



Point heatings with optical precipitation sensor and weather forecast

Requirements

About 64,000 points in Germany belonging to the German railway company Deutsche Bahn AG are heated. Some of them are heated with gas but most of them are kept ice- and snow-free electrically. The energy consumption of the electrical point heatings cumulates to about 230 GWh per winter. This means almost problem-free operation during winter but causes high energy costs. In the course of the progressing increase of efficiency, it is also desired to develop energy-saving systems in the field of point heatings. The integration of weather forecasts enables the reduction of the energy consumption and thus of the costs and the CO2 emissions.

Your advantage

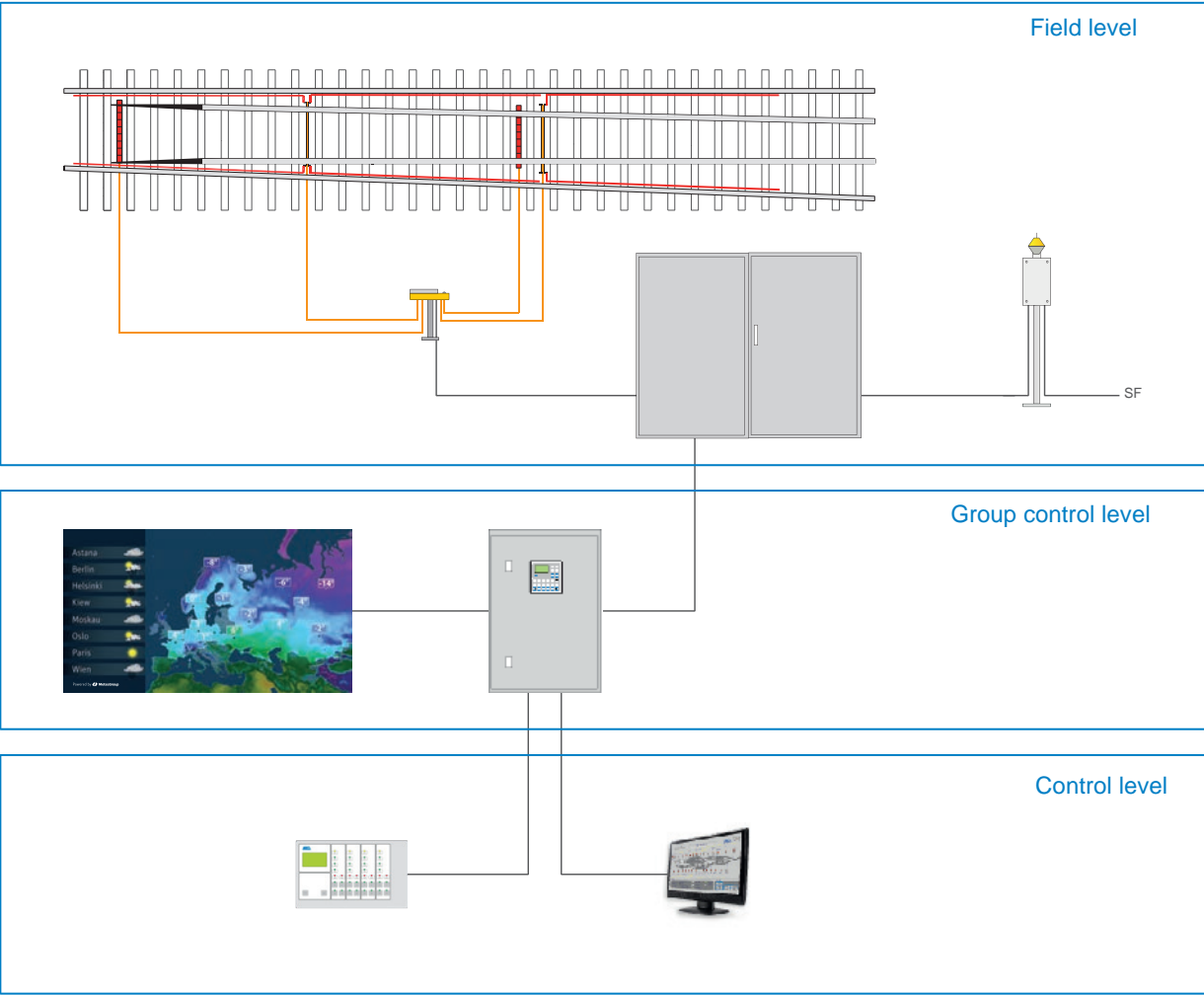
- safe rail operation with full point heating functioning
- pre-heating of the point by precipitation forecasts
- optimum control regime for different kinds of precipitation
- continuous heating in case of severe weather warnings e. g. snow
- weather data from Meteogroup

Potential of energy saving

- mild winters => energy saving potential appr. 30 %
- cold winters => energy saving potential appr. 10 %

Our solution

The point heating control developed by ESA Elektroschaltanlagen Grimma GmbH ensures full point heating functioning even under extreme weather conditions with optimum use of energy combining the integration of weather forecasts and an optical precipitation sensor.



Functioning

A weather service (e. g. Meteogroup) provides re-calculated weather data in regular intervals via web service for a geocoordinate (station). This data is evaluated in the group control level according to a predefined algorithm.

Time stamp	Temperature	Probaility of precipitation	Kind of precipitation
11.2.2014 12:30	1°C	0%	none
11.2.2014 13:00	-2°C	50%	rain
11.2.2014 13:30	-2°C	90%	rain
11.2.2014 14:00	-5°C	90%	snow

Example: weather data from the data source

The system generates a temperature schedule for the rail set temperature on the basis of the given algorithm using the weather data and the recent local data as kind, amount of precipitation etc. This schedule may look like this:

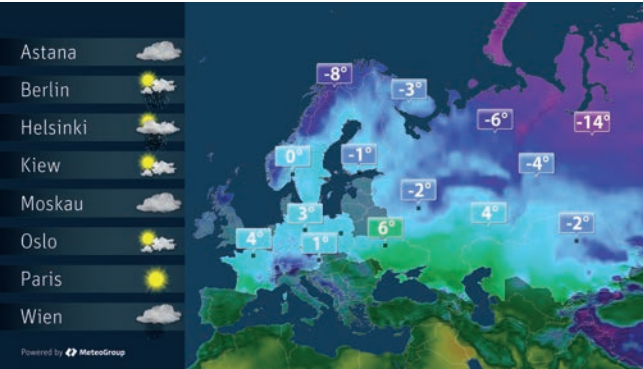
Time stamp	Rail set temperature
11.2.2014 12:30	-99°C
11.2.2014 13:00	-99°C
11.2.2014 13:30	0°C
11.2.2014 14:00	4°C

Example: temperature

The schedule of the rail temperature is sent to the systems in the field level. The control unit receives the schedule and replaces an older schedule it possibly already obtained with the new rail temperature data and processes it.

Failure safety

In general, the system is safe against the failure of the weather forecast. If the process chain fails, the local weather data identification controls the system as usual. The identification sends a fault message to the control level reporting that the weather forecast based control has failed.



Optical precipitation sensor NI-05

Functions:

- detection of the amount of precipitation
- detection of the kinds of precipitation (incl. distinction of different kinds of precipitation based on the particle size)
- detection and fading out of the fault if caused by pollution
- heating of the housing to prevent deposit on the surface of the sensor

Precision of the precipitation detection:

- | | |
|---|---------------------|
| ■ particle size | 0,2...> 8 mm |
| ■ particle speed | 0,2 ...20 m/s |
| ■ distinction of the kinds of precipitation | drizzle, rain, snow |
| ■ minimum intensity | 0,005 mm/h |
| ■ maximum intensity | 250 mm/h |
| ■ weather codes | Metar 4678 |

Interfaces:

- voltage supply +24 V DC and GND (current 2A, incl. heating)
- selectable CAN (protocol CANopen) or RS485 (protocol Modbus)
- potential-free relay contact
- 4-20 mA
- 0-10 V
- USB (configuration/parameterization/update of the firmware)

Connections:

- +24 V DC
- GND
- (RS485) Data A/CAN High
- (RS485) Data B/CAN Low
- Analogue 1
- Analogue 2

Weather data

Functions:

- hourly update of the data
- prognosis horizon 24 hours

Prognosed parameters:

- probability of precipitation
- kind of precipitation
- amount of precipitation
- air temperature (2m above ground)
- dew point
- relative air humidity
- weather condition (code for weather symbol)
- rails: rail temperature and condition
- overhead cable: overhead cable temperature and condition
- wind speed

Weather data is available for many countries including the following

- | | |
|-----------------|---------------|
| ■ Belgium | ■ Austria |
| ■ France | ■ Philippines |
| ■ Germany | ■ Poland |
| ■ Finland | ■ Russia |
| ■ Great Britain | ■ Singapore |
| ■ Ireland | ■ Spain |
| ■ Italy | ■ Sweden |
| ■ Netherlands | ■ Switzerland |
| ■ Norway | ■ Turkey |

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Changes in the scope of the technical progress reserved.
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pixelio: Georges, Reinhard Grieger

ESA Elektroschaltanlagen Grimma GmbH • Bröner Ring 30 • 04668 Grimma
Phone: +49 3437 9211-0 • Fax: +49 3437 9211-26
E-Mail: info@esa-grimma.de • Web: www.esa-grimma.de

