ThermoSoft® INTERNATIONAL CORPORATION

Installation Guide

NeverFreeze® Self-Regulating (PTC) Heating Cable

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DESCRIPTION

Cable Construction	
Service Voltage	110-120V, 220-277V
Width (in/mm)	0.42 (10.6)
Thickness (in/mm)	0.23 (5.8)
Buss Wire Gauge (AWG)	16
Cold Lead Length (in/mm)	35 (900)
Min. Circuit Breaker Size (Amps)	15
Min. Exposure Temperature	185°F (85°C)

NeverFreeze® self-regulating heat cables are intended for use on all types of pipes including metal, plastic, and PVC. They are specially designed for pipe freeze protection and viscosity control to prevent damage to water lines. Unlike constant Wattage cables that produce the same amount of heat regardless of the outside temperature, NeverFreeze® self-regulating cables increase Wattage as needed, reducing energy consumption. NeverFreeze can be installed on both metallic and non-metallic pipes of all sizes. It is suitable for both indoors and outdoors.

The cables are available in custom length plug-in kits or in various spool lengths and terminated on-site. The plugin kits are provided with a factory sealed power connection with 30-inch power cord and plug and a factory sealed end termination.

SIZING

ThermoSoft NeverFreeze® cables are available in 120 or 240 Volts.

Both voltage options come in foot lengths, from 1 to 500 feet. Combine different sizes to heat total area if needed.

INSPECTION

1. Open package and visually check for breaks or nicks in the cable jacket. File claim with carrier if any damage is found.

2. Never energize the cable when it's coiled or on a reel. Test only when it is laid out straight.

3. -After removing the cable from the carton or wrapping, check the insulation resistance of the unit from buss wires to braid with a 2500VDC megger to assure the cables have not been damaged during shipping and handling.

ELECTRIC SHOCK HAZARD.
Verify insulation resistance is 20 megohms or greater before installing.
Contact ThermoSoft if cable is less than 20 megohm.

WARNING

ELECTRIC SHOCK HAZARD.

Disconnect all energy prior to installing or servicing heating cable and accessories. A licensed electrician needs to perform installation and service of heating cable and accessories. The heating cable must be effectively grounded in accordance with the National Electrical Code. Failure to comply can result in property damage or personal injury.

Please make sure to avoid the following problems:

• Do not twist the bus wires together at either end of the heater cable. Each of these wires has a voltage or neutral; twisting them together will result in a short circuit.

• Insulate the black polymer surrounding the bus wires. The black compound around the bus wires is electrically conductive and should be treated as a conductor.

• De-energize all power circuits before installation or servicing.

• Keep ends of the heating cable and kit components dry before and during installation.

• To prevent electrical arcing and fire hazard, all cable connections and electrical wiring connections should be sealed to prevent moisture. This includes the use of proper cable sealing kits and the moisture proofing of all wire connections.

• The metal sheath/braid of the heater cable must be connected to a suitable ground path.

• Do not use products containing plasticizers, such as vinyl electrical tape, or duct tape when installing self-regulating heater cables.

• Do not expose heater cables to temperatures above their maximum ratings. Higher temperatures can greatly shorten the life of a heater cable.

• Immediately replace any damaged heater cable or components. Failure to replace any damaged components (heater cable, components, or thermal insulation) will result in system failure.

• If installing heating cable in classified areas (explosive dust such as granaries or coal handling or gases such as petrochemical or chemical installations) require the use of special electrical components. Call ThermoSoft at (800)308-8057 before conducting your installation.

• Installation on plastic pipe requires special considerations in selections & installation. See the Nelson Heat Trace Design Guide for details in design and selection.

• To prevent creases, ThermoSoft recommends the minimum bending radius be 1 inch (25 mm).

• All the self-regulating heating cables have minimum installation temperature of - 40°C (-40°F). Scheduling The installation of the electric heat tracing requires coordination with the piping, insulation, electrical and instrument groups. Cable installation should begin only after most of the mechanical construction is complete. Pressure testing of the pipe and

installation of the instruments should be complete prior to the start of the heater cable installation.

Pre-Installation Check

Walk the piping system and plan the routing of the heater cable. This action is used to verify completion of all instrumentation and mechanical work. All coatings (paint, etc.) and surfaces must be dry before attempting the heater cable installation.

Heater Handling

• To avoid damage, use a reel holder to roll out the heater cable.

• Keep the cable strung loosely and close to the pipe being traced. This will avoid interference with supports and other equipment.

• Leave an extra 30-46cm (12-18") of heater cable at all power connections, tee splices and end seal connections to facilitate ease of working with the connections.

• Additional heater cable is required on valves, pipe supports and other equipment. See the installation detail section for exact lengths and method of installation.

• When handling the heater cable, avoid pulling it over or installing against sharp edges.

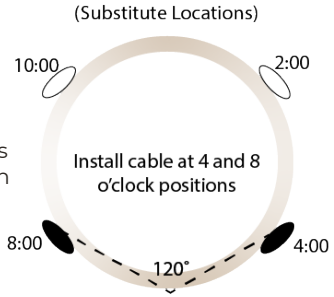
• Do not kink or crush the cable, including walking on it or driving over it with equipment.

DESIGN

NeverFreeze self-regulating heating cables can be configured in straight runs. Always keep cable flat against pipe.

Straight Tracing

When straight tracing is used, install the heater cable on the lower quadrant of the pipe. This helps prevent physical damage to the heater cable from falling objects and from being walked on. When installing two cables on one pipe, always position cables at 4 and 8 o'clock positions.



Attachment

Fiberglass tape is permitted for fastening cable to pipe. If plastic ties are used, they must have a maximum temperature rating equal or better than the system requires. Secure cable snugly against the pipe at 1-foot (355 mm) increments.

Do not fasten heating cable to pipe with metal straps, wire, vinyl electrical tape, or duct tape. In rare instances, aluminum foil tape may be used on plastic pipes, along the entire length of the pipe.

Cutting the Heater Cable

Do not cut the cable until it is attached to the pipe. Confirm the allowances for terminations, connections, and heat sinks (valves, support, etc.) before cutting the cable. Power output is

unaffected by cutting it to length. Protect all cable ends from moisture and damage if left exposed. Allow 1 foot of extra cable per valve.

Installation Details

Heater cables should be applied in a manner to facilitate the easy removal of valves and small in-line devices without the removal of excessive thermal insulation or having to cut the heater cable. The best way to accomplish this is to loop the cable. The amount of heater cable installed on each valve, hanger, etc. varies with the pipe size and type of device.

1. Calculate the amount of cable required.
   Take a string and run it along the piping as if it were heating cable.

2. Calculate the number of circuits required.

Maximum Allowable Circuit Length Per Breaker Rating for 5W/Linear Ft			
	120V		
	15A	**20A**	**30A**
Start up at 0°F	90 ft	120 ft	175 ft
Start up at -20°F	75 ft	100 ft	150 ft
	240V		
	15A	**20A**	**30A**
Start up at 0°F	135 ft	185 ft	275 ft
Start up at -20°F	120 ft	160 ft	250 ft

3. Branch-Circuit Sizing: The ampacity of the branch circuit conductor and the rating or setting of overcurrent devices shall not be less than 125% of the ampere load of the cable or units.

BEFORE INSTALLATION

4. Installing the installation accessories.

A. Install all end seals and splices prior to making power connections.

B. Use only UL Listed weather-proof junction boxes for power connection.

C. ThermoSoft recommends using the following:

Insulation:

a Frost King Fiberglass and Plastic Pipe Wrap Insulation Kit (3" wide x ½" thick x 25' long with 25' plastic vapor barrier); R Value 1.6

b Frost King Pipe Wrap Insulation Tape - Self-Adhesive Foil and Foam (2" wide x 1/8" thick x 15' long); R value 2.0

Tape:

c Duck General Purpose Fiberglass Strapping Tape

d SONTRAX Aluminum Foil Tape (2" wide, -20°F/-30°C to 248°F/120°C)

5. Start-up requirements.

A. The power connection kit contains caution labels that must be visibly located.

a One must be at the circuit breaker panel.

b One must be on or next to the ON/OFF control for the cable unit.

B. The heating cable comes with caution labels that must be visibly located on piping. Place one label every 10 feet, over insulation and plastic wrapping.

C. Prior to energizing the system, make sure the heating cable is free of mechanical damage (nicks, cuts, etc.) and thermal damage (solder, overheating, etc.). Visually check all power connections, splices, and end seals.

D. Perform 2500 VDC meggar check.

The meggar check is performed at the power connection end of the cable between buss wire and the grounding braid (this test is skipped for all 120V plug-in kits). The minimum acceptable reading is 20 megohms. If the installation fails the meggar test, check end seals, splice connections and cable sheath for physical damage or areas where the grounding braid has come in contact with the buss wires or conductive core.

If physical damage cannot be found and end seals or splices are not the cause, then the complete circuit should be removed and replaced with new pipe heating cable.

TIPS

- Clean pipe off and "deburr" (scrape) with razor beforehand to eliminate any sharp spots
- Put cable closest to cold area (closest to wall)
- Put cable at 4 or 8 o'clock positions on pipe
- Trim/cut cable to length
- Position cable, tape around pipe with fiberglass tape
- Cover length of cable with aluminum tape (keeps cable closer to pipe, spreads out more heat)
- Check recommended thickness of insulation...wrap around pipe, overlapping at ends
- Tape end with fiberglass tape around pipe
- If in area prone to wetness, wrap plastic around
- Warning labels every 10 feet
- Each valve requires 1 extra foot of cable
- Add 1 foot of cable for attached splice
- Install 10' away from combustible surfaces

SERVICE

1. The system should be checked twice a year by a qualified professional to ensure reliability and safety. Please use the following sheet to do so:

CONTROLLING YOUR PIPE TRACING CABLE

The hardwired ThermoSoft NeverFreeze® Pipe Tracing Cable works most effectively with an automatic thermostat or GFCI.

When using ThermoSoft NeverFreeze® Plug-In Kits from ThermoSoft NeverFreeze®, no control device is necessary. Simply plug into an outdoor rated outlet supplied by a GFCI breaker of the appropriate voltage.

ELECTRICAL PROVISIONS FOR THE SYSTEM

The electrical connections to the De-Icing Cables shall be in accordance with the National Electrical Code (in the USA) or Canadian Electrical Code (in Canada).

INSTALLING YOUR PIPE TRACING HEATING CABLE

Choose a starting point - Select the starting point of your system by locating the desired placement of the electrical outlet or the junction box routing to the controller. Make sure to use caution and avoid high traffic areas, restrict general access to the cable and stay away from windows, doors and other obtrusions.

Plan the pattern on your pipe - There are multiple methods for applying the cable to the pipes as further described in this manual. We recommend you plan a written route for the cable to ensure the most efficient path and installation method for the heating cable.

PERIODIC INSPECTION RECORD

FREEZE PROTECTION CIRCUITS- Perform these checks as season requiring use approaches

Temperature Maintenance Circuits- **Perform these checks at least twice per year**

Circuit Number	
Circuit Lenth	
Heat Type	

MAINTENANCE CHECKS FOR

Visual inspection inside connection box corrosion, moisture, etc.	Initial															
	Date															
Damage or cracks (leaks) in insulation seals at valves, hangers, pumps, etc.	Initial															
	Date															
Heater cable properly connected and grounded; Heater cable and connections insulated from connection box	Initial															
	Date															
Thermostat checked for moisture, corrosion, set point, switch operation, and capillary damage	Initial															
	Date															
Megger tests performed at power connection with both bus wires disconnected from power wiring	Initial															
	Date															
Circuit voltage at power connection	Initial															
	Date															
Circuit amperage after 5 minutes	Initial															
	Date															
Pipe temperature at time amps were measured	Initial															
	Date															
Watts/Ft Volts x Amps = W/Ft.	Initial															
Feet	Date															
All connections, boxes, and thermostats have been resealed	Initial															
	Date															
End seals, covered splices and tees marked on insulation cladding	Initial															
	Date															

Remarks and Comments	

This form is meant to be used:	
A) 1 sheet per circuit	The results of periodic tests of a single circuit are posted in vertical columns, beginning on the left and working toward the right. This allows easy comparison of test values for up to 7 test sequences on a single circuit.
B) 1 circuit per column	Test data for a single test sequence can be recorded on a single sheet.

HEAT TRACE INSTALLATION RECORD

Location	System	Project Number	Reference Drawing(s)
Trace Heater Number	Line Number	Area Classification	AIT/T-Classification
Panel Number	Location	Circuit Number	Circuit Amp/Voltage
Trace Heater Mfg	Heater Model	Trace Heater Wattage Unit Length/Voltage Rating	

Meghommeter Manufacturer/Model	Voltage Setting	Accuracy/Full Scale

Meghommeter date of last calibration

Multimeter Manufacturer/Model	Ohm Setting	Accuracy/Full Scale

TRACE HEATER TESTING:	Test Value/Remarks	Date	Initials
Note minimum acceptable insulation resistance should be 20 megaohms. Minimum acceptable test voltage is 500 Vdc. However 1000 Vc recommends for MI, 2500 Vdc for polymeric cables.			
1. Receipt of Material on Reel			
Continuity Test on Reel (see note 1)			
Insulation Resistance Test on Reel			
2. Piping Completed (Approval to start heater installation)			
3. After Installation			
Continuity Test (See note 1)			
Insulation Resistance Test			
4. Trace heater installed (approval to start thermal insulation installation)			
Trace heater correctly installed on pipes, vessel or equipment			
Trace heater correctly installed at valves, pipe supports, other heat sinks			
Comonents correctly installed and terminated (power, tee, end seal)			
Installation agrees with manufacturers instructions and circuit design			
5. Thermal Insulation Installation Complete			
Continuity Test (See note 2)			
Insulation Resistance Test (5 megohm min)			

SYSTEM INSPECTED

6. Tagging & Identification Complete (Panel, Field Components, Pipe Decal)		
7. Trace heater effectively grounded		
8. Temperature Controls Properly Installed & Set Points Verified		
9. Ex-Proof Seals Poured		
10. Thermal Insulation Weathertight (all penetrations sealed)		
11. End Seals, Covered Splices Marked on Insulation Outer Cladding		
12. Drawings, Documentation Marked As-Built		

Performed by	Company	Date
Witnessed by	Company	Date
Accepted by	Company	Date
Approved by	Company	Date

NOTES

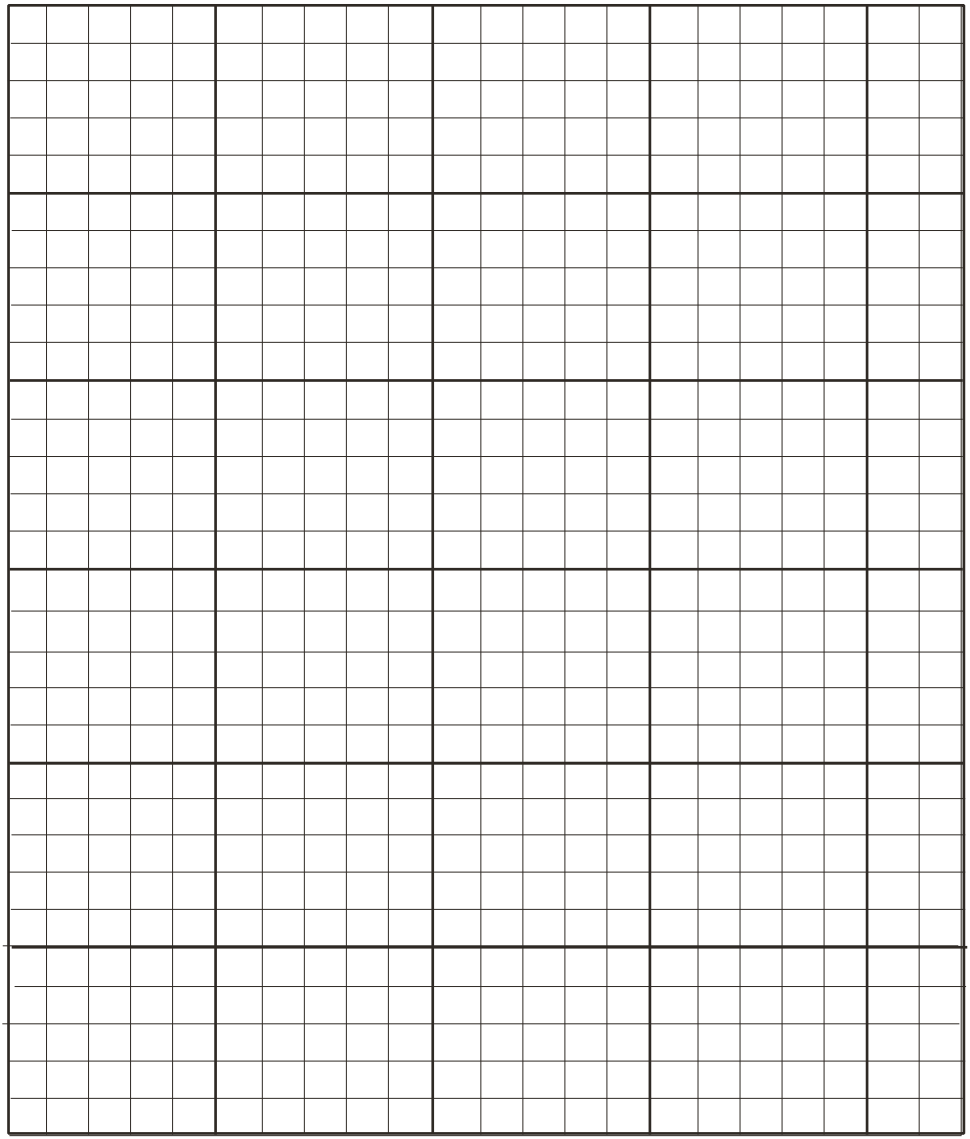
1-Minimum acceptable insulation resistance should be 20 megohm. Minimum acceptable test voltage is 500 Vdc.
However, 1000 Vdc recommend for MI, 2500 Vdc for polyeric trace heaters.

2- Continuity test on self-regulating trace heater only used for short or open circuit.

The Heat Trace Installation Record can be used to monitor the initial installation and check out process. This form can be used in conjunction with the Periodic Inspection Record.

PLANNING YOUR LAYOUT

Draw a plan showing the layout and location of the heating cables below and keep it for future reference.



ThermoSoft NeverFreeze®'s 24/7 Toll Free Technical Number: 1-800-308-8057

INSTALLATION INSTRUCTIONS FOR THE PIPE HEATING CABLE

TIP: You may want to mark the cable pattern with chalk before attaching the cable. Making a drawing of your pipe and your planned pattern on paper is recommended.

1. Make sure you have all necessary items to complete the heating cable installation (fiberglass insulation, fiberglass tape, aluminum tape, GFCI kit, End Seal kit). See FIGURE A.
2. Connect the GFCI to the cable using the GFCI kit (see GFCI kit instructions) and seal ends using the End Seal Kit (see End Seal kit instructions) if no trimming of cable is necessary. See FIGURE B.
3. Clean the pipe surface and scrape off any sharp or uneven “burs”. The pipe should be smooth and dry before installation. Ensure the pipe is in a safe location, away from hazardous or sharp objects that could potentially damage the cable. DO NOT INSTALL CABLE ON PIPES INSIDE WALLS. THE HEATING CABLE SHOULD ALWAYS BE ACCESSABLE.
4. Working from the end of electric source, unroll cable along pipe. DO NOT PLUG IN/POWER CABLE ON.
5. Position cable flatly and snugly along pipe in straight runs. Allow extra cable (1 foot minimum) for spigots, elbows, etc. DO NOT INSTALL IN SPIRAL PATTERN. Position the cable closest to the cold source, or at an 8 o’clock position. NOTE: If attaching two cables along one pipe, position the cables at 4 o’clock and 8 o’clock. If cable is too long, cable can be doubled along pipe.
6. Using fiberglass tape, fasten the cable to the pipe. Make sure to tape all the way around the pipe. Tape every 12 inches (1 foot).DO NOT use vinyl tape or wire.
7. Wrap cable around neck and elbows, keeping cable flat. Spigots should be able to turn on and off and remain accessible. See FIGURE C.
8. Once cable is attached, you may cut the cable as needed. Shortening the cable will not damage the system or alter heat output. After trimming, seal ends using ThermoSoft NeverFreeze End Seal Kit.
9. Apply aluminum tape to pipe and cable. The cable should be located in the middle of the tape, with a few inches of tape on each side. Smooth tape along pipe and cable. See FIGURE D.
10. Wrap the fiberglass insulation strip around the pipe, cable, fiberglass tape, and aluminum tape. Continue winding around the pipe snugly and neatly, overlapping about 1-2 inches for each pass around the pipe. NOTE: Do not cover switches, valves, and spigots. They need to remain operative and easily accessible. See FIGURE E.
11. Wrap the plastic strip around the pipe, cable, fiberglass tape, aluminum tape, and fiberglass insulation. Continue winding around the pipe snugly and neatly, overlapping about 1-2 inches for each pass around the pipe. Secure at each end with fiberglass tape. NOTE: Do not cover switches, valves, and spigots. They need to remain operative and easily accessible. See FIGURE F.
12. Place a caution label on the plastic wrapping, where it can be easily seen and read. Repeat every 10 feet where cable is located. See FIGURE G.
13. Plug in control or GFCI. NOTE: Cable will automatically adjust to temperature conditions but will not turn off by itself. The cable must be disconnected from power source to completely shut down.

14. Conduct maintenance checks twice a year to ensure the health of your system (THIS SHOULD BE DONE BY A LICENSED PROFESSIONAL.) Complete the NeverFreeze Pipe Heating Cable installation and maintenance forms online to ensure warranty is covered.

FIGURE A
Gather your items (step 1).

FIGURE B
Connect GFCI or controller (step 2).

FIGURE C
Connect cable to pipe and tape (step 6).

FIGURE D
Stick aluminum tape over pipe and tape (step 9).

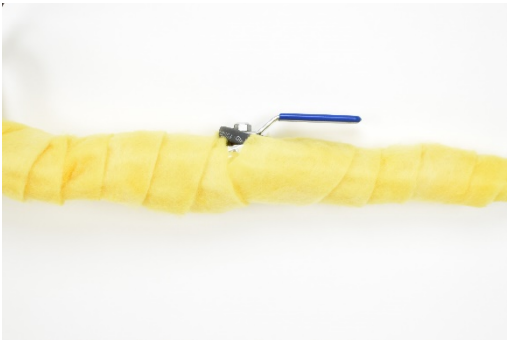


FIGURE E
Wrap insulation around aluminum tape, cable, and tape (step 10).

FIGURE F
Wrap plastic over insulation, aluminum tape, cable and tape (step 11).

FIGURE G
Cover all with caution label (step 12).

Code	Description
ThermoSoft NeverFreeze Power Connection Kit (NF-PCK)	Hardwire Power Connection Kit for Self-Regulating Cable. Includes 2 Caution labels and 1 End Seal Kit.
ThermoSoft NeverFreeze Plug-In Power Connection Kit (NF-GPPCK)	120V Plug-in, GFCI Power Connection Kit for Self-Regulating Cable. Includes 2 Caution Labels. Also Includes 1 End Seal Kit.
ThermoSoft NeverFreeze End Seal Kit (NF-ESK)	End Seal Kit for Self-Regulating Cable.

WARRANTY – PIPE TRACE HEATING CABLES

ThermoSoft NeverFreeze® provides a 3-Year Warranty (from date of purchase) for the Snow Melting Cables for the material and workmanship under normal operating conditions.

In case of defective material, ThermoSoft NeverFreeze®'s obligation will be limited to the repair or supply of new material, free of charge to the customer.

The Warranty does NOT cover installations made by unqualified personal or faults caused by incorrect design by others; misuse; damage caused by others; damage in transit; incorrect installation and any other subsequent damage that may occur. Cost related to repair/replacement will be fully chargeable to the customer if the damage is due to any of the above reasons.

ThermoSoft NeverFreeze® is under no circumstances liable for consequential damages or losses including without limitations the loss or profit arising from any cause whatsoever. The guarantee is a material warranty only and does NOT cover field labor. A qualified electrician MUST connect the heating system.

The Warranty is void if there is any payment default and if data is not filled in correctly.

EXCLUSIONS

ThermoSoft International Corporation shall in no event be liable for incidental or consequential damages, including but not limited to extra utility expenses or damages to property. This Warranty is null and void if:

1) The covering over the heater(s) is damaged, lifted, replaced, drilled into or repaired.
2) The heater fails due to damage caused during installation, unless damage is caused directly by an employee of ThermoSoft. It is therefore essential to check that the heater is working (as specified in the installation manual) prior and during installation.
3) Damage as a result of floods, fires, winds, lightning, accidents, corrosive atmosphere or other conditions beyond the control of ThermoSoft International Corporation.
4) Use of components or accessories is not compatible with ThermoSoft NeverFreeze® heaters.
5) ThermoSoft NeverFreeze® products are installed outside the United States.
6) Parts not supplied or designated by ThermoSoft International Corporation.
7) Damage or repair required as a result of any improper use, maintenance, operation or servicing.
8) Failure to start due to interruption and/or inadequate electrical service.
9) Any damage caused by frozen or broken pipes in the event of equipment failure.
10) Changes in the appearance of the product that does not affect its performance.
11) The owner, or his/her designated representative, attempts to repair the product without receiving prior authorization from ThermoSoft NeverFreeze®. Upon notification of a repair problem, ThermoSoft International Corporation will issue an Authorization to Proceed under the terms of this Warranty. If ThermoSoft NeverFreeze® is required to inspect or repair any defects caused by any exclusions referenced above, all work will be fully chargeable at ThermoSoft NeverFreeze®'s inspection and repair rates then in effect.

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TERMS AND CONDITIONS

Shipping Discrepancies:
Incoming materials should be inventoried for completeness and for possible shipping damage. Any visible damages or shortages must be noted prior to accepting the material. Any discrepancy concerning type or quantity of material shipped, must be brought to the attention of your ThermoSoft NeverFreeze® retailer within 15 days of the shipping date entered on the packing slip for the order.

Miscellaneous:
The terms of this Limited Warranty are exclusive and supersede any other warranty or terms and conditions relating to the subject matter whether included in a purchase order for this product or in any other document or statement.

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