Power-Limiting Cables

nVent RAYCHEM

CONNECT AND PROTECT

This section provides an overview and general design guidelines for nVent RAYCHEM power limiting heat tracing systems. For complete design assistance, contact your nVent representative or visit our website at nVent.com/RAYCHEM.

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INTRODUCTION

nVent RAYCHEM power-limiting heating cables are the ideal technology for applications requiring high power output at elevated temperatures. nVent RAYCHEM VPL heating cables can be used for high maintain temperatures ranging up to 455°F (235°C), depending on cable selection, and can withstand routine steam purges and temperature excursions to 500°F (260°C) with power off.

VPL also can provide a cost-effective alternative to self-regulating heating cables when more than a single run of cable is required (trace ratio > 1).

nVent RAYCHEM power-limiting cables have been certified for use in hazardous and non-hazardous locations.

Power-Limiting Technology

nVent RAYCHEM power-limiting cables are parallel heating cables formed by a coiled resistor alloy heating element wrapped around two parallel bus wires. At a fixed distance, the insulation is removed from one of the bus wires. The process is repeated, removing the insulation from the other bus wire. This distance between contact points forms the heating zone length.

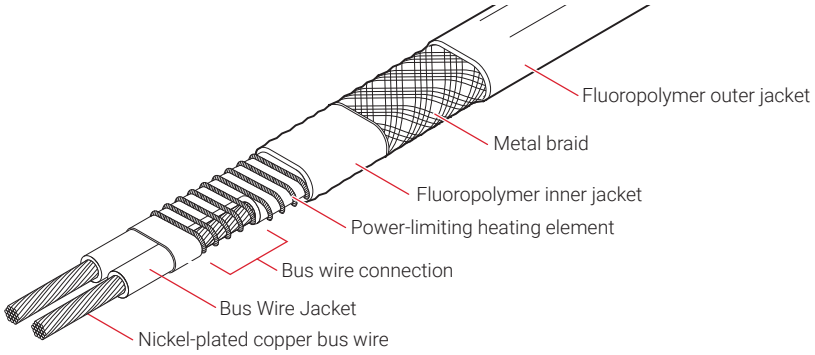


Fig. 1 Heating cable construction

The Positive Temperature Coefficient (PTC) of the heating element reduces power output as ambient temperature increases. This effect allows the power-limiting cable to be crossed over itself since the temperature of the heating element is reduced at the cross over points.

SYSTEM OVERVIEW

Typical Power-Limiting System

A typical power-limiting heating cable system is shown in Figure 2. The heating cable is cut to length at the job site and attached to the pipe with glass tape. A power connection kit connects the heating cable bus wires to power in a junction box. Tees and splices accommodate pipe branches to connect two or three heating cables together. An end seal kit is used to terminate the end of the heating cable. These required connection kits are designed and approved to provide a safe and reliable heat-tracing system. For applications requiring tight temperature control, electrical system monitoring, or remote operation, consider a control and monitoring system.

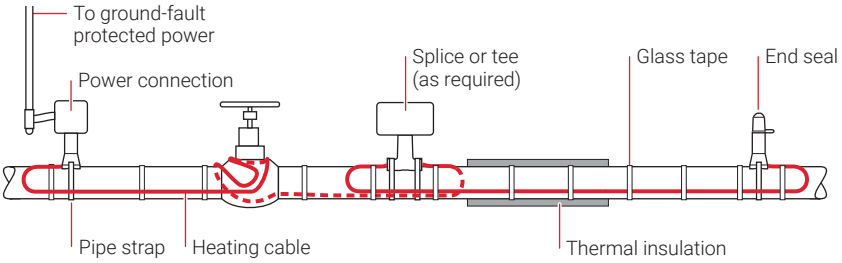


Fig. 2 Typical power-limiting heating cable system

Approvals and Certifications

nVent RAYCHEM power-limiting systems are approved and certified for use in non-hazardous and hazardous locations by many agencies. Please refer to the technical datasheet for more details.

THERMAL DESIGN

The thermal design of a power-limiting heat-tracing system follows the same steps as for a self-regulating system. Refer to Self-Regulating Cables design guide (H56882): Thermal Design section, to determine the pipe heat loss for your application.

The example below can be used to follow the steps for a manual design with VPL power-limiting heating cables.

For an optimized design, use our TraceCalc Pro design software or contact your nVent representative.

HEATING CABLE SELECTION

If your application requires a high maintain temperature up to 455°F (235°C), the heating cable selection process involves three basic steps:

1. Gather the following information:
   - Pipe size and material
   - Insulation type and thickness
   - Maintain temperature (T_M)
   - Minimum ambient temperature (T_A)
   - Minimum start-up temperature
   - Service voltage
   - Chemical environment
   - Maximum intermittent exposure temperature*
   - Electrical area classification**
2. Select the heating cable service voltage.
3. Determine the heating cable power output rating.

* Determines whether a higher exposure temperature heating cable is needed.

** Determines whether special design requirements and connection kits must be used.

For higher maintain temperatures or where more power is required, refer to the Mineral Insulated Cables design guide (H56884) for product selection, or contact your nVent representative.

If your application is in a hazardous location, you must determine the maximum sheath temperature. Power-limiting heating cables do not have an unconditional T-rating as do self-regulating cables. The maximum sheath temperature of the cable must be calculated to ensure that it is compatible with the hazardous location requirements. Use nVent RAYCHEM TraceCalc Pro design software or contact your nVent representative.

Heating Cable Catalog Number

Before beginning, take a moment to understand the structure underlying heating cable catalog numbers. You will refer to this numbering convention throughout the product selection process. Your goal is to determine the catalog number for the product that best suits your needs.

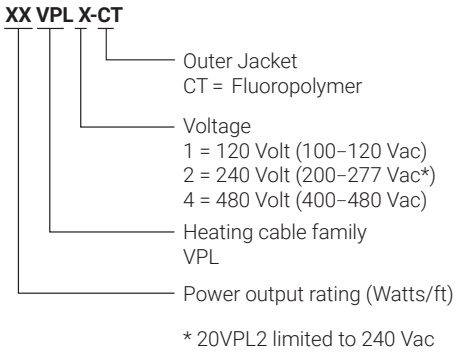


Fig. 3 Heating cable catalog number

Heating Cable Selection
1. Gather information
2. Select service voltage
3. Determine power output rating

Step 1 Gather the necessary information

To select the heating cable, gather and record the following information:

- Pipe size and material _____
- Insulation type and thickness _____
- Maintain temperature (T_M) _____
- Minimum ambient temperature (T_A) _____
- Minimum start-up temperature _____
- Service voltage _____
- Chemical environment _____
- Maximum intermittent exposure temperature* _____
- Electrical area classification** _____

Example: Gather necessary information

Pipe size and material	2 inch, carbon steel
Insulation type and thickness	Fiberglass, 3 inch
Maintain temperature (Tm)	280°F
Minimum ambient temperature (Ta)	–40°F
Minimum start-up temperature	0°F
Service voltage	120 Vac
Chemical environment	Chlorides
Maximum intermittent exposure temperature*	450°F
Electrical area classification**	Non-hazardous

* Determines whether a higher exposure temperature heating cable is needed.

** Determines whether special design requirements and connection kits must be used.

Heating Cable Selection
1. Gather information
2. Select service voltage
3. Determine power output rating

Step 2 Select the heating cable service voltage

Service voltage options: 1 = 120 volts (100–120 Vac)

2 = 240 volts (200–277 Vac*)

4 = 480 volts (400–480 Vac)

Example: Service voltage selection

Input 120 volts (from Step 1)

Catalog number xVPL1-CT

* 20VPL2 limited to 240 Vac

Heating Cable Selection
1. Gather information
2. Select service voltage
3. Determine power output rating

Step 3 Determine the heating cable power output rating

Use Graph 1 on page 6, locate the heating cable with thermal output greater than the heat loss (Q_T) at the pipe maintain temperature (T_M).

If the pipe heat loss, Q_T is in between the two heating cable power output curves, select the higher-rated heating cable. If Q_T is greater than the power output of the highest-rated heating cable, you can:

- Use two or more heating cables run in parallel.
- Spiral the heating cable.
- Use thicker insulation to reduce heat loss.
- Use insulation material with a lower k factor.

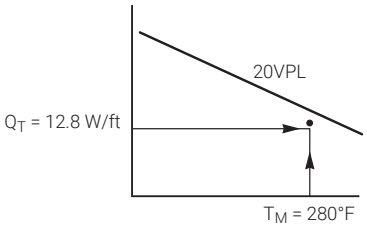


Fig. 4 Heating cable thermal output

Following the thermal design steps described in the Self-Regulating Cables design guide (H56882):

Q_T = 11.8 W/ft + [2/5 x (14.3 – 11.8)]

Q_T = 12.8 W/ft

Spiraling

If spiraling is elected, use the formula below to determine the spiral factor (length of heating cable per foot of pipe):

Spiral factor = Q_T / Heater power output at T_M

When the spiral factor exceeds 1.6 or the pipe size is less than three inches, consider using two or more heating cables run in parallel rather than spiraling.

Example: Power output selection

Input VPL heating cable (determined earlier in this step)

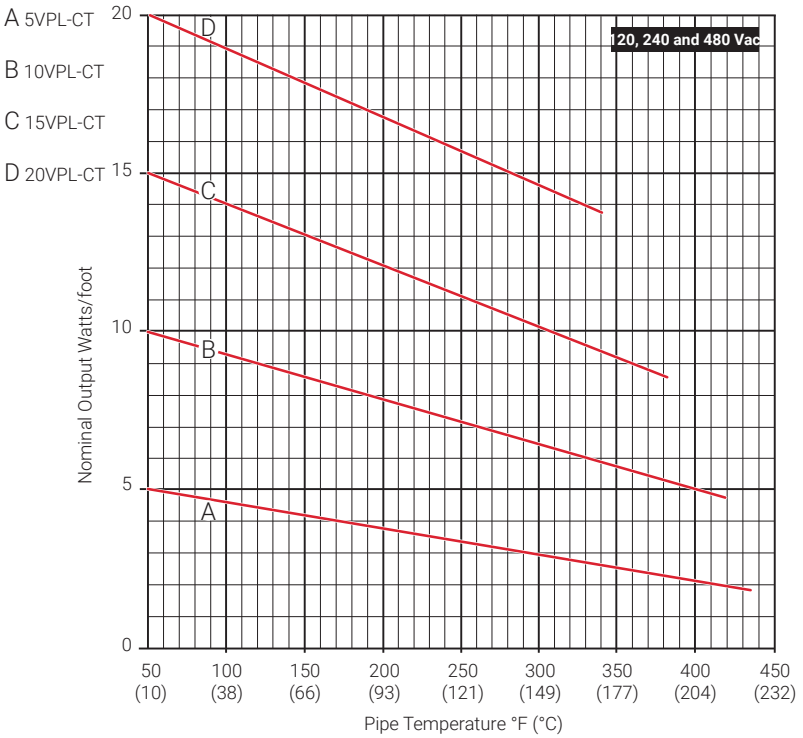
Input Power output rating = 20 (determined earlier in this step)

Input Heat loss is 12.8 W/ft (from Table 1, Self-Regulating Cables)

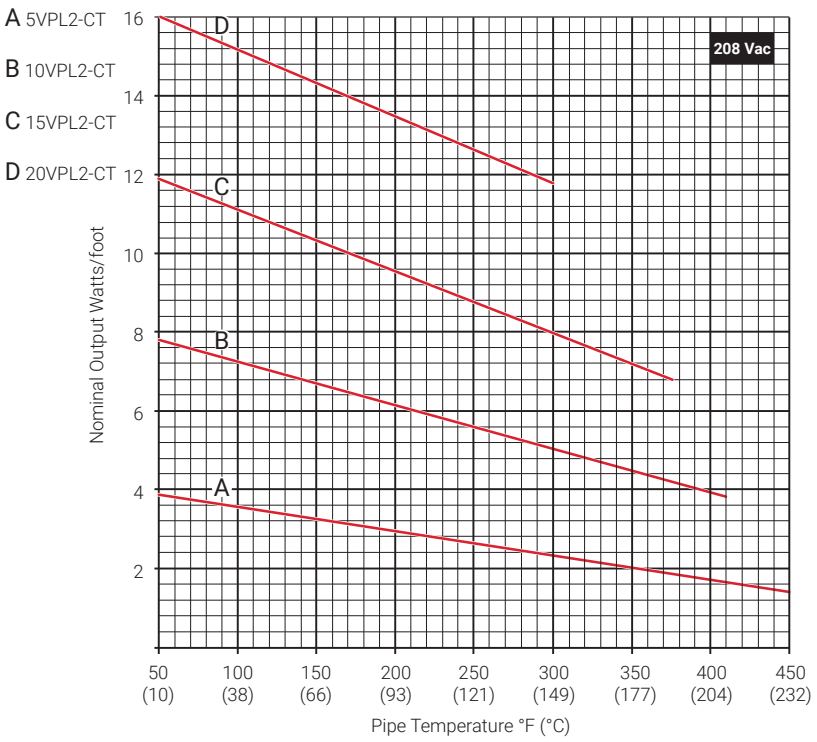
Input 20VPL output of 15.3 W/ft exceeds 12.8 W/ft at 280°F (Graph 1 pg. 6)

Catalog number **20VPL1-CT**

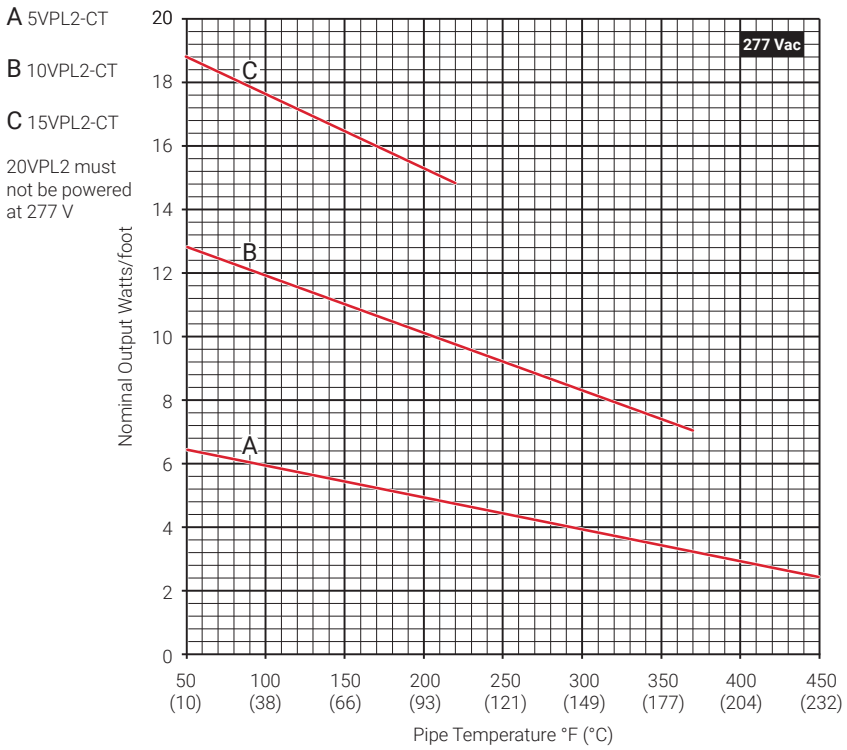
Select one of the following graphs based on the voltage determined in Step 1.



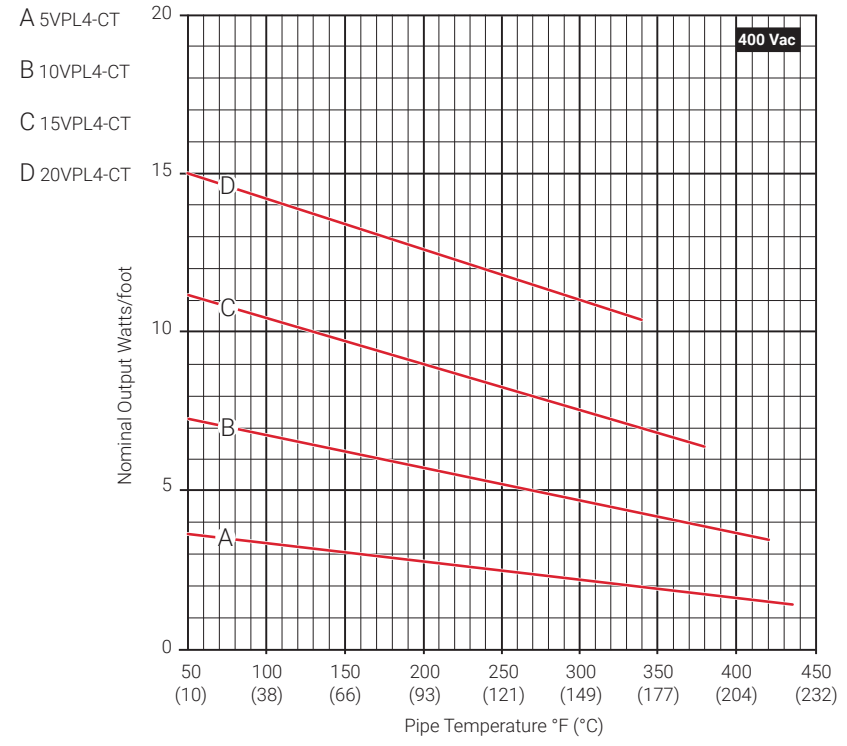
Graph 1 VPL nominal power output at 120 V, 240 V and 480 V



Graph 2 VPL nominal power output at 208 V



Graph 3 VPL nominal power output at 277 V



Graph 4 VPL nominal power output at 400 V

Now that you have selected the correct heating cable for your application, this section helps you to determine:

- Total length of heating cable required.
- Electrical design, including circuit breaker sizing and selection.
- Quantity and type of connection kits and accessories.

Determining the Total Length of Heating Cable

To determine the total length of heating cable, follow the six steps outlined below.

1. Gather the necessary information:
   - Pipe length and diameter
   - Type and number of valves
   - Type and number of pipe supports
   - Start-up temperature
   - Number of circuits and tees in the piping
2. Calculate the total length of heating cable for the piping.
3. Calculate the total length of heating cable for the valves.
4. Calculate the total length of heating cable for the pipe supports.
5. Include additional heating cable for connection kit installation.
6. Add all the lengths together.

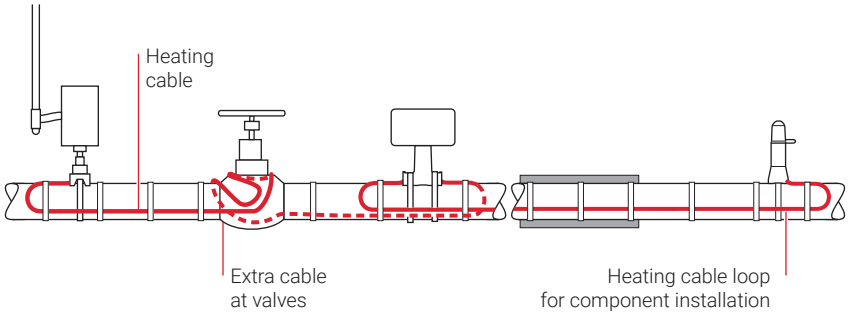


Fig. 5 Typical heating cable layout

Heating Cable Length
1. Gather information
2. Calculate cable length for piping
3. Calculate cable length for valves
4. Calculate cable length for pipe supports
5. Include cable for connection kits
6. Add all heating cable lengths

Step 1 Gather the necessary information

- Pipe size and diameter _____
- Type and number of valves _____
- Type and number of pipe supports _____
- Start-up temperature _____
- Number of circuits and tees in piping _____

Example: Gather necessary information

• Pipe size and diameter	120 feet of 2 inch pipe
• Type and number of valves	Three 2 inch gate valves
• Type and number of pipe supports	Support shoes, thermally insulated: 10
• Start-up temperature	0°F
• Number of circuits and tees in piping	Power connections: 1
	End seals: 3
	Pipe tees: 2

Heating Cable Length
1. Gather information
2. Calculate cable length for piping

Step 2 Calculate the total length of heating cable for the piping

Example: Total length of cable for piping calculation

120 ft of pipe (from Step 1) = 120 ft of cable for single tracing

Heating Cable Length
1. Gather information
2. Calculate cable length for piping
3. Calculate cable length for valves
4. Calculate cable length for pipe supports
5. Include cable for connection kits
6. Add all heating cable lengths

Step 3 Calculate the total length of heating cable for the valves

Use Table 1 to determine the amount of heating cable required for each valve. Multiply by the number of valves to get the total additional footage of heating cable.

TABLE 1 RECOMMENDED VALVE ALLOWANCES

Pipe diameter (IPS) (inches)	Heating cable feet (meters)		Comments*
1/4	0.3	(0.09)	These recommendations are limited by the amount of heating cable that can physically be installed on small valves. Heat loss may not be fully compensated under extreme conditions.
1/2	0.8	(0.2)	
3/4	1.3	(0.4)	
1	2.0	(0.6)	
1-1/4	3.3	(1)	
1-1/2	4.3	(1.3)	
2	4.3	(1.3)	
3	4.3	(1.3)	
4	4.3	(1.3)	
6	5.0	(1.5)	
8	5.0	(1.5)	
10	5.6	(1.7)	These numbers represent the minimum amount of heating cable required for a service loop. Additional cable may be required to compensate for total heat loss.
14	7.3	(2.2)	
18	9.4	(2.9)	
24	12.6	(3.8)	

* Use TraceCalc Pro design software to calculate the exact quantity required for the valve.

Example: Total length of cable for valves calculation

From Table 1 for a 2-inch diameter pipe,

Each valve requires: 4.3 ft

Cable needed for three valves: 3 x 4.3 ft

Total cable length needed for valves: 12.9 ft

Heating Cable Length
1. Gather information
2. Calculate cable length for piping
3. Calculate cable length for valves
4. Calculate cable length for pipe supports
5. Include cable for connection kits
6. Add all heating cable lengths

Step 4 Calculate the total length of heating cable for the pipe supports

Support Shoes

For each pipe support shoe, calculate the additional heating cable required as follows:

Determine the heat loss for one support.

- Formula: Qsupport = 0.7L x (Tm – Ta), where L = Support length (ft) (assumes a 0.25-inch steel welded shoe partially shielded from winds)
- Multiply that heat loss by the total number of supports.
- Add 10 percent to the total heat loss for added safety.
- Obtain the heating cable power output per foot from Graph 1.
- Divide the total support heat loss by the heating cable power output per foot to get the number of feet of heating cable needed.

Example: Total length of cable for pipe supports calculation

Input 20VPL1-CT heating cable (from Product Selection, Step 3)

Input 10 thermally-insulated shoe supports (from Bill of Materials, Step 1)

As the pipe supports are thermally insulated, no additional heating cable is required for this example.

Heating Cable Length
1. Gather information
2. Calculate cable length for piping
3. Calculate cable length for valves
4. Calculate cable length for pipe supports
5. Include cable for connection kits
6. Add all heating cable lengths

Step 5 Include additional heating cable for connection kit installation

Estimate the number of power connections, tees, and splices for the system. Allow an additional three feet for each connection kit.

Example: Include additional cable

Input	1 power connection, 3 end seals, 2 tees (from Step 1)
Total number of connection kits	6 (from Step 1)
Cable needed for 6 connection kits	6 x 3 ft of additional cable
Total cable length for 6 connection kits	18 ft of cable

Heating Cable Length
1. Gather information
2. Calculate cable length for piping
3. Calculate cable length for valves
4. Calculate cable length for pipe supports
5. Include cable for connection kits
6. Add all heating cable lengths

Step 6 Add all the lengths

Example: Final addition

Cable for piping	120 ft (from Step 1)
Cable for valves	12.9 ft (from Step 3)
Cable for supports	0 ft (from Step 4)
Cable for connection kits	18 ft (from Step 5)
Sum of all lengths	120 + 12.9 + 18 = 150.9 ft
Total length of heating cable	151 ft (rounded)

Now that you have the total length of heating cable you can determine the number of electrical circuits you will need.

⚠ WARNING: Fire hazard
There is a danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed. To comply with nVent requirements, certifications, and national electrical codes, and to protect against the risk of fire, ground-fault equipment protection must be used on each heating cable circuit. Arcing may not be stopped by conventional circuit breakers.

Determining maximum length of heating cable on one circuit breaker

Using Tables 2, 3, and 4 match the heating cable catalog number at the expected minimum start-up temperature with the total heating cable length and select a circuit breaker trip rating. The circuit breaker trip rating should not exceed the maximum trip rating shown for heating cables. For example, the trip rating of a circuit breaker protecting several circuits should not exceed 50 amps. To maximize fault current protection, use the lowest allowable circuit breaker sizing.

Maximum circuit length per breaker depends on four factors:

1. Heating cable and catalog number
2. Minimum start-up temperature
3. Service voltage
4. Circuit breaker trip rating

TABLE 2 MAXIMUM CIRCUIT LENGTH (FEET) VS. CIRCUIT BREAKER TRIP RATING (AMPS)

120- and 240-volt heating cables applied to metal pipe with glass tape											
Heating cable	Start-up temperature	120-volt cable					240-volt cable				
		15 A	20 A	30 A	40 A	50 A	15 A	20 A	30 A	40 A	50 A
5VPL-CT	50°F(10°C)	260	350	370	370	370	525	685	740	740	740
	0°F (–18°C)	240	325	370	370	370	485	645	740	740	740
	–20°F(–29°C)	235	315	370	370	370	470	625	740	740	740
	–40°F (–40°C)	225	305	370	370	370	455	610	740	740	740
10VPL-CT	50°F (10°C)	130	175	260	260	260	260	350	525	525	525
	0°F (–18°C)	120	165	245	260	260	245	325	490	525	525
	–20°F (–29°C)	120	160	240	260	260	235	315	475	525	525
	–40°F (–40°C)	115	155	230	260	260	230	310	465	525	525
15VPL-CT	50°F (10°C)	85	115	175	215	215	175	230	350	430	430
	0°F (–18°C)	80	110	165	215	215	165	220	325	430	430
	–20°F (–29°C)	80	105	160	215	215	160	215	320	425	430
	–40°F (–40°C)	75	100	155	210	215	155	210	310	415	430
20VPL-CT	50°F (10°C)	65	85	130	175	185	130	175	260	350	370
	0°F (–18°C)	60	85	125	165	185	125	165	250	330	370
	–20°F (–29°C)	60	80	120	160	185	120	160	245	325	370
	–40°F (–40°C)	60	80	120	160	185	115	155	240	320	370

TABLE 3 MAXIMUM CIRCUIT LENGTH (FEET) VS. CIRCUIT BREAKER TRIP RATING (AMPS)

208- and 277-volt heating cables applied to metal pipe with glass tape											
Heating cable	Start-up temperature	208-volt cable					277-volt cable				
		15 A	20 A	30 A	40 A	50 A	15 A	20 A	30 A	40 A	50 A
5VPL-CT	50°F (10°C)	589	700	700	700	700	465	620	720	720	720
	0°F (–18°C)	545	700	700	700	700	430	574	720	720	720
	–20°F (–29°C)	530	700	700	700	700	418	557	720	720	720
	–40°F (–40°C)	515	686	700	700	700	406	541	720	720	720
10VPL-CT	50°F (10°C)	291	388	490	490	490	236	315	472	515	515
	0°F (–18°C)	272	362	490	490	490	221	294	441	515	515
	–20°F (–29°C)	265	353	490	490	490	215	286	430	515	515
	–40°F (–40°C)	258	344	490	490	490	209	279	419	515	515
15VPL-CT	50°F (10°C)	191	255	383	400	400	160	213	320	420	420
	0°F (–18°C)	180	240	360	400	400	150	200	300	401	420
	–20°F (–29°C)	176	234	351	400	400	147	196	293	391	420
	–40°F (–40°C)	172	229	343	400	400	143	191	287	382	420
20VPL-CT	50°F (10°C)	142	189	284	340	340	†	†	†	†	†
	0°F (–18°C)	135	180	269	340	340	†	†	†	†	†
	–20°F (–29°C)	132	176	264	340	340	†	†	†	†	†
	–40°F (–40°C)	129	173	249	340	340	†	†	†	†	†
† Not permitted (20 VPL must not be powered at 277 V)											

TABLE 4 MAXIMUM CIRCUIT LENGTH (FEET) VS. CIRCUIT BREAKER TRIP RATING (AMPS)

480-volt heating cables applied to metal pipe with glass tape						
Heating cable	Start-up temperature	480-volt cable				
		15 A	20 A	30 A	40 A	50 A
5VPL-CT	50°F (10°C)	1050	1370	1480	1480	1480
	0°F (–18°C)	970	1290	1480	1480	1480
	–20°F (–29°C)	940	1250	1480	1480	1480
	–40°F (–40°C)	910	1220	1480	1480	1480
10VPL-CT	50°F (10°C)	520	700	1050	1050	1050
	0°F (–18°C)	490	650	980	1050	1050
	–20°F (–29°C)	470	630	950	1050	1050
	–40°F (–40°C)	460	620	930	1050	1050
15VPL-CT	50°F (10°C)	350	460	700	860	860
	0°F (–18°C)	330	440	650	860	860
	–20°F (–29°C)	320	430	640	850	860
	–40°F (–40°C)	310	420	620	830	860
20VPL-CT	50°F (10°C)	260	350	520	700	740
	0°F (–18°C)	250	330	500	660	740
	–20°F (–29°C)	240	320	490	650	740
	–40°F (–40°C)	230	310	480	640	740

Example: Determining maximum length of heating cable on one circuit breaker

Input 20VPL1-CT heating cable (from Product Selection, Step 3)

Input 120 volts (from Product Selection, Step 1)

Input 0°F start-up temperature (from Product Selection, Step 1)

Input Maximum circuit length = 165 feet on a 40-amp breaker (from Table 2)

If the total length of cable exceeds 165 feet, you must use a 50-amp circuit breaker, which allows up to 185 feet.

Determine minimum number of circuits

The number of circuits you need depends on the total length of heating cable you will be using and the maximum circuit length for the heating cable you selected.

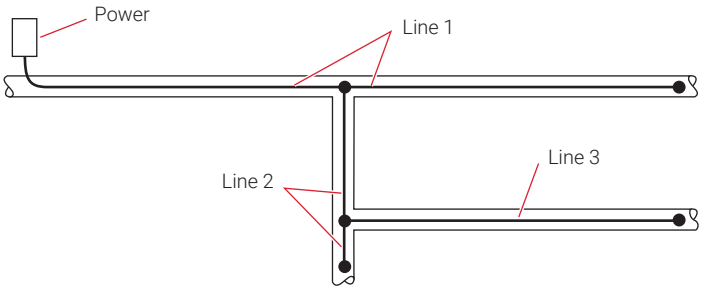
Example: Calculating the minimum number of circuits

Input 165 ft allowed per 40-amp circuit (from Table 2)

Input Total circuit length = 151 ft (from Bill of Materials, Step 6)

Number of circuits 1 circuit

If the total length of heating cable required exceeded 165 feet, you would need to split the total length into two separate circuits (or use a larger circuit-breaker size).



Line 1 + Line 2 + Line 3 ≤ Maximum circuit length

Fig. 6 Maximum heating cable circuit length

Connection Kit Selection and Accessories

⚠ WARNING: Fire hazard
To prevent fire or shock, Raychem brand specified connection kits must be used. Do not substitute parts or use vinyl electrical tape.

Overview

nVent offers a full range of connection kits for power connections, splices, and end seals. These connection kits must be used to ensure proper functioning of the product and compliance with warranty, code, and approvals requirements.

Different power connection, end seal, splice, and tee kits are required depending on the area classification. The data sheets for these connection kits can be found on nVent.com/RAYCHEM or the Technical data sheet section of the nVent Products & Services Catalogue (H56550).

Non-hazardous and hazardous location connection kits

Figure 7 shows the connection kits and accessories available for typical power-limiting systems.

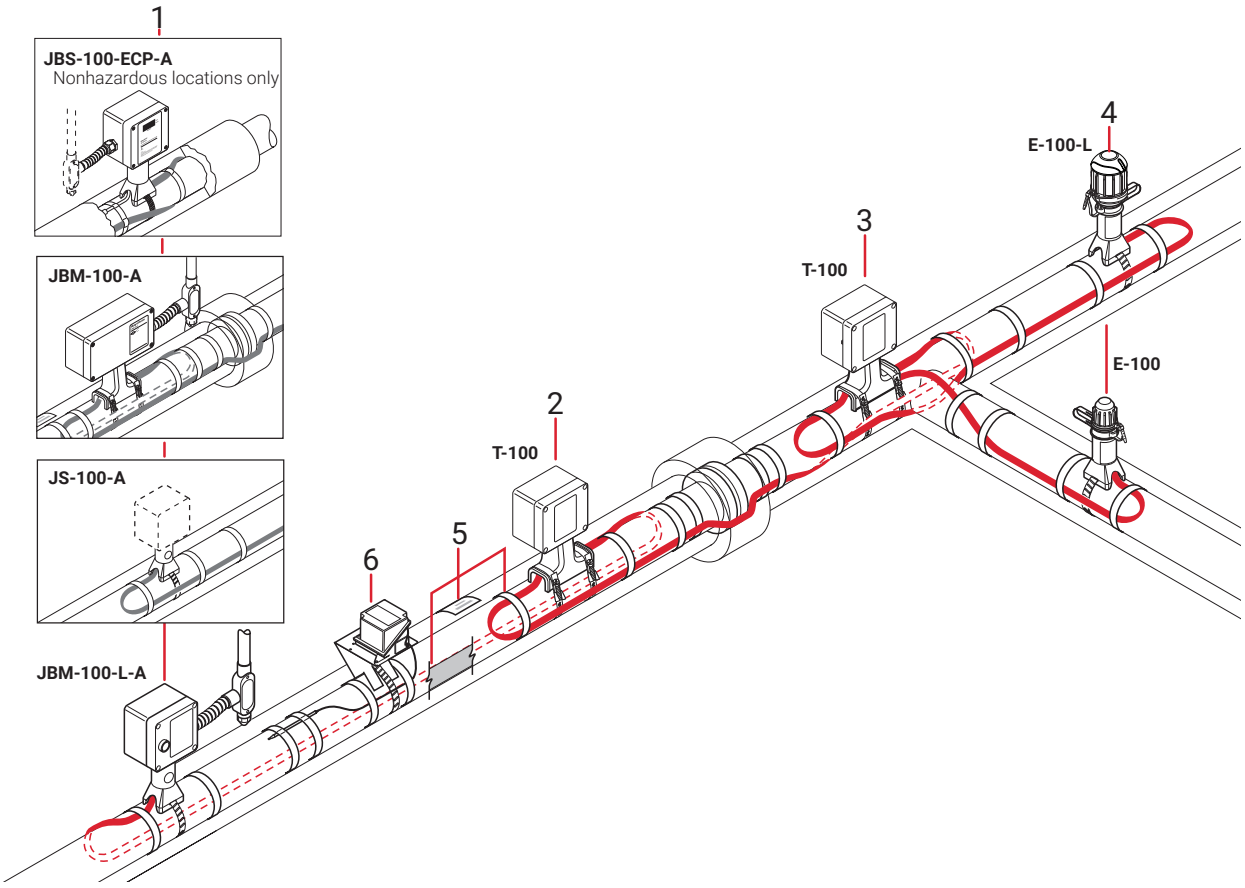


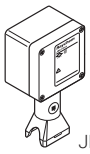
Fig. 7 Power-limiting heating system connection kits and accessories

TABLE 5 NON-HAZARDOUS AND HAZARDOUS CONNECTION KIT AND ACCESSORY SELECTION

Description		Catalog number	Quantity
Connection Kits			
1	**Power connection**		1 per circuit
	Single heating cable	JBS-100-A	
	Single heating cable with light	JBS-100-L-A	
	Single heating cable with digital electronic controller	JBS-100-ECP-A (non-hazardous locations only)	
	Single heating cable (user-supplied junction box)	JS-100-A	
	Multiple heating cables (1, 2, or 3)	JBM-100-A	
	Multiple heating cable with light	JBM-100-L-A	
2	**Splice connection**		1 per splice
	Above insulation	T-100	
3	**Tee connection**		1 per tee
	Above insulation	T-100	
4	**End seal**		1 per power connection plus 1 per tee
	Above insulation	E-100	
	Above insulation with light	E-100-L-A (up to 277 V only)	
Accessories			
5	Attachment tape, labels, and pipe straps		
Controls (optional)			
6	Thermostat — see Control and Monitoring design guide (H56889)		

System connection kits

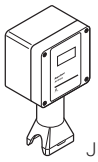
Power Connection Kits for Heating Cable



JBS-100-A

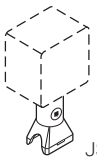
JBS-100-A Power connection for one heating cable in non-hazardous and hazardous locations. Includes cold-applied heating cable core seal. Requires one pipe strap to be ordered separately.

With LED indicator light, order JBS-100-L-A



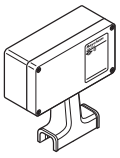
JBS-100-ECP-A

JBS-100-ECP-A Power connection and digital electronic controller. Requires one pipe strap to be ordered separately. Non-hazardous locations only.



JS-100-A

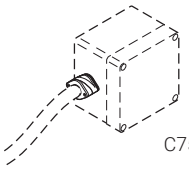
JS-100-A Junction box stand for one heating cable in non-hazardous and hazardous locations. A separate customer-supplied NEMA 4X junction box is required. Includes cold-applied heating cable core seal. Requires one pipe strap to be ordered separately.



JBM-100-A

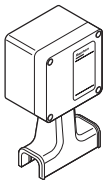
JBM-100-A Multiple-entry power connection for up to three heating cables. Can also be used as a splice or tee connection. For use in non-hazardous and hazardous locations. Includes cold-applied heating cable core seal. Requires two pipe straps to be ordered separately.

With LED indicator light, order JBM-100-L-A



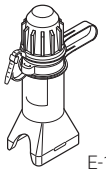
C75-100-A

C75-100-A A NEMA 4X-rated gland kit (3/4" NPT) used to transition heating cables into a junction box in non-hazardous and hazardous locations. Includes cold-applied heating cable core seal. A terminal block (3 x 12 AWG) is included. This kit does not include the junction box or the conduit.



T-100

T-100 Tee or splice connection for up to three heating cables in non-hazardous and hazardous locations. Includes cold-applied heating cable core seal. Requires two pipe straps to be ordered separately.

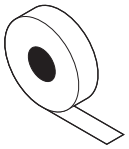


E-100-A

E-100-A End seal for heating cable in non-hazardous and hazardous locations. Re-enterable. Includes cold-applied heating cable core seal. Requires one pipe strap to be ordered separately.

With LED indicator light, order E-100-L-A

Accessories



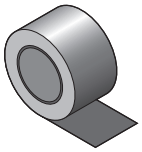
GT-66 and GS-54

GT-66 Glass Installation Tape

- For use on pipes other than stainless steel
- 1/2" x 66' roll
- Strap at 1-foot intervals at minimum application temperature of 40°F (5°C)

GS-54 Glass Installation Tape

- For use on all pipes, particularly stainless steel
- 1/2" x 54' roll
- Strap at 1-foot intervals at minimum application temperature of –40°F (–40°C)



AT-180

AT-180 Aluminum Tape

- For use on all pipe materials
- 2-1/2" x 180' roll
- Minimum installation temperature: 32°F (0°C)

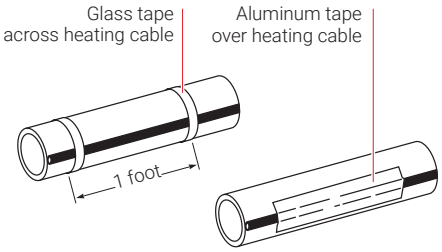
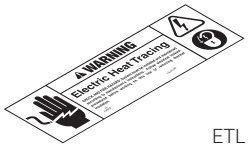


Fig. 8 Tape installation

TABLE 6 ATTACHMENT TAPE REQUIREMENTS

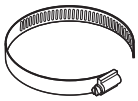
Tape type	Rolls needed per 100 ft of cable Pipe diameter (IPS) in inches						
	1/2	1	2	3	4	6	8
GT-66	0.6	1.2	4	4	6	8	10
GS-54	0.6	1.4	4	6	6	10	12
AT-180	Use one foot of tape per foot of heating						



ETL

ETL (Electric Traced Label)

Attach the label to the outside of the thermal insulation weather barrier to indicate presence of electrical heat tracing. Use one label for every 10 feet (3 m) of pipe, alternating on either side of the pipe.



Pipe strap

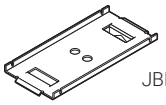
Pipe Straps

Stainless steel pipe straps to attach connection kits to the heat-traced pipe. Use Table 7 below to assist with pipe strap selection.

TABLE 7 PIPE STRAP SELECTION

Catalog number	Pipe size
PS-01	For conduit ≤ 1"
PS-03	For connection kits on pipes with dimensions <2"
PS-10	For connection kits on pipes with dimensions 2" – 10"
PS-20	For connection kits on pipes with dimensions 10" – 19.5"

JBS-SPA

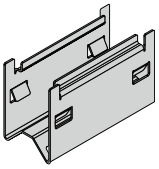


JBM-SPA

Small Pipe Adapters

JBS-SPA Adapter for mounting E-100, JBS-100, and JS-100-A to small pipe.

JBM-SPA Adapter for mounting JBM-100 and T-100 to small pipe.



Junction Box Stand Off

For insulation thickness 4 1/2" to 7" (120 - 180 mm)

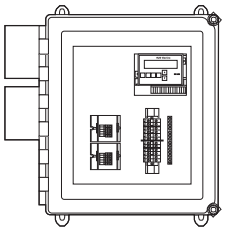
JBM-100-STANDOFF

JBS-100-STANDOFF

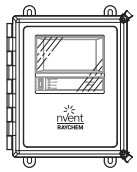
JB-DRAIN-PLUG-3/4IN

Conduit Drain

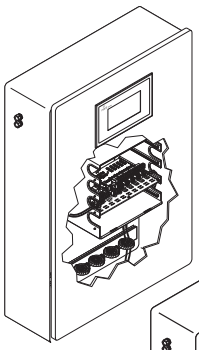
JB-DRAIN-PLUG-3/4IN Conduit drain for JBS-100, JBM-100, and JS-100-A.



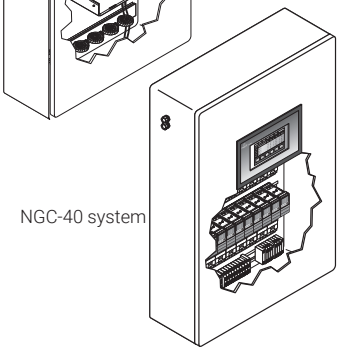
RAYCHEM 920



ELEXANT 4010i/4020i



NGC-30 system



NGC-40 system

Controls

For a complete selection of control and monitoring products, including thermostats, see Control and Monitoring design guide (H56889).

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