K-Series (KE, KK, KM)

Constant-Wattage Heating Cable

Instruction Manual

⚠	You must read and understand this manual before installing, operating, or servicing this product. Failure to understand these instructions could result in an accident causing serious injury or death. Keep these instructions for future reference.

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INTRODUCTION

Thank you for purchasing a KE series constant-wattage heating cable system. A heating cable system is a combination of heating cable, connection / termination kits, temperature controller, and accessories based on your particular application. Your heater is designed to provide a long and efficient service life with function, reliability, and safety in mind.
All Constant-Wattage Heating Cable utilize a parallel resistance modular design. This allows the heating cable to be cut to length and terminated in the field, without affecting the heating power per unit length. The modular design enables the cable terminations / electrical connections to be made with cold leads and cold ends (e.g. cable not heated in electrical junction box).
A temperature controller is required for all constant-wattage heating cable.

APPLICATIONS

Intended Applications:

- General Purpose Trace Heating
- Pipe/Tank/Vessel Heating
- Ordinary and Hazardous Locations
- Dry Area Applications

Prohibited Applications:

- Outdoor use
- Immersion heating
- Use on non-metallic fixtures
- Wet Area Applications

APPROVALS

FM APPROVED

Ordinary Locations
Hazardous Locations
Class I, Division 2, Groups B, C, & D
Class II, Division 2, Groups F & G
Class III, Division 2

CE

2014 / 35 / EU (Low voltage directive)
IEC 60519-1
2011 / 65 / EU (RoHS 2 directive)
2012/19/EU (WEEE Directive)

Approvals valid only when installed in accordance with all applicable instructions, codes, and regulations.

IMPORTANT SAFETY INSTRUCTIONS

⚠ DANGER

A person who has not read and understood all operating instructions is not qualified to operate this product

⚠ DANGER

- Do not immerse heater in liquid.
- Heater must be 5/8 in (13 mm) away from any combustible material.
- Use heater only in approved locations.
- Keep sharp metal objects away from heater.

Failure to observe these warnings may result in electric shock, risk of fire, and personal injury.

⚠ WARNING

End-User Must Comply to the Following:

- Only qualified personnel are allowed to connect the electrical wiring.
- Disconnect all supply power at the source before making any heating cable power input connections.
- All electrical wiring must follow local electrical codes and highly recommend following NEC Article 427.
- The person who performs the final installation / wiring must be qualified for this work.
- The end-user is responsible for providing a suitable disconnecting device.
- The end-user is responsible for providing suitable electrical protection device. It is highly recommended that a ground fault circuit breaker be used.

Failure to observe these warnings may result in personal injury or damage to the heater.

⚠ DANGER

Immediate hazards which **WILL** result in severe personal injury or death.

⚠ WARNING

Hazards or unsafe practices that **COULD** result in severe personal injury or death

⚠ CAUTION

Hazards or unsafe practices that COULD result in minor personal injury or property damage

⚠ CAUTION

- Never handle the heater while it is in operation; always disconnect the heater from the power source and allow to cool prior to handling.
- Inspect heater and connection kits before use.
- Never operate heater without a temperature control device.
- Do not wrap the heating cable over itself.
- If spillage of a foreign matter onto heater occurs, disconnect from power source clean after heater is allowed to cool.
- Never operate a heater without an appropriate heat sink (device being heated is considered a heat sink).
- Do not operate heater above rated temperature value.
- Fasten heater to device using approved methods only.
- Do not repair damaged or faulty heaters.
- Do not crush of apply severe physical stress on heater or cord assembly
- Disconnect heater when not in use

Failure to observe these warnings may result in personal injury or damage to the heater.

⚠

SAFETY ALERT SYMBOL

The symbol above is used to call your attention to instructions concerning your personal safety. It points out important safety precautions. It means **"ATTENTION! Become Alert! Your Personal Safety is involved!"** Read the message that follows and be alert to the possibility of personal injury or death.

CONNECTION / TERMINATION KIT DESCRIPTIONS

KCABUC:

Universal Connection/Termination Kit

2-Lead pouches
2-End pouches
1-3 oz. Tube RTV sealant
1-Caution label
2-Ring terminals
2-Splice connector 12-10 AWG
2-Wire nuts
1-1 in NPT Pipe standoff
2 Pipe straps

Enough to complete one power input connection or one power input splice, two lead terminations and two end terminations.

NOTE: Requires Double-hub junction box.

KCABKC:

Lead/ End Termination Kit

5-Lead pouches
5-End pouches
1-3 oz. Tube RTV sealant

Enough to complete five lead terminations and five end terminations.

KCABSK:

Splice Kit

3-Lead pouches
3-End pouch
1-3 oz. Tube RTV sealant
1-Caution label
3-Ring terminals
3-Splice connectors 12-10

Enough to complete one in-line splice or one tee splice, three lead terminations and three end terminations.

NOTE: Requires single hub junction box, pipe standoff, two pipe straps.

KCABLP:

Lead Termination Kit

1-Lead pouch

Enough to complete one lead termination.

NOTE: Requires RTV silicon.

KCABEP:

End Termination Kit

1-End pouch

Enough to complete one end termination.

NOTE: Requires RTV silicone.

PRIOR TO INSTALLATION

STEP 1:
Check for suspected damage to heater like rips, punctures, etc. Ensure surface to be heated is free of jagged or sharp edges or weld splatter.

STEP 2:
Confirm all necessary installation hardware and tools are readily available. Depending on the application and kit, this may include…

Tools

Diagonal Cutter
Crimping Tool / Wire Stripper
Knife
Measuring Tape/Ruler
Screwdriver

Hardware and Accessories

Temperature Controller
Temperature Sensor
Connection / Termination Kits
(see kit descriptions to verify contents and additional required hardware)
Insulating Material
Monitor Light Kit (Optional)
RTV Sealant
Pipe Straps
Junction Box
Wire Nuts
Caution Labels
Aluminum or Fiberglass Adhesive Tape (verify temperature rating)
Heat Conductive Putty
Pipe Standoffs
Pipe Reducer

STEP 3:
(A) Verify the total amperage of the system does not exceed the maximum amperage that the heating system components can handle. (B) Verify that the total length of cable required does not exceed the maximum circuit length. If the cable length exceeds (A) or (B), the cable must be divided into sections.

LEAD TERMINATION PREPARATION

STEP 1:

Determine the module length of the heating cable. Module points can be identified by slight indentations on the rounded surface of the outer jacket. You can determine the module point by touch or visually by sliding back the metallic overbraid.

NOTE: *KE series cable module points must be visually identified due to FEP outer jacket.*

STEP 2:

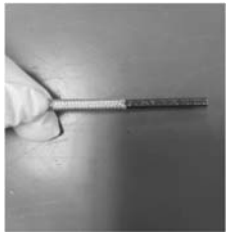
Cut the cable between the module points for the desired length of cold lead. The length of "cold lead" must be at least 12 in (305 mm) but no longer than the module length minus 6 in (152 mm). The section of cable between the end of the cable and the first module point will be the cold lead. This section will be used for lead termination / power input connection.

STEP 3A: (KE cable only)

Using a knife, remove 10 in (254 mm) of the outer jacket, exposing the metallic braid. DO NOT DAMAGE THE BRAID.

STEP 3B: (all K series cable)

Push 6 in (152 mm) of the metallic overbraid back to expose the polyimide layer of the heater. Using a pair of Wire Cutters, cut off 4 in (101 mm) of the exposed heater.

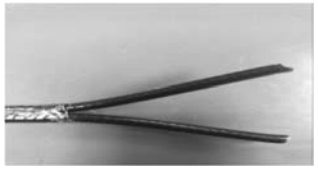


STEP 4:

Pull the metallic braid back over the end of the cable. Push the cable through the side of the metallic braid. Twist the empty braid to form a pigtail lead and crimp a ring terminal on the end (see picture below). A crimp barrel can also be used to extend the ground (braid) to another 12 AWG ground wire.

STEP 5:

Slide the metallic overbraid back at least an additional 4 in (101 mm). Using a knife, carefully cut and remove 4 in (101 mm) of the inner polyimide layer to expose the spirally wrapped resistance wire and the two bus wires. Do NOT damage the bus wires or the bus wire insulation; the resistance wire must NOT come into contact with the exposed bus wires. Unwrap and cut the resistance wire back to the point you cut the cable jacket.



STEP 6:

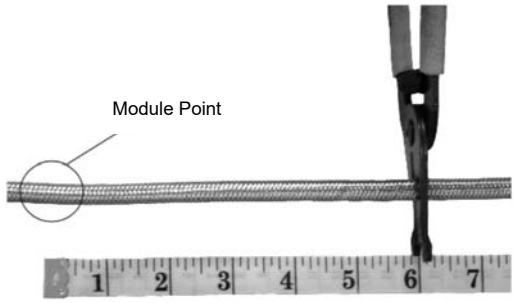
Fill a lead pouch with silicone RTV sealant. Slide the lead pouch over the two bus wires and over the inner wrap and outer braid. Using wire strippers, remove 0.75 in (19 mm) of the insulation from the bus wires to expose the conductors.
DO NOT DAMAGE THE CONDUCTORS.
ENSURE OUTER BRAID DOES NOT CONTACT THE SPIRALLY WRAPPED RESISTANCE WIRE.

ENSURE OUTER BRAID DOES NOT CONTACT THE SPIRALLY WRAPPED RESISTANCE WIRE.

END TERMINATION PREPARATION

STEP 1:

Locate the last module point of the cable run. Cut the cable 6 in (24 mm) beyond this point to form a cold end.

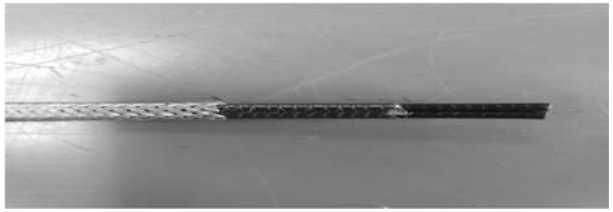


STEP 2A: (KE cable only)

Using a knife, remove 2 in (50 mm) of the outer jacket, exposing the metallic braid. DO NOT DAMAGE THE BRAID.

STEP 2B: (all K series cable)

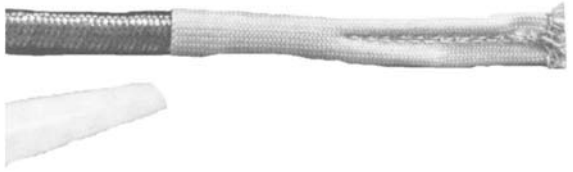
Using diagonal cutters and / or a knife, remove 1.5 in (38 mm) of the metallic braid and 1 in (25 mm) of the polyimide layer to expose the spirally wrapped resistance wire and the two insulated bus wires. Unwrap and cut off the resistance wire back to the polyimide layer. Be careful not to damage the insulation on the bus wires. Make certain the resistance wire, the two bus wires, and the metallic braid do NOT contact each other.



STEP 3:

Fill an end pouch with silicone RTV sealant. Slide the filled end pouch over the two bus wires, inner jacket, and the outer most layer.

Note: When attaching the heating cable to the pipe, make sure that the last module point is in contact with the pipe surface.



POWER INPUT CONNECTION INSTALLATION

⚠ WARNING

Only authorized and trained personnel should perform the following procedure. The hazard of electrical shock exists with any electrical installation project. Disconnect all supply power at the source prior to making the heating cable power input connections.

⚠ CAUTION

A temperature controller is required for all constant-wattage heating cable.

STEP 1:

Prepare heating cable end as specified under "Lead Termination Preparation". Insert approximately 8 in (200 mm) of the heating cable (s) through the bottom of the cast aluminum pipe standoff, making sure the first module point stays in contact with the pipe.

NOTE: *A maximum of three cables fit through pipe standoff.*

STEP 2:

Place the standoff on the pipe surface at the point where the supply wiring and associated fittings will connect to the pipe heat tracing cable. Fasten the standoff to the pipe with pipe straps. Fill the top of the standoff with Silicone RTV to provide a moisture seal between the pipe and electrical junction box. Make certain there are no voids between the cable and pipe standoff. Allow an appropriate amount of time for the Silicone RTV to cure.

STEP 3:

Ensure the junction box chosen is equipped with a minimum of two 1 in NPT female threaded hubs. Secure junction box onto the standoff. Pull the input power source wiring through the associated opening into the junction box. Connect the heating cable lead wires to a temperature controlling device and input power source wiring using wire nuts provided. Be sure to follow temperature controlling device installation instructions. If applicable, secure the braided pigtail ground to the standoff using the standoff ground screw provided or to the junction box using the junction box ground screw/receptacle. Ensure an adequate earth ground is provided to safely ground the entire assembly.

SPLICE INSTALLATION

⚠ WARNING

Only authorized and trained personnel should perform the following procedure. The hazard of electrical shock exists with any electrical installation project. Disconnect all supply power at the source prior to making the heating cable power input connections.

STEP 1:

Prepare the heating cable ends to be spliced together as specified under "Lead Termination Preparation".

CAUTION: *Never connect the two parallel conductors of the heating cable together.*

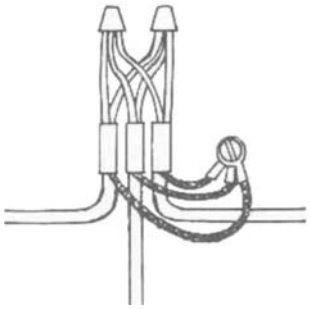
STEP 2:

Insert the heating cable cold leads up through the pipe standoff and into the junction box. Attach the pipe standoff and junction box to the pipe where the splice is to be located. Fasten it with appropriately sized pipe clamps.

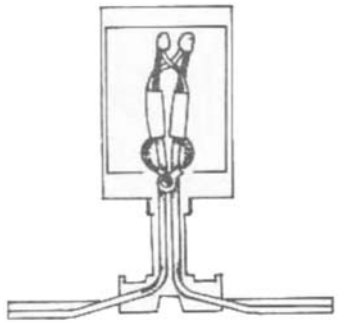
NOTE*: A maximum of three cables fit through pipe standoff.*

STEP 3:

Connect the leads of the heating cable ends together using wire nuts as shown in the illustrations (wire nuts are not provided with KCABSK).



Tee Splice



In-line Splice

STEP 4:

Connect the terminal lugs on the braid leads to a grounded screw on the pipe standoff or on the junction box.

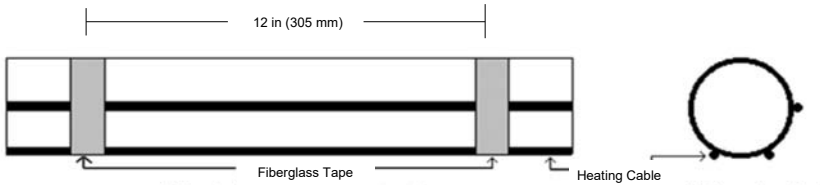
NOTE*: The junction box and pipe standoff must be grounded.*

STEP 5:

Test the cable installation for continuity and insulation resistance. The insulation resistance between the bus wires and the metallic braid must be greater than 50 megohms at 500 volts. Close the junction box and attach the Caution Label to the cover of the junction box.

HEATING CABLE INSTALLATION

Cable Wrapping Techniques



Straight Run (side view) Straight Run (end view)

A straight run is the simplest method to installing heating cable. It is possible to have multiple straight runs on a single object. With a single straight run, position cable at the bottom of a horizontal pipe.

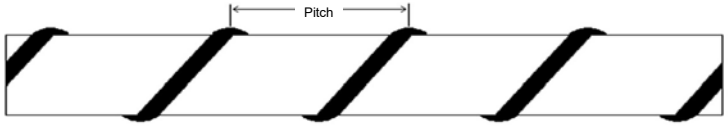
⚠ CAUTION

Do not wrap the heating cable over itself or have two heating cables touch.

All parts of heating cable must make intimate contact with surface to be heated.

Use heat conductive putty to fill voids between cable and pipe surface.

Wrap adhesive tape every 12 in (305 mm) around heating cable and pipe to attach the cable.



Spiral Wrap

Spiral wrapping provides more heater coverage than a straight run. It can also require more heating cable. Verify the pitch length (see illustration) prior to installation to ensure you have enough heating cable to finish the job. If you need assistance in determining the pitch length, call your local distributor or BriskHeat.

⚠ CAUTION **Do not wrap the heating cable over itself or have two heating cables touch.**

Minimum bend radius may not exceed 1 in (25.4 mm)

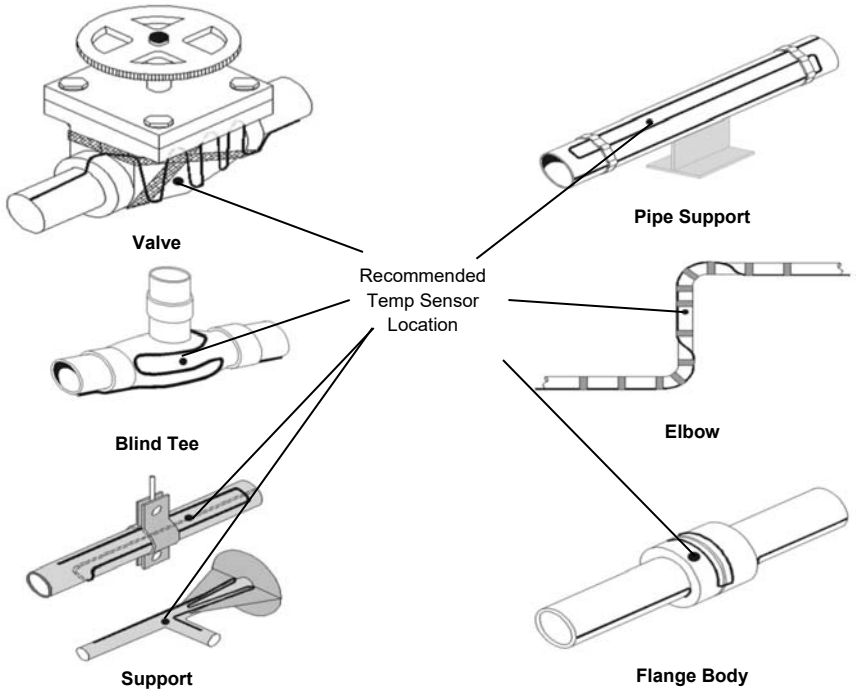
All parts of heating cable must make intimate contact with surface to be heated.

Use heat conductive putty to fill voids between cable and pipe surface.

Wrap adhesive tape every 12 in (305 mm) around heating cable and pipe to attach the cable.

After heating cable installation, an insulation resistance test is recommended before installation of any thermal insulation. See ELECTRICAL INSULATION RESISTANCE TEST section of these instructions for insulation resistance test procedure.

Heating Cable Placement on Different Types of Objects



INSTALLING INSULATION

It is highly recommended that thermal insulation is used with this product. For application assistance and an insulation recommendation, please contact your local BriskHeat representative or us direct to perform a thermal analysis of your application.

For applications requiring FM or CE compliance, thermal insulation is required and not to exceed 1 in (25.4 mm) in thick. For applications requiring greater than 1 in (25.4 mm) thick insulation, contact your local BriskHeat representative or us direct to perform a thermal analysis of your application and to verify FM and/or CE compliance.

After the installation of thermal insulation, an insulation resistance test is recommended before energizing the system. See ELECTRICAL INSULATION RESISTANCE TEST section of these instructions for insulation resistance test procedure.

ELECTRICAL INSULATION RESISTANCE TEST

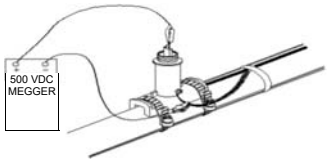
Electrical tests are recommended at specific points in the receipt and installation of the heating cable. This periodical testing is designed to prevent the expenditure of wasted labor in the event of damage to the product. Installation costs of the cable and thermal insulation are much greater that the heating cable. Quick identification of any heating cable damage is the most economic approach to an installation. An insulation resistance test is recommended at the following point of the installation process:

- UPON RECEIPT of the heating cable
- BEFORE thermal INSULATION installation
- IMMEDIATELY AFTER thermal insulation installation
- As part of a PERIODIC MAINTENANCE program

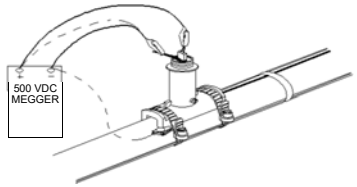
Procedure

The insulation resistance test is used to check for damage to extruded jackets. Connections for the megger are made as shown.

FOR HEATING CABLES WITH BRAID
Test from heating cable bus wires to braid.



FOR HEATING CABLES WITH BRAID AND OUTER JACKET
Test A - *(solid lines)* from heating cable bus wires to braid.
Test B - *(dotted lines)* from braid to metal pipe.



Note: Test should use at least a 500 VDC megger. Do not use a megger with an excess of 2500 VDC. Minimum acceptable readings should be 20 megohms per circuit, regardless of length.

A record should be kept of the readings taken from the time the cable is first installed on the pipe. A history of the insulation resistance reading can be helpful in spotting moisture ingress into the electrical system (indicated by a gradual decline in the insulation resistance) or physical damage to the heating cable (indicated by a sharp decline in the insulation resistance). A sample record for this is shown. *(See the following page)*

PERIODIC INSPECTION RECORD

The Periodic Inspection record Form may be used in one of two ways:

1.**One 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 three test sequences on an individual circuit.

2.**One circuit per column** - Test data for a single test sequence on as many as three circuits can be recorded on a single sheet.

For additional Periodic Inspection Record Forms, contact your local distributor/representative or Briskheat at 1-800-848-7673 (toll free, U.S. / Canada) or 1-674-294-3376 (Worldwide) or bhtsales1@briskheat.com.

Periodic Inspection Record Form

Circuit Number	
Heater Type	
Circuit Length	

Freeze Protection Circuits -			
Perform these checks as season requiring use ap-			
Temperature Maintenance Circuits -			
Perform these checks at least twice per year.			

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

Remarks & Comments			

MAINTENANCE INSTRUCITONS

> ⚠ Anyone who reads and understands these instructions is qualified to maintain this heater.

Maintenance:

- All maintenance should be performed after the heater has cooled to room temperature and with the electricity disconnected.
- Dirt, oil, grease or other foreign matter can be removed with a damp rag and mild household cleaners.
- Do not attempt to repair a damaged heater.

Storage:

- This product should be stored at room temperature in an environment with less than 80% relative humidity.

Disposal:

- This product does not contain any hazardous substances and may be discarded with domestic waste.

EMERGECNY PROCEDURES

> ⚠ Read and understand these procedures prior to using this heater. Disconnect power to the heater in the event of an emergency.

Electric Shock:

- Do not touch the injured person while they are still in contact with the electrical current.
- Call your local emergency service if the injured person experiences: severe burns, confusion, difficulty breathing, heart rhythm problems, cardiac arrest, muscle pain and contractions, seizures or a loss of consciousness.

Minor Burns:

- Hold the burned area under cool running water for 10-15 minutes.
- Remove rings or other tight items from burned area.

Major Burns:

- Call your local emergency service.
- Protect the person from further harm.
- Remove rings or other tight items from burned area.
- Monitor breathing and perform CPR if necessary.

Fire:

- Call your local emergency service

TROUBLESHOOTING GUIDE

Please read this guide prior to contacting BriskHeat. This guide is designed to answer the most commonly asked questions. If you are unable to identify the problem or need additional assistance, please contact us at 615-834-4044 or **protherm@comcast.net**.

PROBLEM	SOLUTION(S)
Entire heating cable run does not heat	Verify heater is connected to proper voltage. Check to see if there is a resistance reading (not an open circuit) in heater using an ohm meter.
Portion of heating cable does not heat	Examine unheated module for damage.
Circuit breaker is tripping	Validate that the circuit breaker is capable of handling the amp requirement of heater. Examine heater and power wiring for any damage. Verify open circuit exists between bus wire and ground braid. Ensure heater length does not exceed maximum circuit length (See tables below).

KE: Maximum Circuit Length ft (m)

Cable	120 VAC ft (m)	208 VAC ft (m)	240 VAC ft (m)	277 VAC ft (m)	480 VAC ft (m)
4 W/ft (13 W/m)	480 (146)	830 (253)	960 (293)	1110 (338)	1920 (585)
8 W/ft (26 W/m)	240 (73)	415 (127)	480 (146)	555 (169)	960 (223)
12 W/ft (39 W/m)	160 (49)	277 (85)	320 (98)	370 (113)	640 (195)

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Cable	120 VAC ft (m)	208 VAC ft (m)	240 VAC ft (m)	277 VAC ft (m)	480 VAC ft (m)
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12 W/ft (39 W/m)	160 (49)	277 (85)	320 (98)	370 (113)	640 (195)
18 W/ft (59 W/m)	105 (32)	185 (56)	215 (65)	245 (75)	425 (130)

WARRANTY INFORMATION

ProTherm warrants to the original purchaser of this product for the period of eighteen (18) months from date of shipment or twelve (12) months from date of installation, whichever comes first. ProTherm's obligation and the exclusive remedy under this warranty shall be limited to the repair or replacement, at ProTherm's option, of any parts of the product which may prove defective under prescribed use and service following ProTherm's examination, is determined by ProTherm to be defective.

ProTherm INDUSTRIES

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