BlueWire

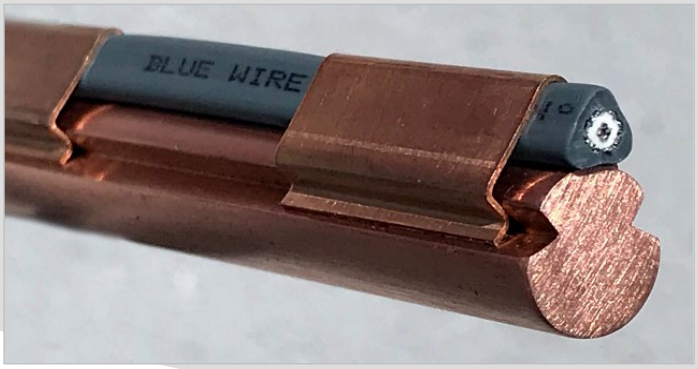
PRODUCT SPECIFICATION

CONTACT WIRE DE-ICING

PERMANENT SOLUTION TO AVOID ICE PROBLEMS

BlueWire a heating cable solution, powered by the overhead wire system itself. A solution to increase traffic regularity and reduce cost for expensive mechanical ice-remover-vehicle or fancy liquids

- **Powered from Overhead wire**
  (500V – 1200V)
- **Always ready for traffic**
  in fully automatic mode or remotely at the tip of your finger.
- **Secure early morning exit**
  Trains and trams out of the depot – every morning – on time
- **Avoid heavy ice-build-up**
  Reduce risk of breaking down the wire system due to extra weight of ice
- **Reduce cost for "night teams"**
  to remove ice on the OHL
- **Extend the lifetime of the pantographs**
- **Chemical and workforce free solution**



Get the trams out of depot every morning

Eliminate costly interruptions of revenue service due to the effect of ice/frost accumulation on the contact wire.

Ice on the contact wire causes tramlines and light rail trains to lose power and in extreme cases leads to the contact wire / catenary system being brought down.

Arcing caused by the presence of ice leads to excessive wear to the pantograph conductors, all leading to traffic delays and service disruption.

Mechanical removal of ice is manpower and time consuming and mechanically stresses the contact wire.

SAN Electro Heat

BlueWire

BlueWire APPLICATIONS

Yards / Depots

Ice on the contact wire very often accumulates during the night. The vehicles cannot move due to ice accumulation causing revenue service interruptions.

In and out of tunnels

The air inside the tunnel maintains a constant temperature and humidity. Traffic in and out and the natural ventilation force the high humidity air to meet the cold environment outside the tunnel. Ice will be created as rime on the contact wire.
Water from the ceiling dripping down on the contact wire will create glaze.

On bridges crossing rivers

The air above the river is normally warmer and the moisture content higher. On the bridge the warmer humid air meets the cold contact wire. Both hoarfrost and rime will accumulate on the wire.

Passing under bridges

Water dripping down from the bridge ceiling hits the cold contact wire, resulting in glaze ice.

Lines along big lakes and rivers

Same problems as for bridges crossing rivers.

Up hill elevated lines

The temperature normally decreases at higher altitude. This means that along the elevated line we will see a big temperature difference. The risk of having rime/white frost conditions somewhere along the line is much bigger. Ice on the contact wire reduces the power when the vehicle needs it the most.

France:
Nantes, near-river-station

Austria:
Pöstlingbergbahn, up-hill

Switzerland:
Montreaux, up-hill

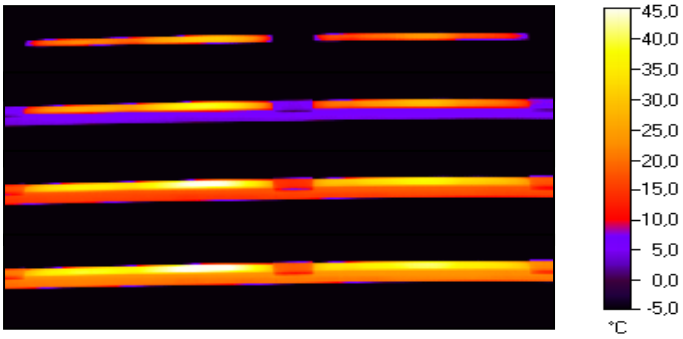
Norway: Bergen Bybane, Depot

BlueWire CABLE SPECIFICATIONS

Heating Cable – Installation

The heating cable is installed on the contact wire using special clips. The clips are made of phosphor-bronze to avoid galvanic corrosion. The heating cable is in a triangular shape. This makes it very easy to mount on top of the contact wire and the shape provides good thermal contact to the contact wire.

Heating Efficiency

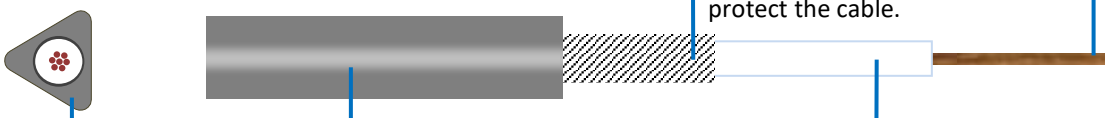


Infrared picture of a heating cable on top of the contact wire. From top: 1, 5, 10 and 15 minutes after turn ON heat

This series of pictures was taken at
-5°C, wind speed 2-3 m/sec, 78% RH, Power 28 W/m.

After just 5 minutes the contact wire is above freezing temperature and ready to avoid icing of the wire.

BlueWire construction



Fiberglas braid:
Mechanical stabilizes and protect the cable.

Lead wires:
Heating wire made of multiple twisted metal alloy wires.

Triangle shape:
Increased thermal contact to contact wire

Heat transfer aid:
Special black UV resistant TPE compound to ease heat transfer and keep a high electrical isolation value.

Heater strip insulation:
An electrical high isolation silicone based material.

Cable type	Circuit length in meter Contact wire voltage (standby)		
	600 V	**750 V**	900 V
BW-102-017	297	**371**	446
BW-102-026	240	**300**	360
BW-102-040	194	**242**	290
BW-102-062	156	**294**	233
BW-102-095	126	**157**	188
BW-102-150	100	**125**	150
BW-102-240	79	**99**	119
BW-102-530	53	**66**	80

The table shows the nominal length of each type of heating cable to be installed based on the contact wire standby voltage (OHL Voltage without trains).

Dimension:	Triangle 7.5 x 7.5 x 7.5 mm
Weight/m:	95-100 g/m including 8 clips
Type:	Serial single-wire heating cable
Power output:	Nominal 24 W/m
Voltage:	Nominal up to 1.000 VDC
Circuit length:	Dynamic design +10% -10% (20 to 30 W/meter)
Max. sheath temp.:	80°C without deformation.
Isolation Voltage:	Minimum 5 kV

INSTALLATION COMPONENTS

System Offering

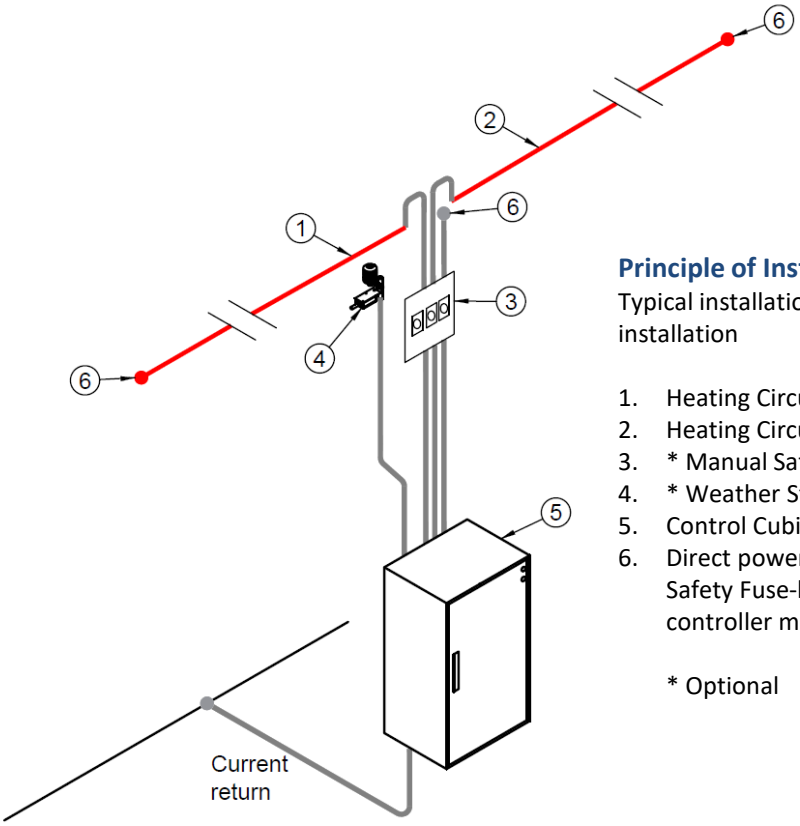
SAN Electro Heat offers a complete BlueWire solution for heating the contact wire to prevent ice from building up. The complete system offering covers:

- Heating cable and easy-to-mount clips
- Installation fittings including crossings etc.
- Manual disconnectors
- Controllers
- Weather stations
- Complete SCADA software for remote control and monitoring of the entire installation.
- Hosting (cloud) SCADA system
- Design of installation.
- Training of local technicians for Installation.
- Installation/commissioning assistance.

Controller Installation

To control and operate the heating, a number of control installations are needed.

The heating cable is stationary connected to the contact wire. The heating power is switched ON/OFF on the negative end (rail).
The controller installation includes a manual disconnector to separate the heating circuit from the rail potential. This separator is mounted some meters above the controller on the same pole.
The controller turns ON the heat when predefined weather situations occur or by direct order.
Each controller is capable of controlling 1 to 4 heating circuits (Depot model up to 8 circuits)



Principle of Installation

Typical installation of a 2x heating circuit installation

1. Heating Circuit 1
2. Heating Circuit 2
3. * Manual Safety Disconnectors
4. * Weather Station at Contact wire hight
5. Control Cubicle (typical pole mounted)
6. Direct power to the heating circuits. Safety Fuse-box for power to the controller mounted on contact wire

* Optional

CONTROLLER SPECIFICATIONS

Controller Features

BlueWire controllers can be configured from basic stand-alone controllers to advanced weather controlled network units. For all controllers counts that they use a powerful rugged RTU to control and monitor the operation.

All controllers:

- Galvanic isolated power supply for all control
- Plastic on Aluminum as baseplate (safety)
- Separation of OHL voltage from control signals
- Automatic circuit breaker/fuse for control power
- Battery backup system
- Manual or Automatic operation
- Operator panel with 4,5” color touch screen for operation status, sensors, alarms and settings
- Weather station input
- OHL voltage measurements
- 2x LED for status and alarms, outside on cabinet door

Heating circuit:

- Line version: One contactor per heating circuit
- Depot version: Up to 4 heating circuits per contactor
- Heating failure alarm (change in cable resistance)
- One fuse per heating circuit
- Contactless current measurement
- One Automatic circuit breaker/fuse per contactor
- * Safety Manual disconnector (pole mounted)

Communication:

- Hardwired remote interface (relays)
- RS-485 Modbus
- Ethernet TCP/IP Modbus
- * Wireless WiFi or G3/G4 GSM modem

Energy saving:

In automatic control the unit will use measurements from the local weather station. Heat will be controlled by air temperature, simulated contact wire temperature and relative humidity.

The automatic mode can be assisted by weather forecast from the monitoring software (cloud based SCADA system). It is also possible to control the heat purely based on these very local and short-sighted weather forecasts.

Controller Network:

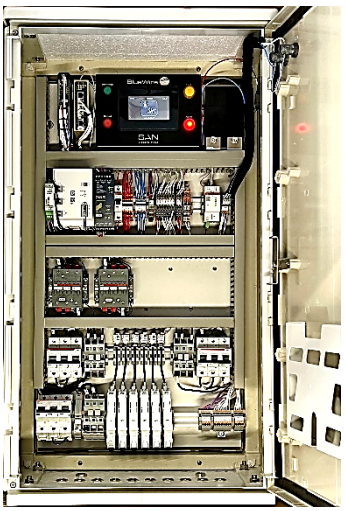
Each controller could be part of a network of controllers. In a depot a configuration it could be one Master (controller with weather station) and a lot of clients (controller without weather station).

For client units it is recommended to include option: Failsafe air thermostat. If the unit loses all communication, it will run as a stand-alone unit based on this thermostat.

MS Controller Specifications

Line models:	**2 or 4 heating circuits**
MS 2	2x contactor 2 output
MS 4	4x contactor 4 output
Depot models:	**4, 8, 12 heating circuits**
MS 1-4	1x contactor 1x4 output (4)
MS 2-8	2x contactor 2x4 output (8)
MS 3-12	3x contactor 3x4 output (12)
Max current:	28 A per contactor
OHL voltage	Std. up to 1.000 VDC Higher voltage on request
Power to controller:	OHL or 230 VAC
Operator switch:	MANUAL - AUTOMATIC
Auto Heat Controlled by:	- Weather station - Weather forecast - Air Thermostat (fail safe) - Remote (SCADA or Relays)
Heating circuit alarm:	
Current:	low, Alarm High, Alarm + Cut-off
Voltage:	low, Alarm High, Alarm + Cut-off
Detection:	Change in Cable resistance
LED indicator on door:	White: ON/OFF Blue: Sum alarm
Current return (minus or rail)	Dual terminals 35mm2
Built in compliance with:	EN 61439-1 2011 EN 61439-2 2011 EN 60204-1 2018
* Dry contact signals:	Input: Demand Heat Output: OK, Heating, Fault
* Failsafe operation:	Air-Thermostat

* Optional



CONTROLLER CONFIGURATOR

BlueWire controller configurator

BW-500-MS				Master Controller and 2x front LED
	2			Line - controller for 2 Heating Circuits
	4			Line - controller for 4 Heating Circuits
	1-4			Depot - controller for 4 Heating Circuits 1x4
	2-8			Depot - controller for 8 Heating Circuits 2x4
	3-12			Depot - controller for 12 Heating Circuits 3x4
		-750		Controller PSU, Line power 600-900 VDC
		-230		Controller PSU, City power 230 VAC
			-std	No further communication (std=RS485 + Ethernet)
			-GSM	GSM Wireless communication by 3G/4G network
				-F02P Fiberglas cabinet IP54 W:590 H:1080 D:322 - Pole mount
				-F02G Fiberglas cabinet IP54 W:590 H:1080+350+600 D:322 - Ground socket
				-B000 Controller on an open aluminium board
				Options:
				-T1 Failsafe Air thermostat
				-W1 WiFi (900Mhz) communication to slave cubicles (for depot installations

Sample order:

BW-500-MS 2 -750 -GSM -F02P BlueWire controller for 2 circuits, Power from OHL, Wireless Com. by GSM modem and antenna, Cabinet fiberglass on pole.

BW-500-MS BlueWire Controller

Size:	Depth:	320	mm
	Height:	1080	mm
	Width:	590	mm
Weight:		xxx	g
Color:		RAL 7035	
Coating:		Yes, Anti-graffiti	
Casing:		IP 44 (54)	

BW-500-WS001 BlueWire Weather Station

Air temperature:	-50°C to +50°C
Humidity:	10 – 99% RH
Dew point	Calculated temperature
Contact wire:	-50°C to +50°C
Contact wire simulation:	100 mm Cupper bar
Interface:	3x 4-20mA transmitters
Cable:	4 wire

BW-400-MD-X (X=1, 2 or 3) Safety Manual Disconnector

Size:	Depth:	140	mm
	Height:	360	mm
	Width:	320	mm
Weight:	1 Disconnectors	3100	g
	2 Disconnectors	3700	g
	3 Disconnectors	4300	g
Casing:		IP 67	

MONITORING & CONTROL

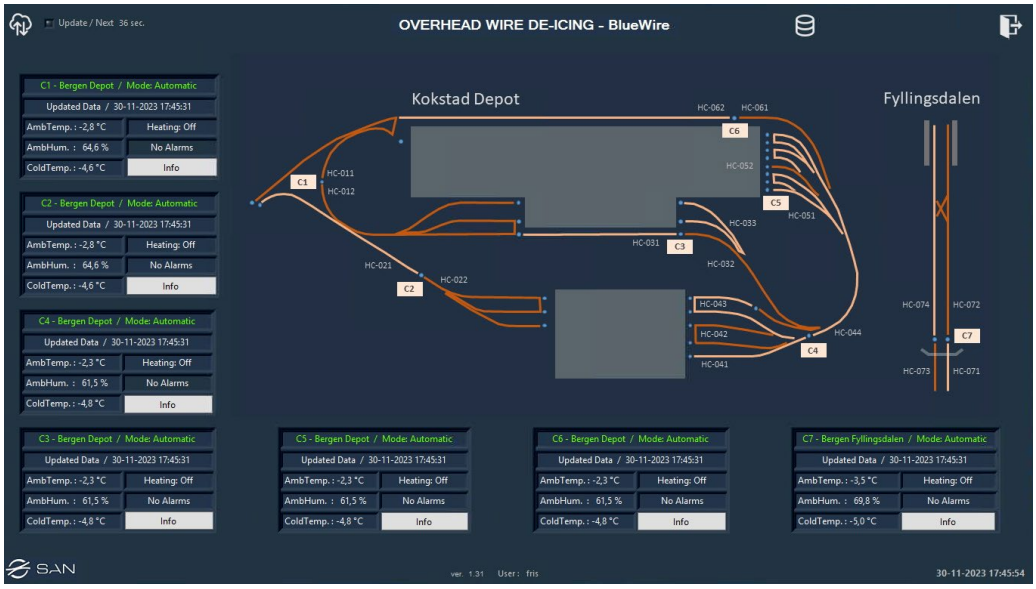
BlueWire – SCADA Remote Monitoring Software

Manage the installation and generate quick actions on system alarms.

Energy optimise the system based on experience and the build-in statistics.

Valuable information at the fingertip for:

- **Traffic Control Department**
- **Maintenance Department**
- **Technical Department**



Operational status:

- Manual or Automatic operation
- Control mode
- Local weather conditions
- Heating circuits ON or OFF
- Heating circuit power
- Current measurement for each heating circuit

Alarms - Instant message:

- Communication error
- Control power failure
- OHL power failure
- Heating circuit failure
- Temperature sensor failure
- Humidity sensor failure

Remote settings:

- Turn individual circuits ON/OFF
- Temperature & Humidity levels for every control mode

Statistics:

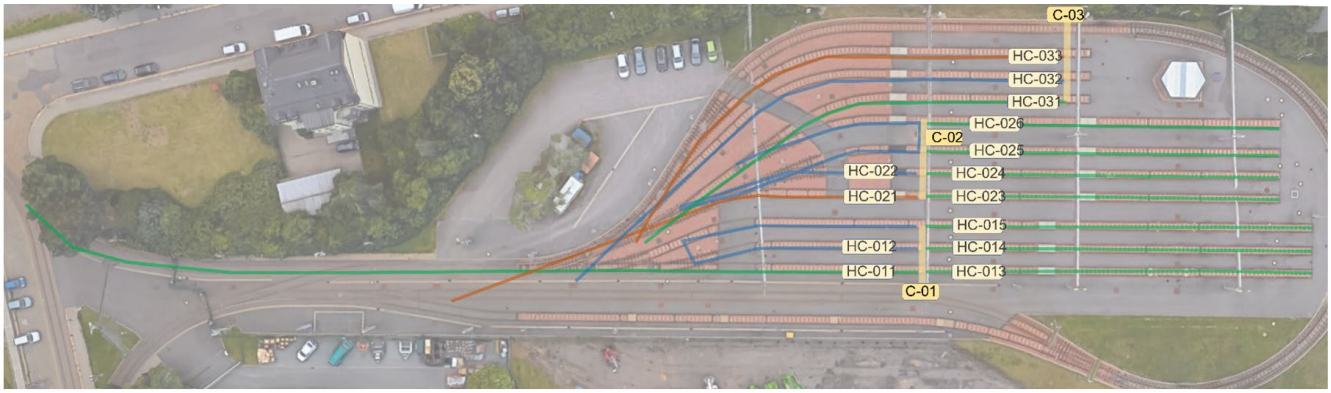
- Energy counters
- Total heating hours
- Heating hours per control mode
- Total hours of operation

SCADA Solution as a cloud or on-premise solution

TURNKEY OR ASSISTED INSTALLATION

Turnkey Installations and Training

Turnkey project and/or training (certification) of local staff. SAN Electro Heat delivers from components to complete projects including design, installing, training, inspection and maintenance.



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NIBE ELEMENT
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