LINITHERM®
insulation systems

LINZMEIER
building elements

PUR/PIR rigid foam
- Insulation over rafters
- Insulation under rafters
- Passive house
- Upper floor ceiling
- Dry screed panels

Polyurethane
for better insulation

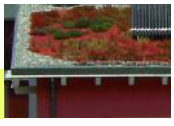
From standard roof to energy-saving roof!

What house builders need to know:
New building, old building, passive house –
right planning and insulation pay out!

Sloping roof / level roof insulation

Insulation under metal roof

Insulation under green roof



Insulation on rafters

Insulation on boarding

Insulation under rafters

Floor insulation

Only the best insulation will also keep you satisfied tomorrow

How to counter the cost explosion

Only one thing is certain about energy costs – they will continue to increase.
Fortunately, there is a way out of the dilemma: Insulation.
Even the best condensing boilers and the latest solar cells are useless, if expensive heating energy is lost through the roof, wall or floor.

Where saving really pays off

Obviously, the right heating technology is important. After all, compared with outdated installations, modern heating equipment can reduce your energy costs by up to 30%.
Unfortunately, the price for heating oil has doubled with a short period.
Anyone who really wants to cut heating costs, must resort to the right insulation.
Because good thermal protection can save up to 70% of the energy required by a conventional house.

You want to feel comfortable within your own four walls?

You have invested a lot of effort and money in your new building or refurbishment.
So you obviously want to enjoy ideal room temperatures – in winter and in summer. The right insulation not only decreases your heating costs in winter; it also ensures bearable temperatures in the summer – even in the attic.
Similarly, unpleasant temperature variations are a thing of the past.
No thermal bridges, no cold feet, no condensation dampness…

You will notice the healthy room climate immediately – 365 days a year.

Guaranteed quality

LINITHERM insulation systems are manufactured according to DIN EN 13165 and meet the highest demands.
PUR/PIR rigid foam is largely resistant against the chemicals encountered in practical application. It is resistant against fungi and microbes, rot proof, odorless, does not decompose, and is physiologically harmless.
Moreover, the material is free of CFC and HCFC.

Thinner insulation lets you live better

Compared with conventional insulations, LINITHERM saves about 40% in material thickness. That translates into more living space.

Airthight insulation saves even more money

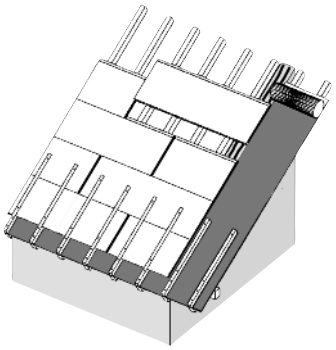
All LINITHERM insulating elements are fitted with tight edge-joining techniques. Therefore, installed surfaces are immediately airtight.

Even under extreme temperature influences, PUR/PIR rigid foam remains dimensionally stable.
Short-term temperature resistance up to 250°C makes it insensitive to hot bitumen, and it withstands continuous temperatures between -30°C and +90°C.
Insulation systems based on PUR/PIR rigid foam are supplied in material class E (normal flammability) according to EN 13501.
If marginal conditions are taken into account, REI 30 constructions can also be manufactured.

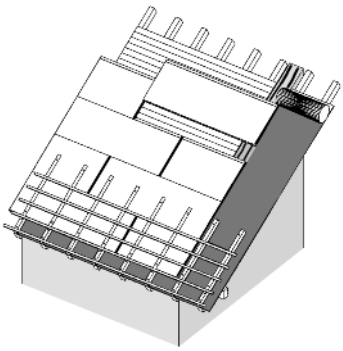
Faster installation lets you move in sooner

LINITHERM insulating panels are processed simply with standard woodworking tools and machines. They are light and easy to handle.

As valuable as cash: the right insulation on the rafters



Insulation above the rafters



Insulation on boarding

LINITHERM insulating panels are all-inclusive: Thermal insulation, vapour barrier, underlay – airtight and windproof.

Intelligent, robust edge joints ensure homogeneous insulation.

To ensure that living costs remain low tomorrow

The best thing that can happen to your roof: Insulation above the rafters
Only with insulation above the rafters or on boarding will you achieve the best possible insulation results. Because it is the only way to cover the entire roof seamlessly and without thermal bridges. What's more, you gain additional interior space and can incorporate the visible rafters in the interior design.

Don't be satisfied with less
You will benefit from the advantages of LINITHERM insulating panels already when erecting the building: The panels are easily handled by professionals, simply cut to size, and quickly installed. No additional supporting structures and no special tools are required. That translates into a short building time and therefore financial gain.

One element – many functions
Even before installation, LINITHERM insulating panels have already saved costs. With LINITHERM panels over the rafters, you have a airtight thermal insulation with integrated vapour barrier as well as an underlay. Right from the start, this prevents subsequent thermal losses through uncontrolled air draughts. Depending on the type of panel, you achieve a rainproof sub-roof immediately after installation, an additionally integrated sound insulation – or the interior facing can be rendered, wallpapered or painted immediately.

Comparison of insulation methods

Insulation between the rafters

Rafter height and insulation thickness are mutually dependent

☒ You have additional costs for larger rafter cross-sections respectively for doubling up the rafters

A separate vapour barrier must be fitted under the rafters. Therefore, expert sealing of the barrier seams is required, especially because they must ensure an airtight layer.

☒ You have additional working time and costs

Difficult overhead work to install the insulation.

☒ You have additional working time and costs

Incorrectly installed or damaged vapour barriers can result in damage to the structure, and reduce the insulation's effectiveness.

☒ You have the risk of later structural damage and high repair costs

LINITHERM insulation above the rafters

Rafter height and insulation thickness are independent of each other.

☑ You save material costs

All functional layers in a single element: Thermal insulating layer, vapour barrier, windproof layer, airtightness, underlay.

☑ You save working time and costs

The insulating panels are processed simply with standard woodworking tools and machines.
They are screwed directly onto the rafters together with the counter-battens in a time-saving manner.

Working steps

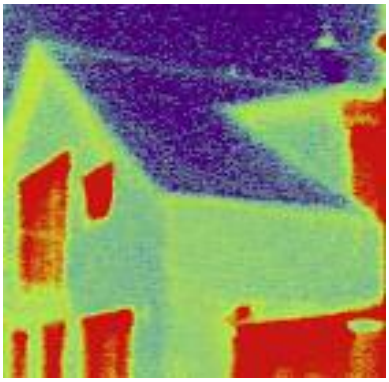
(from outside to inside)

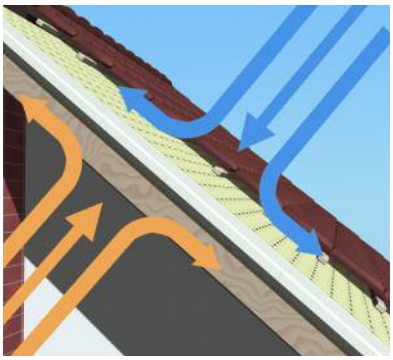
Insulation between rafters

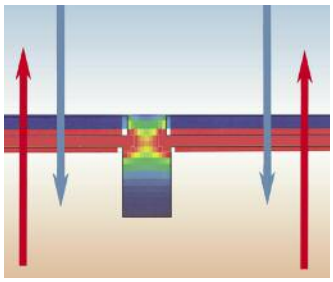
- Roofing structure
- Roof battens
- Counter-battens
- Second water-repellent sheet
- Boarding
- Insulation between the rafters 120 mm TCL 040
- Rafters
- Vapour barrier
- Insulation under the rafters between cross-battens 25 mm TCL 040
- Battens
- Gypsum plasterboard, rendering, wallpaper, paint

Over-rafter insulation with LINITHERM

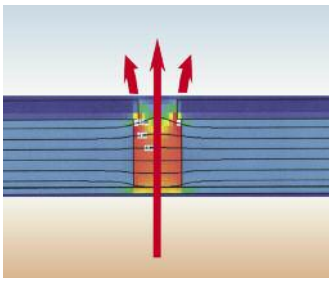
- Roofing structure
- Roof battens
- Counter-battens
- LINITHERM insulating panel 80 mm TCL 023 including the second water-repellent sheet and airtight layer
- Visible wooden facing
- Rafters



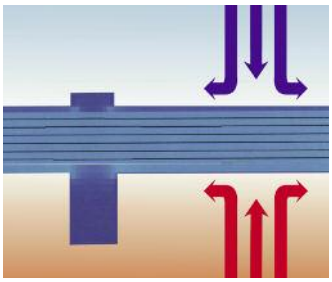




Up to 30% of heat loss occurs through the roof. Without thermal insulation, heat and cold can pass freely through the roof.



Thermal bridges due to the rafters can increase the transmitted heat loss by up to 20%, which corresponds to about 8% of overall building energy loss.



Thermal protection above the rafters is the best solution to insulate your roof. Expensive heating energy stays where it is needed.

Benefits for builders and renovators

- Lower heating costs
- Increased value of the house
- Optimum insulation properties
- Simple installation without thermal bridges
- Keeps out the heat in summer
- Protection from electrosmog
- Additional living space
- Maximum living comfort
- Safe, perfect design from a structural point of view

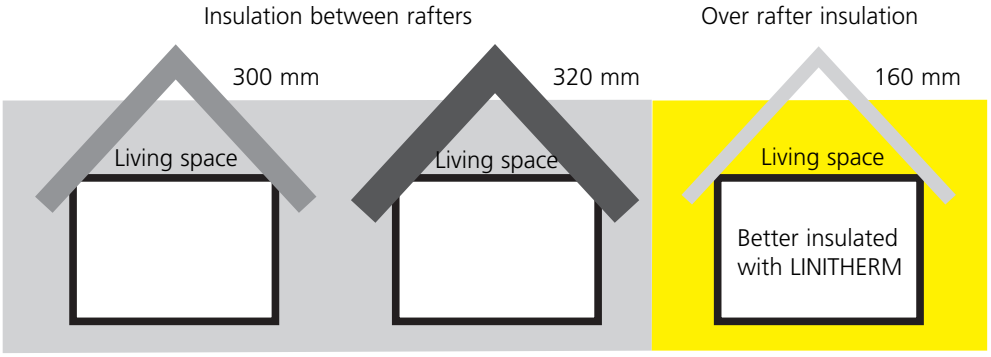
Less is more!

It's the U-value that counts
The poorer a material conducts heat, the more suitable it is for insulation. Therefore, the deciding factor is thermal condtuctivity (U-value): [W/(m²K)].

The lower the U-value, the better the insulation.

Consequently, you can either use thinner insulation or you obtain higher insulation values with the same thickness.
The high-performance material PUR/PIR rigid foam convinces with extremely low thermal conductivity. Therefore, LINITHERM insulation panels made of PUR/PIR, and with thermal conductivity ratings of λ_D = 0,023 W/(m²K) to λ_D = 0,030 W/(m²K), offer ideal insulation performance with minimum thickness.

Comparison of insulation thickness
direct comparison for the same performance



U-value = 0,15 W/(m²K)
Miniral fibers
λ_D = 0,035 W/(mK)

U-value = 0,16 W/(m²K)
Cellulose/wood
λ_D = 0,040 W/(mK)

U-value = 0,14 W/(m²K)
LINITHERM
λ_D = 0,023 W/(mK)

	LINITHERM		LINITHERM		PS or mineral fiber			PS or mineral fiber		
Panel thickness	Thermal conductivity TCL 023		Thermal conductivity < 80 mm TCL 029 80-119 mm TCL 027 ≥ 120 mm TCL 026		Thermal conductivity TCL 035			Thermal conductivity TCL 040		
	R-value	U-value* of insulation	R-value	U-value* of insulation	R-value	U-value* of insulation	U-value** of insulation between rafters	R-value	U-value* of insulation	U-value** of insulation between rafters
[mm]	[m²K/W]	[W/(m²K)]	[m²K/W]	[W/(m²K)]	[m²K/W]	[W/(m²K)]	[W/(m²K)]	[m²K/W]	[W/(m²K)]	[W/(m²K)]
20	0,87	0,94	0,69	1,12	0,57	1,30	1,55	0,50	1,43	1,66
30	1,30	0,67	1,03	0,81	0,86	0,95	1,16	0,75	1,05	1,25
40	1,74	0,52	1,38	0,63	1,14	0,74	0,93	1,00	0,83	1,00
50	2,17	0,42	1,72	0,52	1,43	0,61	0,78	1,25	0,69	0,84
60	2,61	0,36	2,07	0,44	1,71	0,52	0,67	1,50	0,59	0,72
70	3,04	0,31	2,41	0,38	2,00	0,45	0,58	1,75	0,51	0,63
80	3,48	0,27	2,86	0,32	2,29	0,40	0,52	2,00	0,45	0,56
100	4,35	0,22	3,57	0,26	2,86	0,33	0,43	2,50	0,37	0,46
120	5,22	0,19	4,44	0,21	3,43	0,28	0,36	3,00	0,31	0,39
140	6,09	0,16	5,19	0,18	4,00	0,24	0,31	3,50	0,27	0,34
160	6,96	0,14	5,93	0,16	4,57	0,21	0,28	4,00	0,24	0,30
180	7,83	0,13	6,67	0,14	5,14	0,19	0,25	4,50	0,21	0,27
200	8,70	0,11	7,41	0,13	5,71	0,17	0,22	5,00	0,19	0,24
220	9,57	0,10	8,15	0,12	6,29	0,15	0,21	5,50	0,18	0,22
240	10,44	0,09	8,89	0,11	6,86	0,14	0,19	6,00	0,16	0,21
260	11,30	0,09	9,63	0,10	7,43	0,13	0,17	6,50	0,15	0,19
280	12,17	0,08	10,37	0,09	8,00	0,12	0,16	7,00	0,14	0,18
300	13,04	0,08	11,11	0,09	8,57	0, 11	0,15	7,50	0,13	0,17

* Thermal conductivity coefficient U includes the thermal resistance (R_{si} = 0.10 m²K/W and R_{se} = 0.10 m²K/W) in accordance with EN ISO 6946.
** U-value in case of an insulation between rafters with a rafter proportion of 13%.

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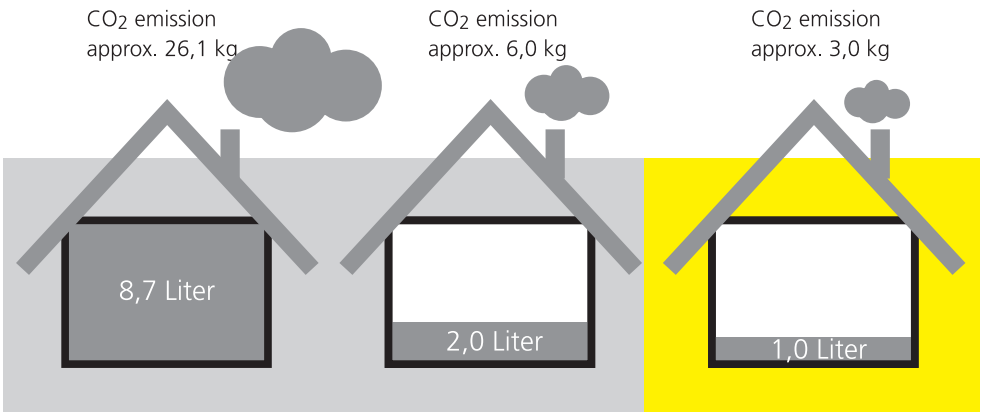
Good for the wallet – good for the environment!

Heating oil consumption and CO_2 emissions (per square meter roof surface/year)



Without insulatio

Insulation between rafters 140 mm
λ_D = 0,040 W/(m²K)

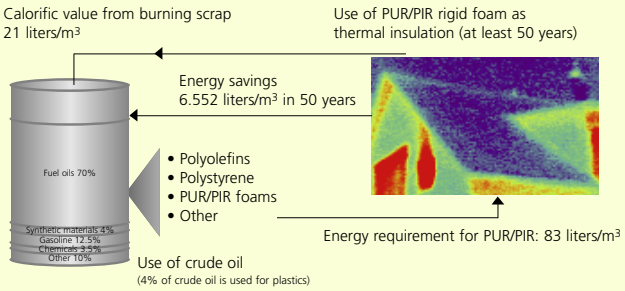
LINITHERM insulation on rafters 140 mm
λ_D = 0,023 W/(m²K)

Insulation helps against the greenhouse effect

Today's most pressing issue about the environment: It must be protected. Therefore, reduction of carbon dioxide emission is the most important task. Every liter of heating oil less translates into 3 kg less carbon dioxide.

So you have two reasons to be pleased: Your heating costs are less, and the environment is preserved. And that's not the only "environmental protection merits" you can earn.

Ecobalance
PUR/PIR insulation as energy multiplier



Example: Roof of a one-family house = 140 m² = 19.6 m³ PUR/PIR rigid foam

	1 m³ PUR	19.6 m³ PUR	€ (-.85/liters)
1. Energy required to produce PUR/PIR	- 83,4 liters	- 1.634,6 liters	- 1.389,41
2. Energy savings over 50 years	+ 6.552,2 liters	+128.423,1 liters	+ 109.159,64
3. Energy yield through thermal recycling at end of insulation lifetime	+ 21,3 liters	+ 417,5 liters	+ 354,86
Total energy yield after 50 years	**6.490,1 liters**	**127.206,0 liters**	**108.125,09**

* Status 11.09.2008
Source: IVPU/ Tescon

Ecological insulation makes a 'green' footprint

LINITHERM insulating panels also have a highly convincing ecobalance.
Their manufacture requires only a fraction of the precious energy that they save over decades. And at the end of their lifetime – more than 50 years – each recycled cubic meter has a calorific value the equals about 21 liters of fuel oil. With minimum residues, and environmentally friendly, of course.
By the way:
Linzmeier reprocesses production scrap and clean cut-offs from building sites into LINIREC recycled building panels, thereby maintaining the material cycle.

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BE / Info PUR / GB / 04-2012 / SD
Subject to changes