

# Higher Safety, Durability and Comfort: Kistler Has Proven to Be the Right Partner for Railway Vibration Measurement

The Chinese Academy of Railway Sciences (CARS) is responsible for the commissioning work for high-speed lines of the majority of the Chinese network, as well as for train manufacturers. For this purpose, CARS must systematically test and evaluate the safety, smoothness and comfort of these high-speed lines to insure proper operation within the expected design speeds. Kistler has proven to be the right partner for Modal Analysis purposes, as well as durability and comfort testing.



Kistler sensor installation at the Chinese Academy of Railway Sciences (CARS) for comfort and durability testing of high-speed trains

CARS is in charge of systematically testing, and evaluating the safety and comfort of high-speed lines. CARS is also responsible for design validation, acceptance, and commission of trains themselves. These two main applications require two different technologies. Piezoelectric dynamic sensors are needed for Modal Analysis purposes on vehicles themselves, while lower frequencies MEMS technologies are needed for all durability and comfort testing. In both cases, a reliable and stable solution is required in such a challenging environment.

## Modal Analysis and High-Frequency Vibration Investigations

For this application, the customer is using single axis, and triaxial IEPE sensors based on ceramic technology in order to perform Modal Analysis, and design optimization on train subcomponents with a full vehicle. Usage of single axis PiezoBeam® Type 8640A, and triaxial PiezoBeam Type 8688A sensors allows the customer to find a lightweight solution, very easy to mount, and very low noise. Usage of the triaxial ceramic shear solution Type 8763B allows them for a rugged solution, with high frequency response.

Stable supply chains, together with the stable performance of Kistler products, supported by a strong Kistler expert team are the main reasons for a successful collaboration.

## Passenger Comfort and Durability: Lower Frequencies

Passenger comfort and durability testing are requiring low frequency response MEMS capacitive sensors. Depending on the train, and subcomponent being tested, different g ranges were needed: 2 g for passenger level, 10 g, 30 g and 50 g for bogie level, and 100 g or 200 g for wheel set and pantograph level. In addition, the customer needed integral cable configuration, easy mounting, and last but not least direct compatibility with its IMC data acquisition system. The customer chose single axis Type 8315A, and triaxial Type 8395A for their integral cable capabilities, different output configuration to adapt to their data acquisition system, and long term and thermal stability performances. Once again, a stable supply chain together with many different type of output options and stable performances of Kistler product supported by a strong Kistler expert team are the main reasons for a successful collaboration.



Three K-Beam® Type 8315A MEMS sensors installed on a high-speed train bogie at CARS

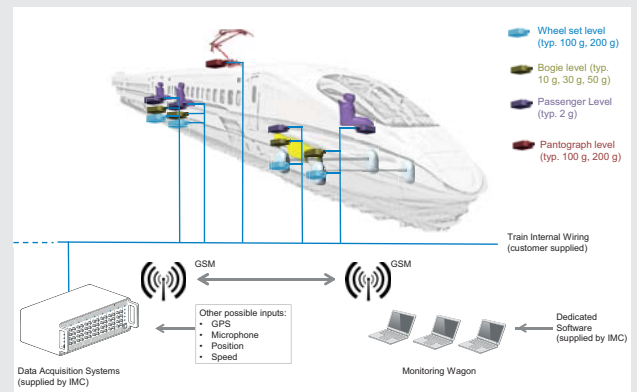


Dynamic performance supervision (source: CARS)

**Kistler K-Beam®: Variable-Capacitance MEMS Sensors**  
 K-Beam accelerometers offer temperature stability between  $-55\text{ }^{\circ}\text{C}$  and  $125\text{ }^{\circ}\text{C}$  combined with low noise levels, ensuring accurate measurement of low-frequency events – from DC up to the 1000 Hz bandwidth in the most challenging environments.



Kistler K-Beam® single axis Type 8315A and Triaxial Type 8395A



Typical comfort and durability vibration testing setup in high-speed train at CARS using Kistler K-Beams® Type 8315A

**For further information, please visit**  
[www.kistler.com/t&m/acceleration](http://www.kistler.com/t&m/acceleration)

### Benefits of Railway Durability and Comfort Testing with Kistler Types 8315A and 8395A

- Wide g range selection from 2 g to 200 g
- Excellent thermal stability and shock resistance
- Low noise that can be combined with differential output configurations
- Exceptional modularity in electrical signal output and cable configurations
- Custom adaptation to train wiring

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