



## User report with imc

### **To make sure safety isn't lost in transit**

ASC sensors ensure high-precision measurements in commissioning testing of long-distance trains

**Measurement systems for commissioning tests of passenger trains have to meet high standards. That's why measurement technology manufacturer imc Test & Measurement GmbH used sensors from ASC GmbH for the test runs of a new long-distance passenger train. Their high precision and toughness won imc over.**

It was just one project among many for the test engineers, who conduct measurements of rail technology applications worldwide. In this case, a British transport company hired them to carry out safety and passenger comfort tests on a long-distance passenger train. These tests are mandatory for a passenger train to receive an operating permit for regular transport. Normally, imc uses sensors from its own suppliers for such tests. "In this case, the customer insisted on ordering sensors for data acquisition through their regular distributor," remembers Torsten Michel, sales engineer at imc. That usually wouldn't be a problem, but there was a hitch: at this point, the measurements were supposed to start in just three weeks and the dealer couldn't deliver on such short notice. "We had to find a replacement quickly. We went looking for alternatives on the Internet and discovered ASC," says Michel. It proved to be a lucky find: while all the other sensor manufacturers and dealers they inquired with declined, due to the short time frame and imc's special requirements, ASC confirmed immediately.

### **Production in Germany enables high flexibility**

The sensor specialists from the picturesque German town of Pfaffenhofen an der Ilm are used to such inquiries. The owner-operated company, founded in 2006, makes its products in Germany, which enables them to react much more flexibly than the competition. As such, even an order with such a short lead time wasn't a problem for the engineers from Upper Bavaria. They immediately established contact with the project managers at imc, defined the required parameters together, and then chose the appropriate sensors from ASC's product range. Time was an especially pressing factor "because the lack of sensors meant that the 60 engineers who had been assigned to carry out the commissioning tests were initially standing around idle," says Torsten Michel.

### **Sensors were configured individually**

The feared waiting times were shorted significantly, however, thanks to the rapid deployment of the experts from ASC. Ultimately, the ASC OS-115LN uniaxial accelerometers and ASC 5411LN triaxial accelerometers were selected, which ASC equipped with customer-specific connectors and cables from a Swiss manufacturer.

The capacitive accelerometers from ASC were to be used to measure the dynamic stability of the bogie on the test train. The operators also wanted to find out how acceleration of the bogie affected the passengers. The train would only receive its operating permit if the values measured from these tests fell within the tolerance limits defined in the corresponding standards, DIN EN 14363 and UIC 518.

The imc engineers chose to use the ASC OS-115LN and ASC 5411LN low-noise sensors "because they have an excellent signal-to-noise ratio, which lets them measure even the lowest frequencies," says Torsten Michel. Combined with a high sampling rate, they enable extremely precise measurements that deliver meaningful results.

### **Tough, but sensitive**

The ASC OS-115LN sensors offer a wide measuring range from  $\pm 2$  to  $\pm 400$  g and produce the lowest spectral and broadband noise of all accelerometers in the OS series (7 to 400  $\mu\text{g}/\sqrt{\text{Hz}}$ ). They can also withstand oscillations and vibrations up to 4000  $\text{g}_{\text{pk}}$  without problems and are hermetically sealed (IP 68). This property was another plus, because the sensor had to be affixed to the bogie of the test train, where harsh conditions prevail.

The ASC 5411LN also works with an excellent signal-to-noise ratio, making it ideal for recording low frequencies and amplitudes. The sensor features the same measurement range as the OS-115LN and is just as sensitive (2000 to 10 mV/g). Since the ASC 5411LN is designed for temperatures from -40 to +100°C, the sensor can be used in nearly any climate zone.

### **Measurement system can record data from thousands of channels**

In addition to the quality of the sensors, the length of the cables used also play a major role, because the sensors had to be connected to the imc CRONOS*flex* measurement system – which has a modular structure that enables distributed measurements over the entire train. The imc CRONOS*flex* is a modular, spatially distributable measurement system for electromechanical tests. Its components can be connected with one another electrically and mechanically through a robust click mechanism.

imc CRONOS*flex* supports nearly every physical sensor and signal type and enables acquisition of thousands of channels. This capability is especially helpful for conducting commissioning tests on trains, where data from a variety of channels has to be acquired and analyzed. The measurement system is available in two versions, with total sampling rates of 400 kSample/s or 2000 kSample/s (up to 100 kS/s per channel) and features a TCP/IP Ethernet interface to connect a PC. It can be used for both centralized and decentralized measurements. The advantage of the latter design is that the assemblies can be mounted directly in the location of the sensor, avoiding the need for extensive, fault-prone sensor wiring.

### **Real-time clearing provides information about current train status**

With the imc CRONOS*flex*, analog signals, the values of incremental encoders, digital process values, and field bus protocols are recorded synchronously. The system is also capable of extracting measured values directly from the multifunction vehicle bus (MVB), which transfers information and commands within a train. This data is read synchronously

and merged together with the data from the analog measurement channels. The integrated imc Online FAMOS realtime platform makes it possible to analyze the streaming raw data online, giving test engineers an overview of the train's current status during the test drive.

### **Sensors were installed in numerous measurement points**

Before the measurements could begin, the test train had to be equipped with the necessary measurement technology. imc technicians installed the ASC OS-115LN accelerometers horizontally and vertically in different places on the bogie. To do so, they bolted them on to assembly plates, which in turn were affixed to the bogie. To measure passenger comfort, the ASC 5411LN sensors were affixed to the floor of the car bodies with double-faced adhesive tape and additionally secured them with sandbags.

### **The derailing test is the most important**

The measurements were conducted over several months on the test track in Melton Mowbray in England. "To do so, the test train traveled at speeds that were around 10 percent above the maximum permitted speed for this type of train. We ran a whole series of tests and the derailing check was the most important of all," says sales engineer Torsten Michel about the procedure. To improve efficiency, however, the individual tests are no longer carried out successively, like they were in the past. "Today we try to take care of as many tests as possible during a single test run," says Michel. This approach not only cuts costs, but also minimizes the adverse effects of the required tests on the public rail network to the extent possible.

### **ASC sensors displayed convincing performance all the way down the line**

The test runs were completed successfully some time ago and the long-distance passenger train is now used in regular operations. Torsten Michel and his colleagues aren't only extremely satisfied with the performance of the ASC sensors; they were also impressed by the company's service levels: "Our contact persons were extremely flexible and catered to our every request." As a result, Michel can easily imagine having ASC sensors on board again for one of their next projects.

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**Captions:**

**ASC-Sensor-Anwendung-shutterstock.jpg:** The sensors from ASC were used to examine the effects of bogie acceleration on the passengers, among other factors

Photo: shutterstock/denisgo/composite illustration: K+P

**ASC-Sensor-Personenzuege-shutterstock.jpg:** Before they are granted a permit for regular operations, all passenger trains have to pass a series of demanding tests

Photo: shutterstock/Denis Belitsky

**ASC-Sensor-Zuganwendung.jpg:** Acceleration and rate sensors from ASC measure numerous parameters on the bogies and in the car bodies of trains

**ASC-Sensor-Zuganwendung-Beschriftung.jpg:** Acceleration and rate sensors from ASC measure numerous parameters on the bogies and in the car bodies of trains

**ASC-Beschleunigungssensor-Drehgestellstabilitaet.jpg:** High-precision accelerometers from ASC measure the mechanical stability of train bogies, among others

**ASC-Beschleunigungssensor-OS-115LN.jpg:** The uniaxial ASC OS-115LN accelerometers feature an excellent signal-to-noise ratio, enabling them to measure even the lowest frequencies

**ASC-Beschleunigungssensor-5411LN.jpg:** The ASC 5411LN accelerometer is suitable for deployment under a wide range of temperatures, which means it can be used in nearly all climate zones

**Keywords:** rail technology, ASC GmbH, imc Test & Measurement GmbH, commissioning tests, accelerometers, sensor technology, sensor systems, capacitive accelerometers, bogie stability, rail vehicles, test stand applications, sensors for test stand applications, rate sensors, calibration, DAkkS, extreme impact resistance, passenger comfort, recalibration, test runs, running dynamics test, EN 13749 bogie stability, EN 14363 running characteristics, tests of wheelsets, tests of bogies, sensors for experimental designs, sensors for measuring low linear acceleration, sensors for measuring low-frequency dynamic acceleration, UIC 518

**Meta-Title:** ASC sensors for commissioning tests

**Meta-Description:** Capacitive accelerometers from ASC enable high-precision measurements on test trains, even under the harshest conditions. [Learn more](#)

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