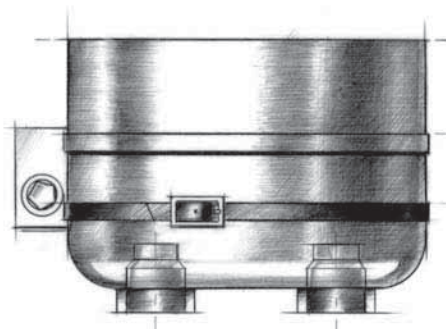
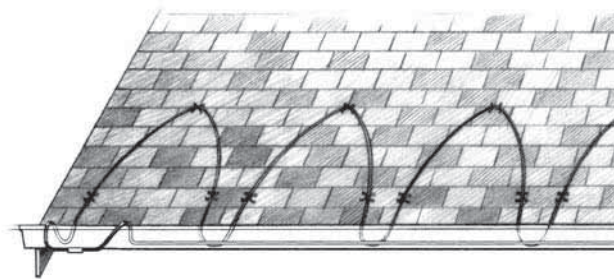
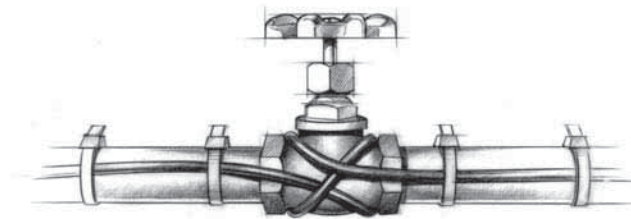


Raychem®

Self-Regulating Heating Products

Application and Design Guide
H53585



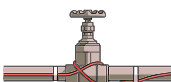
***Tyco Thermal
Controls***

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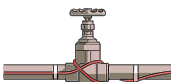
Product Line

120 volt, 5 watt



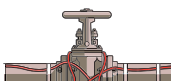
Preassembled

120 volt, 3 watt



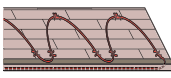
Small piping

120 volt, 6 watt
240 volt, 6 watt



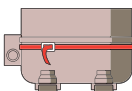
Large piping

120 volt, 6 watt
240 volt, 6 watt



Wet locations, roof
de-icing, and drain lines

120 volt
240 volt



Compressor
crankcase heating

There's a heating cable just
right for the job:

5-watt/ft Gardian heating cable

Catalog #	Voltage	Length (ft)
W51-6P	120	6
W51-12P	120	12
W51-18P	120	18
W51-24P	120	24
W51-50P	120	50
W51-75P	120	75
W51-100P	120	100
W52-6L	240	6
W52-12L	240	12
W52-18L	240	18
W52-24L	240	24

3-watt/ft WinterGard heating cable

Catalog #	Description	Voltage	Length (ft)
H311100	TruckPak*	120	100
H311250	Reel	120	250

6-watt/ft WinterGard Plus heating cable

Catalog #	Description	Voltage	Length (ft)
H611050	Box	120	50
H611100	TruckPak*	120	100
H611250	Reel	120	250
H621050	Box	240	50
H621100	TruckPak*	240	100
H621250	Reel	240	250

6-watt/ft WinterGard Wet heating cable

Catalog #	Description	Voltage	Length (ft)
H612050	Box	120	50
H612100	TruckPak*	120	100
H612250	Reel	120	250
H612500	Reel	120	500
H6121000	Reel	120	1000
H622050	Box	240	50
H622100	TruckPak*	240	100
H622250	Reel	240	250
H622500	Reel	240	500
H6221000	Reel	240	1000

FreezGard crankcase heater

Catalog #	Voltage	Length (ft)
CCH-1C	120	4
CCH-2C	240	4

*TruckPak consists of a 100-foot cable reel, two power connections, one splice/tee kit, one roll of application tape, and 10 "Electric Traced" labels.

Note: Use only in ordinary (nonhazardous) areas. Do not expose to any chemicals. In wet areas, use only WinterGard Wet or Gardian.

Heating Cables Selection Guide

Application	W51 W52	H311	H611 H621	H612 H622	CCH-1C CCH-2C
Freeze Protection					
Pipes in dry areas	■	■	■	■	
Pipes in wet areas	■			■	
Roof and Gutter De-icing				■	
Crankcase Heating					■

WinterGard accessories

H900	Power Connection Kit (hardwired)
H903	Fiberglass Application Tape and Warning Labels
H908	Plug-in Power Connection Kit with built-in ground-fault equipment protection
H910	Splice and Tee Kit
H911	Plug-In Power Connection Kit (for use with H311 cable only)
H912	Gel-filled End Seal Kit (includes two end seals)
H913	Roof Clips (for use with H612 and H622 only; 10 clips per pkg.)
H914	Roof Clips (bulk pack) (for use with H612 and H622 only; 50 clips per box)
H915	Downspout Hanger Bracket (for use with H612 and H622 only)
H921	120-V Outdoor-rated Junction Box (with built-in ground-fault protection)
H931	Plug-In Ground-Fault Circuit Interrupter Receptacle Adapter
AMC-F5	Set Point Thermostat (optional)

Important: Use only WinterGard accessories with WinterGard heating cable.



Warning:

To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of Tyco Thermal Controls and the 1996 National Electrical Code, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit protection.

Note:

This application guide does not take the place of the installation instructions. Carefully follow the installation instructions included in the WinterGard accessory kits. Pipes are shown without insulation for illustrative purposes only.

Technical Information

Technology

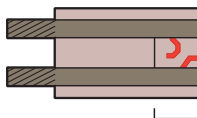
Raychem quality design means superior heating systems

Self-regulation

The self-regulating design of Raychem heating cables eliminates worry about overheating or burnouts from overlapping. The conductive polymer core automatically adjusts heat output at each point along the pipe, with no need for thermostats.

Parallel circuitry

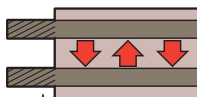
Unlike conventional heating cables, Raychem heating cables feature parallel circuitry. This means you can cut it at any point along its length without interrupting the heating-cable circuit.



Proven advantages for you

Fast, easy to install.

Thanks to their self-regulating, parallel-circuit design, Raychem heating cables require no complex installation procedures. They can be straight-traced, spiraled, or overlapped. On the job, you can cut them to the exact length needed and splice or tee them, adapting each heating-cable circuit as the job requires.



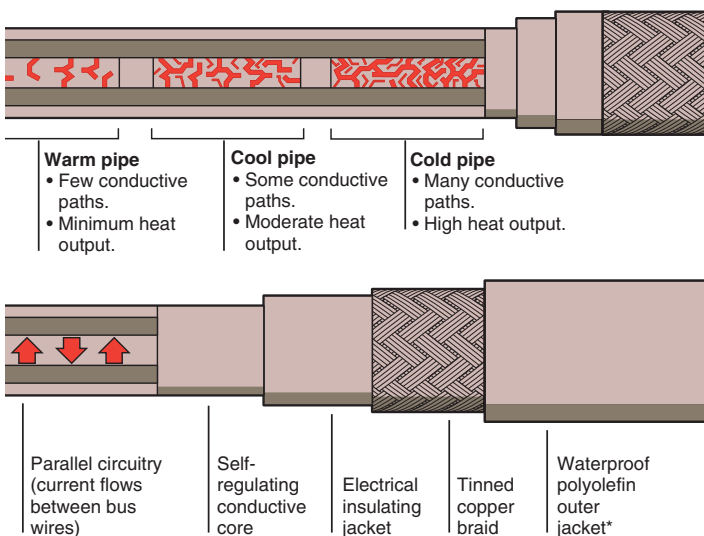
Bus wires

Reliable performance.

Because they're self-regulating, Raychem heating cables require no thermostats, so you're not bothered by breakdowns or callbacks. They will protect against freezing this winter and for many winters to come.

Designed flexibility. Hardwire them or plug them in. With two options of power connection kits, the choice is yours. There's even a preassembled heating cable available in convenient lengths to handle small jobs fast.

Convenient and economical. For larger jobs, you can simply cut the exact amount of Raychem heating cable you need right from the reel. No more wasted heating cable or extra trips to the supply house, because you always have the right size with you.

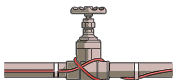


*WinterGard Wet and Gardian heating cables only

Safe on plastic pipes. Raychem heating cables can be used on plastic as well as metal pipes. Their self-regulating heating core adjusts automatically, to protect against overheating or developing hot spots when overlapped or covered with insulation.

Energy-efficient. Raychem heating cables' self-regulating core generates heat when and where it's needed. The core continuously adjusts its heat output to the environment at every point along the heating cable, thus reducing the overall energy cost for the season.

Pipe Freeze Protection



Gardian preassembled 120-V and 240-V heating cable

Pipe runs up to 100 feet, up to 2½ inches in diameter

The perfect solution for small applications and short pipe lengths, Gardian 120-V cable is available in lengths of 6, 12, 18, 24, 50, 75, and 100 feet. Gardian 240-V cable is available in 6, 12, 18, and 24-foot preassembled lengths. Use the tables on pages 16–19 to select the right Gardian cable for your job.



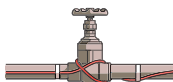
With the Gardian preassembled heating cable, there's no assembly required. Just attach the cable to the pipe, insulate it, and plug it in.



Use Gardian cable for intake and drain lines, water meters, outside pipes, and taps. It's ideal for pipes in unheated attics, basements, and garages.



The 240-V preassembled Gardian heating cable is easy and convenient for use in refrigeration applications. It prevents freeze-up problems on freezer doors and in drain pans and drain lines.



WinterGard 120-V heating cable

Metal or plastic piping up to 2 inches in diameter

For design flexibility, use WinterGard cut-to-length heating cable. It's the economical solution for both metal and plastic pipes with circuit lengths up to 250 feet. See pages 10–15 for information to help you design your WinterGard freeze protection system and pages 30 and 31 for product data.



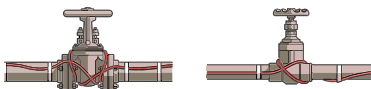
WinterGard cable is the economical way to winterize cold-water, service, and wastewater lines.



Use WinterGard cable to freeze-protect water-service systems. It's ideal for both residential and commercial buildings.



Put an end to frozen pipes in unheated warehouses and other facilities. WinterGard heating cables provide protection you can count on for your maintenance and repair needs on water pipes.



WinterGard Plus 120-V heating cable

Large piping up to 8 inches in diameter

Designed for more demanding residential/commercial applications, WinterGard Plus 120-V heating cables with a durable metal braid are the right choice for larger plastic and metal pipes with diameters up to 8 inches and circuit lengths up to 200 feet.



WinterGard Plus cables keep large diameter pipes freeze-free year-round.

WinterGard Wet 120-V heating cable

Wet locations

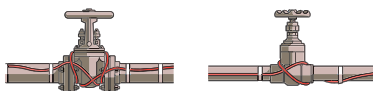
A waterproof outer jacket makes WinterGard Wet 6-watt, 120-V heating cable the answer for freeze protection in wet locations such as drain lines.



Its higher heat output makes it ideal for use on a wide range of pipe diameters, such as on unheated water supply lines in parking garages.



For marine applications or where moisture is a consideration, WinterGard Wet heating cable is the answer. It can also be used for internal tracing of water drain lines.



WinterGard Plus 240-V heating cable

WinterGard Wet 240-V heating cable

Long piping up to 8 inches in diameter

WinterGard Plus and WinterGard Wet 6-watt, 240-V heating cables are especially designed to save installation time and money in applications requiring long circuit lengths (up to 350 feet). With its waterproof outer jacket, WinterGard Wet 240-V heating cable is ideal for providing freeze protection in wet environments or for de-icing drain lines.



WinterGard 240-V heating cables are perfect for freeze-protecting long wastewater lines and chilled water lines.



The metal braid and additional outer jacket make WinterGard Wet heating cable the best choice for applications such as water supply lines in outdoor locations.

Designing a Pipe Freeze Protection System

How to design your WinterGard pipe freeze protection system

To design your WinterGard system, follow the step-by-step guidelines that follow, referring to the shaded tables where indicated.

Step 1:

Collect the necessary information.

Information needed	Example
Type of pipe (metal or plastic)	Metal pipe
Pipe size (0.5"–8.00")	2.5"
Lowest expected air temperature (0°F to –40°F)	–20°F
Insulation thickness (0.5"–2")	0.5"
Voltage (120 V or 208–240 V)	120 V
Location (wet or dry)	Wet

Ensure your application complies with the product data (Table 13) on pages 30 and 31.

Step 2:

Determine heating cable type.

	120 V	208 V–240 V
Dry	H311, H611, H612	H621, H622
Wet	H612	H622

Table 1:
WinterGard
H311
WinterGard Plus
H611, H621
WinterGard Wet
H612, H622

For metal pipes*				
Lowest air temp.	Insulation thickness	Pipe size (in inches)		
		0.50	0.75	1.00
0°F	0.5"			
	1"			
	1.5"			
–20°F	0.5"			
	1"			
	1.5"			
	2"			
–40°F	0.5"			
	1"			
	1.5"			
	2"			

Table 2:
WinterGard
H311
WinterGard Plus
H611, H621
WinterGard Wet
H612, H622

For plastic pipes*				
Lowest air temp.	Insulation thickness	Pipe size (in inches)		
		0.50	0.75	1.00
0°F	0.5"			
	1"			
	1.5"			
–20°F	0.5"			1.1
	1"			
	1.5"			
	2"			
–40°F	0.5"	1.1	1.1	1.5
	1"			
	1.5"			
	2"			

* Information is based on pipes with fiberglass insulation or equivalent

Step 3:

Determine the heating cable wattage and spiraling ratio.

Use Table 1 to select heating cables for insulated metal pipes. Use Table 2 to select heating cables for insulated plastic pipes. Read across the table to find your pipe diameter, then drop down to the line corresponding to the lowest air temperature for that application and the correct insulation thickness. The cell at that intersection has a particular shading and may have a number. The shading indicates which heating cable to use (key to the shading appears above table). A number represents the spiraling ratio (feet of heating cable per foot of pipe).

If no number appears in the cell, straight trace the pipe. If a number does appear in the cell, spiral trace the pipe.

If your spiraling ratio is 2.0, multiple-trace the pipe using two straight traces at the 4 o'clock and 8 o'clock positions.

If your spiraling ratio is 3.0, multiple-trace using three straight traces at the 11 o'clock or 1 o'clock position **and** at the 4 o'clock and 8 o'clock positions.

Key to
Tables 1 and 2:

 H311  H611, H621, H612, H622
 Increase insulation thickness

1.25	1.50	2.00	2.50	3.00	4.00	6.00	8.00
					1.3	1.8	3.0
							1.3
		1.1	1.3	1.5	1.8	3.0	
					1.1	1.5	1.9
						1.1	1.3
1.1	1.2	1.4	1.7	2.0	3.0		
				1.1	1.4	1.9	3.0
						1.4	1.7
						1.1	1.4

1.25	1.50	2.00	2.50	3.00	4.00	6.00	8.00
		1.2	1.4	1.7	2.0	3.0	
					1.2	1.6	2.0
						1.2	1.5
1.3	1.5	1.8	2.0	3.0			
		1.1	1.2	1.4	1.8	3.0	
				1.1	1.3	1.7	3.0
						1.4	1.7
1.8	2.0	3.0	3.0				
1.1	1.2	1.4	1.6	1.9	3.0		
		1.1	1.2	1.4	1.7	3.0	3.0
				1.1	1.3	1.8	3.0

and minimum maintain temperature of 40°F.

Step 4:*Formula:***Calculate the total heating cable length.**

- (a) Pipe length x spiral ratio*
- (b) + 4 ft x # gate/globe valves
x valve length (ft)**
x spiral ratio*
- + 2 ft x # ball/butterfly valves
x valve length (ft)**
x spiral ratio*
- + 2 ft x # flanges
x pipe diameter (in feet)**
x spiral ratio*
- (c) + 2 ft x # pipe supports
x pipe diameter (in feet)**
x spiral ratio*
- (d) + 1 ft for each power connection
- (e) + 2 ft for each splice connection
+ 3 ft for each tee connection
+ 0.5 ft for each H311 or H611 end seal

 = Total heating cable length (ft)

* From Step 3

** See Table 3 below

Table 3:**Conversion chart (inches to feet)**

1/2"	=	0.04
1"	=	0.083
2"	=	0.17
3"	=	0.25
4"	=	0.33
5"	=	0.42
6"	=	0.50
8"	=	0.70

*Example:**(taken from page 10)*

Pipe length	50 ft
Spiral ratio	1.3 (from Table 1, pages 10 and 11)
Globe valves	3 (each 0.5 ft long)
Pipe supports	10 supports for 1" pipe
Power connections	1
Splice connections	1

WinterGard heating cable required

(a) Pipe length x spiral ratio	= 50 ft x 1.3	= 65.0 ft
(b) 3 globe valves (0.5 ft. each)	= 4 ft x 3 x 0.5 x 1.3	= 7.8 ft
(c) 10 pipe supports	= 2 ft x 10 x 0.085 x 1.3	= 2.2 ft
(d) 1 power connection	= 1 ft x 1	= 1.0 ft
(e) 1 splice connection	= 2 ft x 1	= 2.0 ft
Total heating cable length required		= 78.0 ft

Step 5:

Determine maximum heating cable length.

For the maximum heating cable circuit length permitted for a given circuit breaker rating, refer to Table 4 below. Find the appropriate row according to the selected heating cable type and circuit breaker rating. Move across the row to the appropriate minimum start-up temperature. (Use 40°F start-up temperature unless 0°F is required when start-up is below the freezing point.)

If the total heating cable length is greater than the maximum circuit length, use shorter lengths and more circuits. Make sure that each circuit is less than the maximum circuit length shown in Table 4. Select the smallest circuit breaker appropriate for your circuit length.

Example:

You have: WinterGard Wet heating cable: 120 V
Start-up temperature: 40°F
Circuit breaker rating: 15 amps
Total heating cable length: 78.0 ft

You find: 150 ft maximum circuit length
You need: 1 heating cable circuit

Table 4:

Maximum heater circuit length*

Heater type	Circuit breaker rating (amps)	Maximum length (ft) per circuit for minimum start-up temperature	
		40°F	0°F
WinterGard 120 V H311	15	250	150
	20	250	200
	30	250	250
WinterGard Plus 120 V H611	15	150	125
	20	200	160
	30	200	200
WinterGard Plus 240 V H621	15	300	225
	20	350	300
	30	350	350
WinterGard Wet 120 V H612 on pipe	15	150	125
	20	200	160
	30	200	200
H612 in drain	15	125	100
	20	150	125
	30	150	150
WinterGard Wet 240 V H622 on pipe	15	320	225
	20	350	300
	30	350	350
H622 in drain	15	250	200
	20	250	250

* Maximum circuit lengths are based on start-up load. Steady state amps per foot is dependent upon heating cable temperature.

Step 6:

Select the accessories.

The diagram below shows typical heating systems assembled with the proper WinterGard accessories. Either the H900, H908, or H911 power connection kit must be used. See Table 5 to select additional accessories that may be needed for your installation.

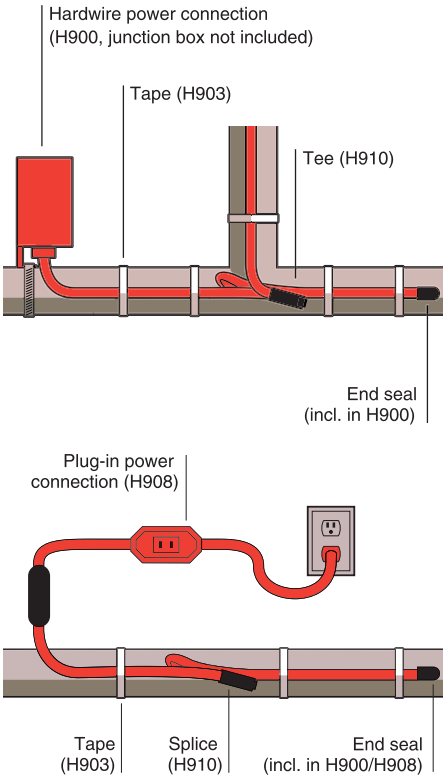


Table 5:

Accessories for WinterGard heating cable

Catalog number	Accessory kit	Use
H900	Power Connection Kit	For a hardwired power connection and end seal for one heating cable circuit.
H903	Application Tape	For attaching heating cable to the pipe. Includes 1 roll (66 ft) of tape and 10 warning labels.
H908	Plug-in Power Connection Kit	For plug-in 120-V power connection (with built-in ground-fault equipment protection) and end seal for one heating cable circuit.
H910	Splice and Tee Kit	Provides material for one splice, or one tee and one end seal.
H911	Plug-In Power Connection Kit	For plug-in 120-V power connection (with built-in ground-fault equipment protection) and end seal for use with H311 cable only.
H912	Gel-filled End Seal Kit	Two extra end seals for use with all WinterGard heating cables.
H921	120-V Junction Box	Outdoor-rated junction box with built-in ground-fault protection for hardwire connection of all 120-V WinterGard heating cables.
AMC-F5	Set Point Thermostat	Thermostat with fixed non-adjustable set point of 40°F. Can be used in an ambient-sensing or line-sensing mode.

Step 7:

Install the system.

Refer to installation instructions in the H900, H908, or H911 power connection kit.



Warning:

To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of Tyco Thermal Controls and the 1996 National Electrical Code, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit protection.

Preassembled
Heating Cable
Design (120 V)

How to design your 120-V Gardian
pipe freeze protection system

Select the right cable from Table 6. If the cable selected is longer than the pipe, spiral it evenly along the entire pipe. (■ indicates that no Gardian cable is recommended; use WinterGard cut-to-length heating cables.) Table assumes lowest outside temperature is 0°F, with a minimum of 1/2" fiberglass insulation or equivalent. For protection to -20°F, use 1" fiberglass insulation or equivalent.

Key to Table 6:

Table 6:

Catalog Number **A** = **B** =
W51-6P W51-12P
METAL PIPES (0°F / -18°C metal pipe freeze protection with 0.5" insu

PIPE						
DIAMETER	3	6	9	12	15	18
0.5"	A	A	B	B	C	C
1.0"	A	A	B	B	C	C
1.5"	A	A	B	B	C	C
2.0"	A	A	B	B	C	C
2.5"	A	B	B	C	C	D

PLASTIC PIPES (0°F / -18°C metal pipe freeze protection with 0.5" insu

PIPE						
DIAMETER	3	6	9	12	15	18
0.5"	A	A	B	B	C	C
1.0"	A	B	B	C	C	D
1.5"	A	B	C	C	D	D
2.0"	A	B	C	D	E	E
2.5"	B	C	D	D	E	E

Table 7:

Accessories for Gardian preassembled heating cable		
Catalog number	Accessory kit	Use
H931	GFCI Receptacle Adapter	Ground-Fault Cir

C = W51-18P
D = W51-24P
E = W51-50P
F = W51-75P
G = W51-100P

Insulation, or -20°F / -29°C with 1" insulation

METAL PIPE LENGTH										
21	24	27	30	40	50	60	70	80	90	100
D	D	E	E	E	E	F	F	G	G	G
D	D	E	E	E	E	F	F	G	G	G
D	D	E	E	E	E	F	F	G	G	G
D	E	E	E	E	F	F	F	G	G	G
E	E	E	E	E	F	F	G	G	G	■

Insulation, or -20°F / -29°C with 1" insulation

PLASTIC PIPE LENGTH										
21	24	27	30	40	50	60	70	80	90	100
D	D	E	E	E	E	F	G	G	G	G
D	E	E	E	E	F	F	G	G	G	■
E	E	E	E	F	F	G	■	■	■	■
E	E	E	F	F	G	■	■	■	■	■
E	F	F	F	F	■	■	■	■	■	■



circuit Interrupter adapter to convert non-GFCI-protected receptacle.

**Preassembled
Heating Cable
Design (240 V)**

**How to design your 240-V Gardian
pipe freeze protection system**

Select the right cable from Table 8. If the cable selected is longer than the pipe, spiral it evenly along the entire pipe (a formula such as 2xW52-24L or 3xW52-24L in a column heading means that two or three heating cables of equal length are used, and run straight on either side of the pipe). Table assumes lowest expected temperature of –20°F with a minimum of 1/2" fiberglass insulation or equivalent. For protection to –40°F use 1" fiberglass insulation or equivalent.

Key to Table 8:

Catalog Number **A** = W52-6L **B** = W52-12L

Table 8:

Metal pipes			
Pipe size	Pipe length (in feet)		
	3	6	9
0.5"	A	A	B
1.0"	A	A	B
1.5"	A	B	B
2.0"	A	B	B
2.5"	A	B	C

Plastic pipes			
Pipe size	Pipe length (in feet)		
	3	6	9
0.5"	A	A	B
1.0"	A	B	B
1.5"	A	B	C
2.0"	B	C	D
2.5"	B	C	D

C =
W52-18L

D =
W52-24L

E =
2 x W52-18L

F =
2 x W52-24L

G =
3 x W52-24L

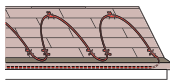


12	15	18	21	24
B	C	C	D	D
B	C	C	D	D
C	C	D	D	F
C	D	D	F	F
C	D	E	F	F



12	15	18	21	24
B	C	C	D	D
C	D	D	F	F
D	E	E	F	F
E	F	F	G	G
E	F	F	G	G

Roof and Gutter De-Icing



De-ice roofs and gutters with WinterGard Wet heating cables

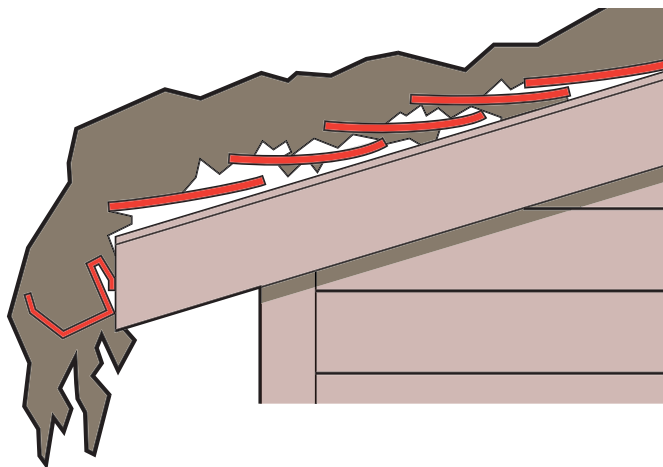
Winter storms cause ice and snow build-ups on roofs and in gutters. Downspouts clog, intensifying the problem. Serious structural damage may result when melting snow penetrates under the roof surface and refreezes. Gutters and downspouts crack, sag, and break from the ice pressure. WinterGard Wet heating cables put an end to ice buildups and to costly repairs.



WinterGard Wet heating cables reliably de-ice roofs of all kinds, including metal, shingle, and tile.



WinterGard Wet heating cables keep roof drains in commercial and industrial applications running free.



Easy to install

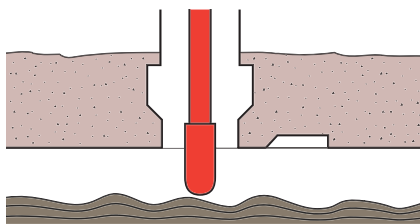
Because of its parallel-circuit design, WinterGard Wet heating cable can be cut to the exact length you need. It speeds installation while it reduces errors, delays, and wasted product.

Reliable

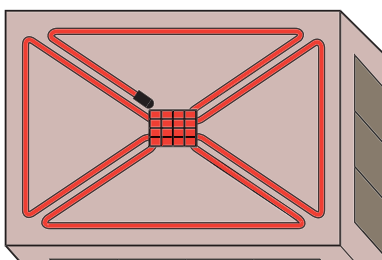
With WinterGard Wet heating cable's self-regulating design there are no burnouts caused by overlapping. And its durable metallic braid and waterproof outer jacket provide additional protection against damage.

Energy-saving

WinterGard Wet heating cable automatically saves on energy costs by increasing heat output when snow and ice are present and decreasing output when ice melts away. It supplies heat when and where it's needed.



WinterGard Wet heating cable can be used to internally trace water and storm drain lines.



WinterGard Wet heating cable protects flat roofs by creating runoff paths for melting ice and snow.

Designing a Roof and Gutter De-Icing System

How to design your roof and gutter de-icing system

To set up your de-icing system to prevent ice buildup on roof edges or in gutters and downspouts, follow these four steps:

Step 1:

Calculate heating cable length.

Find the number of feet of heating cable needed per foot of roof edge in Table 9 below. Then, calculate the amount of total heating cable length you need using the following formula:

Formula:

$$\begin{aligned} \text{Total heating cable length} = & \\ & \text{Roof edge length (ft)} \times \text{Feet of heating cable per} \\ & \text{foot of roof edge (from Table 9)} \\ & + \text{Total gutter length (ft)} \\ & + \text{Total downspout length (ft)} \\ & + 1 \text{ ft for each power connection} \\ & + 2 \text{ ft for each splice connection} \\ & + 3 \text{ ft for each tee connection} \\ = & \text{Total heating cable length (ft)} \end{aligned}$$

Example:

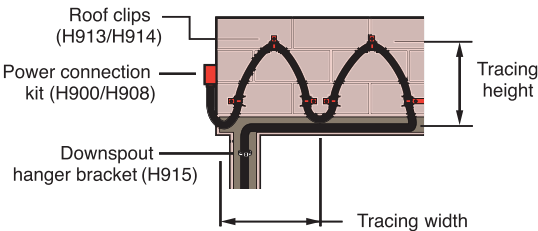
WinterGard Wet heating cable required:

Overhang:	12 in
Roof edge:	70 ft x 2 ft (from Table 9 below)
Roof gutter:	70 ft
Downspout:	15 ft
Power connection:	1 ft x 2 ea
Tee connection:	3 ft x 1 ea
Total WinterGard Wet cable required:	230 ft

Table 9:

WinterGard Wet H612 and H622 cable length for roof de-icing

Roof overhang	Tracing width	Tracing height	Feet of heating cable per foot of roof edge
12"	2'	18"	2'
24"	2'	30"	3'
36"	2'	42"	4'



Step 2:

Determine maximum heating cable circuit length.

Refer to Table 10 below for the maximum heating cable circuit length permitted for a given circuit breaker rating. Choose circuit breaker rating and read across to the right column. Select the smallest circuit breaker appropriate for your circuit length.

If your total heating cable length is greater than the maximum circuit length shown in Table 10, split the heating cable into more circuits.

Example:

You have: 230 ft total heating cable length
120 V @ 40°F start-up
Circuit breaker rating: 20 amps

You find: 150 ft maximum circuit length

Using WinterGard Wet 120 V heating cable, you need two heating circuits:

Circuit 1: 141 ft heating cable for roof edge and power connection
20 amp breaker

Circuit 2: 89 ft heating cable for gutter, downspout, power connection, and tee splice
15 amp breaker

Alternatively, using WinterGard Wet 240 V cable with a 240-V power supply; this installation would require only one 230-ft heating circuit with a 20 amp breaker.

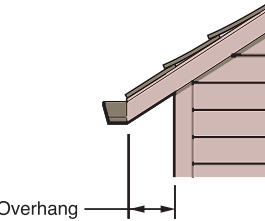
Table 10:

Maximum circuit length*

Heating cable type	Circuit breaker rating (amps)	Maximum heater length (ft) per circuit for minimum start-up temperature	
		0°F	40°F
WinterGard	15	100	125
Wet H612	20	125	150
120 V	30	150	150
WinterGard	15	200	250
Wet H622	20	250	250
240 V			

*Maximum circuit lengths are based on start-up.

Section 426-53 of the National Electrical Code requires ground-fault protection of equipment for snow-melting and de-icing applications. The H908 and H921 kits are equipped with built-in ground-fault circuit protection.



Step 3:

Select WinterGard Wet H612 and H622 accessories:

H900 Power Connection Kit—This kit provides the materials you need for a hard-wired electrical power connection and end seal for one heating cable.

H908 Plug-in Power Connection—This kit provides the materials you need for a plug-in 120-V power connection and end seal for one heating cable run, and features built-in ground-fault protection.

H910 Splice and Tee Kit—For one splice or one tee connection.

H912 Gel-filled End Seal Kit—Contains two extra end seals.

H913 Roof Clips—These durable clips attach the WinterGard Wet heating cable to the roof surface. Use whole or cut in half to make two single-ended clips (as shown on page 22). Kit contains ten clips for approximately 7 linear feet of roof edge.

H914 Roof Clips Bulk Pack—Contains 50 of the same clips as in the H913 kit, for larger jobs.

H915 Downspout Hanger Bracket—Protects one WinterGard Wet heating cable from fraying or other damage caused by sharp edges in gutter and downspout applications. Also provides strain relief. Kit contains one downspout hanger bracket.

H921 120V Junction Box—This outdoor-rated junction box must be used with the H900 Power Connection Kit. Provides built-in ground-fault protection for hardwire connection of all 120-V WinterGard heating cables.

AMC-F5 Set Point Thermostat—Thermostat with fixed, non-adjustable set point of 40°F. Can be used in an ambient-sensing or line-sensing mode.

Step 4:

Follow the installation steps in the H900 or H908 Power Connection Kit.



Warning:

To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of Tyco Thermal Controls and the 1996 National Electrical Code, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit protection.

Refrigeration Applications

- Ice buildup can impair performance as well as damage critical refrigeration systems. Freeze-ups, backups, and compressor burnouts are a real threat. WinterGard heating cables and FreezGard crankcase heaters provide an easy, reliable way to control downtime and expensive repairs.
- Convenient

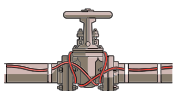
Parallel-circuit design lets you cut WinterGard Plus and WinterGard Wet heating cables to the precise length you need. It's easy to wrap pipes or trace problem areas without wasting product or installation time. And because self-regulating design permits overlapping, WinterGard heating cables and FreezGard crankcase heaters are easy to use in confined spaces.
- Durable

A metal braid on all WinterGard cables provides electrical ground path and adds mechanical strength, while also meeting the 1996 National Electrical Code. And a waterproof outer jacket on WinterGard Wet heating cables makes them ideal for drains and other areas subject to wet conditions.
- Efficient

As equipment goes through its on/off cycle, WinterGard heating cables and FreezGard crankcase heaters can automatically increase heat output when temperatures drop, then decrease output as temperatures rise—maintaining the equipment temperatures while minimizing energy costs.

Table 11:

Accessories for WinterGard heating cable		
Catalog number	Accessory kit	Use
H900	Power Connection Kit	For a hardwired power connection and end seal for one heating cable circuit.
H903	Application Tape	For attaching heating cable to pipe. Includes 1 roll (66 ft) of tape and 10 warning labels.
H908	Plug-in Power Connection Kit	For a plug-in 120-V power connection and end seal for one heating cable circuit.
H910	Splice and Tee Kit	For one splice, or one tee and one end seal.
H911	Plug-In Power Connection Kit	For plug-in 120-V power connection (with built-in ground-fault equipment protection) and end seal for use with H311 cable only.
H912	Gel-filled End Seal Kit	Two extra end seals for use with all WinterGard heating cables.
H921	120-V Junction Box	Outdoor rated junction box with built-in ground-fault protection for hardwire connection of all 120-V WinterGard heating cables.



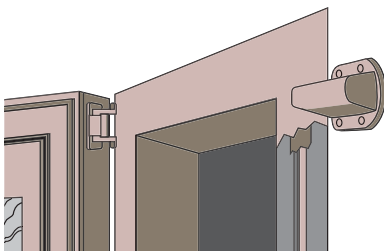
WinterGard Plus heating cable

Plastic and other pipes

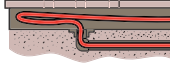
For a variety of pipe and surface-tracing installations, WinterGard Plus heating cable gives you 6-watt/ft output in 120- or 240-volt systems to match your available supply voltage.



Its adaptability to a wide range of pipe diameters and line runs makes WinterGard Plus heating cable ideal for protecting pipes in freezing environments.



Tracing door frames helps prevent surfaces from freezing shut. Heating cable is placed in routed section of door or door frame and must be protected from mechanical damage.



WinterGard Wet heating cable

Wet locations

For applications where water is present, an additional outer jacket makes WinterGard Wet heating cable both waterproof and abrasion-resistant. Choose 120- or 240-volt versions, depending on your supply voltage.

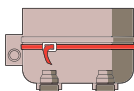


Waterproof jacket lets WinterGard Wet heating cable trace drain pans so water keeps flowing.



Other wet locations, such as drain lines in freezer cases, avoid backup problems when internally traced with WinterGard Wet heating cable.

Note: See page 10 for information to help you design your WinterGard freeze protection system. See Table 11 on page 25 to select accessories.



FreezGard self-regulating crankcase heaters for refrigeration compressors

Prolong motor life and increase compressor efficiency

When compressors operate in cold areas, refrigerant can migrate into the crankcase oil whenever the compressor is not running. On start-up, this can cause excessive motor wear and a loss of refrigeration efficiency.

FreezGard self-regulating crankcase heaters provide reliable peak heating during these critical cold periods and, unlike conventional constant-wattage heaters, reduce their heating once the compressor starts up or when air temperatures rise. Also, self-regulating heaters can be safely overlapped and closely spaced without burning out, so one size fits all hermetic and scroll compressors up to 5 HP that are 40" or less in circumference.

Models for 120 V and 208–277 V are available, and each comes with a flexible lockstrap and prestripped 28" cold leads for easy connection and hardwiring. Use only with refrigeration compressors in nonhazardous areas.



The FreezGard crankcase heater's self-regulating design automatically varies output to maintain adequate oil temperature, while minimizing energy use.

Table 12:

FreezGard technical information

Service voltage	CCH-1C: 120; CCH-2C: 208-277
Power output at 50°F	32 watts minimum
Power output at 0°F	60 watts minimum
Cold lead wire gauge (AWG)	18
Cable width (inches)	0.615
Cable thickness (inches)	0.245
Cable length (inches)	48
Cold lead length (inches)	28
Maximum exposure temperature (intermittent)	185°F
Insulation jacket type	Modified polyolefin
Compressor girth (wraparound) dimension	40 inches or less circumference



General Information

Table 13:

Product Data

	<u>Gardian</u> <u>W51-6P</u> <u>W51-12P</u> <u>W51-18P</u> <u>W51-24P</u> <u>W51-50P</u> <u>W51-75P</u> <u>W51-100P</u>	<u>Gardian</u> <u>W52-6L</u> <u>W52-12L</u> <u>W52-18L</u> <u>W52-24L</u>
Nominal service voltage	120	208–240
Min. power output at 40°F (W/ft)	5	5
Maximum circuit length (ft)	n/a	n/a
Maximum circuit breaker size for 40°F start-up (amps)	15	15
Maximum circuit breaker size for 0°F start-up (amps)	15	15
Weight per 100 ft (lb)	n/a	n/a
Maximum exposure temp. (°F)	150	150
Environment	**	**
Approvals***		
UL System Listed	(1, 2)	(2)
CSA Certified	(4)	(4)

* On pipes at 40°F / in ice and snow at 32°F.

** Use only in ordinary (nonhazardous) areas. Do not expose to any chemicals. In wet areas, use only WinterGard Wet or Gardian.

*** (1) 60J9 Residential and Mobile Home Pipe Heating Cable.

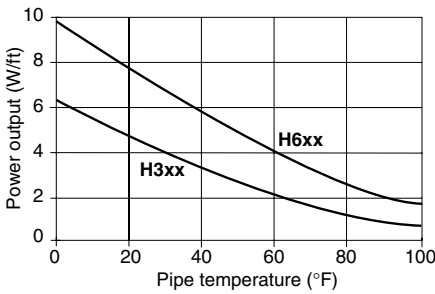
(2) 718K Pipe Heating Cable.

(3) 877Z Roof De-Icing and Snow Melting Equipment.

(4) CSA file LR21133.

<u>WinterGard</u> H311100 H311250	<u>WinterGard Plus</u>		<u>WinterGard Wet</u>	
	H611050	H621050	H612050	H622050
	H611100	H621100	H612100	H622100
	H611250	H621250	H612250	H622250
120	120	208-240	120	208-240
3	6	6	6/8*	6/8*
250	200	350	200/150*	350/250*
15	20	20	20/20*	20/15*
30	30	30	30/30*	30/20*
6	6	6	9	9
150	150	150	150	150
**	**	**	**	**
(2) (4)	(2) (4)	(2) (4)	(2, 3) (4)	(2, 3) (4)

WinterGard Power Temperature Curves



Tyco, FreezGard, Gardian, Raychem, TruckPak, WinterGard, WinterGard Plus, and WinterGard Wet are trademarks of Tyco Thermal Controls LLC or its affiliates.

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