

The background of the entire page is a detailed, light blue technical line drawing on a dark grey background. It depicts a complex industrial or electronic assembly. In the upper left, there are several circular components, possibly sensors or cameras, mounted on a frame. Below them are various electronic components, including what looks like a control panel with a dial and buttons. A large, circular, flange-like component is prominent in the center. To the right, there are more electronic modules and wiring. In the bottom left, there's a large, coiled spring-like structure. The drawing uses fine lines and hatching to represent different materials and components, giving it a technical, engineering feel.

ETCS

ETCS

ETCS is the European Train Control System promoted by the European Commission for use in Europe to replace national Train Control Systems and allows interoperability, i.e. international traffic without the need to equip rolling stock with several country-specific Train Control Systems. ETCS is an automatic train protection system, based on cab signalling and track-to-train data transmission. It ensures safe operation of trains at all times. HaslerRail offers various components and systems to support ETCS train-borne equipment.



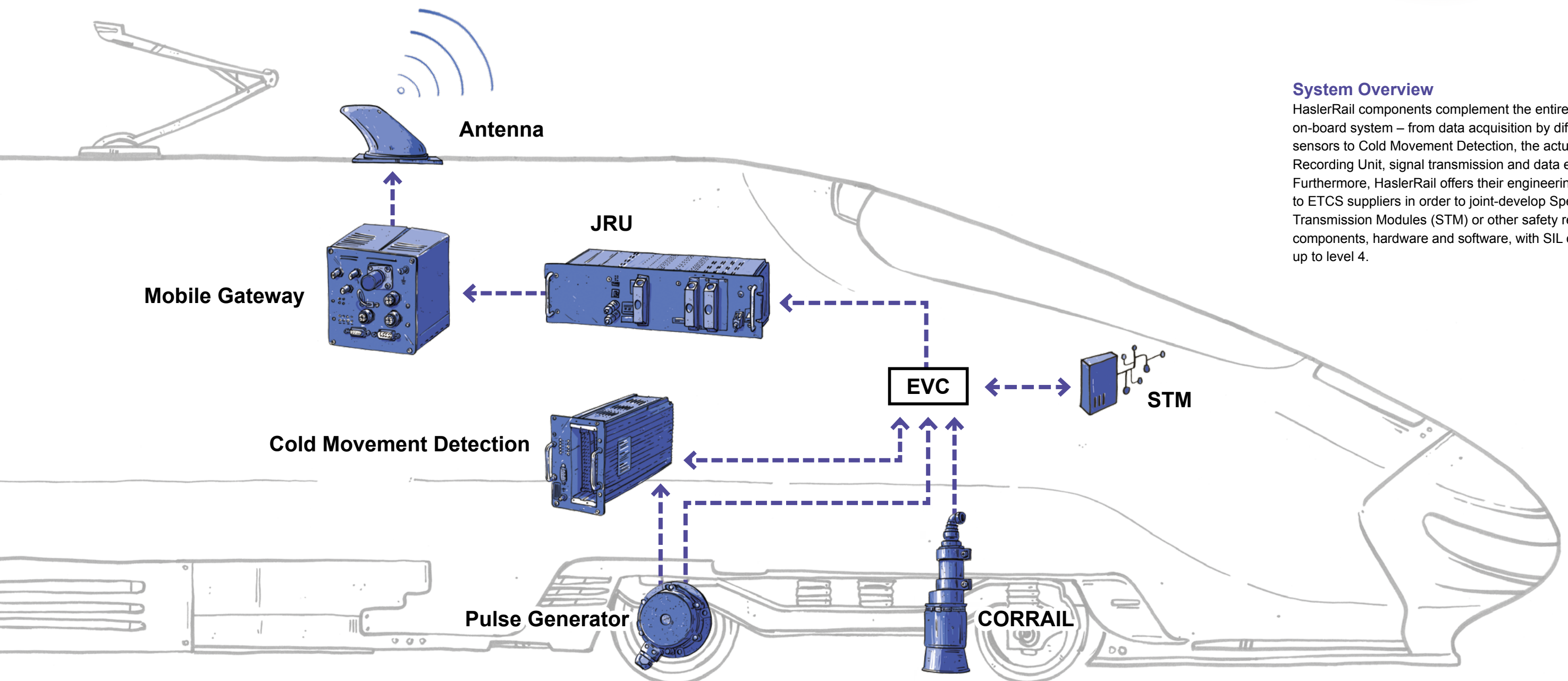
Safety

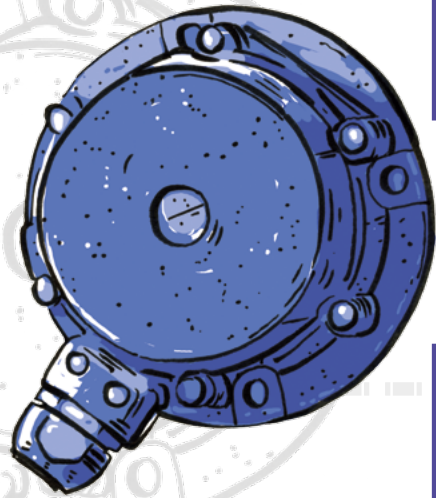
According to current EU legislation, new or modified devices with safety relevant functions have to be designed according to the EN 50126 standard in order to receive a defined Safety Integrity Level (SIL) certification. Safety-relevant information is often already available in the data recorder; therefore, it is sensible to use it to carry out safety-related functions such as roll protection, dead man function, Driver Safety Device (SIFA), speed threshold, etc. To assist our customers in the design of functions up to SIL4 level in new rolling stock or modernisation projects, HaslerRail has developed the Hasler® SABO Safety Board which also helps to simplify the certification process of an entire system.



System Overview

HaslerRail components complement the entire ETCS on-board system – from data acquisition by different sensors to Cold Movement Detection, the actual Juridical Recording Unit, signal transmission and data evaluation. Furthermore, HaslerRail offers their engineering services to ETCS suppliers in order to joint-develop Specific Transmission Modules (STM) or other safety related components, hardware and software, with SIL certifications up to level 4.





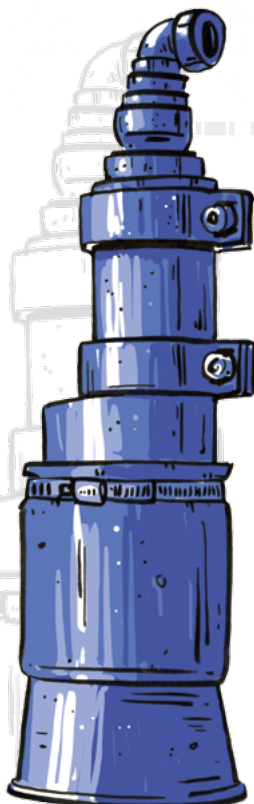
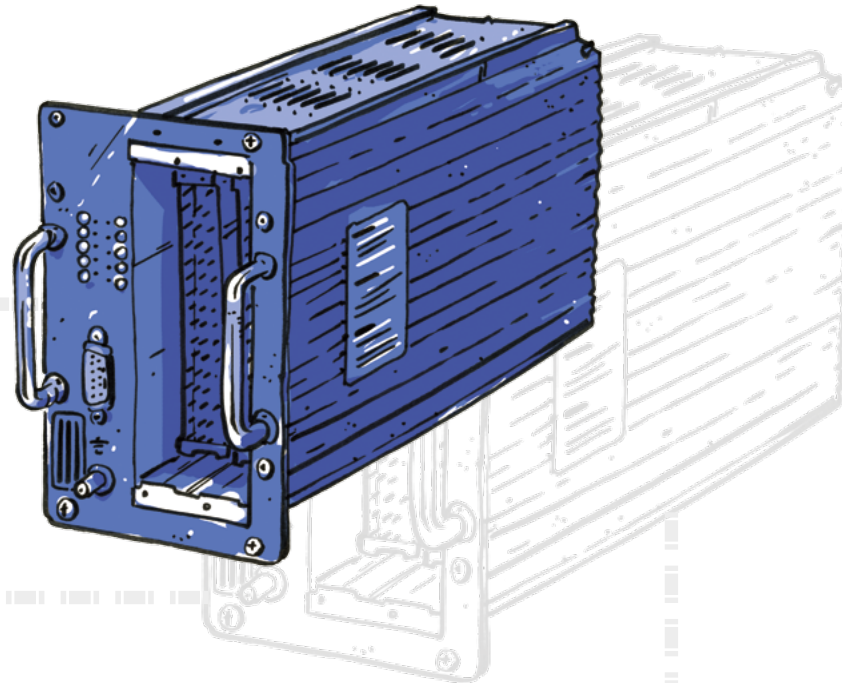
The Hasler® Pulse Generators

HaslerRail provides a complete range of sensor products to be used for ETCS Odometry Unit (ODU). The design of HaslerRail's optical pulse generator, Hasler® OPG, based on an optical system that operates in the infrared range, has been designed to resist the most extreme mechanical and thermal stress. In recent years however, the increase of operational speeds and the optimization of network capacities have led to the fact that the existing standards no longer represent real-life conditions in the rail environment. Based on vibration data collected in the field, HaslerRail has designed a heavy duty pulse generator, Hasler® HDPG, around a new sensor technology in the form of a lightweight ASIC.

Due to its accuracy and reliability, Hasler® Pulse Generators and Hasler® Hall-Effect Sensors are already widely used and longtime proven in service for ETCS, CBTC and National applications.

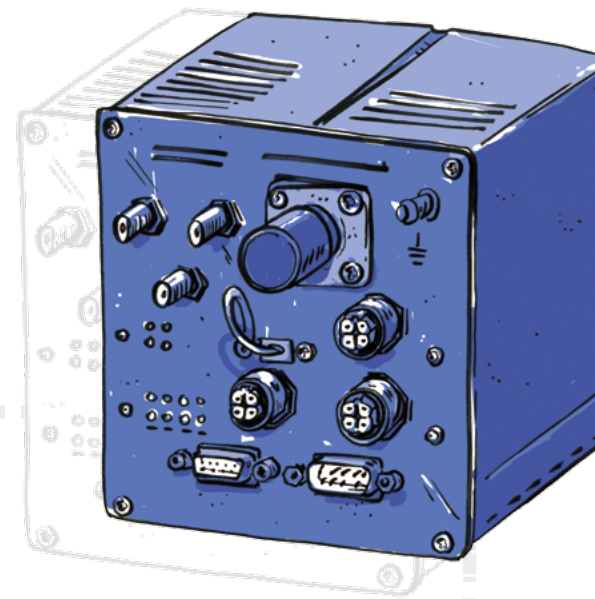
Hasler® CMD Cold Movement Detection

It is important for the ETCS on-board system to know whether an engine (train, locomotive) has been moved or not during the time it has not been powered, i.e. powered off, No-Power mode. If the movement information is missing, the train driver must drive in a degraded mode to the next synchronisation location in order to synchronise its position with the wayside location (e.g. ETCS balise) which is a time-consuming and expensive task for operators. Hasler® CMD supervises movement during power off phase and provides information to the on-board system (ETCS) about the movement (SIL 4 function).



Hasler® CORRAIL1000

Since today's Radar-based ETCS distance measuring devices have revealed their weaknesses in service, e.g. in harsh weather conditions or on iron bridges, HaslerRail has developed the Hasler® CORRAIL1000 sensor which offers a contactless, track-bed independent, direct measurement of a rail vehicle's speed and operating direction, using the railhead as a reference. In order to work even in the harshest environments, particular care was taken to ensure robustness as well as easy maintenance and care. Due to its special construction which will avoid soiling of the LEDs as well as optical dirt detection and its installation on the bogie frame in the wheels' lee, the Hasler® CORRAIL1000 sensor is insensitive to almost any kind of dirt, e.g. ballast dust, snow, rust, etc.

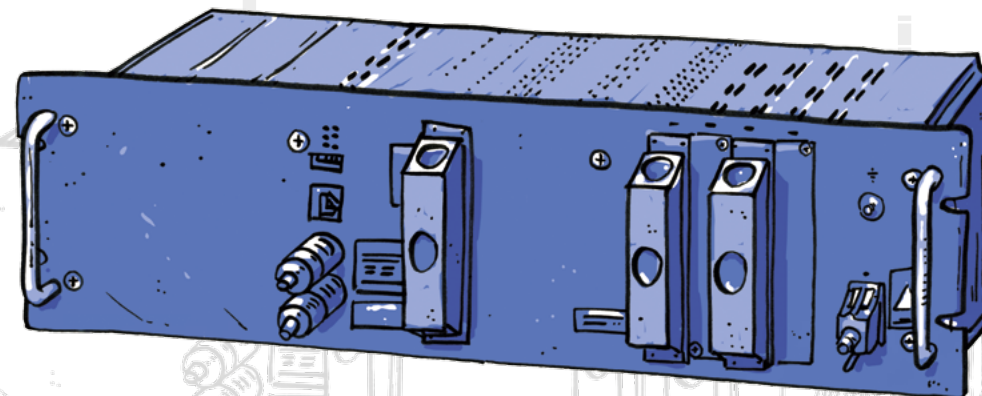
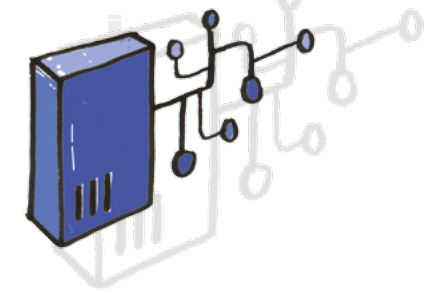


Mobile Gateway

TELOC® systems can be connected to mobile gateways (routers) to send data to an off-board server. This makes data accessible to different interest groups.

STM and other ETCS components

HaslerRail offers its engineering services to ETCS suppliers in order to joint develop Specific Transmission Modules (STM) or other safety related trainborne components, hardware and software, with SIL certifications up to level 4. Various components have been developed over the past years together with ETCS suppliers, e.g. TBL1+ STM for Belgium, where HaslerRail delivers homologated hardware components and software with SIL4 certification.



ETCS Juridical Recording Units (JRU)

The requirements for ETCS Juridical Recording Units (JRU) are defined in TSI OPE and CCS. TSI OPE defines that data pertaining to the running of a train must be recorded and retained for the purposes of supporting systematic safety monitoring as a means of preventing incidents and accidents, identification of driver, train and infrastructure performance in the period leading up to and, if appropriate, immediately after an incident or accident, enabling the identification of causes, and supporting the case for new or changed measures to prevent recurrence and recording information relating to the performance of both the locomotive/traction unit and the person driving.

All HaslerRail TELOC® recorder types are capable of any recording combination: ETCS only, National data only or combined ETCS and National data solutions.

EVA+

Data Evaluation

Data analysis has to be automated in order to look at data continuously and in a uniform manner and to generate information out of recorded data. With this in mind, HaslerRail has developed its software tool Hasler®EVA+.

It is possible to evaluate and compare National and ETCS data sets in the same software tool. Furthermore, JRUs not only record data from on-board equipment but also indirectly from trackside systems, e.g. ETCS balise failures, GSM-R coverage problems, etc. Combined with GPS data these events can be shown on a map. Continuous analysis will show whether the problem is located trackside, e.g. a balise defect, or on the vehicle. This saves costs, as a trackside issue is usually analysed with specially equipped test vehicles that need to be used outside the timing of normal operations which is in most cases during the night.

Hasler® CORRAIL1000 as a high precision speed source for ETCS on a ICE 1 / BR401 High Speed Train

After several years invested in R&D, HaslerRail has launched a new and innovative speed measuring sensor onto the market. With the generous help and support of SBB, ÖBB, Alstom and other OEMs it was possible to run long term trials for 4 years covering more than 7 million kilometers. In this period data was collected from Hasler® CORRAIL1000 sensors installed on trains running in Austria, Germany and Switzerland. In addition HaslerRail invested in simulations and tested the products in wind tunnels as well as in extreme climatic conditions.

The result is a product with the following characteristics:

- Track independent, highly dynamic direct measurement
- Reliable data acquisition during braking and coasting to a standstill
- Direction detection
- Extremely robust design for installation on the bogie
- Low maintenance and service costs
- Very high measuring reliability

The results of the measurement and analysis convinced Alstom as well as DB to use the Hasler® CORRAIL1000 as a primary speed source for their sophisticated ETCS system on the ICE High Speed trains of DB.



S. Terfloth

STM TBL1+ together with Bombardier ETCS system

The rail signalling system in Belgium is a lineside system of lights, it relies on absolute compliance by drivers. A number of driver assistance systems have been installed such as the old Memor/Crocodile system and the newer TBL1+ system. TBL1+ is a first step in the implementation of ETCS across the whole network of Belgium by 2022. ETCS will provide maximal security on the rail network. Therefore, existing and new rolling stock has to be equipped with TBL1+ and the ETCS system.

In order to avoid installation of two systems, Bombardier RCS has, together with HaslerRail, developed a STM (Specific Transmission Module) for TBL1+ which is now installed on different locomotives.

TELOC®2500 JRU with STM TBL1+ functionality and Bombardier BTM and EVC has been homologated in Belgium with the correspondent certificates of conformity by Belgorail.



Alupus

Cold Movement Detection (CMD) with Hitachi Rail

HaslerRail is working closely with Hitachi engineering to integrate the Hasler®CMD system into Hitachi's on-board ETCS system. Hasler®CMD will supervise the movement during the power-off phase and provide information to Hitachi's ETCS Vital Computer accordingly. If the cold movement detector confirms that no movement has taken place, the ETCS onboard system can use the last known

location with certainty which in return will save time and money for the operator.

Hitachi intends to install the CMD functionality onto the new 29 bi-mode AT300 trains from FirstGroup, for the First Great Western franchise, running primarily from London Paddington to Plymouth and Penzance.



Hitachi Rail

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