

ThermoSlab™

Installation Guidelines

Congratulations on your purchase of **ThermoSlab™** heating cable designed for imbedding in the slab for storage floor and space heating. **ThermoSlab** is an energy efficient way to enjoy the luxury of safe, soothing, warm floors.

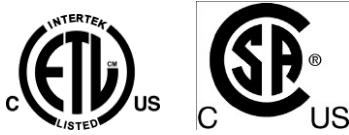


SIZES, COVERAGE & ELECTRICAL SPECIFICATIONS

	Cable Spacing:	4"	5"	6"		
	Watts/S.F.:	<u>17W/SF</u>	<u>14W/SF</u>	<u>12W/SF</u>		
<u>120V</u>	<u>Length</u>	<u>Covers SF</u>	<u>Covers SF</u>	<u>Covers SF</u>	<u>Watts</u>	<u>Amps</u>
TSL55-120	55	20	25	30	350	2.9
TSL85-120	85	30	40	45	510	4.3
TSL115-120	115	40	50	60	700	5.8
TSL145-120	145	50	60	75	870	7.3
TSL175-120	175	60	75	90	1050	8.8
TSL200-120	200	70	90	100	1200	10.0
TSL230-120	230	80	100	115	1380	11.5
TSL290-120	290	100	120	145	1740	14.5
TSL330-120	330	110	140	165	2010	16.8
TSL375-120	375	125	155	190	2250	18.8

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	Watts/S.F.:	<u>17W/SF</u>	<u>14W/SF</u>	<u>12W/SF</u>		
<u>240V</u>	<u>Length</u>	<u>Covers SF</u>	<u>Covers SF</u>	<u>Covers SF</u>	<u>Watts</u>	<u>Amps</u>
TSL300-120	300	100	125	150	1735	7.2
TSL355-120	355	120	150	180	2072	8.6
TSL415-120	415	140	170	205	2410	10.0
TSL470-120	470	155	195	235	2756	11.5
TSL530-120	530	175	220	265	3097	12.9

TSL595-120	595	200	250	295	3470	14.5
TSL680-120	680	225	285	340	3972	16.6



1 ThermoSlab™ Storage Heating System

ThermoSlab Storage Heating System consists of heating cables installed in the foundation of a building either in the concrete slab, or in the sand bed below the concrete slab. Control of the heating cables is achieved with one of **ThermoSoft's** radiant floor heating system thermostats with GFCI (sold separately).

ThermoSoft's power module with GFCI (sold separately) or a separate contactor and GFCI are required for current loads above 15A.

Storage heating consists of heating a concrete slab. One of the economic benefits of **ThermoSlab** is that it makes effective use of off-peak electricity pricing. The slab is charged with heat when electricity rates are low and gently radiates to the floor and living space during the day, providing a comfortable, efficient and reliable heat source.

ThermoSlab benefits over conventional heating methods include:

- Lower capital and operating costs.
- Easy and flexible installation combined with a single point connection.
- Reclaimed interior floor space (no furnace/boiler required).
- Decorating freedom (no heating registers to keep clear).
- Silent, safe, and efficient operation.
- Twin conductor cable. Emits zero EMF (electromagnetic field).
- No cold spots.
- Energy efficiency.
- Reduced dust and allergens.
- Higher degree of comfort.

Versatile and easy to install, **ThermoSlab** storage heating system is the optimal way to heat residential or commercial buildings.

CAUTION!

ThermoSlab is a heating system usually intended to be the sole source of heat in the building.

It is strongly recommended to consult with a building engineer, architect or qualified professional to ensure that the **ThermoSlab** storage heating system selected will be suitable for your intended application.

2 ThermoSlab Cable Specifications

Cable Construction:	Twin conductor, emits zero EMF, single point connection
Rated Voltage:	120V, 240V
Output:	6 Watts per linear foot
Cable length:	55' to 680'
Bending radius:	1.5"
Cable Diameter:	1/4"
Conductor Insulation:	Fluoropolymer and XLPE
Outer Insulation:	PVC
Maximum rated temperature:	220°F(105°C)
Minimum Installation Temperature:	40°F(5°C)
Cold lead:	20 ft.

3 Measuring ThermoSlab™ cable resistance **WARNING:**

Measure resistance.



The InstAlarm® installation monitor shown above-right will constantly monitor the heating wire during the entire installation process. If the ThermoSlab wire is cut or damaged during installation, this device sounds an alarm to prevent imbedding a damaged heat cable.

Using a digital Ohmmeter, the resistance should be measured between the black and white conductors. Compare the measured resistance to the resistance listed on the product label (on the power lead).

Also, measure the resistance between the black and ground wires, and between the white and ground wires to test the insulation resistance. Both should have infinite resistance. If available, it is recommended to use a megger meter for this test with a voltage setting of up to 2500V.

Record the resistance on the warranty card. Documenting the resistance at each stage of the installation is required for warranty purposes. If the resistances do not match the expected values, the cable may be damaged and in need of repair or replacement. Contact **Thermosoft** for a repair kit.

While not required, the resistance of the floor sensor can be verified. It should be approximately 12kΩ at room temperature.

4 GENERAL NOTES -- Read before beginning foundation!

- The installation shall be in accordance with the manufacturer's instructions and national and local electrical codes. The installation shall be in accordance with Part 426, American National Standard

Institute / National Fire Protection Association (ANSI/NFPA70), National Electrical Code (NEC) and Canadian Electrical Code (CEC), Part 1. A ground fault protection device (GFCI) or a Residual Current Device (RCD) must be used.

- All local codes concerning buildings, electrical installations etc. must be adhered to regardless of instructions provided in this manual. If these regulations are in direct conflict with instructions stated herein, please contact ThermoSoft.
- It is important that this equipment is only installed by qualified electricians who are familiar with the proper sizing, installation, construction and operation of electric heating cable systems and the hazards involved. **ThermoSlab** is only designed for installation in concrete or sand applications.
- Metal structures or materials used for the support of or on which **ThermoSlab** is installed must be grounded in accordance with CSA Standard C22.1, Section 10 and the NEC.
- It is recommended to install **ThermoSlab** with a floor heat temperature limiting sensor.
- Ensure that the supply voltage matches the voltage required for the particular **ThermoSlab** product;
- Extreme care must be used to ensure **ThermoSlab** cables are not damaged when using sharp tools, wheelbarrows, heavy machinery, shovels, rakes, or other implements. Avoid walking on the cables during installation.

READ THESE INSTRUCTIONS BEFORE BEGINNING THE CONSTRUCTION OF THE FOUNDATION

- **Never cut the heating cable;**
- **Do not install ThermoSlab cables in such a manner that two heating cables touch, cross or overlap.**
- Measure, verify and record the actual resistance throughout the installation process:
 1. Out of the box
 2. After installation of cable
 3. After laying the sand bed (for sand bed installation)
 4. After the concrete slab is poured (but not set)
 5. When connecting to the thermostat.

Record the above resistance values on the warranty card. Failure to do so will void the warranty.

- **ThermoSlab** storage heating systems are most effective with tile, stone or concrete floors. If carpet, wood or other flooring materials are to be used, please consult with **ThermoSoft**.
- **ThermoSlab** cable must be embedded in mortar or mortar mixture, concrete, sand or similar material.
- Ensure no air pockets exist in the concrete or sand. This can damage to the cable.
- The perimeter of the heated area should be insulated to 4ft below grade with a minimum 2 inches of rigid, closed cell foam insulation (styrofoam) or equivalent suitable for in-ground installation. Foamed urethane or polystyrene are not acceptable as moisture reduces insulation properties.
- Ensure that all sharp stones and debris are removed from the area where the heating cables are going to be installed.
- Make sure the cable is not subjected to excessive tension or strain, especially where the heating cable is connected to the power lead. Heat cable should not cross an expansion joint when installed in concrete. For two or more slabs, the use of separate heat cables in each slab is recommended.
- At low temperatures, the heating cable stiffens and may be difficult to work with. To overcome this, roll out the heat cable completely and connect the cable to power for a brief period of time.
WARNING: Ensure the cable is fully rolled out when connected to power!

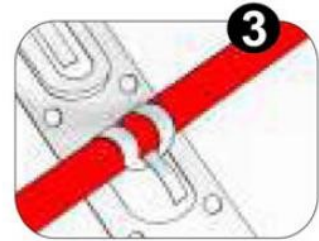
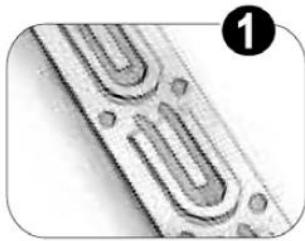
- A minimum of 12 inches should exist between the cables and the perimeter of the foundation, and obstructions such as drains, conduits, and structural members.
- There should be a minimum of 2 inches of concrete or sand above and below the heating cables.
- Allow the concrete to set for at least 30 days before the heating cables are turned on.
- **There should not be any moving groundwater in the building area. Natural moisture in the soil is acceptable. If in doubt, contact ThermoSoft.**

Please consult ThermoSoft for advice or questions.

5 General ThermoSlab Installation Guidelines

5.1 Free Cable and Cable Strapping

- Follow the instructions below if using **ThermoSoft's** or other cable strapping to secure **ThermoSlab** cable.



Secure cable strapping Place **ThermoSlab** cable. Clip cable in place. to the ground surface.

5.2 Installing the heating cable

- **ThermoSlab** cable must be laid out with even spacing over the entire area to be heated.
- If rebar or wire mesh is available, cable strapping is not required. **ThermoSlab** cable can be attached directly to the rebar or wire mesh using tie wraps.
- To ensure an accurate and easy method of installing **ThermoSlab** cable, it is recommended to use **ThermoSoft** cable strapping. The strapping should be laid perpendicular to the direction of the cable. Space the strapping 3 feet apart. Secure the heating cable to the cable strapping at the correct center-to-center distance. Do not secure the cable too tightly as this may damage the cable.

5.3 Center-to-center distance

- To determine the approximate center-to-center distance for **ThermoSlab** cables, the following formulas can be used, or consult with the engineer responsible for the building construction.
 - First determine approximate cable length required as:

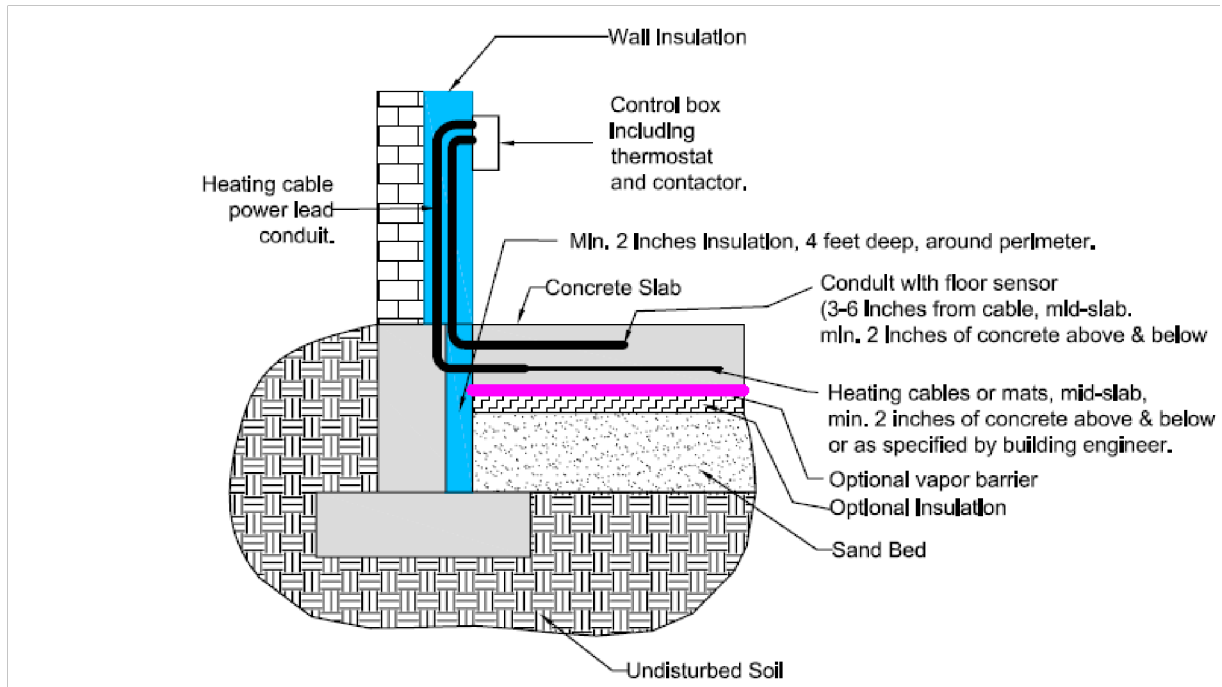
$$\text{Cable length (ft.)} = \text{Power (Watts)} / 6.$$

- Select a combination of cable lengths that most closely totals the length required. ○ Proceed to calculate the center-to-center distance:

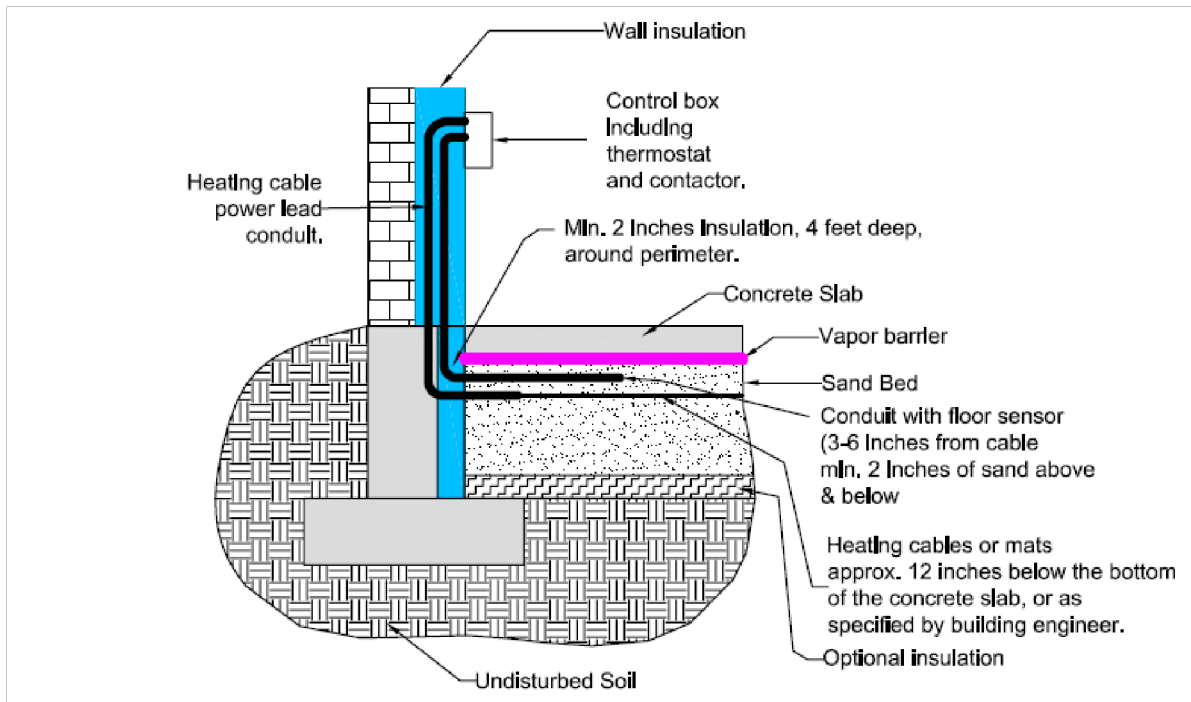
$$\text{Center-to-center (inches)} = \text{Area (S.F.)} \times 12 / \text{cable length (ft.)}$$

6 Typical Installation Diagrams

CONCRETE INSTALLATION



SAND BED INSTALLATION



7 Installation in Concrete Slab

STEP 1: PLAN YOUR LAYOUT

Make a sketch of the area to be covered with **ThermoSlab** heating cables. Determine the location of fixtures such as drains, pipes, electrical conduits, structural members. Keep a distance of 12 inches around such obstacles. All obstacles that shall be in the concrete slab should be installed prior to **ThermoSlab** installation to avoid damaging the cable.

Plan the location of the thermostats, floor sensors and conduit. The start of cables should be as close as possible to the thermostat's location. Refer to guidelines on cable installation earlier in this manual.

STEP 2: INSTALLING THE FLOOR SENSOR AND CONDUIT

A floor sensor for high temperature protection must be installed in a rigid conduit. The conduit protects the sensor and facilitates its replacement in the unlikely event of failure.

The sensor and the conduit may be installed in connection with the actual construction work and connected at a later date. Please observe the following:

- Ensure that the conduit is sealed before the concrete is poured.
- The conduit must be positioned between the heating cables. This is usually at approximately the mid-point of the concrete slab.
- It is recommended to keep the conduit as short as possible and to minimize the number of bends in the conduit. This will simplify installation of the sensor.
- Place the sensor inside the conduit until it reaches the end of the conduit.
- The sensor and conduit should be placed within 3 to 6 inches of the heating cables and with at least 2 inches of concrete or sand above and below.
- The floor sensor should be installed at least 3 feet into the heated area.
- The floor sensor has a standard 10 ft. lead that may be extended with 20 AWG wire. **STEP 3:**

MEASURE THE RESISTANCE OF THE HEATING CABLE

- Using a digital ohm-meter, measure the resistance of **ThermoSlab** cable. Compare the measured value with the resistance listed on the label of the power lead. See page 2 for details.
- **Record the measured resistances on the warranty card. Documenting the resistance at each stage of the installation is required for warranty purposes.**

STEP 4: INSTALLING THERMOSLAB CABLE

- **ThermoSlab** cable is usually attached to the rebar or wire mesh of the foundation.
- For details, refer to guidelines on cable installation on page 5 of this manual. An alternative is to install **ThermoSlab** using the cable strapping. The cables should be approximately at the midpoint of the slab, but in all cases, it is recommended to have at least 2" of concrete above and below the cables.
- The power lead to heating cable connection and at least 12 inches of power lead must be embedded in the mass material. The remainder of the power lead should be in conduit that extends to the thermostat or contactor. The power lead may be extended if required.
- Measure the resistance again as outlined above and record the information on the warranty card.
- **TIP:** It is recommended to take a picture of the cable layout and conduit placement during installation. This can help in the unlikely case that the cables need repair and for warranty claims.

STEP 5: POUR THE CONCRETE SLAB

Pour the concrete slab. Ensure that the contractors are careful not to damage the cable with tools, heavy machinery, etc. Once the slab is poured but concrete is still wet, measure the resistance and record the information on the warranty card.

It is not recommended to power the cables until the concrete has cured (approximately 30 days). Check with the concrete manufacturer for exact curing times. Doing so can affect both the integrity of the slab, and the subsequent proper operation of **ThermoSlab** cables.

STEP 6: CONNECT POWER SUPPLY AND THERMOSTAT

The connection of the thermostat must be done by a qualified electrician familiar with heating cables and in accordance with the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Properly ground the heating cable braid.

If not already done, the sensor should be installed in the conduit. The sensor should reach the sealed end of the conduit. Connect the thermostat and sensor according to the wiring diagram on page 11.

A final resistance reading of the cables should be made and the values recorded on the warranty card.

STEP 7: RECORD INFORMATION AND AFFIX LABELS

- Ensure that all resistance measures are recorded on the warranty card.
- The product code found on the **ThermoSlab** cable power lead must be recorded on the warranty certificate.
- Install the electrical panel label at the electrical panel, indicating the location of the cable.
- Install the Warning label in a visible area of the floor, for the duration of the construction.
- It is also recommended that the label be kept in a suitable location on a permanent basis.

STEP 8: ENJOY THE COMFORT OF THERMOSLAB™

When the **ThermoSlab** thermal storage heating system is ready to use, increase the temperature gradually and adjust it until it reaches the desired level.

Note that it may take several hours for the thermal mass to heat up the first time the system is powered and after extended periods of inactivity.

8 ThermoSlab™ Installation in Sand Bed

STEP 1: PLAN YOUR LAYOUT

Make a sketch of the area to be covered with **ThermoSlab** heating cables. Determine the location of fixtures such as drains, pipes, electrical conduits, structural members. Keep a distance of 12 inches around such obstacles. All obstacles that shall be in the concrete slab should be installed prior to **ThermoSlab** installation to avoid damaging the cable.

Plan the location of the thermostats, floor sensors and conduit. The start of cables should be as close as possible to the thermostat's location. Refer to guidelines on cable installation earlier in this manual.

STEP 2: STARTING THE SAND BED

Ensure that the ground below the sand bed is well compacted, free of organic materials, and generally and sufficiently stable for laying a suitable foundation. Proceed to fill the area with washed masonry sand. The sand should be free of organic material, stones, debris or any other object that could damage the cable. Moisten, and compact the sand.

Raise the sand to a level of 12 inches below the bottom of the concrete slab, or as specified by the engineer. The layer of sand should be at least 2 inches thick.

STEP 3: INSTALLING THE FLOOR SENSOR AND CONDUIT

A floor sensor for high temperature protection must be installed in a rigid conduit. The conduit protects sensor and facilitates its replacement in the unlikely event of failure.

The sensor and the conduit may be installed in connection with the actual construction work and connected at a later date. Please observe the following:

- Ensure that the conduit is sealed before the sand is laid.
- The conduit must be positioned between the heating cables. This is usually 12 inches below the bottom of the concrete slab.
- It is recommended to keep the conduit as short as possible and to minimize the number of bends in the conduit. This will ease the installation of the sensor.
- Place the sensor inside the tube until it reaches the end of the conduit.
- The sensor and conduit should be placed within 3 to 6 inches of the heating cables and with at least 2 inches of concrete or sand above and below.
- The floor sensor should be installed at least 3 feet into the heated area.
- The floor sensor has a standard 10 ft. lead that may be extended with 20 AWG wire.

STEP 4: MEASURE THE RESISTANCE OF THE HEATING CABLE

Using a digital ohm-meter, measure the resistance of **ThermoSlab** cable. Compare the measured value with the resistance listed on the label of the power lead. See page 2 for details.

Remember to record the measured resistances on the warranty card. Documenting the resistance at each stage of the installation is required for warranty purposes.

STEP 5: INSTALLING THERMOSLAB CABLE

Install **ThermoSlab** cable according to the sketch made in step 1. The cable should be secured to prevent movement in subsequent steps. For details, see page 5 of this manual. For cable installation, you may need to install the cable strapping before installing **ThermoSlab** cable.

The power lead to heating cable connection and at least 12 inches of power lead must be embedded in the mass material. The remainder of the power lead should be in a conduit that extends to the thermostat or contactor. The power lead may be extended if required.

Measure **ThermoSlab** cable resistance and record the information on the warranty card.

TIP: It is recommended to take a picture of the cable layout and conduit placement during installation. This can help in the unlikely case that the cables need repair and for warranty claims.

STEP 6: FINISHING THE SAND BED

Continue raising the sand bed with washed masonry sand, to approximately 1 inch below the base of the future concrete slab. Once again sand should be free of organic material, stones, debris or any other object that could damage **ThermoSlab** cables. Gently wet the compacted sand until completely saturated with water.

Ensure that the contractors are careful not to damage the cable with tools, heavy machinery, etc.

Install a vapor barrier over the sand bed with 6" in of overlap for adjacent sheets. Finish the sand bed with an additional 1 inch of compacted sand. This will help to prevent movement of the vapor barrier when during subsequent steps.

Measure the **ThermoSlab** cable resistance and record the information on the warranty card.

It is not recommended to power the cable at this time.

STEP 7: POUR THE CONCRETE SLAB

Pour the concrete slab. Ensure that the contractors are careful not to damage the cable with tools, heavy machinery, etc. Once the slab is poured but concrete is still wet, measure the resistance and record the information on the warranty card.

It is not recommended to power the cables until the concrete has cured (approximately 30 days). Check with the concrete manufacturer for exact curing times. Doing so can affect both the integrity of the slab, and the subsequent proper operation of **ThermoSlab** cables.

STEP 8: CONNECT POWER SUPPLY AND THERMOSTAT

The connection of the thermostat must be done by a qualified electrician familiar with heating cables and in accordance with the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Properly ground the heating cable braid.

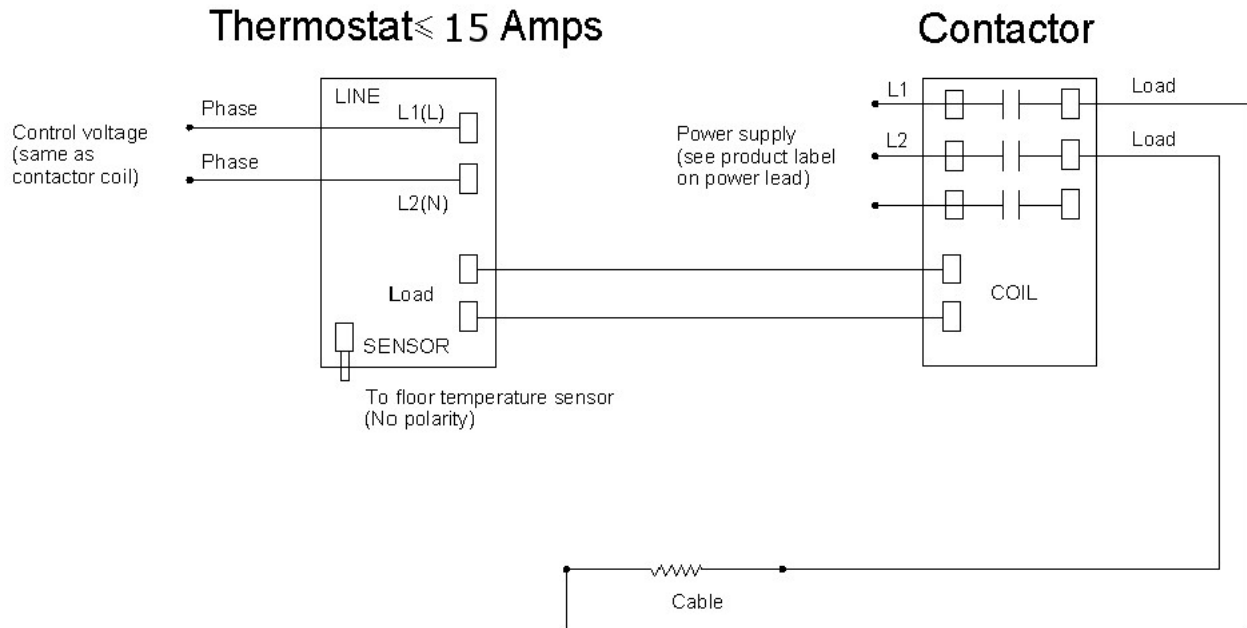
If not already done, the sensor should be installed in the conduit. The sensor should reach the sealed end of the conduit. Connect the thermostat and sensor according to the wiring diagram on page 11.

A final resistance reading of the cables should be made and the measured values recorded on the warranty card.

STEP 9: RECORD INFORMATION AND AFFIX LABELS

- Ensure that all resistance measures are recorded on the warranty card.
- The product code found on the **ThermoSlab** power lead must be recorded on the warranty certificate.
- Install the electrical panel label at the electrical panel, indicating the location of the cable.
- Install the Warning label in a visible area of the floor, for the duration of the construction. It is also recommended that the label be kept in a suitable location on a permanent basis. **STEP 10: ENJOY THE COMFORT OF THERMOSLAB™**
- When the **ThermoSlab** thermal storage heating system is ready to use, increase the temperature gradually and adjust it until it reaches the desired level.
- Note that it may take several hours for the thermal mass to heat up the first time the system is powered and after extended periods of inactivity.

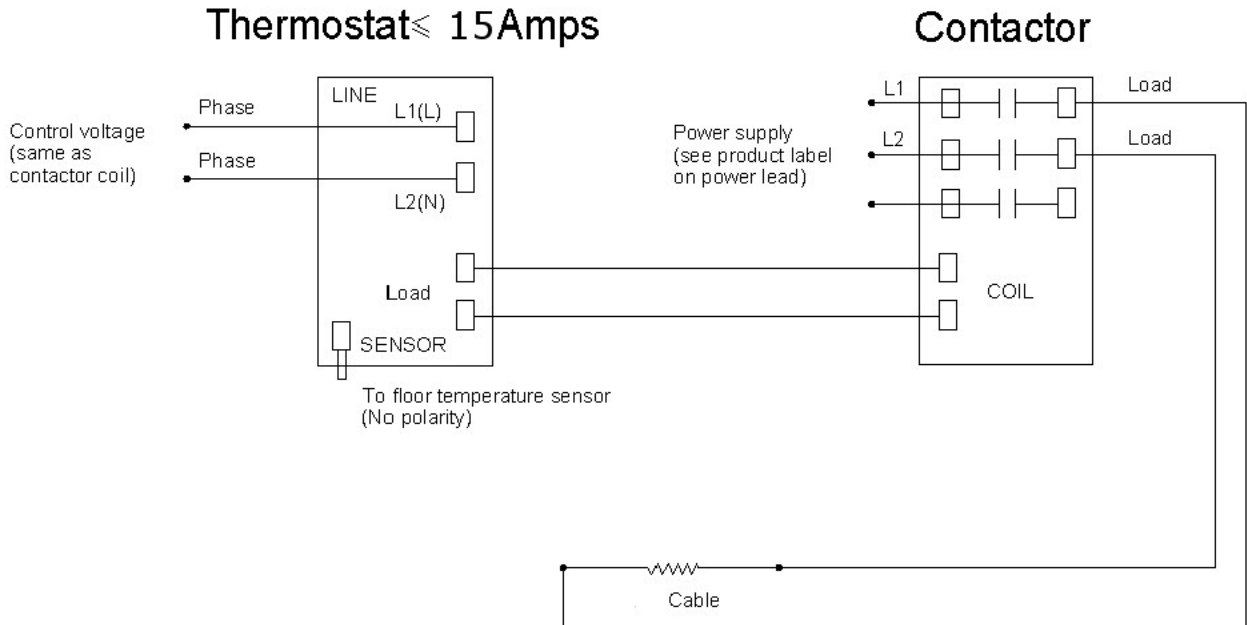
TYPICAL SINGLE PHASE WIRING



NOTES

1. Installation of a ground fault protection device is strongly recommended. Please check local code for requirements.
2. If the total current draw is 15A or less, and the mat voltage is 120/240V then the contactor can be omitted. Connect cable power lead directly to the load terminals of the thermostat.
3. Only one floor sensor is required per thermostat.

TYPICAL SINGLE PHASE WIRING



NOTES

1. Installation of a ground fault protection device is strongly recommended. Please check local code for requirements.
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ThermoSlab® Heat Cable Warranty Registration

Congratulations on-purchasing-ThermoSlab Heat Cable System. A copy of this form and ThermoSlab installation photos are required for the warranty to be valid. Please send a copy of this form to ThermoSoft via mail, FAX at 847-279-8845, or scan and send via e-mail to: sales@thermosoft.com.

KEEP A COPY OF THIS FORM WITH YOUR WARRANTY

OWNER / JOB LOCATION						
Name			Order Number			
Address			Phone			
City			Email			
State		Zip		Job Name		
ELECTRICIAN			CONCRETE INSTALLER			
Name		Phone		Name		Phone
Company			Company			
Address			Address			
City		State	Zip	City		State
City		State	Zip	City		State
Install Date:			Installed Under:			
Material Depth Below Cable:			Material Depth Above Cable:			
Resistance Readings:		Cable 1	Cable 2	Cable 3	Cable 4	Cable 5
Cable Model#						
Zone ID						
OHM Reading 1 - Before Install						
*MegOHM Reading 1 - Before Install						
OHM Reading 2 - During Install						
*MegOHM Reading 2 - During Install						

OHM Reading 3 - After Install						
*MegOHM Reading 3 - After Install						
Serial Number - Internal Use Only						
QC MEGOHM - Internal Use Only						
QC OHM - Internal Use Only						

*MegOhms readings are done across the green ground wire to each conductor separately. If at any time a reading does not exceed 10 MegOhms, please halt installation and contact Thermosoft. Ph. 847-279-3800 Fax 847-279-8845, www.thermosoft.com.

ThermoSlab® Heat Cable Warranty

Thermosoft warrants the ThermoSlab heat cables (“the Product”) to be free from defects in materials and workmanship for ten years from the date of purchase, provided that the Product is installed in accordance with the Thermosoft product installation guide, any special written or oral design or installation guidelines provided by Thermosoft for the specific project that the Product is intended, the provisions of the National Electric Code (NEC), and all applicable local building and electrical codes. If the Product is determined to be defective in materials and workmanship, and has not been damaged as a result of misuse, misapplication or improper installation, Thermosoft will replace the Product or refund the original cost of the Product. Controls are warranted for three years from date of purchase. Should the control be defective or malfunction, return the control to Thermosoft and it will be repaired or replaced (at Thermosoft’s option). The warranty does not cover removal or reinstallation costs. See entire warranty in packaging.

Thermosoft assumes no responsibility under this warranty for any damage to the Product prior to or during installation by anyone, including, but not limited to trades people or visitors to the job site, or damage caused as a result of post installation work. Call our toll free number, 800-308-8057, if you have any questions about installation. The Limited Warranty is null and void if the Product owner or his representative attempts to repair the Product without receiving authorization.

Upon notification of an actual or possible problem, Thermosoft will issue an Authorization to Proceed under the terms of the Limited Warranty. Thermosoft reserves the right to void said warranty, if the product owner repairs any heating wire, for any reason.

Warranty Subject to the Following Conditions: 1. The warranty of the ThermoSlab heating system must be registered by completing and returning the attached ‘Thermosoft Warranty Registration’ card to Thermosoft within 60 (sixty) days of date of purchase along with photographs of the ThermoSlab installation. Please keep your invoice, as proof of date of purchase will be required in the event of a claim. 2. The heating cables or mats must be installed properly under concrete. 3. The slab heating system must be electrically grounded and protected by a GFI (Ground Fault Interrupter). 4. The installation must comply with all national and local electrical and building codes, as well as any other applicable statutory requirements. 5. The manufacturer hereby reserves the right to inspect the installation site at any reasonable time. 6. The warranty is not automatically transferred with change of ownership, but the manufacturer may, on application, transfer the warranty for the period remaining. This transfer is solely at the discretion of the manufacturer. 7. The slab heating system should be used strictly in accordance with the following: Hard wire the slab heating cables to a dedicated circuit. The voltage of the circuit should match the voltage of the slab heating system. Under no circumstances should anyone tamper with or attempt to repair the slab heating system - this will render the warranty null and void. Do not drop heavy articles, pierce or cut the surface that the heating system is installed. All restrictions and warnings detailed in the installation guide must be strictly followed.

THERMOSOFT DISCLAIMS ANY WARRANTY NOT PROVIDED HEREIN, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THERMOSOFT FURTHER DISCLAIMS ANY RESPONSIBILITY FOR SPECIAL, INDIRECT, SECONDARY, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING FROM OWNERSHIP OR USE OF THIS PRODUCT, INCLUDING INCONVENIENCE OR LOSS OF USE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE FACE OF THIS DOCUMENT. NO AGENT OR REPRESENTATIVE OF THERMOSOFT HAS ANY AUTHORITY TO EXTEND OR MODIFY THIS WARRANTY UNLESS SUCH EXTENSION OR MODIFICATION IS MADE IN WRITING BY A CORPORATE OFFICER.