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-

termPIR

Sheets of laminated rigid polyisocyanurate foam (PIR) for the manufacture of thermal roof insulation systems

Certificate holder:

Gór-Stal sp. z o.o.

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Declaration made by SGS INTRON CERTIFICATIE B.V.

This Quality Declaration for Product Certification and Attestation is based on Assessment Directive 1309 "Thermal insulation for flat or pitched roofs on a substructure in combination with a closed roofing system", dated 01/01/2004, including the Amending Leaflet, dated 31/12/2014, issued in accordance with the SGS INTRON Certification Regulations for Certification and Attestation.

The quality system and product characteristics associated with termPIR are checked periodically. On this basis, **SGS INTRON Certificatie B.V. declares that:**

- There is justified confidence that the termPIR sheets manufactured and delivered by Gór-Stal sp. z o.o. meet the technical specifications and all product characteristics and requirements laid down in this Quality Declaration upon delivery, provided that they bear the KOMO® label in a manner indicated herein.
- The essential characteristics set out in Annex ZA to the applicable harmonised European standard are not part of this declaration.
- Roof insulation systems composed with termPIR sheets provide the performance described in the KOMO® Quality Declaration and comply with the requirements of the Buildings Decree included herein, provided that:
 - The technical specification and application conditions laid down KOMO® Quality Declaration are met.
 - Roof insulation systems are manufactured in accordance with the regulations and/or processing methods laid down in the KOMO® Quality Declaration.

SGS INTRON Certificatie B.V. declares that, with due observance of the above, termPIR complies in its application with the requirements of the Buildings Decree as specified in this Quality Declaration.

Within the framework of the KOMO® Quality Declaration, no checks of the manufacture of other components of roof insulation systems are performed; neither is the composition of and/or the installation in roof insulation systems checked in any way.



For SGS INTRON Certificatie B.V.



Eng. J.W.P. de Bont
Certification Manager

Users of this Quality Declaration are advised to enquire at SGS INTRON Certificatie B.V. whether this document is still valid. The valid certificates are listed on the website www.sgs.com/intron-certificatie

The certificate is also included in the overview on the website of the KOMO Foundation: www.komo.nl

This Quality Declaration consists of 1 cover page, 12 pages and 1 annex



Object of review:
Product Quality System
Product Performance in
application
Periodic Control

KEY POINTS OF THE BUILDING DECREE

	Section	Threshold/Method of Determination	Performance Requirements	Comments on Application
2.1	General strength of the building structure	Resistance to wind load in accordance with NEN 6707	examples of application of the strength of the fastening of roofing structures	Subject to compliance with the processing rules.
2.8	Limiting of the occurrence of fire hazards	Inflammability, fire class A1 in accordance with NEN-EN 13501-1	Not examined	-
2.10	Limiting the spread of fire	Resistance to fire penetration and fire spread > 30 or 60 minutes in accordance with NEN 6068	Not examined	The resistance to fire is determined by the total construction
3.1	Protection against external noise	Characteristic noise protection residential area > 18 dB(a) in accordance with NEN 5077	Not examined	-
3.5	Moisture protection	Waterproof in accordance with NEN 2778	Not examined	Insulation material does not determine the waterproofness of a facade construction
		Interior surface temperature factor ≥ 0.5 or 0.65 in accordance with NEN 2778	Not examined	-
5.1	Energy Efficiency	The total energy consumption determined in accordance with NEN 2916 does not exceed the permissible energy consumption in accordance with NEN 2916.		The insulation material makes an important contribution to the energy efficiency of a building. However, there are other aspects that determine energy efficiency.
		Air volume flow (of total areas and rooms) ≤ 0.2 in accordance with NEN 1068	Not examined	
		Heat resistance $R_c \geq 3,5 \text{ m}^2 \cdot \text{K/W}$ according to NEN 1068 and NPR 2068	Application examples, calculated in accordance with NEN 1068 and NPR 2068, that comply with $R_c \geq 3,5 \text{ m}^2 \cdot \text{K/W}$.	

CHANGES COMPARED TO PREVIOUS VERSION

Not applicable: this is the first version of the KOMO® Quality Declaration.

TECHNICAL SPECIFICATION AND LABELS

Product Specifications

The products covered by the KOMO® Quality Declaration are:

Brand name	Code ¹⁾	Description
termPIR@BT	14PIR33	Sheets of rigid polyisocyanurate foam, laminated with bituminised glass fleece on both sides
termPIR@AL	14PIR55	Sheets of rigid polyisocyanurate foam, laminated with aluminium foil on both sides

¹⁾ See Annex 1 for an explanation of the coding system

Table 1: delivery details termPIR Roof insulation

Feature	Method of Determination	Value
Thickness	NEN-EN 13165 § 4.2.3	20 mm - 250 mm
Length x width ¹⁾	NEN-EN 13165 § 4.2.2	2400 mm x 1200 mm

¹⁾ dimensions above are standard. Different lengths are possible in consultation with the manufacturer (600 mm - 6,000 mm).

Packaging:

termPIR insulation sheets are supplied on stacks in parcels equipped with a foil. On the underside of the stacks, there are 3 EPS pads with a thickness of 80 mm. The parcels with insulation material must be stored carefully. If stored outdoors, the parcels and/or sheets must be protected against weather influences by means of, for example, a tarpaulin. The number of sheets per parcel is not always the same, depending on the thickness of the sheets.

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Product requirements

The appearance of the product must be flawless. This means no damage to lamination, no breakage, and no uneven edges. The other requirements for products are laid down in table 2.

Table 2: termPIR Product Requirements

Paragraph	Assessment Aspect	Application-related Requirement				Starting points for the Quality Declaration	
		Class, Level of Specified Requirement					
NEN-EN 13165 § 4.2.2	Length and width tolerance	-	< 1000	≥ 1000 < 2000	≥ 2000 < 4000	≥ 4000	-
			± 5 mm	± 7,5 mm	± 10 mm	not applicable	
NEN-EN 13165 § 4.2.4	Squareness	-	S _b ≤ 6 mm/m			-	
NEN-EN 13165 § 4.2.5	Flatness	-	≤ 0.75 m ²		> 0.75 m ²		-
			≤ 5 mm		≤ 10 mm		
NEN-EN 13165 § 4.2.6.	Dimensional stability (48 h, 70 °C and 90% RH)	-	Δε _l , Δε _b ≤ 2%			-	
BRL 1309 (§ 6.9)	Rebate dimensions type LAP - size A - size B	half sheet thickness 20 mm	A: max. + 2 mm and - 0 mm relative to middle of sheet B: max. + 0 mm and - 3 mm relative to manufacturer's declaration			-	
	Rebate dimensions type TAP	See figure below	-			See figure below	

Figure rebate LAP:

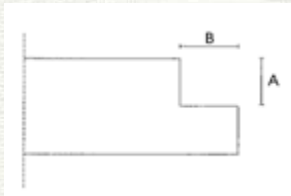
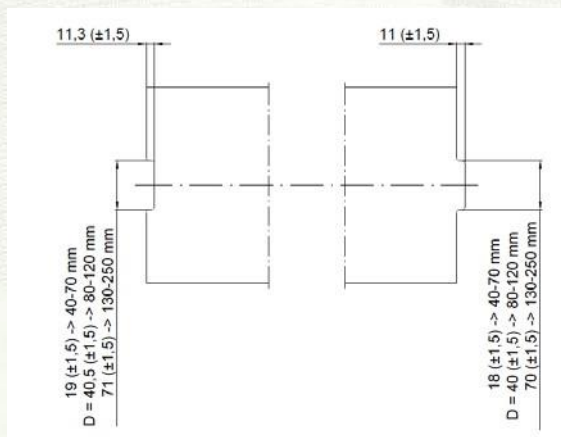


Figure rebate TAG



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System Specifications

General

In general, a roof consists of (from bottom to top):

1. substructure (including any slope layer)
2. vapour retarding layer (if applicable)
3. thermal insulation
4. roofing system.

Insulation systems

Table 3 lists the insulation systems possible with termPIR Roof insulation.

Table 3: specifications of insulation systems with termPIR roof insulation

Code ¹⁾	System description (from bottom to top)
IgPIR-L	<ul style="list-style-type: none"> * termPIR@BT or termPIR@AL loose on the ground * roofing system lying loose on termPIR insulation sheets * ballast layer of washed coarse gravel and/or concrete tiles in accordance with NEN 6707.
niPIR-N	<ul style="list-style-type: none"> * termPIR@BT or termPIR@AL limits mechanical fixation to the substructure (due to possible vapour retarding layer) * roofing system via termPIR insulation sheets mechanically fastened to the substructure.

¹⁾ See Annex 1 for an explanation of the coding system

Tables 4a and 4b give an overview of roofing systems in combination with termPIR roof insulation. In the case of roofing systems with plastic roofing, the most common systems are shown.

The suitability of the roofing systems listed in Tables 4a and 4b as well as roofing systems which are not listed must be demonstrated. This can be done, for example, by means of a valid Quality Declaration of the roofing material.

Table 4a: Possible systems in combination with bituminous roofing

Product type	Product code ¹⁾	Systems ¹⁾
termPIR@BT	14 PIR 33	IgPIR-L, niPIR-N
termPIR@AL	14 PIR 55	IgPIR-L, niPIR-N

Table 4b: Possible systems in combination with plastic roofing

Product type	Product code ¹⁾	Systems ¹⁾
termPIR@BT	14 PIR 33	IgPIR-L, niPIR-N
termPIR@AL	14 PIR 55	IgPIR-L, niPIR-N

¹⁾ See Annex 1 for an explanation of the coding system

²⁾ application of a possible separation layer in consultation with the supplier of the plastic roofing material

Substructure

Standard NEN-EN 1990 including the national annex contains regulations with regard to the strength and stiffness of the substructure in connection with its resistance to characteristic loads.

Substructures of profiled steel sheet must be calculated in accordance with NEN-EN 1993-1-3.

In the chapter "Processing" the requirements for the various substructures are further specified.

Fasteners

In the case of mechanically fastened insulation and roofing systems, the following requirements apply to fasteners and pressure distribution boards:

Durability: minimum 12 cycle Kesternich test in accordance with ISO 3231 lit 17.

Additionally, when fixing insulation sheets in the niPIR-N system, profiled pressure distribution boards with a thickness of at least 0.75 mm and at least Ø 70 mm or square 70 mm must be applied. In the case of niPIR-N systems, pressure distribution boards with a diameter of Ø 45 mm can also be used to fasten the insulation sheets.

Vapour retarding layer

The material used as a vapour retarding layer must be without perforations, damage etc. and must be connected flow-tight where details (e.g. penetrations, raised edges) are located.

The overlaps of the vapour retarding layer must be bonded. The overlaps of the vapour retarding layer must be bonded in accordance with the applicable guidelines.

Existing roofing as a vapour retarding layer

The substrate must have been checked for suitability and condition.

In the case of (tar-containing) ballasted roofings, gravel must be completely removed.

The thermal insulation and/or substructure present under the existing roof covering must be in good condition (dry, firm in composition and suitable for the selected fastening method).

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Slope

After completion of the roofing system, a slope must be present in such a way that an unobstructed flow of water to the rainwater drains is guaranteed even in the event of deflection of the structure.

With an effective slope of 10 mm / m1, this requirement is usually met.

Application on various substrates

Table 5 gives an overview of the application of termPIR insulation products on various common substrates.

Table 5: insulation systems on various substrates

Substrate	termPIR insulation systems	
wooden parts ¹⁾²⁾	IgPIR-L	niPIR-N
concrete and stony slopes ¹⁾	IgPIR-L	niPIR-N
aerated concrete ¹⁾²⁾	IgPIR-L	niPIR-N
organic fibreboards ¹⁾²⁾	IgPIR-L	niPIR-N
plywood ¹⁾²⁾	IgPIR-L	niPIR-N
profiled steel sheet ¹⁾	-	niPIR-N
adhesive bituminous vapour retarding layer	IgPIR-L	niPIR-N
mechanically fixed bituminous vapour retarding layer	IgPIR-L	niPIR-N
loose bituminous vapour retarding layer	IgPIR-L	niPIR-N
vapour retarding PE film	IgPIR-L	niPIR-N
Existing bituminous roofing material		
loose ballasted covering	IgPIR-L	niPIR-N
bonded or mechanically fastened mineralised topcoat	IgPIR-L	niPIR-N
bonded or mechanically fastened <u>non mineralised</u> APP modified top layer	IgPIR-L	niPIR-N
loose ballasted mastic covering ²⁾	IgPIR-L	-

¹⁾ a vapour retarding layer may be necessary, see chapter "Application vapour retarding layer / sealing layer";

²⁾ the application of a ballast layer requires an airtight substructure by, for example, applying a fixed vapour retarding layer.

Other materials

In addition to the above-mentioned products, the specifications of the insulation systems specify a certain number of other materials.

The properties of these auxiliary materials or accessories are not checked and therefore are not part of the certification part of this Quality Declaration.

Labels

The product or its packaging is marked with the KOMO® label. The label looks as follows:



Other indications:

- brand name or other identification label
- name and address of the manufacturer or their representative
- production year
- production code for traceability purposes
- nominal thickness (see table 1)
- length and width (see table 1)
- number of units and surface in packaging (if applicable)
- type of lamination/coating
- certificate number CTG-725

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PROCESSING

General

For the processing of the thermal insulation material, reference is made to the "Trade Guideline on Closed Roofing Systems", unless the processing is described otherwise.

Safety

As safety requirements, at least what is described in the A-Sheet "Application of bituminous and plastic roofs" applies.

Fire safety

The SBR publication includes fire safety requirements. Furthermore, the requirements can be declared applicable in accordance with NEN 6050.

Health

With regard to health, the provisions of the Health and Safety Act and the A-Sheet "application of bituminous and plastic roofs" apply.

Preparatory work

General

Coordinate all work in such a way that no damage is caused to the underlying structural components and spaces. Do not carry out more work per day or predictable dry period than can be finished (possibly temporarily) in a waterproof way during that period.

Requirements and preparatory work for the subsurface

Stony substructures

The strength and stiffness must meet the requirements laid down in NEN-EN 1990, NEN-EN 1991 and NEN-EN 1992. The substrate must be provided with a primer coat of bitumen solution (approx. 250 g/m²) if the insulation sheets or the vapour retarding layer are bonded with bitumen. Allow this primer coat to dry completely before carrying out any further work.

Any open seams between the sheets must be filled with a suitable agent. The height differences between adjacent sheet edges must not exceed 3 mm. Any fasteners must be counter-sunk.

Plywood, chipboard

Plywood should be of quality Exterior I.

All sheet seams must be supported or connected by means of a spring and groove joint.

Height differences between adjacent sheet edges must not exceed 3 mm. Any fasteners must be counter-sunk.

Tongue and groove wooden parts

Waney edges must be put downwards. The parts must be connected to each other with tongue and groove and fixed to each roof beam or purlin with counter-sunk fasteners. Connections must take account of hygric changes in the shape of the timber.

Profiled steel roofing boards

The minimum thickness of the steel roofing sheets must be 0.75 mm with a maximum tolerance of 0.05 mm. The strength and stiffness of the profiled steel roof sheets must meet the requirements stipulated in NEN-EN 1990, NEN-EN 1991 and NEN-EN 1992. Unless explicitly stated otherwise in the specifications, assembly must take place in accordance with the regulations in the publication "Profiled steel sheet in the building industry" by Dumebo.

Metal residues from sawing and/or drilling, as well as residues of nails, pins, etc., must be removed from the roof surface. Deformations of the steel profile and/or damage to the anti-corrosion layer must be repaired before applying the insulation layer. All work on the subsurface, such as erecting uprights, roof penetrations, fraying, etc., must be completed before commencing the positioning of the insulation boards and the roof covering. The insulation sheets must be fitted and fastened to the substrate in such a way that no significant shifts can occur horizontally and, vertically, movement differences between adjacent sheet edges are excluded.

Thermal renovation of existing roofs

Check the released substrate for slope, flatness, flawlessness and suitability, repair where necessary and correct incorrect slope.

Thoroughly clean the existing roof covering with steel brooms and dry where necessary. Dispose of all dirt and grime.

Repair defects in the existing roof covering, such as cracks, bubbles, folds, etc. as follows:

- cover cracks with loose strips of bituminised glass fleece, 200 mm wide, and repair with strips of bituminous polyester mat MEC of ample size and torch completely
- blow, peel and smooth using a burner and a putty knife
- bend, cut away anything that is higher than 10 mm and level.

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If the existing covering is to function as a vapour barrier, it must be sufficiently vapour tight.

Check the height of eaves and other raised roof edges as well as the connection against rising edges. Measured in relation to the new aquifer level, the height of the roof edge is at least 120 mm. If non-shape resistant ballast is used and the height of the eaves is less than 120 mm above the top of the ballast layer, shape resistant ballast must be applied along the eaves according to SBR 465.00.

or:

- 0.6 m, if the thrust pressure at the reference altitude is $\leq 1000 \text{ N/m}^2$
- 1.2 m, if the thrust pressure at the reference altitude is $> 1000 \text{ N/m}^2$

In this case, the height of the roof edge must be at least equal to or higher than the top of the dimensionally stable ballast. The height of all other raised edges must be related to this.

Application of vapour retarding layer/closing layer

Depending on the nature of the substructure and the requirements for water vapour diffusion resistance, the following materials may be used as vapour retarding layer:

- bituminous glass fleece (MEC)
- SBS-modified bituminous aluminium foil
- bituminous aluminium foil
- bituminous polyester mat (MEC)
- modified bituminous polyester mat (MEC)
- self-adhesive bituminous materials
- PE film at least 0.2 mm (loose and ballasted, directly mechanically fastened and indirectly mechanically fastened under a mechanically fastened roof covering only)
- existing roofing systems (if suitable).

Loose strips

As a general rule, in the case of an adhesive vapour retarding layer, all roof panel seams with a centre-to-centre distance of more than 1 m must be provided with a loose area with a width of 1/10 of the length of the roof panel in question and a practical maximum of 330 mm.

The loose zone can be obtained by using bituminous glass fleece.

These loose strips must always be centred on the seam, while care must also be taken to ensure that no adhesive can get under the loose strips when applying the roofing layers.

Application of roofing systems

Loose fitting ballasted and indirect mechanically fastened roofing systems can be applied to termPIR roof insulation.

They must be installed according to the current state of the art or according to the requirements of a KOMO® Quality Declaration. The issued quality declarations for roof coverings are included in the overview of quality declarations issued by Stichting Bouwkwiteit (Foundation for Building Quality).

Application of termPIR Roof insulation

General implementation rules

- store and process the insulation boards dry and free from the substrate, while also taking measures to prevent moisture from being trapped during and after application. Wet insulation must always be removed. In case of long-term storage, measures must be taken against weather influences such as sun irradiation and moisture containment
- apply the insulation boards with closed seams in so-called stretcher bond. Continuous seams on profiled steel roofs at right angles to the flute direction. Connect the boards properly in the grooves; only use fitting pieces smaller than 300 mm in the central area of the roof surface
- on a profiled steel substructure, the relationship between the thickness of the insulation and the non-load-bearing part shown in Figure 1 must not be exceeded
- apply insulation boards only on a dry surface; remove loose dirt.

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System-specific implementation rules

System: IgPIR-L

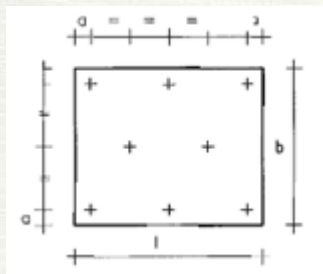
- lay the insulation boards loose on the subsurface
- apply a loose ballasted roofing system; ballast layer in accordance with NEN 6707 and NPR 6708.

Remark:

The ballast layer should be applied immediately. If this is not feasible from a technical point of view, temporary measures must be taken so as to ensure resistance to wind loads and prevent excessive thermal loads.

System: niPIR-N

- lay termPIR Roof insulation in a stretcher bond on the subsurface; fasten the sheets or panel pieces with at least 1 fastener per sheet (fasteners preventing the insulation sheets from being stirred up by the wind or shifting during construction)
* sheet dimensions 2400 mm x 1200 mm, 5 fasteners per sheet
- mechanically fasten the roofing system in accordance with NEN 6707 and NPR 6708.



Details

All details must be carried out in accordance with the "Trade Guideline on Closed Roofing Systems".

PERFORMANCE

Flat or pitched roofs on a substructure in combination with closed roofing systems with the thermal insulation applied according to the KOMO® Quality Declaration comply with the following relevant requirements of the Buildings Decree.

General strength of the building structure - Wind load

System IgPIR-L

The resistance to being stirred up by the wind and damage under wind load of a loose ballasted roofing construction is determined by a calculation in accordance with NEN 6707.

System niPIR-N

In the case of an indirect mechanically fastened system, the insulation does not determine the permissible building height. For the determination of the maximum permissible height, reference is made to the calculation value of the roofing system to be used.

Limitation of the occurrence of fire hazards

If a flat roof is provided with a ballast layer of gravel or concrete tiles, it may be assumed that the roof is not flammable.

Furthermore, roofs constructed with the other termPIR insulation systems mentioned in the KOMO® Quality Declaration are non-flammable in accordance with chapter 3 of NEN 6063, provided that it is demonstrated that the roofing system used in combination with PIR (rigid polyisocyanurate) and the relevant substructure at the applicable pitch complies with NEN 6063.

Limitation of the spread of fire

The resistance to fire penetration and fire spread has not been examined because it is determined by other construction components.

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Protection against external noise

The characteristic noise protection has not been examined.

Moisture protection

The watertightness has not been examined; the insulation material does not determine the waterproofness.

The internal surface temperature factor has not been examined; the KOMO® Quality Declaration therefore does not make any statement about the internal moisture barrier.

Thermal insulation

The following application examples have been calculated on the basis of the starting points for this Quality Declaration:

Product type	λ_D
termPIR@BT	
- 20 mm – 79 mm	0.027 W/(m.K)
- 80 mm – 190 mm	0.026 W/(m.K)
- 120 mm – 250 mm	0.025 W/(m.K)
termPIR@AL	0.022 W/(m.K)

The following tables indicate the minimum thicknesses (in steps of 10 mm) required to meet the requirement set out in Assessment Directive "BRL" 1309 (min. 3.5 .m²K/W)

Structure design 1:

- Load-bearing structure concrete, thickness 200 mm, $\lambda_{calc} = 2.000$ W/m.K
 - Roofing, $R_m = 0.00$ m².K/W.
 - termPIR, bonded or ballasted loose.
 - Roofing + possible ballast layer, $R_m = 0.06$ m².K/W.
- Contact resistances $R_{si} = 0.10$ m²K/W, $R_{se} = 0.04$ m².K/W.
 Correction factor $\alpha = 0.05$.

Construction 1 - Concrete loose ballasted		
Thickness	termPIR@BT	termPIR@AL
	R_c in m²K/W	R_c in m²K/W
80 mm		3.61
90 mm		4.04
100 mm	3.81	4.48
110 mm	4.17	4.91
120 mm	4.72	5.34
130 mm	5.10	5.77
140 mm	5.48	6.20
150 mm	5.86	6.64
160 mm	6.24	7.07
170 mm	6.62	7.51
180 mm	7.00	7.94
190 mm	7.38	8.37
200 mm	7.76	8.80

Structure design 2:

- Load-bearing structure profiled steel, thickness 0.75 mm, $\lambda_{calc} = 50.000$ W/m.K
 - Roofing, $R_m = 0.00$ m².K/W.
 - termPIR, directly or indirectly mechanically fixed
 with 4 stainless steel fasteners per m², \varnothing fastener = 4.8 mm, $\lambda_{calc} = 15.000$ W/(m.K)
 - Roofing, $R_m = 0.06$ m².K/W.
- Contact resistances $R_{si} = 0.10$ m²K/W, $R_{se} = 0.04$ m².K/W,
 Correction factor $\alpha = 0.05$.

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Construction 2 - Steel mechanically fixed		
Thickness	termPIR@BT	termPIR@AL
	R _c in m ² K/W	R _c in m ² K/W
90 mm		3.76
100 mm	3.57	4.18
110 mm	3.92	4.59
120 mm	4.43	5.00
130 mm	5.10	5.77
140 mm	5.48	6.20
150 mm	5.86	6.64
160 mm	6.24	7.07
170 mm	6.62	7.51
180 mm	7.00	7.94
190 mm	7.38	8.37
200 mm	7.76	8.80

The above R_c values are based on the Building Decree 2012 requirement of R_c = 3.50 m²K/W and calculated in accordance with NEN1068:2001. In the meantime, the requirement for roofs in the Buildings Decree has been increased to 6.00 m²K/W and the calculation method has been changed in the 2012 version of NEN1068. This has not yet been incorporated in the current version of BRL 1309. In anticipation, the thicknesses required for the new requirement and the current calculation method are given below.

Structure design 1:

- Load-bearing structure concrete, thickness 200 mm, $\lambda_{calc} = 2.000$ W/m.K
- Roofing, R_m = 0.00 m².K/W.
- **termPIR Roof insulation: thickness/type see table**, loose ballasted.
- Roofing + ballast layer, R_m = 0.06 m².K/W.
- Contact resistances R_{si} = 0.10 m²K/W, R_{se} = 0.04 m².K/W.
- $\Delta U_w = 0.05$.
- $\Delta U_a = 0.00$

Construction 1 - Concrete loose ballasted		
Thickness	termPIR@BT	termPIR@AL
	R _c in m ² K/W	R _c in m ² K/W
140 mm		6.21
150 mm		6.64
160 mm	6.24	7.07
170 mm	6.62	7.51
180 mm	7.00	7.94
190 mm	7.38	8.37
200 mm	7.76	8.80

Structure design 2:

- Load-bearing structure profiled steel, thickness 0.75 mm, $\lambda_{calc} = 50.000$ W/m.K
- Vapour retarding layer, R_m = 0.00 m².K/W.
- **termPIR Roof insulation: thickness/type see table**, directly or indirectly mechanically fastened with 4 stainless steel fasteners per m², \varnothing fastener = 4.8 mm, $\lambda_{calc} = 15.000$ W/mK
- Roofing, R_m = 0.06 m².K/W
- Contact resistances R_{si} = 0.10 m²K/W, R_{se} = 0.04 m².K/W.
- $\Delta U_w = 0.05$.
- $\Delta U_a = 0.00$
- ΔU_{fa} = in accordance with calculation and starting points of the example construction.

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Construction 2 - Steel mechanically fixed		
Thickness	termPIR@BT	termPIR@AL
	R _c in m ² K/W	R _c in m ² K/W
140 mm		6.10
150 mm		6.54
160 mm	6.14	6.97
170 mm	6.52	7.40
180 mm	6.90	7.83
190 mm	7.28	8.27
200 mm	7.66	8.70

Restriction of air permeability

The insulation material does not determine the limitation of the air permeability.

Energy performance

termPIR roof insulation boards make an important contribution to the energy efficiency of a building.

Hygrothermia

For the purpose of assessing the roof for hygrothermia, a classification of 4 climate classes with increasing vapour pressure has been made on the basis of SBR publication 61 for the indoor climate (see table 6). If for climate classes I to III a vapour retarding layer under the thermal insulation is used with a μ_d -value \geq of 10 m and for climate class IV a μ_d -value \geq of 75 m, calculation is not necessary and the roof can be considered to fulfil the hygrothermal performance requirement.

Table 6: indoor climate classes for the Netherlands

Climate class (indoor climate class)	Use of space	Vapour pressure in Pa	Temperature and relative humidity
I	Warehouses Garages Sheds	1030 < P ₁ ≤ 1080	18°C - 50 % up to 18°C - 52 %
II	Residential buildings Offices Shops	1080 < P ₁ ≤ 1320	20°C - 46 % up to 20°C - 56 %
III	Schools Nursing homes Nursing homes for the elderly Recreational buildings	1320 < P ₁ ≤ 1430	22°C - 50 % up to 22°C - 54 %
IV	Laundries Swimming pools Printing houses	P ₁ > 1430	24°C - 48 % and higher

If the above requirements are not met, a calculation must be carried out by an expert. If there is (building) moisture in the structure, a vapour retarding layer must be applied under the thermal insulation.

Linear dimensional change under the influence of temperature

When using thermal insulation, there are no movements that adversely affect the functioning of the roof.

Tendency to warp

If the processing guidelines of the KOMO® Quality Declaration are followed, no deformations will occur in the thermal insulation which will lead to stresses that adversely affect the functioning of the roof.

Influence of movements of the thermal insulation on the durability of the roofing system

If the requirements of the KOMO® Quality Declaration are followed, temperature fluctuations will not cause deformations of the insulation material to such an extent that defects in the roofing system or its adhesion will occur.

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Maximum applicable roof pitch

The max. applicable roof pitch is shown in Table 7:

Table 7: maximum roof pitch in degrees

Code	Roof slope
IgPIR-L	3° (approx. 5 %)
niPIR-N ₁)	-

¹⁾ is not determined by the insulation material.

Variations in dimensions under the influence of moisture

If the requirements of this Quality Declaration are followed, variations in the dimensions of the thermal insulation under the influence of moisture do not give rise to stresses that adversely affect the functioning of the roof.

Changes in mechanical properties under the influence of water after immersion

This performance requirement does not apply because wet insulation must be removed (see processing chapter).

Behaviour under the influence of uniformly distributed load / deformation at specified pressure and temperature

termPIR roof insulation boards fall into class C in terms of resistance to mechanical stress:

Class C roofs or parts of roofs accessible to pedestrians and suitable for frequent maintenance of the roof and the installations on the roof (up to gradient angles of 5 %); of which the roofing system is also protected by e.g. tiles.

Insulation panels must always be finished in a load-bearing fashion.

Resistance to concentrated loads in the area of the profiled sheet flutes of profiled sheet

The relationship between the upper valley width (b) of profiled steel roof sheets and the thickness of the insulation applies (for the longitudinal direction of the roof insulation sheet):

- maximum span $b \leq 3d$

HINTS FOR THE USER

1. Upon delivery of:
 - 1.1. the certified product, verify whether:
 - the delivery matches what was agreed
 - the label and the method of labelling are correct
 - the product does not exhibit any visible defects as a result of transport and so forth
 - 1.2. the other products listed in the "technical specification":
 - check whether they comply with the specifications
 - in so far as these products have been delivered under a Quality Declaration issued by a certification body recognised by the Accreditation Council, check whether the label and the manner of labelling are correct and that the products do not exhibit any visible defects as a result of transport and so forth.
2. Within the context of this Quality Declaration, the performance accuracy of the essential characteristics shall not be verified.
3. The statements in this Quality Declaration must not be used as a substitute for the CE marking and/or the accompanying mandatory Declaration of Performance.
4. Check whether the KOMO® Quality Declaration is still valid; consult the applicable overview of Quality Declarations or contact SGS INTRON Certificatie B.V.
5. Observe the design details included in the KOMO® Quality Declaration.
6. Storage, transport, and processing must be carried out in accordance with the regulations included in the KOMO® Quality Declaration.
7. Storage and transport must be in accordance with the processing instructions of the certificate holder.
8. Observe the application conditions, processing, and maintenance instructions.
9. In case of rejection on the basis of the provisions under 1.1, please contact: **Gór-Stal sp. z o.o.** and, if necessary: SGS INTRON Certificatie B.V.

LIST OF MENTIONED DOCUMENTS

In so far as no dates are given, the correct dates of publication of the said documents are provided in the Assessment Directive 1309.

1. Assessment Directive 1309 - Thermal insulation for flat or pitched roofs on a substructure in combination with a closed roofing system
2. SGS INTRON Certificatie regulations for certification and attestation
4. NEN 2444 - Determination of the thermal resistance and/or thermal conductivity of construction and insulation materials
5. NEN 2778 - Moisture control in buildings; Methods of Determination
6. NEN 6061 - Determination of resistance to the occurrence of fire in furnace rooms
7. NEN 6063 - Determination of the fire hazard of roofs
8. NEN 6707 - Fastenings of roof coverings - Requirements and assessment methods
9. NPR 6708 - Fastening of roof coverings - Guidelines
10. NEN 1068 - Thermal insulation of buildings; Calculation methods
11. SBR brochure 239: Roof insulation on profiled steel sheet - guidelines for calculating mechanical fixing
13. BRL 4702; Execution of roofing structures with closed roofing systems
14. ISO 3231 lit 17 – Determination of humid atmospheres containing sulphur dioxide (Kesternich test)
15. State Gazette of the Kingdom of the Netherlands 657 - Decree of 25 October 1995 laying down rules relating to Ozone Depleting Substances (Decree on Ozone Depleting Substances)
16. SBR brochure 293: The choice of a bituminous roofing system
17. Closed Roofing Systems Directive - Vebidak edition
18. A-Sheet flat roofs - The application of plastic and bituminous roofs - publication Stichting Arbo (Health and Safety Foundation) Amsterdam
19. Building Decree 2011 State Gaz. 2011, 416, 676
20. NEN-EN 1990 – Foundations of the structural design
21. NEN-EN 1991-1-1 - Densities, own weight, imposed load
22. NEN-EN 1993-1-3 – Additional rules for cold-formed thin-walled profiles and sheets.

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 Annex 1

CODING SYSTEMS

Explanation of insulation coding system

The following codes are used to indicate the fixing of insulation materials to the substrate:

- lg = loose and ballasted
- fw = fully bonded with bitumen 110/30
- ni = mechanically fastened under a mechanically fastened roof covering, indirectly via the first layer of roofing material (N-codes roof coverings)
- pb = partially bonded with hot bitumen
- pp = partially bonded with polyurethane adhesive.

For the coding of the insulation material the coding system from BRL 1309 is used

For the coding of the insulation material in the insulation system, the name used in CEN is used:

PIR = rigid polyisocyanurate foam.

The code then contains a letter for attaching the roofing system to the insulation:

- L = loose and ballasted
- P = partially bonded
- F = fully bonded
- N = mechanically fastened.

Product coding

1	4	PUR	44
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Shape of the insulation material (one digit)

- 1 = sheets, bottom and top parallel
- 2 = sheets with a one-sided slope
- 3 = sheets with a two-sided slope
- 4 = swaths, top and bottom parallel
- 5 = swaths with a one-sided slope
- 6 = granules or fibres

Application of the insulation material (one digit)

- 1 = compressible
- 2 = non-pressure-loadable
- 3 = pressure-loadable
- 4 = pressure-loadable and delamination-loadable

Type of insulating material (for combined insulating materials top layer front)

- PIR = rigid polyisocyanurate
- MWG = glass wool

Finishing (two digits, finishing top side first)

- 0 = none
- 1 = naked glass fleece
- 2 = mineral-coated glass fleece
- 3 = bituminous glass fleece/not suitable for torching method
- 4 = bituminous glass fleece/suitable for torching method
- 5 = aluminium foil
- 6 = kraft paper
- 7 = bituminous polyester mat/suitable for torching method
- 8 = bitumen impregnated paper
- 9 = bitumen