

Race car instrument

The Speedbox-INS by Race Technology (UK) continuously monitors its own performance and reports the maximum error for each braking test.

Speedbox as part of the CATS complete automotive system (Photo: Race Technology)

The Speedbox is a non-contact speed sensor that has been designed for professional automotive testing as well as other industrial and high-end motorsport applications. It outputs a low latency, non-interpolated speed

measurement comprised of GPS and inertial data combined using an adaptive filter for exceptional performance even in non-GPS ideal environments. The speed measurement is output in a variety of forms suitable for integration into most datalogging and display systems; CAN, EIA-232, analog, and a fully configurable digital pulse output are all provided as standard.

The maximum error for each braking test is calculated based on many factors, including GPS quality, using an advanced statistical model. After each brake test the system reports both the braking distance and maximum error, for example 42,33 m braking distance and +/- 3 cm maximum error. Engineers and QA Managers can now for the first time be certain that results are valid and measured to an acceptable standard, says the company.

The Speedbox-INS can be used as a standalone sensor, or part of the CATS [Complete Automotive Test System](#) from Race Technology. The CATS system logs data from up to 12 analog channels at up to 1 kHz, five frequency channels, two independent CAN ports and two serial ports. Results can be displayed on the configurable display.

The systems combines GPS and tactical grade inertial sensor data using a [Kalman filter](#); providing accurate and validated results, even with GPS signal interruptions. In real world testing GPS conditions are variable or can drop out completely due to obstructions. Integration of inertial data accurately "fills in" any GPS outages, and the maximum error message reports the overall test accuracy.

The INS option

The INS sensor assembly is connected to the main Speedbox unit, where the raw inertial and GPS outputs are combined in real time to measure vehicle attitude (roll, pitch, yaw), acceleration, velocity, distance, gradient, and heading as well as position. All measurements have a low latency of just a few milliseconds, and are output at a rate of 200 Hz with no interpolation. The dual antenna setup allows for measurements between the two antennas (to within a few mm) so the yaw and pitch angle of the vehicle can be measured to a few tenths of a degree.

The 200 Hz update rate is very important when accurately measuring vehicle responses during testing, assuring the data is accurate during dynamic maneuvers. With such high update rates on the data it is important not to introduce noise into the system, especially when measuring velocity. The whole Speedbox range is optimized for automotive testing ensuring the update rates are as high as possible without introducing noise into the measurements.

The system is suitable for detailed analysis of driver / circuit / vehicle handling, performance testing, brake, and tyre testing, fuel economy, speed verification, development of driver assistance systems etc. The Speedbox unit outputs the data, for logging and live tests. The data can be logged to a Race Technology logging system, or integrated into an existing system using for example the CAN outputs. The company showcased the product at the Automotive Testing Expo 2016 in Stuttgart, Germany from 31 May to 2 June.

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