insulation systems are clad with aluminium on both sides. This means that you have the vapour barrier on the right side at all times: outside in summer, inside in winter. The roof is waterproof within the shortest possible time.

Waterproof right from the start

When renovating older buildings, the creation of the proper connections to the eaves and verges is often a real challenge. Cladding on the room side is usually not air-tight, and thermal insulation insufficient or even non-existent.

LINITHERM insulation elements are equipped with a circumferential tongue and groove press-fit joint. A closed, homogeneous insulation surface is quickly formed without thermal losses through joints or rafters.

The LINITHERM L+D system ensures double certainty when it comes to air tightness: The air-tight layer guarantees the increasing requirements, even for the future.

The solution for any requirement

The high-performance insulation material PUR/PIR rigid foam convinces by its extremely low thermal conductivity level (TCL) of 023. Therefore, LINITHERM insulation systems offer optimal thermal insulation with low panel thickness grades. Due to the rapid installation, the roof is only exposed to the weather for a very short time. By means of the proven edge and connection techniques of the elements, sarking and wind tightness on the installed areas are achieved immediately. The aluminium outer surface serves as a vapour barrier.

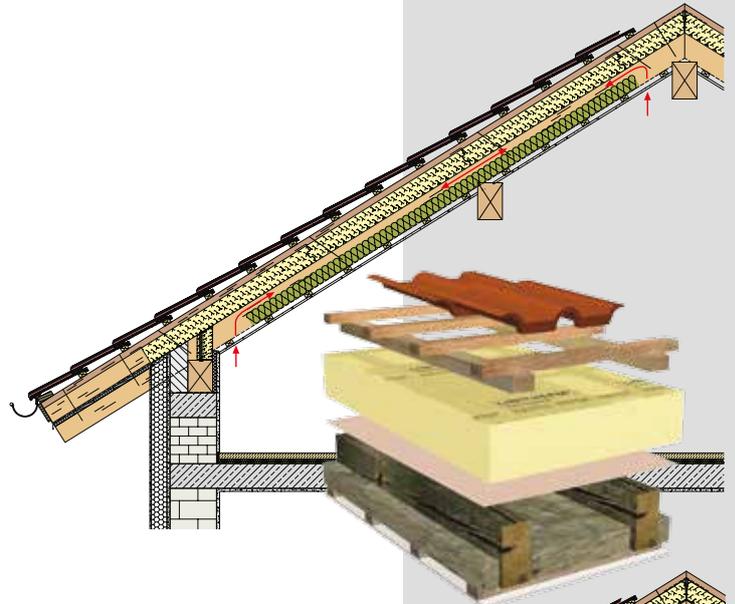
Insulation solution 1: Old building solution

As the old insulation material is usually not properly installed, or is not capable of functioning, it cannot be taken into consideration in the calculation of the U-value.

In order to save disposal and dismantling costs, the between-rafter insulation does not need to be removed completely. Only approx. 50 cm needs to be removed from each rafter field at the edge and the ridge. The old thermal insulation may not reach up to the underside of the new insulation, hence the dew point is within the range of the new insulation in any case. Heavily soiled insulation material should be removed. Moisture damage and the formation of mildew.

Example: Even with such a low thickness of only 100 mm, LINITHERM insulation systems with a thermal conductivity level of (TCL) 023 already fulfil the minimum requirements of the EnEV 2009/2014 for old buildings:

Sloping roof $U \leq 0.24 \text{ W/(m}^2\text{K)}$

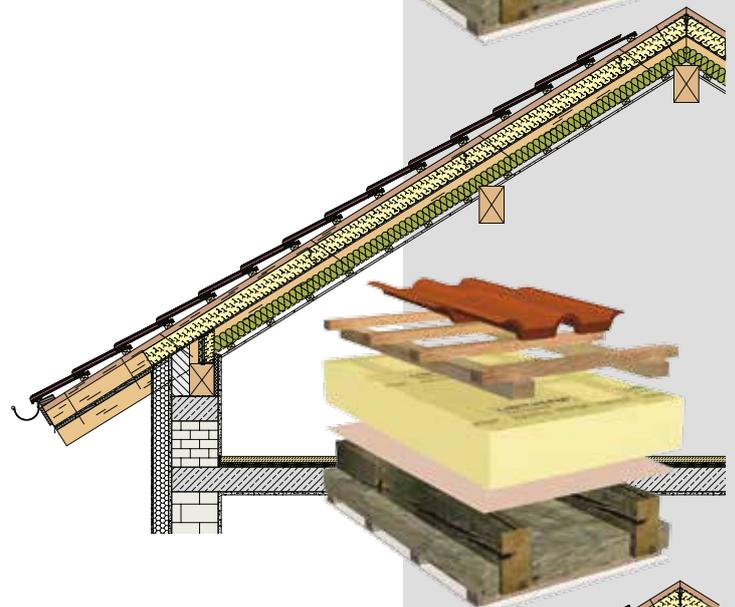


Insulation solution 2: "+4 regulation"

The requirements on the overall efficiency of buildings are constantly increasing. In order to insulate in a sustainable manner and achieve low U-values, an existing, functioning but insufficient between-rafter insulation (TCL ≥ 040) can remain with an additional over-rafter insulation with LINITHERM (TCL 023). The present installation therefore remains unchanged. The rule of thumb applies: 4 cm more over the rafter than between the rafters. With this insulation solution, the structure remains reliably free from condensate.

Example: An existing, functioning, 8 cm thick between-rafter insulation (TCL ≥ 040) can remain if the over-rafter insulation with LINITHERM (TCL 023) is at least 12 cm thick.

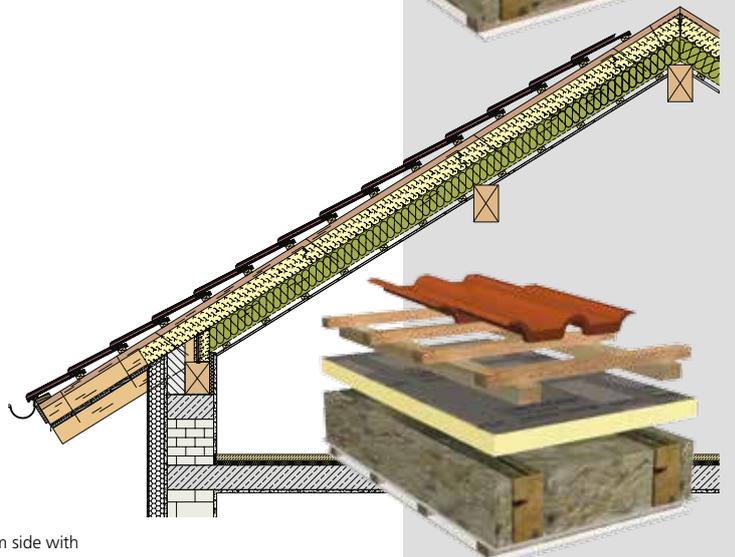
*A U-value of $0.13 \text{ W/(m}^2\text{K)}$ * is achieved.*



Insulation solution 3: PGV T combined insulation

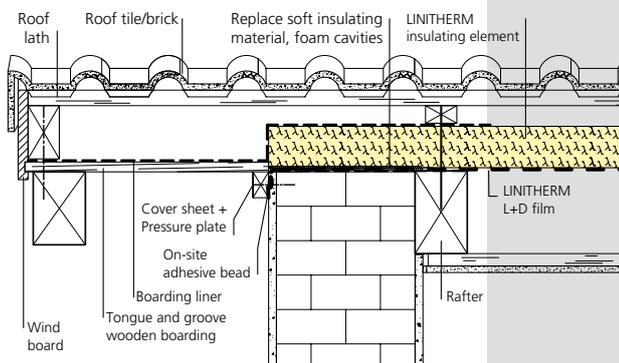
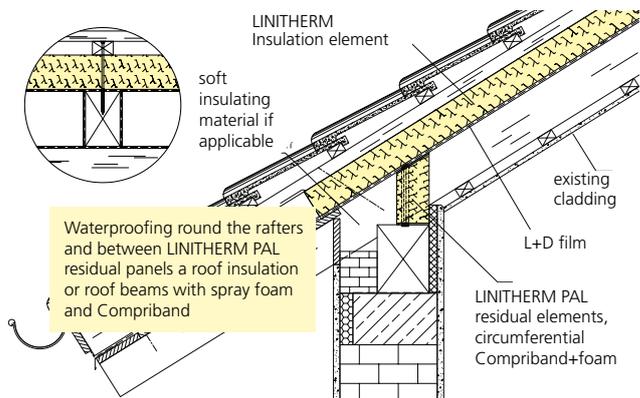
For the renovation of old buildings, LINITHERM PGV T as combined insulation can greatly increase the insulation effect of an existing but insufficient between-rafter insulation and is therefore ideally suitable for the retrofitting of improved insulation above the rafters.

*Example: If the attic floor has already been developed, the diffusible above-rafter insulation LINITHERM PGV T, 100 mm, with an existing vapour and air-tight film on the room side and a functioning between-rafter insulation, 100 mm, TCL 035, can help to achieve a U-value of $0.16 \text{ W/(m}^2\text{K)}$ *. This value is substantially below the requirements of the EnEV 2009/2014 (German Energy Saving Ordinance) for old buildings.*



* U-value considering the thermal transfer resistance R_{si} and R_{se} and a cladding on the room side with 12.5 mm gypsum plasterboard on lathing. A wood proportion of 13% was assumed.

Examples of connection details

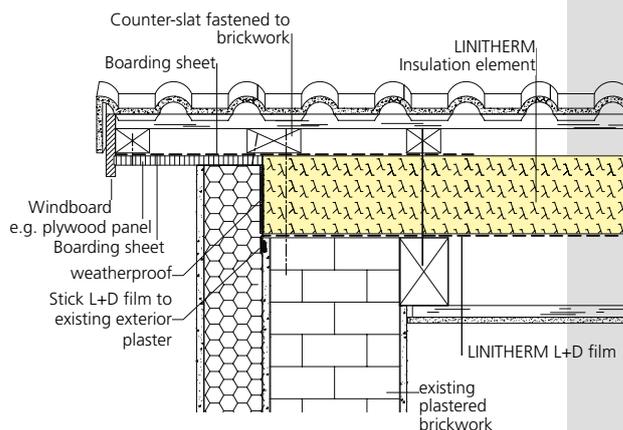
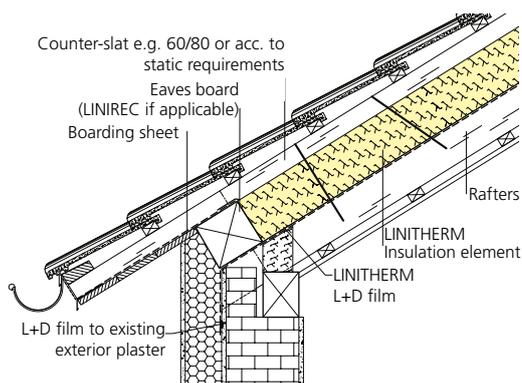


Air-tight eaves connection with LINITHERM insulation systems

Insulate eaves connection properly with residual LINITHERM PAL elements. Cut to size, and create an air-tight connection using Comriband. Apply Comriband in a continuous plane. Use spray foam to fill connecting joints and remaining cavities, e.g. between rafters and roof beams. Alternatively: Establish air-tight eaves joist connection. Insulate larger cavities with soft insulation material.

LINITHERM L+D film - the easy solution for the air-tight connection to the gable brickwork.

Depending on the evenness of the brickwork, place a soft insulating material on the brickwork before installing the insulation element. Subsequently apply the L+D film to the gable brickwork, position the rafters and stick to the exterior plaster.



Details for old buildings with extremely slim roof overhang and full thermal insulation

Install LINITHERM L+D film on the rafters and glue air-tight.

In the case of outer wall insulation (e.g. WDVS), waster penetration behind the wall insulation must be avoided by means of proper bonding or sealing at the brickwork.

Please observe the "General information and examples regarding the installation of LINITHERM above-rafter insulation systems".



LINITHERM PAL N+F

DN ≥ 20° 1)

- Insulating core:** PUR/PIR- rigid foam according to DIN EN 13165, building material class B2, Application type PUR 023 DAD, two-sided cladding with aluminium foil
- Edge connection:** Tongue and groove pressfit joints on all sides, lengthwise additional N+F connection assembly with 6 cm cover
- Please note:** Water bar, 1060 x 40 mm, for sealing of the narrow sided joint, (included in delivery)
- Overlap:** 3000 x 1000 mm (= calculation measurement)

Thickness mm total	Pallet contents Qty.	m ²	TCL ** PUR/PIR	U-value*** [W/(m ² K)]
80	30	90.0	023	0.26
100	24	72.0	023	0.21
120	20	60.0	023	0.18
140	17	51.0	023	0.16
160	15	45.0	023	0.14
*180	13	39.0	023	0.12
*200	12	36.0	023	0.11
*240	10	30.0	023	0.09

other thickness grades on request

1) Roof pitch in accordance with specifications and according to the rules of the ZVDH (Central Organisation of the German Roofing Trade). Special solutions upon request.

* These products may have longer delivery periods

** European thermal conductivity level TCL 022

*** U value taking into account the thermal transfer resistance R_{si} and R_{se} and a 19 mm wooden boarding.

Object-specific features according to DIN EN ISO 6946 are not taken into consideration.

For technical data about the LINITHERM insulating elements please refer to the product data sheet

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