

Powerful, economical and reliable

SIEMENS

ZNAN

Ingenuity for life

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More people, more challenges, one solution



Demographic change, urbanization and climate change: these are the global trends of today and tomorrow. For the world population is not only growing, it's also getting older. Current forecasts expect it to rise to 9.2 billion by 2050.

These people will need efficient transportation and logistics. And that calls for innovative electrification solutions.



Needed more than ever before: efficiency and sustainability

Not only the world's population will continue to grow in the coming years, urbanization will also be on the increase. So much so that experts are predicting that 90 percent of future population growth will be concentrated in cities.

Such trends mean however that traffic densities all over the world will likewise increase – and with them the demand for intelligent, sustainable solutions for mobility.

Intelligent and efficient rail electrification solutions

Concepts that make transport more efficient are in demand with the ever-increasing need for mobility. With our long-standing transport-expertise and out IT know-how, we are constantly developing new, intelligent mobility solutions that increase availability of infrastructure, optimize throughput and improve passenger experience. It's in how we electrify, automate and digitalize infrastructure that we're setting the benchmark for tomorrow's mobility – today.

Optimal service – a competent partner

You can benefit from our decades of experience in the engineering, construction and commissioning of contact line systems for main-line railways.

As one of the world's leading suppliers of electrotechnical plants and innovative technology partner to all major rail operators, we offer you all services from one source and enable you to tap a lot of potential savings. Savings made possible by innovative, powerful overhead contact line systems, by even more reliable systems and enhanced performance capabilities. And by engineering tools which uncover open questions as early as the project analysis phase.

Place your trust in our ability to take a good component and make an even better contact line system. When it comes to regional and main-line railways, we are the right partner for your overhead contact line projects, for consultation and planning, for project implementation and commissioning, and for worldwide service.





Optimum performance from the start: Perfection – from engineering to installation



We consider ourselves to be a world-wide technology partner for our customers when it comes to planning, designing and installating contact line systems for main-line railways.

Profit from our experience in erecting even highly complex systems under difficult conditions.

Engineering and simulation instead of trial and error

The success of an overhead contact line system is crucially dependent on its mechanical interaction with the pantograph. With state-of-the-art IT systems and in-house developed software tools such as Sicat[®] Dynamic, we can simulate and analyze this in advance.

In addition, it enables us to examine and exploit existing system reserves without incurring extra costs.

Systematic planning

Efficient projects need clear structures, so we have defined the following phases for our project planning:

- **Preliminary planning phase:** Centers on the most important decisions concerning the choice of system and design of equipment
- System analysis phase: Analyzes the characteristics of the planned catenary
- System integration phase: Integrates catenary, cantilevers and tension wheel assemblies into one system, includes electrical and mechanical testing
- System design phase: Uses Sicat Master to plan the catenary design for the line and Sicat Candrop or Sicat Candrop Pro to calculate the cantilevers and droppers according to the requirements of the line
- System construction phase: Supplements individual solutions such as for feeders, the equipment for bridges and non-standard tunnels with variable cross-sections or the design of system sectioning points
- At the same time, the planning documents for material procurement and construction work are produced which, in turn, form the basis for the maintenance.

More to it than installation work

Qualified personnel is one prerequisite for perfect work, flexibility is the other. After all, the conditions at the trackside facilities are rarely ideal. Our technicians can draw from a large portfolio of proven methods, technologies and tools to master even the most difficult installation conditions.

As a customer, you benefit from our modular offer. Besides the complete installation of your equipment by our own



personnel, we are also prepared to include your personnel or the staff from local companies and to take over the site management and supervision of the work of third-party companies as well as training of your personnel.

Finished on time!

Overhead contact lines have to be installed when traffic on the lines and time constraints permit. The weather does not play any role as far as our technicians are concerned. Difficult weather conditions and other adverse circumstances do not stop our technicians from successfully installing contact lines in difficult conditions. Through targeted training and continual further education, we combine the highest standards of occupational safety and quality of work in order to finish our installations without a hitch and by the agreed deadline.

Is good, stays good

Higher line utilization and closer headways increase the stresses on your contact line systems.

We offer you complete maintenance service packages which eliminate in advance the possibility of any negative effects occurring. Although our contact line equipment has a low-maintenance requirement, it has to be said that trust is good but diagnostics are better.

We therefore apply our many years of system know-how to draw up individual diagnostics-based maintenance schedules for each facility and, of course, are also glad to take over the responsibility for its maintenance.

Designed for main-line railways: Reliable performance – for decades



High power ratings in freight traffic, high speeds in passenger service and the great expanse of the route network are just some of the boundary conditions which our contact line systems have to take into account in order to offer optimized solutions for main-line railways.

For your projects, you can rely on our know-how as one of the leading designers of highly efficient contact line systems and as an experienced integrator who uses excellent components to make even better systems.

Reliability as a principle

It is especially because an overhead contact line cannot be designed with redundancy that we believe a high degree of system availability should be taken for granted. This includes not only optimizing the corrosion resistance of all components but also minimizing the wear on the contact wire and the contact strip of the pantograph. This is complemented by outstanding resistance to environmental influences, such as to wind and icing, and reactive substances in the atmosphere. Right from the design stage, we take into account the expected temperature fluctuations during rail operations in order to ensure the safe, uninterrupted transmission of electric current from the contact wire to the pantograph under all conditions.

An optimum compromise between the required technical characteristics and costs, of course, must take into account the following operating conditions particular to main-line railways:

- Long distances between stations
- High starting tractive efforts in freight traffic
- High speeds in passenger service
- Expanse of the entire route network

The first choice: Sicat overhead contact line systems

Economy, reliability and high performance are the dimensions within which overhead contact line systems can be optimized for main-line railways.

We recommend the modular Sicat contact line systems. Their materials and designs have been selected so that a large number of customer-specific, high-availability solutions can be created with a reasonable engineering effort from a limited number of service-proven, universally suitable components. These reliable, corrosionresistant and low-maintenance components ensure a consistent reduction in life cycle costs.

Sicat – solutions based on a system

Sicat contact line systems give you a perfect solution for the complete range of requirements and running speeds of up to 350 km/h.

The Sicat portfolio fulfills national and international safety standards and covers the widest range of operating conditions –



from open lines and tunnels to stations and depots, in all speed ranges, and for diverse performance levels. In addition to their high degree of economy, Sicat contact line systems also impress with their long service lives, consistent high quality and very good traversing characteristics.

Efficiency starts with ideas

The efficiency of a contact line system is not limited to safe and reliable operation: new ideas can make the installation of components such as contact wires, disconnectors, elastic supports and motor operated mechanisms even more economical. For example, the design of our lightweight section insulators makes installation a lot easier with fewer personnel.

The intelligent, easy-to-maintain design of Sicat system components offers further advantages, with corresponding savings in the time and cost of maintenance. Lowmaintenance disconnectors with self-lubricating, silver graphite-coated contacts make greasing the contact units unnecessary through the entire life cycle.





Sicat contact lines – Quality by Siemens: Systems with outstanding features



No matter whether the task calls for the highest running speeds or the highest power transmission: The Sicat overhead contact line offers you a safe, economical and reliable solution based on the state-of-the-art.

Specialized for performance

Although the requirements imposed on contact line systems for main-line railways are complex, the answer is simple: Siemens offers a number of systems to ensure utmost performance on main-line railways:

- Sicat HA the high-end overhead contact line for the highest speeds up to 350 km/h
- Sicat SA the economical alternative for high speeds up to 230 km/h
- Sicat HD the overhead contact line built for DC systems and running speeds up to 230 km/h
- Sicat SD for the extension and upgrading of existing overhead contact lines for DC railways up to 160 km/h
- Sicat SR the overhead conductor rail for installation in tunnels and under bridges
- Sicat SX the cost-efficient electrification solution up to 250 km/h

Sicat HA – for the highest loads

The development of Sicat HA focused on high speeds, reliability and interoperability.

So our designers created a contact line system that caters to running speeds over 300 km/h and to a power transmission of 20 MW per train with good traversing characteristics. For the highest speeds, we use a design with optimized stitch wires, spans of up to 70 meters and a tension length of 1,500 meters.

Internationally certified

Sicat HA is certified as a component in general and as a subsystem in specific projects for the trans-European highspeed rail system. This overhead contact line is ideally suited for interoperable railway lines because it allows simultaneous use of the most common and different types of pantograph in Europe.

Sicat HA overhead contact lines not only surpass all requirements in respect of temperature range, current-carrying capacity, wind speed and fouling, but are also extremely robust and wear-resistant.

Sicat SA – economical and reliable

We have developed the Sicat SA as a overhead contact line system that is perfectly suited for new and extended highspeed AC railway lines around the world, as well as for all types of upgraded conventional lines and line extensions in the trans-European high-speed system.

Thanks to the lower electric loading and technically less demanding power transmission in existing route networks, Sicat SA offers more technical design options for open lines, tunnels and stations for speeds up to 230 km/h. Sicat SA convinces users not only with its low wear but also with its low investment and maintenance costs. It is certified as an interoperability component under TSI Energy.



Sicat SX – for cost-efficient electrifications

Sicat SX is an inclined catenary system for main and secondary lines in main-line railways with outstanding dynamic traversing characteristics up to 250 km/h. 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 for AC railways.

Sicat SX has also been certified under the European rail system interoperability directive and the associated Energy TSI as an interoperability component.

Sicat SR – for constricted space conditions

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 aluminium 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 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.

Depending on requirements the overhead conductor rail can be used for voltages up to 3 kV DC and 25 kV AC. Running speeds up to 250 km/h can be realized with Sicat SR.

The overhead conductor rail Sicat SX has been certified under the European rail system interoperability directive and the associated Energy TSI as an interoperability component.

Autotransformer solutions with AC overhead contact line systems

The Sicat HA and Sicat SA overhead contact line systems can be economically designed for particularly tough power requirements or special line conditions with autotransformer systems. In this way, power transmission is increased and energy losses are reduced.

With our extensive experience and the necessary Sicat system components, we make sure that you succeed.

Safe components for main-line railways: Strength of performance in detail



When it comes to investing in contact line systems for mainline railways, place your trust in a partner who has been demonstrating his performance capability for decades.

Siemens offers you modulardesigned, highly efficient and reliable components with customized properties that cater to all main-line applications.



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