Klober THERMO-LINE
The roof insulation of the future
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Klober THERMO-LINE:
The pitched roof insulation of the future

- The German Energy Saving Ordinance 2009 (EnEV 2009), in effect from autumn of that year, already places high importance on insulation, in newbuilds as well as in modernised buildings. The aim of this is to reduce the energy used to heat buildings and produce hot water by around one third (30%).

- The aim of EnEV 2012 is to decrease the energy requirements of both newbuilds and modernised buildings by almost another 30% when compared with EnEV 2009.

Thermo-line consist of

- Permo® therm - rigid tongue and groove insulation board. The boards have a vapour permeable membrane with SK² technology laminated onto the outer surface.
- Wallint® SO - Vapour control barrier or Wallint® solar - Vapour control layer with reflective surface
- Permo® Universal Roll - a vapour permeable connection roll
- Venduct® Extension Sleeve

Inter-rafter insulation

- The insulating layer must be made to fit between rafters
- This allows heat to escape via the rafters, acting as thermal bridges
- Additional heat is lost through gaps between the insulation and the rafters
- Adding an extra layer of rafters is time-consuming and expensive

Pitched roof insulation

- The insulation is applied from outside, leaving no way for heat to escape
- The height of the rafters is irrelevant and only has to satisfy legal requirements
- It is easier and more reliable to install an airtight layer from outside
- It is possible to combine Permo® therm with existing insulation

This thermal image shows weak spots in the insulation: Thermal bridges, which lead to energy loss and possible mould formation show up as blue.

The pitched roof insulation solution: This thermal image shows no weak spots, and there are no apparent thermal bridges.
A WELL-DESIGNED SYSTEM MAKES THE ROOF OF THE FUTURE

And it has a good name: Klober.

For more than 50 years, the Klober system has been developed and produced as the modern roofing solution.

With our roof vents, ventilation systems, underlays and roof safety solutions, we have a whole roofing system in mind, not just a single product.

Klober has always seen itself as your partner in business and manual work. We place a particular value on supporting roofers in matters related to the use of our products.

With Klober THERMO-LINE, we are opening a new chapter in the annals of roof insulation.

THERMO-LINE Product system

1. Permo® therm rooftop insulating elements with unbeatable thermal insulation value and an excellent vapour permeability value of μ=35

2. Venduct® insulation vents rainproof, windproof and airtight routing for both internally-accessible and inaccessible ventilation ducts (not stocked in UK)

3. Venduct® Extension Sleeve an airtight extension sleeve through the Permo® therm, suitable for 100-150mm connection

4. Wallint® 50 a combined air barrier and vapour control layer. It has a vapour resistance of 250MNs, meeting the requirements of BS9250 (Code of Practice for design of the airtightness of ceilings in pitched roofs).
5. Adhesive strips and sealing materials
airtight and windproof connection to brickwork and roofing lath, joint sealing tape

6. Permo® universal connecting roll
for a rain- and windproof connection in ridge, hip and valley areas

7. Wakaflex® and EasyFlash® non lead flashing
stretchable and malleable non lead flashing sealing around chimneys, connecting walls and intersections
A LOOK AT THE DETAILS.

Permo® therm rooftop insulating elements.

Tongue-and-groove arrangement means no thermal bridges
Klober Permo® therm’s tongue-and-groove connection doesn’t just make it particularly easy to install. It also means, above all, no thermal bridge effects, since it forms a closed insulating barrier. The robust connecting edges mean that Permo® therm is easy to install and eliminates thermal bridges. Its grid-printed anti-glare upper surface also makes it quick to work with. When installed properly, the factory-laminated UDB-A-quality underlay guarantees a wind- and rainproof exterior shell.

Short on thickness, long on advantages
There are lots of brands of pitched roof insulation. THERMO-LINE from Klober offers more:
- Outstanding λ-value of 0.022 and exceptionally good vapour permeability
- Only with thicker sheets can conventional rigid foam insulation made from polyurethane or polyisocyanurate achieve the same insulating effect

Over Rafter Insulation with Tiles on Tiling Battens and Counter–Battens
Overlay the insulation boards and lay 25 x 50mm treated softwood counter–battens in line with the rafters and use Butylon® tape to seal and screw penetrations. Secure the counter–battens to the rafters by fixing through the counter–batten and the insulation.

Fixings for Over Rafter Insulation
Approved fixings should be applied at centres appropriate to the design of the roof and location of the building.

Refer to:
- Ancon Building Products
  +44 (0) 114 275 5224 · www.ancon.co.uk
- Helifix Limited
  +44 (0) 20 8735 5222 · www.helix.co.uk
- MAK Fasteners
  +353 (0) 1 451 99 00 · www.makfasteners.com
- Target Fixings Limited
  +44 (0) 1635 58 00 88 · www.targetfixings.com
- Tech Fasteners
  +353 (0) 1 457 33 00 · www.techfasteners.ie
- Wallfast Limited
  +44 (0) 23 9229 8443 · www.wallfast.co.uk

Unrivalled protection from the cold.
Klober Permo® therm offers better insulation than rockwool or polyurethane/polyisocyanurate. This means that Permo® therm can give the best protection from the cold even though it is thinner.

Protection from the heat of summer.
Klober Permo® therm ensures that when it gets hot in the summer, interiors remain at a comfortable temperature.

Protection from noise.
It’s not just heat and cold that needs to be kept out. Thankfully, Klober Permo® therm insulating elements are also excellent at keeping out noise, the effectiveness being dependend on the construction of the building.

Protection for the environment.
The THERMO-LINE system is also good for the environment: the resolfoam base material is manufactured without the use of chlorofluorocarbons (CFCs) does not, therefore, damage the ozone layer – zero ozone depletion potential.
Excellent
vapour permeability \( \mu = 35 \)

R-value = 3.64m² K/W, U-value = 0.24 W/m²K

A healthy environment built in.
Moisture can diffuse through the roof structure, with its exceptionally high vapour permeability, Klober’s Permo® therm prevents the formation of mould and its associated adverse effects on health.

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Permo® therm rooftop insulating element</strong></td>
<td>Can be used in newbuilds as well as modernised buildings, ideal for different types of pitched roof</td>
</tr>
<tr>
<td>Material</td>
<td>High-quality rigid resol foam, environmentally friendly, 100% free of CFCs &amp; HCFCs</td>
</tr>
<tr>
<td>Thermal conductivity in acc. w / EN 13166</td>
<td>( \lambda_D = 0.021 ) W/m²K (( \lambda = 0.022 ) W/m²K)</td>
</tr>
<tr>
<td>Diffusion resistance coefficient in acc. w / EN 12086</td>
<td>( \mu = 35 )</td>
</tr>
<tr>
<td>Fire classification in acc. w / EN 13501-1</td>
<td>E-class</td>
</tr>
<tr>
<td>Compressive strength at 10% deform. in acc. w EN 826</td>
<td>( \geq 120 ) kPa</td>
</tr>
<tr>
<td>Accessibility (fall-through protection) GS BAU 18</td>
<td>Passed (see Permo® therm installation instructions)</td>
</tr>
<tr>
<td>Density</td>
<td>40kg/m³</td>
</tr>
<tr>
<td>Water column</td>
<td>3000mm</td>
</tr>
<tr>
<td>Waste disposal number</td>
<td>EAK 170604</td>
</tr>
<tr>
<td>Corrosion behavior with regard to metal parts</td>
<td>Neutral, acid free</td>
</tr>
<tr>
<td>Laminate</td>
<td>Vapour-permeable, 3-ply fleece with SK²-technology, ZVDH classification UDB-A, can be used as temporary covering for 4 weeks</td>
</tr>
<tr>
<td>Dimensions of individual sheets (surface area, W x H)</td>
<td>1200mm x 2400mm</td>
</tr>
<tr>
<td>Product code (thickness 80mm)</td>
<td>KD0080</td>
</tr>
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</table>
Technical specifications

<table>
<thead>
<tr>
<th></th>
<th>Wallint® 50</th>
<th>Wallint® solar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction to fire</td>
<td>E class</td>
<td>E class</td>
</tr>
<tr>
<td>Resistance to water</td>
<td>W1</td>
<td>W1</td>
</tr>
<tr>
<td>Resistance to water</td>
<td>50m</td>
<td>&gt;100m</td>
</tr>
<tr>
<td>Vapour transmission</td>
<td>200 / 160N/50mm</td>
<td>600 / 550N/50mm</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>60 / 65%</td>
<td>40 / 50%</td>
</tr>
<tr>
<td>Elongation</td>
<td>165 / 175N</td>
<td>250 / 300N</td>
</tr>
<tr>
<td>Resistance to air</td>
<td>&lt; 0,1m³/m²h 50 Pa</td>
<td>&lt;0,003m³/m²h 50 Pa</td>
</tr>
<tr>
<td>Penetration</td>
<td>-40°C / +80°C</td>
<td>-40°C / +80°C</td>
</tr>
<tr>
<td>Water vapour</td>
<td>250 MNsg</td>
<td>&gt;500 MNsg</td>
</tr>
<tr>
<td>Transposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product code</td>
<td>KU0065</td>
<td>KU0063</td>
</tr>
</tbody>
</table>

Extremely robust 3-ply fleece

Sticks fast with SK² technology

Wallint® 50 Wallint® solar
Permo® therm product features and benefits

- Excellent value, very low thermal conductivity ($\lambda = 0.021$ W/mK) under-roof screen Permo® integrated light SK²

- Structure permeable to the diffusion of water vapor different layers promotes drying of the roof and this prevents the formation of mold

- The special tongue and groove on all sides ensures a simple and economical installation, without thermal bridges

- Ecological because completely free of CFCs and HCFCs

- SK² technology as well as concerted tapes and sealants allow safe and reliable windproof adhesion

- Environmentally friendly a 100% CFC- (chlorofluorocarbon) and PFC-free (perfluorinated (hydro)carbon)
The insulation vent for rooftop insulation elements extends the Venduct® roof ventilation system for a secure connection of ventilation ducts to the underlay and vapour barrier. Installed correctly, one product can simply and efficiently guarantee a rainproof and windproof construction.

**Innovative twist-and-click mechanism**
for the simple mounting of upper and lower sections

*Note:* This illustration shows the KE8024

**Roof pitch**
position the vent correctly with respect to the roof pitch with the hinged hood

**Secure condensation outlet**

*Note:* We have a wide range of vent bases, please contact the sales office for more details!

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The insulation vent for newbuilds with internal access:

As long as an airtight connection with the vapour barrier underneath the rooftop insulation system can be made from inside the building, this variant can be used. The lower section of the vent has a built-in condensation outlet which opens and which can be attached to a half-inch tube. The technical specifications of insulation vents intended for existing buildings are otherwise identical.

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**THE MAIN BENEFIT IS IN THE DETAILS.**

Venduct® extension sleeve - new construction.

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**Technical specifications**

<table>
<thead>
<tr>
<th>Article code insulation vent</th>
<th>KE 8200 (for new constructions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition/material</td>
<td>Rigid PVC (sealing ring made of EPDM)</td>
</tr>
</tbody>
</table>
| Diameter of connector               | • Connection between rooftop ventilator and insulation vent: DN 100/125/150  
• Connection of the insulation vent to the continuing ventilation duct: DN 100/125/150 (restricted with existing buildings to max. DN 100 with a rafter height of at least 12cm) |
| Quantities                          | 1 part/box 18 parts/pallet |
| Use                                 | Can be combined  
• with the Venduct® mechanical adaptor with flexible downpipe KE 8024  
• with Venduct® short ventilation pipe DN 100 with rain cap KE 8026 or mesh grille KE 8015-1 |
Permo® Universal Connection Roll

is a vapour permeable, weatherproof connection at the ridge, hip, valley or at the chimney area of the roof. Part of the Thermo-Line product range, used in conjunction with Permo® therm.

Product features & benefits
- Permeability promotes drying of the roof construction
- Simple and quick to install
- Butylon® strips ensures strong adhesion

Product Code / Weight / Dimensions
Permo® Universal Connection Roll
KD 9050 / approx. 145g/m² / 0.3 width x 15m length

Material
3 layers spunbond fleece with integrated 2 Butylon® strips

Technical specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to water penetration, NBN EN 1928</td>
<td>W1</td>
</tr>
<tr>
<td>Resistance to the penetration of air</td>
<td>&lt; 0.1m³/m² h 50 Pa</td>
</tr>
<tr>
<td>Transmission of water vapor sd, NBN EN 12572</td>
<td>approx. 0.03m</td>
</tr>
<tr>
<td>Tensile strength longitudinal / transverse EN 12311-1 NBN</td>
<td>275N/5cm / 230N/5cm</td>
</tr>
<tr>
<td>Tear resistance to longitudinal / transverse nail, NBN EN 12310-1</td>
<td>170N / 185N</td>
</tr>
<tr>
<td>Temperature resistance</td>
<td>-40°C/+80°C</td>
</tr>
<tr>
<td>Impermeability (Test the water column), NBN EN 20811</td>
<td>&gt; 3500mm</td>
</tr>
<tr>
<td>UV stability</td>
<td>4 months</td>
</tr>
</tbody>
</table>

Related products
- Permo® seal
- Permo® TR plus
- Venduct® outlet (not in stock in UK, made to order)
- Wakaflex® and EasyFlash® non lead flashings

Visit www.roof-flashing.info for more information.

Visit www.klober.co.uk for all Klober products and Technical support.
Recommendations as to methods, use of materials and construction details are based on the accumulated experience and knowledge of Klober and are given in good faith as a general guide and service to designers, contractors, merchants, roofers and manufacturers. All products are sold subject to Klober’s ‘Conditions of Sale’, copies of which are available on request. Klober’s policy of continuing development may mean that the products supplied could differ slightly from those described in this brochure and samples.

Certificate no: 11118
ISO 9001, ISO 14001, OHSAS 18001