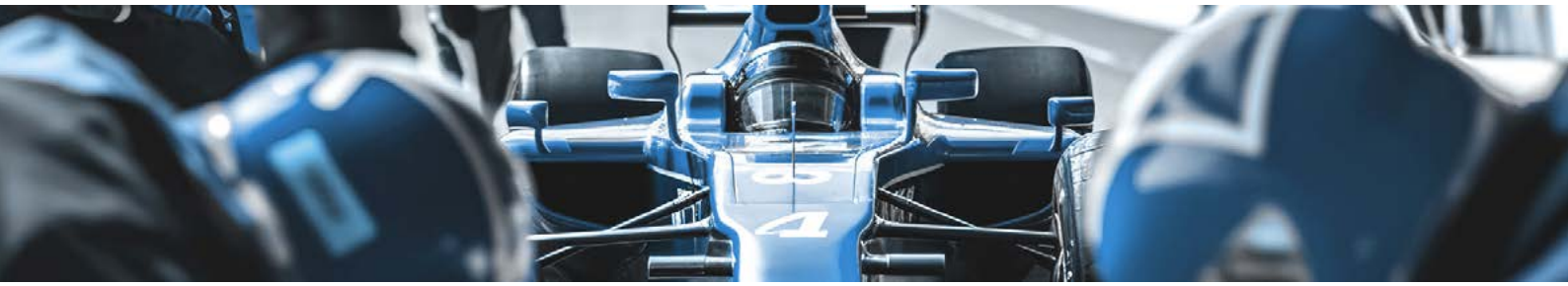
Innovative knock sensor calibration solution for Formula 1



A pioneering approach to early compliance with FIA regulations

In the dynamic realm of Formula One racing, a renowned engine manufacturer and F1 race car team faced a unique challenge. With the impending implementation of new FIA technical regulations in 2026, specifically emphasizing the use of Standard Supplier Power Unit Components (SSPUC), the customer recognized the need to gain a competitive edge early on. Their focus was on knock sensors, critical components of Power Units, and the challenge was twofold.

Firstly, they needed to **implement a testing and calibration solution** that strictly adhered to the upcoming FIA regulations and the precise sensor parameters outlined by the knock sensor manufacturer. Secondly, the specific parameters set by the knock sensor, including **a broad frequency range and high mounting torque,** added complexity to their quest for a reliable solution.

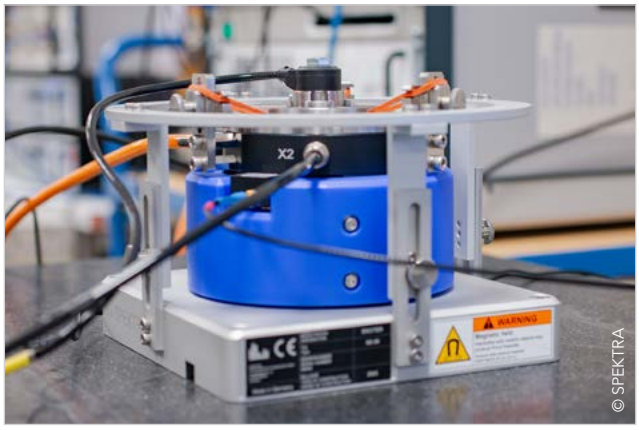
Example of a knock sensor from BOSCH

In the lookout for expert advice, the engine manufacturer turned to SPEKTRA, a company recommended by BOSCH. We proposed a bespoke solution, leveraging our CS Q-LEAP™ calibration system and integrating an SE-09 high-frequency vibration exciter. To address the high mounting torque requirement, our engineers designed and manufactured a special mechanical adapter specifically tailored for knock sensors. This custom knock sensor test bench became the linchpin of the solution, exceeding the customer's expectations and fulfilling all testing requirements while ensuring the sensors' integrity during calibration.

Key facts about the solution

CS Q-LEAP™ calibration system: A versatile and scalable sensor calibration system easily expandable to accommodate a wide range of exciters, demonstrating adaptability for future needs regarding testing and calibration of sensors and measurement equipment.

SE-09 high-frequency vibration exciter:
Engineered to withstand a broad frequency range, crucial for meeting FIA regulations regarding the calibration of knock sensors and equipped with a custom mechanical adapter to handle the high mounting torque.



Knock sensors on a SE-09 vibration exciter from SPEKTRA

Benefits for the customer:

- ✓ **Compliance assurance:** The tailored solution ensured adherence to the stringent upcoming FIA regulations and knock sensor manufacturer's parameters, guaranteeing compliance in the evolving landscape of Formula One racing.
- ✓ **Optimal performance and longevity:** The knock sensor test bench not only met technical requirements while ensuring the integrity of the DUT during calibration under harsh conditions. But it also aimed at enhancing the optimal performance and longevity of the knock sensors in the highly competitive environment of Formula One.
- ✓ **A future-proof and versatile product:** The CS Q-LEAP™ adaptability offered the engine manufacturer a future-proof investment. In fact, it allows for the extension of the system to new exciters to test or calibrate other sensors and measurement equipment, thus saving costs and ensuring long-term usability.

Knock sensors are essential components in internal combustion engines that detect abnormal combustion, commonly known as **engine knock or pinging.** These sensors play a crucial role in optimizing engine performance by allowing real-time adjustments to ignition timing, preventing potential damage and ensuring efficient fuel combustion.

In a sport where milliseconds matter, the collaboration between SPEKTRA and the engine manufacturer exemplifies how innovation in testing and calibration can provide a competitive edge.
We are committed to delivering cutting-edge, TESTelligent solutions.
Are you seeking specialized solutions for high-frequency sensor testing or any engineering service?

Share your challenge with our experts!

Contact us!