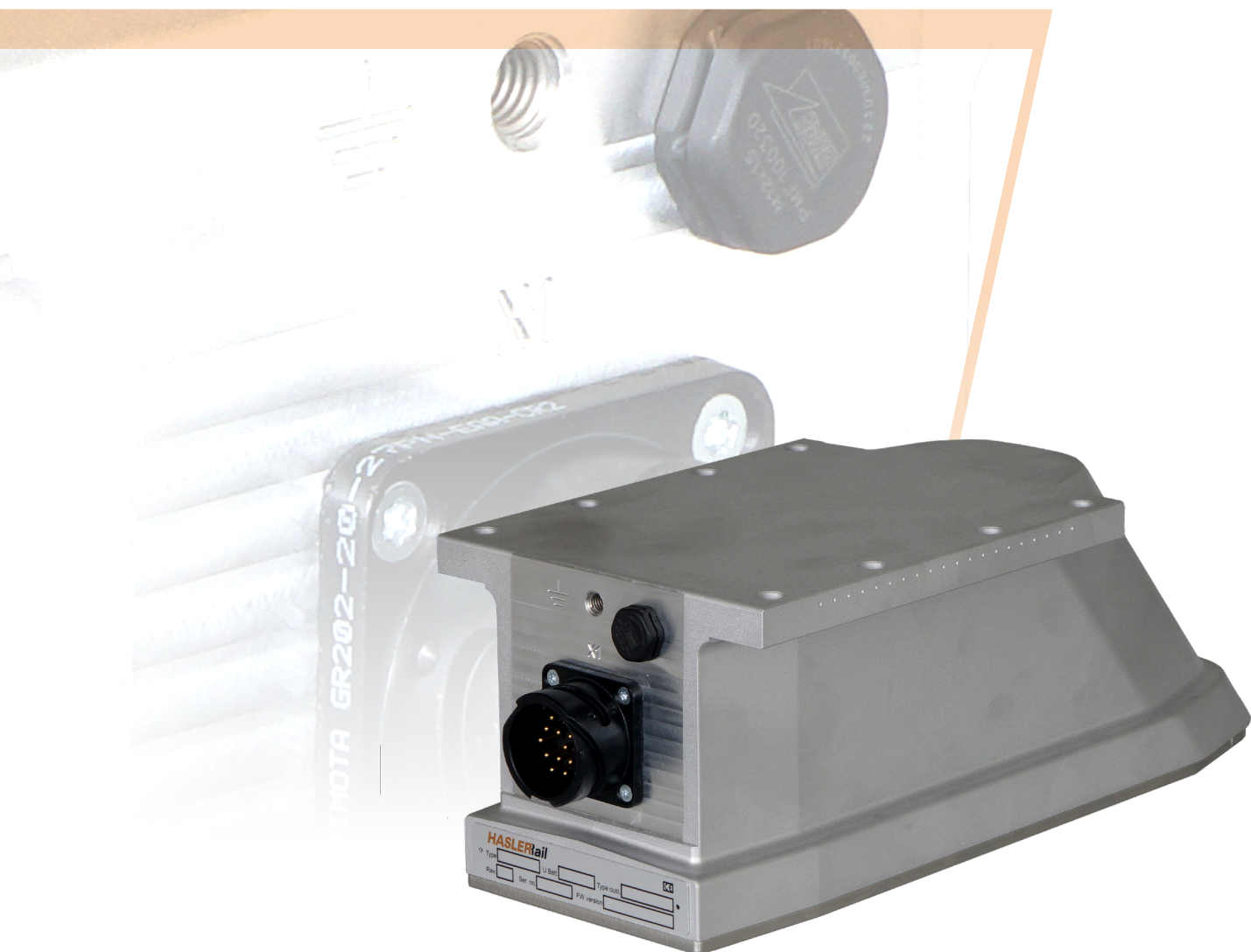


DOPRAIL 1000

SPEED SENSING AND ODOMETRY



SPEED SENSING AND ODOMETRY

TRUE SPEED OVER GROUND SENSORS (TSOG)

ON-BOARD ELECTRONICS

Rail vehicles are equipped with speed, direction and distance detection systems to ensure safe and visible operation on today's busy, centrally supervised networks. HaslerRail offers a comprehensive range of products to satisfy the most demanding detection requirements and applications. In addition to traditional pulse generators and hall effect sensors we also include non-contact speed and distance sensors, so-called True Speed Over Ground Sensors:

The optical CORRail sensor offers contactless, track-bed independent, direct measurement of a rail vehicle's speed and operating direction, using the railhead as a reference.

The DOPRail radar sensor measures the vehicle speed over ground using the Doppler effect.

GENERAL INFORMATION

The DOPRail 1000 incorporates two microwave radar modules to measure the vehicle speed over ground using the Doppler frequency shift effect. Both radar modules generate a detection frequency of 122 GHz (ISM band) limited to 1 dBm maximum of radiated power according to ETSI EN 300 440.

The modules are based on monolithic microwave integrated circuit (MMIC) technology which is unsurpassed in terms of form factor and performance. With an optional inertial measuring unit (IMU) and intelligent signal evaluation integrated into the system, immunity from speed measurement deviations due to angular errors in mounting, pitch and roll is assured with DOPRail 1000.

DOPRail 1000



The DOPRail 1000 completes the existing product portfolio of speed sensors from HaslerRail AG.

MAIN BENEFITS

- ✓ Speed sensing is unaffected by wheel slip / slide
- ✓ Availability >99.5%
- ✓ Virtually maintenance free
- ✓ No calibration is required as sensing is independent of wheel diameter
- ✓ Less affected by changes in track bed substrate. No significant calibration shift compared to rival Doppler radar sensors
- ✓ Precise speed and distance readings are suitable of use with ETCS and ATO

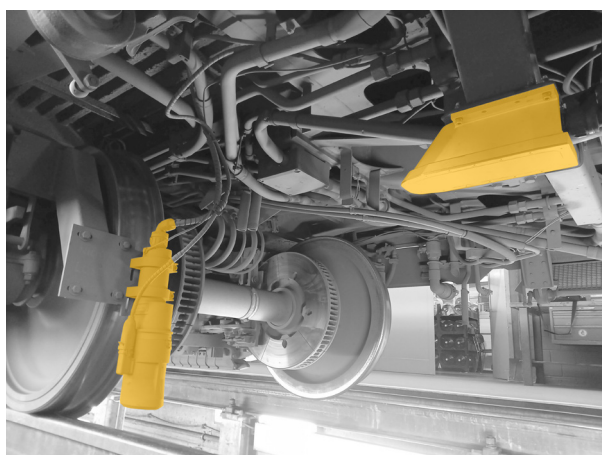
MAIN CHARACTERISTICS

| Technical Data | Value |
|-------------------|---|
| Speed Measurement | 0.2...600 km/h Forward-/ backward detection |
| Error of the Mean | 1 km/h...100 km/h < 0.4 km/h 100 km/h...600 km/h < 0.4 % |
| Statistical Error | 1 km/h...100 km/h < 0.4 km/h 1σ Limit 100 km/h...600 km/h < 0.4 % 1σ Limit |
| Latency | <50 ms |
| (Re-)Boot Time | <1 s |
| Interfaces | RS485 |
| Power Supply | 24 ... 110 VDC |
| Power Consumption | 10 W |
| Useful Life | 20 years |
| MTBF | > 400.000 h |
| Weight | < 4500 g |
| Protection class | IP68 / IP69K |
| Working Distance | 0.2 – 1.2 m (bottom of housing towards ground) |

STANDARDS

Our products are fully compliant and type tested according to the following standards:

- **EN 50155:2017** | Railway applications - Electronic equipment used on Rolling Stock
- **EN 50657:2017 - Basic Integrity** | Railways Applications - Rolling stock applications Software on Board Rolling Stock
- **EN 50121-3-2:2016 +A1:2019** | Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus
- **EN 50126-1:2017 / EN 50126-2:2017** | Registration , Evaluation , Authorization and Restriction of Chemicals 2006
- **EN 45545-2:2020 HL3** | Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components
- **2011/65/EU (ROHS)** | Restriction of the use of certain hazardous substances (RoHS) in electrical and electronic devices 2011
- **1907/2006EU (REACH)** | Registration , Evaluation , Authorization and Restriction of Chemicals 2006



Installation Example

PRODUCT HIGHLIGHTS

COMPARISON

// **DOPRail vs. traditional Doppler radar technologies**

- Less affected by changes in track bed substrate
- High sensing accuracy on smooth surfaces such as concrete and tarmac and therefore suitable for tram and trolleybus systems
- Highest sensing resolution on the market
- Highest MTBF even when mounted on a bogie frame

// **DOPRail vs. pulse generator**

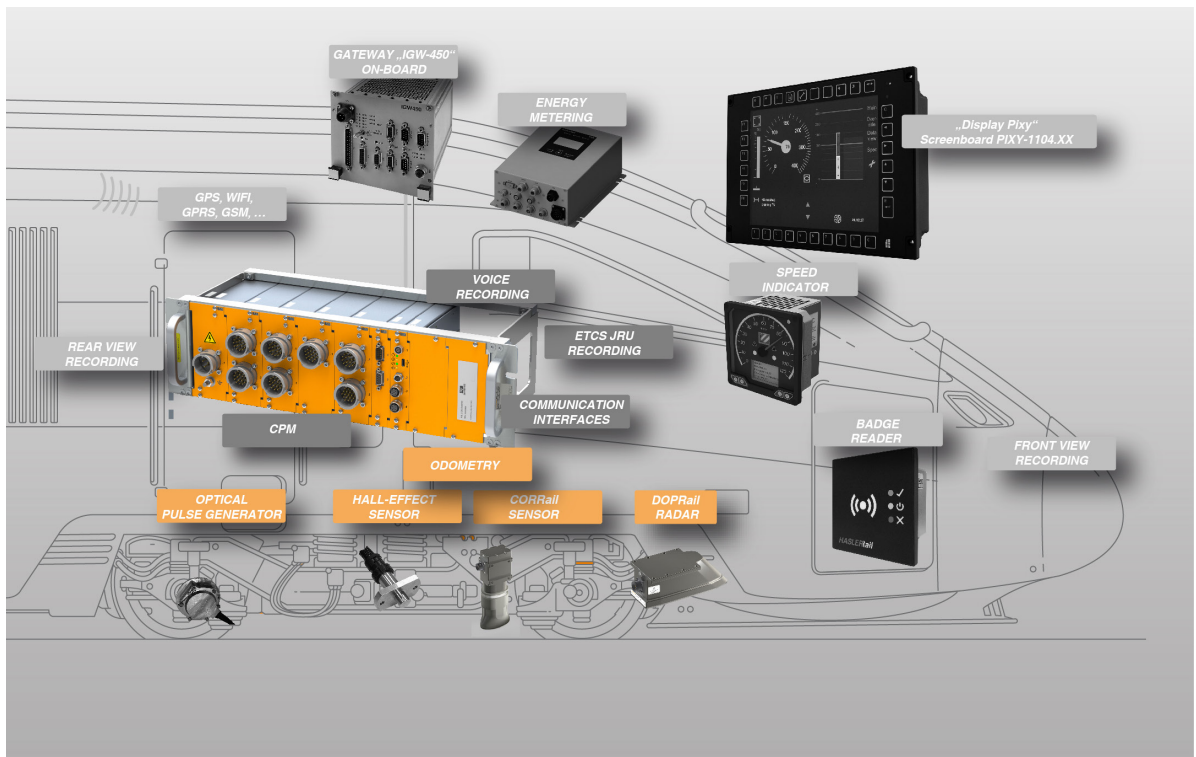
- Speed sensing is unaffected by wheel slip / slide
- No calibration is required as sensing is independent of wheel diameter
- No adjustment required to accommodate wheel wear or change of wheelset
- Higher resolution sensing of speed and distance
- Is suited for traction control systems

Odometry Solutions

Our comprehensive portfolio of odometry solutions encompasses service-proven optical pulse generators and Hall Effect sensors to the latest developments in non-contacting speed sensing (CORRail and DOPRail) for measuring the true speed-over-ground (TSOG) of rail vehicles.

HaslerRail's odometry products are available in several variants to meet the most exacting needs of system integrators and rail operators. The complete sensor portfolio can be networked with our TELOC series of on-train monitoring recording systems (OTMR). The data from multiple sensors is processed and evaluated to ascertain the precise speed and position of the vehicle.

Our customers can specify the sensor type, configuration and data evaluation level to align with their requirements in terms of performance, maintenance schedules and cost.



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