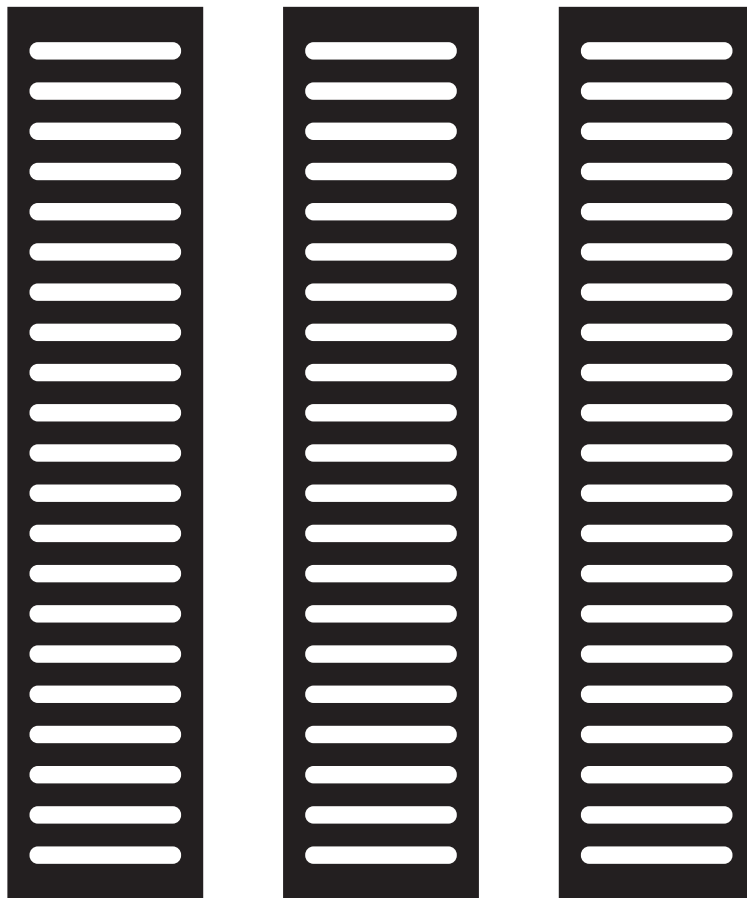


# MORE PAD HVR

RADIANT INTEGRATION ELECTRICAL SYSTEMS  
LOW VOLTAGE



## HEATING SYSTEM OUTDOOR AND INDOOR ELECTRIC RADIANT

---

- **Maximum temperature self-adjusted to 45°C.**
  - **Suitable for heating outdoor surfaces with a frost risk to increase the degree of safety for the transit of people and vehicles.**
  - **Suitable for radiant heating of walls and/or ceilings of small rooms, also for discontinuous use.**
  - **Suitable for heating and defogging mirrors.**
  - **Suitable for the construction of flush-to-wall “invisible radiators”, with any type of final finish.**
  - **Maintenance-free.**
- 

### WHAT IS MORE PAD HVR?

It is a radiant heating system based on the use of a very thin (1.9 mm) mat made with a modulating and self-adjusting semiconductor technopolymer, which heats up when electric current passes through it.

The reaction triggered is a molecular vibration of the nanoparticles that generates progressive heating of the semiconducting polymer.

As the temperature of the mat increases, the nanoparticles contained in the polymer compound, move away from each other resulting in a progressive decrease in electrical continuity; the closer the temperature approaches the maximum threshold reached by the polymer, the lower the electrical absorption through the mat. This characteristic, called PTC (Positive Temperature Coefficient), uses the heating of the material to limit the current flowing through it (and

therefore electrical consumption) by gradually increasing the resistance of the semiconductor as the temperature rises.

Therefore, for the same end effect (temperature of the heating element), using this semiconductor technology significantly cuts down on overall power consumption compared to a similar heater with electrical conductors operating through heating resistors, thanks to the natural, automatic modulation and self-adjustment of the end temperature, without any thermostatic control and limiting element.

It differs from the PAD LVr in that it has a low-voltage mains power supply (230 V AC) and additional dielectric protection in the form of an outer silicone coating.

## PAD HVR 'IN BRIEF'

---

### OPERATING PRINCIPLE

- Semiconductor technopolymer, modulating and self-adjusting, heating up by molecular vibration when electric current passes through it
- 

### APPLICATION

- Wall and ceiling radiant heating integration for indoor areas
  - Anti frost and snow for outdoor surfaces
- 

### INSTALLATION

- Can be installed outdoors on the floor
  - Can be installed indoors, on walls or ceilings
- 

### FLOOR FINISH

- Dry with the floor resting directly on the mat covered by the protective sheet
  - Other finishes placed or bonded directly onto the screed
- 

### WALL/CEILING FINISH

- Plastering with water-based cement mortar that can be smoothed over reinforcement mesh
  - Ceramic wall tiles glued onto cement mortar
  - "Sandwich" drywall application with plasterboard finish board
- 

### ROUTINE MAINTENANCE

- None
- 

### SAFETY

- Heating element with class II electrical insulation
  - Heating element and wiring with IPX7 protection rating
- 

### ELECTROMAGNETIC COMPATIBILITY

- The heating element does not generate electromagnetic phenomena during operation
-

## 2. INFORMATION AND WARNINGS

---

### 2.1. SYMBOLS KEY

The symbols below, with their associated wording, indicate the potential risk arising from failure to comply with the prescription to which they have been combined:



**Warning**

Warns that the failure to comply with the requirement entails a risk of damage to the equipment constituting the mixing unit.



**Danger**  
Risk of electric shock

Warns that there is a risk of electric shock if not observed.



**Danger**

Warns that failure to comply with the requirement entails a risk of harm to persons, animals and/or property.

### 2.2. WARNINGS BEFORE INSTALLATION

---



**Danger**

PAD HVR is a radiant climatic wellbeing control system with electrically powered heating elements embedded in the building envelope.

Before using the system, read the warnings in this manual carefully, as they provide important information on safe installation, operation and maintenance.



**Warning**

Use of the system for purposes other than those specified is not allowed.

Keep this manual in a safe place for further reference, especially when ordering spare parts.



**Warning**

PAD HVR is powered by the building's electrical system.

Check that the operating conditions of your system (voltage and power) are within the functional limits of the air conditioning system.

Check that the power supply is adequately protected as described in the following Chapter 7 "PAD HVR system installation".

Before installation, make sure that the electrical system, if any, has been carried out in a workmanlike manner by requesting the "Declaration of Conformity" and the relevant mandatory attachments.

## 2.3. GENERAL WARNINGS FOR SAFE USE

---



**Danger**  
Risk of electric shock

Improper installation can cause damage to people, animals or property.

The manufacturer is not liable for damage caused by installation errors, non-compliance with these instructions and improper use of the system and individual devices.

Also note the following:

- If the degree of protection does not allow it, do not get the equipment wet and do not install it unprotected, in humid environments or near jets, splashes of water or other liquids.
- Due to the presence of very hot parts, do not place paper and/or plastic objects on the equipment or in its immediate vicinity.
- Packaging parts (plastic bags, expanded polystyrene, etc.) must not be left within the reach of children.
- The operation of the command and control equipment, as well as the handling of the entire device, must be prevented by children, persons not familiar with the work, persons in an altered state or those unable to understand the possible danger.
- Due to the presence of hot parts, contact burns are possible.
- Allow hot equipment to cool down adequately before any maintenance work.
- However, use all protective measures necessary to reduce the possibility of injury.



**Danger**



**Danger**

---

Any work on the electrical circuit, regarding ordinary or extraordinary maintenance operations, must be carried out by professionally specialised personnel authorised according to Italian Ministerial Decree 37/2008.



**Warning**

Refrain from conducting work yourself.

It is strongly recommended to follow the maintenance instructions for the best operation of the system and, if parts of the system have to be replaced, to use the original spare parts supplied by the manufacturer.



**Danger**  
Risk of electric shock

Before carrying out any cleaning and maintenance work, make sure that:

- The power supply is switched off by the thermomagnetic circuit breaker located on the power supply line of the air conditioning system.
- +It is very dangerous to operate the system without any component, especially if this is a safety guard or mechanical and/or electrical safety device.
- Under no circumstances should the air-conditioning system be started up by unqualified personnel during maintenance operations.



**Danger**

In the event of a fault or malfunction of the equipment, switch off the power supply from the line protection circuit breaker.

Do not tamper with the system's equipment.



**Danger**

For reactivation and/or repair, contact the company that issued the declaration of conformity, or alternatively contact your local electrical installer if there are no warranty claims.

## 2.4. GENERAL INFORMATION

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- PAD HVR is an electric radiant heating system.
- PAD HVR consists of a thin mat, electrically powered at low voltage, that self-modulates electrical consumption and self-adjusts maximum surface temperature.
- PAD HVR is not an amorphous thin film extruded resistor in cable, traditional or carbon conductor.
- The heating of the mat takes place thanks to the molecular vibration of the technopolymer making up the semiconductor mat.
- Thermal expansion of the nanoparticles gradually reduces electrical absorption, thereby self-limiting the surface temperature.
- Heated surfaces do not run the risk of overheating when covered; in any case, if total heat exchange is prevented, check the table stating the surface limit temperature.
- PAD HVR is a radiant system that, inside the building envelope, can be combined with finishes of very low inertia, with final thicknesses limited to just 15 mm (dry finish with plasterboard wall panel, or application of ceramic coating with bonding).
- The response times of the PAD HVR system are the same as those of a similar hydronic radiant system and depend on the mass to be energised and the average starting radiant temperature.
- Normally, in a residential environment, the wait time for the surface temperature of approximately 30° C to be reached is about 30/40 minutes for a very low inertia finish.
- The PAD HVR system, like any radiant system, must provide for the interruption of heat conduction in the direction opposite to the radiant transfer into the room. For this reason, it is essential that the surface where the system will be installed is adequately insulated. If there are no specific requirements, provide an insulating layer of at least 20 mm EPS from the rest of the building envelope.
- When used for anti-freezing purposes, the covering layers must favour thermal transmission; it is preferable to favour thermal storage by using screeds or thick driveway slabs.

## 2.5. GENERAL INFORMATION ON LOGISTICS

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- The mat is produced in 30 to 10-metre rolls, each of which is tested to verify the rated power consumption.
- Check that the boxes have not been damaged, are not wet or damp and above all that they do not have a manufacturing date prior to 5 years from the year of installation.
- When opening the package, avoid using blades or cutters to avoid unintentionally cutting into the product contents.
- Protect against UV radiation (like all polymers it is photosensitive).

## 2.6. GENERAL INFORMATION FOR INSTALLATION

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- Read the labels on the packaging to check that the product is correct for the installation being carried out.
- Installation must be carried out by qualified personnel who have been trained in advance, including with the aid of this manual.
- The PAD HVR can be cut to size as there is no minimum length required.
- Any scraps can be reused by electrically wiring them together to give electrical continuity between the mat portions.
- Unlike PAD LVr, PAD HVR cannot be cut or drilled if obstacles interfere.
- For attachment to the substrate, it can be nailed and/or stapled by just the two outer silicone bands, taking care to avoid affecting the polymer and lateral electrical conductors.
- It can also be curved and bent at right angles, taking care not to use bending radii below 10 mm.
- In order to reduce the risk of leakage or short-circuiting, avoid metal parts passing through or touching the silicone coating (e.g. paper clips, drywall screws, etc.) which may in turn be in contact with metal conductive parts.
- Avoid contact with solvents as well as with two-component glues and mortars that could compromise the long-term stability of the technopolymer and the silicone coating.
- The surface of the mat can be covered with any type of building finish (including tiles, natural stone, parquet, water-based cement mortar plaster, laminates and carpet); the transfer of thermal energy must take place by contact between the layers that interpose themselves with the environment to be heated; avoid that the contact is interrupted by air gaps.

## 2.7. GENERAL INFORMATION ON ELECTRICAL INSTALLATION

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- The electrical wiring must be dimensioned and executed in accordance with the current IEC 64-8 standard.
- Installation must be carried out by a qualified installer in a workmanlike manner, as set out in the current technical regulations for the installation of electrical systems as well as in this installation manual, using certified products that allow the declaration of conformity to be issued.
- If the rooms served by a single electric meter exceed the size or installed power limits laid down in Italian Ministerial Decree 37/08, the electrical dimensioning of the system and the related project must be drawn up and signed by a qualified professional registered with a professional association.
- The PAD HVR heating system, consisting of the radiant mat and its accessories, such as self-amalgamating tape and crocodile crimp terminals, is certified with protection rating IP X7.

## 2.8. GENERAL INFORMATION ON ENERGY EFFICIENCY

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- The PAD HVR system complies with the requirements imposed by European Regulation 1188/2015 Annex II Table II on the energy efficiency of electric heating systems incorporated in the interior finish of the building envelope.
- In order to comply with the ErP Directive 2009/125/EC, as well as with current legislation on energy containment in buildings, if PAD HVR is used for heating living areas, its operation must be associated with an electronic room temperature control, with at least daily division into several time bands for controlling at least two levels of room temperature (chronothermostat).

## 2.9. - IDENTIFICATION OF THE MANUFACTURER-DISTRIBUTOR

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This manual provides the technical information necessary for the installation, use and maintenance of the PAD HVR air-conditioning system .

For any further clarification, the customer can contact the manufacturer's technical sales support:






**RBM S.p.A. - Via S.Giuseppe, 1 - 25075 NAVE ( BRESCIA ) - ITALY**  
**Tel ++39 030 2537211 - Fax ++39 030 2531799**  
**info@rbm.eu**



### 3. SYSTEM COMPONENTS

The components of the PAD HVR system are listed below in this manual.

#### PRODUCT TABLE

	Series	Description
	<p>3863M.00.02 (30 m) 3863M.00.10 (10 m)</p>	<p>230V AC low voltage electric heating mat and low consumption, made of self-modulating semi-conducting technopolymer for radiant heating on walls and ceilings and floor anti-freeze systems, with double copper conductor braid embedded in the technopolymer Width 260 mm - Supplied in rolls, length 10 or 30 m.</p>
	<p>3859</p>	<p>Protective, thermally conductive sheet, to be laid over the PAD HVR, when the floor installation involves aggressive cements and adhesives and/or when the laying centre distance exceeds 150 mm in order to favour the uniformity of the surface temperature and/or if there are sands and agglomerates that could affect and damage the surface silicone layer. Width 700 mm - Supplied in rolls, length 20 m.</p>
	<p>3860</p>	<p>Crimp terminal to connect the part of the mat to the electrical distribution cables. Supplied in packs of 20 or 200 pieces.</p>
	<p>3862</p>	<p>Crimping clamp with flat jaws.</p>
	<p>3861</p>	<p>Self-amalgamating double-sided butyl tape reinforced with polyester mesh in bituminous adhesive for dielectric sealing of the areas affected by crimping between terminal, electrical cable and technopolymer. Width 30 mm - Supplied in rolls, length 20 m.</p>

## 4. TECHNICAL FEATURES

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### Mat PAD HVr

Semiconductor material	PE	
Conductor material	copper braid	
Equivalent braid section	3	mm <sup>2</sup>
Specific weight of mat	1.11	Kg/m <sup>2</sup>
Width	260	mm
Thickness	1.9	mm
Roll length	10 o 30	m
Nominal temperature (at 20°C) in a confined environment	45	°C
Max. temperature (with limited heat exchange with the environment)	65	°C
Electrical power supply	230	V AC
Rated input power (at 20°C)	50	W
Absorption reduction (when reaching final temp)	-30	%
Max length of single power supply branch	20	m
Compression resistant	3.778	Pa
Reaction to fire EN 13501-1;2019	class E, Efl	

**ErP Directive - Regulation EU/1188/2015**

System information for electrically powered domestic room heaters built into the building envelope. Valid for indoor use only.

Model identifier: PAD OUTDOOR					
Data	Symbol	Value	Unit	Data	Unit
Thermal power				<b>Type of heat output, only for electric storage space heating appliances (indicate only one option)</b>	
Nominal heat output	$P_{nom}$	0,05	kW	manual thermal load control, with integrated thermostat	NO
Minimum heat output (indicative)	$p_{min}$	0,035	kW	manual control of the heat load with feedback of the ambient and/or external temperature	NO
Maximum continuous heat output	$p_{max.c}$	0,05	kW	electronic heat load control with room and/or outside temperature feedback	NO
<b>Auxiliary power consumption</b>				fan-assisted heat output	NO
At nominal heat output	$el_{max}$	0,000	kW	<b>Type of heat output/room temperature control (indicate only one option)</b>	
At minimum heat output	$el_{min}$	0,000	kW	single-stage heat output without room temperature control	NO
In stand-by mode	$el_{SB}$	0,000	kW	two or more manual steps without room temperature control	NO
$\eta_s = 39\% > 38\%$				with room temperature control via mechanical thermostat	NO
				with electronic room temperature control	NO
				with electronic room temperature control and daily timer	NO
				with electronic room temperature control and weekly timer	YES
				<b>Other control options (multiple options can be selected)</b>	
				room temperature control with presence detection	NO
				room temperature control with detection of open windows	YES
				with remote control option	YES
				with adaptive start-up control	NO
				with operating time limitation	NO
				with black globe thermometer	NO
Contacts	RBM SpA - via S.Giuseppe 1 - NAVE (BS) - ITALY				

## 5. CERTIFICATIONS

EC declaration of conformity with directives:



- EU Regulation 1188/2015 implementing Directive 2009/125/EC (ErP) on Ecodesign requirements for local space heating appliances.
- Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU.
- Directive on waste electrical and electronic equipment (WEEE) 2012/19/EU.
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU.
- Reaction to fire of the heating element - according to UNI EN 13501-1:2019 (Fire classification of construction products and building elements - Part 1), Classification E,Efl.
- Low Voltage Directive (LVD) 2014/35/EU".

## 6. POSSIBLE APPLICATIONS

The main information concerning the possible applications of the PAD HVR system in the rooms to be heated is given below:

application	advantages and limitations
	<p>The very low thermal inertia of the radiant element, in the case of dry installation, allows for quick adjustment of the system. Excellent in cases of intermittent or discontinuous management. Direct bonding of the flooring is possible after applying a layer of adhesive with a self-levelling cement additive to even out the laying surface. Laying on the floor in inhabited interiors is not advisable; if this is desired, the use of a contact probe embedded in the floor is necessary in order to limit the surface temperature to the values required by current regulations.</p>
	<p>The very low thermal inertia of the radiant element allows for fast system adjustments. It is possible to apply the heating element and sandwich it dry with a plasterboard finishing panel. Excellent in cases of intermittent or discontinuous management. Excellent in the case of renovations and additions to rooms without a heating system, as a result of the non-invasive work required.</p>
	<p>The very low thermal inertia of the radiant element allows for fast system adjustments. The heating element can be applied with a plastered, tiled or drywall finish. Excellent in cases of intermittent or discontinuous management. Excellent in the case of integration of bathroom heating.</p>

## 6.1 LEGISLATIVE INFORMATION

---

In the case of renovation or energy refurbishment, it is possible to derogate from the minimum internal living space height of 10 cm.

This possibility is of fundamental importance when it is necessary to insert a radiant underfloor or ceiling heating system inside an existing building.

### **Italian Ministerial Decree 26.06.2015 - Annex 1, art. 2.3.4**

*In existing buildings that have undergone major renovations or energy redevelopment as defined in Article 2, paragraph 1, letters l-vicies ter) and l-vicies quater) of the Italian legislative decree, with the specifications set out in paragraphs 1.3 and 1.4 of this Annex, in the case of the installation of heating systems equipped with radiant floor or ceiling panels and in the case of insulation from the inside, the minimum heights of the living quarters provided for in the first and second paragraphs of Italian Ministerial Decree of 5 July 1975 may be derogated from, up to a maximum of 10 centimetres.*

*However, in mountain municipalities above 1000 metres above sea level, the minimum height of habitable rooms may be reduced to 2.55 metres, taking into account local climate conditions and the local building type.*

Specifically, the energy upgrading activities of a building fall within the normal activities of routine or extraordinary maintenance as stated in

### **Legislative Decree 192.2005 – art. 2 definitions**

*l-vicies ter) "energy requalification of a building" an existing building undergoes energy requalification when the work, however named, including but not limited to: routine or extraordinary maintenance, renovation and conservative restoration, falls into types other than those indicated in letter l-vicies quater); ( \* )*

(\*) the different types concern so-called "major renovation" with work being performed on a surface area 25% larger than the building envelope.

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### **Special environments and applications**

#### **IEC standard 64-8 part 7**

Bathrooms have special environmental conditions that lead to greater risks, especially related to the possibility of electrocution through direct and indirect contact by the user.

The rules for installation in these rooms depend on the identification of danger zones defined by the position of the bath and/or shower within the room in question. This determines the volumes, called "zones", within which the electrical installation and components must meet certain minimum characteristics.

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**System electrical characteristics  
PAD HVR**

Supply voltage:  
230 VAC  
Insulation class:  
class III  
Protection class:  
IPX7

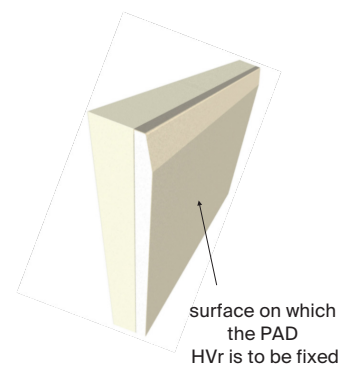
With these electrical characteristics, the PAD HVR system can be installed starting from 'zone 3' areas of the bathroom and wet areas. (refer to IEC64-8)

Regardless of the intended installation, whether floor, wall or ceiling, the PAD HVR system must be separated from the building envelope in the same way as any radiant air conditioning system. This requirement is supplementary to any thermo-technical dimensioning related to the energy efficiency of the building-installation system.

In order to thermally decouple the radiant system from the building envelope, it may be sufficient, for example for the wall or ceiling, to install a sheet of plasterboard pre-coupled with an EPS insulation panel, with a minimum thickness of 20 mm.



**Warning**

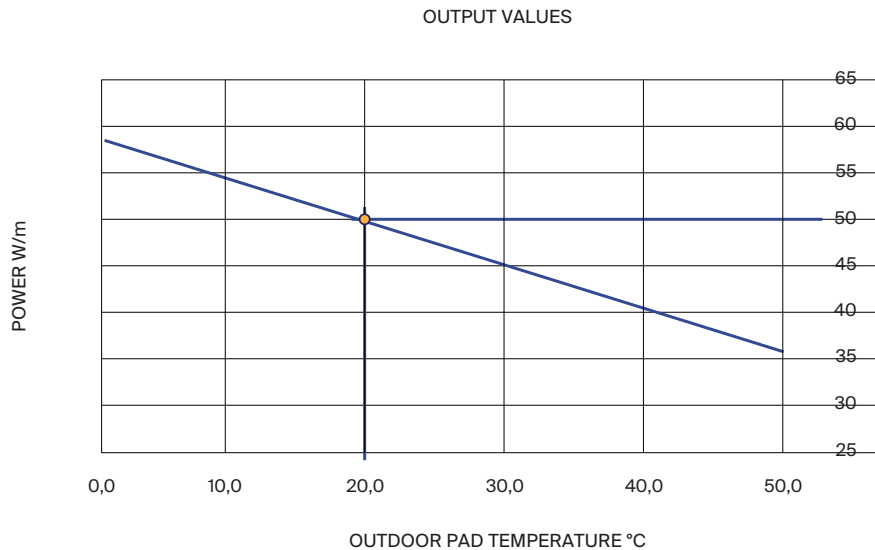


## 7. DIMENSIONING

### Power output of the PAD HVR mat

The rated power, corresponding to the power consumption value at 230V AC, is delivered at a temperature between 10 and 20°C.

The chart below shows the self-adjusting capacity of the technopolymer as the contact temperature of the mat changes.



model	linear power W/m	active area m <sup>2</sup> /m	maximum yield W/m <sup>2</sup>	yield W/m <sup>2</sup> depending on the distance in mm between mats						
				mm	25	50	100	150	200	250
PAD HVR	55	0,26	190	W/m <sup>2</sup>	175	160	150	134	115	100

The table shows the heat output characteristics referring to an environment at 20° C in the different installation centre distance conditions. In any case, even for yields below 40 W/m<sup>2</sup>, it is not convenient to further distance the mats to avoid excessive thermal asymmetry between the heated and unheated zones.

**For dimensioning, proceed in the following logical sequence:**

1. Determine the peak demand, in W, of the room to be heated.
2. Calculate the development in metres of PAD HVR depending on the W/m yield; increase the development by at least 30% to account for the share of energy lost to the separating insulation with the building envelope.
3. Choose the type of installation (floor, wall, ceiling), and depending on the available surface area determine the number of strips of PAD HV to be laid. It is advisable to keep the distance between one mat and the next between 25 and 250 mm; if the surface finish is to be fixed mechanically (e.g. plasterboard or parquet strips), preferably lay the mat at right angles to the fixing direction of the finish itself.
4. Determine the peak electrical power by multiplying the total development in metres of PAD HVR by the nominal electrical power absorbed at 10°C.

**Warning**

This sizing method is intended to provide rapid sensitivity on the necessary heating amount to meet the peak thermal requirements of the environment. This method does not replace the thermo-technical calculation, which must consider the emission value towards the environment as well as the limitation constituted by the thermal resistance of the finishing element.

**Information for electrical dimensioning:**

- For the low-voltage AC line, provide one or more distribution backbones for connection in parallel.
- Each junction box must contain a distribution manifold from which the power braid of each mat is derived. Each braid must feed a length of PAD HVR not exceeding 20 metres.
- The maximum voltage drop recommended by IEC 60480 is 4 % from the point of delivery to the last consumer, normally divided into 1.5 % for the line from the measuring instrument (meter) and 2.5 % for the internal electrical distribution.
- Regardless of the size of the rooms and the electrical power installed, the electrical system to be built must always be preceded by the project drawn up as provided for by Italian Ministerial Decree 37/2008 art. 5 para. 1.



## 8. PAD HVR SYSTEM INSTALLATION

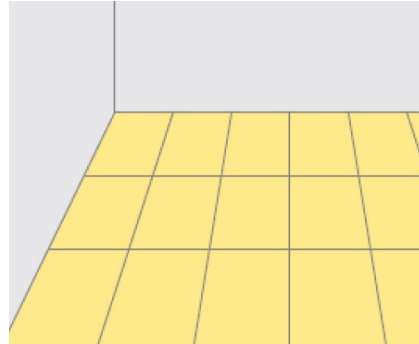
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Check the flatness and cleanliness of the surface on which to apply the insulation layer required for thermal decoupling between the radiant system and the building envelope.

In the case of underfloor installation, a vapour barrier should be laid underneath the insulation layer to protect against rising damp.

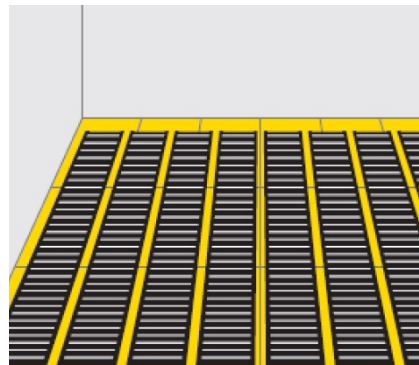
Install the insulation layer as specified in the project (minimum 20 mm), checking that it is laid correctly according to the standards provided by the manufacturer.

In the case of a ceiling or floor system, apply an edging joint to absorb thermal expansion.

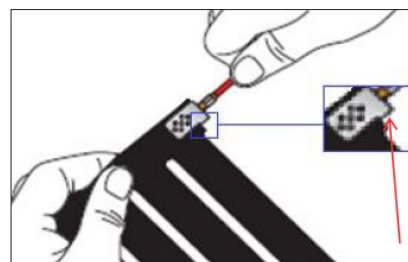


- Cut the heating mat into strips of the length specified in the installation plan.
- Position the strips according to the centre distances specified in the installation plan.
- When installing on the floor, lay an electrical cable duct along the side chosen for the wiring of the mats, to be incorporated into the insulation layer, in which the electrical wiring cables are laid as shown in the plan.

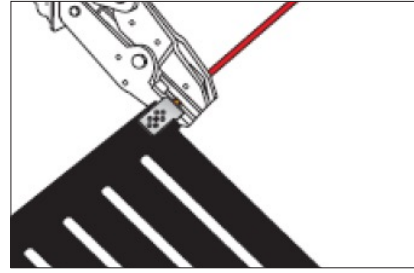
**CAUTION: ensure that there are no metal or conductive parts in direct contact with the polymer or power cords (screws, wire mesh, pipes, structures, etc.).**



- Remove a small portion of polymer in the corner next to the braid, to make it easier to position the crimp terminal so that it remains in line with the braid of the upright embedded in the polymer.
- Insert the stripped cable (single-core 2.5 mm<sup>2</sup> cord) over a length of 1 cm so that it reaches the first teeth of the crimp terminal.



- Clamp the wire into the eyelet terminal, taking care that no wire escapes from the eyelet, and check that the mechanical seal is guaranteed.
- If necessary, flatten the copper braids of the polymer-bonded cord in order to reduce their thickness and facilitate bundling between the crimp terminal and the braid itself.

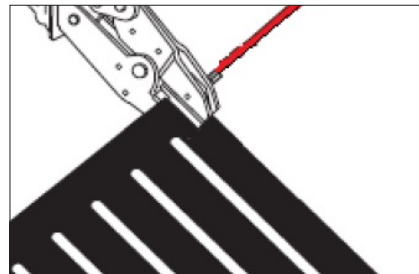


**!** **Warning**

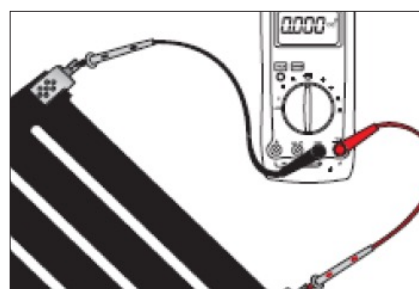
The crimp terminal has an eyelet sized to accommodate a 2.5 mm<sup>2</sup> cross-section cord.

Always prefer parallel connection (or series connection, to connect several pieces of PAD up to a maximum length of 7 m) avoiding the use of multiple connections from the same pole (in and out from the same terminal).

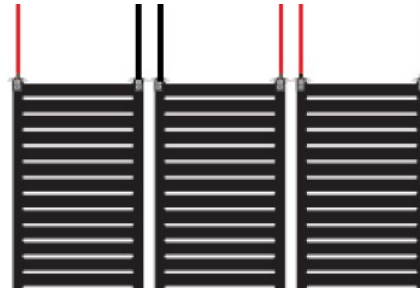
- Crimp the terminal as shown in the figure, in several places, checking that it is perfectly flat and mechanically tight.
- Carry out the same operation on the other upright using a different coloured cord (for the extra-low voltage line, use red and black), so that the two uprights and their polarities can be easily distinguished.
- Mark the wire pair with an identification number so that it can be identified within the junction and junction box.



- On completion of crimping, check with the help of a tester before wiring the electrical cables:
- The absence of electrical continuity between the phase and neutral terminals of each individual PAD string in order to ascertain the absence of short circuits;
- The resistance between each terminal and any metal structure to earth, detecting the 'infinite' value. This check ensures that any fasteners have not connected the tested conductor to any metallic conductive part to earth;
- The resistance between each terminal and the aluminium foil placed in front of the PAD between the two conductors is measured detecting the "infinite" value. This check ensures that there is no damage to the insulating layer.



- Connect the cables in parallel with each other in the sequence shown in the image opposite.
- Alternate the colours of the cables on the strings side by side so that they always have the same colour next to each other (blue-black... black-blue... blue-black, etc.)

**Warning****LOW VOLTAGE SIDE**

- THE PRODUCT IS CLASSIFIED AS DOUBLE-INSULATED (IEC 60335-2-96.2019). SHOULD THE DESIGNER AND/OR INSTALLER NEVERTHELESS DEEM IT NECESSARY TO EARTH EACH OUTDOOR PAD STRING, THE CONNECTION CAN BE MADE BY CRIMPING THE EARTH CONDUCTOR TO THE PROTECTIVE ALUMINIUM LAYER PLACED IN FRONT OF THE PAD BETWEEN THE TWO POWER SUPPLY BRAIDS.
- IT IS ADVISABLE NOT TO FEED THE POLYMER IF IT IS ROLLED OR OVERLAPPED.
- IT IS ADVISABLE NOT TO FEED A BRANCH LONGER THAN 20 METRES.



**Before proceeding with the remaining installation steps, the following functional checks must be carried out and repeated for each power supply:**

**Warning**

- voltage check at junction box (.....V AC)
- voltage check at crimp terminals (.....V AC)
- voltage check at the end of the string (.....V AC)

In addition, check the power consumption of the individual electrical branches in order to detect possible abnormal values in relation to the PAD HVr rated absorption.

The purpose of the tests is to check whether there are any joints or connections which generate excessive resistance resulting in an excessive voltage drop.

With positive electrical checks, after about 15 minutes check that the polymer is correctly heated. Using an infrared camera, check that all strips are uniformly at temperature.

Using the self-amalgamating bitumen tape series 3861 supplied, insulate the copper parts of the cable and the crimp terminal from oxidation.

Press well to release the air trapped in the sandwich in order to make the bituminous parts adhere to make the contact watertight.

Use only self-amalgamating bituminous tape series 3861 to maintain the CE certification of the PAD HVr product as it has been tested in conjunction with the use of this specific tape.



Similarly, also insulate the cuts in the end of the strip, as shown in the photo, to prevent oxidation of the braid on the upright at the cut point.

Do not use any other type of tape as overly aggressive thinners may lead to deterioration of the polymer forming the heating mat.



The self-amalgamating double-sided butyl tape reinforced with polyester mesh in bituminous adhesive has the following functions:

**Warning**

- Dielectric sealing of the areas affected by the crimping between the terminal, electrical cable and technopolymer.
- Antioxidant protection of the electrical cable and terminal.
- Electric protection rating IP X7.

The following precautions must be taken when applying the bituminous tape;

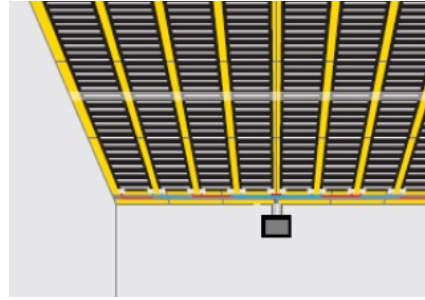
- The parts to be sealed must be clean, free of dust and impurities.
- The application of the tape must take place with temperatures of the environment and the components being sealed between 5 and 40°C.

### Valid for floor, wall or ceiling

Fasten the strips with metal staples on both sides and at each metre, taking care to only overlap the outside of the polymer by 2/3 mm, without touching the braids of the electrical struts.

Alternatively, use plastic nails or paper tape about 5 cm long. The only purpose of fixing is to prevent the mat from shifting during the subsequent finishing stages.

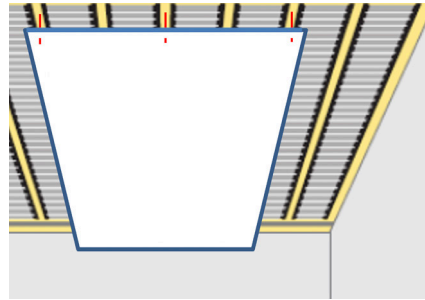
As an alternative to staples and nails to temporarily secure mats to the substrate, is solvent-free reinforced bi-adhesive strip, such as MAPEI Mapecontact, 240 mm wide.



### Valid for the wall and/or ceiling Finishing with plasterboard

The strip centre distance will depend on the peak heat output to be delivered; if there are no specific requirements, it is advisable to ensure a longitudinal centre distance between strings of approximately 400 mm (axis-axis), a measure matching the majority of metal counter spreader structures (structure present in the case of false ceilings)

In order to prevent the formation of bumps and bulges on the final surface of the plasterboard caused by the passage of cables and crimping terminals, it is advisable to remove part of the PAD support surface at the crimping area of the electrical terminal so that it does not generate thickness.



If the wall does not allow electrical cables to be passed inside the false wall or ceiling (laying close to the sandwich sheet), it is advisable to remove a strip of plasterboard of about 50 mm to accommodate the crimping area as well as to facilitate passing the electrical cables.

Once the electrical wiring and functional test have been completed, finish by laying plasterboard counter-sheets to hold the PAD strips inside the sandwich.

Ensure perfect adherence between PAD and counter-slab by correctly anchoring the latter to the dividing structure or the floor

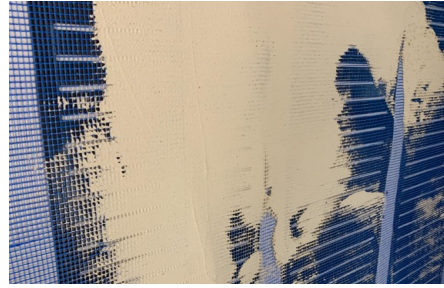


**Valid for wall only**  
**Smooth finish or with ceramic coating**

Temporarily secure mats to the substrate with solvent-free reinforced bi-adhesive strip, such as MAPEI Mapecontact, 240 mm wide.

Once the electrical wiring and functional test is complete, finish by laying a 5x5 mm or 10x10 mm section mesh reinforcement for fibreglass coats, to be fixed with metal clips or plastic dowels for coats.

Apply several coats of water- or latex-based cement mortar that has sufficient elasticity to withstand the normal temperature fluctuations typical of an external coating, as well as avoiding chemical aggression to the polymer.



**Example of stratigraphy:**

- Application on the masonry and PAD HVr of a layer of solvent-free acrylic primer for absorbent and non-absorbent substrates, even with residues of old adhesives (such as Mapei ECO PRIM T).
- 1 mm of reinforced glass fibre mesh 10x10 (such as Mapei MAPEGRID G).
- A layer of pre-blended, two-component, fibre-reinforced, highly ductile, non-combustible cementitious mortar with pozzolanic reactivity binder base, 5 to 25 mm thick (such as Mapei PLANITOP HDM MAXI). The thickness to be applied depends on the degree of unevenness of the substrate.
- For surfaces to be tiled, proceed with laying with adhesive.
- For surfaces that are NOT tiled, a final coat of fine-textured, hydrophobic cementitious smoothing compound for concrete, plastic, glass and porcelain cladding, 1 to 3 mm thick (such as Mapei PLANITOP 200).

Follow the instructions given by the manufacturer of the finishing products for the installation steps and methods.



**Warning**

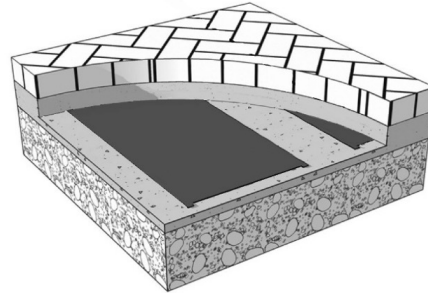
Proceed with the subsequent application of the desired finish, taking care to ensure complete adhesion of the finish to the radiant substrate.

## 9. POSSIBLE FINISHES

### External flooring in self-locking blocks or stone cubes

This type of flooring is used for walkways and driveways built on non-backfilled, consistent and stabilised soil.

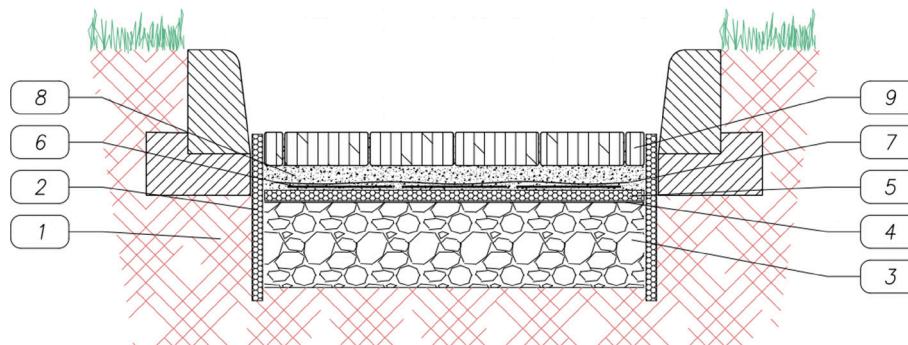
In this case, the heating system can be housed at the base of the sand substrate used for block bedding.



In the presence of backfill soil, or in the case of the construction of carriageway slopes for garage access ramps, the heating system can be housed within the screed support of the flooring, even above the metal reinforcement, prior to casting.

Follow the instructions given by the manufacturer of the products for the steps and methods of laying the various building layers.

### Stratigraphy with sand bed



1. Topsoil with compacted and modelled bottom.
2. Lateral insulation: the walkway to be heated must be bounded around the perimeter by a sheet of rot-proof insulation, such as EPS, at least 20 mm thick; this is necessary to prevent cooling of the portion of the floor to be treated by the action of the lateral transfer of heat flow.
3. Granular mix ballast; it is advisable to shape the bottom of the ballast in such a way as to promote lateral drainage of rainwater.
4. Separation geotextile.
5. Insulating base layer to be executed with rot-proof material such as EPS 150 (class 300 is recommended for driveway portions). The various panels can simply be placed side by side to promote rainwater drainage.
6. PAD HVR strings. Close laying is recommended in order to achieve a load density close to 200 W/m<sup>2</sup>.
7. Application of the protective sheet code 3859.00.02. Leave the ends free so as to encourage lateral drainage of rainwater;
8. Stabilised or compacted sand layer for covering the PAD HVR and bedding the flooring. Thickness 60 - 80 mm.
9. Final flooring layer in self-locking blocks or stone blocks.





The protective cover, to be placed in contact with the PAD HVR mat at the end of the wiring and electrical functional check, has the task of:

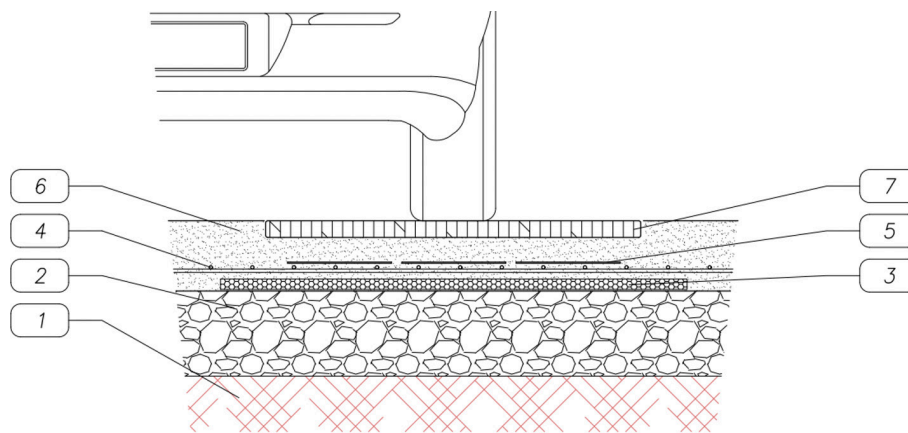
**Warning**

- Distributing the thermal energy evenly to the next layer of sand bedding.
- Protecting the PAD from the inadvertent presence of stones and/or sharp and pointed material.

The sand layer must be compacted to avoid the presence of air pockets and/or material hindering heat transfer and accumulation.

Take care not to use sharp, cutting tools that could damage the surface of the PAD HVR.

**Stratigraphy with screed**



1. Soil with compacted and modelled bottom.
2. Bottom ballast.
3. Insulating base layer to be executed with rot-proof material type EPS 300. It is recommended to extend the insulation layer at least 50 cm on each side of the end of the heating mat.
4. Wire mesh for screed reinforcement.
5. PAD HVR strings. Close laying is recommended in order to achieve a load density close to 200 W/m<sup>2</sup>. The strips can be laid directly on the wire mesh.
6. Possible driveway in self-locking paving blocks or surface knurling.



Check the reinforcement for sharp edges to avoid damage to the PAD HVR strip. It is recommended to place the PAD HVR strip, embedded in the screed, at a depth of no more than 10 cm above the external surface.

**Warning**

Provide a corrugated conduit for the possible future insertion of a surface sensor to detect the presence of moisture, snow and temperature on the external surface.



## 10. DISPOSAL

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For the polymer: CER170411  
For electrical equipment: CER160216



### WEEE Waste Electrical and Electronic Equipment

Italian Legislative Decree 25 July 2005, no.151 "Implementation of Directives 2002/95/EC, 2002/96/EC and 2003/108/EC and subsequent amendments and integrations concerning the reduction of the use of hazardous substances in electrical and electronic equipment, as well as waste disposal".

The crossed-out wheeled bin symbol on the equipment, or on its packaging, indicates that the product, at the end of its useful life, must be collected separately from other waste and taken to separate collection centres. The cost for separate disposal of this end-of-life equipment was originally paid for by the manufacturer.

organised and managed by the manufacturer.

The user who wishes to dispose of the equipment included in this system should, therefore, take it to an authorised centre for separate collection.

Appropriate separate collection for subsequent recycling, treatment and environmentally sound disposal of discarded equipment contributes to avoiding any negative effects on the environment and health while promoting the reuse and/or recycling of the materials the equipment is made of.

RBM spa reserves the right to improve and change the products described and relevant technical data at any moment and without prior notice. The information and images contained in this document are intended for information purposes only, are not binding and in any case do not exempt the user from strictly following the regulations in force and good practice standards.

**RBM MORE**

**Milan**

Via Solferino, 15  
20121 Milan (MI) Italy  
T. +39 0249631136

**Brescia**

Via Industriale, 12/14  
25075 Nave (BS) Italy  
T. + 39 0300984315

[info@rbmmore.com](mailto:info@rbmmore.com)

[rbmmore.com](http://rbmmore.com)

**RBM S.p.A.**

Via S. Giuseppe, 1  
25075 Nave (BS) Italy  
VAT NO. 00551250988

