

The background image shows a red high-speed train in a modern railway station. An overhead conductor rail system is visible above the train. The Siemens logo is in the top left corner.

# SIEMENS

*Ingenuity for life*

## Sicat SR

Overhead conductor rail system  
for mass transit and main-line railways

[siemens.com/rail-electrification](https://www.siemens.com/rail-electrification)

Urban mass transit systems, such as metros and city trains, and even main-line railways often can only reach inner-city areas on railway lines that run through tunnels. Therefore, electric traction must also be made possible in constricted space conditions like those created by small tunnel cross sections.

Due to its low installation height, the aluminum overhead conductor rail Sicat® SR is able to meet this requirements perfectly and is also suitable for train passages with one or more pantographs. It is designed for use in tunnels, under bridges, on lifting bridges as well as in maintenance workshops or even in sections which can be pivoted out of the line gauge, such as in workshops, to ensure very easy inspection of rail vehicles. In addition, Sicat SR can be used for vehicles with electric charger.

### Features

- Rigid aluminum section with four longitudinal guiding edges for the best possible connection of conductor rail joints
- High current-carrying capacity and high short-circuit strength
- Use of long-lasting extruded sections, even for the conductor rail fittings

# Overview

## Advantages compared with conventional overhead contact lines

- Lower installation height (e.g. 600 mm for 25 kV AC systems)
- Elimination of tensioning equipment for contact wire and catenary wire
- No need to observe the overhead contact line zone acc. to EN 50122 or to connect conductive system components to the return conductor
- High current-carrying capacity (e.g. 3,500 A with the clamped contact line AC-150)
- Reduced voltage drop compared to overhead contact lines with single contact wire and with catenary suspension
- High short-circuit strength of the overhead conductor rail
- Simple design based on the use of a low number of different components
- Up to 43 % contact wire wear possible, therefore longer contact wire service life

## Dynamic properties

- The interaction between pantograph and overhead conductor rail meets all quality requirements of the applicable standards.
- Simulations and measurements demonstrate that the contact forces and standard deviations permitted by the applicable standards and regulations are observed.
- Even running of the pantograph pans is ensured by limitation of the conductor rail sagging, gradients and gradient transitions.

## Improvements compared with existing overhead conductor rail systems

- Easy installation of the joints due to additional guiding edges along the conductor rail
- Vibration-proof design of the joints due to the combination of guiding edges and bolt locking elements
- High current-carrying capacity of the joints due to the large contact surface of the inner plate on the inside face of the conductor rail section
- Use of long-lasting extruded profiles, even for the conductor rail fittings
- Due to the possibility to adjust the angle of the support, the mean perpendicular of the overhead conductor rail can always be adjusted according to the pantograph contact strip, even in sections with track superelevation, thus ensuring an optimum quality of pantograph passage and transmission of current at all times
- High clamping force and excellent quality of the electrical contact due to the tapered design of the clamps on the conductor rail profile

## Contact corrosion

The risk of contact corrosion between the aluminum conductor rail and the copper contact wire is combated by the following precautions:

- The provision of drain holes inside the conductor rail to enable condensation to drain off
- The application of contact grease between copper and aluminum when the contact wire is clamped into the conductor rail with special grease device

Regular values		
Nominal voltage	[V DC] [kV AC]	750...3.000 15...25
Permanent current load at 50 K excess temperature, without contact wire	[A]	2,900
Short-circuit current	[kA]	45
Ambient temperature	[°C]	≥ -40
Max. temperature of conductor	[°C]	90
Distance between supports*	[m]	up to 12
Max. running speed	[km/h]	250
Conductor rail cross section without contact wire	[mm²]	2,300
Conductor rail material		Aluminium
Clampable contact wire acc. to EN 50149*		AC-/BC-80 up to 150
Max. permissible half section length	[m]	up to 400
Specific mass of conductor rail without contact wire	[kg/m]	ca. 6.2

\* other values on request

# Design

## Conductor rail

The conductor rail consists of an extruded aluminum alloy profile. A contact wire is clamped into this extruded profile and, like a conventional overhead contact line, transmits the current to the rail vehicle.



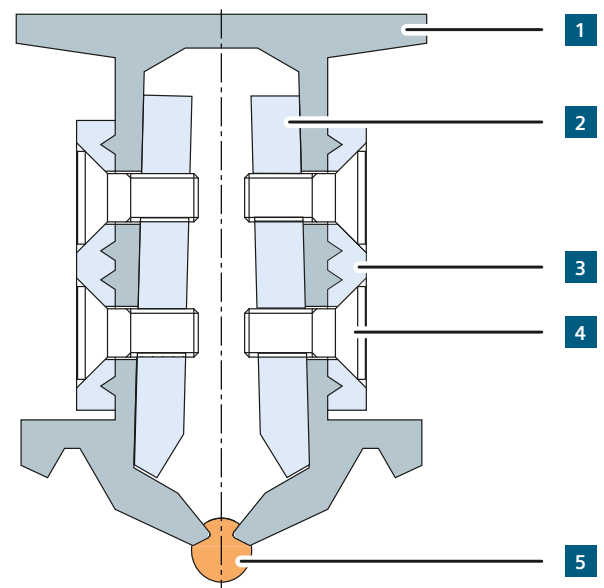
## Conductor rail joint

The conductor rail segments are joined together by means of conductor rail joints.

Four guiding edges along the side of the conductor rail ensure a mechanically stable joint. Two outer plates serve for accurate fixing of the rail height and fastening of the joint. Two inner plates, which have large contact surfaces, perform mainly the task of current transmission between the rail and the joint. Bolt locking elements ensure that the conductor rail joints are vibration-proof and cannot loosen.



Conductor rail joint 8WL7231-0



- |   |                             |
|---|-----------------------------|
| 1 U-shaped conductor rail profile with tapered designed contact edges | 3 Outer plate               |
| 2 Inner plate   | 4 Bolt with locking devices |
|   | 5 Contact wire              |

Conductor rail profile with joint 8WL7230-0A

## Supports

There are two functionally equivalent types of suspension for the Sicat SR overhead conductor rail:

### Supports with gliding suspension clamp

These supports are the preferred choice for constricted installation conditions in which only very short pivotable support arms can be used (e.g. in small round tunnels).

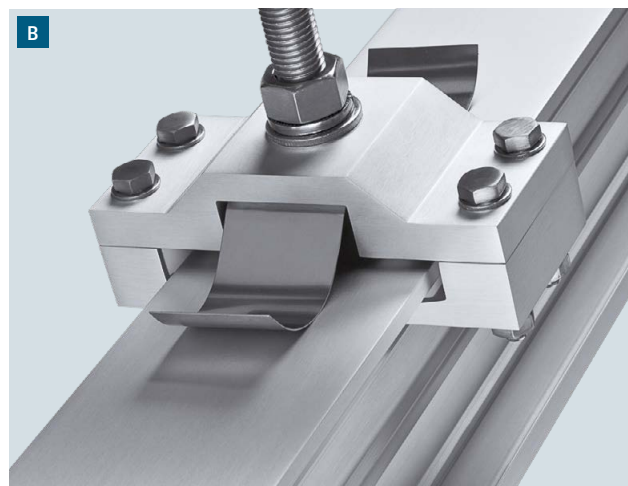
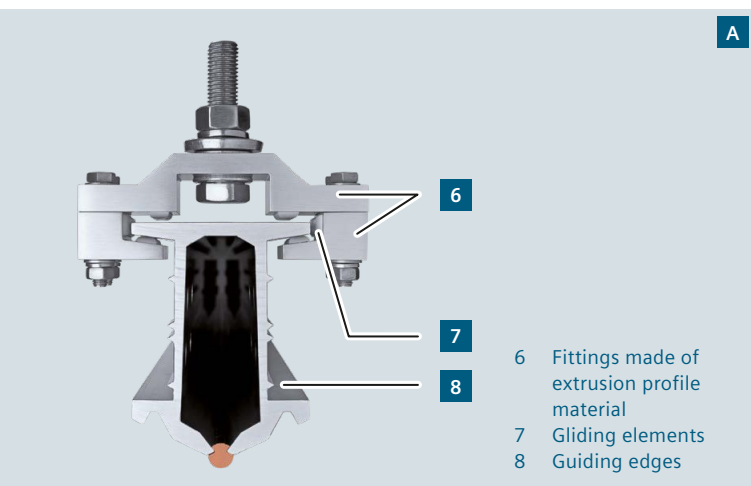
The use of these supports still enables the installation of large section lengths despite such conditions.

For AC systems, the gliding supports have to be equipped with an additional contact spring to provide equipotential bonding between the supporting arm and the conductor rail. For higher running speeds, the use of the contact spring as a damping element to improve the quality of interaction with the pantographs is also recommended for DC systems.

### Pivotable supports

Ever smaller track radii mean ever greater reduction in the section lengths. Pivotable supports are especially well suited for such applications.

Since ever smaller track radii call for ever shorter installed section lengths, it is more cost-effective below a certain track radius to install pivotable supports.



- A Gliding suspension clamp 8WL7233-0
- B Suspension clamp with contact spring 8WL7232-3
- C Transition element 8WL7230-2A
- D Earthing clamp 8WL7234-0A
- E Feeder clamp 8WL7235-0A

## Transition element

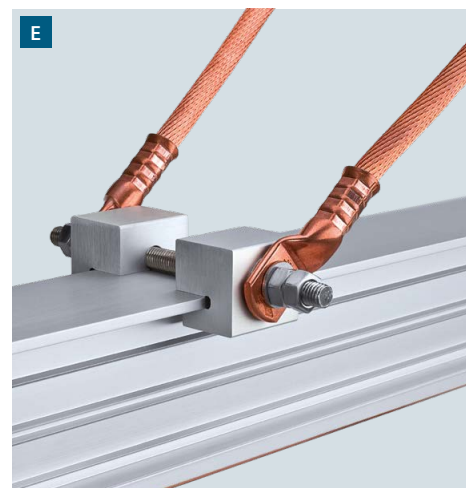
A 5-meter-long transition element is provided to reduce the differences in elasticity at the transition from the conventional overhead contact line to the conductor rail. Increasingly larger cutouts in the conductor rail section enable the moment of inertia to be reduced in the direction of the catenary and, consequently, the elasticity to be adjusted accordingly.

## Earthing clamp

Earthing clamps are provided along the length of the conductor rail for the connection of earthing equipment during maintenance and service work at the overhead conductor rail system.

## Electrical connectors

Electrical connectors bridge the individual rail sections. They consist of flexible copper wires which are connected to the conductor rail by feeder clamps. One feeder clamp is capable of transmitting the total permissible current of the conductor rail.





## Conductor rail section transition

The conductor rail is divided into several section lengths to compensate thermal expansion. Special attention has been paid on a design that ensures optimal quality of interaction with the pantographs and a good electrical connection in the section transitions. Depending on the running speeds, the section transitions will be carried out as conductor rail ramps or as expansion joints.

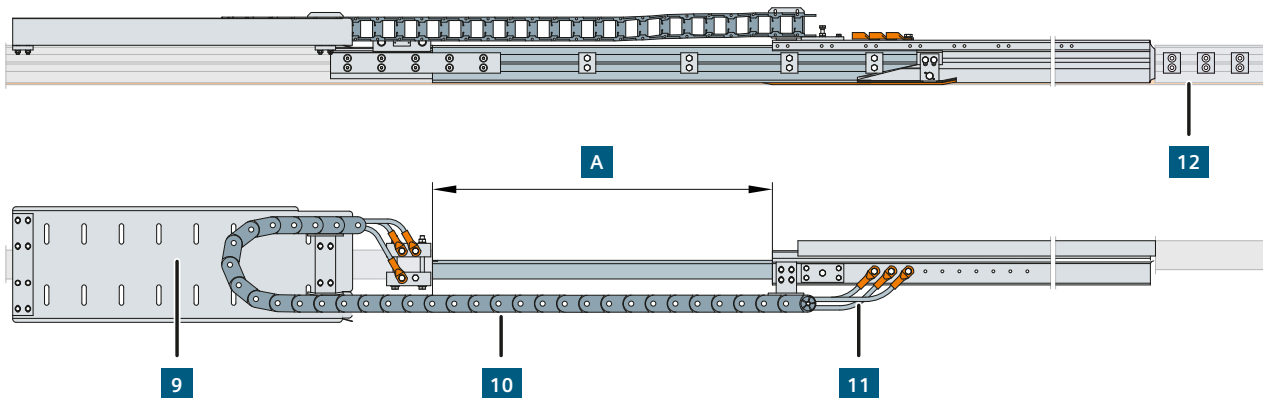
### Conductor rail ramp

A specially shaped conductor rail ramp is provided at the end of each section length to ensure a smooth guiding for the panto-

graph. The type of conductor rail ramp in the section transitions is designed for running speeds up to 140 km/h.

### Expansion joint

At running speeds of over 140 km/h the quality requirements of interaction between pantograph and contact line cannot be ensured by conductor rail ramps. The thermal expansion of sections will be compensated by a specially developed expansion joint design for good dynamic running qualities, which therefore can be achieved even at speeds up to 250 km/h.



- 9 Guidance channel for energy guide chain
- 10 Energy guide chain
- 11 Electric conductor

- 12 Conductor rail profile Sicat 8WL7238-0A
- A Working range

Expansion joint 8WL7238-0A

### Technical data expansion joint

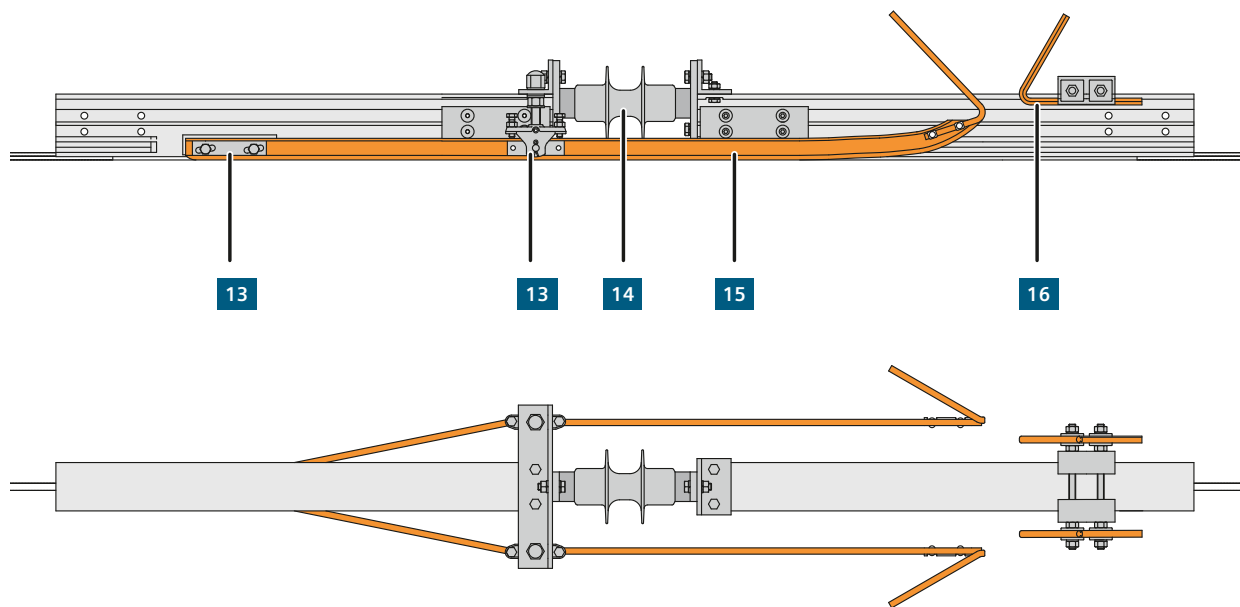
Expansion joint		8WL7238-0A-...-0E	8WL7238-0F...-0J	8WL7238-0K...-0O
Nominal voltage	[kV DC]	up to 3	up to 3	up to 3
	[kV AC]	25	25	25
Working range A	[mm]	2x 500	2x 500	2x 500
Length				
• maximum	[mm]	3,775	3,775	3,775
• minimum	[mm]	2,775	2,775	2,775
Weight	[kg]	54	61	77
Permanent current load	[A]	1,224	2,075	3,150
Rated short-time withstand current	[kA]	45	45	45
Rated short-time duration	[ms]	100	100	100

## Insulated sections

Insulated sections are created either by parallel alignment of two conductor rail profiles or by use of section insulators. At use of section insulators, the electrical connection of the overhead conductor rail is interrupted by an insulator which simultaneously ensures the mechanical connection between the conductor rail elements.

The pantograph of the passing vehicle is guided in the area of the insulator by means of two copper rails. Any arcs that occur during the pantograph passage are guided by the arcing horns and extinguish then.

For section insulation by default section insulators up to 25 kV AC and up to 3 kV DC are offered.



13 Runner adjusting  
14 Insulator

15 Runner with arcing horn  
16 Arc arrester

Section insulator 3 kV DC Sicat 8WL7238-7A for overhead conductor rail

### Technical data section insulator

Section insulator		8WL7238-5A	8WL7238-7A
Permissible operating load	[kN]	10	10
Minimum failing load	[kN]	32	32
Weight	[kg]	45.4	31.1
Nominal voltage	[kV]	up to 25 AC	up to 3 DC
Creepage distance	[mm]	1,255	305
Clearance in air	[mm]	185	60

# Accessories / utilities

In addition Siemens offers a wide range of accessories and utilities for installation and maintenance of the overhead conductor rail and its components like contact wire installation car, greasing device, drilling and cutting templates and special grease for greasing the contact area between contact wire and conductor rail.

## Contact wire installation car

The contact wire installation car enables easy insertion of the contact wire into the profile of the overhead conductor rail. Via a connection rod, the contact wire installation car can be combined with a greasing device.

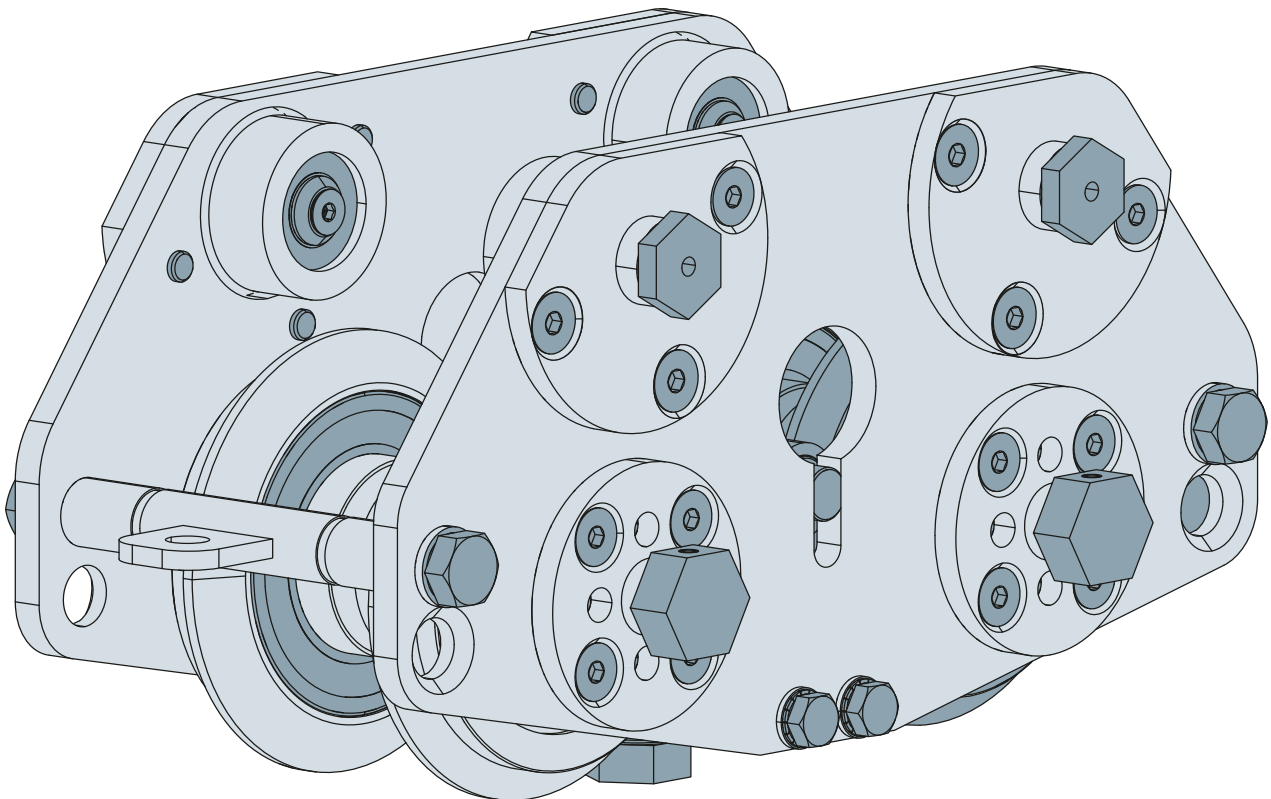
## Greasing device

The greasing is carried out at the contact area between contact wire and conductor rail. The amount of the grease to be applied is regulated depending on velocity (0...5 km/h). To avoid undesirable arcs at the first passings of pantographs, the bottom side of the contact wire is not greased.

### Further features:

- Very low consumption of grease
- Easy use of greasing device
- Greasing device can be used at any point of the conductor rail

Accessory	Order number
Contact wire installation car	8WL7236-4A
Greasing device	
• Control casing	8WL7236-2A
• Adapter	8WL7236-2B
• Connecting rod for greasing adapter	8WL7236-2C
Drilling template	8WL7236-0
Cutting template	8WL7236-1
Grease	8WL7230-4



Contact wire installation car 8WL7236-4A



# Tests

## Electrical tests

The overhead conductor rail elements, clamps and fitting elements are tested for:

- Short-circuit strength
- Proof of continuous current-carrying capacity in a temperature-rise test

acc. to the following standards:

- IEC 61952
- IEC 62271-1
- DIN EN 50119 (VDE 0115-601)

## Mechanical tests

- Test of tensile load for conductor rail joint and anchoring clamp
- Supporting load test for suspension clamps
- Cantilever load for suspension clamps
- Sliding load for suspension clamps
- Tensile and compression test at section insulator




acc. to the following standards:

- DIN EN 50119 (VDE 0115-601)
- DIN VDE 02163
- IEC 61952-2002
- IEC 61109
- Endurance test of expansion joint and gliding suspension clamp

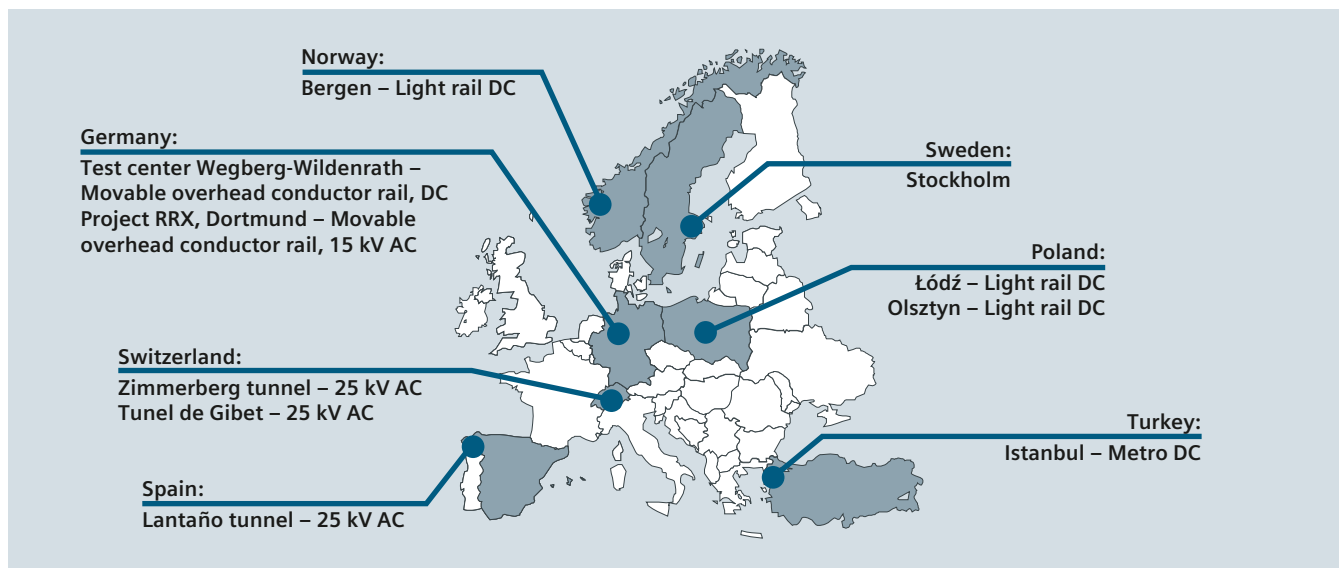
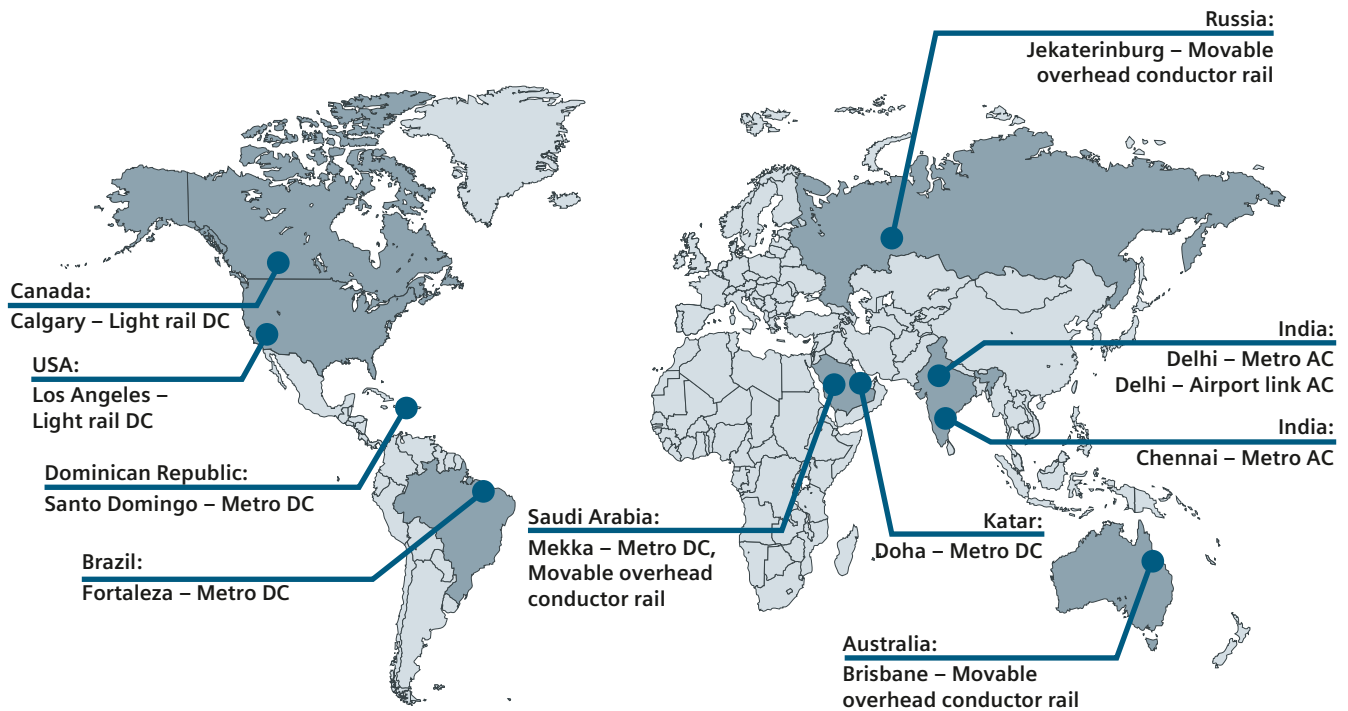
## Certificates

The overhead conductor rail system Sicat SR has been certified as interoperability constituent in accordance with the interoperability directive of the rail system and the related directive TSI Energy.

In addition, the Bundesamt für Verkehr (BAV) of Switzerland has granted type approval for running speeds up to 250 km/h.

<b>Benannte Stelle Interoperabilität Bahnsysteme beim Eisenbahn-Bundesamt</b>	
<b>EG-Zertifikat</b> <i>EC Certificate</i> <b>EG-Entwurfsprüfbescheinigung</b> <i>EC Design Examination Certificate</i>	
<b>Zertifikat-Nummer / Certificate Number: 0893/2/CH1/15/ENE/DE EN/2396</b>	
<small>Gemäß Richtlinie 2008/57/EG vom 17.06.2008 über die Interoperabilität des Eisenbahnsystems in der Gemeinschaft, geändert durch die Richtlinien 2009/131/EG vom 16.10.2009, 2011/18/EU vom 01.03.2011, 2013/9/EU vom 11.03.2013, 2014/38/EU vom 10.03.2014 und 2014/106/EU vom 05.12.2014 In accordance with Directive 2008/57/EC of 17.06.2008 on the interoperability of the rail system within the Community, as amended by Directives 2009/131/EC of 16.10.2009, 2011/18/EU of 01.03.2011, 2013/9/EU of 11.03.2013, 2014/38/EU of 10.03.2014 and 2014/106/EU of 05.12.2014</small>	
wurde die Interoperabilitätskomponente <small>(genauer beschrieben im Anhang)</small> the following interoperability constituent (as detailed in the attached annex)	
<b>Deckenstromschiene Sicat SR</b>	
der Firma / of Applicant <b>Siemens AG</b> <b>Mozartstraße 33b</b> <b>91052 Erlangen</b>	
durch die / has been assessed by <b>Benannte Stelle Interoperabilität Bahnsysteme beim Eisenbahn-Bundesamt – EISENBAHN-CERT</b> <b>Heinemannstraße 6, D-53175 Bonn</b>	
- Kenn-Nummer der Europäischen Kommission: <b>0893</b> - <small>- Identification number of the European Commission -</small>	
<small>in Bezug auf die Übereinstimmung mit den anwendbaren Anforderungen der o. g. Richtlinien und den im Anhang genannten TSI bewertet. Für die Interoperabilitätskomponente wurde die Übereinstimmung unter Berücksichtigung der Benutzungsbedingungen und Nebenbestimmungen festgestellt, die im Anhang aufgeführt und damit Bestandteil dieses Zertifikats sind. in respect of compliance with the applicable requirements of the above Directives and TSI as listed in the attached annex. The interoperability constituent was shown to comply, subject to any restrictions and conditions listed on the attached annex, which forms part of this certificate.</small>	
<small>Das Konformitätsbewertungsverfahren wurde nach Modul CH1 der gemäß der Richtlinie anzuwendenden TSI durchgeführt. The Conformity Assessment procedure has been performed by application of Module CH1 of the relevant TSI adopted pursuant to the Directive.</small>	
<small>Diese EG-Entwurfsprüfbescheinigung ist ohne Einschränkungen gültig bis 17.05.2022 This EC Design Examination Certificate is valid until 17.05.2022 without restrictions</small>	
<small>Dieses EG-Zertifikat ersetzt die EG-Entwurfsprüfbescheinigung Nr. 0893/2/H2/13/ENE/DEEN/2396 vom 29.01.2013. This EC-Certificate replaces the Design Examination Certificate as numbered and dated above.</small>	
Bonn, den 18.05.2015	 Systembereichsleiter / Technical Director <b>EISENBAHN-CERT</b> 

# References





Overhead conductor rail, Westbrook Station Calgary, Canada



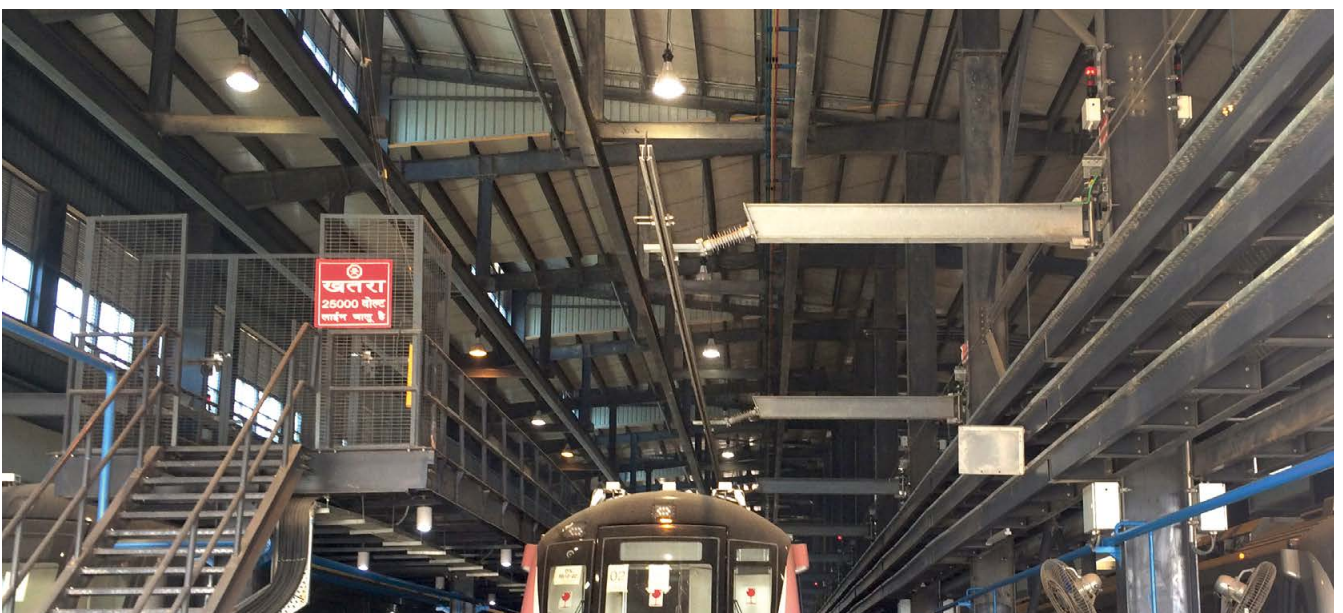
Movable overhead conductor rail, Mekka, Saudi Arabia



Overhead conductor rail, Lantaño tunnel, Spain



Overhead conductor rail, Zimmerberg tunnel, Switzerland



Movable overhead conductor rail, Depot Delhi Metro, India

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