

KiBox® To Go

Measurement and Evaluation System for Combustion Analysis in Test Vehicles

Type 2893A...
with KiBox Cockpit Software

The KiBox is a complete combustion analysis system for mobile use on the road and under extreme ambient conditions.

Special Advantages of KiBox To Go

- Real time calculation of combustion analysis results
- No optical crank angle encoder required
- Measurements and evaluations can be configured extremely easily. Any error messages displayed are easily understood.
- The measurement data is evaluated in the KiBox to avoid any need for your own PC or laptop for combustion analysis. The KiBox can be connected directly to the application PC.
- The KiBox offers a powerful system architecture for fast measurement and for evaluation based on crank angle and time.

Description

The KiBox from Kistler enables you to visualize the quality of combustion in the individual cylinders. The combustion parameters are conveniently integrated into the application system and synchronized with other measurement data and the controlled variables of the ECU via a software interface. This interface is initially available for INCA (the widespread application software from ETAS).



Fig. 1: KiBox® To Go Type 2893AK... with integrated amplifiers Type 5064B...

Applications

You can use the additional information about controlling injection valve operation, ignition and combustion for engine maps optimization with the application system. Or you can use the KiBox as a standalone system for combustion analysis in the vehicle. Combustion diagnosis enables you to analyze and solve a problem that arises in the real vehicle on the road.

System Components

Overview of the complete combustion analysis system:

1. Cylinder pressure sensors and (e.g. glow plug) adapters
2. Current probe for injection and ignition timing
3. Crank angle adapter for connecting to the speed sensor
4. 1 GB connection to laptop with INCA or similar software
5. KiBox with amplifier modules

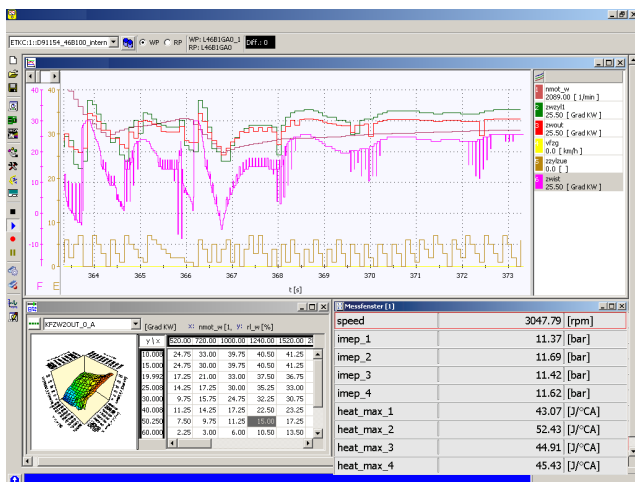


Fig. 2: Combustion analysis parameters on application engineer's screen, integrated and synchronized in INCA

In addition to using INCA, you can display the combustion analysis results in separate windows of the KiBox's own interface.

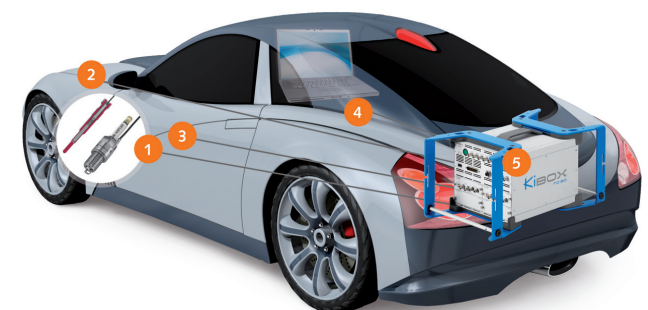
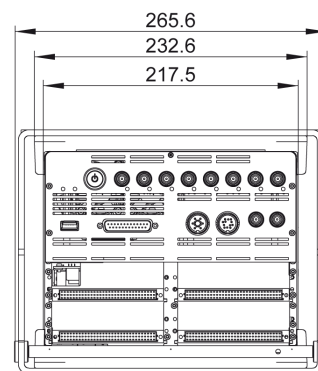
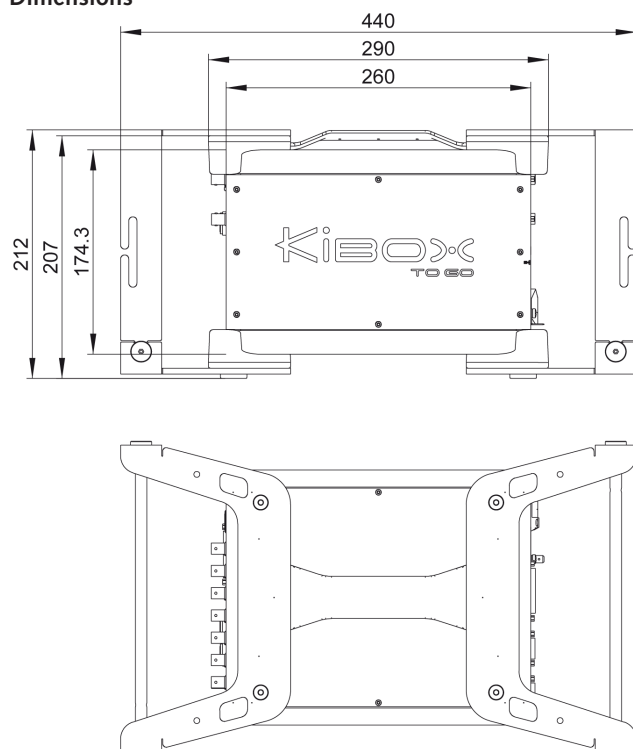


Fig. 3: Arrangement of the system components with connection to laptop of application engineer

Technical Data

Dimensions



Weight

Basic system without amplifiers	approx. 6 kg
Basic system and amplifiers	approx. 8 kg max

Ambient Conditions

Temperature range	-30 ... 50 °C (-20 ... 120 °F)
Relative humidity	0 ... 95 % non-condensing
Power supply	10 ... 36 VDC, 100 ... 250 VAC
Power consumption	approx. 60 W

Fig. 4: Dimensions of KiBox® Type 2893A...

Connections on the Front Panel

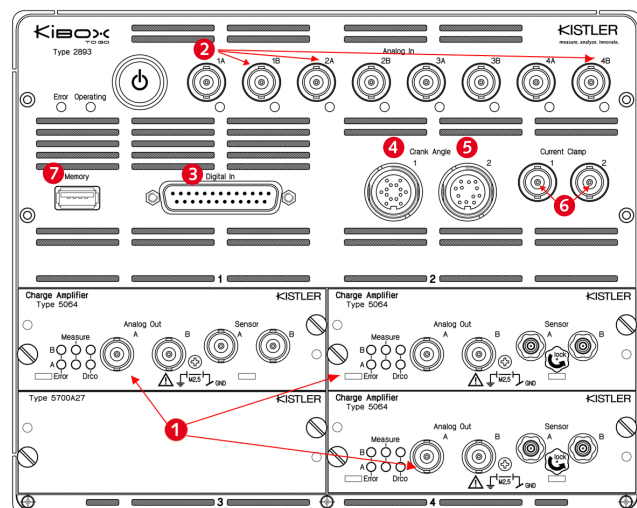
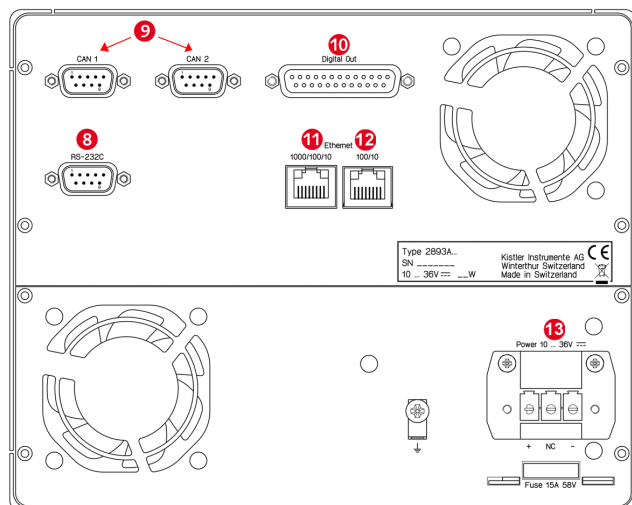


Fig. 5: Connections on the front panel

- Measuring amplifier slots**
4, each with 2 channels – 8 channels in total (Kistler Type 5064B11, Type 5064B12, Type 5064B13)
- Analog In**
8, BNC
- Digital Inputs**
1 25-pin connector (not yet supported in KiBox Cockpit V1.2.1, V1.3.0)
- Crank Angle 1**
1, for Kistler Type 2619A11 crank angle adapter set
- Crank Angle 2**
1, for optical crank angle encoders (Kistler Type 2614B..., AVL Type 365/720 or 365/360)
- Current Clamp 1 & 2**
2, BNC for current clamp Type 2103A11 or Type 2105A...
- Memory Stick**
1, USB (not yet supported in KiBox Cockpit V1.2.1, V1.3.0)

Connections on the Rear Panel



- 8 RS-232C Interface
 - 1, RS-232C (for Kistler use only diagnostic purposes)
- 9 CAN 1 & CAN 2 Interface
 - 2, D-Sub 9 pole male
- 10 Digital Outputs
 - 1 25-pin connector (not yet supported in KiBox Cockpit V1.2.1, V1.3.0)
- 11 Ethernet 1000/100/10
 - 1, 1 000 Base-T, standard KiBox – PC connection
- 12 Ethernet 100/10
 - 1, 10/100 Base-T (not yet supported in KiBox Cockpit V1.2.1, V1.3.0)
- 13 Power
 - 1 power supply connection, 10 ... 36 VDC

Fig. 6: Connections on the rear panel

Analog Input Ports

A maximum number of 8 analog voltage signals can be acquired in KiBox via the measuring amplifier slots or the BNC-connectors situated on the top of the front panel. Additionally to this two analog inputs for current probes are available. Absolutely synchronous measuring data are available thanks to the correction of the delay time of each measuring signal acquired via the internal amplifiers (charge amplifiers for cylinder pressure and current probe amplifiers).

The measuring chain consisting of sensor and amplifier provides voltage signals that have been accurately calibrated, for example in volts per bar of cylinder pressure. The measuring chain is set to the sensitivity of the individual sensor fully automatically.

Measuring Amplifier Slots

Amplifier Slots 4 slots for maximum 8 amplifier channels.

2-Channel Charge Amplifier

Number of channels	–	2
Frequency range (20 V _{pp})	kHz	≈0 ... >200
Measuring range	pC	±100 ... 100 000
Drift compensation operating range	1/min	≈100 ... 20 000

Please see separate data sheet Type 5064B12 (Doc. No. 5064B_000-735) for amplifier specifications.

Analog Inputs for any Voltage Signals

Number	8 channels
Modular architecture	number of analog inputs expandable
Input voltage range	–10 ... 10 V
ADC resolution	16-bit
ADC sampling rate	1,25 MHz (MS/s) per channel
Bandwidth	100 kHz
Low-pass filter	5/10/20/25/30/35/40 kHz



Fig. 7: Type 5064B12

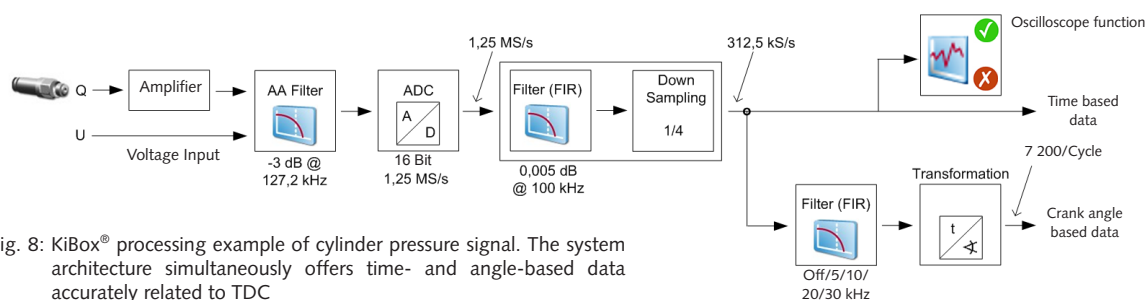


Fig. 8: KiBox® processing example of cylinder pressure signal. The system architecture simultaneously offers time- and angle-based data accurately related to TDC

Number	2 channels
Input voltage range	-1 ... 1 V
ADC resolution	12-bit
ADC sampling rate	2,5 MHz (MS/s) per channel
Bandwidth	125 kHz

Suitable for timing measurements on gasoline and diesel engines

Type	2103A11	2105A30
Bandwidth	100 kHz	100 kHz
Power supply	9 V battery	external
Voltage Output	± 1 V	30/20/40 mV/A
Weight	200 g	10 g

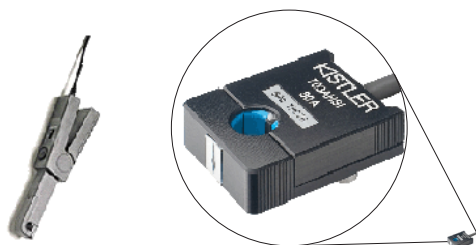


Fig. 9: Current probe Type 2103A11 (left), Type 2105A30 (right)

Please see separate data sheet Type 2105A... doc. no. 2105A_000-953.

The current probe can be clamped onto the ignition or injector cable. Two current probes can be connected to a single KiBox.

Angle and Trigger Inputs

Connection 1	Kistler crank angle adapter Type 2619...
Connection 2	Optical crank angle encoder
	- Kistler Type 2614B
	- other with 600 impulses/360 ° CA
	- other with 1 200 impulses/360 ° CA
	- AVL 365/360
	- AVL 365/720

This adapter conditions analog crank angle signals by transforming them into a digital LVDS pulse train for processing of crank angle and TDC in a KiBox.



Fig. 10: Processing of original speed sensor signal



Fig. 11: Crank angle adapter set Type 2619A11

Connectable sensor types	Encoder wheel with Hall or (inductive) VR sensor, invertible signal
Internal resistance	200 ... 250 kΩ
Input voltage range (Hall)	0 ... 100 V
Input voltage range (inductive)	-100 ... 100 V
Overload range	-200 ... 200 V
Supported number of crank angle marks	60-2, 60-1, 36-2, 36-1, 36+1, 90-1, 24-1, 30-2, 12-1, 60-1-1, 60-1-1-1, 60-2-2, 60-2-2-2, 60+1+1
Crank angle and trigger output	
Crank angle resolution	0,1 ° of CA
Resolution of TDC determination	0,01 ° of CA
Analog signal output	Analog sensor signal for diagnostic purposes with the KiBox oscilloscope function
Degree of protection	IP65 (protected against dust and splashproof)

Optical Crank Angle Encoder Type 2614B

Crank angle signal	720 impulses/360 ° CA
Speed range	0 ... 20 000 1/min
Mounting diameter of encoder	69 mm
Weight (without amplifier)	390 g



Fig. 12: Optical crank angle encoder Type 2614B

Digital Input Port

Digital Inputs for Any Signals¹

Number	8 channels
Sampling rate	2,5 MHz
Min. pulse duration	3,2 µs min.
Input circuit	electrically isolated, floating

Measurement and Processing Power

Measurement and Processing Power

Resolution of measurement data	312,5 kHz and 0,1 ° of crank angle
Engine speed	0 ... ≈15 624 rpm

Local Memory for Measurement Data and Calculated Results

RAM for measurement data		400 MB
	Time based data, angle based data and results	Angle based data and results
Manually saved	500 cycles	2 000 cycles
Automatically saved	500 cycles and 30 s before engine started/ after engine turned off	500 cycles and 30 s before engine started/ after engine turned off

Table 1: Possible duration of measurements with saving of data (stored as files)

¹ Not yet supported in KiBox Cockpit V1.2.1, V1.3.0

² See description of .open data files

Laptop/Host Requirements

PC operating systems	Windows® XP(SP2), Windows® Vista or Windows® Vista (SP1)
Min. available hard-disk space	1 GB
Min. RAM	2 GB
Min. screen resolution	1 280 x 1 024 pixels
PC interface	1 Gigabit Ethernet
Optical drive	CD drive for installing software

Result Interfaces with Application Systems

Interface	OHI 3 (ETAS software interface with INCA Version 6.1, 6.2.0, 6.2.1, 7.0 from Cockpit 1.3.0). Kistler driver software for OHI3 is included as standard, Kistler driver software for other systems is available on request.
Data synchronization	Timestamp from the operating PC, related to each cycle
Definition of timestamp	Start of reference cylinder cycle
Uncertainty	approx. 1 ms (<< 1 cycle)

Data Files/File Format

Read/write	.open File (Kistler open binary file format) ² Supported by Matlab, Uniplot, Turbolab
Data export	I-File (AVL binary file format), ASCII tables (comma separated values)

CAN Interfaces

Number	2
Max. transmission rate	1 Mbit/s max.

Digital Outputs¹

Number	8 channels
Output circuit	electrically isolated, floating

System Components and Type Numbers for Vehicle Combustion Analysis System

Scope of Delivery of Type 2893AK1	Type/Art. No.
Signal processing platform KiBox	2893A121
Blind front panel	5700A27
5-port 10/100/1000 Ethernet Switch	5.211.569
Connecting cable 2-pole, l = 2 m	5.590.314
Gigabit ethernet cable 1:1, l = 1 m	1200A117A1
Gigabit ethernet cable 1:1, l = 5 m	1200A117A5
Gigabit ethernet cross cable, l = 5 m	1200A125A5
Power cable, l = 2 m	7.620.433
Power connector, 3-pole	1599
Power supply 100 ... 240 VAC; 50 ... 60 Hz	5781A4
Power cable	Z16687
D-Sub, 25-pole (m)	5.510.416
D-Sub, 25-pole (f)	5.510.427
Wheelie case for KiBox to Go	5.070.143
KiBox Cockpit software on CD	7.643.034

Accessories (Optional)	Type/Art. No.
Charge amplifier	5064B1...
Blind front panel	5700A27
Crank angle adapter set	2619A11
Crank angle encoder	2614B
TTL to LVDS Converter	Z21209
Current probe set	2103A11
Voltage supply module and signal summing for current probe Type 2105A30	2105A10
Amplifier module for current probe Type 2105A30	2105A20
Current probe, miniaturized	2105A30
Piezosmart extension cable, l = 0,5 m	1987BN0,5
Piezosmart extension cable, l = 7 m	1987BN7
Piezosmart extension cable	1987BFT...
Extension cable, BNC pos. – BNC neg., l = 0,5 m	1603BN0,5
Extension cable, BNC pos. – BNC neg., l = 7 m	1603BN7
Coupling Triax pos. – BNC pos.	1704A4
Coupling Triax pos. – BNC neg.	1704A1
Tablet PC holder	17044
Distribution box	12552, 11371

Optional Software for Off-Line Data Visualization (Third Party), .open File Compatible

	Type
Uniplot	2843A1
Turbolab	2843A2

Training

KiBox Level A (Basics) User Training	9941-E5
KiBox Level B (Expert) User Training	9941-E4
Handling Cylinder Pressure Sensor	9941-E1
Fundamentals of Cylinder Pressure Measurement	9941-E3