Product Catalogue

thermano.eu
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What is THERMANO?

THERMANO is a brand of thermal insulation panels with a polyisocyanurate (PIR) core. The panels are 100% CFC and HCFC free and ensure the lowest thermal conductivity coefficient of all popular insulating materials in construction engineering. The thermal conductivity coefficient of $\lambda = 0.023$ (W/mK) guarantees superior thermal insulation of any structure with an insulation layer that is almost two time thinner than in most other insulating materials.

The THERMANO panels are a perfect thermal insulation system for whole buildings: from floors and walls to the roof.

Manufacturing technology

The chief material used in the manufacturing of the THERMANO panels is polyisocyanurate (PIR), shaped into the panel core and secured on both sides of the panel with a gas-tight cladding, comprising several layers of polymer material and aluminium foil.

The structure of PIR, the material of the THERMANO panels, contains over 90% of closed pores filled with gas of a very low thermal conductivity. This design ensures very high strength parameters at an extremely low thermal conductivity coefficient ($\lambda$) of 0.023 W/mK.

Other advantages of this material include: low absorbability (<2%), complete resistance to VOC (volatile organic compounds), and a significant durability: when exposed to high temperatures, PIR does not dwindle; instead, it forms a permanent and durable scorch. These superior characteristics have been appreciated by U.S. spacecraft design engineers, who were the first to use isocyanate-modified polyurethane (PIR) as a thermal insulating material for the STS (Space Transportation System), better known as the NASA space shuttle.

THERMANO panel structure

1) Outer component: gas-tight cladding

The high gas-tightness of the THERMANO panels ensures stable thermal insulating parameters (the ageing lambda) for a long time (which is 50 years of operating life by standard design), unlike other polyurethane-based materials without cladding, such as spray-applied (in situ) insulation materials.

2) Inner component: polyisocyanurate (PIR) core

The PIR core is formed by polymerization of its two main components, polyols and isocyanates, with an addition of modifiers. The PIR core is a closed cell structure, which means that the material is an essential barrier to capillary wicking of water (by reducing absorbability) and steam (water vapour) diffusion.

The PIR foam exhibits excellent mechanical performance, durability, low absorbability and other physical and chemical characteristics which make the material a perfect choice even in the most demanding construction environment types (roofs, floors, flooring, foundations, basement walls, etc.).
THERMANO is a breakthrough in thermal insulation technology.

See the video: THERMANO – how it’s made
thermano.eu/production
Superior insulating performance

The THERMANO panels boast the lowest thermal conductivity coefficient of all insulating materials ($\lambda = 0.023 \text{ W/mK}$), which means superior thermal insulation performance. In practical terms, it significantly reduces the energy needed to heat the building, which guarantees major financial benefits.

The thermal insulation class A++ puts the PIR panels at the forefront of materials with the best energy efficiency.

In this regard, THERMANO has no peers among traditional thermal insulation materials, such as mineral wool or styrofoam (EPS). The ROI of PIR core panels is as little as a few years; however, remember that polyurethane thermal insulation can last for many generations.

Comparison of thermoinsulating materials: insulation class

<table>
<thead>
<tr>
<th>Class</th>
<th>$\lambda$ range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A++</td>
<td>0.020–0.023</td>
<td>THERMANO</td>
</tr>
<tr>
<td>A+</td>
<td>0.024–0.027</td>
<td>Izolite</td>
</tr>
<tr>
<td>A</td>
<td>0.028–0.031</td>
<td>PUR w/o gas-tight cladding</td>
</tr>
<tr>
<td>B</td>
<td>0.032–0.036</td>
<td>XPS, spray-applied PIR, mineral wool, pitched roof</td>
</tr>
<tr>
<td>C</td>
<td>0.037–0.040</td>
<td>EPS, soft mineral wool, pitched roof</td>
</tr>
<tr>
<td>D</td>
<td>0.041–0.045</td>
<td>hard wool, EPS, flat roof</td>
</tr>
<tr>
<td>E</td>
<td>&gt;0.046</td>
<td>the warmest cellular concrete grades</td>
</tr>
</tbody>
</table>

The list includes the ageing $\lambda$ [W/mK] of a selection of thermal insulation materials. The actual $\lambda$ value may vary with product quality.
Did you know that THERMANO’s energy efficiency is as much as two times better than in traditional thermal insulating products?

See the video: THERMANO insulation system vs. other insulating materials
thermano.eu/comparison
Cost savings

Installing the THERMANO panels helps reduce the insulation layer thickness as compared to traditional thermal insulating materials. THERMANO may reduce the costs of a steel framework structure by as much as 15%. And more savings come from THERMANO’s short installation time.

The THERMANO panels can eliminate all cold bridges, which means high thermal insulation performance and great savings on heating bills.

An investment in THERMANO can pay off already in 4 to 6 years, and brings savings for many more years after.
Did you know that an investment in the THERMANO insulating system can pay off already in 4 to 6 years and bring you savings for years to come?
Durable for generations

The material for the THERMANO panels is the most durable thermal insulation solution in the construction industry with a service life comparable to the overall building life cycle: it may last for generations.

The FIW Thermal Insulation Research Institute of Munich (Forschungsinstitut für Wärmeschutz e.V.) has evaluated decades-old polyurethane insulation samples from existing buildings for thermal conductivity, compressive strength, humidity, dimensional stability and integrity of insulating panels.

The FIW demonstrated that a sample from an insulation layer installed in 1982 had no signs of damage, holes, blisters, cavities or other discontinuities. The sampled PU (polyurethane) insulation panel was still perfectly fit for use and retained all declared characteristics and performance.

In Western Europe, the market share of advanced thermal insulation is almost 80%.
Will serve for generations!

See the video: THERMANO and economy
thermano.eu/savings
Low water absorption

The THERMANO insulating material features a very low absorbability (<2%). This is because closed-cell PIR has no capillary action. The result is that THERMANO largely prevents all problems caused by ingress of water into the insulating layer, including fungal and mould attack. Even if a THERMANO-insulated floor is flooded with water from e.g. a burst pipe, THERMANO’s insulating performance will not be reduced. For the sake of comparison, tests done by SIPUR revealed that as little as 1% of water penetrating a volume of mineral wool reduces its thermal insulating power by a staggering 85%.

Light-weight

The relatively lower profile thickness and small density of panel material reduce the overall roof weight which can cut down the load-bearing structure costs by 15 or 20%.
High compressive strength: 200 kPa (20 tons/m²)

The compressive strength of THERMANO panels is over two times higher than in typical thermal insulation materials. This minimises the risk of surface deformation under pressure.

Insulating a flooring with the THERMANO panels gives a level, stable and rigid surface with minimum risk of flooring surface cracks or sinking of the finished floor, unlike EPS boards as insulation under heavy floors of parquet or planks.
Learn more: THERMANO vs. traditional thermal insulation
thermano.eu/insulation
Resistance to VOC and pests

Unlike other commercially available thermal insulators, the THERMANO panels guarantee complete resistance to all VOC types, as well as to infestation by insects, rodents or birds.

Environment protection

The product is safe to the natural environment from production to waste disposal. The panels are made of a material that is 80% recyclable, and in many ways too.

Standardized multi-criterion LCAs (Life Cycle Assessment) have demonstrated that PIR foam has the lowest environmental costs of all thermal insulation materials for construction, from production and routine use to final disposal.

The THERMANO insulation panels save about 100 more energy than required to make them. They have a minimum impact on the use of mineral materials; they are also the most flexible to modify with renewable raw materials, and completely free of ozone-harming compounds.
Exposure to fire

Fire reaction class: Euroclass E

Unlike other thermal insulating materials exposed to high temperatures (e.g. fire), the THERMANO material does not dwindle; it forms a permanent and strong scorch which isolates the structure from destruction by fire.

Easy and quick installation

Compared to traditional thermal insulation technologies, THERMANO requires less consumables to install, while the installation process is less time-consuming and labour-demanding, which means lower building costs.

The properties of THERMANO which facilitate fast installation include:

- low specific weight, easy working and processing,
- excellent binding with various types of vapour membranes, water membranes and other finishing materials, and a low risk of poor workmanship defects.
THERMANO is incredible
insulating power
and superior $\lambda = 0.023 \text{ W/mK}$
Reference projects

House in Mazury (PL)

» Handover for use: 07/06/2015
» Usable floor area: 200 m²
» Thermal insulation thickness in a cavity wall: 120 mm
» Thermal insulation thickness on the floor: 80 mm
» Thermal insulation thickness on the roof: 120 mm
» Heating system: eco pea coal boiler

<table>
<thead>
<tr>
<th>Parameters</th>
<th>THERMANO λ = 0,023 W/mK</th>
<th>XPS λ = 0,032 W/mK</th>
<th>EPS λ = 0,037 W/mK</th>
<th>Mineral wool λ = 0,038 W/mK</th>
<th>No insulation λ = 0,8 W/mK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual energy use [kWh]</td>
<td>18599</td>
<td>25877</td>
<td>29920</td>
<td>30729</td>
<td>67954</td>
</tr>
<tr>
<td>CO₂ emission with insulation [kg/a]</td>
<td>4295</td>
<td>5976</td>
<td>6910</td>
<td>7096</td>
<td>15693</td>
</tr>
<tr>
<td>Trees to plant to neutralize this CO₂ emission</td>
<td>571</td>
<td>795</td>
<td>920</td>
<td>944</td>
<td>2089</td>
</tr>
<tr>
<td>Roof partitions U =</td>
<td>0,19</td>
<td>0,27</td>
<td>0,31</td>
<td>0,32</td>
<td>0,8</td>
</tr>
<tr>
<td>Cavity wall partitions U =</td>
<td>0,19</td>
<td>0,27</td>
<td>0,31</td>
<td>0,32</td>
<td>0,8</td>
</tr>
<tr>
<td>Flooring partitions U =</td>
<td>0,29</td>
<td>0,4</td>
<td>0,46</td>
<td>0,47</td>
<td>0,8</td>
</tr>
</tbody>
</table>

The table shows the energy effects of applying alternative thermal insulation materials under identical outdoor conditions. To simplify the estimates and clarify the comparison, the reference baseline (zero insulation variant) is the averaged heat transfer coefficient $U = 0.8$ [W/m²K].
House near Gdynia (PL)

- Handover for use: 01/09/2014
- Usable floor area: 280 m²
- Thermal insulation thickness on the wall: 160 mm
- Thermal insulation thickness on the floor: 80 mm
- Thermal insulation thickness on the roof: 200 mm
- Heating system: NG condensing boiler

<table>
<thead>
<tr>
<th>Parameters</th>
<th>THERMANO ( \lambda = 0.023 \text{ W/mK} )</th>
<th>XPS ( \lambda = 0.032 \text{ W/mK} )</th>
<th>EPS ( \lambda = 0.037 \text{ W/mK} )</th>
<th>Mineral wool ( \lambda = 0.038 \text{ W/mK} )</th>
<th>No insulation ( \lambda = 0.8 \text{ W/mK} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual energy use [kWh]</td>
<td>23020</td>
<td>32029</td>
<td>37033</td>
<td>38034</td>
<td>109826</td>
</tr>
<tr>
<td>( \text{CO}_2 ) emission with insulation [kg/a]</td>
<td>5316</td>
<td>7397</td>
<td>8552</td>
<td>8783</td>
<td>25364</td>
</tr>
<tr>
<td>Trees to plant to neutralize this ( \text{CO}_2 ) emission</td>
<td>707</td>
<td>984</td>
<td>1138</td>
<td>1169</td>
<td>3377</td>
</tr>
<tr>
<td>Roof partitions ( U = )</td>
<td>0.11</td>
<td>0.16</td>
<td>0.18</td>
<td>0.19</td>
<td>0.8</td>
</tr>
<tr>
<td>Cavity wall partitions ( U = )</td>
<td>0.14</td>
<td>0.2</td>
<td>0.23</td>
<td>0.24</td>
<td>0.8</td>
</tr>
<tr>
<td>Flooring partitions ( U = )</td>
<td>0.29</td>
<td>0.4</td>
<td>0.46</td>
<td>0.47</td>
<td>0.8</td>
</tr>
</tbody>
</table>

The table shows the energy effects of applying alternative thermal insulation materials under identical outdoor conditions. To simplify the estimates and clarify the comparison, the reference baseline (zero insulation variant) is the averaged heat transfer coefficient \( U = 0.8 \text{ W/m²K} \).
THERMANO is a versatile thermal insulation system

In a general overview of plastics, polyurethanes are materials with the most versatile properties, and in the group of rigid foam thermal insulation materials for construction applications, PUR and PIR foams offer the widest variety of practical applications.

Their primary uses, based on properties, include: pitched roofs (over the rafter, in-rafter and under the rafter installation), flat roofs (new and renovated), energy-efficient and passive buildings, cavity (double brick) walls, floors with heating, floors on the ground and floor slabs, terraces on slabs over heated rooms, balconies, green roofs and inverted roofs, parking lots on slabs over heated rooms, livestock and farm buildings, and many other applications.
See the video: THERMANO and universal use
thermano.eu/usage
### THERMANO insulation on pitched roofs

#### Technical specifications

<table>
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<th>Product technical criteria</th>
<th>Product technical parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>EN 13165:2001</td>
</tr>
<tr>
<td>Maximum strength</td>
<td>Compressive strength at 200 kPa (10% deformation)</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>TR70</td>
</tr>
<tr>
<td>Thermal conductivity coefficient (ageing lambda)</td>
<td>$\lambda_{\text{D}} = 0,023 , \text{W/mK}$</td>
</tr>
<tr>
<td>Bulk density</td>
<td>$\approx 30 , \text{kg/m}^3$</td>
</tr>
<tr>
<td>Resistance to water vapour penetration</td>
<td>$\mu = 50–100$</td>
</tr>
<tr>
<td>Absorbability</td>
<td>$\leq 2%$</td>
</tr>
<tr>
<td>Fire reaction class</td>
<td>Euroclass E (EN ISO 11925-2)</td>
</tr>
</tbody>
</table>

Directive 2012/31/EU compliant.

**THERMANO panel, TOP joint**  
Overall width: 1,200 mm; covering width: 1,185 mm; covering length: 2,385 mm; overall length: 2,400 mm

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>$U^*$ [W/m²K]</th>
<th>$R^{**}$ [m²K/W]</th>
<th>Unit sold</th>
<th>Panels / pack</th>
<th>Overall m² / pack</th>
<th>Uoverall m³ / pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0,46</td>
<td>2,17</td>
<td>Pack</td>
<td>24</td>
<td>69,12</td>
<td>3,46</td>
</tr>
<tr>
<td>80</td>
<td>0,29</td>
<td>3,48</td>
<td>Pack</td>
<td>15</td>
<td>43,20</td>
<td>3,46</td>
</tr>
<tr>
<td>100</td>
<td>0,23</td>
<td>4,35</td>
<td>Pack</td>
<td>12</td>
<td>34,56</td>
<td>3,46</td>
</tr>
<tr>
<td>113</td>
<td>0,20</td>
<td>4,91</td>
<td>Pack</td>
<td>10</td>
<td>28,80</td>
<td>3,25</td>
</tr>
<tr>
<td>120</td>
<td>0,19</td>
<td>5,22</td>
<td>Pack</td>
<td>10</td>
<td>28,80</td>
<td>3,46</td>
</tr>
<tr>
<td>125</td>
<td>0,18</td>
<td>5,43</td>
<td>Pack</td>
<td>9</td>
<td>25,92</td>
<td>3,24</td>
</tr>
<tr>
<td>140</td>
<td>0,16</td>
<td>6,09</td>
<td>Pack</td>
<td>8</td>
<td>23,04</td>
<td>3,23</td>
</tr>
</tbody>
</table>

* Insulation index  
** Thermal resistance
Panel joints

Application

» Pitched roofs – of new and refurbished buildings. Installation: over the rafters, under the rafters, in the rafters, or mixed.

Terms of delivery

» The THERMANO products are sold from the manufacturer’s warehouse in packs.
» Selected thickness options are also available for 600 x 1,200 mm panels.
» Selected thickness and size options are also available with the MASTER and BASIC joints.
» Non-standard panel sizes (length: 2,400 to 5,000 mm) and other joint styles are available on custom order.

» The minimum order quantity for custom products is 2,000 m² of overall product area in one thickness option, one joint style and any length within the available range.
» Free shipping costs on orders for a minimum of 8 packs sized 1,200 x 2,400 mm.
» See the detailed provisions in General Terms & Conditions of Sale on www.balex.eu
Pitched roof installation accessories

Roofing membranes

<table>
<thead>
<tr>
<th>Product technical criteria</th>
<th>ASPIRA Max</th>
<th>ASPIRA Plus</th>
<th>ASPIRA Standard</th>
<th>AQ Metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight [g/m²]</td>
<td>165 ± 20 g</td>
<td>135 ± 15 g</td>
<td>115 ± 20 g</td>
<td>~ 8,70 g</td>
</tr>
<tr>
<td>Thickness [mm]</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Layers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakaway strength (N / 5 cm), lengthwise</td>
<td>&gt; 350</td>
<td>&gt; 280</td>
<td>&gt; 230</td>
<td>&gt; 400</td>
</tr>
<tr>
<td>Breakaway strength (N / 5 cm), crosswise</td>
<td>&gt; 240</td>
<td>&gt; 190</td>
<td>&gt; 150</td>
<td>&gt; 210</td>
</tr>
<tr>
<td>Elongation at break [%], lengthwise</td>
<td>&gt; 70</td>
<td>&gt; 70</td>
<td>&gt; 70</td>
<td>&gt; 70</td>
</tr>
<tr>
<td>Elongation at break [%], crosswise</td>
<td>&gt; 90</td>
<td>&gt; 90</td>
<td>&gt; 90</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>SD: diffusion equivalent layer of air [m]</td>
<td>&gt; 0,015</td>
<td>≥ 0,015</td>
<td>&gt; 0,015</td>
<td>0,015</td>
</tr>
<tr>
<td>Application temperature range [°C]</td>
<td>od - 40 do + 120</td>
<td>od - 40 do + 120</td>
<td>od - 40 do + 120</td>
<td>od - 30 do + 80</td>
</tr>
<tr>
<td>Water permeability resistance class</td>
<td>W1</td>
<td>W1</td>
<td>W1</td>
<td>W1</td>
</tr>
<tr>
<td>UV stability</td>
<td>3 months</td>
<td>3 months</td>
<td>3 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Standard size in reel [m]</td>
<td>1,60 × 50</td>
<td>1,60 × 50</td>
<td>1,60 × 50</td>
<td>1,60 × 25</td>
</tr>
<tr>
<td>Fire resistance class</td>
<td>E</td>
<td>E</td>
<td>E-d2</td>
<td>F</td>
</tr>
</tbody>
</table>

Properties

- Highly permeable roof layers
- Water-tight & vapour permeable
- Long-term UV resistance
- Extends roof service life
- Easier roof installation
- Effective roof structure protection during roofing

Application

- Housing
- Industrial & commercial buildings
- Farm buildings
- New & refurbished buildings
Available products

**ASPIRA Plus (roofing membrane)**
- Perfect for metal roof tile roofs
- Over the rafter installation
- Very good vapour permeability & good strength

**ASPIRA Standard (roofing membrane)**
- High quality & low price
- Over the rafter installation
- Very good vapour permeability & good strength

**AQ Metal (structural membrane)**
- Drainage spacer layer on the outside
- A special microporous layer makes the membrane good for laying on full boarding
- Intended under upright seam panels and flat sheet metal roofing

**ASPIRA Max (roofing screen)**
- Roofing screen class
- Can be installed on full boarding
- Performs in extreme conditions

<table>
<thead>
<tr>
<th>Product name</th>
<th>Parameters</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPIRA Standard</td>
<td>115 g/m², 3-ply, 1,50 × 50 m</td>
<td>m²</td>
</tr>
<tr>
<td>ASPIRA Plus</td>
<td>135 g/m², 3-ply, 1,50 × 50 m</td>
<td>m²</td>
</tr>
<tr>
<td>ASPIRA Max</td>
<td>165 g/m², 3-ply, 1,50 × 50 m</td>
<td>m²</td>
</tr>
<tr>
<td>AQ Metal</td>
<td>400 g/m², 4-ply, 1,50 × 25 m</td>
<td>m²</td>
</tr>
</tbody>
</table>
Other pitched roof installation accessories

<table>
<thead>
<tr>
<th>Product name</th>
<th>Parameters</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>THERMANO installation template</td>
<td>angle 67°</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO aluminium sealing tape</td>
<td>50 μm / 120 mm, 50 mb. *</td>
<td>pcs.</td>
</tr>
<tr>
<td></td>
<td>50 μm / 75 mm, 50 mb. *</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO Torx screw, over the rafter thickness: 80 mm, under the rafter thickness: 80 / 100 mm</td>
<td>6,0 / 160</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO Torx screw, over the rafter thickness: 100 mm</td>
<td>6,0 / 200</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO Torx screw, over the rafter thickness: 113, 120 mm</td>
<td>8,0 / 220</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO Torx screw, over the rafter thickness: 120–160** mm</td>
<td>8,0 / 260</td>
<td>pcs.</td>
</tr>
<tr>
<td>THERMANO Torx screw, over the rafter thickness: 160–200** mm</td>
<td>8,0 / 300</td>
<td>pcs.</td>
</tr>
</tbody>
</table>

* Average sealing tape yield: 1.5 m of length per 1 m² of THERMANO (when applied on one side only)
** Total thickness of THERMANO panels

Fixing screw selection guide

Size & length:
» min. 185 mm for 100 mm thick panels
» min. 210 mm for 100–120 mm thick panels
» 250 mm for 120–160 mm thick panels

Size & diameter:
» dia. 6 for light roofing (metal roof tiles)
» dia. 8 for heavy roofing (ceramic tiles)

Calculating the screw length:
THERMANO panel thickness
+ counterlathing thickness (40 mm)
+ rafter penetration depth (30–40 mm)
+ spare for 67° cant (30 mm)

Quantity
Depending on the rafter spacing, use 3 to 4 screws per 1 m² of the THERMANO insulation panelwork.

You can order the sealing tape and screws with the THERMANO panels from Balex Metal.
THERMANO insulation on pitched roofs

We have roamed UK far and wide. We've had a first-hand experience of what English roofs are exposed to. The extreme temperature variations during the year make our climate more of a challenge than the weather in Spitsbergen.

We have thoroughly studied the roof designs of English homes and found one fundamental flaw: cold bridges.

Traditionally, roofs are insulated between the rafters. This solution is far from perfect. It creates cold bridges, a substantial structural flaw of roofs built in UK. THERMANO can eliminate them effectively.

Cold bridges reduce the thermal insulation performance of structural partitions. They cause water vapour condensation and increased moisture levels in structural and insulation materials, which in turn results in fungi and mould growth. Moreover, cold bridges always cause substantial heat losses.

In-rafter insulation is insulation of the spaces between the individual rafters and should not be installed as such without additional insulating layers. This thermal insulation design, when applied on pitched roofs, makes rafters a large dissipation surface which easily leaks heat from indoors.

Hence, in-rafter insulation should be installed with an under the rafter or over the rafter insulation layer. This will total the thermal resistance of individual THERMANO layers to a sufficient level.
Installation details on pitched roofs

Over the rafter

1) Over the rafter thermal insulation; attic finished with drywall panels under the rafters

- 1. Balex Metal metal roof tiles
- 2. Battens/counter battens
- 3. Balex Aspira roofing membrane
- 4. THERMANO
- 5. Rafter
- 6. Frame + drywall panel

Screw

Rafter

Wall plate

Waterproofing

Anchor

Drywall panel on frame

Fastener, steel anchor

Balex Metal metal roof tiles

Batten

Over-gutter flashing

Rain gutter

Gutter hook

Under-gutter flashing

Fascia

Eaves beam

THERMANO

Counter batten

THERMANO
Section A – A
Scale 1:15

1. Balex Metal metal roof tiles
2. Battens/ counter battens
3. Balex Aspira roofing membrane
4. THERMANO
5. Rafter
6. Frame + drywall panel
2) **Thermal insulation, attic finished**

with drywall panels between the rafters

---

**Section A – A**

*Scale 1:15*

1. Balex Metal metal roof tiles
2. Battens/ counter battens
3. Balex Aspira roofing membrane
4. THERMANO
5. Rafter/frame + drywall panel
3) Over the rafter thermal insulation without an attic finish

1. Balex Metal metal roof tiles
2. Battens/ counter battens
3. Balex Aspira roofing membrane
4. THERMANO
5. Rafter
4) Over the rafter thermal insulation: **eaves detail**

- Version 1

- Version 2

**Image Description:**

- Battens
- Balex Metal metal roof tiles
- Counter battens
- Balex Aspira roofing membrane
- Over-gutter flashing
- Rain gutter
- Gutter hook
- Under-gutter flashing
- Fascia
- Eaves beam
- Rafter
- Flashings:
  - Under-gutter flashing
  - Over-gutter flashing

**Diagram Details:**

- Over the rafter thermal insulation: eaves detail
- Version 1
- Version 2
- Battens
- Balex Metal metal roof tiles
- Counter battens
- Balex Aspira roofing membrane
- Over-gutter flashing
- Rain gutter
- Gutter hook
- Under-gutter flashing
- Fascia
- Eaves beam
- Rafter
- Flashings:
  - Under-gutter flashing
  - Over-gutter flashing
5) Over the rafter thermal insulation:

**details of the roof ridge and valley gutter**

- Seal the gap with low-pressure foam
- Izovent self-adhesive ridge tape
- Self-adhesive aluminium tape
- THERMANO fixing screws
- Alternative THERMANO joint at the ridge
- Balex Aspira roofing membrane
- Counter battens
- Valley gutter
- Balex Metal metal roof tiles
- Flashings:
  - Valley gutter

**Notes:**

- Battens
- THERMANO
- Seal the gap with low-pressure foam
- Self-adhesive aluminium tape
- Rafter
- Valley rafter
6) Over the rafter thermal insulation: **window detail**
7) Over the rafter thermal insulation:

**chimney stack & vent details**

- Vent chimney
- Vent insert
- Bushing
- Batten
- Balex Metal roof tiles
- Counter batten
- Balex Aspira roofing membrane
- THERMANO
- Connection adapter
- Spiro pipe
- Balex Metal metal roof tiles
- Chimney wall
- Flashing
- Wool band
- Counter batten
- Batten
- Balex Aspira roofing membrane
- THERMANO

* Use the wool bands only around chimneys without inserts.
8) Over the rafter thermal insulation:

chimney stack & vent details

Rafter by the wall: VERSIONS 1 & 2

1. Balex Metal metal roof tiles
2. Battens
3. Counter battens
4. Roof membrane BALEX ASPIRA
5. THERMANO insulation
6. Wooden rafters
Extended rafter: VERSIONS 1 & 2

1. Balex Metal metal roof tiles
2. Battens
3. Counter battens
4. BALEX ASPIRA roofing membrane
5. THERMANO insulation
6. Wooden rafters
Under the rafter

1. Balex Metal metal roof tiles
2. Battens/ counter battens
3. BALEX ASPIRA roofing membrane
4. Rafter
5. THERMANO
6. Frame + drywall panel
1. Balex Metal metal roof tiles
2. Battens/ counter battens
3. BALEX ASPIRA roofing membrane
4. Rafter
5. THERMANO
6. Frame + drywall panel

Detail A
Scale 1:4

Section A – A
Scale 1:15
VI THERMANO insulation on flat roofs

Technical specifications

<table>
<thead>
<tr>
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<tr>
<td>Tensile strength</td>
<td>TR70</td>
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<tr>
<td>Thermal conductivity coefficient (ageing lambda)</td>
<td>λₐ = 0.023 W/mK</td>
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<tr>
<td>Bulk density</td>
<td>~30 kg/m³</td>
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<tr>
<td>Resistance to water vapour penetration</td>
<td>μ = 50–100</td>
</tr>
<tr>
<td>Absorbability</td>
<td>≤ 2%</td>
</tr>
<tr>
<td>Fire reaction class</td>
<td>Euroclass E (EN ISO 11925-2)</td>
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</table>

Directive 2012/31/EU compliant.

THERMANO panel, TOP joint
Overall width: 1,200 mm; covering width: 1,185 mm; covering length: 2,385 mm; overall length: 2,400 mm

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>U* [W/m²K]</th>
<th>R** [m²K/W]</th>
<th>Unit</th>
<th>Panels / pack</th>
<th>Overall m² / pack</th>
<th>Overall m³ / pack</th>
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<td>Pack</td>
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</tbody>
</table>

* Insulation index
** Thermal resistance
Panel joints

Application

» Flat roofs – of new and renovated buildings. Also for ballast and green roofs. The panels can be installed on all load-bearing structures, including rafters, troughed sheets and concrete slab floors.

Terms of delivery

» The THERMANO products are sold from the manufacturer’s warehouse in packs.
» Selected thickness options are also available for 600 x 1,200 mm panels.
» Selected thickness and size options are also available with the MASTER and BASIC joints.
» Non-standard panel sizes (length: 2,400 to 5,000 mm) and other joint styles are available on custom order.

» The minimum order quantity for custom products is 2,000 m² of overall product area in one thickness option, one joint style and any length within the available range.
» Free shipping costs on orders for a minimum of 8 packs sized 1,200 x 2,400 mm.
» See the detailed provisions in General Terms & Conditions of Sale on www.balex.eu
### Long plastic pins

The long plastic pins are designed to offset the screws from the outer layer far enough to prevent cold bridges from forming.

**A long plastic pin is a plastic bush with a metal screw** (when installing on troughed sheets) or **a concrete screw** (when installing on reinforced concrete slabs).

#### Size

The screw size may vary with the THERMANO layer thickness and the substrate thickness. The total length of the bush and the screw shall exceed the THERMANO layer thickness by 40 mm on steel sheet substrates (troughed sheets) or at least 60 mm (on reinforced concrete substrates). Example: 100 mm THERMANO panels installed on troughed sheets need a 60 mm screw with 80 mm bushes. When installing on a reinforced concrete substrate, the bush and the screw shall be 80 mm long each.

#### Estimated yield

Single-layer insulation: 2 pcs. per 1 m² of THERMANO. Each standard 1200 x 2400 THERMANO panel requires 6 pcs.
THERMANO insulation on flat roofs

THERMANO is a perfect insulating system for flat roofs of new and refurbished buildings. THERMANO is also an excellent insulation system for green and ballast roofs.

The insulating panels can be installed on all load-bearing surfaces, including rafters, troughed sheets and concrete slab floors. The panels are quick, easy and clean to install. An added value is the compatibility with various vapour barrier films (PE film, aluminium foil and tar paper) and water barriers, including torch-welded membranes (e.g. PVC, TPO, EPDM).

The difference between the installation of THERMANO on troughed sheets and reinforced concrete floor slabs is the selection of screws. Metal sheets require dedicated sheet metal screws, whereas reinforced concrete structures require concrete screws.

Learn more: Instructions for THERMANO panel installation on flat roofs
thermano.eu/flatroof

See the video:
THERMANO installation on flat roofs
thermano.eu/flatrooffilm
1) THERMANO panels on a flat roof with a concrete substrate: single insulating layer

2) THERMANO panels on a flat roof with a concrete substrate: double insulating layer
3) THERMANO panels on a flat roof with troughed sheets:
   single insulating layer

4) THERMANO panels on a flat roof with troughed sheets:
   double insulating layer

Note: Freezer and cold store buildings require an additional vapour barrier film between the THERMANO panel and the waterproofing because of the reversed
direction of energy and vapour transfer in summer.
5) Roof drainage detail

- Waterproofing
- THERMANO insulating panel
- Vapour barrier
- Sloping layer
- Reinforced concrete surface

Seal, designed by the roof drain manufacturer

6) Detail of a roof expansion joint

- Waterproofing
- THERMANO insulating panel
- Vapour barrier
- Vapour barrier
- Reinforced concrete surface

Protective belt of flexible waterproofing
Sealing weld
Expanding filler
Permanently flexible material
Fastener in a long plastic pin bush
7) Roof drainage detail
- Water drain to roof gutter

8) Detail of low attic thermal insulation
9) Detail of high attic/adjacent wall insulation

- Waterproofing
- Sloping wedge
- THERMANO panel
- Vapour barrier
- Sloping layer
- Reinforced concrete surface
- Plasterwork
- Sloping wedge
- Skirt lath
- Flexible material

10) Detail of skylight base

- Waterproofing
- THERMANO insulating panel
- Vapour barrier
- Sloping layer
- Reinforced concrete surface
- Skylight structure
- Fastener
- Metalsheet base
- Fastener
## THERMANO insulation on floors

### Technical specifications

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<td>TR70</td>
</tr>
<tr>
<td>Thermal conductivity coefficient (ageing lambda)</td>
<td>λ&lt;sub&gt;d&lt;/sub&gt; = 0,023 W/mK</td>
</tr>
<tr>
<td>Bulk density</td>
<td>~30 kg/m³</td>
</tr>
<tr>
<td>Resistance to water vapour penetration</td>
<td>μ = 50–100</td>
</tr>
<tr>
<td>Absorbability</td>
<td>≤ 2%</td>
</tr>
<tr>
<td>Fire reaction class</td>
<td>Euroclass E (EN ISO 11925-2)</td>
</tr>
</tbody>
</table>

Directive 2012/31/EU compliant.

### THERMANO panel, TOP joint

Overall width: 1,200 mm; covering width: 1,185 mm; covering length: 585 mm; overall length: 600 mm

### THERMANO panel, MASTER joint

Overall width: 1,200 mm; covering width: 1,190 mm; covering length: 590 mm; overall length: 600 mm

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>U* [W/m²K]</th>
<th>R** [m²K/W]</th>
<th>Unit sold</th>
<th>Panels / pack</th>
<th>Overall m² / pack</th>
<th>Overall m³ / pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
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<td>1.74</td>
<td>Pack</td>
<td>15</td>
<td>10.80</td>
<td>0.43</td>
</tr>
<tr>
<td>50</td>
<td>0.46</td>
<td>2.17</td>
<td>Pack</td>
<td>12</td>
<td>8.64</td>
<td>0.43</td>
</tr>
<tr>
<td>80</td>
<td>0.29</td>
<td>3.48</td>
<td>Pack</td>
<td>7</td>
<td>5.04</td>
<td>0.40</td>
</tr>
<tr>
<td>100</td>
<td>0.23</td>
<td>4.35</td>
<td>Pack</td>
<td>6</td>
<td>4.32</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* Insulation index  
** Thermal resistance

Learn more at [www.thermano.eu](http://www.thermano.eu)
Panel joints

MASTER joints  TOP joints

Application

» Floors: heated/unheated, on balconies and patios, and even the most demanding insulated horizontal structures: patios over heated rooms.

Terms of delivery

» The THERMANO products are sold from the manufacturer’s warehouse in packs.
» Selected thickness options are also available for 600 x 1,200 mm panels.
» Selected thickness and size options are also available with the MASTER and BASIC joints.
» Non-standard panel sizes (length: 2,400 to 5,000 mm) and other joint styles are available on custom order.

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» Free shipping costs on orders for a minimum of 8 packs sized 1,200 x 2,400 mm.
» See the detailed provisions in General Terms & Conditions of Sale on www.balex.eu
Floor installation details

1) Single/multi-family housing floors

- Flooring finish
  - Ballast layer: top concrete
  - Separation/slip layer: e.g. PE film, thickness: 0.2 mm
  - Thermal insulation layer: THERMANO panels
- Waterproofing

- Foundation: lean concrete

- Foundation: levelling bed of compacted sand

2) Single/multi-family housing floors with heating

- Piespiešanas slānis – vīrbetonse
- Floor heating system
  - Separation/slip layer: e.g. PE film, thickness: 0.2 mm
  - Thermal insulation layer: THERMANO panels
- Waterproofing

- Foundation: lean concrete

- Foundation: filter bed (gravel/aggregate)

- Foundation: levelling bed of compacted sand

3) Balconies and patios floors over heated rooms

- Flooring finishing
  - Ballast layer: top concrete
  - Protective layer: tx PE film sheet

- Thermal insulation layer: THERMANO panels
- Vapour barrier: e.g. bituminous adhesive with aluminium cladding

- Sloping layer: cement foundation

- Patio structure: reinforced concrete slab
4) Industrial flooring (in cold stores / freezers)

<table>
<thead>
<tr>
<th>Flooring finish</th>
<th>Flooring: mesh-reinforced concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulating film</td>
<td>THERMANO</td>
</tr>
<tr>
<td>Insulating film</td>
<td>Protective concrete screed</td>
</tr>
<tr>
<td>Heating mat</td>
<td>Concrete foundation</td>
</tr>
<tr>
<td>All-in, compacted in layers</td>
<td></td>
</tr>
<tr>
<td>Stabilized subsoil</td>
<td></td>
</tr>
</tbody>
</table>

5) Floor slab between storeys

<table>
<thead>
<tr>
<th>Flooring finish</th>
<th>Ballast layer: top concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation/slip layer: e.g. PE film, thickness: 0.2 mmm</td>
<td></td>
</tr>
<tr>
<td>Thermal insulation layer: THERMANO panels</td>
<td></td>
</tr>
<tr>
<td>Vapour barrier: e.g. PE film, thickness: 0.2 mm</td>
<td></td>
</tr>
<tr>
<td>Storey floor: e.g. reinforced concrete slab</td>
<td>Lime &amp; cement plaster</td>
</tr>
</tbody>
</table>

See the video: THERMANO installation on floors
thermano.eu/floor film

Learn more: Instructions for THERMANO panel installation on floors
thermano.eu/floor
THERMANO insulation on cavity walls

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<tr>
<td>Thermal conductivity coefficient (ageing lambda)</td>
<td>$\lambda_D = 0.023 \text{ W/mK}$</td>
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<tr>
<td>Bulk density</td>
<td>$\mu = 30 \text{ kg/m}^3$</td>
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<td>Resistance to water vapour penetration</td>
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<tr>
<td>Absorbability</td>
<td>$\leq 2%$</td>
</tr>
<tr>
<td>Fire reaction class</td>
<td>Euroclass E (EN ISO 11925-2)</td>
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</tbody>
</table>

Directive 2012/31/EU compliant.

THERMANO panel, TOP joint
Overall width: 1,200 mm; covering width: 1,185 mm; covering length: 585 mm; overall length: 600 mm

THERMANO panel, MASTER joint
Overall width: 1,200 mm; covering width: 1,190 mm; covering length: 590 mm; overall length: 600 mm

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<td>1.74</td>
<td>Pack</td>
<td>15</td>
<td>10.80</td>
<td>0.43</td>
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<tr>
<td>50</td>
<td>0.46</td>
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<td>Pack</td>
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<td>4.32</td>
<td>0.43</td>
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</table>

* Insulation index
** Thermal resistance
Panel joints

Application

» Cavity (double brick) walls and basement walls of new and refurbished buildings

MASTER joints

TOP joints
Terms of delivery

» The THERMANO products are sold from the manufacturer’s warehouse in packs.
» Selected thickness options are also available for 600 x 1,200 mm panels.
» Selected thickness and size options are also available with the master and basic joints.
» Non-standard panel sizes (length: 2,400 to 5,000 mm) and other joint styles are available on custom order.

» The minimum order quantity for custom products is 2,000 m² of overall product area in one thickness option, one joint style and any length within the available range.
» Free shipping costs on orders for a minimum of 8 packs sized 1,200 x 2,400 mm
» See the detailed provisions in General Terms & Conditions of Sale on www.balex.eu

Installation detail of cavity (double brick) walls

- Cavity wall anchor
- Structural wall
- THERMANO
- Curtain wall/ façade
**Technical specifications**

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<td>Bulk density</td>
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<td>Resistance to water vapour penetration</td>
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<td>Absorbability</td>
<td>$\leq 2%$</td>
</tr>
<tr>
<td>Fire reaction class</td>
<td>Euroclass E (EN ISO 11925-2)</td>
</tr>
</tbody>
</table>

Directive 2012/31/EU compliant.

**THERMANO AGRO panel, BASIC joint**

Overall width: 1,200 mm, covering width: 1,200 mm, covering length: 4,000 mm, overall length: 4,000 mm

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>U* [W/m$^2$K]</th>
<th>R** [m$^2$K/W]</th>
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<th>Uoverall m$^2$ / pack</th>
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<td>Pack</td>
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</table>

* Insulation index
** Thermal resistance
Panel joints

Application

- **Livestock buildings**: e.g. hen houses, pigsties, cowsheds and other farm buildings with high indoor levels of humidity, ammonia and VOC

Terms of delivery

- The THERMANO products are sold from the manufacturer’s warehouse in packs.
- Selected thickness and size options are also available with the MASTER joints.
- Non-standard panel sizes (length: 2,400 to 5,000 mm) and other joint styles are available on custom order.
- The minimum order quantity for custom products is 2,000 m² of overall product area in one thickness option, one joint style and any length within the available range.
- See the detailed provisions in General Terms & Conditions of Sale on [www.balex.eu](http://www.balex.eu)
H joint profiles

<table>
<thead>
<tr>
<th>Product name</th>
<th>Colour</th>
<th>Length</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>H joint profile for 50 mm AGRO panels</td>
<td>White</td>
<td>4 m</td>
<td>m</td>
</tr>
<tr>
<td>H joint profile for 80 mm AGRO panels</td>
<td>White</td>
<td>4 m</td>
<td>m</td>
</tr>
<tr>
<td>H joint profile for 100 mm AGRO panels</td>
<td>White</td>
<td>4 m</td>
<td>m</td>
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</table>

U joint profiles

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<td>White</td>
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</table>

Fastening hanger

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<th>Colour</th>
<th>Length</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>AGRO panel hanger</td>
<td>Galvanized</td>
<td>H = 35 mm</td>
<td>pcs.</td>
</tr>
</tbody>
</table>
THERMANO AGRO insulation

The capacity to precisely control air temperature and humidity has a direct impact on breeding profitability. THERMANO AGRO is a specially designed PIR panel with a reinforced top layer that is more resistant to mechanical damage and chemicals than the regular panel versions. THERMANO AGRO is designed as soffit ceiling panels for livestock buildings. The THERMANO thermal insulation system has the best commercially available insulating performance and guarantees measurable savings on heating and cooling.

THERMANO AGRO insulation applications

» Egg farming
Ambient temperature is critical to the health, growth and usability of farm birds. The ambient temperatures which trigger higher metabolism in egg-laying hens is between 13°C and 18°C. The feed conversion is optimum in this range. THERMANO ensures the right rearing conditions.

» Poultry meat farming
Young chicks suffer from a poor thermal regulation capacity. This prevents the animals to compensate for heat losses. Heating in zones is then recommended (between 16°C and 32°C), which helps the birds choose the temperature zones that are right for them. Bad temperature conditions of rearing nestlings cause uneven body growth. THERMANO helps keep the optimum thermal conditions for high rearing efficiency.

» Milk farming
Cows can easily bear low ambient temperatures down to -10°C. However, temperatures over 25°C expose the animals to thermal stress. Thermal stress effects include: up to 30% reduction of milking capacity, lower protein and fat content in milk, and poor reproduction statistics. Thanks to the special aluminium cladding, the THERMANO panels provide superior protection of cowshed rooms against high outdoor temperatures.

» Pig farming
High indoor temperatures at pigsties reduce the feed intake and body mass growth rate. The rule of thumb is that every 1°C above the optimum indoor temperature reduces the feed consumption by 1–2% and the growth rate by 3%. Stable indoor temperatures and constant relative humidity at optimum levels can be achieved with the materials applied in the THERMANO thermal insulation panels.

Recommended installation thickness

» Cowsheds: 50mm
» Pigsties: 80mm
» Hen houses: 80-100mm

Learn more: THERMANO AGRO
thermano.eu/farming
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  www.balex.eu

- Roof gutters
  www.balex.eu

- Sandwich panels
  www.balex.eu

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  www.balex.eu