The Trackguard Sicas electronic interlocking
Safe, economical and flexible
Fit for the future

With the Trackguard Sicas electronic interlocking

All over the world, safe and environmentally friendly railways provide convenient mobility. In cooperation with railway operators in many countries, Siemens has developed equipment, components and systems for signaling and control which have proven themselves in mass transit and regional services as well as industrial railways worldwide.

Interlockings, train control systems and track vacancy detection systems are essential for efficient rail operation. Powerful and highly available signaling and control systems help to make rail services even safer and more cost-effective.

Trackguard Sicas – economical and flexible

The Trackguard Sicas electronic interlocking system (Siemens computer-aided signaling) is a typical example of how Siemens responds to the demands of the worldwide railway market for customized interlocking systems.

Trackguard Sicas electronic interlockings are low-maintenance systems which are characterized by high safety and availability, cost-effective operation and flexibility. They provide solutions for all kinds of signaling and control systems for mass transit and regional services as well as industrial railways.

Trackguard Sicas electronic interlockings have a long service life. The well-structured system and clearly defined interfaces guarantee easy and fully compatible replacement of components or equipment.

Thus, even many years after installation, it is possible to keep pace with technical innovations.

<table>
<thead>
<tr>
<th>Benefits</th>
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<tbody>
<tr>
<td>Low acquisition and operating costs</td>
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<tr>
<td>High availability</td>
<td></td>
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<td>Highest safety level (SIL4)</td>
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<tr>
<td>Less hardware</td>
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<tr>
<td>Compact design</td>
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<td>Clearly defined interfaces</td>
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<td>Optimized energy consumption</td>
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<td>Reduced amount of spare parts</td>
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</table>
All over the world, safe and environmentally friendly railways provide convenient mobility. In cooperation with railway operators in many countries, Siemens has developed equipment, components and systems for signaling and control which have proven themselves in mass transit and regional services as well as industrial railways worldwide.

**Fail-safe interlocking technology for more than a decade**
The Trackguard Sicas interlocking hardware core consists of computers operating in accordance with the principles of the tried-and-tested and safety-approved Trackguard Simis fail-safe microcomputer system made by Siemens. For more than 20 years, Siemens has successfully been developing and implementing electronic interlockings based on Trackguard Simis computers. To date, more than 300 interlockings equipped with Trackguard Simis computers have been commissioned.

**The advantage for innovative and cost-conscious rail operators**
The hardware and software modules used in Trackguard Sicas interlockings are state-of-the-art and can be flexibly configured to meet even the most diverse customer requirements.

**Additional fail-safety and cost savings thanks to a state-of-the-art test center**
At Siemens’ test center in Braunschweig (Germany), complete interlocking systems can be tested intensively prior to their commissioning on site.

The interlocking software to be commissioned is tested under operating conditions with a wide range of tools using function tests, data tests and stress tests. The most essential benefit resulting from this approach is superior hardware and software quality. This means cost and time savings for rail operators, especially when commissioning the system without disrupting operation.

Moreover, Siemens delivers completely pre-mounted and tested containerized interlockings.
Trackguard Sicas electronic interlockings offer solutions for all kinds of signaling and control systems for mass transit and regional services as well as industrial railways. Several interlocking computers can be interconnected and positioned centrally or decentralized. Furthermore, the fail-safe connection of outdoor components and interfacing to operations control and train control systems is possible.

Simis principle

Safety
Trackguard Sicas electronic interlockings, which have been developed according to the highest safety requirements stipulated in European railway-related CENELEC standards, operate according to the proven and fail-safe Simis principle (Safe Microcomputer System made by Siemens).

Availability
The high reliability of the hardware deployed as well as the redundantly designed hardware core in 2-out-of-3 configuration or 2 x 2-out-of-2 configuration ensure highest availability (hot-swapping of boards).

Maintenance
By using highly reliable hardware, only low maintenance is required. Modules can be removed and re-inserted during operation of the system, thus avoiding an interruption of railway operation through computer shutdown.

An optionally available service information PC allows quick and safe detection of faults by maintenance staff. Text messages on displays and diagnostic indications on the front panels of the modules allow smooth and quick resumption of operation.

Economic efficiency
Trackguard Sicas electronic interlockings require only limited space as the equipment can be installed in compact 19” cabinets. These cabinets can be erected in existing buildings or transportable containers.

The hardware basis is of modular design and requires only a few module types. This reduces spare parts stocking and possible error sources.

The deployment of almost maintenance-free components, low power consumption of the electronic element operating modules and the possibility to set up interlocking software centrally are the reasons for the low life-cycle costs of Trackguard Sicas electronic interlockings.

Flexibility
Trackguard Sicas electronic interlockings can be smoothly adapted to various customer requirements (e.g. centralized or decentralized element operating module cabinets). Thanks to their interface design, Trackguard Sicas interlockings can be easily modified and extended. Modifications of the hardware or a software exchange can be realized during short stoppages without any longer interruption of railway operations.
State-of-the-art technology – tailor-made and compact

Siemens competence and know-how

The first Trackguard Sicas electronic interlocking was successfully commissioned in 1997. Since then, this modular technology has been continuously adapted to new customer requirements – the basic Trackguard Simis principle has remained unchanged. The Trackguard Sicas electronic interlocking system of the latest generation features both the proven Trackguard Simis hardware and standard industrial PC technology.

Excerpt from the Trackguard Sicas electronic interlockings reference list

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Year</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Vienna, Austria</td>
<td>2009</td>
<td>Bangkok, Thailand</td>
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<tr>
<td>2004</td>
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<td>2009</td>
<td>Budapest, Hungary</td>
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<tr>
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<td>2009</td>
<td>Vienna, Austria</td>
</tr>
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<td>2010</td>
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<tr>
<td>2005</td>
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<td>2011</td>
<td>Chongqing, China</td>
</tr>
<tr>
<td>2007</td>
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<td>2011</td>
<td>Suzhou, China</td>
</tr>
<tr>
<td>2007</td>
<td>Madrid, Spain</td>
<td>2011</td>
<td>Stuttgart, Germany</td>
</tr>
<tr>
<td>2008</td>
<td>Beijing, China</td>
<td>2011</td>
<td>Toronto, Canada</td>
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</tbody>
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Trackguard Sicas electronic interlockings are tailor-made
Trackguard Sicas electronic interlockings have a variable scope of functionality to satisfy even the most diverse customer requirements.

- Control and detection of points, signals and other outdoor components
- Route setting and releasing
- Connection of intermittent and continuous train control systems
- Relief operations and cancelation of operator actions
- Locking and unlocking of individual elements

This functional scope optionally comprises automatic operating modes (interlocking operation, through-routing). Moreover, Trackguard Sicas electronic interlockings allow operation via control centers or local control and display equipment which also permit operation per area or section, for instance.

Trackguard Sicas electronic interlockings are compact (single-cabinet interlockings)

Trackguard Sicas electronic interlockings are compact systems. One cabinet accommodates the computer equipment for a basic interlocking with:

- up to 25 elements to be controlled
- up to 200 track vacancy detection operations
- the interface to continuous and intermittent train control systems
- interfaces to the operating and service equipment (e.g. in control centers)

Trackguard Sicas electronic interlockings are scalable

For communication within a Trackguard Sicas electronic interlocking, the industrial standards Ethernet and PROFIBUS are used.

Within a segment, a Trackguard Sicas electronic interlocking of maximum configuration can handle up to 2,500 controlled elements (points, signals, etc.).

The computers can be configured in a way that centralized and decentralized interlocking areas may be set up.
The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.