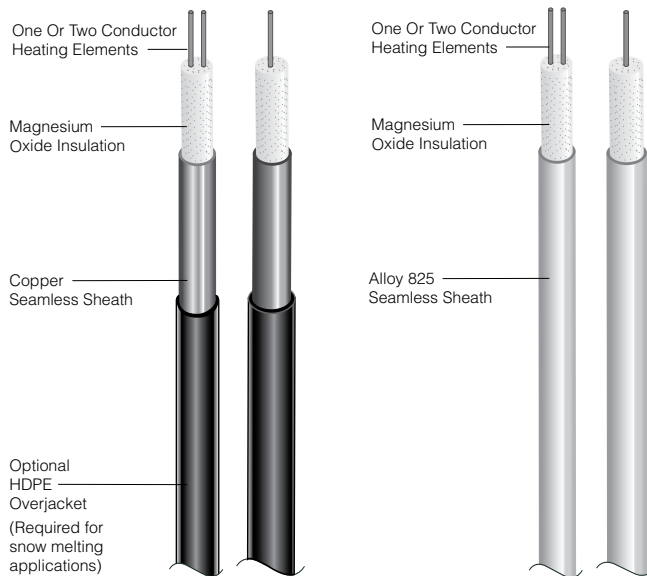


## MINERAL INSULATED (M.I.) HEAT TRACE CABLE ASSEMBLY

### One Conductor And Two Conductor

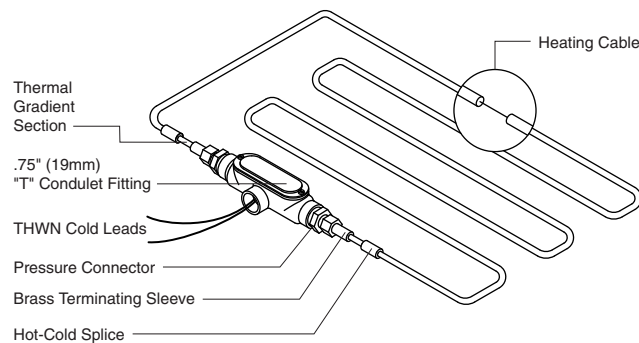


#### DESCRIPTION

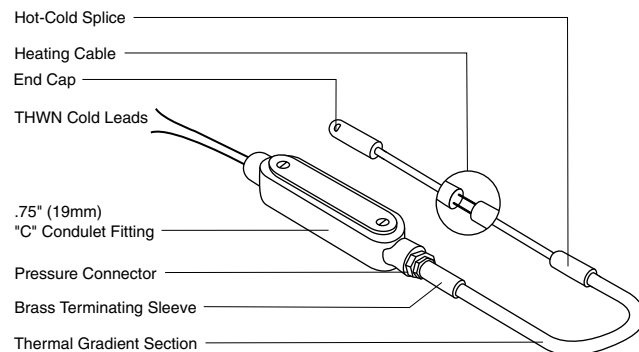
Mineral insulated (M.I.) cable consists of one or two solid conductor heating elements embedded in highly compressed magnesium oxide covered by a copper or an seamless Alloy 825 stainless steel sheath. Application requirements determine resistance size and sheath material

#### M.I. HEATING CABLE ASSEMBLY TERMINOLOGY:

- M.I. Cable - Raw mineral insulated cable.
- Thermal Gradient (TG) Section - Temperature transition section from M.I. heating cable to 19-strand cold lead.
- M.I. Heating Cable Assemblies - Generic term for Delta-Therm's end use mineral insulated cable assemblies.
- M.I. Hangar Door Rail De-icing Cable Assembly - Factory built M.I. heating cable assembly for hangar door rail de-icing applications.
- M.I. Snow Melting Cable Assembly - Factory built M.I. heating cable assembly for snow melting applications.
- M.I. Roof De-icing Cable Assembly - Factory built M.I. heating cable assembly for roof, gutter, and downspout de-icing applications.
- M.I. Radiant Heating Cable Assembly - Factory built M.I. heating cable assembly for radiant heating or floor warming applications.
- M.I. Permafrost Prevention Cable Assembly - Factory built M.I. heating cable assembly for freezer floor permafrost prevention applications.
- M.I. Pipe/Tank Trace Cable Assembly - Factory built M.I. heating cable assembly for pipe or tank trace applications.



**Detail 1. One conductor cable assembly.**



**Detail 2. Two conductor cable assembly.**

#### TERMINATION CONSTRUCTION

Each Delta-Therm M.I. heating cable assembly is fully terminated and moisture proof. The end termination consists of a thermal gradient section connected to 20' THWN cold leads. The 19-strand cold leads are crimped and soldered to the thermal gradient section, insulated with a high-dielectric, high-temperature tape, and epoxy potted in a rigid brass sleeve.

The thermal gradient (TG) section is silver soldered to the solid conductor(s) heating element and protected by a rigid brass sleeve packed with magnesium oxide.





## RECOMMENDED WATTS PER LINEAL FOOT AND CABLE SPACING

	Area	Watts	Centers	Cable
<b>Snow Melting</b>	Pedestrian In. (mm)	27	6" (152) Centers	One or two conductor copper with required HDPE overjacket
	Vehicle In. (mm)	22	6" (152) Centers	
	Vehicle In. (mm)	27	8" (203) Centers	
	Hangar Door	25	Attach to outer bottom (Rail de-icing) flange of rail	
<b>Roof De-icing</b>	Roof (Metal)	8-12	2x Length of roof	One or two conductor copper with optional HDPE overjacket or Alloy 825 Seamless Sheath
	Roof (Plastic or composition)	5-7	2x Length of roof	
	Roof and Gutter (Metal)	8-12	3x Length of roof	
	Roof and Gutter (Plastic or composition)	5-7	3x Length of roof	
<b>Radiant Heating</b>	Floor Warming In. (mm)	6	6" - 8" centers (152 - 203)	One or two conductor copper with optional HDPE overjacket
(With Radiant Heat, do not exceed 7.5 watts per lineal foot.)				
<b>Pipe/Tank Trace</b>	External or internal length of pipe or area of tank	See design guide	Straight length of piping (no branches); Do not spiral	One or two conductor copper with optional HDPE overjacket or Alloy 825 seamless sheath
<b>Permafrost Prevention</b>	Freezer Floor In. (mm)	4-12	4" Centers (122)	Two conductor copper with optional HDPE overjacket or Alloy 825 seamless sheath

## APPROVALS

M.I. heating cable assemblies are UL Listed and CSA Certified for embedded snow melting; embedded radiant floor heating; roof gutter, and downspout de-icing; permafrost prevention, hanger door rail de-icing, external pipe tracing, internal tracing of metal pipes, and tank tracing applications.

- M.I. snow melting cable assemblies can be embedded outdoors in concrete, asphalt, and sand beds.
- M.I. radiant floor heating cable assemblies can be embedded indoors in concrete.
- M.I. roof de-icing cable assemblies can be installed on top of most common roof materials; inside of gutters, scuppers, drains, and downspouts.
- M.I. permafrost prevention cable assemblies can be installed in the ground beneath freezer floor insulation.
- M.I. pipe/tank trace cable assemblies can be attached to the outside of metal or pvc pipes and tanks.
- M.I. pipe/tank trace cable assemblies can be used to internally trace the inside of metal pipes.

## FEATURES OF M.I. HEATING CABLE ASSEMBLIES

### NUMEROUS VOLTAGES

Delta-Therm can design M.I. snow melting cable assemblies for any voltage up to 600 volts.

### FLEXIBLE

M.I. cable is annealed (annealing tempers metal and removes brittleness) and easy to form and install. Irregular areas and obstacles are easily accommodated.

### CORROSION RESISTANT

Copper jacketed cable and Alloy 825 are corrosion resistant. They resist oils, solvents, gasoline, and numerous acids. Copper jacketed cables can also be ordered with a high density polyethylene jacket (HDPE) for added protection against corrosive chemicals.

### HDPE JACKETING

Extruded, high-density polyethylene jacketing adds physical strength and protects against abrasions and corrosives such as calcium chloride and salt.

### FIRE RESISTANT

M.I. cable construction will not contribute to or cause an electrical fire.

### NO DEGRADATION

Delta-Therm M.I. cable is made of inorganic materials. Degradation of M.I. cable is negligible when compared to cables made of organic materials such as plastic.

### UNIQUE TERMINATION DESIGN

Full-rated ampacity, 19-strand THWN pigtails can be any length. Flexible, stranded wire diminishes the risk of cold working failures. Any length feature allows junction boxes to be placed in remote, dry locations and prevents damage caused by condensation.

### COMPREHENSIVE FACTORY TESTING

Each cable undergoes hi-pot, Insulation Resistance (IR), and Total Resistance (TR) tests both before and after overnight immersion in water.

### LOW INSTALLATION COSTS

M.I. cable arrives ready to install. Since terminations are done at the factory, electricians can expedite the installation, helping to reduce overall installation costs.



Warning: Mineral Insulated Cable must be installed by a qualified electrician. All assembly, installation, and test instructions must be followed. Improper installation can result in property damage, serious injury, or death due to electric shock. Please call Delta-Therm Corporation at 1-800-526-7887 with any installation or operating questions.

## STANDARD TERMINATIONS

Applications	Prefix	Thermal Gradient	Cold Leads
<b>Radiant Heating/ Floor Warming</b>	F	2.5' (76cm)	20' (6m)
<b>Hanger Door Rail De-icing</b>	H	2' (60cm)	20' (6m)
<b>Other</b>	O	please specify	20' (6m)
<b>Pipe/Tank Trace</b>	P	5' (152cm)	20' (6m)
<b>Roof Gutter De-icing</b>	R	5' (152cm)	20' (6m)
<b>Roof Gutter De-icing (Metal)</b>	M	5' (152cm)	20' (6m)
<b>Snow Melting</b>	S	2.5' (76cm)	20' (6m)
<b>Permafrost Prevention</b>	T	3' (91cm)	20' (6m)

## STANDARD COLD LEAD LENGTHS

20' (6m) 19-strand THWN cold leads are standard on all M.I. heating cable assemblies. If longer cold leads are needed, please specify at time of order.

19-strand THWN cold lead can be of any length up to 200' (61m).

## COLD LEAD WIRE SIZE

Amps	Wire Size
<b>0-16</b>	12 AWG
<b>16-24</b>	10 AWG
<b>24-45</b>	8 AWG
<b>45-65</b>	6 AWG

## MATERIAL TEMPERATURE LIMITS

<b>HDPE Overjacket* °F (°C)</b>	194** (90°)
<b>Copper °F (°C)</b>	392° (200°)
<b>Stainless Steel °F (°C)</b>	1100° (593°)

\*HDPE overjacketed cable may be exposed to higher temperatures during installation in asphalt.

## CONTROLS

<b>Snow Melting</b>	DTC120-S	Automatic snow melt control
	DTC120-PS	Automatic snow melt control
	MPS	Automatic snow melt control
<b>Roof De-icing</b>	DTC120-G	Automatic roof de-icing control
	MPS	Automatic roof de-icing control
<b>Radiant Heating</b>	UDG-4999	Electronic floor warming thermostat
<b>Pipe/Tank Trace or Permafrost Prevention</b>	OTS-F1	Ambient or line sensing thermostat
	A419ABC-1	Electronic line thermostat and display
	A419AEC-2C	Electronic line thermostat and display

## PANELS

<b>DT-XXPXXX</b>	Enclosed Contactor
<b>GFPE-X-X</b>	Power Control Panel w/GFPE
<b>LNR-X</b>	Low Noise Relay Panel
Custom Control/Monitor/Alarm Panels	

## ACCESSORIES

<b>Snow Melting</b>	PPS-GS-75	Galvanized steel strapping
	PPS-SS-75	Stainless steel strapping
	NEC Plaque	Embedded heating system's marker
<b>Roof De-icing</b>	DT-AS-50	Roof clips for asphalt or metal roofs (50 count)
	RM-25-AL	Aluminum clips for metal roofs (25 count)
	Specialty Clips	Specialty clips roof materials other than metal or asphalt
	DSH	Downspout hanger
<b>Radiant Heating</b>	PPS-GS-75	Galvanized steel strapping
	NEC Plaque	Embedded heating system's marker
<b>Pipe/Tank Trace</b>	T-ALXXX	Aluminum heat distribution tape
	T-FXXX	Fiberglass banding tape
	CL-X	Caution labels
	DT Box	Electrical junction box

## MINERAL INSULATED (M.I.) HEAT TRACE CABLE FOR INTERNAL TRACING OF METAL PIPES TWO CONDUCTOR ONLY

### DESCRIPTION

Where possible, pipes should be traced externally to permit cleaning of the line without removing the heater. However, for existing buried lines, internal tracing will save expensive excavation and avoid removal of insulation if a failure occurs.

### DESIGN REQUIREMENT

Heat loss calculations are the same as with external pipe tracing although excess cable is not allowed. The heater length must match the pipe length as the heater is pulled into the pipe and excess cable cannot be used. Valves and pumps must be traced externally.

.75" (19mm) NPT gland connectors are supplied to provide a liquid tight seal where the thermal gradient section emerges from the pipe. Typical cable output can range from 3 to 20 watts per linear foot (10 to 66 watts per lineal meter) of cable. (Output may be higher than required due to restrictions such as voltage and cable length.)

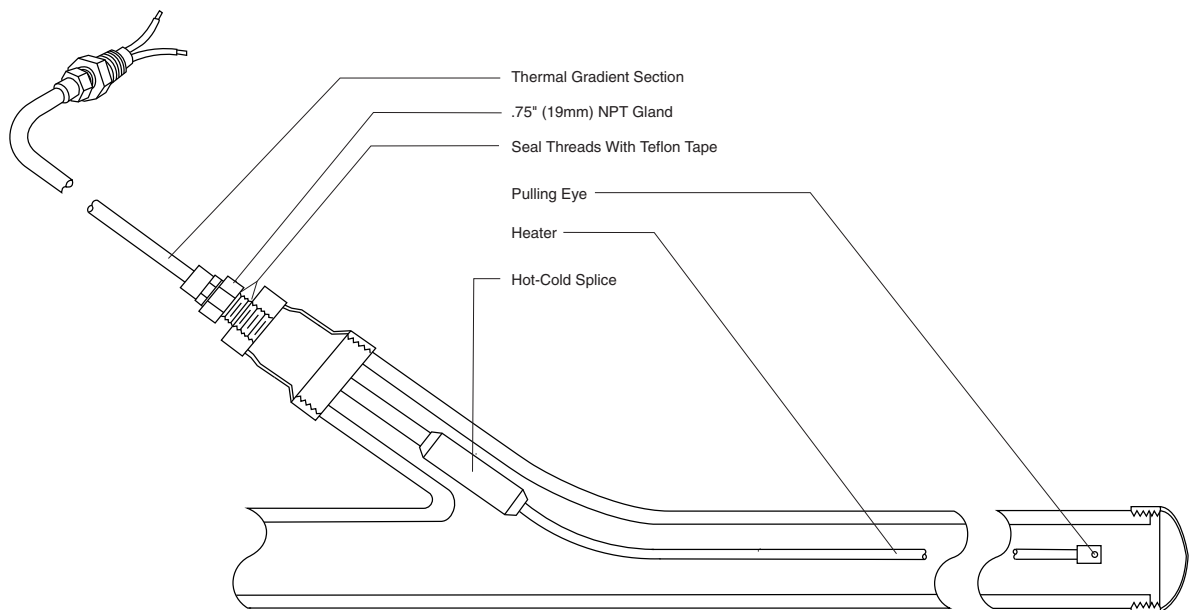
### BENEFITS

- Easy to install. (Pulling eye for easy installation)
- Safe, automatic\* and dependable.
- Removable/replaceable - In key areas with a minimum of construction.

### APPLICATIONS

- Any "hard-to-get-at" areas.
- Closed hose bibs
- Freeze protection
- Limited access piping
- Prisons
- Outdoor drains

\* The system should be controlled by a thermostat.



Detail 1. Typical Detail For Internal Tracing/Metal Pipes.



**WARNING:** Pulsating conditions may cause fatigue failure. Do not pull through valves or pumps. More than 45° of bend in a pipe may cause cable to bind during installation. Fitting may require soft solder "sweating" to maintain watertight connection. System must be grounded.



**MINERAL INSULATED (M.I.)  
ALLOY 825 S.S. HEAT TRACE CABLE ASSEMBLY  
ONE CONDUCTOR AND TWO CONDUCTOR**

**DESCRIPTION**

Delta-Therm seamless Alloy 825 sheath was developed to meet the demands of corrosive environments that are severe and/or unusual. Delta-Therm uses only seamless Alloy 825 tube to avoid the potential problems associated with seam-welded tube used by most heat tracing manufacturers.

Independent laboratory reports have shown Alloy 825 to be superior to most other alloys including Inconel 600. After many years experience with other materials, we have standardized on Alloy 825 as the sheath material on our high temperature heating cable.

**RESISTANCE TO REDUCING ENVIRONMENTS, STRESS CORROSION AND OXIDIZING ENVIRONMENTS**

The relatively high nickel content of alloy 825, plus molybdenum and copper, makes it considerably more resistant to reducing environments (such as sulfuric or phosphoric acids) than most of the common stainless steels. It also effects a high resistance to stress corrosion cracking in chloride or alkaline environments. The chromium content, in combination with the nickel, makes the alloy resistant to a variety of oxidizing environments such as nitric acid solutions, nitrates and oxidizing salts.

**APPEARANCE**

Metallic, 32 micro inch rms finish, or smoother with dull gray finish.

**CARBIDE PRECIPITATION**

Austenitic stainless steels such as type 304, and also many high nickel alloys such as alloy 600, are subject to carbide precipitation at grain boundaries when operated in, or cooled slowly through, the range of -800°F (-427°C) to 1599°F (871°C), rendering the metal susceptible to intergranular attack.

The presence of titanium, plus the low carbon content of alloy 825, makes it relatively immune to this phenomenon at these temperatures. Alloy 825 can be used at temperatures up to 1472°F (800°C) in normal atmospheres.

**LIMITING CHEMICAL COMPOSITION, % BY WEIGHT:**

<b>Nickel</b>	38 - 46
<b>Carbon</b>	0.05 Max.
<b>Manganese</b>	1.0 Max.
<b>Iron</b>	Balance
<b>Sulfur</b>	0.03 Max.
<b>Silicon</b>	0.5 Max.
<b>Copper</b>	1.5 - 3.0
<b>Chromium</b>	19.5 - 23.5
<b>Aluminum</b>	0.2 Max.
<b>Titanium</b>	0.6 - 1.2
<b>Molybdenum</b>	2.5 - 3.5

**EQUIVALENT ANALYSIS**

<b>Material No.</b>	2.4858
<b>DIN/SEW</b>	17744
<b>ASTM/ASME</b>	B423-425
<b>UNS. No.</b>	N 08825
<b>BS</b>	3072-3076
<b>BS No.</b>	NA16

**ALLOY HEAT TRACE CABLE ASSEMBLY QUICK REFERENCE GUIDE\***

Alloy	Description	Nominal Chemical Composition, % (Major Element)				Thermal Conductivity Btu-In/ Ft. 2-hr-°F(W/m-C)		High Temperature Resistance +1000°F (+540°C)		Corrosion Resistance									
		Nickel (+Cobalt)	Iron	Chromium	Other	70°F (21°C)	1500°F (816°C)	Oxidation	Carburization	Sulfuric Acid	Hydrochloric Acid	Hydrofluoric	Phosphoric Acid	Nitric Acid	Organic Acid	Alkalis	Salts	Seawater	Chloride Cracking
INCONEL Alloy 600 Nickel Chromium	High nickel, high chromium content for resistance to oxidizing and reducing environments; for severely corrosive environments at elevated temperatures.	76	8	15.5		103 (15)	193 (28)	G-E	G-E	A	NR	A	A	A	G-E	G-E	G-E	A	G-E
INCOLOY Alloy 825 Nickel - Iron- Chromium	Excellent resistance to wide variety of corrosives. Resists pitting and intergranular type corrosion, reducing acids and oxidizing chemicals.	42	30	21.5	Mo 3.0 Cu 2.2	77 (11)	164 (23)	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E

\* From Huntington Alloys Publication 78-348-2

