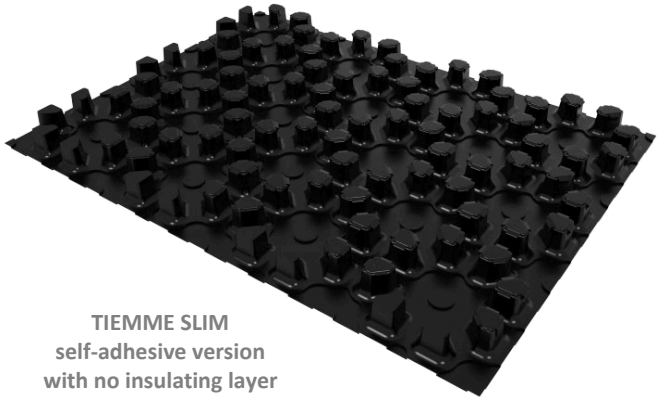
EN

4519

“TIEMME SLIM”
PANEL FOR LOW THERMAL INERTIA RADIANT SYSTEMS



TIEMME SLIM
self-adhesive version
with no insulating layer

TIEMME SLIM
with 5 mm of insulating
layer in EPS

DESCRIPTION

TIEMME SLIM is the **innovative Tiemme system created to meet the demand for radiant systems with low thermal inertia and reduced thickness.**
It can be used in residential and commercial radiant floor heating and cooling systems.
Designed to meet plant engineering requirements in the event of restructuring, thanks to the reduced thickness and the possibility of fixing the panel directly to the existing flooring, the system can be created without having to carry out any demolition work.
The special shape of the panel's ashlars allows the screed to completely wrap around the surface of the pipe to optimise the system's yield. The pipe locking system avoids the use of fixing clips, thus reducing installation time. Diagonal locking at 45° is also possible.
The rigid thermoformed polystyrene sheet is **highly resistant to wearing**.
Available in the self-adhesive version with no insulating layer, or with 5 mm of insulating layer in EPS 200, it adapts to different application requirements.
Coupling between the panels is guaranteed by a special interlocking system with perimetral joints (by overlapping lateral ashlars).

CAUTION: The panel must be protected from direct sunlight and stored in dry and ventilated places, away from sources of heat and open flames.

ADVANTAGES / STRENGTHS

- Low thermal inertia (in combination with lowered screeds).
- Reduced thickness: 24 mm certified system.
- High resistance to wearing.
- Quick and easy installation, thanks to the preformed relief (ashlars) and interlocking grooves on the perimeter of the panel (by overlapping lateral ashlars).
- Pipe can be laid diagonally: guaranteeing maximum flexibility of the system as it can also be laid in rooms with irregular floorplans.
- Panel with self-adhesive bottom (in the version with no insulating layer): no unwanted movement and demolition works.
- Can be combined with Ø 16x2 mm and Ø 17x2 pipe: guaranteeing excellent flow rates with low pressure drops.

PRODUCTION RANGE

Art.	Code	Total panel size (mm)	Insulation thickness (mm)	Thermal resistance (m^2 K/W)	C.R 10% (kPa)	Packaging Unit (m^2)	No. of panels per packaging unit (pcs.)
4519	450 0641 *	1450 x 850 x 19	-	-	-	17.92	16
	450 0642 **	1450 x 850 x 23.6	5 ***	0.15	200	22.40	20

* Thermoformed panel with no thermal insulation, with self-adhesive bottom
** Thermoformed panel coupled with 5 mm thick insulating layer in EPS 200
*** Thickness of insulating layer 5 ± 3 mm (the dimensional tolerance ± 3 mm is due to production processes of the insulating panel in EPS with very reduced thickness).

DIMENSIONAL SPECIFICATIONS

		Panel code	
		450 0641	**450 0642**
Insulation thickness	(mm)	-	5
Total thickness	(mm)	19	23.6
Rigid covering sheet thickness	(mm)	1	0.6
Applicable pipe diameter	(mm)	16 and 17	
Minimum pipe laying distance	(mm)	50 (laying 90°) – 71 (laying 45°)	
Total panel dimensions	(mm)	1450 x 850	
Usable panel dimensions	(mm)	1400 x 800	
Usable panel dimensions	(m^2)	1.12	

TECHNICAL SPECIFICATIONS

		Panel code		Reference standard
		450 0641	**450 0642**	
Declared thermal conductivity **λ_D**	(W/mk)	-	0.034	UNI EN 12667
Thermal resistance **R_D**	(m^2 K/W)	-	0.15	UNI EN 13163
Compressive resistance at 10% deformation * **σ10**	(kPa)	-	200	UNI EN 826
Reaction to fire classification	(Euroclass)	E		UNI EN 13501-1

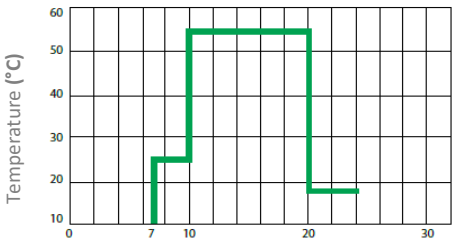
* Minimum compressive resistance at 10% crushing: σ10 ≥ 200 kPa
Therefore, a pressure greater than, or equal to, 200 kPa (2.0 kg/cm^2 - 2000 kg/m^2) must be applied for the panel to be crushed by 10%.

GUIDE TO MAKING THE SCREED

Optimal performance of the TIEMME SLIM radiant system is obtained when the screed, an integral part of the radiant section, completely embraces the pipe, guaranteeing optimal heat transmission by conduction.
A good screed must ensure that surfaces are levelled and loads evenly distributed. They should provide an excellent foundation for flooring and above all, ensure perfect housing for underfloor heating systems.
In combination with the innovative TIEMME SLIM system, Tiemme recommends using KNAUF blends: **NE 499 for screeds up to 5/10 mm** above the ashlar, **NE 425 for screeds up to 20 mm** above the ashlar.

NB: If using a self-leveling screed, follow the supplier's instructions.

THERMAL CYCLE



- No mesh
- Joints every 20 m

KNAUF screed		Panel code	
		450 0641	**450 0642**
NE 499 5/10 mm thickness λ = 1.3 W/mk	Panel thickness	19 mm	23.6 mm
	Panel thickness + screed	24 / 29 mm	33.6 mm
NE 425 20 mm thickness λ = 1.4 W/mk	Panel thickness	19 mm	23.6 mm
	Panel thickness + screed	39 mm	43.6 mm

VALUES OF OVERLOADS FOR DIFFERENT CATEGORIES OF CONSTRUCTION USE

A series of laboratory tests have been carried out on samples of the TIEMME SLIM radiant system to verify the physical and mechanical characteristics.

The technical construction standards referred to in Ministerial Decree 17-01-2017 paragraph 3.1.4 OVERLOADS classify loads depending on the different types of intended use of the installation.

The TIEMME SLIM panels with self-levelling KNAUF NE 499 and NE 425 screeds meet the legal requirements for categories up to Cat. E1 (Tab.3.1.II)

Tab. 3.1.II - Overload values for the different categories of building use.

Cat.	Environments	q_k (kN/m²)	Q_k (kN)	H_k (kN/m)
A	Environments for residential use			
	Areas for domestic and residential activities; this category includes the rooms of houses and relative services, hotels (excluding areas subject to crowding), hospital rooms	2.00	2.00	1.00
	Shared staircases, balconies, walkways	4.00	4.00	2.00
B	Offices			
	Cat. B1 Offices not open to the public	2.00	2.00	1.00
	Cat. B2 Offices open to the public	3.00	2.00	1.00
	Shared staircases, balconies, walkways	4.00	4.00	2.00
C	Environments subject to crowding			
	Cat. C1 Areas with tables, such as schools, cafes, restaurants, halls for banquets, readings and receptions.	3.00	3.00	1.00
	Cat. C2 Fixed seating areas such as churches, theatres, cinemas, conference and waiting rooms, university classrooms and lecture halls	4.00	4.00	2.00
	Cat. C3 Spaces with no obstacles to the movement of people, such as museums, exhibition halls, access areas to offices, hotels and hospitals, to lobbies of railway stations	5.00	5.00	3.00
	Cat. C4 Areas with possible physical activities such as ballrooms, gyms, stages	5.00	5.00	3.00
	Cat. C5 Areas that are subject to large crowds, such as public event buildings, concert halls, sports arenas and related grandstands, staircases and railway platforms	5.00	5.00	3.00
	Shared staircases, balconies, walkways	according to the category of use served, with the following limitations		
		≥ 4.00	≥ 4.00	≥ 2.00
D	Environments for commercial use			
	Cat. D1 Shops	4.00	4.00	2.00
	Cat. D2 Shopping centres, markets, department stores	5.00	5.00	2.00
	Shared staircases, balconies, walkways	according to the category of use served		
E	Areas for warehousing and commercial and industrial use			
	Cat. E1 Areas for the storage of goods and related areas of access, such as libraries, archives, warehouses, depots, manufacturing workshops	≥ 6.00	7.00	1.00*
	Cat. E2 Environments for industrial use	to be assessed case-by-case		
F-G	Depots and areas for vehicle traffic (excluding bridges)			
	Cat. F Depots, areas for traffic, parking and waiting areas for light vehicles (weight at full load up to 30 kN)	2.50	2 x 10.00	1.00**
	Cat. G Areas for traffic and car parks of medium-size vehicles (full-load weight between 30kN and 160 kN), such as access ramps, cargo loading and unloading areas	to be assessed case-by-case and, in any case, no less than		
		5.00	2 x 50.00	1.00**
H-I-K	Roofing			
	Cat. H Roofing accessible for maintenance and repair only	0.50	1.20	1.00
	Cat. I Roofing subject to the pedestrian traffic of environments in the category of use between A and D	Depending on the category they belong to		
	Cat. K Roofing for special uses, such as plants, heliports	to be assessed case-by-case		

* This does not include the horizontal action that may be exerted by stored materials

** only for railings or partitions in pedestrian areas. The action exerted by vehicles on the barriers must be assessed case by-case

THERMAL YIELDS

WINTER OPERATION - CERAMIC 10 mm (ceramic, terracotta, marble, quartz, etc. with a thermal resistance of 0.01 m^2 K/W)

Thermal resistance of flooring (**ceramic 10 mm**)	$R_{\lambda,B}$	0.01	[m^2K/W]
KNAUF screed thermal conductivity	λ_E	1.3	[W/mk]
Pipe thermal conductivity (Tiemme COBRAPEX pipe)	λ_R	0.38	[W/mk]
External diameter of the pipe	D_a	16.0	[mm]
Pipeworks thickness	S_r	2.0	[mm]
Screed thickness (above the pipe)	$S_{\mu,0}$	5.0	[mm]
Room temperature	θ_i	20.0	[°C]

SPECIFIC POWER AND AVERAGE SURFACE FLOOR TEMPERATURE (Values in compliance with the operating conditions indicated above)

Flow temperature [°C]	ΔT [°C]	Pipe distance 100 [mm]		Pipe distance 150 [mm]	
		Q [W/m^2]	Surf. T [°C]	Q [W/m^2]	Surf. T [°C]
33	5	73.5	26.8	62.5	25.9
	6	69.1	26.4	58.9	25.6
	7	64.6	26.0	55.0	25.2
	8	59.7	25.6	50.8	24.9
35	5	88.0	28.0	74.9	26.9
	6	83.8	27.7	71.3	26.6
	7	79.4	27.3	67.6	26.3
	8	74.9	26.9	63.7	26.0
38	5	109.6	29.8 *	93.3	28.4
	6	105.5	29.5 *	89.9	28.2
	7	101.4	29.1 *	86.3	27.9
	8	97.1	28.8	82.6	27.6
40	5	124.0	30.9 *	105.5	29.5 *
	6	120.0	30.6 *	102.1	29.2 *
	7	115.9	30.3 *	98.7	28.9
	8	111.7	30.0 *	95.1	28.6

* Value higher than the maximum floor temperature of 29°C foreseen by the UNI EN 1264 standard in living areas. In the perimeter areas the surface temperature of the floor can reach 35°C.

Surf. T = Average surface temperature of the floor. **Q** = Emission expressed in W/m^2.

SUMMER OPERATION - CERAMIC 10 mm (ceramic, terracotta, marble, quartz, etc. with a thermal resistance of 0.01 m^2K/W)

Thermal resistance of flooring (**ceramic 10 mm**)	$R_{\lambda,B}$	0.01	[m^2K/W]
KNAUF screed thermal conductivity	λ_E	1.3	[W/mk]
Pipe thermal conductivity (Tiemme COBRAPEX pipe)	λ_R	0.38	[W/mk]
External diameter of the pipe	D_a	16.0	[mm]
Pipeworks thickness	S_r	2.0	[mm]
Screed thickness (above the pipe)	$S_{\mu,0}$	5.0	[mm]
Room temperature	θ_i	26.0	[°C]

SPECIFIC POWER AND AVERAGE SURFACE FLOOR TEMPERATURE (Values in compliance with the operating conditions indicated above)

Flow temperature [°C]	ΔT [°C]	Pipe distance 100 [mm]		Pipe distance 150 [mm]	
		Q [W/m^2]	Surf. T [°C]	Q [W/m^2]	Surf. T [°C]
14 (51%) *	3	48.5	19.3	42.1	20.1
	4	45.9	19.6	39.8	20.4
	5	43.2	20.0	37.5	20.7
	6	40.4	20.3	35.0	21.0
15 (56%) *	3	43.9	19.9	38.1	20.6
	4	41.2	20.2	35.8	20.9
	5	38.5	20.6	33.4	21.2
	6	35.6	21.0	30.9	21.6
16 (60%) *	3	39.2	20.5	34.1	21.2
	4	36.6	20.8	31.7	21.5
	5	33.7	21.2	29.3	21.8
	6	30.7	21.6	26.6	22.1

* According to the UNI EN 1264 standard, the flow temperature of the system in cooling mode must be no less than 1K compared to the dew point value calculated in the presence of a dehumidification system For example, considering an environment at 26°C and relative humidity of 51%, the dew point temperature is 15°C, the flow temperature of the radiant floor system cannot be lower than 14°C.

Surf. T = Average surface temperature of the floor. **Q** = Emission expressed in W/m^2.

THERMAL YIELDS

WINTER OPERATION - PARQUET 15 mm (wood, linoleum, etc. with a thermal resistance of 0.06 m^2K/W)

Thermal resistance of flooring (**parquet 15 mm**)	$R_{\lambda,B}$	0.06	[m^2K/W]
KNAUF screed thermal conductivity	λ_E	1.3	[W/mk]
Pipe thermal conductivity (Tiemme COBRAPEX pipe)	λ_R	0.38	[W/mk]
External diameter of the pipe	D_a	16.0	[mm]
Pipeworks thickness	S_r	2.0	[mm]
Screed thickness (above the pipe)	$S_{\mu,0}$	5.0	[mm]
Room temperature	θ_i	20.0	[°C]

SPECIFIC POWER AND AVERAGE SURFACE FLOOR TEMPERATURE (Values in compliance with the operating conditions indicated above)

Flow temperature [°C]	ΔT [°C]	Pipe distance 100 [mm]		Pipe distance 150 [mm]	
		Q [W/m²]	Surf. T [°C]	Q [W/m²]	Surf. T [°C]
33	5	48.3	24.6	42.3	24.1
	6	45.4	24.4	39.8	23.9
	7	42.4	24.1	37.2	23.7
	8	39.2	23.8	34.4	23.4
35	5	57.7	25.5	50.7	24.9
	6	55.1	25.2	48.3	24.6
	7	52.2	25.0	45.8	24.4
	8	49.2	24.7	43.1	24.2
38	5	72.0	26.7	63.2	25.9
	6	69.4	26.5	60.8	25.7
	7	66.6	26.2	58.4	25.5
	8	63.8	26.0	55.9	25.3
40	5	81.5	27.5	71.4	26.6
	6	78.9	27.3	69.1	26.4
	7	76.2	27.0	66.8	26.2
	8	73.4	26.8	64.4	26.0

Surf. T = Average surface temperature of the floor. **Q** = Emission expressed in W/m^2.

SUMMER OPERATION - PARQUET 15 mm (wood, linoleum, etc. with a thermal resistance of 0.06 m^2K/W)

Thermal resistance of flooring (**parquet 15 mm**)	$R_{\lambda,B}$	0.06	[m^2K/W]
KNAUF screed thermal conductivity	λ_E	1.3	[W/mk]
Pipe thermal conductivity (Tiemme COBRAPEX pipe)	λ_R	0.38	[W/mk]
External diameter of the pipe	D_a	16.0	[mm]
Pipeworks thickness	S_r	2.0	[mm]
Screed thickness (above the pipe)	$S_{\mu,0}$	5.0	[mm]
Room temperature	θ_i	26.0	[°C]

SPECIFIC POWER AND AVERAGE SURFACE FLOOR TEMPERATURE (Values in compliance with the operating conditions indicated above)

Flow temperature [°C]	ΔT [°C]	Pipe distance 100 [mm]		Pipe distance 150 [mm]	
		Q [W/m²]	Surf. T [°C]	Q [W/m²]	Surf. T [°C]
14 (51%) *	3	35.9	20.9	31.9	21.4
	4	34.0	21.2	30.2	21.6
	5	32.0	21.4	28.5	21.9
	6	29.9	21.7	26.6	22.1
15 (56%) *	3	32.5	21.4	28.9	21.8
	4	30.6	21.6	27.2	22.1
	5	28.5	21.9	25.4	22.3
	6	26.4	22.2	23.4	22.5
16 (60%) *	3	29.1	21.8	25.9	22.2
	4	27.1	22.1	24.1	22.5
	5	25.0	22.3	22.2	22.7
	6	22.8	22.6	20.2	23.0

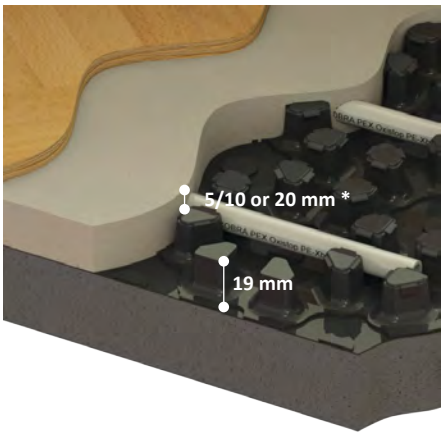
* According to the UNI EN 1264 standard, the flow temperature of the system in cooling mode must be no less than 1K compared to the dew point value calculated in the presence of a dehumidification system For example, considering an environment at 26°C and relative humidity of 51%, the dew point temperature is 15°C, the flow temperature of the radiant floor system cannot be lower than 14°C.

Surf. T = Average surface temperature of the floor. **Q** = Emission expressed in W/m^2.

LAYERING OF THE SYSTEM

TIEMME SLIM self-adhesive, with no insulating layer

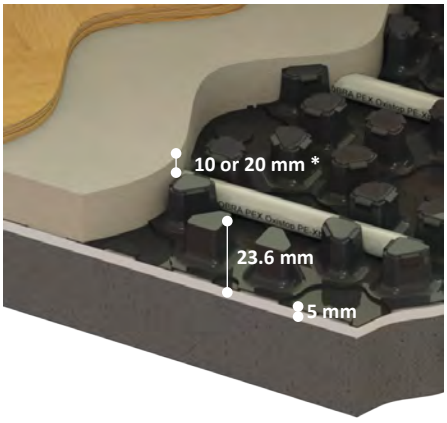
1)	Skirting	-
2)	Covering	-
3)	Lowered screed	-
4)	Pipe	**Art. 0200B**
5)	Panel	**Art. 4519**
6)	Perimetral band	**Art. 4507**



* Depending on the type of KNAUF screed used.

TIEMME SLIM with 5 mm thick insulating layer in EPS

1)	Skirting	-
2)	Covering	-
3)	Lowered screed	-
4)	Pipe	**Art. 0200B**
5)	Insulating panel	**Art. 4519**
6)	Perimetral band	**Art. 4507**
7)	PE sheet	**Art. 4503**



* Depending on the type of KNAUF screed used.

IMPORTANT NOTES:

To allow adequate absorption of system expansion, provide a perimetral band **Art. 4507** positioned along the entire perimeter of the premises and around any structural elements (e.g. pillars ...).

Make sure **the foundation that the installation will be laid onto is perfectly flat, an essential condition for applying lowered levels. Furthermore, when installing self-adhesive panels (to guarantee adhesion of the double-sided tape) the foundation must be clean, not dusty, free from bond-breakers, dry, free from rising damp and mechanically resistant.**

ITEM SPECIFICATIONS

Art. 4519 - Cod. 450 0641

Panel for radiant floor systems in compliance with UNI EN 1264, made of 1 mm thick, rigid thermoformed polystyrene, characterised by high resistance to wearing. Provided with studs for blocking pipe with external diameter of 16 and 17 mm and multiple laying distance of 50 mm (with pipe laying at 90°) or multiple of 71 mm (with pipe laying at 45°) and special interlocking system with perimetral joints (by overlapping lateral ashlars) for a solid joint between panels. Ashlars with undercut for laying pipe without having to use fixing clips. Panel equipped with bumps that minimise contact of the pipe with the insulation and maximise contact with the screed. Can be combined with lowered levels up to a minimum thickness of 5 mm above the pipe.
Flame retardant, Euroclass E reaction to fire (according to UNI EN 13501-1). Total plan dimensions: 1450x850 mm. Total thickness 19 mm.

Art. 4519 - Cod. 450 0642

Insulating panel for radiant floor systems in compliance with UNI EN 1264, made of 5 mm thick sintered expanded polystyrene (EPS), coupled with a 0.6 mm thick rigid sheet in thermoformed polystyrene which gives the panel high resistance to wearing. Provided with studs for blocking pipe with external diameter of 16 and 17 mm and multiple laying distance of 50 mm (with pipe laying at 90°) or multiple of 71 mm (with pipe laying at 45°) and special interlocking system with perimetral joints (by overlapping lateral ashlars) for a solid joint between panels. Ashlars with undercut for laying pipe without having to use fixing clips. Panel equipped with bumps that minimise contact of the pipe with the insulation and maximise contact with the screed. Can be combined with lowered levels up to a minimum thickness of 10 mm above the pipe.
Complies with European Standard UNI EN 13163 with CE marking, flame retardant, Euroclass E reaction to fire (according to UNI EN 13501-1), compressive strength at 10% crushing 200 kPa, declared thermal conductivity 0.034 W/mk.
Total plan dimensions: 1450x850 mm. Available insulation thickness: 5 mm (R_D = 0.15 m² K/W). Total thickness 23.6 mm.

CERTIFICATIONS

UNI EN 13163