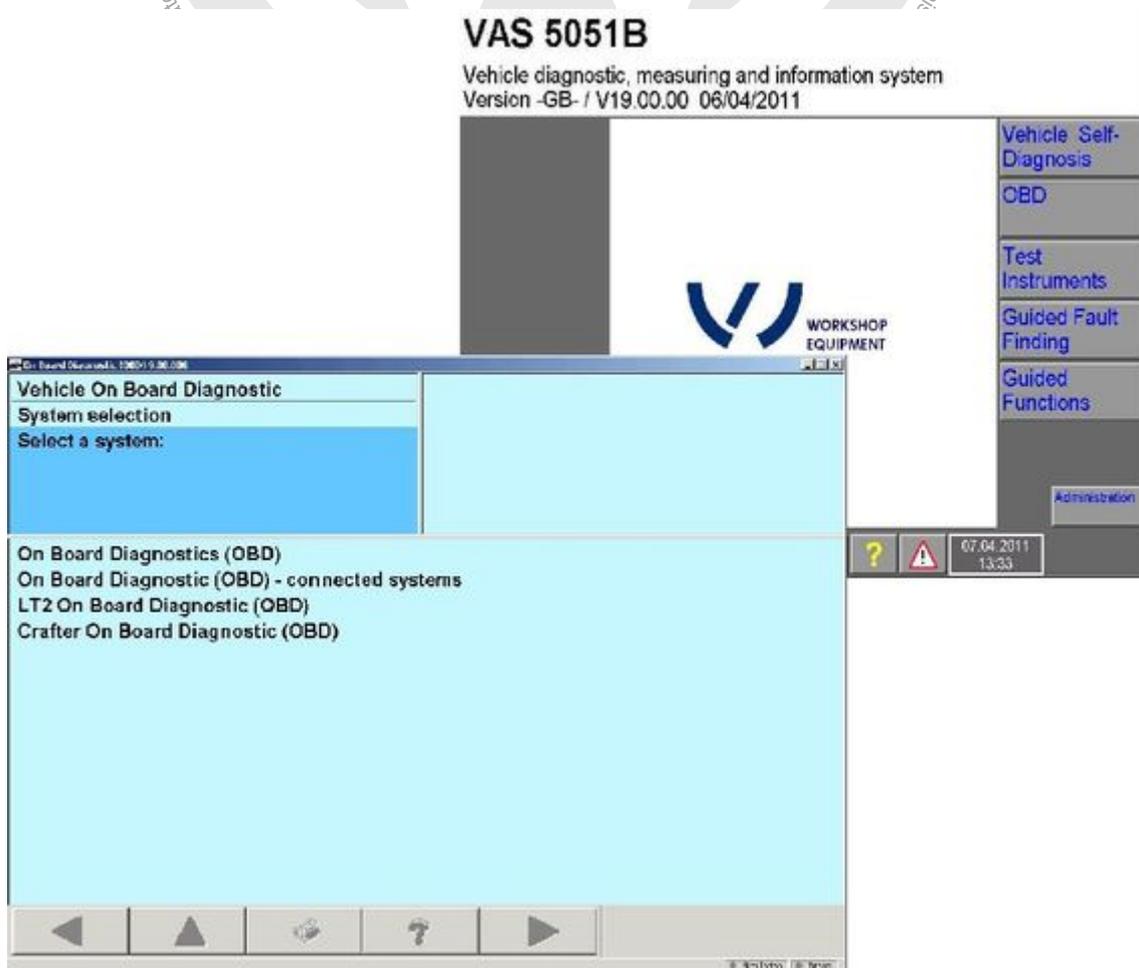


VOLKSWAGEN AG

Vehicle Self-Diagnosis

Operating Manual, Self-Diagnosis

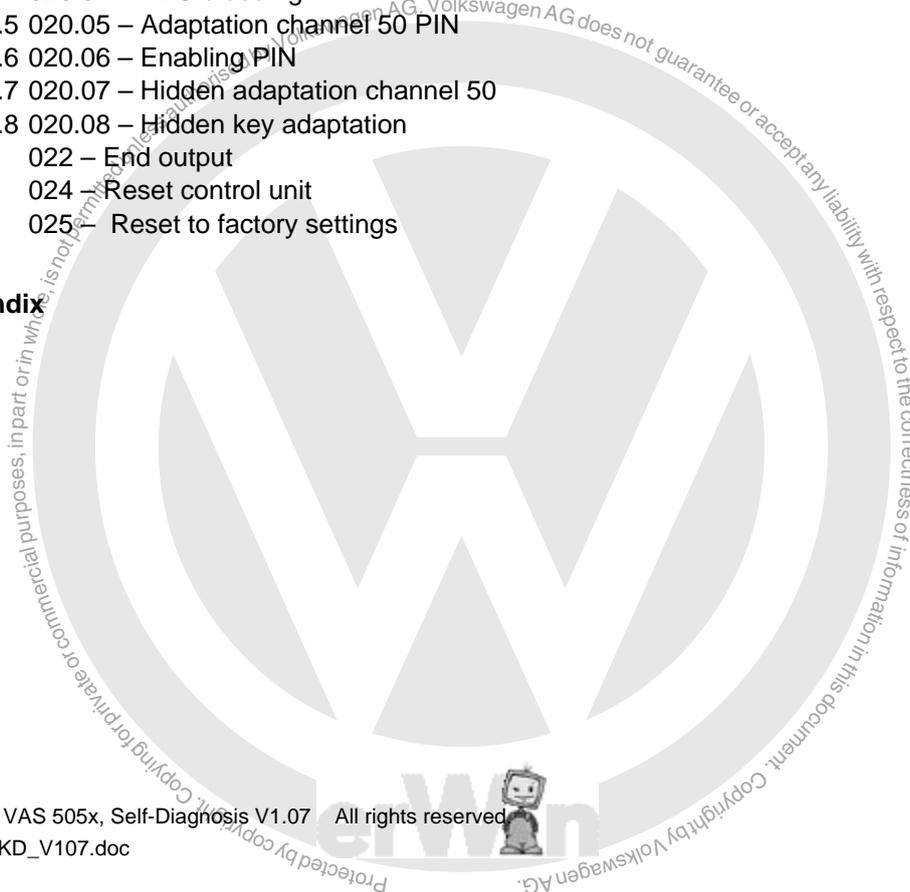
V1.07



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1 General information

1.1 General notes

This operating manual contains the information you will need to operate the vehicle self-diagnosis system of Workshop Tester VAS 505x and VAS-PC. The vehicle self-diagnosis is also referred to in the document as “tester”.

The masks displayed may deviate slightly in content from the masks displayed on the tester. The contents of the masks are partly created via a vehicle system simulation. This means that the values shown in them are artificially generated and cannot be transferred to real vehicle systems.

1.2 Using the operating manual

The operating manual is installed on the device in electronic form. You can open the operating manual in the vehicle self-diagnosis by pressing the ? button.

1.3 Starting vehicle self-diagnosis

The “*Vehicle self-diagnosis*” operating mode is activated by pressing the “*Vehicle self-diagnosis*” button on the start mask (see Figure 1-1).



Figure 1-1 Start mask, activating “*Vehicle self-diagnosis*”

1.4 Starting OBD

The OBD functions are available for communication with vehicle systems that support the standard "SAE J1979: 1991-12 E/E Diagnostic Test Modes" (according to ISO/DIS 14230-4 (KWP2000) and ISO/DIS 11519-4 (SAE J1850)) and react to the commonly used address 33H. OBD operating mode is activated via the appropriate button on the start mask (see Figure 1-2). A selection of the masks for OBD functions is described in section 3.4.

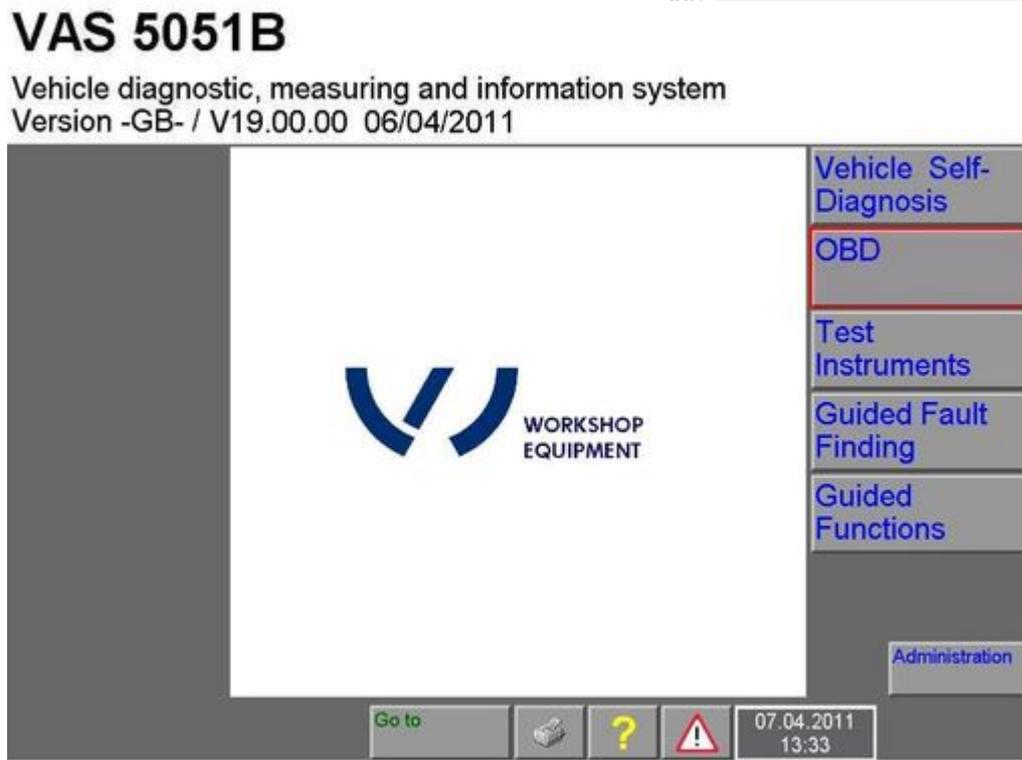


Figure 1-2 Start mask, activating OBD

2 Basic functions

2.1 Overview

In *Vehicle self-diagnosis* operating mode, you can communicate with all vehicle systems available on the diagnostic bus if the diagnostic cable is connected and the ignition is switched on. Use the selection mask to select the vehicle system to be diagnosed. Afterwards you can start the possible diagnostic functions for this vehicle system.



Note



The **OBDD** button takes you directly from the start mask to the list of OBD functions; see chapter 3.4.

To use the *vehicle self-diagnosis* application, you need the appropriate repair guide. If you select a vehicle system that is not installed in the connected vehicle, a malfunction message is displayed:

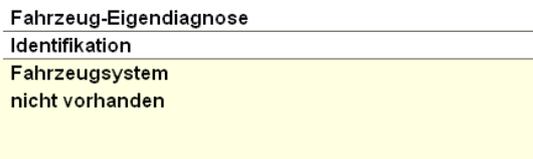


Figure 2-1 Malfunction message, vehicle system not available

A message is also displayed if you select a diagnostic function that the vehicle system does not recognise or if this function is not currently executable:

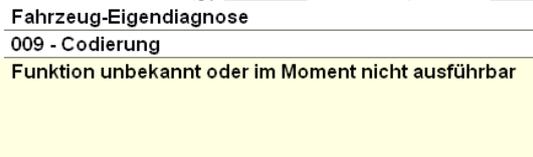


Figure 2-2 Malfunction message, function unknown or not currently executable



Note for VAS 5051B

After switching to the *Test instruments* operating mode, you can also display selected measured values from the *vehicle self-diagnosis* application there.

2.2 User interface elements

The user interface is described using the following mask.

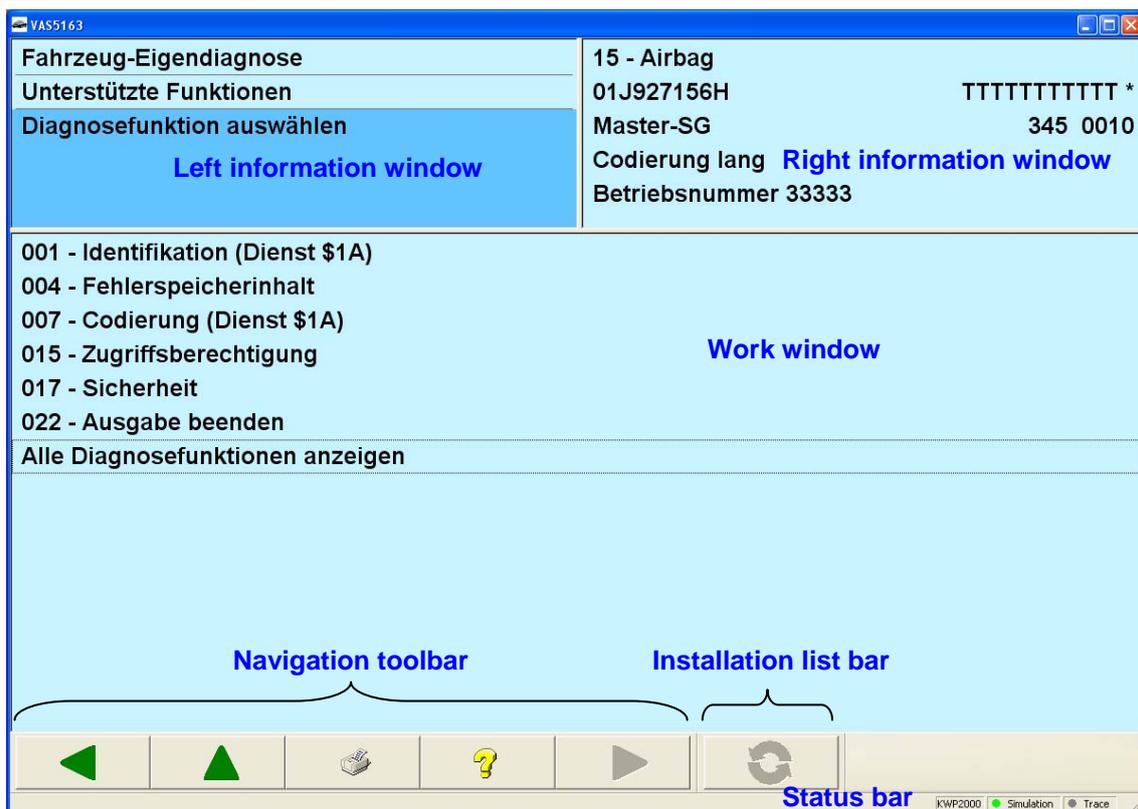


Figure 2-3 VAS505x user interface

2.2.1 Left and right information windows

Most masks have two information windows (Figure 2-3) above the work window.

The left information window (LIW) displays the following information:

- 1st line (LIW1):** name of the operating mode (vehicle self-diagnosis, administration)
- 2nd line (LIW2):** Name of the function currently activated in this operating mode (e.g., identification, supported functions).
- 3rd, 4th lines (LIW3):** Operating instructions (e.g., Select diagnostic function), status display (e.g., Function not found) or detailed information on the displayed function.

The right information window (RIW) shows the results of the vehicle identification after a connection to a vehicle system has been established. If the RIW is clicked on when the vehicle identification is shown, then the standard identification is displayed in the work window. Clicking on it again will change the display back to the original contents of the work window.

After a connection to a vehicle system interconnection has been established, a list with the interconnected vehicle systems is shown instead of the vehicle identification. If a vehicle system in the list is clicked on, the information about this vehicle system appears in the work window.

2.2.2 Work window

The work window (Figure 2-3) takes up the largest part of the mask. Program functions, diagnostic functions and their results are displayed here.

2.2.3 Navigation toolbar

In the *vehicle self-diagnosis* masks, you can use the navigation toolbar buttons (see Figure 2-4) to select vehicle systems and functions.



Note

You can also switch to the other available operating modes and, if present, to the test instruments. For the other operating modes, this requires that you have already switched out of them and into the vehicle self-diagnosis system.

The buttons on the navigation toolbar are explained below.



Figure 2-4 Navigation toolbar

“Go to” button



Figure 2-5 Go to button

The **Go to** button has the following menu entries:

- Administration:** From the start mask and the *Select vehicle system* mask, go to the *Administration* mask.
- Guided Fault Finding:** Go to *Guided Fault Finding*.
- Guided Functions:** Go to *Guided Functions*.
- Test Instruments:** Go to the *Test Instruments*.
- Compiling services:** Go to *1001 – Compiling services*.
- Cancel:** Cancel the current function
- End:** End the diagnosis and return to the start mask.



“Continue” button



Figure 2-6 **Continue** button

The **Continue** button can be used to execute the list entry currently selected.

“Back” button



Figure 2-7 **Back** button

You can use the **Back** button to exit the mask currently displayed and return to the previous mask.

“Help” button



Figure 2-8 **Help** button

Press this button to open the operating manual.

“Print” button



Figure 2-9 **Print** button

If the self-diagnosis protocol has not been filled out yet, the **Print** button is only available after setting up communication with the vehicle system.

Vehicle identification number and license plate number can be entered using the **Enter Vehicle Identification Number / registration plate** menu point. The data is copied into the self-diagnosis protocol and displayed there.

Eigendiagnoseprotokoll befüllen
Eigendiagnoseprotokoll speichern
Bildschirm (Drucker)
Eigendiagnoseprotokoll (Drucker)
Ausgabemedium wählen
Fahrzeug-Ident.-Nr./Kennzeichen eingeben
Hardware sicher entfernen

Figure 2-10 Menu of the **Print** button before the protocol has been filled out

Eigendiagnoseprotokoll anzeigen Eigendiagnoseprotokoll speichern
Bildschirm (Drucker) Eigendiagnoseprotokoll (Drucker)
Ausgabemedium wählen Fahrzeug-Ident.-Nr./Kennzeichen eingeben
Hardware sicher entfernen

Figure 2-11 Menu of the **Print** after the protocol has been filled out

The context menu of the **Print** button has the following menu items (Figure 2-10 and Figure 2-11):

Fill in self-diagnosis protocol: After communication setup, you can copy the current screen contents into the self-diagnosis protocol using this function. With each activation, the current screen contents are attached to the existing self-diagnosis protocol.

If you have selected a new vehicle system before selecting the **Fill in self-diagnosis protocol** function and if a protocol already exists, you will be asked whether or not you want to erase the protocol. If you select **Yes**, the previous data is overwritten. If you select **No**, the new data is attached to the previous data.

The **Back** button closes the display of the self-diagnosis protocol and you can continue your work in the screen mask last displayed.

Display self-diagnosis protocol: You can use this function to display the Self-diagnosis protocol on the screen.

Save self-diagnosis protocol: After filing it out, you can save the self-diagnosis protocol with this function. If the Chassis number and the license plate number have not been entered yet, a window appears with an input option.

Screen (Printer) or Screen (External memory drive): You can print the current screen contents using this function or save them as a file on the connected external memory drive. You can determine the output medium (printer or external memory drive) using the **Select output medium** function.

Self-diagnosis protocol (Printer) or Self-diagnosis protocol (External memory drive): You can print the self-diagnosis protocol on the printer or save it as a file on the external memory drive. The output medium (printer or external memory drive) can be determined using the **Select output medium** function.

Select output medium: Selection of the output medium on which the screen printout or the self-diagnosis protocol is output.

Enter vehicle identification number/license plate: Before outputting the protocol, you can use the alphanumeric keyboard which appears to enter the chassis number and the license plate number of the vehicle being diagnosed, thereby ensuring clear assignment of the protocol to the vehicle. When protocols are saved to external memory drives, the chassis number also appears in the file name. For this reason, you must enter it before saving. The chassis number and the license plate number are deleted again when the operating mode is exited.

Safely remove hardware: If you wish to remove the external memory drive from the tester, activate this function first. That ensures that all the data is written on to the external memory

drive before the external memory drive is removed. After selecting this function, the external memory drive is no longer available and needs to be reconnected before it can be used again.

If the self-diagnosis protocol has not been saved or printed yet on closing the tester, a message appears requesting the printing of the protocol. **Yes** prints the self-diagnosis protocol on the default printer. **No** exits self-diagnosis without printing the self-diagnosis protocol. The self-diagnosis protocol is saved automatically and can be printed the next time self-diagnosis is opened.

The next time that work is carried out using self-diagnosis, if the self-diagnosis protocol is filled out again, a message appears asking whether the old self-diagnosis protocol is to be erased. If you select **Yes**, the old self-diagnosis protocol is erased and a new self-diagnosis protocol is generated and filled in with the current screen contents. The chassis number and the license plate number have to be re-entered. If **No** is selected, the old self-diagnosis protocol is maintained and the current screen contents are attached.



Note

Protocols are output in XML format in the VAS 505x, together with the corresponding format file *Format.xml*. When data is written to external memory drives, viewing the data on a PC will require the appropriate application, such as Internet Explorer 6.0. If several protocols are written to the external memory drive, the format file is still written just once and determines the format of the pages displayed.

2.2.4 Installation list bar

The installation list bar consists entirely of the **Interrogate the vehicle installation list** button.

You can trigger a new read-out of the vehicle installation list with the **Interrogate the vehicle installation list** button in the *Select vehicle system* mask. This button is only active if the *Self diagnosis* grouping has been selected and the cyclical interrogation of the vehicle installation list has been deactivated in the administration (2.3) under **Configure diagnosis access**.



Figure 2-12 **Interrogate the vehicle installation list** button

2.2.5 Status bar

Information about the activated settings of the tester are displayed in the status bar.



The status bar consists of up to three fields which appear depending on the setting or the displayed mask. From left to right, this includes:

Field 1: Diagnostic protocol display

After the connection to a vehicle system has been setup, the diagnostic protocol being used by the tester is shown here. The field only appears when the connection to a vehicle system has been established.

- KW1281: For the diagnostic protocol KW1281 (on CAN or K-line)
- KWP2000: For the diagnostic protocol KW2000 (on CAN or K-line)
- LT2: For the diagnostic protocols in commercial vehicle 2 (LT2)
- DiagCAN-DC: For the diagnostic protocol diagnostics on CAN for Crafter vehicle systems by Daimler
- UDS: For the UDS diagnostic protocols (on CAN) in corporate vehicles besides the Crafter.

Field 2: Display for activated control unit simulation

For training and test purposes, the answer behaviour of vehicle systems can be simulated. Whether the simulation is activated will be displayed here. No communication with a real vehicle system is performed in this case.

Field 3: Display for an activated trace recording

During a diagnostic session, diagnosis and program sequence data (so-called traces) can be recorded. You can see here whether the trace recording has been activated.

2.2.6 Screen keyboards

Many diagnostic functions require the input of numerical values by the user. The entry can either be made via the keyboard at the computer or with the screen keyboard which appears. Values are entered using keys for numbers and/or letters. Erroneous entries are corrected with the **C** key. The **Q** key is used to accept the entered value.

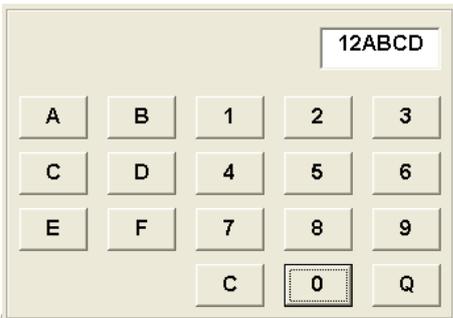


Figure 2-13 Screen keyboard for the entry of hexadecimal values

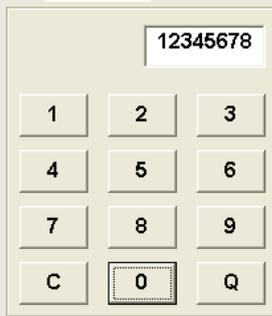


Figure 2-14 Screen keyboard for the entry of decimal values



Figure 2-15 Screen keyboard for the entry of letters and numbers

2.3 Administration

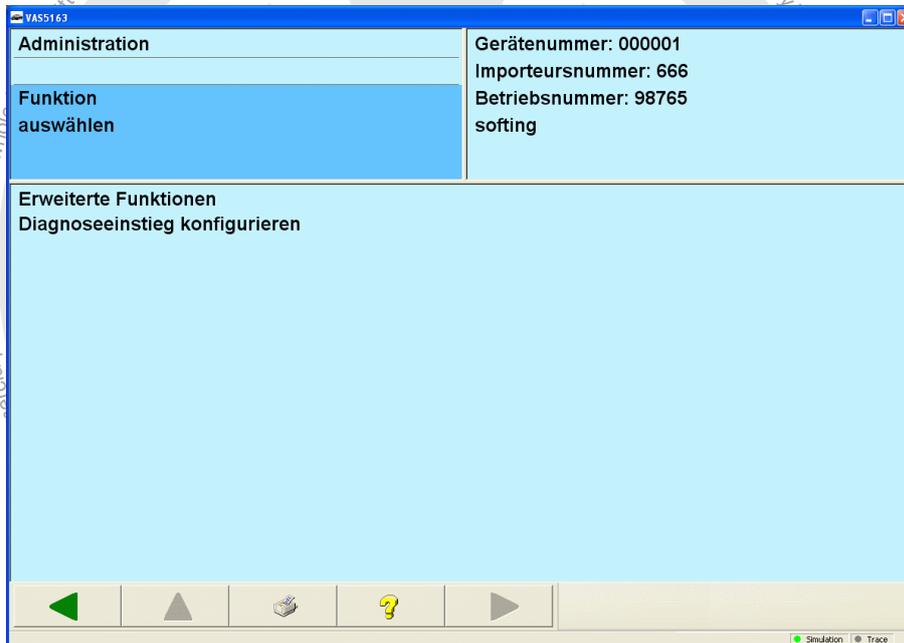


Figure 2-16 Administration

The following configuration options are available:

Expanded functions

Under **Expanded functions**, you can activate the control unit simulation and the trace recording. Enabling by means of an enabling code is necessary for activation.

Configuring diagnosis access

This offers the possibility of controlling the interrogation of the vehicle installation list. This refers to the *Select vehicle system* mask when the *Self-diagnosis* grouping has been selected.

Cyclical interrogation of the vehicle installation list

Two operating modes are possible:

Active: The installation list is cyclically interrogated and updated.

Inactive: The installation list is only interrogated once. A re-interrogation can be triggered by the **Interrogate the vehicle installation list** button.

Cycle time in milliseconds:

If active has been selected for the cyclical interrogation, you can enter a time here which is to be waited after the conclusion of the list compilation until the start of the next interrogation. A value of 0 leads to immediate re-interrogation.

2.4 Groupings of the vehicle systems

After the start of *Vehicle Self-Diagnosis*, the tester offers you a list of system groupings.

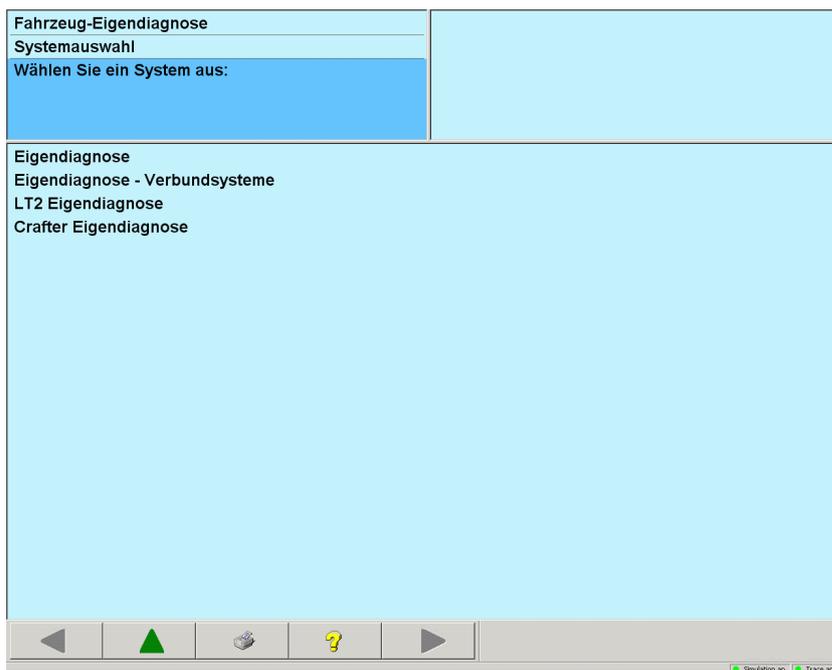


Figure 2-17 System selection

The vehicle systems offered for selection in the *Vehicle self-diagnosis* operating mode can be grouped by various criteria. That is, before communication setup with a vehicle system, you must select which vehicle systems should be offered for selection. The vehicle systems are grouped either by series (e.g. **Crafter self-diagnosis**) or according to a certain sequence (VIS access) to determine vehicle systems (e.g. **Self-diagnosis**).

The following selection options are available:

- **Self-diagnosis**

The tester carries out an automatic bus system and diagnostic protocol identification (VIS access). Only the vehicle systems that are installed in the vehicle will be offered.

The self-diagnosis can be performed via the bus systems K-line, CAN Low Speed 100 kBaud or CAN High Speed 500 kBaud (1 MBaud, see compiling services). The communication using the following diagnostic protocols is supported:

- KWP2000 via K-line
- KWP2000 via TP 1.6
- KWP2000 via TP 2.0
- KWP1281 via K-line
- UDS via ISO-CAN

Interconnected vehicle systems are not offered under **Self-diagnosis**.

- **Self-diagnosis – interconnected systems**

All interconnected vehicle systems are offered for selection.

- **LT2 self-diagnosis**
All vehicle systems for the LT2 commercial vehicle are offered for selection.
- **Crafter self-diagnosis**
All vehicle systems for the Crafter are offered for selection.

The presence of a vehicle system in the selection list does not mean that it is actually present in the vehicle to be diagnosed.

3 Vehicle self-diagnosis

3.1 Selecting the vehicle system

After selecting a system group, the **Select vehicle system** mask appears. Vehicle systems are offered to you for selection in this mask.

The **Self-diagnosis** grouping is a special case. Under **Self-diagnosis**, the list of vehicle systems is dynamically structured. In addition, the tester reads the chassis number from the vehicle and shows it in the right information window.

If the tester cannot read out the chassis number, then the user will be queried about this by a dialog (Figure 3-1). A valid chassis number (17 characters) must be entered here. Otherwise the dialog can only be exited via **Cancel**, whereupon the list of the system groupings will continue to be shown.

Figure 3-1 Dialog box Vehicle Identification Number (VIN) and license plate

Afterwards the tester will read the current list of all installed vehicle systems from the Gateway-ECU, the so-called **Databus OBD Interface**, and offer them for selection. Depending on the setting under **Configure diagnosis access** in administration (2.3), the list is updated automatically in a cyclical manner or manually upon request.

Additionally, status information from the Gateway-ECU will be displayed for each of the offered control units. This display is dependent on the Gateway generation. If the tester could not read out any information from the Gateway-ECU, then all vehicle systems which are known to the tester will be offered. In this case no status information will be shown.

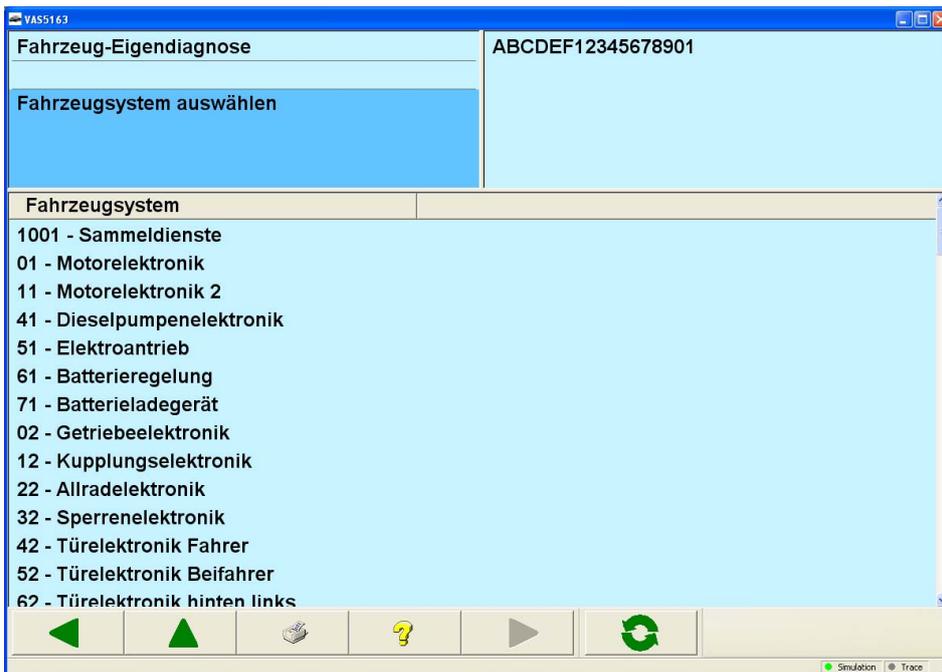
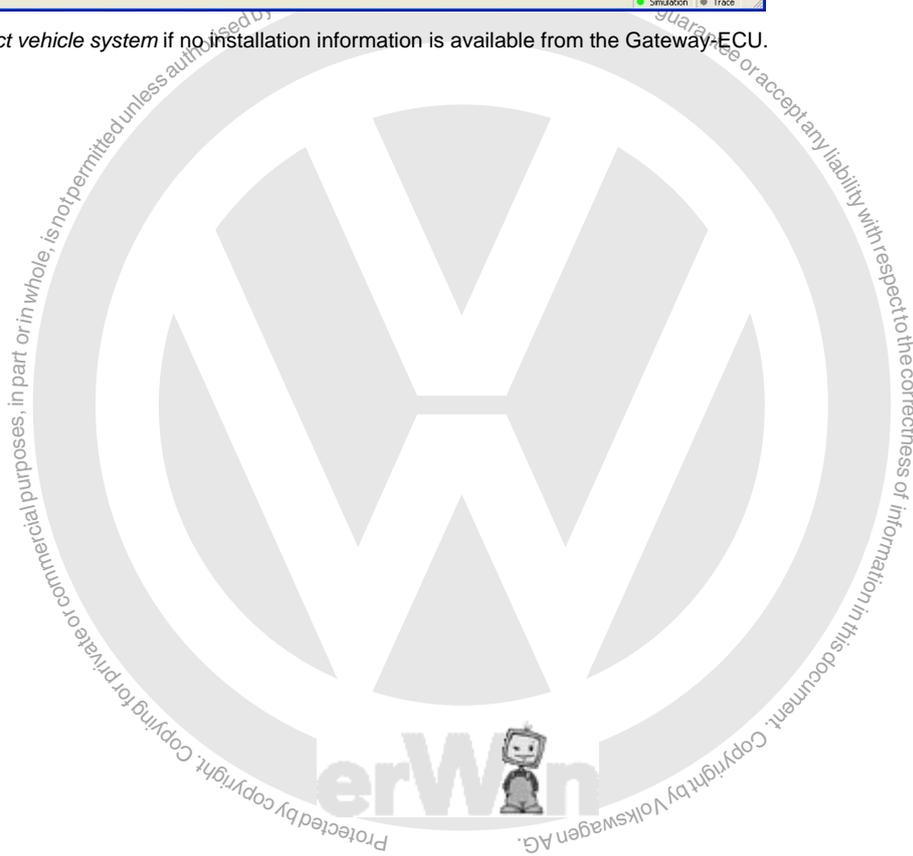


Figure 3-2 Select vehicle system if no installation information is available from the Gateway ECU.



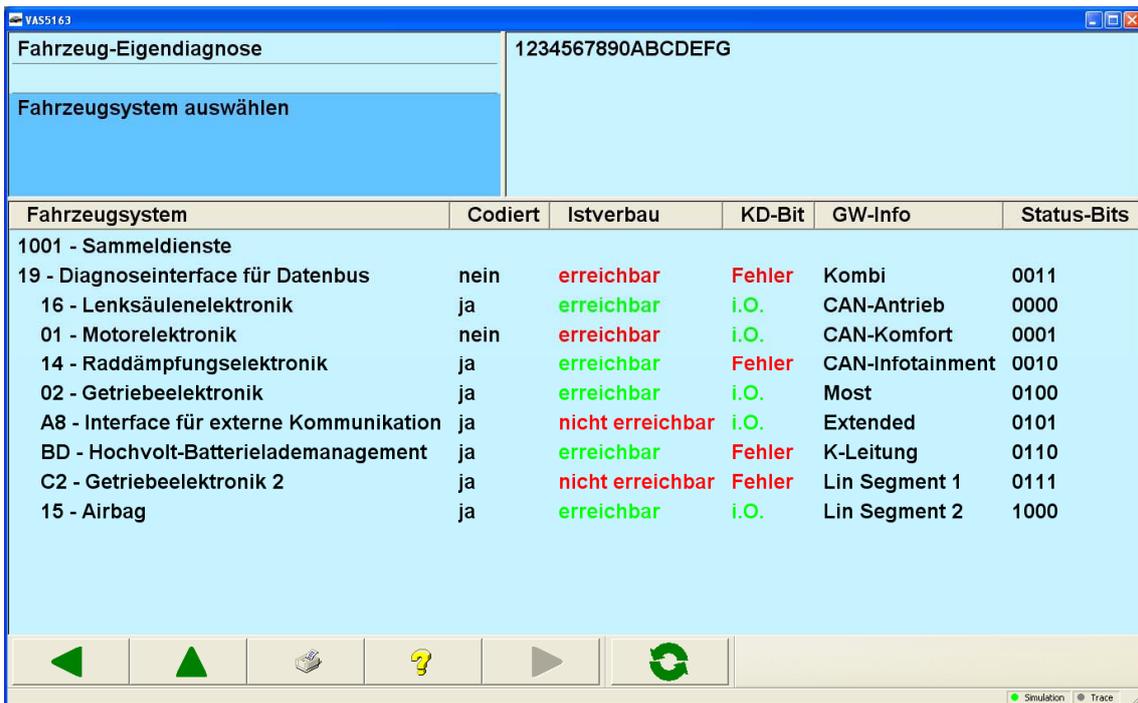


Figure 3-3 Select vehicle system if a Gateway-ECU delivers installation information according to the diagnosis protocol KWP2000 on TP 2.0.

Status	Status bits	Meaning
OK	0000	Communication OK. DTC memory is empty
OK	1000	There are malfunctions filed in the Gateway-ECU due to sporadic communication malfunctions
Cannot be reached	11xx	Static communication malfunction
malfunction	x010	DTC memory is not empty
Not registered	0001	Control unit not coded

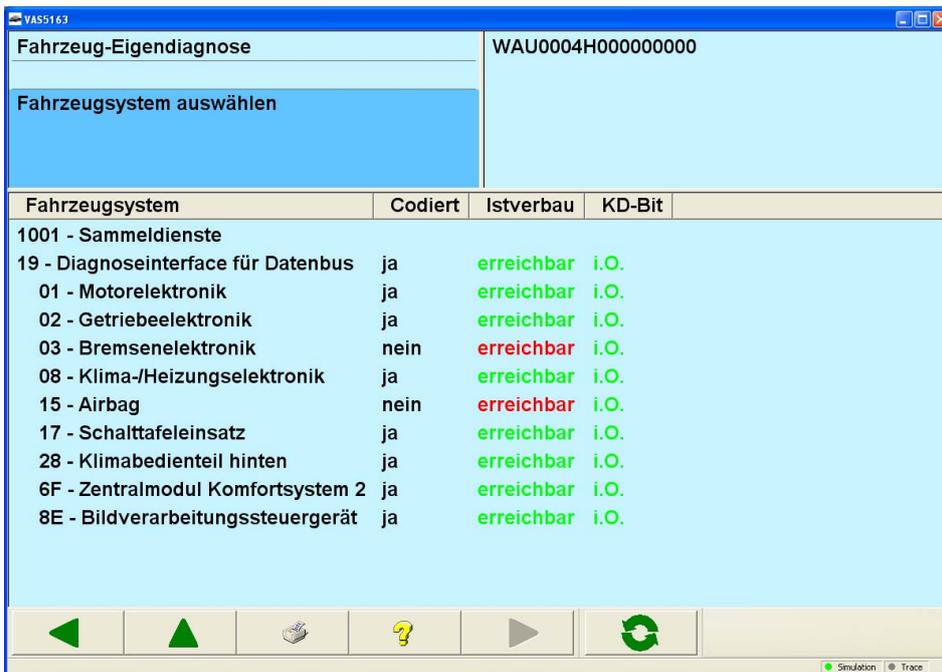


Figure 3-4 Select vehicle system if a Gateway-ECU delivers installation information according to the diagnostic protocol UDS (D4).

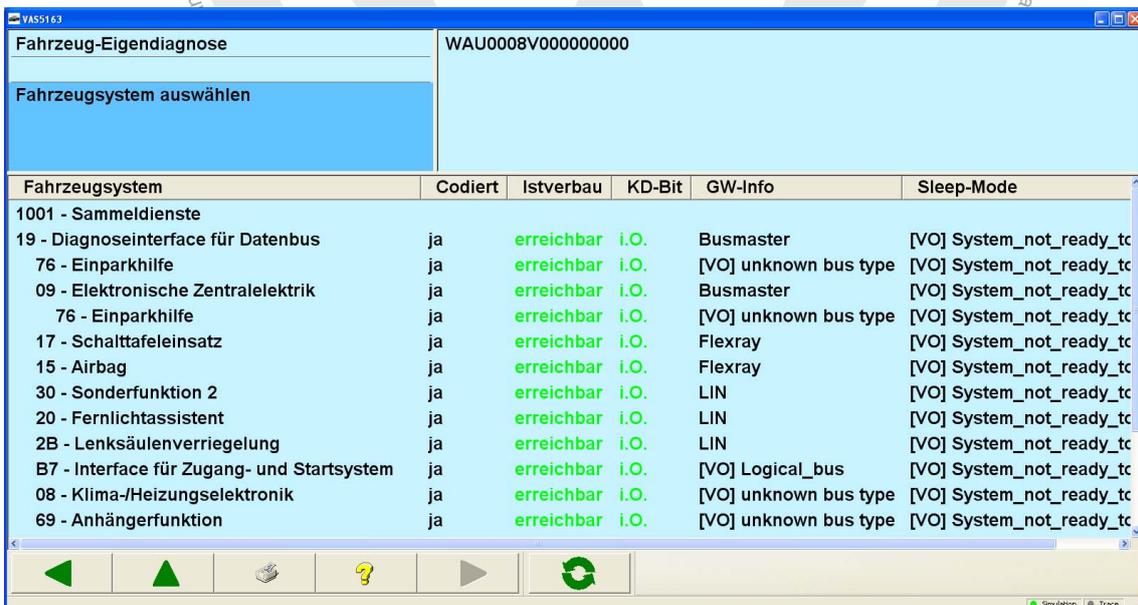


Figure 3-5 Select vehicle system if a Gateway-ECU delivers installation information according to the diagnostic protocol UDS (MQB).

If the cyclical interrogation of the vehicle installation is not active, a new read-out of the list of vehicle systems can be triggered via the **Interrogate the vehicle installation list** button (see chapter 2.2.4).

The cyclical interrogation of the installation list can be activated or deactivated in administration (2.3) under **Configure diagnosis access**.

After the selection of a vehicle system, **Continue** is used to establish communication via the diagnostic bus. The procedure is indicated in the left information window by the text *Communication setup*.

After communication has been set up, the identification data is read from the vehicle system and displayed in the right information window. In the work window, a selection of diagnostic functions appears (see chapter 3.3).



Note

Before you can use certain security-protected functions, you may need to transmit an identification number to the vehicle system first using the function **015/016 – Access authorization** for these functions to be enabled.



3.1.1 Special case 31 – Engine electronics connection

If you are addressing an individual vehicle system (e.g. via the **01 – Engine electronics** selection) which is a part of a vehicle system interconnection, a message appears:

The selected vehicle system is working together with other vehicle systems.

Do you want to continue working with the individual vehicle system?

The extent of the diagnosis is limited for the individual vehicle systems.

If you select an engine control unit individually instead of via interconnection, a star symbol is displayed after the system name in the right information window to indicate a connection.

After selection of the **31 – Engine electronics connection** function, the control unit's version data is automatically identified and displayed on a mask in the work area. Pressing **Continue** takes you to the selection of functions.

The **003 – Identification** diagnostic function lists all interconnected control units along with their identification data in the work window.

The **004.01 – Checking DTC memory** diagnostic function reads the malfunctions of all the interconnected vehicle systems and lists them in the order in which the vehicle systems are read. Each diagnostic function begins with the first interconnected vehicle system recognised after starting. Only those functions supported by the selected interconnection are displayed.

For the diagnostic functions **005 – Final control diagnosis**, **006 – Basic setting**, **011 – Measured values** and **012 – Adaptation**, all recognised vehicle systems are displayed in a list in the right information window (see Figure 3-6). In the list, you can switch to a different vehicle system by selecting the line of the vehicle system. The selection bar indicates the control unit you have selected.

The **007 – Code control units** diagnostic function automatically codes all interconnected vehicle systems and, after coding, lists them together with the new data in the work window – not in the right information window as is the case with individual vehicle systems.

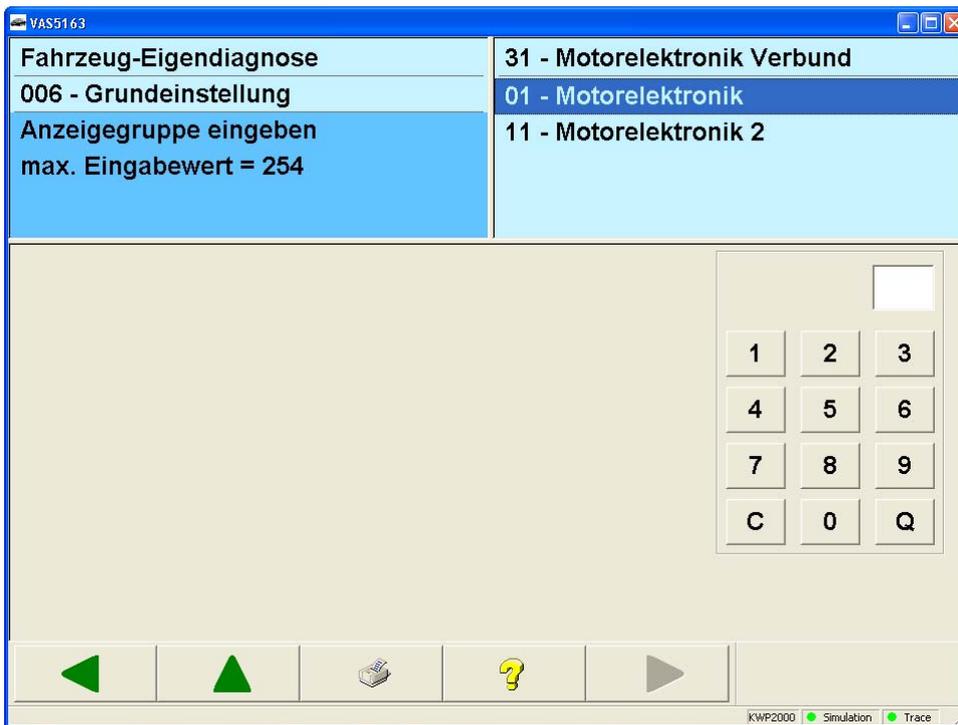


Figure 3-6 Selection in the right information window (basic setting mask as example)



3.2 1001 – Compiling services

The compiling services are vehicle-specific diagnostic functions. Depending on the selected grouping (see chapter 2.4), the tester will only offer a subset of the following list.

- 1001.01 – Checking DTC memory – Entire system
- 1001.02 – Erase DTC memory – Entire system
- 1001.03 – Activate transport mode
- 1001.04 – Deactivate transport mode
- 1001.05 – Erase DTC memories – All OBD systems
- 1001.07 – Diagnosis with 1 MBaud
- 1001.08 – Diagnosis with 500 kBaud

3.2.1 1001.01 – Checking DTC memory – Entire system

Basically, this function is used to read the contents of the DTC memory from all vehicle systems in the current grouping (see chapter 2.4). Only the vehicle systems which could be contacted are in the results list. The number of malfunctions that are entered in the DTC memory is given for each vehicle system. “No malfunctions” is displayed by a green tick.

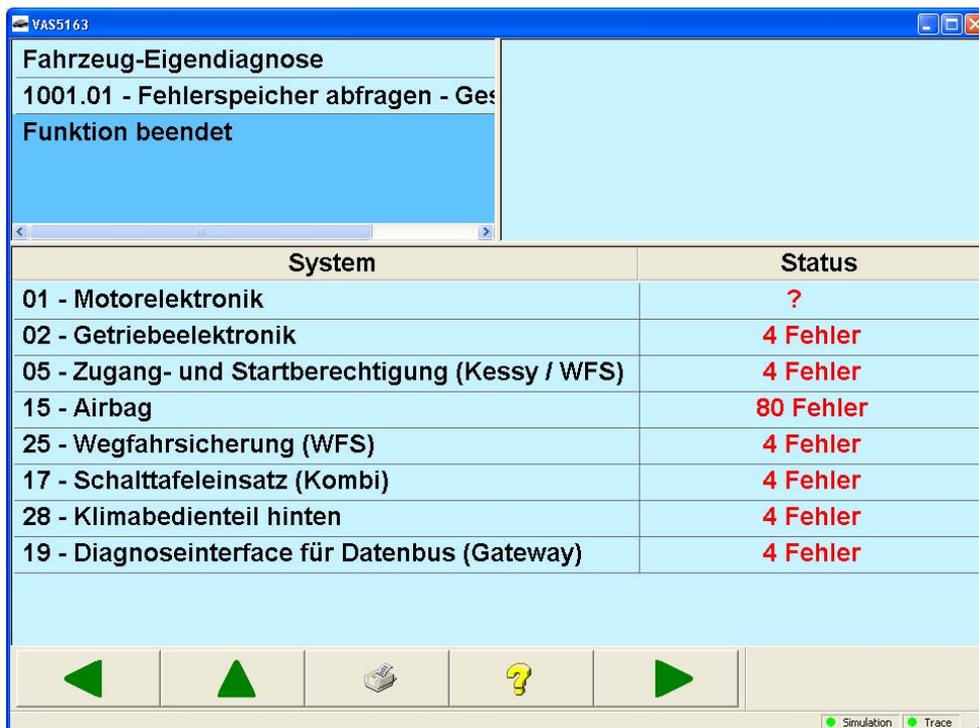


Figure 3-7 Checking DTC memory – Entire system for Gateway installation list

You can cancel the function with the **Back** button. All the DTC memory entries recognised up to then will be output.

After all DTC memories have been retrieved, you can view information on individual malfunctions by pressing **Continue**.



Kennzahl	SAE-Code	Text	Status
01 - Motorelektronik			?
02 - Getriebeelektronik			4 Fehler
00016	P0010	Bank1, Nockenwellenverstellung Einlass Unterbrechung	sporadisch
00017	P0011	Bank1, Nockenwellenspätverstellung Soll nicht erreicht	sporadisch
01027	P0403	Ventil für Abgasrückführung Fehlfunktion	
01028	P0404	Abgasrückführungssystem Regeldifferenz	statisch
05 - Zugang- und Startberechtigung (Kessy / WFS)			4 Fehler
00016		Stellmotor Fußraum-/ Defrostklappe hinten rechts-V195	sporadisch
00017		Stellmotor Fußraum-/ Defrostklappe hinten links-V196 oberer Grenzwert überschritten	sporadisch

Figure 3-8 Checking DTC memory – Entire system

3.2.2 1001.02 – Erase DTC memory – Entire system

This function tries to erase the DTC memories of all vehicle systems in the vehicle. This is done first via a TP 2.0 broadcast service and then by a functional UDS service.



Note

This function is not available in the **Crafter self-diagnosis**.

3.2.3 1001.03 – Activate transport mode

This function tries to switch on the transport mode. This is done first via a TP 2.0 broadcast service and then by a functional UDS service. It is used to deactivate a vehicle in order to reduce energy consumption. In this mode, vehicles are stored or transported over long distances, for instance, overseas.



Note

This function is not available in the **Crafter self-diagnosis**.

3.2.4 1001.04 – Deactivate transport mode

This function tries to switch off the transport mode. This is done first via a TP 2.0 broadcast service and then by a functional UDS service. This function is used to reactivate vehicles after transport.



Note

This function is not available in the **Crafter self-diagnosis**.

3.2.5 1001.05 – Erase DTC memories – All OBD systems

This function is used to erase the DTC memory of all OBD vehicle systems via a functional UDS service.



Note

This function is not available in the **Crafter self-diagnosis**.

3.2.6 1001.07 – Diagnosis with 1 MBaud

This function sets the baud rate of the diagnostic communication with the vehicle systems attached to the CAN to 1 MBaud.



Note

This function is only available if a UDS Gateway-ECU which supports the high baud rate has been installed in the vehicle.

This function is not available in the **Crafter self-diagnosis**.

3.2.7 1001.08 – Diagnosis with 500 kBaud

This function sets the baud rate of the diagnostic communication with the vehicle systems attached to the CAN to 500 kBaud.



Note

This function is only available if a UDS Gateway-ECU which supports the high baud rate has been installed in the vehicle.

This function is not available in the **Crafter self-diagnosis**.

3.3 Selecting the diagnostic function

The overview of the diagnostic functions (see Figure 3-12) is shown as soon as the diagnostic connection to the vehicle system has been set up.

The diagnostic functions which are suitable for the vehicle system are offered in the work window. The vehicle system's identification data is shown in the right information window (RIW). The standard identification is shown in the work window by clicking in the RIW. Another click restores the original view in the work window. This does not apply to the RIW in the **Crafter self-diagnosis** or to the RIW in the diagnosis of interconnected vehicle systems.

Example KWP2000:

Vehicle system	_____	01 - Motorelektronik	_____	**** = in conjunction, otherwise empty
Software part number	_____	4F0910560C	4E0907560 *	Hardware part number
System description	_____	E5F8C6A *G	--- XE10	Software version
Coding	_____	Codierung 11711	_____	
Dealership number	_____	Betriebsnummer 6796		

Fig. 3-9 Identification data from a KWP2000 vehicle system (right-hand information window)

Example, Crafter:

Vehicle system	_____	96 - Schalttafeleinsatz	
Variant	_____	VW_HighLine_04h02h	
Hardware part number	_____	HW-Teilenummer: 9064461421	
Software part number	_____	SW-Teilenummer: 9064480521	
	_____	Werkstattcode: 30999 666 98765	
			Equip. no. Importer no. Dealership no.

Fig. 3-10 Identification data from a Crafter vehicle system (right-hand information window)

Sample UDS:

Vehicle system	_____	02 - Getriebeelektronik (UDS)
Variant	_____	EV_TCMVL381_A02
Version ODX data status	_____	Version: A02216

Figure 3-11 Identification data from a UDS vehicle system (right information window)

If multiple vehicle systems are interconnected, their identification data is first displayed in a separate mask.

Vehicle systems with subsystems

A vehicle system can consist of a main system (master) and of several subsystems connected to it. These systems can be accommodated within a single housing or as separate units.

The identification data of a main system is always displayed in the right information window during *vehicle self-diagnosis*. Subsystems, on the other hand, are displayed in a separate mask, which appears before the diagnostic function is selected.

The tester transmits all diagnostic functions to the main system. If necessary, the main system then passes the diagnostic functions on to the desired subsystem, from which the main system can also retrieve the results. The **Sub-Bus System Coding** function is an exception to this rule. This function allows you to select all systems individually.

Diagnostic bus faulty

If instead of the diagnostic function you get the malfunction message **Diagnostic bus faulty**, this probably means the diagnostic cable is not plugged in, the ignition is not switched on or the voltage level in the vehicle battery is too low. Correct the problem and repeat the function.

Ending communication

The communication with the vehicle system is maintained until you:

- Select the **022 End output** diagnostic function
- Use the **Back** button to return to the *Select vehicle system* mask
- Or end the *vehicle self-diagnosis*.

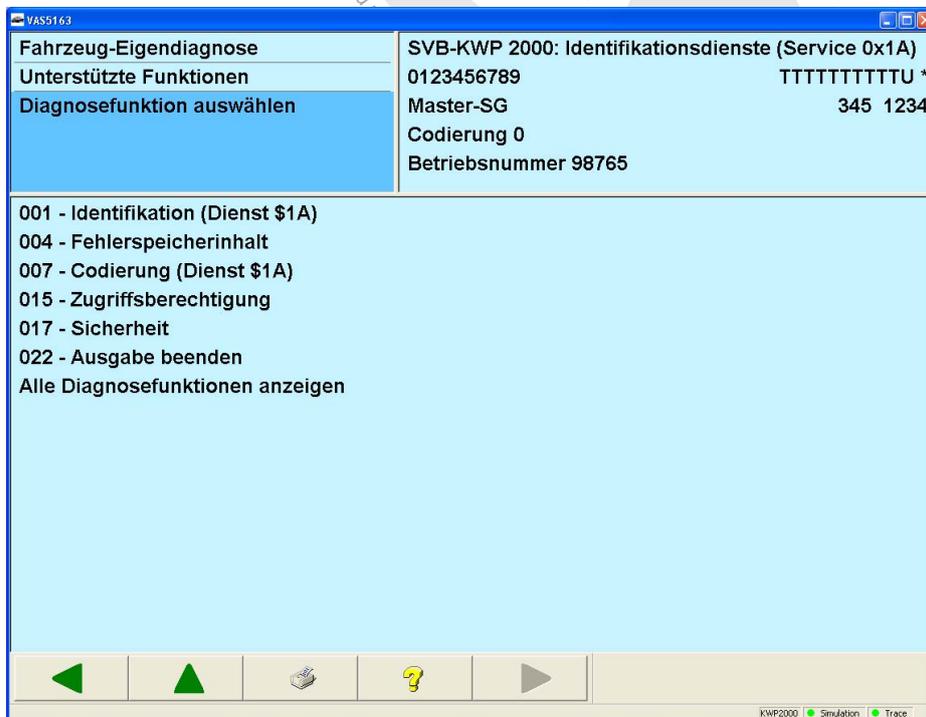


Figure 3-12 Selecting diagnostic functions (example)

3.3.1 Diagnostic functions

For KWP2000 vehicle systems, only the diagnostic functions are offered which the vehicle system reports as supported. Generally all diagnostic functions are offered for KWP1281 vehicle systems. For UDS and Crafter vehicle systems, only the diagnostic functions are offered which are supported by the ODX database.

If you have selected a function that does not exist in the respective vehicle system, the tester displays a malfunction message.

3.3.2 Display all diagnostic functions

If the diagnostic functions are not displayed correctly for KWP2000 vehicle systems, you can show all available diagnostic functions in the selection list with **Display all diagnostic functions**. This means that the selection of diagnostic function is still possible even if not all displayed functions are supported by the vehicle system in question.

3.3.3 001 – Identification (Service \$1A)

KWP2000 Vehicle systems

Under the **001 – Identification (Service \$1A)** menu point, all functions are grouped together that read out identification information from the vehicle system. This function is offered for KWP2000 vehicle systems which do not support Service \$22. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **001.01 – Control unit identification (Service \$1A)**
- **001.02 – History data (Service \$1A)**

If a vehicle system does not support the selected identification service, a message about this appears in the left information window (LIW3).

3.3.3.1 001.01 – Control unit identification (Service \$1A)

KWP2000 Vehicle systems

The **001.01 – Control unit identification (Service \$1A)** menu point is used to read out different identification data of the vehicle system. These are:

- *Flash status*

The status of the flash memory is read from the electronic control unit.

Programmierstatus:	00000000
Zähler Programmierversuche:	20
Zähler erfolgreiche Versuche:	10
Status Programmierbedingungen:	00000000
Flash-Tool-Code:	011111 222 33333
Flash-Datum:	dd.mm.yy

- **Software version**

The software version of each software module is read. It is not necessarily the same as the software version of the complete control unit as it appears in the right information window.

01 A1
02 B22
03 D333
04 E4444
05 F5
01 A2
02 B33
03 D444
04 E5555
05 F6

- **Hardware part number**

The original part number of a programmable control unit is read.

Teilenummer: TTTTTTTTTU*
Baugruppe Hardware: BBB
Sortenschlüssel Hardware: SS

Teilenummer: UUUUUUUUUUV*
Baugruppe Hardware: BBB
Sortenschlüssel Hardware: SS

- **Expanded identification**

Additional data for ECU identification is determined, e.g., date of control unit manufacture, manufacturer number, etc.

Subassembly or series number: 12345678901234
Manufacturer plant identification number / -identification: hhh-kkk
Date of manufacture: dd.mm.yy
Manufacturer change status: 12345678
Manufacturer- test stand number: PPPP
Running manufacturer number: nnnn

Subassembly or series number: 12345678901234
Manufacturer plant identification number / -identification: hhh-kkk
Date of manufacture: dd.mm.yy
Manufacturer change status: 12345678
Manufacturer- test stand number: PPPP
Running manufacturer number: nnnn

- **Vehicle identification number**

The chassis number is determined using the ECU identification.

WAU0004F000000000

ABCDEF12345678901

- **Engine or serial number**

AKF

AKF

- **Type test number**

1234567

1234567

3.3.3.2 001.02 – History data (Service \$1A)

KWP2000 Vehicle systems

Under the **001.02 – History data (Service \$1A)** menu point, the vehicle system history data is read out.

```

01XX
2003-11-19,06:00:00*0001*001**
2003-11-19,01:00:00*0001*001**
2003-11-18,22:00:00*0001*001**
2000-01-01,00:00:00*0000*000*00003***
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000*00000***
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000**
2000-01-01,00:00:00*0000*000*00000***
02XX
2003-11-30,04:00:00*0000*00.00*001**
2003-11-29,23:00:00*0000*00.00*001**
2003-11-29,20:00:00*0000*00.00*001**
2003-11-29,19:00:00*0000*00.00*001**
2003-11-27,01:00:00*0000*01.00*001**
2003-11-26,23:00:00*0000*00.00*001**
2003-11-26,20:00:00*0000*00.00*001**
2003-11-26,18:00:00*0000*00.00*001**
2003-11-26,17:00:00*0000*00.00*001**
2003-11-26,13:00:00*0000*00.00*001*00025***
03XX
00.00*00.00*+00.00*00*00*+0000*+00000*000000*2000-01-01-01,00:00:00*0-0-0-0-0*00.0*00.0*000.0*00*00*00*00*000**
    
```



3.3.4 002 – Identification (Service \$22)

KWP2000 Vehicle systems

Under the **002 – Identification (Service \$22)** menu point, all functions are grouped together that read out identification information from the vehicle system. This function is offered for KWP2000 vehicle systems which do not support Service \$1A. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **002.01 – Identification of electronic control units (Service \$22)**
- **002.02 – History data (Service \$22)**
- **002.03 – Identification services (Service \$22)**

If a vehicle system does not support the selected identification service, a message about this appears in the left information window (LIW3).

3.3.4.1 002.01 – Identification of electronic control units (Service \$22)

KWP2000 Vehicle systems

The **002.01 – Control unit identification (Service \$22)** menu point is used to read out different identification data of the vehicle system. This data from the main system (master) is displayed separately from that of the subsystems connected to it.

- **Master**
Master:
SCH-KWP 2000: Identification services (service 0x22)
0123456789: TTTTTTTTTU
System description H34 0010
00010203040506070809101112131415161718193031323334536373839
- **Subsystems, class 1/2**
Subsystem class 1 / 2:
Wiping angle control
4F0123456AA 4F9993456AA
System__01 C99 B121
1
Rain/light sensor (RLS)
4F0123456AB 4F9993456AB
System__02 C99 B122
2
Light switch (LDS)
4F0123456AC 4F9993456AC
System__03 C99 B123
3
- **Subsystems, class 0**
Subsystem class 0:
0010203040 50 60
0111213141 51 61
0121113142 52 62
0313233343 53 63
0414243444 54 64

3.3.4.2 002.02 – History data (Service \$22)

KWP2000 Vehicle systems

Under the **002.02 – History data (Service \$22)** menu point, all functions are grouped together which can be used to read out and delete the history data of the vehicle system. The following functions are available for selection:

- **Block 1 (\$0490)**
- **Block 2 (\$0491)**
- **Block 3 (\$0492)**
- **Block 4 (\$0493)**
- **Block 5 (\$0494)**
- **Block 6 (\$0495)**
- **Block 7 (\$0496)**
- **Block 8 (\$0497)**
- **Block 9 (\$0498)**
- **Block 10 (\$0499)**
- **Block 11 (\$049A)**
- **Block 12 (\$049B)**
- **Block 13 (\$049C)**
- **Block 14 (\$049D)**
- **Block 15 (\$049E)**
- **Block 16 (\$049F)**
- **Erase**

You can select one or more blocks at the same time. The **Erase** menu point can only be used singly.

Example after the selection has been made:

Contents Block 1 (\$0490):
20040623154730?#Eg

Contents Block 2 (\$0491):
0123456789

Contents Block 3 (\$0492):
ABCDEFGHIJ

Contents Block 4 (\$0493):
Howdy!

Contents Block 5 (\$0494):
Howdy,?partner!

Contents Block 6 (\$0495):
Howdy,
partner!

Contents Block 7 (\$0496):
000102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E1F20212223242526272

Contents Block 8 (\$0497):
000102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E1F20212223242526272

Contents Block 9 (\$0498):

Contents Block 10 (\$0499):
A

3.3.4.3 002.03 – Identification data (Service \$22)

KWP2000 Vehicle systems

The **002.03 – Identification data (Service \$22)** menu point is used to read out different identification data of the main system (master) and the subsystems. In the first step, you can select whether you want to see identification data of the main system or a subsystem. The only subsystems offered are those that are available in the vehicle system.

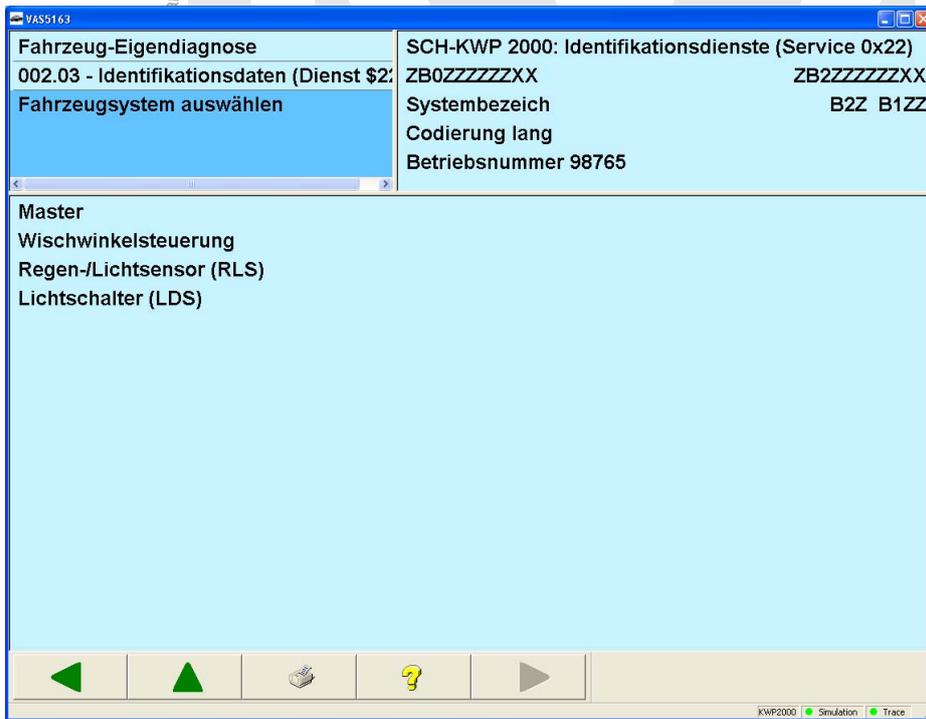


Figure 3-13 List of all systems

In the next step, you can select one or more identification data entries.

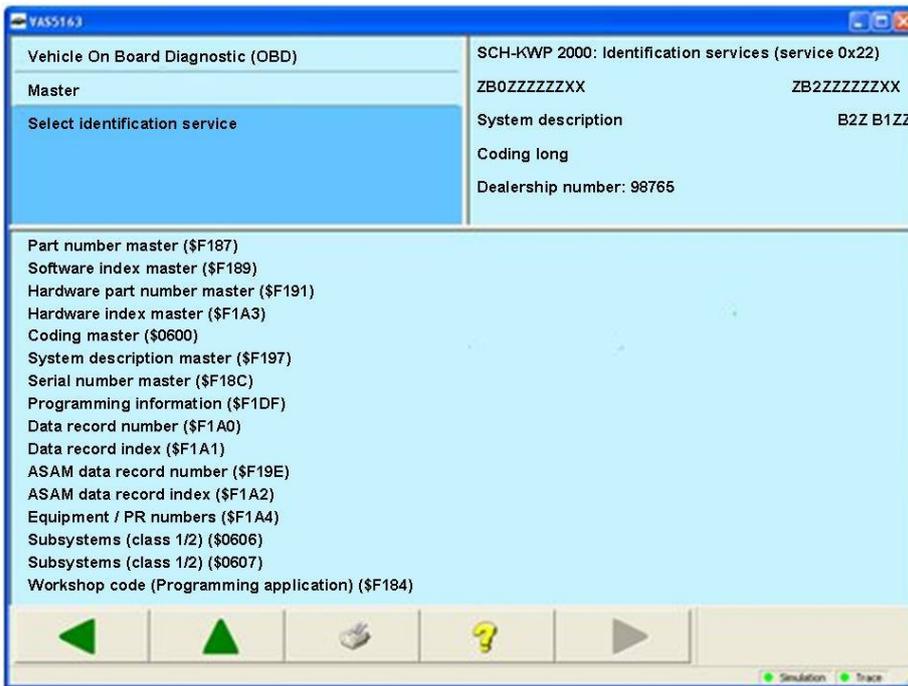


Figure 3-14 List of all identification data entries of the master

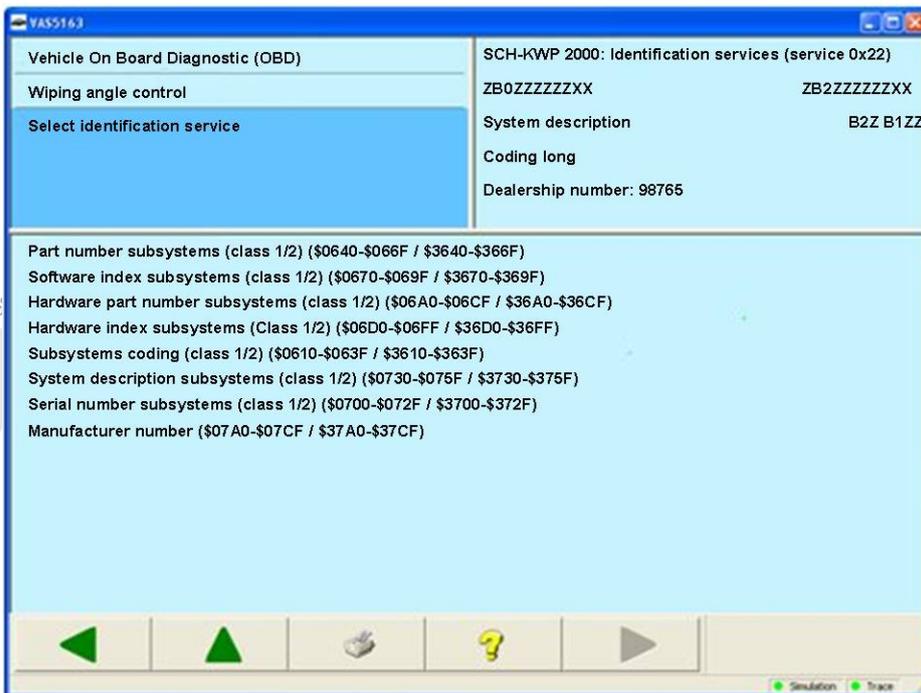


Figure 3-15 List of all identification data entries of a subsystem

After the selection of one or more entries, the values will be shown in the following form in the work window:

Master:

Part number master (\$F187):
ZB0ZZZZZXX

Software index master (\$F189):
B1ZZ

Hardware part number master (\$F191):
ZB2ZZZZZXX

Hardware index master (\$F1A3):
B2Z

Coding master (\$0600):
000102030405060708091011121314151617181930313233343536373839

System description master (\$F197):
System description

Serial number master (\$F18C):
0123456789A

Programming information (\$F1DF):
programmable after Flash-LH
Program installed

Subsystem:

Part number subsystems (class 1/2) (\$0640-\$066F / \$3640-\$366F):
ZB1ZZZZ1XX

Software index subsystems (class 1/2) (\$0670-\$069F / \$3670-\$369F):
B1Z1

Hardware part number subsystems (class 1/2) (\$06A0-\$06CF / \$36A0-\$36CF):
ZB2ZZZZ1XX

Hardware index subsystems (Class 1/2) (\$06D0-\$06FF / \$36D0-\$36FF):
B2Z

Subsystems coding (class 1/2) (\$0610-\$063F / \$3610-\$363F):
000001

System description subsystems (class 1/2) (\$0730-\$075F / \$3730-\$375F):
System__01

Serial number subsystems (class 1/2) (\$0700-\$072F / \$3700-\$372F):
0123456789ABCDEFGHIIP



3.3.5 003 – Identification

Crafter/UDS/Motor interconnection vehicle systems

Under the **003 – Identification** menu point, all functions are grouped together that read out identification data from the vehicle system. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **003.01 – Identification, master**
- **003.02 – Identification, subsystems**

In the **Crafter self-diagnosis**, there are no further submenus under the **003 – Identification** menu point.

Crafter vehicle systems

After selecting the function, all identification data from the vehicle system will be read out and displayed. The list and the description of the entries depend on the vehicle system.

Name	Wert
Steuergeräte-Herkunft	DCS
Lieferantenkennung	Borg
Diagnosekennung	\$00000005
Steuergeräte-Identifikation	4
Produktion/Entwicklungsstatus	Produktion
Diagnose-Version	\$00000405
Hardware-Version	527
Software-Version	61936
Hardware-Teilenummer	9064461421
Software (Boot ID) Modulanzahl	\$00000001

Figure 3-16 Display identification data

3.3.5.1 003.01 – Identification, master

UDS vehicle systems

At the **003.01 – Identification, master** menu point, the identification data of the main system (master) is offered for selection. The only identification data offered is that which is available in the vehicle system.

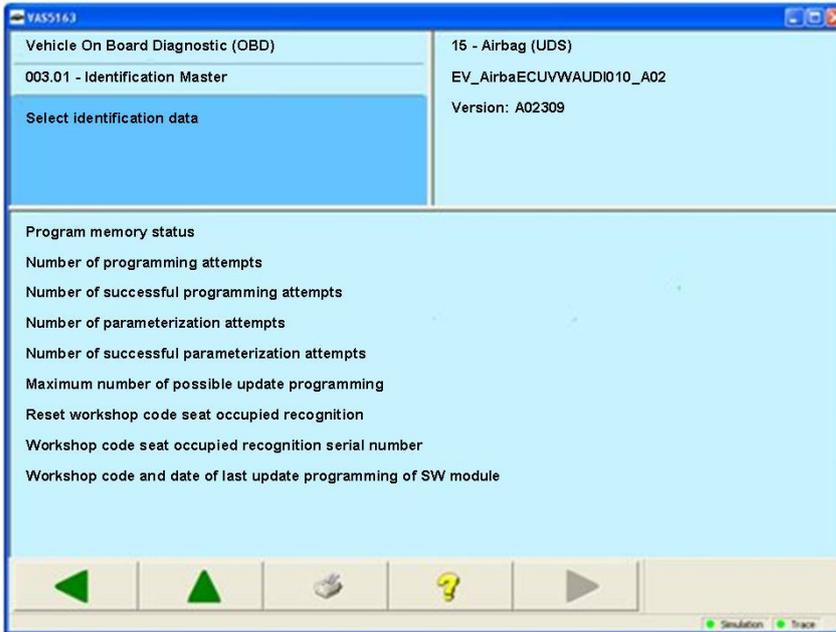


Figure 3-17 Select identification data from main system

After selecting one or more entries, the respective identification data from the vehicle system will be read out and displayed.

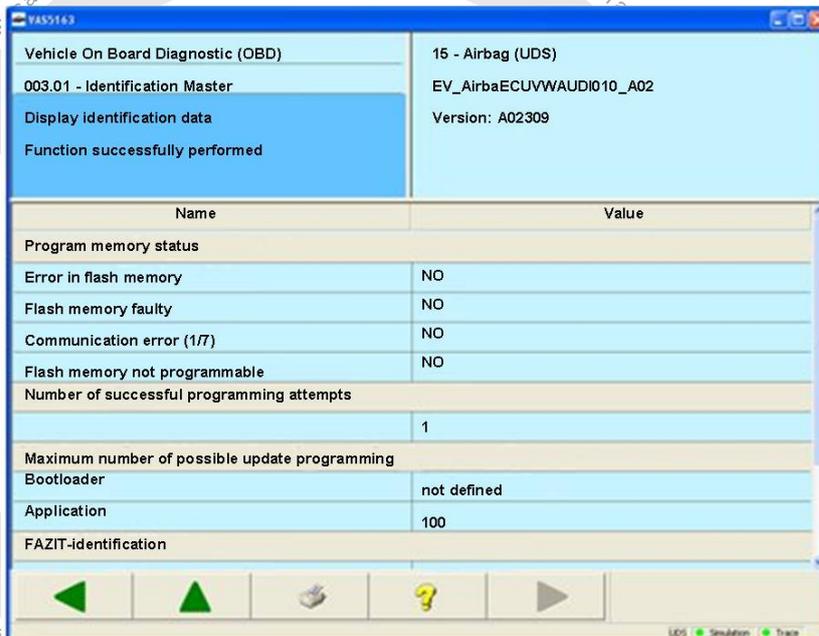


Figure 3-18 Display identification data from main system

3.3.5.2 003.02 – Identification, subsystems

UDS vehicle systems

At the **003.02 – Identification, subsystems** menu point, the identification data of the subsystems is read out and displayed.

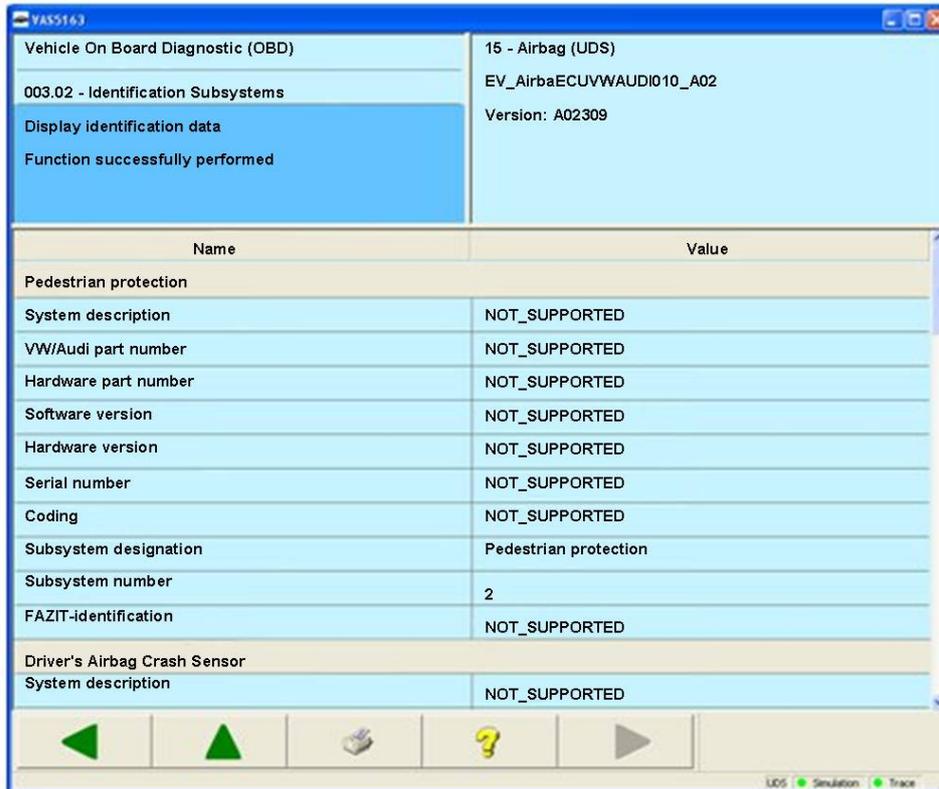


Figure 3-19 Identification data of subsystems

3.3.6 004 – DTC memory contents

All vehicle systems

At the **004 – DTC memory contents** menu point, all functions are grouped together that access the DTC memory in the vehicle system. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **004.01 – Checking DTC memory**
- **004.02 – Diagnostic status of all error paths**
- **004.03 – List of all unchecked error paths**
- **004.04 – List of all active malfunctions**
- **004.10 – Erase DTC memory**

3.3.6.1 004.01 – Checking DTC memory

All vehicle systems

At the **004.01 – Checking DTC memory** menu point, the DTC memory contents of the vehicle system are read out and displayed. When this is done, a distinction is made between faults and notes. Notes are indicated by the additional text *Note* to the right of the malfunction code display.

The number of DTC memory entries read appears in the left information window (LIW3).

If environment conditions are saved together with a malfunction, they can also be displayed. Environment conditions are measured values that are measured when a malfunction occurs. They provide more precise information about a malfunction, e.g. when it was entered (date and time).

Additionally, information from the ODX data input (if available) for UDS vehicle systems can be displayed.

The scope and structure of the displayed data depends on the vehicle system.

KWP1281 Vehicle systems

Display of a DTC memory entry:

Malfunction code (5-digit, decimal)	SAE number (if available)	Fault type 1 (3-digit, decimal)
Text for the malfunction code		
Text for fault type 1		
Text for fault type 2		

- **Malfunction code**
The five-digit malfunction code (e.g., 00001) indicates the malfunction location (e.g. *brake control unit*)
- **SAE number**
A malfunction code according to the SAE standard can be allocated to the malfunction code.
- **Fault type 1**
The 3-digit fault type 1 more precisely describes the fault symptom (e.g. *is not currently testable*)

- **Fault type 2**
Fault type 2 describes how the fault manifested itself (e.g., *statically* or *sporadically*).

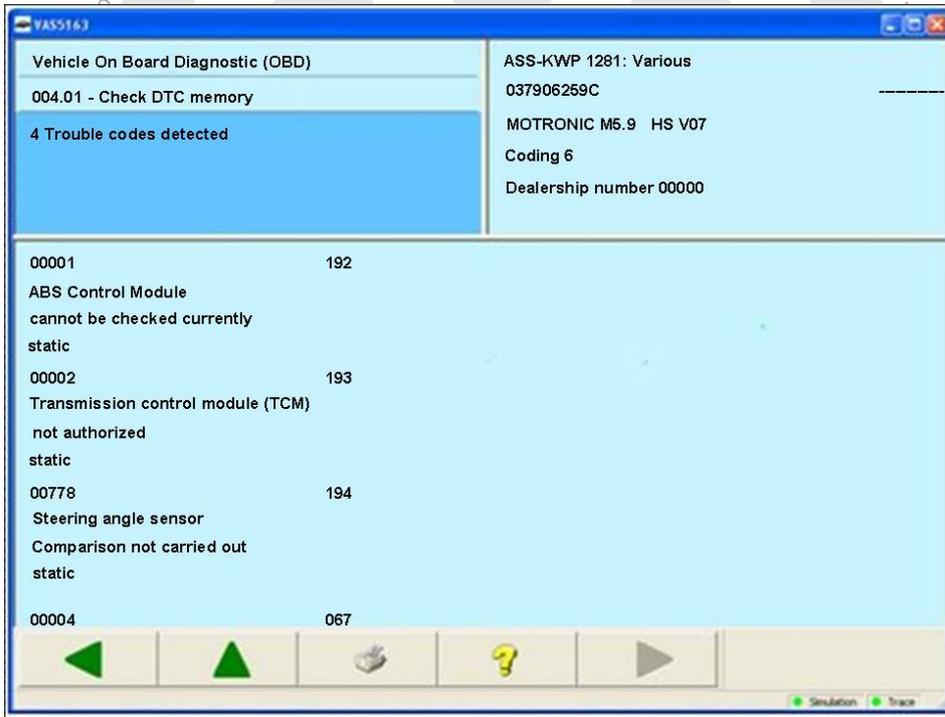


Figure 3-20 Checking DTC memory

KWP2000 Vehicle systems

Display of a DTC memory entry

Malfunction code (5-digit, decimal)	SAE number (if available)	Fault type 1 (3-digit, decimal)	Note (for entries with lower priority)
Text for the malfunction code			
Text for fault type 1			
Text for fault type 2			

- **Malfunction code**
The five-digit malfunction code (e.g., 00001) indicates the malfunction location (e.g. *brake control unit*)
- **SAE number**
A malfunction code according to the SAE standard can be allocated to the malfunction code.
- **Fault type 1**
The 3-digit fault type 1 more precisely describes the fault symptom (e.g. *is not currently testable*)
- **Fault type 2**
Fault type 2 describes how the fault manifested itself (e.g., *statically* or *sporadically*).
- **Note**
DTC memory entries with a priority higher than 6 will be designated as a note.

In the case of vehicle systems that also supply environment conditions, these can be displayed at the right side of the work window by means of the **Environment conditions** button.

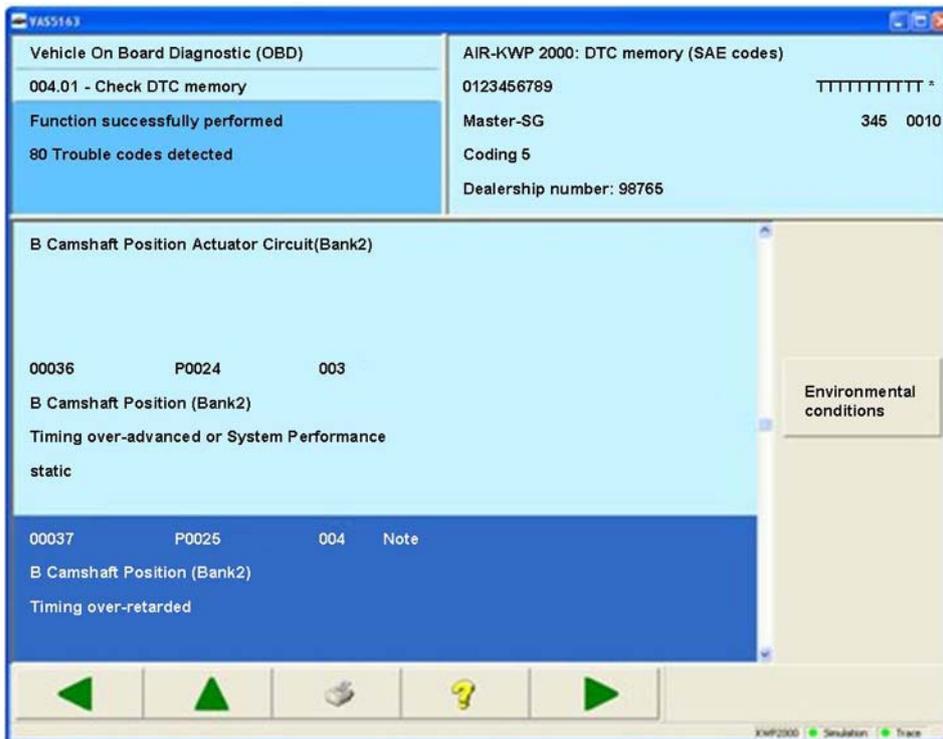


Figure 3-21 Checking DTC memory, example with selected error

If you press the **Environment conditions** button without having selected a malfunction, the tester displays the standard values and/or measured values which may have been saved for the first malfunction entry.

If you first select a fault and then press the **Environment conditions** button, only this selected fault and its corresponding environment conditions will be displayed.

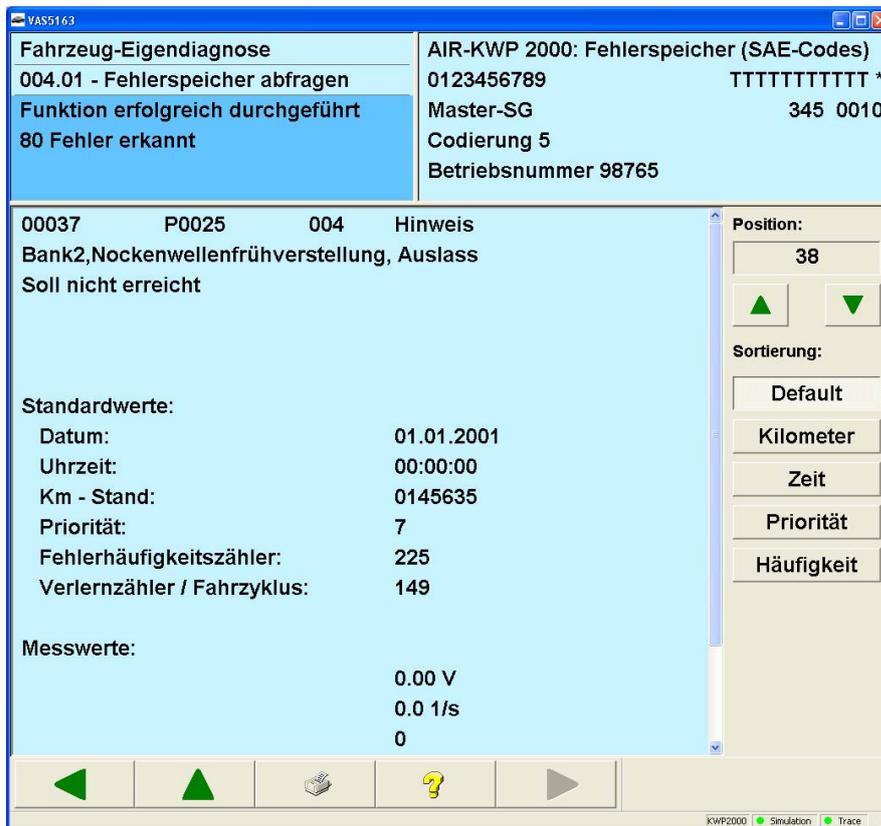


Figure 3-22 Checking DTC memory, displaying environment conditions

The following environment conditions can be output:

- **Standard values** (when provided)
The following environment conditions are grouped under this:
 - **Date, time:** Time when the fault was detected.
 - **Odometer reading:** Shows odometer reading when the fault was detected.
 - **Priority:** The priority can have a value between 0 and 15:
 - 0 - 5: malfunction ID with descending priority
 - 5 = malfunction with lowest priority
 - 6 - 15: note, no malfunction.
 - **Malfunction frequency counter:** The counter can have values between 0 and 254. Every time the malfunction occurs (through all driving cycles) the counter is incremented by 1.
 - **Unlearning counter/driving cycle:** Counter status of the unlearning counter. When a fault occurs, the unlearning counter is set to a vehicle-system and fault-code-specific value – for example, 40. If the fault does not occur during the next driving cycle it is marked as *sporadic*. Every subsequent driving cycle without a malfunction reduces the unlearning counter by 1.
- **Measured values** (when provided (additional environment conditions))
Up to eight measured values can be displayed additionally or exclusively for the individual fault codes. The environmental conditions (which may number up to eight) can in each case consist of a standard value and up to seven measured values, or up to eight measured values without a standard value.

You can control the sorting and positioning of the displayed malfunctions via the buttons on the right part of the work window:

- **Position**
The first malfunction in the list displayed together with its environment conditions takes the 1st position. You can navigate between the malfunctions by means of the two arrow buttons.
- **Sorting**
When the mask opens, the setting is always **Default**. With the displayed buttons you can, however, switch sorting over to different criteria:
 - **Default:**
The malfunctions are sorted in ascending order by malfunction code
 - **Kilometre:**
The faults are sorted by the registered odometer reading, starting with the lowest. Malfunction codes without an odometer reading appear at the end of the list in the order in which they were read from the DTC memory.
 - **Time:**
The faults are sorted by the time stamp, starting with the oldest. Malfunction codes without a complete time stamp, (date, time) appear at the end of the list in the order in which they were read from the DTC memory.
 - **Priority:**
The malfunctions are sorted starting with the highest priority (by ascending values). Malfunction codes without a priority indicated appear at the end of the list in the order in which they were read from the DTC memory.
 - **Frequency:**
The malfunctions are sorted starting with the highest frequency of occurrence (by descending values).

Crafter vehicle systems

All DTC memory entries are displayed in a table in the work window:

- ID number:** Indicates the malfunction code.
Text: Indicates the corresponding malfunction description in plain text.
Status: **Test complete** indicates whether the test of the DTC memory entry was completed.

In the case of vehicle systems that also supply environment conditions, these can be displayed at the right side of the work window by means of the **Environment conditions** button.

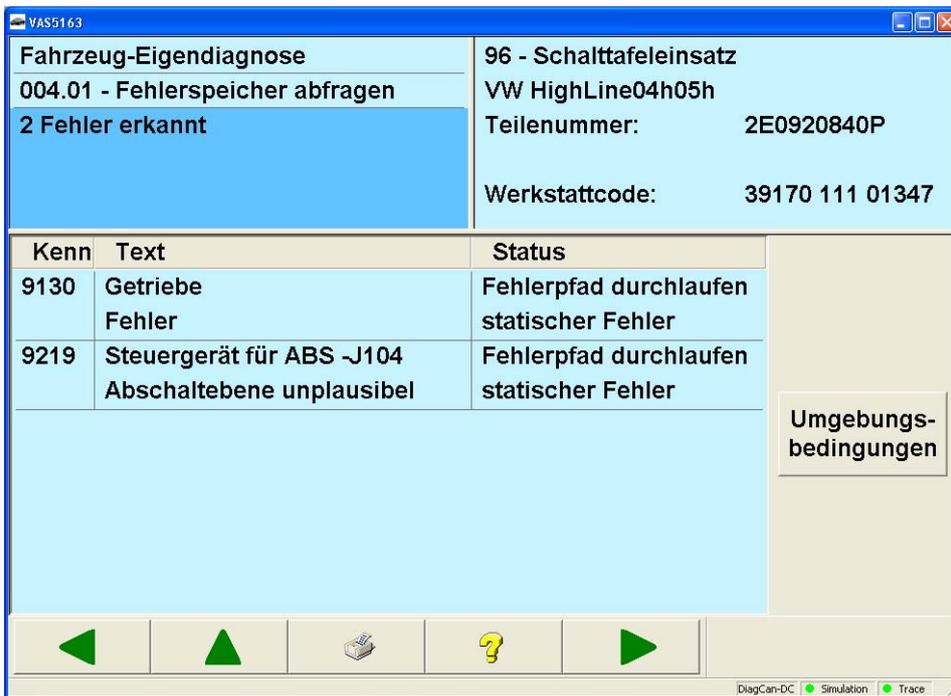


Figure 3-23 Checking DTC memory, in the Crafter self-diagnosis, example with **Environment conditions** button

If you press the **Environment conditions** button without having selected a malfunction, the tester displays the standard values and/or measured values which may have been saved for the first malfunction entry.



Figure 3-24 Checking DTC memory, displaying environment conditions

If you first select a fault and then press the **Environment conditions** button, only this selected fault and its corresponding environment conditions will be displayed.

The list of environment conditions is malfunction-specific.

UDS vehicle systems

All DTC memory entries are displayed in a table in the work window:

SAE code: Indicates the malfunction code.

Text: Indicates the corresponding malfunction description in plain text.

Status: Status of the malfunction.

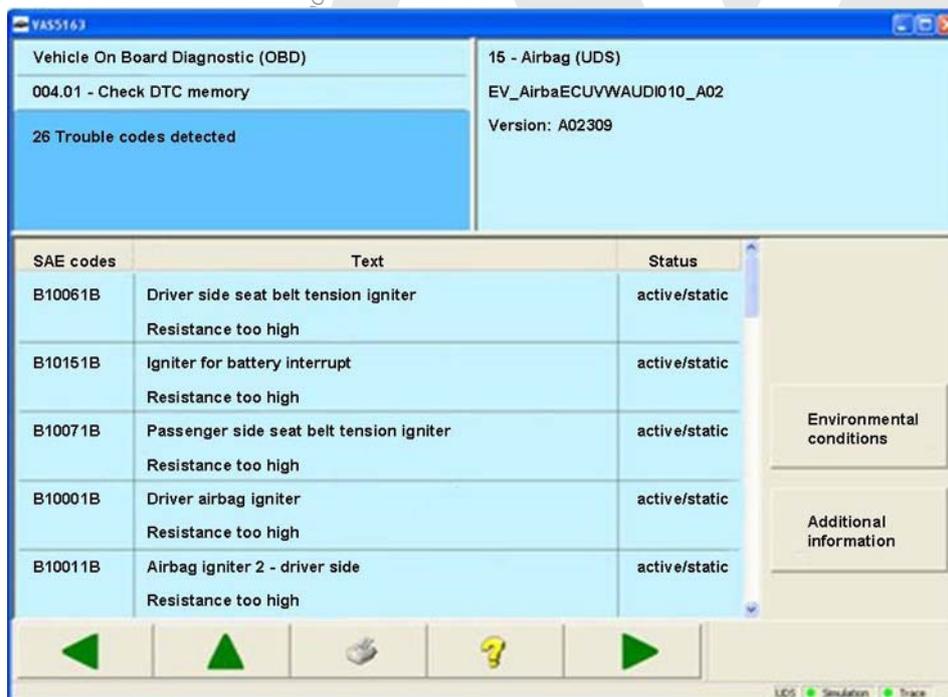


Figure 3-25 Checking DTC memory, in the UDS self-diagnosis, example with the **Environment conditions** and **additional information** buttons.

In the case of vehicle systems that supply environment conditions, these can be displayed at the right side of the work window by means of the **Environment conditions** button. If you press the **Environment conditions** button without having selected a malfunction, the tester displays the standard values and/or measured values which may have been saved for the first malfunction entry. If you first select a fault and then press the **Environment conditions** button, the tester will display the standard values and/or measured values for the selected fault. The list of environment conditions is malfunction-specific.

In the case of vehicle systems that also provide additional information from the ODX database, these can be displayed at the right side of the work window by means of the **Additional information** button.

If you press the **Additional information** button without having selected a malfunction, the tester displays any additional information which may have been saved for the first malfunction entry. If you first select a fault and then press the **Additional information** button, the tester will display the additional information for the selected fault. The listing of additional information is malfunction-specific.

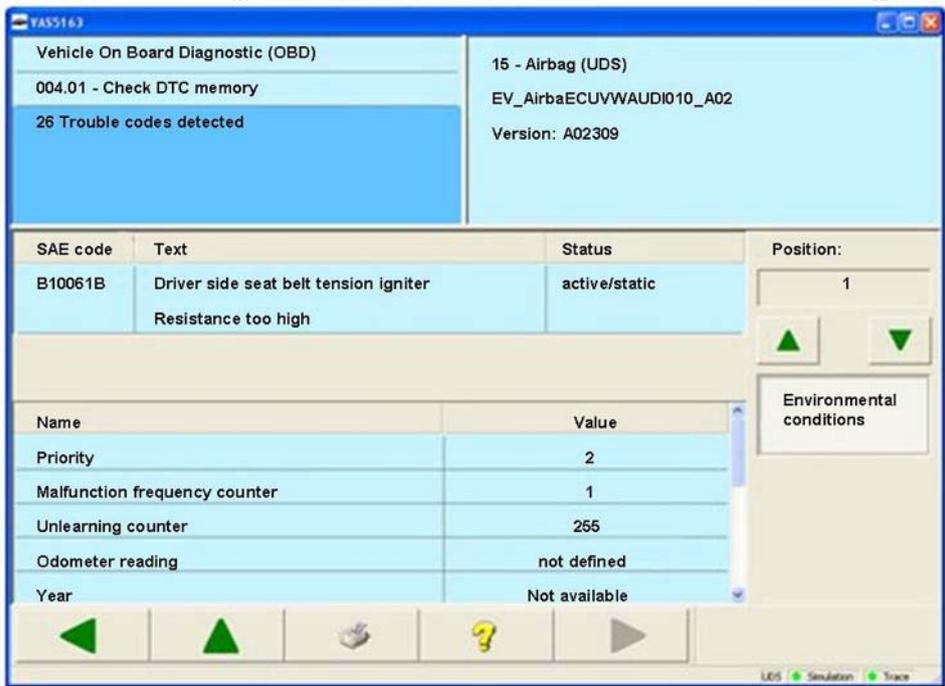


Figure 3-26 Checking DTC memory, displaying environment conditions

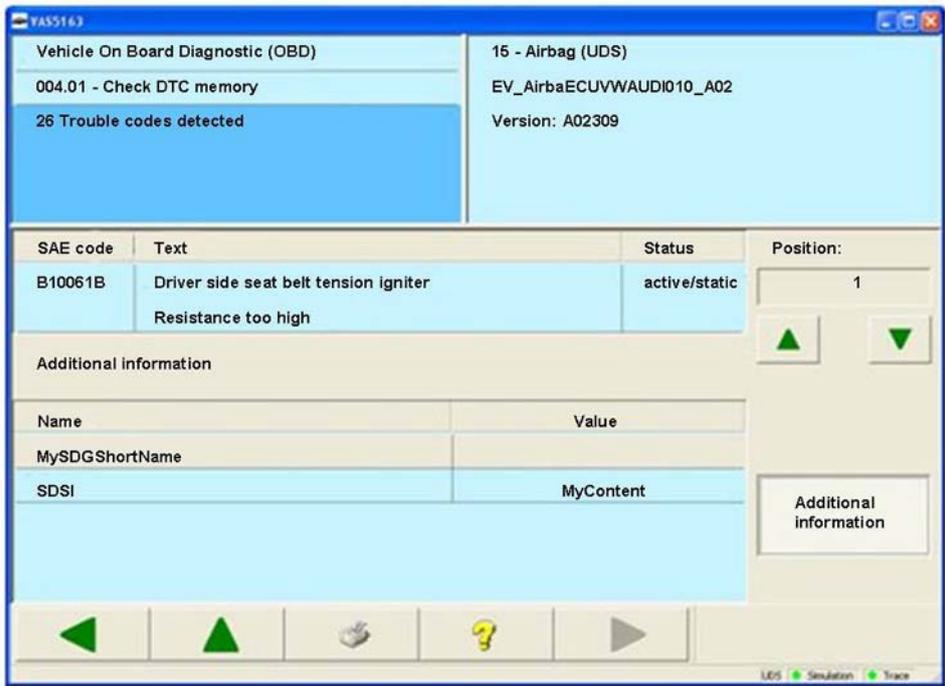


Figure 3-27 Checking DTC memory, displaying additional information

3.3.6.2 004.02 – Diagnostic status of all error paths

At the **004.02 – Diagnostic status of all error paths** menu point, all error paths from the selected vehicle system are shown.

KWP2000 Vehicle systems

Display of a DTC memory entry:

Error ID number (malfunction code) (5-digit)	Malfunction status (3-digit, decimal)
Diagnostic test	
MIL	
Memory status	

The list of the malfunction entries can be sorted according to:

- **Default**
- **Diagnostic test**
- **MIL**
- **Memory status**
- **Error ID number**

Default means that the sorting is done in the order in which the malfunction entries are read out of the vehicle system.

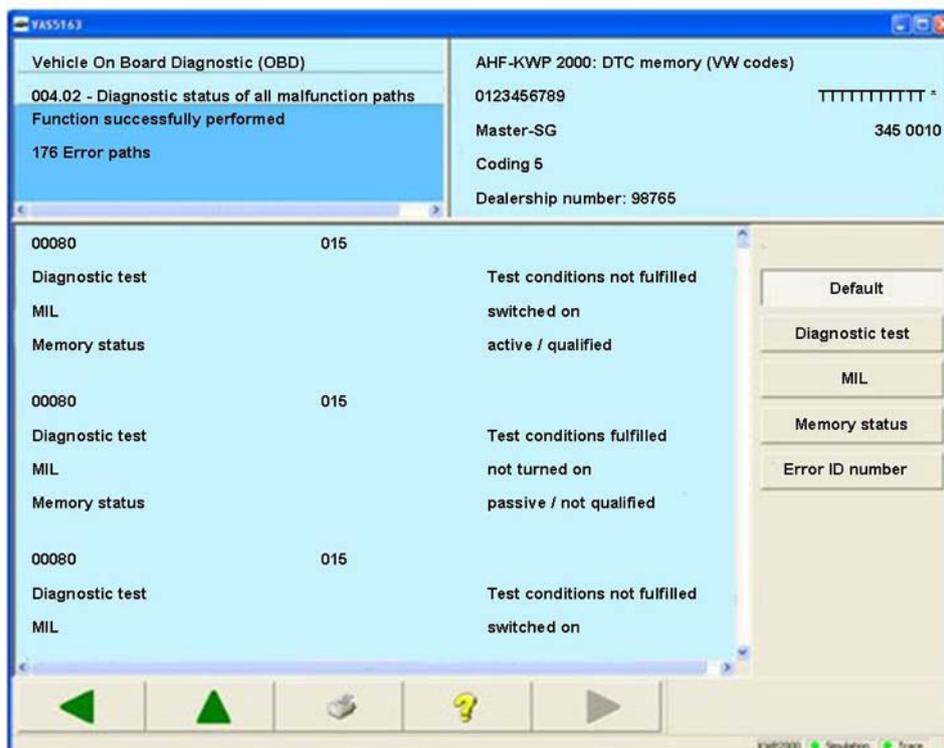


Figure 3-28 Diagnostic status of all error paths in the KWP2000 self-diagnosis

Crafter vehicle systems

All DTC memory entries are displayed in a table in the work window:

SAE code: Indicates the malfunction code (ID number).

Text: Indicates the corresponding malfunction description in plain text.

Status: Status of the malfunction.

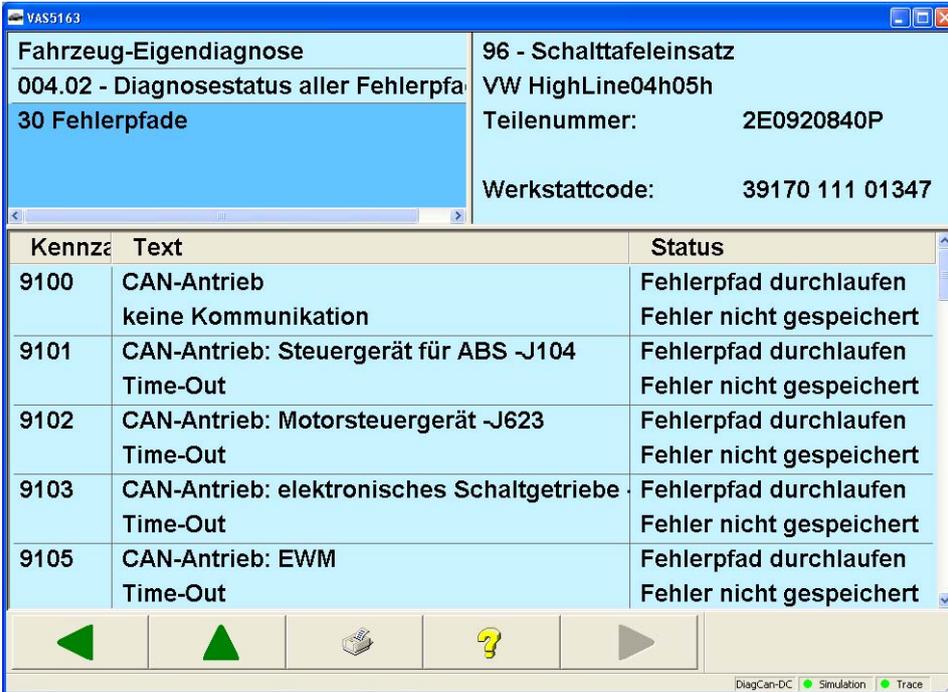


Figure 3-29 Diagnostic status of all error paths in the Crafter self-diagnosis

3.3.6.3 004.03 – List of all unchecked error paths

UDS vehicle systems

At the **004.03 – List of all unchecked error paths** menu point, all unchecked error paths and their statuses are shown for the selected vehicle system.

All DTC memory entries are displayed in a table in the work window:

SAE code: Indicates the malfunction code.

Text: Indicates the corresponding malfunction description in plain text.

Status: Status of the malfunction.

SAE-Code	Text	Status
P000000	Symptom number: \$0010F3	passive/sporadic
P000000	Symptom number: \$0010FD	passive/sporadic
P227900	Intake Air System Leak	passive/sporadic
P163E00	Control unit defective	passive/sporadic
U042400	Invalid Data Received From HVAC Control Module	passive/sporadic
P000000	Symptom number: \$00111C	passive/sporadic
U043300	Invalid Data Received From Cruise Control Front	passive/sporadic
	Distance Range Sensor	
U043300	Cruise Control Front Distance Range Sensor	passive/sporadic

Figure 3-30 List of all unchecked error paths in the UDS self-diagnosis

3.3.6.4 004.04 – List of all active malfunctions

UDS vehicle systems

At the **004.04 – List of all active malfunctions** menu point, all currently active error paths and their statuses are shown for the selected vehicle system.

All DTC memory entries are displayed in a table in the work window:

SAE code: Indicates the malfunction code.

Text: Indicates the corresponding malfunction description in plain text.

Status: Status of the malfunction.

SAE-Code	Text	Status
U000200	High Speed CAN Communication Bus Performance No communication	active/static
P048000	Cooling Fan 1 Control Circuit Electrical malfunction	active/static
P048100	Cooling Fan 2 Control Circuit Electrical malfunction	active/static
P061500	Starter Relay Circuit Open circuit	active/static
P304900	Activation starter relay 2 Open circuit	active/static

Figure 3-31 List of all active malfunctions in the UDS self-diagnosis

3.3.6.5 004.10 – Erase DTC memory

All vehicle systems

At the **004.10 – Erase DTC memory** menu point, the DTC memory of the selected vehicle system is erased. For UDS vehicle systems which are OBD-relevant, this menu point is missing. In these vehicle systems, the erasing of the DTC memory is done using the collective service **1001.05 – Erase DTC memory – All OBD systems**.

When you activate **004.10 – Erase DTC memory**, the tester displays a dialogue box with the following message:

Should the function be executed?

Note: Data will be erased.

Press the **Cancel** button to cancel or **OK** to irrevocably erase the data. The execution is confirmed in the left information window:

DTC memory erased



Note

You can only erase the DTC memory if you have read it out first via the **004.01 – Checking DTC memory** function. In this way, the tester prevents important information on malfunctions that occurred from being lost.

The **004.10 – Erase DTC memory** function automatically follows the **004.01 – Checking DTC memory** function. That means that if the malfunction in the vehicle has not been rectified and if the malfunction code is thus still detected and saved in the vehicle system, the contents of the DTC memory are presented by the tester once more. The following appears in the left information window:

DTC memory erased 1 malfunction detected

In addition, the fault information is displayed in the work area.

3.3.7 005 – Final control diagnosis

The **005 – Final control diagnosis** menu point is used to perform a check of the control elements. To do this, the control elements are activated.

KWP1281/KWP2000 Vehicle systems

If you select the **005 – Final control diagnosis** function, the tester activates the first control element. The note **Control element test is waiting, continued switching required** appears in the left information window. After the **Continue** button is pressed, the measured values for the respective control element are displayed at the bottom of the display window and **Control element test is running, continued switching allowed** is displayed in the left information window.

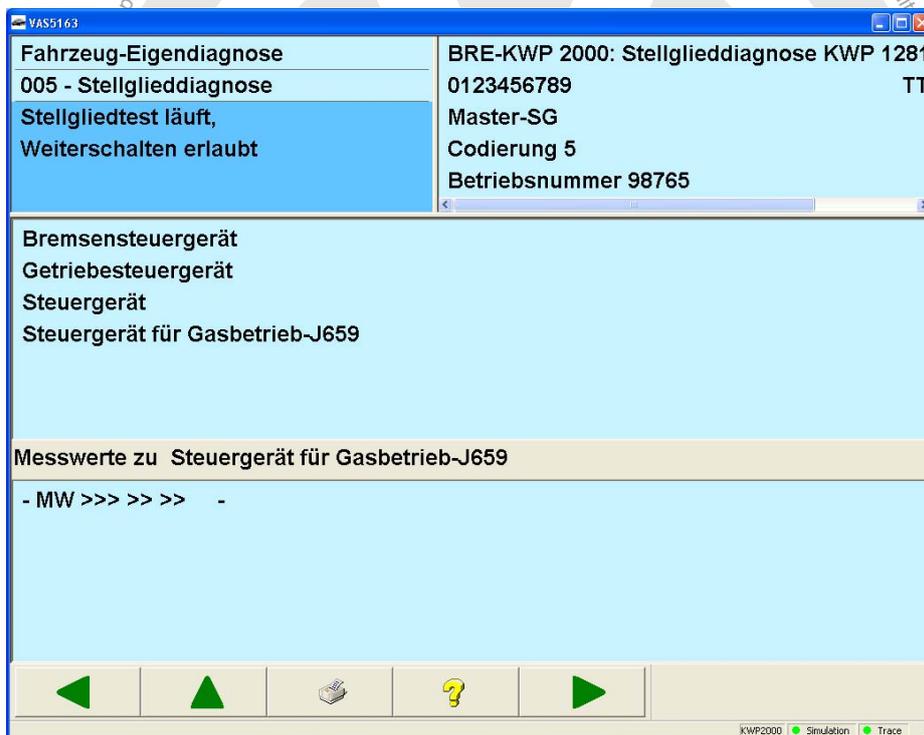


Figure 3-32 Final control diagnosis

In some cases, the processes can be monitored at the vehicle visually (e.g. control lamps) or acoustically (e.g. relay).

Press the **Continue** button to activate and display the next control element. The **Back** button cancels the final control diagnosis.

In certain cases, measures are required in the vehicle or on control elements during the final control diagnosis. You can find more information in the repair guide. For KW1281 vehicle systems, no measured values are shown for the control elements.

Crafter vehicle systems

Control elements can be activated in groups or sequences. For the grouped test, the selected control elements are activated simultaneously, so to speak. For the sequential test, the selected control elements are activated in succession.

Sequential control element test

With the sequential control element test, you have the option of creating a test sequence. To generate a test sequence, you can select the desired control element tests from the list of available control element tests. Selected control element tests are displayed on a dark background.

The activation of the control elements via different services is done one after the other. The next control element is only activated after the activation of the previous control element is completed.

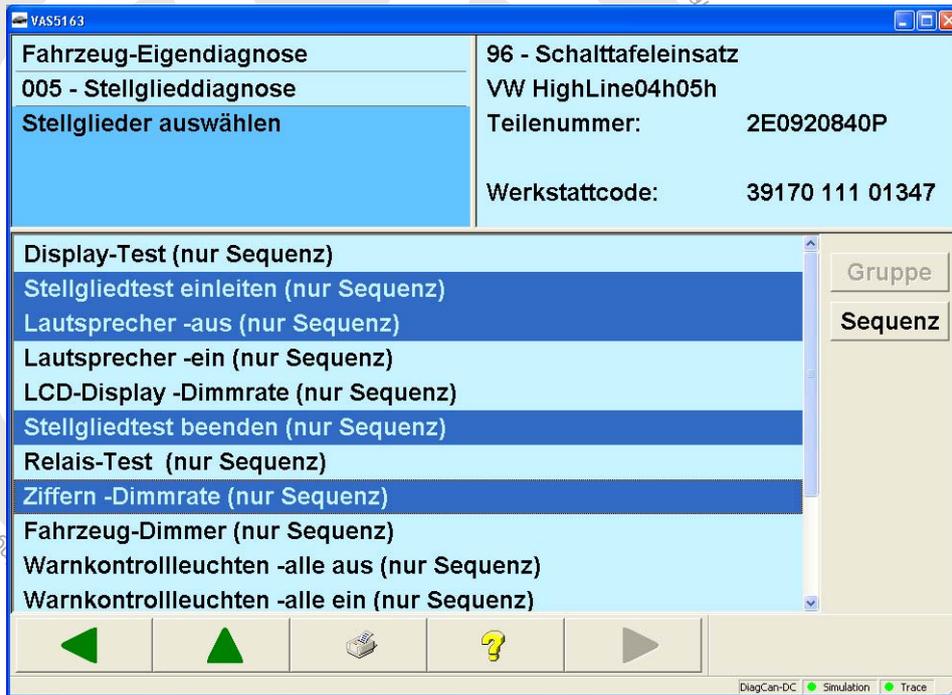


Fig. 3-33 Selection of services for a sequential control element test

Pressing the **Sequence** button applies the individual control element tests in the sequence and takes you to the *Define sequence* mask. The control element tests are parameterised in this mask and the position of a control element test in the test sequence is determined.

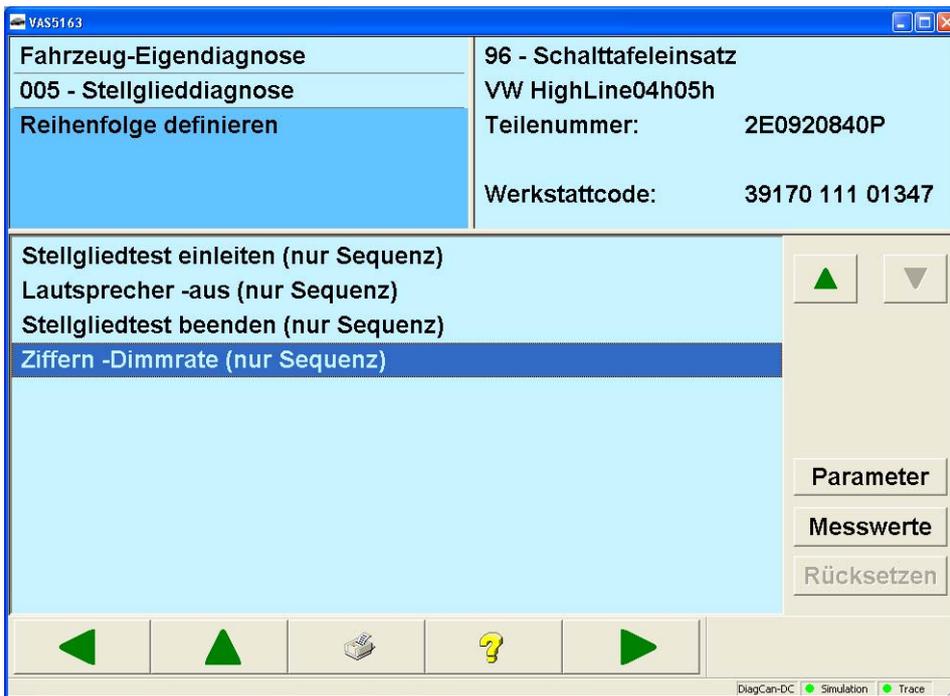


Figure 3-34 Define sequence in the Crafter final control diagnosis

The following settings can be made:

Button	Description
Arrow up	Moves the position of a selected control element test up within the sequence.
Arrow down	Moves the position of a selected control element test down within the sequence.
Reset	Resets the sorting of the measured values to the original sequence.
Parameter	Adapting of the start and stop parameters, provided the tester offers these setting options. The start parameters are set when the control element test is activated. The stop parameters are set on exiting the control element test. Press the Continue button to accept the set values.
Measured values	Selection of measured values to be read and displayed during the final control diagnosis. It is possible to select multiple measured values. Press the Continue button to accept the set values. You can change the sequence in which the measured values are read and displayed in the following <i>Define sequence</i> mask using the Arrow up and Arrow down buttons.

The **Stop parameters** button is only activated if stop parameters exist for the control element test. That is only the case for routines for which a service exists to stop the routine and if this service accepts parameters.



Figure 3-35 Adapt start parameters in the Crafter final control diagnosis



Figure 3-36 Allocate measured values in the Crafter final control diagnosis

Press the **Continue** button to activate the sequence. The first control element test can be carried out using the **Start** button. The **Display start/stop parameters** button shows the start or the stop parameters. The start and stop parameters are listed directly underneath the description of the control element. Blue text is used for start parameters; black text is used for stop parameters. Measured values are displayed underneath on a light background. The

selected measured values are read and displayed cyclically, even if the control element test is not in progress.



Figure 3-37 Sequential test, test does not run (Crafter final control diagnosis)

During the sequential test, the control elements are activated one after the other so that only one control element is ever displayed. The **Continue** button can be used to select the next control element test in the sequence without executing the control element test displayed.

Press **Start** to execute the control element test displayed. Once a control element has been tested, the **Continue** button is activated and you can switch to the next control element of the sequence.



Figure 3-38 Sequential test, test is running (Crafter final control diagnosis)

Test is running is displayed in the left information window. Press **Stop** to stop the test. The test can be restarted with **Start**. Press **Continue** to switch to the next control element test in the sequence. **Back** ends the sequence.

Grouped control element test

The grouped control element test gives you the option to activate a group of control elements so that more than one control element is active at the same time. To create a group, you can select the desired control element tests from the list of available control element tests. Selected control element tests are displayed on a dark background.

The activations of all control elements in a group are performed by the tester in direct succession. Afterwards, all activations of a group are maintained concurrently.



Figure 3-39 Final control diagnosis in the Crafter self-diagnosis: Selection of services for a grouped or sequential control element test

Pressing the **Group** button applies the individual control element tests in the group and takes you to the *Define sequence* mask. The control element tests are parameterised in this mask.



Figure 3-40 Define sequence in the Crafter final control diagnosis

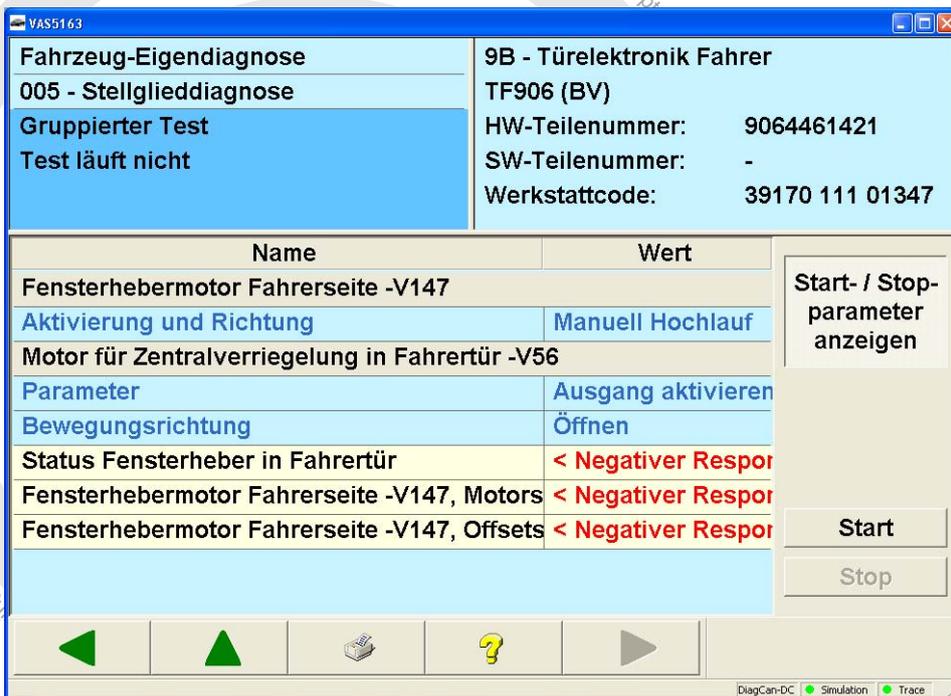


Figure 3-41 Grouped test, test is running in the Crafter final control diagnosis

For the grouped test, the selected control elements are activated simultaneously. The parameters of all activated control elements are displayed at the top of the work window if the **Display start/stop parameters** button is pressed.

The start and stop parameters are listed directly underneath the description of the control element. Blue text is used for start parameters; black text is used for stop parameters. Measured values are displayed underneath on a yellow background.

UDS vehicle systems

You have the option of creating a test sequence with the final control diagnosis. To generate a test sequence, you can select the desired control element tests from the list of available control element tests. Selected control element tests are displayed on a dark background. The activation of the control elements via different services is done one after the other. The next control element is only activated after the activation of the previous control element is completed.

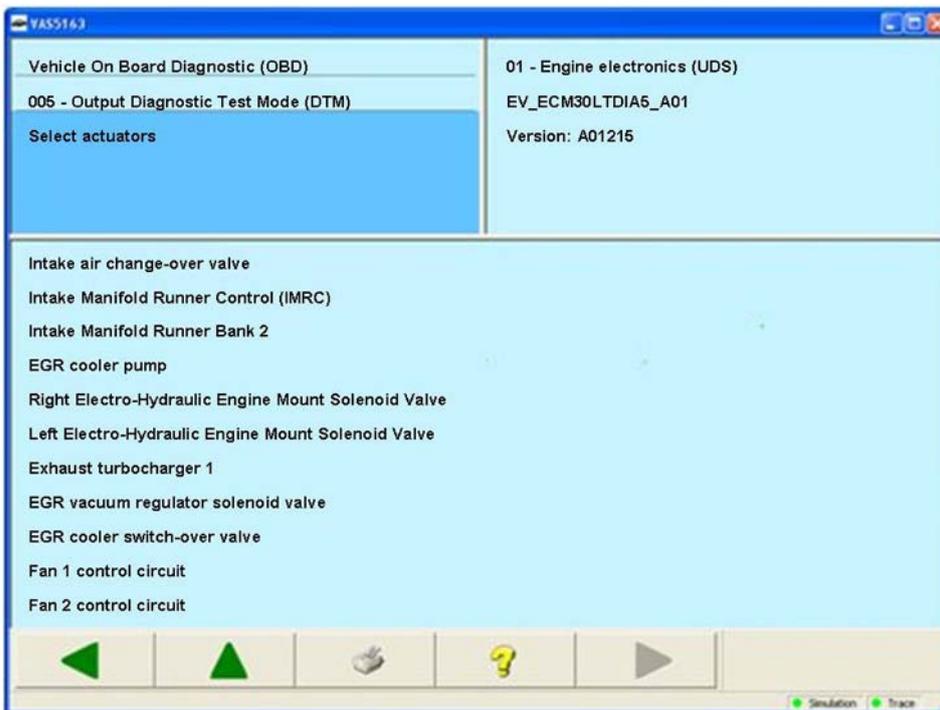


Figure 3-42 Select actuators in the UDS self-diagnosis: selection of control elements for the control element test

After the selection of the control element tests you press the **Continue** button to go to the **Configure activations** mask. The buttons for the configuration are described in the final control diagnosis for Crafter vehicle systems.

The last initiated status is displayed for each control element (not started, started, stopped).

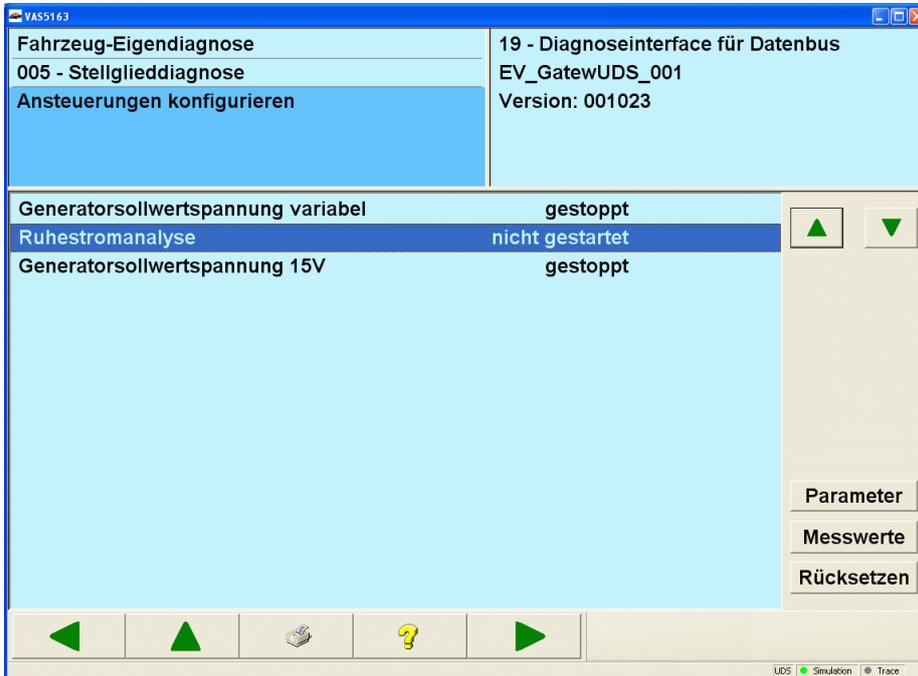


Figure 3-43 Configure activations in the UDS final control diagnosis

The **Parameter** button opens the *Change parameter* mask in which the respective parameters for the marked control element can be edited:

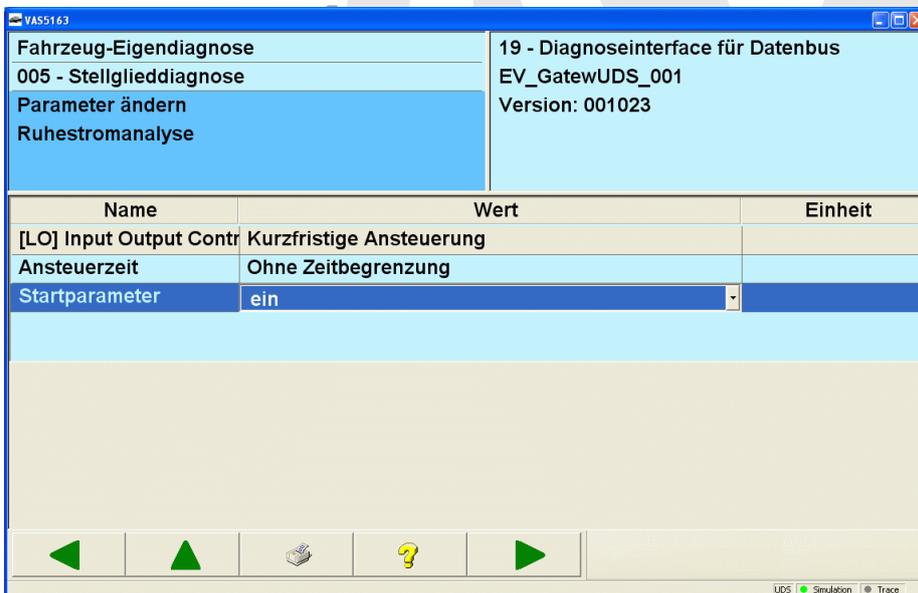


Figure 3-44 Change parameter in the UDS final control diagnosis

The **Measured values** button opens the *Allocate measured values* mask:

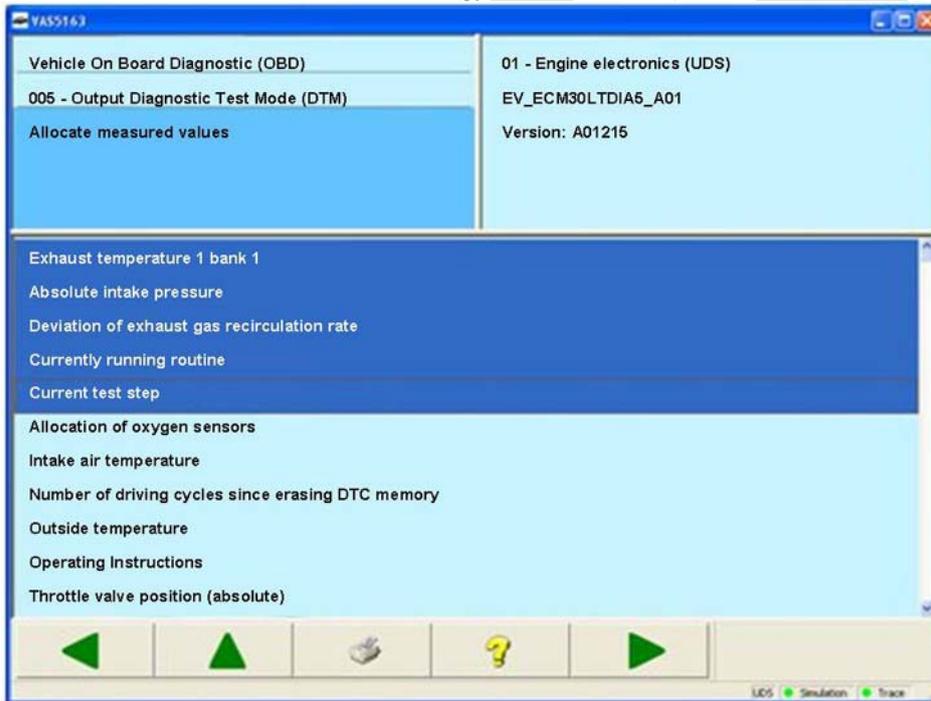


Figure 3-45 *Allocate measured values* in the UDS final control diagnosis

The **Continue** button opens the *Define sequence* mask, which permits the ordering of the displayed measured values:

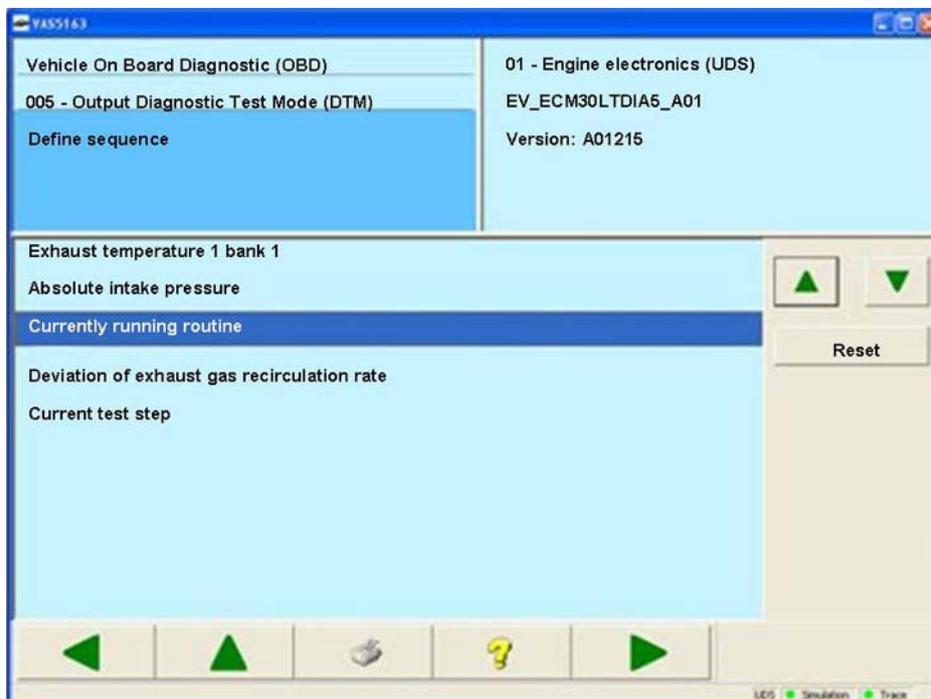


Figure 3-46 *Define sequence* in the UDS final control diagnosis

Press the **Continue** button to activate the sequence. The first control element test can be carried out using the **Start** button. The **Display parameters** button shows the parameters. Measured values are displayed underneath on a light background. The selected measured values are read and displayed cyclically, even if the control element test is not in progress.

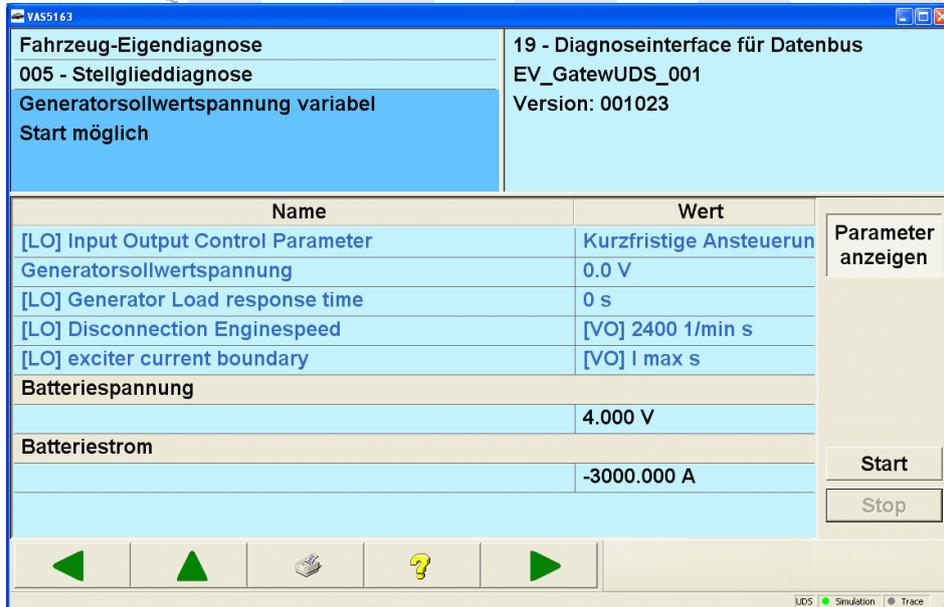


Figure 3-47 Test, test does not run (UDS final control diagnosis)

The control elements are activated one after the other so that only one control element is ever displayed. The **Continue** button can be used to select the next control element test in the sequence without executing the control element test displayed.

Press **Start** to execute the control element test displayed. Once a control element has been tested, the **Continue** button is activated and you can switch to the next control element of the sequence.



Figure 3-48 Test, test is running (UDS final control diagnosis)

The test can be stopped with **Stop**. The test can be restarted with **Start**. Press **Continue** to switch to the next control element test in the sequence. **Back** ends the sequence.

3.3.8 006 – Basic setting

KWP1281/KWP2000/UDS/Crafter Vehicle systems

The **006 – Basic setting** menu point displays measured values when the vehicle system is in basic setting.

KWP1281/KWP2000 Vehicle systems

Before the measured values for the basic setting are shown, you have to enter the display group of the measured values.

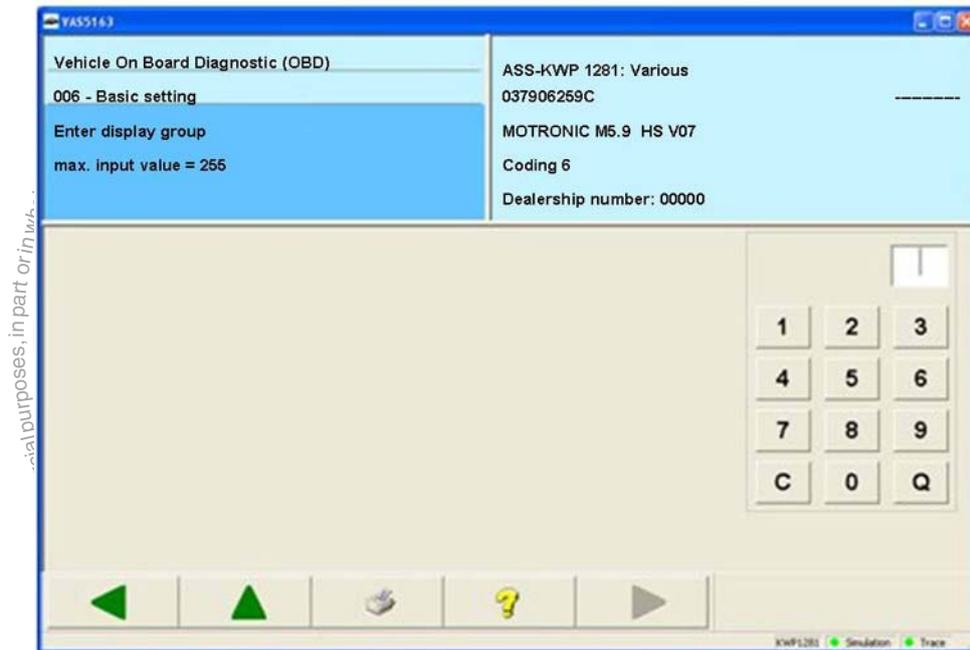


Figure 3-49 Selection of the display group

After the input of the display group, the measured values from this display group are shown.

KWP1281 Vehicle systems

The **Activate** buttons in the respective screen areas are used to display measured values in basic setting and measured values not in basic setting.
The display group can be advanced using the **Arrow up** or the **Arrow down** buttons.



Figure 3-50 Display of the measured values



KWP2000 Vehicle systems

The **Activate** buttons in the respective screen areas are used to display measured values in basic setting and measured values not in basic setting.
The display group can be advanced using the **Arrow up** or the **Arrow down** buttons.



Figure 3-51 Display of the measured values

The display group for the KW1281 vehicle systems can be advanced using the **Arrow up** or the **Arrow down** buttons.

UDS vehicle systems

A basic setting is selected from the list.

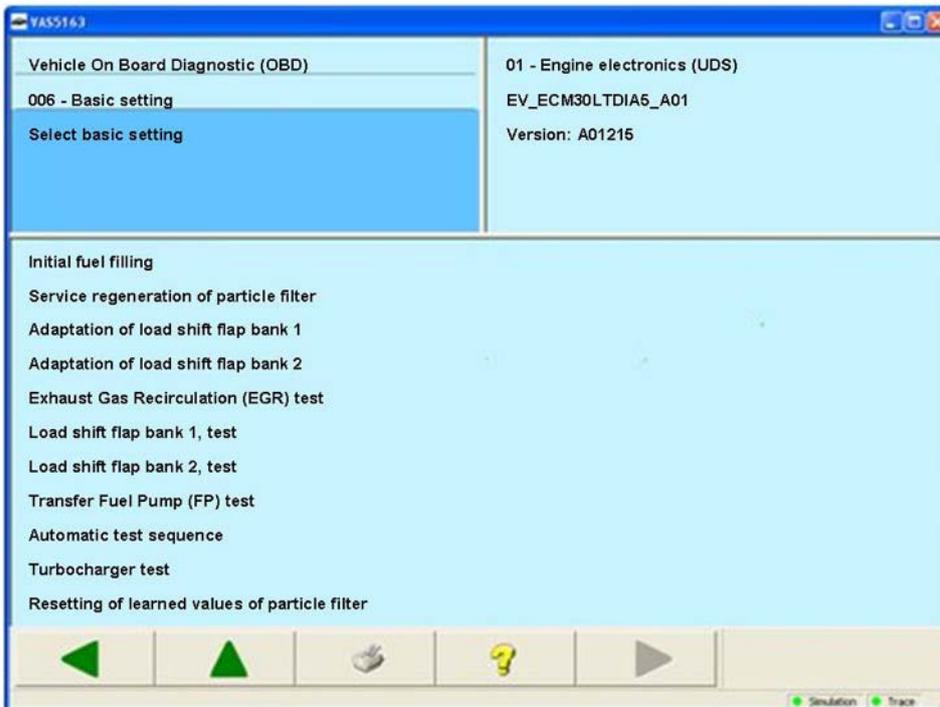


Figure 3-52 Select basic setting in the UDS self-diagnosis:

After selection of a basic setting, you can use the **Continue** button to go to the *Configure activation* mask.



Figure 3-53 Configure activation in the UDS basic setting

The last initiated status is displayed for each routine (not started, started, stopped).
 The **Parameter** button opens the *Adapt parameter* mask in which the respective parameters for the marked basic setting can be edited. Press the **Continue** button to accept the set values.

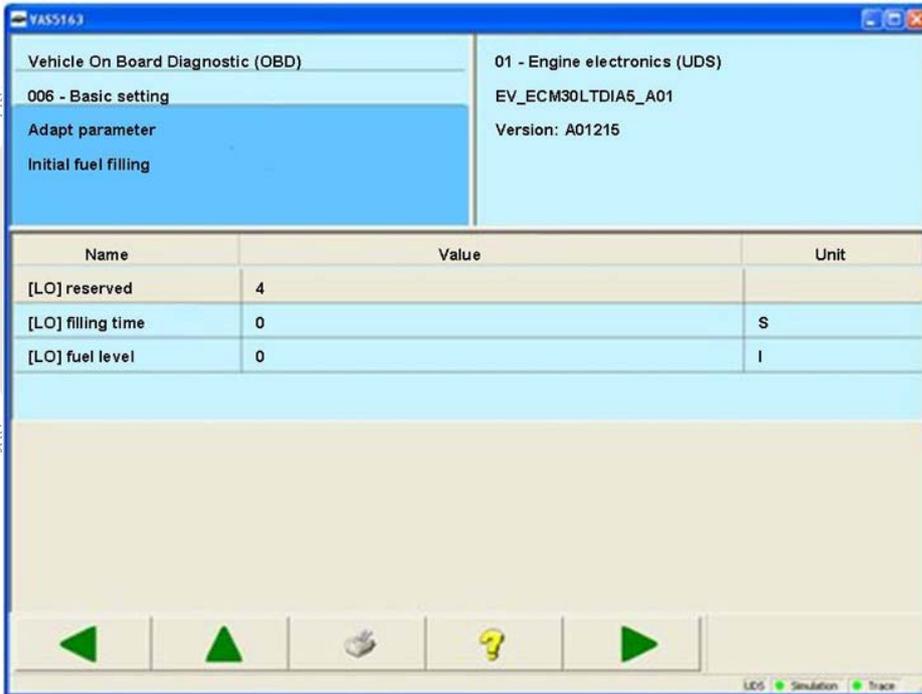


Figure 3-54 *Adapt parameter* in the UDS basic setting

The **Measured values** button opens the *Allocate measured values* mask:

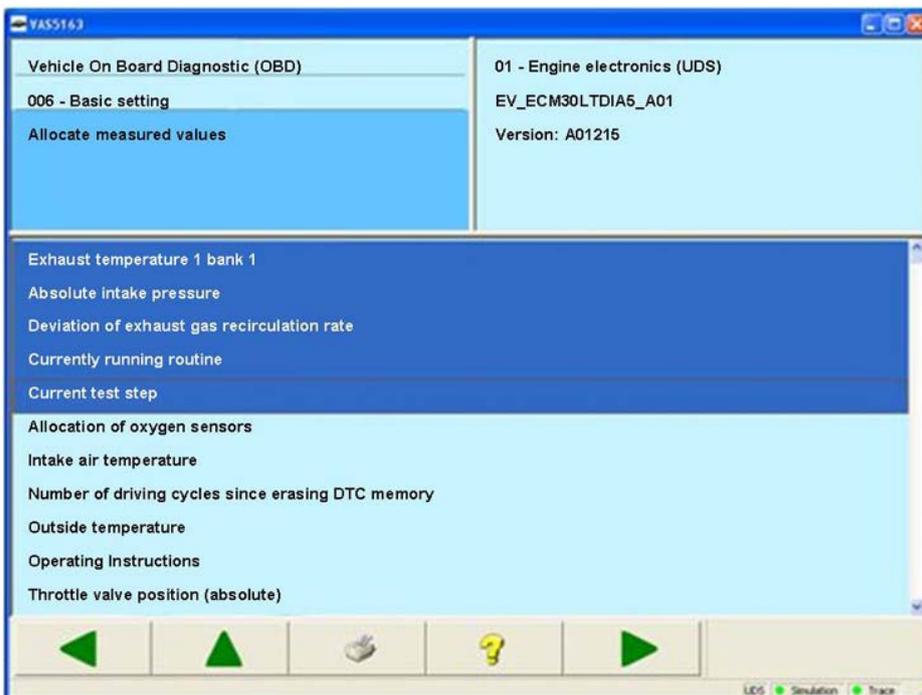


Figure 3-55 *Allocate measured values* in the UDS basic setting

One or more measured values can be selected which are read out and displayed during the basic setting. The **Continue** button accepts the set values and opens the *Define sequence* mask which permits the ordering of the displayed measured values using the **Arrow up** and **Arrow down** buttons:

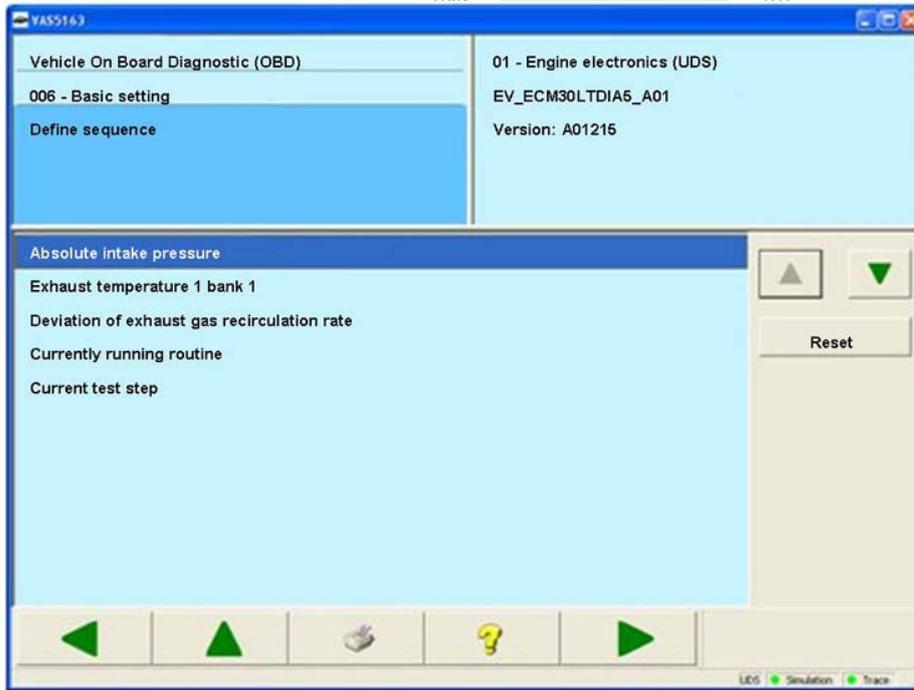


Figure 3-56 *Define sequence* in the UDS basic setting

Press the **Continue** button to call up the mask. The **Display parameters** button shows the parameters. Measured values are displayed underneath on a light background.



Figure 3-57 *UDS basic setting, does not run*

Press **Start** to execute the basic setting displayed.

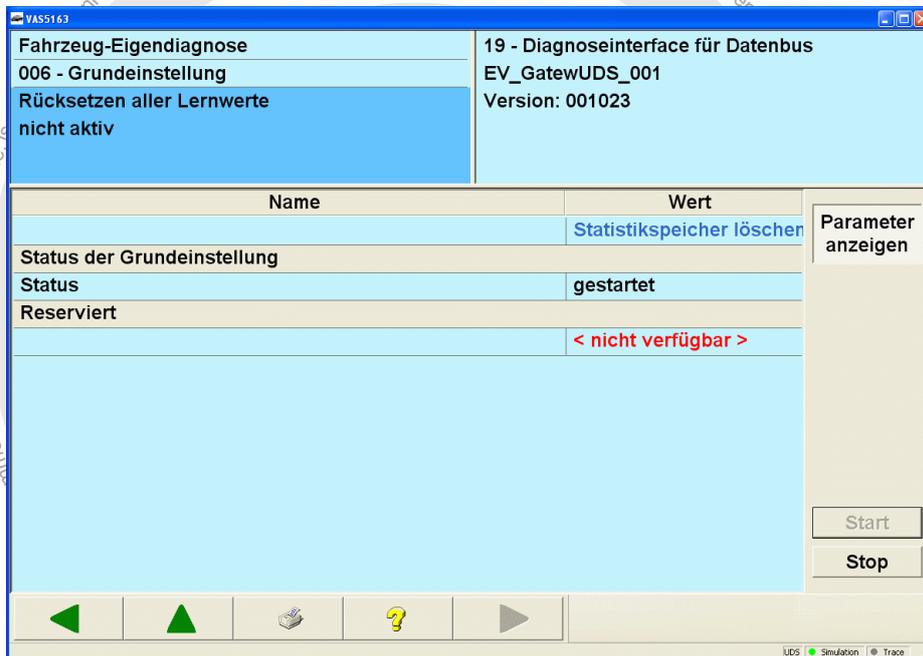


Figure 3-58 UDS basic setting, is running

The basic setting can be stopped with **Stop**. The basic setting can be restarted with **Start**. **Back** takes you back to the *Configure activation* mask.

Crafter vehicle systems

This function gives you the option of performing a basic setting in the vehicle system. You can select a basic setting from the list of all available basic settings. The selected basic setting is displayed on a dark background.

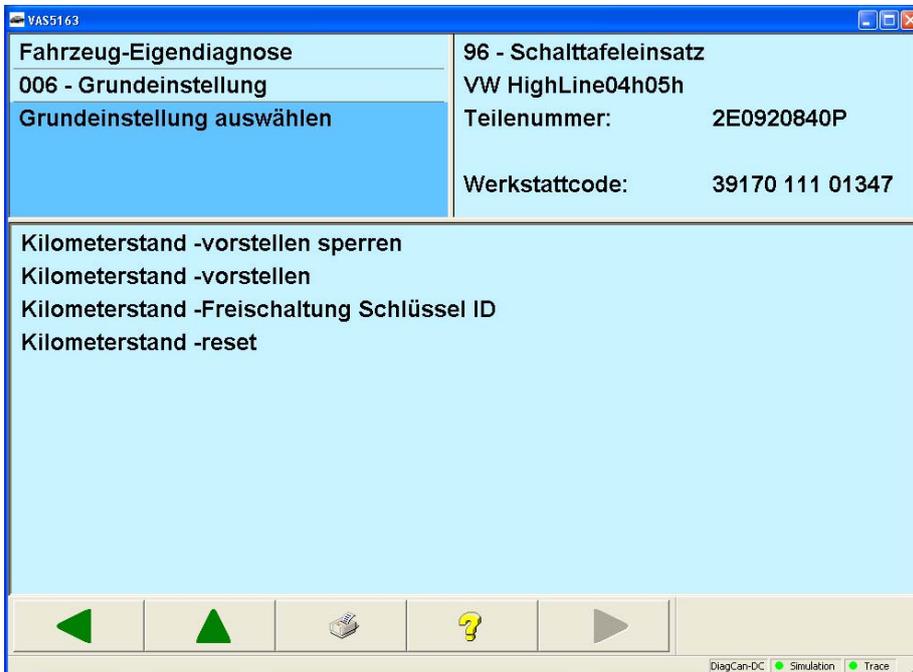


Figure 3-59 Selection of a basic setting

Continue takes you to the mask for the parameterisation of the basic setting and for selection of measured values. The **Parameter** button is only activated if parameters exist for the basic setting.



Figure 3-60 Parameterisation of the basic setting



Figure 3-61 Carry out the parameterisation of the basic setting

The **Measured values** button can be used to allocate measured values for a basic setting. The selected measured values are read and displayed cyclically, even if the basic setting is not in progress.



Figure 3-62 Select data

Press the **Continue** button to go to the mask for activation of the basic setting. The activation is controlled via the **Start** and **Stop** buttons. The **Display start/stop parameters** button shows the parameters. The parameters are directly listed at the identification of the basic setting. Blue text is used for start parameters; black text is used for stop parameters. Measured values are displayed underneath on a light background. The selected measured values are read and displayed cyclically, even if the basic setting is not in progress.



Figure 3-63 Activation of the Crafter basic setting

3.3.9 007 – Coding (Service \$1A)

KWP2000 Vehicle systems

At the **007 – Coding (Service \$1A)** menu point, a coding is written into the vehicle system. A distinction is made between three types of coding:

- Short coding
- Long coding
- Gateway coding

If subsystems are connected to a vehicle system, you will be shown the identification data of the main system (master) and the subsystems (e.g., access and start authorization, immobilizer, etc.).

After selecting an identified system, you can move on to the actual coding by pressing the **Continue** button.

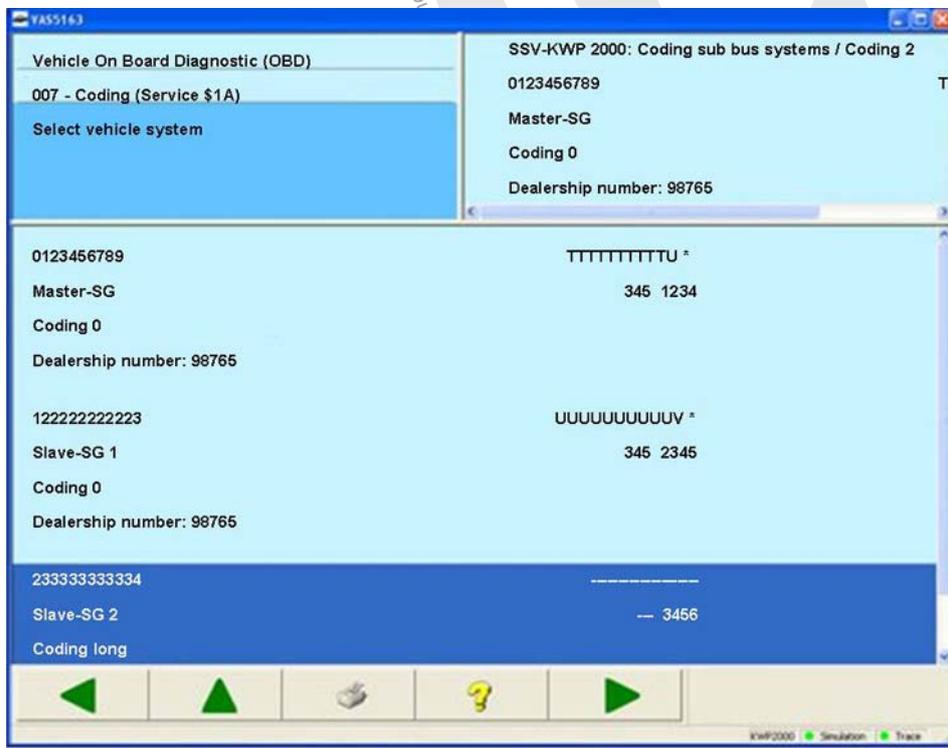


Figure 3-64 Selection of the main system and subsystems

Short coding

After a connection to a vehicle system is setup, the current coding value is displayed in the right information window. This value is changed with the short coding. To do this, the new coding value is entered using the screen keyboard. The new coding value is displayed in the right information window, followed by the previous coding value in brackets.

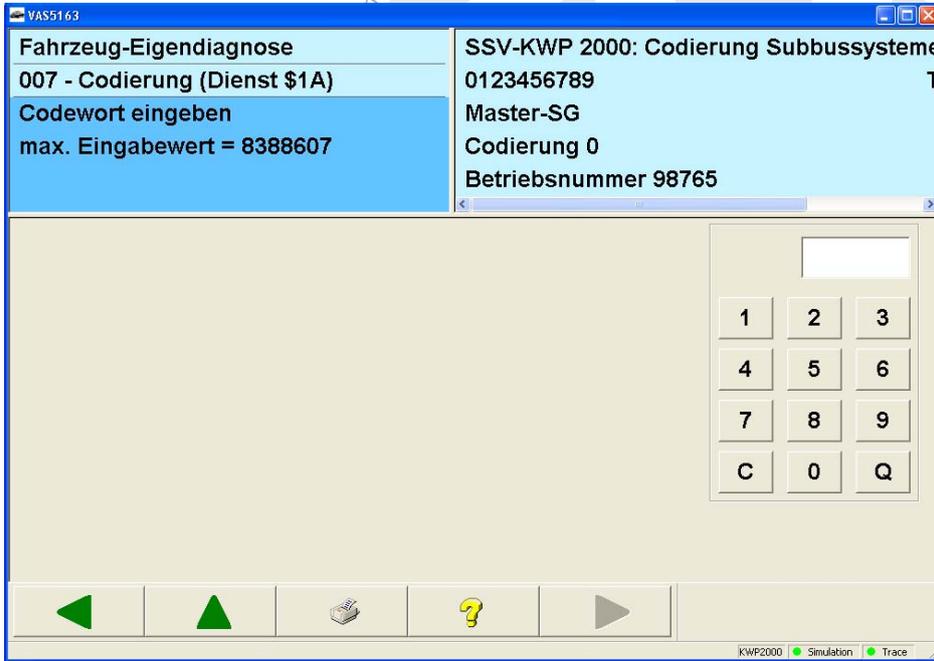


Figure 3-65 Entering the short coding



Figure 3-66 Short coding result

Long coding

If the tester recognises on the basis of the identification data that a vehicle system with long coding is present, then *Long coding* is shown instead of the coding value in the right information window. Long coding can include up to 255 bits.

Long coding is displayed line by line for each byte. You can switch the screen keyboard between hexadecimal and binary.

- Editing a byte:
Select the relevant byte and modify it using the screen keyboard which appears.
- Adding a byte:
Mark the empty line under the last byte, and add another byte using the screen keyboard. You cannot skip any bytes.
- Erasing a byte:
Select the relevant line and press the **Remove byte** button.

If you press the **Continue** button, all modifications are accepted.

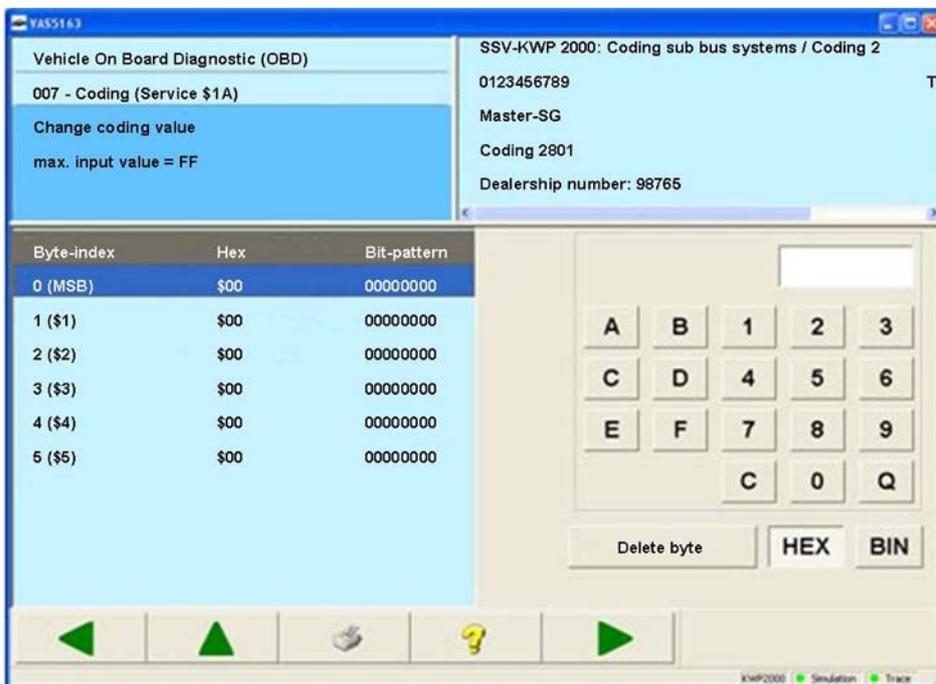


Figure 3-67 Long coding result

Long coding, gateway

The coding for a Gateway-ECU differs from that of other vehicle systems. All the vehicle systems in a vehicle that can be diagnosed are registered (coded) in a Gateway-ECU (which can be selected via vehicle system **19 – Diagnostic interface for data bus**). A bit is set in the corresponding coding word of the Gateway-ECU for every vehicle system installed. For coding the installed systems, the tester shows you the Gateway-ECU's list of possible vehicle systems and their current coding.



Figure 3-68 Read/write long coding for a Gateway-ECU

Proceed as follows for Gateway coding:

1. One after the other, select the vehicle systems whose coding you wish to modify. Their entry is set from *not coded* to *coded* and vice versa.
2. Press the **Continue** button to accept the new coding.
3. Depending on the type of the Gateway-ECU, pressing the **Continue** button will display separate coding tables for entering the variants for vehicle fittings. You can use these tables to code the variants by means of plain text templates:
 - Brand (VW, Audi, Seat, ...)
 - Derivative (short back, versions, ...)
 - Right/left hand drive
 - Four-door (< 4 doors, >= 4 doors)

Finally, a security dialog appears to confirm the coding. The coding is then written to the Gateway-ECU. The **Coding in vehicle system performed** message is output in the left information window.

3.3.10 008 – Coding (Service \$22)

KWP2000 Vehicle systems

At the **008 – Coding (Service \$22)** menu point, all functions are grouped together that perform a coding in the vehicle system. Only if the vehicle system's **19 – Databus OBD Interface** is selected will the following functions be offered for selection:

- **008.01 – Coding**
- **008.02 – Installation list, code**

These submenus are missing in all other vehicle systems. The masks for **008.01 – Coding** are directly at **008 – Coding (Service \$22)**.

If subsystems are connected to a vehicle system, you will be shown the identification data of the main system (master) and the subsystems (e.g.: access and start authorization, immobilizer, etc.).

After selecting an identified system, you can move on to the actual coding by pressing the **Continue** button.

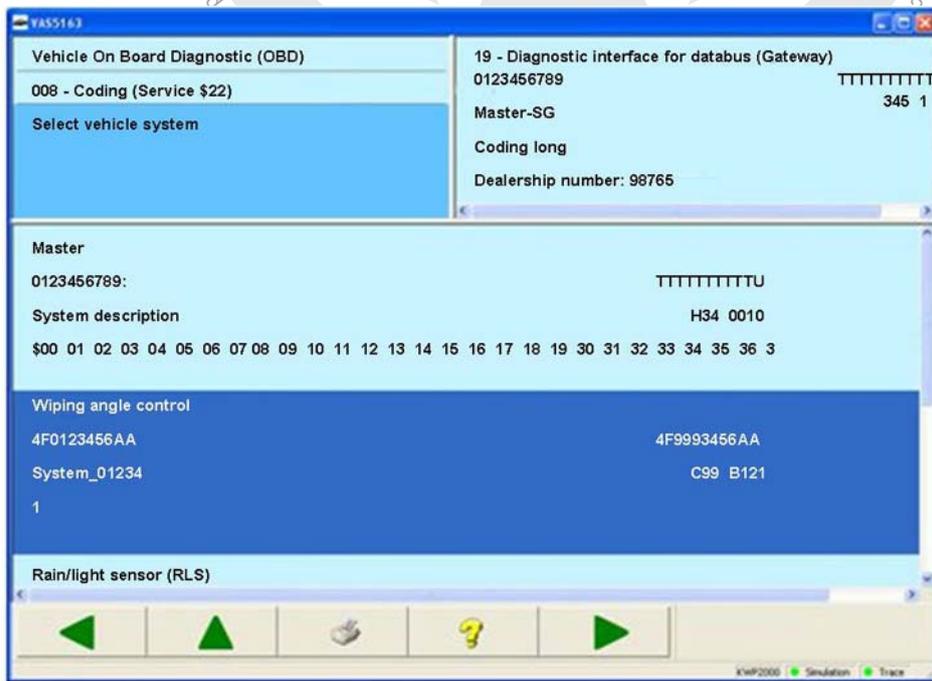


Figure 3-69 Selection of the main system and subsystems

3.3.10.1 008.01 – Coding

KWP2000 Vehicle system

The coding is displayed line by line for each byte. You can switch the screen keyboard between hexadecimal and binary.

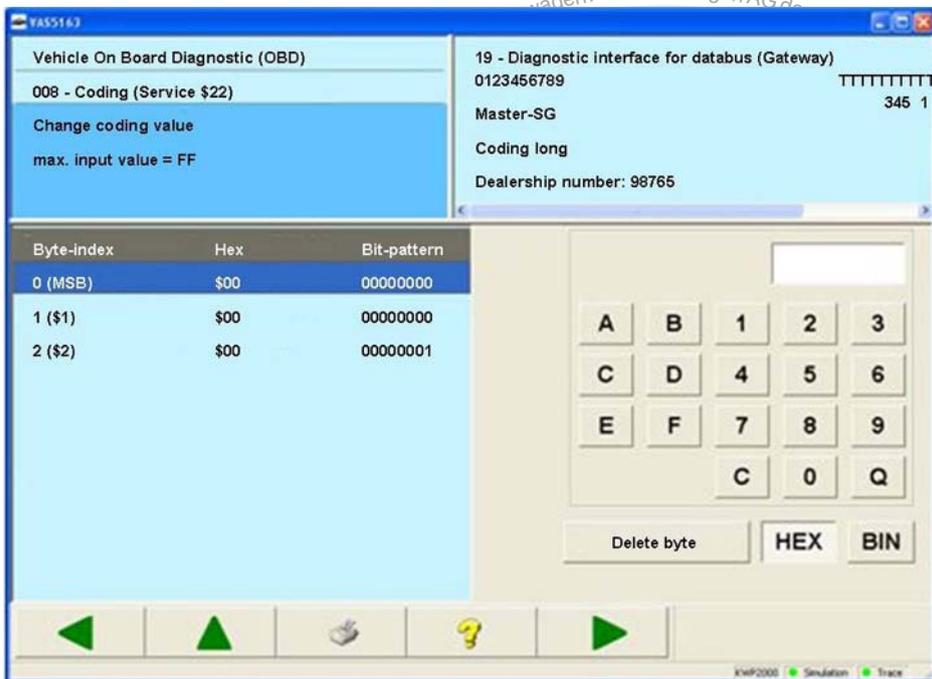


Figure 3-70 Coding result

3.3.10.2 008.02 – Installation list, code

KWP2000 Gateway

All the vehicle systems in a vehicle that can be diagnosed are registered (coded) in the Gateway-ECU (which can be selected via vehicle system **19 – Databus OBD Interface**). A bit is set in the corresponding coding word of the Gateway-ECU for every vehicle system installed. For coding the installed vehicle systems, the tester shows you the Gateway-ECU's list of possible vehicle systems and their current coding.

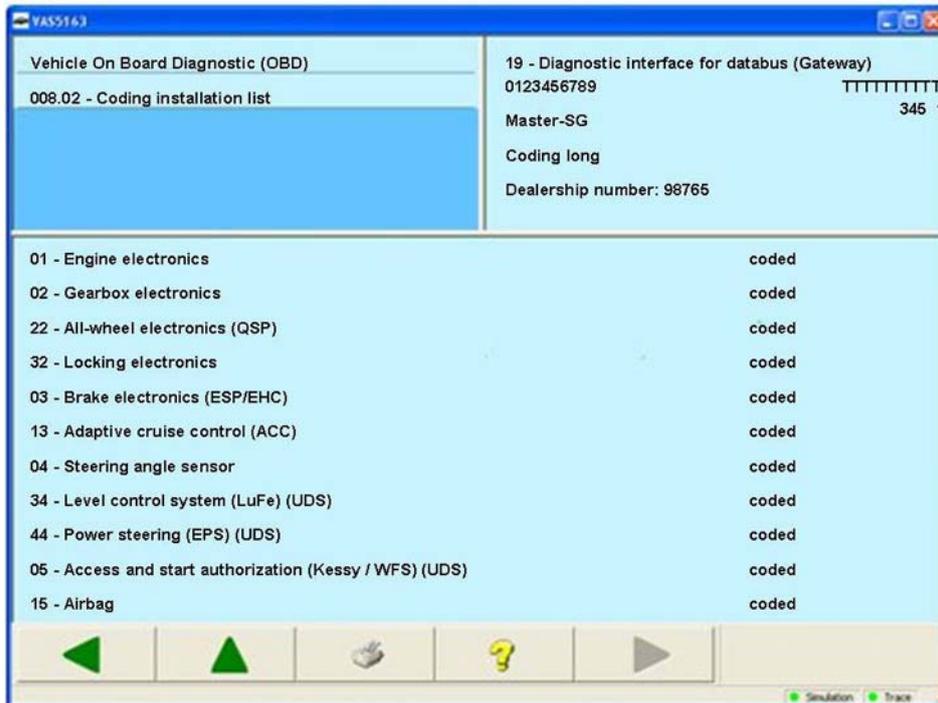


Figure 3-71 Installation list coding in a Gateway-ECU

3.3.11 009 – Coding

KWP1281/Crafter/UDS Vehicle systems

At the **009 – Coding** menu point, all functions are grouped together that perform a coding in the vehicle system. The following functions are only available for selection in UDS vehicle systems:

- **009.01 – Binary coding**
- **009.02 – Plain text coding**

These submenus are missing for all other vehicle systems. The coding is done directly at **009 – Coding**.

KWP1281 Vehicle systems

After a connection to a vehicle system is setup, the current coding value is displayed in the right information window. This value is changed with the coding. To do this, the new coding value is entered using the screen keyboard. The new coding value is displayed in the right information window, followed by the previous coding value in brackets.

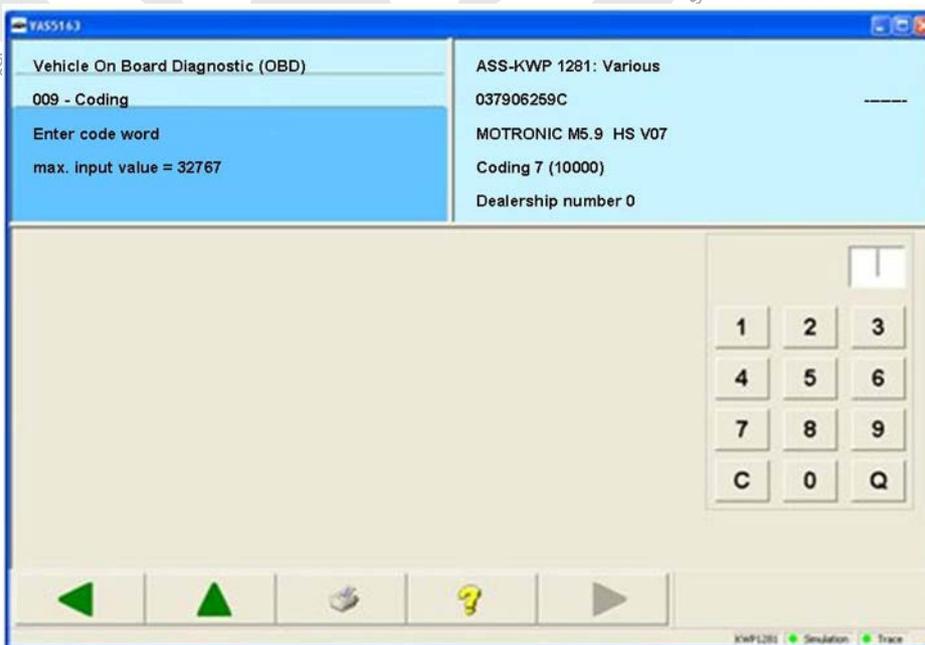


Figure 3-72 Entering the coding

Crafter vehicle systems

All available coding strings of the vehicle system are displayed in the work window.

Inputting individual coding strings

Individual coding strings can only be manually entered (not by file).

Inputting an entire data record

If you press the **Read coding of vehicle system and save to file** button, the entire current coding of the vehicle system can be read and saved to a file by the tester. When a coding is saved, it can be read in from the previously saved file to code the vehicle system by pressing the **Read coding from file and write into vehicle system** button.

This function is for providing support when replacing control units. Identical vehicle system variants are required for it to work. The coding of the vehicle system to be replaced is read and saved using this function. After the new vehicle system is installed, the coding is written back into the new vehicle system. A security dialog appears before the coding is written.

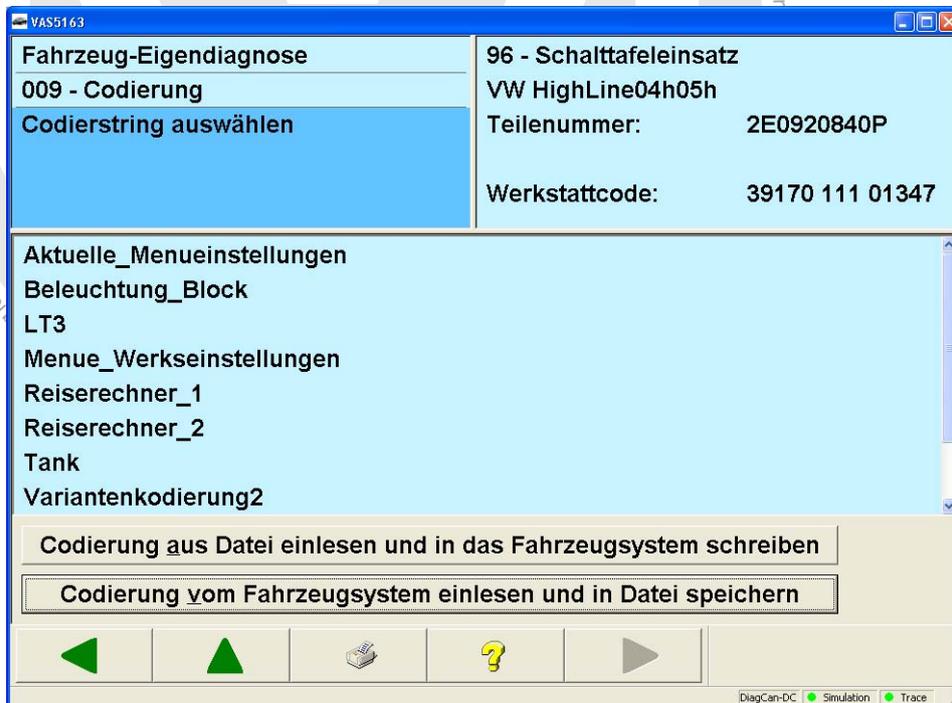


Figure 3-73 Coding for a Crafter control unit

To enter new coding data, the correct coding string needs to be selected. Pressing the **Continue** button takes you to the *Enter test character* mask. Here you can enter the test character delivered with the coding data, which has to fit the coding data. The test character prevents erroneous coding values (due to manual entry) from being accidentally written into the vehicle system. If there is no test character, you can skip this mask by pressing **Continue**. In this case, a warning is displayed stating that no errors can be recognised when entering the coding string.



Figure 3-74 Enter test character for the Crafter coding

After confirming this note, the *Change coding value* mask appears. Press the **Storing coding in file** button to save this coding string to a file. The saved coding string can be read back in again by the tester by pressing the **Read coding from file** button.

You can change a coding value of the coding string with the screen keyboard which appears in the right half of the work window if you select a coding value.

After entering all new coding values, the changed coding string is sent to the vehicle system when you press the **Continue** button. Confirm that the coding is to be performed by pressing **OK** on the message box.



Figure 3-75 Select coding value for editing a Crafter coding string

The successful performance of the coding is shown in the left information window. In some cases, the electronic control units need to be reset to complete the coding. The tester shows this in the work window. Press the **Continue** button to reset the control units.

If no control unit reset is required, return to the list of coding strings by pressing the **Back** button.

UDS vehicle systems

After selection of the **009 – Coding** function, first select the vehicle system (main system and, if applicable, subsystems). **Continue** will take you to the selection of the coding method (binary coding or plain text coding). Both coding methods describe the vehicle system in the same way. They only differ in the display of the coding data.

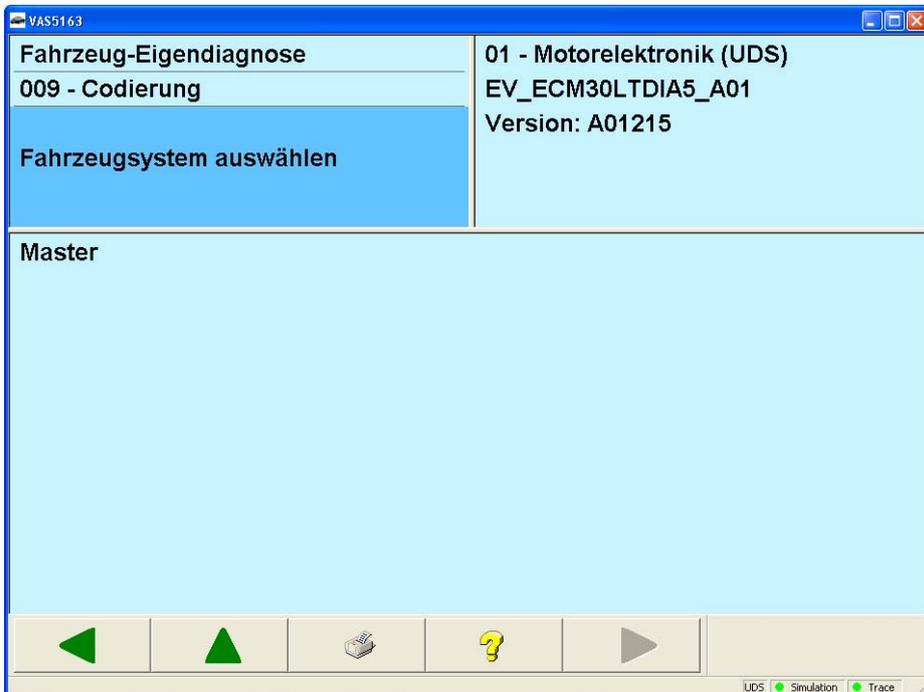


Figure 3-76 Select vehicle system

3.3.11.1 009.01 – Binary coding

UDS vehicle systems

After selection of the **009.01 – Binary coding** function, you use **Continue** to go to the *Enter test character* mask. Here you can enter the test character, which has to fit the coding data. The test character prevents erroneous coding values (due to manual entry) from being accidentally written into the vehicle system. If there is no test character, you can skip this mask by pressing **Continue**. In this case, a warning is displayed stating that no errors can be recognised when entering the coding string.

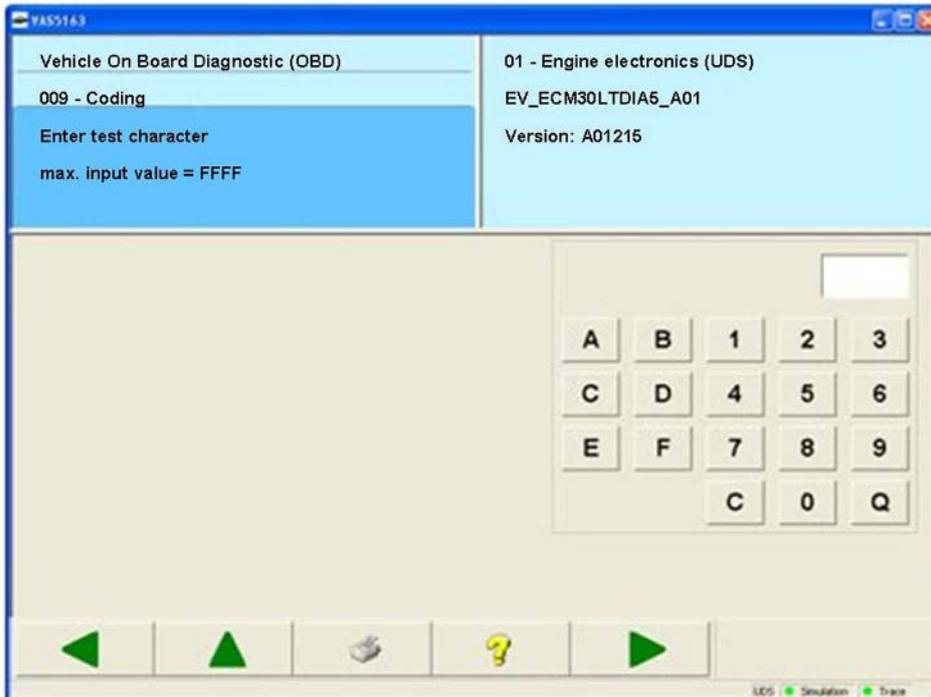


Figure 3-77 Enter test character for the UDS binary coding

After confirming this note, the *Change coding value* mask appears. You can change a coding value of the coding string with the screen keyboard which appears in the right half of the work window if you select a coding value.

After entering all new coding values, the changed coding string is sent to the vehicle system when you press the **Continue** button. Confirm that the coding is to be performed by pressing **OK** on the message box.

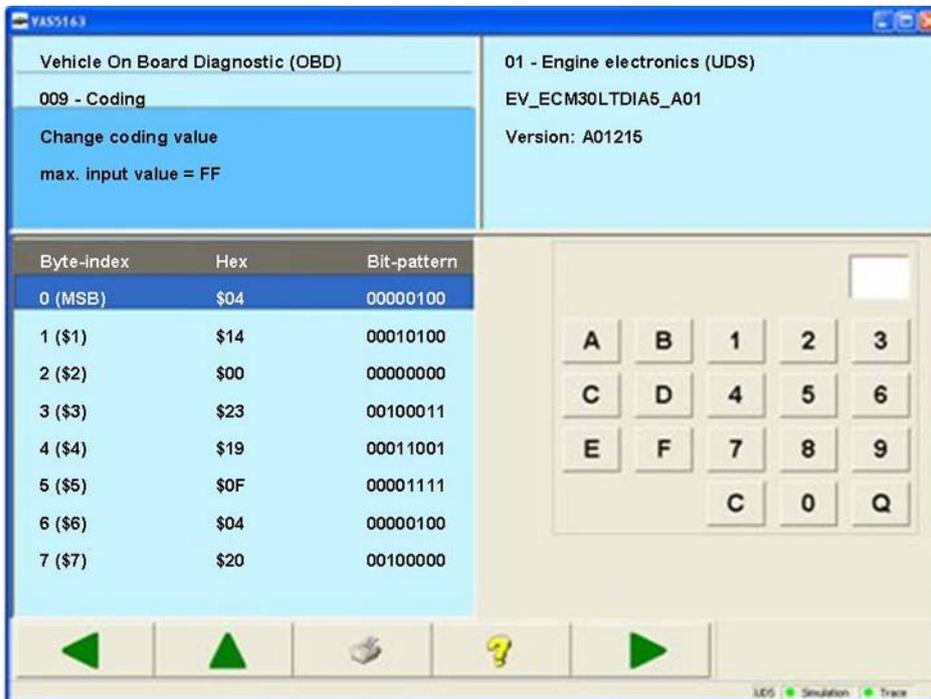


Figure 3-78 Select code value

The successful performance of the coding is shown in the left information window. With the **Back** button, you return to the *Enter test character* mask.

3.3.11.2 009.02 – Plain text coding

UDS vehicle systems

After selection of the **009.02 – Plain text coding** function, you go to the *Adapt parameter* mask. Here you can edit the offered parameters.

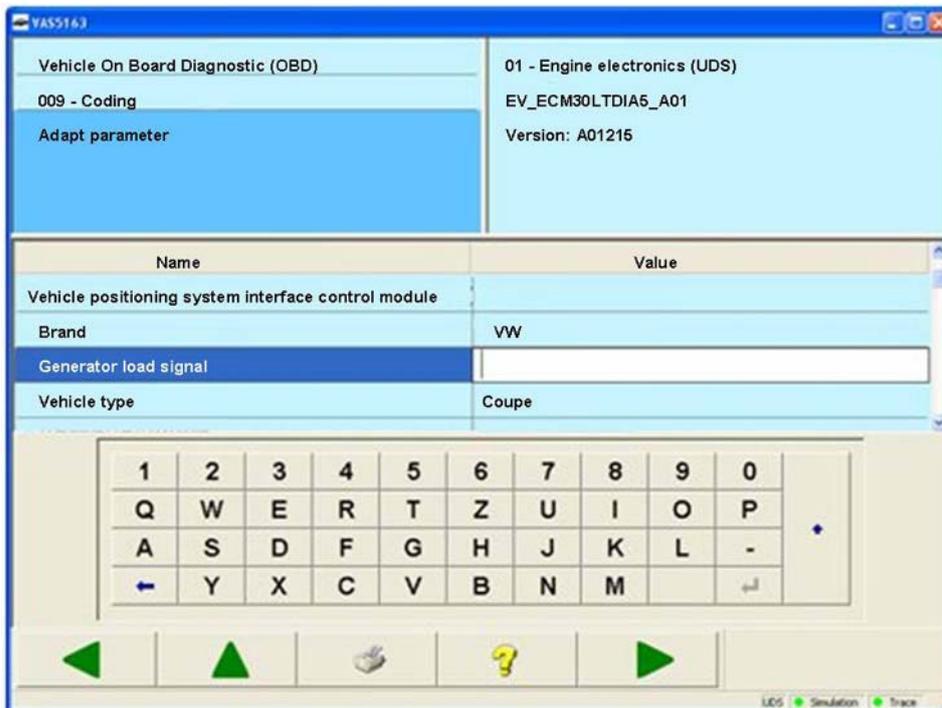


Figure 3-79 Plain text coding

Press the **Continue** button to accept the set values and to perform the coding. The successful performance of the coding is shown in the left information window.

With the **Back** button, you return to the *Coding, selecting* mask.

3.3.11.3 009.03 – Installation list, coding

UDS vehicle systems

After selection of the **009.03 – Coding installation list** function, a mask opens in which individual vehicle systems can be coded.



Figure 3-80 Coding installation list

By selecting a vehicle system from the list, the set installation list will change from “no” to “yes” or the other way around.

Press the **Continue** button to accept the set values and to perform the coding. The successful performance of the coding is shown in the left information window.

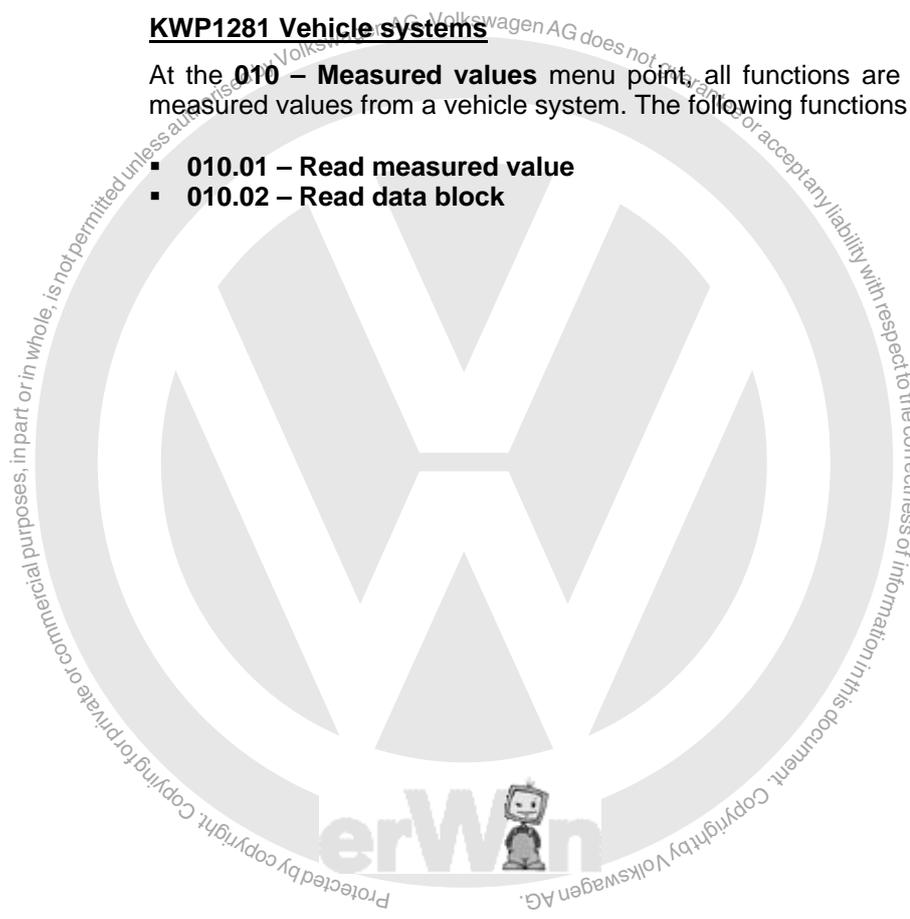
With the **Back** button, you return to the *Coding, selecting* mask.

3.3.12 010 – Measured values

KWP1281 Vehicle systems

At the **010 – Measured values** menu point, all functions are grouped together that read out measured values from a vehicle system. The following functions are available for selection:

- **010.01 – Read measured value**
- **010.02 – Read data block**



3.3.12.1 010.01 – Read measured value

KWP1281 Vehicle systems

At the **010.01 – Read measured value** menu point, individual measured values from the vehicle system are read. For this you enter the channel number for the measured value.

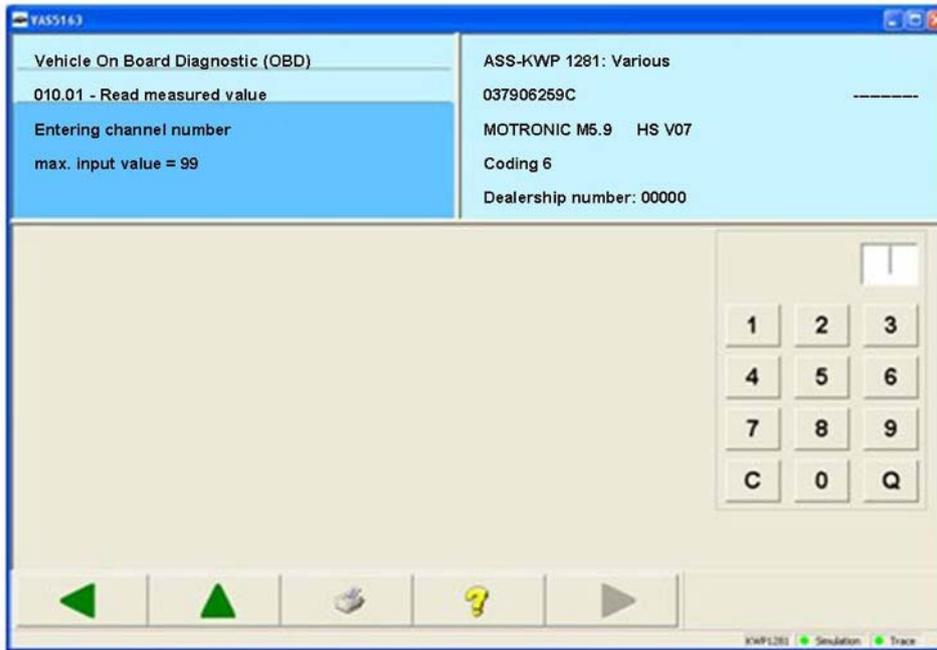


Figure 3-81 Channel input for *Read measured value* for KW1281 vehicle systems

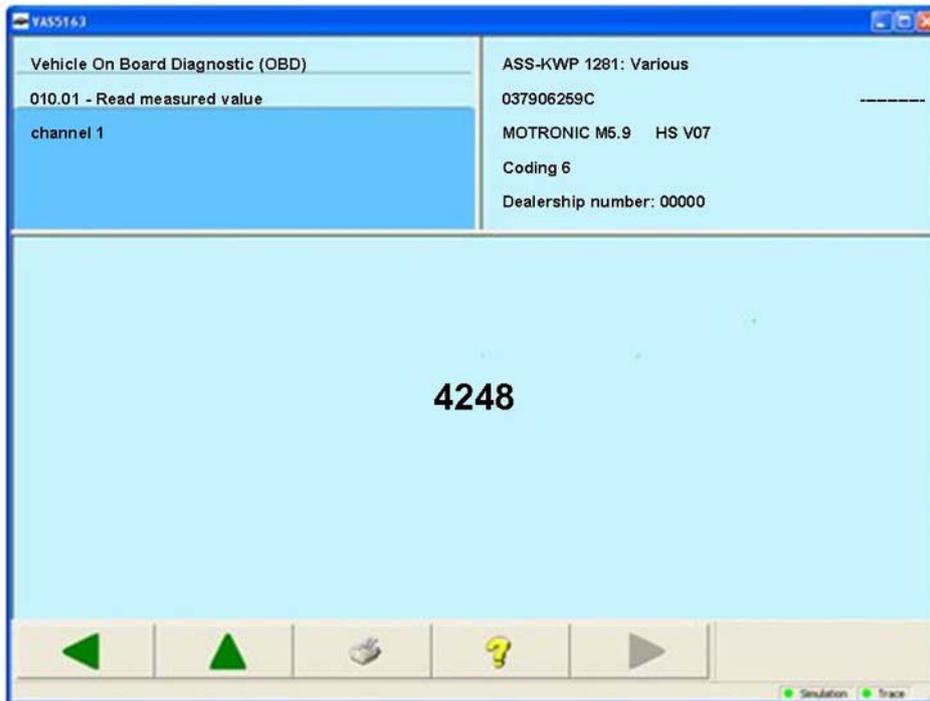


Figure 3-82 *Read measured value* for KW1281 vehicle systems

3.3.12.2 010.02 – Read data block

KWP1281 Vehicle systems

At the **010.02 – Read data block** menu point, measuring value blocks from the vehicle system are read. For this you first enter the desired display group. **Continue** takes you to the mask in which the measured values are displayed.

This mask is identical to the mask for the basic setting (chapter 3.3.8). The **Activate** buttons in the respective screen areas are used to display measured values in basic setting and measured values not in basic setting.

The display group can be advanced using the **Arrow up** or the **Arrow down** buttons.

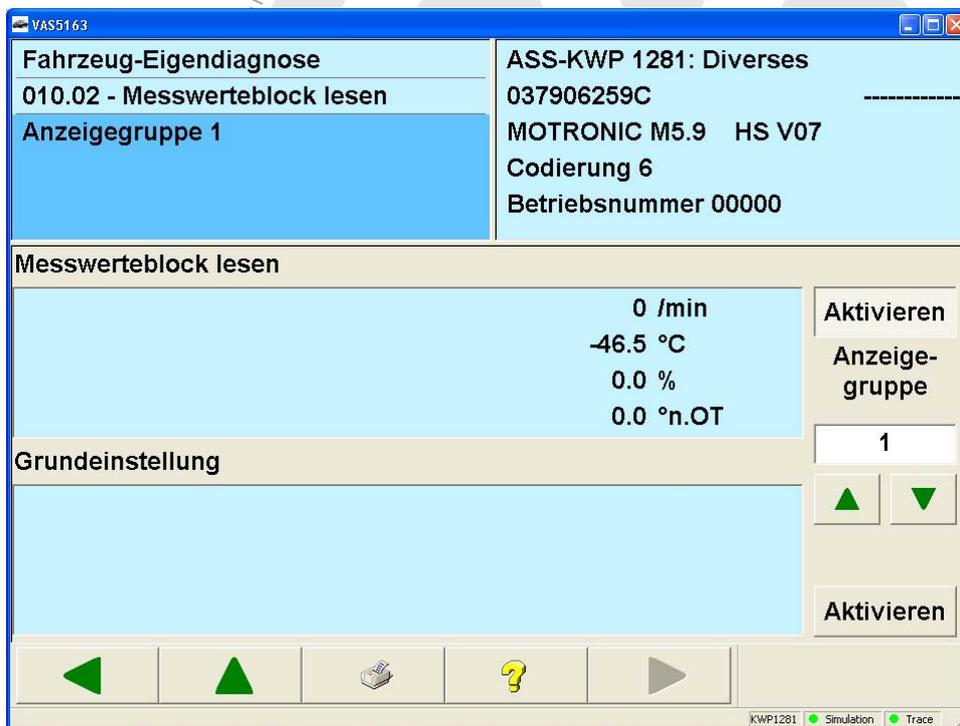


Figure 3-83 Read data block for KW1281 vehicle systems

3.3.13 011 – Measured values

KWP2000/UDS/Crafter Vehicle systems

At the **011 – Measured values** menu point, measured values from the vehicle system are read. Depending on the vehicle system, you can read measured values from the vehicle system and have them displayed cyclically. To do this, enter the desired **display group** (*Display group no.* in the repair guide) or select the measured values from a list.

KWP2000 Vehicle systems

Select a display group using the screen keyboard. A display group contains a maximum of four measured values. The measured values are displayed together with their physical unit. You can change the numbers of the display group using the **arrow up** or **arrow down** buttons.

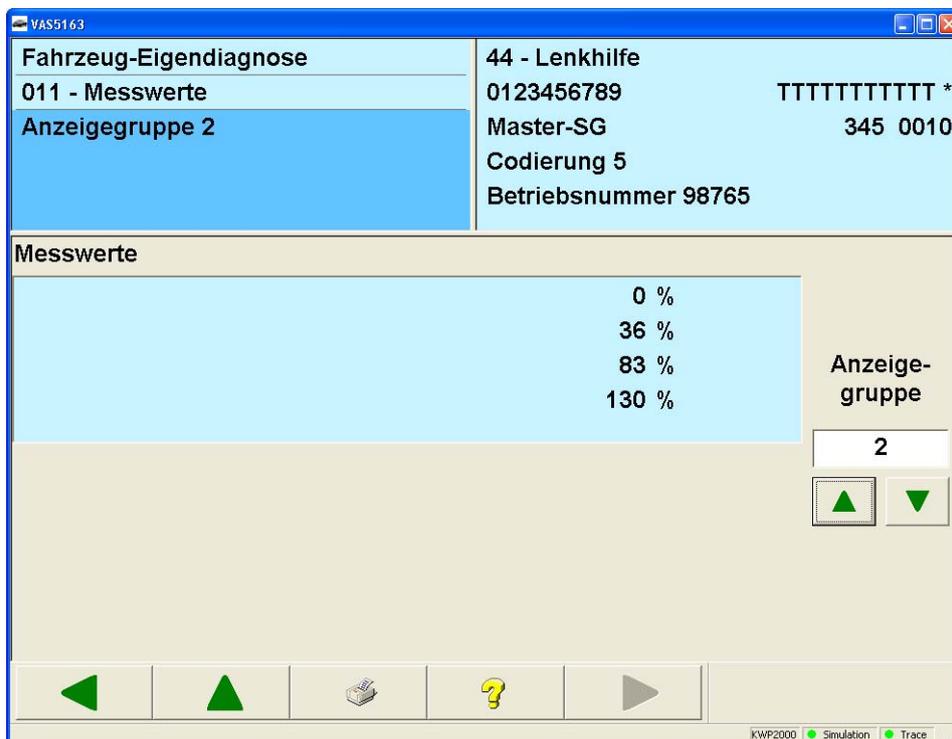


Figure 3-84 Display measured values for KWP2000 vehicle systems

Crafter vehicle systems

The desired measured values can be selected from the list of offered measured values by multiple selection in the *Allocate measured values* mask.

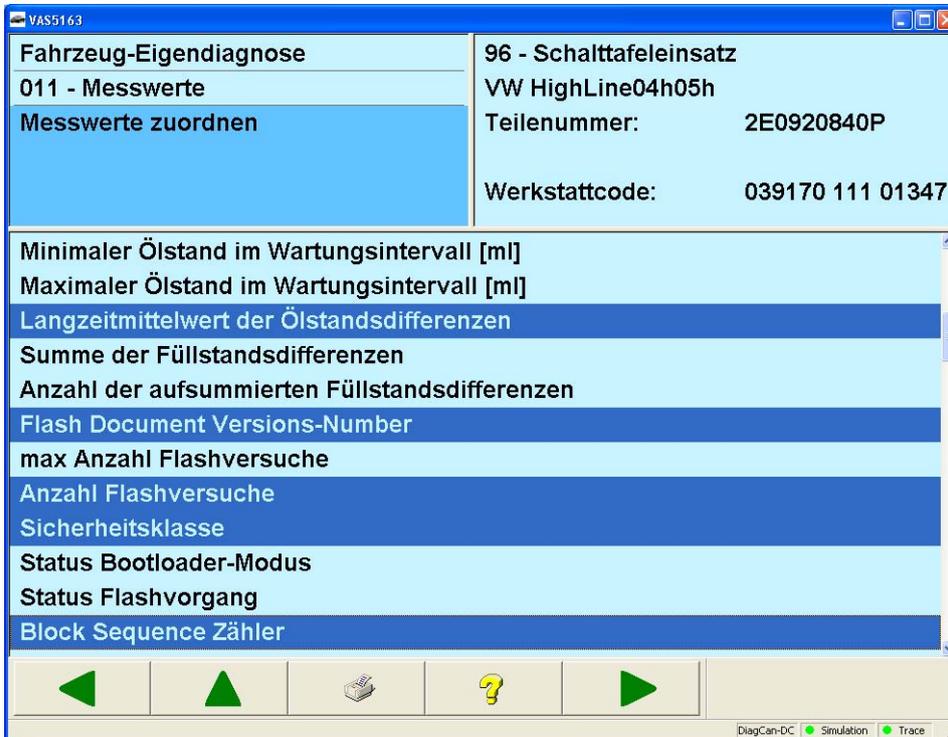


Figure 3-85 *Allocate measured values* in the Crafter self-diagnosis

Press **Continue** to accept your selection. You can specify the sequence of the measured values in the following *Define sequence* mask.

The following functions are available:

Button	Description
Arrow up	Moves the position of a selected measured value up.
Arrow down	Moves the position of a selected measured value down.
Reset	Reset sorting of the measured values.

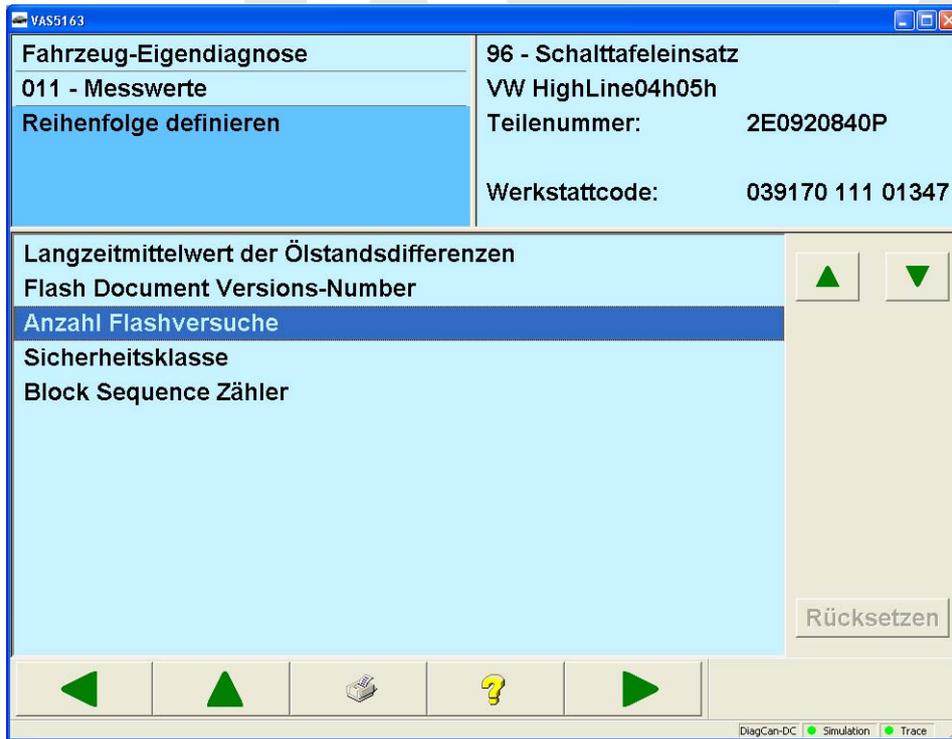


Figure 3-86 *Define sequence* in the Crafter self-diagnosis

By pressing the **Continue** button, the group of selected measured values is displayed in the sequence defined above. The values are cyclically updated.

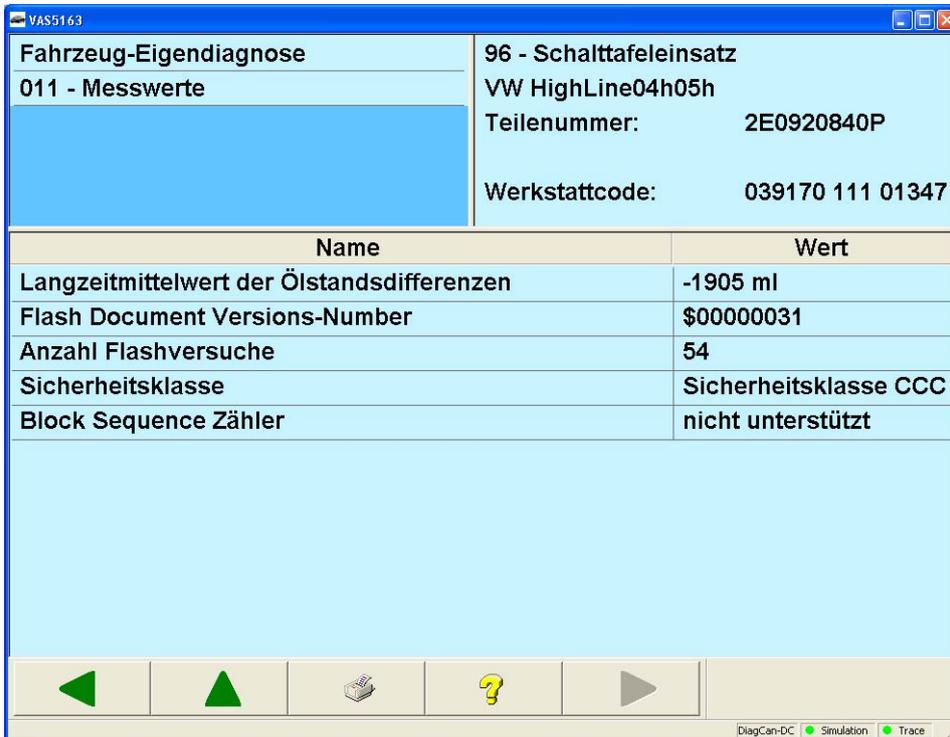


Figure 3-87 Measured values in the Crafter self-diagnosis

UDS vehicle systems

The desired measured values can be selected from the list of measured values offered by the vehicle system by multiple selection in the *Allocate measured values* mask. Alternatively you can select one or more already defined groups of measured values from a list of favourites.

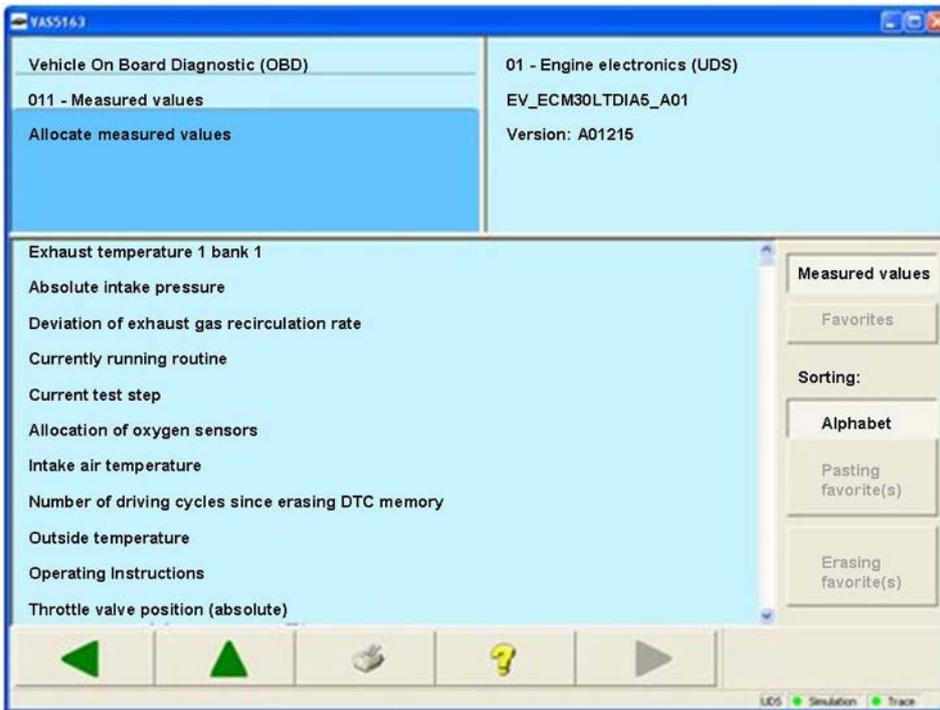


Figure 3-88 *Allocate measured values* in the UDS self-diagnosis

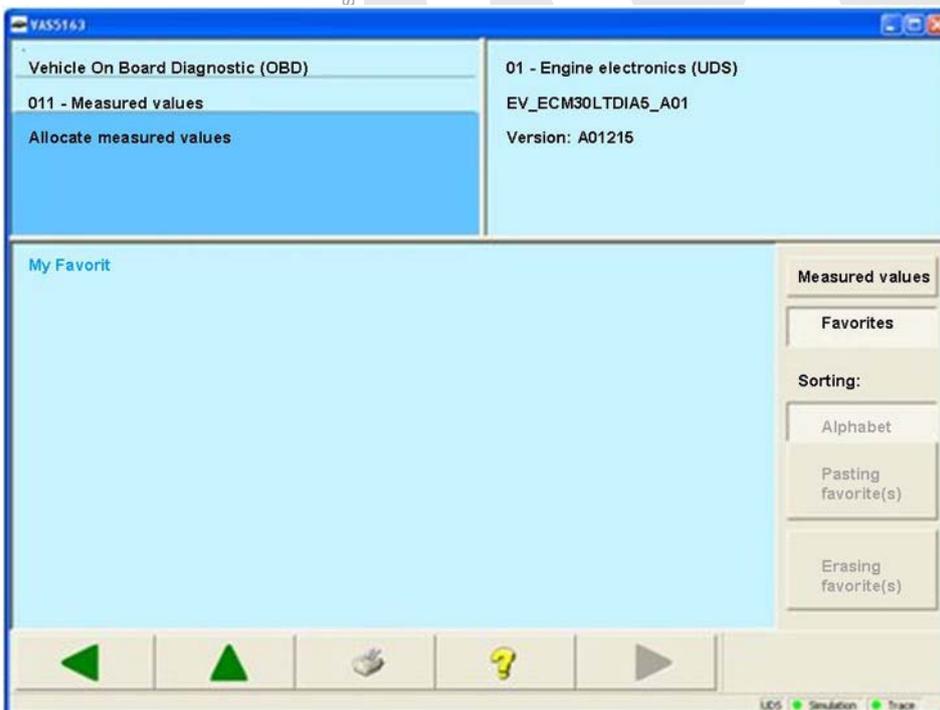


Figure 3-89 *Allocate measured values, favourites* in the UDS self-diagnosis

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You can change back and forth between the views by pressing **Measured values** or **Favourites**. Multiple selection is possible in both views. In the *Measured values* view you can use the **Alphabet** button to switch the alphabetic sorting of the measured value list on and off. In the *Favourites* view, the **Erase favourite** button permits the erasing of all marked favourites after a security query "Really erase favourites?".

In the *Measured values* view, you can use the **Add favourite(s)** button to add a new favourite, which will receive the currently marked measured values. By pressing this button or by pressing **Continue** in a *Measured values* view with several marked measured values, you will reach the mask *Define sequence*. Here you can change the order of the measured values.

The following functions are available:

Button	Description
Arrow up	Moves the position of a selected measured value up.
Arrow down	Moves the position of a selected measured value down.
Reset	Resets the sorting of the measured values to the settings prior to pressing the Arrow up and Arrow down buttons.
Store	Only exists in the <i>Favourites</i> view. Changes to the "Store favourite" mask.

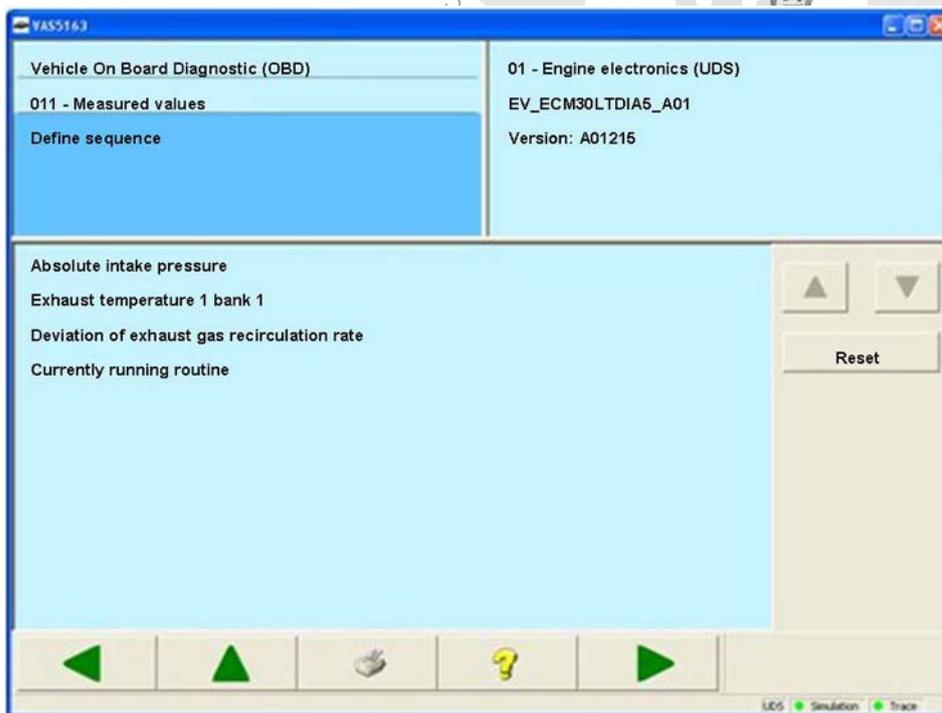


Figure 3-90 Define sequence for UDS vehicle systems

Press the **Continue** button to access the measured value display. The group of selected measured values is displayed in the sequence defined above. The values are updated cyclically in the sequence displayed.

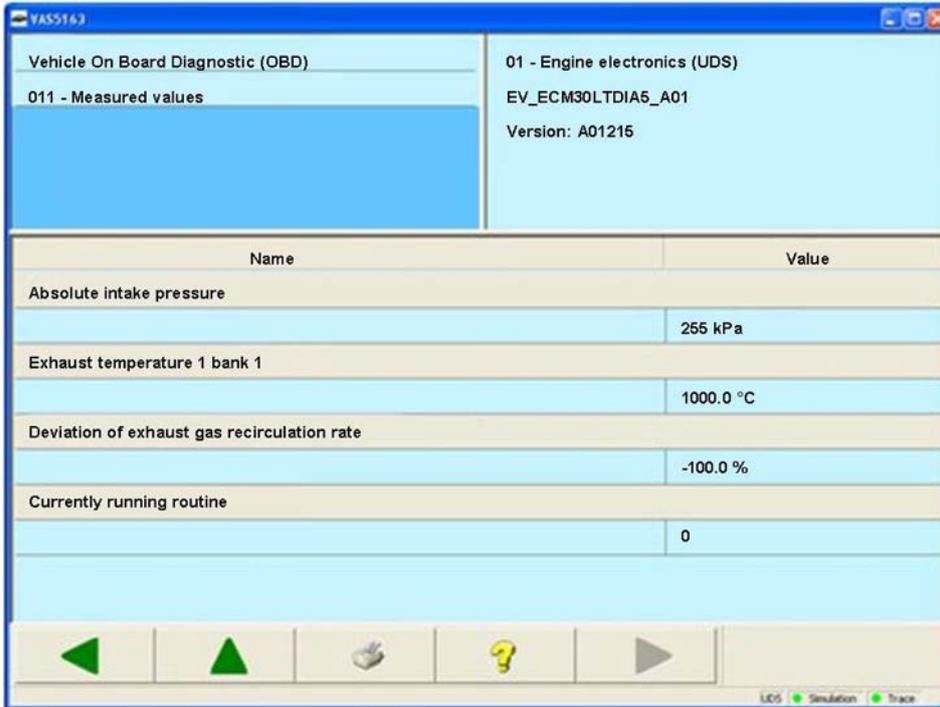


Figure 3-91 Measured values for UDS vehicle systems

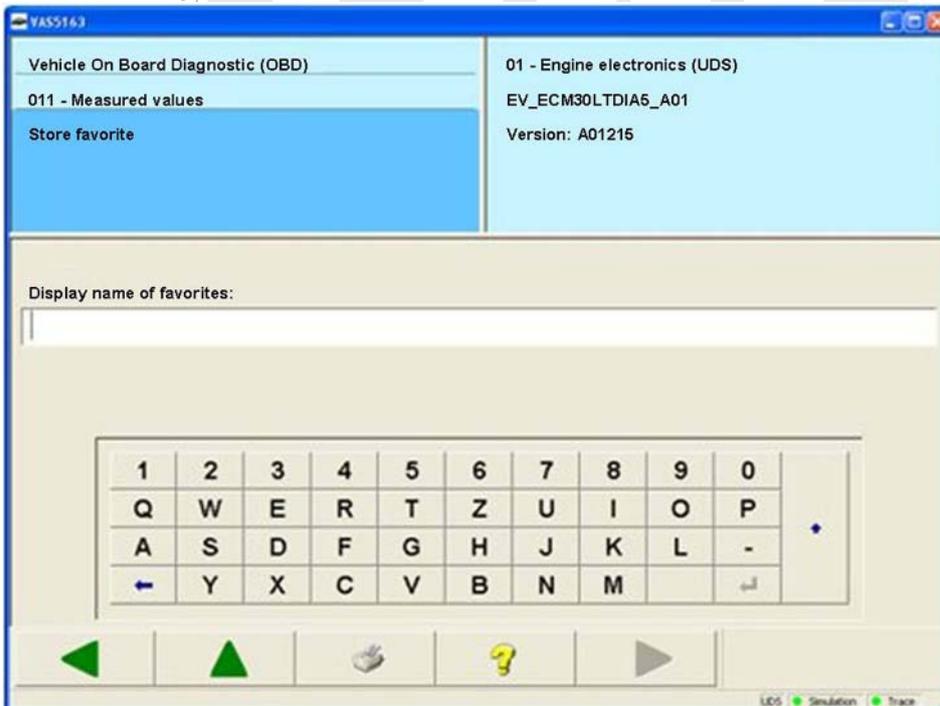


Figure 3-92 Store favourite for UDS vehicle systems

In the *Store favourite* mask you can enter a name for the favourite and save the newly created favourite by pressing **Continue**.

3.3.14 012 – Adaptation

KWP1281/KWP2000/Crafter/UDS Vehicle systems

At the **012 – Adaptation** menu point, adaptations in the vehicle system are performed. The adaptation is used for reading, testing and saving set values (adaptation values) of vehicle systems.

KWP1281/KWP2000 Vehicle systems

First select the channel number on the screen keyboard displayed. The tester reads the current adaptation value and displays it. Whether it displays measured values in the work window depends on the vehicle system and the selected channel number.

Adaptation values are changed using a screen keyboard (activation via the **Keyboard** button) or the slide control. If you move the slide to the very right, the set value range is doubled, e.g. from 8 to 16 etc. You can test the effect of the settings you have made on the vehicle without having to press the **Save** function.

Press the **Store** button when the correct adaptation value has been found. The tester first shows the old and the new adaptation value. The new value will only be saved in the vehicle system after you have pressed the **Accept** button.

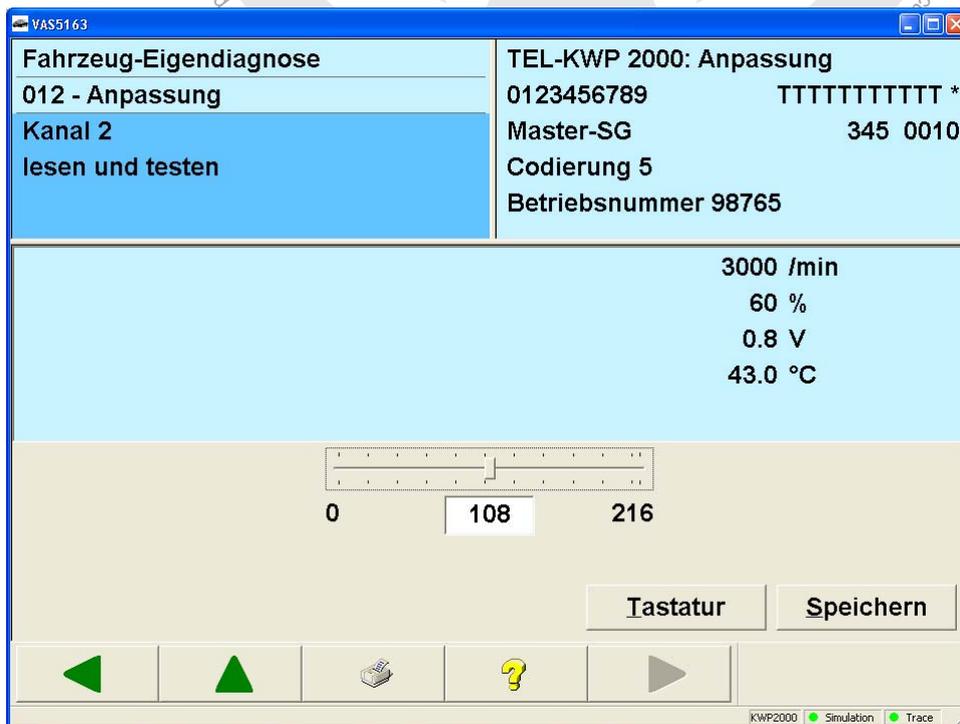


Figure 3-93 Adaptation

Erasing learnt values

By entering the channel number **0** when making the selection, you can erase all learnt values stored in the vehicle system. The tester displays the following text in the left information window:

Channel 0**Erase learnt values?**

Select **Continue** to erase the stored learnt values or **Back** to cancel the function and return to the *Select diagnostic function* Figure 3-12 mask. When the values have been erased, this is confirmed by the tester in the left information window.

Crafter vehicle systems

Select the desired adaptation function and press **Continue**. The *Change adaptation* mask opens. Press the *Value* field of the parameter that you would like to change on the screen. The screen keyboard appears, which you can use to enter a new value. If you press the *Value* field of any other parameter that is present, you can change it in the same way. If you select the **Back** button, the procedure is cancelled and you are taken back to the selection of adaptation functions.

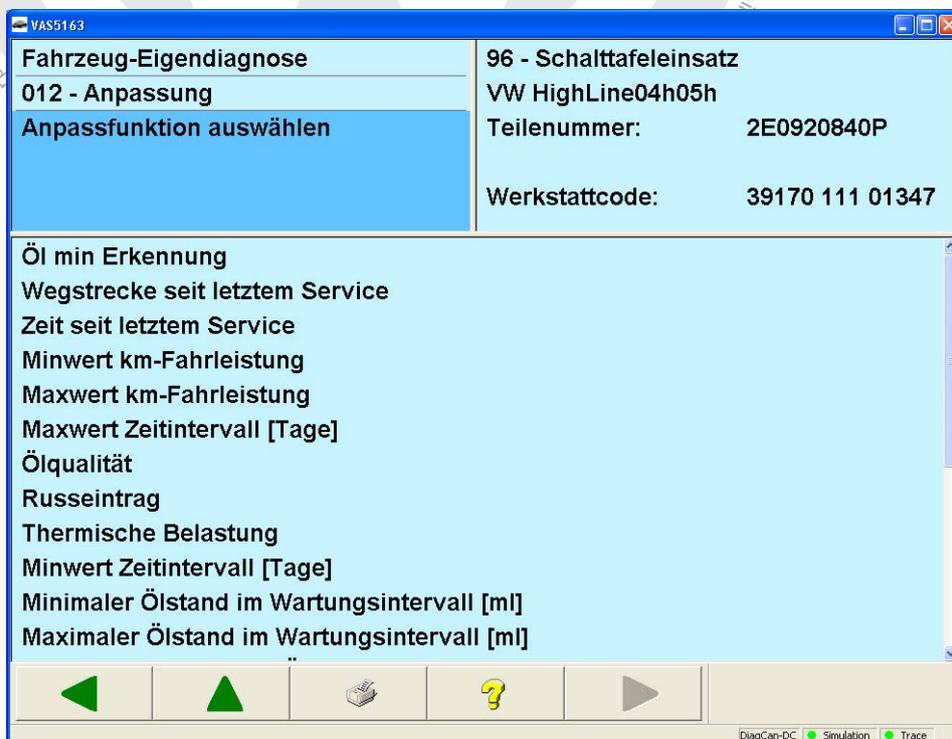


Figure 3-94 *Adaptation* in the Crafter self-diagnosis

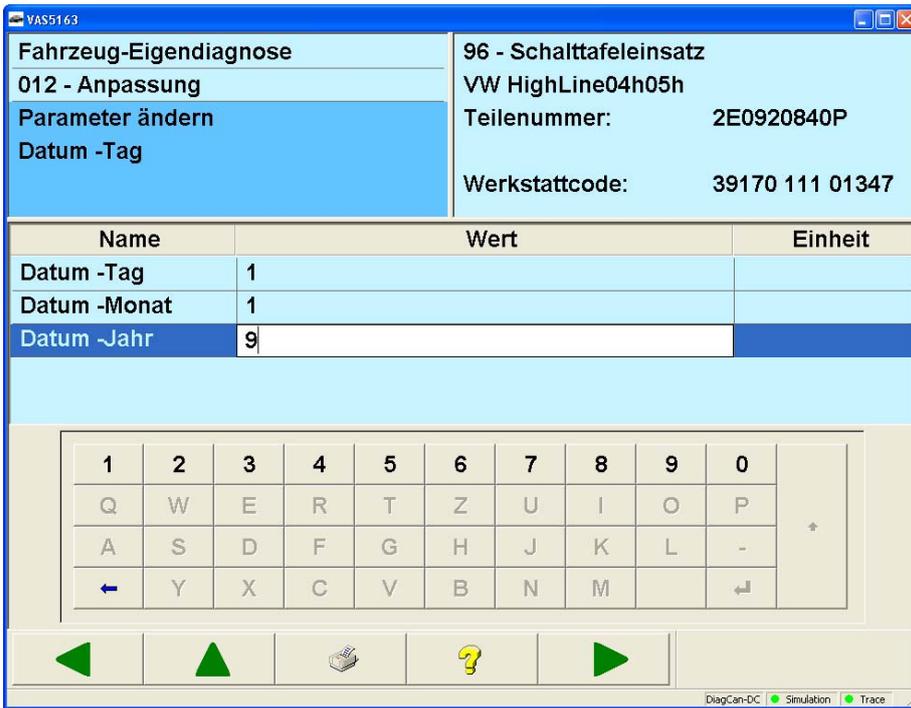


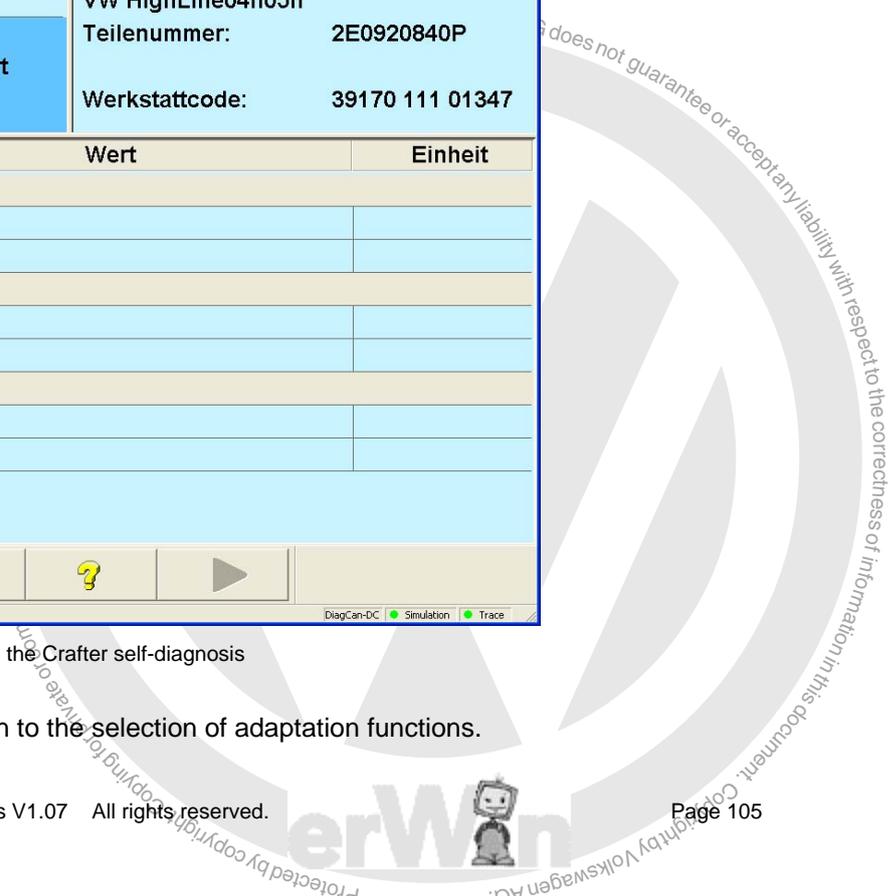
Figure 3-95 Change parameter in the Crafter self-diagnosis

The changes are applied by pressing **Continue** and are displayed in the following mask: *Performing adaptations – Function successfully performed*. Which value was written and then read is displayed for each parameter.



Figure 3-96 Performing adaptations in the Crafter self-diagnosis

With the **Back** button, you return to the selection of adaptation functions.



UDS vehicle systems

The UDS adaptation works almost identically to the adaptation of Crafter vehicle systems. The only difference is in the *Performing adaptations* – *Function successfully performed* mask, where the original value before the adaptation is also displayed next to the written and read value.

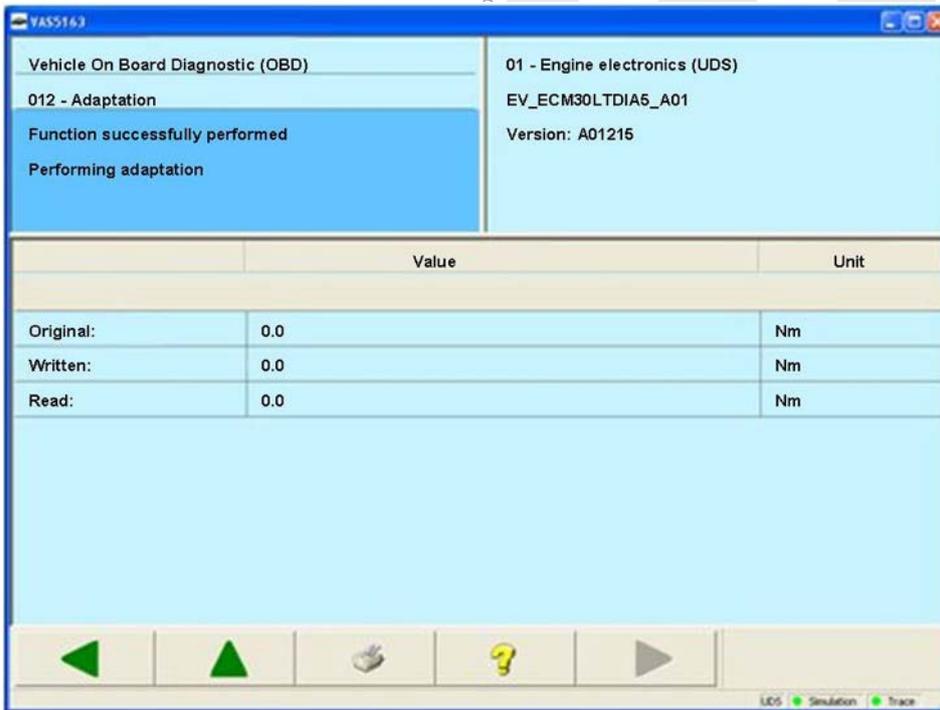


Figure 3-97 Performing adaptations in the UDS self-diagnosis

3.3.15 014 – Long adaptation

KWP2000 Vehicle systems

At the **014 – Long adaptation** menu point, adaptations in the vehicle system are performed. Adaptation is used for reading, testing and saving set values (adaptation values) of vehicle systems.

First select the channel number on the screen keyboard displayed. The tester reads the current adaptation value and displays it. Whether it displays measured values in the work window depends on the vehicle system and the selected channel number.

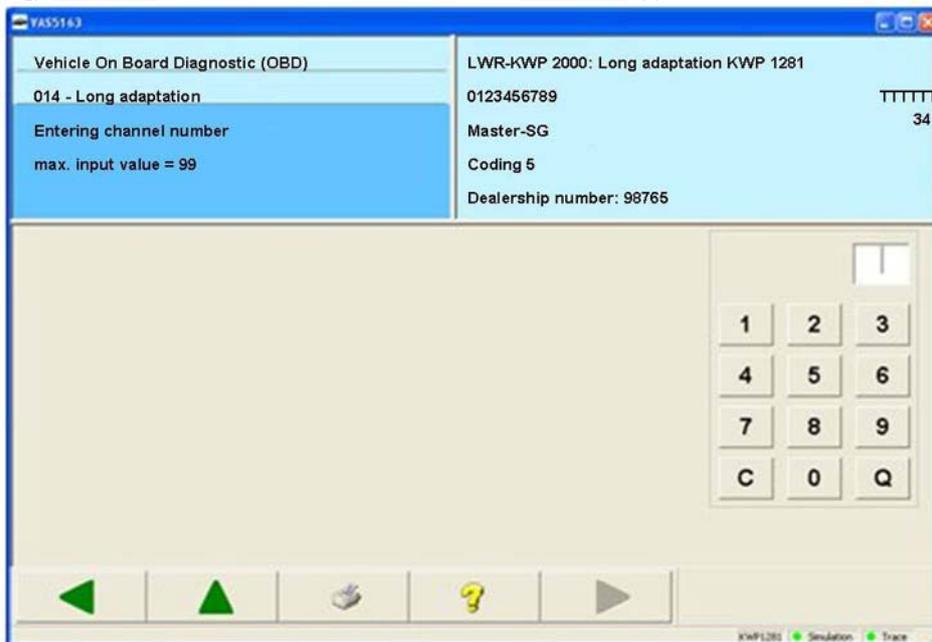


Figure 3-98 Entering channel number for the long adaptation

3.3.16 015 – Access authorization

KWP2000 Vehicle systems

At the **015 – Access authorization** menu point, all functions are grouped together that control the enabling of functions in the vehicle system. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **Coding 2**
- **Security access (automatic)**

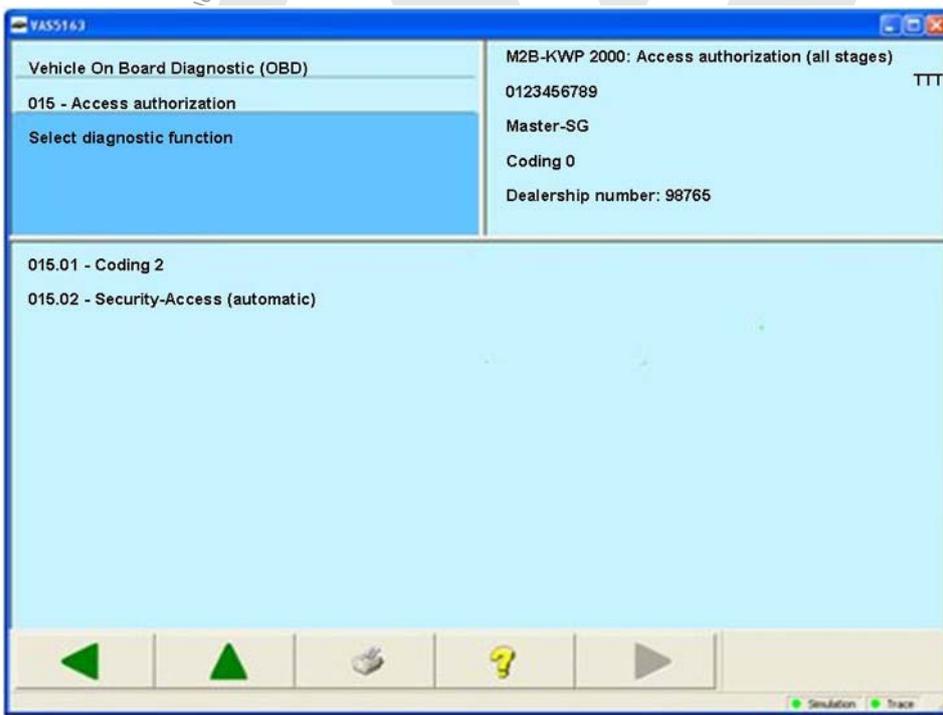


Figure 3-100 Select diagnostic function in the access authorization

3.3.16.1 015.01 – Coding 2

KWP2000 Vehicle systems

At the **015.01 – Coding 2** menu point, a certain functionality in the vehicle system is enabled.

Enter a code word using the screen keyboard for the enabling. The code word is specific to the vehicle system.

3.3.16.2 015.02 – Security access (automatic)

KWP2000 Vehicle systems

At the **015.02 – Security access (automatic)** menu point, an enabling in the vehicle system is performed. The security level is automatically selected when this is done.

Enter a code word for the enabling. The code word is specific to the vehicle system.

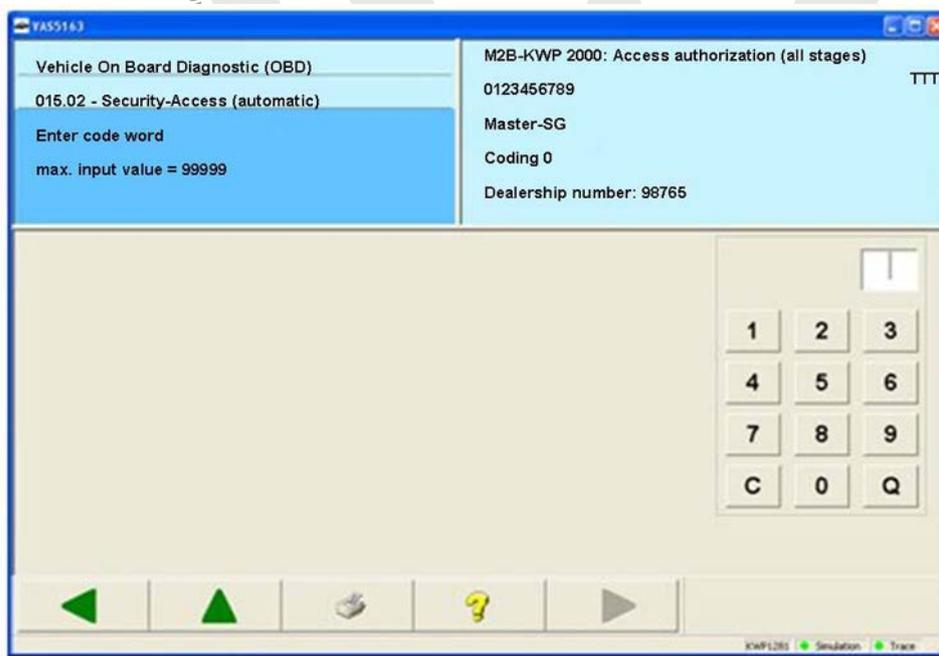


Figure 3-101 Enter code word in the access authorization

After entering the code using the screen keyboard, the service will be executed and an empty mask shown in which the left information window contains the results:

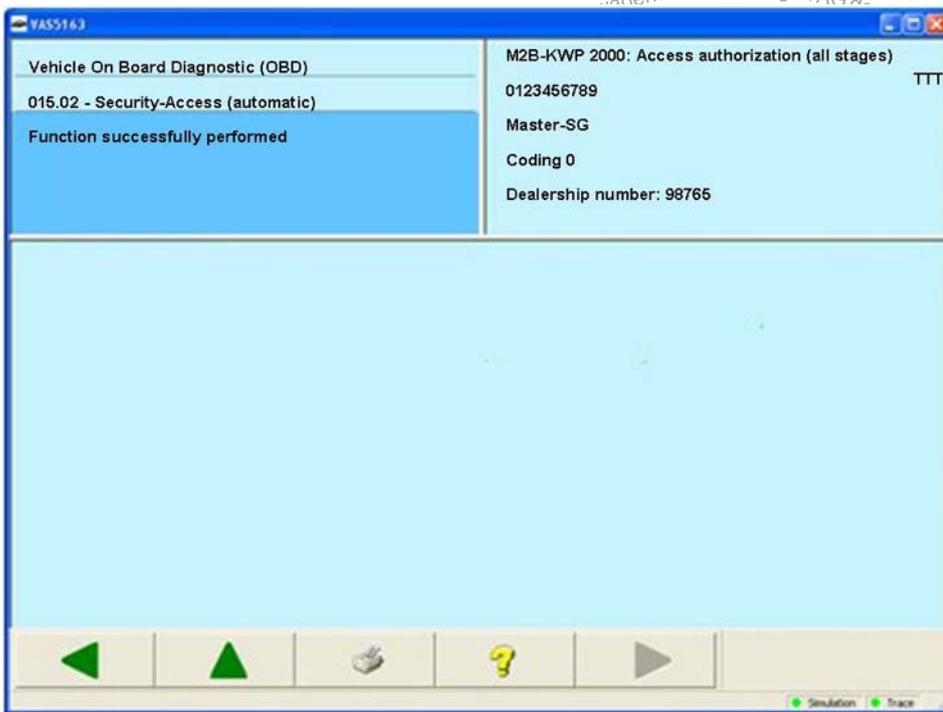


Figure 3-102 Result mask of the access authorization

Successful execution will be shown by *Function successfully performed*. With the **Back** button, you return to the *Enter code word* mask.

3.3.17 016 – Access authorization

UDS vehicle systems

At the **016 – Access authorization** menu point, all functions are grouped together that control the enabling of functions in the vehicle system. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **Login**

Enter a code word using the screen keyboard after the selection of the function for the enabling. The code word is specific to the vehicle system.

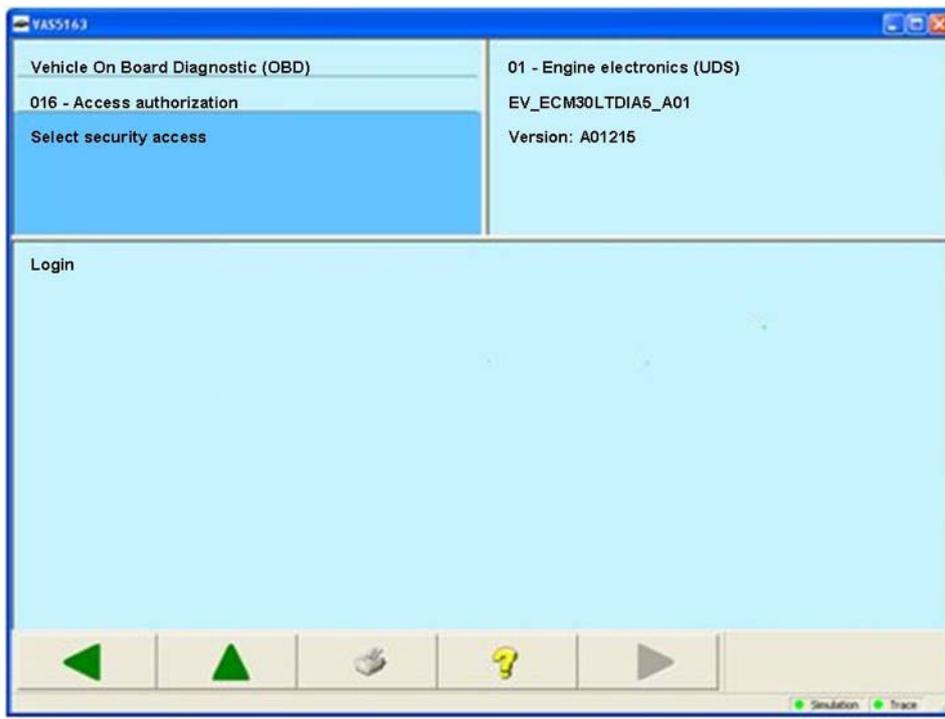


Figure 3-103 Select security access in the UDS self-diagnosis

3.3.18 017 – Safety

KWP2000 Vehicle systems

At the **017 – Safety** menu point, all functions are grouped together that are related to the immobilizer and the component protection. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **017.01 – Challenge read out immobilizer IV (1st body version)**
- **017.02 – Challenge read out immobilizer IV (2nd body version)**
- **017.03 – Enabling immobilizer IV (1st body version)**
- **017.04 – Enabling immobilizer IV (2nd body version)**
- **017.05 – Component protection (Generation 1)**
- **017.06 – Component protection (Generation 2)**

3.3.18.1 017.01 – Challenge read out immobilizer IV (1st body version)

KWP2000 Vehicle systems

At the **017.01 – Challenge read out immobilizer IV (1st body version)** menu point, the challenge value is read out and displayed. The tester reads this data from the vehicle system and shows it in hexadecimal format in the work window. This data is necessary in order to obtain the immobilizer data used to enable the immobilizer.

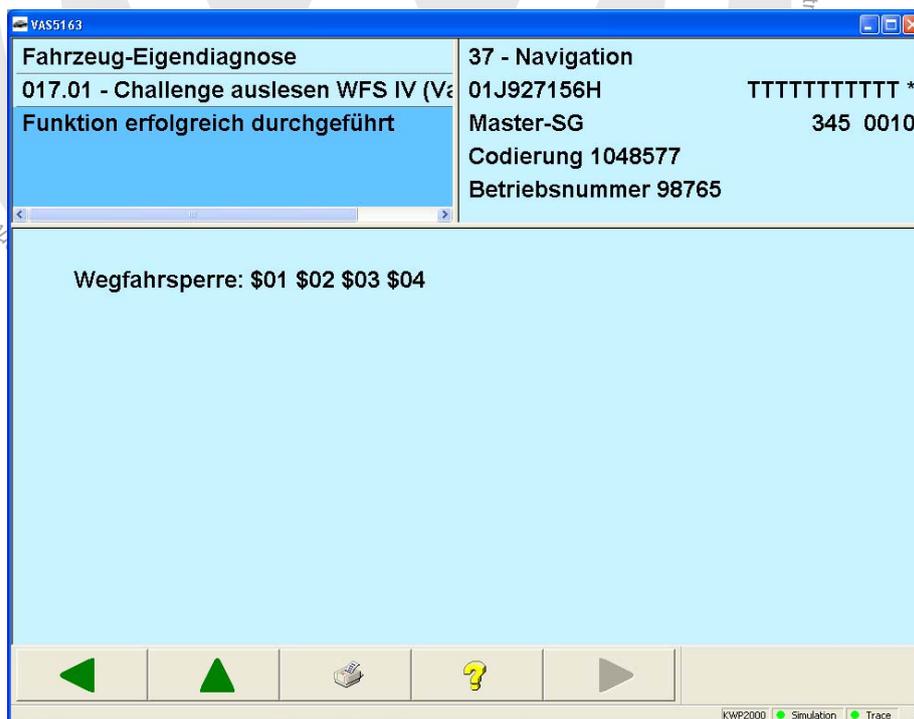


Figure 3-104 Challenge read out immobilizer IV

This function concerns vehicle systems such as:

- 05 – Access and start authorization
- 25 – Immobilizer
- 17 – Instrument cluster

3.3.18.2 017.02 – Challenge read out immobilizer IV (2nd body version)

KWP2000 Vehicle systems

At the **017.02 – Challenge read out immobilizer IV (2nd body version)** menu point, the challenge value is read out and displayed. The tester reads this data from the vehicle system and shows it in hexadecimal format in the work window. This data is necessary in order to obtain the immobilizer data used to enable the immobilizer.

This function concerns vehicle systems such as:

- 05 – Access and start authorization
- 25 – Immobilizer
- 17 – Instrument cluster

3.3.18.3 017.03 – Enabling immobilizer IV (1st body version)

KWP2000 Vehicle systems

At the **017.03 – Enabling immobilizer IV (1st body version)** menu point, the immobilizer is enabled. To do this, enter the required data using the screen keyboard:

- Chassis number: 17 characters, alphanumeric
- Immobilizer serial number: 14 characters, alphanumeric
- Immobilizer data: 28 bytes, hexadecimal
- Input of RESULT encrypted

This function concerns vehicle systems such as:

- 05 – Access and start authorization
- 25 – Immobilizer
- 17 – Instrument cluster

Select **Input of RESULT encrypted** if the immobilizer data is to be entered in encrypted form. You can obtain the immobilizer data from the RESULT database.

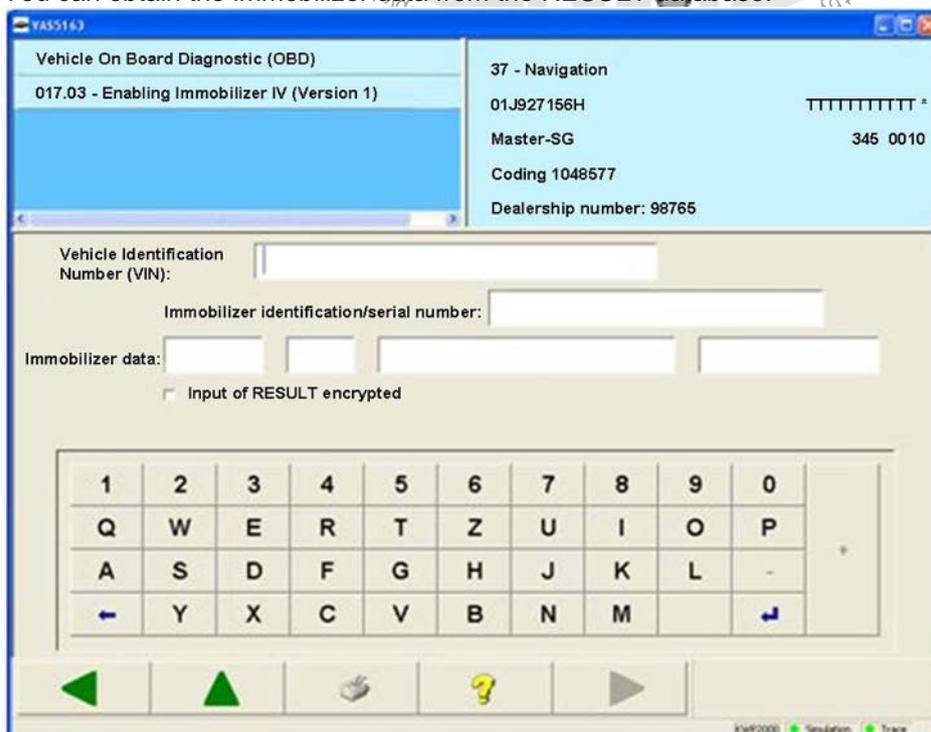


Figure 3-105 Enabling immobilizer IV

3.3.18.4 017.04 – Enabling immobilizer IV (2nd body version)

KWP2000 Vehicle systems

At the **017.04 – Enabling immobilizer IV (2nd body version)** menu point, the immobilizer is enabled. To do this, enter the required data using the screen keyboard:

- Chassis number: 17 characters, alphanumeric
- Immobilizer data: 40 bytes, hexadecimal

This function concerns vehicle systems such as:

- 05 – Access and start authorization
- 25 – Immobilizer
- 17 – Instrument cluster

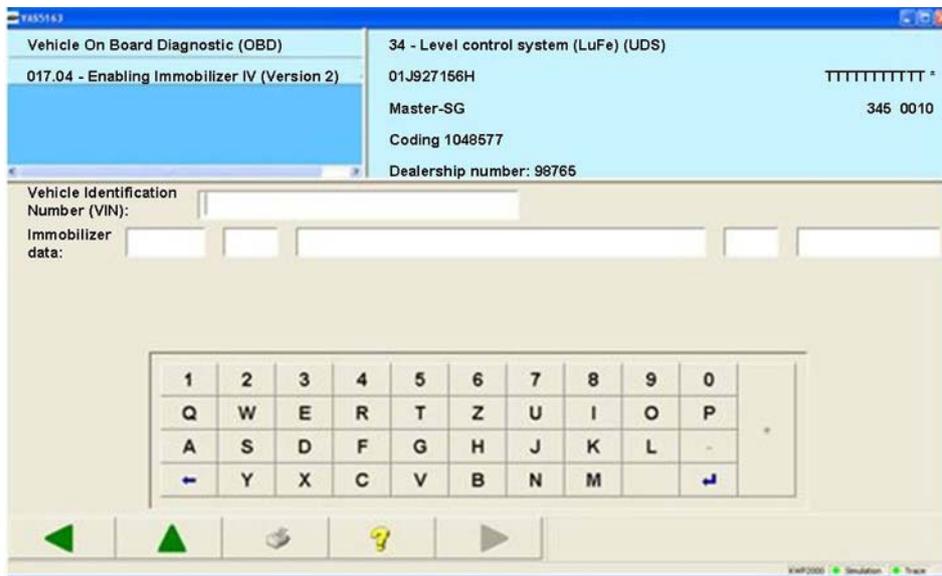
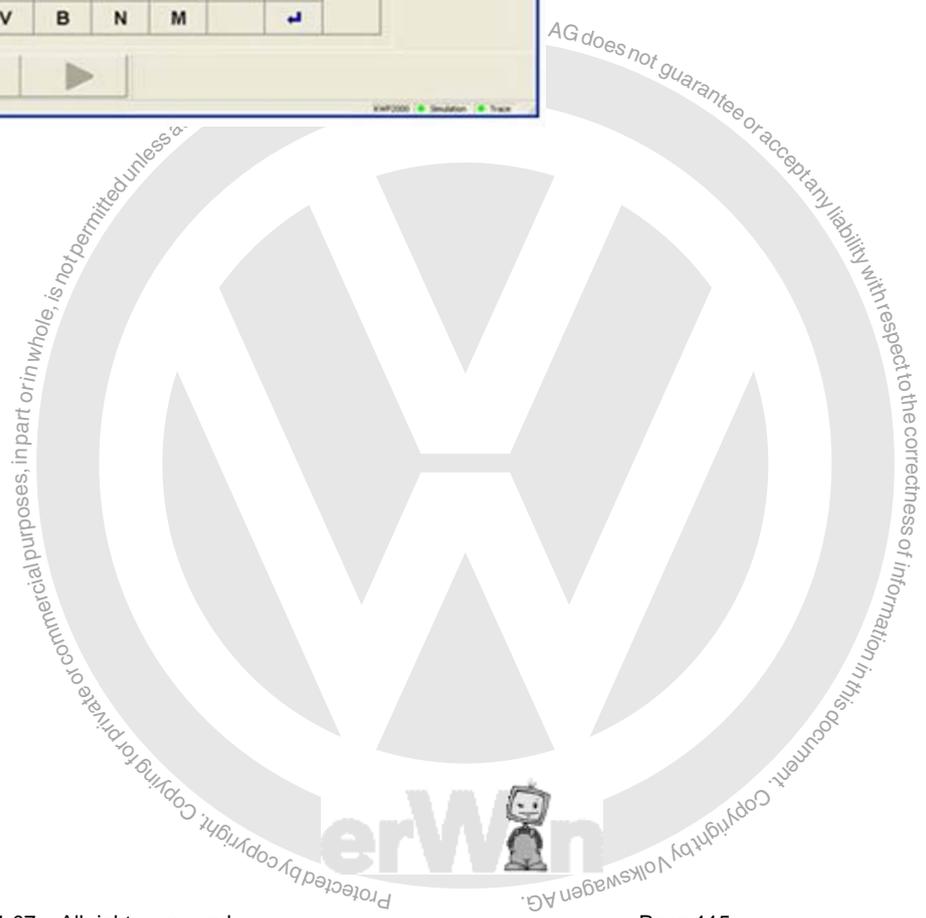


Figure 3-106 Enabling immobilizer IV



3.3.18.5 017.05 – Component protection (Generation 1)

KWP2000 Vehicle systems

At the **017.05 – Component protection (Generation 1)** menu point, individual components of the connected vehicle are enabled. For reasons relating to theft protection, it may be necessary to enable individual components, especially for the connected vehicle. The required data is retrieved from an external database, entered in the mask and transferred to the control unit.

If you select the entry **017.05 Component protection (Generation 1)** in the **017 – Safety** mask, you can enter the required data via the screen keyboard which appears:

- Secret number (maximum 7-digit, decimal)
- Identification data (8-digit, hexadecimal)
- Input of RESULT encrypted (selection specifying whether the data is to be entered in encrypted or unencrypted form)

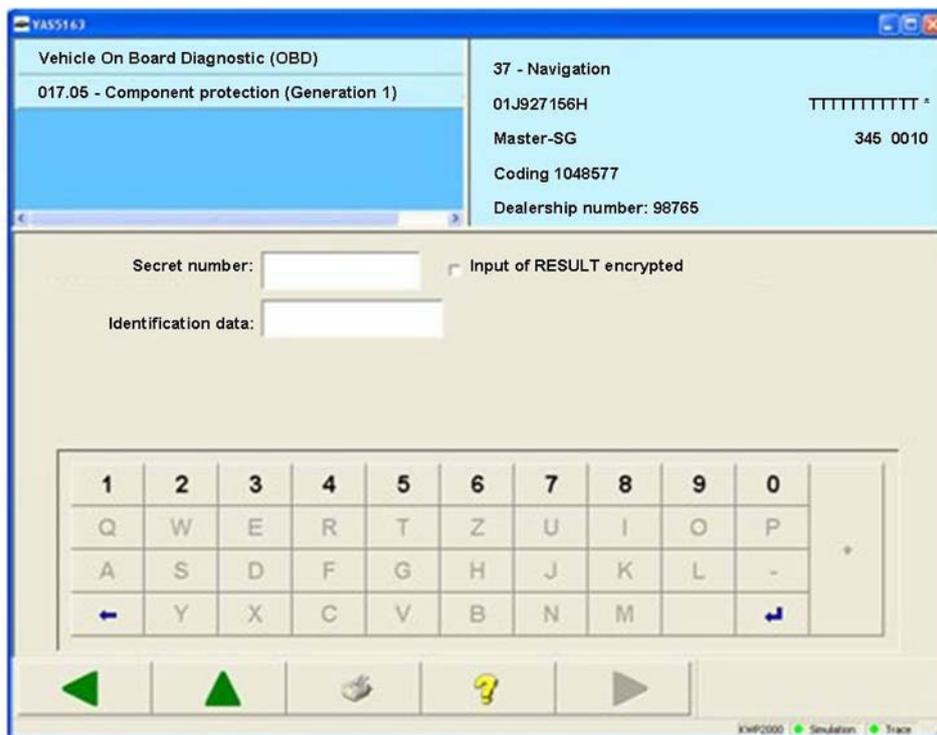


Figure 3-107 Component protection (1st generation)

3.3.18.6 017.06 – Component protection (Generation 2)

KWP2000 Vehicle systems

At the **017.06 – Component protection (Generation 2)** menu point, individual components of the connected vehicle are enabled. For reasons relating to theft protection, it may be necessary to enable individual components, especially for the connected vehicle. The required data is retrieved from an external database, entered in the mask and transferred to the control unit.

If you select the entry **017.06 Component protection (Generation 2)** in the **017 – Safety** mask, you will be offered a selection:

- Component protection IKA, adapting

The screenshot shows the VAS5163 diagnostic software interface. The title bar reads 'VAS5163'. The main window is divided into several sections:

- Left sidebar:** Contains menu items: 'Vehicle On Board Diagnostic (OBD)', 'Component protection IKA adapting' (highlighted), and 'Enter data'.
- Top right area:** Displays vehicle information:
 - 34 - Level control system (LuFe) (UDS)
 - 01J927156H
 - Master-SG
 - Coding 1048577
 - Dealership number: 98765
- Center area:** A text input field with the label 'Data of information coordinating center on waste:'.
- Bottom area:** A numeric keypad with letters (QWERTY layout) and a bottom navigation bar with arrows and a question mark icon.

Figure 3-108 Entering IKA data

- Component protection GFA, adapting

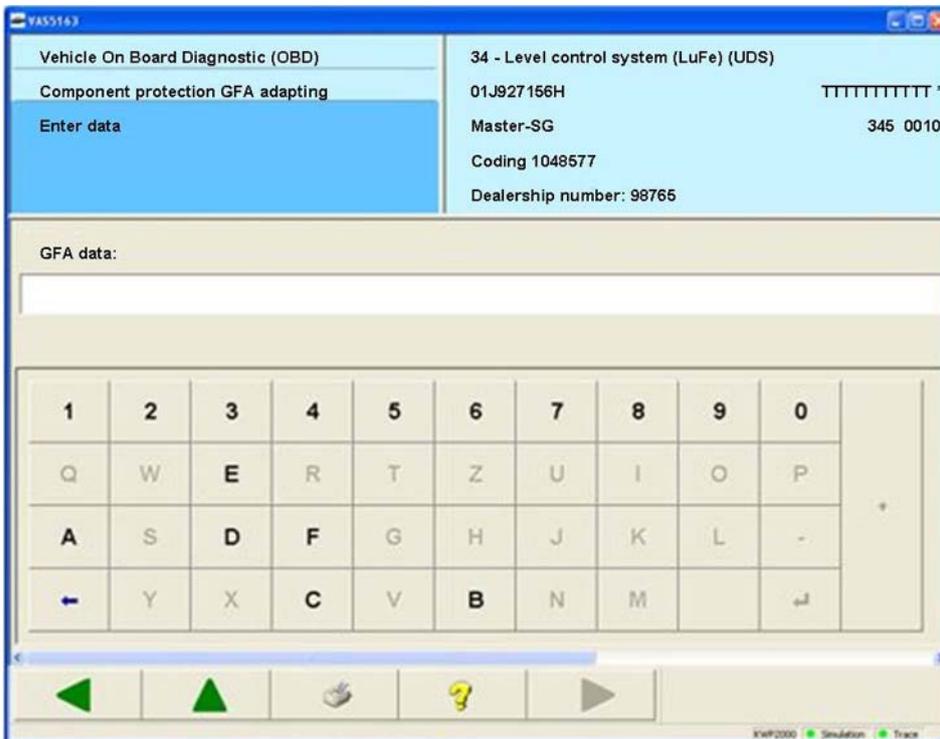


Figure 3-109 Entering GFA data

If you select **Component protection IKA, adapting / Component protection GFA, adapting**, you can enter the required IKA/GFA data using the screen keyboard which appears (68-digit, hexadecimal).

After enabling is complete, the following message will appear in the left information window **Adaptation occurred**

3.3.19 019 – Update programming

KWP1281/KWP2000/UDS/Crafter Vehicle systems

In the **019 – Update programming** menu point, the update programming is performed in the vehicle system; that is, the program version of the vehicle system is updated.

This menu point only appears if it is possible to perform the update programming on this vehicle system and if there is a more recent program version available than the one in the vehicle system on the tester or on a CD inserted before the vehicle system was selected.

KWP1281/KWP2000 Vehicle systems

If you have already performed update programming successfully for a vehicle system, then this diagnostic function will no longer be offered in the tester for the same version.



Note

Note the information enclosed with the flash CD on updating programming.

If the necessary requirements for the update programming have not been met in the vehicle system, a warning appears. Meet the displayed requirements and restart update programming.

A message text with the new version number is displayed. Follow the request.

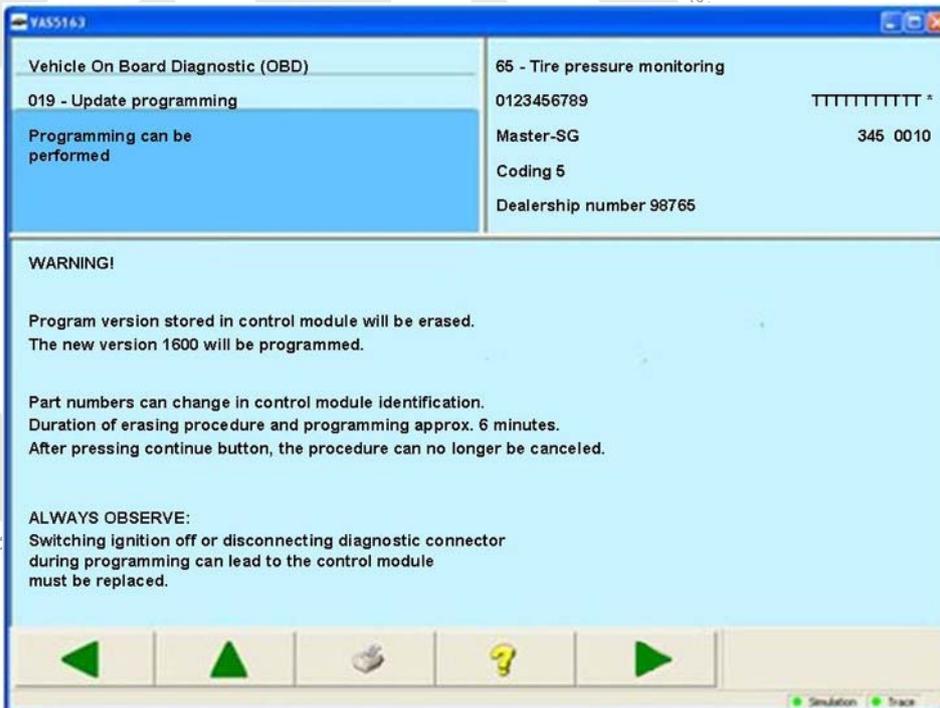


Figure 3-110 Note *Programming can be carried out* in the update programming

After pressing **Continue**, the new program version will be loaded into the vehicle system. This can take several minutes. The progress will be continually shown via a bar.

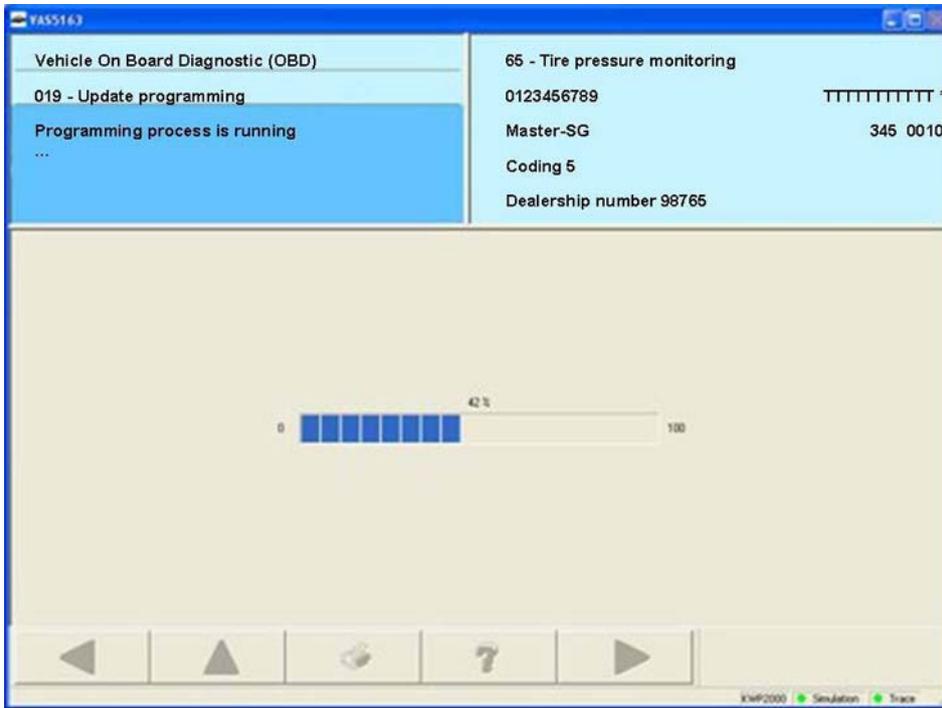


Figure 3-111 Note *Programming in progress* in the update programming

If an error occurs during the update programming, the vehicle system is no longer ready for use. After a new connection set-up to the vehicle system, only the diagnostic function **019 – Update Programming** is still visible in the selection of diagnostic functions. Repeat the update programming.

After the conclusion of the update programming, some vehicle systems require an ignition off/on cycle. After the ignition is switched off and on again or this step is skipped, the old and new control-unit identification data will be shown.

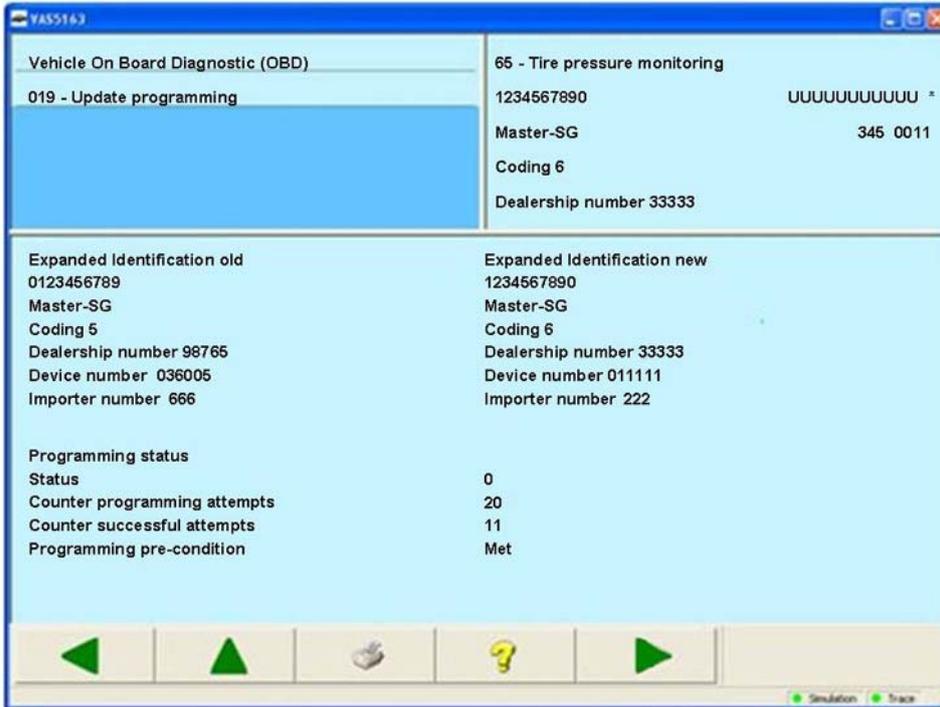


Figure 3-112 Note *Identification* in the update programming

After pressing **Continue**, you have the option of erasing the DTC memory of all vehicle systems. The update programming is immediately ended with **Back**; the erasing of the DTC memory is started with **Continue**.

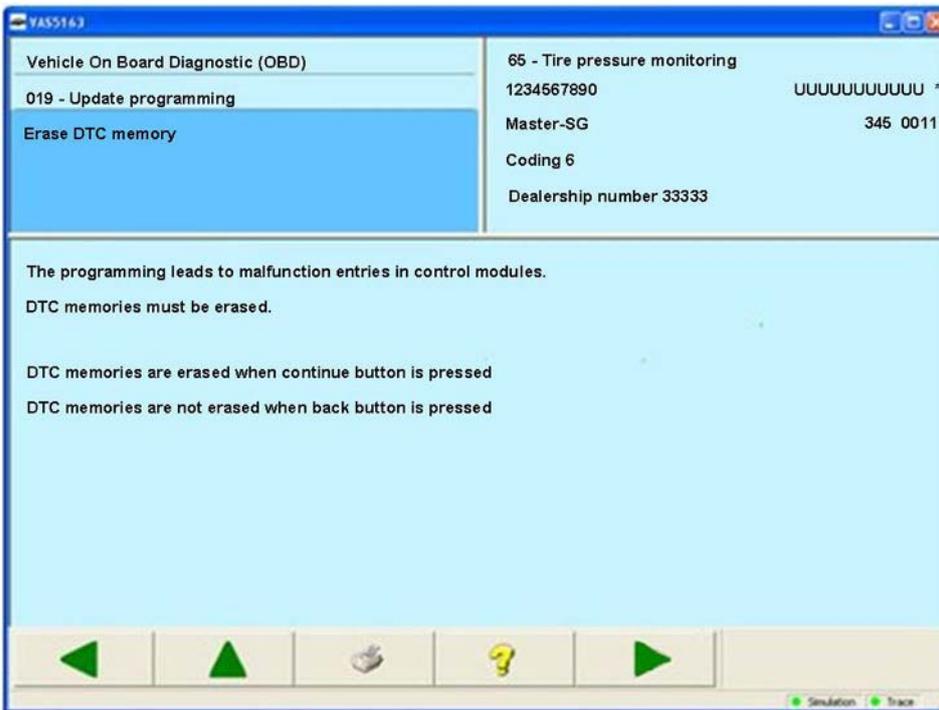


Figure 3-113 Note Erasing of the DTC memory in the update programming

At the end of update programming, all erased DTC memories are displayed.

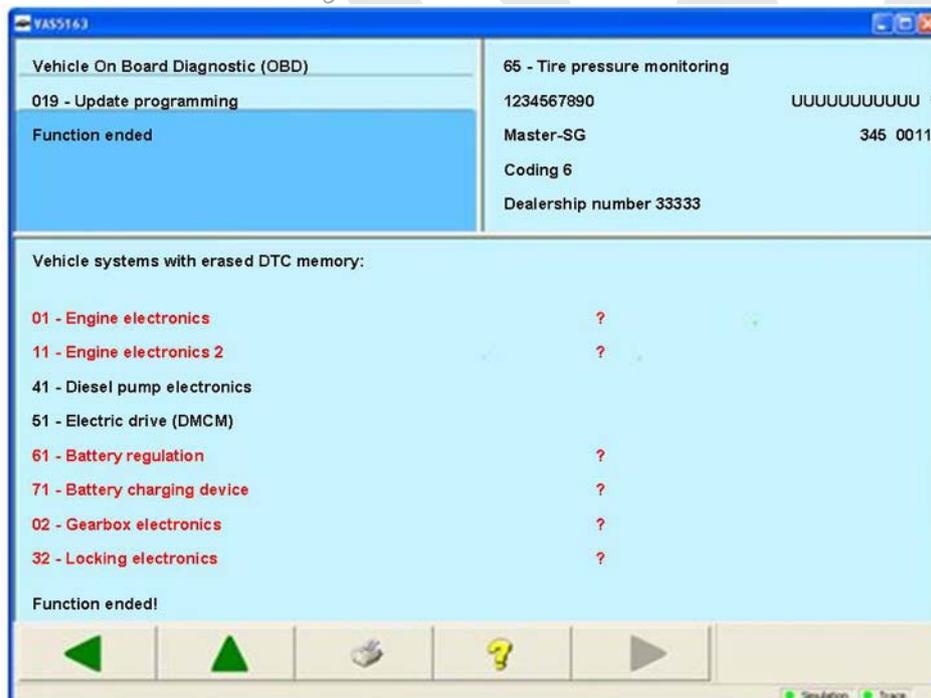


Figure 3-114 End of the update programming

Press **Back** to return to the selection of functions for the vehicle system.

UDS/Crafter vehicle systems

For the update programming of a vehicle system, a file with the format SOX, FRF or ODX is needed. If a suitable file for the current vehicle system is found in the DatFlash directory, then one or more flash sessions will be offered for selection.

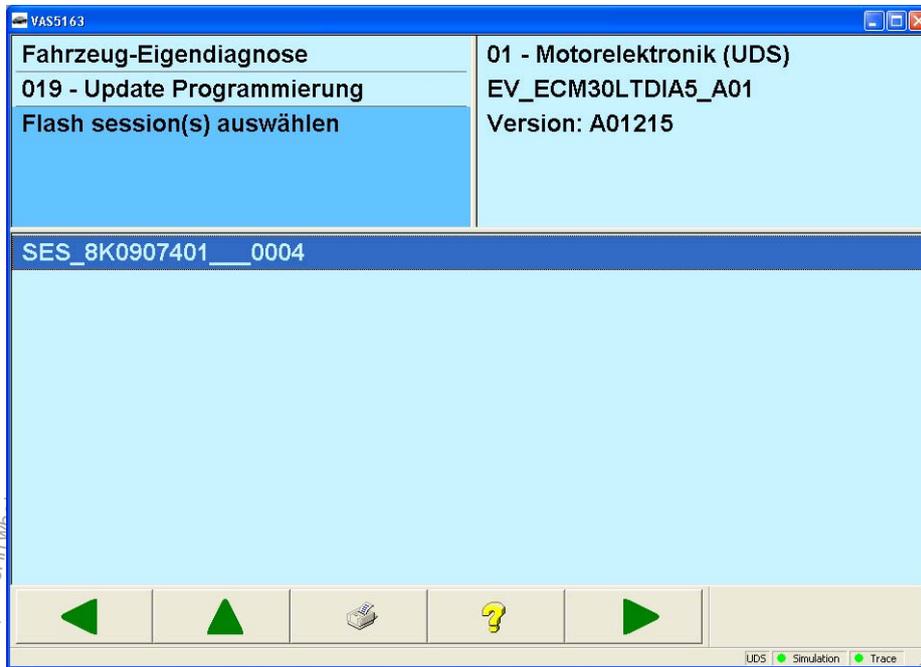


Figure 3-115 Selection of the flash session

In this case, select a flash session and press **Continue**. After you have acknowledged the security queries, the update programming starts.

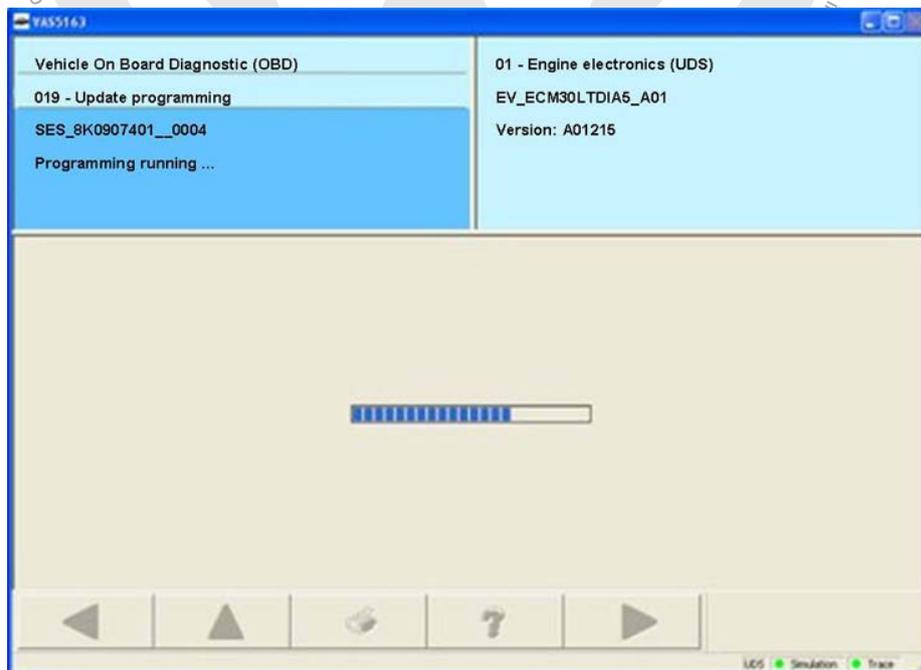


Figure 3-116 The update programming is in progress

A progress bar is displayed during programming. You must not terminate the connection to the vehicle during this time. The programming, depending on the vehicle system, may take a while (about 5-10 minutes). Upon completion of the programming, **Programming successful** appears in the left information window.

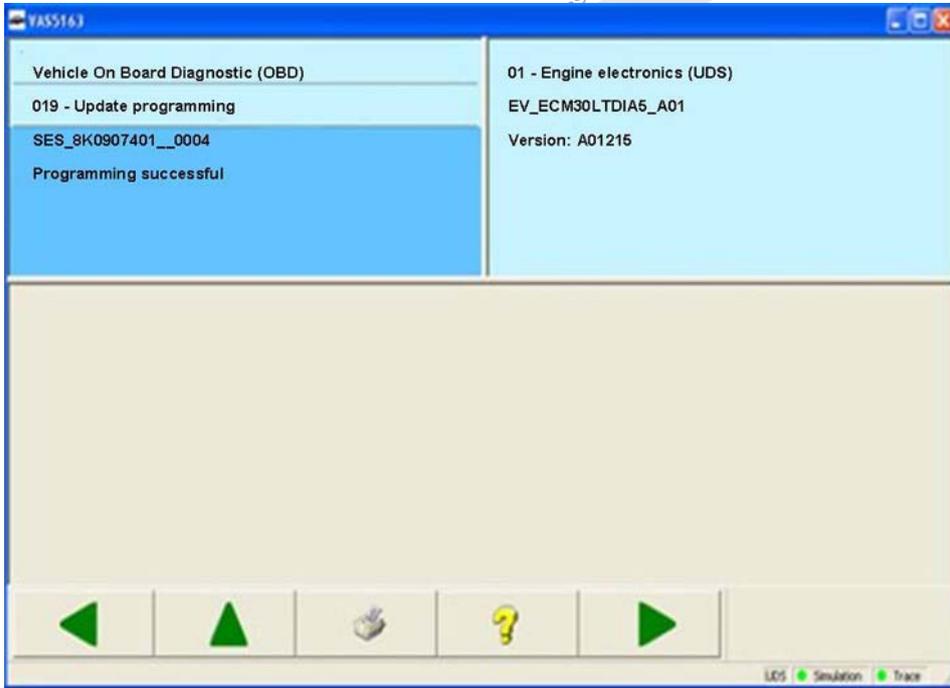


Figure 3-117 The update programming is finished

To avoid inconsistencies, all DTC memories for the vehicle should be erased after completing programming. Press the **Continue** button to erase the DTC memories for all vehicle systems. The DTC memories are not erased if you press the **Back** button.

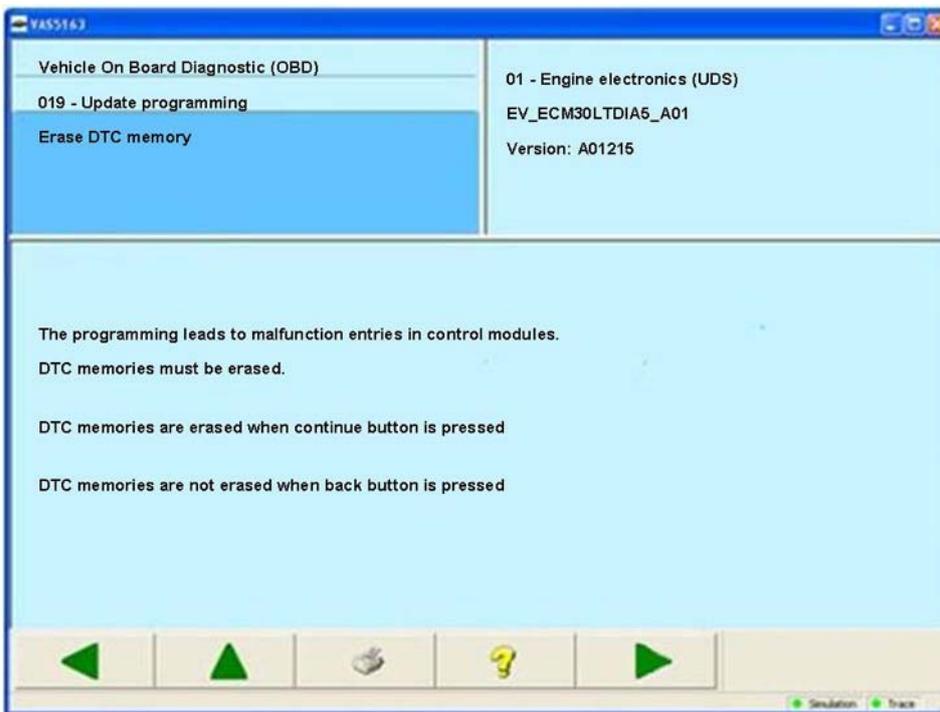


Figure 3-118 Erasing DTC memory after the programming

At the end of update programming, all erased DTC memories are displayed. Press **Continue** to return to the selection of functions for the vehicle system.

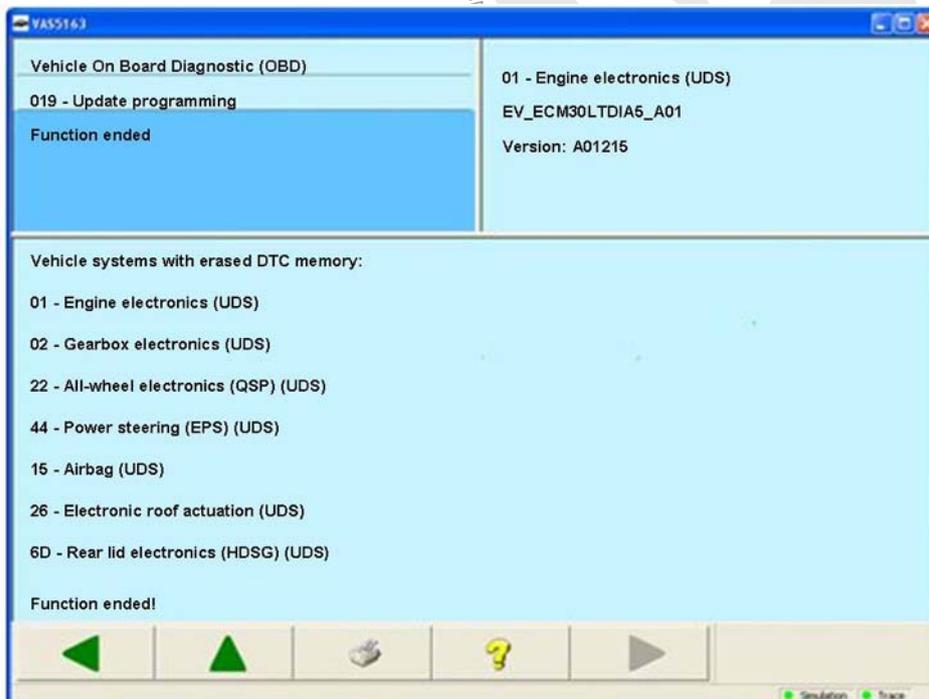


Figure 3-119 End of the update programming

3.3.20 020 – Special function

KWP2000/UDS Vehicle systems

At the **020 – Special functions** menu point, all functions are grouped together with which vehicle-specific functions are executed. Depending on the vehicle system, a portion of the following functions is offered for selection:

- **020.01 – Readiness code**
- **020.02 – Selective final control diagnosis**
- **020.03 – Transfer vehicle identification number**
- **020.04 – ABS bleeding**
- **020.05 – Adaptation channel 50 PIN**
- **020.06 – Enabling PIN**
- **020.07 – Hidden adaptation channel 50**
- **020.08 – Hidden key adaptation**

3.3.20.1 020.01 – Readiness code

KWP2000 Engine electronics

At the **020.01 – Readiness code** menu point, the so-called readiness code is read out of the engine electronics and displayed.



3.3.20.2 020.02 – Selective final control diagnosis

KWP2000 Vehicle systems

At the **020.02 – Selective final control diagnosis** menu point, individual control elements are selectively activated in contrast with **005 – Final control diagnosis**.

A control element code has to be entered first in the selective final control diagnosis. Then the activation is done with the same masks as were described in chapter 3.3.7.

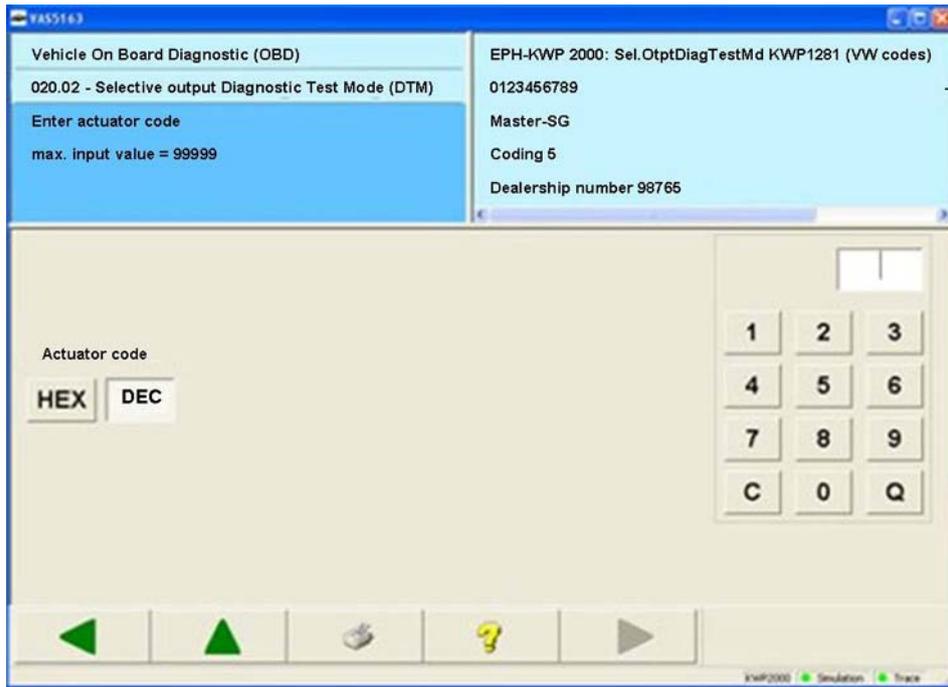


Figure 3-120 Enter actuator code

3.3.20.3 020.03 – Transfer vehicle identification number

KWP2000 Vehicle systems

The **020.03 – Transfer vehicle identification number** menu point is used to perform a vehicle-system-specific special function.

3.3.20.4 020.04 – ABS bleeding

KWP2000 Vehicle systems

The **020.04 – ABS bleeding** menu point is used to perform a vehicle-system-specific special function.

3.3.20.5 020.05 – Adaptation channel 50 PIN

KWP2000 Vehicle systems

The **020.05 – Adaptation channel 50 PIN** menu point is used to perform a vehicle-system-specific special function.

3.3.20.6 020.06 – Enabling PIN

KWP2000 Vehicle systems

The **020.06 – Enabling PIN** menu point is used to perform a vehicle-system-specific special function.

3.3.20.7 020.07 – Hidden adaptation channel 50

KWP2000 Vehicle systems

The **020.07 – Hidden adaptation channel 50** menu point is used to perform a vehicle-system-specific special function.

3.3.20.8 020.08 – Hidden key adaptation

KWP2000 Vehicle systems

The **020.08 – Hidden key adaptation** menu point is used to perform a vehicle-system-specific special function.

3.3.21 022 – End output

KWP1281 Vehicle systems

The **022 – End output** menu point is used to end the diagnostic connection to the vehicle system. The diagnostic connection is also closed if you push the **Back** button repeatedly until you come to the *Select vehicle system* mask or if you use the “Go to” destination menu and close the *Vehicle Self- Diagnosis* operating mode with **Exit** and return to the start mask.



3.3.22 024 – Reset control unit

Crafter vehicle systems

At the **024 – Reset control unit** menu point, the vehicle system can be restarted. Confirm the security query to reset it (Figure 3-121).

After resetting a control unit, the connection to the vehicle system needs to be re-established.

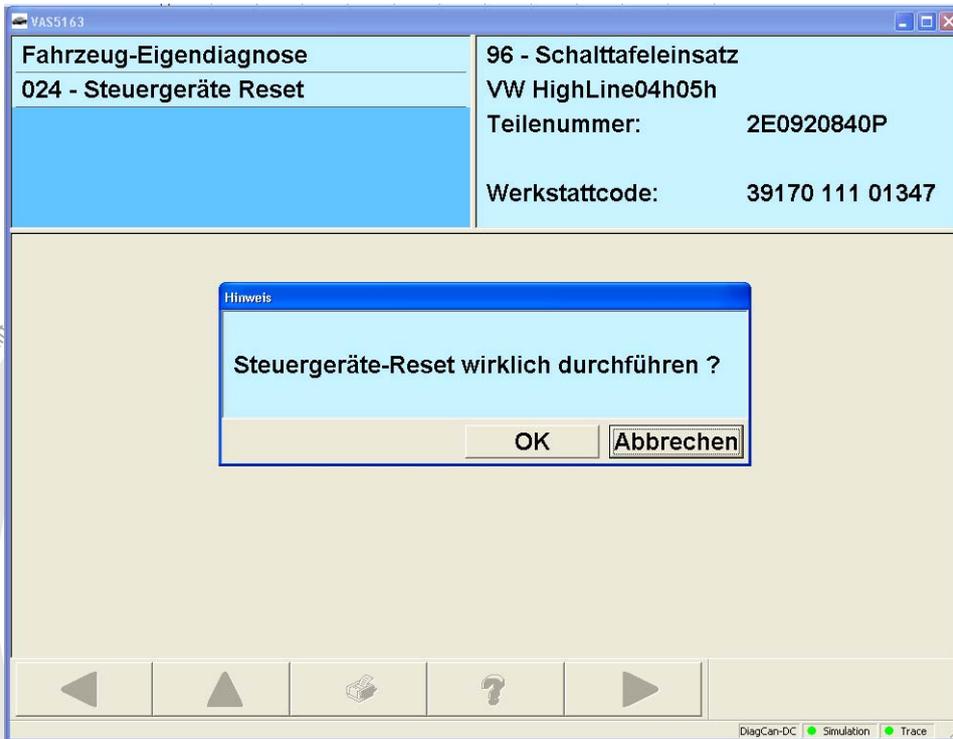


Figure 3-121 Reset control units mask in Crafter self-diagnosis

3.3.23 025 – Reset to factory settings

UDS vehicle systems

After selection of the **025 – Reset to factory settings** menu point, the user is shown the list of available reset routines.

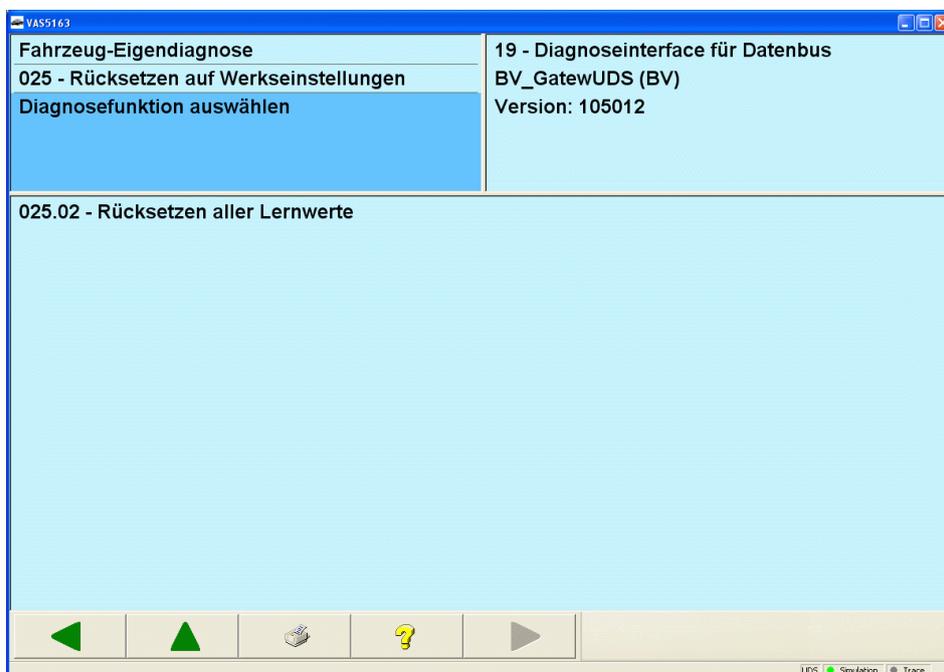


Figure 3-122 Select diagnostic function in "Reset to factory settings"

After selection of a Reset routine, press the **Continue** button and confirm the security query to start the routine and open the *Reset active* mask. The current status of the reset routine is shown.

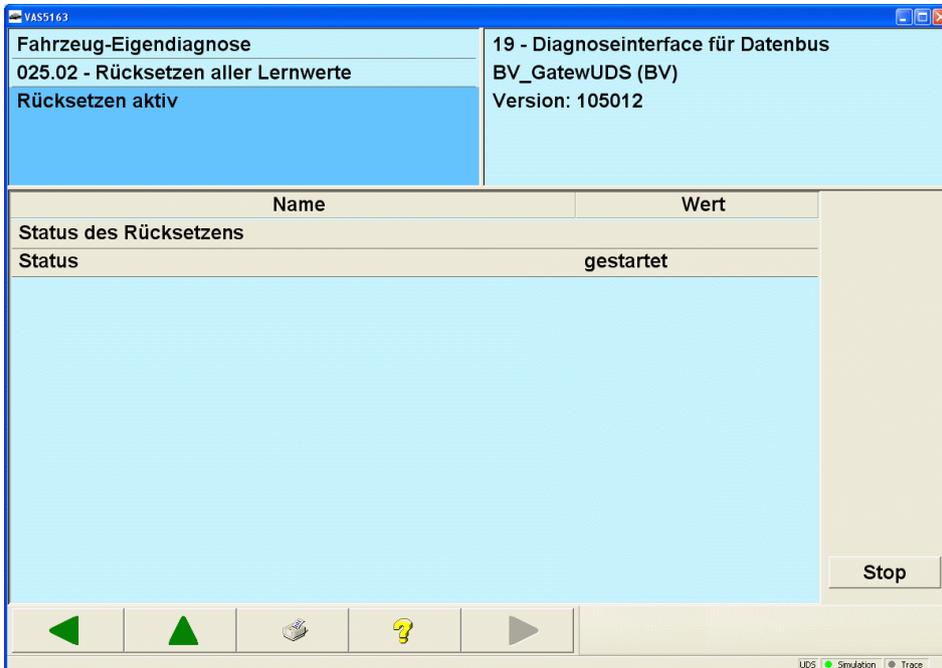


Figure 3-123 *Reset active* in "Reset to factory settings"

The execution of the reset routine can be waited for or interrupted by pressing the **Stop** button. The new status will be shown.

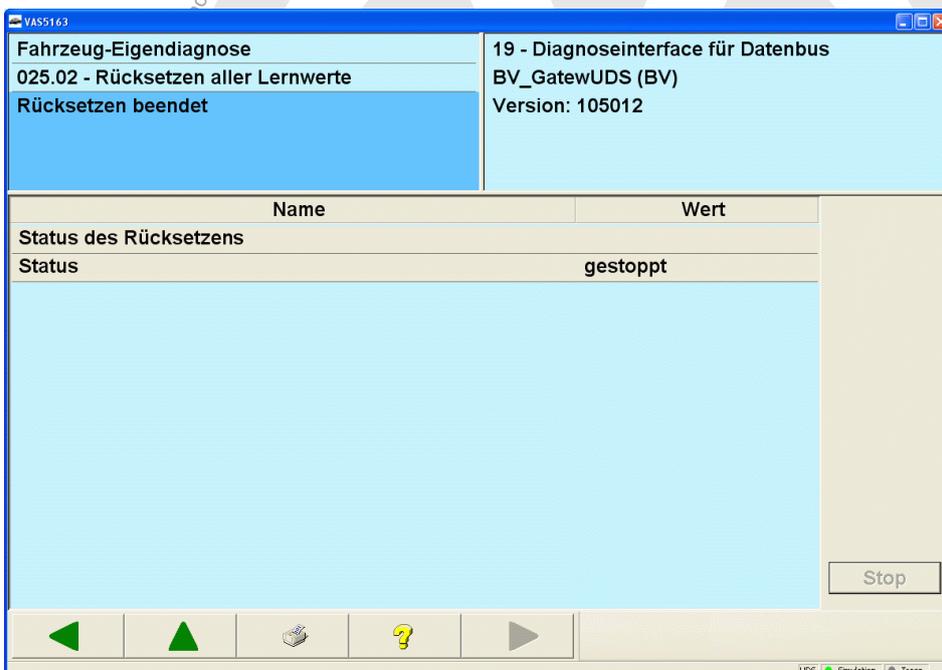


Figure 3-124 *Reset active* in "Reset to factory settings"

3.4 OBD

With the OBD functions, vehicle data is read out from the OBD-relevant vehicle systems in accordance to the OBD requirements. The tester tries to functionally establish the connection to the vehicle systems in the vehicle in the following order.

1. ISO/DIS 15765-4 (CAN)
2. ISO 9141-2 with 5 baud initialisation
3. ISO 9141-2 with fast initialisation
4. ISO/DIS 14230-4 (keyword protocol 2000) with 5 baud initialisation
5. ISO/DIS 14230-4 (keyword protocol 2000) with fast initialisation
6. ISO/DIS 11519-4 (SAE J1850) PWM (Ford)
7. ISO/DIS 11519-4 (SAE J1850) VPW (Chrysler, GM)

If you select the entry *OBD* in the *Navigation* menu or press the respective button in the toolbar, the OBD diagnosis will start. This function is only available in the start mask of the testers. The tester automatically searches for connected vehicle systems which support the OBD functions.

Once such vehicle systems are found, the selection of the diagnostic functions appears for the OBD operating mode (see Figure 3-125). In it, you can choose between the OBD operating modes 1 to A.

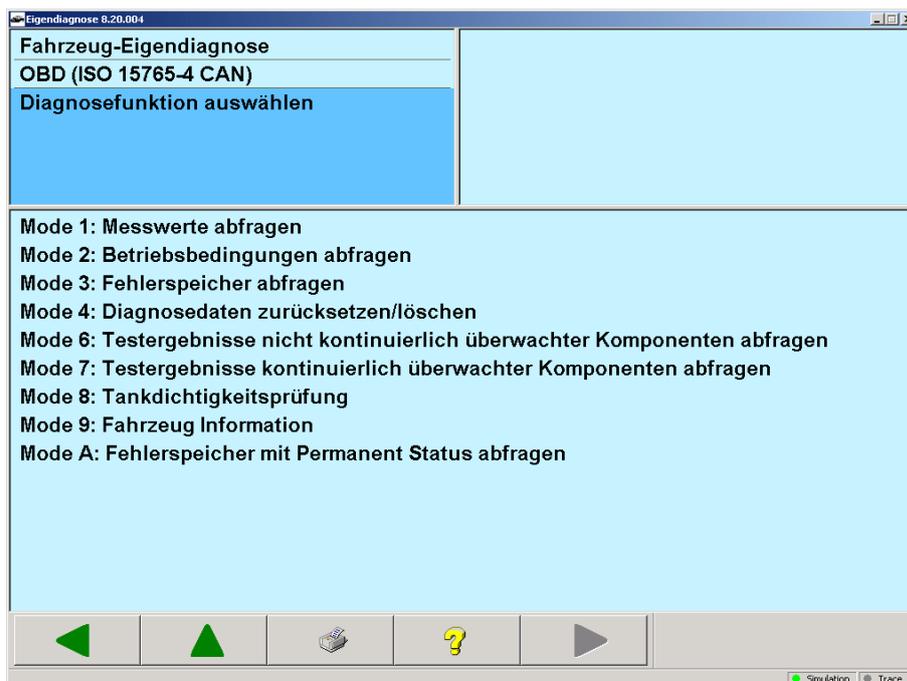


Figure 3-125 Selecting diagnostic functions

In the OBD masks, all vehicle systems that support the OBD standard are displayed in the right information window. The vehicle systems and the corresponding results are displayed in different colours for more clarity.

If a given diagnostic mode has several functions, then you may select multiple lines in the displayed list. If you press the **Continue** button, all selected functions will be processed.

The following OBD functions are available:

- **Diagnostic mode 1:** Interrogating measured values
You have the option of interrogating exhaust-relevant information, such as analogue and binary measured values and system status information.
- **Diagnostic mode 2:** Interrogating operating conditions
When malfunctions occur in a subsystem for the first time, the current operating conditions need to be saved to the vehicle system in addition to the registration of the faults. You can read these operating conditions for your decision how to proceed with repair measures.
- **Diagnostic mode 3:** Checking DTC memory
You can read and display the stored exhaust-relevant fault codes for all vehicle systems.
- **Diagnostic mode 4:** Resetting/erasing diagnostic data
You can erase or reset exhaust-relevant information in the vehicle system.
Erasing refers to:
 - Erasing the number of fault codes
 - Erasing the fault codes
 - Erasing the fault codes for *Freeze frame data*
 - Erasing of *Lambda probe monitoring values*
 - Resetting the monitoring status
 - Manufacturer-specific information
 It is only possible to erase the data if the DTC memories have been read first (diagnostic mode 3).
- **Diagnostic mode 5:** Interrogating lambda test results
You can have the results of the lambda probe vehicle monitoring displayed.
- **Diagnostic mode 6:** Interrogating test results on non-continuously monitored components
You can have the test results of non-continuously monitored components displayed.
- **Diagnostic mode 7:** Interrogating test results on continuously monitored components
You can have the test results of continuously monitored components displayed.
- **Diagnostic mode 8:** Tank leak test
You can have the results of the tank leak test displayed.
- **Diagnostic mode 9:** Vehicle information
You can interrogate and display data on the connected vehicle.
- **Diagnostic mode A:** Interrogate DTC memory with permanent status
You can read and display the permanently stored exhaust-relevant fault codes for all vehicle systems.

Example for a mask sequence in mode 1: Interrogate measured values:

In the mask displayed below, you can select those measured values that you wish to read from the vehicle system.

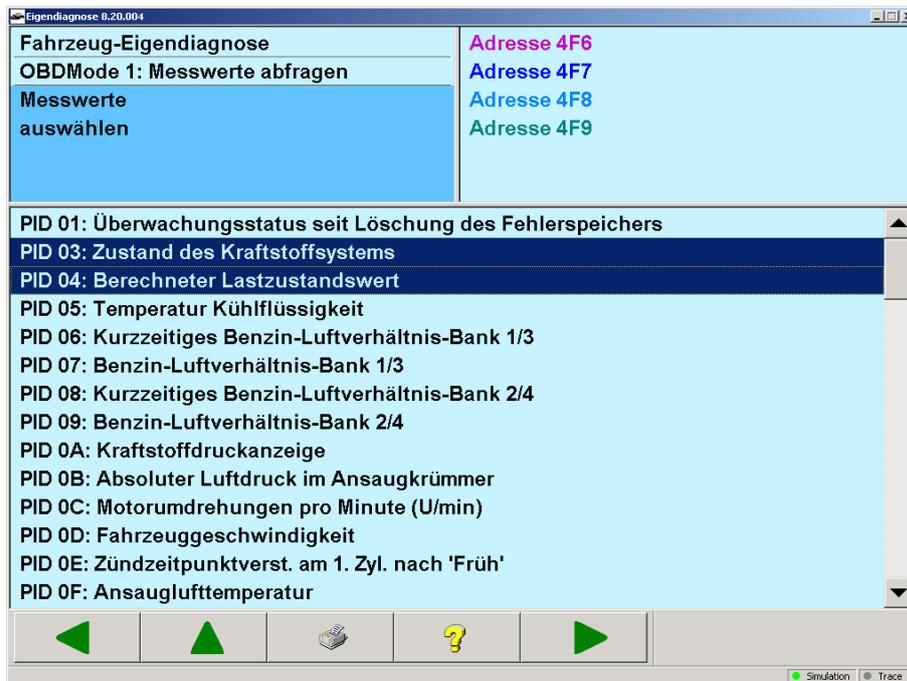


Figure 3-126 Select data

For multiple selection, press and hold the Ctrl key when you want to add another selection.

The following mask shows the results. Coloured display is used here for the allocation of the measurement results/vehicle systems.

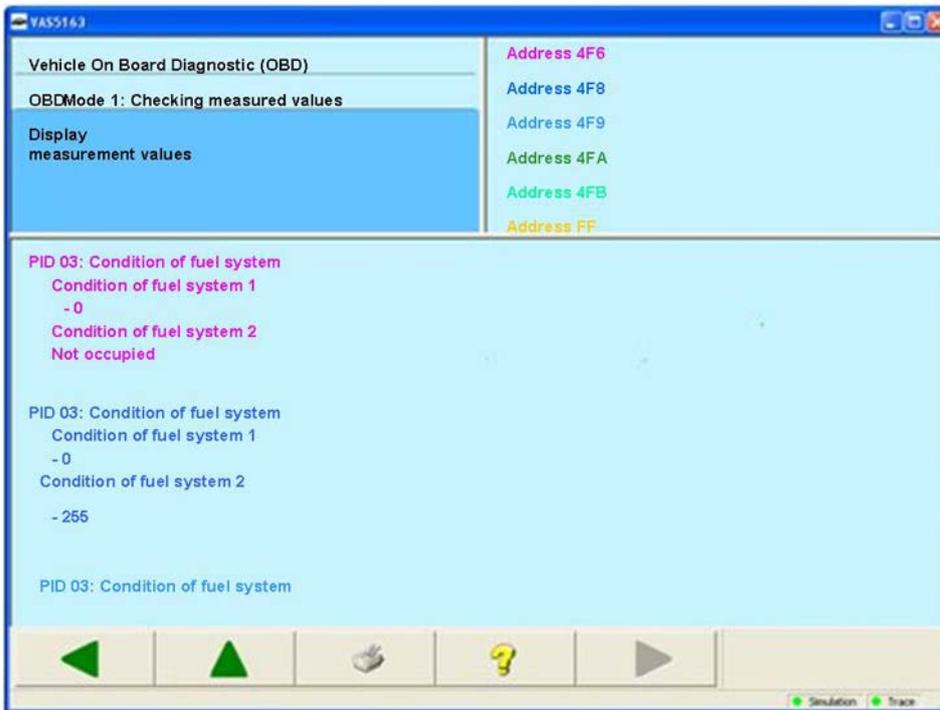


Figure 3-127 Display measured values



4 Appendix

List of diagnostic functions for all protocols

Designation
001 – Identification (Service \$1A)
001.01 – Control unit identification (Service \$1A) (only KWP2000)
001.02 – History data (Service \$1A) (only KWP2000)
002 – Identification (Service \$22)
002.01 – Identification of electronic control units (Service \$22) Master Subsystem class 1/2 Subsystem class 0 (only KWP2000)
002.02 – History data (Service \$22) (only KWP2000)
002.03 – Identification data (Service \$22) (only KWP2000)
003 – Identification (for Crafter, UDS and engine conjunction)
003.01 – Identification, master (only UDS)
003.02 – Identification, subsystems (only UDS)
004 – DTC memory contents
004.01 – Checking DTC memory
004.02 – Diagnostic status of all error paths (only KWP2000)
004.03 – List of all unchecked error paths (only UDS)
004.04 – List of all active malfunctions (only UDS)
004.10 – Erase DTC memory
005 – Final control diagnosis
006 – Basic setting
007 – Coding (Service \$1A) (only KWP2000)
008 – Coding (Service \$22) (only KWP2000)
008.01 – Coding (only KWP2000 Gateway)
008.02 – Installation list, code (only KWP2000 Gateway)
009 – Coding (for Crafter, UDS and KWP1281)
009.01 – Binary coding (only UDS)
009.02 – Plain text coding (only UDS)
009.03 – Installation list, coding (only UDS and only Gateway)

Designation
010 – Measured values (only KWP1281)
010.01 – Read measured value (only KWP1281)
010.02 – Read data block (only KWP1281)
011 – Measured values (All except KWP1281)
012 – Adaptation
014 – Long adaptation (only KWP2000)
015 – Access authorization (only KWP2000)
015.01 – Coding 2 (only KWP2000)
015.02 – Security access (automatic) (only KWP2000)
016 – Access authorization (only KWP1281 and UDS)
017 – Safety (only KWP2000)
017.01 – Challenge read out immobilizer IV (1st body version) (only KWP2000)
017.02 – Challenge read out immobilizer IV (2nd body version) (only KWP2000)
017.03 – Enabling immobilizer IV (1st body version) (only KWP2000)
017.04 – Enabling immobilizer IV (2nd body version) (only KWP2000)
017.05 – Component protection (Generation 1) (only KWP2000)
017.06 – Component protection (Generation 2) (only KWP2000)
019 – Update programming
020 – Special function
020.01 – Readiness code (only KWP1281 and KWP2000)
020.02 – Selective final control diagnosis (only KWP2000)
020.03 – Transfer vehicle identification number (only KWP2000)
020.04 – ABS bleeding (only KWP2000)
020.05 – Adaptation channel 50 PIN (only KWP2000)
020.06 – Enabling PIN (only KWP2000)
020.07 – Hidden adaptation channel 50 (only KWP2000)
020.08 – Hidden key adaptation (only KWP2000)
022 – End output (only KWP1281 and KWP2000)

Designation
024 – Reset control unit <i>(only Crafter)</i>
025 – Reset to factory settings <i>(only UDS)</i>
025.01 – <i>(Display dependent on data input in the ODX data)</i>
025.02 – <i>(Display dependent on data input in the ODX data)</i>



List of all compiling services

Designation
1001 – Compiling services
1001.01 – Checking DTC memory - Entire system
1001.02 – Erase DTC memory – Entire system
1001.03 – Activate transport mode
1001.04 – Deactivate transport mode
1001.05 – Erase DTC memories – All OBD systems
1001.07 – Diagnosis with 1 MBaud
1001.08 – Diagnosis with 500 kBaud



Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the VAG 1551 Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.
- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the VAG 1551 Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

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