

## Electric Heat Tracing INSTALLATION PROCEDURES



**The Heat Tracing Specialists<sup>®</sup>**

# Electric Heat Tracing

The following installation procedures are suggested guidelines for the installation of a Thermon electric heat tracing system<sup>1</sup>. Individuals installing these products are responsible for complying with all applicable safety and health guidelines. Proper personal protective equipment, or PPE, should be utilized during installation. Contact Thermon if you have any additional questions.

## Applications . . .

1. Electric heat tracing cables are used for freeze protection or temperature maintenance of piping, tanks and instrumentation. This set of instructions covers typical piping applications. For installation details on tanks and instrumentation, refer to the Installation Guides on our website [www.thermon.com](http://www.thermon.com).
2. Heat tracing cables may be installed in ordinary (nonclassified) and hazardous (classified) locations depending on the specific cable options and approvals<sup>2</sup>.



The National Electric Code and Canadian Electrical Code require ground-fault protection be provided for electric heat tracing.

## Types of Heating Cables . . .

### Self-Regulating Heating Cables:

- BSX™ Self-Regulating Heating Cable (refer to Form TEP0067)
- RSX™ Self-Regulating Heating Cable (refer to Form TEP0004)
- KSX™ Self-Regulating Heating Cable (refer to Form TEP0072)
- HTSX™ Self-Regulating Heating Cable (refer to Form TEP0074)
- VSX™ Self-Regulating Heating Cable (refer to Form TEP0008)

### Power-Limiting Heating Cable:

- HPT™ Power-Limiting Heating Cable (refer to Form TEP0011)

### Parallel Constant Watt Heating Cable:

- FP Parallel Constant Watt Heating Cable (refer to Form TEP0016)

### Series Constant Watt Heating Cables:

- TEK™ Series Constant Watt Heating Cable (refer to Form TEP0021)
- HTEK™ Series Constant Watt Heating Cable (refer to Form TEP0022)

### Notes . . .

1. Illustration depicts a typical self-regulating heating circuit.
2. Ground-fault equipment protection is required for all heat tracing circuits.
3. Temperature control is recommended for all freeze protection and temperature maintenance heat tracing applications.
4. All heat-traced lines must be thermally insulated.
5. Refer to Thermon form number PN50273 for installation instructions for MIQ mineral insulated heating cables.

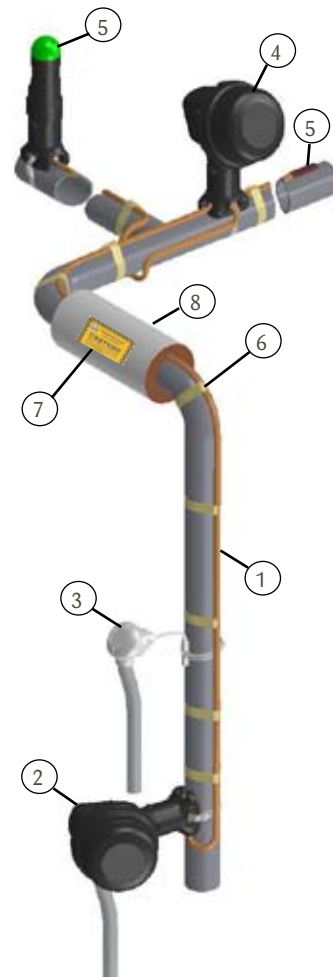
## Complete Electric Heat Tracing System . . .

A complete electric heat tracing system will typically include the following components<sup>1</sup>:

1. Electric heat tracing cable<sup>2</sup> (self-regulating, power-limiting, parallel constant watt or series constant watt).
2. Power connection kit.
3. RTD sensor or control thermostat<sup>3</sup>.
4. In-line/T-splice kit (permits two or three cables to be spliced together).
5. Cable end termination.
6. Attachment tape (use on 12" intervals or as required by code or specification).
7. "Electric Heat Tracing" label (peel-and-stick label attaches to insulation vapor barrier on 10' intervals or as required by code or specification).
8. Thermal insulation<sup>4</sup> and vapor barrier (by others).

The absence of any of these items can cause a system to malfunction or represent a safety hazard.

### Illustration A: Typical Heat Tracing Installation

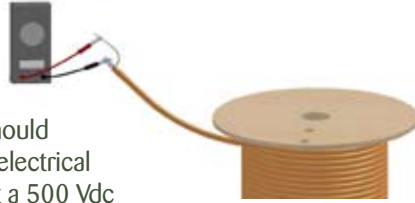


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# Electric Heat Tracing

## Upon Receiving, Cable . . .

1. Upon receiving heating cable, check to make sure the proper type and output have been received. All flexible cables have the catalog number, voltage rating and watt output printed on the jacket.
2. Visually inspect cable for any damage incurred during shipment. The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megger between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc. Minimum resistance should be 20 megohms. Connect the positive lead of the megger to the cable bus wires and the negative lead to the metallic braid. **(Record 1 on Cable Testing Report.)**
3. Store in dry location.



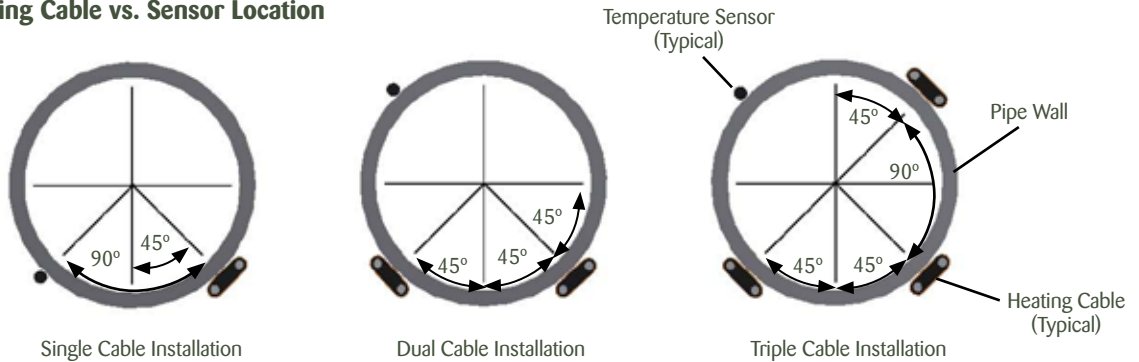
## Before Installing Cable . . .

1. Be sure all piping and equipment to be traced is completely installed and pressure tested.
2. Surface areas where heat tracing is to be installed must be reasonably clean. Remove dirt, rust and scale with a wire brush and oil and grease films with a suitable solvent.

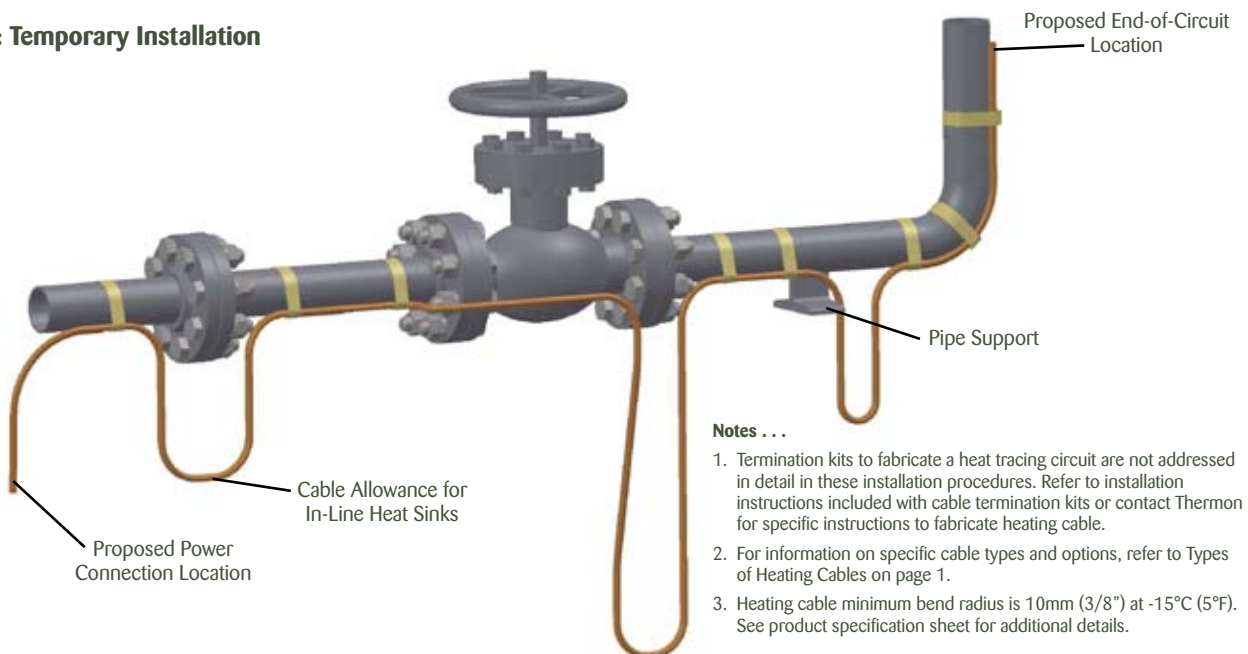
## Initial Installation . . .

1. Locate the cable on the lower quadrant of the pipe at the 4 or 8 o'clock position. If accessibility is a problem the cable may be installed at the 10 or 2 o'clock position. Temperature sensor should be located at least 90° from all heating cables. Refer to Illustration B for Heating Cable vs. Sensor Location.
2. Begin temporary installation at the proposed end-of-circuit location and lay out heating circuit on the pipe, allowing extra cable for the power connection and for any splice locations<sup>3</sup>. Refer to Illustration C for temporary installation.
3. Make heating cable allowances for valves, flanges, elbows and supports as per the applicable drawings and table on pages 3 and 4 of these installation procedures.

**Illustration B: Heating Cable vs. Sensor Location**



**Illustration C: Temporary Installation**



# Electric Heat Tracing

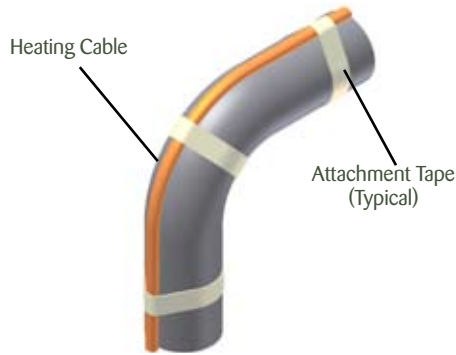
## Installation on Elbows, Supports and Flanges . . .

1. Install heating cable in accordance with Illustrations D, E and F below. Secure heating cable to piping using attachment tape.
2. Elbows: Locate the cable on the outside radius of an elbow to provide sufficient heat to compensate for the added piping material. Secure the cable to the pipe on each side of the elbow with attachment tape.
3. Pipe Supports: Insulated pipe supports require no additional heating cable. For uninsulated supports, allow two times the

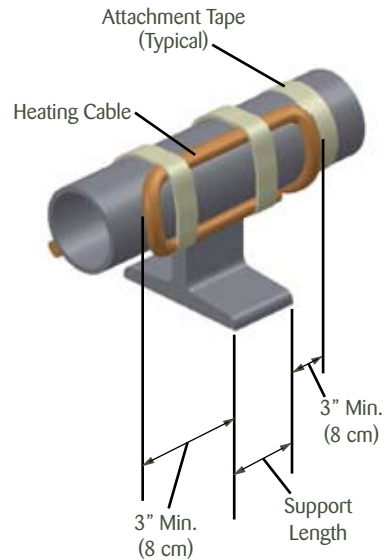
length of the pipe support plus an additional 15" (40 cm) of heating cable.

4. Flanges: Allow cable to be looped around pipe on each side of and adjacent to the flange. Heating cable must maintain contact with flange when bending around pipe flanges to compensate for additional heat loss.
5. Refer to the product specifications sheet for minimum bend radius for the specific cable type. Do not exceed bend radius when completing installation.

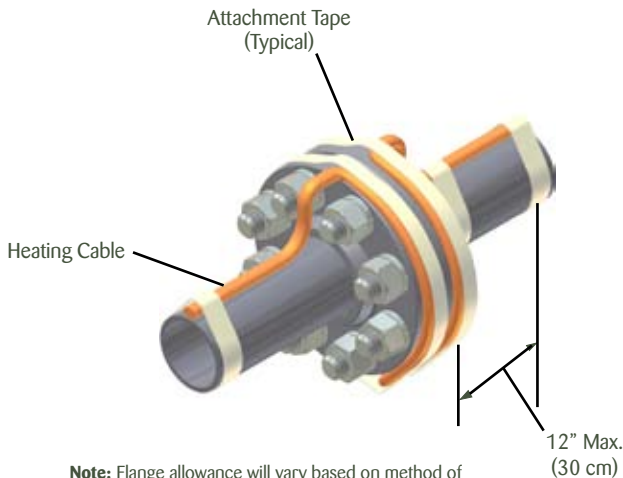
**Illustration D: Pipe Elbow**



**Illustration E: Pipe Support**



**Illustration F: Pipe Flange**



**Note:** Flange allowance will vary based on method of insulating flange and adjacent piping.



Circuit Layout on Support



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## Installation on Valves and Pumps . . .

1. Install heating cable in accordance with Illustrations G and H below. Secure heating cable to piping using attachment tape.
2. Additional cable is required to provide extra heat at valves, pumps and miscellaneous equipment to offset the increased heat loss associated with these items. Refer to Table 1 for estimated cable requirements for installation on typical valves and pumps. Allowances shown in Table 1 are for 150 pound valves. More cable is required for higher rated valves. Refer to heat trace isometric drawing for project specific allowances.
3. Install heating cable on valves and pumps utilizing a looping technique (this allows the valve or pump to be removed if required). Crossing constant watt heating cable over itself should be avoided.
4. Refer to the product specifications sheet for minimum bend radius for the specific cable type. Do not exceed bend radius when completing installation.

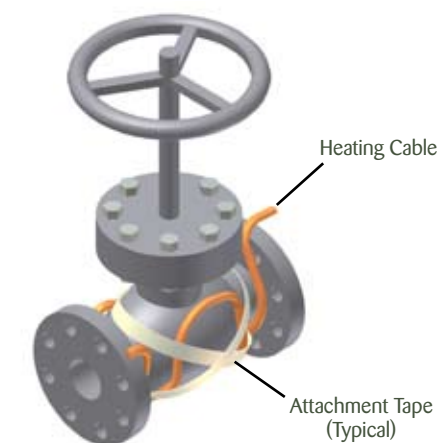
**Table 1: Valve and Pump Allowances<sup>1</sup>**

Pipe Size	Valve Allowance			Pump Allowance		Flange Allowance
	Screwed or Welded	Flanged	Butterfly	Screwed	Flanged	
1/2"	6"	1'	0	1'	2'	1' 3"
3/4"	9"	1' 6"	0	1' 6"	3'	1' 6"
1"	1'	2'	1'	2'	4'	1' 6"
1 1/4"	1' 6"	2'	1'	3'	4' 6"	2' 0"
1 1/2"	1' 6"	2' 6"	1' 6"	3'	5'	2' 0"
2"	2'	2' 6"	2'	4'	5' 6"	2' 3"
3"	2' 6"	3' 6"	2' 6"	5'	7'	2' 3"
4"	4'	5'	3'	8'	10'	2' 9"
6"	7'	8'	3' 6"	14'	16'	3' 3"
8"	9' 6"	11'	4'	19'	22'	3' 9"
10"	12' 6"	14'	4'	25'	28'	4' 3"
12"	15'	16' 6"	5'	30'	33'	5' 0"
14"	18'	19' 6"	5' 6"	36'	39'	5' 6"
16"	21' 6"	23'	6'	43'	46'	6' 0"
18"	25' 6"	27'	6' 6"	51'	54'	6' 6"
20"	28' 6"	30'	7'	57'	60'	7' 3"
24"	34'	36'	8'	68'	72'	8' 3"
30"	40'	42'	10'	80'	84'	10' 0"

**Note . . .**

1. The valve allowance given is the total amount of additional cable to be installed on the valve. If multiple tracers are used, total valve allowance may be divided among the individual tracers. The total valve allowance may be alternated among tracers for multiple valves in a heat trace circuit. Allowances are for 150 pound valves. More cable is required for higher rated valves. Refer to heat trace isometric drawing for project specific allowances.

**Illustration G: Typical Valve Detail**

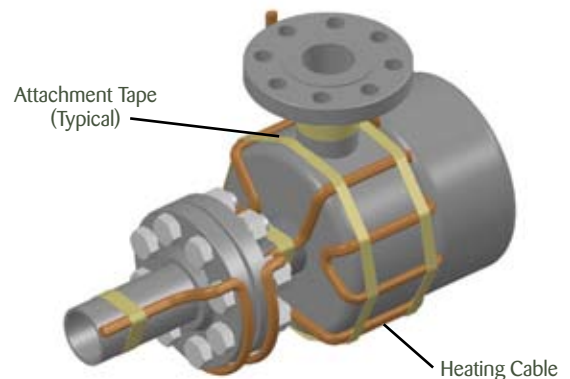


Heating Cable Serpentine on Valve



Circuit Layout on Valve

**Illustration H: Typical Pump Detail**



Heating Cable Serpentine on Pump



Circuit Layout on Pump

# Electric Heat Tracing

## Completing the Installation . . .

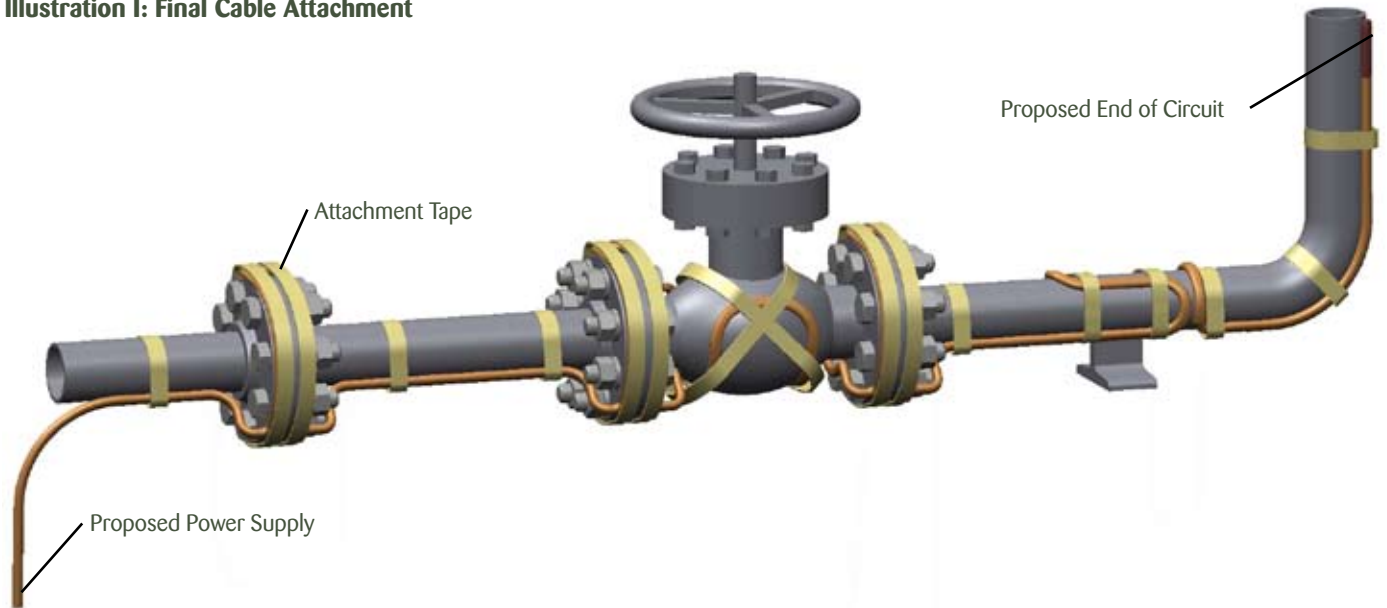
1. Begin final cable attachment by securing the end-of-circuit termination kit and working back toward the power supply. Refer to Illustration I.
  - Flexible heating cables are to be installed using attachment tape. Circumferential bands of tape should be installed at 12" (30 cm) intervals to keep the cable in proper contact with the pipe. Refer to Table 2 below to calculate the number of rolls of attachment tape required based on the pipe diameter<sup>1</sup>.
  - If applicable, refer to installation details provided with the project drawings or contact Thermon for additional information regarding installation.
2. In addition to the circumferential tape requirements, a continuous covering of aluminum foil tape may be required when:
  - Spray or foam<sup>2</sup> thermal insulation is applied.
  - Heat tracing nonmetallic piping.

3. Complete splice connections (if required) in accordance with the installation instructions provided with the splice kit.
4. Before making power connections, The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megger between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc. Minimum resistance should be 20 megohms. **(Record 2 on Cable Testing Report.)**
5. Install power connection kit in accordance to the detailed installation instructions provided with the kit.
6. Secure temperature sensor (if required) to pipe utilizing attachment tape. Locate temperature sensor as shown on page 6.

### Notes . . .

1. Table 2 assumes circumferential bands every 12" (30 cm) along the length of the process piping.
2. Verify exposure temperature of heating cable versus curing temperature of insulation.

**Illustration I: Final Cable Attachment**



**Table 2: Attachment Tape (Value Represents Approximate Linear Pipe Length Allowance Per Roll)**

Tape Length	Pipe Diameter in Inches															
	½"-1"	1¼"	1½"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"
36 yd	130'	115'	110'	95'	75'	65'	50'	40'	35'	30'	26'	23'	21'	19'	16'	13'
60 yd	215'	195'	180'	160'	125'	105'	80'	65'	55'	50'	43'	38'	35'	31'	27'	22'

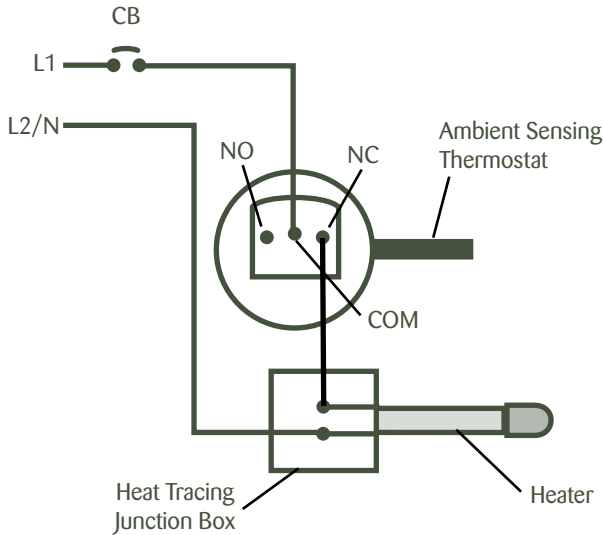


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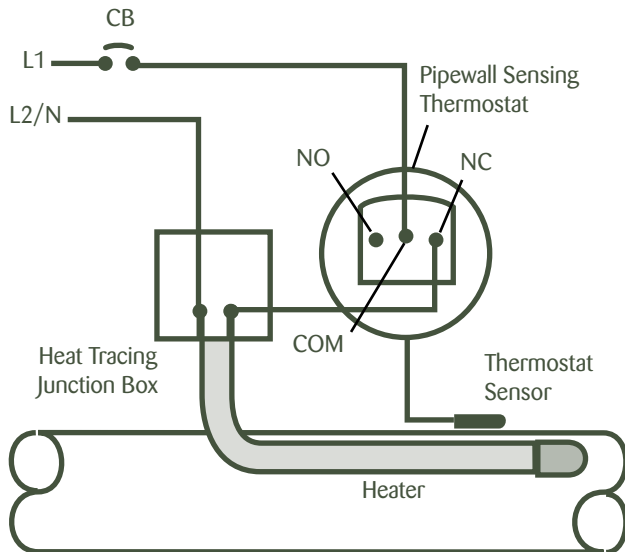
## Final Connections . . .

1. Follow the circuit fabrication instructions for the specific cable type. Power connection and end-of-circuit termination kits are designed for each type of cable; substitutions should not be made.
2. For ambient controlled power, the heating circuit should be connected directly to the switched power feed wiring.



(SPDT Thermostat Shown)

3. For pipewall sensing thermostatic control, the heating circuit is to be connected in series with the control contacts as shown below. The pipewall sensing thermostat may require more than one support point.



(SPDT Thermostat Shown)

## Thermal Insulation . . .

1. **The need for properly installed and well-maintained thermal insulation cannot be overemphasized.** Without insulation, heat losses are generally too high to be offset by a conventional heat tracing system.
2. In addition to piping and in-line equipment such as pumps and valves, all heat sinks must be properly insulated. This includes pipe supports, hangers, flanges and, in most cases, valve bonnets.
3. Regardless of the type or thickness of insulation used, a protective barrier should be installed. This protects the insulation from moisture intrusion, physical damage and helps ensure the proper performance of the heat tracing system. Seal around all penetrations through the thermal insulation.
4. After the installation of the thermal insulation and weather barrier but **BEFORE ENERGIZING THE HEATING CIRCUIT**, the megohmmeter test should be repeated. This should call attention to any damage to the heating cable that may have occurred during the insulation installation. **(Record 3 on Cable Testing Report)**
5. Apply caution labels to insulation weather barrier at required intervals along pipe

## Final Inspection and Documentation . . .

1. It is recommended that the circuit be temporarily energized so that the volts, amps, pipe temperature and ambient temperature may be recorded. This information may be of value for future reference and should be maintained for the historical operating data log **(Record 4 on Cable Testing Report)**.
2. Stabilized design can be used for self-regulating heating cables to assign a lower T-class through the use of the Thermon CompuTrace software or Thermon Engineering.
3. Stabilized design can be used for power-limiting and constant watt heating cables without a limiting device to determine the T-class through the use of the Thermon CompuTrace software or Thermon Engineering.
4. A sample historical operating data log form is included in the Electric Heat Tracing Maintenance and Troubleshooting Guide, Thermon Form TEP0066).



The National Electric Code and Canadian Electrical Code require ground-fault protection be provided for branch circuits supplying electric heat tracing.

# Cable Testing Report

1. Refer to Thermon Installation Procedures, FORM PN 50207, for general installation procedures, requirements and guidelines.
2. Upon receiving heating cable, check the cable to make sure the proper type and output have been received. All flexible cables have the catalog number, voltage rating and watt output printed on the outer jacket.
3. Visually inspect cable for any damage incurred during shipment. The heating cable should be tested to ensure electrical integrity with at least a 500 Vdc megger between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc. Minimum resistance should be 20 megohms. **(Record 1 on Cable Testing Report.)**
  - A. Connect the positive lead of the megger to the cable bus wires.
  - B. Connect the negative lead of the megger to the metallic braid.
  - C. Energize the megger and record the reading. Readings between 20 megohms and infinity are acceptable. Readings below 20 megohms may mean the electrical insulation has been damaged. Recheck the heating cable for physical damage between the braid and the heating element; small cuts or scuffmarks on the outer jacket will not affect the megger reading unless there was actual penetration through the braid and dielectric insulation jacket.
4. Once the installation is complete, but prior to installation of thermal insulation, recheck the heating cable with at least a 500 Vdc megger between the heating cable bus wires and the heating cable metallic braid. IEEE 515 recommends that the test voltage for polymer insulated heating cables be 2500 Vdc should be 20 megohms. **(Record 2 on Cable Testing Report.)**
5. After the thermal insulation is installed, the megohmmeter test should be repeated. Minimum resistance should be 5 megohms. **(Record 3 on Cable Testing Report.)**
6. After the thermal insulation is installed and power supply is completed, record the panel and circuit breaker information. Ensure all junction boxes, temperature controllers, cable glands, etc. are properly secured. Set the temperature controller (if applicable) to the manual setting and apply rated voltage to the heat tracing circuit(s) for 5 minutes. Record the ambient temperature, measure and record the circuit(s) voltage and current. **(Record 4 on Cable Testing Report.)**



**NOTE: To ensure the heating cable warranty is maintained through installation, the testing outlined on this sheet must be completed on the installed heating cables, and the test results recorded and mailed/faxed to:**

Thermon Customer Service  
100 Thermon Drive  
San Marcos, Texas 78666  
Fax: 512-754-2420



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# Cable Testing Report

make additional copies as required for each circuit.

Customer: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone No: \_\_\_\_\_  
Project Reference: \_\_\_\_\_

Contractor: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone No. \_\_\_\_\_

## Record 1: Prior to Installation

Cable Type: \_\_\_\_\_  
Reel Length: \_\_\_\_\_  
Reel Number: \_\_\_\_\_  
Insulation Resistance M Ohms: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 2: After Installation of Heating Cable

Insulation Resistance M Ohms: \_\_\_\_\_  
Heater Length: \_\_\_\_\_  
Heater Number: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 3: After The Thermal Insulation Is Installed

Insulation Resistance M Ohms: \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_

## Record 4: Final Commissioning

Panel Number: \_\_\_\_\_  
Breaker Number: \_\_\_\_\_  
Volts: \_\_\_\_\_  
Ambient Temperature (deg. F): \_\_\_\_\_  
Pipe Temperature (deg. F): \_\_\_\_\_  
Recorded Amps (After 5 Min.): \_\_\_\_\_  
Tested By: \_\_\_\_\_  
Witnessed By: \_\_\_\_\_

Date: \_\_\_\_\_  
Date: \_\_\_\_\_





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