Installation Instructions
MINERAL INSULATED (M.I.) SNOW MELTING CABLE ASSEMBLY

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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.
**Section 1. Overview**

### 1.1 PRECAUTIONS

- Installation in accordance with the National Electric Code and local electrical codes. Do not bend cable within 3” of a termination. (Terminations labeled DO NOT BEND HERE)
- Do not bend cable tighter than 3” inside diameter.
- Do not twist, kink, or spiral the cable.
- Do not pull cable from coil. Roll coil to unreel cable.
- Test the cable before installation with a 500 VDC insulation resistance tester and multimeter (ohm meter).
- Do not overlap heating cable.
- All related components and controls should be properly rated for the specified location classification.
  Do not alter the M.I. cable length in the field, as this will damage the system and void all warranties.
- Minimum center to center spacing per the NEC is 1”
- Minimum installation temperature is -20°C
- The metal sheath of the M.I. cable needs to be bonded to a suitable earth terminal.

### 1.2 M.I. CABLE AND COMPONENTS

Each M.I. cable assembly is factory terminated. Each M.I. snow melt cable assembly includes a base kit. Each base kit includes:
- (1) .75” conduit body (C or T type)
- (1) Bag of Delta Dry hydroponic powder
- (1) Piece of duct-seal
- Required pressure connector(s)

Each M.I. cable has a UL or CSA label attached to the THWN cold lead within 3” of the brass terminating sleeve stating in order:
- Cable type prefix
- Number of conductors
- Cable resistance
- Cable length in feet
- Operating voltage
- Current draw
- Total wattage
- Watts per lineal foot

Note: Do not remove the UL or CSA label.

### 1.3 GENERAL ACCESSORIES

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<tr>
<td><strong>Product Number</strong></td>
<td><strong>Description</strong></td>
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<tr>
<td>EHSM</td>
<td>Brass Identification Marker</td>
</tr>
<tr>
<td>PP-GS-75</td>
<td>Pre-punched galvanized steel strapping</td>
</tr>
<tr>
<td>PP-SS-75</td>
<td>Pre-punched stainless steel strapping</td>
</tr>
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Custom Control/Monitor/Alarm Panels

**Controls**

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<th>Product Number</th>
<th>Description</th>
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<tr>
<td>DTC-24S</td>
<td>Snow Melting Control</td>
</tr>
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<td>DTC-24A</td>
<td>Snow Melting Control</td>
</tr>
<tr>
<td>MPS W/MP</td>
<td>Snow Melting Control</td>
</tr>
<tr>
<td>RID</td>
<td>Remote Indicator/Activation Timer</td>
</tr>
</tbody>
</table>
Section 1. Overview

1.4 TOOLS RECOMMENDED
- 500 VDC insulation resistance tester
- Digital multimeter
- Clamp-On Ammeter
- Adjustable wrench
- Flat head screwdriver
- Fastening system (as required): nylon cable ties, pre-punched strapping, or metal ties

1.5 SITE PLAN
Delta-Therm offers engineered drawing services as outlined in our Price List. If drawings were ordered, please compare the drawing bill of materials to materials supplied with your order and verify that you received all of the Delta-Therm components. Before starting the installation verify the proper location and layout of heating cable(s), control(s), and/or accessories.

1.6 CABLE STORAGE
All M.I. cables should be stored in a cool, dry location. Cables should be protected from damage. Following the cable testing instructions in section 4, test all cables removed from storage and record the readings on the warranty card.

1.7 CABLE LABELING
Delta-Therm Mineral Insulated Heating Cables are UL listed and CSA certified for embedded applications in concrete, asphalt, and paver based products. Each cable has a UL or CSA label attached to the THWN cold lead within 3” (76mm) of the metal sleeve. The label states the following information in order: cable type (prefix, number of conductors, and cable resistance), cable length, operating voltage, current draw, total wattage, watts per lineal foot, and cold lead length. The cable has a standard THWN cold length of 10’ (3m).

1.8 CABLE TESTING
Please refer Section 3 for all cable testing procedures.

1.9 SITE PREPARATION
Review installation, engineering, electrical, and/or architectural drawings prior to installation. Verify that available voltage is the same as the cable operating voltage indicated on the UL or CSA label. Install conduit from the cable feed points to an indoor or dry junction box, continuing to the power panel per site plan. Install appropriate grounding system per prevailing electrical code.

Provide a system for relief of condensation or moisture in the conduit system. Install conduit expansion joints anywhere the conduit crosses a planned expansion joint. Be sure the ground is maintained across the expansion joint.

Cap or plug all conduit openings temporarily before installing the M.I. cable, ensure that all surfaces which the cable may come in contact with are free from sharp edges and protect cable from items that may cut or cause damage.

1.10 PROPER CABLE HANDLING
Always unroll the coil of M.I. cable. Do not pull the cable in a helix fashion. Please refer to Detail 1 and Detail 17 to review single and dual conductor cable finished assembly and base kit components.

1.11 NEC CODE
Please consult NEC Article 426 Fixed Outdoor Electric Deicing and Snow-Melting Equipment with attention to:

Section 426.20 Embedded Deicing and Snow-Melting Equipment.

Section 426-13 Identification
The presence of outdoor electric deicing and snow-melting equipment shall be evident by the posting of appropriate caution signs or markings where clearly visible.

1.12 CONDUIT AND CIRCUIT WIRE
The cable assemblies require a permanently wired and grounded conduit system. Use only UL Listed (CSA Certified) weatherproof junction boxes.
Section 2. Installing M.I. Snow Melt Cable

2.1 INSTALLATION IN SLABS

Before starting the installation please refer to Section 1.5 Site Plan, Section 1.9 Site Preparation, and test cables following the directions in Section 3.1 Pre-Installation Testing. Please refer to Detail 1 and Detail 17 to review single and dual conductor cable finished assembly and base kit components.

1. Uncap conduit and swab if necessary to remove all moisture. Install the 75’ (19mm) T type conduit body (TB) so that the opening is face up. Install the pressure connectors into the TB.

2. Unpack and test cables.

3. Inspect the area to be heated. Verify that the cable depth will be between 2” (16mm) and 3” (76mm) below the finished surface. Cables may be fastened to rebar, or reinforcing wire mesh. Cables installed deeper than 3” (76mm) will have a longer warm up time at the surface and potential less heat at the surface.

4. Lay out the heating cable pattern using a chalk line or other means. Refer to the cable layout drawings for the pattern and spacing. If there isn’t a layout drawing, lay the zone out in a similar manner as the typical zone plan in section 2.3 and calculate spacing.

To calculate cable spacing, find the square footage of the area to be heated and divide by the length of cable given on the UL or CSA label. Multiply this number by 12 to get the approximate spacing in inches (mm) on center.

Example:
100 Sq. Ft. (31mm) area
200 Ft. (61m) of M.I. cable
100/200 = 0.5
0.5 x 12” (306mm) = 6” (152mm)

5. Feed one cold lead through a pressure connector until the metal termination sleeve is midway into the pressure connector. Wrap the UL or CSA label around the cold lead to feed through the connector. Tighten the connector.

6. Wrap the thermal gradient section around the TB as indicated on Detail 1. Roll the cable out carefully and fasten to the substrate using pre-punched stainless steel strap, metal clips, or nylon cable ties.

7. Bring the second lead back and wrap around the TB as indicated on Detail 1.

8. Pull the cold lead through the pressure connector until the metal sleeve is midway through the connector. Tighten the connector and pull the leads through the conduit to the junction box.

9. Test the cables for insulation resistance and total resistance. Record the readings.

10. Install the duct seal between the TB and the conduit. Fill the TB with Delta-Dry powder and seal with a gasket and cover.

Detail 1. The single conductor M.I. snow melting cable assembly is typically installed in slabs. The assembly is factory terminated and ships with a base kit as described in section 1.2.
Section 2. Installation

2.1 Slabs: Concrete, Asphalt, and Pavers

Detail 2. Plan of single conductor M.I. cable entry into the T type conduit body (TB). Pull cold leads through conduit and install duct seal. Fill the conduit body with Delta-Dry power, install gasket and cover.

Detail 3. Typical single conductor cable layout for a zone plan. The thermal gradient section is crossed over itself.

Detail 4. Expansion joint detail using a minimum 14"x16"x8" size malleable iron box under the slab. Box to be filled with sand.
Section 2. Installation

2.1 SLABS: CONCRETE, ASPHALT, AND PAVERS

Detail 5. Cables attached to rebar in a single pour concrete system.


Detail 7. Cables covered in asphalt cap, over asphalt.
Section 2. Installation

2.1 SLABS: CONCRETE, ASPHALT, AND PAVERS

Before starting the installation please refer to Section 1.5 Site Plan, Section 1.9 Site Preparation, and test cables following the directions in Section 3.1 Pre-Installation Testing. Please refer to Detail 1 and Detail 17 to review single and dual conductor cable finished assembly and base kit components.

1. Identify all areas where handrail holes are located or will be cored, and identify where any penetrations to the concrete will occur, i.e., signage, drains, or other.

2. Uncap conduit and swab if necessary to remove all moisture. Install the ¾" (19mm conduit body supplied with the M.I. cable to the conduit. Position the conduit body with the opening facing up. Install the provided pressure connector in the conduit body.

3. Unpack and test the M.I. cable per the cable instructions.

4. Inspect the area to be heated. Verify that the cable depth will be 2" from the finished surface of the stairs. Verify rebar or other cable supporting devices are in place and secured.

5. Refer to the cable layout drawings for the pattern and spacing required.

6. Insert one of the THWN wire cold leads (if using single conductor M.I. cable) or both THWN wire cold leads (if using a two conductor M.I. cable) into the compression connector and out of the conduit body. Be careful not to damage the wire insulation. Continue until the metal sleeve (where the wire connects to the M.I. cable) is midway through the compression connector. The cable UL or CSA label will need to wrap around the cold lead to feed through the connector. Tighten the connector. Position the wire as to avoid damage.

7. Position the thermal gradient section of the M.I. cable as shown in the cable layout drawing. Caution: do not bend the cable at the hot/cold junction (where larger diameter thermal gradient fitting connects to smaller diameter heating section of the M.I. cable).

8. Roll the M.I. cable out and position per the cable layout drawing. Attach the cable with pre-punched stainless steel strap, metal clips, or nylon cable ties as shown in the cable layout drawing.
Section 2. Installation

2.2 STAIRS: CONCRETE AND METAL PAN

9. When installing a single conductor MI cable the end of the cable must return to the conduit body. A second compression fitting should be installed into the T type conduit body. The cold lead wire shall feed through the compression fitting and out of the conduit body. Tighten the connector.

10. Pull the two cold lead wires through the 3/4" conduit to the junction box or control equipment. Test the cable at the junction box or control equipment for insulation resistance and total resistance. Record these readings.

11. Install the duct seal between the conduit body and connecting 3/4" conduit. Fill the conduit body with the supplied Delta-Dry powder and seal with the gasket and cover.

12. Do not apply power to the cable. The cable is must be embedded in concrete and the concrete sufficiently cured prior to energizing the cable.
Section 2. Installation

2.2 STAIRS: CONCRETE AND METAL PAN

Detail 13. Side view of M.I. cable installed in metal pan stairs. Install one dual conductor cable per tread at depth of 2-3” below finished surface.

Detail 14. Side view of M.I. cable conduit bodies in stringer.

Detail 15. Plan view of M.I. cable in a metal pan stair landing.
Section 2. Installation

2.2 STAIRS: CONCRETE AND METAL PAN

![Diagram of stair with M.I. Snow Melt Cable]

Before starting the installation please refer to Section 1.5 Site Plan, Section 1.9 Site Preparation, and test cables following the directions in Section 3.1 Pre-Installation Testing. Please refer to Detail 1 and Detail 17 to review single and dual conductor cable finished assembly and base kit components.

1. Do not place the cable in direct contact with the rail.
2. M.I. cable is to be embedded in concrete only for this application. Do not install the heated section in conduit. The only portion that can be placed in conduit is the THWN cold lead.
3. Space the cable 3 inches from the rail laterally and 2 inches from the finished concrete surface.
4. Place a 2 inch diameter semi-circle loop downward every 20 feet of straight MI cable for thermal expansion.
5. If snow melting adjacent area, space adjacent cable(s) on 6 inch centers into the adjacent area to be snow melted.
6. M.I. cable may be installed in a two pour type manner to eliminate saw cutting of concrete. The cable may be installed in a single pour manner by attaching cable to rebar, mesh, or other elevating or stand-off means.
7. The sensor for the automatic snow melting control system must be placed within the heated area of the slab, also in an area most indicative of snow conditions. The sensor shall not be obstructed from contact with falling snow, wind-blown snow, or moisture from the melting snow and ice through the course of de-icing.
8. No outdoor electrical splices are required. The M.I. cable shall be supplied with integral non-heating (cold-lead) connection wire of sufficient length to be routed through conduit to an indoor, appropriately rated junction box or power control device. Mount all electrical controls at least 48” above finished floor in an ordinary location.
9. The required amount of branch circuits shall route to a NRTL Listed contactor type power switching panel. The non-heating M.I. cable lead wire shall route to this panel.
10. The automatic snow melting control system shall control the contactor type panel by switching 120VAC to the contactor coils. The embedded snow/moisture sensor and ambient over-ride thermostat shall be 24 VDC class 2 wiring.

2.3 DE-ICING HANGAR DOOR RAILS

![Diagram of hangar door rail with M.I. Snow Melt Cable]

Before starting the installation please refer to Section 1.5 Site Plan, Section 1.9 Site Preparation, and test cables following the directions in Section 3.1 Pre-Installation Testing. Please refer to Detail 1 and Detail 17 to review single and dual conductor cable finished assembly and base kit components.

1. Do not place the cable in direct contact with the rail.
2. M.I. cable is to be embedded in concrete only for this application. Do not install the heated section in conduit. The only portion that can be placed in conduit is the THWN cold lead.
3. Space the cable 3 inches from the rail laterally and 2 inches from the finished concrete surface.
4. Place a 2 inch diameter semi-circle loop downward every 20 feet of straight MI cable for thermal expansion.
5. If snow melting adjacent area, space adjacent cable(s) on 6 inch centers into the adjacent area to be snow melted.
6. M.I. cable may be installed in a two pour type manner to eliminate saw cutting of concrete. The cable may be installed in a single pour manner by attaching cable to rebar, mesh, or other elevating or stand-off means.
7. The sensor for the automatic snow melting control system must be placed within the heated area of the slab, also in an area most indicative of snow conditions. The sensor shall not be obstructed from contact with falling snow, wind-blown snow, or moisture from the melting snow and ice through the course of de-icing.
8. No outdoor electrical splices are required. The M.I. cable shall be supplied with integral non-heating (cold-lead) connection wire of sufficient length to be routed through conduit to an indoor, appropriately rated junction box or power control device. Mount all electrical controls at least 48” above finished floor in an ordinary location.
9. The required amount of branch circuits shall route to a NRTL Listed contactor type power switching panel. The non-heating M.I. cable lead wire shall route to this panel.
10. The automatic snow melting control system shall control the contactor type panel by switching 120VAC to the contactor coils. The embedded snow/moisture sensor and ambient over-ride thermostat shall be 24 VDC class 2 wiring.
Section 2. Installation

2.3 DE-ICING HANGAR DOOR RAILS

Detail 17. Dual conductor M.I. snow melting cable assembly is installed to de-ice hangar door rails. The assembly is factory terminated and ships with a base kit as described in section 1.2.

Detail 18. Install dual conductor M.I. cable in new hanger rail installation. Embed cable 3" from rail and 2" below finished drain surface. Please refer to door rail manufacturer for exact rail configuration.

Detail 19. Install dual conductor M.I. cable in existing hangar rail installation. Saw cut and embed cable 3" from rail and 2" below finished drain surface. Please refer to door rail manufacturer for exact rail configuration.

Detail 20. Bend straight runs of M.I. cable every 20' for thermal expansion.
## Section 3. Testing and Trouble-Shooting

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<th>Description</th>
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<tr>
<td><strong>3.1 PRE-INSTALLATION TESTING</strong></td>
<td>Unpack the M.I. cable and test each cable for insulation resistance (IR), and total resistance (TR).</td>
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<tr>
<td></td>
<td>To test TR, connect each lead of the ohmmeter to each M.I. cable cold lead conductor. Test in accordance with the meter manufacturer’s instructions. Compare TR reading from ohmmeter to calculated TR (multiply the heated length of cable by the cable resistance value found on UL/CSA label). The ohmmeter reading should be within 10% of the calculated TR.</td>
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<tr>
<td></td>
<td>To test IR, connect one lead of the 500 VDC insulation resistance tester to one cold lead conductor and the other lead to the M.I. cable metal sheath. Test in accordance with the meter manufacturer’s instructions. IR reading should be greater than 10 megohms.</td>
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<td>Please enter the TR and IR readings on the warranty card.</td>
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<td><strong>3.2 MONITORING CABLE DURING INSTALLATION</strong></td>
<td>Repeat the steps as described in Section 3.1 and enter the information on the warranty card. If there is a change in the meter reading, please check the cable for damage, as well as any power connections, splices, and end terminations.</td>
</tr>
<tr>
<td><strong>3.3 FINAL TESTING</strong></td>
<td>Repeat the IR test steps as described in Section 3.1. To test TR, connect each lead from the ohmmeter to the two cold leads that will be attached to power. Enter the information on the warranty card. If there is a change in the meter reading, please check the cable for damage, as well as any power connections, splices, and end terminations.</td>
</tr>
<tr>
<td><strong>3.4 MAINTENANCE</strong></td>
<td>Annually check system for loose or damaged cable.</td>
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<tr>
<td><strong>3.5 TROUBLE-SHOOTING AND TECHNICAL SUPPORT</strong></td>
<td>If during any test the meter readings vary by +/- 10% from the previous test, stop the installation and investigate. Please check for pinched or crushed cables, test splices, test power connections, test end terminations, and repair accordingly. Check for water in all junction boxes or conduit. Any faults should be repaired by a qualified electrician or factory technician before the final pour is made.</td>
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<td>For additional trouble-shooting and repair procedures, please contact Delta-Therm technical support at 1-800-526-7887. Please be prepared to provide:</td>
</tr>
<tr>
<td></td>
<td>• Part numbers for all installed equipment</td>
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<tr>
<td></td>
<td>• IR and TR readings on all installed cables</td>
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<tr>
<td></td>
<td>• Verification that incoming voltage matches design voltage of Delta-Therm equipment</td>
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<td>• Verification that you have checked all wiring, junction boxes, etc.</td>
</tr>
<tr>
<td></td>
<td>• Digital photos of installed equipment</td>
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<td></td>
<td>If you have any questions or comments about these instructions or your installation please call Delta-Therm at 1-800-526-7887.</td>
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