



**2018 EDITION**

# PRODUCT CATALOG



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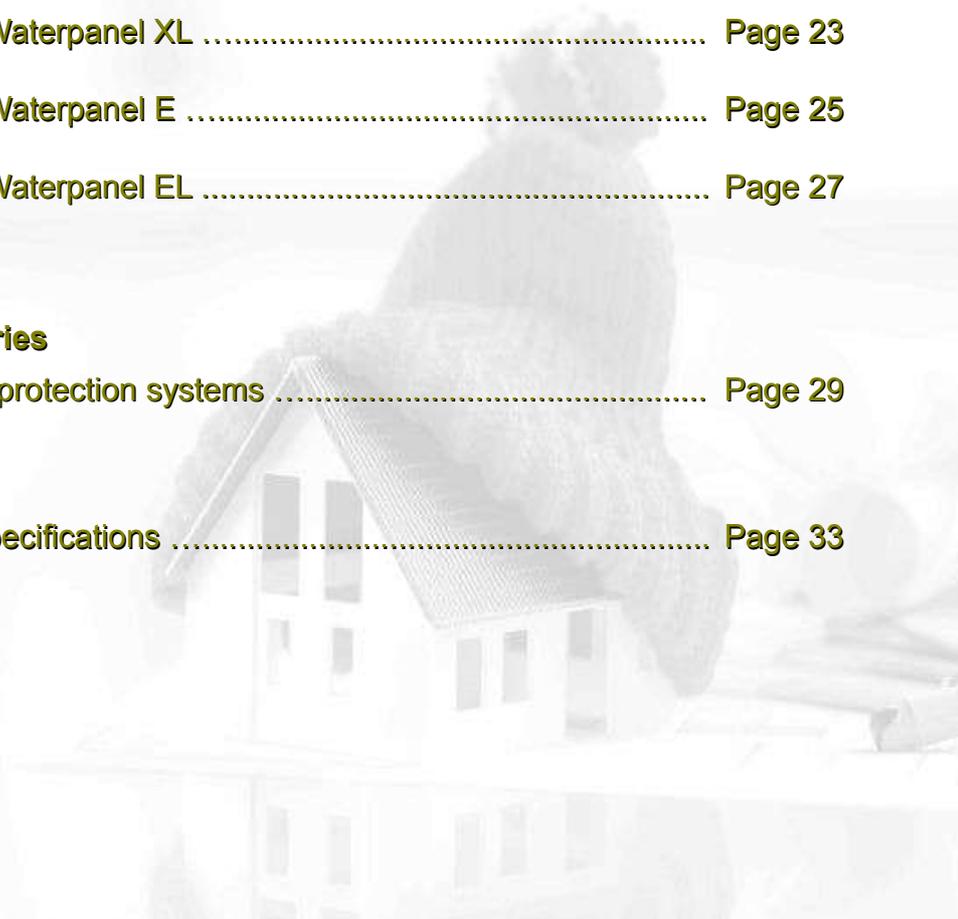
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# INSULATION SYSTEMS without screeds



ELEKTRA Kardo s.c. was established back in 1993. Initially, the company was founded as building firm, dealing in the designing and building of housing. In 1995, ELEKTRA Kardo s.c. formed a partnership with a Polish producer of underfloor electric heating mats and heating cables - ELEKTRA. Over our 25 years of business we have acquired new experiences and constantly increased our technical knowledge, with our specialism becoming electric heating.



Since 2007, we have started the production of lightweight building components and modern insulation systems, as well as radiant heating and cooling systems. We also manufacture the thermostats and accessories for the anti-frost systems.

ELEKTRA Kardo s.c. headquarters is the site of the sales team and the customer store. The second site is the production plant which has two main parts - the production line and the storage area. The production line is well equipped for the efficient delivery and fulfillment of our orders.

Through our own numerous research studies and experiments, we have been able to enrich our product range. Most of our products are now widely recognized throughout many EU and non-EU countries. We hope you will find products in our range which will enable you to carry out your renovation plans or to enable your customers to fulfill their heating requirements. We seek and invite partnerships among retailers, wholesalers, distributors, construction companies and designers.



# KARDO THERMOPANEL

\* \* \* floor finish without expansion joints \* \* \*

## PRODUCT SPECIFICATION

KARDO Thermopanel is an insulation board with an XPS core, it is reinforced with a glass fibre mesh and covered with a cement polymer.

### Application:

The KARDO Thermopanel system has been designed to be used as a thermal insulation material. Floor coverings, like ceramic tiles, carpet, etc. can be put directly on top of KARDO Thermopanel. The system can be mounted on a levelled construction base with no necessity of using a concrete screed. In this way we get a durable surface with thermal insulation. With KARDO Thermopanel, no expansion joints are required on large surfaces (e.g. on terraces). This insulation board is recommended for heating mat or heating cable underfloor heating systems.



### Product Features:

KARDO Thermopanel is exceptionally durable and easy to cut, it can be installed outdoors and in damp areas. It has insulation properties and the ability to provide mechanical durability. Moreover, it can be fixed to tiles or any other kind of floors.

### Approvals:

Declaration of Performance for XPS insulation boards. Polish Law regarding building materials. Dated from 16th April 2004. Declaration Reference: Dz.U. Nr 92 poz 881, art.10.

### Types:

Product name thickness	Dimensions length x width	Weight	Collective Packaging	Properties
<b>KARDO Thermopanel</b> 10 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	2.0 kg (+/- 10 %)	12 pcs. / carton	Coefficient of thermal conductivity: < 0.034 W/mK Water absorption after 24h: < 0.1 % Apparent density: > 34 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 300 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow-burning) Maximum temperature of use: +75°C, frostproof
<b>KARDO Thermopanel</b> 22 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	2.2 kg (+/- 10 %)	6 pcs. / carton	
	2600 x 600 (mm) (+/- 10 mm)	4.3 kg (+/- 10 %)		
<b>KARDO Thermopanel</b> 32 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	2.4 kg (+/- 10 %)	8 pcs. / carton	
<b>KARDO Thermopanel</b> 42 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	2.6 kg (+/- 10 %)	6 pcs. / carton	

Our production process allows for the bespoke manufacturing of alternative dimensions and thicknesses on request.

# KARDO THERMOPANEL

\* \* \* floor finish without expansion joints \* \* \*

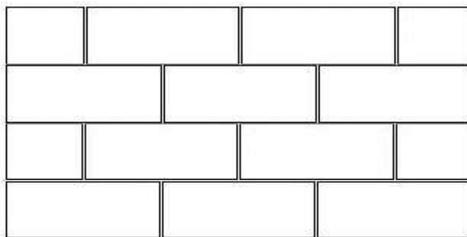
## ASSEMBLY

### **Preparation of the base:**

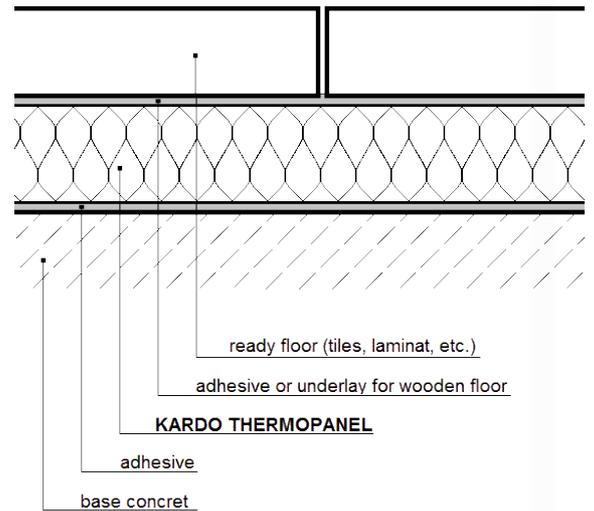
The building base must be load-bearing, stable, levelled and dust and grease free. Old layers of oil and paints must be removed.

### **Installation of KARDO Thermopanel on a concrete base**

- Insulation boards should be held down to the floor base with flexible adhesive on a levelled construction base (concrete or reinforced concrete) all the joints between the boards must be staggered and sealed by made using a minimum 10 cm width mesh joint tape. The mesh should be held down using flexible adhesive.

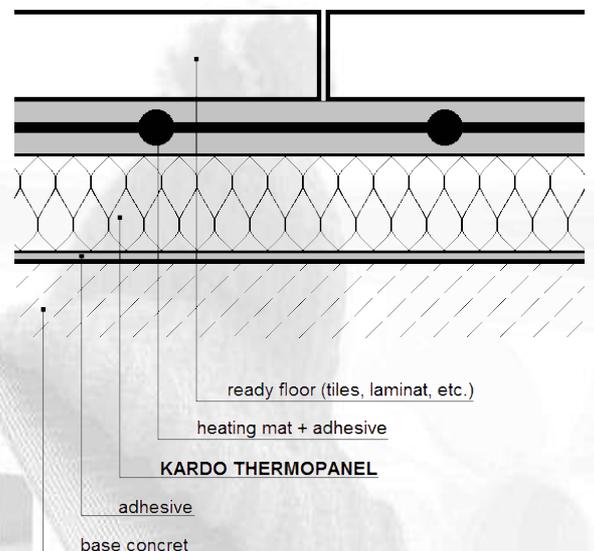


- Floor finishes like tiles, carpet, vinyl, laminate flooring or other floor materials can then be laid directly on the top of the boards.



### **Installation of electric heating mats or heating cables on KARDO Thermopanel**

- The entire assembly process should be carried out as described, laying the boards as in the case of concrete substrate. After combining plates with fiberglass tape we can proceed with the installation of a cable or heating mat.
- Apply highly elastic adhesive to the surface and place cable / heating mat pressing against the ground. Excess glue we even out and leave to dry.
- After approx. 24 hours, you can start to stick ceramic claddings or other floors.

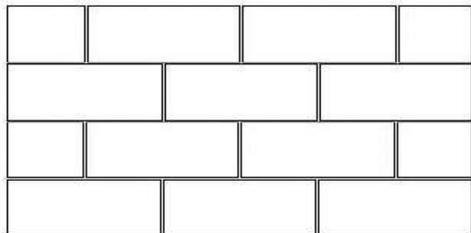


# KARDO THERMOPANEL

\* \* \* floor finish without expansion joints \* \* \*

## Installation of KARDO Thermopanel on a wood-like substrate (e.g. OSB)

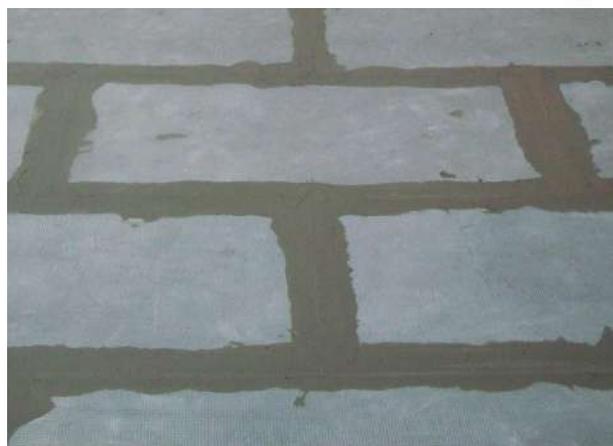
- We put boards on an even wood-like construction substrate insulation KARDO Thermopanel in the so-called "Brick" – moving. They are half their length in relation to each other (Figure below).



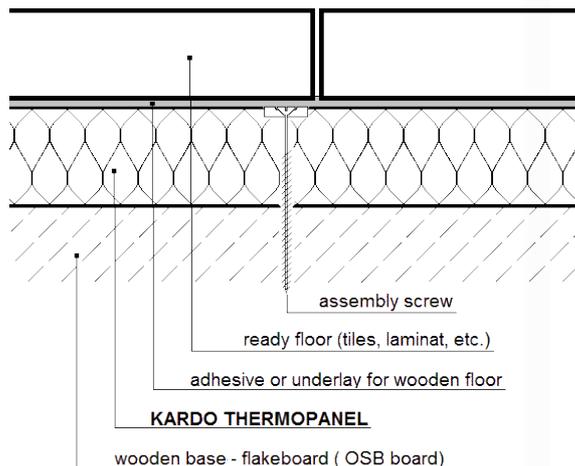
- We fix KARDO Thermopanel boards to the ground with the aid of steel screws with washers in the amount of 5 pieces per 1 plate.



- Fill larger gaps between boards with polyurethane foam, and cover the joints with stripes fiberglass tape with a minimum width of 10 cm, melting them into a highly elastic adhesive - as in the picture next to.



- On such prepared substrate stick we can use terracotta tiles, stoneware, etc. or lay the floor panels in accordance with assembly technology recommended by Producer's.

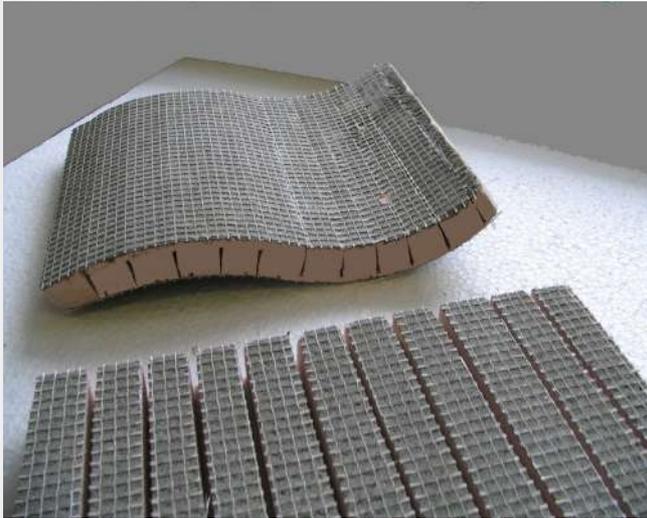


# KARDO THERMOPANEL

\* \* \* floor finish without expansion joints \* \* \*

## BATH CONSTRUCTION

KARDO Thermopanel is also fast and comfortable way of housing any type of arched building structures. It is also the perfect design to insulate bathtubs and shower trays. Thanks to a stable construction and strategically prepared cuts of KARDO Thermopanel, it can be freely shaped. This provides a great foundation for attaching tiles or applying plaster.



# KARDO THERMOPIAN

\* \* \* boxing in without cold rolled steel C Sections \* \* \*

## PRODUCT SPECIFICATION

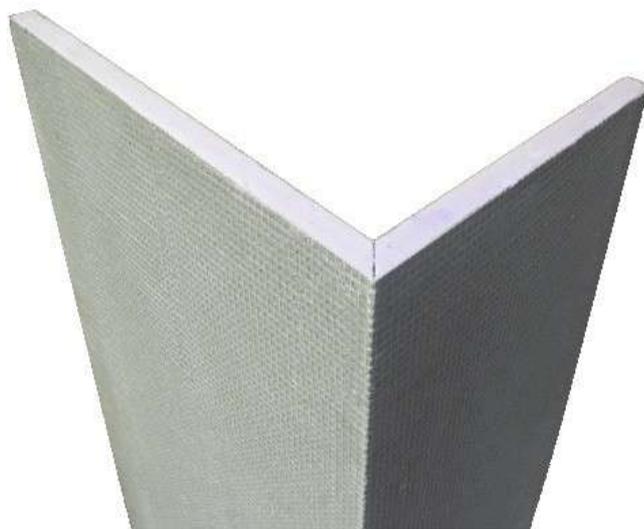
KARDO Thermopian is an Angle Board with an XPS core, it is reinforced with glass fibre mesh and covered with a cement polymer.

### Application:

KARDO Thermopian is designed for quick and easy boxing-in of pipe work such as: sewage systems, sprinkler systems, hydrants, air conditioning and ventilating pipe systems. It can also be used for interior styling.

### Product Features:

KARDO Thermopian can be installed outdoors and in damp rooms, it is exceptionally durable, easy to cut and has insulation properties. It can be fixed to battens and plastered, painted or tiled to blend with the surroundings.



### Approvals:

Declaration of Performance for XPS insulation boards. Polish Law regarding building materials. Dated from 16th April 2004. Declaration Reference: Dz.U. Nr 92 poz 881, art.10.

### Types:

Product Name thickness (mm)	Dimensions height x width x length (mm)	Weight	Properties
<b>KARDO Thermopian 22</b> (+/- 2 mm)	200 x 400 x 2600 (+/- 10 mm)	3.80 kg (+/- 10 %)	Coefficient of thermal conductivity: < 0.034 W/mK Water absorption after 24 hrs: < 0.1 % Apparent Density (XPS): < 34 kg/m <sup>3</sup> Compressive strength at 10% deformation: >300 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow burning) Maximum temperature of use: +75°C, frost proof
<b>KARDO Thermopian 22</b> (+/- 2 mm)	300 x 300 x 2600 (+/- 10 mm)	3.80 kg (+/- 10 %)	
<b>KARDO Thermopian 22</b> (+/- 2 mm)	200 x 400 x 1250 (+/- 10 mm)	1.9 kg (+/- 10 %)	

Our production process allows for the bespoke manufacturing of alternative dimensions and thicknesses on request.

# KARDO THERMOPIAN

\* \* \* boxing in without cold rolled steel C Sections \* \* \*

## ASSEMBLY

### **Preparing the base:**

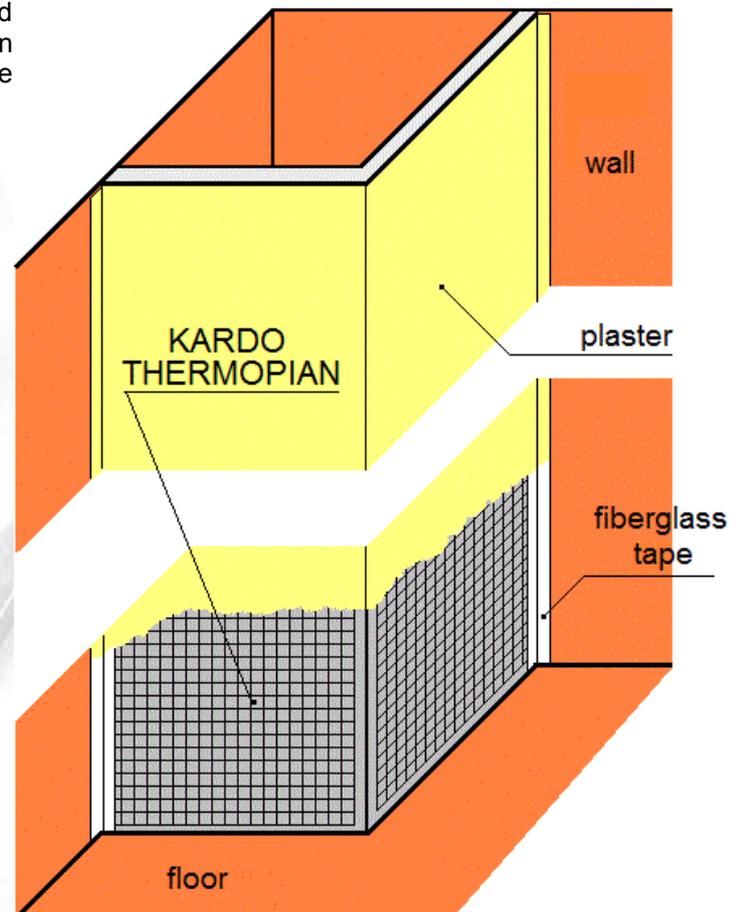
The building base must be load-bearing, stable, levelled, dust and grease free. Old layers of oil, paint, chalk and peeling plaster must be removed.

### **Assembly without using cold rolled steel C Sections**

- If necessary, cut the KARDO Thermopian to the desired length and width with a hand-held fine saw or a utility knife.
- Apply an appropriate layer of glue to the polystyrene foam ensuring all edges are covered. Apply the edges to the wall and press firmly. Hold until adhesive is dry, in accordance to the manufacturer's instructions.
- After drying, fill any gaps with foam and then remove the excess with a sharp knife.
- In places where the Thermopian meets the wall or ceiling, apply plaster or flexible fiberglass connection tape.
- If necessary, you can use a saw or an assembly knife to cut the inspection hole for any purpose (e.g. water meter, valve, etc.).



We recommend using glue for mounting the angle board by using polyurethane foam. In the case of having an even surface, whether it's a wall or ceiling, we recommend using mounting glue for the styrofoam.



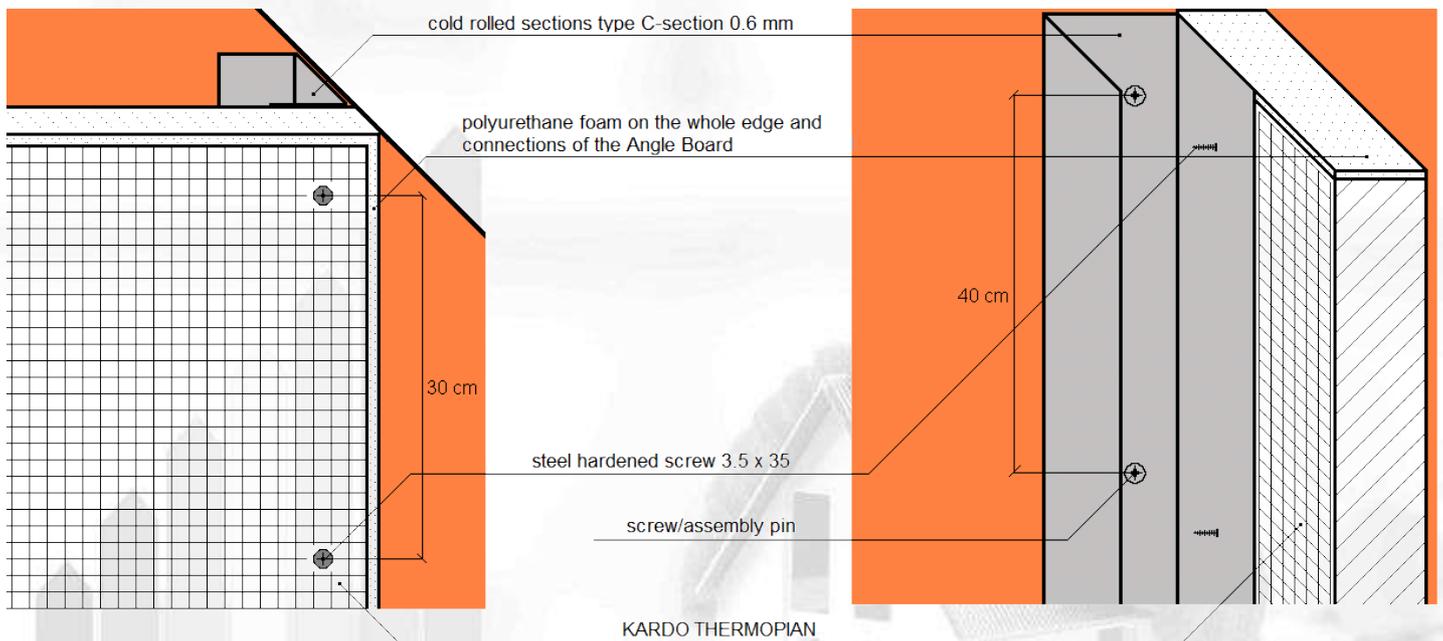
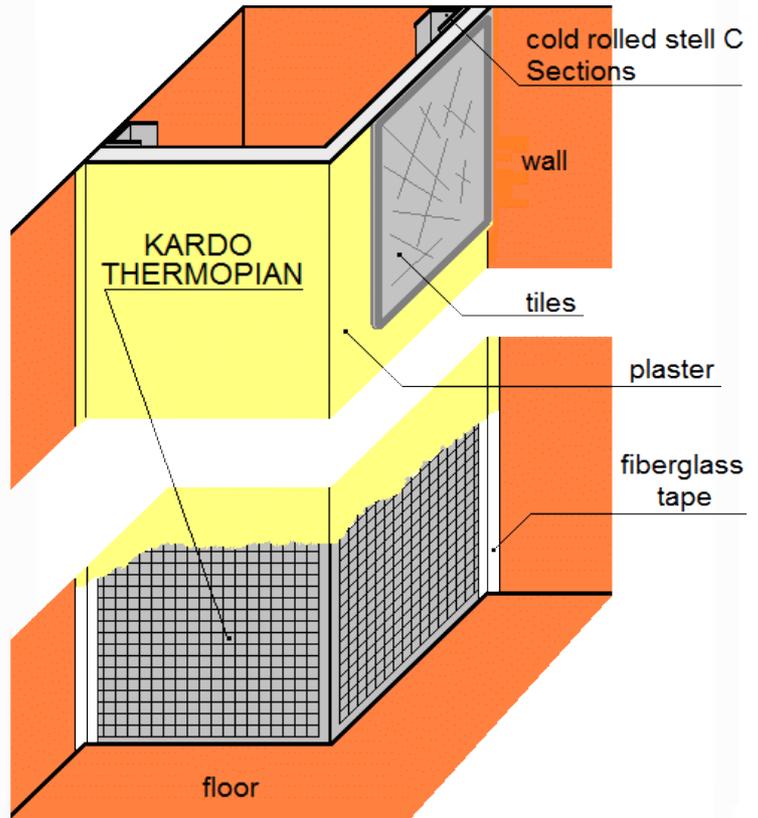
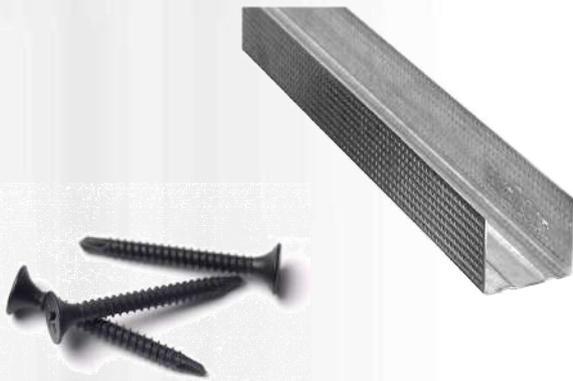
# KARDO THERMOPIAN

\*\*\* boxing in without cold rolled steel C Sections \*\*\*

## Install of KARDO Thermopian angle board in horizontal or vertical positions using cold rolled steel C Sections

- If the KARDO Thermopian is to be covered with ceramic tiles, or to be mounted horizontally, there must be attached to the wall with steel C Sections. The steel C Sections should be attached with self-drilling screws spaced every 30 cm - according to the diagram below.

**NOTE:** There is no need for steel C Sections if the angle board will be set vertically without ceramic tiles or other heavy items.



# KARDO THERMOPANEL S

\* \* \* for the anti-freeze of stairs and platforms \* \* \*

## PRODUCT SPECIFICATION

KARDO Thermopanel S is a system which consists of an Insulation Board and an Angle Board with an XPS core, it is reinforced with a glass fibre mesh and covered with a cement polymer with grooves for heating cable installation.



**KARDO Thermopanel Sk** - stair tread  
**KARDO Thermopanel Sp** - platform plate

### Application:

KARDO Thermopanel Sp is an Insulation Board and KARDO Thermopanel Sk is an Angle Board. Both boards are designed to be used as an insulation material for underfloor heating for outdoor stairs to protect them against snow and ice. KARDO Thermopanel Sp can also be used as an insulation material for underfloor heating cables inside rooms. The grooves allow easy and quick heating cable installation.

### Product Features:

KARDO Thermopanel S is an exceptionally durable and easy to cut Insulation Board. This system can be installed outdoors and in damp areas and has insulation properties. This system allows to increase the heating efficiency of snow and ice protection systems (the warm-up time is shorter) and decrease the running cost. It can be fixed to tiles or any other kind of floor covering.

### Approvals:

Declaration of Performance for XPS insulation boards. Polish Law regarding building materials. Dated from 16th April 2004. Declaration Reference: Dz.U. Nr 92 poz 881, art.10.

### Types:

Product Name thickness (mm)	Dimensions height x width x length (mm)	Spacing of grooves	Weight	Properties
<b>KARDO Thermopanel Sk</b> 22 mm (+/- 2 mm)  stairs tread	1250 x 400 x 200 (mm) (+/- 10 mm)	86 mm (+/- 2 mm)	1.9 kg (+/- 10 %)	Coefficient of thermal conductivity: < 0.034 W/mK Water absorption after 24 hrs: < 0.1 % Apparent Density (XPS): < 34 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 300 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow burning) Maximum temperature of use: +75°C, frost proof
<b>KARDO Thermopanel Sp</b> 22 mm (+/- 2 mm)  plate	1250 x 600 (mm) (+/- 10 mm)	86 mm (+/- 2 mm)	1.9 kg (+/- 10 %)	

# KARDO THERMOPANEL S

\* \* \* for the anti-freeze of stairs and platforms \* \* \*

## ASSEMBLY:

### **Preparing the base:**

The building base must be load-bearing, stable, levelled and dust and grease free. Old layers of oil and paints must be removed.

### **Installation:**

- To fit a KARDO Thermopanel S on the required area according to the shape of stairs, cut off an Insulation Board or an Angle Board and place it on the stairs.
- The KARDO Thermopanel S boards should be held down to the floor base with flexible adhesive on a levelled construction base (concrete or reinforced concrete).
- The same flexible adhesive must be used to fill up grooves.

**NOTE:** First fill up the grooves with adhesive, after that press in the heating cable. The cable must be completely covered and fully submerged into the adhesive from all sides.

- Then press the heating cable in these grooves. All the joints between the boards must be staggered and sealed by made using a minimum 10 cm width mesh joint tape. The mesh should be held down using flexible adhesive.
- Floor finishes, like tiles, or other floor materials can be laid directly on top of the boards.



# KARDO THERMOPANEL W

\* \* \* heating in grooves \* \* \*

## PRODUCT SPECIFICATION

KARDO Thermopanel W is an Insulation board with an XPS core (rough - without technological smooth skin), with grooves for heating cable installation.

### **Application:**

KARDO Thermopanel W is an Insulation board designed to be used as an insulation material for underfloor heating cables. We recommend the power output up to 10 W/m, inside rooms. The grooves allow easy and quick heating cable installation.



### **Product features:**

KARDO Thermopanel W is an exceptionally durable and easy to cut insulation board. This system can be installed outdoors and in damp areas. It is designed so that a finished floor can be realised without expansion joints. This system allows an increased heating efficiency (the warm-up time is shorter) and decrease the running cost. It can be fixed to tiles or any other kind of floor coverings.

### **Approvals:**

Declaration of Performance for XPS insulation boards.

### **Types:**

Product Name thickness	Dimensions height x width x length	Spacing of grooves	Weight	Properties
<b>KARDO Thermopanel W</b> 20 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	86 mm (+/- 2 mm)	0.5 kg (+/- 10 %)	Coefficient of thermal conductivity: < 0.034 W/mK Water absorption after 24 hrs: < 0.1 % Apparent Density (XPS): < 34 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 300 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow burning) Maximum temperature of use: +75°C, frost proof

# KARDO THERMOPANEL W

\* \* \* heating in grooves \* \* \*

## ASSAMBLY

### **Preparing the base:**

The building base must be load-bearing, stable, levelled, dust and grease free. Old layers of oil and paints must be removed.

### **Installation:**

- When installing the KARDO Thermopanel W, it is possible to cut it to the exact shape of the room which requires the insulation.
- The KARDO Thermopanel W boards should be held down to the floor base with flexible adhesive on a levelled construction base (either concrete or reinforced concrete). The same flexible adhesive must be used to fill up the grooves.
- Then press the heating cable (we recommend the power output up to 10 W/m) in these grooves.
- The boards must be staggered and sealed using a glass fibre mesh. The mesh should be held down using flexible adhesive.
- Floor finishes like tiles, or other floor materials can then be laid directly on top of the boards.

### **Note:**

First fill up grooves with adhesive, after that press in the heating cable. The cable must be completely covered and fully submerged into the adhesive from all sides.



# WATER RADIANT SYSTEM HEATING & COOLING

## GENERAL INFORMATION

Ultra thin KARDO Waterpanel surface heating / cooling system is an alternative to floor heating systems based on traditional methods of laying floors with the use of wet concrete. Its high strength and resistance to deformation and effective thermal efficiency, allows refrain from laying dry screeds. This is less popular, but equally well-known method of making floors. KARDO Waterpanel is an extremely light and doesn't require screed, which makes it easy to assemble. It can be easily mounted both horizontally and vertically whilst still maintaining its integrity. It should be noted that in certain cases this type of installation may be the only possible technical solution.

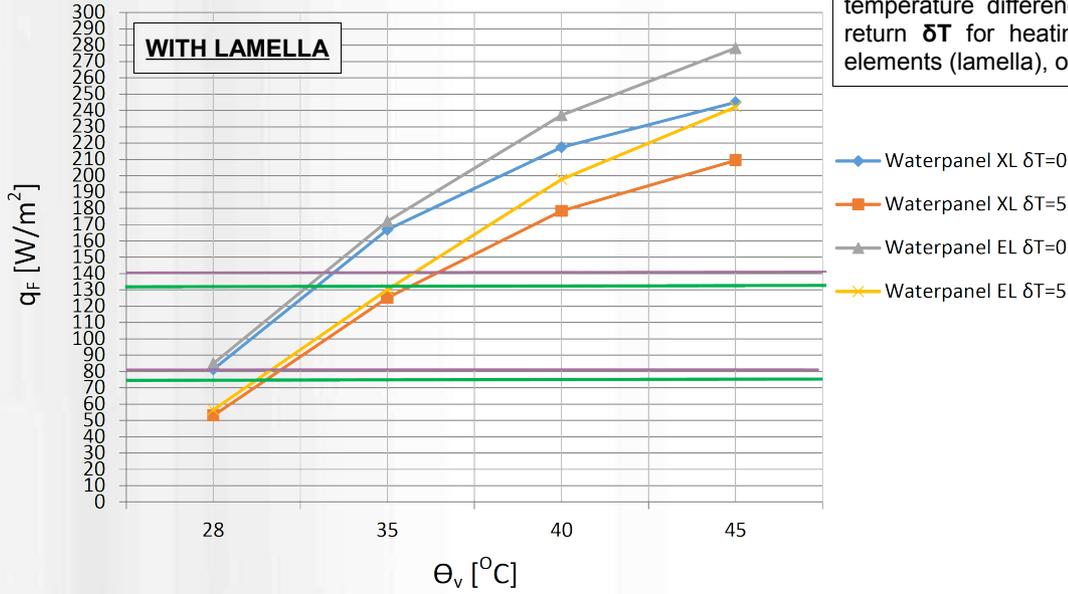
### The advantages of the KARDO Waterpanel system:

- **lightweight** - due to the low weight and without the need for screed, it is possible for this to be used in a variety of not only big but also small bearing capacities for example, wooden constructions and floors (e.g. OSB).
- **small thickness** - important for renovation of rooms due to the fixed dimensions of the window openings and door lintels
- **high compressive strength** - it's possible to use in all types of applications such as public utility buildings, industrial halls and even sports facilities
- **speed, ease and aesthetics of assembly** - ready-made system grooves definitely speeds up the process of laying the water pipes; there is no need to use heavy construction equipment (concrete mixers, aggregates, etc.); due to the lack of need for screed, the whole process becomes much quicker. It is possible to operate the heating / cooling system almost immediately after laying the final flooring.
- **low heating inertia** - allows you to quickly achieve the assumed temperature on the surface floor. Ideal for underfloor heating when using heat pumps due to the low temperature heating medium (28 - 35 °C)
- **effective cooling** - the design of the KARDO Waterpanel radiator meets the conditions needed to obtain maximum cooling capacity on the surface, ie: small distances between pipes (good cooling at appropriate supply temperature); optimum tube diameter is 16 mm, short circuits cooling up to 80 m (small pressure drop); the right finish of the floor (their good thermal conductivity); thin floor construction (the possibility of precise temperature control around the dew point)



KARDO Waterpanel has undergone endurance and thermal tests in independent laboratories in Poland. Scientific input in this area was also provided by the Białystok University of Technology, where research was carried out of temperature distribution on the radiator surface made with KARDO Waterpanel boards at different spacing of heating pipes. The experiment showed that the use of a heat spreader in the form of aluminum foil (lamella) used at production of KARDO Waterpanel XL, it is advisable to equalize the temperature on the entire floor surface. At the same time, it was found that the use of this type of "heater" without the use of lamellas would ensure comfort of use and sufficient thermal efficiency only with smaller spacing of heating pipes (10.0 -12.5 cm). Thanks to these properties, KARDO Waterpanel insulation boards increase the efficiency of heating as well cooling systems powered by renewable energy sources.

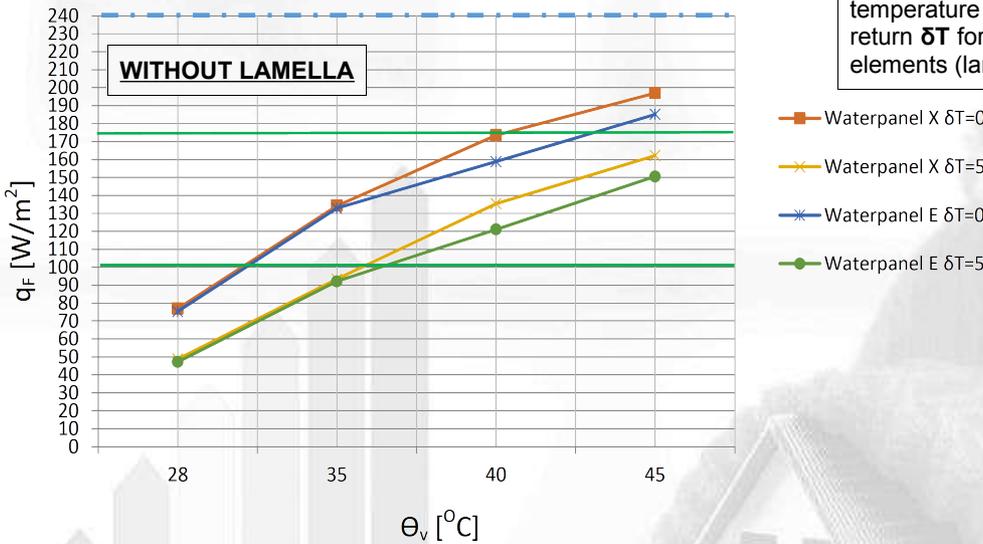
The graphs below show the dependence of the heat flux density [q] on the power supply temperature [ΘV]. The heat flux density [q] was calculated from the formula based on the conducted and averaged measurements of the radiator surface using a thermal imaging camera.



The dependence of the thermal efficiency q on the power supply temperature ΘV, with the temperature difference of the power supply and return ΔT for heating positions with dissipating elements (lamella), on the floor from tiles.

- q lower line (in the central zone) and upper line (in the edge zone) for the spacing of coil 15cm
- q lower line (in the central zone) and upper line (in the edge zone) for spacing of coil 12.5cm

The horizontal lines show the limit values of the heat flux in the central zone and the edge zone. Exceeding these values is undesirable due to the comfort of use.



The dependence of the thermal efficiency q on the power supply temperature ΘV, with the temperature difference of the power supply and return ΔT for heating positions without dissipating elements (lamella), on the floor from tiles.

- q lower line (in the central zone) and upper line (in the edge zone) for the spacing of coil 10 cm and 12.5 cm
- - - q limit for a wall surface heater

The average square absolute error of the heat flux density [q] was 6 W/m2.

### PRODUCT SPECIFICATION

KARDO Waterpanel insulating boards are made on the base of expanded polystyrene (EPS) or extruded polystyrene (XPS) - a material that has better thermal properties and mechanical strength.

Due to these differences, Kardo products have been assigned to two groups: **Comfort** (XPS) and **Economic** (EPS). The table below helps you choose a Kardo Waterpanel product depending on the final finish of the floor. If we are laying a different material on the floor, we need a contact its' manufacturer.

	terracotta, gres, stone cladding	laminate flooring
<b>COMFORT</b> version	KARDO Waterpanel X or XL	KARDO Waterpanel X or XL
<b>ECONOMIC</b> version	KARDO Waterpanel E or EL	KARDO Waterpanel EL

Table of temperature difference on the floor made from the tiles with KARDO Waterpanel system

With aluminium heat dissipations (lamella)				
Model	Supply temperature $\theta_v$ [°C]	The room temperature [°C]	Pipes spacing [cm]	The difference of average temperature on the floor over the coil and between it $\delta\theta_v$ [°C]
Waterpanel XL	28	20	15	0.3
	35			0.9
	40			2.9
	45			5.0
Waterpanel EL	28	20	12.5	0.2
	35			0.4
	40			1.0
	45			2.7

Without aluminium heat dissipations (lamella)				
Model	Supply temperature $\theta_v$ [°C]	The room temperature [°C]	Pipes spacing [cm]	The difference of average temperature on the floor over the coil and between it $\delta\theta_v$ [°C]
Waterpanel X	28	20	10	0.9
	35			2.3
	40			3.6
	45			4.5
Waterpanel E	28	20	12.5	1.0
	35			2.4
	40			5.2
	45			7.0



Underlay  
KARDO Alumax

During installation of Kardo Waterpanel XL or EL insulation boards, we should choose the underlay (that is under the laminate flooring) with low thermal resistance. In case when the laminate flooring is being laid directly on Kadro Waterpanel X boards is laying a laminate flooring, we use a Kardo Alumax high-quality underlay of 1.5 mm or 2.0 mm thickness to equalize temperatures and increase thermal conductivity.

Grubość Troszyna Thickness								
2 mm	25% / ★★★★★	18 dB / ★★★★★	250 kPa / ★★★★★	1.0 mm / ★★	0,010 m <sup>2</sup> K/W / ★	>75 m / ★★	Bf-s1	★★★★★
1.5 mm	20% / ★★★	16 dB / ★★★	250 kPa / ★★★★★	0.5 mm / ★	0,010 m <sup>2</sup> K/W / ★	>75 m / ★★	Bf-s1	★★★★★

Selection tables for the stable work of the ultra thin KARDO Waterpanel surface heater

With aluminium heat dissipations												
Model	Supply temperature $\theta_v$ [°C]	$\delta T$ [°C]	The room temperature [°C]	Pipes spacing [cm]	R=0.00 [m <sup>2</sup> K/W]		R=0.05 [m <sup>2</sup> K/W]		R=0.10 [m <sup>2</sup> K/W]		R=0.15 [m <sup>2</sup> K/W]	
					The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]
Waterpanel XL	28	0	20	15	27.5	81.2	25.1	53.5	24.0	41.0	23.4	34.3
	35				34.3	166.9	30.1	113.3	28.3	91.3	27.3	79.3
	40				38.2	217.3	32.0	136.9	29.6	107.1	28.2	90.0
	45				40.3	244.9	33.2	152.0	30.0	111.9	28.3	91.1
	28				25.1	53.0	22.4	22.8	21.3	11.4	20.7	5.6
Waterpanel EL	35	5	20	15	31.0	125.1	26.4	69.1	24.6	48.2	23.6	36.9
	40				35.2	178.3	28.6	95.4	26.2	66.7	24.8	50.4
	45				37.6	209.3	30.1	113.7	26.9	74.8	25.2	54.9
	28				27.8	84.8	25.4	56.4	24.3	43.8	23.7	37.1
	35				34.7	172.0	30.4	117.7	28.6	95.6	27.6	83.5
Waterpanel EL	40	0	20	12.5	39.7	237.0	33.4	155.2	31.0	125.0	29.6	107.6
	45				42.8	278.1	35.6	183.2	32.4	142.3	30.7	121.0
	28				25.4	56.4	22.9	28.2	21.8	16.5	21.2	10.4
	35				31.4	130.1	27.0	76.3	25.2	55.1	24.2	43.6
	40				36.7	197.7	30.3	116.3	27.9	86.9	26.5	70.2
45	40.1	242.1	32.8	147.4	29.6	107.4	27.9	86.7				

Without aluminium heat dissipations												
Model	Supply temperature $\theta_v$ [°C]	$\delta T$ [°C]	The room temperature [°C]	Pipes spacing [cm]	R=0.00 [m <sup>2</sup> K/W]		R=0.05 [m <sup>2</sup> K/W]		R=0.10 [m <sup>2</sup> K/W]		R=0.15 [m <sup>2</sup> K/W]	
					The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]	The floor temperature $\theta_f$ [°C]	Heat flow density $q_f$ [W/m <sup>2</sup> ]
Waterpanel X	28	0	20	10	27.1	76.9	24.2	43.1	23.1	30.9	22.5	24.3
	35				31.8	134.2	27.0	75.3	25.2	54.2	24.2	42.7
	40				34.9	173.5	28.1	88.5	25.7	59.9	24.3	43.8
	45				36.7	196.9	30.0	111.9	26.8	73.1	25.1	53.1
	28				24.7	48.8	21.9	18.0	20.8	6.9	20.2	1.4
Waterpanel X	35	5	20	10	28.5	93.4	23.8	38.2	22.0	18.6	21.0	8.5
	40				31.9	135.3	25.2	54.1	22.8	27.1	21.4	12.4
	45				34.0	162.1	26.4	68.3	23.2	31.7	21.5	13.6
	28				27.0	75.3	24.0	41.0	22.9	28.8	22.3	22.3
	35				31.7	132.8	26.2	66.4	24.4	45.5	23.4	34.3
Waterpanel E	40	0	20	12.5	33.7	158.8	27.4	80.6	25.0	52.4	23.6	36.5
	45				35.8	185.1	28.6	95.1	25.4	57.0	23.7	37.6
	28				24.6	47.2	21.8	17.0	20.7	6.0	20.1	0.7
	35				28.4	92.1	23.1	31.0	21.3	11.9	20.3	2.4
	40				30.7	121.0	24.3	44.4	21.9	18.1	20.5	4.2
45	33.1	150.5	25.8	61.1	22.6	25.0	20.9	7.5				

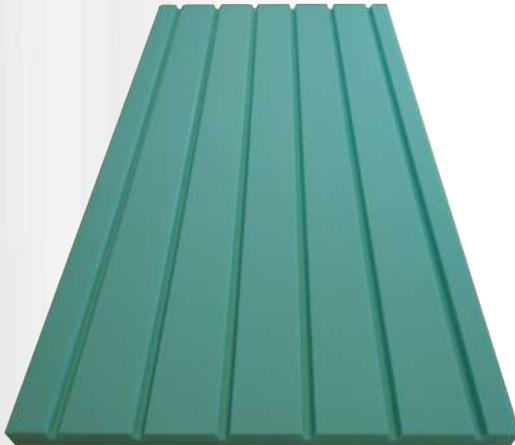
# KARDO WATERPANEL X

\* \* \* radiant heating & cooling without screed \* \* \*

## PRODUCT SPECIFICATION

KARDO Waterpanel X is a system which consists of two Insulation Boards with an XPS core with grooves for underfloor heating pipes installation.

**KARDO Waterpanel X<sub>s</sub> – Central Board**



**KARDO Waterpanel X<sub>b</sub> – Edge Board**



### Application:

KARDO Waterpanel X is an Insulation Board designed to be used as an insulation material for water radiant heating/cooling (floor, wall or ceiling). It is designed to not require screed, but adhesive with the glass fibre mesh which will be placed on the surface of the insulation board, means that tiles or other type of coverings can be laid straight on top.

### Product features:

KARDO Waterpanel X is an exceptionally durable and easy to cut Insulation Board. This system can be installed in damp areas and has superb insulation properties. This system facilitates an increase in heating efficiency (the warm-up time is shorter) and decrease the running cost. The surface is rough which enables the reinforcement layer to be embedded and the ceramic cladding to be glued.

### Approvals:

Declaration of Performance for XPS Insulation Boards.

### Types:

Product Name thickness	Dimensions length x width	Distance between grooves	Weight	Properties
<b>KARDO Waterpanel X<sub>s</sub></b> 30 mm (+/- 2 mm) central board	1250 x 600 (mm) (+/- 10 mm)	100 mm (+/- 2 mm)	0.68 kg (+/- 10 %)	Thermal conductivity: < 0.034 W/mK Water absorption after 24 hrs: < 0.1 % Density (XPS): < 34 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 300 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow burning) Maximum temperature of use: +75°C, frost proof
<b>KARDO Waterpanel X<sub>b</sub></b> 30 mm (+/- 2 mm) edge board	1250 x 600 (mm) (+/- 10 mm)	100 mm (+/- 2 mm)	0.68 kg (+/- 10 %)	

# KARDO WATERPANEL X

\* \* \* radiant heating & cooling without screed \* \* \*

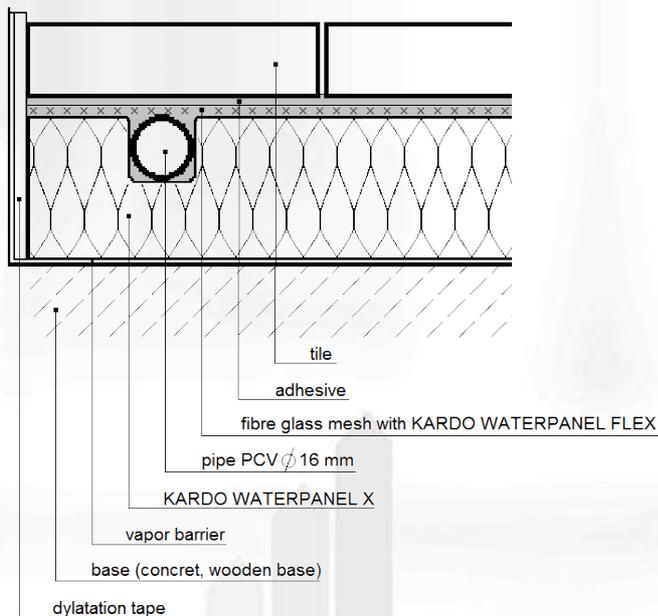
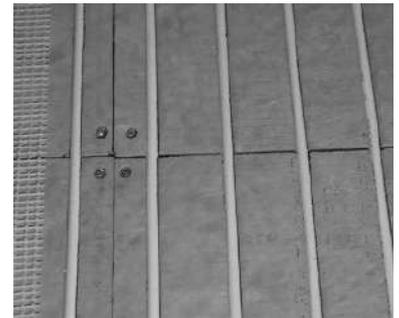
## INSTALLATION

### Preparing the base:

The building base must be load-bearing, stable, levelled, dust and grease free. Old layers of oil and paints must be removed.

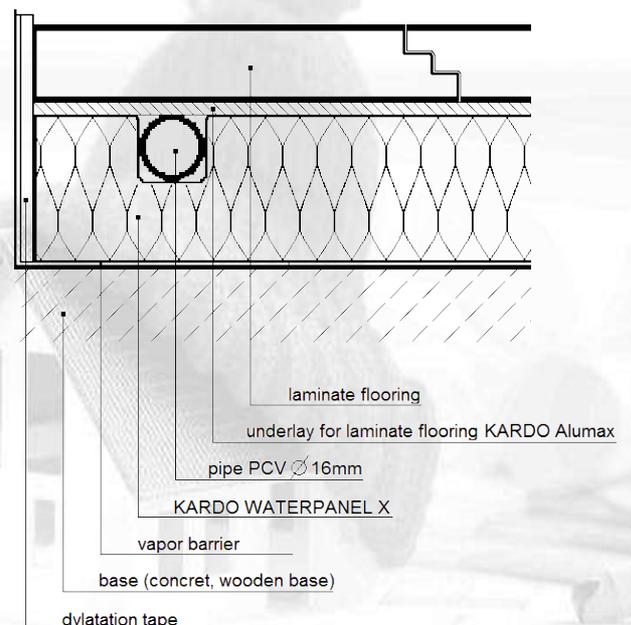
### Installation of KARDO Waterpanel X on a concrete and wooden floor (OSB):

- The first step is to lay PE foil 0.2 mm thickness along the wall partitions of a room with an edge band or styrofoam / wool.
- Next lay KARDO Waterpanel X boards and rough XPS boards on the areas which won't require the radiant heating system. If the floor or wall need insulation boards which are thicker than 30 mm, then a layer of standard XPS is required to be laid underneath this system.
- Install the pipes by pressing them into the 16 mm diameter grooves.  
**NOTE:** It is recommended to form coils into a meander-like shape which is efficient for up to 80 m of the pipe on one heating installation. If there is a need to use longer pipes it is possible to create the next heating surface with coils of up to 80 m.
- Connect the pipes to distributors and a pumping set for surface heating. Due to the possible effect of boards lifting during the laying of water pipes, it is possible to fasten the base with pins or wood screws with washers.



### Installation for ceramic tiles

A fibre glass mesh with a minimum weight of 320 g/m<sup>2</sup>, should be then placed onto and sunk into this adhesive. The fibre mesh should be invisible and completely covered by this adhesive. The thickness of adhesive should be 3-5 mm. Floor finishes like tiles, or other floor (wall) materials can then be laid directly on top. KARDO Flex adhesive is recommended for installation, as written on the pack. Please consult ELEKTRA Kardo s.c. before using another brand of adhesive.



### Installation for laminate flooring

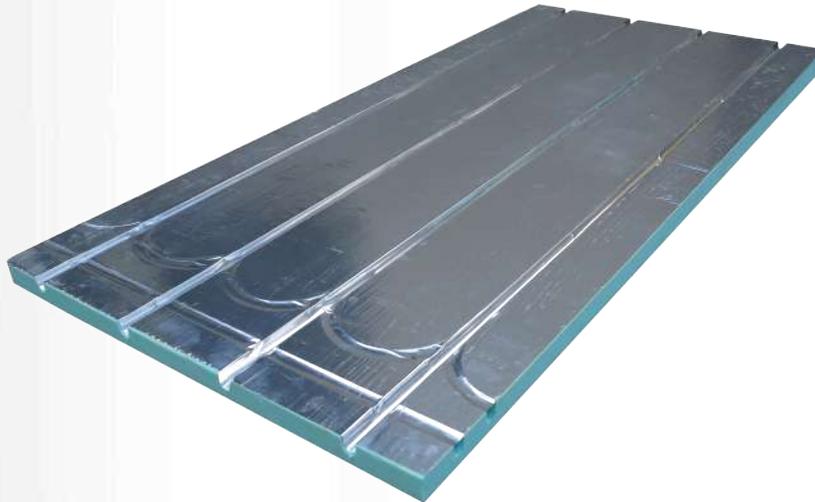
Insert the water pipes into the grooves on the surface of the KARDO Waterpanel X. Arrange KARDO Alumax underlay and proceed to assembly of laminate flooring in accordance with the producer's recommendations.

# KARDO WATERPANEL XL

\* \* \* radiant heating & cooling without screed \* \* \*

## PRODUCT SPECIFICATION

**KARDO Waterpanel XL** is an Insulation Boards with an XPS rough core with grooves, for underfloor heating pipes installation. All is covered by aluminium foil to increase the thermal conductivity.



### **Application:**

KARDO Waterpanel XL is an Insulation Board designed to be used as an insulation material for water radiant heating / cooling (floor, wall or ceiling). It's designed to not require screed but flex adhesive which will be placed on the surface of the insulation board meaning that tiles or other type of coverings can be laid straight on top.

### **Product features:**

KARDO Waterpanel XL is an exceptionally durable and easy to cut Insulation Board. This system can be installed in damp areas and has superb insulation properties. This system facilitates an increase in heating efficiency (the warm-up time is shorter) and decreases the running cost.

### **Approvals:**

Declaration of Performance for XPS insulation boards. Polish Law regarding building materials. Dated from 16th April 2004. Declaration Reference: Dz.U. Nr 92 poz 881, art.10.

### **Types:**

Product Name thickness	Dimensions length x width	Distance between grooves	Weight	Properties
<b>KARDO Waterpanel XL</b> 30 mm (+/- 2 mm)	1250 x 600 (mm) (+/- 10 mm)	150 mm (+/- 2 mm)	1.2 kg (+/- 10 %)	Thermal conductivity: < 0.034 W/mK Water absorption (24h): < 0.1% Density: > 34 kg/m <sup>3</sup> Compressive strength at 10% deflection: > 300 kPa Aluminum thickness: 50 microns Detachment strength: > 300 kPa Shear strength: > 600 kPa Reaction to fire: Euro class E Working temperature: +75°C, frost proof

# KARDO WATERPANEL XL

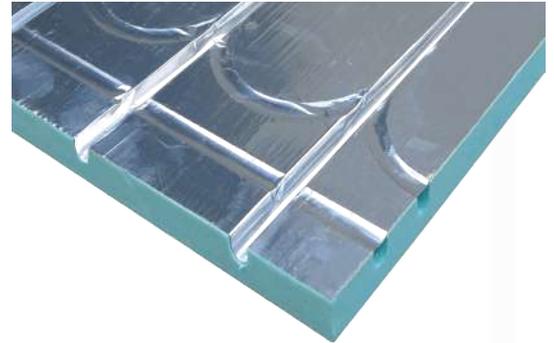
\* \* \* radiant heating & cooling without screed \* \* \*

## ASSEMBLY ON THE FLOOR

### Preparing the base:

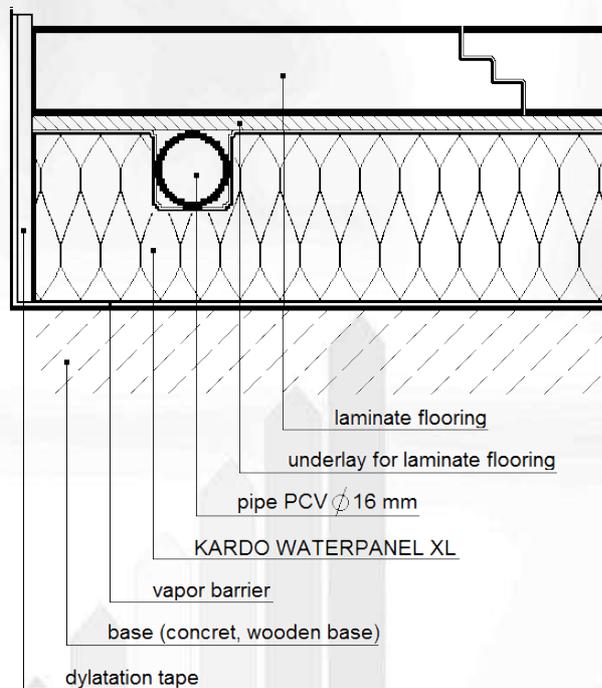
The building base must be load-bearing, stable, levelled, dust and grease free. Old layers of oil and paints must be removed.

- The first step is to lay PE foil 0.2 mm thickness along the wall partitions of a room with an edge band or styrofoam / wool.
- Next, lay KARDO Waterpanel XL boards and standard XPS boards on the areas which won't require the radiant heating system. If the floor or wall heating system requires insulation boards which are thicker than 30 mm, then a layer of standard rough XPS is required to be underneath this system.
- Install the pipes by pressing them into the 16 mm diameter grooves. Cut the aluminum foil on the bends and edge line if you need to make a loop or return of the heating pipe. NOTE: It is recommended to form coils into a meander-like shape which is efficient up to 80 m of the pipe on one heating installation. If there is a need to use longer pipes, it is possible to create the next heating surface with pipe up to 80 m.
- Connect the pipes to distributors and a pumping set for surface heating. Floor finishes, like tiles, or other floor (wall) materials can then be laid directly on top of the boards, using the same type of adhesive.



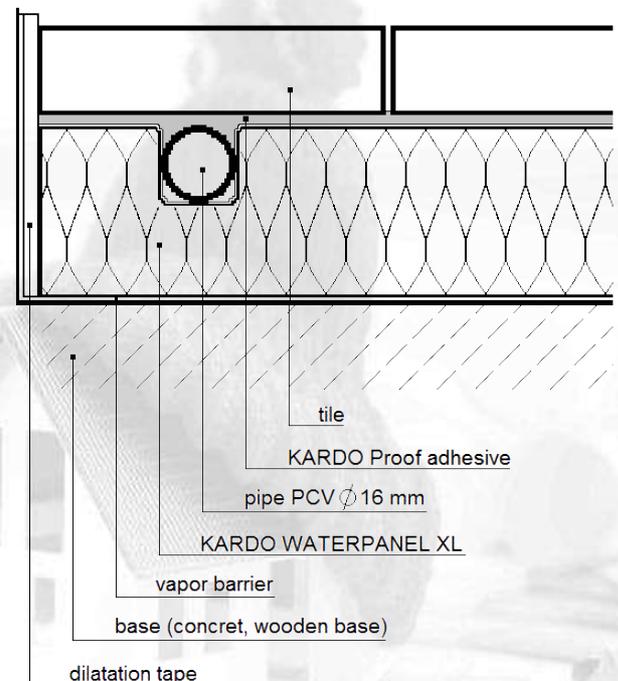
### Installation for laminate flooring

On the surface of the KARDO Waterpanel XL, insert the water pipes into the grooves. Prepare suitable underlay and proceed to assembly of laminate flooring in accordance with the producer's recommendations.



### Installation for ceramic tiles

The insulation boards must be staggered and sealed by KARDO Proof adhesive with thickness minimum 2 mm.



# KARDO WATERPANEL E

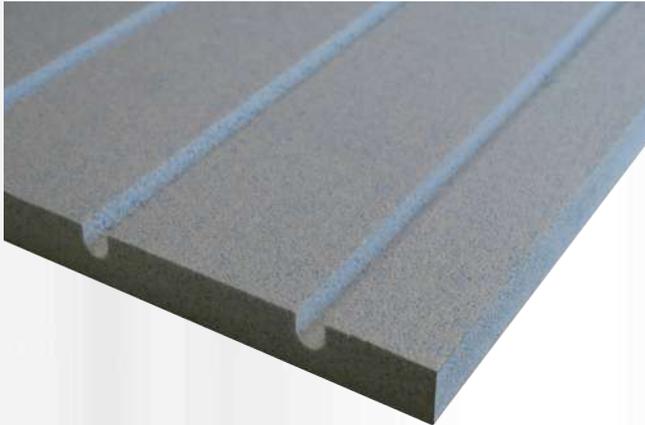
\* \* \* heating and water cooling without screeds \* \* \*

## PRODUCT SPECIFICATION

KARDO Waterpanel E is an EPS insulation board which is suitably designed to reduce water absorption. Its manufactured grooves are designed for the installation pipes for water systems.

They are produced in two varieties:

**KARDO Waterpanel Es – Central Board**



**KARDO Waterpanel Eb – Edge Board**



### **Application:**

KARDO Waterpanel E is an Insulation Board designed to be used as an insulation material for water radiant heating/cooling (floor, wall or ceiling). It is designed to not require screed, but adhesive with the glass fibre mesh which will be placed on the surface of the insulation board. It means that tiles or other type of coverings can be laid straight on top.

### **Product Features:**

Durable for high surface pressure, easy to process and moisture resistant. It has excellent thermal insulation properties. The grooves allow easy installation of multilayer pipes with a diameter of 16 mm, serving as heating elements in a surface heating or cooling system. The surface is rough, which enables the reinforcement layer to be embedded and the ceramic cladding to be glued.

### **Approvals:**

Declaration of Performance for EPS insulation boards.

### **Types:**

Product Name thickness	Dimensions length x width	Distance between grooves	Weight	Properties
<b>KARDO Waterpanel Es</b> 30 mm (+/- 2 mm)  central board	1000 x 500 (mm) (+/- 10 mm)	125 mm (+/- 2 mm)	0.35 kg (+/- 10 %)	Thermal conductivity:< 0.036 W/mk Water absorption after 24 hrs:< 3% Density (EPS): 27 - 33 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 200 kPa Tensile strength perpendicular to the surface: > 600 kPa Fire resistance class: E (slow burning) Temperature of use: +75°C, frost proof
<b>KARDO Waterpanel Eb</b> 30 mm (+/- 2 mm)  edge board	1000 x 500 (mm) (+/- 10 mm)	125 mm (+/- 2 mm)	0.35 kg (+/- 10 %)	

# KARDO WATERPANEL E

\* \* \* heating and water cooling without screeds \* \* \*

## ASSEMBLY

### Preparation of the substrate:

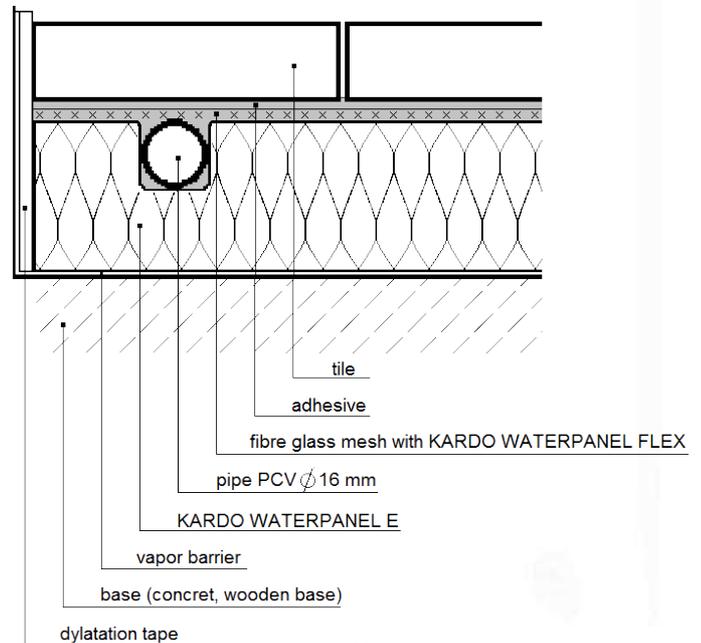
The base on which the KARDO Waterpanel E thermal insulation boards will be laid must be clean, ideally leveled and stable. In the case of a base made of wood-like OSB boards, it is recommended to arrange the boards (OSB) in two layers to avoid the "lifting floor" effect.

### Installation of KARDO Waterpanel E on a concrete or wood-based substrate (OSB):

- We put a vapor barrier foil 0.2 mm thick on the prepared substrate, and around the walls we place dilatation tape.
- We place KARDO Waterpanel E boards in the desired place of heat. Unheated zones we complete with rough sheets of EPS 200 boards. If the floor or wall need insulation boards which are thicker than 30 mm, then a layer of standard EPS 200 is required to be laid underneath this system.
- Install the pipes by pressing them into the 16 mm diameter grooves.

**NOTE:** It is recommended to form coils into a meander-like shape which is efficient for up to 80 m of the pipe on one heating installation. If there is a need to use longer pipes, it is possible to create the next heating surface with pipe up to 80 m.

- The ends of the pipe are connected to the main one heating installation, using valves and hydraulic thermostats. Due to the possibility of the boards lifting, during the laying of water pipes, they are allowed to be fastened to the base with pins or wood screws with washers. A fibre glass mesh with a minimum weigh of 320 g/m<sup>2</sup>, should be then placed onto and sunk into this adhesive. The fibre glass mesh should be invisible and completely covered by this adhesive. The thickness of adhesive should be 3-5 mm.
- Floor finishes like tiles, or other floor (wall) materials can then be laid directly on top. KARDO Flex adhesive is recommended for installation, as written on the pack. Please consult ELEKTRA Kardo s.c. before using another brand of adhesive, belonging to the group of elastic adhesives class C2S1.



# KARDO WATERPANEL EL

\* \* \* heating and water cooling without screeds \* \* \*

## PRODUCT SPECIFICATION

KARDO Waterpanel EL is an Insulation Board with an EPS core (designed to reduce water absorption) with grooves, for underfloor heating pipes installation. All is covered by aluminium foil to increase the thermal conductivity.



### Application:

KARDO Waterpanel EL is an Insulation Board designed to be used as an insulation material for water radiant heating / cooling (floor, wall or ceiling). It is designed to not require screed, but flex adhesive which is placed on the surface of the insulation board, meaning the tiles or other type of coverings can be laid straight on top.

### Product Features:

KARDO Waterpanel EL is an exceptionally durable and easy to cut insulation board. This board can be installed in damp areas, has superb insulation properties and has an increased thermal conductivity due to the aluminum foil used. This system facilitates an increase in heating efficiency (the warm-up time is shorter) and decrease the running cost.

### Approvals:

Declaration of Performance for EPS insulation boards. Polish Law regarding building materials. Dated: 16 of April 2004 Dz.U. Nr 92 poz 881, art.10

### Types:

Product Name thickness	Dimensions length x width	Distance between grooves	Weight	Properties
<b>KARDO Waterpanel EL</b> 30 mm (+/- 2 mm)	1000 x 500 (mm) (+/- 10 mm)	125 mm (+/- 2 mm)	0.5 kg (+/- 10 %)	Thermal conductivity: < 0.036 W/mk Water absorption after 24 hrs: < 3% Density (EPS): > 27 - 33 kg/m <sup>3</sup> Compressive strength at 10% deformation: > 200 kPa Tensile strength perpendicular to the surface: > 600 kPa Aluminum thickness: 50 microns Detachment strength: > 200 kPa Shear strength: > 400 kPa Fire resistance class: E (slow burning) Temperature of use: - 50°C to +70°C

# KARDO WATERPANEL EL

\* \* \* heating and water cooling without screeds \* \* \*

## ASSEMBLY

### Preparation of the substrate:

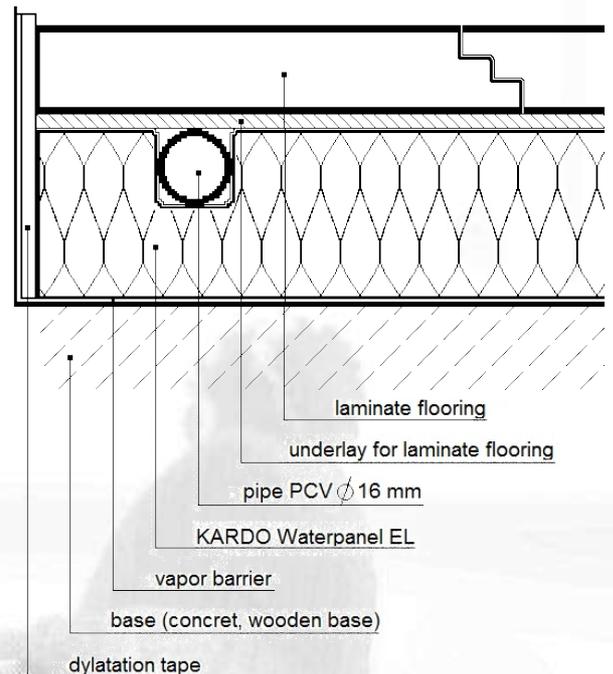
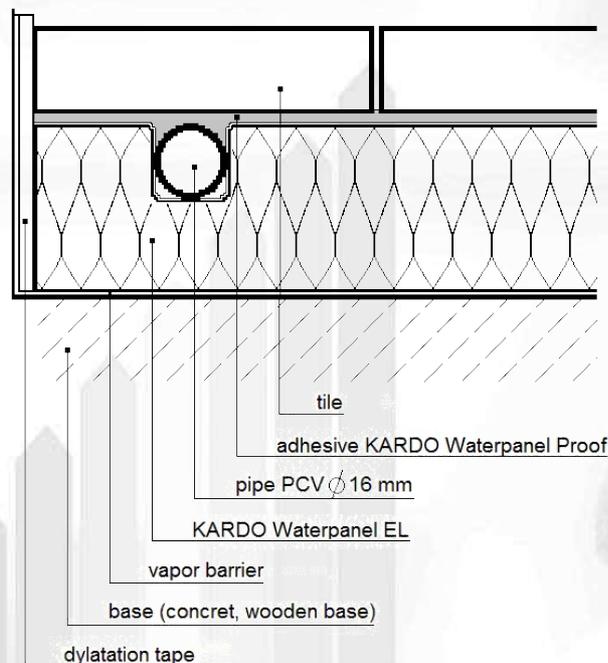
The base on which the KARDO Waterpanel EL thermal insulation boards will be laid must be clean, ideally leveled and stable. In the case of a base made of wood-like OSB boards, it is recommended to arrange the boards (OSB) in two layers, to avoid the floor lifting.

### Installation of KARDO Waterpanel EL on a concrete or wood-based substrate (OSB):

- The first step is to lay PE foil 0.2 mm thickness along the wall partitions of a room with an edge band or styrofoam / wool (dylatation tape).
- Next, lay KARDO Waterpanel EL boards and EPS 200 boards on the areas which won't require the radiant heating system. If the the floor or wall heating system requires insulation boards which are thicker than 30mm, then a layer of EPS 200 is required to be underneath this system.
- To install the pipes, the aluminium foil must be cut prior to the installation. Once the foil is prepared, press the pipe into the 16 mm diameter grooves. NOTE: It is recommended to form coils into a meander-like shape which is efficient up to 80 m of the pipe on one heating installation. If longer pipes are required, it is possible to create the next heating surface with pipe up to 80 m.
- Connect the pipes to distributors and a pumping set for surface heating. Due to the possiblity of the boards lifting during the laying of the water pipes, they are allowed to be fastened to the base with pins or wood screws with washers.

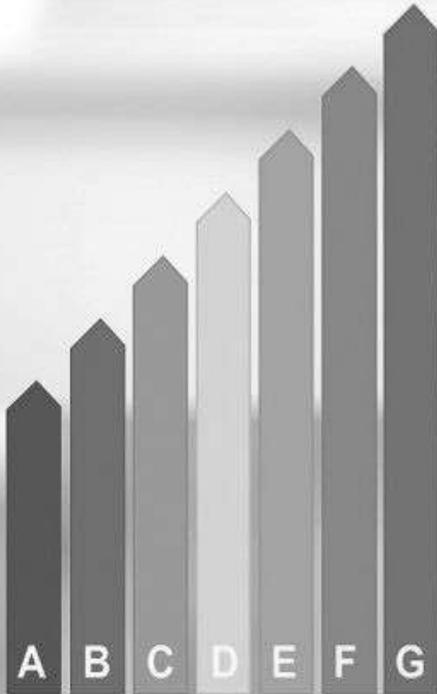
### Installation under laminate flooring

On the surface of KARDO Waterpanel EL, after inserting the pipes into the grooves, arrange suitable underlay and proceed to the assembly of laminate flooring in accordance with the producer's recommendations.



### Installation under ceramic tiles

Floor finishes like tiles can be laid directly on top of the boards, using KARDO Proof adhesive with thickness minimum 2 mm. KARDO Proof adhesive is recommended for installation, as written on the pack. Please consult KARDO insulation before using another brand of an adhesive.



# Anti-frost Protection System

## ACCESSORIES

# FC 2 CONTROLLER

\* \* \* snow and ice protection systems \* \* \*

FC2 controller have been designed to control snow and ice protection systems, such as: roofs, gutters, drainpipes, driveways, loading bays and walkways. The controller is designed to be mounted on a Din rail. The FC2 controller turns the system on if the following two conditions are fulfilled - the air temperature is lower than the temperature set on the FC2 controller, or / and the moisture has been detected on the sensor which is installed in the ground or the gutter.



Supply voltage.....230V +/- 10%, 50–60Hz  
 Built-in transformer .....~24VAC/ ~6VAC  
 Output relay (L1-potential contact)..... 15A, 230V ~  
 Assembly ..... on the DIN rail  
 Temperature regulation range..... - 40°C ÷ 50°C  
 Working temperature range (ambient).....- 20°C ÷ 50°C  
 Moisture adjustment range.....min 1 – max 10  
 Work signaling.....LED  
 Connection terminals..... screw up to 4 mm2  
 Dimensions of the regulator..... 6 modules (90x105x66mm)  
 Weight.....670g  
 Product marked ..... CE

# PRR

\* \* \* flat bar to the gutters \* \* \*

Flexible cable support PRR is designed to protect the heating cables against damage between the gutter and downpipe in anti-frost protection systems. The set contains 2 pcs of stainless steel, flat bars and 4 pcs of mounting bands which are UV resistant.



Width: .....25 mm  
 Length: .....250 mm  
 Material: ..... stainless steel

A B C D E F G

# PLR

\* \* \* *hanger for installing the cable in the downpipe* \* \* \*

The downpipe spacing wire support bar PLR is laid on the bottom of the gutter directly in the downpipe, which allows the attachment of heating cables.



Diameter: ..... 6 mm  
Length: ..... 325 mm  
Material: .....stainless steel

# LU

\* \* \* *hanging heating cables in downpipe* \* \* \*

Downpipe wire spacing clips LU are designed for hanging heating cables in downpipes. Both ends are finished with a loop, that allows the division of the wire into two parts, which easily hangs on the support bar PLR. These clips are required in order to reduce the tension, and prevents movement of the wire.



Length: ..... 5, 10, 15, 20 m  
Material: .....stainless steel  
Spacing of the clips: ..... every 40 cm

# TME-K

\* \* \* adhesive tape for fixing the heating cable \* \* \*

This Aluminum tape has a width of 25 mm with a special adhesive, which is resistant to aging and UV. It is suitable for installing heating cables on roofing covered with metal sheets, tiles or concrete. It provides high strength adhesion on both rough and uneven surfaces. Spacing between the clips are 3 cm. Before gluing the surface using TME-K, it must be clean and dry.



Length: ..... 10 mb  
Width: ..... 25 mm  
Material:..... aluminum& UV resistant self adhesive tape  
Temperature range: ..... - 40°C + 80°C





# Range Specifications

## TABLE

Type of the board	Dimension of the board X/Y/Z [mm]	Collective packaging			Palette with the goods in collective packaging				Palette with the goods (without collective packaging)		
		Quantity of boards [pcs]	Parcel size X/Y/Z [mm]	Weight of parcel [kg]	Quantity of boards [pcs]	Quantity of parcels	Weight of parcels without palette [kg]	Dimension of parcels without palette X/Y/Z [mm]	Quantity [pcs]	Weight of goods without palette [kg]	Dimension of the goods without palette X/Y/Z [mm]
<b>Thermopanel</b>	1250/600/10	12	1260/610/130	25	120	10	250	1170/740/1260	144	288	1170/770/1255
	1250/600/22	6	1260/610/145	14.2	54	9	127.8	1160/740/1260	72	158.4	1170/770/1255
	2600/600/22	-	-	-	-	-	-	-	-	-	-
<b>Thermopanel Sp</b>	1250/600/32	8	1260/610/265	20.2	40	5	101	1170/740/1260	48	115.2	1170/770/1255
	1250/600/42	6	1260/610/265	16.6	30	5	83	1160/740/1260	34	88.4	1170/770/1255
	1250/600/22	6	1260/610/145	12.4	54	9	111.6	1160/740/1260	72	136.8	1170/770/1255
	1250/400/200	4	1260/480/280	8.6	28	7	60.2	1140/760/1260	32	60.8	1140/760/1255
<b>Thermopanel W</b>	1250/600/20	6	1250/600/120	3	-	-	-	-	80	40	1170/770/1255
<b>Thermopanel</b>	2600/400/200	-	-	-	-	-	-	-	-	-	-
	2600/300/300	-	-	-	-	-	-	-	-	-	-
<b>Waterpanel X</b>	1250/400/200	4	1260/480/280	8.6	28	7	60.2	1140/760/1260	32	60.8	1140/760/1255
	1250/600/30	8	1250/600/240	5.5	-	-	-	-	52	35.4	1170/770/1255
<b>Waterpanel XL</b>	1250/600/30	8	1250/600/240	9.6	-	-	-	-	50	60	1170/770/1255
<b>Waterpanel E</b>	1000/500/30	10	1000/500/300	3.5	-	-	-	-	60	21	1200/800/1000
	1000/500/30	10	1000/500/300	5	-	-	-	-	60	30	1200/800/1000





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