R

BlueWire

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-vechicle 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.





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



Up hill elevated lines

rivers.

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







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.



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: Weight/m:	Triangle 7.5 x 7.5 x 7.5 mm 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 temn ·	80°C without deformation

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

(6)

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
- Control Cubicle (typical pole mounted)
 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 standalone 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 medele:	2 or 4 hosting singuite						
Line models.	2 of 4 fleating circuits						
	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						

- * Dry contact signals:
- * Failsafe operation:
- * Optional



EN 61439-2 2011

EN 60204-1 2018

Air-Thermostat

Input: Demand Heat

Output: OK, Heating, Fault





CONTROLLER CONFIGURATOR

BlueWire controller configurator

_							
BW-500-MS	Master Contr	oller and 2x front LE	D				
2	Line - control	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 Depot - controller for 12 Heating Circuits 3x4						
3-12							
-750	Controller PS	U, Line power 600-9	00 VDC				
-230	Controller PS	U, City power 230 V	AC				
-std	No further co	No further communication (std=RS485 + Ethernet) GSM Wireless communication by 3G/4G network					
-GSM	GSM Wireless						
-F02P	Fiberglas cabi	net IP54 W:590 H:10)80 D:322 - Pole	e mount			
-F02G	Fiberglas cabi	net IP54 W:590 H:10)80+350+600 D:	322 - Ground socket			
-B000	Controller on	an open aluminium	n board				
	Ontions						
-T1	Epilsofo Air th	ormostat					
-11-		communication to	slave cubicles	(for denot installation			
			slave cubicles				
Sample order:							
BW-500-MS 2 -750 -GSM -F02P	BlueWire con	troller for 2 circuits,	Power from Ol	HL, Wireless Com. by			
	GSM modem	and antenna, Cabin	et fiberglass or	i pole.			
			ller				
SAN' Bears less	BAA-200-IAI2	Bluewire Control	lier				
Ø	Size:	Depth:	320	mm			
•		Height:	1080	mm			
		Width:	590	mm			
	Weight:		XXX	g			
	Color:		RAL 7035				
73	Coating:		Yes, Anti-graffiti				
	Casing:		IP 44 (54)				
(BW-500-WS0	001 BlueWire Wea	ther Station				
	Air temperatu	re:	-50°C to +50°C				
	Humidity:	Humidity:		10 – 99% RH			
3	Dew point	Dew point		Calculated temperature			
	Contact wire:		-50°C to +50°C				
	Contact wire s	Contact wire simulation:		100 mm Cupper bar			
	Interface:	Interface:		3x 4-20mA transmitters			
	Cable:		4 wire				
	BW-400-MD-	-X (X=1, 2 or 3) Sa	afety Manual I	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

StartDate : 10.21.2018

EndDate : 10.24.2018

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

Electro Heat



	Location	DateTime	Mode Air	'F Hum % Cold	F Dew.'F Mai	inH HeatH In	rush LowAirH	LowColdH H	HighHumH	WhitefrostH M
	Trimet 04	10.23.2018 02:40:01 PM	System Off -66	.8 -25 33	0 -125,3 3	48,9 348,4	1 348,7	344,1	9,9	9,7
	Trimet 04	10.23.2018 02:20:01 PM	System Off -66	0.8 -25 32 3.8 -25 32	0 -125,3 1	48,6 348,1	8 348.3	343.8	9,9	9,7
	Trimet 05	10.23.2018 02:20:01 PM	System Off -66	.8 -25 32	0 -125,3 1	76,3 175.5	5 175,6	175,6	0,6	0
	Trimet 04	10.23.2018 02:00:01 PM	System Off -66	3,8 -25 32	0 -125,3 3	48,2 347,7	7 348	343,4	9,9	9,7
	Trimet 04	10.23.2018 01:40:01 PM	System Off -66	1.8 -25 32	0 -125,3 3	47,9 347,4	6 347,7	343,1	9.9	9.7
	Trimet 05	10.23.2018 01:40.01 PM	System Off -60	3.8 -25 32	0 -125,3 1	75,6 174,9	3 175	175	0,6	0
	Trimet 04	10.23.2018 01:20:01 PM	System Off -66	5.8 -25 32	0 -125,3 3	47,6 347,1	5 347,3	342,8	9,9	9,7
	Trimet 04	10.23.2018 01:00:01 PM	System Off -66	3.8 -25 32	0 -125.3 3	47.2 346.7	4 347	342.4	9.9	9.7
	Trimet 05	10.23.2018 01:00.01 PM	System Off -66	.8 -25 32	0 -125,3 1	74,9 174,2	1 174,3	174,3	0,6	0
	Trimet 04	10.23.2018 12:40.01 PM	System Off -68	.8 -25 32	0 -125,3 3	46,9 346,4	3 346.7	342,1	9,9	9,7
	Trimet 04	10.23.2018 12:20:01 PM	System Off -66	.8 -25 32	0 -125,3 3	46,6 346,1	2 346,3	341,8	9,9	9,7
	Trimet 05	10.23.2018 12:20.01 PM	System Off -66	.8 -25 32	0 -125,3 1	74,3 173,5	6 173,6	173,6	0,6	0
	Trimet 04 Trimet 05	10.23.2018 12:00:01 PM	System Off -66 Sustem Off -66	0.8 -25 32	0 -125,3 3	46,2 345,7	1 346	341,4	9,9	9,7
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		-	Ö	0	Sett	inas	14-11	2022		0
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										9,7
Coldtemp -4,9 °C	HeatHour	1927.5 h	_							0
		1027,5 11		h1	Ch 2	Ch 3		Ch4		9,7
AirHum 71,5 %	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				CHIZ	Cins		CILI		
	LowAirHour	1947,3 h								
Battery 13,4 V				I Line C		 •				
	LowColdHour	2336.8 h		Heat C		P				
Ch.1 Amp 2,6 A		2330,0 11								
and the second	CONTRACTOR OF STREET	Free A				lSet °C		Set %		
Ch.2 Amp 14,1 A	HighHumHour	5665,4 h								
		-								
Ch.3 Amp 2,6 A	Manual/Constant	0,1 h							<u>.</u>	
		-							2 I I	
Ch.4 Amp 11,3 A	Inrush	6272							o	
		ULIE								
Indicators										
	Devide (Milester	f								
AirLow 🥥 ——	DewPoint / White	nost								
ColdLow 🔵 ——										
HighHumidity	DewPoint	-7,5 -0								
Constant 🕘 📖	Whitefrost (De	wPoint < 37.4 °	C)							
System On		The second second								
System On	WhitefrostHour	4393,0 h								
Manual 🕥 ——										
Heat Ch.1	Setnointe									
<u> </u>	serpoints	-								
Heat Ch.2	AirSet	3.0 °C								
Heat Ch.3										
	ColdSet	30 °C		CIII S	r [A]	Cn.	H SEL[A]			
Heat Ch.4 🥥										
Alarma	HumSet	70.0 %								
Alatins	Humber	10,0 %								
Ch.1 Ch.2 Ch.3 Ch.4	01101									
0 0 0 0	Ch.1 Set	2,0 A								
Manual UPS PS Buffer Battery	Ch.2 Set	2,0 A								
0 0 0 0										
	Ch.3 Set	2,0 A								
AmpSen. Air Hum <u>Cold</u>	Ch.3 Set	2,0 A					-			
AmpSen. Air Hum Cold	Ch.3 Set	2,0 A			Uplo	ad Setting	s			

Data Alarm Inputs Settings Station All Stations

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 onpremise 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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