



This section provides an overview of the longline heat-tracing technologies available from Pentair Industrial Heat Tracing Solutions. For complete design assistance, contact your Pentair representative or phone Pentair at (800) 545-6258. Also, visit our web site at www.pentairthermal.com.

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INTRODUCTION

Pentair provides industry-proven solutions for longline applications.

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. Pentair 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 Pentair offers several technologies to choose from, thus providing the best cost optimization for your project. These technologies are:

- Self-regulating heating cables
- Mineral insulated heating cables
- Series-resistance heating cables
- Skin-effect heat-tracing systems

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

SELF-REGULATING HEATING CABLES

LBTV and SLBTV

LBTV cable is especially well suited for tracing pipelines up to 1125 feet (342 m) containing temperature-sensitive fluids, or where high reliability is required.

SLBTV extends the maximum circuit length to 2000 feet (610 m) from one power connection point.

Raychem brand LBTV and SLBTV heating cables can provide temperature maintenance and freeze protection for continuous circuit lengths up to 1125 feet (342 m) and 2000 feet (610 m) respectively powered from a single source. The cable is especially well suited for tracing long pipelines containing temperature-sensitive fluids, or where high reliability is required.

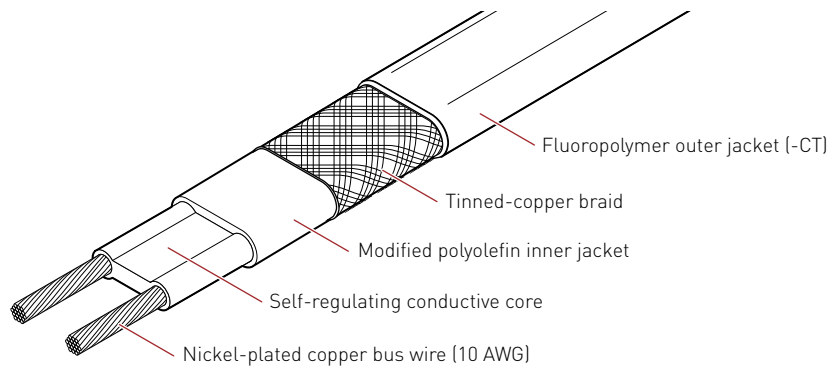


Fig. 1 LBTV and SLBTV heating cable

Raychem LBTV and SLBTV heating cables maintain process temperatures up to 150°F (65°C) and can withstand intermittent exposure to temperatures up to 185°F (85°C). The cable is configured for use in nonhazardous and hazardous locations, including areas where corrosives may be present.

LBTV and SLBTV 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 the Pentair web site, www.pentairthermal.com, or the Technical data sheet section of the Industrial Heat Tracing Solutions Products & Services Catalogue (H56550).

VLBTV and VLKTV

VLBTV and VLKTV heating cables can be used with piping systems up to 12,000 feet (3660 m) in length and can be used in hazardous locations and where corrosives are present.

The VLBTV and VLKTV are three-phase heating cables for very long piping systems. Each can be used in hazardous locations and where corrosives are present. They can also be pulled through installation channels when necessary.

VLBTV

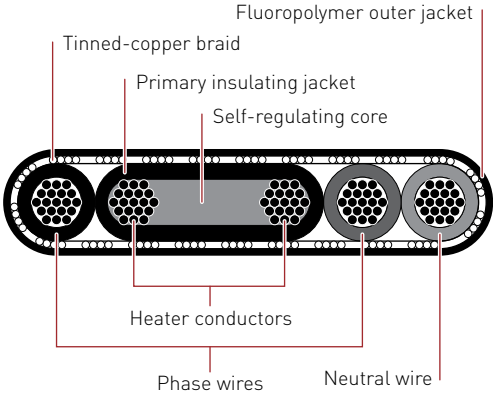


Fig. 2 VLBTV cross section

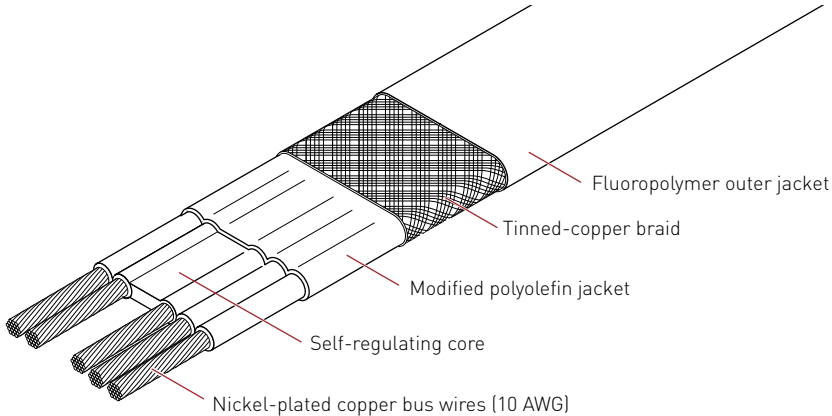


Fig. 3 VLBTV heating cable

Raychem VLBTV heating cable can maintain process temperatures up to 150°F (65°C) and can withstand intermittent exposure to temperatures up to 185°F (85°C).

VLBTV provides basic freeze protection and low-temperature maintenance for medium-long pipelines. The heating cable can maintain process temperatures up to 150°F (65°C) and can withstand intermittent exposure to temperatures up to 185°F (85°C). VLBTV can be used for circuit lengths up to 12,000 feet (3660 m) powered from a single source.

Refer to the data sheet (H52396) for more detailed information. Data sheets can be found on the Pentair web site, www.pentairthermal.com, or the Technical data sheet section of the Industrial Heat Tracing Solutions Products & Services Catalogue (H56550).

VLKTV

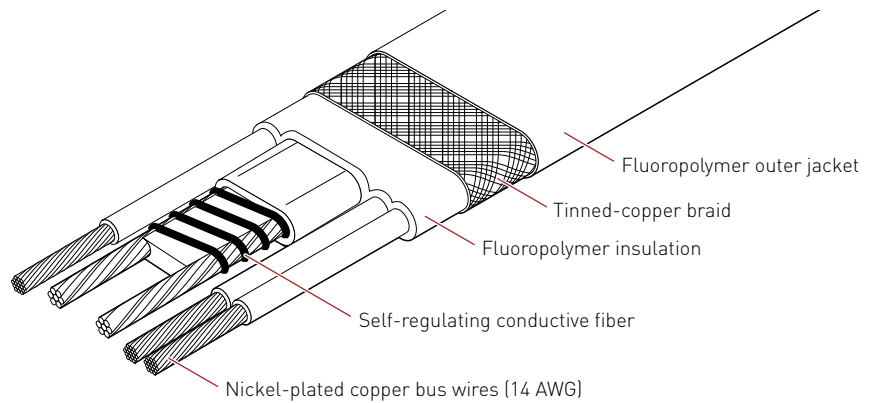


Fig. 4 VLKTV heating cable

VLKTV is especially well suited for tracing long pipelines containing temperature-sensitive fluids, or where extreme heating cable reliability is required.

Raychem VLKTV provides high-temperature maintenance for longline applications. VLKTV can also be used to provide low-temperature maintenance for long lines that are exposed to high temperatures. The VLKTV heater can withstand continuous exposure to temperatures up to 300°F (150°C) and intermittent exposure to 420°F (215°C). It can be used for circuit lengths up to 6000 feet (1830 m), powered from a single source. VLKTV is especially well suited for tracing long pipelines containing temperature-sensitive fluids, or where extreme heating cable reliability is required.

Refer to the VLKTV data sheet (H55822) for more detailed information. Data sheets can be found on the Pentair web site, www.pentairthermal.com, or the Technical data sheet section of the Industrial Heat Tracing Solutions Products & Services Catalogue (H56550).

MINERAL INSULATED HEATING CABLES

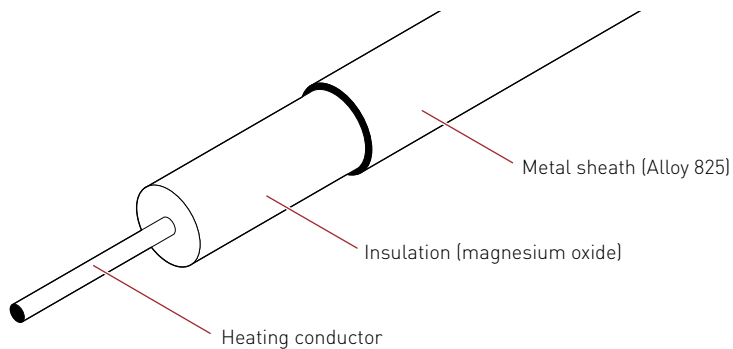


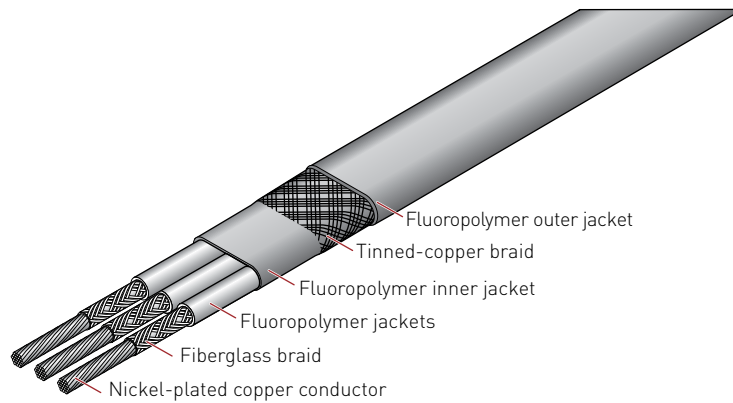
Fig. 5 MI heating cable

Raychem MI heating cable is rugged and economical, and can be used for lines up to 5000+ feet (1500+ m).

Raychem brand mineral insulated heating cables are used in longline applications where high temperature maintain and/or high temperature exposures 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.

SERIES-RESISTANCE HEATING CABLES**SC****Fig. 6 SC heating cable**

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.

Raychem brand 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 Pentair 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.

STS

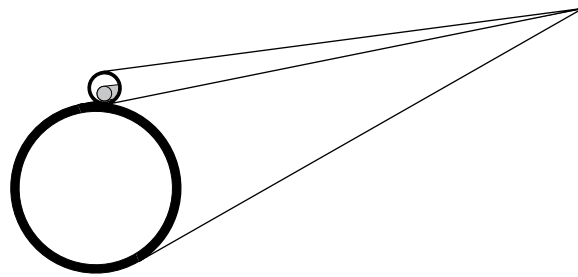


Fig. 7 Skin-effect heat-tracing system (STS)

The Raychem STS system is custom engineered for the specific application and is ideally suited for long transfer pipelines up to 15 miles (25 km).

The Raychem brand skin-effect heat-tracing system (STS) is custom engineered by Pentair for the specific application and is ideally suited for long transfer pipelines over one mile (1.6 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.

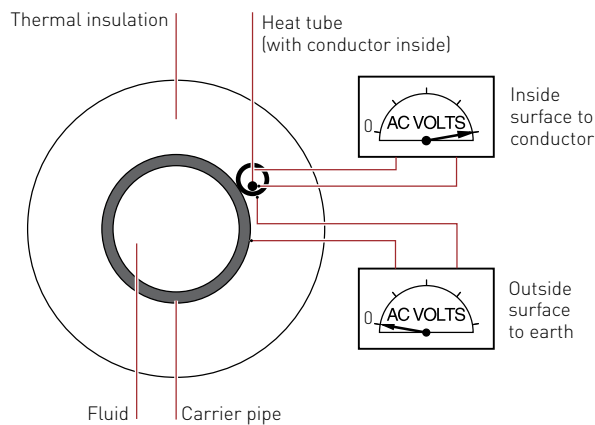


Fig. 8 Raychem STS cross section

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.

A Raychem skin-effect heat-tracing system minimizes the number of power supply points required by offering the longest circuit lengths available to the industry.

The allowable circuit length is determined by the power output, heat tube size, conductor size, and the carrier pipe temperature. 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 Raychem STS system minimizes the number of power supply points required by offering the longest circuit lengths available to the industry.

LONGLINE SYSTEM SELECTION

Pentair 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 Pentair 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	1125	(343)	185°F	(85°C)	10	277
SLBTV	2000	(610)	185°F	(85°C)	—	277
VLBTV	12,000	(3660)	185°F	(85°C)	20	600
VLKTV	6000	(1829)	420°F	(215°C)	20	600
MI	5000+	(1524+)	1200°F	(650°C)	61	600
SC	12,000	(3659)	250°F	(250°C)	—	600
STS	82,000	(24,993)	200°F	(200°C)	49	2000–5000

* Design dependent

CONTROL AND MONITORING OF LONGLINE SYSTEMS

Control of these heat-tracing systems usually involves significant current switching.

Standard on-pipe sensing and control can be effectively used since the piping system usually has a single flow path. A PASC system should be considered if there are multiple flow paths, or some instrumentation piping involved.

Sensor location is important since flow is usually intermittent and starts from one end of the piping system. Multiple sensors may be used to provide better monitoring of the temperature along the length of the pipe, with the lowest temperature controlling

the system turn-on. Current monitoring is effective on all series-heating cable and STS systems and ground-fault protection must be used as required by national electrical codes and standards. Due to high power requirements, these systems typically use dedicated power transformers

VLBTV and VLKTV heat-tracing systems need special control and monitoring configurations. Please contact Technical Support for proper design of these systems.



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