ThermTrac™ SKIN EFFECT HEATING SYSTEMS

APPLICATION

A ThermTrac system provides a cost-effective alternative to conventional resistance heat tracing on long pipelines by eliminating the need for an extensive power distribution system. A pipeline up to 15 miles (25 kilometers) long can be traced from a single power point. The versatility of the system makes it ideal for temperature maintenance, freeze protection and heat-up applications.

The system generates heat in the heat tube by the return electrical current flowing through the impedance of the inner skin of the heat tube. There is no voltage or current on the outer skin of the heat tube.

The ThermTrac insulated conductor is the heart of Thermon's skin effect heating system. This conductor is custom designed by Thermon with dielectric insulation and optional scuff jacket to meet specific project applications. ThermTrac insulated conductor is manufactured 100% by Thermon so the highest quality can be obtained.

RATINGS [1]

System operating voltages
  TT-XR...up to 5 kV
  TT-HT...up to 3.5 kV
Max. maintenance temperature
  TT-XR...230°F (110°C)
  TT-HT...392°F (200°C)
Max. continuous exposure temp. power-off
  TT-XR..302°F (150°C)
  TT-HT..500°F (260°C)
Minimum installation temp. ....down to -40°F (-40°C)
Minimum bend radius .... 6x cable o.d.
T-rating [2] ....T6 to T2

Notes

1. Each ThermTrac system is custom designed for the application. Please consult Thermon for specific project details.

2. Hazardous area temperature classifications are determined for each installation in accordance with the guidelines set forth in IEEE Std 844. IEEE Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General Testing, Marking, and Documentation Requirements

3. Power transformers for skin effect trace heating systems are custom manufactured to meet the specific design application requirements. These transformers shall be of the shielded and isolated type. The secondary of the skin effect heating system transformer shall not be grounded.

CERTIFICATIONS/APPROVALS

FM Approved

FM Approvals
Ordinary Locations
Hazardous (Classified) Locations
  Class I, Division 2, Groups A, B, C and D
  Class II, Division 2, Groups F and G
  Class III, Divisions 1 and 2
  Class I, Zone 2, Group IIC

CE ⟨Ex⟩

DEKRA 12ATEX0175 X
II 2 G Ex eb IIC T6...T2
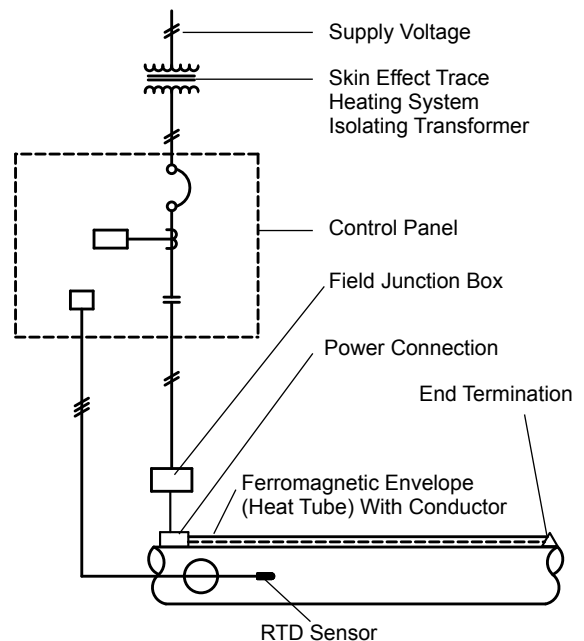II 2 D Ex tb IIIC T85 °C...T300 °C

IEC IECEx

International Electrotechnical Commission
IEC Certification Scheme for Explosive Atmospheres
DEK 12.0055X
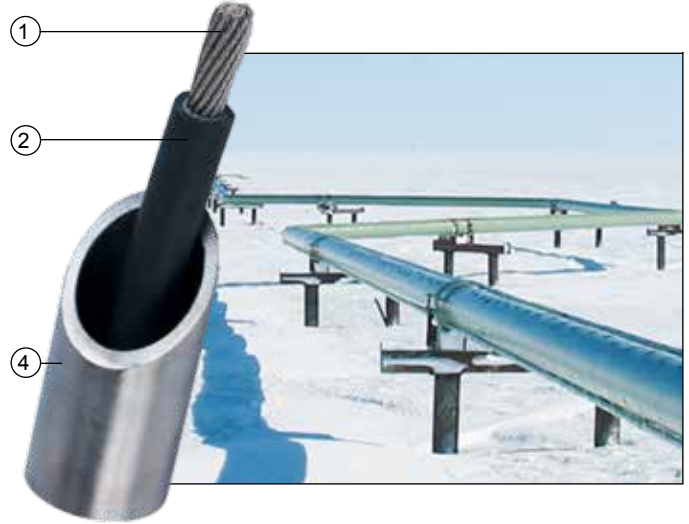
CONSTRUCTION

1 Highly flexible, Class H, nickel-plated copper conductor
2 TT-XR - Polyolefin dielectric insulation
  TT-HT - Fluoropolymer dielectric insulation
3 TT-XR - Optional polyolefin scuff jacket (not shown)
  TT-HT - Optional fluoropolymer scuff jacket (not shown)
4 Carbon steel heat tube

TYPICAL WIRING DIAGRAM, SINGLE PHASE SUPPLY

- Supply Voltage
- Skin Effect Trace Heating System Isolating Transformer
- Control Panel
- Field Junction Box
- Power Connection
- End Termination
- Ferromagnetic Envelope (Heat Tube) With Conductor
- RTD Sensor

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# ThermTrac™ SKIN EFFECT HEATING SYSTEMS

OPERATING CHARACTERISTICS

The operating principle of a ThermTrac skin effect heating system is based on two phenomena: proximity effect and skin effect. The heating device is a carbon steel pipe called a "heat tube" with a specially designed skin effect conductor inside. The heat tube and insulated conductor are joined together at one end, while at the opposite end the heat tube and the conductor are connected across an AC voltage source

When the system is energized, current flows through the conductor to the end point, then is concentrated toward the inner surface of the heat tube by the skin effect phenomenon and the attendant proximity effect. This electromagnetic interaction ensures that the return current travels on the inner surface of the heat tube with virtually no measurable voltage on the outer surface. The current flow through the impedance of the inner skin of the heat tube generates heat.
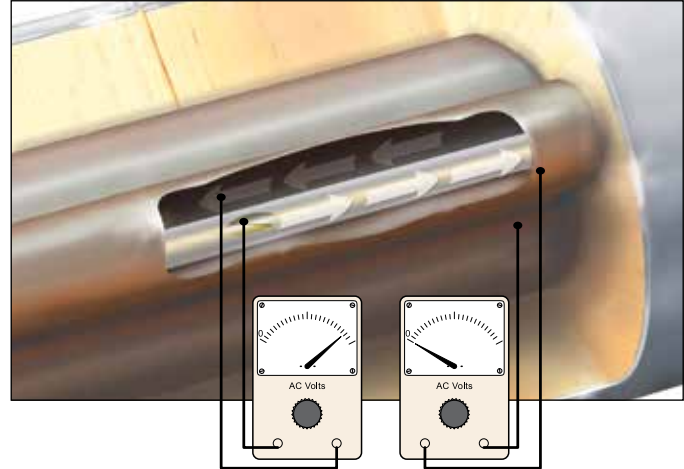
AC voltage will generate a current in the conductor which returns through the inside surface of the heat tube. There is virtually no measurable voltage on the outer surface of the heat tube, allowing the piping system to be grounded.

TYPICAL THERMTRAC SYSTEM

ThermTrac Power Connection, Pull/Splice, and End Termination Boxes are integral to the skin effect heating system and carry current in the same manner as the heat tube. These boxes are constructed of heavy wall ferromagnetic materials and must be welded to the heat tube to ensure the continuity of the skin effect electrical path. The boxes are constructed to conform to the carrier pipe and provide water-resistant protection with gasketed, bolted covers.
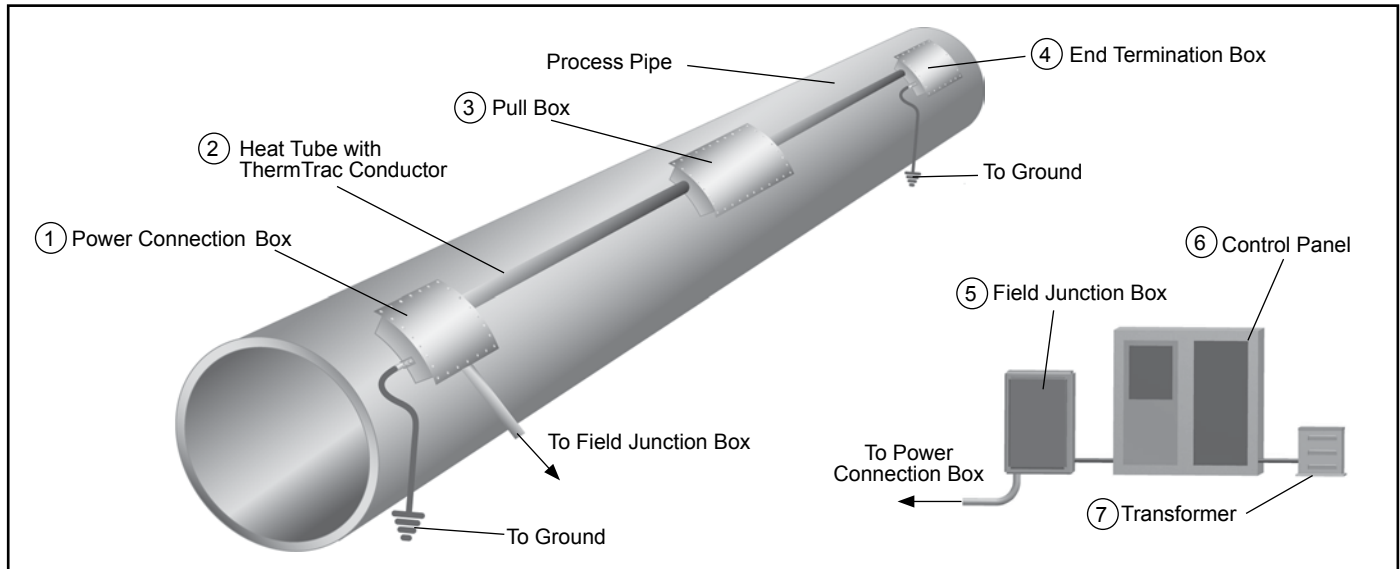
1. Power Connection Box: Located at the power feed end of the ThermTrac circuit, the power connection box permits the connections that supply electrical energy to the system. An external tab on the box permits grounding of the system.

2. Ferromagnetic Heat Tube: Used to produce heat based on the two phenomena of proximity effect and skin effect.

3. Pull Box: Located periodically along the heat-traced pipe, this box permits access for installing the ThermTrac conductor. The box is sized to provide for expansion/contraction of the conductor, and versions of the box allow the heat tube to cross over the carrier pipe if necessary at elevation or directional change points.

4. End Termination Box: The design and construction of the end termination box allows the ThermTrac conductor and heat tube to be joined together thereby allowing electrical current to return to the power connection box via the inside surface of the heat tube. An external tab on the box permits grounding of the system.

5. Field Junction Box: Located between the Power Connection and the Load Center it provides an access point to terminate the ThermTrac conductor and the power feed wiring.

6. Control Panel: Typically consists of all electrical power, control and monitoring devices.

7. Transformer: Custom transformer equipped with over and under voltage taps.