

ASC Sensors

CETEST and ASC Sensors Set New Standards in Rail Technology Certification

German inertial sensor specialist ASC Sensors and Spanish test and analysis centre CETEST have been collaborating to address critical measuring and evaluation challenges, providing unrivalled monitoring outcomes to railway manufacturers and operators across the world.

Industry-Leading Railway Expertise

CETEST, an independent technology testing and analysis specialist, provides advanced engineering, testing and monitoring services. Accredited to ISO17025 and based on a more than 30-year legacy in railway technology evaluation, the company has been helping leading global rail manufacturers including Alstom, CAF, Hitachi, Siemens and Stadler through relevant regulatory approval processes for new and refurbished vehicles, individual components and systems around the world.

One area in which the Spanish testing lab has developed industry leading expertise is the critical interaction between pantographs and overhead lines. This aspect is key in the validation of new rolling stock to run on existing infrastructure, as well as in approving new infrastructure designs. It also bears a significant impact on maintenance costs.

Pantograph Testing at 350km/h and Beyond

Uni-axial ASC 4421MF accelerometers play a pivotal role at CETEST in evaluating pantograph performance as



ASC 4421MF accelerometer used in pantograph testing at 350+ km/h
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well as rolling stock ride comfort and dynamic behavior. Based on proven MEMS technology and capacitive operating principle, they feature a broad measurement range of 2 to 200g. The integrated electronic circuitry enables a differential analog voltage output ($\pm 2.7V$ FSO) and flexible power supply voltage from 5 to 40VDC. ASC's medium-frequency (MF) accelerometers provide a wide frequency response range of 0Hz to 7kHz (± 3 dB) and an extremely robust design with shock resistance up to 6,000g.

"We're using ASC's accelerometers in a special precision instrumentation system for pantograph contact force testing at train speeds exceeding 350 km/h," says Carlos Carmuega Tena, Quality Director

at CETEST. The ASC MF4421 is employed to measure vertical acceleration in the pantograph. Based on these measurements, the inertia forces due to effects of the mass of components between the sensors and the contact point get corrected.

Robust Sensors Resist NVH and Electromagnetic Interference

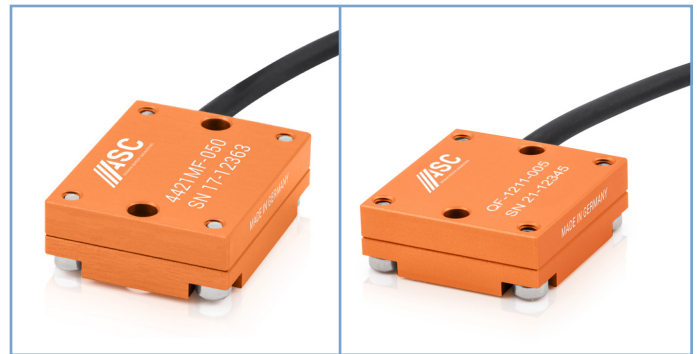
For these testing series, the sensors are installed between the pantograph body and the contact strip. The latter is in direct contact with the catenary and represents, therefore, a high-voltage area. *“Not only does this position lead to high heat exposure due to the voltages used,”* the expert explains, *“they also cause plenty of electromagnetic interferences. And the extreme exposure of this demanding sensor application to noise, vibrations and harsh environmental conditions (NVH) like heat, rain and ice plays an even bigger role in obtaining accurate, stable results.”*

To resist all that, the uniaxial ASC 4421MF series features a reliable lightweight aluminum housing of protection class IP67 and an integrated cable of configurable length with connectors. Its ultra-flat design allows for convenient installation, a fundamental requirement in pantograph testing as the position, size and weight of the sensors used are of particular relevance for the validity of the tests results.

“When we evaluated accelerometers of different makes previously, an issue we encountered was that those were easily damaged by the high voltages,” Carmuega Tena remembers. *“Using ASC’s robust sensors, we can now avoid electrical problems due to voltage and obtain good quality signals, despite electromagnetic interferences and other external conditions.”*

Testing Ride Comfort, Dynamic Behaviour, Curve Radius ... and More

“While our collaboration with ASC Sensors started because of their accelerometers’ superior behaviours in our pantograph tests, we soon expanded into additional uses,” reflects the CETEST engineer. *“Another decisive advantage was the convenient compatibility of ASC’s sensor technology with our existing instrumentation and measurement data processing ecosystem. Its competitive pricing, delivery*



Left: ASC 4421MF

Right: ASC QF-1211

times, compact dimensions and ease of installation also turned out to be a great fit.”

Therefore, after rigorous evaluations of various alternative sensor models, CETEST started leveraging the ASC 4421MF accelerometer in dynamic behaviour and ride comfort analyses, too. *“We’re also using them in brake tests for measuring the acceleration and deceleration of the train. As well as in investigations into specific issues occurring in active trains post approval,”* Carmuega Tena explains. In addition, the MEMS-based uniaxial ASC QF-1211 accelerometer, with ultra-low noise level and a resolution of less than 1µg, serves as a calibration reference at CETEST, ensuring superior testing accuracy. While triaxial ASC 273 gyroscopes get utilised to accurately determine curve radii in various speed and acceleration analyses, which a new train model needs to pass to get approved for active service.

Mutual Partnership to Create Novel Solutions

With these and further applications, some trains evaluated by CETEST carry more than 50 individual sensors manufactured by ASC.

“Beyond the technical quality of their flexible sensor solutions, what’s impressed us over time is the sheer dedication and outcomes orientation of ASC’s engineers,” reflects the CETEST expert. *“When I ask for a sensor, they ask me for the application. On that basis, they typically come back with tailor-made recommendations for a complete solution addressing our specific challenge. While usually, with other suppliers, we would have to accept a standard product.”*

www.asc-sensors.de



Unlocking superior railway performance: ASC RAIL series

High-precision measurement of smallest vibrations in vehicles and infrastructure is a basic requirement for safe, comfortable, productive rail transport. Inertial sensors play a key role, therefore global manufacturers have been relying on accelerometers, gyroscopes and inertial measurement units from ASC Sensors.

With its expanded RAIL sensor series, ASC is now further advancing the railway industry. Specialized models, such as the compact ASC RAIL-x151LN accelerometers and the ASC RAIL-27x1 gyroscopes, are setting **new standards in railway safety, capacity and efficiency.**

All ASC RAIL sensors are robust, flexible and precise – designed to withstand the toughest challenges. Certified to applicable norms including **EN 50155**, **EN 50121-3-2** and **EN 45545**, they provide reliable solutions that meet national and international standards.

Through ASC's comprehensive portfolio of MEMS-based acceleration and gyroscope sensors, railway operators can easily implement customized sensor solutions while reducing documentation requirements.

The outcome:

- **enhanced safety**
- **increased productivity**
- **and stable long-term performance of rolling stock.**

ASC inertial sensors are used for

Characterization of track geometry
(EN 13848)

Specifying structural requirements
for bogie frames (EN 13749)

Dynamic interaction between
pantograph and overhead contact
line (EN 50317)

Passenger ride comfort (EN 12299)

Running characteristics
of railway vehicles (EN 14363)



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