



**R&D with
Kistler Solutions.**

Get Better. With Kistler.

Engine Combustion Analysis

Pressure Sensors and Innovative System Solutions

Kistler Pressure Sensors...

From pioneer to technological leader – Kistler has been involved in the development, production and use of piezoelectric sensors since the 50s. The company's sensors have also played a key role in the development of combustion engines over this extended period. This striking success reflects their "inside view" of the combustion chamber as the only source of the information needed to optimize combustion for better efficiency and to minimize harmful emissions.

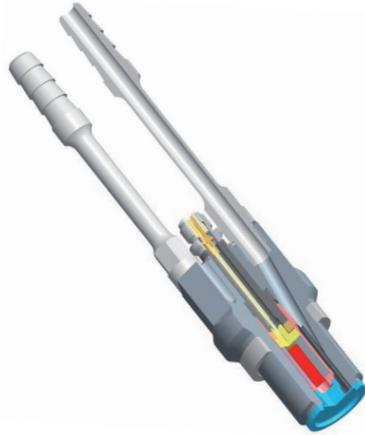
Reliable Development Partner for Research and Industry

From small-/mid-sized engines and racing engines to large marine Diesel engines and power plants, to use Kistler's solutions brings you clear advantages for your engine development. Indeed, innovative capacity, close contact with the world's leading engine manufacturers and application expertise help to explain why Kistler now sets the pace for engine measurement. Kistler always offers the best solution for accurate pressure measurement over a wide spectrum from high-precision research to demanding racing applications.

Piezoelectric Pressure Sensors

Piezoelectric sensors can only be used for quasistatic rather than truly static measurement. They are ideal for dynamic applications. Piezoelectric pressure sensors can be employed wherever rapidly changing pressures at temperatures of up to 400 °C have to be measured and recorded as accurately as possible.

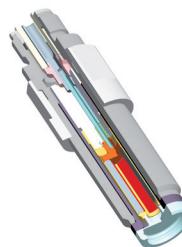
In addition to quartz, particularly for uncooled sensors, Kistler uses crystals developed and grown in-house. These PiezoStar crystals are characterized by high sensitivity and high thermal stability.



*M8 cooled piezoelectric pressure sensor,
Type 6041B...*

Piezoresistive Pressure Sensors

The piezoresistive principle is based on the semiconductor effect first described in 1954, which states that under mechanical stress semiconductors change their electrical resistance. Compared with the conventional strain gage measurement of the time, this opened up completely new applications. Since then further similar breakthroughs have included the thin film technique on metal and its thick layer counterpart on ceramic.



*M5 uncooled piezoelectric pressure sensor,
Type 6052C...*



*Piezoresistive miniature pressure sensor,
Type 4007C...*

PiezoStar® – Kistler has been growing their own crystals with high sensitivity and temperature stability for more than ten years

...Innovative System Solutions

The KiBox® To Go Type 2893A... allows very accurate determination of the key combustion parameters in real time under actual operating conditions for in-vehicle and engine test bed applications.



Plug & Go

Hardware and Software Optimized for Convenience and Portability

Key features of the KiBox are its compact size, modular vehicle accessories and the fact that all sensor connections are located on the front panel. The measuring parameters can be configured using a graphical user interface featuring a simple and intuitive layout. The combustion analyzer KiBox can be easily interfaced with test bed automation systems.



User-friendly and Quick

Optimum Functionality with PiezoSmart® and INCA Integration

The sensor signals are configured automatically by means of the electronic data sheet (TEDS) and the running time is acquired and saved for sensor management purposes. Designed with engineers in mind, the results calculated in KiBox can be processed and displayed in the familiar INCA environment. The "KiBox Cockpit" graphical interface also provides a fully independent data display for simple analysis of measuring data.



Integrated and Simple to Use

Interface to the Calibration System PC

The system offers high-performance, integrated computing with key parameters in real time and a time synchronous transmission of results to the ECU calibration tool. Setup is performed directly on the calibration system's laptop with calibration tools (e.g. Etas, Vector, ATI). It is also used for any custom visualization required.



Simple and Innovative

CrankSmart® for Enhanced Measurement Quality

CrankSmart is a brand new method for measuring indication signals precisely without an optical crank angle encoder. The existing engine speed sensor is used for the crank angle and the TDC reference.



Dynamic and Precise

Reliable Combustion Analysis in All Operating Conditions

With no additional effort required for any engine operating condition – starting, accelerating, stopping – measurements are acquired dynamically and delivered with precision, even before the crankshaft begins to rotate.



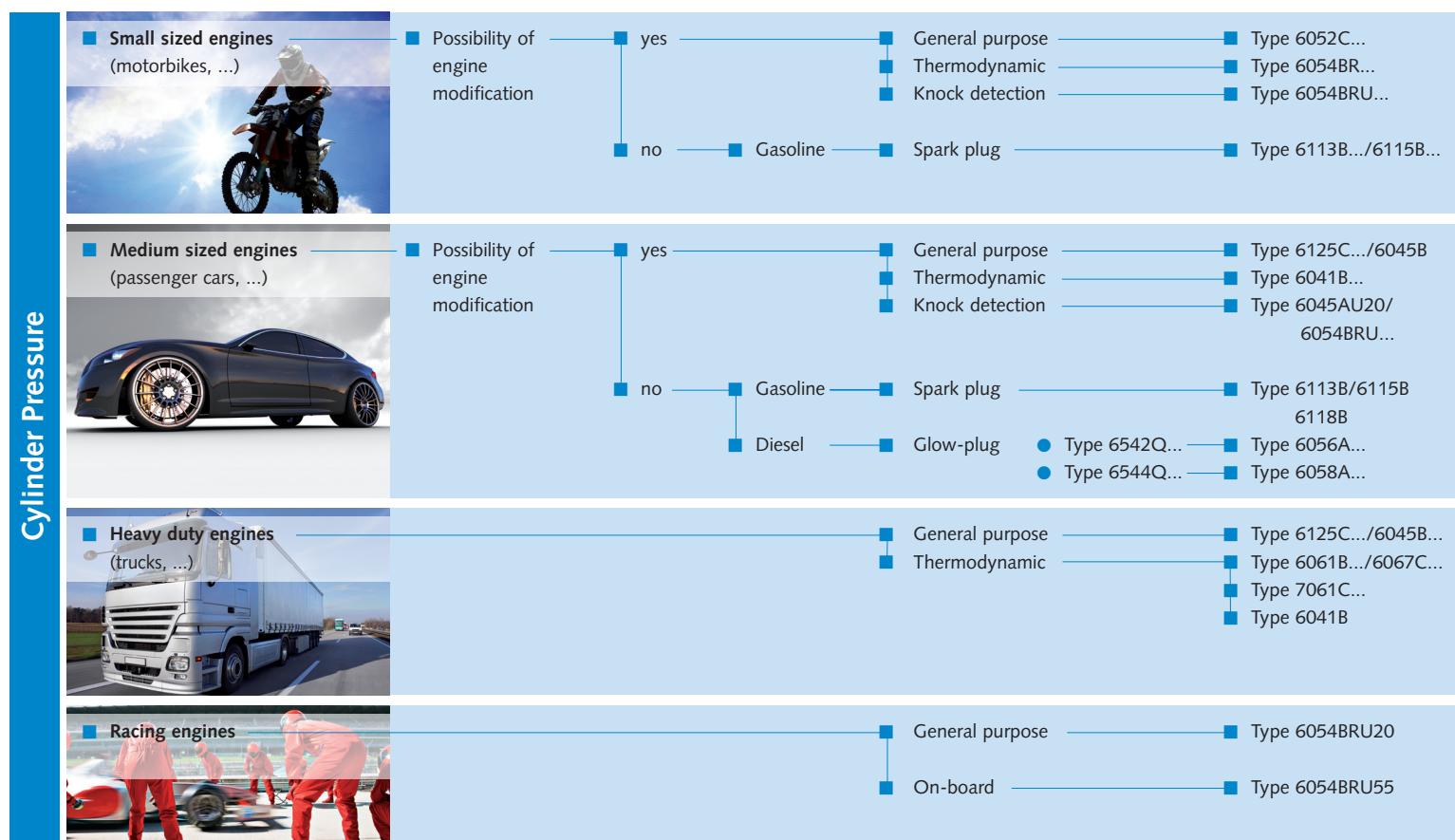
Modular System, Secure Investment

Standard PC Processors and Plug-in Amplifiers

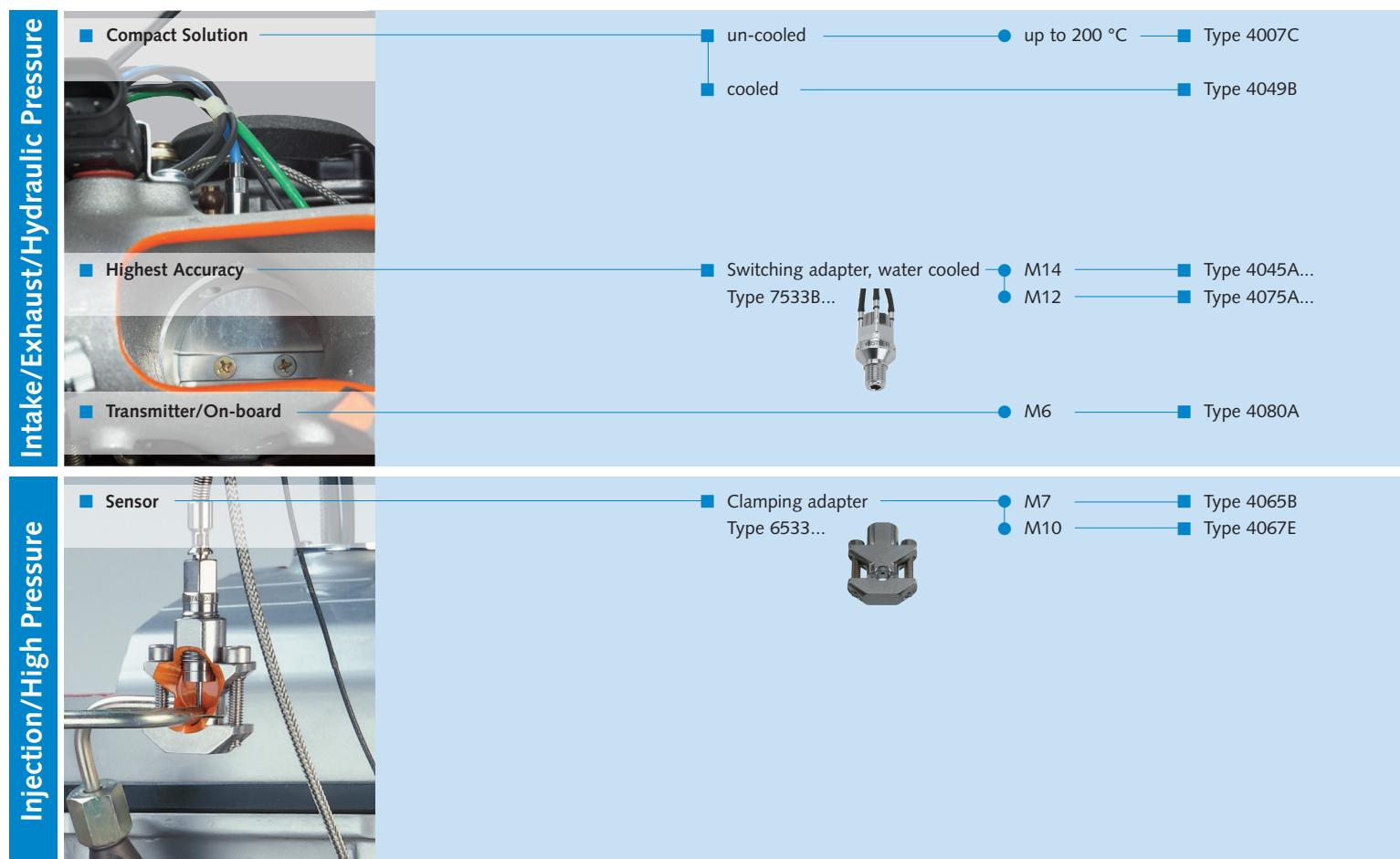
To protect your investment, the KiBox is based on standard PC processors combined with specific data acquisition hardware, ensuring that the system remains cost-effective. The amplifier modules come from the established Kistler SCP Slim series, making the KiBox the perfect tool for combustion analysis in test vehicles. Practical modular accessories, such as the bracket for securing the KiBox in the vehicle are part of the system.

Sensor Selection Guide

Piezoelectric Sensors



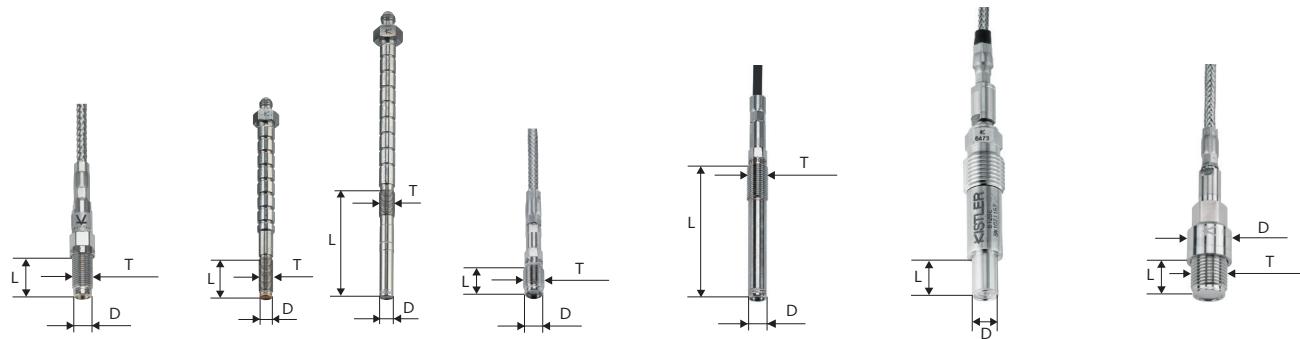
Piezoresistive Sensors



Piezoelectric Sensors

Pressure Measurement in Combustion Engines

Sensors and measuring probes, uncooled



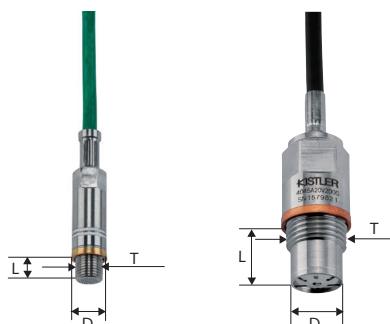
Technical data	Type 6052C...	Type 6053CC.../6055C...	Type 6054BR...	Type 6056A.../58A...	Type 6125C...	Type 6045B...
Pressure range bar	0 ... 250 / ... 300*	0 ... 250 / ... 300*	0 ... 250 / ... 300**	0 ... 250 (300*) / 0 ... 250	0 ... 300	0 ... 250 / ... 300***
Sensitivity pC/bar	-20	-20	-14/-9**	-20/-17	-36	-35/-44***
Temperature range °C	-20 ... 350	-20 ... 350	-20 ... 350	-20 ... 350	-20 ... 350	-20 ... 350
Dimensions D mm	4,4	4,4	4,4	4,4/4,0	6,2	9,8
L mm	10	14,5/33,5	7	33,5	9,9	7,9
T	M5x0,5	M5x0,5	M5x0,5	M5x0,5	-	M8x0,75
Characteristics	Low thermal sensitivity drift over engine operation map, compensated for acceleration, ideal thermal shock behavior, long life. PiezoSmart optional.	Sensor properties as Type 6052C... constructed for direct mounting in 6,0 mm hole, even possible to install through coolant passages. PiezoSmart optional.	Very compact, rugged design for high performance measurements even in limited space and for applications with high vibrations. PiezoSmart optional.	Sensor properties as Type 6052C... constructed for glow plug application in adapter Type 6542Q.../6544Q... or direct mounting. PiezoSmart optional.	Swivel-nut construction, low thermal shock and ground isolation, suitable for high performance measurements free of interference. PiezoSmart optional.	Shoulder-sealing, mounting dimensions compatible with Type 6041B... high sensitivity, low thermal sensitivity drift, long life. PiezoSmart optional.
Data sheet	000-552	000-571 (6053CC) 000-572 (6055C)	003-046	000-529 (6056A) 000-573 (6058A)	000-695	003-172

* U20 version with reinforced diaphragm, ** 6054BRU20/U55 version with reinforced diaphragm, *** 6045AU20 with reinforced diaphragm

Piezoresistive Sensors

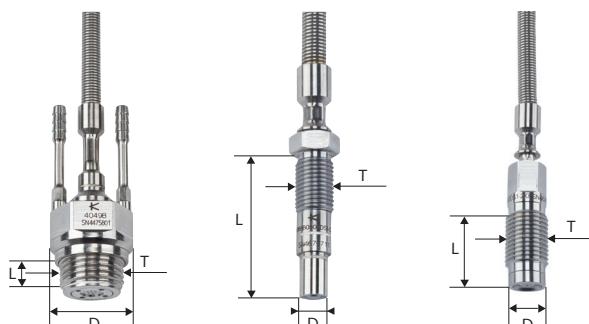
Pressure Measurement in the Intake and Exhaust Systems

Low-pressure sensors



Injection Pressure Measurement

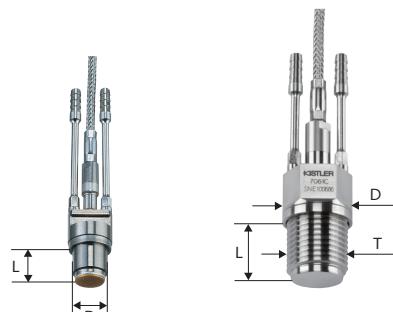
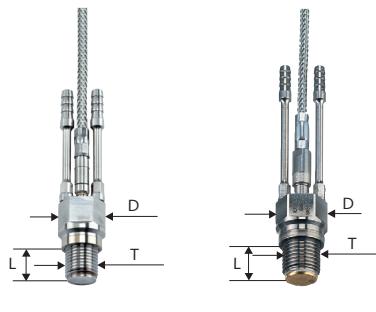
High-pressure sensors



Technical data	Type 4007C...	Type 4045A...	Type 4075A...	Type 4049B...	Type 4065B...	Type 4067E...
Measuring range bar	0 ... 5 / ... 10 / ... 20 0 ... 50 / ... 100 / ... 250	0 ... 2 / ... 5 / ... 10 0 ... 20 ¹⁾	0 ... 5 / ... 10 / ... 20 ¹⁾	0 ... 5 / ... 10 / ... 20	0 ... 200 / ... 500 0 ... 1 000	0 ... 2 000 / ... 3 000
Min. / Max. temp. °C	-40 / 200	0 / 140 ²⁾	0 / 140 ²⁾	0 / 120	-40 / 140	-40 / 200
Dimensions D mm	6,2	12	9,5	18	5	8,5
L mm	4	14	35	6,7	25,3	18,6
T	M5x0,5	M14x1,25	M12x1	M14x1,25	M7x0,75	M10x1
Characteristics	Miniature pressure sensor with PiezoSmart and digital temperature compensation for intake pressure measurements. Ideal for applications with limited space. For amplifiers Type 4624A and 4665(B)	Media separated pressure sensor with PiezoSmart. Highest accuracy. Ideal for use with cooled switching adaptors. For amplifier Type 4665(B)	Compact media separated pressure sensor with PiezoSmart. Highest accuracy. Ideal for use with cooled switching adaptors. For amplifier Type 4665(B)	Compact pressure sensor with integrated water cooling, PiezoSmart and digital temperature compensation. Media separated. For amplifiers Type 4624A and 4665(B)	Compact high-pressure sensor with PiezoSmart and digital temperature compensation. Robust steel diaphragm for harsh and high dynamic applications. For amplifiers Type 4624A and 4665(B)	High-pressure sensor with front sealing, robust steel diaphragm (harsh/high dynamic application), PiezoSmart, digital temperature compensation. For amplifiers Type 4624A and 4665(B)
Application	• Intake pressure • General pressure	• Intake pressure • Exhaust pressure	• Exhaust pressure	• Exhaust pressure	• Injection pressure	• Injection pressure
Data sheet	003-144	000-003	000-003	003-145	003-165	003-166

Pressure Measurement in Combustion Engines

Sensors and measuring probes, cooled

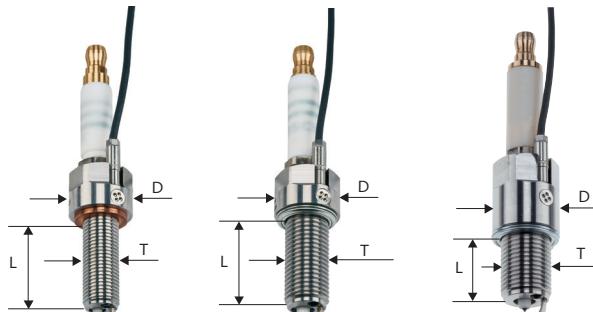


Type 6041B...	Type 6061B...	Type 6067C...	Type 7061C...	Type 6113B...	Type 6115B...	Type 6118B...
0 ... 250 / ... 300****	0 ... 250 / ... 300*	0 ... 250 / ... 300*	0 ... 300	0 ... 200	0 ... 200	0 ... 200
-40	-25	-25	-92	-10	-10	-10
-20 ... 350	-20 ... 350	-20 ... 350	-20 ... 350	-20 ... 200	-20 ... 200	-20 ... 200
11,5	13,5	9,9	16	17,5	18	18,5
7,9	10	9,5	13	12/17,5/19/22/26,5	18/19/26,5/28/25	9,5/19/21,5/25/26,5
M8x0,75	M10x1	M10x1	M14x1,25	M10x1	M12x1,25	M14x1,25
Smallest water cooled pressure sensor, ideal thermal shock behavior and excellent thermal drift stability. Ideal reference sensor. PiezoSmart optional.	Water cooled pressure sensor, ideal thermal shock behavior and excellent thermal drift stability. Ideal reference sensor. PiezoSmart optional.	Sensor properties as Type 6061B... . Special mounting sleeve construction, easy to install and remove. PiezoSmart optional.	Water cooled pressure sensor, best thermal shock behavior and excellent thermal drift stability. Best reference sensor. PiezoSmart optional.	M10 measuring spark plug, sensor flush mounted with high natural frequency. Ceramic insulator, cable and sensor replaceable. PiezoSmart recommended.	M12 measuring spark plug, sensor flush mounted with high natural frequency. Ceramic insulator, cable and sensor replaceable. PiezoSmart recommended.	M14 measuring spark plug, sensor flush mounted with high natural frequency. Ceramic insulator, cable and sensor replaceable. PiezoSmart recommended.
000-516	000-020	000-021	003-042	000-732	000-697	000-699

**** 6041AU20 with reinforced diaphragm

Pressure Measurement in Combustion Engines

Measuring spark plugs



Type 4080A

0 ... 5 / ... 10 / ... 20
0 ... 130 / 0 ... 250
-40 / 150
11
48,7
M6x1

Robust, media separated miniature pressure transmitter. Ideal for on-board applications and applications with limited space.

• Motorsport general purpose
003-136

- 1) Other measuring ranges available
- 2) Other temperature ranges available

PiezoSmart®

Automatic Sensor Identification

Recording of operating time, cycles and classification of pressure values

PiezoSmart is an active system for identifying individual piezoelectric and piezoresistive pressure and acceleration sensors. The main element of PiezoSmart is an electronic data sheet called TEDS (TEDS = Transducer Electronic Data Sheet). This contains all the essential data of an individual pressure sensor and can exchange these with ancillary equipment.

All piezoelectric and piezoresistive pressure sensors from Kistler are available with PiezoSmart.

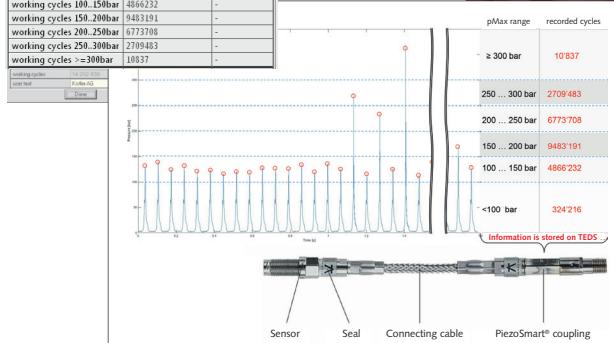
Charge or voltage amplifiers automatically set the correct parameters by exchanging data with the TEDS of the pressure sensor.

- Correct assignment of the sensor data is always guaranteed. Your benefit: enhanced process reliability
- Measurement can take place independently without any database
- Automatic recording of operating time and cycles of PiezoSmart® pressure sensors with classification of pMax values

SCP charge amplifier Type 5064C...



Frame	Value	Status
template name	PIEZOSMART	
template version	0.00	
model	KISTLER	
version letters	C	
serial no.	1414077	
template name	PIEZOSMART	
template version	0.00	
working time	128233.31	hours
working cycles total	3251380	-
working cycles < 100 bar	324216	-
working cycles 100 ... 150 bar	4866272	-
working cycles 150 ... 200 bar	9483191	-
working cycles 200 ... 250 bar	6773708	-
working cycles 250 ... 300 bar	2709483	-
working cycles >= 300 bar	10937	-



TEDS template with working time for a piezoelectric pressure sensor

Automatic recording of operating time of PiezoSmart® pressure sensors with classification of pMax values

Signal Conditioning

Signal Conditioning Platforms and Amplifier Modules

Multichannel

Amplifier

Single channel

Signal conditioning platform	2852B...	2853B...				2853B...	2853B...	
Module								
Application								
Type	5064C...	4665B...	5247	5269	5271	2207A	4624AK...	5018A...
Cylinder pressure	■							■
Fuel pressure		■					■	
Intake pressure		■					■	
Exhaust pressure		■					■	
pMax monitoring	■			■				
Needle lift measurement			■					
Temperature measurement		■ ¹⁾				■ ²⁾	■ ¹⁾	
Voltage measurement					■			
Strain gage measurement					■			
Sensor identification	■	■					■	■
Recording of working time	■							■

¹⁾ Sensor temperature measurement

²⁾ Thermocouple temperature measurement

Combustion Analysis System

KiBox® To Go

Combustion analysis

KiBox® To Go

Accessories



Technical data	
Analog inputs for any voltage signals	channels
Digital inputs	channels
Input voltage range	V
ADC resolution	Bit
ADC sampling rate (per channel, MS/s)	MHz
Space for integrated amplifier modules	–
Low-pass filter	kHz
Min. / Max. temperature	°C
Weight	kg
Dimensions (WxHxD)	mm

Type 2893AK1

Current clamp	Crank angle adapter	Crank angle encoder	Piezoresistive amplifier	Charge amplifier
2105A...	2619A...	2614CK...	4665B1*	5064C11/C12*/C13*
000-953	000-724	003-049	000-724	003-047

Characteristics

The KiBox is a complete combustion analysis system for on-board and test bed applications. The KiBox enables the visualization of the quality of combustion. The combustion parameters are conveniently integrated into the ECU calibration system, test bench system and synchronized with other measurement data.

Data sheet

000-724

* with
PiezoSmart
function

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