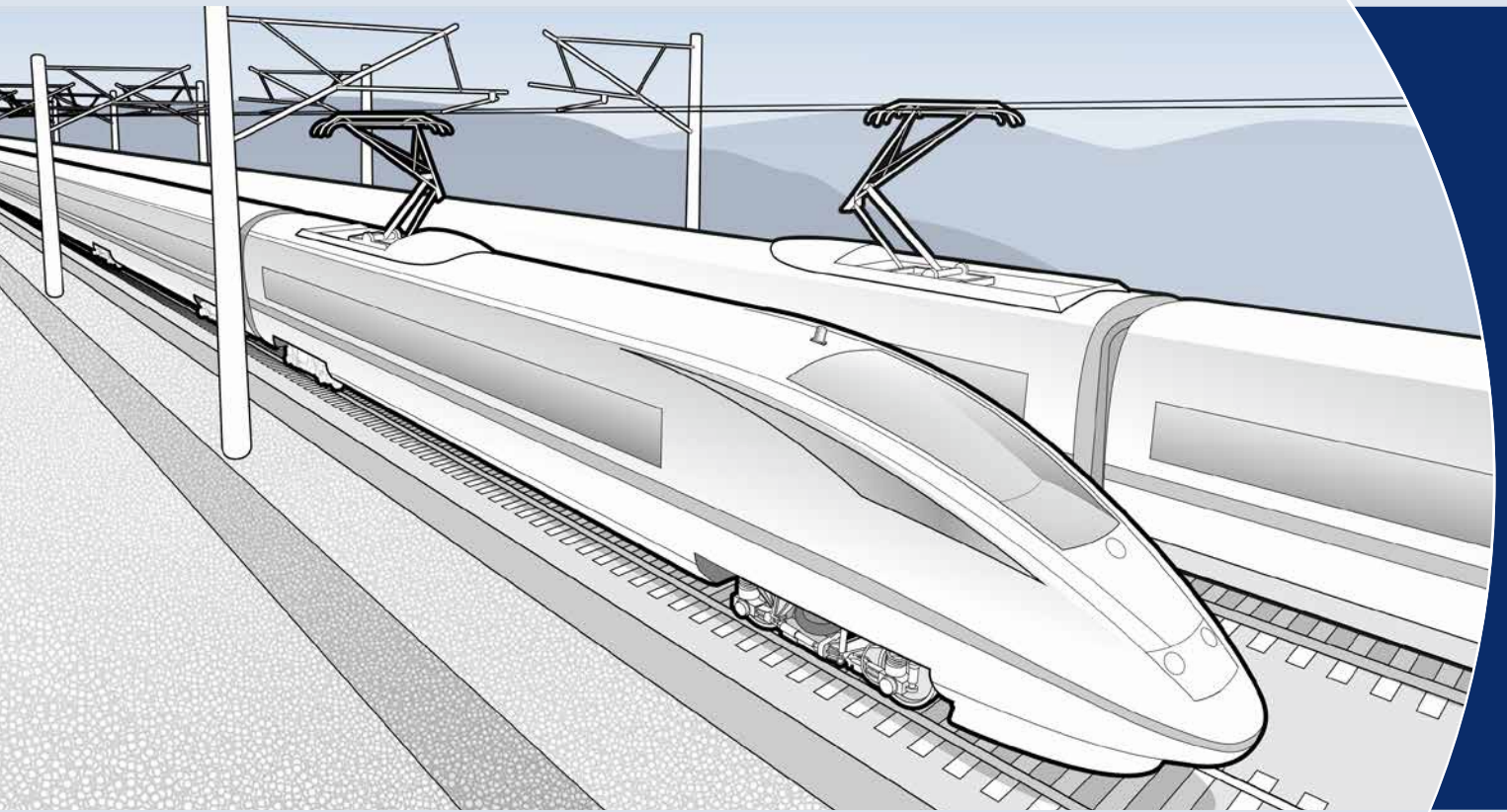


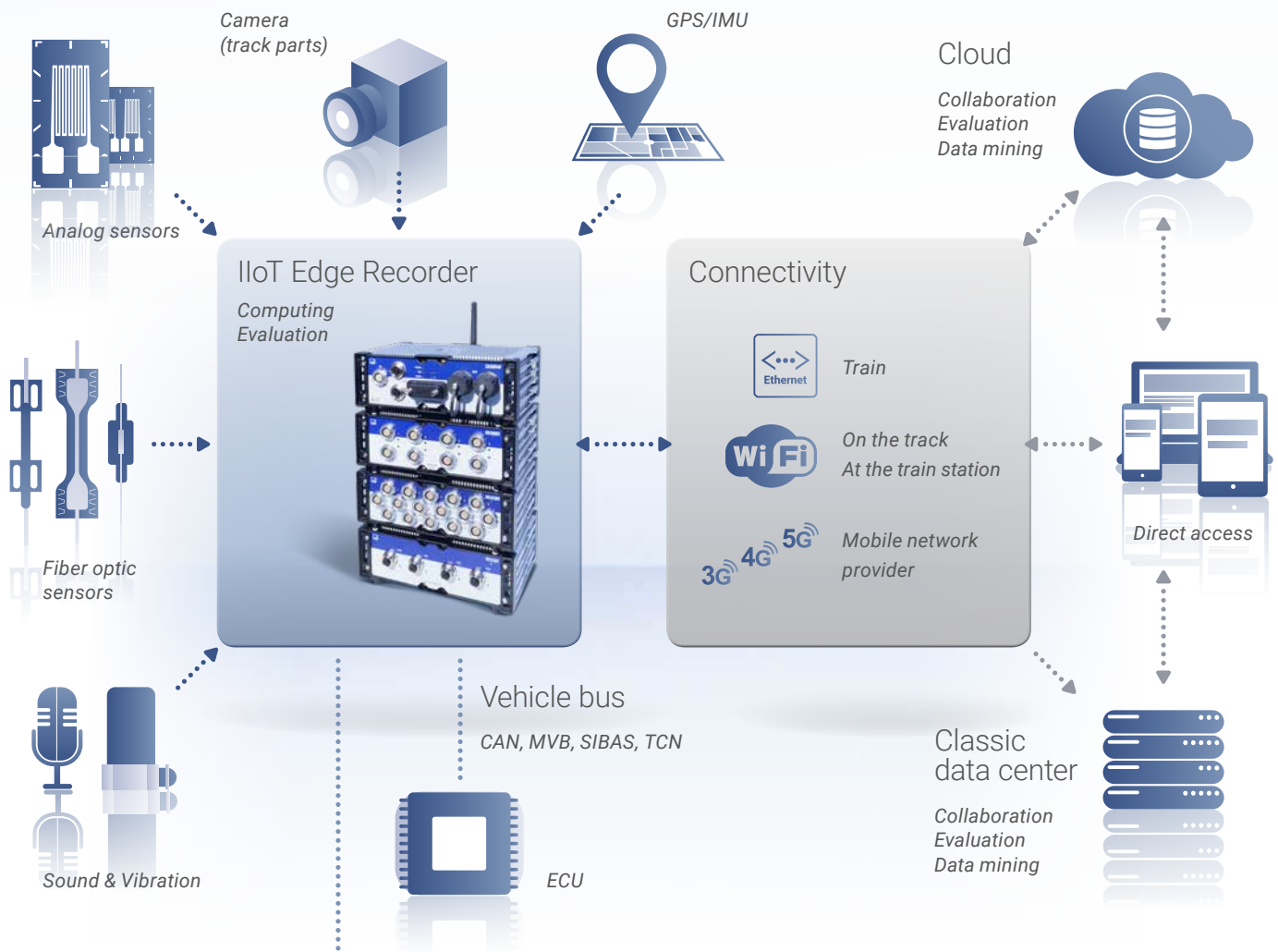
Mobile Testing and Onboard Monitoring

Solutions from HBM



The Right Solution for Your Application

HBM consistently follows a customer- and problem-oriented approach to providing testing and measuring as well as monitoring solutions. We measure pressure, force, strain, displacement, acceleration/vibration, noise / acoustics, temperature, voltage, current, power, video, track position, vehicle bus data, and many more quantities. We provide flexible math functions for analyzing time-synchronized signal data from anywhere.



- Ultra-robust (vibration, shock) according to MIL-STD202G
- Extended temperature range: -40...+80 °C, dew-point resistant
- Dust- and water-proof with ingress protection grade IP65 and IP67
- Fire protection rating according to DIN EN 45545-1:2013
- Reliable design offering 10,000 plug cycles
- Distributed system

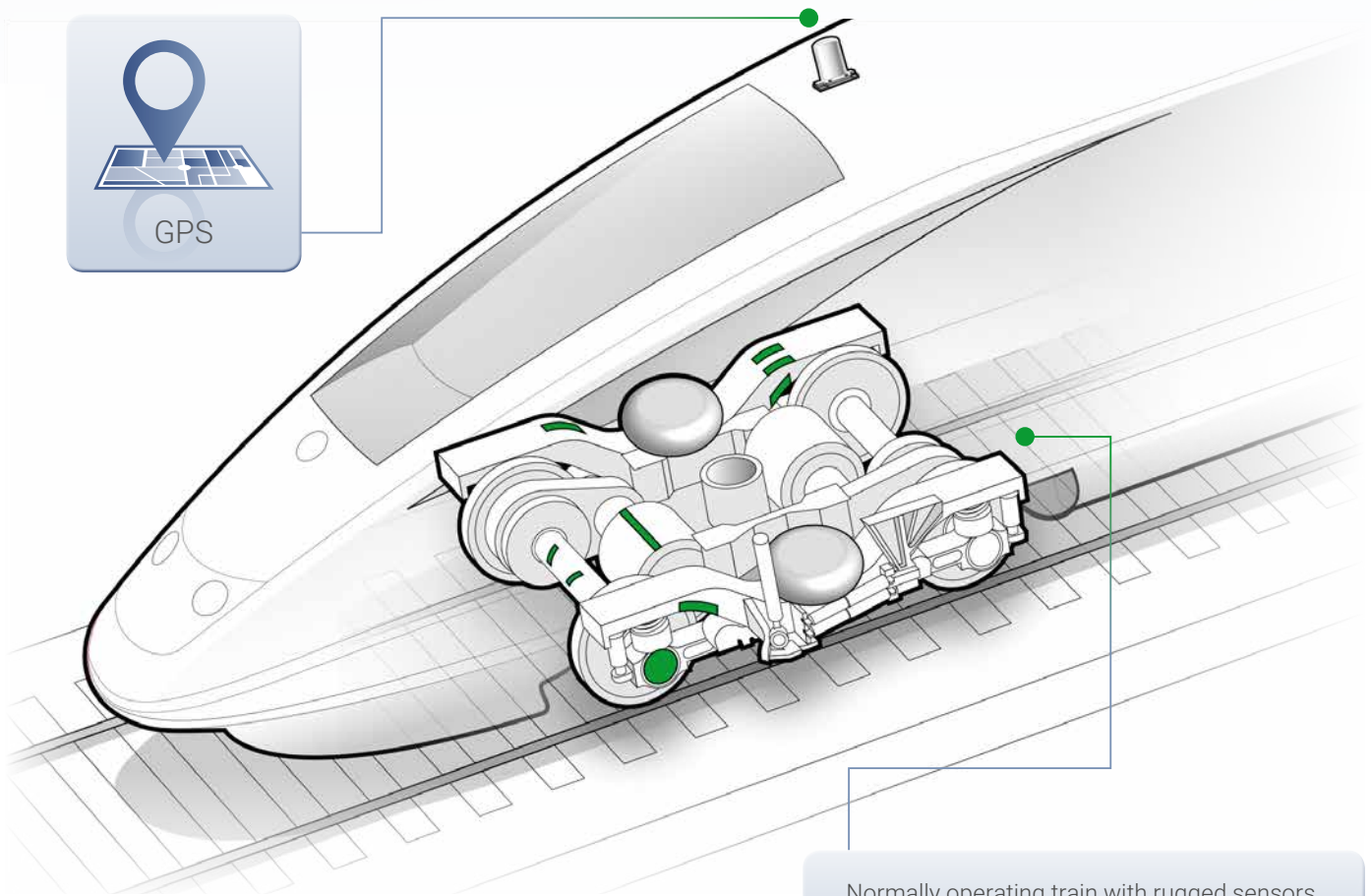


- Wide range of physical and digital inputs
- High data quality
- Time-synchronized data
- Distributable measurement modules
- Long-term reliable solution
- Flexible math functions for analyzing data from anywhere

Onboard Track Condition Monitoring

As the efficiency demands of a growing rail transportation industry continue to increase, the challenge of prioritizing track maintenance before poor conditions cause vehicle damage is becoming more difficult every day. HBM provides cutting-edge technologies that enable the industry to optimize track maintenance planning.

We offer completely automated, autonomous track condition monitoring systems that provide a complete setup including high-quality data evaluation and automatic report generation. This allows locating problem spots and assessing the severity of problems, and supports proactive maintenance planning.



Normally operating train with rugged sensors on bogie for autonomous 24/7 operation



- All relevant information: acceleration, strain, temperature
- High data quality
- Position based track monitoring in web
- Rugged solution ensures long-term reliability
- Fire-protection rated electronics (according to EN 45545)

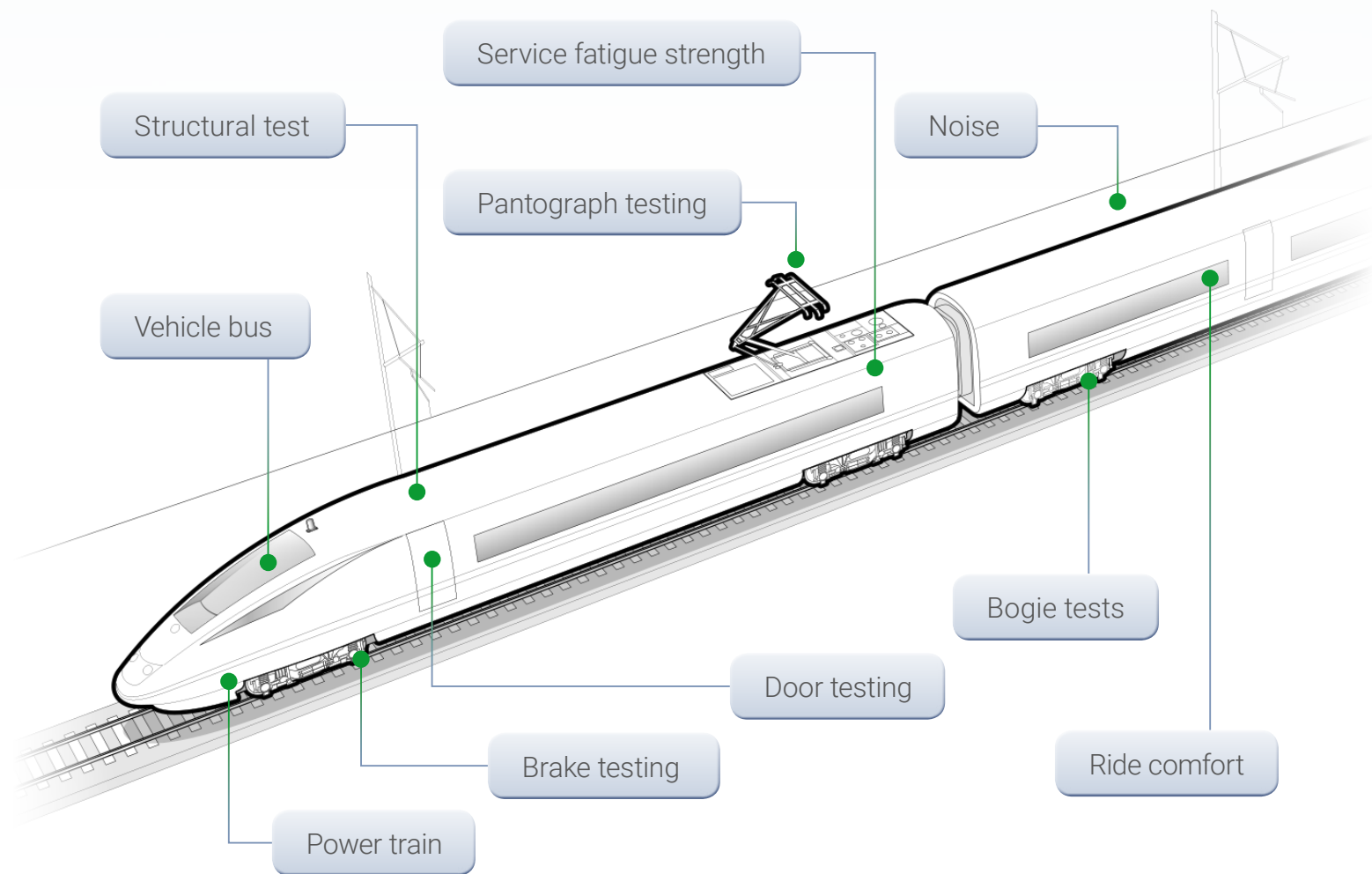


Vehicle Validation and Verification

Railway vehicles need extensive mechanical testing in labs and on tracks, which includes the approval of mechanical and electrical components, brakes, and the overall vehicle acoustics.

HBM delivers cutting-edge end-2-end testing and measuring solutions from the sensor to the cloud.

For example brake testing according to UIC 540ff needs to measure pressure (main pressure line, all brakes, Mg brake, current, vehicle (radar) and wheel speed, vehicle acceleration, vehicle communication status (SIBAS, TRDP, CANopen, MVB), brake displacement, temperatures, wheel slip, GPS, video, noise/acoustics, and many more.



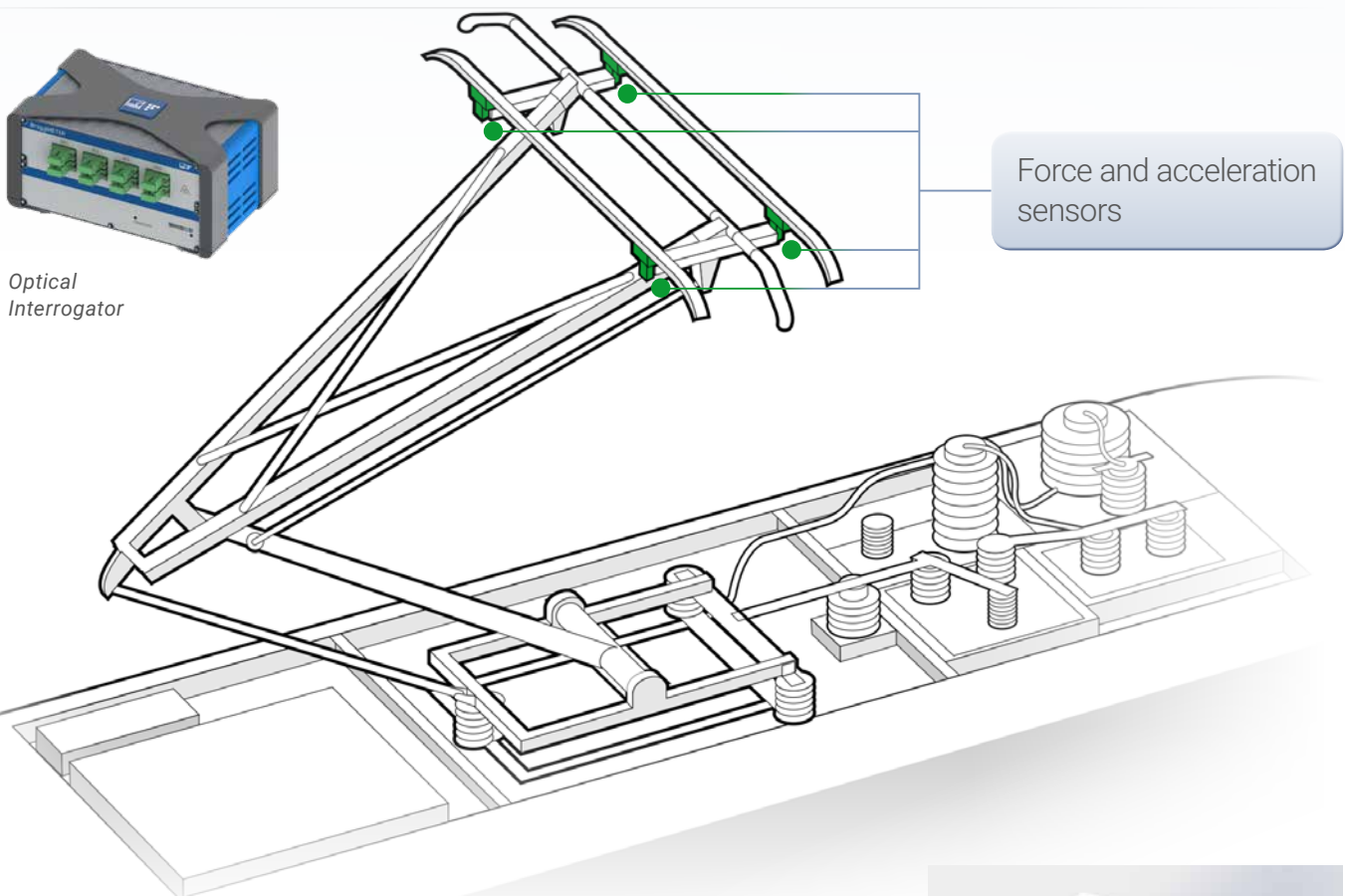
- All relevant information in one data file
- Reliable mobile data recorder
- Distributable measurement modules (short sensor lines)
- Intelligent signal data evaluation
- Automatic reporting



Overhead-Line Contact Force Monitoring

The correct contact between the pantograph and the catenary is mandatory for efficient train operation. This can be ensured by monitoring forces and accelerations through optical sensors integrated in the pantograph structures.

HBM's fiber optical measurement solutions can be used to characterize and certify pantographs, evaluate overhead power line condition and control the line contact force as part of the complete setup with map-based position analysis in a scalable overall solution.



Optical Interrogator

Force and acceleration sensors



- Contact force, acceleration and sideways position
- No electromagnetic influences (purely optical)
- High data quality
- Long-term reliability: 24/7 operation in standard trains
- Map/track-based data analysis
- OEM solutions



Accelerometer



Force sensor

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measure and predict with confidence

