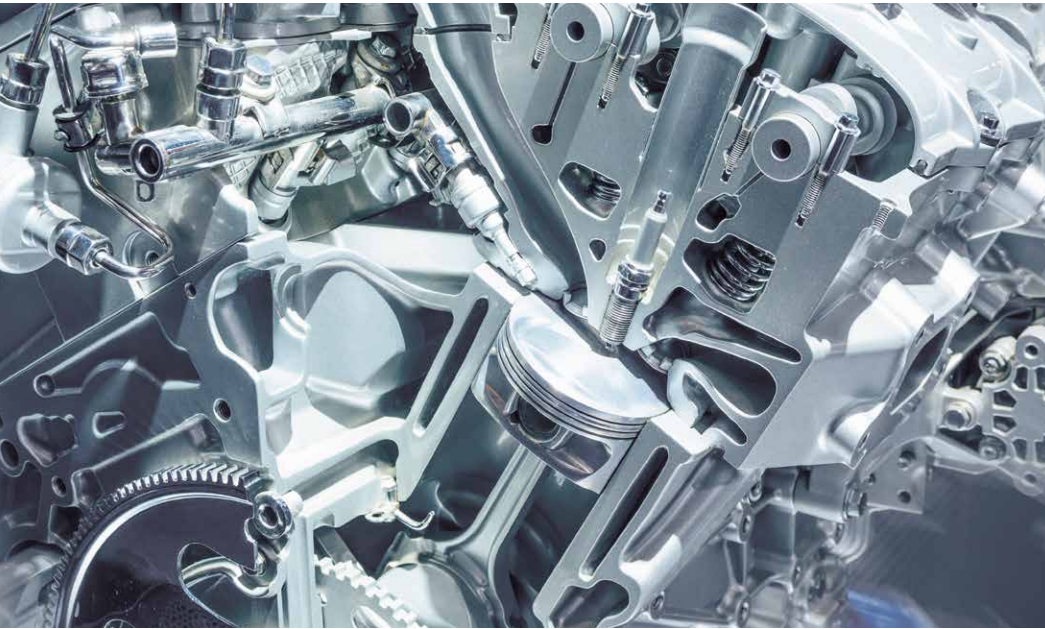


**High-Precision
Engine Indicating –
Onboard and on
the Test Bench**



Indicating Power

KiBox® – the Flexible Indicating System from Kistler



Kistler – Your Partner for Process Efficiency and Cost-Effectiveness

The Kistler Group is one of the world's leading manufacturers of sensors and systems to measure pressure, force, torque and acceleration. Thanks to systems from Kistler, measurement signals can be captured and analyzed – so companies benefit from increased process efficiency and enhanced business success over the long term.

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KiBox®. For Equally Reliable Results in both Application Areas.

The Challenge of Engine Indicating

Over the road or on the test bench – no matter where you're working, you need high-precision results from combustion analysis. Developers want a fast, straightforward way of validating the large volumes of data from engine test benches in over-the-road testing. They need a tool that offers excellent functionality and high computing power to assist them in every phase of their work. A single, flexible, across-the-board solution is the only way of achieving results that are consistently valid and comparable.

KiBox®: a Winner on Both Fronts

Kistler's compact KiBox® is a complete combustion analysis system – for use onboard and on the test bench. It delivers detailed information on combustion quality in each individual cylinder, and makes all the key engine development data available in real time – synchronized with other measurement data and ECU control variables. Standardized interfaces, high-performance PC technology and tried-and-tested SCP amplifier modules – these assets equip the KiBox® to meet future challenges. This is a fast, easy-to-operate tool that will supply you with accurate data.

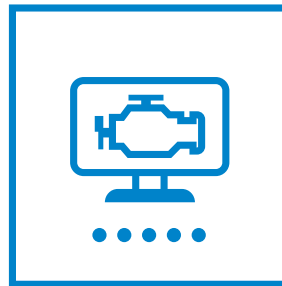
Benefits of the Flexible KiBox®:

- High reliability
- Qualitative measurement results
- Enhanced testing efficiency
- Individual know-how is developed and safeguarded



Mobile Use

onboard indicating



Stationary Use

Indicating on the test bench



Coordinated Measuring Chain

To be workable in practice, combustion analysis must not significantly influence engine operation, and it must also deliver high-grade measurement results. To meet these requirements, all the components in the measuring chain must be optimized both individually and as interacting elements of the whole assembly. Kistler supplies the right products for each link in this chain. Kistler's KiBox® is part of an optimal complete system solution.

Intuitive Operability

It's simple to organize, evaluate and visualize the measurement data thanks to KiBox® Cockpit – operating software that is designed to be clear and straightforward. The Cockpit is integrated into usual work environments, such as the INCA calibration tool.

Maximum Data Quality

High data quality is essential if a measurement campaign is to deliver meaningful results on combustion analysis in transient engine operation. One of the many convincing features of KiBox® is innovative signal conditioning that completely eliminates any occurrence of aliasing effects.

Key Parameters* Direct from the KiBox®

- Knock
- Peak pressure (mechanical load) and its angular position
- Indicated mean effective pressure (overall, high pressure and gas exchange components)
- Heat release
- Energy conversion values and combustion duration
- Ignition timing
- Injection timing
- Speed (average and high-resolution)
- Maximum pressure rise and its angular position
- Combustion noise (frequency analysis)
- Statistical evaluations of all parameters
- Any desired result from user formula calculation

*real-time calculation on the hardware

Onboard Indicating. Fast. Simple. Precise.

For several invehicle calibration tasks a mobile combustion analysis system is recommended. For this, Kistler is your ideal partner thanks to our compact KiBox® – featuring a host of innovative functions specifically tailored to this application area.

The KiBox®: Ideal for Mobile Use.

Realistic mapping of real driving conditions is an increasingly important factor in optimizing the combustion process inside the engine. Physical boundary conditions that impact engine characteristics can only be visualized on a test bench to a limited extent; in many cases, highly complex algorithms are required for evaluation. However, developers need flexibility and the ability to act quickly. When it comes to engine calibration and trouble-shooting, a compatible, mobile indicating system is the key to straightforward validation of test bench results in over-the-road testing. Calibration engineers require a tool for in-vehicle use that offers excellent functionality and computing power before, during and after the measuring run. The KiBox® is the ideal solution to meet these requirements.

The critical factor in mobile indicating: the tool must be easy for users to operate. This is why KiBox® is designed with compact dimensions. The entire data acquisition hardware and software is integrated in one single device.



KiBox® – Communicative and Accurate

Synchronous Integration into ECU Calibration Systems (MCD)

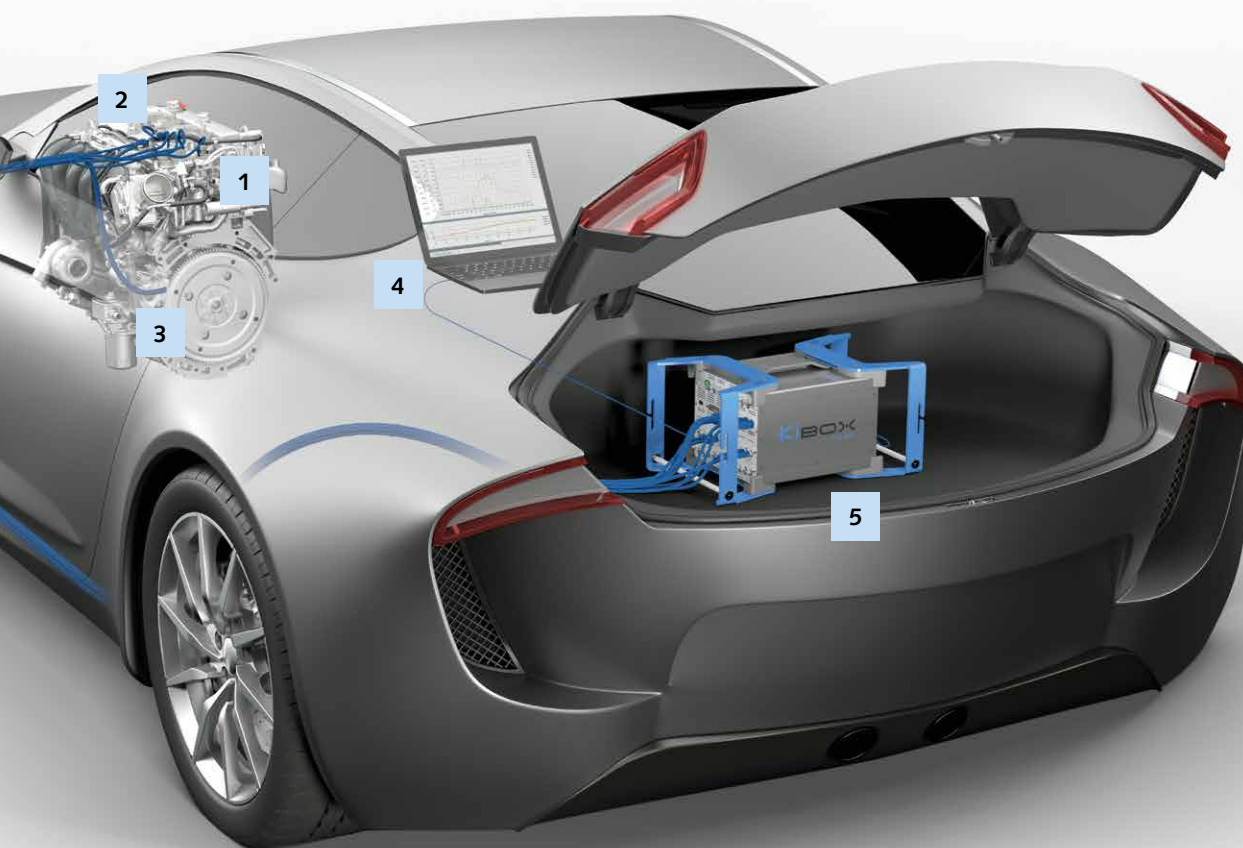
KiBox® supports synchronous integration of results into calibration systems such as Inca, Canapé and Vision, e.g. for basic engine control parameterization. Another advantage: KiBox® software is remote-controlled, so application engineers can parameterize KiBox®, select the results, control measurements and trigger data storage in their customary environment.

Automatic Data Storage

During measurement runs in normal road traffic, it's important for the driver to concentrate fully on the road. That's why KiBox® offers automatic triggering of data storage based on conditions specified by the user, in addition to the manual triggering option.

Standalone Operating Mode

If no space is available or if the environment is unsuitable for an operating PC, KiBox® can also be operated as a stand-alone solution. In this case, it continuously transmits parameters via the CAN bus, or it can stream raw signals to an external USB storage medium.



CrankSmart® – for Reliable Data Quality

KiBox® generates relations to the crank angle and top dead center with the standard flywheel, and interpolates them with high resolution in 0,1-degree gradations. KiBox® reduces the setup effort for each test vehicle; absolute comparability is ensured between results from test bench measurements and mobile indicating, despite the difference in crank angle sensing.

Knock Analysis

Knock analysis from the cylinder pressure curve and its correlation to the engine's own knock detection via acceleration sensors offer calibration engineers an efficient solution for optimizing knock control.

- 1 Cylinder pressure sensors and adapters, e.g. glow plug adapters
- 2 Current clamp for injection timing and/or ignition timing
- 3 Crank angle adapter to connect to the vehicle's flywheel sensor
- 4 GB Ethernet connections to the laptop with INCA or similar.
- 5 KiBox® with plug-in amplifiers

Indicating on the Test Bench. Valid. Comparable. Versatile.

For mechanical, thermodynamic and calibration testing – KiBox® also offers an extensive range of functions on the test bench. This system is equally suitable for mobile and stationary use, so you always obtain valid, comparable data generated on the same basis.

More Channels Open Up More Possibilities

When working on the test bench, you can use KiBox® not only to measure cylinder pressures, but also for intake and exhaust pressures, as well as numerous other signals. From V3.0 onwards, KiBox® Cockpit supports 16 channels – opening up even more possibilities. Two cascaded KiBox® systems are used to make the additional channels possible. Complete combustion analysis measurements are possible without external signal conditioning, because Kistler's piezoresistive sensors are used in the intake and exhaust channels, together with a matching amplifier module in the KiBox®. In addition to combustion investigations, these innovations also allow users to perform gas exchange analyses. Another plus: users can program real-time calculations according to their own algorithms, so they can safeguard their know-how.

Versatile Interfaces

KiBox® offers numerous interfaces for integration into the test bench environment. As well as interfaces such as CAN, digital in/out and a documented remote API, it also supports commonly used interface protocols between the combustion analysis and automation systems.



KiBox® – for Instant, Accurate Results:

Precise Determination of TDC

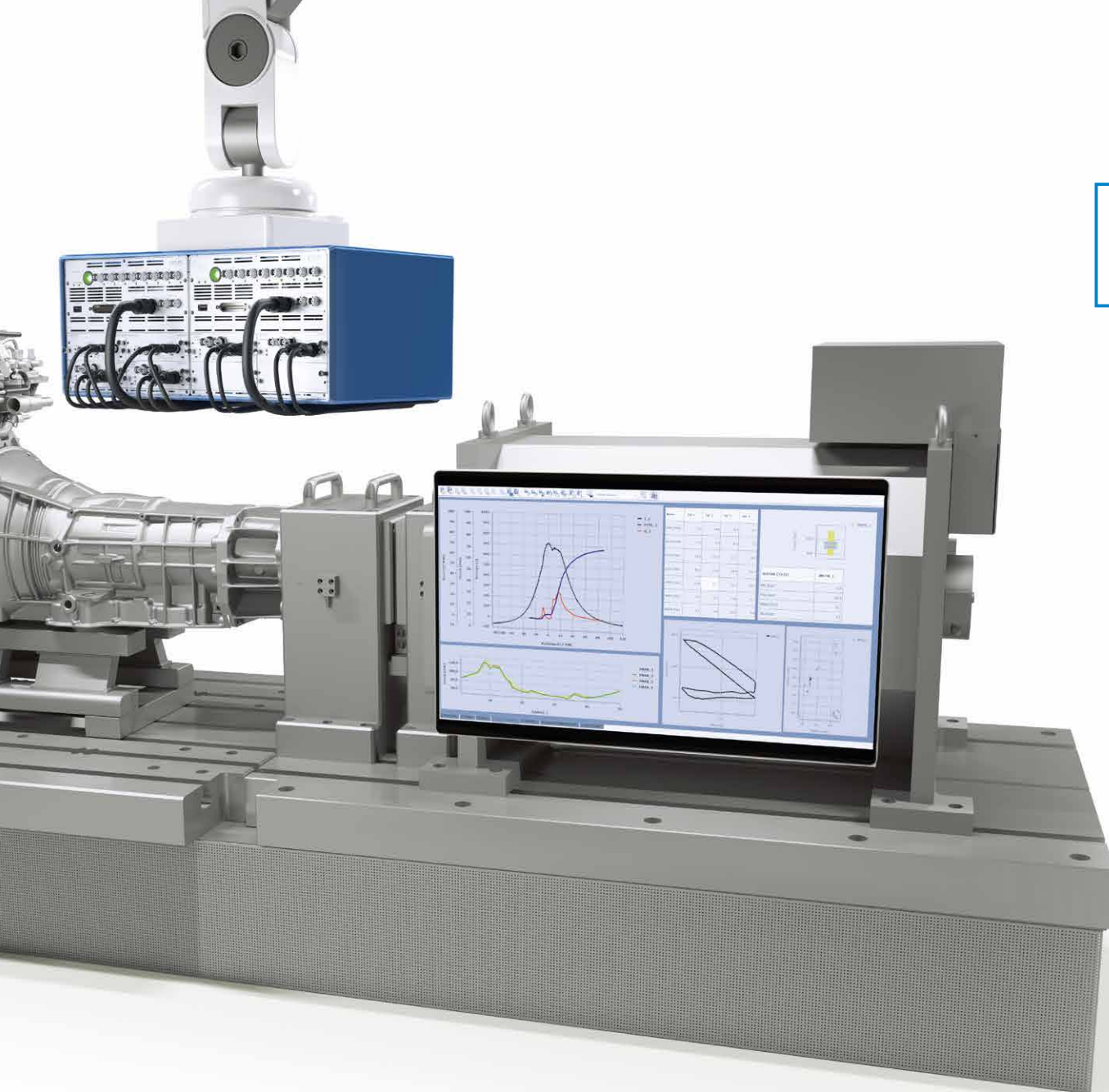
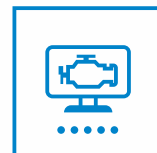
Assignment of the TDC position to the angle information from the crank angle encoder has a major impact on measurement quality. KiBox® offers diverse options for performing this assignment with maximum precision.

Precise and Flexible Angle Sensing

Two options are available for crank angle sensing: the innovative CrankSmart® system, and also support from an optical crank angle encoder (such as the Kistler Type 2614C with resolution of 0,5° KW).

High-Performance Individual Data Visualization

The KiBox® Cockpit software features a freely configurable user interface to visualize data during and after measurements. Users can choose from various types of charts and tables required for combustion analysis, so they actually have the feeling of following the combustion process as it is happening.



Limit Value Monitoring with No Interruptions

The LimitMonitoring functionality allows users to monitor limit values in real-time. As well as storing measurement data in case of an incident, a digital signal can be sent to the test bench as soon as an incident occurs so that appropriate protective actions can be initiated.

Gas Exchange Analysis

Complete combustion analysis measurements are possible without external signal conditioning thanks to the additional use of Kistler's piezoresistive sensors in the intake and exhaust channels, together with Type 4665B piezoresistive amplifier module in the KiBox®.



Kistler Service. Just as Mobile and Versatile as Your KiBox®.

Backed by a worldwide service network, Kistler offers customized services for your KiBox®. We will always assist you at the location which best meets your requirements in terms of cost and time.

Perfect Calibration

Our calibration service ensures that your KiBox® will operate accurately and reliably throughout its long service lifetime. If you so wish, we will carry out calibrations on site at your premises or in the Kistler Tech Center nearest to you. Your benefits: efficient quality management and constantly high process reliability. Each calibration is documented with a certificate to confirm that your KiBox® is in proper operating order and to guarantee traceability to national and international standards.

Comprehensive Consulting & Engineering Services

Our experts are on hand to assist you during every phase of combustion analysis – either with highly specific tasks, or throughout the entire process.

Our Range of Services:

1. Test preparation and initial operation
2. Performing and optimizing measurements
3. Evaluation and on-the-job training
4. Development and implementation of customer specific computation algorithms (user formula)

Keep Control of Costs, Quality and Time

Our services will prevent any unpleasant surprises as regards costs and resources. Simply call on assistance from Kistler's measurement experts whenever you need it. Our experience and our holistic approach to developing solutions are your guarantee of highly efficient, goal-oriented combustion analysis. We are flexible, we are ready to assist you at short notice, and we will share our know-how with you on the spot – wherever you need us. That means you can improve your processes immediately, so you gain valuable time.



Worldwide Presence for Our Customers.

Wherever vehicle and engine tests are carried out, Kistler is on hand to offer sensors and systems – backed up by a host of services that range from professional advice and support to calibration and speedy deliveries of spare parts across the globe. To offer even better technical support, Kistler is setting up Tech Centers throughout the world – delivering exactly the service that our customers expect so they can optimize their testing activities.

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Kistler Group includes the Kistler Holding AG and
all its subsidiaries in Europe, Asia, Americas and Australia.

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KISTLER
measure. analyze. innovate.