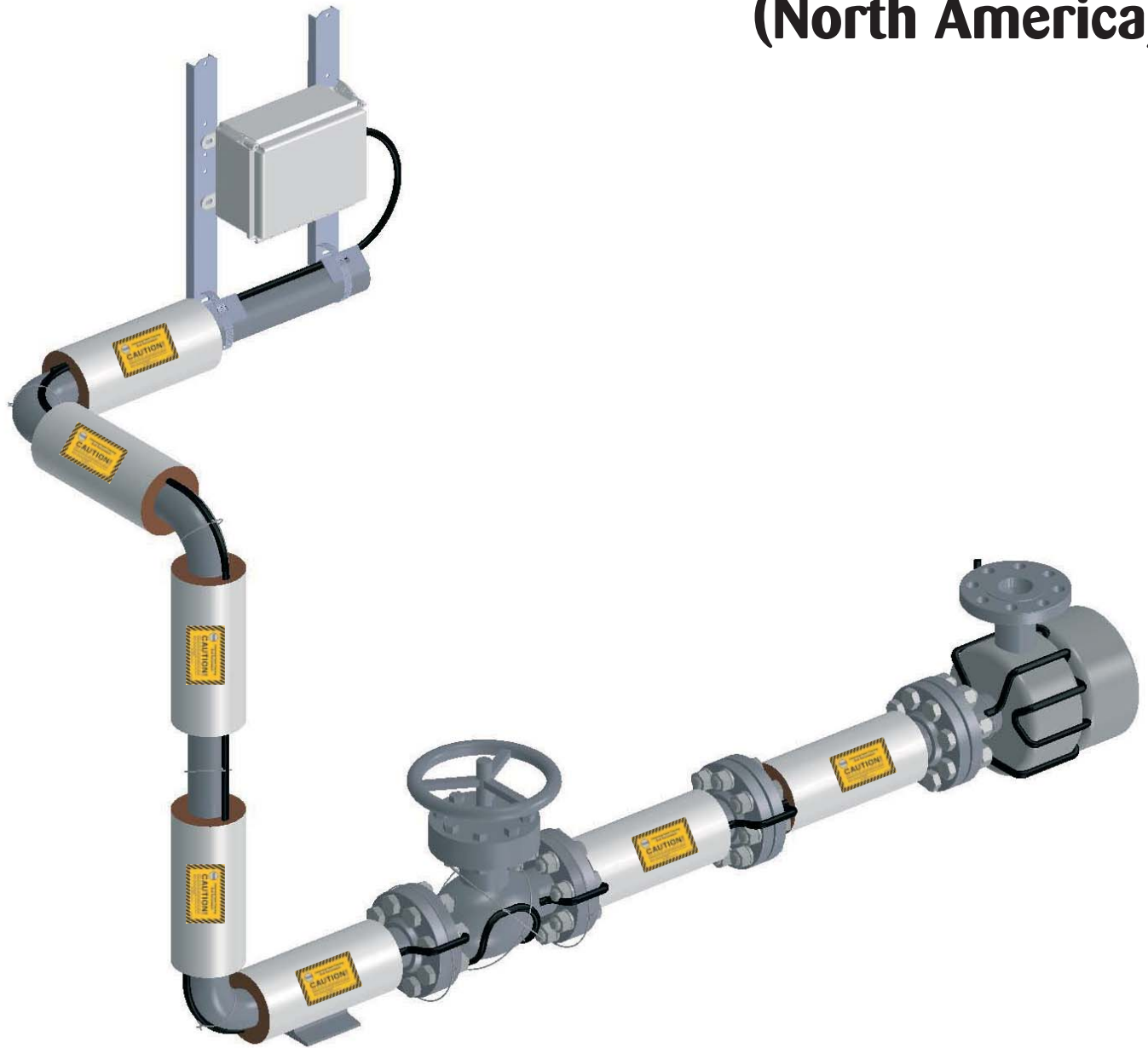


HMT Heating Cable INSTALLATION PROCEDURES (North America)



The Heat Tracing Specialists®

HMT Heating Cable

The following installation procedures are guidelines for the installation of a Thermon HMT heat tracing system. Refer to project specifications, if applicable.

Applications . . .

1. HMT heating 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.

Heating Cable Installation General Information

1. Identify the heating cable to ensure the proper type and quantity have been received. Compare information on the supplied I.D. tag with packing slip and purchase order to verify receipt of correct shipment.

Available HMT Cables . . .

Catalog Number	Service Voltage	Power Output w/ft (W/m)	Zone Length in (cm)
HMT 5-120	120	5 (16)	12 (30)
HMT 10-120	120	10 (33)	12 (30)
HMT 15-120	120	15 (49)	12 (30)
HMT 20-120	120	20 (66)	12 (30)
HMT 5-208	208	5 (16)	24 (61)
HMT 10-208	208	10 (33)	12 (30)
HMT 15-208	208	15 (49)	12 (30)
HMT 20-208	208	20 (66)	12 (30)
HMT 5-240	240	5 (16)	24 (61)
HMT 10-240	240	10 (33)	24 (61)
HMT 15-240	240	15 (49)	12 (30)
HMT 20-240	240	20 (66)	12 (30)
HMT 5-277	277	5 (16)	24 (61)
HMT 10-277	277	10 (33)	24 (61)
HMT 15-277	277	15 (49)	12 (30)
HMT 20-277	277	20 (66)	12 (30)



DO NOT connect power to heating cable while it is in the shipping carton.

2. Inspect materials for damage incurred during shipment.
3. Store in clean dry place. HMT cable ends must be kept dry before, during and after installation.
4. Do not connect power to heating cable while in shipping carton or before being installed on pipe/vessel.

5. Test insulation resistance of heating cable set when received, when installed with pipe uninsulated and after thermal insulation has been installed. Using a 500 Vdc megohmmeter, the minimum acceptable reading is 20 megohms between conductor and metallic sheath. IEEE 515 recommends that the test voltage be 1000 Vdc. After the application of thermal insulation the measured value should not be less than 5 megohms.
6. Heating cables shall not touch, cross over, or overlap itself after installation.
7. Ground-fault equipment protection is required for all heat tracing circuits.
8. Minimum installation temperature is -76°F (-60°C).
9. High limit or solid state temperature control device must be used when the system T-rating relies on controlled designs to limit sheath temperature.
10. Heating cable must not be embedded in the thermal insulation.
11. Heating cable set shall be spaced at least 1/2" (13 mm) from any combustible surface.
12. Do not damage cable by repeatedly bending and straightening at same location.
13. Minimum spacing between cable is 1" (25 mm) when installing multiple passes or loops.
14. The metal covering shall not be used as the bonding-to-ground means. Alternate means of protection shall be provided per applicable codes. The metal covering on this set and metal structures or materials used for the support of this set shall be grounded.
15. Provisions must be made to protect HMT cable from welding slag, grinders, etc.
16. Keep lids on all power and splice junction boxes. Plug any unused entries.
17. Refer to Thermon Form TMP0006 for information on electrical safety precautions for electrical heat tracing.
18. At tee branch in a pipeline, particularly if the branch pipe is smaller than the main pipe, double tracing the smaller pipe with the main heating unit may cause unbalanced pipe temperature. Use caution, check schedules to see if permissible.
19. Junction boxes must be configured to exclude moisture. If applicable, all conduits feeding into the junction box shall be provided with appropriately rated drains to prevent moisture migration into the junction box.



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INSTALLATION PROCEDURES

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.
3. Review any applicable local codes and standards prior to beginning the installation.
4. Refer to heat tracing isometric drawings for power point location, equipment allowances, etc.

Initial Installation . . .

1. Determine the orientation of the heating cable(s) on the pipe. The upper 90° of the pipe should be avoided to minimize the possibility of mechanical damage to the heating cable. Also, the sides of the pipe should be avoided since this is the normal location of the insulation seams. Refer to Illustration B for typical heating cable orientations.
2. Begin temporary installation at the proposed power end location and lay out heating circuit on the pipe. Refer to Illustration A 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.
4. Install cable with slight "wave" on pipe. Secure cable to pipe with stainless steel tie wire or banding.
5. Adjust cable where necessary.

Illustration A: Temporary Installation . . .

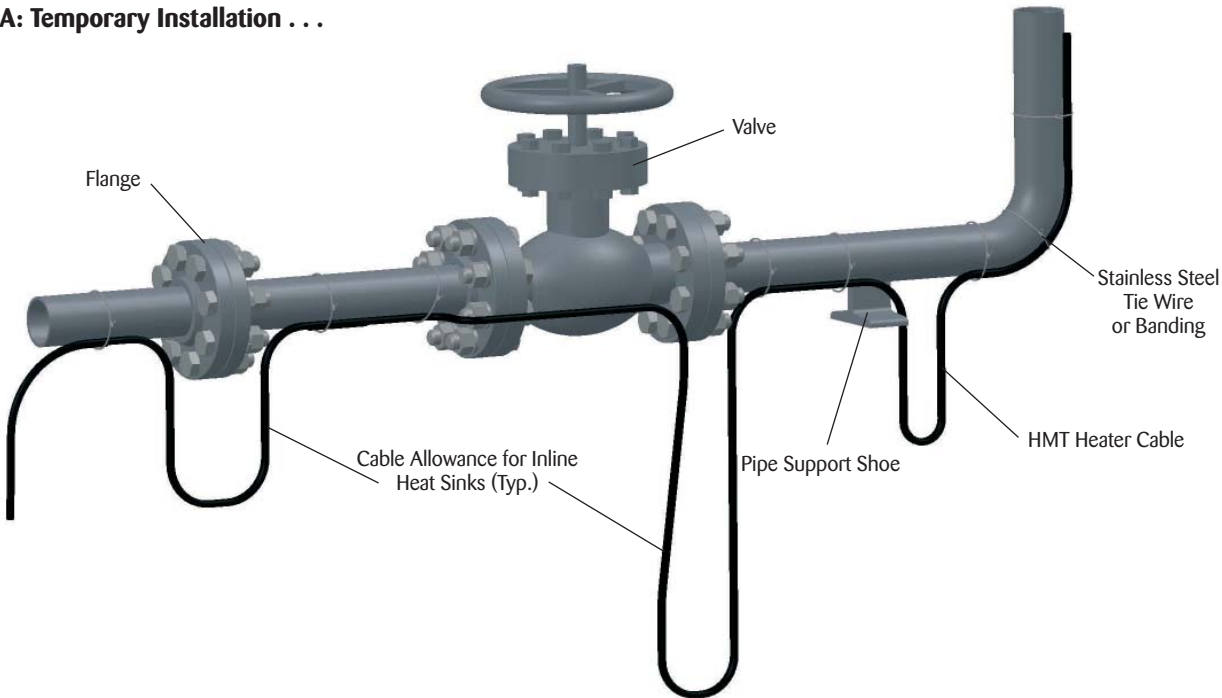
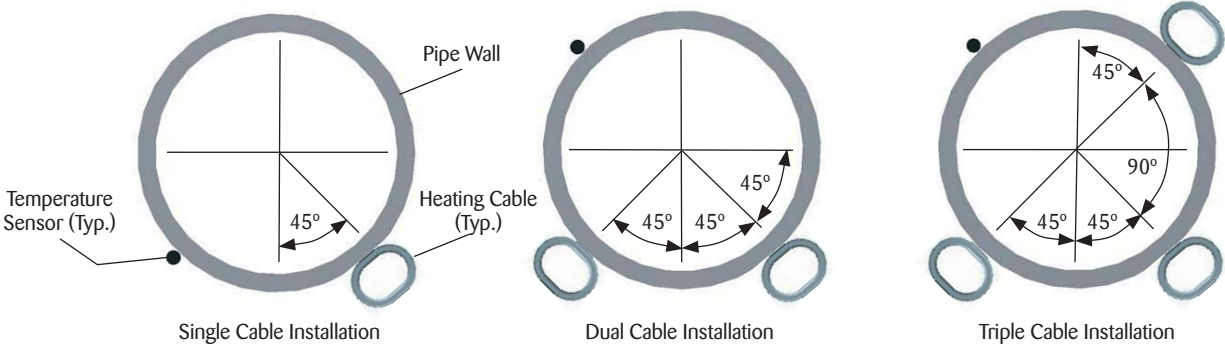


Illustration B: Typical Orientation of Heating Cable and Sensor Location . . .

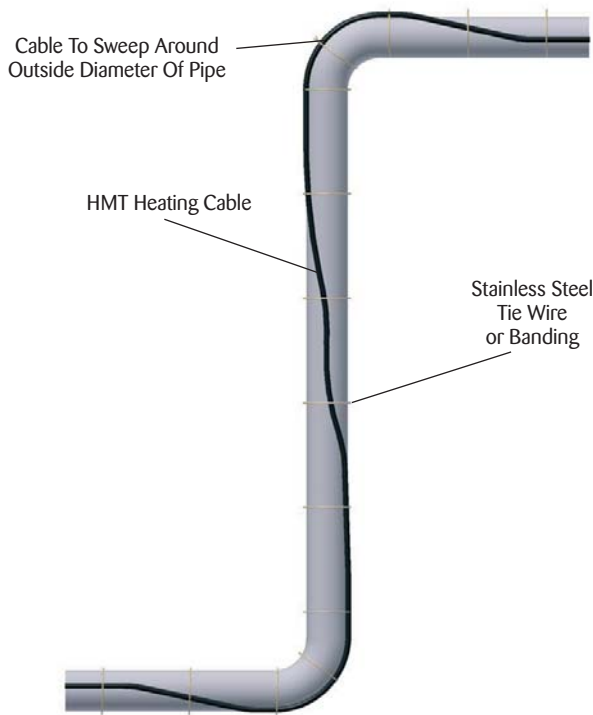


HMT Heating Cable

Installation on Elbows, Supports and Flanges . . .

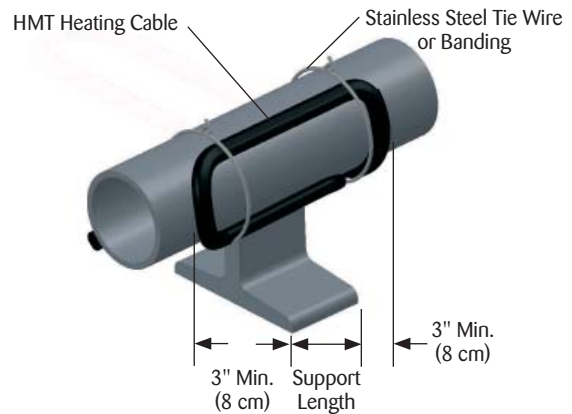
1. Install heating cable in accordance with Illustrations C thru E below. Secure heating cable to piping using stainless steel tie wire or banding.
2. Elbows: Locate the cable on the outside radius of an elbow to provide sufficient heat to compensate for the added piping material. Secure the cable to the pipe on each side of the elbow with stainless steel tie wire or banding.
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: Heating cable should maintain contact with flange when bending around pipe flanges to compensate for additional heat loss. In potentially explosive areas, it is recommended to secure HMT cable with stainless steel banding at all flanges or any other irregular shaped equipment.
5. Do not exceed minimum bend radius when completing installation.

Illustration C: Pipe Elbow . . .



NOTE:
Slack cable can be taken up by running the cable on the outside radius of the pipe elbows. Running the cable on the inside radius of the pipe elbows will add slack to the cable.

Illustration D: Pipe Support . . .



NOTE:
Loop cable 3" (8cm) past pipe shoe support on both sides.

Illustration E: Pipe Flange . . .

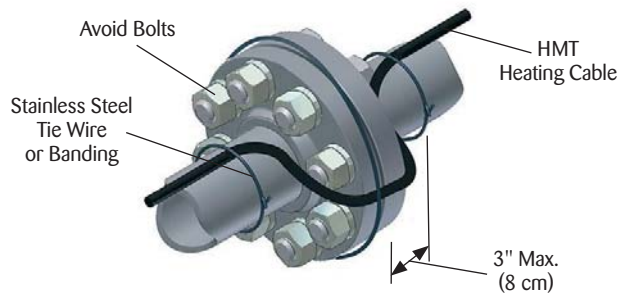


Table 1 Flange Allowance (pair) . . .

Flange Size	IN (mm)	1 (25)	1 1/4 (32)	1 1/2 (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)
Flange Allowance	IN (mm)	4 (102)	5 (127)	5 (127)	5 (127)	5 (127)	6 (152)	6 (152)	6 (152)	7 (178)	8 (203)	9 (229)	10 (254)	10 (254)	11 (279)	12 (305)	19 (483)



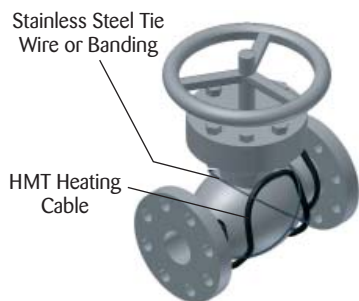
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INSTALLATION PROCEDURES

Installation on Valves and Pumps . . .

1. Install heating cable in accordance with Illustrations F and G below. Secure heating cable to piping using stainless steel tie wire or banding.
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 2 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). Do not cross cable.
4. Do not exceed minimum bend radius when completing installation.
5. In potentially explosive areas, it is recommended to secure HMT cable with stainless steel banding at all flanges, valves or any other irregular shaped equipment.

Illustration F: Typical Valve Detail . . .



Heating Cable Serpentine on Valve

Illustration G: Typical Pump Detail . . .



Heating Cable Serpentine on Pump

NOTE: Individual HMT cable set recommended for pumps.

Table 2: Valve and Pump Allowances

Pipe Size in (mm)	Valve Type			Pump Type	
	Screwed or Welded ft (m)	Flanged ft (m)	Butterfly ft (m)	Screwed ft (m)	Flanged ft (m)
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)

Notes . . .

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.
2. Allowances are for 150 pound valves. More cable is required for higher rated valves.
3. Refer to heat trace isometric drawing for project specific allowances.

HMT Heating Cable

Illustration H: Pipe Hanger . . .

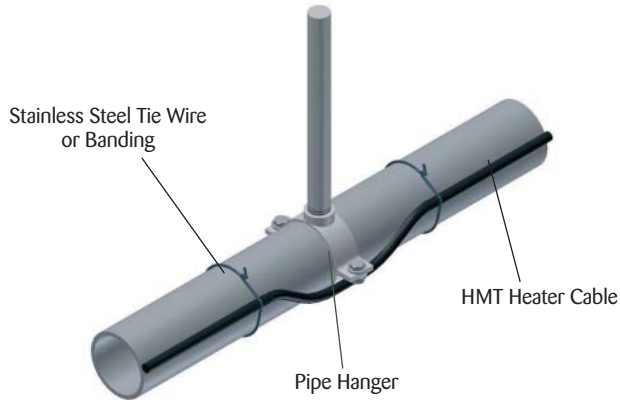
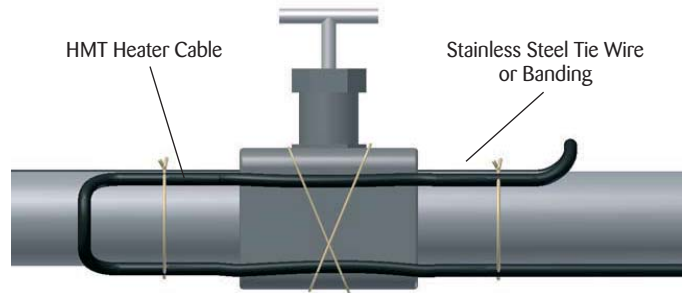


Illustration I: Socket Weld Valve . . .

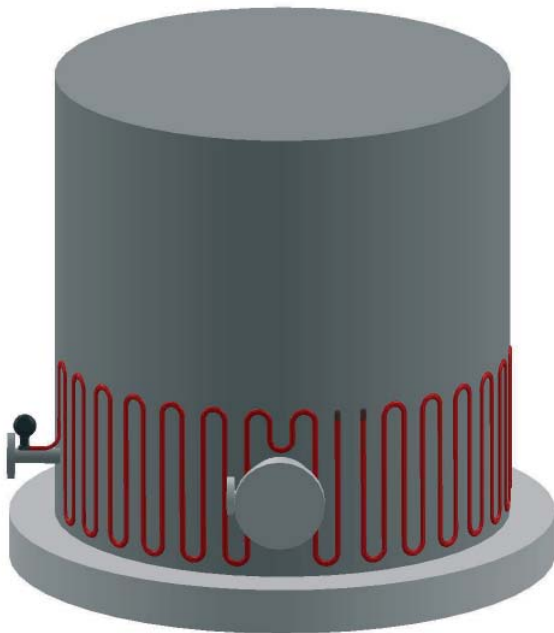


Notes. . .

1. For small valves (less than 2" (51mm)) it may be impractical to install the correct cable allowance on the valve body itself. It can be installed in a uniform manner across the valve and either side of the pipe as shown above.
2. At tee branch pipe line (less than 2" (51mm)) if the branch pipe is double traced and the main pipe is single traced, then there is no additional requirement for cable allowance for valve.

Installation on Tanks and Vessels . . .

Confirm design and material requirements for the heat tracing system for each tank. Typically, for temperature maintenance, heat ups or boil offs, the heating cable should be below the normal liquid level. Keep records of all tank and pipe heat tracing system designs and include the heat tracing system in a regular preventative maintenance program.

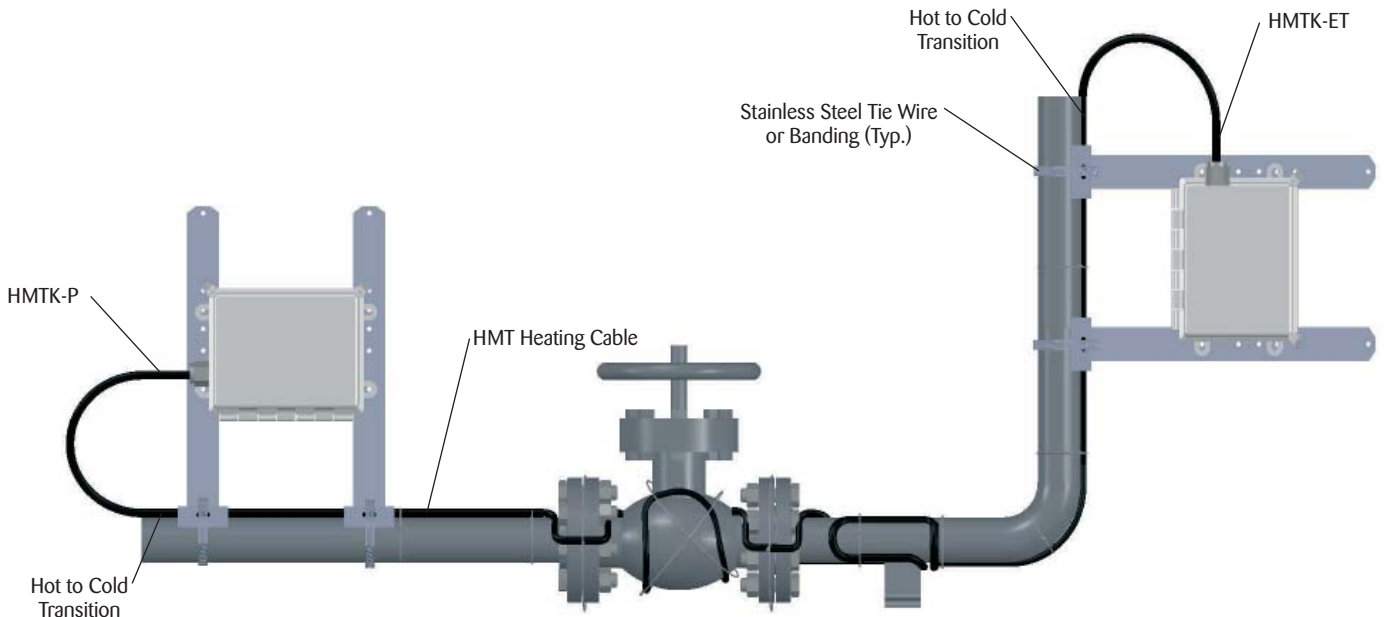


INSTALLATION PROCEDURES

Completing the Installation . . .

1. Begin final cable attachment by securing the end of circuit and working back toward the power supply.
 - HMT heating cables are typically installed with tie wires or stainless steel banding at 12" (30 cm) intervals. Use only Thermon approved banding. Do not over tighten banding or tie wire.
 - If applicable, refer to installation details provided with the project drawings or contact Thermon for additional information regarding installation.
2. Before making power connections, the HMT cable should be tested to ensure electrical integrity with at least a 500 Vdc megohmmeter (megger) between the conductors and the metal sheath. IEEE 515 recommends test voltage of 1000 Vdc for mineral insulated cable. Minimum resistance should be 20 megohms.
3. All HMT cable shall be terminated off of the heated surface. The hot to cold transition node should be located on the pipe. A HMTK-P connection kit shall be used to connect all HMT heating cables to a power junction box. A HMTK-ET connection kit shall be used to connect all HMT heating cables to an end junction box.
4. Junction boxes to complete a typical HMT circuit connection to power may not be supplied as part of the system. All junction boxes shall be certified for the application. The type or IP rating of the HMT electrical heat trace cable system is dependent upon the rating of the connection kits. Refer to Installation instructions included with power, splice and end enclosures or contact Thermon for additional information.
5. Route HMT cable set cold lead(s) into junction box hub(s). Slowly tighten gland connector until the compression nut begins to make positive contact with the compression ferrule and cannot be moved by hand. Then tighten fitting 1/4 additional turn.
6. Secure temperature sensor (if required) to pipe utilizing stainless steel banding. Locate temperature sensor as shown in Illustration B.

Illustration J: Typical Installation. . .



HMT Heating Cable

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 weather 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. The measured value should not be less than 5 megohms. This should call attention to any damage to the heating cable that may have occurred during the insulation installation.
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.
2. A sample historical operating data log form is included in the Electric Heat Tracing Maintenance and Troubleshooting Guide, Thermon Form TEP0066.



The Canadian Electrical Code requires that ground-fault protection be provided for branch circuits supplying electric heat tracing.



Receiving Inspection Test Report for HMT Heating Cable Document "A"

Item	Heating Cable Batch Number	Heating Cable Catalog Number	Visual Check By	Date	Insulation Resistance Test By	Reading (MΩ)	Date	Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Representative	Name	Signature	Date

Customer: _____
Project Reference: _____
Contractor: _____
Megohmmeter Voltage: _____



Insulation Test Report for HMT Heating Cable Document "B"

Heating Cable Information		After Installation of Cable					After Thermal Insulation of Pipe/Cable					Remarks	
		Heating Cable Batch Number	Heating Cable Catalog Number	Visual Check By	Date	Insulation Resistance Test By	Reading (M Ω)	Date	Visual Check By	Date	Insulation Resistance Test By		Reading (M Ω)
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Representative	Name	Signature	Date

Customer: _____
Project Reference: _____
Contractor: _____
Megohmmeter Voltage: _____



Commissioning Test Report for HMT Heating Cable Document "C"

Circuit Data						By Installation Contractor						
Item	Panel Number	Breaker Number	Heater Number	Line Number	Volts	Insulation Resistance Test By	Reading (M Ω)	Date	Amperage Test By	Amps	Date	Remarks
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

Representative	Name	Signature	Date

Customer: _____
Project Reference: _____
Contractor: _____
Megohmmeter Voltage: _____



Cable Testing Report

1. Refer to these Thermon Installation Procedures 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.
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 sheath. IEEE 515 recommends that the test voltage be 1000 Vdc. Minimum resistance should be 20 megohms.
 - A. Connect the positive lead of the megger to the cable bus wires.
 - B. Connect the negative lead of the megger to the metallic sheath.
 - 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.
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 sheath. IEEE 515 recommends that the test voltage be 1000 Vdc. Minimum resistance should be 20 megohms.
5. After the thermal insulation is installed, the megohmmeter test should be repeated. Minimum resistance should be 5 megohms.
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.



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Specifications and information are subject to change without notice. Form TMP0035-1011