Sicas S7 electronic interlocking

Compact and scalable for maximum flexibility

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SIEMENS

Innovative rail automation

Economic operation through industrial standards

Ensuring mobility is one of the big challenges in our society. That is why, with "Complete mobility", Siemens creates integrated networked transport and logistics solutions – for safe, cost-effective and environmentally friendly passenger and cargo traffic: from infrastructure equipment for rail and road traffic, rail vehicles through to airport logistics and postal automation.

The trend towards further rationalization at highest safety integrity level (CENELEC SIL4) imposes increasingly higher requirements on cost-effectiveness in mainline, mass-transit and regional transport as well as in the field of industrial railways. The main objectives are low investment and operating costs, short implementation times and long-term spare parts supply.

Siemens has come up with a safe, innovative and customer-oriented solution for these requirements: the design of compact electronic interlockings with standard industrial automation components from the Simatic® family.

The Sicas® S7 (***Si****emens* ***c****omputer-****a****ided* ***s****ignaling – S7*) interlocking offers a wide range of applications envisaging economic operating concepts and simplified conditions.

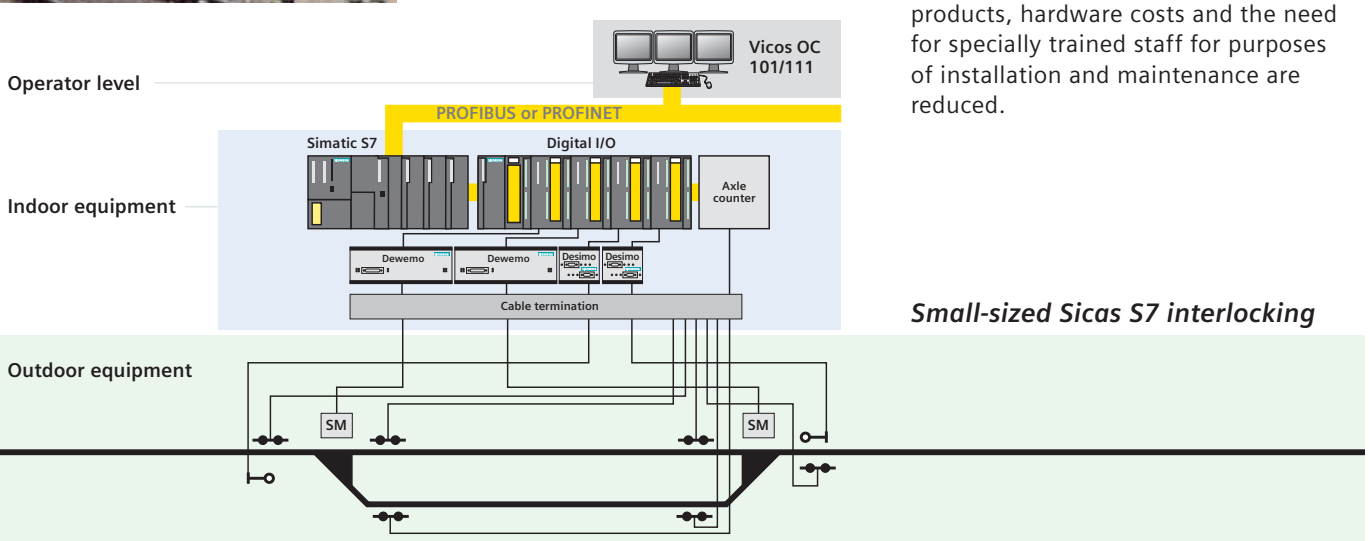
Simple individual solutions
The Sicas S7 electronic interlocking is based on Siemens' tried-and-tested Simatic S7 programmable logic controllers. Scalable automation solutions on this basis have established themselves as a cost-effective industrial standard.

Simatic controllers can be used to handle very different control and regulating tasks both efficiently and flexibly.

Benefits of Sicas interlockings
Introduced on the market in 1993
Highest safety integrity level (SIL4)
Low life-cycle costs
High reliability and flexibility
Innovative system solutions
High level of scalability
Compact design

Thanks to the modular design of both hardware and software, Sicas S7 electronic interlockings can be adjusted and extended in line with a wide range of different requirements and environments.

The worldwide spread of Simatic controllers ensures that railway operators are supplied with spare parts both fast and economically. Hardware innovations, e.g. new higher-performance CPUs, can be integrated without entailing any new safety case. By using widely spread and readily available industrial standard products, hardware costs and the need for specially trained staff for purposes of installation and maintenance are reduced.



Small-sized Sicas S7 interlocking

Safe, flexible and cost-effective

Modular hardware

The basis and core of the Sicas S7 interlocking comprise standardized, highly reliable industrial components of the well-known Simatic S7F automation system. The fail-safe processors of the S7-300F and S7-400F series and the fail-safe digital interface modules are in use. The fail-safe controllers use the same hardware components and the same bus system for standard and safety applications. In this way, additional hardware is saved and availability is increased.

The signals are pre-processed both flexible and economically within the fail-safe decentralized peripherals. The digital input and output modules are equipped with their own processors, which – in addition to the simple integration of the components into the system – provide convenient functions for diagnostics of the logical and electrical peripheral statuses. Communication between the interface modules and the CPU is fail-safe by using the PROFIsafe protocol. Parallel to the capturing of safe signals, non-safe information is provided by standard CPU modules for further processing.

Technical data

Temperature	–25 °C to +60 °C
Relative humidity	5% to 95% short-term condensation permitted
IP rating	IP20 to IP65

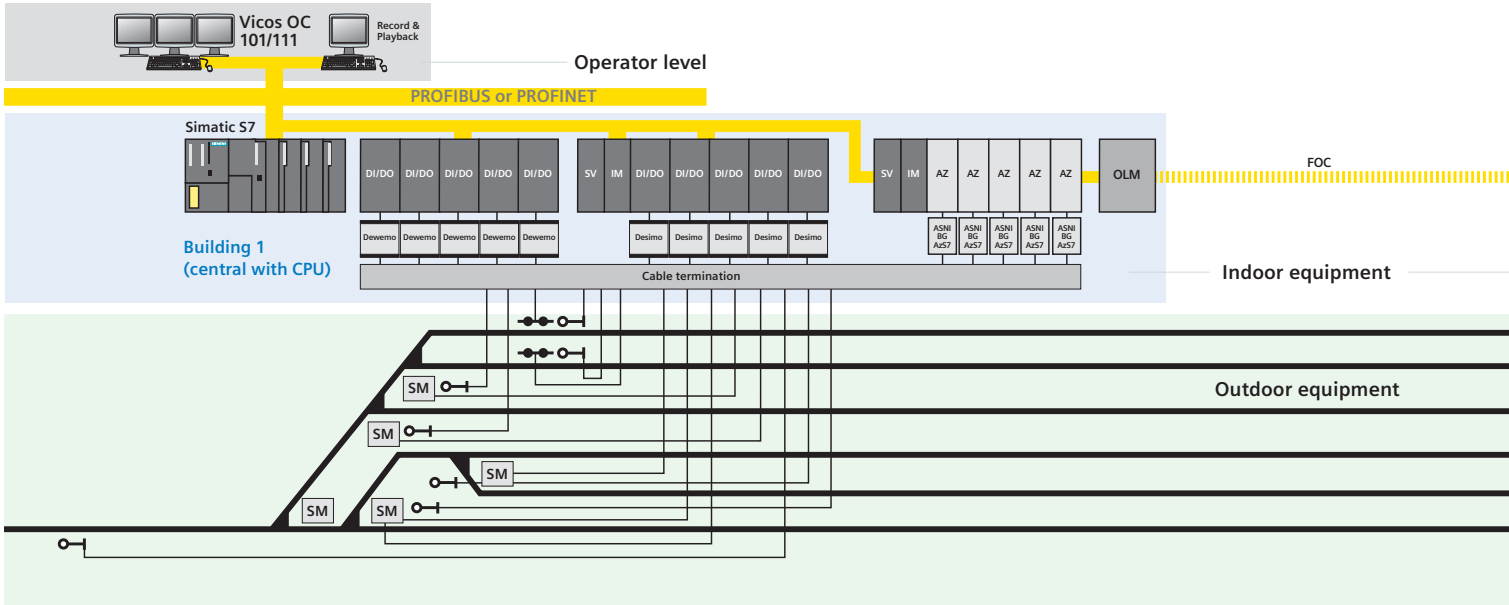
Mechanical requirements:

• Vibrations	to IEC 69 T2-6
• Shocks	to IEC 68 T2-27

Compliance with safety requirements:

- EN 954 (EU)
- IEC 61508
- EN 50126, 50128 and 50129 (SIL4)
- DIN V 19250
- EBA (certification number: 3085592/0/4)
- NFPA 79-2002 (US)
- NFPA 85 (US)

Marshalling yard interlocking



For reliability and availability

Integrated diagnostics

Simatic-based interlocking systems have proven their reliability many times in industrial railway applications and on regional lines worldwide. Detailed diagnostic information contributes to easy error localization which permits operations to be continued soon after a safety-induced interruption.

References

Railway operator	Installation / line	Number of controlled elements	Year of commissioning
RandstadRail, Netherlands	RandstadRail Metro Line, Rotterdam–The Hague, line length 42 km, 12 interlockings	580	2006
SWEG Lahr, Germany	Kaiserstuhlbahn Line, Endingen–Gottenheim, line length 20 km, 5 interlockings	235	2006
CSX Transportation Inc. Jacksonville, USA	St. Johns Control Point	4	2007
Hupac (Termi SpA) Busto Arsizio, Italy	Freight terminal between Milan and Malpensa Airport, 1 interlocking	91	2007
Indian Railways	Indian Mainline, 20 interlockings	617	2007
Spoornet, South Africa	Historic freight line Orex Line, 20 interlockings,	492	2007

Worldwide, the Sicas S7 electronic interlocking has been commissioned more than 70 times.

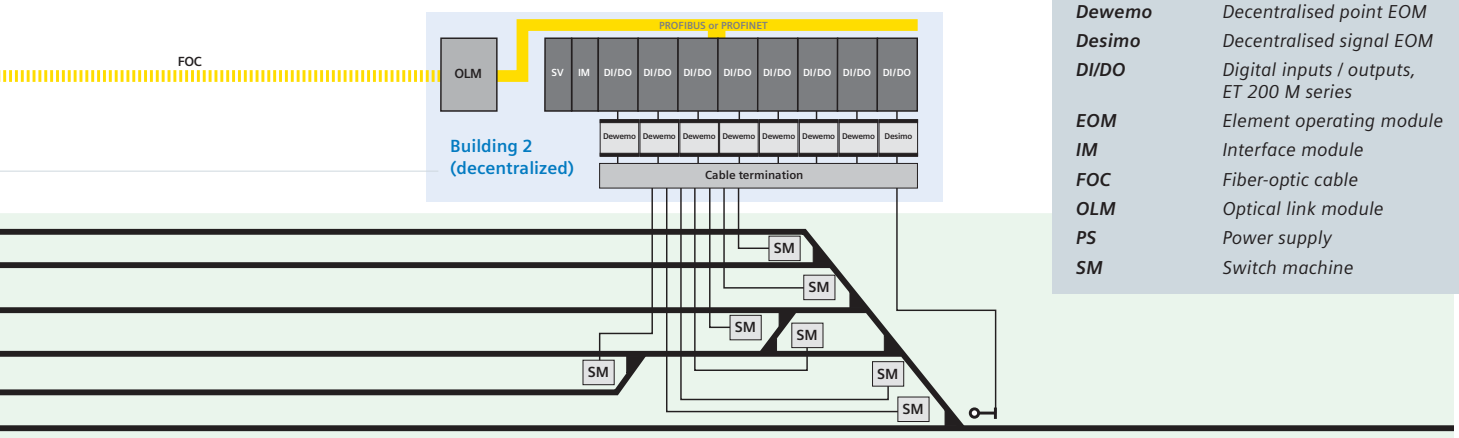
Fast error localization

The integrated system and process diagnostic functions of the interlocking logic and the Simatic controllers reduce standstill periods and increase interlocking availability.

The decentralized peripherals provide reliable information on the system status.

The module status is immediately detected and clearly reported by means of remote diagnostics. Faulty modules can be easily replaced without interrupting operation. The operator control and monitoring system offers various process diagnostic functions.

Operating sequences can be recorded and then reproduced and evaluated at a later point in time. The system keeps a configurable daily operating log which logs and indicates detailed events and provides printing functions.



ASNI AzS 7 board	*Interface board for evaluation of axle count signals*
AC	*Axle counter*
Dewemo	*Decentralised point EOM*
Desimo	*Decentralised signal EOM*
DI/DO	*Digital inputs / outputs, ET 200 M series*
EOM	*Element operating module*
IM	*Interface module*
FOC	*Fiber-optic cable*
OLM	*Optical link module*
PS	*Power supply*
SM	*Switch machine*

Scalable, powerful and compact

Key factors for efficient railway operation

High scalability
The Sicas S7 electronic interlocking offers solutions for a wide range of different applications and requirements. It is just as suitable for controlling individual switches or signals as for safe automation in major stations. In its design, the interlocking is very space-saving. The modules can be accommodated in a rack or cabinet. These can be compactly installed in buildings, containers or outdoor cabinets.

With its small, powerful units, the Sicas S7 interlocking has a modular design and is thus individually configurable. Depending on the application involved, several hundred controlled elements can be connected. The interlocking can be easily extended later, even without interrupting operation.

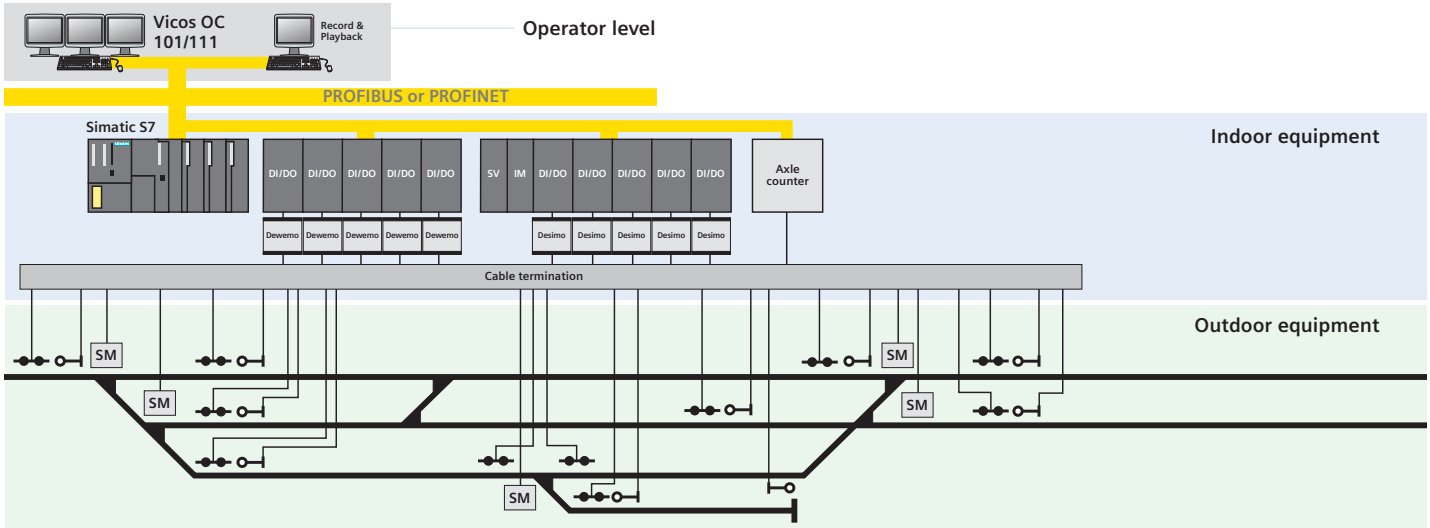
Cost-effective implementation
The Sicas S7 electronic interlocking can be processed rapidly and is cost-effectively configurable. This is achieved by the parameterizable software of the cyclically controlled element model.

The software modules describe self-contained interlocking functions in geographical circuitry. The functions of the individual elements and the adjacent element relations are parameterizable.

Flexible system architecture
Depending on the requirements involved, the interlocking can be configured to the customers' needs. Sicas S7 can be installed in both a centralized and decentralized manner. By using decentralized peripheral modules for field elements which are located far away from the element control computer, costs for the cable system can be reduced.
The PROFIsafe protocol on the basis of the PROFIBUS or PROFINET bus systems ensures fail-safe communication between the interlocking components.

Sicas S7 interlockings can be easily integrated into existing signaling systems. Existing outdoor elements can also be simply connected using highly flexible decentralized element operating modules (DSTT).

Station with Sicas S7 interlocking



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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.

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Thanks to the new ECC (element control computer) element operating module generation, Sicas S7 offers a compact, highly integrated modular system. The reliable, worldwide-tested ECC element operating modules feature a higher level of availability and meet the highest safety standards.

The new element operating module generation extends the existing Sicas S7 element operating module landscape so that more complex requirements (e.g. larger control distances) can be mastered on the same system platform. The usage of PLC (programmable logic controller) tools enables efficient, clear diagnostics.

Existing Sicas S7 applications can easily be expanded with the new element operating module generation.

The first interlockings in this technology are already in operation.

Benefits

State-of-the-art, fully electronic hardware
- compact and highly integrated
- maximum reliability and safety
- available as a 2-out-of-3 system
- developed in line with CENELEC SIL4
- approval by the Federal German Railways Office (EBA)
- worldwide-tested in application

Cost-effective and flexible
- optimal for spanning large control distances
- low life-cycle costs

Compliance with industry standards
- communication via PROFINET IO
- improved diagnostic functionality
- integration into the PLC tool world

Sicas S7 with ECC coupling

Cost-effective for spanning large control distances

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Example of a Simatic S7,
ECC and ACM track vacancy detection
system in one cabinet

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