

## KiBox2

Type 2895A...  
with KiBox Cockpit Software

### Capability and measurement efficiency for the next generation vehicle powertrains

The KiBox2 is a complete, propulsion analysis solution that forms a hardware and software eco-system ready for all current and future powertrain development challenges.

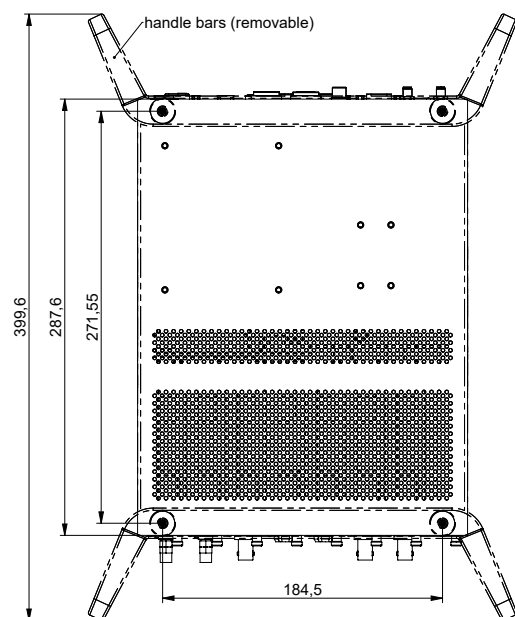
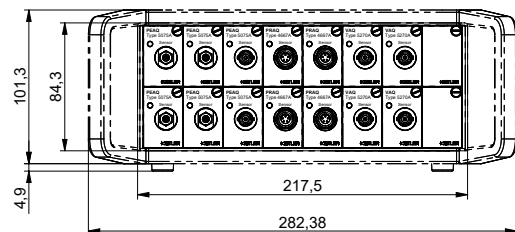
#### Features of the KiBox2 system

- Simultaneous or independent time and angle-based data recording concept with flexible definition of acquisition frequency
- Crank-smart technology, "encoder less" operation
- Real-time calculation of standard combustion parameters
- Real-time calculation of user defined formulas via formula compiler
- Limit value monitoring with highly configurable triggers and data storage concept
- "Endless Measurements" with complex multi-recorder concept
- Convenient integration with electronic control unit calibration tool chains via XCP and/or CAN
- Full connectivity with all common test bed automation systems via DCOM, Remote Control API, TCP/IP, WLAN
- Bi-direction CAN interface, full support of CAN-FD
- Scale able channel count concept with cascade able acquisition units and freely configurable channel inputs via measuring modules
- Wide range DC power supply options, optimized for in-vehicle measurement application
- "Headless" standalone operation without a host PC, with automated data synchronization
- KID (Knock Intensity Detection) according to Bosch method and workflow, for gasoline engine calibration

#### Description

Engineers need to be able to produce efficient powertrains, that reach all design targets, with the minimum development time. The KiBox2 is a multi-dimensional measurement platform that is able to measure accurately and blend, measured data from multiple complex propulsion system devices, that typically require harmonizing and optimizing in a modern, efficient vehicle powertrain.

With the KiBox2, all measured data can be captured, aligned, and visualized in real-time for display and storage in order to fully understand the status and efficiency of the propulsion system under real time operating conditions, on a second-by-



second basis. Thus, facilitating the ability for the development engineer to make the right engineering decisions, at the right time in the development process.

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### Application

KiBox2 allows measurement and analysis of power flows within standard (ICE only) or complex powertrains (MHEV, PHEV, BEV). Data is recorded and stored via the comprehensive array of input interfaces that the system provides, both analogue and digital. The data is fully time aligned with the possibility of applying subsequent standard or user-defined calculators, in real time, for “on-the-fly” analysis. The data can then be stored, viewed, and analyzed within the KiBox2 Cockpit software. Or, for further processing using industry standard, offline analysis tools, a comprehensive number of industry standard file export formats are available. standard file export formats are available.

In addition, the system can be interfaced to a host (typically a test bed automation system or control system application tool) allowing data communication during measurement run-time for synchronization of KiBox2 data with other devices and/or the host. The KiBox2 tool interfaces deploy industry standard protocols and support remote control (as well as data transfer) when this is available on the host system.

The system supports wireless connectivity to allow equipment usage without needing interconnecting cabling to the host PC. In addition, full GPS location capability allows the user to integrate positionbased tracking data during on-the-road testing.

### System components

Overview of the complete powertrain analysis system:

- 1 Cylinder pressure sensors and adapters, e. g. measuring spark plugs or glow plug adapters
- 2 Current clamp for injection and ignition timing
- 3 Crank angle adapter for connecting to the OEM engine crank position sensor
- 4 Voltage and current probes for AC machine analysis, and or DC system current flows
- 5 Flywheel, driveshaft or wheel torques
- 6 KiBox with measuring modules
- 7 KiBox Cockpit

### Display of powertrain real-time data

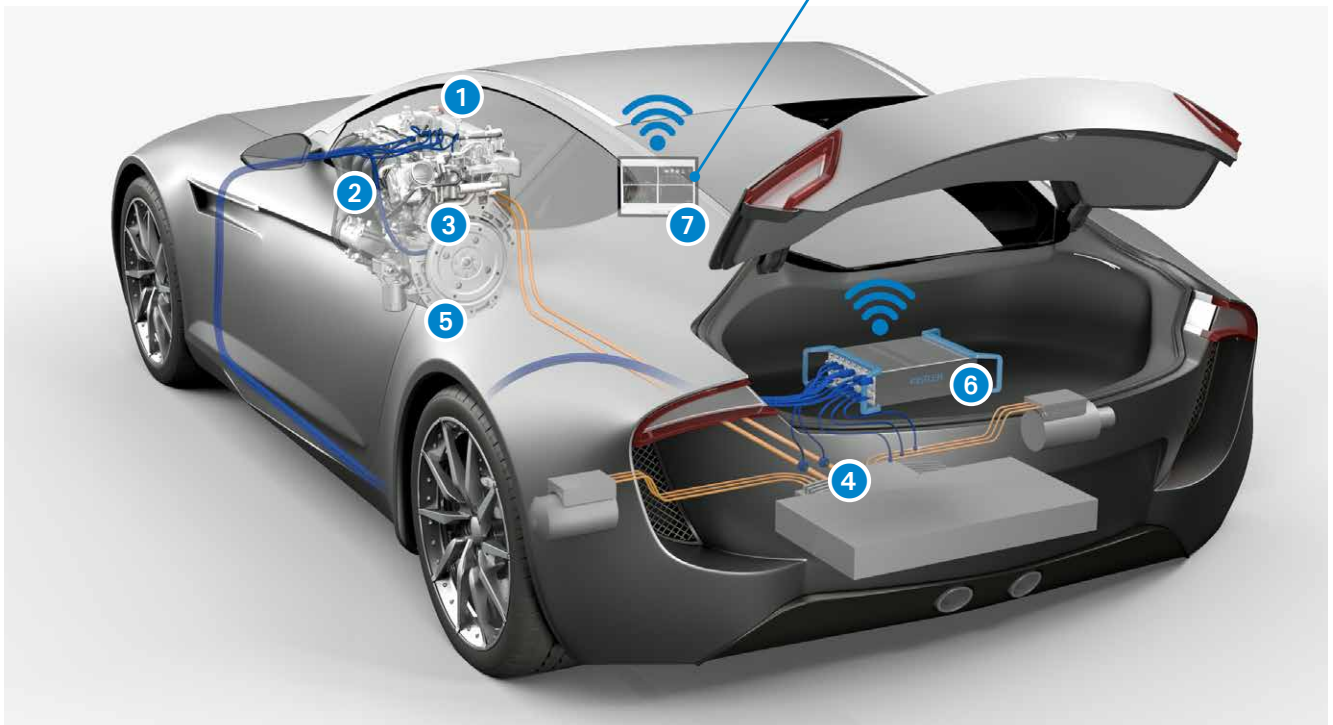
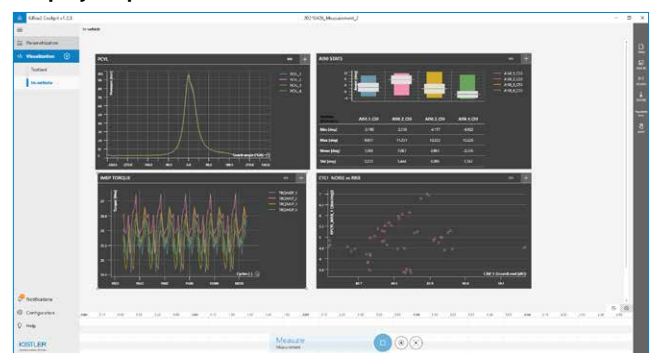


Fig. 1: Arrangement of the system components with connection to the user laptop

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## Technical data

### Ambient conditions

Operating temperature range w/o data acquisition modules	°C	-40 ... 70
	°F	-40 ... 158
Humidity	%	0 ... 95
Maximum peak power consumption	W	75
Number of data acquisition module slots		16
Number of digital inputs		8
Number of digital outputs		8
Number of CAN-FD interfaces		2
Number of crank angle inputs		3

### Connections on the front panel



Fig. 2: Connections on the front panel

### Connections on the rear panel

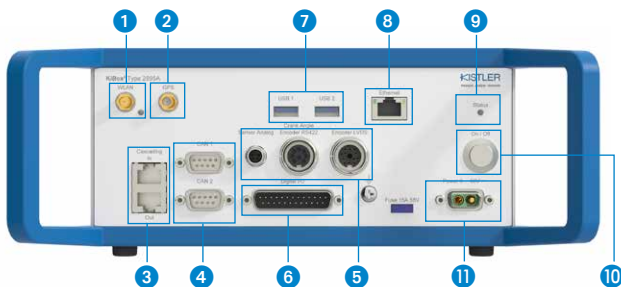


Fig. 3: Connections on the rear panel

Description	
1	WLAN – Antenna connector: Reverse-polarity SMA (RP-SMA), Status LED
2	GPS – SMA connector
3	Cascading IN/Out – RJ-45 connector
4	CAN 1 & 2 – D-Sub 9 pin (male)
5	Crank Angle Inputs – Sensor Analog/RS-422/Encoder LVDS
6	Digital I/O – D-Sub 25 pin (male)
7	USB 1 & 2 – future use
8	Ethernet – 1 000 Base-T, standard connection KiBox2 – PC
9	Status LED
10	On/Off – System is switched on by a short push. Short push of the button 5 sec. the KiBox2 will power down immediately.
11	Power supply – connection, 6 ... 60 VDC

### Input channels

A KiBox2 system consists of at least one data acquisition unit which has the capability of 16 analogue channels, in addition to the available digital ports and interfaces. The number of analogue channels active in a device depends only on the number of measuring modules installed.

The KiBox devices are fully cascable and multiple units can be connected together or used separately as required. A maximum of 4 devices can be connected giving the capability of 64 analogue channels (plus digital inputs/interfaces).



Fig. 4: Type 5075A2



Fig. 5: Type 5075A1



Fig. 6: Type 4667A



Fig. 7: 5270A

Each analogue channel is accessed and configured with a measuring module.

PEAQ is used for piezo-electric charge signals, PRAQ is used for Piezo-resistive signal and VAQ is for general purpose voltage inputs. The measuring module is configured from the Cockpit software, the position of the unit in the KiBox is not restricted and fully movable or removable. Where no module is fitted to a channel a blanking plate can be used to prevent dirt or moisture ingress to the KiBox itself.

### Measuring amplifier slots

Slots for measuring modules	<b>16</b>
Number of measuring channels per slot	<b>1</b>
Supported measuring modules	<ul style="list-style-type: none"> <li>• Charge amplifier</li> <li>• Piezoresistive amplifier</li> <li>• Voltage amplifier</li> </ul>
	<b>Type 5075A_</b> <b>Type 4667A_</b> <b>Type 5270A_</b>

#### Type 5075A 1-Channel Charge Amplifier (PEAQ)

ADC resolution	Bit	18
Frequency range	kHz	≈0 ... >200
Measuring range	pC	±100 ... 50 000
Drift compensation operating range	1/min	≈100 ... 50 000

#### Type 4667A 1-Channel Piezoresistive Amplifier (PRAQ)

ADC resolution	Bit	18
Frequency range	kHz	≈0 ... >90
Amplifier range		10 ... 220
Sensor supply (I ref)	mA	1

#### Type 5270A 1-Channel Voltage Interface (VAQ)

ADC resolution	Bit	18
Frequency range	kHz	≈0 ... >300
Max. voltage input	V	+/- 60
Input impedance	MOhm	>1

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### Crank angle connections

Connection 1	Analog: Crank Angle sensor probe (2643A) for connecting engine specific crank angle encoders
Connection 2	LVDS: Optical crank angle encoder Type: Kistler 2614B/C/D other with 600 ppr/1 200 ppr/1 800 ppr AVL 364/365/366
Connection 3	RS-422 ABZ input for using the Kistler encoder 2614DK2 or any generic ABZ encoder

Analogue (2643A)		
Input voltage	V	+/-50
Bandwidth	kHz	>800
ADC resolution	Bit	16
Sampling rate	MHz	>10
LVDS		
Output voltage (5V)	V	≈5
Output current (5V)	mA	300
Output voltage (15V)	V	15
Output current (15V)	mA	120
RS422		
Input voltage	V	+/- 3.9
Bandwidth	kHz	>800
ADC resolution	Bit	16
Sampling rate	MHz	>10

### Crank angle sensor probe 2643A

The crank angle sensor probe is the measurement adapter between the engine crank shaft position sensor (CPS) and the KiBox2 crank angle input. The differential crank angle signal is picked up by this high resistance probe in order to measure the signal with very high precision.

An appropriate driver inside the crank angle sensor probe transmits the analog signal to the KiBox2. The supply power for the probe is provided by the KiBox2 using the same cable. Analog-to-Digital conversion is done inside the KiBox2.



Fig. 10: Processing of the OEM crankshaft position sensor

### Digital input channel

#### Digital inputs for any signals

Number of channels	No.	8
Maximum input frequency	MHz	10
Input voltage, max.	V	±30
Input level low	V	<2
Input level high	V	>4,5
Input circuit	Galvanic isolated between each other and the rest of the system	

### Digital output channel

#### Digital inputs for any signals

Number of channels	No.	8
Maximum output frequency	MHz	10
Output voltage, max.	V	5.5
Output level low	V	<2
Output level high	V	>4
Output circuit	Digital outputs are TTL-level and have a common ground. They are not galvanic isolated from each other, but the common ground is galvanic isolated from the rest of the system.	

### CAN interfaces

Number of channels	No.	2, input and output
CAN Standard		CAN/CAN-FD
Maximum supported bit rate by hardware transceiver	MBit/s	8

### WLAN interface

Supported countries/areas	CE/EFTA FCC/IC
WLAN standards	IEEE 802.11 b/g/n Single stream
Frequency band	2.4
Channel bandwidth	20
Supported WLAN channels	1 ... 11
Modes	Station (STA) Micro-AP
Maximum number of stations in Micro-AP mode	8

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**Measurement and processing power**

Nominal sampling rate	MHz	2.5
Resolution of measurement data	kHz ° CA	625 0.025
Speed range	1/min	≈0 ... 20,000

**Performance of result interfaces to application systems**

Interface	XCP/PTP is included in the standard scope of delivery. It is a standardized and independent interface between Cockpit Software and any 3rd party systems
Data synchronisation	Time stamp from the operating PC, assignment for each combustion cycle, support of Precision Time Protocol (PTP, IEEE 1588)
Definition of timestamp	End of the combustion cycle
Uncertainty PTP	<1ms

**Test bench interface**

Interface	KiBox API (extended Remote Control API) IndiCom DCOM IndiCom ISTB XCP, PTP (IEEE1588)
Multi-client capability	yes

**Data files/file format**

Input file formats	<p><b>KiBox</b></p> <ul style="list-style-type: none"> <li>• .open Data file</li> <li>• .formula User formula</li> </ul> <p><b>KiBox2</b></p> <ul style="list-style-type: none"> <li>• .mf4 Data file</li> <li>• .k2p Parameter file</li> <li>• .k2c User calculator</li> <li>• .dbc CAN database file</li> </ul>
Output file formats	<p><b>KiBox2</b></p> <ul style="list-style-type: none"> <li>• .mf4 Data file</li> <li>• .k2p Parameter file</li> <li>• .k2c User calculator</li> <li>• .dbc CAN database file</li> </ul> <p><b>3<sup>rd</sup> party</b></p> <ul style="list-style-type: none"> <li>• .csv Comma separated data file</li> <li>• .ifi AVL iFile</li> <li>• .a2l ETAS INCA</li> </ul>

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**System components and Type numbers for the combustion analysis system Type 2895AK1**

<b>Included accessories</b>	<b>Type/Art. No.</b>
• KiBox base unit	2895A1
• Blind front panel complete	5700A33
• Ethernet Switch 5-Port 10/100/1000BaseT	5211569
• Connecting cable 2 pin, l = 2 m	5590314
• Gigabit Ethernet cable 1:1, l = 1 m	1200A117A1
• Gigabit Ethernet cable 1:1, l = 5 m	1200A117A5
• Power cable, l = 2 m	
• Power supply 100 ... 240 VAC	5781B4
• Country specific power cable	Z16687
• D-Sub, 25 pin (f)	5510427
• Crank Angle Sensor Probe to KiBox2	2643A
• WLAN antenna with SMA connector	
• GPS antenna incl. Cable and SMA connector	
<b>Document folder</b>	
• Quick Start Guide/Safety Instructions	002-963e
• Calibration certificate 2895A	
• USB memory stick incl. operating instructions & Cockpit SW	
• xAQ protection case	
• Wheel case incl. inlay for KiBox2	

<b>Optional accessories</b>	<b>Type/Art. No.</b>
• Blind front panel complete	5700A33
• PRAQ measuring module to KiBox2	4667A
• VAQ measuring module to KiBox2	5270A
• PEAQ measuring module to KiBox2 (BNC)	5075A1
• PEAQ measuring module to KiBox2 (Fischer, TEDS)	5075A2
• Crank Angle Sensor Probe to KiBox2	2643A
• Crank angle encoder set	2614DK2
• TDC-Sensor System, Probe length 285,5mm	2629DK0
• Piezosmart extension cable, l=0.5m	1987BN0,5
• Piezosmart extension cable, l=7m	1987BN7
• Piezosmart extension cable	1987BFT...

**Services & training for the combustion analysis system (please contact Kistler for requests)**

**Services**

- KiBox calibration
- KiBox rent
- KiBox service on the road: planning, preparation and realization of on-site combustion measurements by a Kistler expert

**Training**

- KiBox Level A (Basic) user training
- KiBox Level B (Experts) user training

**Warranty and maintenance options**

- Basic
- Standard
- Premium

• Extension cable, BNC pos. - BNC neg., l=0.5m	1603BN0,5
• Extension cable, BNC pos. - BNC neg., l=7m	1603BN7
• Coupling Triax pos. -BNC pos.	1704A4
• Coupling Triax pos. -BNC neg.	1704A1
• 19" 2HE Mount. base cpl. 482,6x86,9x360 for KiBox2/SCP Slim	5736A
• Blind front panel 9,5" 2HE	5748A4
• Cascading set KiBox2 (2-4 units)	1200A247A1

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