

# VOLKSWAGEN AG

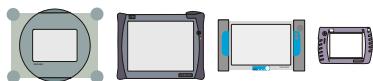
## Vehicle Diagnostic, Testing and Information System VAS 5051B

Operating manual A01.4

08/04

Ausgabestand: 06.08.04





## Safety Instructions

### Meaning of symbols

The safety instructions in the Operating Manual, the Startup/Unpacking Instructions or in other documentation provided, on screen displays on the tester during operation and on the products themselves use symbols with the following meanings:



#### **Warning!**

Text with this symbol contains information for your safety and how you can reduce the risk of severe or fatal injury.

The **WARNING**  symbol warrants particular attention for your safety.



#### **Caution!**

Text with this symbol contains information about how you can avoid damage to the vehicle and the tester.

The **Caution**  symbol tells you that if the information is ignored, damage to the vehicle and/or the tester could result (e.g.: Ensure that the touchscreen is not touched with sharp, edged objects).



#### **Note**

Text with this symbol contains additional, useful information.

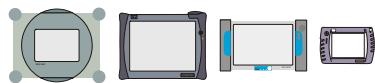
A **Note**  symbol contains other, special instructions for using the device, and related information.



#### **Note**

The general safety instructions are listed in the following. Further instructions are to be found in the Operating Manual. Therefore read **the Operating Manual** before use.

Safety instructions may also appear on the screen of the tester. Follow all the instructions displayed.



## **IMPORTANT SAFETY INSTRUCTIONS**



### **1. Warning!**

Read all instructions.



### **2. Warning!**

Do not operate equipment with a damaged cord or if the equipment has been damaged - until it has been examined by a qualified serviceman.



### **3. Warning!**

Do not let cord hang over edge of table, bench or counter, or come in contact with hot manifolds or moving fan blades.



### **4. Warning!**

An extension cord is not allowed. For testing use only specified cables.



### **5. Warning!**

Always unplug equipment from electrical outlet when not in use. Never yank cord to pull plug from outlet. Grasp plug and pull to disconnect.



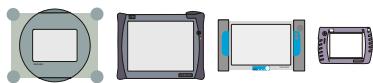
### **6. Warning!**

To protect against risk of fire, do not operate equipment in the vicinity of open containers of fuel (gasoline).

#### **Risk of explosion**

This equipment has internal arcing or sparking parts which should not be exposed to flammable vapour.

This equipment should be located at least 460 mm (18 inches) above the floor.



## 7. Warning!

Adequate ventilation should be provided when working on operating combustion engines.



## 8. Warning!

Use only as described in this manual. Use only manufacturer's recommended attachments.



## 9. Warning!

When connected to electrical power supply, the devices correspond to protection class 1 and are fitted with a safety-tested power cable. They may only be connected to electrical networks with an earthed protective conductor (TN networks) or electrical outlets with earthed protective conductors.



## 10. Warning!

All measurement probes shall be used within their specifications and as described within these instructions. All measurement clamps shall be used on appropriate insulated wiring. Do not conduct measurement, if the wiring is damaged.

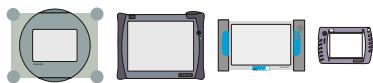


## 11. Warning!

During test drives, secure the tester with a strap on the vehicle's back seat and connect it to the vehicle using the diagnostic cable. A second person must operate the tester from the back seat. Operation from the front seat is too dangerous, e.g. in the event of airbag activation.

### VAS 5051

To supply the VAS 5051 with power from the vehicle battery, use only the 3 m diagnostic cable.



## 12. Warning!

Electrical ignition systems carry currents of up to approx. 30 kV. Observe general safety guidelines for workshops at all times.



## 13. Warning!

If you open the tester or its accessories without authorisation or carry out improper alterations to them, considerable risk to you and to the device may result.



## 14. Caution!

Fluctuations and deviations in the power supply beyond the permitted range of tolerance can lead to malfunctions and damage.



## 15. Caution! VAS 5051 - changing fuse

For inline current measurement with the VAS 5051, only a replacement fuse of the same type and same amperage may be installed in order to avoid risks of fire and to protect the device. To order original parts, refer to the corresponding chapters of the Operating Manual.



## 16. Caution! when connecting other vehicle makes

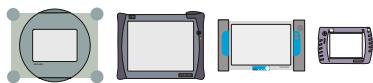
The VAS 505x diagnostic devices were developed for vehicles from the Volkswagen group. If the tester is connected directly to vehicles from other manufacturers, damage to the vehicle could result.

Therefore if vehicles of other makes are to be tested using the general OBD functions in the self-diagnosis application, the OBD adapter cable VAS 5052/16 needs to be connected between the diagnostic cable and the diagnostic connection on the vehicle (with fewer cable connections).



## 17. Caution!

- Battery change may only be performed by qualified personnel.
- Do not short out the battery.
- Do not incinerate the battery.
- Dispose/recycle the battery in accordance with local environmental regulations.



**Warnings because of built-in Bluetooth transceiver**



**18. Warning!**

FCC 15.105: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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**19. Warning!**

FCC 15.19: This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

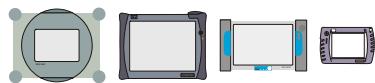
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**20. Warning!**

FCC 15.21: Changes or modifications made to this equipment not expressly approved by COMPANY may void the FCC authorization to operate this equipment.

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## 21. Warning!

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## **SAVE THESE INSTRUCTIONS**

Trade Name: Siemens AG  
Model No: VAS 5051B



FCC ID: LYHVAS5051B

IC: 267AA-VAS5051B

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions. (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



### Note

A Bluetooth interface application for communication with external devices, e. g. diagnostic head VAS 5054 is projected.



## 2 Technical Data

### 2.1 VAS 5051B Operating Unit (Tester)

#### 2.1.1 Operating Data

<b>Dimensions (W x H x D)</b>	Approx. 410 x 310 x 95 mm	
<b>Weight</b>	Approx. 7.6 kg	
<b>Ambient conditions</b> Operation  Transportation and storage	Ambient temperature Relative humidity	+5 to +40 °C by max. +25 °C 10 to 80 %, non-condensing
	Ambient temperature Relative humidity	-20 to +60 °C by max. +25 °C 10 to 80 %, non-condensing
<b>Electrical protection and safety</b>	<p>Safety regulations</p> <ul style="list-style-type: none"><li>- Workshop devices: UL 201</li><li>- Devices for information processing: DIN EN 60950 (VDE 0805), EN 60950, IEC 950, UL 1950, CSA-C22.2 No. 950</li><li>- Testing devices: DIN EN 61010-1 (VDE 0411 Part 1), EN 61010-1, IEC 1010-1</li></ul> <p>Protection class I (as per DIN EN 60950), relevant for the external adapter unit only</p> <p>Protected from water and foreign objects as per DIN VDE 0470 Part 1 (EN 60529, IEC 529)</p> <ul style="list-style-type: none"><li>- Degree of protection: IP 20</li></ul> <p>For company-internal use only</p> <p>Pollution Degree II</p> <p>Overvoltage category I</p>	
<b>Power supply</b>	<p>Power is supplied by one of the following, depending on the application:</p> <ul style="list-style-type: none"><li>- Power adapter</li><li>- Battery</li><li>- Vehicle electrical system</li></ul>	



Power supply from power adapter	
Current consumption	DC 24 V, 5 A
<b>Power supply from the battery</b>	If the external power supply (power adapter, mains power, vehicle electrical system) is interrupted, the tester is buffered with the battery.
Battery type	Li-ION, 14.8 V
Buffer time	Usually 1 h (depending on operating mode, battery state and the external consumers)
Recharge time (on mains)	Approx. 2.5 h (only with adapter unit connected)
<b>Power supply from the vehicle electrical system</b>	The tester can be powered from the vehicle electrical system.
Rated voltages	DC 12 V, DC 24 V
Current consumption in the load range	max. 5 A with 12 V battery voltage
Protection	The input is protected against disturbance variables to DIN 40839 part 1, test pulses 1 to 4, test severity IV. The input is protected against polarity reversal.



External interfaces, wired	
COM1 (V.24)	9-pin Sub-D connector for RS232/RS485
USB interface	4 x USB 2.0 standard
Monitor (VGA)	15-pin Sub-HD socket
Ethernet interface	RJ45 socket
Audio input	Jack bush 3.5 mm
Audio output	Jack bush 3.5 mm, At 8 W load: 200 mW (at 0.1 % distortion)
Power output	At 32 W load: 85 mW (at 0.1 % distortion)
<b>Card reader</b>	Smartcard as per ISO 7816
PCMCIA slot	For PCMCIA cards 1 x type III or 2 x type II
DC input	2-pin mini SNAP socket, size 2.
Socket panel (test instruments)	Mini SNAP sockets
DIAG	Diagnosis interface, 18-pin
URDI	Multimeter, 14-pin, size 3
DSO1, DSO2	Storage oscilloscope, 12-pin, size 2
SZ	Current pick-up, 8-pin, size 2
KV	Kilovolt pick-up, 5-pin, size 1
TZ	Trigger pick-up, 5-pin, size 1
T/D	Temperature/pressure, 10-pin, size 2
<b>External interfaces, wireless</b>	
IrDA	Infrared interface for printer
Bluetooth	Radio interface for extensions

## 2.2 Power Adapter

<b>Power Adapter</b>	The power adapter supplies the VAS 5051B operating unit from the 230 (110) volt network. The power adapter is housed in the workshop trolley.
Rated voltage range	AC 100 to 240 V
Rated frequencies	50 - 60 Hz
<b>DC cable</b>	The DC cable (approx. 1.2 m) is permanently connected to the power adapter.



**Mains cable (internal)**

Plug type

The mains cable (approx. 3 m) is connected to the mains network in the workshop trolley.

Plug for non-heating apparatus **type C13**,  
**EN60320/C13**

Variant 1: Schuko plug, Type VII as per CEE(7) **VII**

Variant 2: USA plug, Type 498 G as per NEMA 5-15



## 2.3 Test Instruments

### 2.3.1 Multimeter



#### Caution

Maximum voltage of the U/R/D/I measuring lead: DC 50 V or 42 V<sub>peak</sub>

Direct voltage at U/R/D/I ( $R_i \geq 1 \text{ M}\Omega$ )	<i>Range</i> -2 to +2 V -20 to +20 V -50 to +50 V	<i>Resolution</i> 0.001 V 0.01 V 0.01 V	<i>Tolerance</i> $\pm 0.5\%$ of m. $\pm 2 \text{ mV}$ $\pm 0.5\%$ of m. $\pm 20 \text{ mV}$ $\pm 0.5\%$ of m. $\pm 50 \text{ mV}$
Alternating voltage at U/R/D/I (effective value, 50 Hz to 5 kHz, crest factor max. 3, $R_i \geq 1 \text{ M}\Omega$ )	<i>Range</i> 0 to 2 V 0 to 20 V 0 to 40 V	<i>Resolution</i> 0.001 V 0.01 V 0.01 V	<i>Tolerance</i> $\pm 1.5\%$ of m. $\pm 4 \text{ mV}$ $\pm 1.5\%$ of m. $\pm 40 \text{ mV}$ $\pm 1.5\%$ of m. $\pm 80 \text{ mV}$
Alternating voltage at U/R/D/I (effective value, 5 kHz to 10 kHz, crest factor max. 3, $R_i \geq 1 \text{ M}\Omega$ )	<i>Range</i> 0 to 2 V 0 to 20 V 0 to 40 V	<i>Resolution</i> 0.001 V 0.01 V 0.01 V	<i>Tolerance</i> $\pm 5\%$ of m. $\pm 4 \text{ mV}$ $\pm 5\%$ of m. $\pm 40 \text{ mV}$ $\pm 5\%$ of m. $\pm 80 \text{ mV}$
Direct current inline ( $R_i \leq 250 \text{ m}\Omega$ ) via U/R/D/I measuring lead	<i>Range</i> -0.2 to 0.2 A -2 to 2 A	<i>Resolution</i> 0.0001 A 0.001 A	<i>Tolerance</i> $\pm 1\%$ of m. $\pm 1 \text{ mA}$ $\pm 1\%$ of m. $\pm 10 \text{ mA}$
Alternating Current inline (effective value, 30 to 500 Hz, crest factor max. 3, $R_i \leq 250 \text{ m}\Omega$ ) via U/R/D/I measuring lead	<i>Range</i> 0 to 0.2 A 0 to 2 A	<i>Resolution</i> 0.0001 A 0.001 A	<i>Tolerance</i> $\pm 1.5\%$ of m. $\pm 1 \text{ mA}$ $\pm 1.5\%$ of m. $\pm 10 \text{ mA}$



Resistance via U/R/D/I measuring lead	<p>The measured current depends on the measurement range and is maximum 5 mA.</p> <table><thead><tr><th>Range</th><th>Resolution</th><th>Tolerance<sup>2)</sup></th></tr></thead><tbody><tr><td>0 Ω to 10 Ω</td><td>10 mΩ</td><td>±1 % of m. ±5 mΩ</td></tr><tr><td>0 Ω to 100 Ω</td><td>0.1 Ω</td><td>±1 % of m. ±50 mΩ</td></tr><tr><td>0 Ω to 1 kΩ</td><td>1 Ω</td><td>±1 % of m. ±1 Ω</td></tr><tr><td>0 Ω to 10 kΩ</td><td>10 Ω</td><td>±1 % of m. ±10 Ω</td></tr><tr><td>0 Ω to 100 kΩ</td><td>100 Ω</td><td>±1.5 % of m. ±100 Ω</td></tr><tr><td>0 Ω to 1 MΩ</td><td>1 kΩ</td><td>±2 % of m. ±1 kΩ</td></tr><tr><td>0 Ω to 10 MΩ</td><td>10 kΩ</td><td>±2 % of m. ±10 kΩ</td></tr></tbody></table> <p>An acoustic signal is heard at a test object resistance of &lt; 2 Ω in continuity measurements in the range 10 Ω.</p> <p><sup>2)</sup> Accuracy in measurement range 10 Ω and 100 Ω is given only after zero balancing</p>				Range	Resolution	Tolerance <sup>2)</sup>	0 Ω to 10 Ω	10 mΩ	±1 % of m. ±5 mΩ	0 Ω to 100 Ω	0.1 Ω	±1 % of m. ±50 mΩ	0 Ω to 1 kΩ	1 Ω	±1 % of m. ±1 Ω	0 Ω to 10 kΩ	10 Ω	±1 % of m. ±10 Ω	0 Ω to 100 kΩ	100 Ω	±1.5 % of m. ±100 Ω	0 Ω to 1 MΩ	1 kΩ	±2 % of m. ±1 kΩ	0 Ω to 10 MΩ	10 kΩ	±2 % of m. ±10 kΩ
Range	Resolution	Tolerance <sup>2)</sup>																										
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Diode test via U/R/D/I measuring lead	<p>Measurement current 1 mA Measurement voltage max. 5 V</p> <p>The current flow direction is indicated by a diode symbol. During the measurement the polarity of the measurement current is reversed.</p>																											
Direct current via current pick-up 100 A	<table><thead><tr><th>Range</th><th>Resolution</th><th>Tolerance</th></tr></thead><tbody><tr><td>-5 to +5 A</td><td>1 mA</td><td>±2 % of m. ±10 mA<sup>1)</sup></td></tr><tr><td>-50 to +50 A</td><td>10 mA</td><td>±2 % of m. ±20 mA<sup>1)</sup></td></tr><tr><td>-100 to +100 A</td><td>100 mA</td><td>±2 % of m. ±200 mA<sup>1)</sup></td></tr></tbody></table> <p><sup>1)</sup> The accuracy of the current pick-up is given only after calibration and without change of position and temperature.</p>			Range	Resolution	Tolerance	-5 to +5 A	1 mA	±2 % of m. ±10 mA <sup>1)</sup>	-50 to +50 A	10 mA	±2 % of m. ±20 mA <sup>1)</sup>	-100 to +100 A	100 mA	±2 % of m. ±200 mA <sup>1)</sup>													
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Alternating current via current pick-up 100 A (effective value, 30 Hz to 1 kHz, crest factor max. 3)	<table><thead><tr><th>Range</th><th>Resolution</th><th>Tolerance</th></tr></thead><tbody><tr><td>0 to +5 A</td><td>1 mA</td><td>±3 % of m. ±15 mA<sup>1)</sup></td></tr><tr><td>0 to +50 A</td><td>10 mA</td><td>±3 % of m. ±25 mA<sup>1)</sup></td></tr><tr><td>0 to +100 A</td><td>100 mA</td><td>±3 % of m. ±200 mA<sup>1)</sup></td></tr></tbody></table> <p><sup>1)</sup> The accuracy of the current pick-up is given only after calibration and without change of position and temperature.</p>			Range	Resolution	Tolerance	0 to +5 A	1 mA	±3 % of m. ±15 mA <sup>1)</sup>	0 to +50 A	10 mA	±3 % of m. ±25 mA <sup>1)</sup>	0 to +100 A	100 mA	±3 % of m. ±200 mA <sup>1)</sup>													
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0 to +100 A	100 mA	±3 % of m. ±200 mA <sup>1)</sup>																										
Direct current via current pick-up 1800 A	<table><thead><tr><th>Range</th><th>Resolution</th><th>Tolerance</th></tr></thead><tbody><tr><td>-900 to +900 A</td><td>0.1 A</td><td>±3.5 % of m. ±1.5 A<sup>1)</sup></td></tr><tr><td>-1800 to +1800 A</td><td>1 A</td><td>±5.5 % of m. ±2 A<sup>1)</sup> ±3.5 % of m. ±2 A<sup>1)</sup> bis ±1500 A</td></tr></tbody></table> <p><sup>1)</sup> The accuracy of the current pick-up is given only after calibration.</p>			Range	Resolution	Tolerance	-900 to +900 A	0.1 A	±3.5 % of m. ±1.5 A <sup>1)</sup>	-1800 to +1800 A	1 A	±5.5 % of m. ±2 A <sup>1)</sup> ±3.5 % of m. ±2 A <sup>1)</sup> bis ±1500 A																
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Alternating current  
via current pick-up 1800 A  
(effective value, 30 Hz to  
500 Hz, crest factor max. 3)

Range	Resolution	Tolerance
0 to +900 A	0.1 A	±5.5 % of m. ±2.5 A <sup>1)</sup>
0 to +1800 A	1 A	±5.5 % of m. ±3 A <sup>1)</sup> ±3.5 % of m. ±2 A <sup>1)</sup> bis ±1500 A

<sup>1)</sup> The accuracy of the current pick-up is given only after calibration.



### Caution

Maximum voltage on DSO measuring lead: 400 V<sub>peak</sub> or 400 V DC

Direct voltage at DSO1  
( $R_i \geq 4 \text{ M}\Omega$ )

Range	Resolution	Tolerance
-1.6 to 1.6 V	0.001 V	±1 % of m. ±4 mV
-4 to 4 V	0.001 V	±1 % of m. ±8 mV
-16 to 16 V	0.01 V	±1 % of m. ±20 mV
-40 to 40 V	0.01 V	±1 % of m. ±40 mV
-160 to 160 V	0.1 V	±1 % of m. ±200 mV
-400 to 400 V	0.1 V	±1 % of m. ±400 mV

Alternating voltage at DSO1  
(effective value,  
30 Hz to 5 kHz,  
crest factor max. 2,  
 $R_i \geq 4 \text{ M}\Omega$ )

Range	Resolution	Tolerance
0 to 1.6 V	0.001 V	±3.5 % of m. ±6 mV
0 to 4 V	0.001 V	±3.5 % of m. ±11 mV
0 to 16 V	0.01 V	±3.5 % of m. ±55 mV
0 to 40 V	0.01 V	±3.5 % of m. ±80 mV
0 to 160 V	0.1 V	±3.5 % of m. ±275 mV
0 to 400 V	0.1 V	±3.5 % of m. ±550 mV

Alternating voltage at DSO  
(effective value,  
**5 kHz** to 10 kHz,  
crest factor max. 2,  
 $R_i \geq 4 \text{ M}\Omega$ )

Range	Resolution	Tolerance
0 to 1.6 V	0.001 V	±4.5 % of m. ±6 mV
0 to 4 V	0.001 V	±4.5 % of m. ±11 mV
0 to 16 V	0.01 V	±4.5 % of m. ±55 mV
0 to 40 V	0.01 V	±4.5 % of m. ±80 mV
0 to 160 V	0.1 V	±4.5 % of m. ±275 mV
0 to 400 V	0.1 V	±4.5 % of m. ±550 mV



### 2.3.2 Temperature Sensor

#### T/P measuring input

*The measuring input is designed for connection of a temperature sensor with a PT100 measuring element.*

### 2.3.3 Pressure Sensor

#### T/P measuring input

*The measuring input is designed for connection of a pressure sensor with a 4 mA to 20 mA interface.*

### 2.3.4 Digital Storage Oscilloscope (DSO)



#### Caution

Maximum voltage on DSO measuring lead: 400 V<sub>peak</sub> or 400 V DC

Measuring leads	DSO1/DSO2 measuring leads kV pick-up Trigger pick-up Current pick-up 100 A, 1800 A Pressure or temperature sensor
Measurement inputs DSO1, DSO2	Make sure that both measurement connections are adapted on each cable. Bandwidth 100 kHz ( $\pm 3$ dB) Resolution 10 Bit Accuracy DC to 10 kHz $\pm 1$ %; 100 kHz -3 dB
Measurement range selection	Manual or automatic in Auto Setup



Measurement ranges DSO1, DSO2	Differential inputs	Voltage divider $\geq 4 \text{ M}\Omega$ , 25 pF against protective conductor potential
	<i>Range</i>	<i>y deflection</i>
	$\pm 0.4 \text{ V}$	50 mV/DIV
	$\pm 1.6 \text{ V}$	200 mV/DIV
	$\pm 4 \text{ V}$	500 mV/DIV
	$\pm 16 \text{ V}$	2 V/DIV
	$\pm 40 \text{ V}$	5 V/DIV
	$\pm 160 \text{ V}$	20 V/DIV
	$\pm 400 \text{ V}$	50 V/DIV



Measuring channels CH1, CH2	Sampling rate	max. 40 MHz in channel 1 mode
	Input bandwidth (-3 dB)	10 MHz (without sensor)
	Sampled-data storage	Depth 64 k (meas.vals.)/channel
	Coupling	AC, DC, GND
	Measuring channels	2
	Measurement inputs	DSO1, DSO2, kV pick-up current pick-up 100 A, 1800 A Pressure or temperature sensor
	<i>Time base</i>	<i>Sampling rate</i>
	1.25 $\mu$ s/DIV	40 MHz <sup>3)</sup>
	2.5 $\mu$ s/DIV	20 MHz
	5 $\mu$ s/DIV	10 MHz
	10 $\mu$ s/DIV	5 MHz
	20 $\mu$ s/DIV	2.5 MHz
	50 $\mu$ s/DIV	1 MHz
	100 $\mu$ s/DIV	500 kHz
	200 $\mu$ s/DIV	250 kHz
	500 $\mu$ s/DIV	100 kHz
	1 ms/DIV	50 kHz
	2 ms/DIV	25 kHz
	5 ms/DIV	10 kHz
	10 ms/DIV	5 kHz
	20 ms/DIV	2.5 kHz
	50 ms/DIV	1 kHz
	100 ms/DIV	500 Hz
	200 ms/DIV	250 Hz
	500 ms/DIV	100 Hz
	1 s/DIV	50 Hz
	2 s/DIV	25 Hz
	5 s/DIV	10 Hz
	10 s/DIV	5 Hz
	20 s/DIV	2.5 Hz <sup>4)</sup>
	50 s/DIV	1 Hz <sup>4)</sup>
	100 s/DIV	0.5 Hz <sup>4)</sup>

<sup>3)</sup> In channel 1 mode

<sup>4)</sup> Only in Draw mode



Measurement range kV	<b>Range</b> ±8 kV ±20 kV ±40 kV	<i>y deflection</i> 1 kV/DIV 2.5 kV/DIV 5 kV/DIV	<b>Tolerance</b> ±15 % of m. ±200 V ±15 % of m. ±400 V ±15 % of m. ±800 V
	<p>The size of the measurement error depends on the ignition cable insulation and applies to use in vehicle systems with mechanical distributors. The kV input and the kV pick-up (ignition voltage adapter) form a capacitive voltage divider. The tester can be adapted to a stationary ignition distributor system by external connection of the ignition voltage adapter.</p>		
Trigger pick-up input	To record ignition timing on high-voltage cables (secondary ignition coil)		
Trigger functions	Trigger channel Trigger coupling Trigger edge Trigger level Trigger delay Trigger mode	DSO1, DSO2, Trigger pick-up or kV pick-up AC, DC, HF, LF positive, negative Automatic or adjustable in 1 % measurement range increments Pre-trigger and post-trigger, adjustable in 10 % deflection increments Single, Normal, Auto, Auto Level, Auto Setup, Draw mode	



## 2.4 Measuring Leads

Diagnostic cable	5 m
Diagnostic cable, optional	3 m
Diagnostic adapter	0.3 m (for testing old vehicles)
Diagnostic cable LT, optional	3 m
Cable bend diameter	10 x cable diameter
Plug cycles	> 1.000

## 2.5 Mains Cable on Workshop Trolley

<b>Mains cable</b>	<p>The mains cable (6 m) can be replaced with a mains cable of the type applicable in the country of use. The mains cable must comply with the standard for operating appliances on an earthed power supply network.</p> <p>(VDE 0805, EN 60950, IEC 950, UL 1950, CSA 22.2 No. 950)</p> <p>For operation in the USA and Canada, use a UL cable, an oil resistant cable or a CSA-approved mains power cable.</p>
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