Trainguard LEU S21
Central trackside equipment component
Trainguard LEU S21 – cross-border safety with ETCS Level 1

Ensuring mobility is one of the big challenges in our society. To ensure our mobility in future, we need networked transportation and information systems. And we will only meet these mobility requirements through efficient coordination and perfect meshing of all modes of transportation. This is why Siemens – with its “Complete mobility” approach – is offering integrated transportation and logistics solutions for safe, cost-effective and environment-friendly passenger and freight services.

Trainguard is the Siemens solution for the standardized European ETCS automatic train control system which is gradually replacing the different national train protection and train control systems.

The Trainguard LEU S21 (lineside electronic unit) is the link between the existing fixed trackside signals and the in-track ETCS components Trainguard Eurobalise S21 and Trainguard Euroloop S21 F. In more than 1,000 applications in various countries, the Trainguard LEU S21 has demonstrated its extreme reliability.

Principle of operation
A transmission point equipped for ETCS normally comprises a fixed-data balise and a variable-data balise. The telegrams are transmitted intermittently using Eurobalises, but continuous transmission by means of Euroloops is also possible at certain locations. The aspect shown by a signal is extracted by the Trainguard LEU S21, the associated telegram selected and a serial data stream transmitted continuously to the variable-data balise(s) or Euroloop modem via a standardized interface. When a vehicle equipped with ETCS passes, the ETCS telegram is sent and evaluated by the EVC (European vital computer). All the configuration data, signal codes and telegrams belonging to a signal are stored in the Trainguard LEU S21. When the LEU detects an invalid signal aspect, a fault telegram is output.

Programming and diagnostics
The core element for Trainguard LEU S21 programming and diagnostics is a handheld computer. The data created during configuration is transferred via the handheld computer and safely stored in the Trainguard LEU S21 memory. Moreover, the displays on the Trainguard LEU S21 as well as the handheld computer offer convenient support for diagnostics.

Installation
The entire wiring and all connectors for external connections are integrated into a mounting rack and accessible from the front. The Trainguard LEU S21 is generally accommodated in the signal cabinet of the signal being equipped. It is connected directly to the cable feeder from the interlocking to the signal or the lamp circuit.
Benefits and features of the Trainguard LEU S21

Compact design
Installation is possible in practically all off-the-shelf cabinets which are accessible from the front. This enables easy component replacement and guarantees low modification costs.

Safe current pick-off
A low-impedance transformer can be looped into existing signal circuits without affecting the control distance. Lamp tapping using a current transformer is in conformance with SIL 4.

Absence of interaction
Easily proven thanks to the properties of the isolating current transformer. The Trainguard LEU S21 has already been approved for various signaling systems.

Cascadability
A modular Trainguard LEU S21 with signal interface supplies the signal aspect to up to three simplified cascaded LEUs. Hence, a maximum of eight outputs is available for balises/loops.

Patented programming procedure
The patented programming procedure ensures data transmission between the handheld computer and the Trainguard LEU S21 in conformance with SIL 4.

Three-level diagnostic concept
General diagnostics without tools is possible at two levels:
- LEDs (operating state)
- 7-segment display (cause of fault)

Detailed diagnostics using a handheld computer allows data recording in the case of temporary faults.

High level of availability
The Trainguard LEU S21 disables outputs for Eurobalises/Euroloops in the event of faults and enables them as soon as the fault has been remedied. Monitoring functions ensure smooth operation, thus increasing availability of trackside equipment considerably and minimizing the number of maintenance staff deployed.

Maintenance-free operation
The Trainguard LEU S21 is maintenance-free – no periodic checking is required.

Legend:
1. Trainguard LEU S21
2. S21 fixed-data balise
3. S21 variable-data balise
4. Trainguard Euroloop S21 F (optional)
5. Balise/loop antenna
6. Receive-and-forward unit
7. European vital computer (EVC, on-board computer)
8. DMI (driver-machine interface)
9. Odometer pulse generator
10. Radar
## Technical data

### Current inputs
- **Number of inputs**: up to 16 inputs configurable
- **Input range**: 30 mA to 4 A (15 to 440 Hz)
- **Flashing detectors**: up to four inputs configurable

### Voltage inputs
- **Number of inputs**: up to eight inputs configurable
- **Input range**: AC 0 V<sub>min</sub> bis 181 V<sub>max</sub> (15 Hz bis 66 Hz); DC 0 bis 181 V
- **Flashing detectors**: 2 inputs configurable

### Power supply
- **Input ranges**: AC 88 V<sub>min</sub> bis 264 V<sub>max</sub> (15 Hz bis 90 Hz); DC 34 V bis 177 V

### Telegram generator/outputs
- **Outputs**: 2 S21 variable-data balises
  2 Trainguard Euroloops of type S21 F or combination
- **Extension**: up to eight outputs using cascaded Trainguard LEU S21
- **Interface signal ‘C’**: as per UNISIG SUBSET-036 FFFIS for Trainguard Eurobalise
- **Interface signal ‘CL’**: as per UNISIG SUBSET-044 FFFIS for Trainguard Euroloop
- **Number of telegrams**: 1,023 (2 x) telegrams per output
- **Telegram length**: 341 or 1,023 (2x) bits (selectable)
Trainguard LEU S21

Technical data

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Reliability</td>
<td>&gt; 31.7 years</td>
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<tr>
<td>(MTBF as per SN 29500)</td>
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<tr>
<td>Dimensions (L x W x H)</td>
<td>185 x 190 x 286 mm</td>
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<tr>
<td>Weight</td>
<td>3.8 kg</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40 °C to +70 °C</td>
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<tr>
<td>IP rating</td>
<td>IP20 (installation in housing with rating of at least IP 54)</td>
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1. Trainguard LEU S21 for bus connection
2. Trainguard LEU S21 with handheld computer
3. Trainguard LEU S21 with ELM S21 F Euroloop modem in signal cabinet
4. Trainguard LEU S21 for signal connection
The information in this document contains general descriptions of the technical options available. The required features should therefore be specified in each individual case at the time of closing the contract. For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action and integrate each component into a holistic, state-of-the-art security concept. Third-party products that may be in use should also be considered.