Requirements

Availability

The contact line system is **not redundantly designed**.

Contact line systems are widely distributed.

In contrast to overhead lines, consumer loads in the case of contact lines are **non-stationary** and the power consumption fluctuates considerably.

Contact line systems are exposed to **external influences** of rail operation and third parties.

Contact line systems are erected in **publicly accessible areas**. Mechanical and electrical safety requirements need to be met.

In the **rail system**, the interaction of track, vehicle and overhead contact line is to be considered.
# Requirements

## Availability

<table>
<thead>
<tr>
<th>Safety</th>
<th>Capacity</th>
<th>Economic Efficiency</th>
<th>Energy Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>Passengers</td>
<td>Investment</td>
<td>No-load ratings</td>
</tr>
<tr>
<td>Passengers, Pedestrians</td>
<td>Vehicles</td>
<td>Operation</td>
<td>Recuperative Braking</td>
</tr>
<tr>
<td>Operating Equipment</td>
<td>Timetables</td>
<td>Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

### Power Utility
- Demand on network
- Handle load peaks
- Measurement and Protection

### Line Requirements
- Stations
- Tunnels/Viaducts
- Crossings
- Technical buildings

### Availability
- Reliability of supply
- Redundancy
- Actionable Data

> 99 percent required availability

### Standards
- Local
- International

### Geographical
- Climate
- Topography

### Environment
- Electrical and Magnetic fields
- Noise Emissions
- Climate ($\text{CO}_2$)

### Rail Automation
- Signaling
- Control System

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Solutions

Complete product portfolio

Proven system design

System monitoring

Complete range of service
Sicat
Contact system components for every function

- Tensioning equipment
- Contact wires and cables
- Cantilevers and supports
- Insulators
- Contact lines under structures
- Conductor rail
- Tension wheel equipment
- Section insulators
- Disconnectors and motor operators
Sicat
Contact system components for every function

Reliability as a principle
- Outstanding resistance to environmental influences.
- Minimized wear on contact wire and pantograph carbon strips.
- Low maintenance and easy to install.

Composite Insulators
- Soil and water repellent surface due to silicone rubber
- Modular design for a varied field of applications
- High resistance to mechanical and electrical loads

Disconnect Switches
- Low maintenance due to self lubricating, silver graphite-coated contacts and silicone rubber insulators
- High resistance to mechanical and electrical loads
Elastic supports attenuate contact line oscillations that occur during the passage of pantographs. Thus they provide a good dynamic behavior of the contact wire similar to that of a catenary suspension system.

Ease of installation, low maintenance and reduced contact wire wear due to rubber-bonded-metal torsion element.

The section insulators are designed for ease of installation with an effective adjusting device allowing for excellent traversing properties.

The section insulators are compatible with single or double contact wire systems and are universally applicable to the varying types.
Solutions

Complete product portfolio

Proven system design

System monitoring

Complete range of service
Sicat
Contact systems for every task

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

Sicat contact line systems give you a perfect solution for the complete range of requirements and running speeds of up to 250 mph.

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.

<table>
<thead>
<tr>
<th>Running speed</th>
<th>DC</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 45 mph</td>
<td>Sicat 3S</td>
<td>–</td>
</tr>
<tr>
<td>≤ 65 mph</td>
<td>Sicat LD</td>
<td>–</td>
</tr>
<tr>
<td>≤ 100 mph</td>
<td>Sicat SD</td>
<td>Sicat SR</td>
</tr>
<tr>
<td>≤ 120 mph</td>
<td>Sicat SR</td>
<td>Sicat LA</td>
</tr>
<tr>
<td>≤ 150 mph</td>
<td>Sicat HD</td>
<td>Sicat SA / Sicat SX</td>
</tr>
<tr>
<td>&gt; 150 mph</td>
<td>–</td>
<td>Sicat HA</td>
</tr>
</tbody>
</table>
**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 we can simulate and analyze this in advance.

- Sicat Master
- Sicat Candrop Pro
- Sicat Dynamic
Solutions

- Complete product portfolio
- Proven system design
- System monitoring
- Complete range of service
Sicat DMS
Disconnecter Monitoring System

Continuous Monitoring of Switch Position

- Reliable contactless indication of the moving blade.
- Long component life.
- No impact to switch operation.

Direct Indication of Blade

- Eliminates indication errors from operating rod/mechanism or disconnect switch failure.
- Verification of blade insertion depth for increased safety.

Ease of Implementation

- Indication to SCADA through floating contacts or integrated with motor drive mechanism.
- Slow or obstructed operation generates fault signal.

Sicat DMS - Rotary and opto-mechanical indicator
The switch position on the disconnector is measured by means of a magnetic rotation angle sensor (or additionally an opto-mechanical indicator).

This contactless sensor detects the angular displacement at the axis of rotation of the moving swivel base by means of an external position sensor (permanent magnet). This means that the disconnector monitoring system is wear-free and does not affect functioning of the disconnector.
Sicat CMS
Catenary Monitoring System

Continuous Monitoring of Line Tension
- Contactless measurement of wheel inclination
- Long component life
- No impact to wheel operation or efficiency

Immediate Detection of Faults
- Large or drastic changes in wheel inclination are reported
- Alarms can be sent over SCADA based on preset thresholds
- Location of fault can be immediately known

Numerous Operational Benefits
- Condition based maintenance by means of continuous monitoring
- Increased safety and operation with real time tension data
- Reduce the impact of faults by early detection and action

Prototype Installation – April 2006
Sicat CMS
Catenary Monitoring System

- Scada / control center
- System infrastructure, e.g. WAN or radio
- Evaluation station
- LWL cable, e.g. Profinet
- Data acquisition station with sensors, connected by sensor cables
Sicat CMS continuously monitors the tensile forces in the contact wire and messenger wire and passes the sensor information on to the control center.

A single data acquisition station can collect measurements of up to four sensors located in proximity. Up to 40 acquisition stations can be filtered and processed through a single evaluation station.

Sicat CMS can be installed in all tension wheel equipment with weight sets and can be retrofitted in existing installations as well.

System can be easily configured to monitor a single critical point (grade crossing) or an entire alignment.
Solutions

Complete product portfolio

Proven system design

System monitoring

Complete range of service
Our Portfolio
Increase efficiency, availability and reliability

- Contact Line for Main-line Railways
- Contact Line for Mass Transit
- Network Control
- AC Traction Power Supply
- DC Traction Power Supply
Our Portfolio
Increase efficiency, availability and reliability

Siemens Mobility Services – we keep the world running

Proven solutions for maximum availability and efficiency.

Easy and excellent solutions for optimized spare part inventories.

Smart remote monitoring and data services for maximum reliability.

Expertise to enhance the value of your systems.

Certified solutions for testing systems and training customer personnel.

Complete solutions to optimize operation and performance.

Maintenance Services
Spare Part Services
Digital Services
Upgrade Services
Qualification Services
Operation Services
Our Portfolio
Increase efficiency, availability and reliability

Project Management

Consulting/Financing
Configuration (System Design)
Configuration (Detailed Design)
Production
Delivery
Installation & Commissioning
Documentation
Training
After Sales Service

Quality Management
Contact

Asthana Mitra
Phone: +1 601 421-6057
astha.mitra@siemens.com

Siemens Industry, Inc
Turnkey Projects & Electrification
20393 SW Avery Ct
Tualatin, OR 97062
Main: +1 503 612-0070
Fax: +1 866 804-0478

Mark Godsey
Phone: +1 503 550-9238
mark.godsey@siemens.com

Brett Tharp, P.E., PMP
Phone: +1 503 720-0295
brett.tharp@siemens.com