In competition between rail and road, Europe is now moving towards a high-capacity, multinational railway system. This entails cost-effective trainborne equipment which complies with the new requirements of a changing market. A new requirement particularly involves connecting the world of classic automatic train protection technology, such as Indusi (inductive intermittent system) for example, with that of the new standard, the European Train Control System (ETCS).

With the introduction of Trainguard® Basic Indusi, Siemens is presenting a new generation of the Indusi/PZB 90 (PZB – intermittent automatic train control) trainborne automatic train protection system which meets the new European conditions.

### Benefits

- **Modular upgradability to ETCS with investment security**
- **Complete PZB 90 functionality**
- **User-friendly control and display by means of a simple or multifunction display unit with train data input on the driver’s console**
- **Simple installation due to its compact size (six units high 19” design)**
- **Standardized terminal box with a connector interface**
- **Maintenance-free**
- **Diagnostic system which can be integrated into the central vehicle diagnostic facility**
- **MVB (multifunction vehicle bus) architecture, resulting in**
  - less cabling work
  - possibility of connection to the train operations control system
  - interface to the EVC for the STM functionality
- **Short multiple-unit trains needing only one set of trainborne equipment**
With a view to the future, the functionality of the national Indusi/PZB 90 automatic train protection system is being implemented on the basis of the following trainborne ETCS components:
- on-board computer based on the European Vital Computer (EVC)
- Driver-Machine Interface (DMI)
- data recorder, upgradable to the Juridical Recorder Unit (JRU)

Communication from track to train is by means of classic Indusi magnets. ETCS-compatible odometer pulse generators are used for distance and speed measurement. The PZB operator actions “Release”, “Override” and “Acknowledge” are performed by means of the classic PZB operating buttons.

### Trainguard Basic Indusi – three key features in one unit
- **Trainguard**
  Modern platform for mass transit and mainline train control systems from Siemens
- **Basic**
  Modular basis for ETCS
- **Indusi**
  Indusi/PZB 90 functionality using classic Indusi magnets

#### ETCS pre-equipping solution
Due to its compact, modular design, Trainguard Basic Indusi is the optimum solution for modern tractive units which are to be pre-equipped with Indusi/PZB 90 as a first step and upgraded to ETCS during their service life. Trainguard Basic Indusi is the solution for migration from Indusi to ETCS with investment security.

Indusi, the inductive automatic train protection system, which is one of the most frequently used systems in Europe, will probably continue to be used for the next 20 years before being replaced by ETCS throughout Europe. In the mid-term, the focus in Germany is initially on equipping rail corridors with ETCS. Hence, when equipping new Indusi-fitted rolling stock, vehicle manufacturers are urgently recommended to check that cost-effective upgrading to ETCS is ensured already at this stage.

#### Trainguard Basic Indusi as an ETCS pre-equipping solution
It is precisely here that Trainguard Basic comes into action. Thanks to its modular structure and the fact that it is part of the Trainguard product family, it is optimally prepared for ETCS. The level of pre-equipping can be determined by the classic or standard variants. While the standard variant uses ETCS components consistently, the classic variant represents a low-cost solution nevertheless permitting easy upgrading at a later point in time.

### Trainguard Basic Indusi Classic
- Display by means of classic indicator lamp units and train data input device on the driver’s console
- Low-cost data recorder for PZB data

### Trainguard Basic Indusi Standard
- Display by means of DMI, upgradable to ETCS
- Data recorder, upgradable to ETCS

#### Migration through optimized upgrade concept
Trainguard Basic is designed so that, by expanding the hardware (boards and peripheral elements) and updating the software, it can be converted into an ETCS trainborne equipment with integrated Indusi functionality.

The following upgrade levels are distinguished:
- Trainguard Basic Indusi (PZB 90)
- Trainguard Basic Indusi Semi-STM PZB
- Trainguard 100 Bi (ETCS Level 1 with integrated Indusi/PZB 90)
- Trainguard 200 Bi (ETCS Level 2 with integrated Indusi/PZB 90)
Trainguard Basic Indusi Semi-STM
By a software update, Trainguard Basic Indusi Standard is expanded to Semi-STM PZB which includes the transitions in accordance with German Railways’ ETCS System Requirement Specifications 4. All functions required in Germany for a running transition between PZB and ETCS are thus offered.

Trainguard 100 Bi
Trainguard Basic is expanded to Trainguard 100 Bi by using Eurobalise receiver boards and the Eurobalise antenna. By connecting additional odometry detectors, position-finding is upgraded to the high-level requirements governing precision and availability.

The ETCS Level 1 functionality is added by a software update. Of course, the bistandard solution also performs all transitions in accordance with German Railways’ ETCS System Requirement Specifications 4.

Trainguard 200 Bi
Trainguard 200 Bi differs from Trainguard 100 Bi in that the hardware for GSM-R data communication is integrated (boards and GSM-R antenna) and a software update causes all components to achieve ETCS Level 2 compatibility in addition.

Trainguard 200 Bi + STM
In standard practice, national signaling and safety systems are connected in ETCS via an STM (Specific Transmission Module). Trainguard 200 Bi is made STM-capable by adding the PROFIBUS STM interface.

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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.

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