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Sicat SX

Overhead contact line system for main-line railways

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Sicat® SX is an inclined catenary system for main and secondary lines in the main-line transit. The system is characterized by simplified arrangement of overlaps, longer tension sections and greater span lengths and based on proved standard components of Sicat contact line systems from Siemens. Because of low investment costs and maintenance efforts the life-cycle costs of Sicat SX will be favorable.

Features

- Components reduction per track kilometre as a result of greater span lengths enable few installation and maintenance efforts
- Use of alterative materials instead of copper and copper alloys enable an additional reduction of investment costs
- Simple and fast installation by using IT driven dropper and cantilever calculation and due to use of standard installation tools

Overview

Advantages over conventional overhead line systems

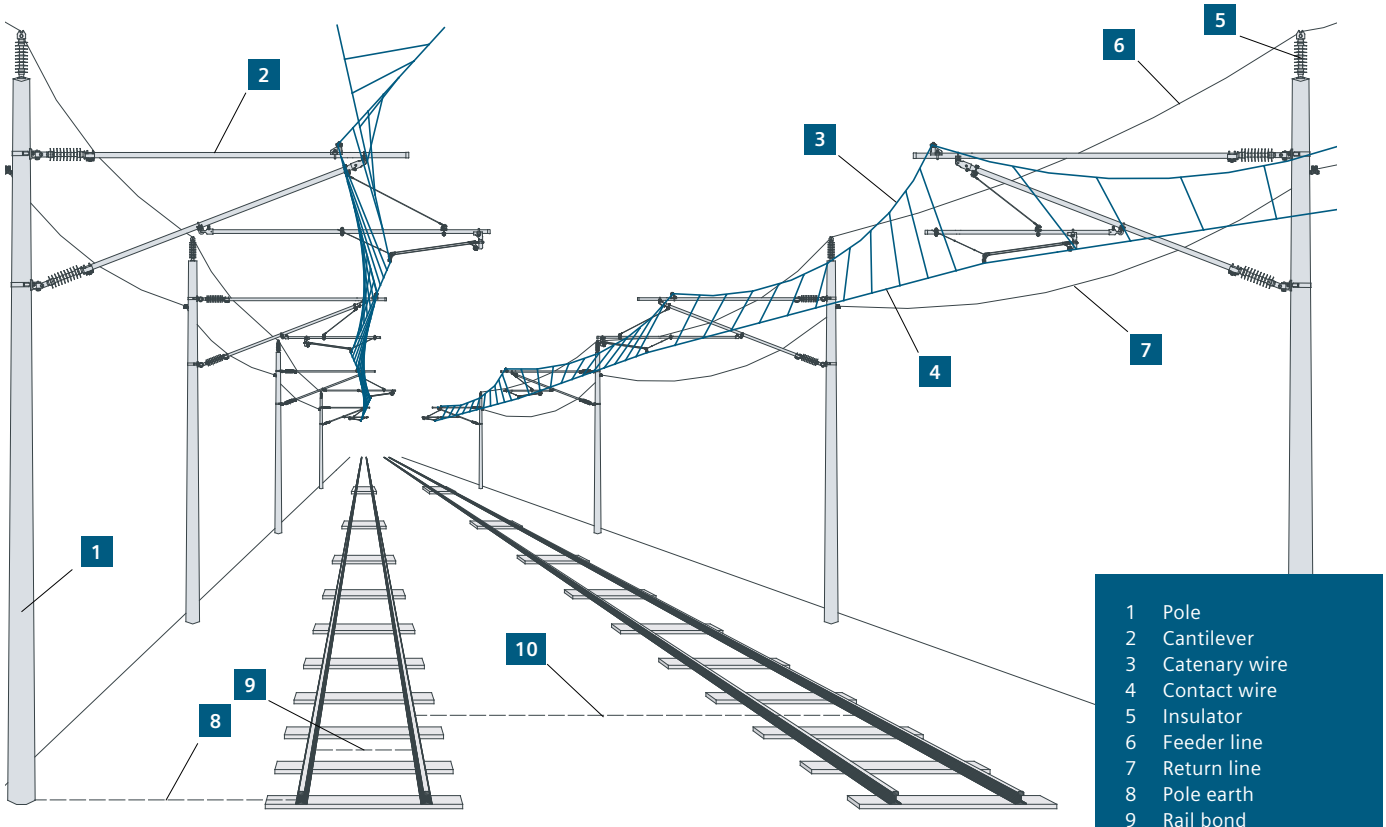
- Reduction of required components and materials for railway electrification
- Less installation work due to fewer overhead contact line components per kilometer of track
- Conservation of resources due to reduction of components and materials
- Use of alternative materials reduces attractiveness to material thieves
- Excellent quality of interaction between pantograph and contact wire at speeds of up to 250 km/h
- Reduced operating costs: fewer components to service and maintain
- Precise planning of the overhead contact line system with efficient software tools (Sicat Master, Sicat Candrop) minimizes adjustments

Regular values	
Nominal voltage	15 / 25 kV AC
Continuous current-carrying capacity without feeder	600 A
Running speed	up to 250 km/h
Temperature range	-30...+80 °C
Contact wire (EN 50149)	AC-80, CuMg0.5
Contact wire tensioning force	15 kN
Catenary wire (EN 50182)	95/55 aluminium/steel
Catenary wire tensioning force	30 kN
Span length*	up to 102 m
Tensioning length	up to 2,000 m
System height	1.40 m
Weight	~13.4 N/m

* v_{wind} = 27.4 m/s

Design

Sicat SX is an auto-tensioned catenary system without stitch wires on the supports but with outstanding quality of interaction between pantograph and contact wire. The catenary wire and contact wire of the catenary system are installed with oppositely aligned lateral positions with low impact from own weight. This design ensures a high degree of elasticity in the overhead contact line.
As with all Sicat systems, proven standard components are used.



Sicat SX layout (schematic view)

1 Pole
2 Cantilever
3 Catenary wire
4 Contact wire
5 Insulator
6 Feeder line
7 Return line
8 Pole earth
9 Rail bond
10 Track bond

The four keys to reducing investment and maintenance costs

1 Reduced component and material requirements

- Greater span lengths enable catenary supports to be spaced further apart, which means every kilometer requires:
  - Fewer foundations
  - Fewer poles
  - Fewer cantilevers
  - Reference project: Sicat SX = 10 supports/km
  - MÁV overhead contact line system = 14 supports/km
- Span lengths increased by
  - Raising the tensioning force of contact wire and catenary wire
  - Optimizing the weight of the catenary system
  - Using an inclined design for the catenary system to reduce wind-induced deflection

2 Replacing high-cost materials

- Use of alternative materials for overhead line system components
  - Aluminum/steel catenary wire with aluminum-clad steel wires to prevent corrosion
  - Concrete supports
- Reduced conductor cross-sections
  - Smaller contact wire cross-section using the AC-80, CuMg0.5 contact wire for reduced copper content
  - Saving of 180 kg of copper per kilometer as compared with an AC-100 contact wire

3 Planning, installation and maintenance

- Exact layout design planning using Sicat Master software
- Precise length specifications for cantilever and dropper manufacturing using Sicat Candrop software
- The exact dropper position specifications produced using the Sicat Candrop software enable droppers to be installed quickly and easily and remove the need for laborious catenary adjustment
- Shorter installation times for every kilometer of supports and cantilevers reduces project duration
- Reducing the total number of overhead contact line components optimizes maintenance costs throughout the service life of the system
- Installation and maintenance can be completed using just the standard installation vehicles and tools

4 Simplified overhead contact line system design

- Maximum tension section lengths of up to 2,000 m, so fewer tensioning devices are required
- Catenary with no stitch wires
- Two-span overlaps as standard overlaps
- Three-span insulated overlaps
- System height reduced to 1.40 m
- Use of the same conductor as the catenary wire for optional return conductors and feeders
- Clamp-type mountings for attaching cantilevers to supports provide a high level of flexibility for installation

Potential savings

The Sicat SX overhead contact line system first of all is suitable for efficient new electrification projects for lines with predominantly straight route or large track radii.

The following potential savings compared to conventional overhead contact line systems can be achieved depending on track topography:

Proportion of track radii below 1,000 m:		low	high
Cost savings	Material:	14.5%	8.2%
	Installation:	19.6%	12.5%
	Total:	13.3%	8.3%

Tests

The components used in the Sicat SX overhead contact line system are almost exclusively Siemens standard overhead contact line components. All of the components used have been type-tested. The aluminum / steel wire and the respective clamps have been in use in power transmission line applications for more than 30 years. The system was designed and tested in accordance with EN 50119.

Certificates
As a result of a successfull pilot testing of the Sicat SX overhead contact line system, national approval from the road, rail and shipping department of the Hungarian national transport authority has been granted. Sicat SX has also been certified under the European rail system interoperability directive and the associated Energy TSI as an interoperability component.

References

The Sicat SX overhead line system is already in use on the following routes:

- Bajánsenye-Boba, Hungary, since 2010
- Banedanmark, Denmark, ~1,300 km until 2026

Project Banedanmark, Denmark

Project Bajánsenye-Boba, Hungary

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