SELF-REGULATING HEATING CABLE FOR FIRE SPRINKLER SYSTEMS – PRODUCT GUIDE

NELSON HEAT TRACE

EMERSON

THE COMPLETE FREEZE PROTECTION SYSTEM

Nelson self-regulating electric heat trace cables are now listed and certified for freeze protection from main water lines to sprinkler heads.

Recent NFPA 13 changes have approved self-regulating cables for use with branch sprinkler systems to ensure reliable fire suppression in unheated commercial and industrial facilities.

Nelson freeze protection is inexpensive to run, with virtually no maintenance needed. It also contributes to improved fire safety, since sprinkler systems can respond immediately without the need for antifreeze chemicals.

SELF-REGULATING CABLES

Nelson CLT and LT Series heating cables are available for both 120 and 208-277 Vac applications, with a choice of power densities to provide freeze protection in ambient temperatures as low as –40°C (–40°F). These cut-to-length cables can be used in wet or dry environments. The LT Series is also approved for hazardous locations when used with appropriate connection kits.

CONNECTION KITS

A complete selection of connection kits and accessories are available for spicing cables under pipe insulation or in a rugged NEMA 4X enclosure for exceptional weather and corrosion resistance.

MONITORING AND CONTROL

Choose from a range of industrial thermostats, cable monitoring systems and circuit management systems for simple, reliable operation of any heating cable configuration. Nelson offers ordinary and hazardous location controls with approvals and certifications for practically any application.

Self-Regulating Cables

Connection Kits

Monitoring and Control

NELSON HEAT TRACE

A SIMPLER AND SAFER FREEZE PROTECTION SOLUTION

Nelson freeze protection overcomes the safety shortcomings of other methods.

Nelson's fire protection system is ideally suited for garages, warehouses, porticos and other unheated commercial or industrial locations where branch sprinkler systems are used for fire protection. Because the system is always charged with water, there is less risk of corrosion due to trapped moisture and air.

Electricity costs are minimal because Nelson's self-regulating cables and temperature controls apply heat only where and when it is needed.

APPROVALS

The NFPA 13, 2010 Edition, Standard for the Installation of Sprinkler Systems allows listed electrical heat tracing to be utilized for freeze protection of supply lines, standpipes, and branch lines containing sprinklers.

Nelson CLT and LT Series self-regulating cable systems are approved to the following standards:

- cCSAus Certified to the IEEE standard . 515.1-2012 in the United States for supply lines, standpipes, branch lines and sprinkler heads.
- CAN/CSA C22.2 No. 130-03 in Canada for supply lines, standpipes, branch lines and sprinkler heads.
- UL Listed for supply lines, standpipes and branch lines not containing sprinklers.

With dry systems, valves control water flow. As a result, water takes longer to reach the sprinklers from the source. Nelson products ensure that water is immediately available at each sprinkler head in the event of a fire.

No antifreeze is needed, eliminating the possibility of chemicals leaking into drains and ground water. If a fire does occur, no chemicals are sprayed in the facility or equipment.

STEP 1: CALCULATING HEAT LOSS REQUIREMENTS

To determine the heat loss that must be replaced by the heating cable, the following should be determined:

- Tf: Fluid Temperature to be maintained
- Ta: Minimum ambient temperature
- Size of pipe to be heated
- Thermal insulation – type and thickness

TEMPERATURE DIFFERENTIAL

Determine the temperature differential to be maintained by subtracting the ambient temperature from the fluid temperature to be maintained. (Tf – Ta)

HEAT LOSS

Use Table 1 to look up the heat loss for the proper pipe diameter and thickness of insulation. If a rigid insulation such as calcium silicate is used, the insulation should be oversized to the next available size. All insulations should be sized to provide adequate space for the heating cable and allow the joints to properly seal. The heat loss values in Table 1 include a 10% safety factor.

TABLE 1: PIPE HEAT LOSS (WATTS/FT)

Insulation Thickness mm (in)	(ΔT)		Pipe Diameter in Inches (IPS)								
	°C	°F	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
25 (1.0)	18	10	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.1
	28	50	1.7	1.9	2.2	2.5	2.8	3.3	3.8	4.4	5.4
	56	100	3.5	3.9	4.5	5.3	5.8	6.8	7.9	9.2	11.3
	83	150	5.4	6.2	7.1	8.3	9.1	10.7	12.4	14.4	17.6
38 (1.5)	18	10	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.7	0.8
	28	50	1.3	1.5	1.7	1.9	2.1	2.5	2.8	3.2	3.9
	56	100	2.8	3.1	3.5	4.1	4.4	5.1	5.9	6.8	8.2
	83	150	4.4	4.9	5.5	6.4	6.9	8.1	9.2	10.6	12.8
50 (2.0)	18	10	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6
	28	50	1.2	1.3	1.4	1.6	1.8	2.0	2.3	2.6	3.1
	56	100	2.4	2.7	3.0	3.4	3.7	4.3	4.8	5.5	6.6
	83	150	3.8	4.2	4.7	5.4	5.8	6.7	7.6	8.6	10.3
63 (2.5)	18	10	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5
	28	50	1.0	1.2	1.3	1.4	1.6	1.8	2.0	2.3	2.7
	56	100	2.2	2.4	2.7	3.0	3.3	3.7	4.2	4.7	5.6
	83	150	3.4	3.8	4.2	4.8	5.1	5.8	6.6	7.4	8.8
75 (3.0)	18	10	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5
	28	50	1.0	1.1	1.2	1.3	1.4	1.6	1.8	2.0	2.4
	56	100	2.0	2.2	2.5	2.8	3.0	3.4	3.7	4.2	5.0
	83	150	3.2	3.5	3.9	4.3	4.6	5.3	5.9	6.6	7.8

Insulation Thickness mm (in)	(ΔT)		Pipe Diameter in Inches (IPS)								
	°C	°F	6	8	10	12	14	16	18	20	24
25 (1.0)	18	10	1.5	1.9	2.4	2.7	3.0	3.4	3.8	4.2	5.0
	28	50	7.5	9.5	11.5	13.5	14.7	16.7	18.6	20.5	24.4
	56	100	15.7	19.8	24.2	28.2	30.8	34.9	38.9	43.0	51.1
	83	150	24.6	31.0	37.8	44.2	48.3	54.6	61.0	67.3	80.0
38 (1.5)	18	10	1.1	1.4	1.6	1.9	2.1	2.4	2.6	2.9	3.4
	28	50	5.3	6.7	8.1	9.4	10.2	11.5	12.8	14.2	16.8
	56	100	11.2	14.0	16.9	19.7	21.4	24.2	26.9	29.6	35.1
	83	150	17.6	21.9	26.5	30.8	33.6	37.9	42.2	46.5	55.0
50 (2.0)	18	10	0.9	1.1	1.3	1.5	1.6	1.8	2.0	2.2	2.6
	28	50	4.2	5.2	6.3	7.3	7.9	9.0	9.9	10.9	12.9
	56	100	8.9	11.0	13.2	15.3	16.6	18.7	20.8	22.8	27.0
	83	150	13.9	17.2	20.7	24.0	26.1	29.3	32.6	35.8	42.3
63 (2.5)	18	10	0.7	0.9	1.1	1.2	1.3	1.5	1.7	1.8	2.1
	28	50	3.6	4.4	5.2	6.0	6.6	7.3	8.1	8.9	10.5
	56	100	7.5	9.2	11.0	12.7	13.7	15.4	17.1	18.7	22.1
	83	150	11.7	14.4	17.2	19.9	21.5	24.1	26.8	29.4	34.6
75 (3.0)	18	10	0.6	0.8	0.9	1.1	1.1	1.3	1.4	1.6	1.8
	28	50	3.1	3.8	4.5	5.2	5.6	6.3	7.0	7.6	8.9
	56	100	6.5	8.0	9.5	10.9	11.8	13.2	14.6	16.0	18.8
	83	150	10.3	12.5	14.9	17.1	18.5	20.7	22.9	25.0	29.4

Note: Multiply heat loss values by 3.28 for Watts/m.

STEP 1: CALCULATING HEAT LOSS REQUIREMENTS

ADJUSTMENTS TO HEAT LOSS VALUES

The heat loss values in Table 1 are based on glass fiber insulation. If other insulations are used, multiply the heat loss value by the correction factor shown in Table 2 for your specific insulation. Heat losses are based on outdoor applications with 20 mph wind. If piping is located indoors, multiply the heat loss value by 0.9.

ADJUSTMENTS FOR HEAT SINKS

Any thermally conductive item that protrudes through the thermal insulation will require additional heat to be applied to the pipe. The footage shown in Table 3 and Table 4 should be added to the required heater cable length to compensate for these extra heat loss areas. When multiple traces are required, increase the cable adders proportionally.

TABLE 2: INSULATION FACTORS

Preformed Pipe Insulation	Correction Factor	Based on K factor @ 50°F (10°C) mean temperature (BTU/hr-°F-ft²/inch)
Glass Fiber	1.00	0.250
Cellular Glass	1.84	0.400
Rigid Urethane	0.76	0.165
Mineral Fiber	1.20	0.300
Mineral Wool	1.04	0.260
Flexible Elastomer	1.16	0.290

EXAMPLE

Maintain = +4°C (+40°F)
Minimum ambient = -23 °C (-10°F)
Sprinkler piping = 3/4" diameter
Insulation = 1.0” Flexible Elastomer
Location = Unheated indoor storage facility

Calculate Temperature Differential

ΔT = Tf – Ta
ΔT = +4 – (-23)°C
ΔT = +27°C

ΔT = Tf – Ta
ΔT = +40 – (-10)°F
ΔT = +50°F

Heat Loss (Q)

Use Table 1 to find heat loss. Where desired temperature falls between two values, use interpolation. From Table 1:

@ +27°C ΔT
Q = 6.2 Watts/m

@ +50°F ΔT
Q = 1.9 Watts/ft

Adjustments to Heat Loss (QM)

Adjust the heat loss for flexible elastomer. From Table 2, the correction factor is 1.16.

QM = Q x 1.16
QM = 6.2 Watts/m x 1.16
QM = 7.2 Watts/m

QM = Q x 1.16
QM = 1.9 Watts/ft x 1.16
QM = 2.2 Watts/ft

Since the piping is indoors, an adjustment is necessary for the absence of wind. If piping is located indoors, multiply the heat loss value by 0.9.

QM = 7.2 Watts/m x 0.9
QM = 6.5 Watts/m

QM = 2.2 Watts/ft x 0.9
QM = 2.0 Watts/ft

STEP 2: SELECT THE PROPER HEATING CABLE

Nelson Type CLT self-regulating heater cable is a parallel circuit electric heater strip. An irradiation cross-linked conductive polymer core material is extruded over the multi-stranded, tin-plated, 18-gauge copper bus wires.

The conductive core material increases or decreases its heat output in response to temperature changes. A thermoplastic elastomer dielectric jacket is then extruded over the conductive core. A copper braid is installed over this jacket providing a continuous ground path. A UV stabilized thermoplastic elastomer overjacket is provided to cover the braid for wet applications and exposure to the sun.

Nelson Type LT self-regulating heater cable is a parallel circuit electric heater strip. An irradiation cross-linked conductive polymer core material is extruded over the multi-stranded, tin plated, 16-gauge copper bus wires.

The conductive core material increases or decreases its heat output in response to temperature changes. Two jackets provide extra dielectric strength, moisture resistance, and protection from impact and abrasion damage. The inner thermoplastic jacket is extruded over and bonded to the core material. A thermoplastic elastomer outer jacket is then extruded over the inner jacket. A stranded tinned copper metal braid is supplied on all heaters. An optional overjacket (fluoropolymer or modified polyolefin) can be specified when the heater cable is to be installed in wet or corrosive environments.

When selecting the proper heater cable, you should verify the following conditions:

- Maintain Temperature
- Supply Voltage
- Piping Material

CABLE SELECTION

When selecting the heating cable with the desired power output, match a cable from Figure 1 greater than or equal to the heat loss value in Step 1. For designs requiring more than a single run of cable, use multiple runs of the same wattage cable to meet the heat loss requirements.

VOLTAGE ADJUSTMENT

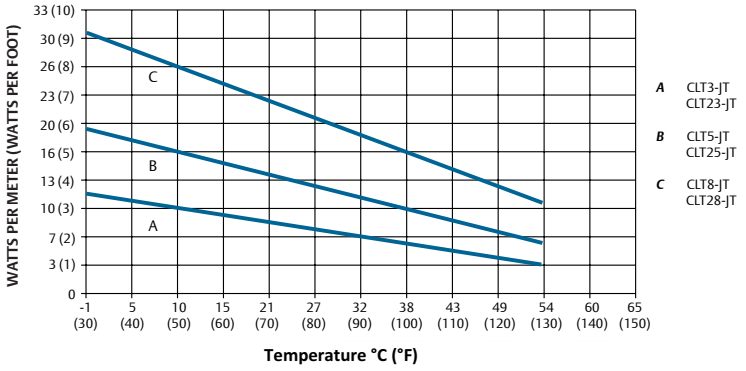
Use of products at other than nominal voltages requires minor adjustments in power and maximum circuit lengths. Use Power Adjustment Multiplier from Table 4 to verify that cable selected still meets the desired power output conditions.

PIPING MATERIAL

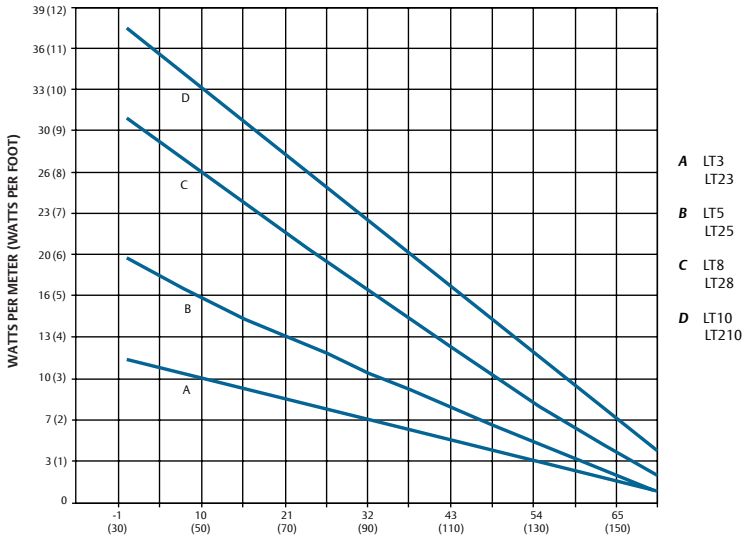
The actual power output of the cable is affected by the installed piping material. If the piping system is non-metallic, additional adjustments must be made based on the specific piping material. Please consult a product representative for technical assistance.

FIGURE 1: POWER OUTPUT ON METAL PIPE

CLT SELF-REGULATING HEATER CABLE



LT SELF-REGULATING HEATER CABLE



NELSON HEAT TRACE

STEP 2: SELECT THE PROPER HEATING CABLE

TABLE 3: PERFORMANCE AND RATING DATA

Catalog Number	Nominal Voltage	Maximum Segment Length m (ft)	Maximum Maintenance Temperature °C (°F)	Maximum Intermittent Exposure °C (°F)
CLT SELF-REGULATING HEATER CABLE				
CLT3-JT	120	67.4 (221)	65 (150)	85 (185)
CLT23-JT	240	162.5 (533)	65 (150)	85 (185)
CLT5-JT	120	54.3 (178)	65 (150)	85 (185)
CLT25-JT	240	139.6 (458)	65 (150)	85 (185)
CLT8-JT	120	43.3 (142)	65 (150)	85 (185)
CLT28-JT	240	105.8 (347)	65 (150)	85 (185)

Catalog Number	Nominal Voltage	Maximum Segment Length m (ft)	Maximum Maintenance Temperature °C (°F)	Maximum Intermittent Exposure °C (°F)	T-Rating ①
LT SELF-REGULATING HEATER CABLE					
LT3	120	99.1 (325)	65 (150)	85 (185)	T6
LT23	240	198.1 (650)	65 (150)	85 (185)	T6
LT5	120	82.3 (270)	65 (150)	85 (185)	T6
LT25	240	164.6 (540)	65 (150)	85 (185)	T6
LT8	120	64.0 (210)	65 (150)	85 (185)	T5
LT28	240	128.0 (420)	65 (150)	85 (185)	T5
LT10	120	54.9 (180)	65 (150)	85 (185)	T5
LT210	240	109.7 (360)	65 (150)	85 (185)	T5

① *Electrical equipment T rating codes define the maximum surface temperature that equipment will reach. It is used in hazardous (classified) area applications.*

TABLE 4: VOLTAGE ADJUSTMENT MULTIPLIER

Catalog Number	208 Vac		220 Vac		277 Vac		Absolute Max Length m (ft)
	Power	Length m (ft)	Power	Length m (ft)	Power	Length m (ft)	
CLT SELF-REGULATING HEATER CABLE							
CLT23-JT	0.71	0.32 (1.04)	0.81	0.31 (1.02)	1.34	0.30 (0.98)	162 (533)
CLT25-JT	0.80	0.31 (1.01)	0.87	0.30 (1.00)	1.22	0.31 (1.02)	140 (458)
CLT28-JT	0.87	0.30 (1.00)	0.92	0.30 (1.00)	1.12	0.31 (1.03)	106 (347)
LT SELF-REGULATING HEATER CABLE							
LT23	0.76	0.28 (0.93)	0.85	0.29 (0.96)	1.27	0.33 (1.07)	198.1 (650)
LT25	0.79	0.28 (0.93)	0.87	0.29 (0.96)	1.24	0.33 (1.07)	164.6 (540)
LT28	0.84	0.28 (0.93)	0.90	0.29 (0.96)	1.19	0.33 (1.08)	128.0 (420)
LT210	0.86	0.28 (0.93)	0.92	0.29 (0.96)	1.16	0.33 (1.09)	109.7 (360)

STEP 3: DETERMINE HEATING CABLE LENGTH

The total cable requirements are based on the pipe lengths plus adders.

PIPING REQUIREMENTS
Multiply the length of each pipe by the number of cable runs required.

PIPING ADDERS
Additional heating cable will be required for heat sinks which increase the total heat loss of the piping system. Add the footages from Table 5 to the calculated piping requirements.

SPRINKLER ADDERS
Additional heating cable will be required for sprinklers which increase the total heat loss of the piping system. Add the footages from Table 6 to the calculated piping requirements and piping adders.

CABLE LENGTH
Total cable length is determined from the sum of the previous calculations.
Total Length = Piping Requirements + Piping Adders + Sprinkler Adders

Refer to figures in the Installation and Maintenance Information section for specific installation details for sprinkler heads with sprigs, sprinkler heads without sprigs, and dry pendant sprinklers in freezer installations. This information is to be used together with the Installation and Maintenance Manual for Self-Regulating Heater Cable, document number GA-1765 and Installation Instructions for Branch Sprinkler Systems, document number GA-1935.

TABLE 5: HEAT LOSS ADDERS FOR VALVES, PIPE SUPPORTS AND FLANGES

Additional Heater Length in Meters (Feet) for Various Heat Sinks					
Pipe Size	Valves	Pipe Hanger (Non-Isolated)	U-Bolt Support	Pipe Shoe	Standard Flange
1/2	0.3 (1.0)	0.3 (1.0)	0.3 (1.0)	3x shoe length	0.1 (0.3)
3/4	0.3 (1.0)	0.5 (1.5)	0.5 (1.5)	3x shoe length	0.1 (0.3)
1	0.3 (1.0)	0.5 (1.5)	0.5 (1.5)	3x shoe length	0.1 (0.3)
1-1/2	0.5 (1.5)	0.5 (1.5)	0.5 (1.5)	3x shoe length	0.1 (0.3)
2	0.6 (2.0)	0.6 (2.0)	0.6 (2.0)	3x shoe length	0.1 (0.3)
3	0.8 (2.5)	0.6 (2.0)	0.6 (2.0)	3x shoe length	0.2 (0.5)
4	0.9 (3.0)	0.8 (2.5)	0.8 (2.5)	3x shoe length	0.2 (0.5)
6	1.1 (3.5)	0.8 (2.5)	0.8 (2.5)	3x shoe length	0.2 (0.75)
8	1.2 (4.0)	0.8 (2.5)	0.8 (2.5)	3x shoe length	0.2 (0.75)
10	1.5 (5.0)	0.9 (3.0)	0.9 (3.0)	3x shoe length	0.2 (0.75)
12	1.8 (6.0)	0.9 (3.0)	0.9 (3.0)	3x shoe length	0.2 (0.75)
14	2.1 (7.0)	0.9 (3.0)	0.9 (3.0)	3x shoe length	0.3 (1.0)
16	2.4 (8.0)	1.1 (3.5)	1.1 (3.5)	3x shoe length	0.3 (1.0)
18	2.7 (9.0)	1.1 (3.5)	1.1 (3.5)	3x shoe length	0.3 (1.0)
20	3.0 (10.0)	1.1 (3.5)	1.1 (3.5)	3x shoe length	0.3 (1.0)
24	3.7 (12.0)	1.2 (4.0)	1.2 (4.0)	3x shoe length	0.3 (1.0)

Adders are for various inline pipe fittings to compensate for greater areas of heat loss.
Note: For design conditions requiring more than a single run of heater cable, the values shown are required for each cable run.

TABLE 6: HEAT LOSS ADDERS FOR SPRINKLERS

Additional Heater Length in Feet for Sprinklers		
Sprinkler without sprig	Sprinkler with sprig	Dry sprinkler for freezer installations
(Refer to Figure 3)	(Refer to Figure 4)	(Refer to Figure 5)
4x pipe diameter	2x sprig length	2x drop length

STEP 4: DETERMINE ELECTRICAL LOAD REQUIREMENTS

To determine the electrical requirements for your project, you must determine the number of circuits and calculate the transformer loading.

To calculate your electrical requirements, you will need the following:

- Total cable length
- Supply voltage
- Minimum ambient/start-up temperature

VOLTAGE ADJUSTMENT

Use of products at other than nominal voltages requires minor adjustments in power and maximum circuit lengths. Use Length Adjustment Multiplier from Table 4 or Table 6 to verify adjusted maximum circuit lengths.

NUMBER OF CIRCUITS

Use Table 4 and Table 7, if necessary, to determine your maximum circuit length allowed. Divide your total cable length by the maximum length to determine the number of electrical circuits required. To reduce distribution costs, select the smallest branch circuit breaker rating as possible.

CALCULATE TRANSFORMER LOADING

Using your selected supply voltage, use Table 8 to calculate your Amp/Ft value at your selected minimum ambient/start-up temperature. To calculate your transformer load, use the following formula:

Amps/Ft x total cable length x supply voltage / 1000 = Transformer Load (kVA or kW)

TABLE 7: CIRCUIT BREAKER SELECTION

Watts/M (Watts/Ft)	Start-up °C (°F)	Max. Length in Meters (Feet) Vs. Circuit Breaker Size					
		120 Volt			240 Volt		
		15A	20A	30A	15A	20A	30A
CLT SELF-REGULATING HEATER CABLE							
32.3 (3)	10 (50)	67.4 (221)	67.4 (221)	67.4 (221)	162.5 (533)	162.5 (533)	162.5 (533)
	-18 (0)	63.4 (208)	67.4 (221)	67.4 (221)	126.8 (416)	162.5 (533)	162.5 (533)
	-29 (-20)	57.0 (187)	67.4 (221)	67.4 (221)	114.0 (374)	152.1 (499)	162.5 (533)
53.8 (5)	10 (50)	54.3 (178)	54.3 (178)	54.3 (178)	125.9 (413)	139.6 (458)	139.6 (458)
	-18 (0)	45.7 (150)	54.3 (178)	54.3 (178)	91.1 (299)	121.6 (399)	139.6 (458)
	-29 (-20)	41.1 (135)	54.3 (178)	54.3 (178)	82 (269)	109.4 (359)	139.6 (458)
86.1 (8)	10 (50)	43.3 (142)	43.3 (142)	43.3 (142)	88.1 (289)	105.8 (347)	105.8 (347)
	-18 (0)	32.0 (105)	42.7 (140)	43.3 (142)	64.0 (210)	85.3 (280)	105.8 (347)
	-29 (-20)	29.0 (95)	38.7 (127)	43.3 (142)	57.9 (190)	77.1 (253)	105.8 (347)

Watts/M (Watts/Ft)	Start-up °C (°F)	Max. Length in Meters (Feet) Vs. Circuit Breaker Size							
		120 Volt				240 Volt			
		15A	20A	30A	40A	15A	20A	30A	40A
LT SELF-REGULATING HEATER CABLE									
32.3 (3)	10 (50)	99.1 (325)				198.1 (650)			
	-18 (0)	70.1 (230)	93.0 (305)	99.1 (325)		140.2 (460)	189.0 (620)	198.1 (650)	
	-29 (-20)	62.5 (205)	83.8 (275)	99.1 (325)		125.0 (410)	167.6 (550)	198.1 (650)	
53.8 (5)	10 (50)	68.6 (225)	82.3 (270)			140.2 (460)	164.6 (540)		
	-18 (0)	47.2 (155)	62.5 (205)	82.3 (270)		94.5 (310)	126.5 (415)	164.6 (540)	
	-29 (-20)	41.1 (135)	54.9 (180)	82.3 (270)		83.8 (275)	112.8 (370)	164.6 (540)	
86.1 (8)	10 (50)	44.2 (145)	59.4 (195)	64.0 (210)		89.9 (295)	118.9 (390)	128.0 (420)	
	-18 (0)	30.5 (100)	39.6 (130)	59.4 (195)	64.0 (210)	61.0 (200)	80.8 (265)	120.4 (395)	128.0 (420)
	-29 (-20)	27.4 (90)	35.1 (115)	53.3 (175)	64.0 (210)	53.3 (175)	71.6 (235)	106.7 (350)	128.0 (420)
107.6 (10)	10 (50)	35.1 (115)	45.7 (150)	54.9 (180)		70.1 (230)	93.0 (305)	109.7 (360)	
	-18 (0)	25.9 (85)	33.5 (110)	47.2 (155)	54.9 (180)	50.3 (165)	67.1 (220)	99.1 (325)	109.7 (360)
	-29 (-20)	22.9 (75)	30.5 (100)	44.2 (145)	54.9 (180)	45.7 (150)	59.4 (195)	88.4 (290)	109.7 (360)

1. *Circuit breakers are sized per national electrical codes.*
2. *When using 240 volt product at 208, 220 or 277 volts, use the circuit adjustment factors shown in the Voltage Adjustment Table.*
3. *When using 2 or more heater cables of different wattage ratings in parallel on a single circuit breaker, use the 15A column amperage of 15 amps, divide it by the maximum footage to arrive at an amps/foot figure for each cable. You can then calculate circuit breaker sizes for these combination loads. These amps/foot factors include the 125% sizing factor.*
4. *National electrical codes require ground-fault equipment protection for each branch circuit supplying electric heating equipment. Exceptions to this requirement can be found in the 2002 N.E.C.*
5. *Heater cables with D1 optional construction require the use of ground fault interrupter/ground leakage device with a trip setting no greater than 30mA.*

STEP 4: DETERMINE ELECTRICAL LOAD REQUIREMENTS

TABLE 8: TRANSFORMER SIZING (AMPS/FT)

Start-up Temperature	CLT3	CLT5	CLT8	CLT23			CLT25			CLT28		
	120	120	120	208	240	277	208	240	277	208	240	277
CLT SELF-REGULATING HEATER CABLE												
10 (50)	0.037	0.055	0.080	0.013	0.019	0.025	0.023	0.028	0.034	0.035	0.040	0.045
-18 (0)	0.055	0.078	0.111	0.020	0.028	0.038	0.031	0.039	0.047	0.048	0.056	0.062
-29 (-20)	0.061	0.086	0.123	0.022	0.031	0.042	0.034	0.043	0.052	0.054	0.062	0.069

Start-up Temperature	LT3	LT5	LT8	LT10	LT23			LT25			LT28			LT210		
	120V	120V	120V	120V	208V	240V	277V	208V	240V	277V	208V	240V	277V	208V	240V	277V
LT SELF-REGULATING HEATER CABLE																
10 (50)	0.035	0.054	0.082	0.104	0.013	0.018	0.022	0.021	0.027	0.033	0.034	0.041	0.049	0.045	0.052	0.060
-18 (0)	0.052	0.078	0.120	0.140	0.020	0.026	0.033	0.031	0.039	0.048	0.050	0.060	0.071	0.060	0.070	0.081
-29 (-20)	0.058	0.089	0.134	0.160	0.022	0.029	0.037	0.035	0.045	0.055	0.056	0.067	0.080	0.069	0.080	0.093

Multiply transformer sizing by 3.28 for Amps/m.

Note: For start-up temperatures other than those shown above, interpolation may be used for sizing accuracy.

STEP 5: CONNECTION KITS AND ACCESSORIES

Nelson's PLT Series non-metallic connection kits are UL (Underwriter's Laboratory) and CSA (Canadian Standards Association) approved for use in freeze protection application for wet sprinkler piping systems when used with approved Nelson heating cables. PLT Series connection kits are approved for use with all Nelson CLT and LT Series field-fabricated heating cables.

Enclosures supplied in PLT Series connection kits are rated NEMA 4X. In addition to power connection kits and end seals, Nelson also provides splice connections, tee splice connections and associated accessories as required to complete your entire heat tracing installation.

FIGURE 3: TYPICAL FREEZE PROTECTION SYSTEM FOR SPRINKLER LINES

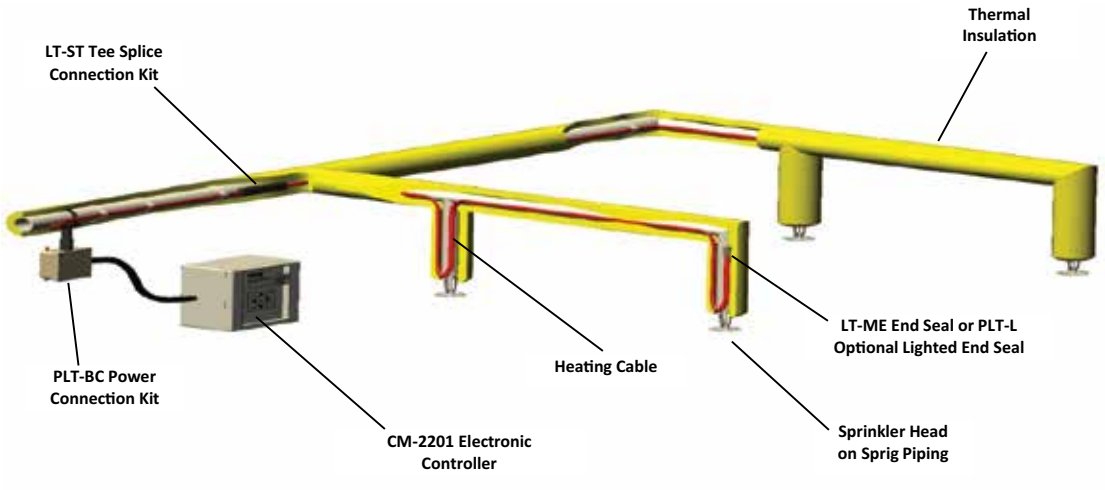


TABLE 9: CONNECTION KITS AND GENERAL ACCESSORIES

Catalog Number	Units Each	Description
PLT-BC-J-3	1	Power Connection Kit for 1/2" to 3" diameter pipe
PLT-BC-J-12	1	Power Connection Kit for 3 1/2" to 12" diameter pipe
PLT-BC-J-20	1	Power Connection Kit for 12 1/2" to 20" diameter pipe
PLT-BS-U-3	1	Splice Connection Kit for 1/2" to 3" diameter pipe
PLT-BS-U-12	1	Splice Connection Kit for 3 1/2" to 12" diameter pipe
PLT-BS-U-20	1	Splice Connection Kit for 12 1/2" to 20" diameter pipe
PLT-L(X)-J-3	1	Lighted End Seal for 1/2" to 3" diameter pipe, replace (X) with voltage
PLT-L(X)-J-12	1	Lighted End Seal for 3 1/2" to 12" diameter pipe, replace (X) with voltage
PLT-L(X)-J-20	1	Lighted End Seal for 12 1/2" to 20" diameter pipe, replace (X) with voltage
LT-SS	5	Splice Connection Kit, heat shrink version
LT-ST	5	Tee Splice Connection Kit, heat shrink version
GT-6	1	Fiberglass Tape, 18 meters (60 feet)
GT-60	1	Fiberglass Tape, 55 meters (180 feet)
AT-50	1	Aluminum Foil Tape, 46 meters (150 feet)
WS-100	1	Warning Signs
LT-ME	5	End Seals, molded silicone
LT-MP	5	Power End Terminations, molded silicone
LT-SE	5	End Seals, heat shrink version
LT-SP	5	Power End Terminations, heat shrink version

Note: PLT Series Connection Kits include both the end seal and/or power end terminations for a single heat tracing segment. Additional components may be required based on the specific piping system configuration.

INSTALLATION AND MAINTENANCE INFORMATION

For proper installation of Nelson CLT and LT Series heating cables on sprinkler piping, refer to the details below. These details are supplemental to the Installation and Maintenance Manual for Self-Regulating Heater Cable, document number GA-1765 and Installation Instructions for Branch Sprinkler Systems, document number GA-1935.

FIGURE 3: SPRINKLER HEAD WITHOUT SPRIG

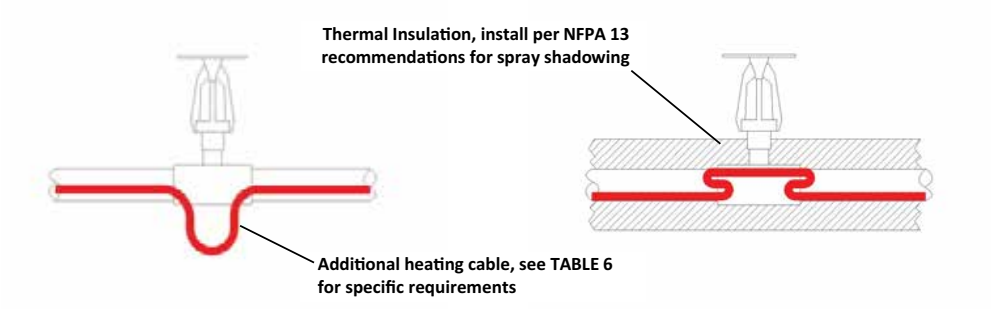


FIGURE 4: SPRINKLER HEAD WITH SPRIG

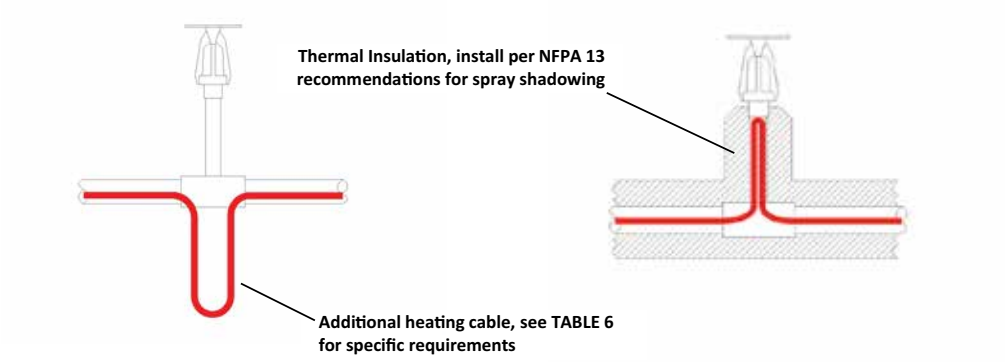
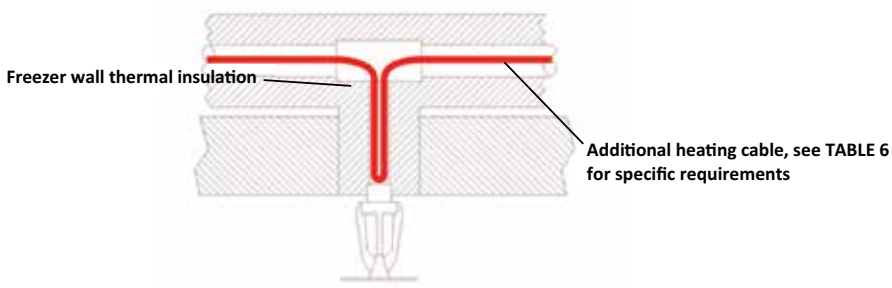


FIGURE 5: DRY PENDANT SPRINKLER IN FREEZERS



1. *The illustrations in Figures 3 – 6 are basic examples of various sprinkler installations and are for reference only. For sprinkler and/or sprinkler piping not reflected in these details, please consult your local representative for optional recommendations.*
2. *Use on insulated appropriately Listed or Certified steel schedules 5, 10, 20 and 40 standpipe, supply lines, and branch lines containing sprinklers up to and including 6 inch size. Includes use on elbows, tees, flanges, hangers and valves. Appropriately Listed or Certified fiberglass insulation with a k-factor of 130-140 W/m-K @ 24°C (0.25-0.27 BTU-in / hr-°F-ft² @ 75°F) with weatherproof cladding must be used.*
3. *For systems having piping which connects between buildings, in unheated areas, coolers or freezers where the temperature is -40°C (-40°F) or greater.*
4. *For use in Ordinary Hazard Occupancies only as specified in NFPA 13 the Standard for the Installation of Sprinkler System. The system must comply with the obstruction requirements of NFPA 13 so that the thermal insulation over the trace heating does not unacceptably obstruct the sprinkler or cover the wrench boss.*
5. *For use with sprinkler heads with a temperature rating of 68°C (155°F) or higher.*

Nelson Heat Trace provides a full line of products and expertise for the powering, controlling and monitoring of pipeline temperatures under Appleton Group, a business unit of Emerson Industrial Automation. Our tailored, trouble-free, efficient and cost-effective systems are used around the globe, from frozen tundras to arid deserts.

Emerson Industrial Automation brings integrated manufacturing solutions to diverse industries worldwide. Our comprehensive product line, extensive experience, world-class engineering and global presence enable us to implement solutions that give our customers the competitive edge.

For over 150 years, our electrical product brands have been providing a rich tradition of long-term, practical, high quality solutions with applications ranging from the construction and safe operation of petrochemical and process plants to providing quality power that precisely controls automotive robotic production.

Engineers, distributors, contractors, electricians and site maintenance professionals around the world trust Emerson Industrial Automation brands to make electrical installations safer, more productive and more reliable.

Appleton Group is organized into three focused businesses that provide distributors and end-users expert knowledge and excellent service.

Electrical Construction Materials

This group is made up of the Appleton, Nutsteel and O-Z/Gedney brands. They manufacture a broad range of electrical products including conduit and cable fittings, plugs and receptacles, enclosures and controls, conduit bodies and industrial and hazardous lighting. Whether the application is hazardous location, industrial or commercial, the electrical construction materials group has the products to meet your needs.

Power Quality Solutions

The SolaHD brand offers the broadest power quality line, including uninterruptible power supplies, power conditioners, voltage regulators, shielded transformers, surge protection devices and power supplies.

Heating Cable Systems

This group is made up of the EasyHeat and Nelson brands. They offer a broad range of electrical heating cable products for residential, commercial and industrial applications.

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