







SAN[®]

Railway Systems



HEATING ELEMENTS RAILWAY SWITCH POINT HEATING (ELECTRICAL)

-  **Unique vibration proof design**
Solid straight inner heating conductor with a spun fibre glass insulation around.
-  **Long lifetime**
Excellent return on investment. Proven records of 30 years+. More than 15.000 installations in the rough railway environment.
-  **Energy saving**
Slim-line, flexible design to improve surface contact to rail. Elements for both stock and switch rail.
-  **Standard or customized**
Length up to 7.5 m, power up to 1000 W/m, voltage 48-240 V, pre bended to specific shape or tools to do it on-site.
-  **Reduce safety malfunction**
Dual insulation layer around the heating conductor secure no electrical shorts to outer shield.
-  **Time Saving Installation**
Easy clamp system and flexible heating elements reduces installation costs.

No switch point heating system is better than the HEATING ELEMENT.

Railways must run quickly, safely, punctually and economically 24-7. Interruption due to lack of performance on subsystems or components are not acceptable.

During wintertime switch points might fail due to accumulation of snow and ice typical between the stock rail and the switch point blade.

A "SAN Railway System" electrical heating element is designed specific to solve these problems. The flexible flat stainless steel element withstand the harsh environment associated with train traffic for instance corrosion problems and vibrations. The single ended connection is totally sealed to avoid any moisture problems.

The heating elements is produced in various sizes, shapes, length, electrical compatibility, energy intensity, insulation grades and outer shield material. All depending on the actual locale demands and conditions.

The economical cost of railway traffic interruptions clearly calls for high quality reliable systems and components.

DESIGNED FOR RAILWAY ENVIRONMENT

The railway environment is known as a very rough environment.



The atmosphere:

The atmosphere in contact with the element is a combination of iron dust, iron oxide, oil, grease, acid rain and railway chemicals (herbicides etc.). This in combination with changing temperatures and humidity creates a very corrosive environment.

The physics:

The railway rails are exposed to very heavy physical stress that creates different kinds of mechanical shock and vibrations. When a train passing the switch, fast or slow, heavy cargo trains or high speed trains they all makes the rail vibrate. During maintenance of the rail body e.g. grinding and when changing/reorganize the ballast the rails are exposed to mechanical stress.

All the above mentioned conditions are the faced challenges when designing reliable components for the railways.

SAN Railway systems (SAN Electro Heat A/S) has more than 30 years of experience in this industry and ten thousands of installations that proves that our design meets the demands year in and year out.



CONSIDERATIONS

Malfunction of a switch point normally means no traffic through this switch or no switch function before someone physically has examined and manually fixed the problem at the switch point. A very costly consequence caused by only a small amount of ice and/or snow.

Heating the rails in a switch point is done to avoid problems when ice or snow is accumulated between the point blade and the stock rail and/or ice is disturbing the locks and linkage to work properly.



Designing the right solution depends on multiple circumstances e.g.:

- **Winter Weather type.** Long winter with very low temperatures and a lot of snow, snow storms etc. or winters with a limited number of snow days.
- **Access to power.** How much power is it possible to get for the switch point heating.
- **Existing installation.** Electrical and perhaps mechanical compatibility with an existing installation.
- **Type of Turnouts.** Long high-speed turnouts or small radius side-track turnouts.

SAN railway systems has a deep knowledge about all these questions and will assist to design a cost and energy efficient system.



Snow /
Ice Rain



Snow
Warning



Snow
Storm



White Frost
Warning

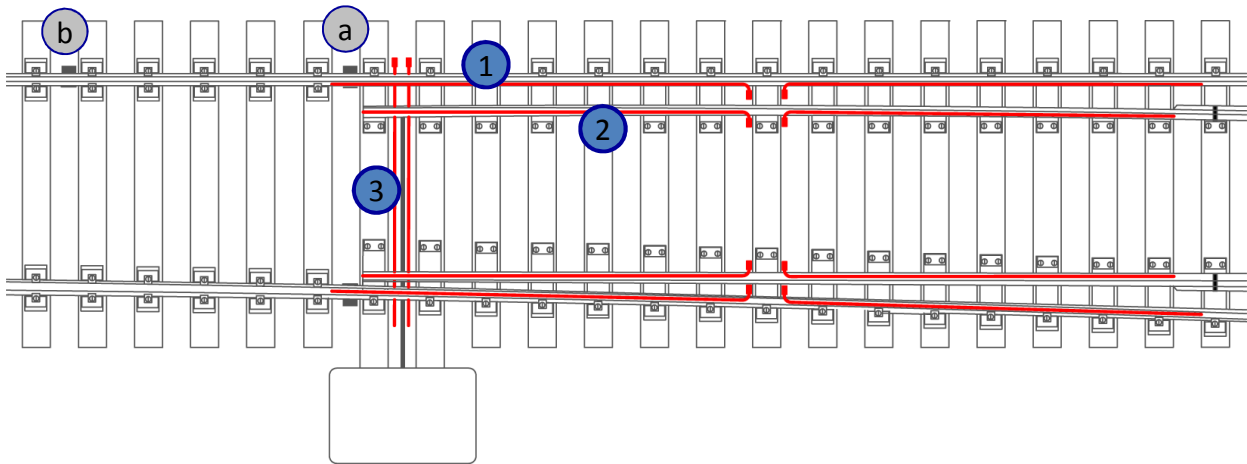
HEATING A SWITCH POINT

Switch point heating is about heating the rails to melt any ice or snow before it accumulates between the point blade and the stock rail and melting the ice that disturbs the switch mechanism to work properly. Melting the ice and snow is done from various attack points. Using conducted heating as well as radiated heating.

SAN Electro Heat A/S is dividing the need for heating into 3 area's

1. Stock Rail heating
2. Switch blade heating
3. Switch mechanism heating
 - a. Correct place for "Hot Rail" temperature feedback sensor
 - b. Correct place for "Cold Rail" temperature sensor

Illustration shows a 1:9 Radius 190 switch point



STOCK RAIL HEATING

Using SAN Electro Heat SSV or SV type heating element the element is easily mounted on the shoulder on the inner side of the stock rail. The flat design of the heating element creates a greater surface for the heat transfer to the rail.

The conducted heating in the rail combined with the radiated heating direct from the heating element keeps the area between the stock rail and the switch blade free from snow and ice.

It is recommended to heat up the same length on the stock rail as the length of the switch blade. The length depends on the switch point radius. Normally the length is so long that two or sometimes three heating elements is required.



SWITCH BLADE HEATING

In some occasions it is not efficient enough only to heat the stock rail. Critical switch points in e.g. open areas with drifting snow problems. In these cases heating both the stock rail and the switch blade is a very efficient solution.

The heating element is mounted on the inner side of the switch blade. The heated length of the switch blade is normally the full length of the moving blade.

Energy saving: In more and more cases SAN railway systems recommends decreasing the total power consumption in a switch point but heat both the stock rail and the switch blade. The efficiency of melting the ice between the stock rail and the switch blade is simply better if both rails are heated.



SWITCH MECHANISM HEATING

Switch mechanism heaters serve to keep locks and linkage free of snow and ice. The heater consists of a stainless steel heat conducting plate with a flat bended heating element on the back.

The heating element is similar to the rail heating element but clamped on the back side of the heat conducting plate. The Switch mechanism heater is placed in the switch mechanism duct.



FLEXIBLE CLAMPS

SAN Electro Heat SSV and SV elements are mounted on the base of the rail by means of special clamp straps made of corrosion-resistant chrome-nickel steel.

SAN Electro Heat SSV and SV elements are mounted on the base of the rail by means of special clamp straps made of corrosion-resistant chrome-nickel steel. The chosen surface pressure guarantees an optimum in heat transfer. Beyond that it allows an unavoidable linear extension of the heating elements without limitation. The strong fixing right in front of the connection head prevents the heating elements from creeping.

Complete program of clamps for the stock rail and for the switch blade is available for these rail profiles:

DSB45, S49, S54, UIC54, UIC60 og BS113A

For all other profiles clamps will be made upon request.



RAIL TEMPERATURE SENSORS



Cold and Hot (heated) Rail Temperature sensors
Special Bracket for actual Rail. Side-rail mounted or Bottom-rail mounted.

Measuring Range: -50°C to +50°C
Accuracy: $\pm 0,1^{\circ}\text{C}$
Resolution: 0,1°C
Measuring principle: PT100 3 wire
Measurement aluminum block (without Bracket): 150 x 30mm
Protection: IP65

The "Hot rail" sensor is normally mounted on the shoulder of the rail.

The "Cold rail" sensor is often mounted under the rail. This is to make sure that sunshine and the like is not making any disturbances in the cold rail temperature reading.



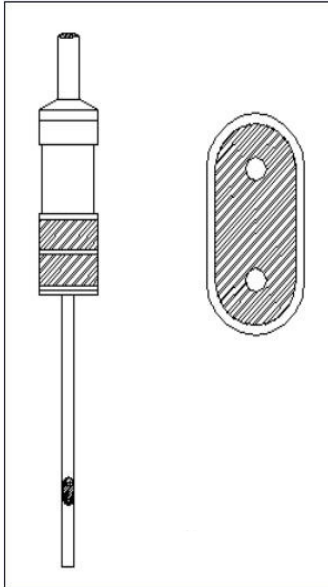
INSTALLATION



Special tools are available for on-site bending of the heating elements and for quick mounting of the different clamps along the rail.



SSV - ELEMENT TECHNIC



SSV type heating element is our best selling heating element for railway applications.

The design of this flat stainless steel tubular heating element is made specially for the tough railway environment.

The outer shield withstand corrosion and the inner construction is extremely resistant to heavy vibrations and mechanical shocks.

The soft flexible design of the heating element makes it possible to bend the element for best fit on location.

The heating element has the following key features:

- **Extreme resistant to mechanical chocks and vibrations**
Long lifetime – good return on investment
- **Dual electrical insulation**
Secure no electrical shorts to outer shield/rail
- **Energy efficient shape**
Flat surface to maximize heat transfer to the rail
- **Corrosion free outer jacket**
Stainless steel AISI 316, 321 or MONEL 400
- **Completely sealed connection**
No risk of malfunction due to moisture and termination corrosion problems.
- **Flexible length and shape**
Made to fit the switch best possible
- **Small physical size**
Will fit narrow places in switch point



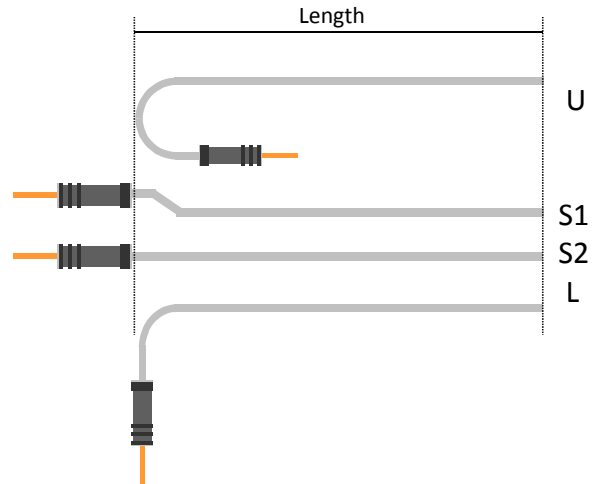
Outer shield Stainles steel

Magnesium oxide for insulation and mechanical stabilisation

Fiberglas thread. Chock absorber and electrical insulation

Solid or multi core robust heating wire

SHAPES



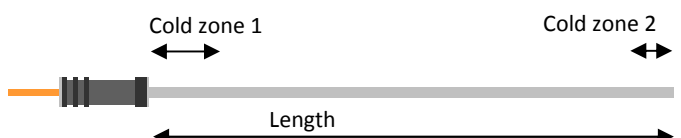
The heating elements are pre-bended in four different shapes: S straight 1 and 2, L or U shape.

Special pre-bended elements are available for a number of specific switch point types.

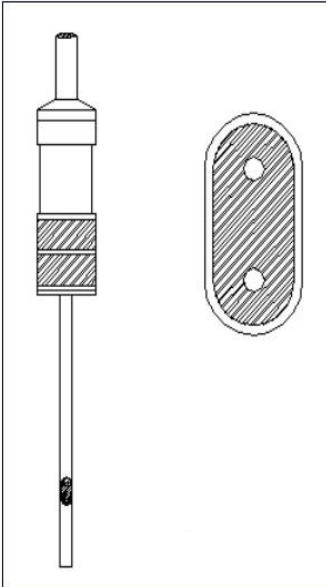
SPECIFICATIONS

Output Power:	Up to 350 Watt / meter
Supply voltage:	40 to 750 V
Cold zone 1:	Typical 150 mm
Cold zone 2:	Typical 20 mm
Physical size:	
Heating element:	11 x 5,5 mm*
Connection head:	OD 26 mm Length 75 mm
Heating element length:	Up to 7500 mm
Cable length:	To be specified
Cable connection:	Permanent molded
Cable type:	PUR H07BQ-F
Protection class:	IP65
Electrical isolation:	> 10 M Ohm
Outer jacket:	Stainless steel AISI 316, 321 or MONEL 400
On-site bending:	Yes Down to OD 30mm

* In some combination of low supply voltage and high output power it is necessary to use 13 x 5,5 tubing.



SV - ELEMENT TECHNICAL



SV Same flat stainless tubular heating element design, but slightly wider. The SV design is made where there is a demand for extra power. Up to 1000 Watt per meter.

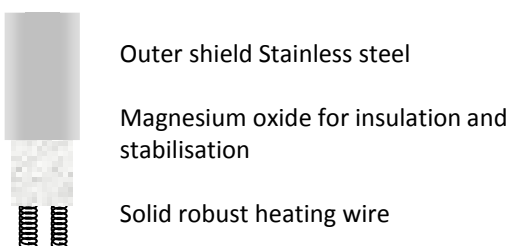
The heating wire is a solid wire wound in a spiral. The spiral is completely encapsulated in highly compressed magnesium oxide. The heating element has been through a thermo cycle to reduce the fragility.

The element can be bended on-site or can be delivered pre bended.

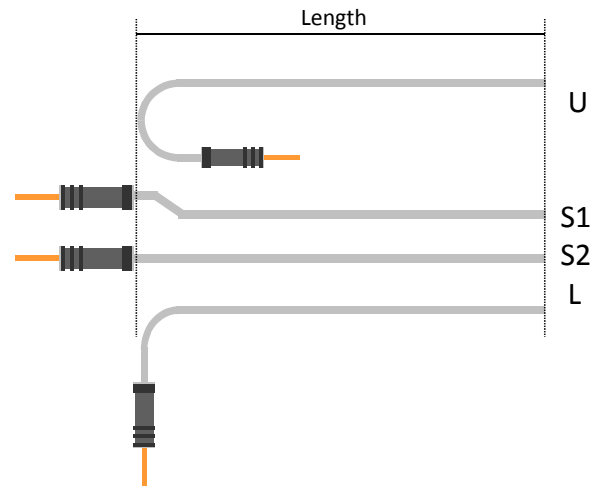
SV can be delivered with multi-zone power output. E.g. first half of the elements makes 650 W/m and the rest makes 970 W/m. This Has been delivered for switch points where higher power was wanted at the toe of the point.

The SV heating element has the following key features:

- **Resistant to mechanical chocks and vibrations**
Long lifetime – good return on investment
- **Multi zone heating**
Increase the efficiency and saves energy
- **High Power**
High heating capacity for very challenging winter weather conditions
- **Corrosion free outer jacket**
Stainless steel 316, 321 or MONEL 400
- **Completely sealed connection**
No risk of malfunction due to moisture and termination corrosion problems.
- **Flexible length and shape**
Made to fit the switch best possible
- **Small physical size**
Will fit narrow places in switch point



SHAPES

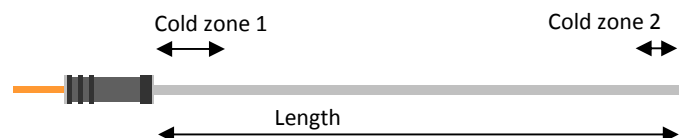


The heating elements are pre-bended in four different shapes: S straight 1 and 2, L or U shape.

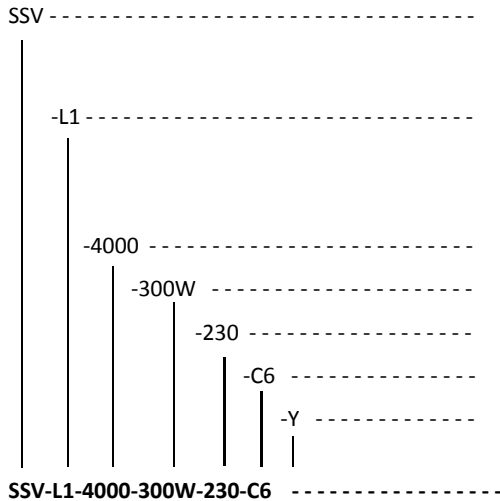
Special pre-bended elements are available for a number of specific switch point types.

SPECIFICATIONS

Output Power:	Up to 1000 Watt/meter
Supply voltage:	40 to 750 V
Cold zone 1:	Typical 150 mm
Cold zone 2:	Typical 20 mm
Physical size:	
Heating element:	13 x 5,5 mm*
Connection head:	OD 26 mm Length 75 mm
Heating element length:	Up to 7500 mm
Cable length:	To be specified
Cable connection:	Permanent molded
Cable type:	PUR H07BQ-F
Protection class:	IP65
Electrical isolation:	> 10 M Ohm
Outer jacket:	Stainless steel AISI 316, 321 or MONEL 400



MODEL SPECIFICATION - SWITCH POINT HEATING ELEMENTS



SSV-L1-4000-300W-230-C6

Type of heating element
 SSV....(5x11 mm Extra flexible and mechanical shock absorbent)
 SV.....(5x13 mm High power)

Shape of the element
 L1, L2, L3....L shape as per drawing
 U1, U2, U3...U shape as per drawing
 S1, S2, S3....straight element as per drawing

Length in mm

Power output in Watt per meter

Supply voltage

Cable length in meters

Y..... Yes, something special to add about this heating element

SAMPLE MODEL: SSV type heating element, L shaped as per drawing L1, 4000mm length, power output of 300 Watt per meter, 230 V supply voltage, delivered with 6 meter of cable.

SPECIAL ORDER SPECIFICATIONS

In some cases it could be necessary to order heating elements that is just a little bit special from the standard. E.g. The L shape distance from the connection head to the angle has to be bigger, or we supply the connection head with a coloured ring for easy identification.

In these cases add the -Y in the end of the ordering number and add the extra specification in writing.

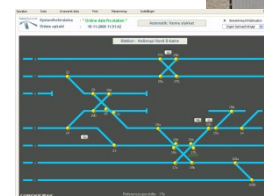
Many countries have there special requirements for dedicated switch points or for the hole territory. SAN is very flexible to help meeting these demands.

COMPLETE SOLUTION

The key to minimize the energy consumption and still not jeopardize the railway traffic is to use an intelligent system to control the switch point heating elements.

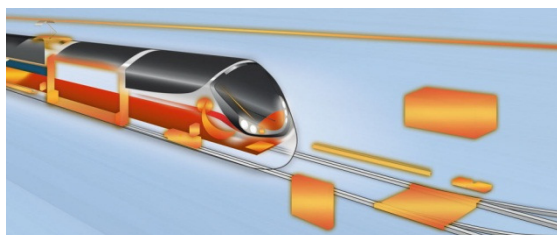
The system BLUE POINT uses multiple information to control the heating process. Some information are measured directly other information's is coming from the server (supervision system / SCADA).

See more in the Product Specification:
PS-SBP-CONTROL



SAN Electro Heat A/S (Member of the NIBE group)

Danish located, international company offering more than 50 years of experience in developing and manufacturing of advanced, technical electric heating solutions and components. Products highly cost and energy optimized developed together with the customer. Our focus and know-how is divided into four business areas: Railway Systems, Wind Power, Industrial Process and Comfort Heating.



SAN - Railway Systems (Part of NIBE Railway Components)

Complete systems to secure optimal operation under any winter weather situations: Switch Point Heating, Overhead Wire de-icing and Third rail de-icing. Our focus is to deliver highly efficient systems that reduces energy consumption and reduces the total cost of ownership. From heating elements through intelligent controllers to advanced server based computer monitor program. Including all necessary fittings, power transformers, weather stations etc. Rolling stock comfort heating, door step de-icing, heating of hydraulic systems, toilet/waste water systems and Test load resistors.

Our design has proven its reliability trough thousands of installations all over Europe.

SAN Elektro Heat A/S - SAN Railway Systems

Gillelejevej 30 Tel.: +45 48 39 88 88 san@san-as.com
 3230 Graested Fax: +45 48 39 88 98 www.san-as.com CVR no.: 42 16 59 13
 Denmark

Information in this document is subject to change without notice.
 ©2009, by SAN Electro Heat A/S.
 All rights reserved.