

Heat Tracing Products

Application & Selection Guidelines

General Product Summary

This section is designed to assist you in determining the appropriate cable for use in your application.

Step 1 — Collect Required Application Data and Determine Heat Loss

Step 2 — Choose the cable that best meets your specific application parameters based on the summary. Consideration of application temperature, exposure temperature, application requirements and environmental ratings should be made.

Step 3 — Select Heating Cable Wattage Rating

Step 4 — Determine Total Cable Required

Step 5 — Determine Circuits and Circuit Protection

Step 6 — Select Appropriate Accessories

Step 1 — Collect Required Application Data & Determine Heat Loss

Application data required can be split into two categories. The first is the heat loss data. This includes:

- Maintenance Temperature
- Minimum Ambient Temperature
- Pipe Size
- Insulation Type (or K factor)
- Insulation Thickness
- Indoor/Outdoor Installation
- Maximum Expected Wind Speed
- Required Safety Factor.

Refer to the Technical section of this catalog, “Determining Heat Energy Requirements — Pipe & Tank Tracing” for details on

performing heat loss calculations. For Commercial Freeze Protection, please see Cable Selection Tables in this section.

The second category of data required is the application and environmental conditions. This includes:

- Maximum Exposure Temperature (Power Off Condition)
- Circuit Length Considerations
- Available Voltage
- Hazardous Area Requirements
- Type of Pipe (Plastic or Metal)
- Chemical Exposure
- Fire Resistance.

Step 2 — Select the Cable

Choose the cable that best fits your specific application parameters and wattage requirements.

Heat Tracing Product Features

Features	Industrial						Commercial		
	SRL	SRP	SRM/E	CWM	SLL	Alloy 825 MI	SRF	SRF-RG	HWM
Max. Maintenance Temp. (°F)	150	225	302	320	302	900	100	50	225
Max. Exposure Temp. (°F) Power Off	185	275	420	400	450	1,100	185	185	275
Max. W/Ft.	10	15	20	12	12	50	8	12	15
Max. Circuit Length (Ft.)	95-660	55-750	150-750	225-900	7,500	330-1,000	180-660	135-540	500-800
Buss Wire Size	16	16	16	12	16,14,12,10	N/A	16	16	16
Voltages	120, 208-277	120, 208-270	120, 208-277	120, 208-277, 480	120-600	Up to 600	120, 208-277	120, 208-277	120, 208-270
Hazardous Ratings	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Usable on Plastic Pipe	Yes	No	No	No	No	No	Yes	Yes	Yes
Cut-to-Length in Field	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Field Splicable	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Can be Overlapped	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Output Varies with Temp.	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Varies Output Along Length	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Design of System	Simple	Simple	Simple	Simple	Involved	Involved	Simple	Simple	Simple
Installation of System	Easiest	Easiest	Easiest	Simple	Simple	Involved	Easiest	Easiest	Easiest
Fire Resistance	Fair	Fair	Fair	Fair	Fair	Excellent	Fair	Fair	Fair
Chemical Resistance	See Corrosion Guide, next page								
Size (Max. In.)	.435x.185	.435x.185	.435x.185	.435x.235	.435x.185	0.4	.435x.185	.435x.185	.435x.185
Accessories	DL/EL/U	D/UL	DL/U	DL/EL/U	U		DL/EL/U	RG Access.	DL/U
Monitor Wire Available	Yes	Yes	Contact Factory	Contact Factory	No	No	No	No	Yes
Applications	FL,PL	FL,FH, PL,PH	FL,FH, PL,PH	FL,FH, PL,PH	FL,FH, PL,PH	FL,FH, PL,PH	FL	RG	HWM
	FL = Freeze Protection FH = Freeze Protection, High Exposure Temp. PL = Process Maintenance, Low Temperature				PH = Process Maintenance, High Temperature RG = Roof and Gutter De-icing HWM = Hot Water Maintenance				

HEAT TRACING PRODUCTS

Heat Tracing Products

Application & Selection Guidelines *(cont'd.)*

Agency Approvals

Area	SRL-C	SRL-CR	SRL-CT	HSRL	SRM/E-C	SRM/E-CT	SRP	HSRM	CWM-C	CWM-CT	MI	SRF-C	SRF-CR	SRF-RG	HWM
Ordinary Area															
UL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Factory Mutual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CSA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ATEX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Class 1 Div 2, Groups B,C,D															
UL															
Factory Mutual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
CSA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
ATEX															
Class II Div 2, Groups F,G															
UL															
Factory Mutual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
CSA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
ATEX															
Class III Div 2															
UL															
Factory Mutual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
CSA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
ATEX															
Class 1 Div 1, Groups B,C,D*															
UL															
Factory Mutual				✓				✓							
CSA			✓	✓	✓			✓				✓			
ATEX															
Class II Div 1, Groups F,G															
UL															
Factory Mutual				✓				✓							
CSA			✓	✓	✓			✓				✓			
ATEX															
Class III Div 1															
UL															
Factory Mutual				✓				✓							
CSA				✓				✓				✓			
ATEX															
Zone 2 and Zone 22															
Factory Mutual							✓				✓				
CSA											✓				
ATEX			✓			✓									
Zone 1 and Zone 21															
Factory Mutual											✓				
CSA											✓				
ATEX															

*Class I, Division I, Groups B,C & D - UL, CSA, FM - Contact your Local Chromalox Sales office for design assistance.

Corrosion Guide to Select Proper Cable Construction

Exposure To	Industrial								Commercial		
	SRL	SRM/E	SRP	HSRL	HSRM	CWM	SLL	Alloy 825 MI	SRF	SRF-RG	HWM
Moisture	C, CR, CT	C, CT	C, CT	CT	CT	C, CT	CT	Yes	C, CR	Yes	C, CT
Aqueous Solutions of Inorganic Compounds	CR, CT	CT	CT	CT	CT	CT	CT	No	No	No	CT
Liquids Organic Chemicals	CT	CT	CT	CT	CT	CT	CT	Yes	No	No	CT
Acids or Bases	CT	CT	CT	CT	CT	CT	CT	No	No	No	CT

Note — This is a recommendation guide. Chromalox cannot warrant any Electric Heat Trace against failure by sheath degradation if such failure is the result of operating conditions beyond the control of the heater manufacturer. It is the responsibility of the purchaser to make the ultimate choice of sheath material based on knowledge of the chemical composition of the corrosive solution, character of materials entering the solution, and controls which maintains the process.

Heat Tracing Products

Application & Selection Guidelines (cont'd.)

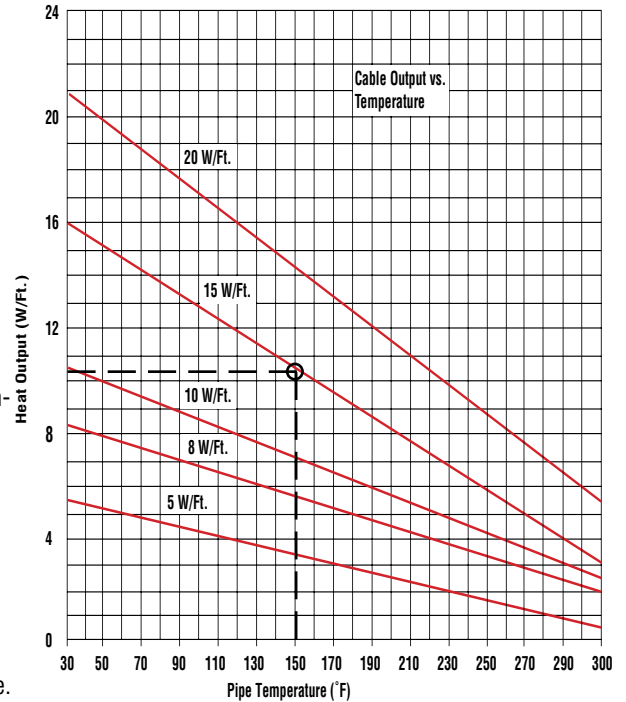
Required Jacket Material

Select the appropriate jacket configuration for the desired level of mechanical and corrosive chemical protection. The CR over-jacket option can be used when additional mechanical protection is desired. The CR over-jacket option is required when the cable can be exposed to aqueous inorganic chemicals. The CT over-jacket option is required when the cable can be exposed to organic chemicals or strong corrosives. Use Corrosion Guide above to determine the correct jacket material option for the cable type selected.

Step 3 — Select Heating Cable Wattage Rating

After calculating the heat loss in the pipe and adjusting for any application deviations, you may determine which cable rating to use. If you have selected a self-regulating cable you must adjust the output based on maintenance temperatures, using the Thermal Output Rating Graphs shown on the individual product pages, select the lowest cable rating that will provide the pipe maintenance temperature. **For Example:** A 15 W/Ft. SRM/E cable @ 150°F will output approximately 10 W/Ft. Multiple passes or runs of cable may be required to provide sufficient output per foot calculated in Step 1. This is accomplished with parallel runs of cable or spiraling. Contact your Local Chromalox Sales office.

Cable Output vs. Temperature



Step 4 — Determine Total Length of Cable Required

The total amount of heating cable is determined by adding the total footage of pipe to be traced and adding for allowances for the components such as flanges, valves, pipe supports; then, multiply by the total number of runs or Wrap Factor determined in Step 3.

(Total Feet of Traced Pipe + Cable Allowance for Components) x # of Runs = Total Cable Length

Step 5 — Determine Circuits & Circuit Protection

Circuit protection depends on the breaker size being used and the start-up temperature. The National Electric Code (NEC 1996) requires the use of ground fault protection breakers for heating cable. Refer to the specific data of the individual heat trace cable to determine maximum circuit lengths. To determine the number of circuits required for each pipe, divide the total cable length found in Step 4 by the maximum circuit length found in the individual cable data charts. Round up to the next higher number.

$$\text{Number of Circuits} = \frac{\text{Cable Length}}{\text{Maximum Circuit Length}}$$

Pipe Component Cable Allowance Estimation

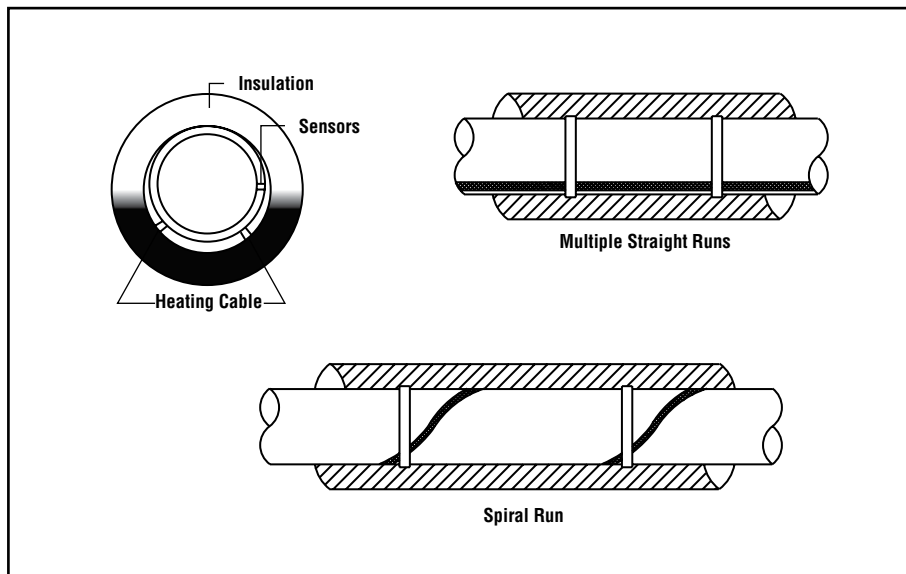
Component	Cable Allowance Factor (Ft.)	x	# Components	Total Additional Cable
Flange Pair	1.5	x		
Pipe Support	2.0	x		
Butterfly Valve	2.5	x		
Ball Valve	2.7	x		
Globe Valve	4.0	x		
Gate Valve	5.0	x		

Example: Pipe: 150 feet
 Valves: 1 globe valve
 Pipe Supports: 2
 Flanges: 2
 Total Cable Length = [150 + (1 x 4) + (2 x 2) + (2 x 1.5)] x 2 runs
 = 161 feet x 2 runs
 = 322 feet

Heat Tracing Products

Application & Selection Guidelines (*cont'd.*)

Design of Multiple Runs when Heat Requirements Exceed Cable Output Ratings



Step 6 — Select Controls & General Application Accessories

Chromalox provides a wide range of termination accessory and control options for your heat tracing systems needs.

Accessory options range from ordinary area under the insulation kits in our EL series all the way through connections and terminations for Division 1 hazardous areas in our HL series. The accessories carry a full complement of third party approvals from UL, Factory Mutual, Canadian Standards, ATEX and IECex.

Controls range from Thermostats for both ambient air and pipe/tank sensing applications to WeatherTrace power distribution and controls panels through our IntelliTrace line of distribution, monitoring and control panels. Whether your project is a few lines of freeze protection or a few hundred lines of process piping we have the right control option for your needs.

Accessory Descriptions

U Series

- Designed for Ordinary and Hazardous Area use in Industrial applications
- Integrated design allows for quick cable termination
- Line carries worldwide approvals including ATEX and IECex
- Reduced parts count results in fast installation times
- Line includes:
 - Power Connection
 - Multi Entry Connection (for splice, tee or multiple power to 3 cables)
 - Above Insulation End Seal
 - Below Insulation End Seal
 - Lighted End Seal
 - Ambient Thermostat
 - Line Sensing Thermostat
 - Lighted End Seal

Thermostats also serve as power connection for cable - eliminating need for extra power connection box.

DL Series

- Designed for Ordinary and Hazardous Area use in Industrial Applications
- Integrated design allows for fast installation
- Box design allows easy access for field wiring, maintenance and trouble shooting
- CSA, Factory Mutual and UL approved for ordinary and Hazardous area use (Div. 2)
- Line Includes
 - Power Connection
 - Splice and Tee (connect up to 3 cables)
 - Below Insulation End Seal
 - Lighted End Seal (ordinary area use only)
 - Ambient Thermostat
 - Line Sensing Thermostat
- Thermostats also serve as power connection for cable - eliminating need for extra power connection box.

Heat Tracing Products Application & Selection Guidelines *(cont'd.)*

EL Series

- Designed for use in ordinary areas for both commercial and industrial applications
- Low profile designs allow for ease of insulation around connections
- Kits include standard electrical terminations and heat shrink products familiar to most installers
- Low parts count allows fast termination of cables
- Third Party Approvals through UL, Factory Mutual and CSA.
- Line Includes
 - Junction Box
 - Pipe Stand off with sealing grommets and cable boots
 - Heat shrink splice and tee kits
 - Heat Shrink end caps

HL Series

- Specifically designed for use in Division 1 hazardous areas
- Corrosion Resistant housing made of high strength cast aluminum
- Reduced parts count for fast installation
- Small profiles for ease of insulation
- Line Includes
 - Power Connection
 - Splice Kit
 - Tee Kit
 - End Seal Kit
 - Add on Signal lights for End Seal and Power Connection

Controls Descriptions

DL Controls

The DL Series temperature controls are available in four models to handle a broad range of applications. Models include two ambient sensing and two line sensing thermostats. These high quality models combine On/Off temperature control and cable power connection in one affordable, convenient easy to install package. The line includes two 22 amp capable models for Ordinary Area installations and two 11 amp capable hermetically sealed models for Division 2 hazardous area applications. Products carry UL, Factory Mutual and CSA approvals.

EL Controls

The EL controls line contains ambient and line sensing controllers for use in Division 1 and Division 2 areas. All products switch 22 amps and come in NEMA 4x and NEMA 7 rated enclosures. Two models are available in dual output form. All capillaries are nontoxic oil filled available in 8 and 10 foot lengths. Products carry UL, Factory Mutual and CSA approvals.

WeatherTrace Control and Distribution Panels

The Chromalox FPAS, FPASM, FPLS, and FPLSM series panels offer power distribution, ground fault protection, individual circuit alarming, with options for both line sensing and ambient sensing control. Line sensing is accomplished in conjunction with U SERIES, DL SERIES or EL SERIES thermostats. Ambient sensing can be accomplished with thermostats or optional Chromalox solid state 1604 series temperature controllers. The panels are housed in NEMA 4 enclosures for indoor/outdoor applications. NEMA 4X 304 stainless steel enclosures may be selected as an option for more harsh environments. The standard models are available in 12,18,20,30 and 42 position panel boards with 100 and 225 amp bus ratings in single and three phase configurations. Branch circuit breakers are available in 20, 25, 30 and 40 amp single pole and two pole configurations with 30mA ground-fault equipment protection. Options for Z-purge systems for hazardous area installation are available. Sentinel monitoring system is available for alarm indication when a circuit loses power. Common alarm available for interface to building management systems. Panels are built in a UL 508 certified manufacturing plant and carry UL and cUL approvals.

DTS Digital Thermostat

The DTS-HAZ is a single circuit controller which switches 30 Amps at 100-277 Vac in Class I, Division 2 areas. It employs SSR on/off control, soft start feature, programmable paramater values, AC or DC alarm and large LED display. It comes complete with a standard pipe stand or optional wall mount as well as an RTD sensor. All of this is housed in a 6" x 6" enclosure, wich facilitates all wiring needs.

IntelliTRACE® ITC Series

The ITC is a 1 or 2 circuit microprocessor-based temperature controller, switching 40 Amps per circuit at 100-277 Vac, and may be used in either freeze protection or process temperature control applications. The ITC's compact 10" x 8" x 6" NEMA 4X enclosure facilitates all of the electrical connections and it features a high resolution TFT display, PID or On/Off SSR control, selectable soft start program, dual RTD sensor input per circuit, current load and GFEP monitoring. All process variables may be monitored both locally and remotely. The ITC is designed for line or ambient sensing heat trace applications in hazardous (Class I, Division 2) or non-hazardous areas.

Should the ITC unit realize a failed sensor, the controller automatically switches into a user adjustable manual output duty cycle. This controller provides LED indication of load, power and alarm status for each circuit, has front panel capacitive touch user interface buttons and comes complete with heavy gage stainless steel mounting brackets.

IntelliTRACE Control, Monitoring and Distribution Panels

The IntelliTRACE ITAS and ITLS Series is a micro-processor based Control/Monitoring and Power Management and Distribution system for Heat Trace Applications. The ITAS and ITLS Series has models suitable for ordinary as well as Class I, Division 2 areas and will manage 6-72 circuits

The ITAS and ITLS Control Panel Series provides alarms for high / low temperatures, high/low current, ground fault leakage and sensor faults.

The 40 Amps per circuit capacity, the Integral Circuit Panel and the Soft Start feature save significant time, installation and maintenance costs.

The customizable I/O (Sensor) Mapping, the remote monitoring capability and the wireless communication option provide desirable process management flexibility options.