



Components

Pipes - Insulating sheets

Additives - Installation accessories

UNI EN 1264 Certificate



aquatechnik®

aquatechnik led the success of radiant heating systems in European countries: in the '80s, it had already conceived a complete system including pipes, components and devices for regulation purposes, which met the most varied needs in designing this plant-engineering typology.



In this way, the **valu-technik** system was created; it makes use of the principle of radiant heat exchange and allows obtaining house comfort levels higher than any other heating/conditioning system. The continuous evolution of the materials, the constant improvement of the components, in addition to a thirty-year experience and the most varied implementations, allowed aquatechnik to improve the **valu-technik** system, with the passing of time, to make it increasingly performing and suitable for the standards in force. Also concerning the summer version of the radiant system, aquatechnik was one of the first companies to offer this innovatory type of installation, and obtained great appreciation by the international market.



The constant attention by the company to new technologies and to the worksite needs, whose purpose is to continuously improve technical solutions and products, allowed **aquatechnik** to supply the market with a complete and high-quality range of products, which obtained the certification according to the UNI EN 1264 standards concerning the installation of civil and industrial floor radiant systems.

The wide range of pipes, insulating sheets, additives for screeds and accessories in general, allows creating any type of system with radiant panels, besides allowing every technician to choose the more suitable solution. Choosing **aquatechnik** does not mean to simply select a supplier, but to operate with a skilled partner, which always pays attention to specific needs and manufacturing problems.



PIPING

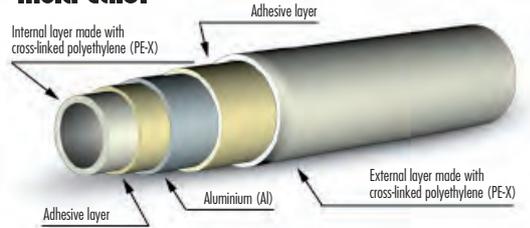
aquatechnik offers three different piping types to create floor-panel radiant systems.

The **multi-color** pipe is a high-quality multilayer pipe; the intermediate layer among the 5 layers is made with a special aluminium alloy that, besides having the function of anti-oxygen barrier, allows product ductility during the processing operations. The **multi-color** pipe is suitable for all system types: heating, air-conditioning and sanitary; this feature allows recovering processing scrap. It complies with the European UNI EN 21003 standards and it was approved by the most important international institutes; it is a reference point for quality and performance at European level.

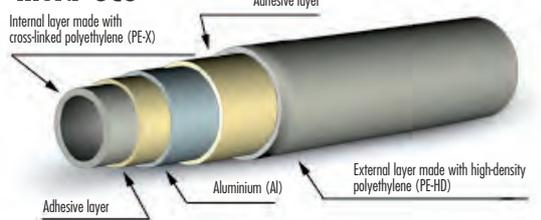
The **multi-eco** pipe is equipped with the same stratigraphy as the **multi-color** pipe; the difference is the reduced thickness of the aluminium alloy-thus, assuring an excellent malleability and a reduced cost with a performance always above the standards, even if slightly lower than the **multi-color** pipe.

The **polipert** pipe is the only product without the internal aluminium layer, as it is completely made with plastic material. It includes 5 layers and the intermediate one is made with EVOH, whose function is to be an anti-oxygen barrier. The product low weight and the excellent flexibility allow easy installation, even if it does not assure the same ductility of the products provided with the aluminium layer. Tested according to the European and DIN 16833, 16837 and 4726 standards, it is a specific product for heating plant-engineering and is primarily used in floor-panel radiant systems, it offers an excellent quality/price ratio and is more suitable in case of processing operations with shaped sheets provided with thermoshaped and mechanical coupling.

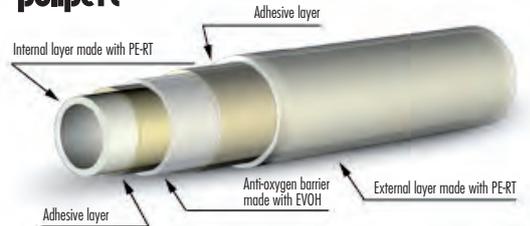
multi-color



multi-eco



polipert



TECHNICAL FEATURES OF THE PIPING

MULTI-COLOR PIPES (PE-X/Al/PE-X)

Code	Description	Nom. Ø	Thick.	Alu- minium	Internal Ø	Water content	Pack.	Weight per metre	Weight package
		mm							
74005	Multi-color pipe in coils	16	2	0,30	12,0	0,113	250	0,120	30,0
84005	Multi-color pipe in coils	16	2	0,30	12,0	0,113	500	0,120	60,0
84009	Multi-color pipe in coils	20	2	0,40	16,0	0,201	250	0,150	37,5



MULTI-ECO PIPES (PE-X/Al/PE-HD)

Code	Description	Nom. Ø	Thick.	Alu- minium	Internal Ø	Water content	Pack.	Weight per metre	Weight package
		mm							
74505	Multi-eco pipe in coils	16	2	0,20	12,0	0,113	250	0,120	30,0
74507	Multi-eco pipe in coils	16	2	0,20	12,0	0,113	500	0,120	60,0
74511	Multi-eco pipe in coils	20	2	0,20	16,0	0,201	250	0,150	37,5



POLIPERT PIPES (PE-RT/EVOH/PE-RT)

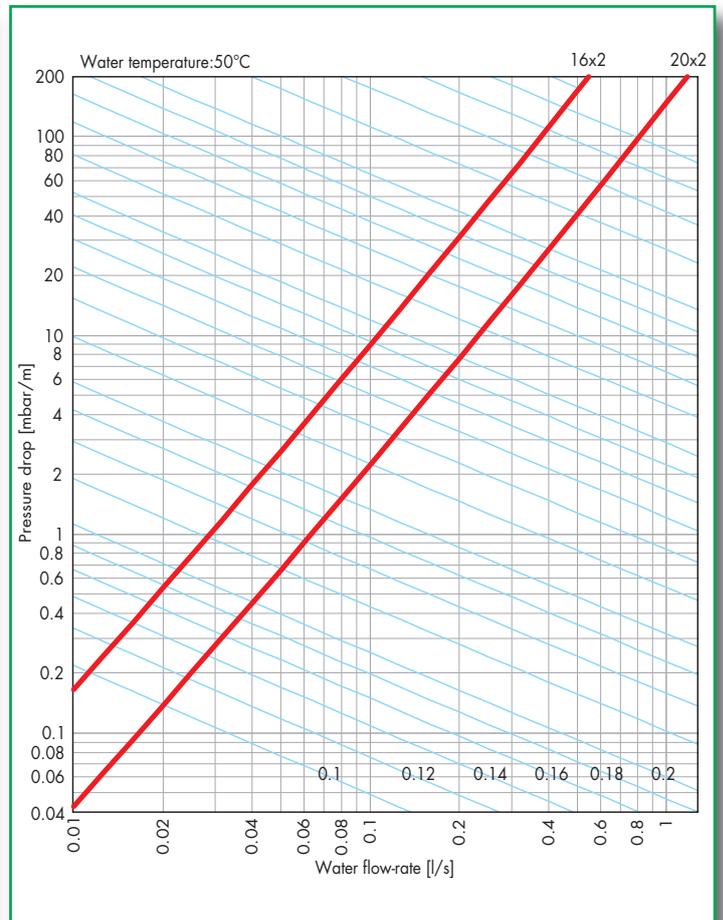
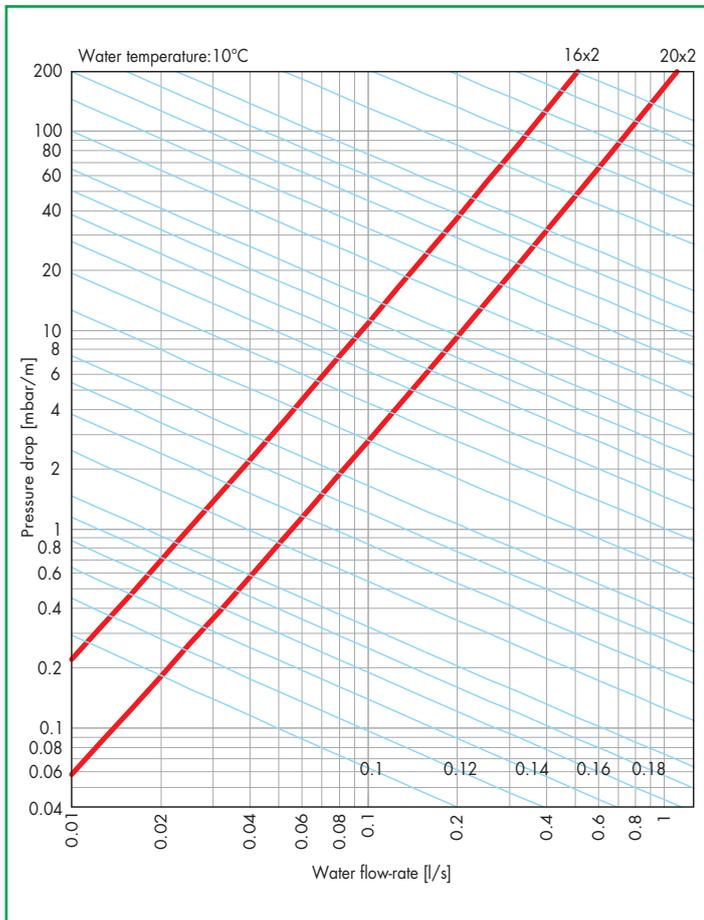
Code	Description	Nom. Ø	Thick.	Alu- minium	Internal Ø	Water content	Pack.	Weight per metre	Weight package
		mm							
75005	Polipert pipe in coils	16	2		12,0	0,113	250	0,080	20,0
75007	Polipert pipe in coils	16	2		12,0	0,113	500	0,080	40,0
75011	Polipert pipe in coils	20	2		16,0	0,201	250	0,110	27,5



TECHNICAL FEATURES

Feature	multi-calor	multi-eco	polipert
Name	PE-X + Al + PE-X (cross-linked polyethylene + aluminium + cross-linked polyethylene)	PE-X + Al + PE-HD (cross-linked polyethylene + aluminium + high-density polyethylene)	PE-RT+EVOH+PE-RT (polyethylene with increased resistance to temperature by means of an EVOH internal layer)
Colour	White	Grey	Semi-transparent
Aluminium welding	butt welding with TIG method (with control camera)	butt welding with TIG method (with control camera)	—
Chemical cross-linking	PE-Xb with silanes, minimum value 65% as per the UNI EN ISO 21003 standard	PE-Xb with silanes, minimum value 65% as per the UNI EN ISO 21003 standard	—
Adhesive	adhesion value always higher than 80 N/cm ²	adhesion value always higher than 80 N/cm ²	adhesion value always higher than 80 N/cm ²
Permeability to oxygen	% mg/l 0.00 (according to the DIN 4726 standard)	% mg/l 0.00 (according to the DIN 4726 standard)	% mg/l-24h < 0.1 (according to the DIN 4726 standard)
Maximum temperature	95°C	95°C	70°C
Maximum pressure	10 bar at 95°C / 30 bar at 20°C	10 bar at 95°C / 25 bar at 20°C	6 bar at 70°C
Working conditions	hot	class 1	class 1
	cold	5°C/20 bar: min. duration 50 years	5°C/20 bar: min. duration 45 years
Thermal conductivity at 20°C	0,430 W/mK	0,430 W/mK	0,400 W/mK
Linear expansion coeff.	0,026 mm/mK	0,026 mm/mK	0,190 mm/mK
Internal roughness	0,007 mm	0,007 mm	0,007 mm

DIAGRAM OF PRESSURE DROPS

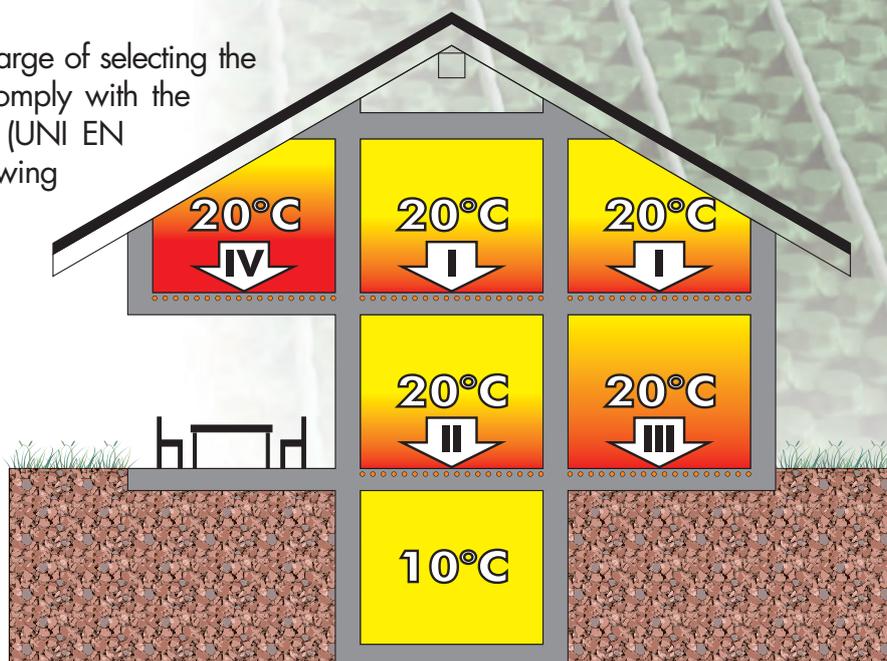


INSULATING SHEETS

In the for radiant panel systems, the insulating sheets have the important function of supporting and fastening the pipes, besides assuring the thermal insulation of the base. The sole presence of the insulating sheets assures significant energy savings thanks to the thermal insulation action preventing temperature dispersions both in summer and winter versions.

aquatechnik offers a wide range of insulating sheets, all of them are manufactured in compliance with the standards in force. Besides meeting all technical needs (minimum thickness: 10mm to 42mm), they adapt to site needs, thus facilitating the laying and the installation (sheets made with thermoformed and formed materials, plain sheets, with shapes, with and without soundproofing material, with and without vapour barrier).

The designer is in charge of selecting the sheets which must comply with the European standards (UNI EN 1264). The following illustrative diagram concerns the dimensioning of the minimum thickness of the insulating material according to the building structure and the insulating features of the sheets (thermal resistance).



HOW TO SELECT THE SHEETS

MINIMUM THERMAL RESISTANCE DOWNWARDS OF THE INSULATING MATERIALS ACCORDING TO THE UNI EN 1264-4 STANDARDS

	Lower heated area	Lower non-heated area or heated in a non-continuous way or directly on the ground*	Design external temperature $T_d \geq 0^\circ\text{C}$ (Southern Italy)	Design external temperature $0^\circ\text{C} > T_d \geq -5^\circ\text{C}$ (Central-Northern Italy)	Design external temperature $-5^\circ\text{C} > T_d \geq -15^\circ\text{C}$ (Northern Italy)
Thermal resistance	0,75 m ² K/W	1,25 m ² K/W	1,25 m ² K/W	1,50 m ² K/W	2,00 m ² K/W
Case	I	II/III	IV	IV	IV
Examples with shaped/plain aquatechnik sheets	art. 91232 - sm 25 mm	art. 91222 - sm 42 mm	art. 91222 - sm 42 mm	art. 91344 - sm 30 mm (sheet with soundproofing material)	art. 91222 - sm 42 mm +30 mm structural insulating material
Examples with aquatechnik sheets made with thermoformed material	art. 91240 - sm 25 mm	art. 91242 - sm 42 mm	art. 91242 - sm 42 mm	art. 91364 - sm 30 mm (sheet with soundproofing material)	art. 91356 - sm 42 mm +30 mm structural insulating material

* In case of phreatic surface ≤ 5 m, the value should be increased/ ** Values obtained from the UNI EN 1264 standard

NB1: sm = minimum sheet thickness

NB2: as for the structural insulating material, which can also be already included in the screed, we took into consideration a heat conductivity value equalling 0.04 W/mK.

If too thick sheets are difficult to be installed or in particularly unfavourable cases (as it is pointed out in the table above, example IV in Northern Italy), you can increase the screed insulation level by adding it with sheet materials, additives or products in general (such as, for example clay, polyurethane or wooden fibres), which increase the relevant thermal resistance. Remember that the above-mentioned solutions must be previously checked by the designers and approved by construction managers.

THERMAL INSULATION SHEET MADE WITH PREFORM

Thermal-insulation sheet that includes a polystyrene base with shapes in relief that allow a quick installation of 16mm-diameter pipes.

The sheet allows obtaining 50mm multiple passes, an effective pipe locking and its protection after the steps concerning the installation up to the total covering with the radiant screed.

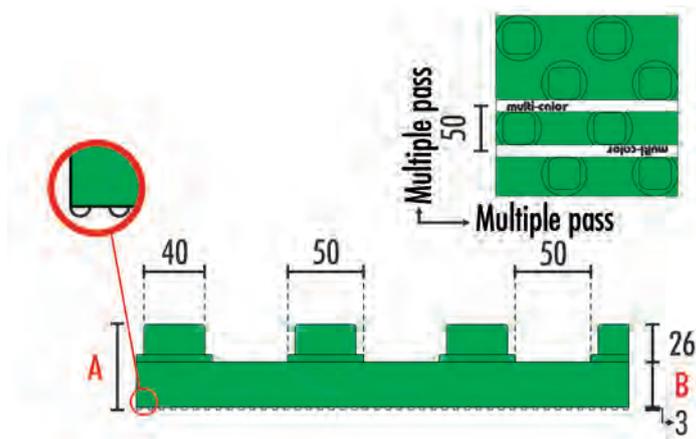
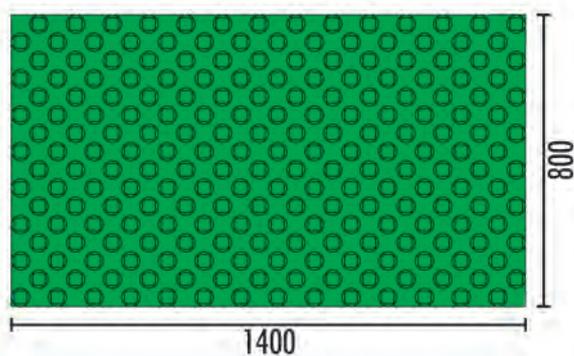
The upper part of the sheet is homogeneously hot-coupled to a solid high-density rolled polystyrene film (thickness: 0.15 mm), which is eco-friendly, in order to be fully impermeable to going up water vapour.

The base of the sheet is textured and, together with the shapes, allows increasing the thermal resistance level (as it is below specified in the weighted thermal resistance entry*) besides having a sound absorption function.

To install the sheets in an easier way, they are equipped with effective complementary joints on the four sides that allow a constant alignment, as well as a safe fixing.



Code	Package m ²	Effective area of sheet m ²	A mm	B mm	Thermal resistance R ₀	Weighted thermal resistance*	Transmittance
91230	10	1,12	44	15	0,45	0,66	K=2,22
91232	10	1,12	54	25	0,76	0,96	K=1,32
91220	10	1,12	59	30	0,91	1,12	K=1,10
91222	10	1,12	71	42	1,27	1,48	K=0,79



Properties	Reference standard	Unit of measurement	Value
EPS Class	EN 13163	—	200
Density	—	Kg/m ³	≥ 30
Heat conductivity λ _D	EN 12667	W/mK	0,033
Reaction to fire	EN 13501-1	—	Class E
Crushing strength R _c	EN 826	kPa	≥ 200
Sound insulation index (dynamic stiffness)	EN 29052-1	M/Nm ³	50
Sound absorption index	EN12354-2	ΔLw	≤ 20 dB
Water absorption after total immersion	EN12087	%	≤ 3
Vapour barrier (sheet coating)	—	μ	10.000
Water vapour diffusion resistance (sheet only)	EN 12086	μ	30 to 70
Water vapour permeability δ (sheet only)	EN 12086	Mg/(Pa.h.m)	0,010 to 0,024
Limit working temperature	—	°C	-30 to 80
Material	Sheet	EPS200 (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire	
	Sheet coating	HIPS High density extruded polystyrene (not self-extinguishing)	
Colour	Sheet	White	
	Sheet coating	Green	
Duration	it keeps its technical features in time		
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment		
Standards	The product complies with the provisions of Directive 89/106/EEC "Construction Products". During creation steps, UNI EN 13163 Product Standards were considered and applied.		



THERMAL INSULATION SHEET MADE WITH SOUNDPROOFING PREFORM

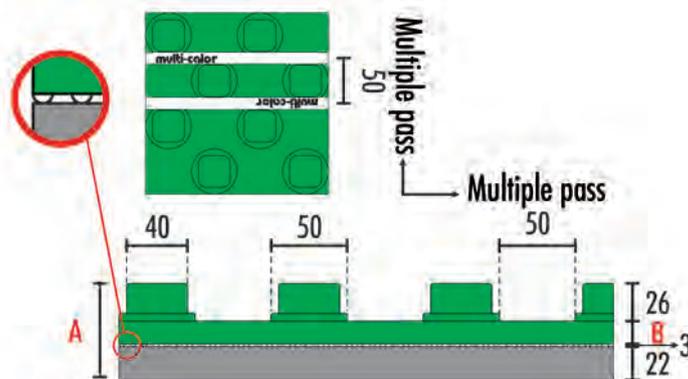
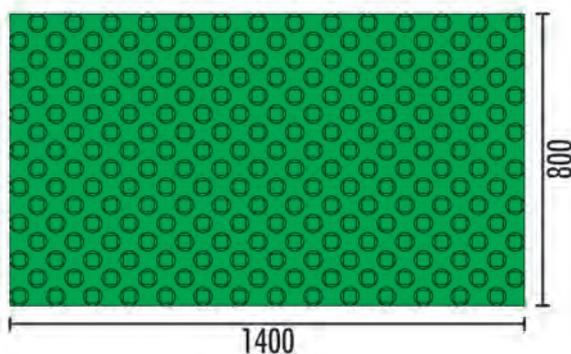
Thermal-insulation sheet that includes a polystyrene base with shapes in relief that allow a quick installation of 16mm-diameter pipes. The sheet allows obtaining 50mm multiple passes, an effective pipe locking and its protection after the steps concerning the installation up to the total covering with the radiant screed.

The upper part of the sheet is homogeneously hot-coupled to a solid high-density rolled polystyrene film (thickness: 0.15 mm), which is eco-friendly, in order to be fully impermeable to going up water vapour. The base of the sheet is textured and, together with the shapes, allows increasing the thermal resistance level (as it is below specified in the weighted thermal resistance entry*) besides having sound absorption function.

The lower layer is coupled with an impact sound insulating sheet made with elasticised expanded polystyrene (thickness: 22 mm), which assures effective sound insulation (ΔLw : >36 dB) besides remarkably increasing heat insulation. To install the sheets in an easier way, they are equipped with effective complementary joints on the four sides that allow a constant alignment, as well as a safe fixing.



Item	Package m ²	Effective area of sheet m ²	A mm	B mm	Thermal resistance R _D	Weighted thermal resistance*	Transmittance
91340	10	1,12	66	15	1,16	1,37	K=0,86
91344	10	1,12	81	30	1,62	1,83	K=0,62



Properties		Reference standard	Unit of measurement	Value
EPS Class	Sheet	EN 13163	—	200
	Sound-absorbing sheet	EN 13163	—	T
Density	Sheet	—	Kg/m ³	≥ 30
	Sound-absorbing sheet	—	Kg/m ³	≤ 20
Heat conductivity λ _D	Sheet	EN 12667	W/mK	0,033
	Sound-absorbing sheet	EN 12667	W/mK	0,031
Reaction to fire	EN 13501-1		—	Class E
Compressibility class	EN 12431		—	CP2 (that is, an overload is allowed in the finished floor equalling 500 kg/m ²)
Sound insulation index (dynamic stiffness)	EN 29052-1		M/Nm ³	≤ 20
Sound absorption index	Sheet	EN12354-2	ΔLw	≤ 20 dB
	Sound-absorbing sheet	EN12354-2	ΔLw	≥ 28 dB
Water absorption after total immersion	EN12087		%	≤ 3
Vapour barrier (sheet coating)	—		μ	10.000
Water vapour diffusion resistance (sheet only)	EN 12086		μ	30 to 70
Water vapour permeability δ (sheet only)	EN 12086		Mg/(Pa.h.m)	0,010 to 0,024
Limit working temperature	—		°C	-30 to 80
Material	Sheet	EPS200 (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire		
	Sheet coating	HIPS High density extruded polystyrene (not self-extinguishing)		
	Sound-absorbing sheet	EPS T (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire		
Colour	Sheet	White		
	Sheet coating	Green		
	Sound-absorbing sheet	Grey		
Duration	it keeps its technical features in time			
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment			
Standards	 The product complies with the provisions of Directive 89/106/EEC "Construction Products". During creation steps, UNI EN 13163 Product Standards were considered and applied.			

THERMAL INSULATION SHEET WITHOUT VAPOUR BARRIER

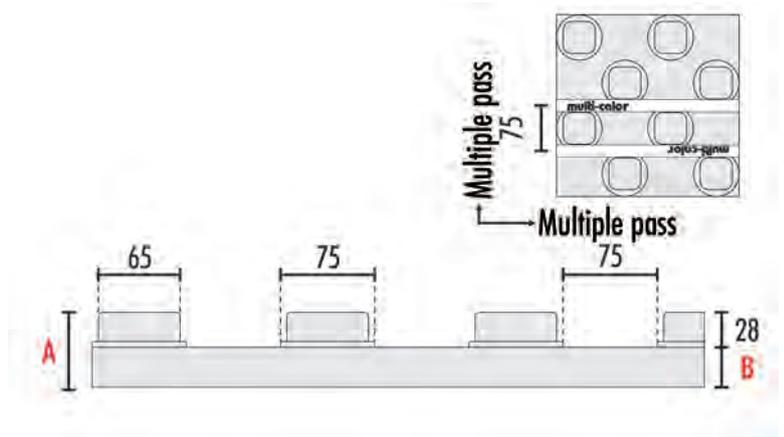
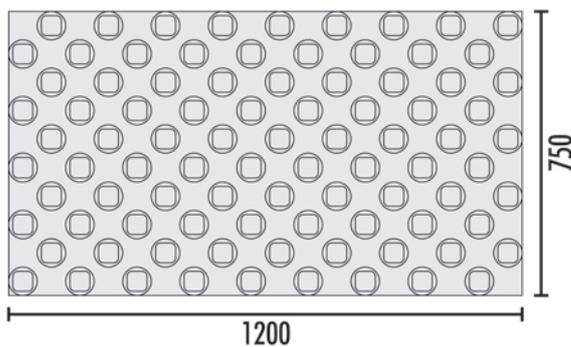
Thermal-insulation sheet including a polystyrene base with shapes in relief that allow a quick installation of pipes whose diameter is included between 16mm and 20mm. The sheet allows obtaining 75mm multiple passes, an effective pipe locking and its protection after the steps concerning the installation up to the total covering with the radiant screed

The presence of the shapes allows increasing the thermal resistance level (as it is below specified in the weighted thermal resistance entry*).

To install the sheets in an easier way, they are equipped with effective complementary joints on the four sides that allow a constant alignment, as well as a safe and fixing.



Code	Package m ²	Effective area of sheet m ²	A mm	B mm	Thermal resistance R ₀	Weighted thermal resistance*	Transmittance
91235	9	0,90	56	25	0,76	0,96	K=1,32
91237	9	0,90	73	42	1,27	1,47	K=0,79



Properties	Reference standard	Unit of measurement	Value
EPS Class	EN 13163	—	200
Density	—	Kg/m ³	≥ 30
Heat conductivity λ ₀	EN 12667	W/mK	0,033
Reaction to fire	EN 13501-1	—	Classe E
Crushing strength R _c	EN 826	kPa	≥ 200
Sound insulation index (dynamic stiffness)	EN 29052-1	M/Nm ³	50
Sound absorption index	EN12354-2	ΔL _w	≤ 20 dB
Water absorption after total immersion	EN12087	%	≤ 3
Water vapour diffusion resistance (sheet only)	EN 12086	μ	da 30 a 70
Water vapour permeability δ (sheet only)	EN 12086	Mg/(Pa.h.m)	da 0,010 a 0,024
Limit working temperature	—	°C	da -30 a 80
Material	EPS200 (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire		
Colour	White		
Duration	it keeps its technical features in time		
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment		
Standards	The product complies with the provisions of Directive 89/106/EEC "Construction Products". During creation steps, UNI EN 13163 Product Standards were considered and applied.		



THERMAL INSULATION SHEET MADE WITH PREFORM

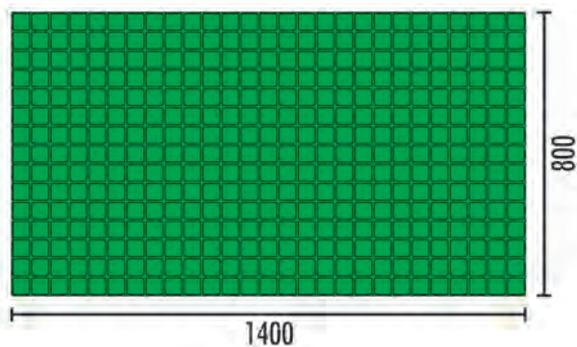
Thermal-insulation sheet including a flat polystyrene base with bas-relief squares having a 50mm side, which allow aligning pipes of any diameter. To effectively lock the pipe during the installation steps, it is advisable to use specific fastening clips.

The upper part of the sheet is homogeneously hot-coupled to a solid high-density rolled polystyrene film (thickness: 0.15 mm), which is eco-friendly, in order to be fully impermeable to going up water vapour.

To install the sheets in an easier way, they are equipped with effective complementary joints on the four sides that allow a constant alignment, as well as a safe fixing.



Code	Package m ²	Effective area of sheet m ²	A mm	Thermal resistance R _D	Transmittance
91240	10	1,12	25	0,76	K=1,32
91242	10	1,12	42	1,27	K=0,79



Properties	Reference standard	Unit of measurement	Value
EPS Class	EN 13163	—	200
Density	—	Kg/m ³	≥ 30
Heat conductivity λ _D	EN 12667	W/mK	0,033
Reaction to fire	EN 13501-1	—	Class E
Crushing strength R _c	EN 826	kPa	≥ 200
Sound insulation index (dynamic stiffness)	EN 29052-1	M/Nm ³	50
Sound absorption index	EN12354-2	ΔLw	≤ 20 dB
Water absorption after total immersion	EN12087	%	≤ 3
Vapour barrier (sheet coating)	—	μ	10.000
Water vapour diffusion resistance (sheet only)	EN 12086	μ	30 to 70
Water vapour permeability δ (sheet only)	EN 12086	Mg/(Pa.h.m)	0,010 to 0,024
Limit working temperature	—	°C	-30 to 80
Material	Sheet	EPS200 (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire	
	Sheet coating	HIPS High density extruded polystyrene (not self-extinguishing)	
Colour	Sheet	White	
	Sheet coating	Green	
Duration	it keeps its technical features in time		
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment		
Standards	The product complies with the provisions of Directive 89/106/EEC "Construction Products".		
	During creation steps,		
UNI EN 13163 Product Standards were considered and applied.			

INSULATING SHEET MADE WITH THERMOFORMED MATERIAL

Insulating sheet made with thermoformed material including an expanded polystyrene base coupled with a solid high-density polystyrene thermoformed material (thickness: 0.6 mm).

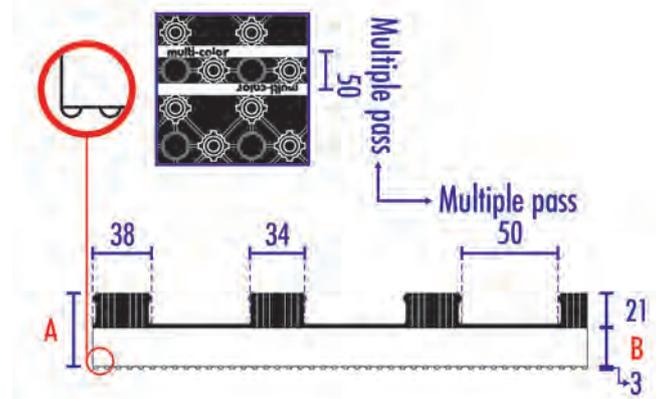
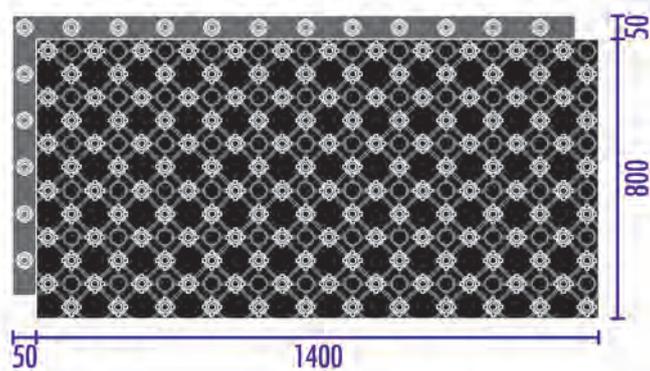
The particular structure of the shapes in the thermoformed material allows to safely, quickly and effectively lock 16mm-diameter pipes, thus assuring a quicker and easier installation, besides providing full impermeability to going up water vapour.

During the installation, the sheet coupling is facilitated by a protruding band in the thermoformed material, which allows overlapping and jointing the shapes; the presence of the aforesaid band on two sides allows a homogeneous installation and assures the absence of thermal bridges.

The base of the sheet is textured and, together with the shapes, allows increasing the thermal resistance level (as it is below specified in the weighted thermal resistance entry*) besides having a sound absorption function.



Code	Package m ²	Effective area of sheet m ²	A mm	B mm	Thermal resistance R ₀	Weighted thermal resistance*	Transmittance
91350	10	1,12	34	10	0,30	0,47	K=3,33
91352	10	1,12	44	20	0,61	0,77	K=1,64
91353	10	1,12	49	25	0,76	0,92	K=1,32
91354	10	1,12	54	30	0,91	1,08	K=1,10
91356	10	1,12	66	42	1,27	1,44	K=0,79



Properties	Reference standard	Unit of measurement	Value
EPS Class	EN 13163	—	200
Density	—	Kg/m ³	≥ 30
Heat conductivity λ _D	EN 12667	W/mK	0,033
Reaction to fire	EN 13501-1	—	Class E
Crushing strength R _c	EN 826	kPa	≥ 200
Sound insulation index (dynamic stiffness)	EN 29052-1	M/Nm ³	50
Sound absorption index	EN12354-2	ΔLw	≤ 20 dB
Water absorption after total immersion	EN12087	%	≤ 3
Vapour barrier (sheet coating)	—	μ	10.000
Water vapour diffusion resistance (sheet only)	EN 12086	μ	30 to 70
Water vapour permeability δ (sheet only)	EN 12086	Mg/(Pa.h.m)	0,010 to 0,024
Limit working temperature	—	°C	-30 to 80
Material	Sheet	EPS200 (EN 13163) Self-extinguishing expanded polystyrene, class E of reaction to fire	
	Sheet coating	HIPS High density extruded polystyrene (not self-extinguishing)	
Colour	Sheet	White	
	Sheet coating	Black	
Duration	it keeps its technical features in time		
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment		
Standards	The product complies with the provisions of Directive 89/106/EEC "Construction Products". During creation steps, UNI EN 13163 Product Standards were considered and applied.		

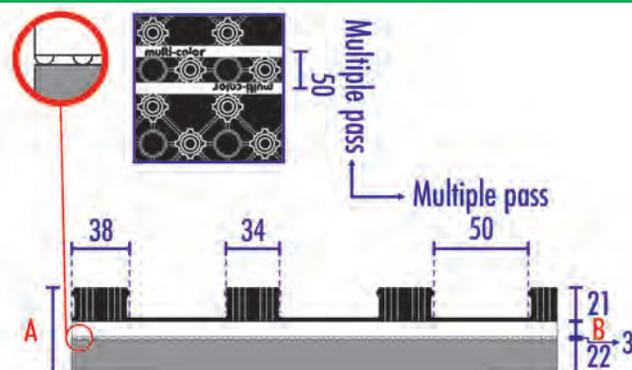
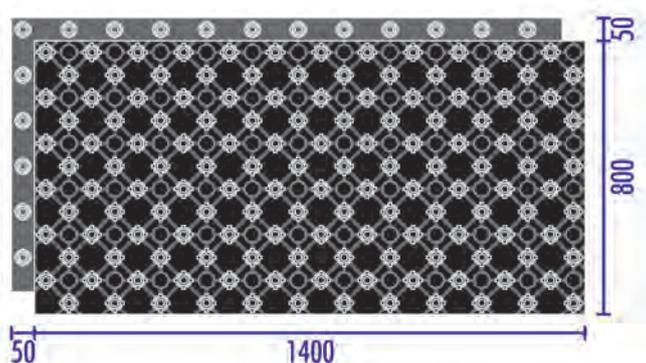


INSULATING SHEET MADE WITH SOUNDPROOFING THERMOFORMED MATERIAL

Soundproofing insulating sheet made with thermoformed material, including an expanded polystyrene base coupled to a high-density solid polystyrene thermoformed material (thickness: 0.6 mm). The particular structure of the shapes in the thermoformed material allows to safely, quickly and effectively lock 16mm-diameter pipes, thus assuring a quicker and easier installation, besides providing a full impermeability to going up water vapour. The lower layer is coupled to an impact insulating sheet made with elasticised expanded polystyrene (thickness: 22 mm), which assures an effective sound insulation (ΔL_w : >36 dB) besides remarkably increasing the heat insulation. Between the insulating and the soundproofing sheets, there is a texture that, together with the shapes, allows to increase the thermal resistance level (as it is below specified in the weighted thermal resistance entry*) besides having a sound absorption function. During the installation, the sheet coupling is facilitated by a protruding band in the thermoformed material, which allows overlapping and jointing the shapes; the presence of the aforesaid band on two sides allows a homogeneous installation and assures the absence of thermal bridges.



Code	Package m ²	Effective area of sheet m ²	A mm	B mm	Thermal resistance R ₀	Weighted thermal resistance*	Transmittance
91360	10	1,12	56	10	1,01	1,18	K=0,99
91362	10	1,12	66	20	1,32	1,48	K=0,76
91364	10	1,12	76	30	1,62	1,79	K=0,62



Properties	Reference standard	Unit of measurement	Value
EPS Class	Sheet	EN 13163	200
	Sound-absorbing sheet	EN 13163	T
Density	Sheet	—	Kg/m ³ ≥ 30
	Sound-absorbing sheet	—	Kg/m ³ ≤ 20
Heat conductivity λ ₀	Sheet	EN 12667	W/mK 0,033
	Sound-absorbing sheet	EN 12667	W/mK 0,031
Reaction to fire	EN 13501-1	—	Class E
Compressibility class	EN 12431	—	CP2 (that is, an overload is allowed in the finished floor equalling 500 kg/m ²)
Sound insulation index (dynamic stiffness)	EN 29052-1	M/Nm ³	≤ 20
Sound absorption index	Sheet	EN12354-2	ΔL _w ≤ 20 dB
	Sound-absorbing sheet	EN12354-2	ΔL _w ≥ 28 dB
Water absorption after total immersion	EN12087	%	≤ 3
Vapour barrier (sheet coating)	—	μ	10.000
Water vapour diffusion resistance (sheet only)	EN 12086	μ	30 to 70
Water vapour permeability δ (sheet only)	EN 12086	Mg/(Pa.h.m)	0,010 to 0,024
Limit working temperature	—	°C	-30 to 80
Material	Sheet	EPS200 (EN 13163)	Self-extinguishing expanded polystyrene, class E of reaction to fire
	Sheet coating	HIPS	High density extruded polystyrene (not self-extinguishing)
	Sound-absorbing sheet	EPS T (EN 13163)	Elasticised expanded polystyrene, self-ext., class E of reaction to fire
Colour	Sheet	—	White
	Sheet coating	—	Black
	Sound-absorbing sheet	—	Grey
Duration	it keeps its technical features in time		
Release of dangerous substances to the external environment	it does not release dangerous substances to the environment		
Standards	The product complies with the provisions of Directive 89/106/EEC "Construction Products". During creation steps, UNI EN 13163 Product Standards were considered and applied.		

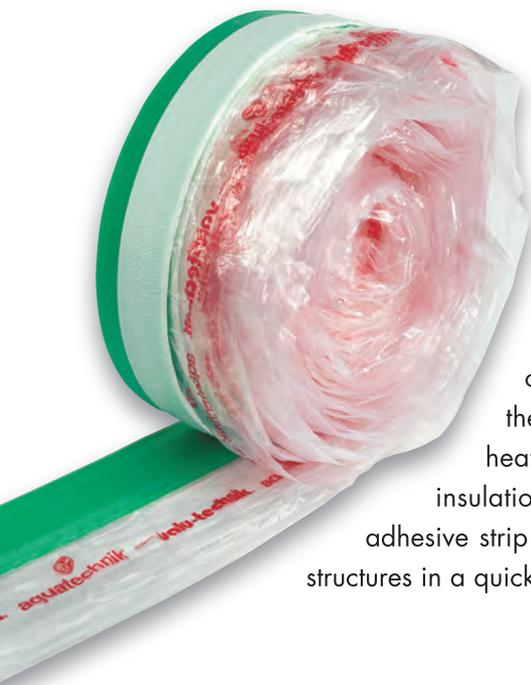


OTHER ACCESSORIES

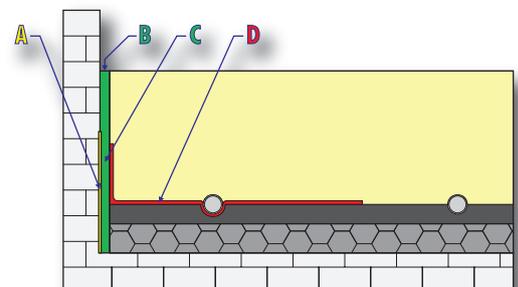
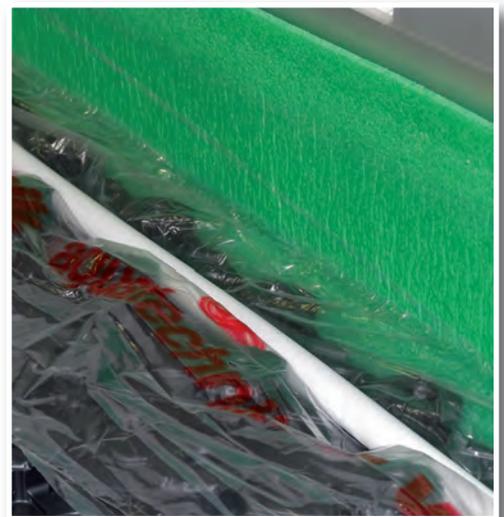
aquatechnik offers a range of accessories to lay and complete the screed.

THERMAL-INSULATION BASEBOARD

The thermal-insulation baseboard over the perimeter is a product made with closed-cell expanded polyethylene; it is light, impermeable, rot-proof, mildew-proof and highly resistant to chemical attacks and to alkaline reactions of cement manufactured objects; it has to be installed along all walls, columns, against the staircases and, generally speaking, close to every vertical surface that is going to enter into contact with the slab (in compliance with the provisions of the UNI EN 1264 standards).



The function of the thermal-insulation baseboard is to limit the expansion of the screed when the system is operating and to prevent thermal bridges. It is equipped with a transparent strap that is glued into the baseboard. The strap overlaps the insulating sheet and so prevents the concrete casting from penetrating under the sheets, thus lifting them and creating heat bridges. Furthermore, the thermal-insulation baseboard is provided with an adhesive strip that allows installing it against vertical structures in a quick and simple way.



Code	Coil length	A Bonding agent height	B Thickness	C Polyethylene height	D Strap height	E Total height
91250	50 m	100 mm	8 mm	150 mm	300 mm	360 mm
91251	50 m	100 mm	8 mm	250 mm	300 mm	460 mm

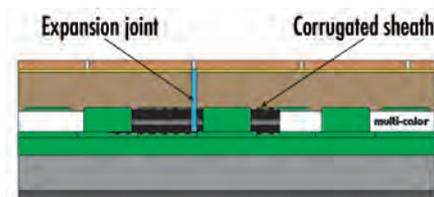
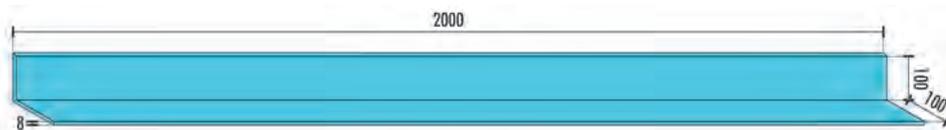
Properties	Reference standard	Value
Density	—	23/25 kg/m ³ - 30/33 kg/m ³ /100kg
Heat conductivity λ ₀	UNI EN 12667	0,040 W/mK
Compressive stress at 10% deformation	UNI EN 186	13,002 kPa (tested in a 5mm thickness)
Working temperature	—	-10° +70°C
Resistance to ozone	—	Excellent
Resistance to mildews and insects	—	Excellent
Toxicity	ANFOR NF 16-101-1988 - ANFOR NF X70/100/2001 ANFOR NF 10-702-1-1995 - ANFOR NF 10-702-2-1994	Report no. CSI DC 01/494F05 dated 07/07/05
Resistance to deformations	—	Excellent
CFC-free (Freon)	Compliant with the Italian Law 549 dated 28/12/93	

EXPANSION JOINTS

The expansion joints are products made with closed-cell expanded polyethylene; they are light, impermeable, rot-proof, mildew-proof and highly resistant to chemical attacks and to alkaline reactions of the cement objects, they are used to balance screed expansions/contractions.

They must cross the entire layer of concrete and must be realized in case of surfaces > 40 sqm or in case of lengths > 8 m (in compliance with the provisions of the UNI EN 1264 standards).

Next to the aforesaid joints, the pipe must be protected by using a specific corrugated 30/40cm sheath.



Properties	Reference standard	Value
Item	—	91258
Density (specific weight)	—	23/25 kg/m ³
Compressive stress at 10% deformation	UNI EN 186	13,002 kPa (tested in a 5mm thickness)
Working temperature	—	-20° +80°C
Resistance to ozone	—	Excellent
Resistance to mildews and insects	—	Excellent
Toxicity	ANFOR NF 16-101-1988	Conventional toxicity index: 10 Smoke index: 7 – Smoke class: F1
Resistance to deformations	—	Excellent
Vapour permeability	—	Excellent
CFC-free (Freon)	In compliance with the Italian Law 549 dated 28/12/93	

SYNTHETIC FIBRES

Polypropylene synthetic fibres agglomerated into flocks, characterised by a high specific surface, were expressly conceived to prevent the plastic shrinkage of concrete, which causes cracks especially during the middle ageing period.

Perfect dispersibility in cementitious mixtures, high adherence properties to the matrix, chemical resistance in alkaline environment and absence of degradation phenomena caused by mildews, fungi, etc., make synthetic fibres particularly suitable to be used in cement matrices.

The use of synthetic fibres, when fresh, allows:

- considerably limiting the shrinkage of concrete during the plastic phase;
- limiting bleeding and segregation phenomena;
- facilitating surface finishing.

When hardened, they contribute to obtain more long-lasting concrete, as it is crack-free, and so more resistant to the attack by aggressive agents.



Properties	Value
Code	91270
Length	24 mm
Diameter	30 µm
Specific mass	0,91 g/cm ³
Electrical conductivity	none
Compliance	the product is not a compound classified as dangerous according to the Directive 1999/45/EC
	<ul style="list-style-type: none"> - Screeds in private houses (thickness: 65 mm, according to DIN standards): 0.5 Kg per m³ of cement mixture. - Reduced screeds in private houses (thickness: 45 mm, according to DIN standards): 0.7 to 0.8 Kg per m³ of cement mixture. - Industrial screeds with variable thickness: 0.5 to 0.8 Kg per m³ of cement mixture.
Dosage	<p>NB1: for product uses in doses other than the specified values and in particular cases, it is advisable to call the Engineering Department.</p> <p>NB2: product overdosing, as well as unsuitable preparation of the cement mixture, can cause material accumulations, which may weaken the structure of the screed.</p>

THERMAL ADDITIVE

The VHF thermal additive is a super-fluidifying agent based on second-generation polycarboxylate ethers; it was specifically conceived and manufactured for cement mixtures. Its features make it particularly suitable to make ready-mixed concrete materials for floor-mounted radiant systems.

The use of the VHF thermal additive allows:

- improving the workability and the mechanical resistance of concrete, as well as increasing its duration and impermeability;
- increasing the heat conductivity of the screeds by increasing the density;
- reducing the possibility of cracks next to the pipes thanks to improved mechanical resistances;
- limiting shrinkages by offering a breaking prevention action thanks to the reduction in the water/cement ratio (the VHF thermal additive allows reducing water by 20% ± 30% compared with normal screeds without additives).



Properties	Value
Code	91265
Shape	Liquid
Colour	Amber-coloured
Specific weight	1.024-1.064 g/ml at 20°C
Density	1-1.1 g/cm ³ at 20°C
pH	5-7 as is at 20°C
Boiling point	> 100°C
Solubility in water	mixable at 20°C
Viscosity	50-150 cps at 20°C
Package	10l.
Conformity	chloride-free in compliance with UNI EN 934-2, UNI EN 480 (1-2), UNI 10765, and ASTM C494-92 (type F) standards
Dosage	- Screeds in private houses (thickness: 65 mm, pursuant to DIN standards): 0.5 to 0.7 Kg per 100 Kg of cement or 1.8 Kg per m ³ of cement mixture.
	- Reduced screed in private houses (thickness: 45 mm, pursuant to DIN standards) or high-fluidity casts: 1 to 1.4 Kg per 100 Kg of cement or 3.6 Kg per m ³ of cement mixture.
	- Industrial screeds with variable thickness: 1 Kg every 100 Kg of cement or 3 Kg per m ³ . For product uses in doses other than the specified values and in particular cases, it is advisable to call the Engineering Assistance Service.
NOTE: for product uses in doses other than the specified values and in particular cases, it is advisable to call the Engineering Department.	

ACCESSORIES SUPPORTING THE INSTALLATION OF THE SYSTEM

To facilitate the operations to install the system with radiant panels, **aquatechnik** provides the technicians with several accessories that allow improving and speeding up the final result of piping installation.

MULTI-PURPOSE TROLLEY TR 20

The trolley TR 20 is a very useful device that can facilitate and speed up the piping installation operation (art. 50205); its functions are as follows:

- **rools support:** the trolley can hold pipe rools of all lengths up to 250 m and with 14, 16, 18 and 20 diameters. In addition, it can hold coated pipe rools;
- **unrolling of the rools:** thanks to a clutch system, the trolley TR 20 can facilitate pipe reel unrolling operations;
- **straightening of the rools:** the trolley TR 20 is also equipped with a piping straightening system.

The above-mentioned features of the trolley TR 20 allow facilitating and improving the installation of hydraulic circuits, besides allowing considerable economic savings. Indeed, its use allows the technicians to work autonomously, without the support of a second operator.



HOW TO FASTEN THE PIPES

During the laying operation, the elastic memory of the piping can cause pipe lifting, usually next to pipe curves.

aquatechnik provides the technicians with a complete range of clips, which allow anchoring the piping to the thermal-insulation sheets.

Clips (art. 90210): they are made with plastic material; thanks to their rounded shape, they embrace the pipe. They are provided with fins that facilitate the introduction into the thermal-insulation sheets and prevent the relevant disconnection. They are supplied individually (in packages with 100 pcs) for manual fastening or assembled into strips with 100 pcs (art. 90230) for anchoring operations by using a specific fastening device (art. 50203).

They can be installed both in thermal-insulation sheets with shapes and in plain sheets.

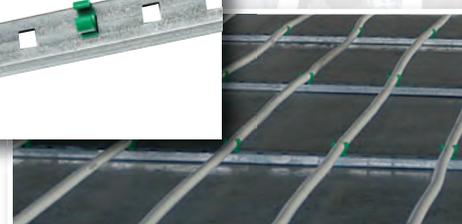
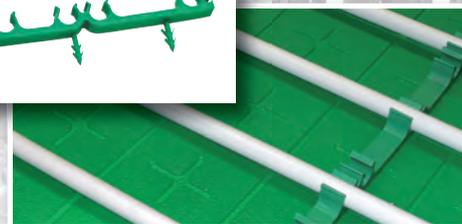
Bridge clips (art. 90265): they are made with plastic material and are provided with fins that facilitate the introduction into the thermal-insulation sheets and prevent the relevant disconnection. They lock the pipes installed in thermal-insulation sheets with shapes and can also have the function of locking the electro-welded net.

Rail clips (art. 90260): they are made with plastic material and, on the base of the strips, are provided with fins that facilitate the introduction into the thermal-insulation sheets and prevent the relevant disconnection.

They lock the pipes installed in plain thermal-insulation sheets, and allow creating multiple passes. Rail clips (300mm long) are modular and suitable for the installation of pipes over large areas.

Clips for metal strips (art. 90270): they are made with plastic material and are provided with a system to hook metal strips (art. 90280) with multiple pass of 50 cm, they are particularly suitable for the installation of pipes over large surfaces.

As for the installation, you can use the specific clip-wrench (art. 50245), which allows fastening the clips onto the metal bar in a quick and handy way.



CURVE TEMPLATES

When installing the systems with radiant panels, in particular with **polipert** pipes that are completely made with plastic material, the use of curve templates (art. 91120 for 16mm, 17mm and 18mm pipes, and art. 91122 for 20mm pipes) allows creating 90° curves, as in case of pipes with aluminium layer, thus preventing pipe narrowing and damaging.



OTHER ACCESSORIES

To complete the **valu-technik** range, **aquatechnik** offers all accessories that are necessary to professionally and safely process the system:

- cutter (art. 50285): a specific cutter conceived to cut the thermal-insulation sheets;
- metal wrench (art. 50402): specific tool to tighten Eurocone fittings;
- gauger (art. 50410): it is made with plastic material; it is necessary to calibrate pipe heads (14, 16, 18 and 20 diameters);
- shears CM 26 (art. 50275): precision shears to cut plastic and multilayer pipes (diameters: 14 to 20) with a single blow;
- shears (art. 50280): ratchet shears to cut plastic and multilayer pipes (diameters: 14 to 40).



SCREED

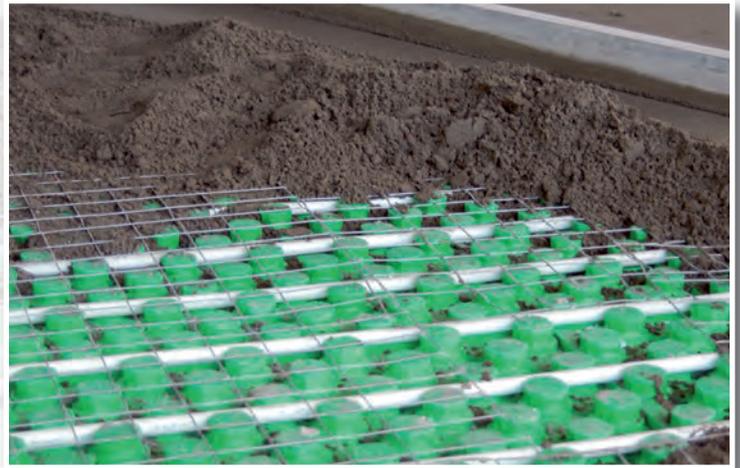
The term "screed" includes the various horizontal construction elements contributing to the creation of the flooring where the finishing items will be installed afterwards (tiles, parquet, resin, etc.).

The thickness of the screed varies according to the type of premises (for example, within a building, it can vary from 4 cm to 8 cm). Its purpose is to level the concrete substrate below (flooring); secondly, it is used to contain pipes and service cables.

The screed mainly includes three materials: cement, sand and water, which can be added with additives, increasing the relevant mechanical resistance, as well as their duration, impermeability and density (factor that increases heat conductivity), besides reducing the formation of cracks.

Furthermore, you can use iron nets or synthetic fibres to make the screed more resistant and strong.

The insulating sheets are buried into the screed; the pipes will be installed on such sheets and will contain the water conditioning the surrounding thanks to the principle of heat exchange by radiation.



APPROXIMATE CALCULATION OF THE MATERIALS

The two following tables are used to approximately and generally calculate the materials necessary to design the heating systems with radiant panels for civil and industrial uses.

The following tables aim at giving approximate instructions about the necessary quantities of materials.

Remember that the effective and thorough calculation must be carried out by design departments, who need to receive a scale plan of the building (to make an estimate) and the information about final flooring, as well as structural data about the house area, such as glasses, floors, walls, insulations, etc. (to perform the executive design).

CIVIL-USE HEATING SYSTEMS

Material	UM	Pass				
		5 cm	7,5 cm	10 cm	15 cm	20 cm
Pipe Ø 16	m	A x 19,00	A x 12,50	A x 9,50	A x 6,25	A x 5,00
Thermal-insulation sheet	m ²	A x 1	A x 1	A x 1	A x 1	A x 1
Clips (art. 90210)	pcs.	A x 40	A x 25	A x 20	A x 15	A x 10
Perimeter baseboard	m	A x 1	A x 1	A x 1	A x 1	A x 1
VHF thermal additive	Kg	A x 0,1	A x 0,1	A x 0,1	A x 0,1	A x 0,1
Synthetic fibres	Kg	A x 0,07	A x 0,07	A x 0,07	A x 0,07	A x 0,07

NB1: as for the calculation, a 6.5cm cement screed was taken into consideration to cover the circuits.

NB2: A means the area/surface to be heated.

INDUSTRIAL-USE HEATING SYSTEMS

Material	UM	Pass				
		5 cm	7,5 cm	10 cm	15 cm	20 cm
Pipe Ø 20	m	A x 9,50	A x 6,25	A x 5,00	A x 4,00	A x 3,50
Thermal-insulation sheet	m ²	A x 1	A x 1	A x 1	A x 1	A x 1
Metal strips (art. 90280)	pz.	A x 0,25				
Clips (art. 90270)	pz.	A x 5,0	A x 3,4	A x 2,5	A x 2,0	A x 1,7
Perimeter baseboard	m	A x 1	A x 1	A x 1	A x 1	A x 1
VHF thermal additive	Kg	A x 0,2				
Synthetic fibres	Kg	A x 0,14				

NB1: as for the calculation, a 13cm cement screed was taken into consideration to cover the circuits.

NB2: A means the area/surface to be heated.

PRACTICAL RECOMMENDATIONS

To perform a state-of-the-art installation of all above-mentioned components, please see the following practical instructions about the relevant installation and use. The instructions are the result of **aquatechnik** experience, which has been achieved thanks to constant support to plant engineers and designers to create systems with radiant panels.

However, it is necessary to remember that the following instructions must be purely interpreted as recommendations. All installations must be carried out in full compliance with the provisions that are included in the UNI EN 1264 standards. In addition, the thermotechnical designers are in charge of dimensional and structural calculations, as well as of particular instructions about material installations.

THERMAL-INSULATION BASEBOARD

- It is important to install the perimeter strip along all vertical structures: walls, columns, staircase steps, etc.
- Fasten the perimeter strip to the vertical structures by using the specific adhesive.
- The perimeter strip must rise from the supporting base up to the surface of the finished floor, and allow a clearance of the supporting layer equalling at least 5 mm.
- The upper part of the perimeter strip standing above the finished floor has not to be cut before completing the final coating and, in case of a textile or plastic coating, until the additive has hardened.
- Cut the part in excess of the insulating baseboard only after laying the final flooring and before installing the skirting board.

THERMAL-INSULATION SHEETS

- It is advisable to lay the radiant panels when the internal plasters have been finished to assure that the screed is clean to lay the final flooring.
- Install the insulating sheets granting minimum thermal resistances according to the thermal conditions underlying the floor-radiant heating structure and according to the UNI EN 1264 standard.
- Install the insulating sheets granting minimum sound resistance according to the sound conditions underlying the heating structure.
- It is advisable to use thermoshaped insulating sheets.
- Before laying the insulating sheets, it is important to check the conditions of the worksite. The surface of the concrete slab must be free from rubble, encrustation and should not have hollows.
- Before laying the insulating sheets, make sure that the slab is flat; if it is necessary, put a layer of dry sand on the irregular areas.

- Before installing the system with radiant panels, check that the available floor heights are the ones established by the reference standards (UNI EN 1264).
- It is advisable to lay a nylon sheet onto the concrete slab of the embankment to create a vapour barrier under the insulating panels.
- It is advisable to start installing the insulating sheets from the wall opposite to the door of the room to prevent trampling onto the sheets during the relevant installation.
- The insulating sheets must be laid close to the vertical baseboard; the nylon sheet sealed in the baseboard must be lifted and put onto the sheets. The aforesaid precaution is used to prevent screed penetrations towards the supporting concrete slab while casting the screed.
- It is advisable to start installing the insulating sheets from the left to the right, so that the side with the interlock downwards goes close to the perimeter baseboard; re-use the waste in the following rows by always restarting from the left to the right.
- While laying the sheets, couple them in a correct way to prevent possible grouting penetrations while casting the screed.

PIPES

- Organise and streamline circuit laying according to the project and the available pipe coils; write the length of the loops to have the least pipe waste as possible.
- It is advisable to use pipes provided with anti-oxygen barrier to prevent the corrosion of the metal components in the system.
- It is advisable to use pipes with the best thermal conductivity.
- When the pipes reach the worksite, they must be protected against possible dangerous elements and must be kept away from direct sunlight.
- It is preferable to create loops with spiral shape (snail), which allow increased floor temperature homogeneity, pipe laying easiness also in conditions of low external temperature, as you create 90° curves and not 180° curves, as it is the case of coil-shape laying.
- It is advisable to create one or several independent circuits for every room to be heated/cooled.
- It is advisable to intensify the centre distance of the pipes next to glass doors or, any way, highly dispersing walls.
- It is advisable to direct the delivery pipe of the circuits towards the external walls, that is, the coldest walls.
- Introduce \varnothing 25/32 mm plastic-material elbows (electrician cable-gland type) into the pipes next to the connection to the manifold: these elbows, besides protecting the pipes, help in directing the pipes from the vertical position of connection to the manifold to the horizontal position of the floor, thus reducing the folding radius to assure the relevant

whelming into the screed. The aforesaid precaution can be omitted by using pipes provided with multilayer anti-oxygen barrier because the aluminium assures maintaining the fold obtained in the pipe.

- Insulate the pipes next to the manifolds by using 6mm thick, closed-cell sheath, until reaching the nominal pass of the panel (the aforesaid precaution is compulsory in the systems with cooling function).
- Lay the pipes of the circuits at a distance longer than 5 cm from internal vertical structures and at 20 cm from steps, wooden staircases, fireplace perimeters, chimney flues, stoves, lift wells, etc.
- Lay the pipes of the circuits at a distance longer than 5 cm from external vertical structures in case of heating and at 10 cm in case of cooling.
- When reaching the centre of the circuit, as for the 180° reversal curve, keep a 20/25cm distance between the delivery and the return pipes to prevent the pipe from getting crushed while being folded.
- It is advisable to take pictures of possible joints where the aforesaid operation becomes necessary, before covering panel pipes with the screed.
- While laying the pipes, avoid bending radiuses that are too narrow in order not to reduce the internal section and increase pressure drops. The aforesaid precaution also allows preventing the pipe molecular structure from cracking due to crushing.
- In sanitary premises, it is advisable to distribute sanitary-fixture and draining systems along the perimeter to leave as much useful surface as possible to the radiant panel.
- It is not advisable or, at any rate, pay attention when laying the pipes under shower trays, toilet bowls, bidets and baths.

THERMAL ADDITIVE

- After installing the system, it will be necessary to cast the screed as soon as possible, to limit the risks of damaging the pipes.
- Before casting the screed, it will be necessary to provide for wooden catwalks to be laid onto the pipes to allow the passage of the operators and wheel-barrows and preventing damages to the same pipes.
- When you need to install the floorings, such as Venetian-style terraces, Palladian floors, stones, half stones and, at any rate, all floors that must be fastened with mortar, it is advisable to perform a first casting to cover the pipes (at least 3 cm above the pipes).
- The building company and the concrete mixing station are in charge of correctly dosing the product.
- The company in charge or the Works Management are entrusted with the structure of the screeds.
- If building mixtures are supplied as already mixed with other types of additives that are suitable for floor-mounted heating systems, do not use the VHF additive.

- Keep the product at a temperature not lower than +5°C. In case of freezing, heat the product at least at 30°C and stir before mixing up.
- Even if the VHF additive does not imply a toxicity risk, it is advisable to wear rubber shoes and gloves, as well as protective goggles during processing operations. In case of contact with the eyes, the skin and mucosa, rinse with abundant water.
- In case of fire, use water, sprayed water, foam, carbon dioxide, and dry powder.
- Keep out of reach of children.

SYNTHETIC FIBRES

- The use of synthetic fibres reduces screed cracking possibility, but cracking is not completely prevented: the execution of expansion joints, the correct installation of the insulating baseboard and the use of the thermal additive, as well as following the project instructions (metal nets, etc.) are compulsory and can never be replaced by the use of synthetic fibres.
- Avoid direct sunlight; keep in a fresh and dry place; keep away from all heat and ignition sources.
- The product, in compliance with long-term and chronic, acute toxicity provisions, is not noxious when applied in a correct way. Anyway, during handling operations, it is advisable to wear gloves. In case of skin inflammation, wash with abundant water.

EXPANSION JOINTS

- It is compulsory to execute the expansion joints according to the corporate guidelines and with reference to the UNI EN 1264 standards in force.
- Execute the perimeter expansion joints by installing the perimeter strip along all vertical structures, walls, columns, steps, etc.
- Protect the pipe with a sheath (insulating or for electrical wires) when crossing the expansion joints and the walls.
- Peripheral expansion joints are usually enough, but in case of large rooms, it will be necessary to provide for specific expansion joints, always with reference to the guidelines established by the standards in force and, more precisely:
 - a) the surface of each room has not to exceed 40 m².
 - b) the maximum length of a room has not to exceed 8 m².
 - c) the ratio of wall dimensions in each room has not to be higher than 1/2.
- Execute an expansion joint in all doors.
- The installer must have a plan specifying the position of the expansion joints.

ACCESSORIES

- To lay the pipe onto the smooth insulating sheets with

barrier, it is advisable to use the specific fastening device for anchoring the clips in a quick way.

- To lay the pipe, it is advisable to use the specific unrolling device that facilitates the processing operation.
- To cut the pipe, it is advisable to use the specific shears with undamaged and well sharpened blades.
- To connect the multilayer pipe to the manifold with Eurocone outputs, it is advisable to ream the internal diameter by using the specific calibrator.
- To tighten the caps, both safety and Eurocone type, it is advisable to use the specific wrenches.

CASTING OF THE SCREED

- Prepare the cement mixture by mixing the sand with the cement in the concrete mixer, and add the thermal additive with the concrete being already partially hydrated, into the mixing water. Complete the preparation of the mixture by adding water and mix for at least 10-15 minutes until reaching the optimal consistency.
- Comply with the dose of thermal additive established in the technical data sheets and according to the thickness of the screed.
- In case of mixing particular screeds, which are quick drying, self-levelling, synthetic or, anyway, rich in anhydride, call the suppliers to know the correct additive dosing.
- Absolutely exclude the pipe covering with screeds formed by cellular cement, concrete admixed with insulating bitumen or with expanded granules.
- Wait at least three weeks after casting the screed to lay the final flooring.
- In case of floor holes, they must be formed before installing the system with radiant panels to prevent the pipes from being accidentally drilled.
- Before laying wooden floors, it is important to check that the humidity of the screed is included within the values that were pre-established by the suppliers. So, it is advisable to switch ON the system before laying wooden floors. Besides, if you install raw woods, it is advisable to switch ON the system once again before the sanding operation and after glue drying. As for the specific times, call the flooring suppliers.
- If you need to install the system in winter, do not cast the screed in case of temperatures lower than 5°C and keep a temperature equalling at least 5°C for minimum 3 days after screed casting.
- The supporting layer (screed) made with self-levelling material can be cast at a minimum temperature of 0°C.
- **aquatechnik** is relieved from any responsibility concerning the structures of the screeds, of cement mixtures, of final flooring and from any other worksite responsibility.

DESIGN ACTIVITY

- To prevent physiological discomfort conditions, the surface temperature of the floor must be lower than the values established by the reference standards (UNI/CEN 130 and UNI EN 1264-2), max. 29°C in residential living areas, max. 35°C in marginal areas with the limit of 1 m depth from external walls.
The 35°C max. temperature can also be reached in the so-called transit and/or passage areas (ex. access areas and corridors) and in toilets.
- To prevent useless heat accumulations and to reduce the already remarkable thermal inertia of this type of systems, during the design step, keep the value of the power supplied by the panel lower than the value provided for in reference standards (UNI/CEN 130 and UNI EN 1264), that is, max. 100 W/m².
- It is preferable to use modulating-type thermoregulations, that is, capable of adapting the system to the external climatic conditions. Indeed, differently from thermostatic thermoregulations, which are also called fixed-point because they always maintain the same water temperature within the system, the thermoregulations with climatic regulator assure the reduction of useless heat accumulations in the screed with the subsequent reduction of the thermal inertia in the same system. In addition, selecting modulating thermoregulation assures considerable energy saving when managing the system.



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