Longline Heating

CONNECT AND PROTECT

This section provides an overview and general design guidelines for nVent RAYCHEM longline heat tracing systems. For complete design assistance, contact your nVent representative or visit our website at nvent.com/RAYCHEM.

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INTRODUCTION

Heating long pipelines for freeze protection, viscosity control, or temperature maintenance presents special requirements for electrical heat tracing. These applications require long electrical circuit lengths, usually with a single electrical power point. nVent RAYCHEM provides a wide range of industry-proven solutions for these applications. Extreme long lines are usually transfer lines between processing plants or to storage or transportation facilities. Tank farms, piers for ocean transport vessels, and pipes between petrochemical facilities are all examples of applications for which longline heat tracing may be used. Even if a processing plant uses steam for in-plant heat tracing, electrical tracing may be beneficial for these transfer lines.

Typical applications for longline heating systems include:

- Water and steam condensate lines
- Water supply and injection lines
- Sewage lines
- Natural gas gathering lines (condensation prevention)
- Crude oil gathering lines (viscosity control)
- Off-site crude and fuel oil lines
- Temperature-sensitive lines
- Product transfer lines

Longline tracing systems can be complex to design and install. For this reason nVent RAYCHEM offers several technologies to choose from, thus providing the best cost optimization for your project. These technologies are:

- Self-regulating heating cables
- Series resistance mineral insulated heating cables

- Series-resistance polymer insulated heating cables
- Skin-effect tracing systems (STS)

All longline heat tracing should be designed with engineering support from nVent. For assistance in selecting the best technology for the application, contact your nVent representative.

SELF-REGULATING HEATING CABLES

nVent RAYCHEM LBTV

nVent RAYCHEM LBTV heating cables can provide temperature maintenance and freeze protection for continuous circuit lengths up to 1125 feet (342 m) powered from a single source. The cable is especially well suited for tracing long pipelines containing temperature-sensitive fluids.

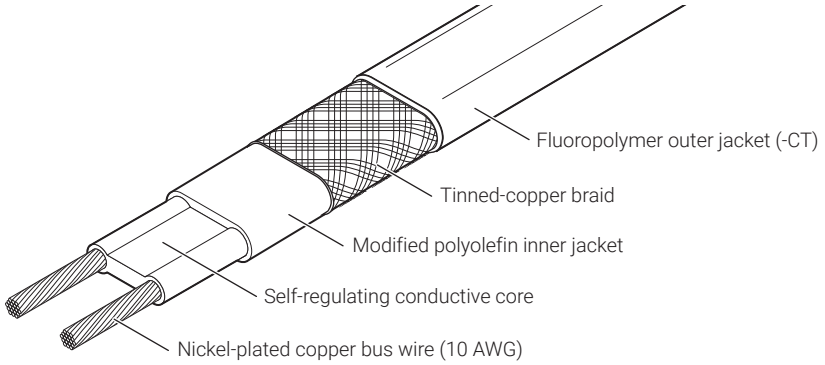

Fig. 1 LBTV heating cable

LBTV heating cables provide electrical freeze protection and temperature maintenance up to 150°F (65°C) for long piping systems in both nonhazardous and hazardous locations. This single-phase, self-regulating heating cable provides freeze protection and low-temperature maintenance for medium-length applications. The parallel circuit design results in a cable that can be cut to length in the field.

Within the circuit length limitations, the heat output per foot is independent of circuit length. The cable is constructed with 10 AWG copper bus wires, permitting longer circuit length with less voltage drop than the 16 AWG BTV cable bus wires. These heating cables maintain process temperatures up to 150°F (65°C) and can withstand intermittent exposure to temperatures up to 185°F (85°C). They are approved for use in nonhazardous and hazardous locations, including areas where corrosives may be present.

Refer to the data sheets for more detailed information. Data sheets can be found on nVent.com/RAYCHEM, or the Technical data sheet section of the Industrial Heat Tracing Solutions Products & Services Catalogue (H56550).

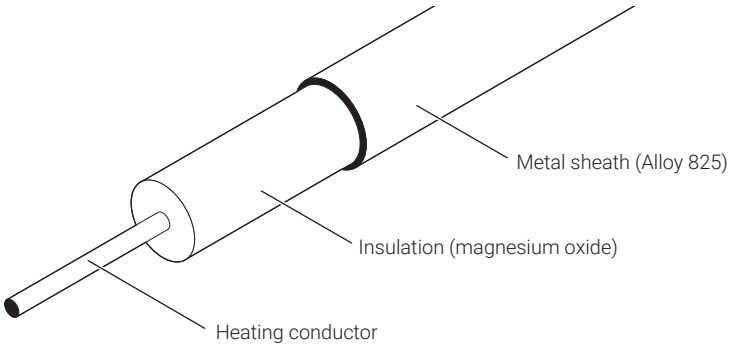

Fig. 2 MI heating cable

nVent RAYCHEM mineral insulated heating cables are used in longline applications where high maintain temperatures and/or high exposure temperatures exist, or high power output is required. MI heating cable is used in many applications, including transfer lines. It is rugged and economical, and can be used for lines up to 5000+ feet (1500+ m).

A 600-Vac Delta or Wye electrical configuration balances the electrical load well. Designs must be done on a case-by-case basis because the total resistance must be matched to the transformer characteristics.

Refer to the Mineral Insulated Cables design guide (H56884) for more detailed information.

nVent RAYCHEM SC

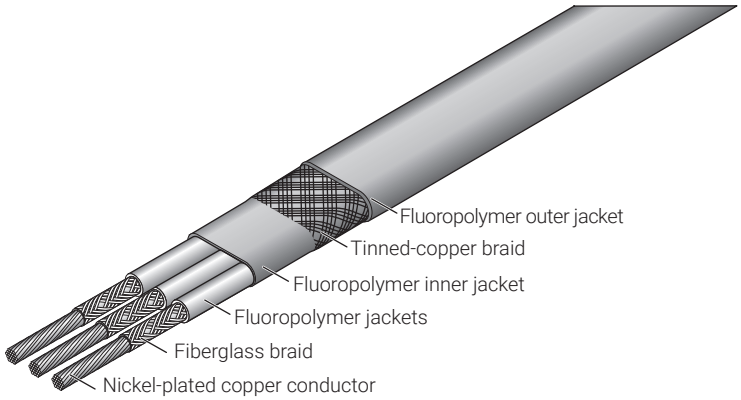

Fig. 3 SC heating cable

nVent RAYCHEM flexible series-resistance heating cables can be used when circuit lengths exceed the ratings of conventional parallel-resistance heating cables and a single power source is needed. Ohmic heating of the conductor provides the heat in this series circuit heating cable. Engineering design by nVent is required since the wattage output depends on the total circuit length and the voltage applied.

SC cables are available in single-, double-, and triple-conductor configurations for single- or three-phase system designs. The resistance conductors are electrically isolated with high-temperature, heavy-wall fluoropolymers; a grounding braid; and a final fluoropolymer jacket. Maximum exposure temperatures are 400°F (204°C) for SC cables, 482°F (250°C) for SC/H cables, and 195°F (90°C) for SC/F cables. SC cables are capable of supporting circuit lengths up to 12,000 feet (3659 m) with one power supply point, and voltages up to 600 Vac.

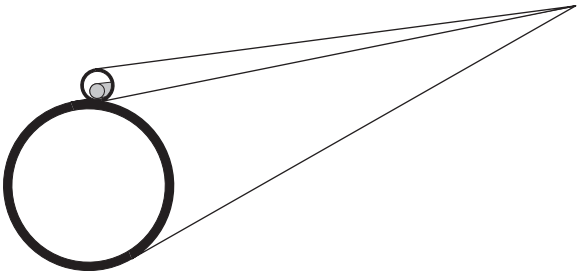

Fig. 4 Skin-effect Tracing System (STS)

nVent RAYCHEM skin-effect tracing systems (STS) are custom engineered by nVent for each unique application and are ideally suited for long transfer pipelines over one mile (1.6 km) in length, and for individual circuit lengths up to 31 miles (50 km) in length. Consideration is given to transformer power requirements, control and monitoring designs, conductor wire selection, and the installation of the complete system. In the STS heating system, heat is generated on the inner surface of a ferromagnetic heat tube that is thermally coupled to the pipe to be heat traced. An electrically insulated, temperature-resistant conductor is installed inside the heat tube and connected to the tube at the far end. The tube and conductor are connected in series to an AC voltage source. This method of heating is called skin-effect heating because the return path of the circuit current is pulled to the inner surface (approximately 1 mm) of the heat tube by both the skin effect and the proximity effect between the heat tube and the conductor. The outside surface of the heat tube is at ground potential, while the inner surface of the tube carries full current.

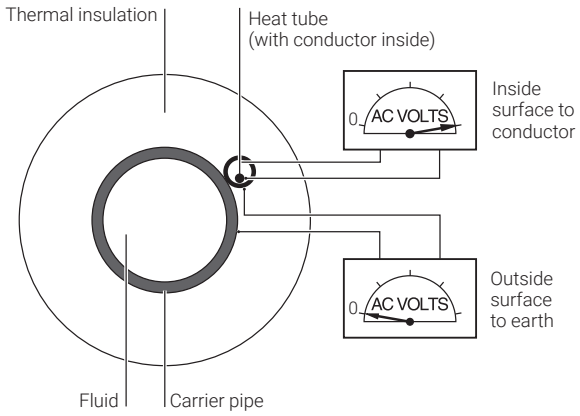

Fig. 5 nVent RAYCHEM STS cross section

The STS circuit impedance is mainly resistive, generating heat in the heat tube wall and, to a lesser extent, in the insulated conductor. Additional heat results from eddy currents induced in the heat tube wall.

The allowable circuit length is determined by the power output, heat tube size, conductor size, and the carrier pipe temperature. STS cables are available in two different temperature ratings, 302°F (150°C) and 482°F (250°C), and three voltage ratings, 2,500V, 5,000V and 10,000V. These cables are also available in different conductor sizes for design and installation efficiency. The highest installed cost component in electrical heat-tracing systems is often the power distribution system. This is especially true for long lines where power feeds are unavailable. A nVent RAYCHEM STS system minimizes the number of power supply points required by offering the longest circuit lengths available to the industry.

LONGLINE SYSTEM SELECTION

nVent provides a broad range of options for heat-tracing long lines. Decision variables include maintenance temperature, heat-loss circuit length, maximum exposure temperature, power availability, piping system support and construction, thermal insulation k values, and local codes and standards. Use the following table for preliminary cable selection and contact nVent for complete system design and optimization.

TABLE 1 SYSTEM CHARACTERISTICS MATRIX

	Maximum circuit length ft (m)	Maximum exposure temperature	Maximum power output* (Watts/ft)	Maximum voltage (Vac)
LBTV2	1250 (381)	185°F (85°C)	10	277
MI	5000+ (1524+)	1200°F (650°C)	61	600
SC	12,000 (3659)	482°F (250°C)	—	600
STS	164,000 (50,000)	482°F (250°C)	45.7	10,000

* Design dependent

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