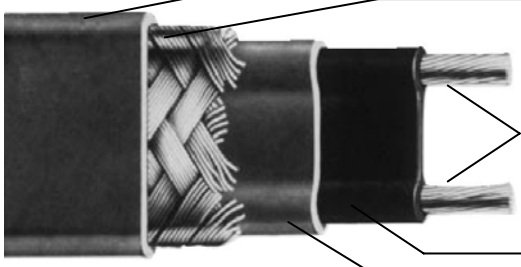
NELSON™

SELF-REGULATING HEATERS

APPLICATION INFORMATION

TYPE CLT



Description:

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-guage 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.

Principle of Operation:

The parallel bus wires apply voltage along the entire length of the heater cable. The conductive core provides an infinite number of parallel conductive paths permitting the cable to be cut to any length in the field with no dead or cold zones developing. The heater cable derives its self-regulating characteristic from the inherent properties of the conductive core material. As the core material temperature increases, the number of conductive paths in the core material decreases, automatically decreasing the heat output. As the temperature decreases, the number of conductive paths increases, causing the heat output to increase. This occurs at every point along the length of the cable, adjusting the power output to the varying conditions along the pipe. The self-regulating effect allows the cable to be overlapped without creating hot spots or burnout. As the cable self-regulates it heat output, it provides for the efficient use of electric power, producing heat only when and where it is needed, and also limiting the maximum surface temperature.

Application:

Nelson's Type CLT self-regulating heater cable is ideal for use in maintaining fluid flow under low ambient conditions. Freeze protection and low watt density process temperature systems such as pipelines, fire protection, process water, dust suppression systems, hot water and structure anti-icing are typical applications for this product. For other than metal pipe heating, see appropriate application guide. The base product is supplied with a copper metal braid with a thermoplastic elastomer overjacket for wet applications, exposure to the sun, and where mechanical abuse is a problem.

NELSON HEAT TRACE

Cable Selection @ 0°F Minimum Ambient Temperature

Application Design Conditions	
Maintain Temperature	*40°F*
Insulation Type	*Fiberglass*
Wind Speed	*20 MPH*
Safety Factor	*10%*
Heater Attachment	*GT-6 Fiberglass Tape*

Metallic Pipe Applications* include Carbon Steel, Stainless Steel and Copper pipe.
Non-Metallic Pipe Applications* include FRP, PVC, CPVC, HDPE, ABS and Polypropylene.

The information in the tables below represents the wattage of cable necessary to meet the Design Conditions. CLT3 = *3*, CLT5 = *5*, CLT8 = *8*. If a single pass of cable does not satisfy the heat loss requirement, then multiple passes are shown. Example: *5(2)* (two passes of *5* watt product).

Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*8(2)*	*8(2)*
1.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*5*

120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
1.0”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*8*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*

277 VAC @										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*5(2)*	*8(2)*
1.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*

Non-Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*		
1.0”	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*8(2)*	*8(2)*
1.5”	*3*	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*8(2)*
2.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*

120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*		
1.0”	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
1.5”	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*5(2)*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*8*	*8*

277 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*3*	*3*	*5*	*8*	*8*	*5(2)*	*5(2)*	*8(2)*	
1.0”	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*5(2)*	*5(2)*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*8*	*8*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*8*

Cable Selection @ -20°F Minimum Ambient Temperature

Application Design Conditions	
Maintain Temperature	*40°F*
Insulation Type	*Fiberglass*
Wind Speed	*20 MPH*
Safety Factor	*10%*
Heater Attachment	*GT-6 Fiberglass Tape*

Metallic Pipe Applications* include Carbon Steel, Stainless Steel and Copper pipe.
Non-Metallic Pipe Applications* include FRP, PVC, CPVC, HDPE, ABS and Polypropylene.

The information in the tables below represents the wattage of cable necessary to meet the Design Conditions. CLT3 = *3*, CLT5 = *5*, CLT8 = *8*. If a single pass of cable does not satisfy the heat loss requirement, then multiple passes are shown. Example: *5(2)* (two passes of *5* watt product).

Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*5*	*5*	*8*	*8*	*8*				
1.0”	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
1.5”	*3*	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*5(2)*
2.0”	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*
120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*5*	*5*	*5*	*8*	*8*				
1.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*8*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*
277 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*3*	*3*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*	
1.0”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*5(2)*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*
2.0”			*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*

Non-Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*				
1.0”	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*		
1.5”	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*
2.0”	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*5*	*8*	*5(2)*	*5(2)*	*8(2)*	*8(2)*			
1.0”	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	
1.5”	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
2.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*
277 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*5*	*5*	*8*	*5(2)*	*5(2)*	*8(2)*	*8(2)*		
1.0”	*3*	*3*	*3*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*	
1.5”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*5(2)*	*8(2)*
2.0”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*5(2)*

TYPE CLT

Cable Selection @ -40°F Minimum Ambient Temperature

Application Design Conditions	
Maintain Temperature	*40°F*
Insulation Type	*Fiberglass*
Wind Speed	*20 MPH*
Safety Factor	*10%*
Heater Attachment	*GT-6 Fiberglass Tape*

Metallic Pipe Applications* include Carbon Steel, Stainless Steel and Copper pipe.
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Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*	*8(2)*		
1.0”	*5*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*
1.5”	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*
2.0”	*3*	*3*	*3*	*5*	*5*	*5*	*5*	*8*	*8*	*5(2)*
120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*		
1.0”	*3*	*3*	*3*	*5*	*5*	*8*	*8*	*8*	*8(2)*	*8(2)*
1.5”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*5(2)*
2.0”	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*8*
277 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*3*	*5*	*5*	*8*	*8*	*5(2)*	*5(2)*	*8(2)*		
1.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*5(2)*	*8(2)*
1.5”	*3*	*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*	*5(2)*
2.0”			*3*	*3*	*3*	*3*	*3*	*5*	*5*	*8*

Non-Metallic Pipe Applications *

208 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*8*	*8*	*5(2)*	*8(2)*	*8(2)*					
1.0”	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*	*8(2)*		
1.5”	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*	
2.0”	*5*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*
120/240 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*8*	*8*	*8*	*8(2)*	*8(2)*	*8(2)*				
1.0”	*5*	*5*	*5*	*8*	*8*	*5(2)*	*5(2)*	*8(2)*		
1.5”	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*	
2.0”	*3*	*3*	*5*	*5*	*5*	*8*	*8*	*8*	*5(2)*	*8(2)*
277 VAC										
Insulation Thickness	**Pipe Size (in inches)**									
	0.50	**0.75**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**4.00**	**6.00**	**8.00**
0.5”	*5*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*				
1.0”	*3*	*3*	*5*	*8*	*8*	*5(2)*	*5(2)*	*8(2)*		
1.5”	*3*	*3*	*3*	*5*	*5*	*8*	*8*	*5(2)*	*8(2)*	*8(2)*
2.0”	*3*	*3*	*3*	*3*	*5*	*5*	*5*	*8*	*5(2)*	*8(2)*

Performance and Rating Data:

Catalog No.	CLT3	CLT5	CLT8	CLT23	CLT25	CLT28
Voltage (VAC)	120	120	120	240	240	240
Power Output @ 40°F (W/ft.)	3.2	5.4	8.6	3.2	5.4	8.6
Maximum Segment Length (ft.)	221	178	142	533	458	347
Minimum Installation Temp (°F)	-35°F	-35°F	-35°F	-35°F	-35°F	-35°F
Current Load (amp/foot):						
At 0°F Start-up	.072	.100	.143	.036	.050	.071
At -20°F Start-up	.080	.111	.158	.040	.056	.079
At -40°F Start-up	.088	.122	.174	.044	.061	.087

Note: Amp/Foot values include 20% breaker derating per National Electrical Code.

Circuit Breaker Selection:

Watts/Ft.	Start-Up Temp.	Maximum Length (feet) Vs Circuit Breaker Size						
		120VAC			240VAC			
		15A	20A	30A	15A	20A	30A	40A
3	40°F	268	358	537	537	716	1074	1432
	0°F	208	277	416	416	555	832	1110
	-20°F	187	249	374	374	499	748	998
	-40°F	170	226	340	340	453	679	906
5	40°F	192	256	384	384	511	767	1023
	0°F	150	199	299	299	399	598	798
	-20°F	135	180	269	269	359	539	718
	-40°F	123	163	245	245	327	490	654
8	40°F	134	179	269	269	358	537	716
	0°F	105	140	210	210	280	421	561
	-20°F	95	127	190	190	253	380	506
	-40°F	86	115	173	173	231	346	461

Notes:

1. Maximum segment length is the maximum continuous heater run with minimal voltage drop. For breaker loading, multiple heater segments can be installed in parallel providing no individual length is longer than the maximum published segment length. For voltages other than 240VAC, multiply the amps/foot value in the table above by the power adjustment value below, then divide full breaker amperage rating by the adjusted value to determine maximum total footage allowed.
2. Circuit breakers are sized per Article 427-4 of the 1999 National Electrical Code.
3. Article 427-22 of the National Electrical Code requires ground-fault equipment protection for each branch circuit supplying electric heating equipment. Electrical connections should be made by a licensed electrician.
4. Cable Selection Tables are designed for product selection over a wide range of piping materials. For specific applications utilizing heat transfer aids, such as AT-50 aluminum foil tape, consult your Nelson products representative.

Voltage Adjustment:

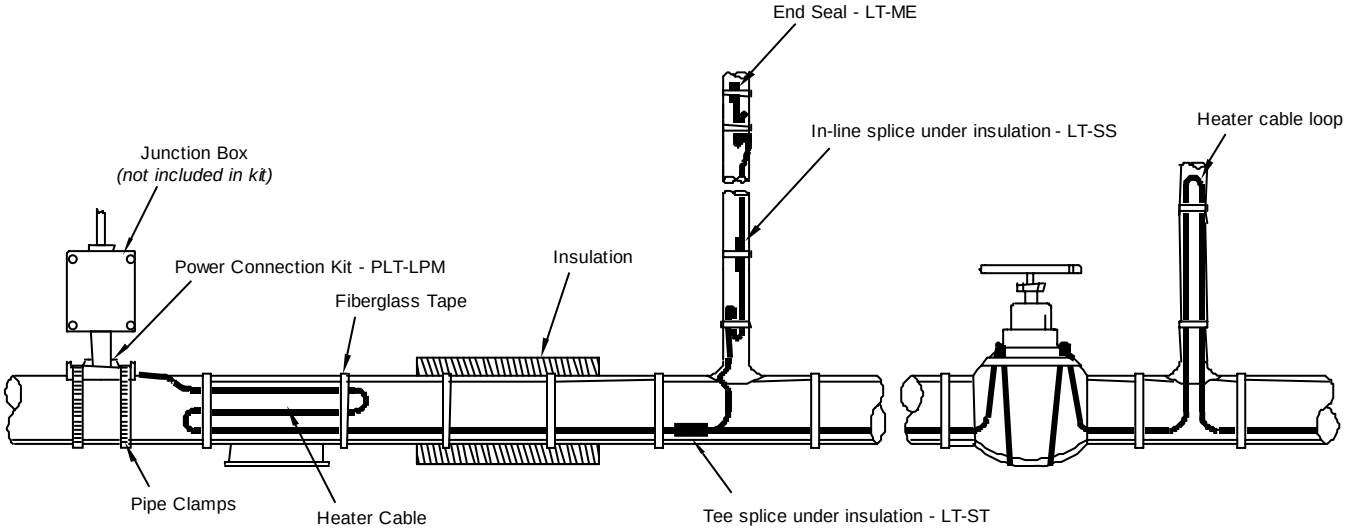
Use of Type CLT products at other than nominal voltages requires minor adjustments in power and maximum segment lengths.

Adjustment Multiplier				
	208VAC		277VAC	
Product	Power	Length	Power	Length
CLT23	.71	1.04	1.34	.98
CLT25	.80	1.01	1.22	1.02
CLT28	.87	1.00	1.12	1.03

Catalog Numbers:

Voltage	Overjacketed		
	3	5	8
120VAC	CLT3-JT	CLT5-JT	CLT8-JT
240VAC	CLT23-JT	CLT25-JT	CLT28-JT

Additional Footage of Heater for Various Heat Sinks						
Pipe Size	**Standard Flange**	**Blind Flange**	**Pipe Support**	**Screwed or Welded Valve**	**Flanged Valve**	**Butterfly Valve**
0.50	.3	.5	1.0	1.0	1.0	1.0
0.75	.3	.5	1.5	1.0	1.5	1.0
1.00	.3	.5	1.5	1.0	2.0	1.0
1.50	.3	.5	1.5	1.5	2.5	1.5
2.00	.3	.5	2.0	2.0	2.5	2.0
3.00	.5	.75	2.0	2.5	3.0	2.5
4.00	.5	.75	2.5	3.0	4.0	3.0
6.00	.75	1.0	2.5	3.5	5.0	3.5
8.00	.75	1.0	2.5	4.0	7.0	4.0



Note: Heater cable power connections and end seals are included in Power Connection Kit (PLT-LPM). Additional heater cable end seals, splices, tees and thermostats are used as needed.

Components and Accessories:

Catalog No.	Units	Description
PLT-LPM	Ea.	Power Connection Kit with Cable Seals
LT-SS	5 Ea.	Splice Kit – Heat Shrink
LT-ST	5 Ea.	Tee Splice Kit – Heat Shrink
LT-ME	5 Ea.	End Termination Cable Seals
PC03	Ea.	Pipe Clamp, .50-3.00” Pipe
PC12	Ea.	Pipe Clamp, 3.50-12.00” Pipe
GT-6	Ea.	Glass Fiber Tape, 60 Feet/Roll
AT-50	Ea.	Aluminum Foil Tape, 50 Yards/Roll
WS-100	Ea.	Warning Sign
JB-552	Ea.	Junction Box, 5” x 5” x 2”, NEMA 4X
TF4X40	Ea.	Thermostat, 40°F Fixed Setpoint, NEMA 4X Enclosure
TH4X325	Ea.	Thermostat, 25-325°F, NEMA 4X Enclosure
TA4X140	Ea.	Ambient Thermostat, 15-140°F, NEMA 4X Enclosure

Total Cable Requirements:

The total cable length for deicing is determined by including all elements of the roof system that need protection. Use the following tables to determine the total length of cable required.

Item	Feet of cable/Ft. Item	Comments
Gutter	1'	1 Trace/6" gutter width
Downspout	2'	Unless downspout is on end of circuit, the cable is looped down and back
Roof Valley	6'	Per Valley
Dormer	1'	1 ft. of cable/foot of dormer perimeter

Cable Footage Required for Roof Overhangs (Feet of Cable per Foot of Roof)			
Eave Overhang	Feet of Cable Loop Height	Shingle Roof	Metal Roof
12"	18"	1'-10"	2'-6"
24"	30"	2'-8"	3'-6"
36"	42"	3'-8"	4'-6"
48"	54"	4'-8"	5'-6"

Performance and Rating Data:

Catalog No.	CLT5-JT	CLT25-JT		
Voltage (VAC)	120	208	240	277
Power Output in Ice (W/ft.)	9.2	8.1	9.2	10.2
Maximum Segment Length (ft.)	141	370	377	381
Minimum Installation Temp (°F)	-35°F	-35°F	-35°F	-35°F
Current Load (amp/foot):				
At 20°F Start-up	.125	.055	.063	.071
At 0°F Start-up	.140	.062	.070	.078
At -20°F Start-up	.156	.069	.078	.087
At -40°F Start-up	.171	.076	.086	.095

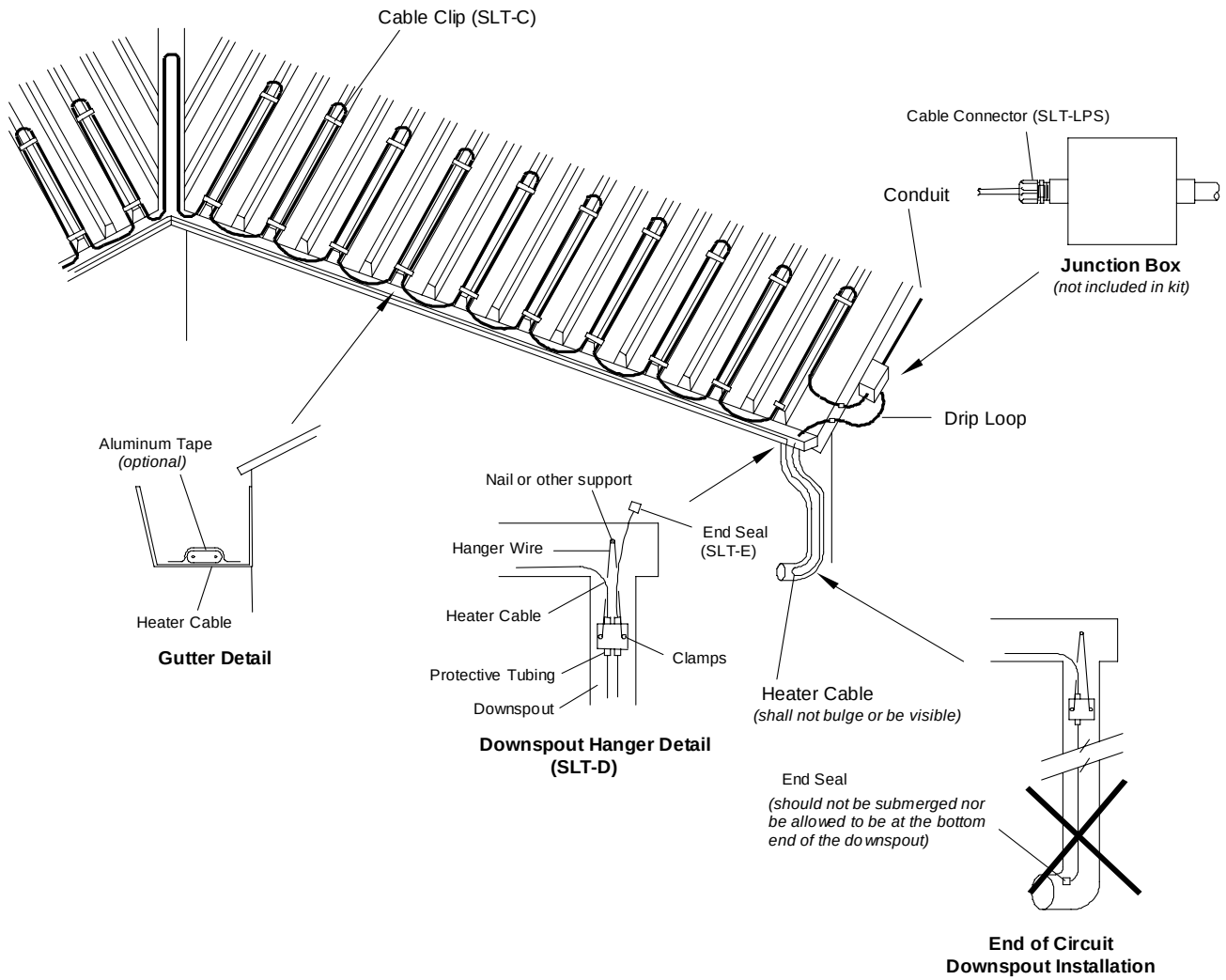
Note: Amp/Foot values include 20% breaker derating per National Electrical Code.

Circuit Breaker Selection:

Start-Up Temp.	Maximum Length (feet) Vs Circuit Breaker Size						
	CLT5-JT @ 120VAC			CLT25-JT @ 240VAC			
	15A	20A	30A	15A	20A	30A	40A
20°F	120	160	240	240	320	480	640
0°F	107	142	214	214	286	429	571
-20°F	96	128	192	194	258	387	516
-40°F	88	117	175	174	232	348	464

Notes:

1. Maximum segment length is the maximum continuous heater run with minimal voltage drop. For breaker loading, multiple heater segments can be installed in parallel providing no individual length is longer than the maximum published segment length. For voltages other than 240VAC, divide full breaker amperage rating by amps/foot @ start-up temperature to determine maximum total footage allowed.
2. Circuit breakers are sized per Article 426-4 of the 1999 National Electrical Code.
3. Article 426-28 of the National Electrical Code requires ground-fault equipment protection for fixed outdoor electrical deicing equipment. Electrical connections should be made by a licensed electrician.



Components and Accessories:

Catalog No.	Units	Description
SLT-LPS	Ea.	Power Connection Kit with Cable Seals
SLT-RC	25 Ea.	Roof Clips
SLT-C	25 Ea.	Roof Clips (Universal)
SLT-D	5 Ea.	Downspout Hangers
SLT-S	5 Ea.	Splice Kit – Heat Shrink
SLT-E	5 Ea.	End Termination Cable Seals – Heat Shrink
AT-50	Ea.	Aluminum Foil Tape, 50 Yards/Roll
TF4X40	Ea.	Thermostat, 40°F Fixed Setpoint, NEMA 4X Enclosure
TA4X140	Ea.	Ambient Thermostat, 15-140°F, NEMA 4X Enclosure

APPROVALS	
CSA **Ordinary Locations** C US	**UL** **Ordinary Locations** c UL us LISTED

Nelson Heat Tracing Systems products are supplied with a limited warranty. Complete Terms and Conditions may be found on Nelson's website at www.nelsonheaters.com.

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