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Wayguard Simis LC – Intelligent Protection of Level Crossings

Cost-effective, highly available and reliable

Simis LC axle counter-driven level-crossing protection system

Futureproof and customer-oriented



Level-crossing protection systems from Siemens have proven themselves worldwide and are characterized by a high level of safety, reliability and cost-effectiveness. Simis[®] LC is a highly available, modular level-crossing protection system which can easily be adapted to the conditions of individual level crossings and customer-specific requirements.

For any level crossing

Fast, uncomplicated, anywhere

The Simis LC (fail-safe microcomputer system from Siemens, level crossing) axle counter-driven level-crossing protection system has been designed for operators of mainline, regional, industrial and urban railways.

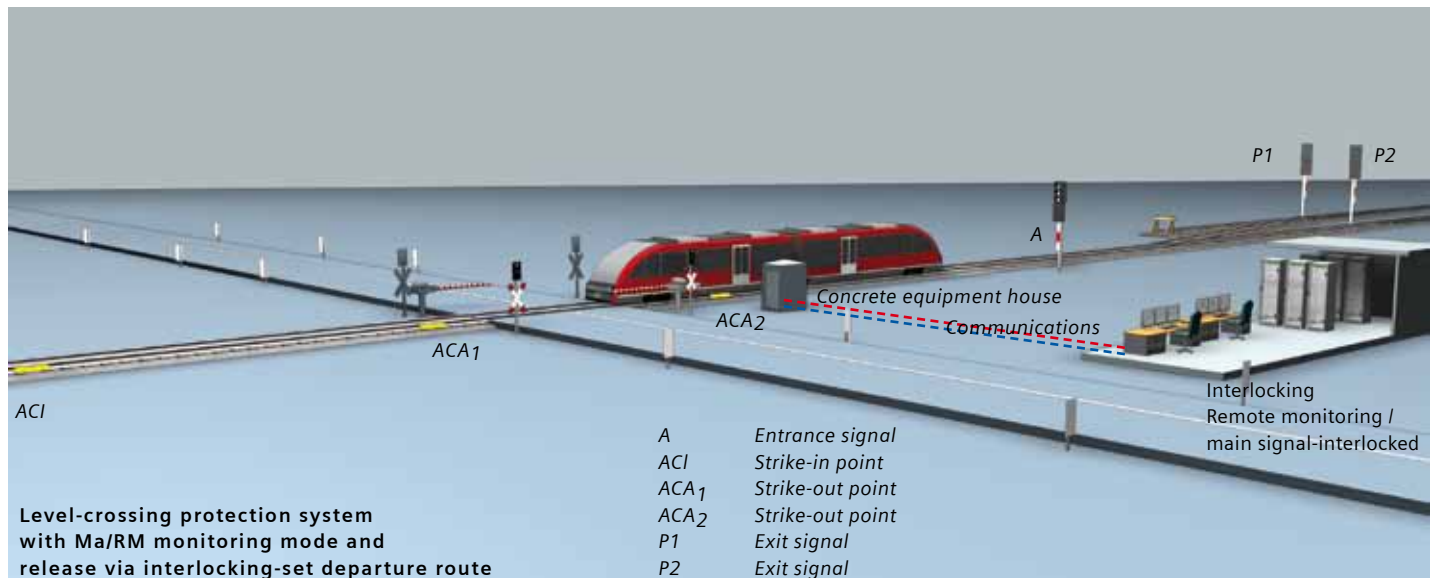
It can be used:

- with all traction types
- in station areas
- on single- and multiple-track lines
- on lines with permitted speeds of up to 160 km/h and optionally 200 km/h
- on lines with and without blocking
- where the distance to an adjacent level crossing is less than the warning distance

- for demand-controlled activation of advance road signals
- for the following monitoring modes:
 - Ma (signal-interlocked)
 - double Ma interface to different network operators
 - RM (remotely monitored)
 - MS (with a monitoring signal)
 - MS_{QA} (with a monitoring signal and optimized activation) and
 - mixed forms
- with automatic obstruction detector
- connected to road signals (Büstra)
- in replacement of old flashing light systems
- in 1:1 replacement of the indoor equipment
- for the operation of two independent level-crossing systems with one controller and one equipment house

Outdoor equipment

Reliable activation and deactivation of level crossings



Axle counting double wheel detectors

Axle counting double wheel detectors are used for train-activated activation and deactivation of the level-crossing protection system.

When the strike-in point (ACI) is passed, in remotely monitored and monitoring signal-interlocked systems, the direction of travel and occupancy state are determined in the computer. The status indications are evaluated and the command for activation of the level crossing is generated. In main signal-interlocked level-crossing systems, protection of the level crossing is initiated and monitored with the setting of the route. The main signal is not released until the level crossing has been successfully protected.

By occupying and clearing the axle counting section ACA₁ – ACA₂, the train deactivates the level-crossing protection system and resets it (providing there is no other activation command).

Other components

Besides the axle counting double wheel detectors, the following components can be used in the outdoor equipment:

- *road signals*
dual-filament activation of double-filament lamps and LEDs as well as single-filament activation of lamps and LEDs for:
 - yellow / red road signals
 - red flashing lights
 - white flashing lights
 - red alternating flashing lights
 - vacate signals
- *monitoring signals*
single-filament activation of double-filament lamps and LEDs
- *barrier drives*
 - for half and full barriers
 - for level-crossing wicket gates
 - optional barrier boom lighting with flashing lights, alternating lights or steady lights
 - optional broken-barrier loop
- *sound signals*
signal sources operating simultaneously (synchronously) or in pairs (asynchronously)
optional volume reduction at night and optional re-activation when trains meet
- *switches and buttons*
for activation and deactivation or inhibition of strike-in detectors
- *interfaces to interlocking*
EBUET-compatible with all types of interlocking

Simis ECC

The key to hardware minimization



High-availability computer

As the standard hardware, the fail-safe Simis ECC is used as a 2-out-of-3 system. The hardware core comprises three ECC CU (element control computer – central unit) boards which can be supplemented by two communication boards (mezzanine modules).

Four peripheral board types control and monitor the components of the outdoor equipment.

- The Wom (wheel sensor operating module) monitors up to four axle counting double wheel detectors and preprocesses the detector signals.
- The Badom (barrier drive operating module) operates two barrier drives each.
- The Lesom (level-crossing signal operating module) controls up to four double-filament lamps for road and monitoring signals.
- The Unom (universal operating module) is used to read in digital indications and issue commands.

Few circuit boards

The ECC mounting frame is supplied in 19" design. An extension frame can be attached to the base frame if necessary. The number of peripheral boards depends on the configuration of the outdoor equipment. They are mounted in freely selectable slots in the mounting frame, permitting flexible configuration. The use of minimum hardware results in a high level of reliability, reduced stocking of spare parts and low operating and maintenance costs.

Outdoor cabinet option

Simis LC can optionally be supplied in an outdoor cabinet.

1:1 replacement of the indoor equipment

Old systems can be modernized by replacing the indoor equipment. The outdoor equipment can continue to be operated or alternatively partially replaced.

References

Simis LC level-crossing protection systems have been in operation throughout German Railways since April 2000. Simis LC systems are currently installed in:

- Hungary (MÁV)
- Saudi Arabia (SRO)
- Lithuania (LG)

Benefits for railway operators

Highly available and integrable



Customer benefits

Versatile, cost-effective and simple

- Easy modification in the event of alterations and extensions
- Rapid implementation of customer demands through simple configuration
- Low maintenance and repair costs through
 - preventive diagnostics
 - high availability
 - local and remote diagnostics via a service PC or text message alerting
 - maintenance dialog: permits the manual control of individual outdoor components
 - use of maintenance-free batteries (optional)
- Consistent spare parts stocking for Simis LC and other fail-safe signaling equipment
- Small space requirement and reduced outlay for installation through
 - compact, modular structure
 - slot independency of peripheral circuit boards
- No special demands on insulated permanent way through use of axle counting double wheel detectors

- Large control distances thanks to 2 x 24 V battery power supply
- Extended lightning protection of the lineside components by overvoltage protection
- Lower costs for the cable system by using an electronic interface in the level crossing, by means of the digital transmission system to the interlocking (Simis D, Simis C, SpDr S 60, SpDr S 600)

System features

- CENELEC-compliant development
- Fail-safe and highly available in a 2-out-of-3 configuration
- Simis ECC (ECC – element control computer) as a standard system base for Simis LC, Simis D, Simis W and Simis IS future interlocking systems
- Modular structure of both hardware and software
- Link-up with road signaling systems feasible
- Outdoor components: automatic compensation for cable resistance in accordance with the control distance

- Configurable barrier operation times and speed profiles for lowering / raising of barrier booms
- Application software independent of hardware
- Application software and number of outdoor components configurable
- Use of LED road signals
- Control of several level-crossing protection systems from one system
- Electronic interface to the interlocking via ISDN or Ethernet

Safety in accordance with CENELEC

Simis LC is based on the CENELEC standards for railway applications. The safety objectives determined in the risk analysis for electronic level-crossing systems are fully met.

Approval

Simis LC has been approved by the German Federal Railways Office.

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Wayguard Simis LC vB

Simplified electronic level-crossing protection system

Key to hardware optimization

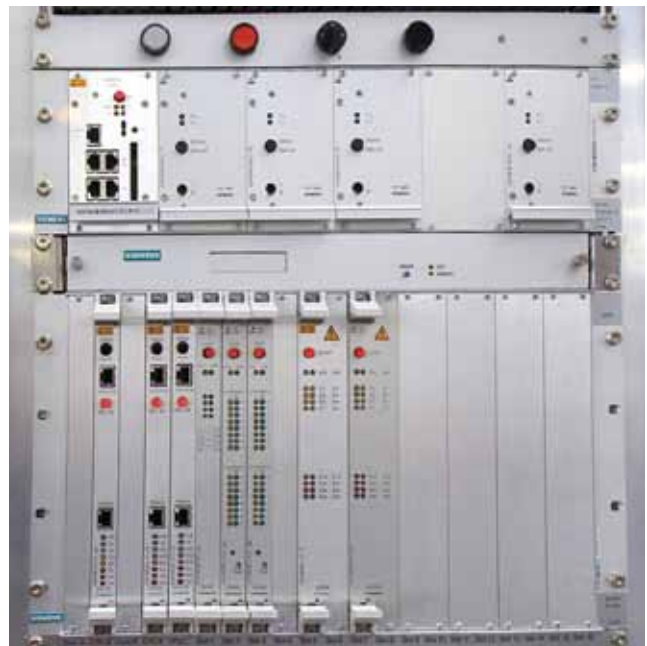
The Wayguard Simis LC level-crossing protection system has been simplified for applications with a lower level of complexity. Simis LC vB is now available as this scalable system.

This system is used for simplified conditions in railway operations and, in contrast to Simis LC, features restricted functions such as the following:

- two open lines with a standard speed of max. 120 km/h
- Hp (main signal) and ŨS (monitoring signal) monitoring modes without application variants
- LED road signals with single-filament control
- 36 V power supply monitored in single-channel mode
- limited number of outdoor components

Benefits

- Less hardware
- Less board diversity
- Modular, compact design
- Design identical to that of Simis LC and Simis D
- Diagnostics by radio or main cable
- Diagnostic interface identical to that of Simis LC
- Possibility of usage in outdoor cabinets
- No need for additional training
- Additional stocking of spare parts not required
- Simple modification for extensions
- Compact design due to reduced indoor equipment



Customer benefits

- Reduction in investment costs
- Safety level as for Simis LC
- Use of barrier drives from different manufacturers

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Wayguard Sim 6/13 Barrier Drive

Cost-effective and maintenance-friendly for new and old installations

Low-cost in operation

The Sim 6/13 barrier drive is a cost-effective solution: low procurement costs, easy-to-install design and minimal operating costs.

Maintenance is simple and can be performed without needing any specialist know-how: hardly any parts subject to wear and short repair times thanks to the easily accessible modular design. Another benefit: current consumption has been drastically reduced.

Benefits at a glance

- Environmentally friendly since no hydraulic oil is required
- Compatible with all known controllers and power supplies
- Reliable
- Maintenance-friendly, ideal working height
- Cost-effective
- No holding magnet test in the controller, thus enabling shorter strike-in distances
- Full electronic control with a soft start for Simis LC
- Lightweight design, no hoisting gear required
- For square and round boom lengths of up to 10 m, also with fringes





Robust design

The Sim 6/13 barrier drive is equipped with a DC motor. Protected by a compact, permanently corrosionproofed aluminum housing, it is installed on a hot-galvanized steel stand.

Counterweights balance out the weight of the barrier booms so that the movement forces for raising and lowering the barrier are offset.

The friction clutch and the time-limited control current activation circuitry prevent damage if the end positions are not reached.

Sophisticated power transmission and kinematics

The electric motor operates a ball spindle drive via a gearbox with toothed belt. The rotating motion of the spindle moves a ball nut which is inside the rotor. The two supporting rollers fitted to the rotor move linearly to the ball spindle drive. They transfer the torque via the two driver forks to the shaft of the barrier drive. The shaft turns and moves the boom.

Intelligent kinematics and the speed controller in the end position zones of the spindle cause the boom to be gently raised from and lowered into its end positions. Limit switches monitor the end positions and switch off the motor.

Individual and flexible

The design of Sim 6/13 complies with the known national requirements. If required, it is available with round or square booms, supported on one or both sides, and fitted with boom lighting, broken boom detection facility and skirt. An emergency lowering function is available as an option.

Risk-free operation

The torsionally rigid pedestal prevents any consequential damage in the case of a broken barrier. The electrical connection is screened. When the crank handle is inserted, a control current cut-off mechanism automatically interrupts the control current and makes it safe to manually operate the barrier. Even if the barrier drive is mechanically key-locked, the control current is cut off. The key can only be removed if the drive has been unlocked again. As overload protection for the screw gearing and the motor, the supply voltage is cut off on a time-dependent basis and

- in the case of EBUET 80, a mechanical friction clutch protects the barrier drive against damage
- in the case of Simis LC, the increase in current is evaluated by the electronic barrier operating module and the motor current is limited by an electronic friction clutch.



Technical data	
Supply voltage	36 V DC or 48 V DC for Simis LC
Boom length	max. 10 m
Raising / lowering times	6 s or 10 s or 4 to 12 s or 8 to 16 s for Simis LC; raising / lowering times individually adjustable
Upper end position	85 °C (max. 90 °C)
Weight of barrier drive	95 kg
Width (flange to flange)	500 mm
Maintenance intervals	every 12 months (running-in phase 6 months) or after 100,000 operations
Service life	>10 ⁶ operations
IP rating	IP54
Temperature range	-40 °C to +60 °C

Easy replacement

Old, maintenance-intensive barrier drives can be rapidly and easily replaced by new Sim 6/13. On the basis of prepared basic circuitry diagrams, replacement, including the boom bearing assemblies, is both fast and straightforward. Replacement is ergonomic, since the fitter can work upright.

Sim 6/13 is compatible with level-crossing systems of conventional design:

- Simis LC
- BUE S7
- EBUET 80
- NE BUE 90E
- BUE 95F
- FÜ 60
- BUES 72

High reliability

Robust mechanics and a low level of susceptibility to faults combined with a long service life and long maintenance intervals all speak for themselves. Sim 6/13 is not dependent on seasonal factors. The pedestal-mounted barrier drive housing protects Sim 6/13 against snowdrifts and flooding.

References

- Germany
- Greece
- Hungary
- Saudi Arabia
- Switzerland
- Lithuania

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New Detector Generation for Wayguard Simis LC

Contactless switching and indication

The WSD (Wheel Sensor Double) wheel detector is an electronic switch which responds contactlessly to wheel flanges. It comprises two electronic proximity switches mounted with a certain offset in the direction of travel and is suitable for counting functions requiring a direction criterion. The WSD wheel detector is a new wheel detection system from Siemens AG and is integrated into the Simis LC level-crossing system as a strike-in and strike-out criterion. The WSD wheel detector replaces the Frauscher RSR 122 detector used so far.

Benefits

- Maintenance-free
- Intelligent automatic adjustment
- Additional trackside evaluation unit not required
- Mounting-compatible with other wheel detector attachments (same drilling dimensions)
- Rail web or rail base clamp mounting
- Rail base mounting over a sleeper possible
- TSI-conformant in line with the CR TSI CCS and HS TSI CCS standards
- Low level of installation work in connection with trackwork
- Automatic idle-current compensation
- High-value temperature compensation
- Compact design for trackside installation



Technical data

Train operation

Detection	wheel flange
Rail profiles	all common rail profiles with heights of between 127 mm and 192 mm when new, rail channels with cutout
Wheel diameter	250 mm to 2300 mm
Wheel flange geometry	as per the German Railway Building and Operation Regulations (EBO), others on request
Wheel flange depth	25 mm to 38 mm below top of rail
Wheel flange width	≥ 20 mm, measured at 10 mm height above measuring circle level / running tread
Lateral wheel offset	≤ 75 mm
Traversal speed	≤ 50 km/h for wheel diameters of ≥ 250 mm ≤ 80 km/h for wheel diameters of ≥ 300 mm ≤ 160 km/h for wheel diameters of ≥ 360 mm ≤ 250 km/h for wheel diameters of ≥ 600 mm ≤ 400 km/h for wheel diameters of ≥ 800 mm ≤ 450 km/h for wheel diameters of ≥ 900 mm on lines with DC traction: ≤ 160 km/h

Minimum countable wheel (example)	wheel diameter: ≥ 320 mm wheel flange depth: ≥ 25 mm wheel flange width: ≥ 19 mm traversal speed: ≤ 10 km/h lateral running variation: ≤ 70 mm
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Rail current immunity in operation	≤ 2 kA _{rms} with AC traction ≤ 10 kA with DC traction
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Rail current immunity in case of contact line short-circuit	≤ 15 kA _{rms} with AC traction ≤ 30 kA with DC traction
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Static switching behavior

Switching state	continuous occupied state for stationary wheel per subsystem
System offset	93 mm ± 5 mm

Dynamic switching behavior

Output signals	pulse length proportional to speed
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Electrical data

Outputs	idle current of 5 mA ± 5%
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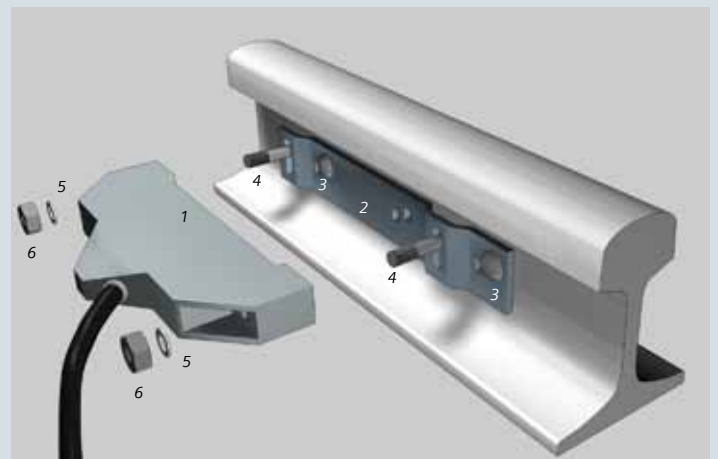
Cabling

Cable type	star-quad or paired
Cable cores	4 cores (2 cores per subsystem)
Loop resistance	≤ 362 Ω, depending on evaluation unit
Cable capacitance	≤ 145 nF/km
Control distance	≤ 6.5 km

Environmental data

Operating temperature	-40 °C to +85 °C
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IP rating as per EN 60529	IP66 IP68 (1000 mm water gage / 60 minutes)
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Mounting of the WSD wheel detector on the rail web

- 1 Wheel detector
- 2 Adapter plate
- 3 M12 x 55 or M12 x 65 mushroom-head screw
- 4 M12 x 90 or M12 x 100 mushroom-head screw
- 5 Washer
- 6 M12 prevailing torque-type hexagon nut

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Requirement-oriented Activation of Advance Level-crossing Road Signals

Road occupancy monitoring at level crossings

If a railway line runs parallel to a main road, situations are frequently encountered where low-traffic roads joining the main road have their own level crossings.

Advance level-crossing road signals are installed to allow traffic intending to join the main road to clear the level crossing in good time. Whenever a train approaches, these signals cause traffic on the main road to stop even if no vehicle has to clear the level crossing. To improve this situation, road traffic detectors are to be used to activate advance road signals in line with traffic requirements whenever a vehicle has to clear the departure zone of a level crossing.

If no vehicle is detected by the detectors, the advance level-crossing road signals are not activated and traffic on the main road continues as usual. This results in a high level of acceptance by road users and the approval bodies involved.



Road traffic detectors cover the danger zone

Benefits

- Activation of advance level-crossing road signals only as and when required
- Monitoring of the affected area by road traffic detectors
- Pilot application at Birken level crossing on Südostbayernbahn's Mühldorf – Landshut line (commissioned in July 2010)



Road occupancy monitoring at a level crossing
1 Coverage of the danger zone by Siemens traffic detectors
2 A road traffic detector covers the danger zone

The installed road traffic detectors have detected a vehicle and cause the advance road signals at the Wayguard Simis LC level-crossing protection system to be activated. Any vehicles can then clear the level crossing.

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Radio-operated Approach Annunciator

Lower investment costs by saving on cables and avoiding full-barrier booms

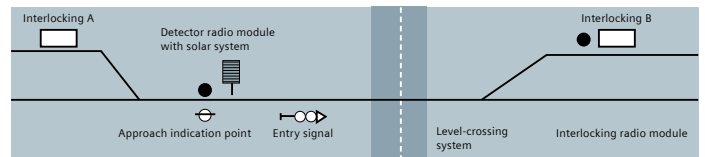
If trains are to run across interlocking-controlled level crossings, the level crossing can only be initiated in time by the interlocking and the additional criterion of an approach indication. The approach indication is triggered by the first axle of an approaching train which passes a WSR (Wheel Sensor Relay) detector.

Overview of functions

An interlocking-controlled level-crossing system with entry signal (see the illustration on the right) is only to be initiated if the train route has been set and the approach indication point is passed by an approaching train running from interlocking A in the direction of interlocking B (approach indication). This approach indication is transmitted via a GSM-R or GSM radio link. For this purpose, a radio module is used both in the interlocking and at the approach indication point. The detector radio module operates entirely independently and is powered by a battery-buffered solar system.

Optimized approach indications

If a train running slowly at a constant speed exceeds the maximum approach time of 240 s in the case of half-barrier level-crossing protection systems, the approach indication can be delayed depending on the speed. This causes the approach time to be shortened. Selective activation of the approach annunciator at stops in the strike-in section also causes the approach time to be shortened.



These additional functions enable the approach time to be optimized. Conventionally planned full-barrier level-crossing protection systems can be planned as half-barrier systems.

Interlocking radio module

The interlocking radio module is installed in the relay room of the interlocking and is powered by the interlocking-internal power supply unit.

In good time prior to an expected train run, monitoring of the approach indication point is activated from the interlocking. This is to optimize the energy balance of the detector radio module. This method also enables the approach indication point and the radio link to be tested by means of appropriate feedback.

Detector radio module

The antenna is mounted at the top, behind the panel. The apparatus case on the mast houses the radio module, radio modem, charge regulator, batteries, terminals and fuses (see the illustration). The detector radio module includes a radio modem and a WSR wheel detector. These components are powered by a battery-buffered solar system.

The radio modules are used both at the approach indication point for the purpose of monitoring the WSR wheel detectors and in the electronic or electromechanical interlocking for communication with relay units. The respective function is configurably determined by the loaded software.

Each radio module can:

- be powered by both an external power pack and a battery-buffered solar system
- transmit or receive via a GSM or GSM-R radio module
- be operated by the interlocking or by wheel detectors (four relay inputs)



- trigger approach indications in the interlocking or power trackside wheel detectors where required (four relay outputs)
- be easily tested by means of switches and LEDs
- be diagnosed via an optional display

Customer benefits

- Use of the cableless radio-operated approach annunciators powered by solar electricity reduces investment and energy costs
- Saving of the entire WSR wheel detector cabling
- Detection of the direction of travel
- Speed monitoring
- Any control distances
- Power supply independent of mains power supplies through solar energy
- Function-compatible formation of approach indications as for conventional systems
- Usage in connection with all level-crossing and interlocking systems

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Trackguard Simis DTS

Fail-safe transmission of digital information

The Simis DTS digital transmission system is used for the fail-safe transmission of any information. It is based on a fail-safe μ ECC (micro-element control computer) as the hardware core and is a follow-up product for the EF 180 and TF 460 single- and carrier-frequency transmission systems or PCS 560 pulse code transmission system. Simis DTS is based on the Simis ECC base system. It is on this basis that the DTS application has been specifically developed for the transmission function. Consequently, DTS equipment can be used as a stand-alone system in combination with two or more units.

Simis DTS is available as two variants:

- variant 1: for installation in a cabinet or rack
- variant 2: for installation in signal apparatus cases or for wall mounting

Transmission is via an ISDN or Ethernet connection between two or more DTS units. Using ISDN, ranges of up to 20 km are possible via a copper cable. If the cable quality is not sufficient, an additional Simis DTS unit in the repeater function or an ISDN repeater can also be used in order to increase the range. The distance is irrelevant in the case of an Ethernet connection via an existing IT network or a fiber-optic cable.



Benefits

- Reduction of cable and installation costs in a large number of applications (e.g. block transmission, remote relay unit connection)
- Fail-safe transmission of digital information in line with CENELEC SIL 4
- Large signal-to-noise ratio through digital transmission mode
- Connection via ISDN (copper) or Ethernet (IT network, fiber-optic)
- Convenient diagnostics via the ISDN or Ethernet channel
- Suitable for use in wide voltage ranges and various applications
- Suitable for outdoor usage
- Available modular systems for cabinets, racks and apparatus cases, especially signal apparatus cases, and for wall mounting on a base plate
- Wear-free floating transistor outputs
- Rapid transmission times
- Configuration without jumpers, configuration retrievable via diagnostics

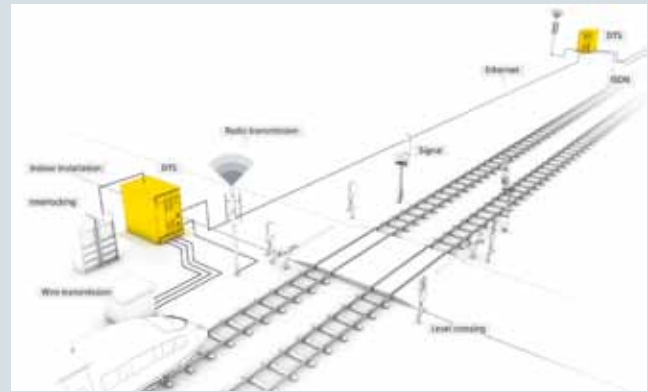
References

In operation:

- Augsburg – Westheim line, ZbS 600 centralized block
- Bad Hersfeld
- Bad Schandau / Pirna
- Burg Stargard
- Dresden cargo station
- Dresden-Neustadt
- Dresden-Reick
- Göttingen
- Harz-Weser network project, Simis D, ZbS 600 adjustments, adjustment of an EBÜT-80-Fü system
- Munich-Laim marshaling yard
- Springe electronic interlocking project, ZbS 600 adjustment, usage of a Simis DTS unit with through-routing function
- Teterow
- Würzburg
- Cottbus
- Fürth

In progress:

- Munich-Pasing North and South
- Munich South-west
- Székesfehérvár (Hungary)
- Budapest – Esztergom (Hungary)



Electrical data

Operating voltage (isolated)	min. 16.2 V DC, max. 72 V DC
Ripple content of input voltage	max. 3%
Power consumption	typical 30 W (4 Dinos), 18 W (2 Dinos)
Feeder protection	max. 6.3 A
Temperature range	-40 °C to +70 °C

Other data

EMC emission	as per EN 61000-6-4
EMC interference immunity	as per EN 61000-6-2
Safety integrity level	nach CENELEC SIL 4
Availability	99.997% (for medium component level)

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LED Signals for Wayguard Simis LC

Minimization of maintenance work

Today, LED light sources are primarily being used instead of classic, conventional signal lamps. Thanks to the use of state-of-the-art LEDs, energy-saving LED technology results in optimum signal light values. Even in poor lighting conditions, LED signal light units with their bright, uniform radiation can be reliably detected by road users. The widely feared phenomenon of phantom light (reflection when the sun is low) is almost completely suppressed. The electrical interface to Simis LC is formed by the LAB board which is integrated into the level-crossing road signal. In line with HD 638 / DIN VDE 0832-100, the LAB board can be used to operate the LED signal light units directly on the Lesom (level-crossing signal operation module) board. LED light sources have a considerably longer lifetime than conventional signal lamps and ensure a high level of system availability. Failures caused by faulty signal lamps are now something of the past. Running costs for power supply are correspondingly low. Due to the high level of efficiency featured by LED light sources, electrical power consumption is considerably reduced. Thus, LED signal light units with their low power consumption levels make a valuable contribution to environmental protection. In comparison to signal lamps, energy savings of up to 80% are possible.

The benefits of LED signal light units at a glance:

- no phantom color due to colorless lenses
- phantom class 5
- energy savings of up to 80% in comparison to signal lamps
- high EMC interference immunity
- electrical activation optimized to Simis LC
- considerably longer lifetime in comparison to signal lamps
- higher availability of road signal systems
- robust, simple design with state-of-the-art high-performance LEDs (no matrix)
- simple-to-replace LED units
- all signaling options realizable:
 - red / yellow
 - steady red light (individual)
 - flashing red light (retention of existing system)



Design of the LED signal

Technical data

Optical properties of LED signal light units as per DIN EN 12368 / DIN 67527-1:

Height	200 mm	
Luminous intensity distribution class	B2/2	
Axial luminous intensity, typical value	red	> 200 cd
	yellow	> 200 cd
Radiation characteristics	W (wide-angled signals)	
Uniformity of luminance	1:10	
Chromaticity coordinate as per DIN EN 12368	red	613 to 631 nm
	yellow	585 to 597 nm
Symbol class	S1	
Phantom class	5	
Electrical and mechanical properties of LED signal light units:		
Operating current (nom.)	350 mA DC	
Operating voltage (nom.)	17.8 V DC	
Power consumption	6 W	
Power factor	0.9	
EMC	as per DIN EN 50293	
IP rating	IP65	
Diffusion disks	system-specific colorless plastic lenses	
Symbol masks	standard design (symbol lenses for small-sized signal light units)	
Impact resistance	IR 3	
Operating temperature	-40° C to +65° C class A, B, C	
Relative humidity	20% to 95%	
Lenses	system-specific, colorless diffusion disks	
Standard symbol design	as symbol masks	
Housing color	pebble gray, RAL 7032	



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Wayguard Simis LC Diagnostic System for Local and Remote Diagnostics

Simple, flexible and intuitive

Convenient diagnostics

The Simis[®] LC diagnostic system supports the person responsible for inspection, maintenance and troubleshooting of level-crossing protection systems. It consists of the diagnostic module (Dimo) and the Dimo Tools control and display software which are supplied with each level-crossing protection system. An integrated text message signaling system and the transportable CompactFlash data memory round off the diagnostic system.

Dimo Tools control and display software

DIMO Tools displays detailed system statuses and events which are required for the continuation or fast restoration of operability. The diagnostic data is stored on the PC as an HTML or text file. The PC software is installed without administrator rights or a dongle.

Diagnostic center

- Reception of indications from the connected level-crossing protection systems
- Storage and analysis of indications
- Forwarding in line with configurable rules
- Processing of settings
- Display of statuses



User interface of the Simis LC diagnostic system

Dimo diagnostic module

The Dimo receives and stores the operating and diagnostic indications transmitted from the Simis computer. For this purpose, the Dimo contains a mini-PC (64-pole DIL base) designed as a plug-in module. A CompactFlash card is used as a storage medium. It can be replaced on the Dimo by means of an eject mechanism. The CompactFlash memory capacity can be determined by the user. The stored indications can be displayed on the Dimo by means of a notebook or in a diagnostic center by remote transmission. A graphic user interface enables simple data analysis.

On the front panel, there are one RS422 interface and three Unilink interfaces for connecting the module to the Simis computer. Triple channel operation is possible at the same time (read-only operation in safety-related operation with a special cable). An Ethernet connection is available for the purpose of connecting a notebook. There are two RS232 interfaces and one CAN bus interface at the multiple plug connector of the module. A maximum of eight digital information units from contacts (e.g. power supply and fan indications) can be read in via the multiple plug connector. In the Simis LC system, the CAN bus interface is used for control and data exchange with indoor components.

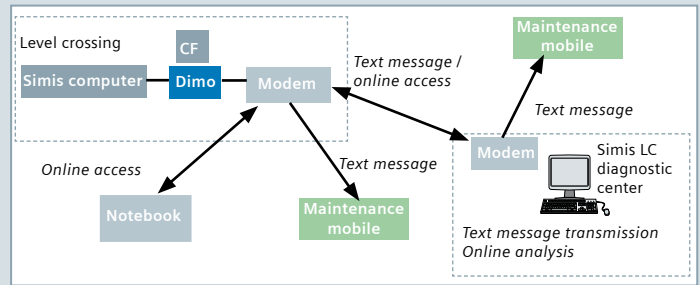
All interfaces are electrically isolated. The Dimo features a hardware clock with power reserve.

The user interface enables the following modes:

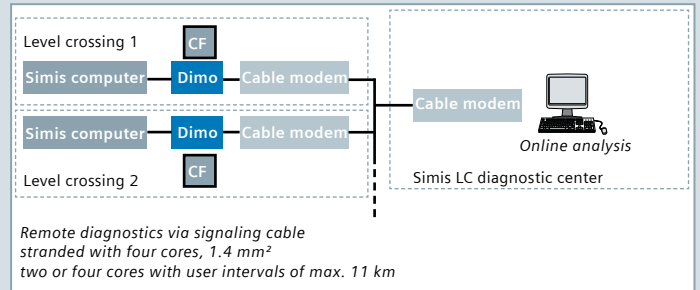
- diagnostics
- archive evaluation
- settings
- general status
- maintenance

Abbreviations:

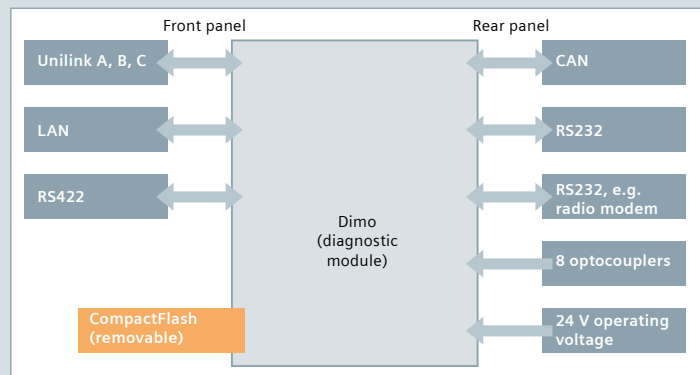
CAN	controller area network
CF	CompactFlash
Dimo	diagnostic module
LAN	local area network
LC	level crossing
RS	recommended standard
Simis	fail-safe microcomputer system from Siemens



Remote diagnostics with radio transmission



Remote diagnostics with cable transmission



Hardware interfaces



Dimo diagnostic module

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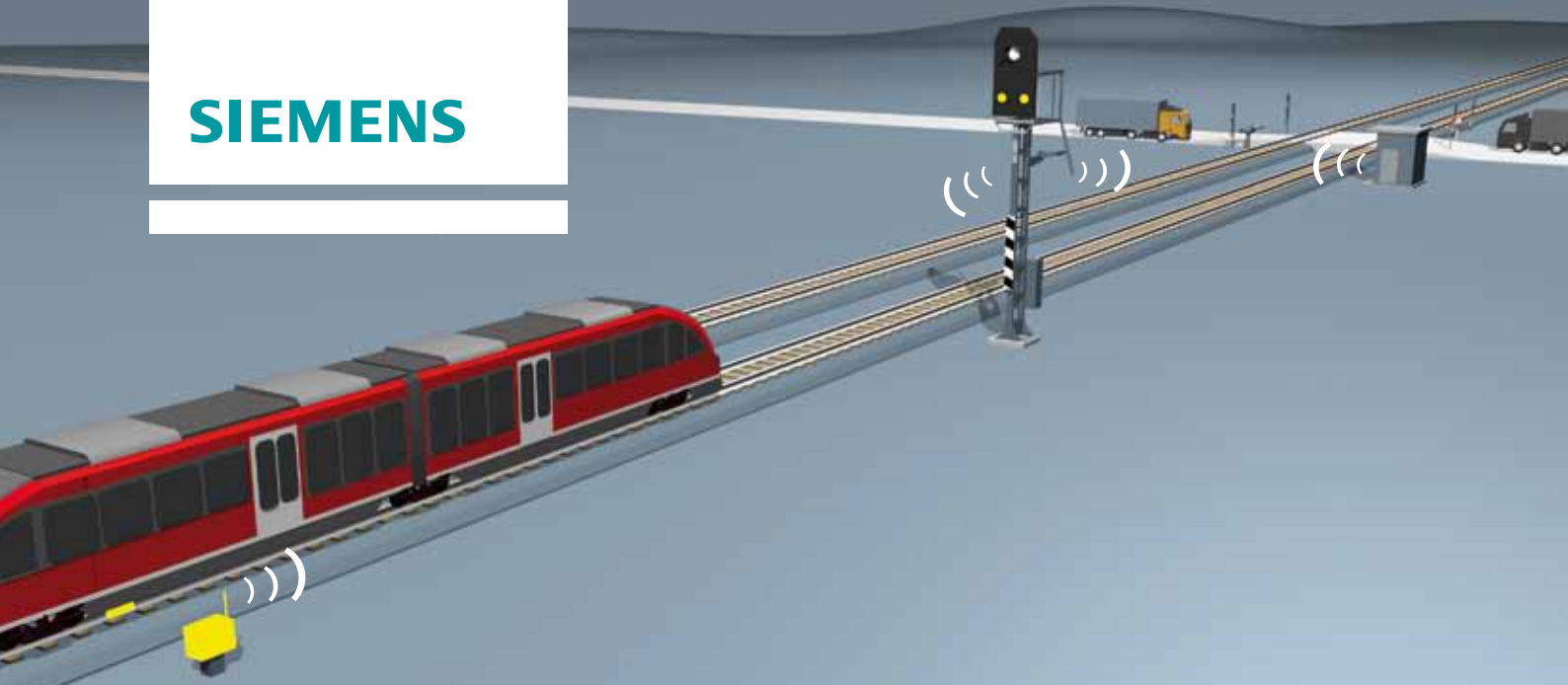
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Radio-operated Strike-in and Radio Monitoring Signal for Simis LC

Wireless communications in control and signaling systems

Since signaling systems were first introduced in rail transport, signal control has been linked to a permanent connection between indoor and outdoor equipment. Initially, wire ropes were used in mechanical interlockings, being replaced, during the course of time and with the introduction of modern interlocking types, by copper cables. Today, copper cables are still used in level-crossing protection systems to connect signals / strike-in treadles to the indoor equipment. The introduction of Siemens' radio-operated approach indicators is the first step towards cableless communications.

The next milestone is the set-up of a radio link for systems with the ÜS (monitoring signal) monitoring mode between the strike-in point, the monitoring signal and the Simis LC controller. This means that the entire scope of work involved in underground cable laying and other activities for set-up of the electrical connection between the indoor and outdoor equipment are no longer required.

The use of innovative communication technology drastically cuts high investment costs for cabling along the line. In this way, Siemens makes a contribution to the reduction of costs for level-crossing systems.



Design study of a radio monitoring signal



State-of-the-art radio technology is used, allowing communications to be encrypted. The strike-in point with the necessary inhibit button and the monitoring signal are powered independently by appropriately dimensioned batteries with an additional solar power supply.

The radio solution comprises the following:

1. radio-operated strike-in point
2. radio monitoring signal
3. radio center

The configurable logic is located in the radio center which is housed in the level-crossing equipment house.

The radio-operated strike-in point consists of at least one WSD wheel detector and the radio detector module which permits transmission of the wheel detector data to the equipment house by radio. As an option, an inhibit button can also be used.

The radio monitoring signal comprises at least one monitoring signal, which can be optionally extended with an Indusi magnet, and the radio signal module.

Functional description

When a train is detected, the radio-operated strike-in point sends a telegram to the radio center which then activates the Simis LC system.

Once the level crossing is protected, the radio center sends a telegram to the radio monitoring signal. The radio signal module activates the monitoring signal. After the train has cleared the level crossing, the radio center immediately sends a telegram for deactivation of the monitoring signal to its radio signal module.

In order to detect any failure of a system component, an “alive” signal is regularly sent by the component to the radio center via the radio channel. Such a failure is assessed at the radio center and results in appropriate responses by the level-crossing controller.

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