Automotive Diagnostic Software

ScanMaster ELM

User Manual

Version 2.0

2009

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Basic Features

- Supports:
    1. SAE J1850 PWM (41.6 Kbaud)
    2. SAE J1850 VPW (10.4 Kbaud)
    3. ISO 9141-2 (5 baud init, 10.4 Kbaud)
    4. ISO 14230-4 KWP (5 baud init, 10.4 Kbaud)
    5. ISO 14230-4 KWP (fast init, 10.4 Kbaud)
    6. ISO 15765-4 CAN (11 bit ID, 500 Kbaud)
    7. ISO 15765-4 CAN (29 bit ID, 500 Kbaud)
    8. ISO 15765-4 CAN (11 bit ID, 250 Kbaud)
    9. ISO 15765-4 CAN (29 bit ID, 250 Kbaud)
- Automatically determines and identifies to the user the vehicle communication protocol under test.
- Supports generic SAE J1979 (Mode $01) parameter identifiers (PIDs) $00 through $87.
- Displays all or custom list of diagnostic data parameters supported by the vehicle's OBD II controller with line graphs and meters.
- View the condition of the vehicle system at the time when an emission related diagnostic trouble code was stored with Freeze Frame mode.
- Read emission DTCs (and their common SAE descriptions) that cause the MIL to be illuminated. Plus, display the DTC number for the non-SAE defined DTC numbers and descriptions that are reported by OBD II emission ECUs.
- Supports over 4200 generic diagnostic trouble codes descriptions from SAE J2012 and over 3600 enhanced OBD-II codes, or a codes defined by the Original Equipment Manufacturer (OEM).
- Clear all emissions-related diagnostic information. (Mode $04)
- Review the results of the oxygen sensor testing performed by the vehicle's powertrain control module with "Oxygen Sensors" mode (Mode $05).
- Displays non-continuous diagnostic test results specific to the vehicle manufacturer (Mode $06 data) with the "Monitoring Tests Results" mode.
- Reports vehicle's continuously monitored emissions-related tests that have failed during a drive cycle and have not matured to indicate a diagnostic trouble code with "Pending Diagnostic trouble Codes" mode.
- Displays specific information applicable to the vehicle under test (VIN, Calibration ID, Calibration Verification Number, In-Use Performance Tracking).
- Metric and English units of measure.
- Shows Readiness for State Inspection.
- Shows Fuel Consumption since version 1.3.
- Drag Measurement since version 1.8.
- Power and Torque Measurement since version 1.9.
- Direct connection methods for USB, Bluetooth® and WLAN interfaces since version 2.0.

Minimum Platform and Software Requirements

You must have Microsoft Windows 98/ME/2000/XP/7 with Microsoft Internet Explorer 5.01 or later or Firefox installed on your computer as well as Acrobat Reader.

Minimum hardware requirements:

- Pentium 200MHz or faster
- 64MB of RAM or higher
- CD-ROM or DVD-ROM Drive
- Free COM or USB Port

- For Bluetooth® or WLAN interface the computer must have Bluetooth® or WLAN

Warnings

ATTENTION!

- During a test drive the computer or notebook should be secured fixed in the car.
- During a test drive the passenger should handle these units.
- OBD connection cable, adapters and other tools should not disturb control of the car.
- Do not run the engine in closed rooms. A running engine produces perilous gases.

What is OBD-II?

OBD-II stands for On-Board Diagnostics second (II) generation, a computer-based system built into all model year (MY) 1996 in USA and newer light-duty cars and trucks. OBD-II monitors the performance of some of the engines' major components, including individual emission controls. The system provides owners with an early warning of malfunctions by way of a dashboard "Check Engine" light (also known as a Malfunction Indicator Light or MIL, for short). By giving vehicle owners this early warning, OBD-II protects not only the environment but also consumers, identifying minor problems before they become major repair bills.

EOBD - European On-Board Diagnostic

EOBD is a standard that is issued by the European Community. The main goal with the standard is to give the authorities a tool to control the exhaust emission from vehicles. The EOBD standard has been implemented in petrol cars throughout the European Union from 01.01.2001 (EU directive 98/96/EC). For LPG and Diesel vehicles the implementation of applicable regulations is scheduled to take place before 2005. The EOBD standard includes five different communication protocols: ISO 9141-2, ISO 14230-4(KWP2000), SAE J1850 VPW, SAE J1850 PWM and ISO 15765-4 CAN.

If the car supports EOBD you have the possibilities to read out stored information from the ECU in the car, including:

- Read fault codes
- Erase fault codes
- Read freeze frame data
- Get real-time data (displayed as numbers or graphs)
- Get monitoring results from oxygen sensors
- Get result from readiness test

To read out the information you require an OBD-II/EOBD diagnostic tool such as the ScanMaster software together with an approbiate interface for the connection between the cars diagnostic connector and the computer or notbook.

How do I know the OBD system is working correctly?

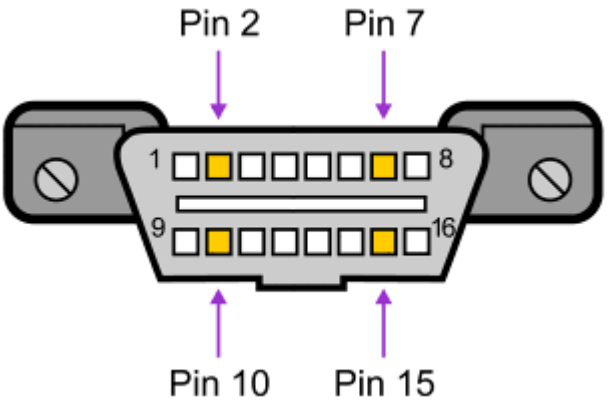
When you turn on the ignition, the "Service Engine Soon" or "Check Engine" light should flash briefly, indicating that the OBD system is ready to scan your vehicle for any malfunctions. After this brief flash, the light should stay off while you drive as long as no problems are detected. If so, you'll be glad to know that your vehicle is equipped with an early warning system that could save you time, money, and fuel in addition to helping protect the environment!

Which OBD-II protocol is supported by vehicle?

All cars and light trucks built for sale in the United States after 1996 are required to be OBD-II compliant. The European Union adopted a similar law in 2000 for gasoline-powered vehicles, and in 2003 for cars with diesel engines.

An OBD-II compliant vehicle can use any of the five communication protocols: J1850 PWM and VPW, ISO9141, ISO14230 (also known as Keyword Protocol 2000), and more recently, CAN (ISO15765/SAE J2480). Car manufacturers were not allowed to use CAN until model year 2003.

As a general rule, you can determine which protocol your vehicle is using by looking at the pinout of the DLC:



The following table explains how to determine the protocol:

Pin 2	Pin 6	Pin 7	Pin 10	Pin 14	Pin 15*	Standard
J1850 Bus+	CAN High	ISO 9141-2 K Line and ISO/DIS 14230-4	J1850 Bus	CAN Low	ISO 9141-2 L Line and ISO/DIS 14230-4	
must have	-	-	must have	-	-	J1850 PWM
must have	-	-	-	-	-	J1850 VPW
-	-	must have	-	-	may have	ISO9141/14230
-	must have	-	-	must have	-	CAN
The connector should have: Pin 4 - Chassis Ground, Pin 5 - Signal Ground, Pin 16 - Battery power						

This means that:

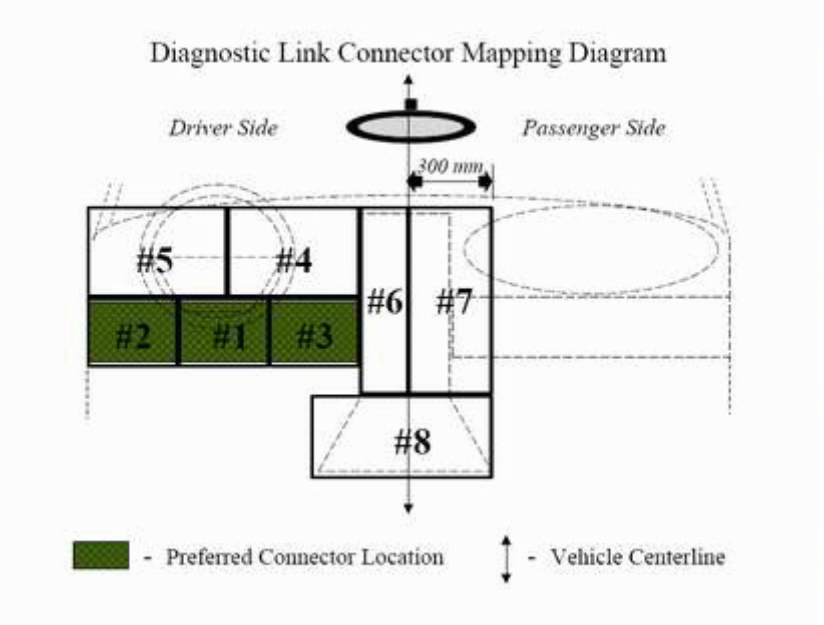
Protocol	The connector must have pins
PWM	2, 4 and/or 5, 10, and 16
VPW	2, 4 and/or 5, and 16, but not 10.
ISO	4 and/or 5, 7, and 16. Pin 15 *may or may not be present.
CAN	4 and/or 5, 6, 14 and 16

*For ISO communications, pin 15 (L-line) is not always required. Pin 15 was used on earlier ISO/KWP2000 cars to "wake-up" the ECU before communication could begin on pin 7 (K-Line). Later cars tend to communicate using only pin 7 (K-Line).

Because of the different protocol a car might have it is recommended to use an interface which supports all protocols as all modern interfaces do.

Diagnostic Link Connector (DLC) Mapping Diagram Explanation

The mapping diagram of DLC locations contains a divided instrument panel (IP) with numbered areas. Each numbered area represents specific sections of the IP where manufacturers may have located DLCs. This document briefly clarifies the numbered locations on the mapping diagram. We will use this mapping diagram to catalog manufacturer responses to the recent 208 letter requesting OBD DLC locations for 96MY and future vehicles. Areas 1-3 fall within the preferred DLC location while the remaining areas, 4-8, fall into the allowable DLC location according to EPA requirements. Areas 4-8 require that manufacturers label the vehicle in the preferred location to notify parties of the alternate connector location.



Preferred Location(s)

Location #1: This location represents a DLC positioned on the underside of the IP directly under the steering column (or approximately 150mm left or right of the steering column). Visualizing the underside of an IP divided into three equal parts from inside the passenger compartment, this represents the center section.

Location #2: This location represents a DLC positioned on the underside of the IP between the steering column and the drivers side passenger door. Visualizing the underside of an IP divided into three equal parts from inside the passenger compartment, this represents the left section.

Location #3: This location represents a DLC positioned on the underside of the IP between the steering column and the center console. Visualizing the underside of an IP divided into three equal parts from inside the passenger compartment, this represents the right section.

Allowable Location(s)

Location #4: This location represents a DLC positioned on the upper part of the IP between the steering column and the center console (but not on the center console, see location #6).

Location #5: This location represents a DLC positioned on the upper part of the IP between the steering column and the driver side, passenger door.

Location #6: This location represents a DLC positioned on the vertical section of the center console and left of the vehicle center line.

Location #7: This location represents a DLC positioned 300 mm right of the vehicle centerline either on the vertical section of the center console or on the passenger side of the vehicle.

Location #8: This location represents a DLC positioned on the horizontal section of the center console either left or right of the vehicle center line. This does not include the horizontal section of the center console that extends into the rear passenger area (see location #9).

Location #9: This location, not shown, represents any DLC positioned in an area other than those mentioned above (e.g., in the rear passenger area on the driver side armrest).

OBD-II Diagnostic Protocol

The diagnostic protocol for OBD-II is SAE J1979. A diagnostic request or response message has a maximum of seven data bytes. The first byte following the header is the test mode. It is also called the service identifier (SID or PID). The following bytes vary depending on the specific test mode.

There are nine diagnostic test modes:

Mode $01 – Request Current Powertrain Diagnostic Data - This service gives access to current emission-related data values, including analogue inputs and outputs, digital inputs and outputs and system status information.

Mode $02 – Request Powertrain Freeze Frame Data - This service gives access to current emission-related data values in a freeze frame. A freeze frame consists of data values stored at a specific event; such as an engine malfunction of some kind.

Mode $03 – Request Emission-Related Powertrain Diagnostic Trouble Codes - The purpose of this service is to enable the external test equipment to obtain "confirmed" emission-related DTCs.

Mode $04 – Clear/Reset Emission-Related Diagnostic Information - The purpose of this service is to provide a means for the external test equipment to command ECUs to clear all emission-related diagnostic information. This includes:

- Number of diagnostic trouble codes
- Diagnostic trouble codes
- Trouble codes for Freeze Frame data
- Freeze Frame data
- O2 test data
- Status of system monitor tests
- On-board monitor test results
- Travelled distance with activated MIL
- Number of warm startups since DTC clear
- Travelled distance since DTC clear
- Engine runtime (minutes) with MIL activated
- Time since DTC clear
- as well as learned adaptive values of the injection system.

Other manufacturer specific clear/reset actions might be possible.

Mode $05 – Request Oxygen Sensor Monitoring Test Results - The purpose of this service is to allow access to the on-board oxygen sensors monitoring test results.

Mode $06 – Request On-Board Monitoring Test Results for Non- Continuously Monitored Systems - This service gives access to the results for on-board diagnostic monitoring tests of specific components/systems that are not continuously monitored. Examples of this are catalyst monitoring and the evaporative system monitoring.

Mode $07 – Request On-Board Monitoring Test Results for Continuously Monitored Systems - Through this service, the external test equipment, can obtain test results for emission-related Powertrain components/systems that are continuously monitored during normal driving conditions.

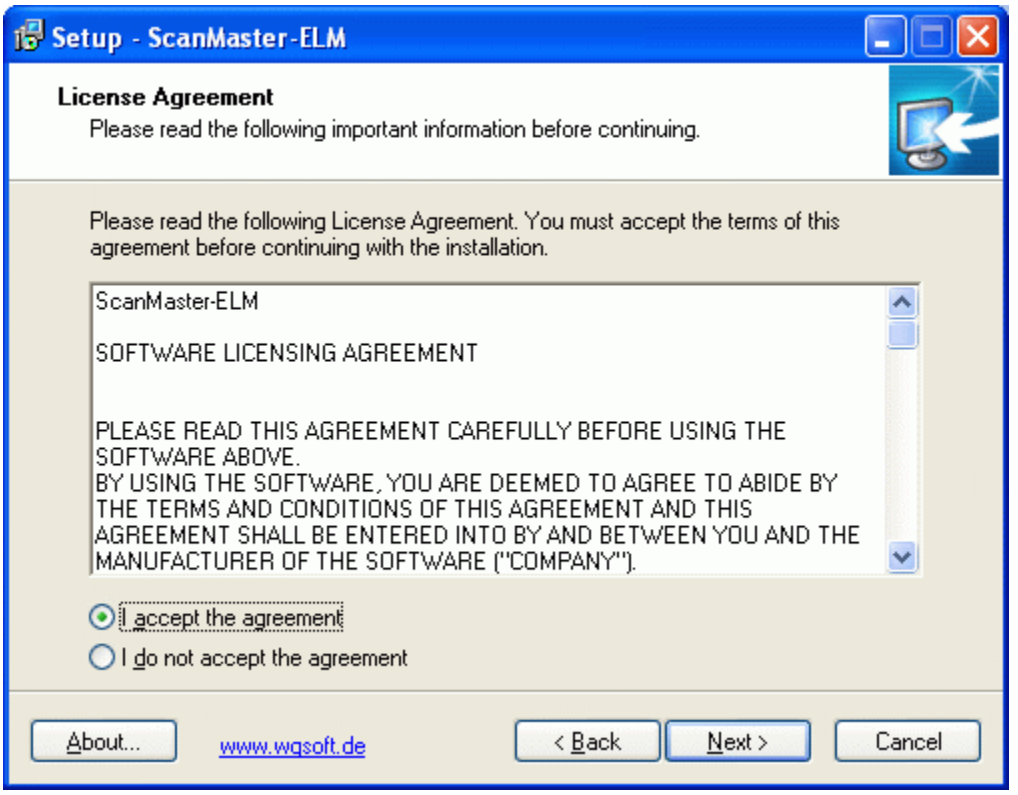
Mode $08 – Request Control of On-Board System, Test or Component - This service enables external test equipment to control the operation of an on-board system, test or component.

Mode $09 – Request Vehicle Information - This service gives access to vehicle specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

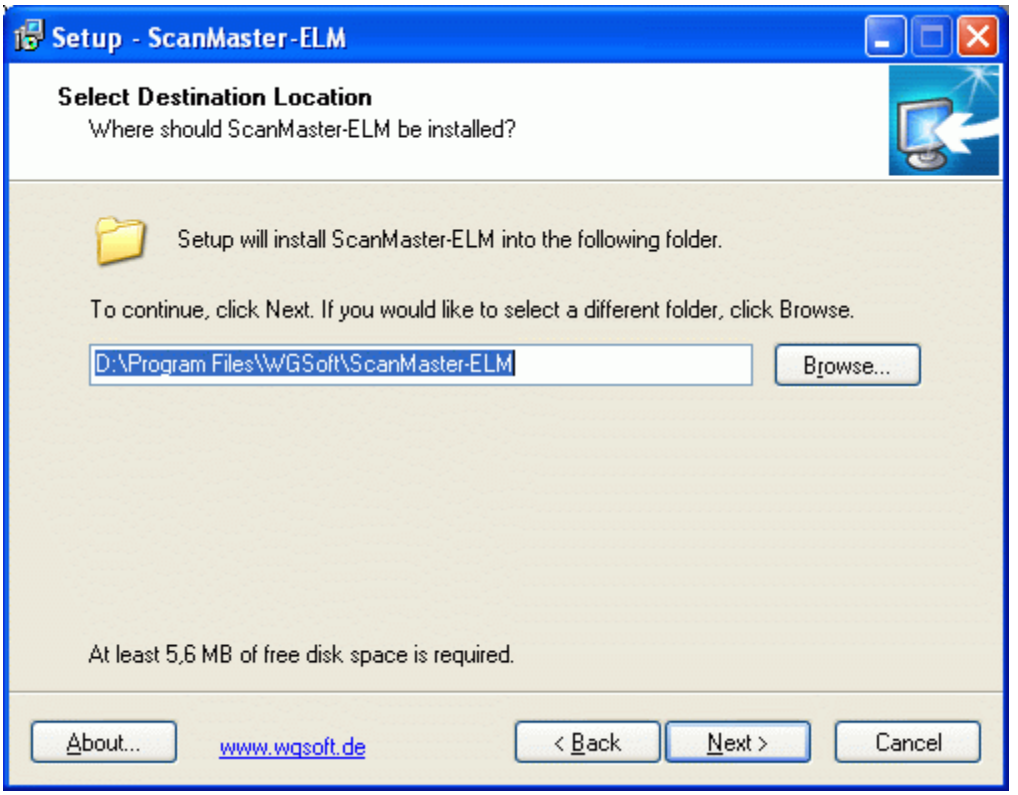
Installation

Start the ScanMaster-ELM installation by double clicking the installation file. The installation wizard will provide instructions for how to complete the installation.

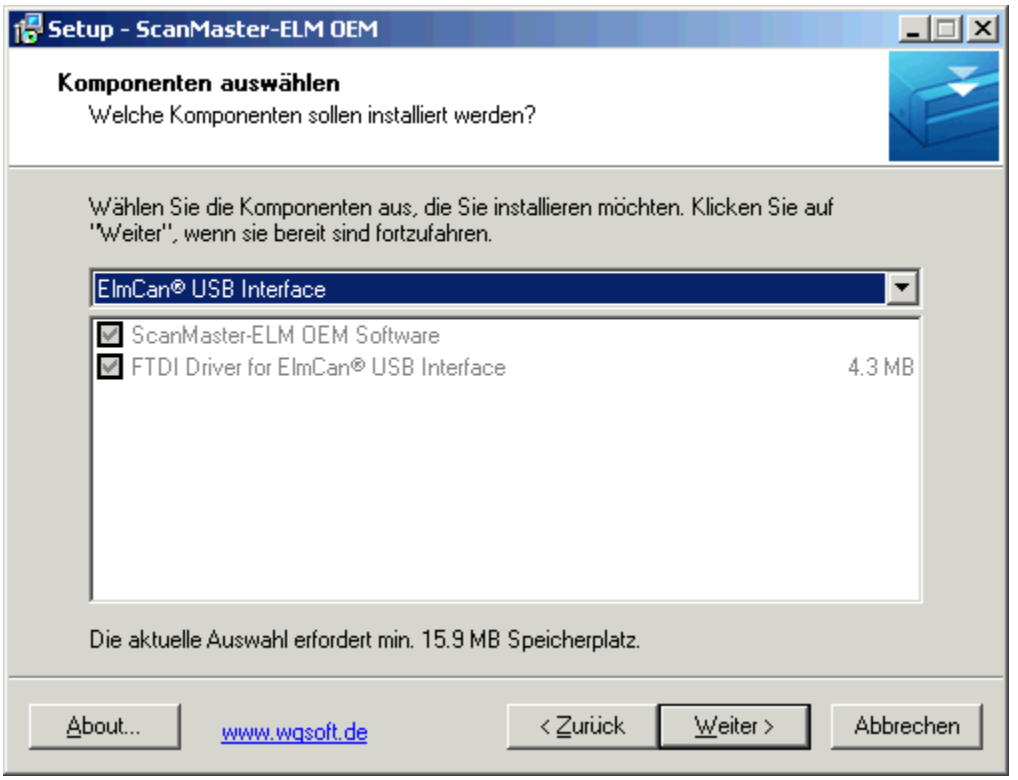
Installation start up



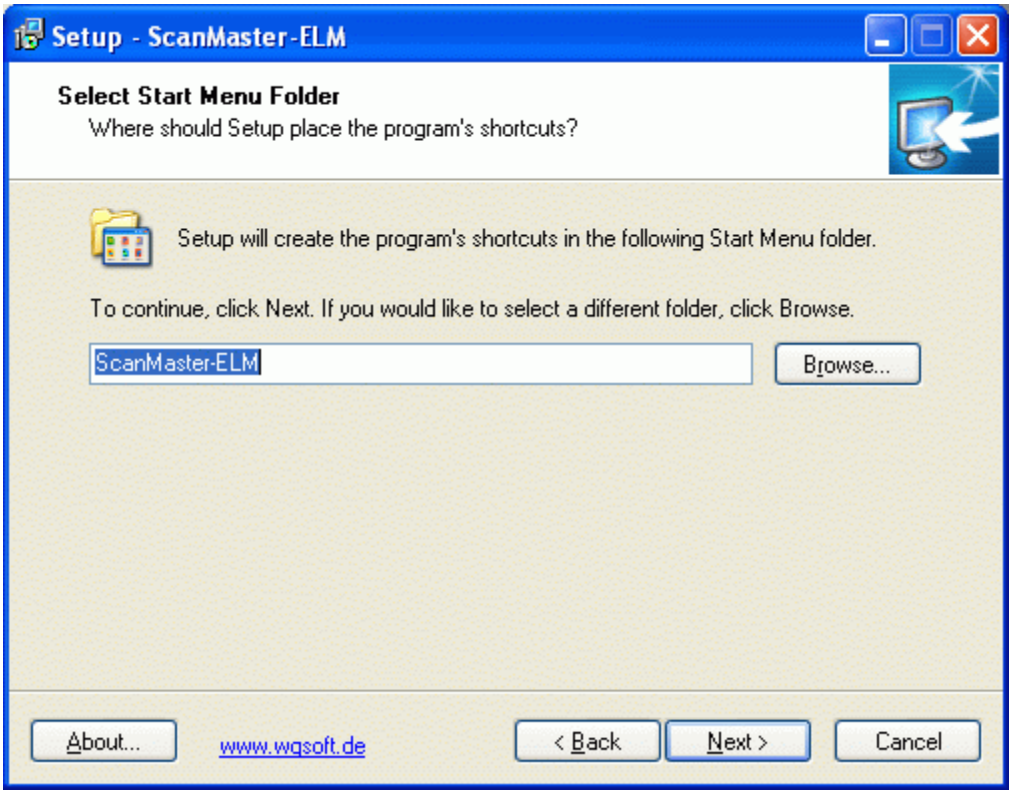
Accept the License Agreements



Select Destination Location or better accept the predefined Location for easier updates later on



Only for the ScanMaster-ELM OEM version for ElmCan® interfaces you will see the window above where you choose the type of interface you have: USB interface or serial interface. For ElmCan®-USB interface you choose USB and for all others (serial, Bluetooth® or WLAN) you choose Serial.



Select Start Menu Folder

Setup has finished installing ScanMaster on your computer.

Deinstallation

For deinstallation please use the common Windows procedure for deinstalling software. Simply delete the item ScanMaster-ELM in the software list of the Windows system settings.

Product Activation

For the ScanMaster-ELM OEM version please see next chapter below.

To be able to use ScanMaster-ELM permanently, you must register the product with your dealer within 21 days after you install it. You will then receive an activation code with which you can activate the program license.

As long as the ScanMaster-ELM license is not activated, you will be asked to register the program each time you start it.

Notes

Registration is bound to the PC on which ScanMaster-ELM is installed by means of a hardware code. The activation code you receive from your dealer when registering ScanMaster-ELM can therefore only be used on the PC on which you perform the registration. If you want to install ScanMaster-ELM on another PC or if you reinstall the program after changing the hardware configuration of your PC, you must register the program again.

Note the following concerning the hardware code

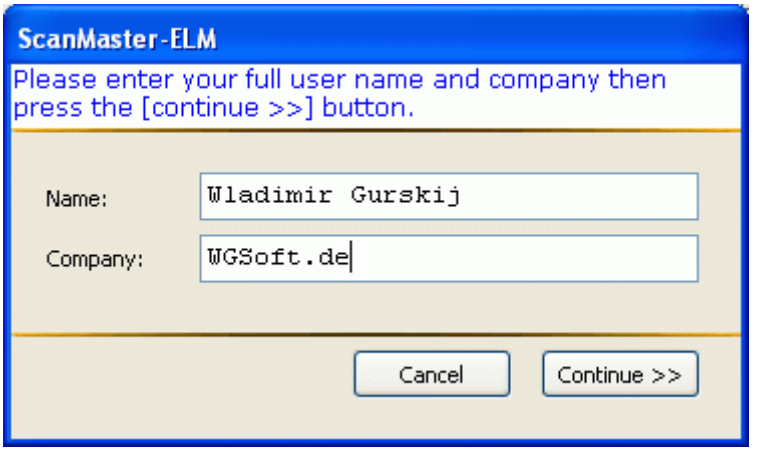
The hardware code is used exclusively to generate a valid activation code for your PC.

Software or personal data on the PC are not taken into account for the hardware code. Only general hardware components are used for generating the code.

The hardware code cannot be decoded, so it is not possible to see from the hardware code which components are installed in a PC.

Registration (not for ScanMaster-ELM OEM)

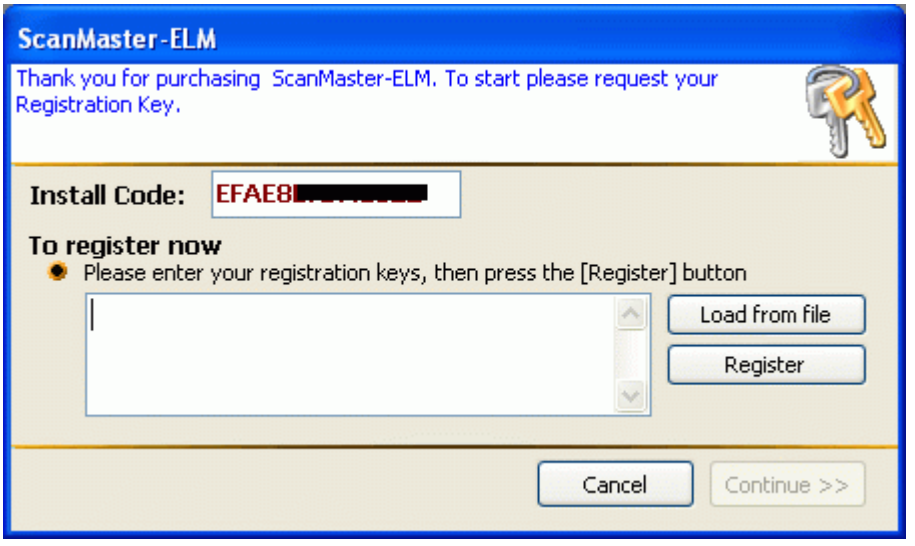
Following successful installation this screen will appear.



Now you need to enter your name and company on which you would like to register the program.

Then click "Continue >>"

The following window appears.



You inform your dealer about the "Install Code" and you get a registration key of him, which you enter in this window. Then click on "Register" to complete the activation.

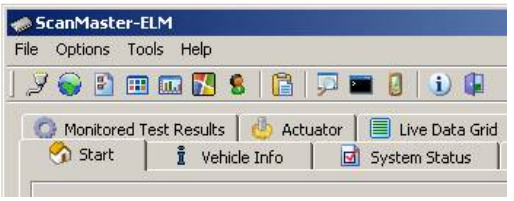
If you have carried out the procedure correctly you will see the confirmations screen. Congratulations! You have now installed and registered ScanMaster-ELM Software. Click "OK" and you are finished.

Product Activation for ScanMaster-ELM OEM

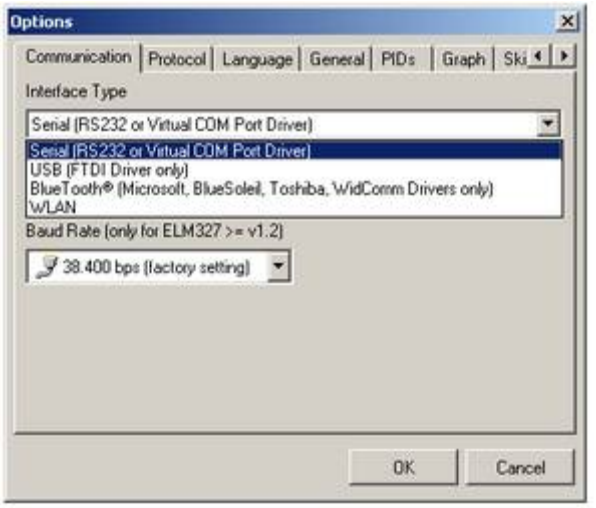
For the ScanMaster-ELM OEM version the activation method is different. You will get detailled descriptions from your dealer for activating ScanMaster-ELM OEM which is normally delivered with the ElmCan® interface together.

Options

Before you start to work with the program, it is recommended to carry out the most important program options. Open the appropriate item in menue Options or click on the symbol in the symbol list below.



Communication



Make first the settings for your interface type. Choose between

- Serial (serial interface with serial connection cable to the computer with 9-pin connector, interface type ElmCan®-Serial)

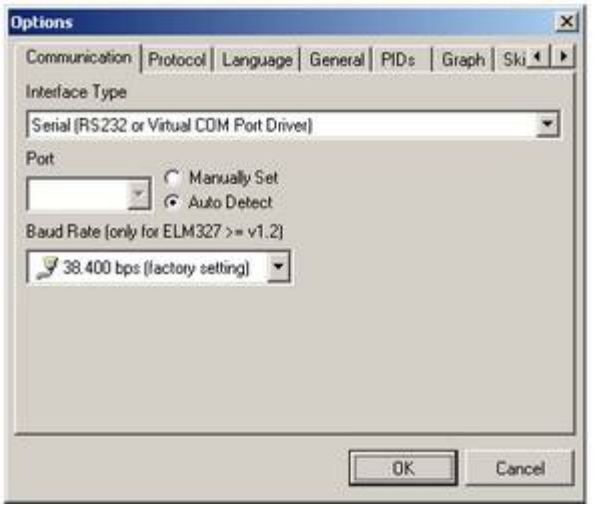
- USB (USB interface with USB connection cable to the computer, the interface must have a FTDI chip like the ElmCan®-USB interface)

- Bluetooth® (wireless connection to the computer, the interface connects wireless via Bluetooth® radio to the computer, the computer must have buildin Bluetooth® or an USB Bluetooth® dongle with Bluetooth® software stack from Microsoft, Blue Soleil, Toshiba or Widcomm, interface typ ElmCan®-BT)

- WLAN (wireless connection to the computer, the interface connects wireless via WLAN radio to the computer, the computer has buildin WLAN, interface type ElmCan®-WLAN)

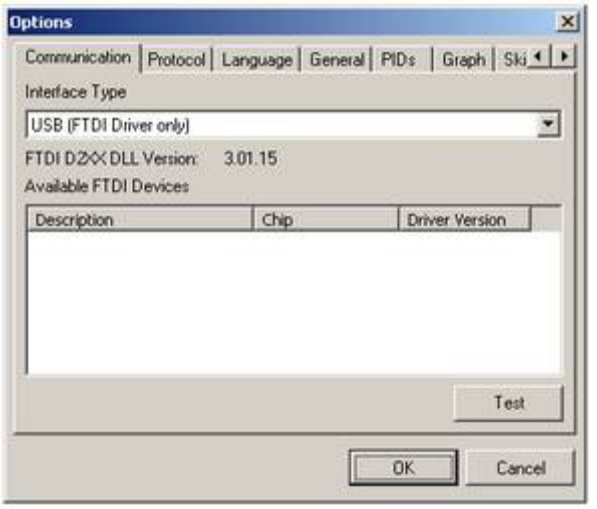
For the above connections USB, Bluetooth® and WLAN there is a direct connection with this medium. Also a connection via a virtual com port is possible with these mediums choosing Serial (virtual com port driver).

Selecting Serial the applicable COM-Port number may be selected manually (if known, for the physical 9-pin connector mostly port 1, for virtual com ports a number greater 4) or the correct COM-Port number might be searched automatically by ScanMaster-ELM. For first use leave the baudrate at 38,400 bps.

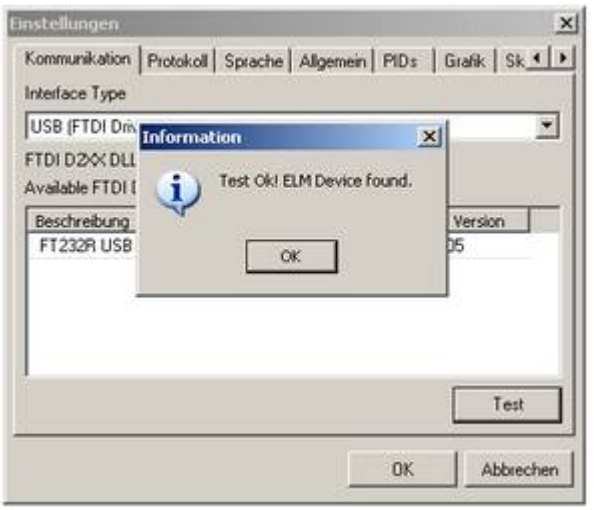


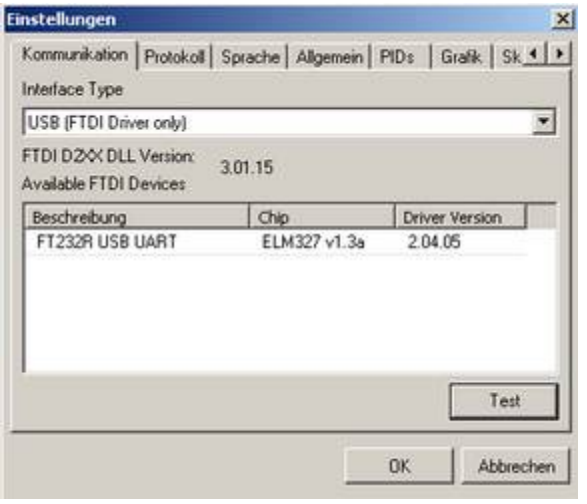
Confirm with "OK" to use the serial interface then.

For an USB type interface you select USB:



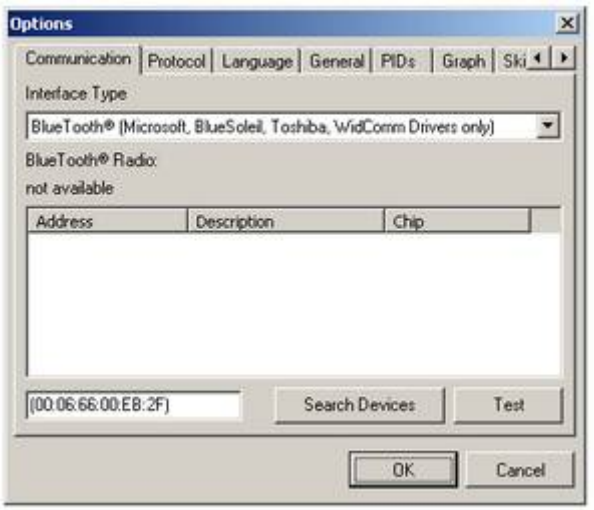
First click "Test" button to find the USB interface and to test it. Once the test was successful you will get the information and data about the device similar as in the pictures below.

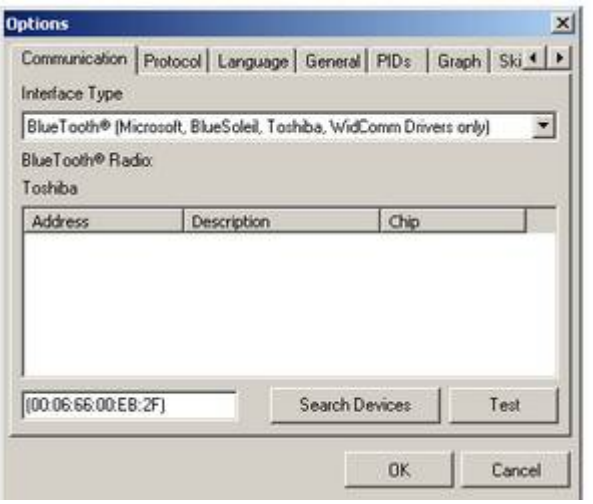




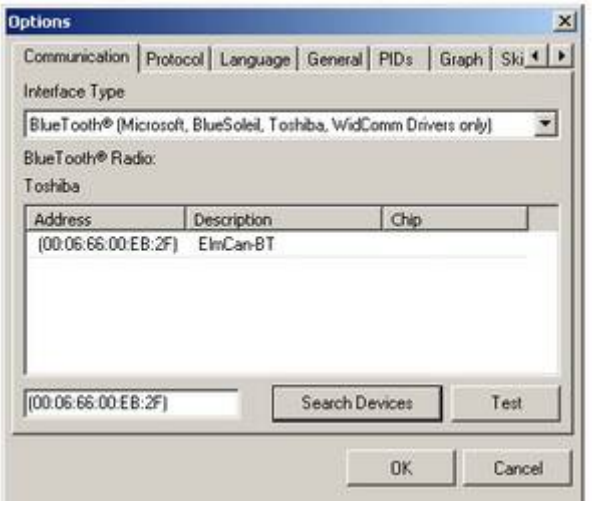
Confirming with "OK" you can use the USB interface now.

If you have a Bluetooth® interface you choose as interface type Bluetooth® after the Bluetooth® software stack was installed at the computer. Please read the documentation about your Bluetooth® stack. Also the attachment about Bluetooth® in the ElmCan® hardware manual may help understanding the behavior of Bluetooth® devices.



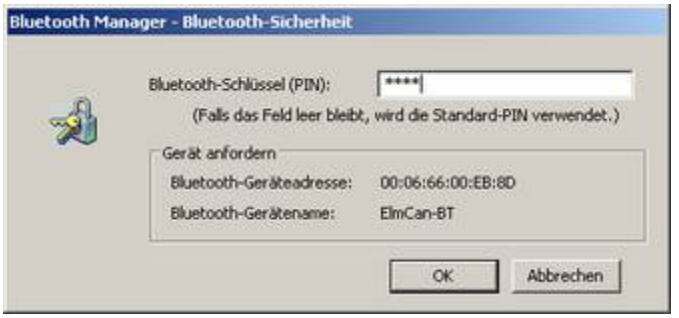


In the left picture above there is no Bluetooth® stack available on the computer, a search for devices will fail therefore. The right picture shows however the Toshiba stack and click at the "Search Devices" button will just do that. The search will be only successful when the Bluetooth® OBD-2 interface is powered up, so it must be connected to the car.



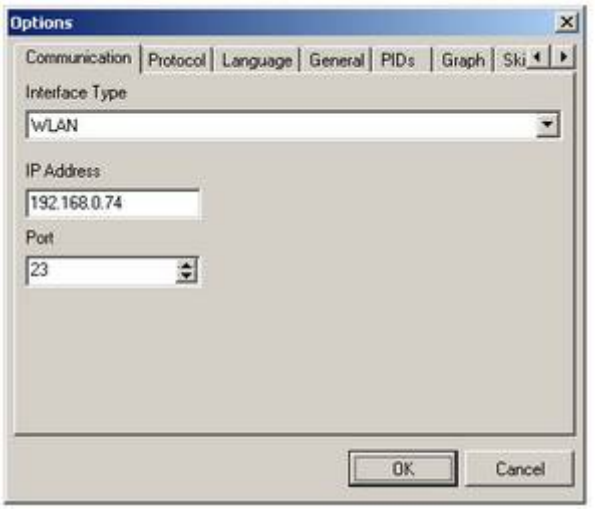
Once found mark the line in the list, so the line is highlighted and click "Test" button to test the interface.

During the test you may be asked to enter the security key for the interface. See the interface documentation for this step.



Confirm the settings with "OK" buton in the Options window above. The Bluetooth® interface is ready for use now.

If you own a WLAN OBD-2 interface, select interface type WLAN. The formerly needed WLAN driver HW-VSP is not needed anymore with ScanMaster-ELM version 2.0 and higher. Choosing interface type WLAN the standard IP address and port number is already predefined for the ad-hoc mode connection between the interface and the computer. If you run the system in infrastructure mode make the appropriate settings according to your network.

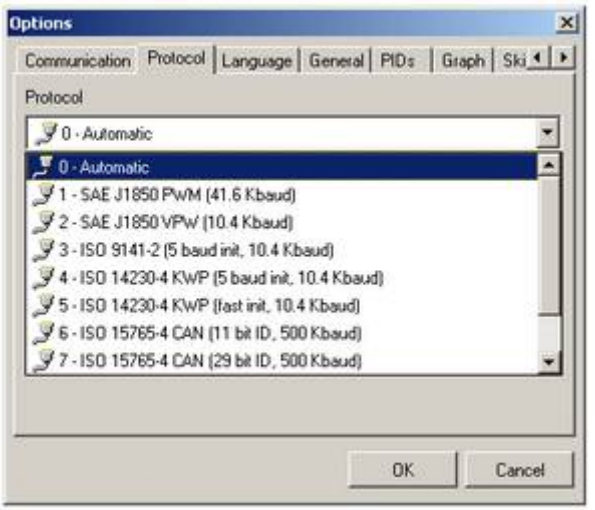


Note:

If the above settings in "Options / Communication" are not made or not made correctly to your type of interface then no connection between the interface and the computer is possible. You will seen a message in the start screen: Interface not found.

Protocol

Select the right diagnostic protocol which is supported by the vehicle. If you do not know the protocol or work with several vehicles with different protocols, select "0 - Automatic". In this case the interface will look for the right protocol and build up the connection with the vehicle. This procedure takes however some time until the applicable protocol is found during initialisation.



Language, Measurement system

GUI Language

Select desired language of the program GUI. So that this attitude gets valid, the program must be started newly.

System of measurements

It is possible with the program to work with metric and English system of measuring. You can determine this in the selection box.

General

This tab provides the following settings:

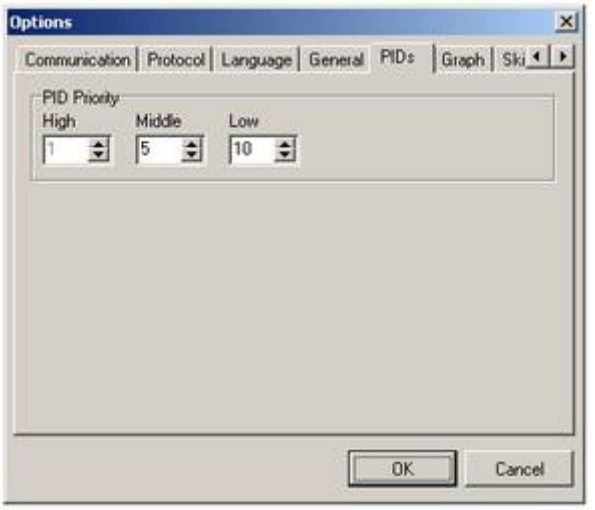
Save on exit

Check "Form size" and "Form position" or "Maximize on startup" if you wanted that these attitudes are stored.

Communication Datalogging

Activate it when asked to send a logfile to the support in the case of trouble shooting. The generated logfile helps to find out any reason for a problem which might occurred. Because a log continously saves each session, this item should not be activated if not really needed, otherwise it results into a large file after times.

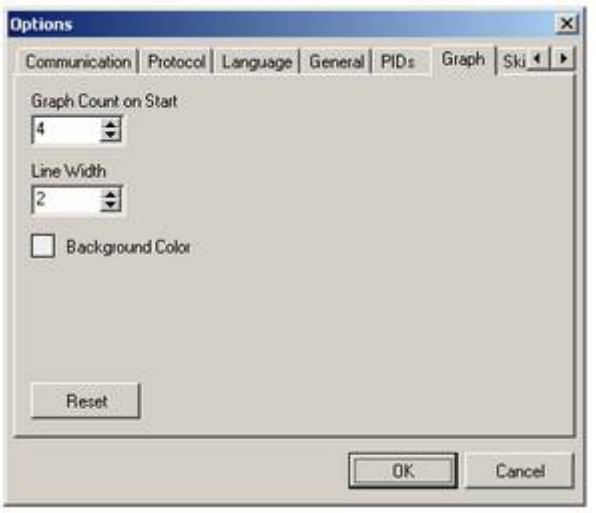
PIDs



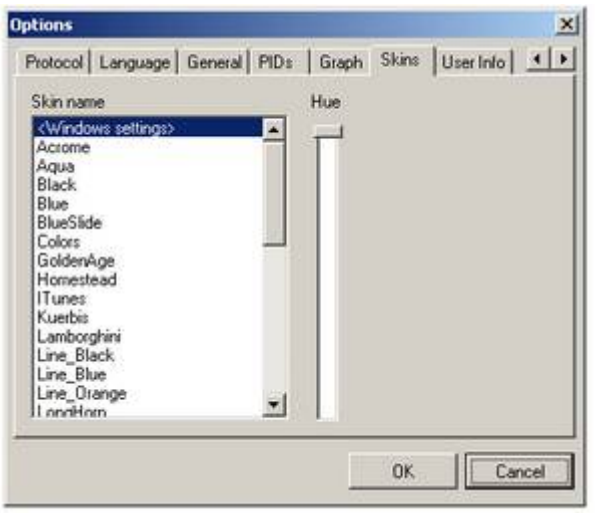
This settings are for the global scan rate (high, middle, low) of sensor values. The value 10 for a low priority means that all sensors with this priority are only asked each 10th scan for its value. This is e.g. applicable for the engine cooling temperature which does not change very fast and therefore must not be scanned each scan cycle. Note, this are the global values for priority, each PID can be adjusted in the PID configuration screen separately.

Graph

The graph tab provides settings for the number of graphs shown in the graph screen at startup (it can be changed later in the graph screen also), the line width of the graph plots and the background color of the graph. The "Reset" button resets the settings to the default.



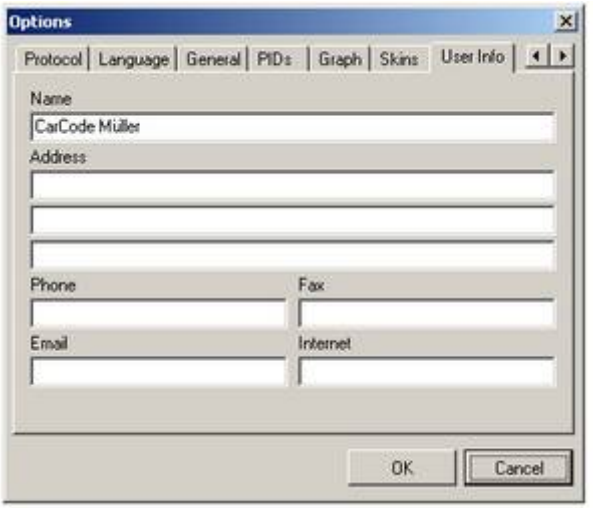
Skins



Since version 1.3 of ScanMaster-ELM Skins can be used to alter the look of the application by the user. Select the desired Skin and change its color with the slider gadget.

User Info

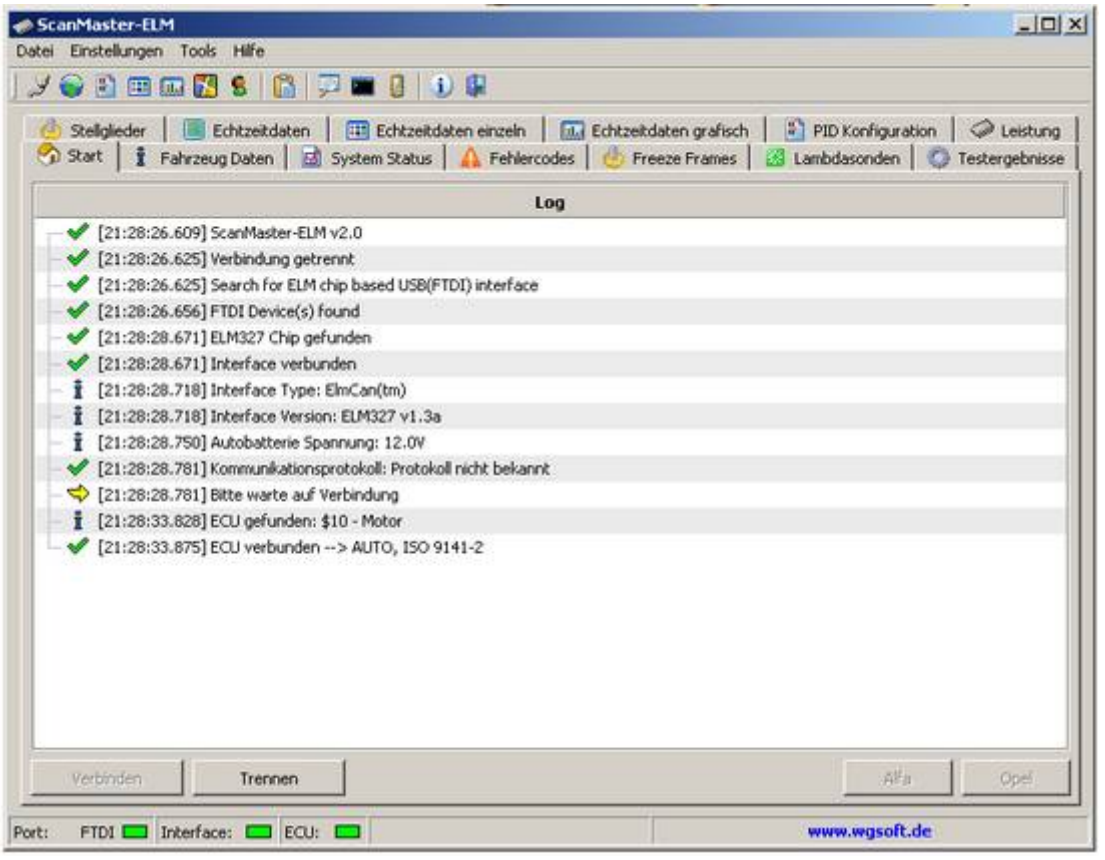
This tab takes the user data which are used also in the diagnostic reports.



All settings tabs are explained herewhich. Time to start a diagnostic session now.

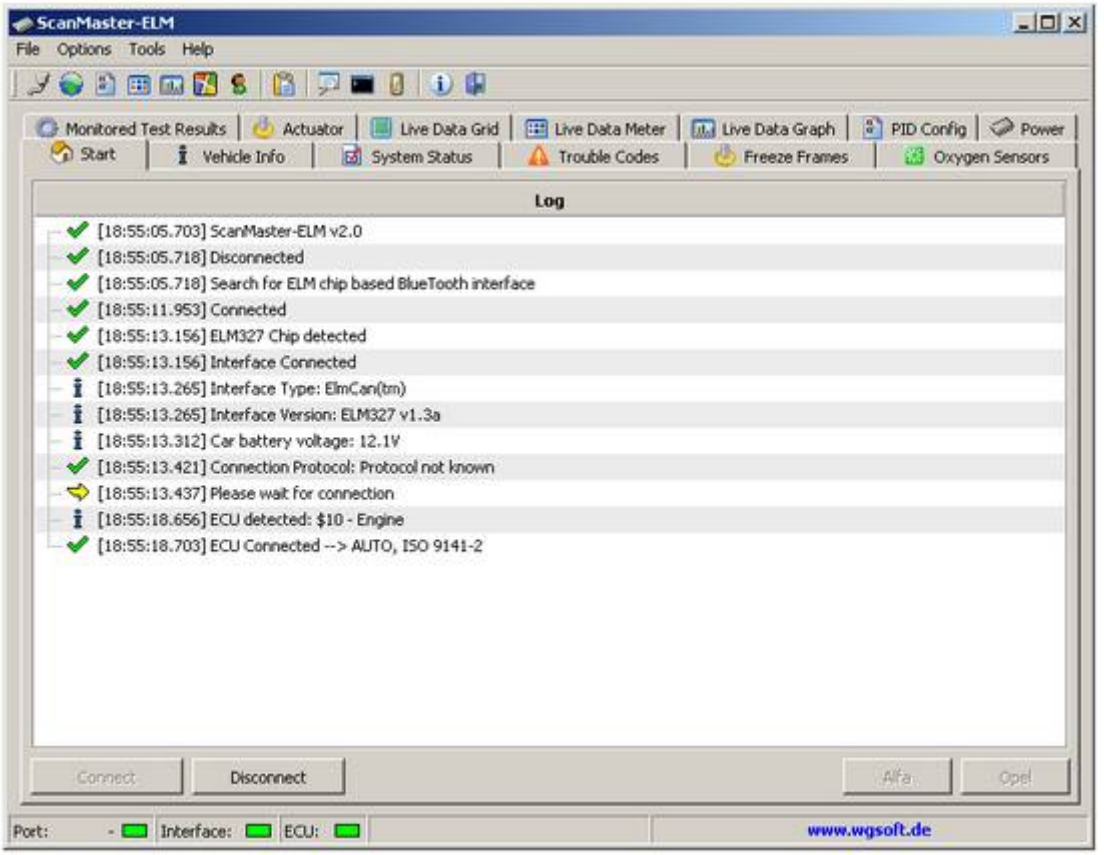
Start Form

This is the start screen. It has a Connect button and a Disconnect button. The Connect button starts the communication with the vehicle and the Disconnect button breaks off the communication.

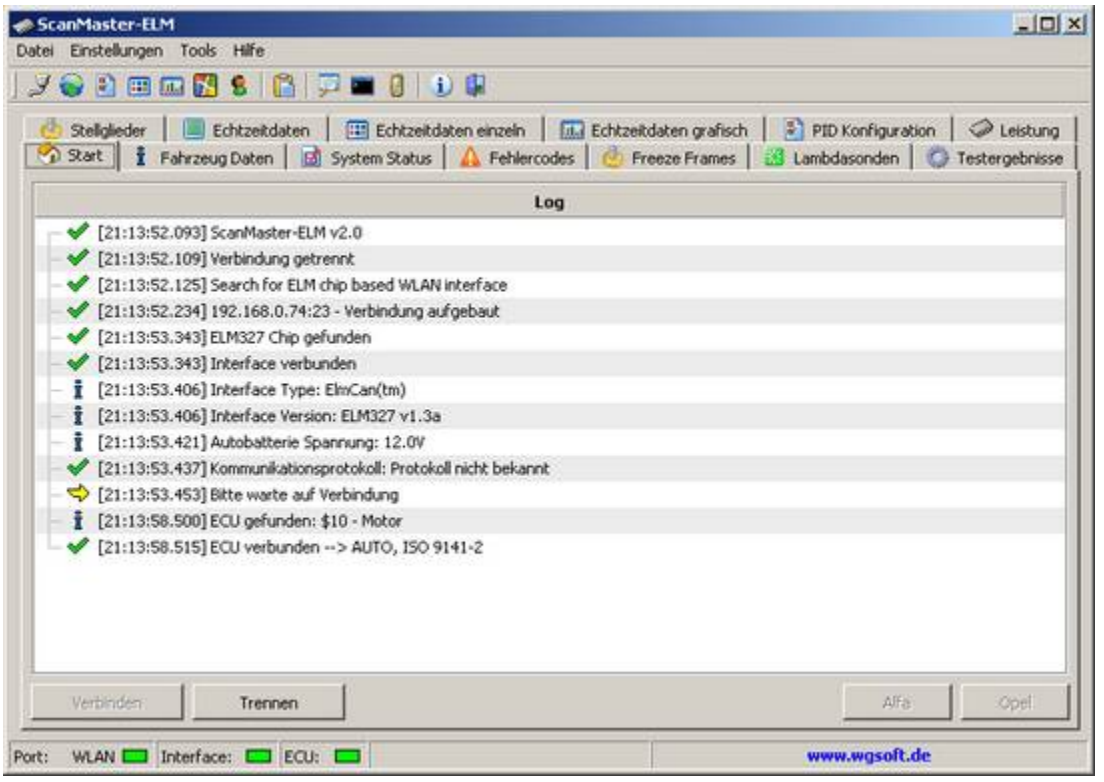


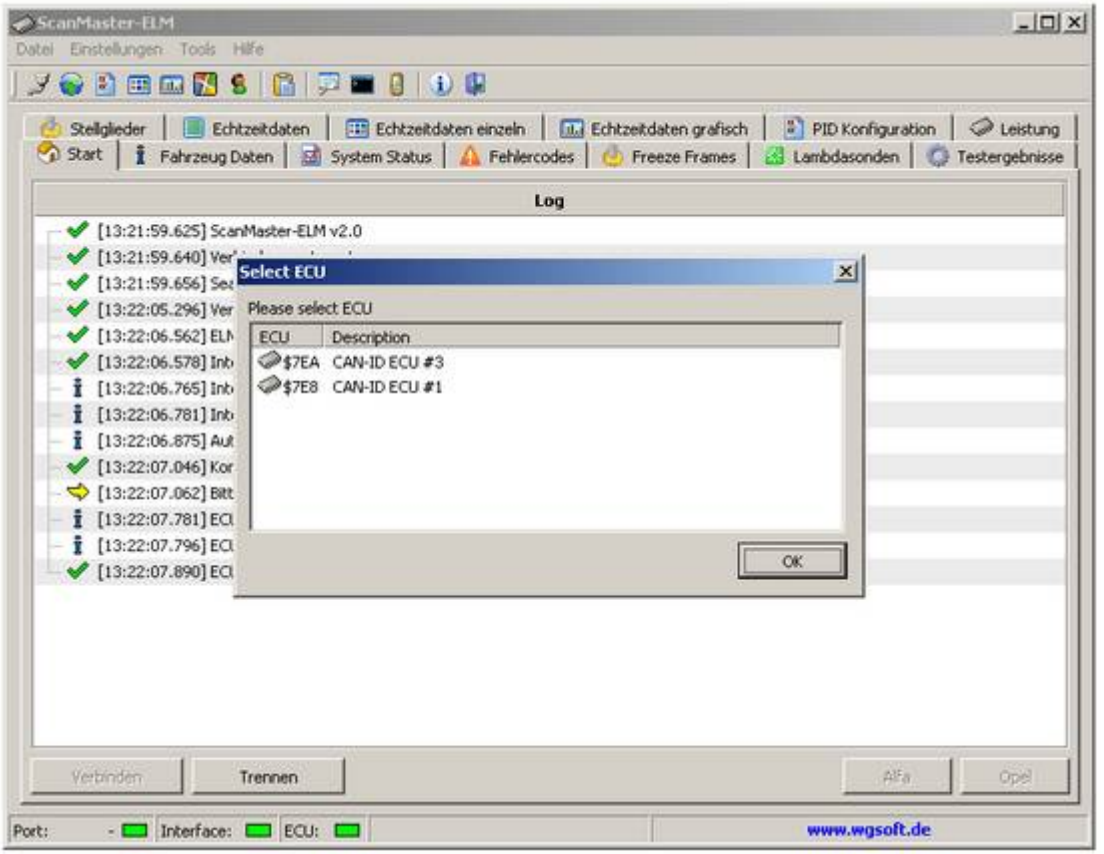
Only for some older cars from Alfa Romeo, Fiat and Opel are the buttons "Alfa" and "Opel" to connect with at the right bottom of the screen (see above). These cars do have the 16-pin connector but no OBD-2 compliant ECUs (years of build 1996 – 2001). All other OBD-2 compliant cars connects with the "Connect" button (left). The resulting new window has a button "Supported ECUs" which shows right this when clicked. Opel means Vauxhall as well and Alfa offers the choice of engine or selespeed ECU.

Depending of the used interface type and the found transfer protocol of the car the initialisation log informations in the start screen may look different. The picture of the page before was taken with an USB interface and ISO 9141-2 protocol.



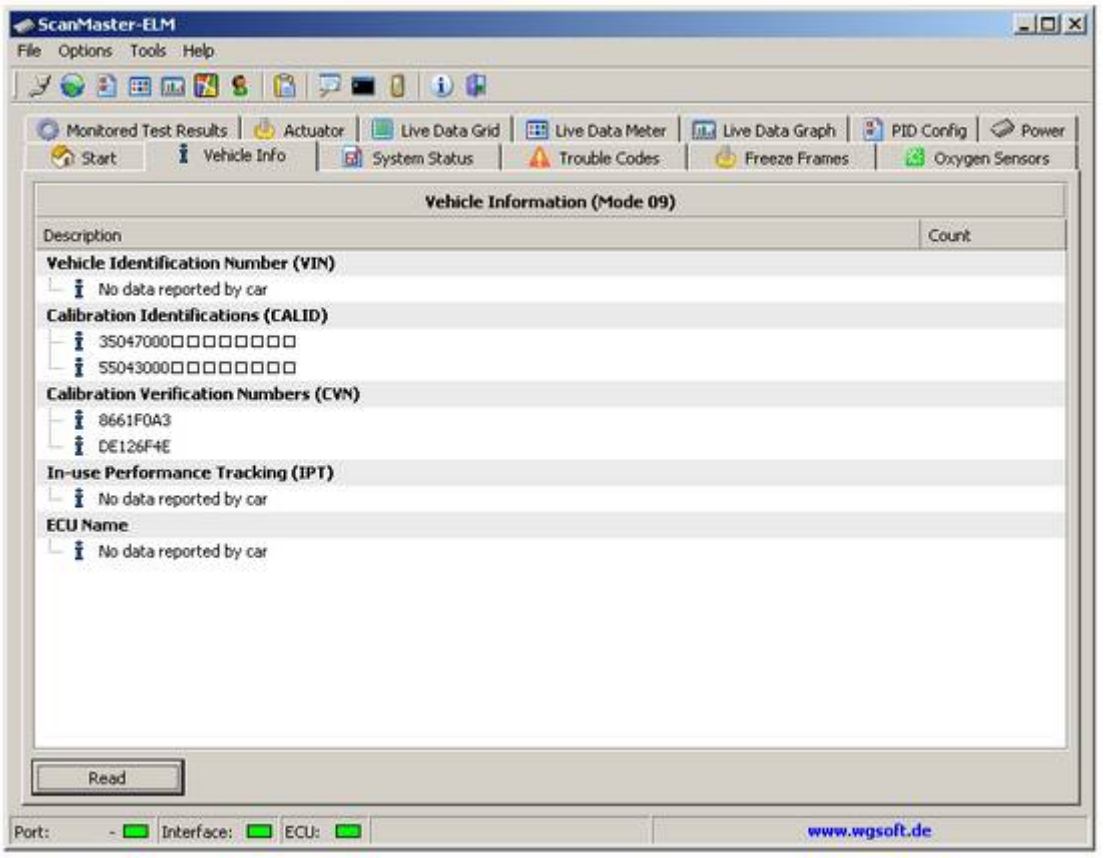
This start screen above shows the connection with a Bluetooth® type interface and the same car as before. The next screenshot is of a WLAN interface. Remark the different GUI languages as configured in "Options / Languages".


ScanMaster-ELM
Datei Einstellungen Tools Hilfe
Stellglieder Echtzeitdaten Echtzeitdaten einzeln Echtzeitdaten grafisch PID Konfiguration Leistung
Start Fahrzeug Daten System Status Fehlercodes Freeze Frames Lambdasonden Testergebnisse
Log
[21:13:52.093] ScanMaster-ELM v2.0
[21:13:52.109] Verbindung getrennt
[21:13:52.125] Search for ELM chip based WLAN interface
[21:13:52.234] 192.168.0.74:23 - Verbindung aufgebaut
[21:13:53.343] ELM327 Chip gefunden
[21:13:53.343] Interface verbunden
[21:13:53.406] Interface Type: ElmCan(tm)
[21:13:53.406] Interface Version: ELM327 v1.3a
[21:13:53.421] Autobatterie Spannung: 12.0V
[21:13:53.437] Kommunikationsprotokoll: Protokoll nicht bekannt
[21:13:53.453] Bitte warte auf Verbindung
[21:13:58.500] ECU gefunden: $10 - Motor
[21:13:58.515] ECU verbunden --> AUTO, ISO 9141-2
Verbinden
Trennen
Alfa
Opel
Port: WLAN Interface: ECU:
www.wgsoft.de


ScanMaster-ELM
Datei Einstellungen Tools Hilfe
Stellglieder Echtzeitdaten Echtzeitdaten einzeln Echtzeitdaten grafisch PID Konfiguration Leistung
Start Fahrzeug Daten System Status Fehlercodes Freeze Frames Lambdasonden Testergebnisse
Log
[13:21:59.625] ScanMaster-ELM v2.0
Select ECU
Please select ECU
ECU
Description
$7EA CAN-ID ECU #3
$7E8 CAN-ID ECU #1
OK
Verbinden
Trennen
Alfa
Opel
Port:
Interface:
ECU:
www.wgsoft.de

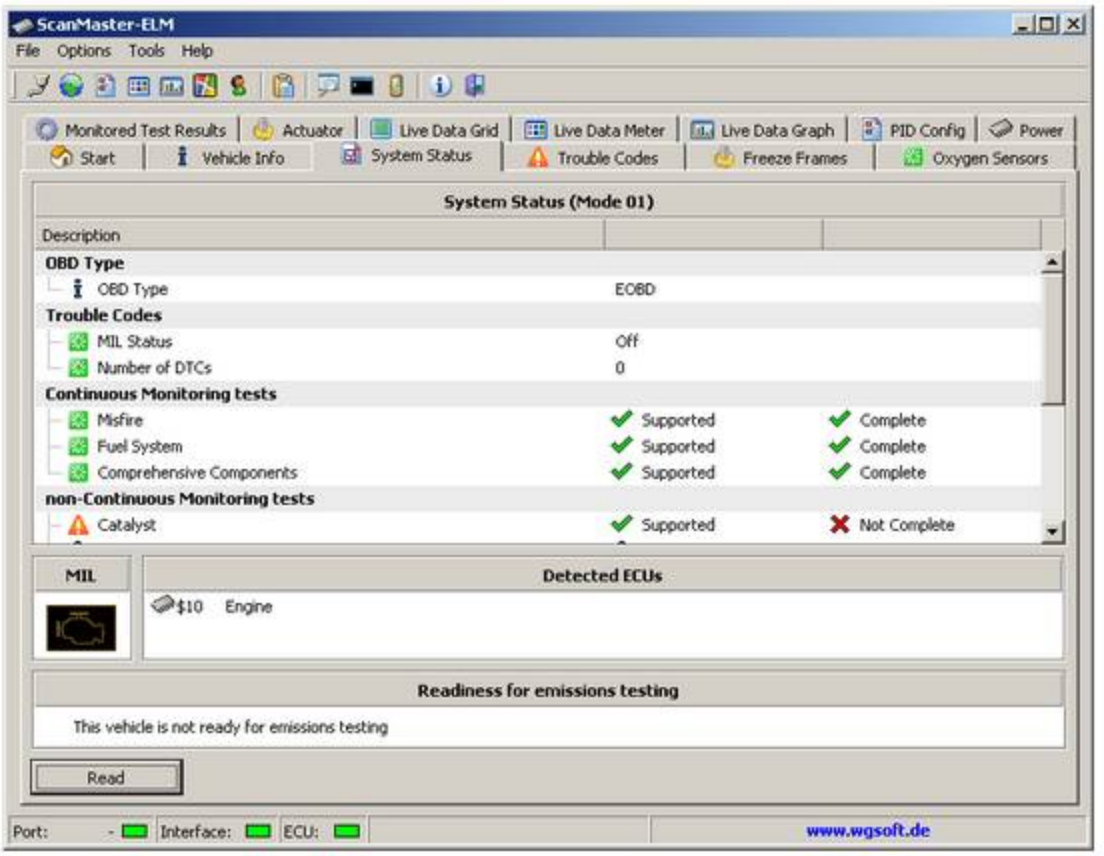
In the case more than one ECU are detected during initialisation, a window pops up to select the ECU for further diagnostics. Start diagnostics with the lowest ECU number and select it to proceed (picture above).

Vehicle Info



This screen shows the general information about the vehicle (VIN, CALID, CVN, IPT) as far as they are supported by the vehicle.

System Status

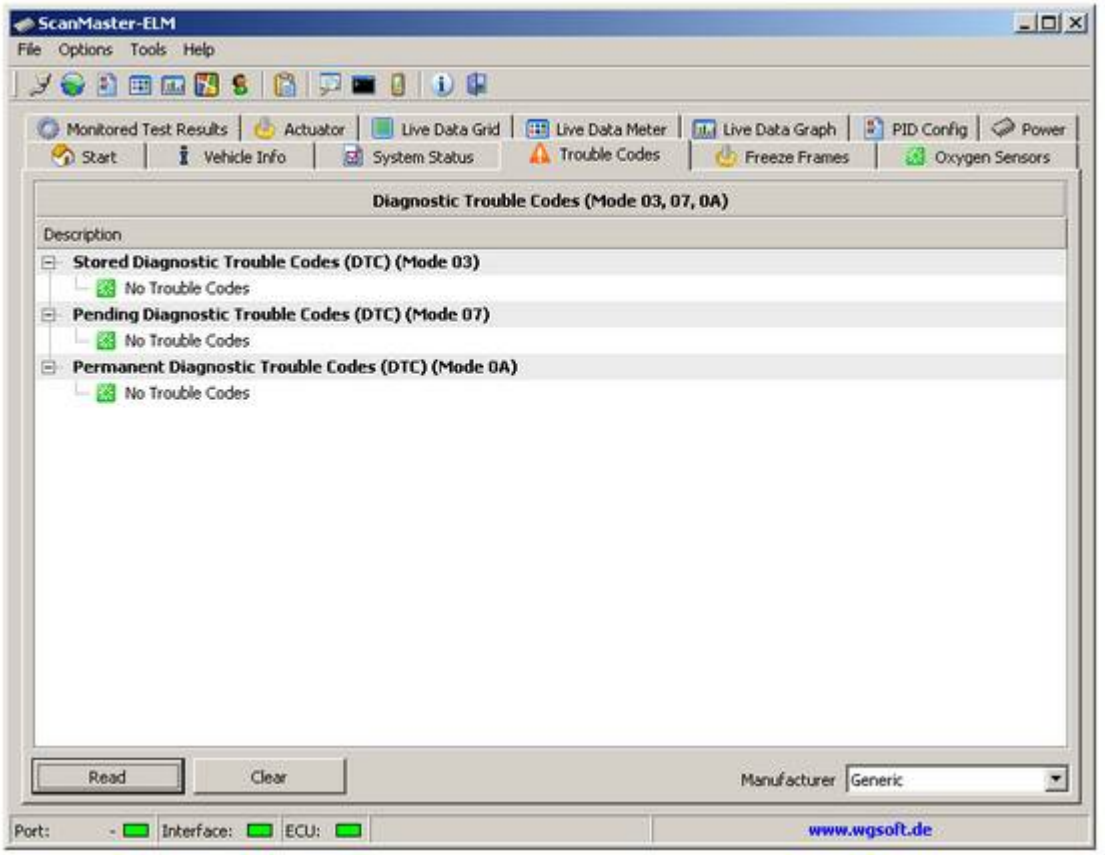


This screen shows the MIL Status, number of stored DTCs and the readiness tests. All available ECUs will be presented in this form.

Depending of the vehicle more or less monitored systems are shown as supported. The monitored status should be completed for a car in good condtion. A not completed status as shown above results from a recent error code clearing or a not functional system. Same as a stored error code and lighted MIL such a car is not ready for state inspection. Repair the faulty system in case of stored error codes or check again after some further driving cycles to maintain the readiness for emission tests.

Same as for any other screen click "Read" to get the actual data out of the ECU.

Trouble Codes



This screen shows the Stored (Mode $03), Pending (Mode $07) and Permanent (Mode $0A) DTCs. Permanent DTCs are introduced with the latest version of the SAE standard J1979.

Press "Read" to read the codes. Two categories of trouble codes exist: Generic and enhanced. Generic codes are standard for all vehicle manufacturers. Enhanced codes are not unique and may overlap with another manufacture, or even the same manufacturer on different models. Select "Manufacturer" from the dropdown menu to show the right manufacturer-specific codes.

Check your vehicle's service manual for DTC meaning if you think the codes you are getting do not make sense.

Remember:

- Visual inspections are important!
- Problems with wiring and connectors are common, especially for intermittent faults.
- Mechanical problems (vacuum leaks, binding or sticking linkages, etc.) can make a good sensor look bad to the computer.
- Incorrect information from a sensor may cause the computer to control the engine in the wrong way. Faulty engine operation might even make the computer show a known good sensor as being bad!

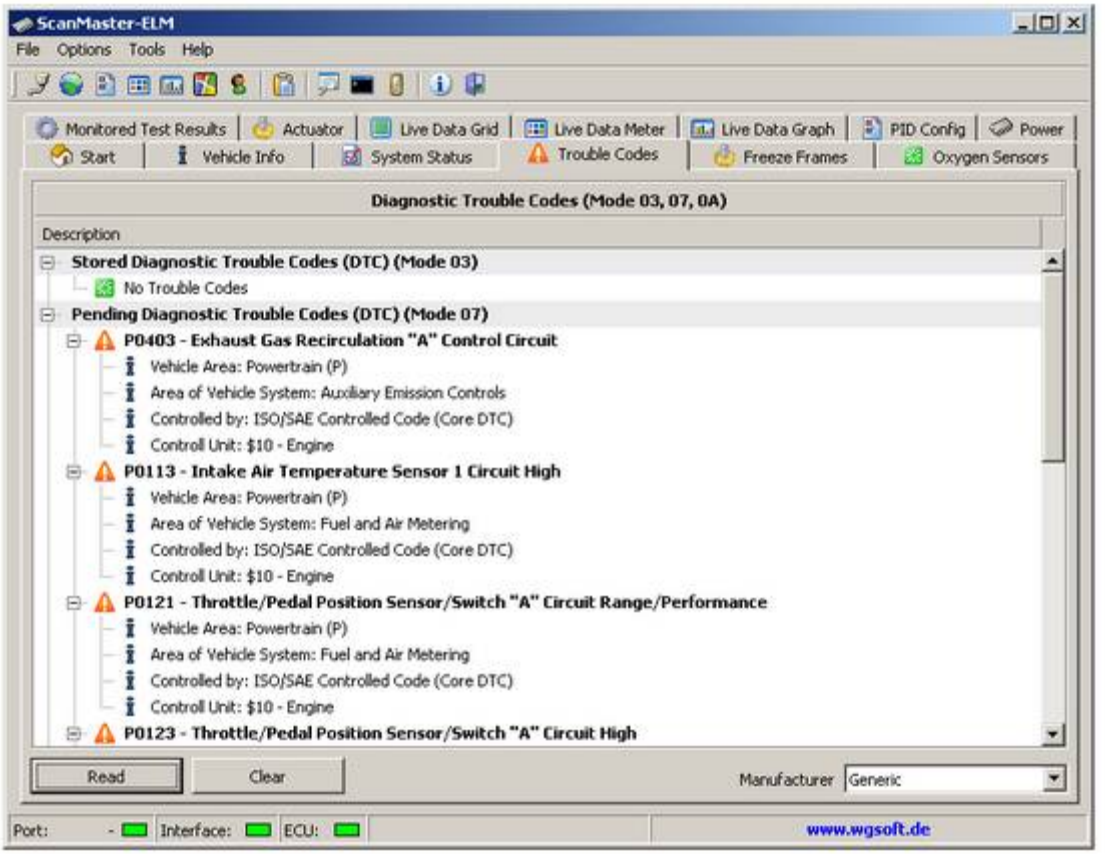
To clear the diagnostic information, click 'Clear' and follow the prompt's.

Stored Diagnostic Trouble Codes

This mode displays emission related Diagnostic Trouble Code (DTC) number, ECU number and description and text description for DTCs that are currently stored in the vehicle ECU. The software will display the quantity of stored DTCs as well as the ECU storing them.

Pending Diagnostic Trouble Codes

Pending DTCs mode enables you to obtain test results for emissions-related components and systems that are continuously monitored. This mode reports tests that have failed during the driving cycle and have not matured to indicate a DTC. Results are displayed in DTC format together with the reporting ECU.



Clear Diagnostic Information

The "Clear" mode clears all MIL illuminating DTCs that are emission related. This function also clears additional diagnostic information that the controller has saved.
This includes:

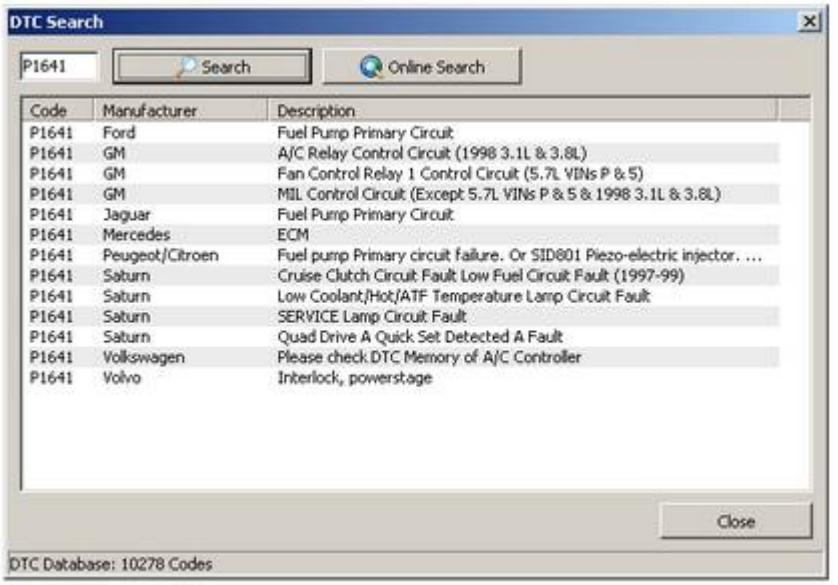
- Number of diagnostic trouble codes
- Diagnostic trouble codes
- Trouble code for freeze frame data
- Freeze frame data
- Oxygen sensor test data

- Status of system monitoring tests
- On-board monitoring test results
- Distance traveled while MIL is activated
- Number of warm-ups since DTC cleared
- Distance traveled since diagnostic trouble codes cleared
- Minutes run by the engine while MIL activated
- Time since diagnostic trouble codes cleared
- as well as adaptive data of the fuel injection system

DTC Search

The program has an integrated database with trouble codes of different manufacturers.

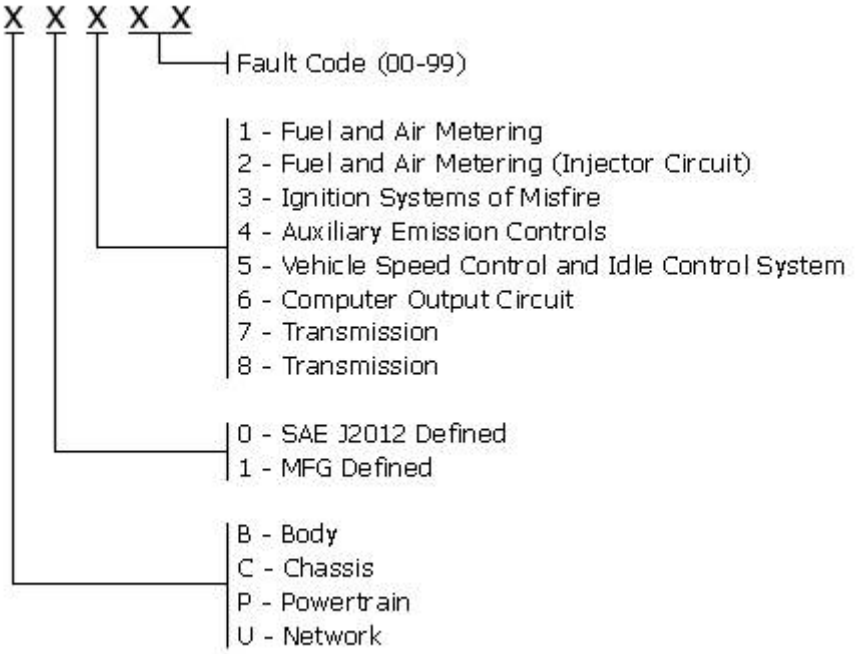
If you liked to find a text description to a code, you click on the symbol. A window appears where you can enter the code. The descriptions of all manufacturers who are stored in the program are shown to this code.



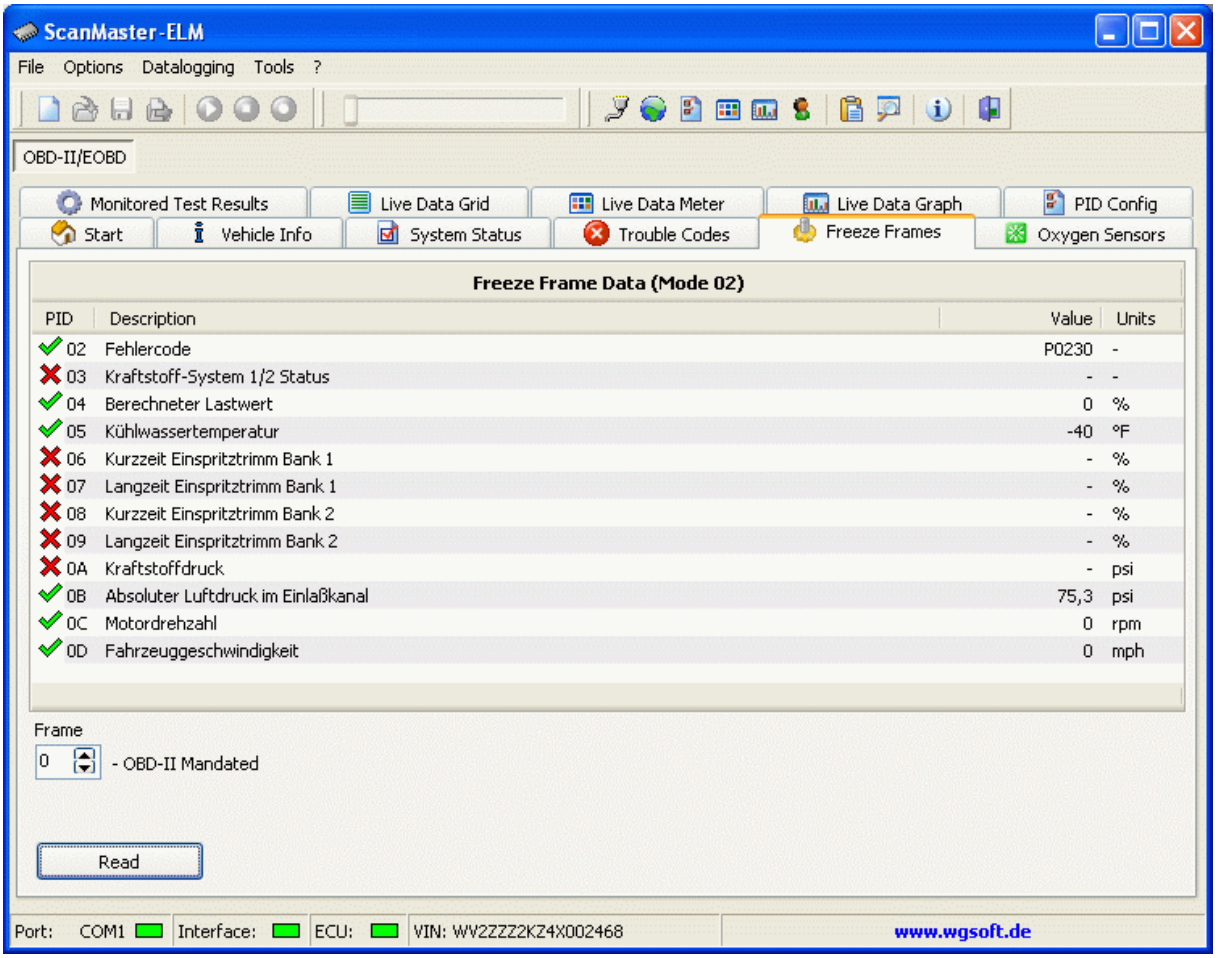
Alternatively you may look into the internet with button "Online Search" if your computer is connected to the internet.

Anatomy of the DTC

A DTC is made up of 5 digits. The figure below demonstrates the composition of a DTC. With this information it is easier to trouble shoot a DTC without knowing the description of the code.



Freeze Frame

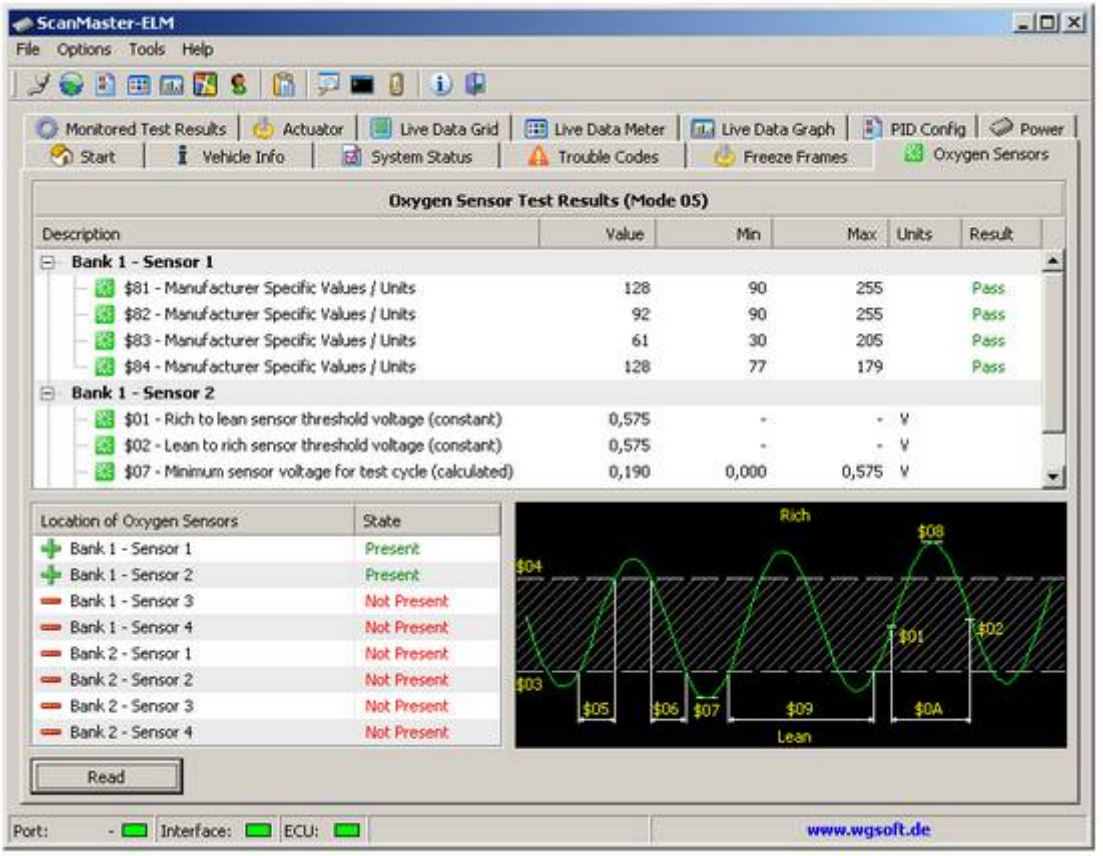


Press "Read" to read the Freeze Frame. The Freeze Frame screen displays the freeze frame log as stored by the car ECU. When a Diagnostic Trouble Code occurs that illuminates the Check Engine light, the vehicle's computer saves the current values of the vehicle sensors at the instant the error occurred. If a freeze frame exists, it will displayed. Each vehicle supports a different complement of sensors. The freeze frame screen displays only sensors appropriate for the vehicle under test. This screen will remain blank if no freeze frame information is available from the vehicle.

Frame selection box

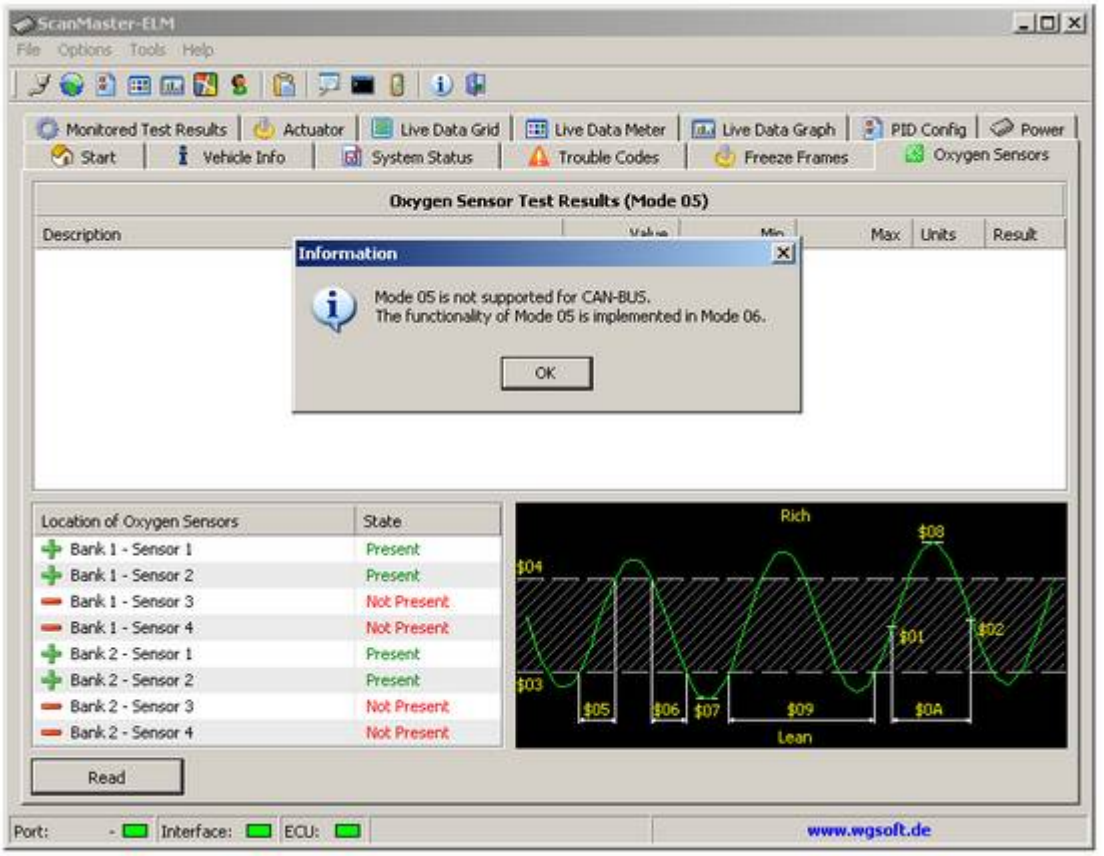
A left mouse click on up-down arrow will change the requested frame number. The frame number byte will indicate 0 for the mandated freeze frame data. Manufacturers may optionally save additional freeze frames (up to 255).

Oxygen Sensor Test Results



The Oxygen Sensor screen displays the vehicle's oxygen sensor test results. The results displayed here are measured by the vehicle's on-board computer (ECU) and not the scan tool. These are not live values but instead the results of the ECU's last O2 sensor test.

Not any vehicle supports these data. Go to "Monitored Test Results" tab (mode 06) and read the O2 values there if your car does not support mode 05.



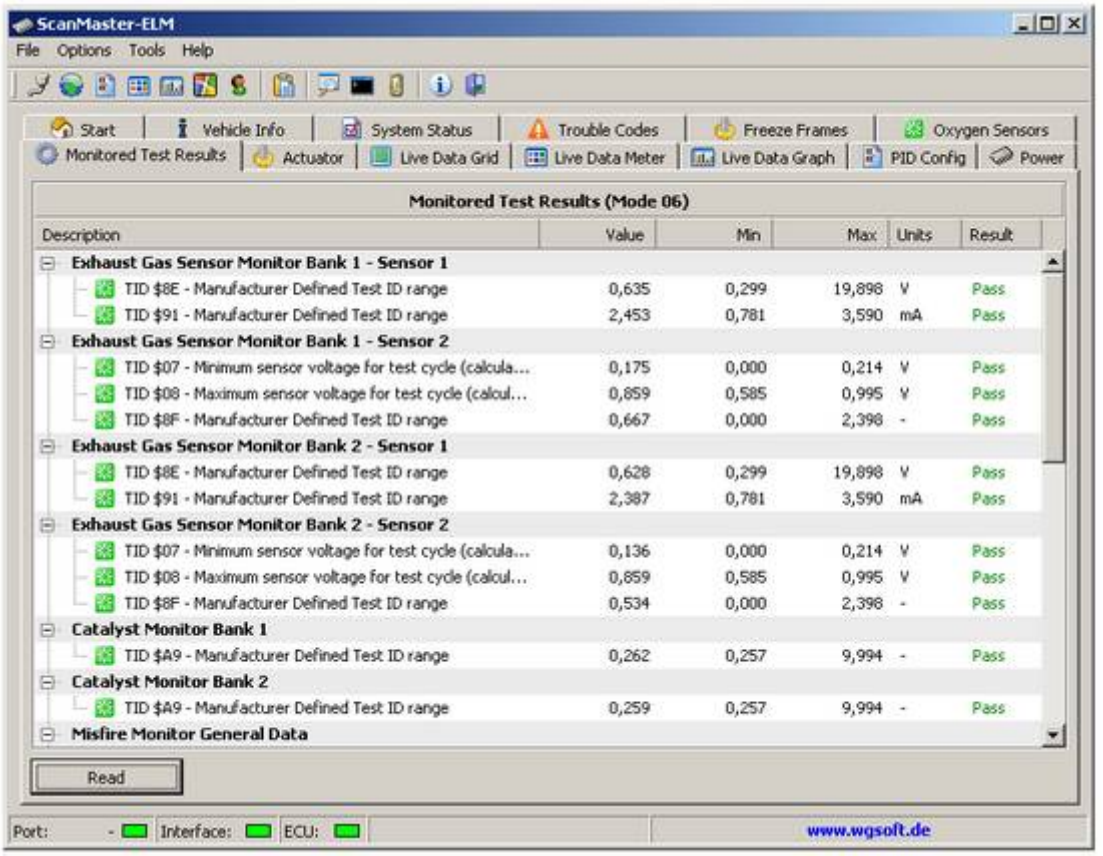
Monitored Test Results

This mode allows access to the results for on-board diagnostic monitoring tests of specific components and systems that are not continuously monitored. Test results are requested by test ID.

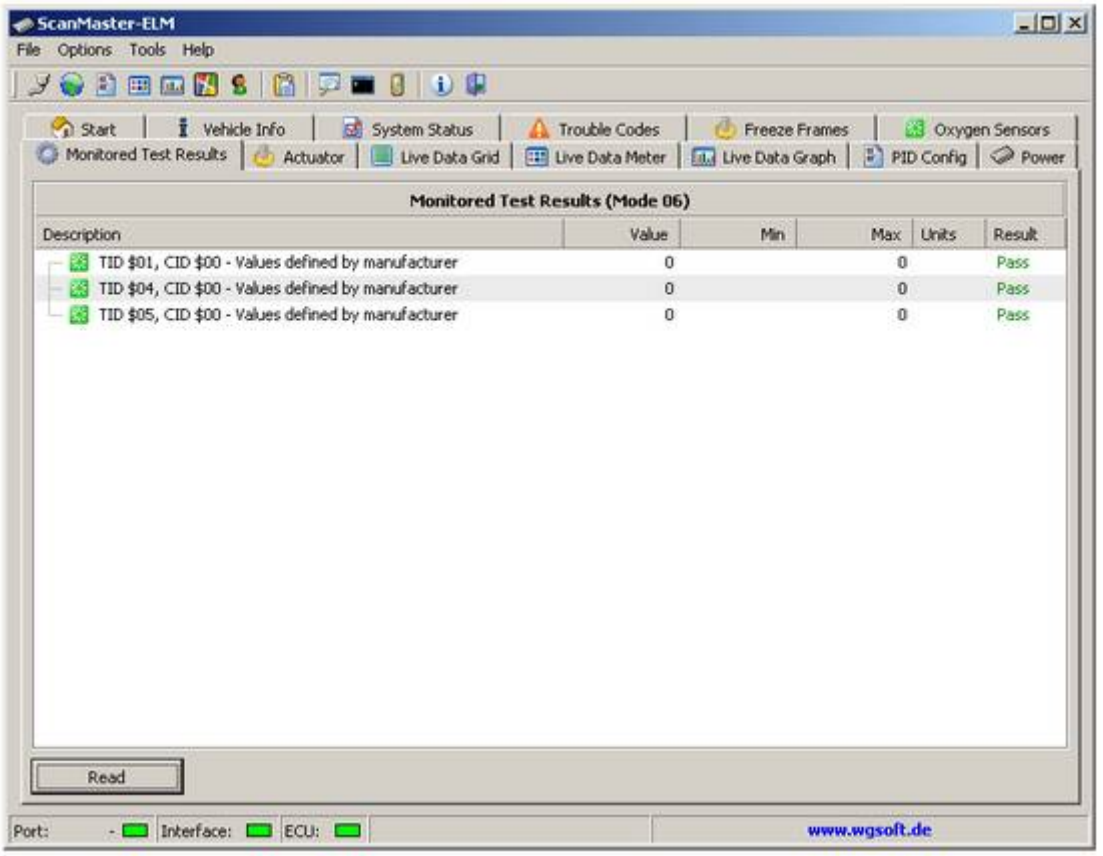
The vehicle manufacturer is responsible for assigning "Manufacturer Defined Test IDs" for different tests of a monitored system. The latest test values (results) are to be retained, even over multiple ignition OFF cycles, until replaced by more recent test values (results). Test values (results) are requested by On-Board Diagnostic Monitor ID. Test values (results) are always reported with the Minimum and Maximum Test Limits.

If an On-Board Diagnostic Monitor has not been completed at least once since Clear/reset emission-related diagnostic information or battery disconnect, then the parameters Test Value (Results), Minimum Test Limit, and Maximum Test Limit shall be set to zero (0) values.

The ScanMaster has a built-in database of descriptions and scaling values derived directly from the manufacturers. If the Test Results data reported from your vehicle is listed in the database, ScanMaster will translate it for you. Keep in mind that not all Test Results data is documented by the manufacturer, and not all manufacturers even support Test Results.



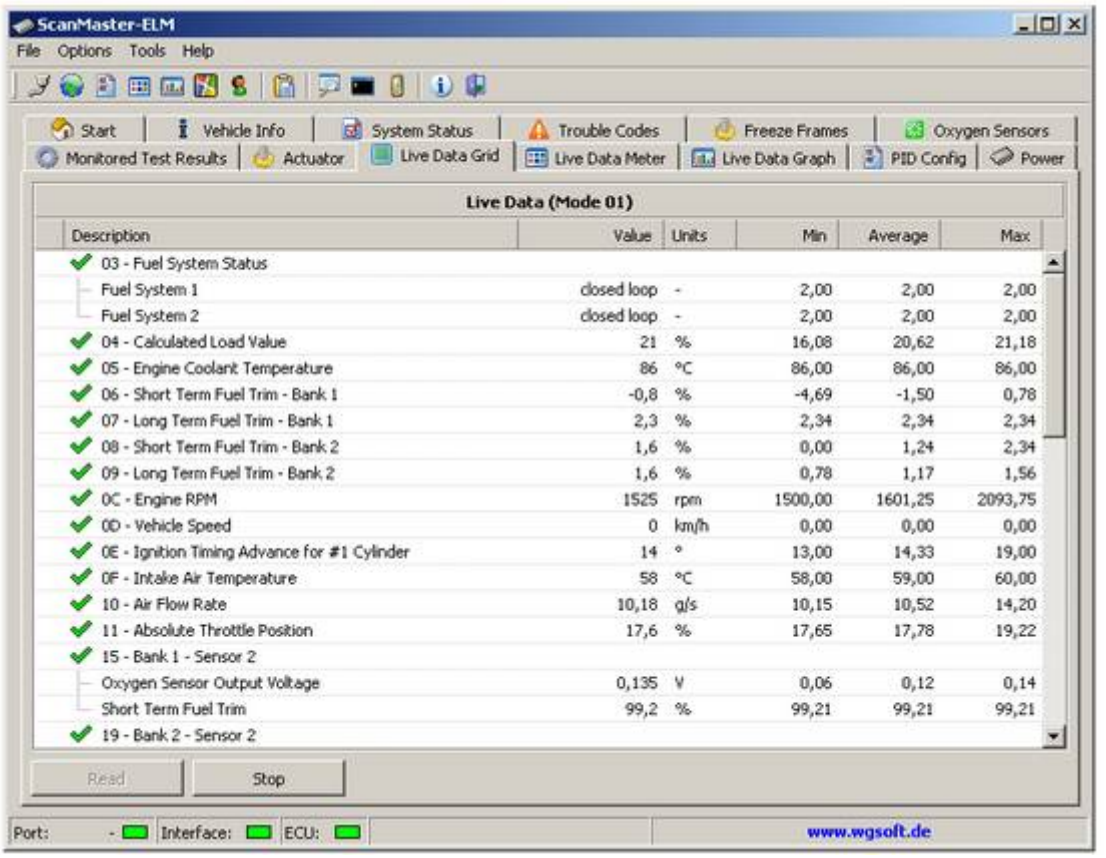
See also the different readings of another car in the screenshot below:



Sensor Data

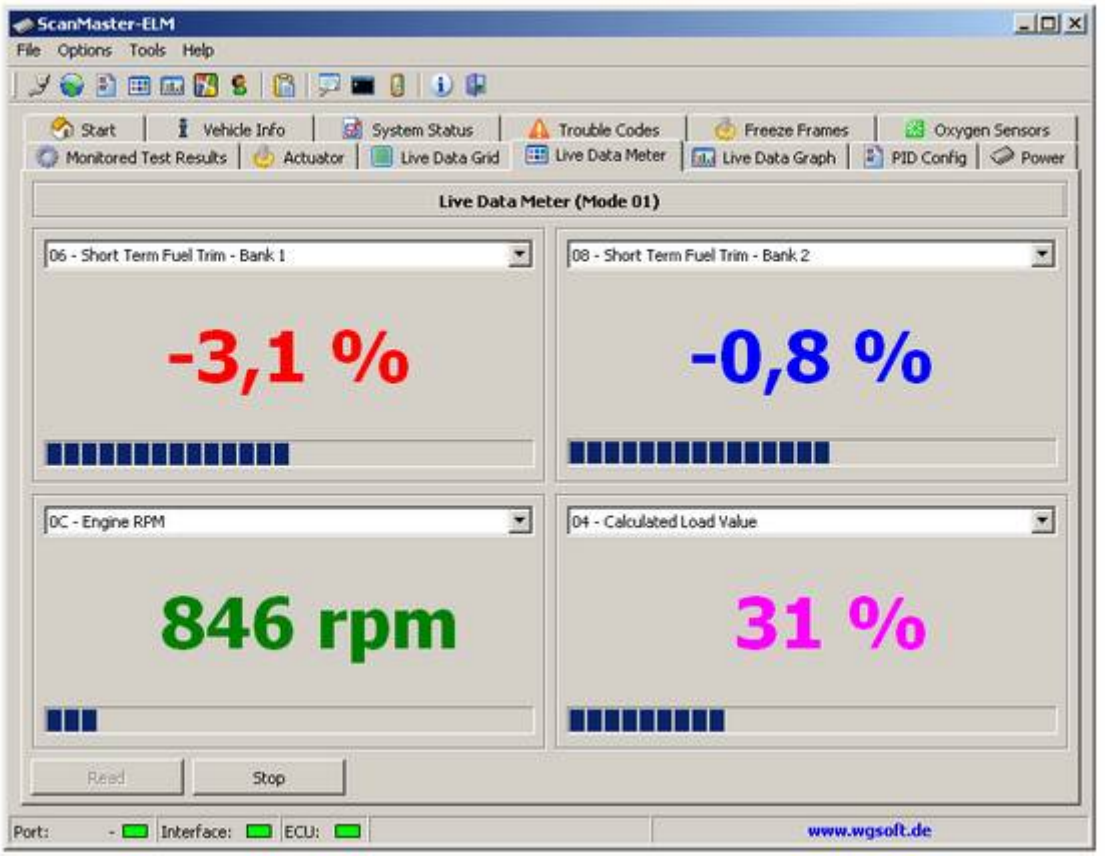
The ScanMaster displays sensor measurements in either English or Metric units. The default units of measure are located on the Options / Language Form.

Live Data Grid - This screen shows a list of the available data parameters that the car supports. To read the data press "Read" button. "Stop" button stops the reading.



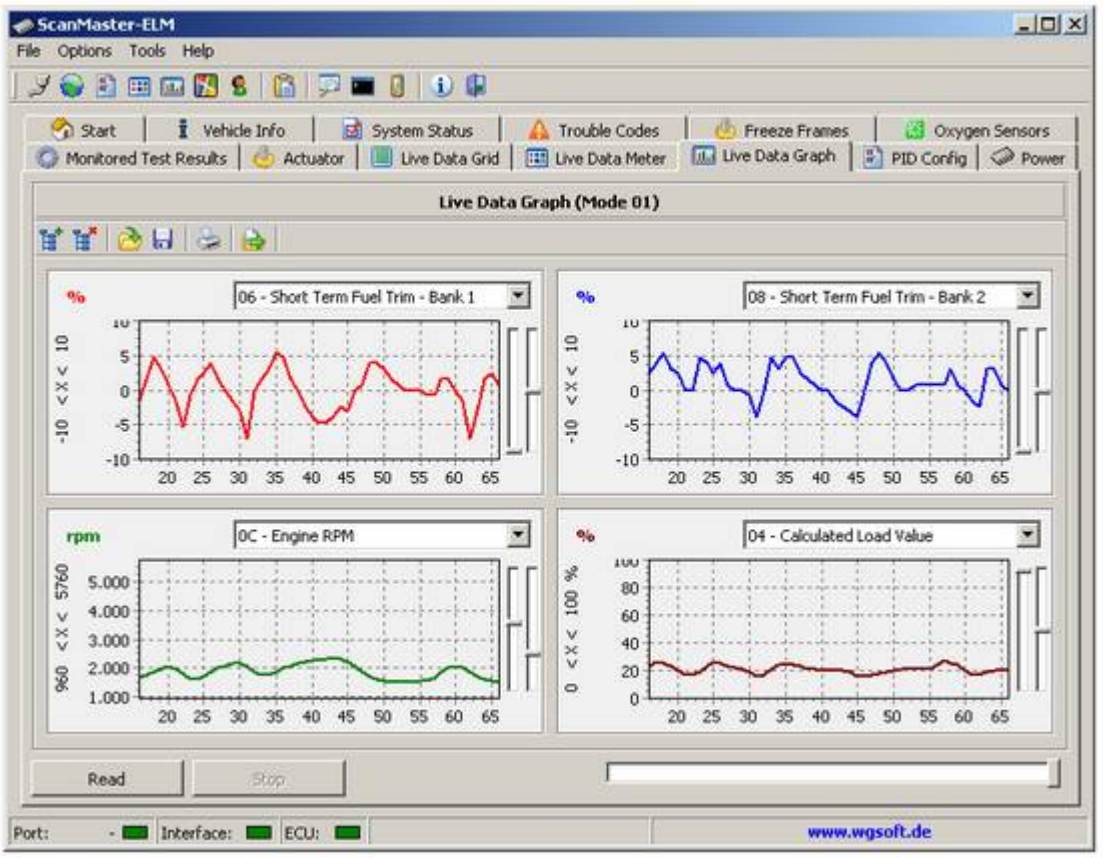
It is often wanted to read the values of an interesting sensor with a higher data rate. You are doing this by disabling the other sensors in the PID configuration list, so the interesting sensor is scanned more often then.

Live Data Meter - This screen can display the parameters in digital format. Four parameters can be shown at the same time.



Select the wanted sensors (PIDs) out of the list menue above each item.

Live Data Graph - This screen can display the parameters in graphical format. One to twelve parameters can be shown at the same time.



For scaling the plots use the slider gadgets at the right of the graphs. E.g. a scaling of -10/+10 for Short Term Fuel Trim at the y-axis is a good value because these values are never higher than 10. For vehicles changed to run with LPG gas it is importand to watch this trim values while switching back and forth gasoline to gas. Any hop in the graph shows that the gas system had to be adjusted, otherwise the ECU might store a trouble code.

Beginning with ScanMaster-ELM version 2.0 the read data can be stored in this screen too. They can reloaded, played back, printed and exported to a file in CSV format using the symbols below:

The first symbol at the left adds another graph to the screen (up to 12), the second symbol deletes a graph. With the folder symbol you load a saved data file, while the disk symbol opens the requester for saving the actual data into a file.

Using the printer symbol you select the parameter graph for printing. See next picture as example:

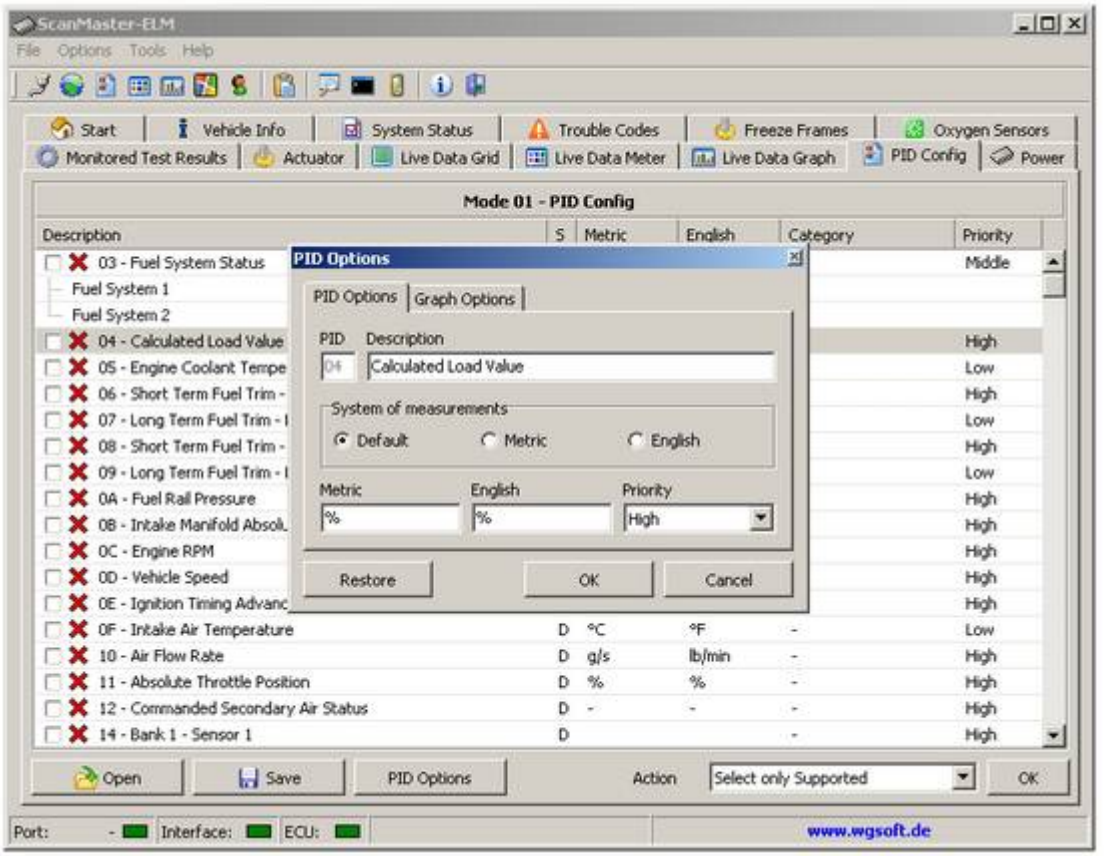
The last symbol on the right is provided to export the data into a file in CSV format which can loaded in any spreadsheet software for further processing.

PID Config

Here you can decide which sensors are displayed. It is recommended to select the needed sensors only to receive a higher resolution, quality and accuracy of the graphs.

Note: Not all vehicles supports all parameters. The supported sensors (better called PIDs) of the car are automatically requested by the software at initialisation.

Settings made here can be stored and reloaded. Each PID may be individually configured. You may configure the PID description, system of measurement, scan priority and the limits for the graph. Store your settings with the "Save" button to use them in your next session.



Open the PID Options window with double click onto the parameter line or use the button "PID Options" for the highlighted line. See the tab "Graph Options" below:

The attitudes can be stored and opened when required again.

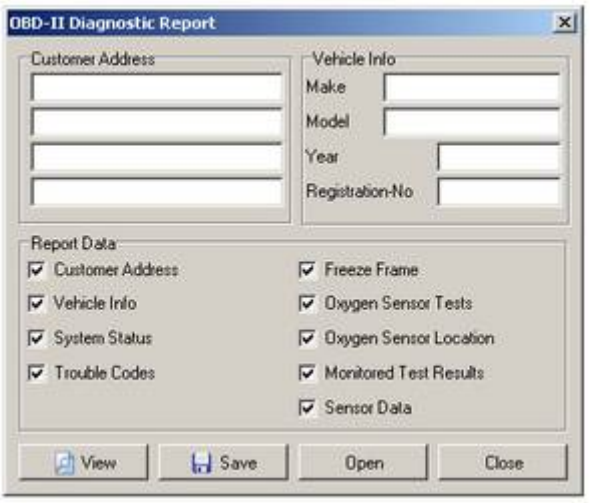
Datalogging

Users of the former versions of ScanMaster-ELM will find the datalogging now in the Live Data Graph screen (see above).

Diagnostic Report

Report Options

The application made it possible to prepare and print a diagnosis report. Click for this on the symbol in the symbol bar.



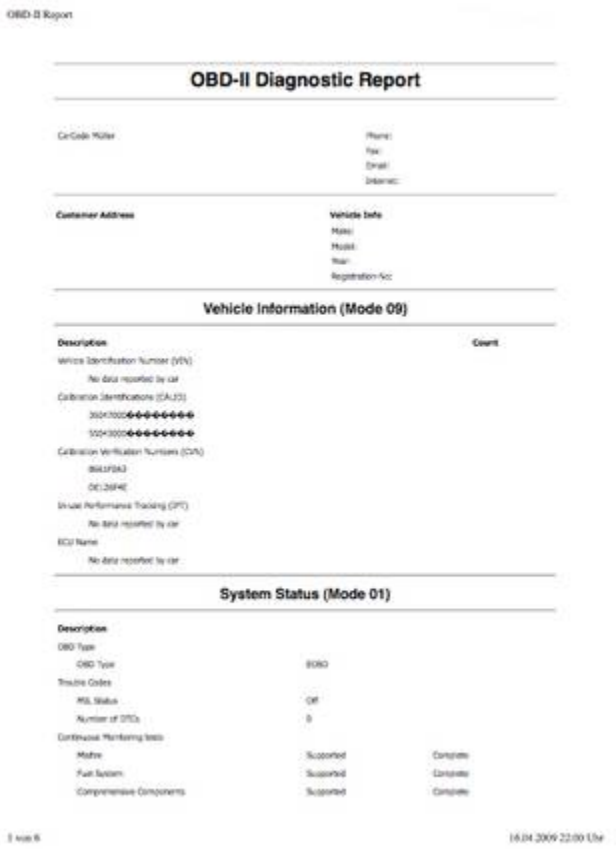
Type the customer data in here and select the data which shall be printed.

View – A preview window opens where the report can be looked at and printed.

Save – Save the report on the hard disk.

Open – Open the stored report of the hard disk. The open report can be looked at and printed.

Report Preview



OBD-II Report

OBD-II Diagnostic Report

CarCode Müller

Phone:
Fax:
Email:
Internet:

Customer Address

Vehicle Info
Make:
Model:
Year:
Registration No:

Vehicle Information (Mode 09)

Description	Count
Vehicle Identification Number (VIN)	
No data reported by car	
Calibration Identifications (CALID)	
35047000●●●●●●●●	
55047000●●●●●●●●	
Calibration Verification Numbers (CVN)	
8661F0A3	
DE126F4E	
In-use Performance Tracking (IPT)	
No data reported by car	
ECU Name	
No data reported by car	

System Status (Mode 01)

Description		
OBD Type		
OBD Type	EOBD	
Trouble Codes		
MIL Status	Off	
Number of DTCs	0	
Continuous Monitoring tests		
Misfire	Supported	Complete
Fuel System	Supported	Complete
Comprehensive Components	Supported	Complete

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16.04.2009 22:00 Uhr

Diagnosis report can be looked at and printed in the started browser window.

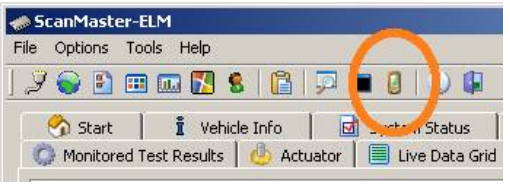
Fuel consumption display

Rising fuel prices leads to the idea to implement a fuel consumption display to the ScanMaster-ELM application. This can be useful to verify such an existing display in a car or provide one. It might be also more powerful than an existing display.

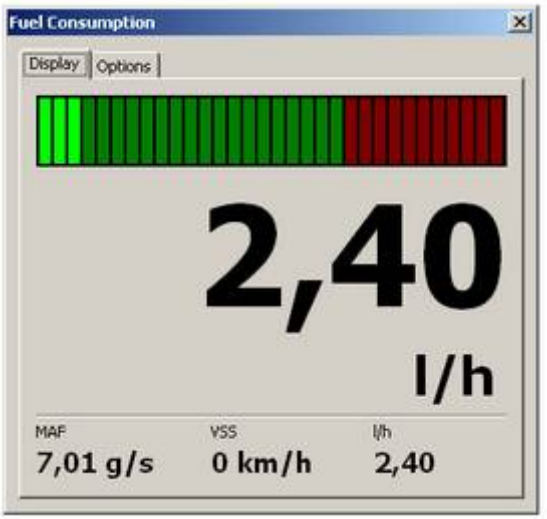
A fuel consumption display shows not only the real consumption but is also helpful for the driver saving fuel and might show engine problems. So when a trouble code is stored in the ECU, the ECU might switch into an emergency program with a higher fuel consumption. A high fuel consumption is seen also during strong accelerations and often brakings.

For processing the fuel consumption the data of the mass airflow sensor (MAF) and the speed sensor (VSS) are needed. The PID config table shows if these sensors are present, otherwise the display does not work.

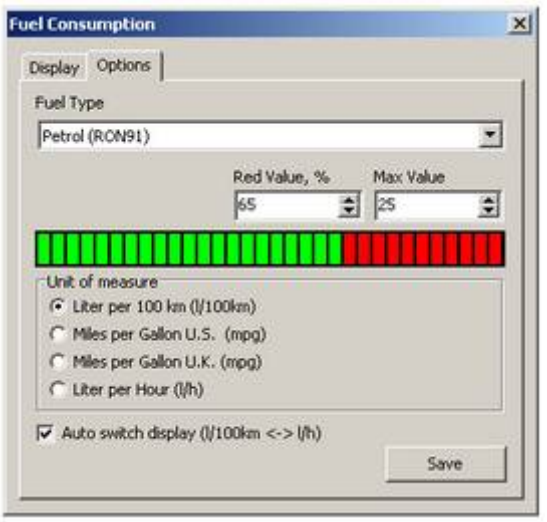
Start the display with the symbol below:



The window below shows up:



MAF and VSS values are shown also, here the car stops with idling engine. You may configure the display with the Options tab:



Select the fuel type, configure the bar indicator and select the measurement type. Activating "Auto switch" makes the display switching automatically when the car runs or stops.

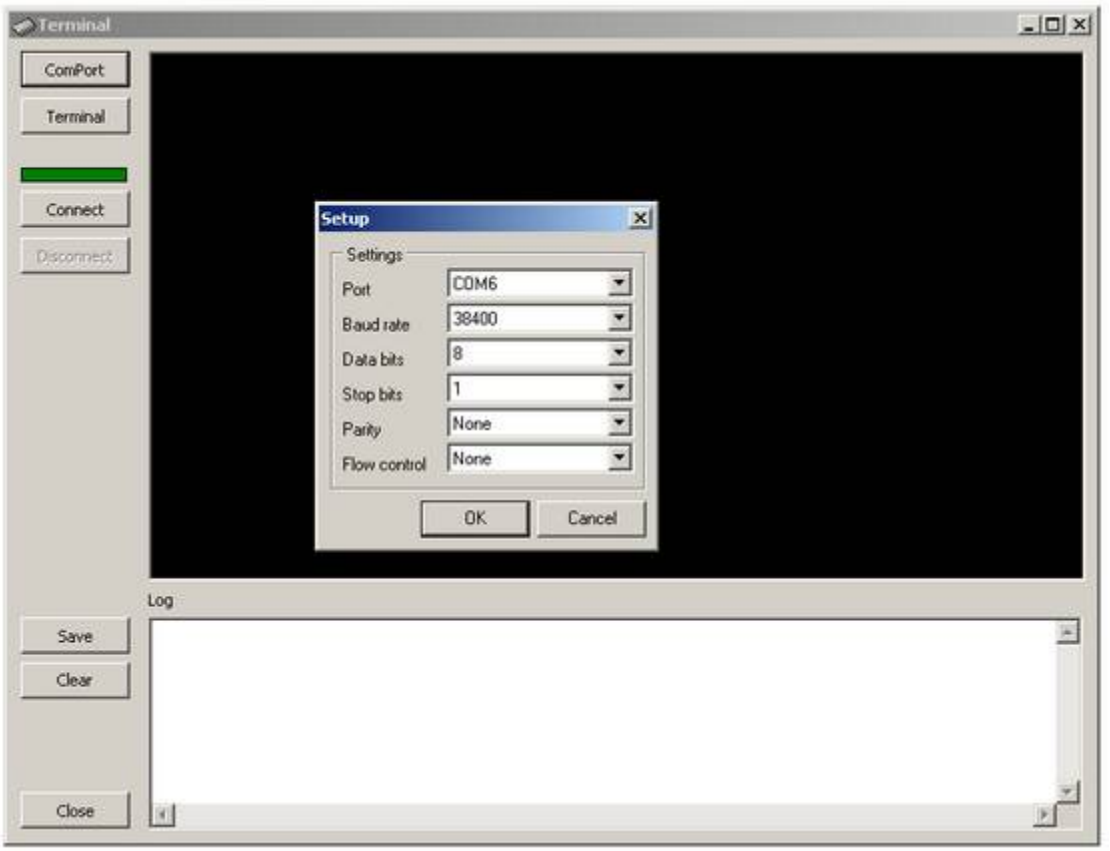
The display does not show the average consumption but the actual consumption. So be warned if you see high values, these are real values when you accelerate e.g.

As always while using the interface and notebook during driving it is warned to handle the system by the driver. The passenger should work with the system.

Terminal Module

Starting with the below marked symbol or the Tools menue ScanMaster-ELM provides a Terminal Module.

The Terminal allows to send hexadecimal OBD-2 commands directly to the ECU throught the interface. You need to configure the appropiate COM-Port with the "ComPort" button and then connect to the ECU with the "Connect" button. That means the Terminal Module does work only when the interface provides a physical or virtual COM-Port.

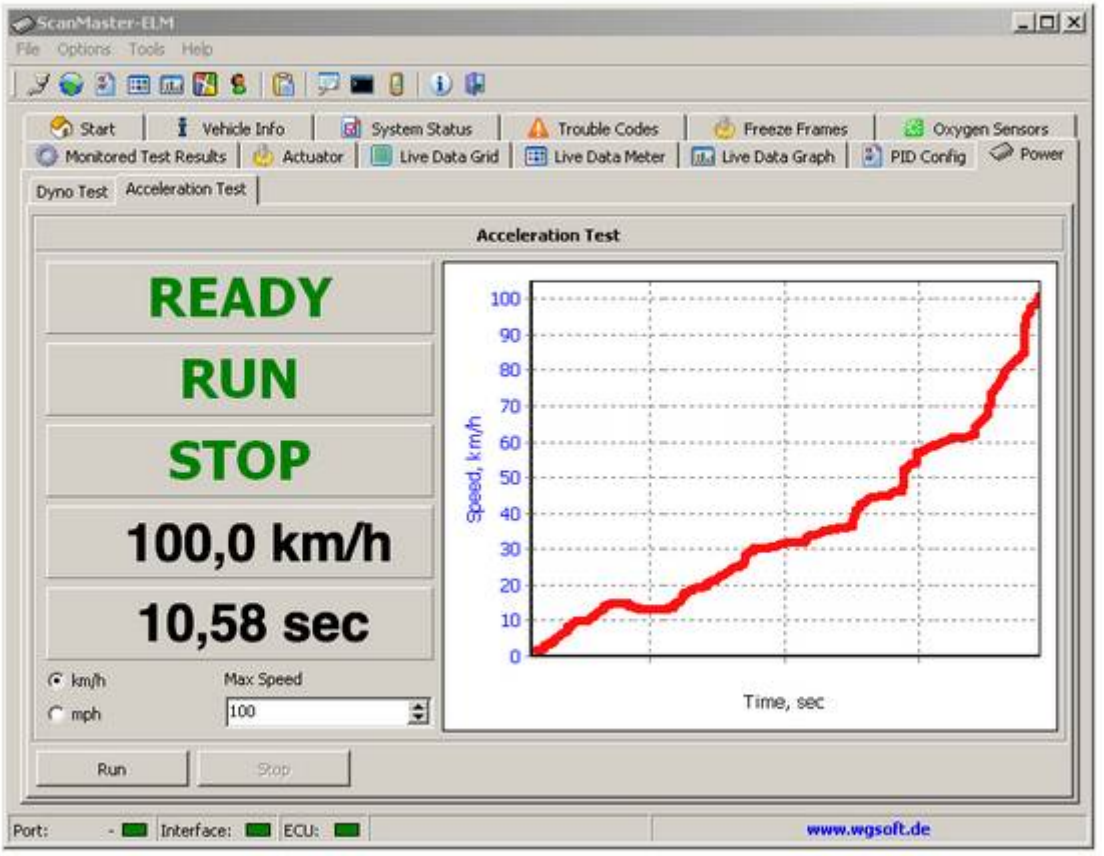


The default settings available with the "Terminal" button are usually sufficient. You may save your session shown in the log below or clear the log listing. A saved session might be useful for the support personal.

Acceleration Test

Note: Drag measurements should been taken on public roads. Handling should be done by the passenger.

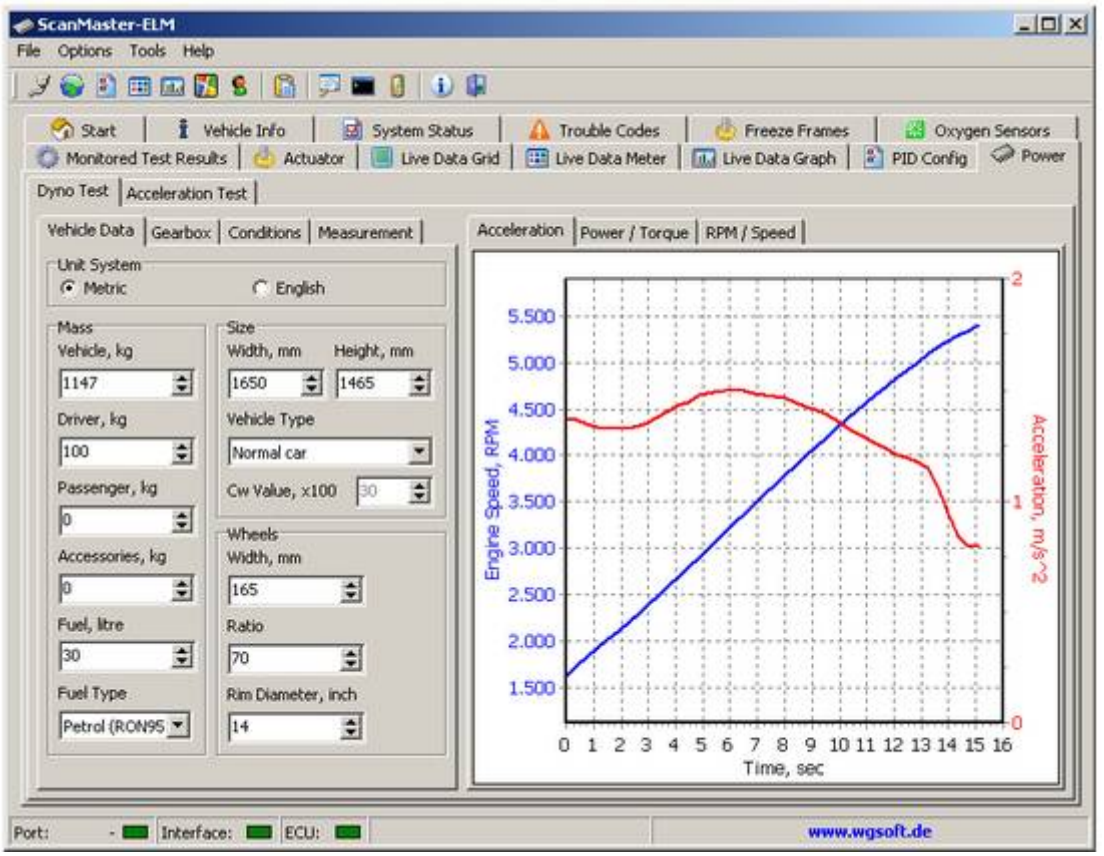
Since version 1.8 ScanMaster-ELM provides a drag measurement.



After selecting the max. speed click "Run" and accelerate the from stop to the choosen end speed. The calculation of the graph is done automatically then. Results depends of environments such as wind, incline or load of the vehicle.

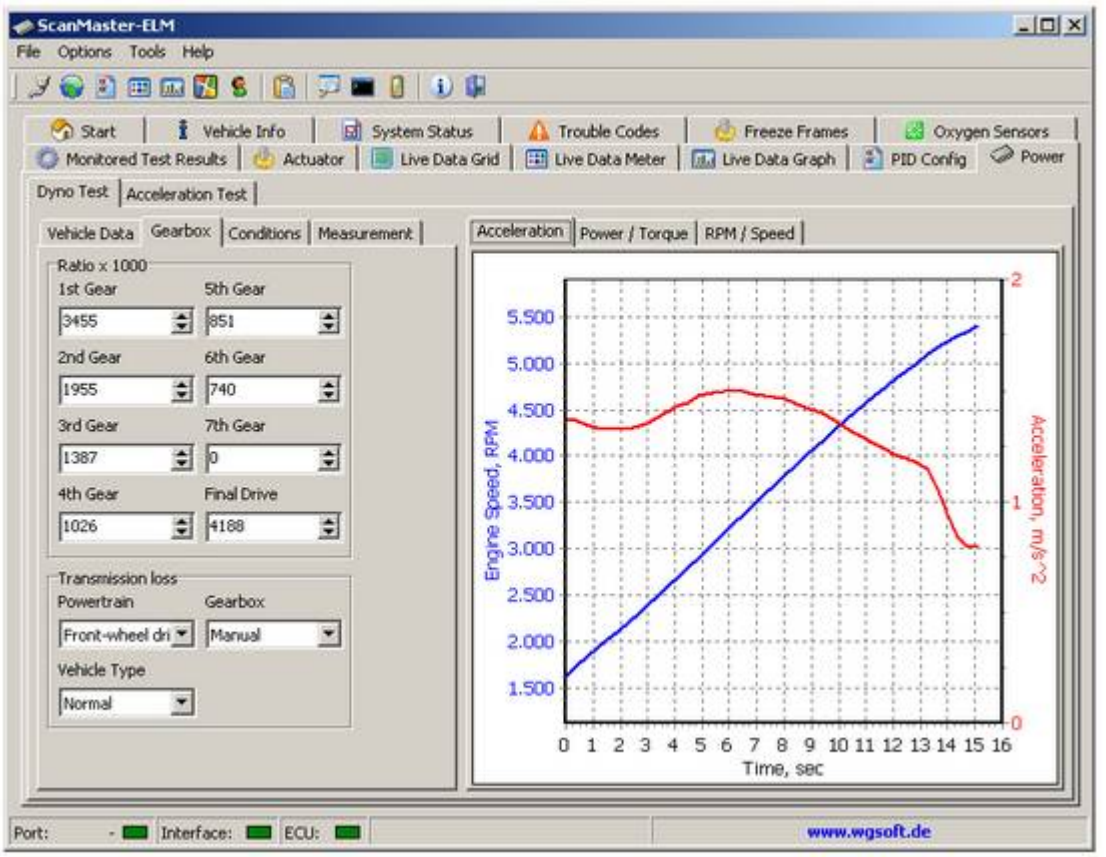
Dyno Test

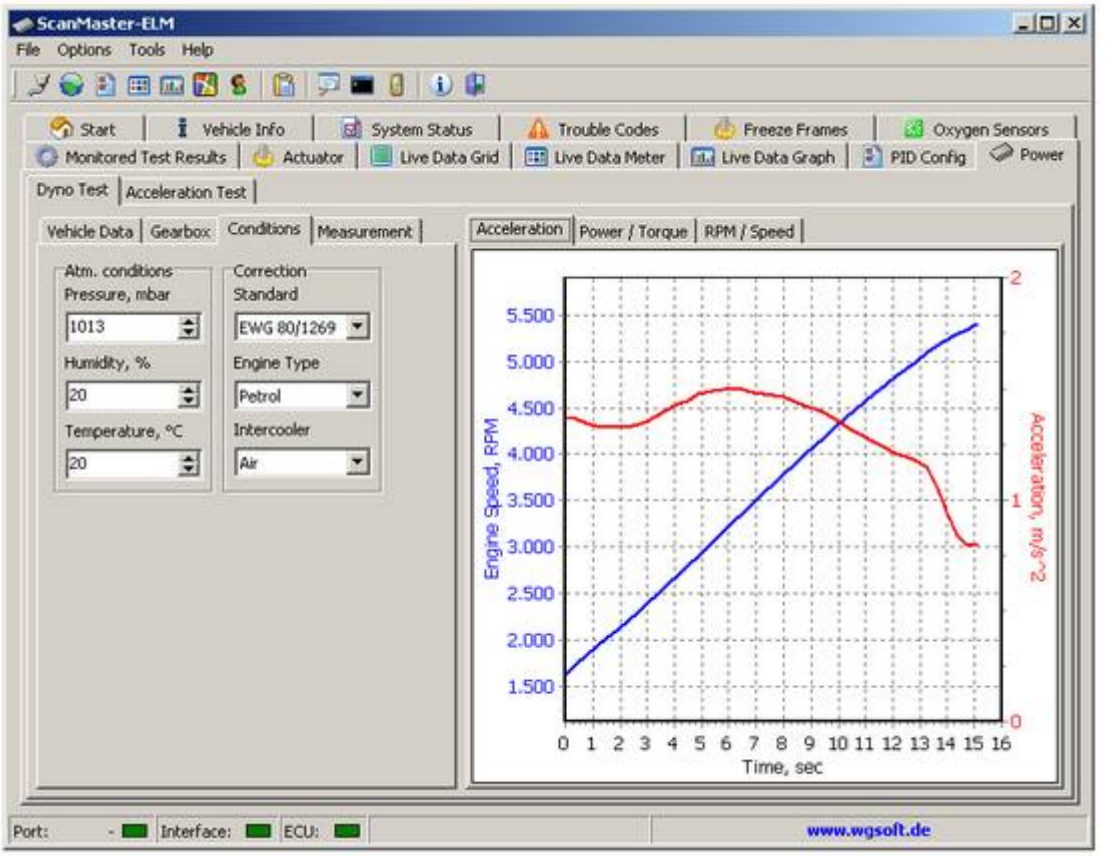
Since version 1.0 ScanMaster-ELM provides a dynamic dyno test for measuring power and torque. Before starting the needed test drives several settings have to be made for best results. These are parameters of the car, the gear box, the environments such as air pressure, temperature, humidity etc. Correction factors of standards DIN 70020, EWG 80/1269, ISO 1585, SAE J1349 or JIS D1001 may be selected for a formerly unknown accuracy.



The more exact you enter the parameter data, the more exact will be the result of the calculations. It is also recommended driving the measurement trip in both directions and compare both results. This way errors resulting from the trip (inclining) or weather (wind from one direction) can be elimated. The entered width and height of the car takes in account the wind resistance (cw value), but the weather conditions will affect the results.

Before first use it is recommende to load the delivered sample file (button "Open" in tab "Measurement") and see how the values are entered.


ScanMaster-ELM
File Options Tools Help
Start Vehicle Info System Status Trouble Codes Freeze Frames Oxygen Sensors
Monitored Test Results Actuator Live Data Grid Live Data Meter Live Data Graph PID Config Power
Dyno Test Acceleration Test
Vehicle Data Gearbox Conditions Measurement
Ratio x 1000
1st Gear 3455
5th Gear 851
2nd Gear 1955
6th Gear 740
3rd Gear 1387
7th Gear 0
4th Gear 1026
Final Drive 4188
Transmission loss
Powertrain Front-wheel dri
Gearbox Manual
Vehicle Type Normal
Acceleration Power / Torque RPM / Speed
Engine Speed, RPM
Acceleration, m/s^2
Time, sec
Port: Interface: ECU:
www.wgsoft.de


ScanMaster-ELM
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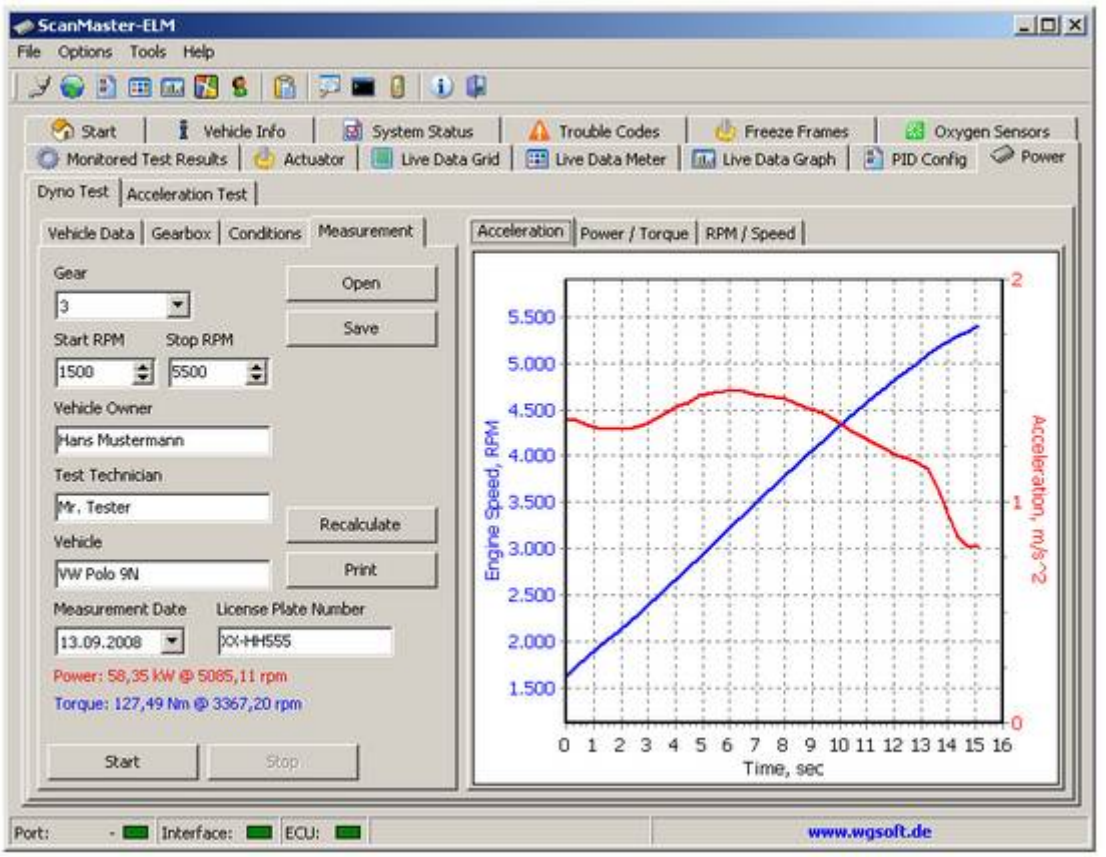
Monitored Test Results Actuator Live Data Grid Live Data Meter Live Data Graph PID Config Power
Dyno Test Acceleration Test
Vehicle Data Gearbox Conditions Measurement
Atm. conditions
Pressure, mbar 1013
Humidity, % 20
Temperature, °C 20
Correction
Standard EWG 80/1269
Engine Type Petrol
Intercooler Air
Acceleration Power / Torque RPM / Speed
Engine Speed, RPM
Acceleration, m/s^2
Time, sec
Port: Interface: ECU:
www.wgsoft.de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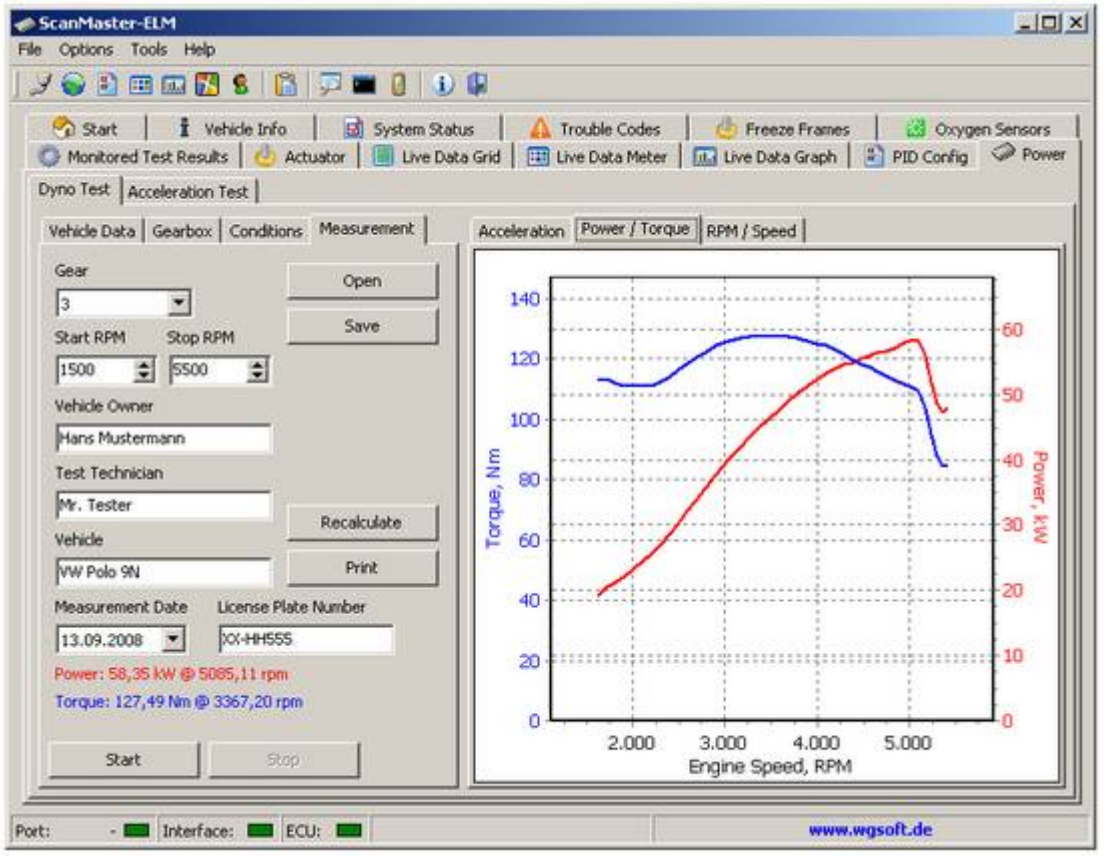
Dyno Test Acceleration Test
Vehicle Data Gearbox Conditions Measurement
Gear
3
Start RPM
1500
Stop RPM
5500
Vehicle Owner
Hans Mustermann
Test Technician
Mr. Tester
Vehicle
VW Polo 9N
Measurement Date
13.09.2008
License Plate Number
XX-HH555
Power: 58,35 kW @ 5085,11 rpm
Torque: 127,49 Nm @ 3367,20 rpm
Open
Save
Recalculate
Print
Start
Stop
Acceleration Power / Torque RPM / Speed
Engine Speed, RPM
Acceleration, m/s^2
Time, sec
Port:
Interface:
ECU:
www.wgsoft.de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Test Technician
Mr. Tester
Vehicle
VW Polo 9N
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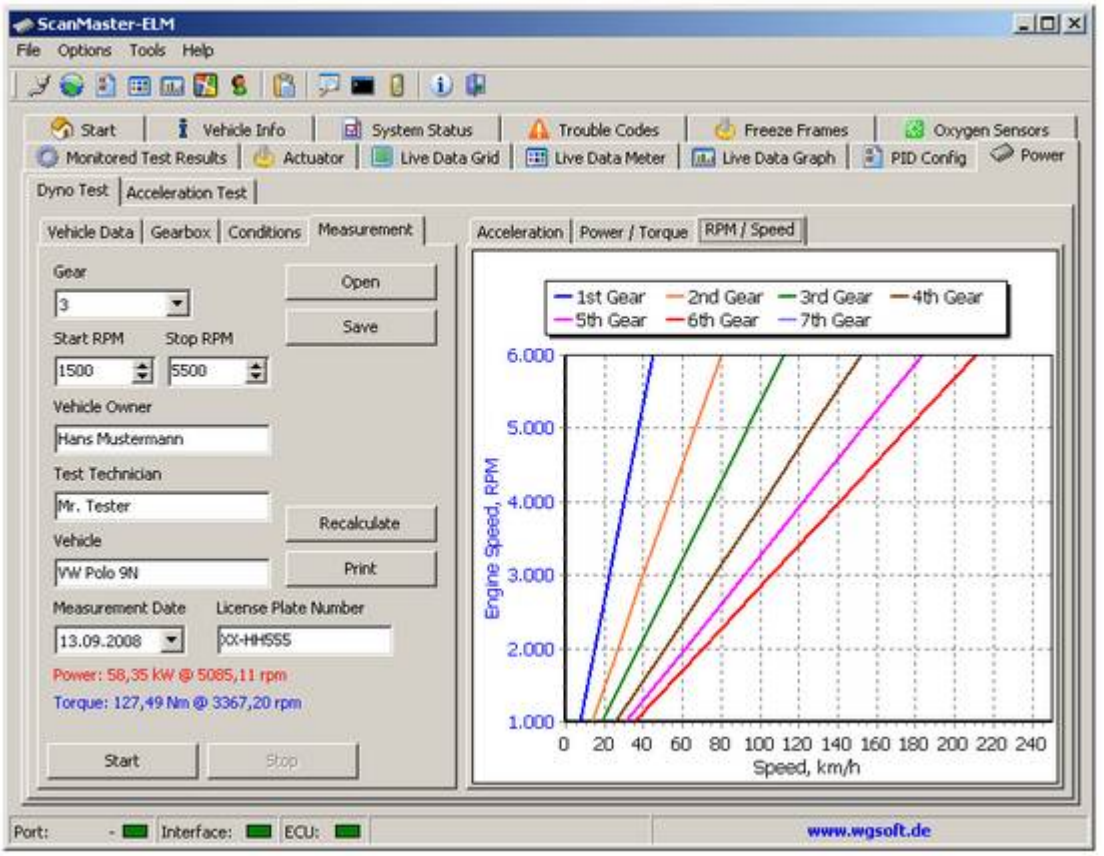
Torque: 127,49 Nm @ 3367,20 rpm
Open
Save
Recalculate
Print
Start
Stop
Acceleration Power / Torque RPM / Speed
Torque, Nm
Power, kW
Engine Speed, RPM
Port:
Interface:
ECU:
www.wgsoft.de

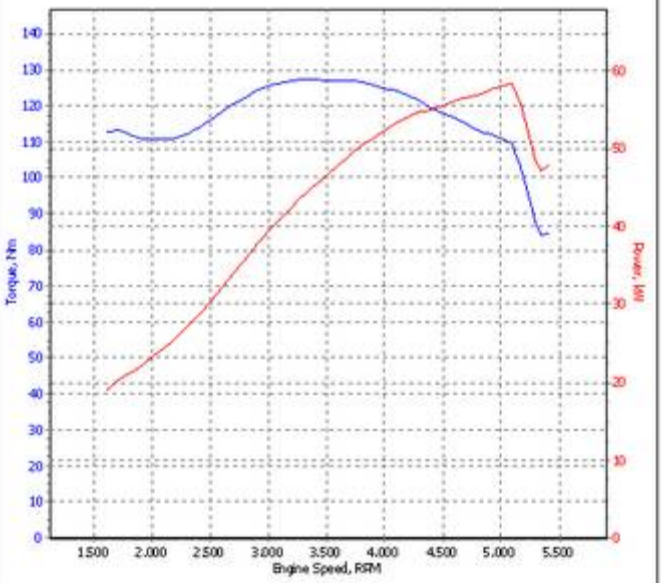


For the power range to be measured select the start and stop RPM and click the Start button. The measurements runs automatically between these limits. Save the measurement into a file for later offline calculation. Beside the screen output the resulting calculated graph may be printed with "Print" button.

Dyno Test

WGSoft.de
AUTOMOTIVE DIAGNOSTIC SOFTWARE

Vehicle:	VW Polo 9N	Engine Type:	Petrol
License Plate Number:	XX-HH555	Intercooler:	Air
Test Technician:	Mr. Tester	Gearbox:	Manual
Vehicle Owner:	Hans Mustermann	Powertrain:	Front-wheel drive
Measurement Date:	13.09.2008	Vehicle Type:	Normal



AtmospheriConditions		DynoData	
Temperature:	20 °C	Correction:	EWG 80/1269
Humidity:	20 %	Correction Coefficient:	0,96
Atmospheric Pressure:	1013 mbar	Engine Power:	58,35 kW (79,36 hp)
		Wheel Power:	52,69 kW (71,66 hp)
VehicleData		Max. Power RPM:	5085 rpm
Gross Weight:	1269,8 kg	Torque:	127,49 Nm
Frontal Surface:	1,93 m2	Max. Torque RPM:	3367 rpm
CwCoefficient:	0,30	Gear:	3rd Gear

Created by ScanMaster ELM (C) 2008 WGSoft.de, Vladimir Scholz

Trouble shooting

Vehicle electonics and computers (or PDAs, Smartphones) are different worlds. Therefore an electronic interface is needed to connect these worlds together. The line between the vehicle, the interface and the computer may have faults however when something doesn't work as it should.

Look for troubleshooting first into the lines of the initialisation log of the start screen. If you see during connection any line with „ELM Chip found" or you see the battery voltage, then the connection between the computer and the interface is OK. Otherwise:

- Check if you have made the right settings in „Options / Communucation" for your type of interface. (See above in Options section of this manual and read also the hardware documentation for your interface.)

- Check if the connectors are fixed together.

- Check while entering the OBD-2 connector into the car if the 4 Rx/Tx LEDs are flashing once each other and the power LED stays on. Repeat entering the OBD-2 connector for proof. (The interface is powered by the cars OBD-2 diagnostic connector. An interface without power has no function.)

If there is no transfer protocol shown at the end of the initialisation log of the start screen (No Connect message), then there is something wrong within the line of the interface to the ECU of the car. In this case please check:

- Was ignition on and/or the engine running? (If not the ECU has no power and cannot connect.)

- Are all connections between interface and vehicle OK and connected?

- Was item „0-Automatic" selected in „Options / Protocol"? (If yes, try with the supposed protocol of the car from the list. It might be helpful to check the pin assignment at the cars diagnostic connector. Leave baudrate at the default 38400 bps.)

- Is pin number 5 (signal ground) assigned at the cars diagnostic connector? If not you may jumper pin 4 (chassis ground) to pin 5. In ElmCan interfaces a solder bridge may be set, see hardware documentation.

- If all this has no success then the car might have no OBD-2 compliant ECU, if it is a car sold in Europe and build before 2001 (gasoline engine) or before 2004 (diesel engine). Only for some Alfa, Fiat and Opel/Vauxhall without OBD-2 connects with the Alfa or Opel button.

When you still encounter problems or need other help then the support will be glad to receive from you a logfile, a description of the shown lines in the start screen and

a complete description of your problem. These needed informations for the support garants a fast answer to the problem.

Glossary

CAN	Controller Area Network
CARB	California Air Resources Board
DLC	Data Link Connector
DTC	Diagnostic Trouble Code
ECM	Engine Control Module
ECU	Engine Control Unit
EEC	Electronic Engine Control
EGR	Exhaust Gas Recirculation system
EOBD	European On-Board Diagnostics
EPA	Environmental Protection Agency
KWP2000	Key Word Protocol 2000, also known as ISO 14230-4
MIL	Malfunction Indicator Lamp. The "Check Engine Light" on your dash.
O2	Oxygen
OBD	On-Board Diagnostic
OBD II	Updated On-Board Diagnostics standard effective in cars sold in the US after 1-1-96
PCM	Powertrain Control Module, the on-board computer that controls engine and drive train
PID	Parameter Identification
PWM	Pulse Width Modulation
SAE	Society of Automotive Engineers
ScanTool	Computer based read-out equipment to display OBD II parameters
SID	Service Identification
VIN	Vehicle Identification Number