



**CONNECT AND PROTECT**

# Rail Heating Systems

Ensuring safe, reliable operations with solutions that prevent ice buildup on critical rail infrastructure







Innovative heating solutions from nVent allow for safe, reliable railway operations in harsh winter conditions.

Snow and ice buildup on track poses a major operational challenge that can cause serious disruptions to rail service and adversely impact safety. nVent is an integral supplier of heating systems to freight and transit railroads, providing solutions that prevent costly delays and service disruptions during the winter. This offering brings together core nVent capabilities including the industrial heating expertise of nVent RAYCHEM and the extensive railway industry experience of nVent ERICO. Our comprehensive offering includes heating solutions for switches, contact rail (third rail), and overhead catenary wire. In addition, nVent offers heating system control solutions that allow for remote or on-site operation. We offer full system design with a wide range of options and configurations to provide heating solutions that meet the specific needs of a given site. When it comes to safe, reliable rail operations in challenging winter conditions, trust nVent. WE CONNECT AND PROTECT.

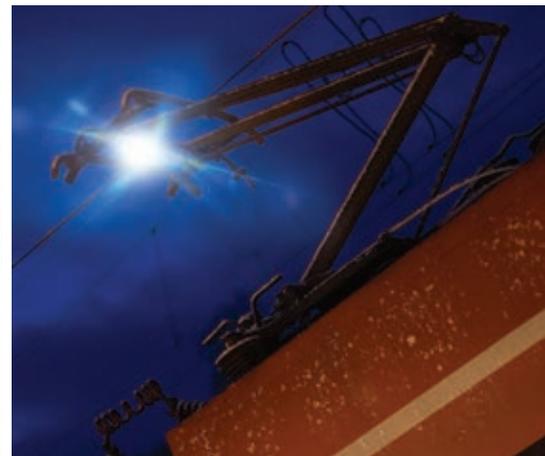
### SWITCH HEATING



### CONTACT RAIL HEATING



### CATENARY HEATING



# Switch Heating



## Railway switches are mission critical to railway safety.

Railway switches are a critical part of safe, reliable railway operations. During the winter months, snow and ice buildup on track can prevent switches from properly aligning and locking into place. With innovative nVent RAYCHEM heating cable technology along with the rail industry expertise and high quality components of nVent ERICO, nVent offers the following types of switch heating systems;

- The **nVent Self-Regulating Switch Heating System** is an innovative solution that automatically adjusts power output to compensate for temperature changes, delivering the exact amount of power required to keep tracks clear.
- The **nVent Flat MI Switch Heating System** is a service-proven solution featuring a robust flat MI (mineral insulated) heating element that delivers robust, long-lasting heat to critical rail infrastructure in even the harshest winter conditions.



nVent Self-Regulating Switch Heating System

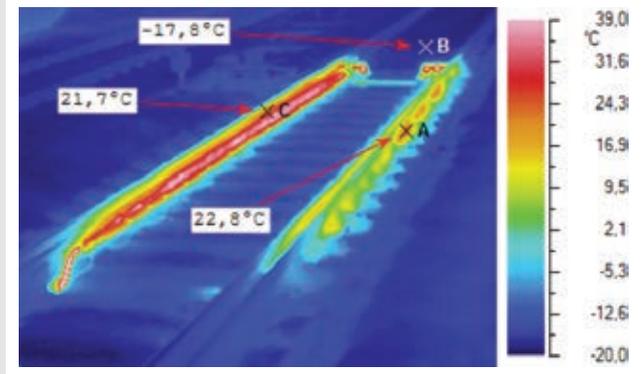
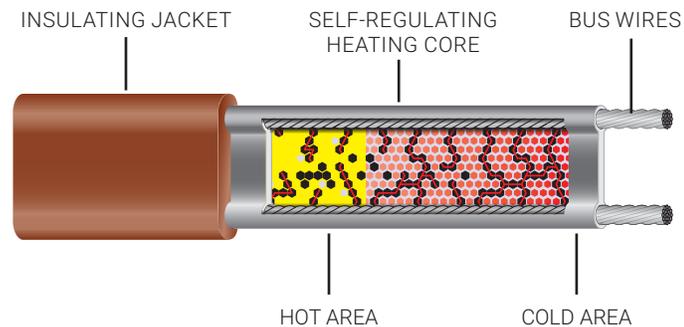
# nVent Self-Regulating Switch Heating System

## SELF-REGULATING HEATING CABLE TECHNOLOGY

Self-Regulating heating cables were pioneered by the Raychem Corporation (now nVent RAYCHEM) more than 30 years ago. This innovation led to heating applications for many industries, including railway switch heating systems.

Today, nVent provides switch heating systems with self-regulating heating cables that is effective and up to 30% more energy efficient than conventional systems. Self-Regulating cables automatically vary power output in response to sensed changes in ambient temperature at every point along the length of the cables. As the surrounding temperature changes, the nVent Self-Regulating Switch Heating System provides heat where and when it is needed, virtually eliminating unnecessary energy consumption. This innovative nVent solution offers many advantages, including:

- **Safety** – System temperature maxes out at 176°F/80° C / 25V, which makes it safe to the touch for personnel.
- **Energy Efficiency** – System eliminates wasted wattage consumption, significantly lowering energy costs, and thus total cost of ownership.
- **Durability** – Features a simple design with rugged construction that is secured in place with high quality, corrosion resistant nVent ERICO rail clips, which allow the system to withstand the rigorous vibration of heavy rail traffic.
- **Flexibility** – Systems are customized to the exact requirements of each application, with heating cables cut to the specific lengths. nVent also provides ongoing support and a host of value-added options, including state-of-the-art connection kits and accessories.



Infrared thermography taken with a thermal imaging camera detects infrared energy emitted from an object, converts it to temperature and displays an image of temperature distribution. This image demonstrates how nVent Self-Regulating Switch Heating System distributes heat evenly to the switch point and stock rail. Even heat distribution ensures that snow and ice evenly and prevents hot spots from forming.

Specification	nVent Self-Regulating System
Voltages	24 VAC-24 VDC
Output	Nominal 25-30 W/ft (82-98 W/m) @ 32° F (0° C)
Total number of cable runs	4 -24 runs depending the application and customer preference
Heating element	Polymeric self-regulating core
Sheath material	Fluoropolymer
Attachment method	nVent ERICO Rail Clips & Accessories & Stainless Steel Channel
Heater location	Stock rail and moving rail
Heater dimensions	12 mm (0.47" ) x 4 mm (0.16")
Lengths available	3 ft (.91 m) to 36 ft (10.97 m)
Custom length	Yes
Heating technology	Self-Regulating
Controller required?	Not required by can be implemented per the customer's preference
Control options	- Snow Sensor - Advanced control systems with remote monitoring and telemetry

# nVent Flat MI Switch Heating System

## CONSTANT WATTAGE TECHNOLOGY

The **nVent Flat MI Switch Heating System** is an established, service-proven solution used on track switches in North America and other parts of the world that experience severe winter weather. This system features a robust flat MI (mineral insulated) heating element that delivers powerful convective heat to a large surface area on the rail web to prevent ice buildup and keep track switches functioning properly. The nVent Flat MI Switch Heating System provides key advantages, including;

- **Reliability** – Through a commitment to quality, the nVent Flat MI Switch Heating System offers the best of both performance and service-life longevity. This system features an American made heating element that complies with AAR (American Association of Railroads) design criteria. Before system delivery, the heater element undergoes thorough dielectric testing to ensure proper functionality, and is subjected to extreme conditions (including hydro-testing) to ensure there are no cracks or other defects that could cause the system to fail prematurely. This rigorous quality control process results in a reliable system that consistently performs to customer's expectations, year after year.
- **Simplicity** – The nVent Flat MI Switch Heating System makes heating critical switch locations simple. nVent offers comprehensive system design assistance to provide heating solutions that meet the specific needs of each site. Installation is simple with the convenient flat profile heating element that requires no removal or loosening of braces. The heating element is secured in place with high quality nVent ERICO heater clips, which are available multiple designs to allow for versatile system configurations. Once installed, the system requires virtually no maintenance and doesn't necessarily require removal for maintenance of the switch and surrounding track structure. nVent also offers optional rail heating control systems for on-site or remote operation

[see p. 9].



The nVent Flat MI Switch Heating System heater dimensions (at .340" thickness x .625" width) are thicker, with less width than competitive alternatives. This added thickness contributes to greater reliability and longer service life. And, by occupying less width, the heater element provides better clearances to fit within existing track material.

Specification	Switch Point Heating System	Switch Rod Heating System
Voltages	Up to 750V AC or DC	Up to 750V AC or DC
Output	100 to 500 W/ft (328 to 1,640 W/m)	100 to 500 W/ft (328 to 1,640 W/m)
Heating Element	nichrome constant wattage	nichrome constant wattage
Additional Material	incoloy/stainless steel Sheath	aluminum/stainless steel/steel channel
Heater Location	field or gauge side of stock rail	under switch rods between ties
Heater Shape	Flat cross-section	u-bend or straight
Dimensions	8.6 mm (.34") X .159 mm (.625")	5" wide x 1.75" tall
Endings	double ended	hairpin or single ended
Lengths Available	single element up to 33ft (10m) standard	up to 20ft (6m) standard
Custom Features Available	yes	yes
Custom Lengths	yes	no
Heating Technology	constant wattage	constant wattage
Control Options	Snow sensor – advanced control systems with remote monitoring and telemetry	



# Contact Rail Heating

A contact rail, or third rail, provides power to rolling stock via an additional rail that acts as an electrical conductor. Typical in passenger transit systems, **the contact rail is a critical** part of track infrastructure that **must be protected from snow and ice** to avoid serious disruptions to service. nVent helps transit systems maintain safe, reliable train service in harsh winter conditions with proprietary heating solutions for contact rails. We offer two types of contact rail heating systems, nVent RAYCHEM CRH-SL and nVent RAYCHEM PTC-Z.

## NVENT RAYCHEM CRH-SL

The CRH-SL Self-Regulating heating cables feature a polymeric, semi-conductive core extruded between the two parallel bus wires. This parallel construction allows the cable to be cut to length. The power output of heating cables decreases with increasing temperature due to the self-regulating behavior of the semi-conductive core. This ensures no overheating of the cables at high power outputs. The cables have rugged aluminum lamination that ensures efficient heat transfer to the rail as well as reduced risk of in-service or installation damage.



## NVENT RAYCHEM PTC-Z

- Service-proven system capable of high wattage output to melt snow and ice in the most demanding winter conditions.
- Utilizes an energy-efficient, power-limiting technology that reduces total cost of ownership.
- Features a rugged heating cable, durable enough to resist in-service damage to provide long-lasting performance on track.
- Efficient system is easy to install with included proprietary spring clips and fiberglass channel attachment hardware. It arrives at the job site pre-terminated for simple field connections.



Specification	nVent RAYCHEM CRH-SL	nVent RAYCHEM PTC - Z
Power output	27- 35 W/ft (88–115 W/m) at 32° F (0° C)	30, 40, 50 W/ft (98, 131, 164 W/m) at 32° F (0° C)
Voltage	600, 625, 650, 750 VDC	480 VAC, 600, 625, 650, 750 VDC
Minimum installation temperature	0° F (-18° C)	0° F (-18° C)
Maximum intermittent exposure temperature	230° F (110° C)	392° F (200° C)
Sheath material	Fluoropolymer with aluminum lamination	Thermally conductive silicone rubber

## APPROVALS

nVent RAYCHEM PTC-Z contact rail heating cables meet the requirements of the U.S. National Electrical Code and the Canadian Electrical Code. The contact rail heaters are typically offered as a part of an integrated system with optimized energy-efficient design for each rail type and operating conditions. The system includes heater terminations, attachment hardware (spring clips, fiberglass channel and abrasion pad), fuse boxes, telemetry and controls. For additional information, contact your thermal representative, or call (800) 545-6258.

# Catenary Heating

Catenary systems are common in passenger trains, providing electrical power for train propulsion via wires situated over the track. In cold-weather regions, ice will often pose a challenge to rail operators throughout the winter months. Even in warmer climates, ice buildup from freezing rain can cause serious problems for railroads – especially the accumulation of ice on overhead lines. Ice buildup on contact wires will interrupt the electrical energy transmission to the train and add weight that increases tension on the wires, placing the entire infrastructure at risk for failure. Besides the obvious risks ice poses to safety, fixing damage caused by ice on catenary systems can be extremely costly. This is why protecting overhead lines from ice buildup is necessary in any region where temperatures are cold enough to produce freezing rain. In addition to proven solutions for melting snow and ice on tracks, nVent provides a state-of-the-art system for keeping overhead contact wires free from ice.



nVent RAYCHEM CATHeat system features a high-temperature fluoropolymer jacket, thermally-conductive silicone outer jacket, and phos-bronze mounting clips



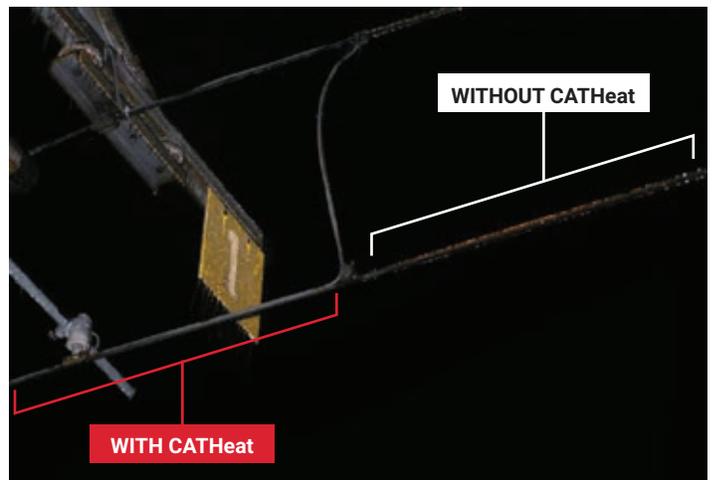
CATHeat installed on METRA Highliner, Chicago IL

## CATHEAT ADVANTAGES

- **Service-proven** CATHeat is a unique, superior alternative to ice cutters and mechanical ice removal methods.
- **Efficient system** quickly transfers energy to the contact wire, providing ice-melting heat to the overhead line in a short period of time.
- **Easy-to-operate** system is simple to install and will not interfere with network infrastructure or vehicle operations.
- **Energy-efficient** constant wattage heating technology provides reliable performance with a low cost of operation.
- **Value-added** nVent control and communication modules offer numerous configurations for system operation, including via remote dispatch center.

## APPROVALS

The CAT Heat cables meet all applicable requirements of IEEE 515 and IEEE 515.1 standards.



Specification	nVent RAYCHEM CAT Heat
Power output	10 W/ft. (33 W/m)
Voltage	600, 750, 1500, 3000 VDC
Circuit lengths	250–3000 ft (75–900 m)
Maximum intermittent exposure temperature	392° F (200° C)
Heating technology	Constant wattage
Sheath material	Thermally conductive silicone rubber

# Controls & Telemetry

nVent trackside heating solutions include control and telemetry products, forming systems that can be controlled from on-site and remote locations. We offer control systems for contact rail, catenary, and switch-heating applications. nVent trackside heating control panels contain standard industry PLCs, electronics and hardware, and SCADA system components that link on-site controllers to off-site operator interfaces via wireless data transmission. The control panels utilize well-established nVent products, such as nVent Hoffman enclosures, nVent ERICO surge protection and nVent ERIFLEX electrical connection solutions. Because every trackside heating requirement is unique, we provide custom control panel configurations for each project to ensure proper fit and function. Offering this comprehensive line of control and telemetry products is one of the many ways that nVent connects and protects critical systems that improve rail safety and reliability.

## FUNCTIONALITY

Adding control and telemetry modules to nVent trackside heating systems allows for numerous operational configurations and functional advantages, including:

- **Real-time control and monitoring capability**, allowing for operations on site or at a remote dispatch center.
- **Data communication**, providing real-time power consumption data and retaining historical records for analysis.
- **Operational simplicity**, allowing most troubleshooting to be performed remotely.
- **Industry standard components** that easily integrate into, and interface with, existing sub-systems (e.g., power distribution centers and safety equipment), which are easy to replace when necessary.
- **Cost savings** through strategic system utilization of heating system, especially with features like automatic on/off functionality that can be preprogrammed based on certain criteria.

## TECHNICAL SPECIFICATIONS

### Trackside Control Panels

- 600–750 VDC capabilities
- 250A switching capability
- Available surge/lightning protection
- Fuse boxes

### Control Communication Systems

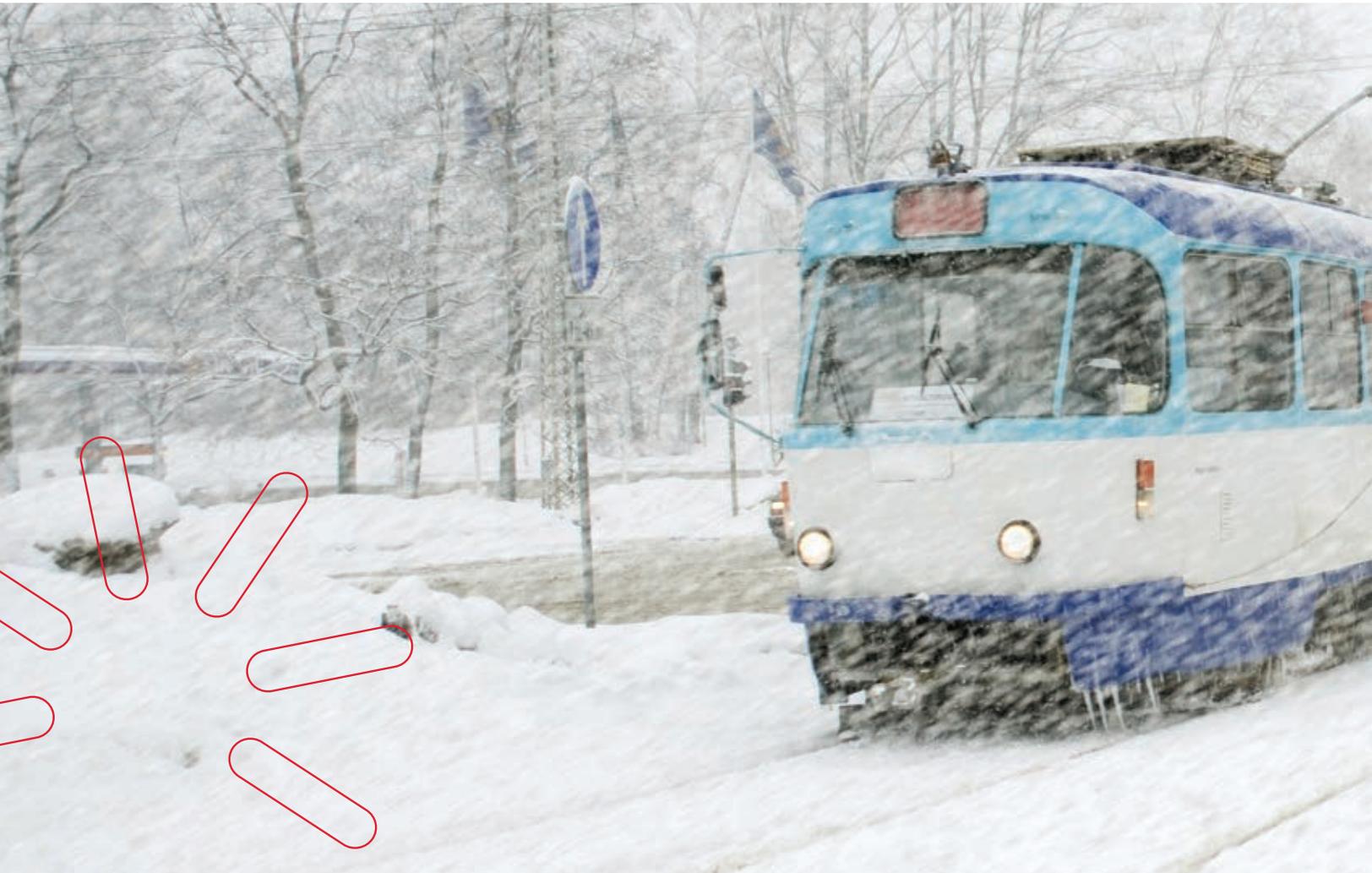
- Wireless, fiber optic, RS-485
- Telemetry to and from OCS SCADA interface
- Touchscreen user interface (HMI)
- Data recording and analytics

### Hardware Requirements

- Control panel
- 2.4GHz/900MHz wireless radio
- Programmable logic controller (PLC)
- Industrial PCs
- SCADA software



# About nVent



At nVent, we believe that safer systems ensure a more secure world. We improve the safety and reliability of assets across a wide range of industries through inventive electrical solutions that securely connect and protect mission-critical systems. Maximize your productivity. Minimize downtime. Reduce operating costs. Trust nVent to connect and protect your electrical infrastructure.

We serve global railway markets with trusted solutions from nVent ERICO, ERIFLEX, HOFFMAN, RAYCHEM and SCHROFF. Our customers include major freight and transit railroads as well as global transportation companies that build rail vehicles and operate railway networks. We are well versed in the design criteria of rail networks, from railway engineering standards like AREMA (American Railway Engineering and Maintenance-of- Way Association) and CENELEC (European Committee for Electro technical Standardization).

nVent products meet and exceed global electrical and electronic engineering standards set forth by the IEEE (Institute of Electrical and Electronics Engineers) and UL electrical product safety standards. nVent produces railway products at over 15 locations, part of a manufacturing footprint that includes a total of 23 sites spread over a dozen countries. nVent facilities maintain the highest standards for production quality, with certifications that include ISO 9000, ISO 9001 and IRIS REV 02.

# nVent Worldwide Presence



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