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Troubleshooting

Read through the entire instruction manual before you begin. Make sure you have selected the correct type and model of heating mat(s).

Cautions

Improper installation, use, and maintenance of under-floor heating system can cause fire, electric shock or injury to persons and damage to property.

Only a qualified electrician should connect the heating mat/s to the thermostat and/or to the electrical supply circuit.

Jordfelsbrytare skall installeras innan värmematta

NEVER

Never install one mat on top of another or allow its heating cable to cross over or touch each other at any point. This will cause overheating.

Never layout heating cable with spacing less than 3.2". Doing so will cause overheating and void the warranty.

The power lead may be cut shorter if necessary, but never remove completely from the heating cable.

Never bang a trowel, other sharp tools, or heavy objects on the cable while tiling. Be careful not to nick, cut, or pinch the cable.

Never use nails, staples, or similar to fasten the mat/cable to the floor.

Never attempt to repair the heating cable or power lead if it is damaged, it must be replaced. Do not attempt to splice or repair any part of the system.

Never splice one mat/cable to another to make a longer mat/cable (connection in series). The power leads of multiple mats must be wired in parallel in a junction box or to the thermostat.

Never run the floor sensor wire or power lead to cross over or under the heating cable.

Never install mats on stairs, up walls or partitions that extend to the ceiling.

Never install mats under cabinets or other built-ins (i.e. tubs, vanity units, bookshelves, walls or partitions), having zero-clearance, or in small closets. Excessive heat will build up in these confined spaces, and the mat could be damaged by nails or screws used to install built-ins.

Never remove the nameplate label from the power lead. Make sure it is viewable for inspection later.

Never connect the mat to power when folded or during testing.

Never switch on the installed heating system until the adhesive has fully cured (2 weeks minimum).

Never leave surplus matting - use the right size.

Never step directly on the heating cable during installation and tiling.

Do not install the mat across expansion joints.

Never extend the heating mat beyond the room or area in which it originates.

ALWAYS

Always completely embed the heating wire and factory splice (the join between the heating cable and cold lead) in the floor mortar or levelling compound underneath the floor covering.

Always pay close attention to voltage and amperage requirements of the breaker, the thermostat, and the mat/s.

Always wear gloves to prevent irritation from the fiber glass mesh.

Always follow the manufacturer's instructions for installing floor covering materials, scratch coat, thin-set mortar, or quick drying mortar beds.

The type and thickness of floor covering materials used including must not exceed a total thermal insulation R value of 1.

A ground-fault circuit interrupter (GFCI) must always be used in company with the thermostat for electric shock prevention.

Heating mat/s must be installed on a dedicated circuit.

Ensure the tip of the sensor cable be placed away from other heat sources i.e. sunshine or heat vents to give an accurate reading of floor temperature.

Ensure the system is tested before, during and after installation.

Heating mat system must be installed on a dedicated circuit coming directly from the circuit breaker panel. It's necessary to mark the appropriate circuit breaker reference label indicating which branch circuit supplies the circuits to those electric heating products.

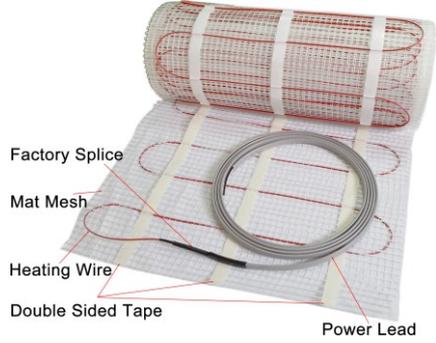
General Information

This manual covers general under-floor heating mat design, installation procedures, precautions, and floor covering guidelines. The manual also discusses controls and testing of the **UTHM14** heating system.

Heating System Description

UTHM14 heating system is a heating mat consisting of a series heating cable and a power lead that runs in the wall and connects to the electric power supply through a thermostat.

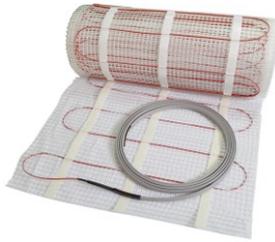
UTHM14 heating cable(s) are constructed by a braided twin-wire design to reduce electromagnetic fields (EMF) to ultra-low levels.

Specification	Appearance
Mat Dimension: 2ft(60cm)/3ft(90cm) Heating Cable: 2 wires, grounded, fluoropolymer insulating jackets Power Lead: 3 × 14 AWG; 10ft (3 m) length	
Performance	
Operating Voltage: 120Vac/240Vac Power Output: 14W/ft ² (150W/m ²) Min. Bend Radius 1in(25mm) Max. Ambient Temp. 85°F(30°C) Max. Exposure Temp. 195°F(90°C) Min. Installation Temp. 40°F(5°C)	Electrical Requirement Max. Circuit Overload Protection: 20A GFCI: Required for each circuit
Application: Type (-X) for indoor floor heating application only. Type (-W) can be installed into shower floors	
System Approvals	
UL Listed for U.S. and Canada under UL 1683 and CAN/CSA C22.2 No. 130-03	

Preparations

You will require the following items to install and test the floor warming system:

Material Required



(A) **UTHM14** heating mat(s)



(B) Listed junction boxes for fitting the thermostat of your choice, in accordance with local building & electrical codes.



(C) Listed thermostats with 15Amp minimum load, in accordance with local building & electrical codes.

(D) Conduit for floor sensor (included in kit)

(E) External contactor (Relay) (if required)

(F) Breaker with GFCI (if not part of the thermostat)

(G) Insulation (if required)

(H) Mortar/ Backer board/ tile....

Tools Required



Craft knife



Multi-meter (Digital)



Scissors



Tile installation tools



Wire stripper



Screwdriver



Chisel

Inspection

Remove the materials from their packages. Inspect them for any visible damage and verify everything is the correct size and type according to the plan and the order. Do not attempt to install a damaged product.

The model number, serial number, voltage, and resistance range as well as the application marking "(-X)" and "(-W)" are shown on a nameplate label attached to the power leads. Record the product information in table1.

Testing heating mat

You must perform the insulation resistance test, the resistance test of heating cable, and the sensor resistance test before you start the installation. For details of testing procedure, please refer to the section of “Testing” of this manual.

Testing

Insulation and Resistance test must be performed before, during, and after the installation of the mats to validate the warranty. It is very important to take resistance readings of the mat and the floor sensor wire to make sure they have not been damaged.

Caution: Make sure power is not applied until heating mat is fully installed and ready for final testing.

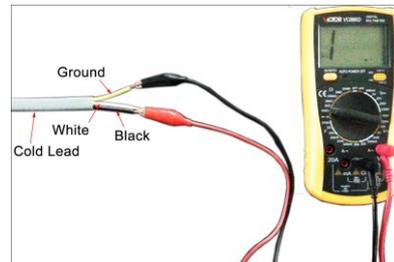
Caution: If there is any change in the reading, record this information and contact the supplier before continuing.

Always: Record the product information and the testing result in table1. Give the records to the homeowner to keep.

Insulation Test

This test ensures that the insulation of the heating cable(s) are not damaged.

Acquire a digital multi-meter. Place one of the meter probes on the conductor wire in either the white or black lead and the other probe on the conductor wire in the green lead (ground). This measurement should be “open”, usually indicated by an “OL” or an “I”.



Resistance Test

Heating cable resistance test

This test is used to determine circuit integrity of the mat.

Set the digital multi-meter to the appropriate setting (normally 200 ohm range). Place one of the meter probes on the conductor wire in the white lead and the other probe on the conductor wire in the black lead. The measured resistance reading should be within the resistance range specified in the “Product Selection Table” of this manual or on the nameplate label.



A cut or break in the wire is indicated by a resistance of “infinite” ohms usually indicated by an “OL” or an “I”.

Record these readings on the Commissioning Record.

Sensor resistance test

This test measures the resistance of the floor sensor and is used to verify the sensor integrity.

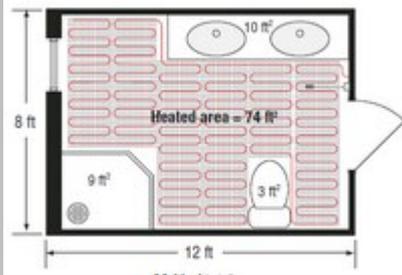
Change resistance range of the digital multi-meter to the appropriate setting (normally 20KΩ) and measure the resistance between the lead wires of the sensor probe. Probe wires resistance reading should be within the range specified in thermostat’s specification table (normally 8-18 KΩ)



Record these readings on the Commissioning Record.

Design

Step1: Determine the heated area of the floor to be heated



Gross room area=8*14=112 ft²

Built-in area

Sink: 12ft²

Toilet: 3ft²

Shower: 11 ft²

Area to be heated:

112-(12+3+11)= 86 ft²

- Sketch the interior perimeter of the room. Begin measuring from one corner of the room and measurement should be made from wall-to-wall and include size and location of permanent fixtures or furniture such as vanities, cabinets, tub, showers, toilet flanges, etc.
- Measure and record the total square footage of floor area to be warmed by subtracting the area associated with the built-ins.

Caution: Locate power locations, fixtures, toilet flanges, doorways and all other floor obstructions accurately on your drawing.

Note: Sketch a diagram of the matting layout for future reference, which should be kept with the manual for future reference.

Step2: Planning

- Select either 120 VAC or 240 VAC depending on the power available.
- Determine the optimum floor warming mat layout for your heated area to ensure coverage.
- Select a spot for the thermostat in the wall above the heated area where it can be reached by the 10-foot (3m) cold lead on the mat, and the corresponding floor temperature sensor.

Step3: Confirm Your Product Selection

Following the example, if the apply voltage is 240V and the heated area is 86 ft², select the 80 ft² mat.

- Select the appropriate mats from table3. Confirm that your mat is no larger than the heated area.
- For heated areas greater than 160 ft² (for 240V)/80 ft² (for 120V), multiple mats may be used.

Caution: The heating wire must never be cut shorter to fit, do not select a product larger than necessary.

Caution: When selecting multiple mats, make sure the thermostats, circuit breaker, and all wiring have the proper capacity.

Caution: If the area requires more than 15 amps to be controlled by one thermostat, use relays to take the additional amp load. (For details please consult a qualified personnel or licensed electrician.)

Table3. Product Selection Table

Voltage	Mat Size		Current (Amp)	Resistance (Ohms) +10%~-5%	Total Power (W)	Model No		
	(m ²)	(ft ²)				Mat Width:2'	Mat Width:3'	
	240V							1.86
2.79			30	1.75	137.2	420	UTHM14-4U0420-2	UTHM14-4U0420-3
3.72			40	2.33	102.9	560	UTHM14-4U0560-2	UTHM14-4U0560-3
4.65			50	2.92	82.3	700	UTHM14-4U0700-2	UTHM14-4U0700-3
5.58			60	3.50	68.6	840	UTHM14-4U0840-2	UTHM14-4U0840-3
6.50			70	4.08	58.8	980	UTHM14-4U0980-2	UTHM14-4U0980-3
7.43			80	4.58	52.4	1100	UTHM14-4U1100-2	UTHM14-4U1100-3
8.36			90	5.21	46.1	1250	UTHM14-4U1250-2	UTHM14-4U1250-3
9.29			100	5.63	42.7	1350	UTHM14-4U1350-2	UTHM14-4U1350-3
10.2			110	6.46	37.2	1550	UTHM14-4U1550-2	UTHM14-4U1550-3
11.2			120	7.00	34.3	1680	UTHM14-4U1680-2	UTHM14-4U1680-3
12.1			130	7.58	31.7	1820	UTHM14-4U1820-2	UTHM14-4U1820-3
13.0			140	8.13	29.6	1950	UTHM14-4U1950-2	UTHM14-4U1950-3
13.9			150	8.67	27.7	2080	UTHM14-4U2080-2	UTHM14-4U2080-3
14.9			160	9.38	25.6	2250	UTHM14-4U2250-2	UTHM14-4U2250-3
120V			0.93	10	1.17	102.8	140	UTHM14-1U0140-2
		1.39	15	1.75	68.6	210	UTHM14-1U0210-2	UTHM14-1U0210-3
		1.86	20	2.33	51.4	280	UTHM14-1U0280-2	UTHM14-1U0280-3
		2.32	25	2.92	41.1	350	UTHM14-1U0350-2	UTHM14-1U0350-3
		2.79	30	3.50	34.3	420	UTHM14-1U0420-2	UTHM14-1U0420-3
		3.72	40	4.67	25.7	560	UTHM14-1U0560-2	UTHM14-1U0560-3
		4.65	50	5.83	20.6	700	UTHM14-1U0700-2	UTHM14-1U0700-3
		5.58	60	7.00	17.1	840	UTHM14-1U0840-2	UTHM14-1U0840-3

Electrical Rough-in

Step1: Confirm power supply

Confirm that the power supply is either 120 or 240 V depending on the mat you chose.

All mats must be protected against overload by a circuit breaker and connected to the electrical service through a Ground Fault Circuit Interrupter (GFCI) some of them are built into the thermostat controls.

Caution: The electrical rough-in must be made by qualified personnel familiar with generally accepted construction techniques and safe electrical practices to validate warranty.

Step2: Determine the number of circuits

The floor warming system must be connected to an appropriate sized electrical circuit breaker.

The rating of the breaker is determined by the amp draw of the heating mats (located on the UL tag attached to the power leads). If multiple mats are to be controlled by one breaker, total their amp draws. If this total exceeds 20 amps (depend on local codes), an additional breaker will be required.

Step3: Install electrical junction box

Install the electrical junction box for accommodating the thermostat into interior walls at a convenient height—typically 5' (150cm) above the floor.

Note: The spot of the junction box must be reached by the 10' (3m) cold lead on the mat, and the corresponding floor temperature sensor.

Remove two knock-outs on the bottom of the electrical junction box and make two paths inside the wall leading to the floor. You will need these holes and paths to route the power lead and the floor temperature sensor wire.

Install appropriate 12 or 14 AWG electrical wire from the circuit breaker or branch circuit source to the thermostat electrical box following all codes.

If Relay(s) are used, feed appropriate wire between the Relay(s) and the thermostat(s).

Installation

Step1: Prepare the subfloor

Prior to heating mat installation, it is important that the sub-floor is properly prepared as per Tile Council of America Guidelines.

It is recommended that layers of underlay (ex. insulation board, cement backer-board or plywood) be put down above the sub-floor and underneath the mat. This will not only strengthen the floor but also help to direct the heat generated to the floor surface.

Install the cement backer board/ Insulation board as per manufacturer's instructions.

Make sure the floor area to be heated is clean, flat, and without any debris that can damage the mat, such as nails, dirt, wood, and other construction objects.

Wet mop the floor to ensure there is no dirt or dust. This will allow proper bonding of the mortar and strong sticking of the double-sided tape.

Step2: Install the power lead/ splice

Position the cold lead of the mat as close as possible to the wall near the electrical junction box. Place the mat on the floor to ensure the power lead will reach the junction box.

Run the power lead inside the wall (through electrical conduit) up to the junction box location, leaving at least 8"(20cm) of free power lead coming out of the knock-out for easy connection to the thermostat.

As the power lead and splice is thicker than the mat, you must chisel a path or gouge out the subfloor so that the lead wire and the splice are level with the mat.

Make sure the factory splice lay completely flat in the floor, not in the wall. Use hot glue to secure the power lead and splice to the floor.

Caution: All old flooring and adhesive such as, linoleum, bitumen must be removed.

Note: The heating mat is not intended to be installed directly upon the sub-floor.

Caution: The type and thickness of underlay materials used must not exceed a total thermal insulation R value of 2.

Caution: The cold lead must be routed outside of the heating mat, never under or over the heating cable.

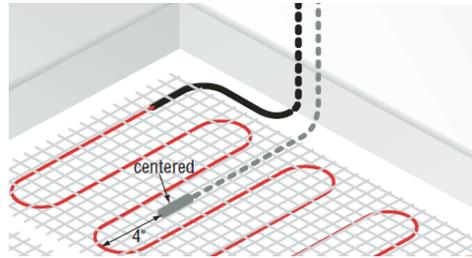
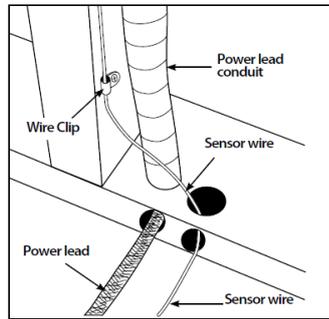
Note: Position the nameplate on the cold lead inside the electrical junction box.

Caution: Do not place the sensor in the same conduit as the power leads to avoid possible interference.

Important: Do not allow heating cable, cold lead, or floor temperature sensor to cross over themselves or each other.

Step3: Install the thermostat sensor

(※For floating laminate and engineered wood flooring materials application skip this step, please refer to the step6 of this section for the detail of thermostat sensor installation)



A floor sensor is included with the thermostat.

Feed the sensor through the other knock-out of the junction box, down through the conduit out into the floor where the heating mat will be installed. Leave at least 8"(20cm) of free lead length at the junction box for easy connection to the thermostat.

Center the floor temperature sensor between two runs of the heating cable, 4 inches from the end of the heating cable loop (or 12" into the heated area), and secure it using hot glue.

Step4: Laying out the heating mat

Dry fit the mat(s) to ensure it fits the outlines of the room and provides proper coverage.

Lay out the mat flat by removing the paper from the double-sided tape along one mat edge and press the tape down to temporarily hold it in place according to your design to cover the intended area.

Ensure it fits well and flat on the floor and has no folds. This will help to make a smooth surface for spreading mortar.

If it is necessary to make a turn in the direction or to make the mat(s) fit odd-shaped spaces, fit into corners, and work around angles or built-ins, cut the mesh with scissors being careful not to damage the heating cable. See figures below for examples.

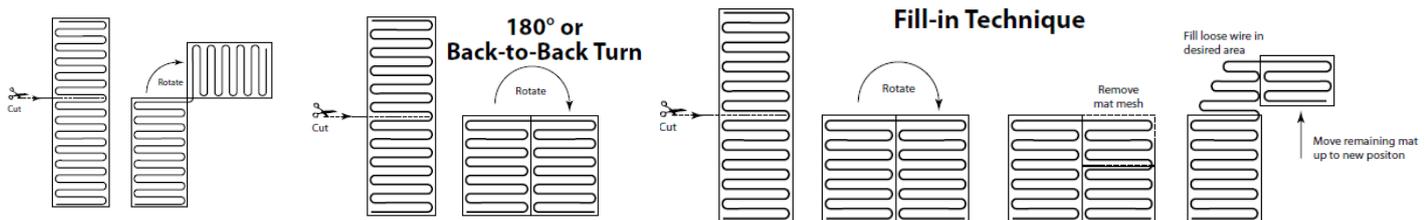
Install the mat approximately 4"-6" away from walls, showers, tubs, toilets, drains, etc.

Align the mats so that the fiberglass mesh is edge to edge. If it is necessary to remove the heating cable from the mesh to route around an obstacle, maintain a min. 3.2" spacing between the cables.

Take photographs of the mat installation. This can be very useful later during remodel work to help avoid possible wire damage. Keep the photos with this installation manual and provide to end user upon completion.

Note: If there is too much mat for the area, it cannot be cut shorter to make it fit the area. All heating wire must be embedded in the floor mortar.

Note: If you remove the wire from the mesh for a custom layout, maintain a min. 3.2" max. 4" spacing between the heating cables.



Step5: Conduct insulation & resistance tests

You must perform the insulation resistance test, heating cable resistance test, and the sensor resistance test before you embed the mat in mortar to confirm that the heating cable and floor sensor have not been damaged.

Step6: Floor Covering

For tile and Stone floor	
<p>A. Embed the mat, power lead, splice, and end seal in mortar</p> <p>Apply a thin coat of self-leveling or acrylic/latex modified thin-set mortar to tile over the mat, power lead, splice, and end seal. Select the proper size trowel using the flat side to avoid any damage to the mat. Spread the mortar evenly over the mat filling in all spaces between the floor, mesh and heating cable. Once the surface is smooth and even, allow it to cure to a hard surface before installing the flooring material.</p> <p>Note: Make sure the thin-set and grout fully cured before activating the mat. Note: Take particularly care when tiling not to dislodge or damage the heating cable. Note: Apply a layer of minimum 1/2" modified thinset cement or adhesive over the heating mat.</p>	
<p>B. Repeat the insulation and resistance test of the heating cable and floor sensor wire</p>	
<p>C. Install the tile/stone</p> <p>Tile and grout the floor in accordance with the Tile Council of North America (TCNA) guidelines or ANSI specifications The thin-set thickness applied is according to the floor covering requirements.</p> <p>Note: Clean excess thin-set from grout lines with a sponge or small plastic Note: Ensure that each tile is solidly bedded in tile adhesive, with no gaps or voids beneath.</p>	
<p>D. Repeat the insulation and resistance test of the heating cable and floor sensor wire</p>	
<p>① Tile, stone, granite or marble with grout ② Thin-set or self-leveling mortar bed ③ Under-floor heating mat (UTHM series) ④ Insulation Board ⑤ Insulation board adhesive ⑥ Concrete slab subfloor</p>	<p>① Tile, stone, granite or marble with grout ② Thin-set or self-leveling mortar bed ③ Under-floor heating mat (UTHM series) ④ Backer board/plywood ⑤ Plywood subfloor ⑥ Insulation (per IRC recommendations)</p>

Glue down Wood floor

A. Embed the mat, power lead, splice, and end seal in mortar

Apply a thin coat of self-leveling or acrylic/latex modified thin-set mortar to tile over the mat, power lead, splice, and end seal. Select the proper size trowel using the flat side to avoid any damage to the mat. Spread the mortar evenly over the mat filling in all apaces between the floor, mesh and heating cable. Once the surface is smooth and even, allow it to cure to a hard surface before installing the flooring material.

Note: Make sure the thin-set and grout fully cured before activating the mat.

Note: Ensure that the heating mat is covered with a minimum of 1/2" of self-leveling compound.

B. Repeat the insulation and resistance test of the heating cable and floor sensor wire

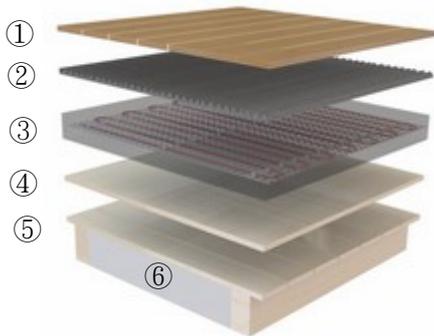
C1. Use an adhesive that is approved for use with radiant floor heating systems.

C2. Apply a layer of adhesive with a notched trowel evenly across the working surface following adhesive manufacturers' instructions.

C3. Install the laminate or engineered wood flooring per manufacturer's instruction.

Note: Nail down installations or other fasteners penetrating the floor can not be used in the heating mat area.

D. Repeat the insulation and resistance test of the heating cable and floor sensor wire



- ① Laminate or engineered wood floor
- ② Glue adhesive
- ③ UTHM embedded in mortar
- ④ Backer board
- ⑤ Wooden or concrete Subfloor
- ⑥ Insulation (per IRC recommendations)

Step7: Thermostat Installation

(Only use Listed thermostats with 15Amp minimum load, in accordance with local building & electrical codes.)

Refer to the Installation and Operation Manual, included with the thermostat for instructions on how to install and to program (if necessary) the thermostat.

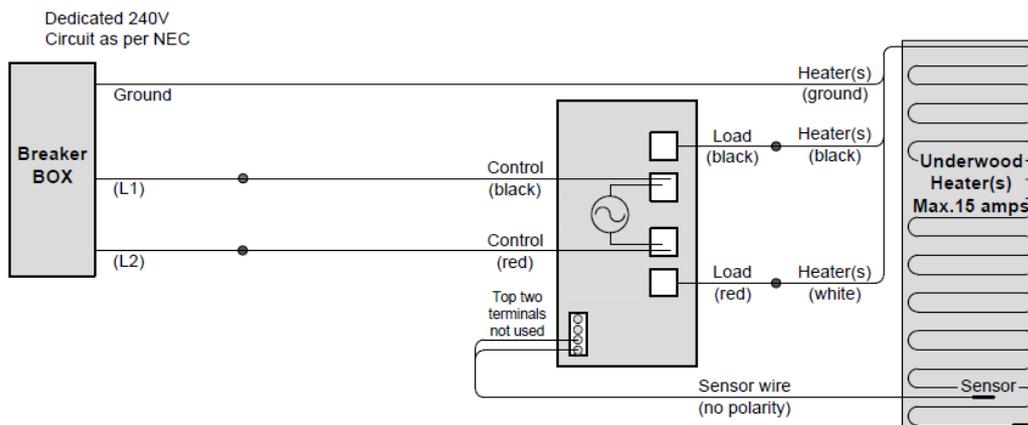
If installing heating mat in a bathroom, install the thermostat on an internal wall outside the bathroom as close to power cable of the mat as possible.

Connect the ground wire to the electrical box ground screw and attach to the GFCI with a standard ground copper conductor. And Make any final connections to the circuit breaker or branch circuit source

Caution: All electrical work must be performed by a qualified electrician in accordance with local building & electrical codes and the National Electrical Code (NEC), especially Article 424, Part V of the NEC, ANSII NFPA 70.

Recommend: When connecting multiple mats it may be easier to connect the mats at a floor level junction box rather than direct to the thermostat (junction box).

Typical wiring for a Thermostat GFCI Control to an Existing Breaker:



Step8: System start up

Wait at least 2 weeks minimum before switching on the system to allow mortar to dry. The heating may be slow to react at first, especially if installed on a new screed floor or in a new building. Start by setting the floor temperature at approx 64°F(18°C) and build up by 2°F (or 1°C) per day until your desired temperature is reached.

***Shower area installation**

Heating mat only with (-W) on the nameplate label may be installed into a floor in a wet location such as, shower area.

The heating system should be completely embedded into mortar directly, also do not run the heating cable through a non-masonry curb, causing it to overheat.

Only tile, stone or other masonry surface can be used as floor covering material for this application.

Install a dedicated heating mat in the shower area, separate from the rest of the bath floor.

The end of the heating cable has a waterproof splice that may be located in the shower area, fully embedded into the mortar like the heating cable.

Make sure the control is located at least 4' away from shower openings such that it cannot be exposed to water or touched by a person in the shower area.

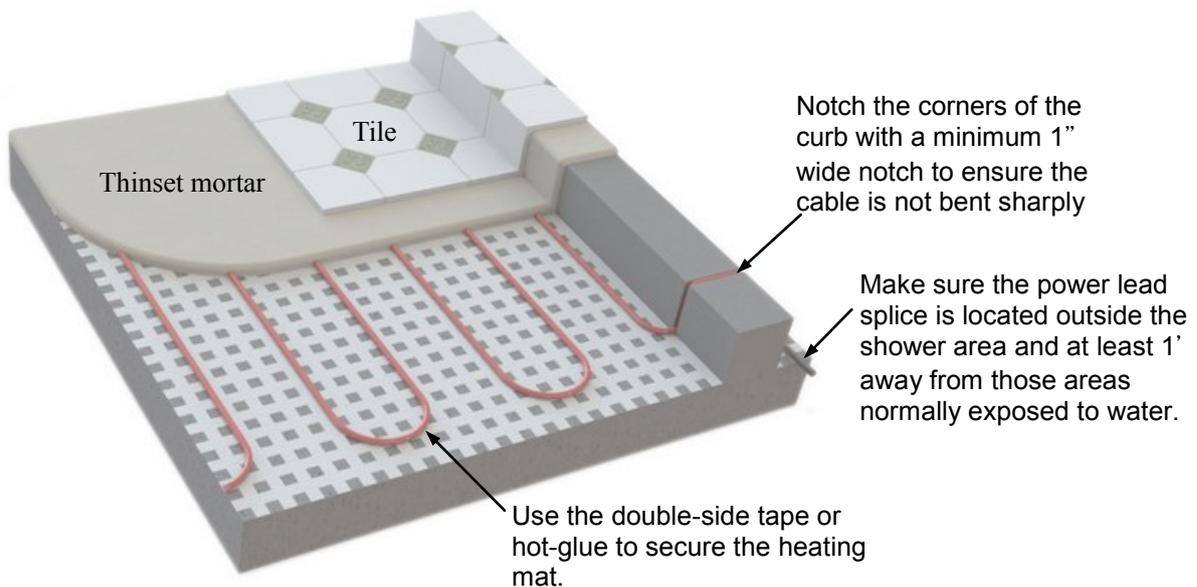
Caution: This product is not for installation in pool and spa areas, nor for outdoor use.

Caution: It's necessary to connection the heating system to a GFCI or other protective device as required by local codes to keep proper grounding of the product.

Note: This product must be installed only in locations in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, and as permitted by the Authority Having Jurisdiction.

Note: Do not use staples or anything that will damage any waterproofing components.

Install a heating cable around the drain leave at least 2" spacing from the edge of the flange.



Troubleshooting

If problems arise with the heating mat or its related electrical components, please consult this troubleshooting guide. All electrical related works must be carried out a qualified, licensed electrician. Any electrical troubleshooting should be performed with the power removed from the circuit, unless otherwise noted.

Problem	Causes	Solution
Floor do not heat up	Thermostat not programmed properly	Refer to instructions and re-program
	Bad connections in junction box or heating mats	Call your electrician to correct the connection. Multiple heating mats must be connected in parallel.
	No voltage to thermostat	Check circuit breaker
	No voltage out of thermostat	Call your electrician - return thermostat to place of purchase for replacement
	Incorrect voltage supplied	Measure and check to ensure the right voltage used.
	Sensor placed on heating wire	Call your tile setter to reposition sensor
	Heating mat has been damaged	Check for mat resistance readings. If incorrect, record resistances between all wires and contact the manufacturer.
	Sensor in direct sunlight	Call your tile setter to reposition sensor
	GFCI light is on	Check for loose wire connections. Reset the GFCI. If GFCI keeps tripping, check for a short circuit in the heating mat. If mat is not damaged, replace the GFCI.
Floor heats continuously	Sensor wire is loose	Check the sensor wire for loose connection.
	Sensor is broken	Measure resistance across the sensor wires. For detail please refer to the section "Testing" of this manual.
	Incorrect wiring	Make sure wiring connections are correct. Make sure the thermostat was not bypassed when it was wired to the power supply. Consult the wiring diagram of the thermostat come with the thermostat.
	Defective thermostat	Return it to dealer for replacement.
Floor not warm enough	Wrong thermostat settings	Carefully read and follow thermostat programming instructions.
Thermostat is not working at all	Incorrect wiring	Ensure that the wiring of thermostat is in accordance to the thermostat installation and operation manual
	No voltage to the thermostat	Check circuit breaker and all connections between breaker and thermostat.
	Defective thermostat	Return it to dealer for replacement.
	Sensor wire is loose or not wired properly	Make sure sensor wiring connections are correct.
Thermostat is not working correctly	Problem with the thermostat	Return it to dealer for replacement.
	Sensor wire is loose or not wired properly	Make sure sensor wiring connections are correct.
	The programming may be incorrect for a programmable thermostat.	Carefully set the program by reading and following thermostat instructions again.

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