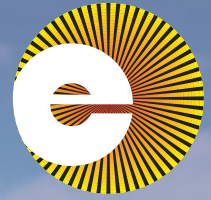


eltherm[®]



Solutions in Rail Heating Systems

Rail Heating Proposal

Innovations in
heat tracing

Innovations in heat tracing

eltherm® – our company

- How can we protect antennas from ice in frosty weather?
- How can we transport and process liquid chocolate and prevent it from becoming solid?
- And how can we make sure that trains run smoothly despite, ice winter conditions?

The eltherm Elektrowärmetechnik company has the answer.

This is the place where heating cables, heating tapes, heated hoses, heating jackets and trace heating components are manufactured and, furthermore, where they are designed and developed to customer's needs in our own engineering office. Customer in countries all over the world gets excellent service, provide by both our local trade partners and our export department. We also realise special customer complete solutions for major projects.

We are constantly improving existing processes and implementing optimisations within our quality management system, to achieve a high level of customer satisfaction. Quality

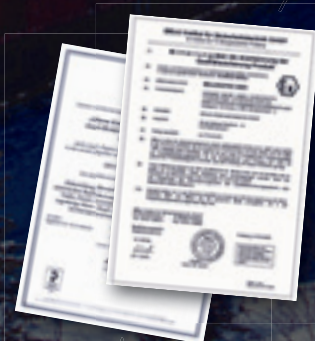
means: faultless production and reliably operating products, which inspire our customer and give them commercial success.

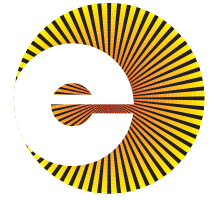
eltherm Elektrowärmetechnik is not only a cable manufacturer but also an engineering company with its own production facilities. It is able to combine application and production know how, based on more than 30 years of experience. Innovative products, customised non-standard solutions, modern QA and development departments have put eltherm among the leading manufacturers for electrical pipe heating systems.

The slogan „eltherm – Innovations in heat tracing.“ are no empty words.

Qualified solutions

eltherm® has its own production facilities and its own engineering office. This is where innovative solutions are born and where products are constantly improved to meet market requirements. Our quality-management system ensures that only top quality and fully functionally products leave our factory. Apart from CSTB certification and VDE guidelines, for instance, eltherm® also meets the strict requirements of the ATEX certification. In addition, eltherm® has had ISO 9001 certification for many years.





Purpose of rail heating

In areas with frequent and long frost periods, any surface exposed to open air is likely to be covered by snow and / or ice. In case of the track of a Light Railway System, ice or snow covered track running surfaces reduce the friction between the rubber wheels and the track and thus restrict

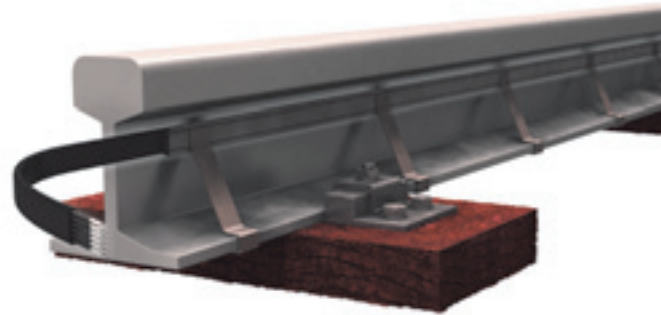
mobility of the train. More over, ice covered third rails are compromising the reliability of train detection systems – a major safety issue. Thus, for trouble free and safe train operation during winter seasons, rail heating is recommended to keep the track surface free of ice and snow.

Basic design considerations

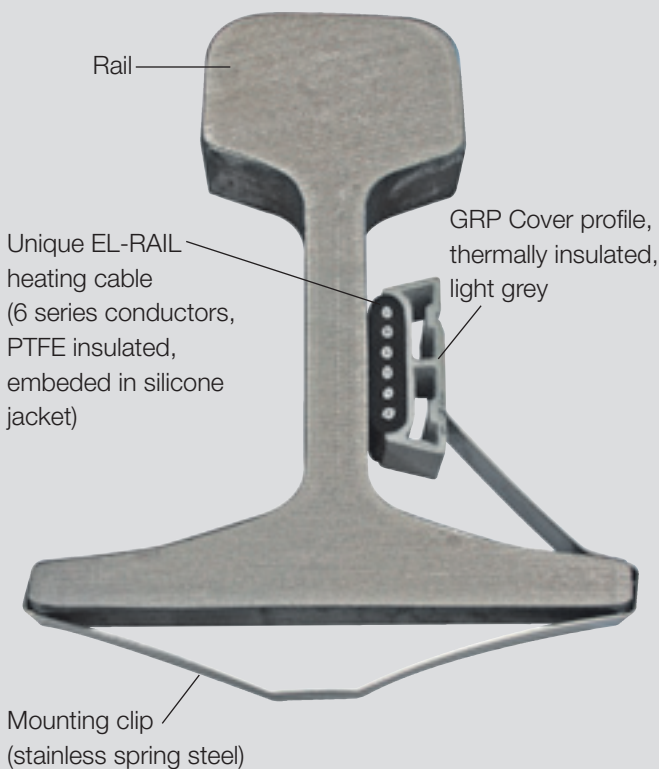
When using electric trace heating on rails, it is recommended that:

- The number of tracings on the rail is kept to a minimum by
 - choosing a cable of high possible output
 - placing it at the most efficient position of the rail
 - ensuring a maximum heat transfer to the rail
- The total number of supply points is kept to a minimum by installing maximum possible circuit length of the cable
- The total number of cable terminations and splices is kept to a minimum, again by installing maximum possible circuit length of the cable

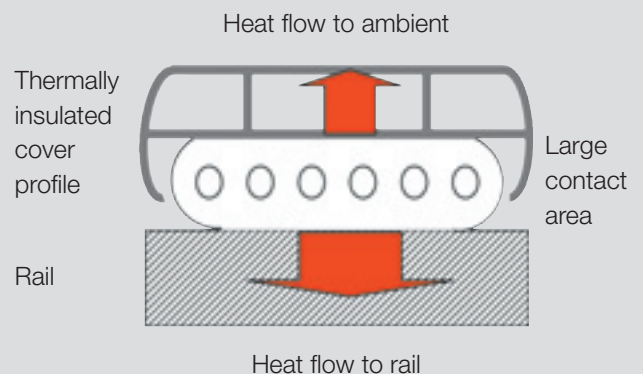
All of those considerations are directly linked to a cost effective installation and maintenance and to a reliable operation of the heating cable. With regard to a cost effective operation of the heating system, suitable controls are required.



eltherm® proposal

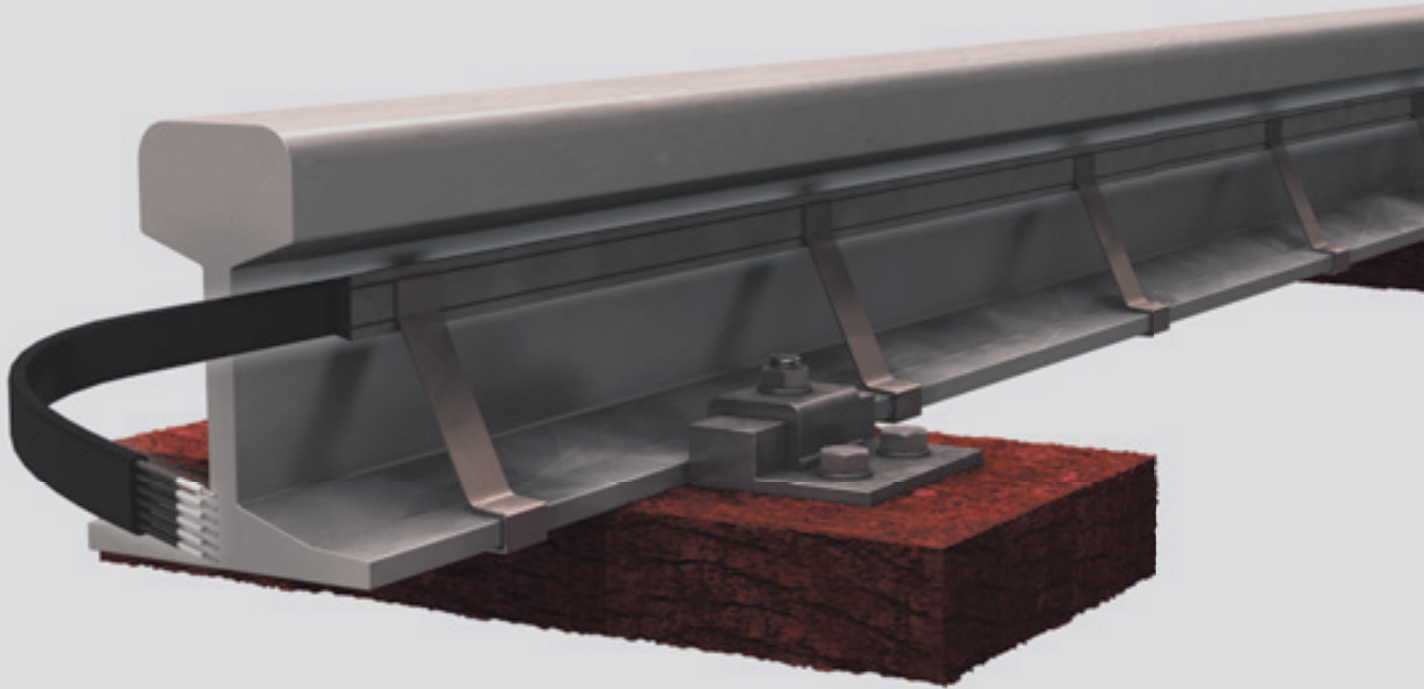
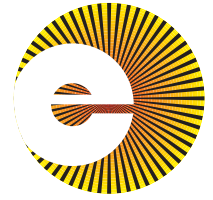


Heat flow for eltherm EL-RAIL



The eltherm® proposal utilizes a single series cable per rail. This cable has got an unique flat shape to ensure maximum heat transfer to the rail. This effect is achieved by a rigid, thermally insulated cover profile, which presses the cable firmly against the rail by means of spring steel mounting clips with defined pressing force.





Summary of benefits

- Lowest possible number of power supply points for the heating cable because of unmatched circuit lengths
 - Evenly distributed heat along the entire rail because voltage drop in El-Rail cable is 0%
 - No risk of cold zones on the rail caused by low power or dead cable sections
 - Excellent thermal efficiency due to
 - thermally insulating cover profile which directs heat flow towards the rail
 - good contact between heating cable and rail provided by unique large flat cable surface, rigid cover profile and spring steel fitting clips
- That means:
El-Rail cable will achieve higher surface temperatures on top of the rail at lower power consumption compared to other systems
- No special effort for the handling of inrush currents necessary
 - PTFE electric insulation provides superior temperature with stand properties along with an unequalled flexibility, thus providing extra electrical safety in case of Voltage peaks (El-Rail cable passes 20000V factory spark test)
 - El-Rail cable has self-stabilising properties due to its copper conductors with PTC behaviour. This will automatically restrict the thermal effects of possible Voltage peaks, thus providing additional safety against overheating
 - Quick and easy installation due to unique fitting clips that can be fastened either by a MMS bolt directly in the concrete basement of the rail, by means of a spot welded bolt directly on the rail itself or by embracing the bottom flange of the rail
 - Low maintenance costs due to
 - low number of power distribution panels, junction boxes and cold end connections
 - protected position of the heating cable and additional protective cover profile
 - All materials are by mechanical properties suitable for heavy duty use and are resistant against oil, glycol, herbicides and UV radiation. The PTFE insulation layer provides additional safety against extremely aggressive media like acids etc.

Innovations in heat tracing

Datasheet

EL-RAIL Rail Heating Cable

Available resistances: upon request

Dimensions: 8 x 34mm

Min. bending radius: 50 mm

Weight: approx. 400 g/m

Max. circuit length at 150 W/m

800 m / 1000 VAC or 250 m / 230 VAC

(supply from both sides)

400 m / 100 VAC or 125 m / 230 VAC

(supply from one side)

Benefits:

- Heating circuits up to 1,200 m at ~70 W/m
- Optimal heat distribution and heat transfer due to a large heat transfer surface
- Constant power output up to 150 W/m
- Low cost of installation, termination and mounting material caused by single heat tracer solution per rail
- Low end termination costs
- High quality, mechanical and chemical resistance due to additional PTFE insulation of bus wires
- High efficiency with thermally insulating covering profile
- Perfected mounting system
- Voltage range 230 V to 1,000 V, heating cable with stands 5 kV tests

The eltherm® EL-RAIL is a flat cable, combining six PTFE insulated series heating conductors in a silicone over-jacket. Superior properties of the heating system, low installation and operation costs and professional support from eltherm® makes the EL-RAIL to a first choice in rail heating applications.

Cable specifications:

Insulation Class 2

First insulation 0.8 mm PTFE

Second insulation 2.5 mm Silicone

(Insulation based on VDE 0253 standard)

Braid (optional) tinned copper

Max. loading 150 W/m

Max. voltage 1,000 VDC

Max. current 30 A per conductor

Max. temp. operated: 50°C

Max. temp. de-energized: 150°C

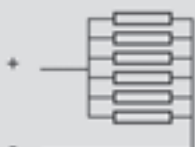
Min. installation temp.: -40°C

Ohm values: according to site conditions

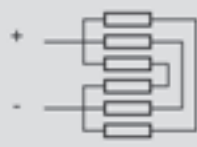
Resistant against UV rays, Glycol, mineral oil and herbicides

Possible Connections:

6 parallel



3 parallel 2 series

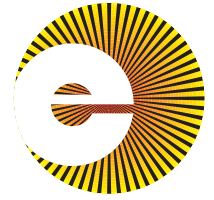


6 series



Star

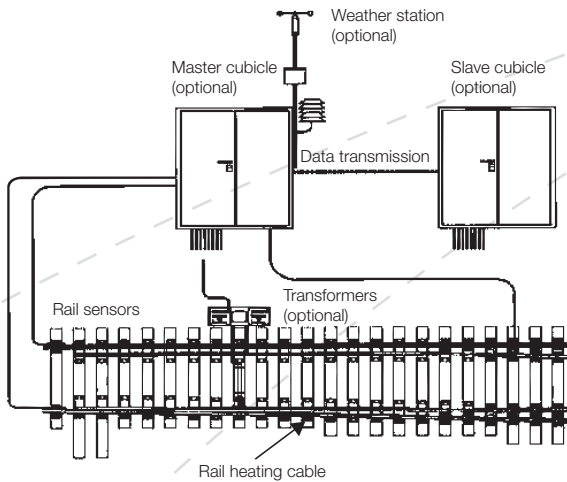




Control and monitoring system

Sophisticated controls are recommended in order to preserve as much energy as possible:

Layout for Rail Heating Monitoring Control System



The control and monitoring concept starts with placing one or more cubicles at the remote site, each having an intelligent controller, responsible for driving the local heating elements. The heating control is based upon actual measurements on weather parameters via one or more weather stations. The weather station(s) measure temperature, wind speed and

detects rain or snow. It is possible to connect more weather stations or rail sensors on a complete system.

The cubicles do more than just distribute heat. They also monitor the complete system and detect errors – if any.

Although our control cubicles are designed to run autonomous with a minimum of service and maintenance, it is sometimes necessary or just convenient to be able to dial the remote site for status update or upgrade of software. For this reason, we prefer to deliver master cubicles with a built in Modem or GSM modem.

Server Based control system

The central server offers several benefits:

- Central Modem pool
- All alarms are sent to one place.
- All alarms are stored in the same database
- Alarms can be rerouted to e.g. E-mails, SMS messages via server.
- All software is stored in one place, this means easy maintenance, upgrades and back-up routines.
- Customized user rights management.



Control cubicles



Innovations in **heat tracing**



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