

termPIR® AL, WS, BWS, BT boards

Thermally insulated polyurethane **termPIR®** boards, installed in flat roofs, have been tested for fire resistance by Instytut Technologii Budowlanej **FIRES**. They obtained the **REI 30 / REI 15** class (fire rating), regardless of the substrate which may consist of steel trapezoidal sheet or reinforced concrete elements.

Parameters of thermal insulation boards	
Kind of core	Rigid polyisocyanurate foam (PIR)
Apparent core density	$\rho = 30 \text{ kg/m}^3$
Declared heat transfer coefficient for lining	$\lambda_D = 0,022 \text{ W/m}\cdot\text{K}$ for termPIR® AL, $\lambda_D = 0,027 \text{ W/m}\cdot\text{K}$ for thickness $20 \leq d_n \leq 80 \text{ mm}^*$ $\lambda_D = 0,026 \text{ W/m}\cdot\text{K}$ for thickness $80 \leq d_n \leq 120 \text{ mm}^*$ $\lambda_D = 0,024 \text{ W/m}\cdot\text{K}$ for thickness $120 < d_n \leq 250 \text{ mm}^*$
Board facing	<ul style="list-style-type: none"> AL¹ - double-sided cladding consisting of aluminum, paper and polyethylene WS² - fiberglass BWS² - on one side a fiberglass, on the other a bitumen lining BT² - bitumen lining
Standard board dimensions [mm]	600 x 1200 / 1200 x 2400
Individual order panel dimensions [mm]	1000 x 1200 / 1200 x 1200 / 1200 x 1800 / 1200 x 3000
Joint types	FIT - flat milling, LAP - stepwise milling**, TAG - tongue and groove**
Board thickness [mm]	20 30 40 50 60 80 100
Thermal resistance R_s [m²·K/W]	0,90 ¹ 1,35 ¹ 1,85 ¹ 2,30 ¹ 2,75 ¹ 3,70 ¹ 4,65 ¹ 0,70 ² 1,14 ² 1,45 ² 1,85 ² 2,20 ² 3,05 ² 3,80 ²
Heat transfer coefficient U [W/m²·K] (for roofs)	0,96 ¹ 0,67 ¹ 0,50 ¹ 0,41 ¹ 0,35 ¹ 0,26 ¹ 0,21 ¹ 1,14 ² 0,80 ² 0,62 ² 0,50 ² 0,42 ² 0,31 ² 0,25 ²
Board thickness [mm]	120 140 150 180 200 220 250
Thermal resistance R_s [m²·K/W]	5,55 ¹ 6,50 ¹ 6,95 ¹ 8,35 ¹ 9,30 ¹ 10,2 ¹ 11,6 ¹ 4,80 ² 5,60 ² 6,00 ² 7,20 ² 8,00 ² 8,80 ² 10,0 ²
Heat transfer coefficient U [W/m²·K] (for roofs)	0,18 ¹ 0,15 ¹ 0,14 ¹ 0,12 ¹ 0,11 ¹ 0,10 ¹ 0,08 ¹ 0,20 ² 0,17 ² 0,16 ² 0,14 ² 0,12 ² 0,11 ² 0,10 ²
Reaction to fire (of the product as placed on the market)	20-49: F class, 50-250: E class for termPIR® AL, termPIR® WS, F class for termPIR® BT, 20-49: F class, 50-250: E class (WS facing) / F class (BT facing) for termPIR® BWS
Reaction to fire (end of use)	B-s2,d0 (on a substructure from trapezoidal sheets) for termPIR® AL, termPIR® WS undeclared for termPIR® BT, termPIR® BWS
Roof(t1) / NRO	Roof(t1) mounted: mechanically / using glued system (for termPIR® AL, termPIR® WS)
Fire resistance	REI 30/REI 15 (by Fires/ITB) $\geq 120/100 \text{ mm}$ (for termPIR® AL, termPIR® WS)
Compressive strenght at 10% of deformation	$\sigma \geq 120 \text{ kPa} - 20 \leq d_n < 30 \text{ mm}$ $\sigma \geq 150 \text{ kPa} - 30 \leq d_n \leq 250 \text{ mm}$
Absorptivity [kg/kg]	$\leq 2,0 \%$
* for others ** dimensions of boards with joint types are 2 to 4 % smaller . Milling: LAP available for the boards from 30 mm, TAG for the boards from 40 mm KEY: 1 - for termPIR® AL (gas-tight), 2 - for termPIR® WS, termPIR® BWS, termPIR® BT (gas permeable)	

Factory of Insulation Boards

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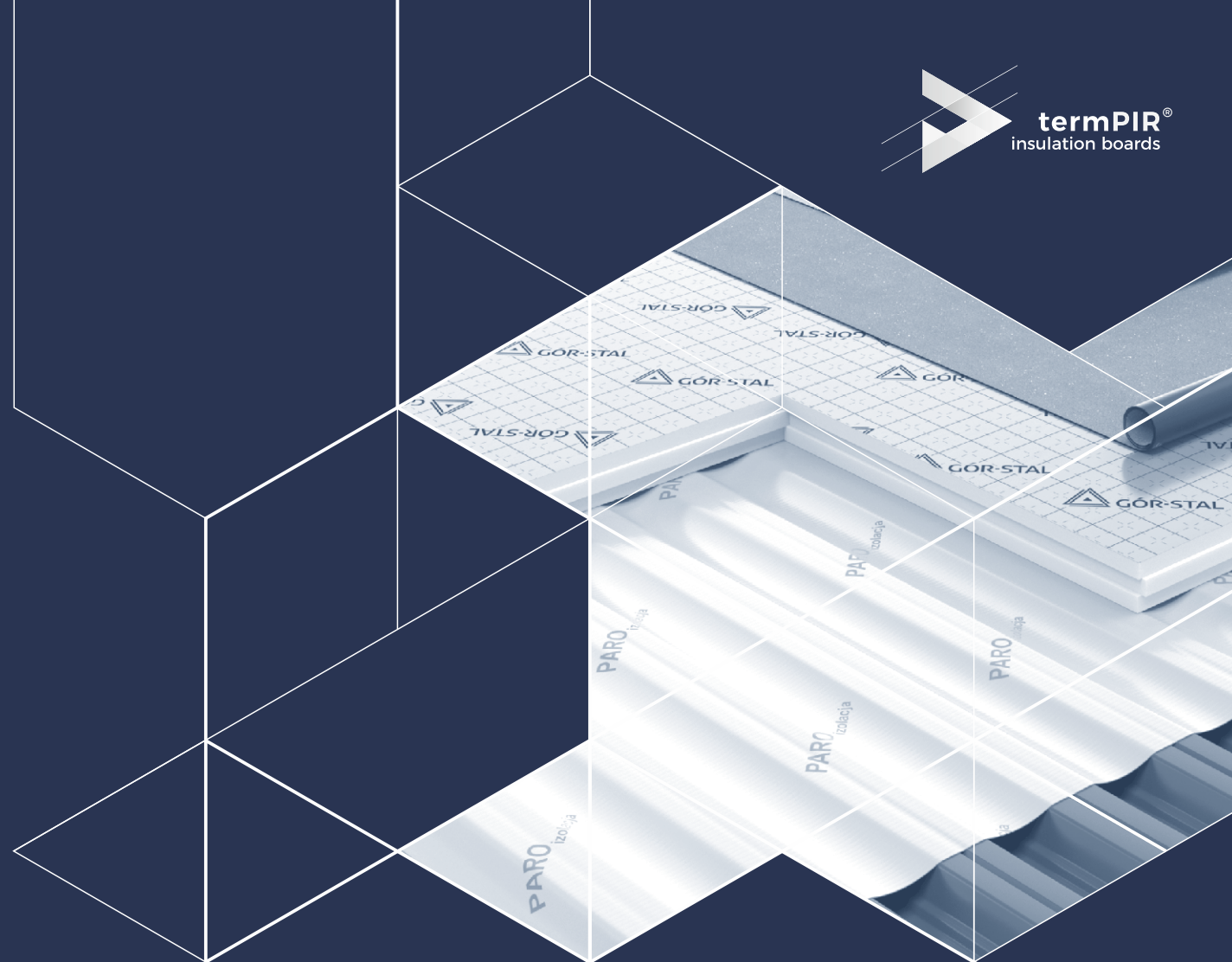
Factory of Sandwich Panels

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termPIR® Insulation boards

HOUSING AND INDUSTRIAL
CONSTRUCTION

FLAT ROOF



Perfect thermal insulation material for flat roofs

termPIR® boards for insulation of flat roofs are also used as insulation for ballast and green roofs in a traditional system. Ideally suited for mounting on trapezoidal sheet, reinforced concrete slabs and other flat roof bearing substrates. An additional advantage is the compatibility with a wide range of vapor barriers and waterproofing, including: thermo-welded membranes sensitive to point fire action. The installation of **termPIR®** boards is fast, simple and clean.

INSULATION CLASSES	
A+++ $\lambda = 0,018$	termPIR® MAX18
A++ $\lambda = 0,019$	termPIR® MAX19
A+ $\lambda = 0,022$	termPIR® *
A $\lambda = 0,024 - 0,026$	termPIR® **
B $\lambda = 0,029 - 0,034$	STYROFOAM XPS
C $\lambda = 0,031 - 0,044$	STYROFOAM EPS
D $\lambda = 0,031 - 0,045$	MINERAL WOOL
E $\lambda = 0,042 - 0,046$	CELLULAR CONCRETE
AMENDED VALUE FOR DIFFERENT MANUFACTURERS * for termPIR® AL, termPIR® AGRO AL, termPIR® AGRO P, termPIR® AL GK, termPIR® AGRO P REV ** for termPIR® ETX, termPIR® WS, termPIR® PK, termPIR® BWS, termPIR® PK REM, termPIR® BT	

Why insulate with termPIR® boards?

- They make a great insulating material - $\lambda_D = 0,022 \text{ W/m}\cdot\text{K}$ a **140 mm** plate is sufficient (applies to the roof partition) to meet the technical conditions for 2021.
- They are hard and damage resistant - $\sigma_{10} = 150 \text{ kPa}$ (from 30 mm) will not change shape over time (they do not slump), as well as being light weight - only **3,6 kg/m²** boards of **120 mm** in thickness.
- They are water resistant - water absorption **below 2%**** forget replacing damp insulation boards, and you can install them almost all year round.
- They are **biologically** and **chemically** resistant you do not have to share your home with rodents and insects or worry about fungi or mould.
- Our boards feature increased **fire resistance** they are a self-extinguishing material, i.e. they do not support combustion.

* for termPIR® AL, ** for termPIR® AL / WS

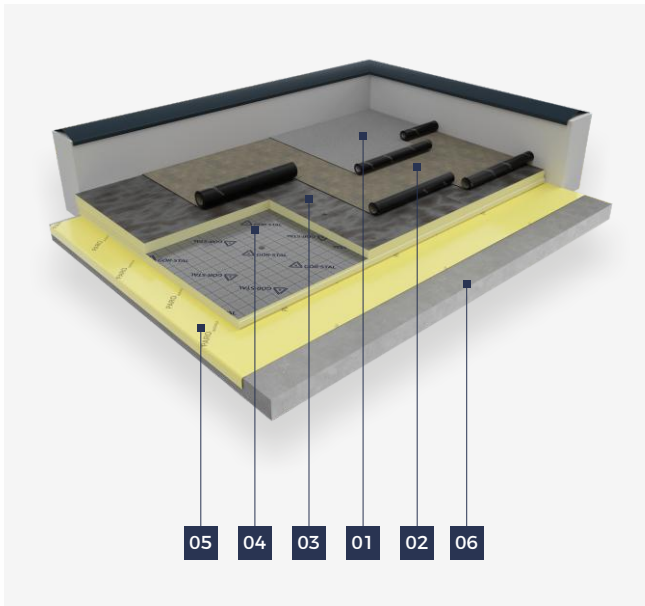
Proposed thermal insulation systems for flat roofs

The insulation material used for roof insulation should be characterized by low dead weight and low water absorption, in addition to high insulation parameters.

The core density of the PIR foam at 30 kg/m³ archives its application as an end-use product. This allows to reduce the total weight of the roof itself, (compared to roofs insulated with popular mineral wool), and thus "relieve" the loads of the roof. The water absorption at not greater than 2.0% and declared heat conduction coefficients, taking into account the ageing, guarantee the preservation of very good thermal-moisture parameters and performance of partitions insulated with **termPIR**[®] boards.

Below are suggestions for making a flat roof using **termPIR**[®] boards.

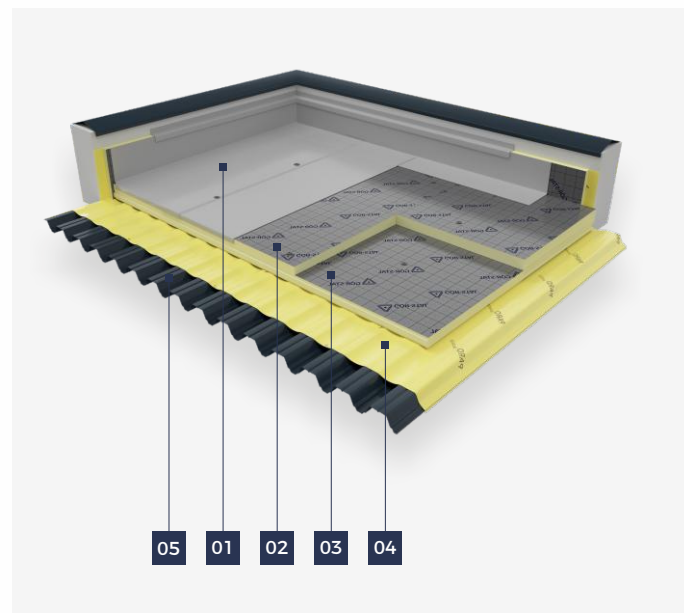
Reinforced concrete roofs



Legend:

01. Waterproofing (welded top-cover roofing membrane)
02. Waterproofing (weldable roofing base felt)
03. termPIR BT / BWS[®] boards - sloping layer
04. termPIR AL[®] boards - appropriate waterproofing
05. Vapor barrier
06. Support layer (reinforced concrete slab)

Roofs on a trapezoidal sheet substrate



Legend:

01. Waterproofing (PVC membrane)
02. termPIR AL[®] boards - sloping layer
03. termPIR AL[®] boards - appropriate insulation
04. Vapor barrier
05. Support layer (trapezoidal metal sheet)

The effectiveness of insulation made from **termPIR**[®] boards is influenced by:

- ▢ possibility of choosing the thickness of panels suitable for customer requirements
- ▢ light weight of boards, compared to other popular insulating materials, makes the building structure lighter, and thus cheaper (core density: $\rho = 30 \text{ kg/m}^3$)
- ▢ easy installation
- ▢ the boards are ecological and safe for humans

Fire resistance of **termPIR**[®] boards

We have prepared products that have fire resistance classes, to meet the increasing fire-fighting requirements for industrial facilities. Details in "Parameters of thermal insulation boards" table.

So-called sloping wedges are offered by **Gór-Stal** as a supplement to the flat roofs coverage system.

The application of drop wedges on flat roofs allows to correctly shape the geometry of waterproofing on roofs, without tampering with the roofing structure. Dedicated solutions, in which wedges are made from the same material as the insulating layer, that allows to shape the designed roof drops and at the same time maintain the uniformity of thermal insulation layer. This ensures maintaining of correct thermal and moisture parameters inside the roof layers.

Individual approach to each project and a wide range of wedges offered as assortments, makes **Gór-Stal** meet even the most sophisticated requirements of both domestic and foreign customers, amongst them, Nordic countries.

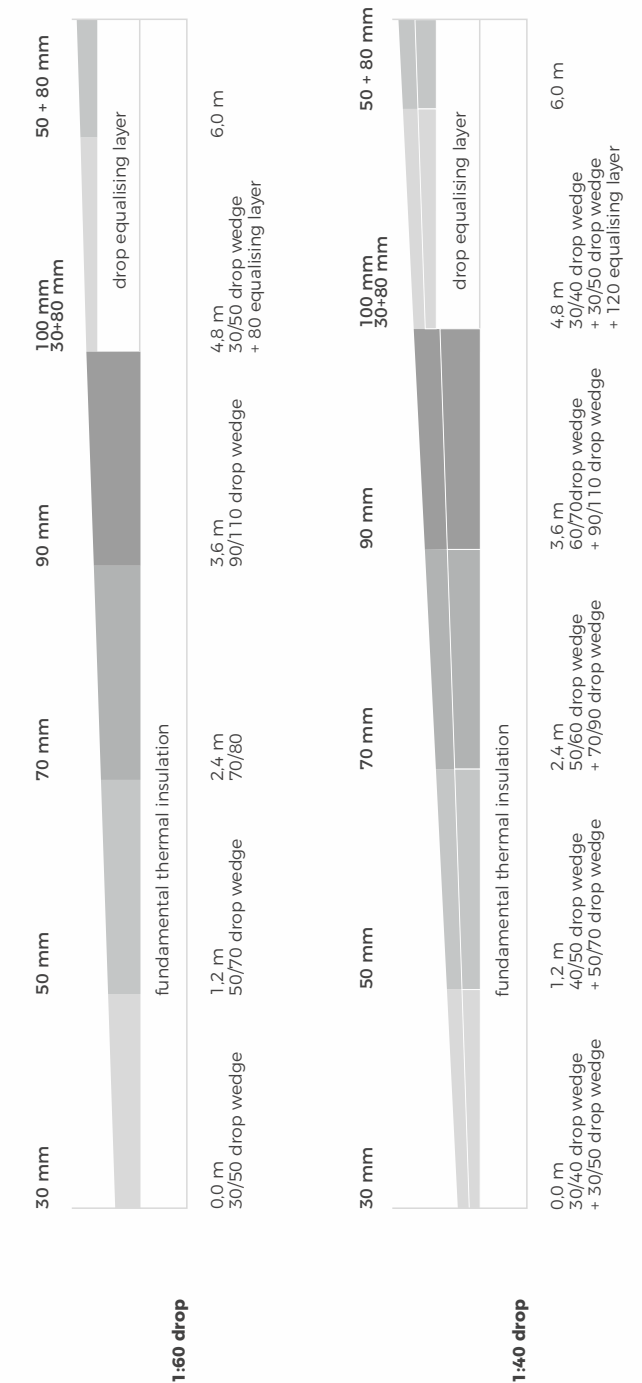
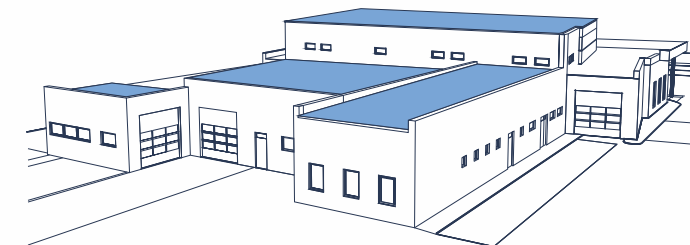
20 mm drop (1:60)

Thickness [mm]	Declared heat transfer coefficient for lining, U [W/m ² K]		
	U _{max}	U _f	U _{min}
30-50	0,90	0,68	0,54
50-70	0,54	0,45	0,39
70-90	0,33	0,33	0,29
90-110	0,29	0,26	0,24

10 mm drop (1:120)

30-40	0,90	0,77	0,68
40-50	0,68	0,60	0,54
50-60	0,54	0,49	0,45
60-70	0,45	0,42	0,39
70-80	0,39	0,36	0,33
80-90	0,33	0,31	0,29
90-100	0,29	0,27	0,26

Green
architecture 



1:60 drop

1:40 drop