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Trainguard Eurobalise S21 and S22

For track-to-train communications



Trainguard Eurobalise S21 and S22 – central component for ETCS

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 environmentally 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. Standardized interfaces between track and train ensure interoperability across national borders. Siemens in its role as one of the ETCS pioneers offers Trainguard 100 and Trainguard 200 as advanced ETCS systems and components. One important component of the Trainguard product family are the Trainguard Eurobalises S21 and S22 which have already proven themselves in more than 10,000 applications.

Range of applications

Siemens Eurobalises are used to transmit data for locating and train control purposes to the vehicle at any point along the track. They are used in mainline and mass transit applications all over the world. Due to their small dimensions and weight, the Trainguard Eurobalises S21 and S22 are easy to install. They are weather-proof and maintenance-free. Existing outdoor equipment can be easily extended by implementing Trainguard Eurobalises.

Interoperability

The Eurobalises made by Siemens allow trouble-free interoperation with components from various manufacturers. They have been developed, tested and certified on the basis of the European Union’s TSI (Technical Specification for Interoperability).

Optimal operating conditions

The Trainguard Eurobalise S21 is a reduced-size balise with a height of only 4 cm. The Trainguard Eurobalise S22 is also a reduced-size balise with a height of 5.5 cm. It meets all requirements of a Class A balise. Thanks to proven foam embedding technology and compact design, in-track application presents no problems.

The Trainguard Eurobalises S21 and S22 are available in two variants each which can be applied universally. Each time a train passes, the fixed-data balise containing a permanently stored telegram transmits the same data to the balise antenna aboard the vehicle. The other Eurobalise S21 variant, the S21 transparent-data balise, transmits variable data according to the signal aspect. This balise variant is controlled by a lineside electronic unit (LEU) which is connected via a permanently attached cable without plug.

Benefits of the Eurobalise S21

cost-effective

compact

highly reliable data transmission up to 500 km/h

contactless programming



1

Principle of operation

The Trainguard Eurobalises use a standardized transmission protocol. The transmission method is based on inductive coupling and data transmission with frequency shift keying and has been used successfully for years by Siemens for train control purposes.

When a train passes, the balise / loop antenna aboard the vehicle activates the Eurobalise by emitting a low-power signal. The Eurobalise uses this power to transmit its information to the balise / loop antenna. In this course, it transmits the data required for train control to the vehicle intermittently. This information is used by the EVC (on-board computer) for train supervision purposes and serves as a basis for the data displayed on the DMI (driver-machine interface) in the driver's cab. Depending on the application, fixed-data or transparent-data balises of type S21 or S22 are deployed.

Programming

The Eurobalises are programmed contactlessly across an air gap by means of a handheld computer and a test and programming unit. Using this unit, line operators can read out and change the balise programming conveniently at any time.



2

Trainguard Eurobalise S21 and S22 plus Trainguard Euroloop S21

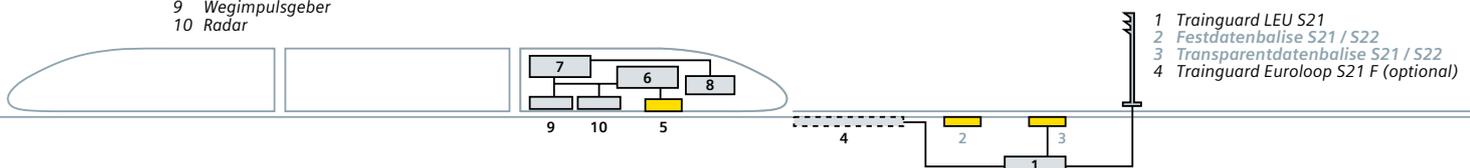
The Trainguard Euroloop S21 increases line capacity and improves safety.

The Trainguard Euroloop S21, a member of the Trainguard 100 family, is a continuous option complementing the Trainguard Eurobalise S21 which permits semi-continuous data transfer to the vehicle. In both cases, the same balise / loop antenna aboard the train is used.

The Trainguard Euroloop S21, an up to 1,000 meter-long leaky feeder, is laid at the base of the rail web between the distant and main signals. The advantage of the data transfer is that the latest information is sent to the vehicle continuously (infill), not which merely via a defined point. With minimal modification to the vehicles, the Trainguard Euroloop S21 allows higher train speeds in the relevant sections with a continuing high level of safety.

- 1 Balise / loop antenna (top) and Trainguard Eurobalise S21 or S22
- 2 Cableless programming with the test and programming unit
- 3 Trainguard Eurobalise S21 or S22

- 5 Balisen-/Loop-Antenne
- 6 Empfangs- und Übertragungseinheit
- 7 EVC (Fahrzeugrechner)
- 8 DMI (Driver-Machine Interface)
- 9 Wegimpulsgeber
- 10 Radar



- 1 Trainguard LEU S21
- 2 Festsdatenbalise S21 / S22
- 3 Transparentdatenbalise S21 / S22
- 4 Trainguard Euroloop S21 F (optional)



3

Two for the line

Universally applicable

S21 and S22 fixed-data balise

As a fixed-data balise, the Eurobalise sends a line data telegram to the vehicle. This telegram contains operating information and provides details of the position of the vehicle on the line (reference point). In the fixed-data balise, the line data telegram is stored permanently. This data can be altered by the user at any time, if required.

S21 and S22 transparent-data balise

All signal codes corresponding to the possible signal aspects and their associated telegrams are stored in a Trainguard LEU S21 (lineside electronic unit) installed at the trackside. In accordance with the signal aspect, the appropriate telegram is passed on to the transparent-data balise which in turn transmits it to the vehicle.



3

Trainguard Eurobalise S21 and S22

Technical data

Speed range	0 to 500 kph (310 mph)
Power transmission frequency	27.095 MHz
Data transmission frequency	4.234 MHz
Data transmission rate	565 kbit/s
Type of modulation	Frequency shift keying (FSK)
Telegram length	341 bits or 1,023 bits (selectable)
Usable data length	210 bits or 830 bits (selectable)
Programming	contactless via an air gap by means of a test and programming unit
Operating distance LEU S21–Eurobalise	up to 5,000 m
Reliability (MTBF as per SN 29500)	S21 fixed-data balise > 800 years S21 transparent-data balise > 160 years
Dimensions (L x W x H) S21 balise S22 balise	480 x 260 x 40 mm 480 x 260 x 55 mm
Weight	4 kg without cable (Trainguard fixed-data balise S22), 10 kg with 9.6 m cable (Trainguard transparent-data balise S22)
Ambient temperature	–40 °C to +55 °C (without direct exposure to the sun)
IP rating	IP67
Type	Reduced size balise
Trainguard Eurobalise S21 Debris Class	Installation condition according to Class B
Trainguard Eurobalise S22 Debris Class	Installation condition according to Class A
Conformity	UNISIG SUBSET-036 FFFIS for Eurobalise UNISIG SUBSET-085 Test Specification for Eurobalise FFFIS UNISIG SUBSET-091 Safety Requirements for the Technical Interoperability of ETCS at Levels 1 & 2

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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.

