Electric Heat Tracing

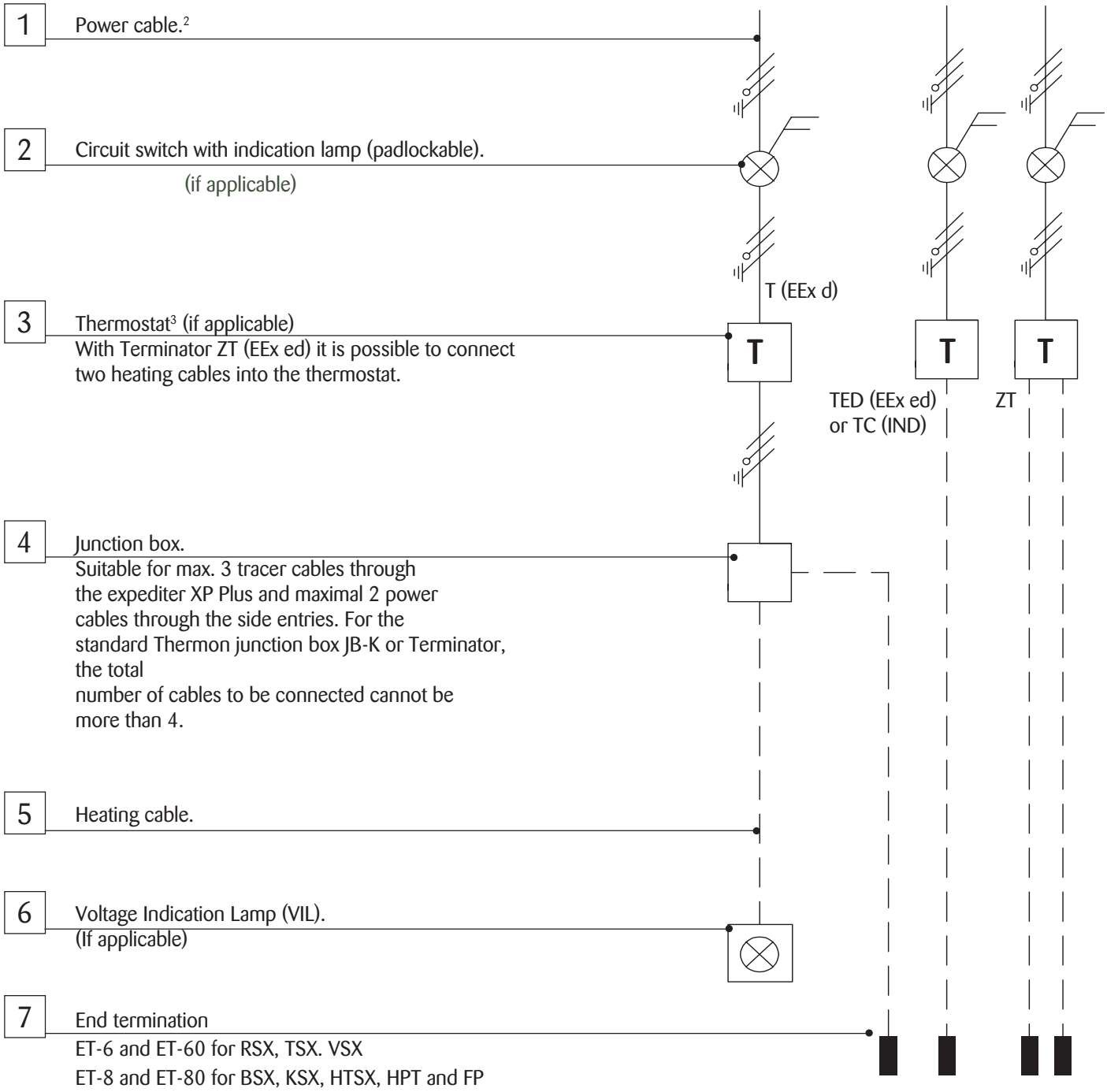
INSTALLATION PROCEDURES

THERMON®

The Heat Tracing Specialists®

Electric Heat Tracing

Illustration A: Typical Heat Tracing Installation[1]



Notes . . .

1. All heat-traced lines must be thermally insulated.
2. Due to the risk of electrical shock, arcing and fire caused by product damage or improper usage installation or maintenance, a ground-fault protection device is required for all heat tracing circuits. Bond the metal sheath/braid of the heat tracing cable to a suitable earth terminal.
3. Thermostatic control is recommended for all freeze protection and temperature maintenance heat tracing applications.

Complete Electric Heat Tracing System . . .

Types of Heating Cables[1] . . .

1. Self-Regulating Heating Cables:
   - BSX™ (refer to Form TEP0067U) CE 0539 Ex II 2 G & D EEx e II T6 Ⓓ 02ATEX0132424 (T5 for BSX 10)
   - RSX™ 15 (refer to Form TEP0048U) CE 0539 Ex II 2 G & D EEx e II T5 Ⓓ 02ATEX0152668
   - TSX® (refer to Form TEP0006U) CE 0539 Ex II 2 G & D EEx e II T3 Ⓓ 02ATEX0152666
   - HTSX™ (refer to Form TEP0074U) CE 0539 Ex II 2 G & D EEx e II T3 Ⓓ 02ATEX0120790
   - KSX™ (refer to Form TEP0072U) CE 0539 Ex II 2 G & D EEx e II T3 Ⓓ 02ATEX0148864
   - VSX™ (refer to Form TEP0008U) CE 0539 Ex II 2 G & D EEx e II T3 Ⓓ 02ATEX0152667 (T2 for VSX 20)
2. Power-Limiting Heating Cable:
   - HPT™ (refer to Form TEP0011U) CE 0539 Ex II 2 G & D EEx e II T2 To T6 Ⓓ 02ATEX0132337X
3. Parallel Constant Watt Heating Cable:
   - FP (refer to Form TEP0016U) CE 0539 Ex II 2 G EEx ed IIC T2 To T6 LCIE 01ATEX6051X
4. Series Constant Watt Heating Cables:
   - TES™ (refer to Form TEP0063U) CE 0539 Ex II 2 G EEx edm IIC T2 To T6 LCIE 00ATEX6014X
   - TESH™ (refer to Form TEP0070U) CE 0539 Ex II 2 G EEx edm IIC T2 To T6 LCIE 00ATEX6014X
   - MIK™ (refer to Form TEP0020U) CE 0539 Ex II 2 G EEx e II T1 To T6 LCIE 00ATEX6025

Notes . . .

1. Refer to the heating cable product specification sheets for temperature ratings as limited by the manufacturer.

Site Practice . . .

1. Provide protective clothing, personal protective equipment, and other protective equipment needed to protect employees from potential arc flash and shock hazards identified in the analysis.
2. Provide training to create qualified employees capable of understanding the purpose/function of the electrical heat tracing, its electrical power supply/control equipment, and how to recognize and avoid the hazards associated with its operation and maintenance.
3. Treat all electrical conductors and circuit parts as though they are energized until they are placed in an electrically safe work condition by doing the following:
   - Identify the circuit or equipment to be de-energized and all possible sources of electrical energy supplies to the specific circuit or equipment.
   - Interrupt the load currents appropriately, and then open the circuit disconnecting device(s).
   - Visually verify, where possible, that the appropriated circuit disconnecting device is indeed open.
   - Apply lockout/tagout devices according to a documented and established procedure.
   - Test for absence of voltage with an approved voltmeter (where the voltmeter is tested on a known circuit voltage prior to and immediately following application).
   - Ground the phase conductors or circuit parts before touching them where the possibility of induced voltages or stored electrical energy exists.
   - Apply ground-connecting devices rated for the available fault duty where the conductors or circuit parts being de-energized could possible contact other exposed energized conductors or circuit parts.

Electric Heat Tracing

Read and carefully follow all installation procedures before installing a Thermon electric heat tracing system[1]. Product certifications and performance of heat tracing system is dependant upon proper installation with certified Thermon components.

The installation must be installed in accordance with the regulations as per the norm EN IEC 60079-14 and IEC 62086-2 for hazardous areas (where applicable). The system installation must also comply with all local and national electrical codes.

Applications . . .

1. Electric heat tracing cables are used for freeze protection or temperature maintenance of piping, tanks and instrumentation.
2. Heat tracing cables may be installed in ordinary (nonclassified) and hazardous (classified) locations depending on the specific cable options and approvals. See 'Types of Heating Cables' on page 2.

Receiving, Storing and Handling . . .

1. Identify the heating cable to ensure the proper type and quantity have been received. The cable model number will be visible on parallel heating cables (on braided cables, the information is printed on the jacket below the braid); factory-fabricated series circuits will have an imprinted I.D. tag with pertinent data. Compare information on heating cable with packing slip and purchase order to verify receipt of correct shipment.
2. Visually inspect materials for damage incurred during shipment. Report damages to the carrier for settlement.
3. Store in a dry place. Keep ends of heating cable dry and sealed before and during installation

Caution: Do not connect power to heating cable while it is still on the reel or in a shipping carton.

Before Installing Cable . . .

1. Before removing the heating cable from the reel, an insulation resistance test should be conducted. The cable should be tested with a test voltage of at least 500 Vdc. However, for mineral insulated cables, a test voltage of 1000 Vdc is recommended, and for polymer insulated heating cables, 2500 Vdc is recommended. The minimum acceptable level should not be less than 20 megohms.

   Testing should occur at the following stages of installation.
   - While the cable is still on the reel
   - After installing heating cable
   - After installation of thermal insulation
   - Prior to connecting cable to power
   - As part of a routine maintenance program
2. Be sure all piping and equipment to be traced is completely installed, pressure tested and painted (if applicable)
3. 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.

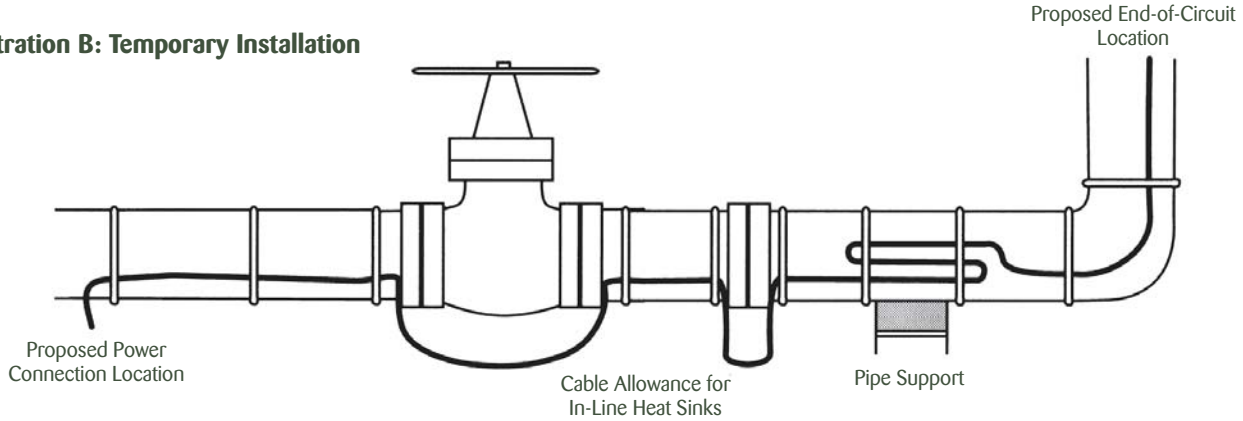
Initial Installation . . .

1. 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[2]. Refer to Illustration B for temporary installation.
2. Make heating cable allowances for valves, flanges, elbows and supports as per the applicable drawings, refer to pages 4 and 5 of these installation procedures.

Notes . . .

1. Termination kits to fabricate a heat tracing circuit are not addressed in detail in these installation procedures. Refer to installation instructions included with cable termination kits or contact Thermon for specific instructions to fabricate heating cable.
2. Minimum bending radius of heating cable is 32 mm (except HPT is 57 mm, FP is 19 mm, TESH and MI is 5 x OD).

Illustration B: Temporary Installation



Installation on Elbows, Supports and Flanges . . .

1. Install heating cable in accordance with Illustrations C, D and E below. Secure heating cable to piping using attachment tape rated at the application temperature.
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.

Caution: Do not use metal pipe straps or tie wire to attach heating cable. Use approved attachment tape only.

3. Pipe Supports: of diameter ≥ 2" require additional heating cable, allow two times the length of the pipe support plus an additional 8 cm of heating cable. (In process temperature maintenance systems the pipe supports must be isolated from the pipes. In winterizing systems, Thermon highly recommends to isolate the pipe supports from the pipes)
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.

Illustration C: Pipe Elbow

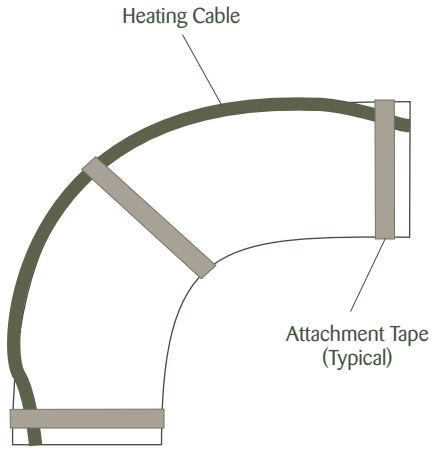


Illustration D: Pipe Support

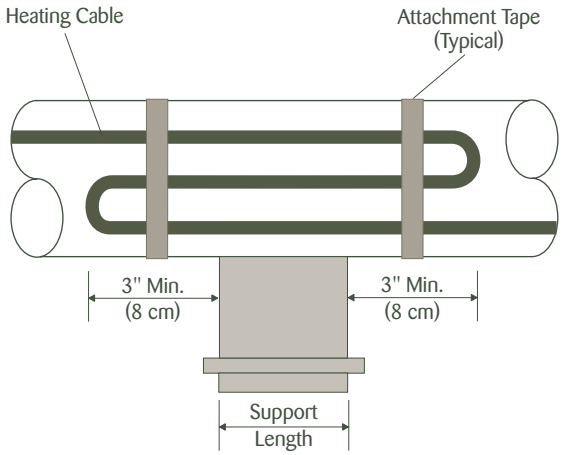
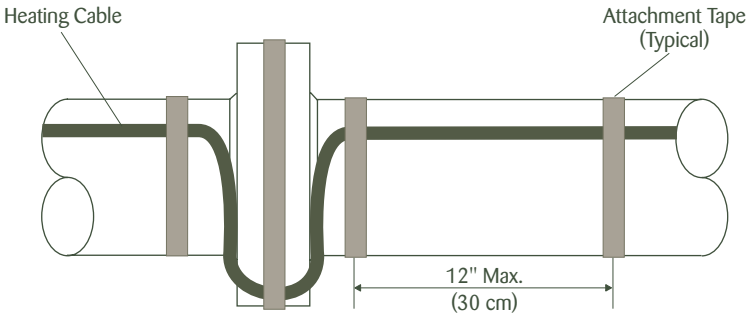


Illustration E: Pipe Flange



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

Electric Heat Tracing

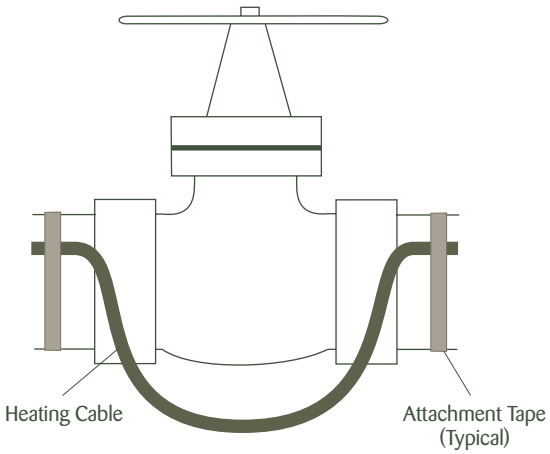
Installation on Valves and Pumps . . .

1. Install heating cable in accordance with Illustrations F and G below. Secure heating cable to piping using attachment tape rated at the application temperature.
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.
3. Install heating cable on valves and pumps utilizing a looping technique (this allows the valve or pump to be removed if required). Crossing series 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.

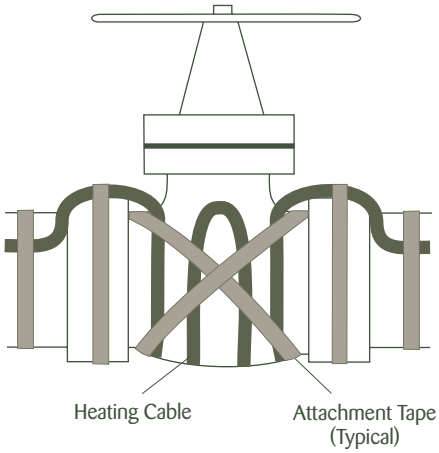
Table 1: Valve and Pump Allowances

Pipe Size in (mm)	Valve Type Screwed ft (m)	Valve Type Flanged ft (m)	Valve Type Welded ft (m)	Pump Type Screwed ft (m)	Pump Type Flanged ft (m)
½ (12)	.5 (.15)	1 (.30)	0	1 (.30)	2 (.61)
¾ (19)	.75 (.23)	1.5 (.46)	0	1.5 (.46)	3 (.91)
1 (25)	1 (.30)	2 (.61)	1 (.30)	2 (.61)	4 (1.22)
1¼ (32)	1.5 (.46)	2 (.61)	1 (.30)	3 (.91)	4.5 (1.37)
1½ (40)	1.5 (.46)	2.5 (.76)	1.5 (.46)	3 (.91)	5 (1.52)
2 (50)	2 (.61)	2.5 (.76)	2 (.61)	4 (1.22)	5.5 (1.68)
3 (80)	2.5 (.76)	3.5 (1.07)	2.5 (.76)	5 (1.52)	7 (2.13)
4 (100)	4 (1.22)	5 (1.52)	3 (.91)	8 (2.44)	10 (3.05)
6 (150)	7 (2.13)	8 (2.44)	3.5 (1.07)	14 (4.27)	16 (4.88)
8 (200)	9.5 (2.90)	11 (3.35)	4 (1.22)	19 (5.79)	22 (6.71)
10 (250)	12.5 (3.81)	14 (4.27)	4 (1.22)	25 (7.62)	28 (8.53)
12 (300)	15 (4.57)	16.5 (5.03)	5 (1.52)	30 (9.14)	33 (10.06)
14 (350)	18 (5.49)	19.5 (5.94)	5.5 (1.68)	36 (10.97)	39 (11.89)
16 (400)	21.5 (6.55)	23 (7.01)	6 (1.83)	43 (13.11)	46 (14.02)
18 (450)	25.5 (7.77)	27 (8.23)	6.5 (1.98)	51 (15.54)	54 (16.46)
20 (500)	28.5 (8.69)	30 (9.14)	7 (2.13)	57 (17.37)	60 (18.29)
24 (600)	34 (10.36)	36 (10.97)	8 (2.44)	68 (20.73)	72 (21.95)
30 (750)	40 (12.19)	42 (12.80)	10 (3.05)	80 (24.38)	84 (25.60)

Illustration F: Typical Valve Detail

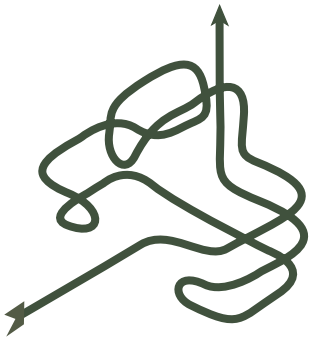


Temporary Loop of Cable on Valve

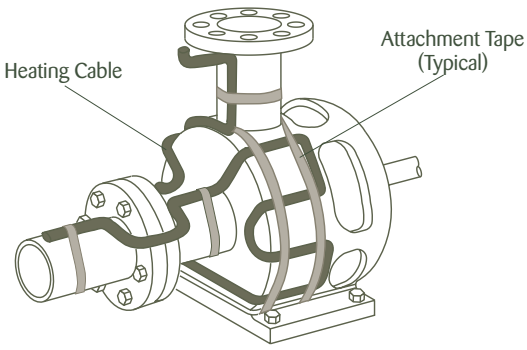


Heating Cable Serpentined on Valve

Illustration G: Typical Pump Detail



Circuit Layout on Pump



Heating Cable Serpentined on Pump

Completing the Installation . . .

1. Begin final cable attachment by securing the end-of-circuit termination kit and working back toward the power supply.
   - Flexible heating cables are to be installed using attachment tape rated at the application temperature. Circumferential bands of tape should be installed at maximum 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[1].
   - MI mineral insulated heating cables are typically installed with stainless steel banding. These cables may also be installed with heat transfer compound and metal channels.
   - 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 urethane[2] thermal insulation is applied.
   - Heat tracing nonmetallic piping.
   - Design requirements dictate the use of aluminum tape to improve heat transfer.
3. Complete splice connections (if required) in accordance with the installation instructions provided with the splice kit.
4. Before making power connections, repeat the megger test. The cable should be tested with a test voltage of at least 500 Vdc. However, for mineral insulated cables, a test voltage of 1000 Vdc is recommended, and for polymer insulated heating cables, 2500 Vdc is recommended. The minimum acceptable level should not be less than 20 megohms.
5. Install power connection kit in accordance to the detailed installation instructions provided with the kit. (MI series resistance heating circuits are typically prefabricated at the factory. Pipe-mounted junction boxes to complete a typical MI circuit connection to power may not be supplied as part of the system.)
6. Secure temperature sensor (if required) to pipe utilizing attachment tape. Locate temperature sensor as shown in Illustration H.

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 H: Heating Cable vs. Sensor Location

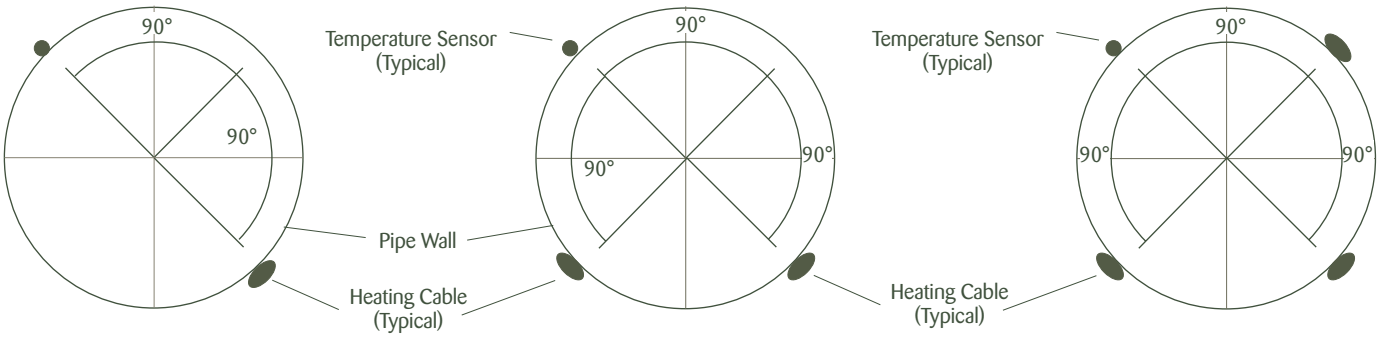


Table 2: Attachment Tape Allowance

Pipe Size in (mm)	½"-1" (12-25)	1¼" (32)	1½" (40)	2" (50)	3" (80)	4" (100)	6" (150)	8" (200)	10" (250)	12" (300)	14" (350)	16" (400)	18" (450)	20" (500)	24" (600)	30" (750)
Length of Pipe/Roll of Tape Ft (m)	360' (109.7)	260' (79.2)	220' (67.0)	180' (54.9)	150' (45.7)	120' (36.6)	90' (27.4)	70' (21.3)	60' (18.2)	50' (15.2)	40' (12.2)	35' (10.7)	30' (9.1)	25' (7.6)	20' (6.0)	15' (4.6)

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. The power connection junction box can be pipe mounted and/or wall mounted.
2. Megger testing should be conducted. The cable should be tested with a test voltage of at least 500 Vdc. However, for mineral insulated cables, a test voltage of 1000 Vdc is recommended, and for polymer insulated heating cables, 2500 Vdc is recommended. The minimum acceptable level should not be less than 20 megohms.
3. For ambient controlled power, the heating circuit should be connected directly to the switched power feed wiring.
4. For pipewall sensing thermostatic control, the heating circuit is to be connected in series with the control contacts with a maximum load of 16A. The pipewall sensing thermostat may require more than one support point.

Thermal Insulation . . .

1. Before installing thermal insulation, megger testing should be conducted. The cable should be tested with a test voltage of at least 500 Vdc. However, for mineral insulated cables, a test voltage of 1000 Vdc is recommended, and for polymer insulated heating cables, 2500 Vdc is recommended. The minimum acceptable level should not be less than 20 megohms.
2. 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.
3. 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.
4. 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.

Final Inspection and Documentation . . .

1. 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.
2. It is recommended that the circuit be temporarily energized so that the volts, amps, pipe temperature and ambient temperature may be recorded. Take the values after 15 minutes of energizing. This information may be of value for future reference and should be maintained for the historical operating data log.
3. 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.
4. 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.
5. The maximum temperatures provided by Thermon's CompuTrace software and by Thermon engineering are calculated to the methods and requirements of IEC 62086-2 Cl. 6.7.
6. If stabilized design is used, the end user must record the system parameters and the area T-class, and keep these records for the time the heating cable is in operation.
7. Inspect system on a regular basis at least once per year. Record all information after conducting test. If the system fails any test, refer to Thermon's Maintenance and Trouble Shooting Guide for assistance. De-energize circuits affected and make the necessary repairs immediately.

THERMON

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www.thermon.com

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European Headquarters
Boezemweg 25 • 2641 KG Pijnacker
PO Box 205 • 2640 AE Pijnacker • The Netherlands
Phone: +31 (0) 15-36 15 370 • Facsimile: +31 (0) 15-36 15 379

Corporate Headquarters
100 Thermon Dr. • PO Box 609
San Marcos, TX 78667-0609 • U.S.A.
Phone: +1 512-396-5801 • Facsimile: +1 512-396-3627

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