STEKiO

Summary

This document contains the instructions those allow you operating with Stekio and STKpro user software other then all practical hints and tips that help you to understand the data you will collect during measurements.

Introduction

Stekio is the most effective and complete device to analyze vehicles through the digital measurement of **Air-Fuel-Ratio** (AFR) or **Lambda** (λ) value, the detection of the dangerous **Knock** (detonation) and the **diagnosis** of the main electronic on board sensors.
Stekio is designed to be connected to your vehicle using its wirings, to sample signals and display their information on its screen.
You can link Stekio to a computer to download and review your performed data loggings or do a real-time data logging straight on your PC monitor using the **STKpro** software. Stekio can also perform a diagnosis of the main electronic on board sensors.
If you prefer, it can be permanently installed on your vehicle.

Warnings

⚠️ ⚠️ ⚠️ **WARNING** ⚠️   ⚠️   ⚠️

To correctly use Stekio we recommend reading the present guidebook entirely. The device utilizes oxygen sensors (lambda probes) that become very hot during their normal operation.
It is recommended to respect the following precautions to avoid damages to people or things:

1. **Always wear fire-proof gloves when handle oxygen sensors.**

2. **Fit sensors to vehicle while engine is turned off.**

3. **Always connect oxygen sensors to Stekio and follow instructions displayed on its screen to activate them before you turn on engine.**

4. **Don't touch oxygen sensors by any means during Stekio or engine operation.**

5. **Let chill sensors before handle them.**

6. **Don't work with oxygen sensors near flammable substances.**

7. **Use only oxygen sensors supplied by Alientech Srl...**

If you don't respect all the instructions contained in this document and if you use Stekio in different way as described, it can causing damages to the device.
We remember you that an unpowered oxygen sensor could rapidly damage if exposed to the exhaust gas hot stream.

STEKIO USER GUIDE

Versione 2.0

Chapter 1 – General information

This chapter contains the basic information that gives you a hand to know Stekio, in order to quickly prepare it for your work. Next section will describe the sockets laid on the device box those allows you connecting the supplied wirings and to collect signals from vehicles.

Display, keys and sockets

The front side of Stekio (**Figure 1**) presents an LCD display and the cover with six keys used to move among the graphic interface screens. The keys are sorted in:

1. **Arrow keys**.

2. **Decisional keys**: **Y** to confirm and **N** to annul a task.

Figure 1: front side, cover.

The upper side of the box (**Figure 2**) presents three sockets where you can connect all the wirings supplied with Stekio, in particular:

1. **12 pins socket for STK wideband cable**.

2. **9 pins socket for STK Power cable (also used for the next additional item "EOBD/OBD2 Diagnostic cable")**.

3. **20 pins socket for STK Universal Lambda cable and MultiLink Cable**.
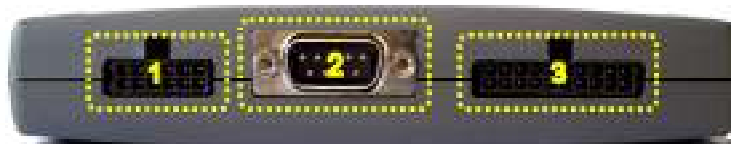
Figure 2: upper side, sockets for supplied wirings.

The lower side of the box (**Figure 3**) presents an USB port so you can link Stekio to your computer using the supplied USB cable.

Figure 3: lower side, USB connector.

Installing STKpro user software

To configure Stekio it is necessary to install a copy of STKpro user software on your computer and verify that it is provided with an USB port. Follow the next procedure to install STKpro software:

1. Download the installation file from our website www.alientech.to or send an email to service@alientech.to specifying to request a copy of STKpro user software install file.

2. Execute the file *STKpro.exe*; you will be guided during the installation procedure (**Figure 4 and 5**).

Figure 4 e 5: installation procedure.

3. After installation, execute STKpro software from the desktop icon or the file *Stekio.exe* placed in the folder *C:\Programs\AlienTech\STKpro*.

4. Now just connect Stekio to your computer using the USB cable and click button *Link* that appears in the user software main windows.

Cables and items

Stekio can be connected to various cables to perform measurements; it is possible that some items listed below aren't included in your package because they belong to different kits.

STK Power cable (**Figure 6**): it allows supplying Stekio from vehicle battery (12 Volts); to perform any measurement you don't have to remove the power cable from vehicle cigar lighter socket. Remember that USB supply voltage is not sufficient to operate during a measurement session.

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Figure 6: STK Power cable.

STK Wideband cable (**Figure 7**): it allows connecting up to two lambda probes (oxygen sensors) and operating them from Stekio, to perform a digital measurement of AFR (Air-Fuel-Ratio) or Lambda value captured by the sensor placed in the exhaust pipe.

Figure 7: STK Wideband cable.

Exhaust Adapter (**Figure 8**): it allows fastening an oxygen sensor to an exhaust pipe; the adapter is provided with a screw that serves to quickly fit it to any silencer and a threaded hole to screw in a lambda probe.

Figure 8: exhaust adapter.

USB Cable (**Figure 9**): it allows linking Stekio to your computer to configure it other then downloading data loggings stored inside memory and to perform a real-time capture from device.

Figure 9: USB cable.

STK Universal lambda cable (**Figure 10**): it allows collecting one electric signal generated by any BOSCH stock oxygen sensor installed on board your vehicle that represents the value of air fuel mixture. The cable is also equipped of a knock sensor connector.

The cable is called *Universal* because it can be linked to every kind of BOSCH lambda sensors; traditional Narrowband (up to 4 wires) and the new Wideband (LSU 4.x, 5-6 wires).

Figure 10: Universal Lambda and knock sensor cable.

MultiLink Cable (**Figure 11**)**:** it allows collecting up to two electric signal generated by any BOSCH stock oxygen sensor and connecting up to two knock sensors, six analog signals 0-5 Volt (Auxiliary inputs), the engine revolution signal (RPM) and a programmable analog output.

Figure 11: MultiLink cable.

Additional items

We suggest you to periodically connect to our website ([www.alientech.to)](www.alientech.to) and check the availability of new additional items for Stekio. Currently we are developing a new cable that allows Stekio implementing the OBD-Scan Tool features and an external box to measure vehicles acceleration (longitudinal and lateral axis accelerometer) also provided with two temperature probe inputs (K type thermocouple).

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Chapter 2 - Stekio operation

This chapter contains the information that allows you to learn Stekio and to understand how to link the device to vehicle and perform your measurements. Every section is explained in details and illustrated with useful pictures.

Graphic user interface messages

The graphic interface is the set of all the messages those appear on the display of Stekio and help you to access to all its tasks. It was designed to be very simple and intuitive.
Figure 12 shows the graphic user interface structure and the selection those appear inside each menu.
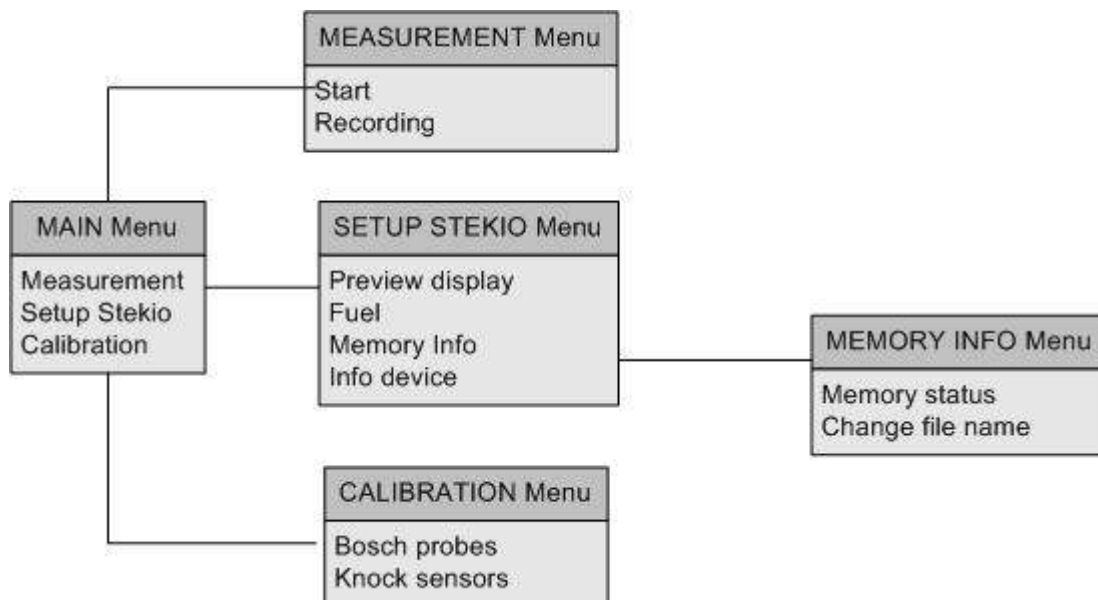
Figure 12: graphic user interface structure.

To move from a screen to another just use the four arrow keys and the two decisional keys **Y** and **N** lay on Stekio cover, those allow you to **Confirm or Annul** a selection.
In some screens, the functions related to the arrow keys could be different; in those cases, the displayed screen will explain the new features related to the arrow keys.

Main Menu

The three selections showed in the **MAIN Menu** screen enable you to quickly access to the related submenus. To enter in a submenu just move cursor with arrow keys on the desired selection and then press **Y** key.
Below are listed the three selections of the **MAIN Menu**:

1. **Measurement**: it leads up to "*MEASUREMENT Menu*" submenu.

2. **Setup Stekio**: it leads up to "*SETUP DEVICE Menu*" submenu.

3. **Calibration:** it leads up to "*CALIBRATION Menu*" submenu.

1 – MEASUREMENT Menu

The *MEASUREMENT Menu* allows you to start a new measurement or to check if the configurations for visualization, data logging and real-time capturing are those desired.

1. **Start**: selecting this command and then pressing the **Y** key, you will start a new measurement session.

2. **Recording**: selecting this command and then pressing the **Y** key, you will see the signals list that Stekio can collect and next to every channel the icons those indicate if a signal is activated to be <u>displayed</u> (**Eyes** icon), <u>data logged on Stekio memory</u> (**Pencil** icon) or <u>real-time captured on PC monitor</u> (**Camera** icon).

2 – SETUP DEVICE Menu

The *SETUP DEVICE Menu* serves to check the current configuration stored inside the device and the information about *memory and hardware version* (read section info Device).

1. **Preview display**: selecting this command and then pressing the **Y** key, you will see an image that reproduces the screen which Stekio will show during the measurement session.

2. **Fuel**: selecting this command and then pressing the **Y** key, you will see the Lambda signals list (probe BOSCH inputs, Wideband inputs and Narrowband inputs) and next to them the conversion scale related to every input.

3. **Memory Info**: selecting this command and then pressing the **Y** key, you will access to the MEMORY **INFO menu**; we suggest you to read the section *MEMORY INFO Menu*.

4. **Info Device**: selecting this command and then pressing the **Y** key, the display will show the information about the serial number and the firmware version of your device.

MEMORY INFO Menu

The *MEMORY INFO Menu* serves to check the information that concerns the recordings stored on Stekio memory.

1. **Memory status**: selecting this command and then pressing the **Y** key, the information about percentage of utilized memory and the current number of recordings stored inside memory will be showed.

2. **Change file name**: selecting this command and then pressing the **Y** key, all the existing recordings sorted by number will be showed with the related file name.

3 – CALIBRATION Menu

The *CALIBRATION Menu* allows you adjusting Stekio to perform le measurements using the *BOSCH LSU 4.2* and *knock sensors* those can be connected directly to the device.

1. **BOSCH probes**: selecting this command and then pressing the **Y** key, you will access to the calibration procedure for BOSCH LSU 4.2 sensors; pay attention to correctly connect the wirings and to supply Stekio from cigar lighter. The procedure is explained in the following section *Calibration* of the current chapter.

2. **Knock sensors**: selecting this command and then pressing the **Y** key, you will access to the calibration procedure for knock; pay attention to correctly connect the wirings and to supply Stekio from cigar lighter socket. The procedure is also useful to test if the sensor position is suitable to *watch* a good signal.

Calibration

As mentioned in the previous section, Stekio can be directly connected and operate with two kinds of sensors: *BOSCH LSU 4.2 probes* and *knock sensors*.
To have a precisely calibrated device, you have to periodically repeat the calibration procedure of those sensors and check if the related wirings are damaged.
Remember that to perform a calibration procedure it is necessary that Stekio is supplied from cigar lighter socket and the sensors to calibrate are already connected to the device using the related wirings.

Measuring Air-Fuel-Ratio or Lambda value

The main feature of Stekio is the measurement of the *stoichiometric composition of air/fuel mixture inside exhaust gas* burned by an internal combustion engine.
The complicated previous sentence can be summarized with two simple words: **Fuel mixture**.
You can act in two ways to measure the fuel mixture using Stekio:

1. Using the **oxygen sensor BOSCH LSU 4.2** (read section *Placing the BOSCH oxygen sensor* of the current chapter for more detailed information).

2. Using the **stock Lambda inputs** to collect signals from on board lambda sensors, both if they are **Narrowband** (traditional) and they are new **Wideband** (linear) sensors.

In both cases, Stekio performs a digital measure of AFR or λ value of fuel mixture.
To help you understanding the numeric value of fuel mixture collected by the device, it is possible to choose among 8 different conversion scales, **but they represent the same information in different ways**.
Thanks to **STKpro** user software you can chose the conversion scale which you prefer view represented the value of the fuel mixture.
The conversion scale can be chosen among:

1. **AFR Gasoline**: the stoichiometric value is **14.7** that match to **λ=1** e **λ^{-1}=1000**.

2. **AFR Diesel**: the stoichiometric value is **14.5** that match to **λ=1** e **λ^{-1}=1000**.

3. **AFR LPG**: the stoichiometric value is **15.5** that match to **λ=1** e **λ^{-1}=1000**.

4. **AFR CNG**: the stoichiometric value is **17.2** that match a **λ=1** e **λ^{-1}=1000**.

5. **AFR Ethanol**: the stoichiometric value is **9.0** that match to **λ=1** e **λ^{-1}=1000**.

6. **AFR Methanol**: the stoichiometric value is **6.4** that match to **λ=1** e **λ^{-1}=1000**.

7. **Natural Lambda λ**: the stoichiometric value is **1.0** that match to **λ^{-1} =1000**.

8. **Inverted Lambda λ^{-1}(multiplied by 1000)**: the stoichiometric value is **1000** that match to **λ=1**.

How to understand la fuel mixture using different conversion scales

Depending on the chose conversion scale used to measure the fuel mixture, you have to pay attention to understand the displayed values.
The conversion scales can be grouped in three categories:

1. **AFR conversion scales**: by choosing one of these scales, **fuel mixture is LEAN** if the measured value is grater than stoichiometric one (example: Gasoline 14.7) and **fuel mixture is RICH** if smaller.

2. **Natural Lambda λ conversion scale**: by choosing this scale, the **fuel mixture is LEAN** if the measured value is grater than stoichiometric one ($\lambda=1$) and **fuel mixture is RICH** if smaller.

3. **Inverse Lambda λ^{-1} conversion scale**: by choosing this scale, **fuel mixture is RICH** if the measured value is grater than stoichiometric one ($\lambda=1000$) one and **fuel mixture is LEAN** if smaller.

Placing the BOSCH oxygen sensor

If you want to utilize the BOSCH LSU 4.2 lambda probe, commanded by Stekio, to perform a fuel mixture measurement, you can act in two ways:

1. Make a hole on the exhaust pipe, solder a *threaded bung (or a very short tube) M18x1.5* before the catalyst and then screw in the oxygen sensor (**Figure 13**).

Figure 13: threaded bung **M18x1.5 soldered on exhaust pipe.**

2. Utilize the *exhaust adapter* (**Figure 14**) to fit sensor outside a silencer.

Figure 14: exhaust adapter.

In both cases you have to respect some instructions to avoid damaging the probe or its cable:

1. Oxygen sensors must be connected using **STK Wideband cable** and Stekio must be supplied from cigar lighter socket before ignite on engine. If sensor oxygen isn't correctly supplied (unpowered sensor or cold) it could rapidly damage if exposed to the exhaust gas hot stream.
2. Oxygen sensors are designed to detect the oxygen concentration inside fuel mixture of engines supplied with unleaded gasoline. Measuring engines supplied with leaded gasoline or very smoky diesel, it can strongly reduce their lifetime.

If you want to measure the fuel mixture of a *TURBO* engine making a hole on exhaust pipe, it is necessary fit the sensor as near as possible to the silencer because high pressure and temperature of *TURBO* engines could alter the measurement of *AFR or λ value* or damage the sensor.

Linking stock oxygen sensor

If you want to link with a stock sensor to measure fuel mixture, it is necessary recognize the kind of sensor installed on board. Stekio is designed to be connected only to *BOSCH sensors or equivalent replacing parts*. Sensors made by other manufacturers (for example NTK) are not compatible; in that case proceed to measure fuel mixture using the external BOSCH sensor so the *STK Wideband cable*.

To recognize which BOSCH sensor is installed on board, **you have just to count the number of wires that form the cable** directed to the Electronic Control Unite (ECU).

The BOSCH stock oxygen sensors installed on board vehicles can be grouped in two categories:

1. **Narrowband**, traditional oxygen sensor: up to **4** wires.

2. **Wideband**, new linear sensor: **5**-**6** wires.

Regardless of the sensor installed on board vehicle, to collect the signal and estimate the fuel mixture, you can utilize two cables: **Universal Lambda and knock sensor cable** or the **MultiLink cable**.
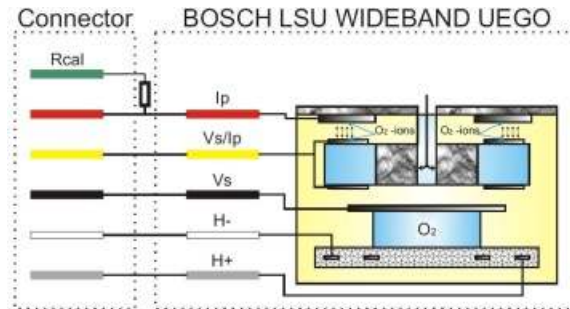
If you want to link to a traditional BOSCH (narrowband) sensor, you can follow **Figure 15**.
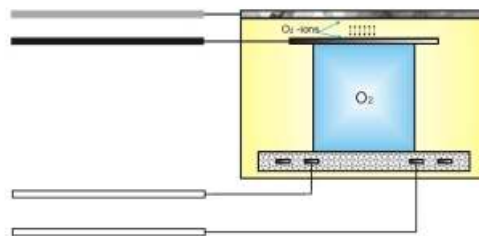
Figure 15: narrowband, traditional oxygen sensor.

The clasps must be connected to **Black wire (red clasp/positive)** and **Grey wire (black clasp/negative)**; there aren't special restrictions to connect the clasps.

If you want to link to a new BOSCH (wideband) sensor, you can follow **Figure 16**.

Figure 16: wideband, linear oxygen sensor.

The clasps must be connected to **Green wire (red clasp/positive)** and **Red wire (black clasp/negative)**. If wires colors of a sensor are different from **Figure 16**, next table shows the connections for some wideband BOSCH LSU sensors.

BOSCH Code	Rcal	Ip	Vs/Ip	Vs	H-	H+
0258006066	6	1	3	2	4	5
0258007057	2	6	5	1	4	3
0258017025	5	1	2	6	3	4

The clasps must be linked to the cable on the sensor side, near to the plastic connector, as showed in **Figure 17**, and not to the side that is directed to the electronic control unite (ECU).

Figure 17: clasps position for a wideband sensor.

Detecting knock

To perform a professional tuning it is necessary to know if the engine you are testing could be affected by knock or detonation.
That dangerous phenomenon could occur on every kind of combustion engines, but it is especially frequent on gasoline engines; it could be caused by a not correct fuel mixture or incorrect spark advance.
Also an "expert" mechanic finds very difficult to recognize that problem and if you are testing a two banks engines, to heard if the engine knocks doesn't help you to know on which bank you have to work.
Stekio is designed to connect up to two knock sensors (depending on the supplied cable) in order to simplify the knock detection on any engine.

To connect knock sensors to Stekio you can choose between two wirings:

1. **STK Universal lambda cable**: it can connect only one knock sensor.

2. **MultiLink cable**: it can connect up to two knock sensors.

Enabling knock signal visualization on Stekio display using the *STKpro user software*, you can **watch the engine knock signal** distinguishing knock signal from engine noise, <u>without be an "expert" mechanic but just using your eyes</u>.
With STKpro user software <u>you can choose to display the knock signal with different graphic visualizations</u>; we suggest you the graphic functions **Spectrum analyzer** and **Oscilloscope** because the first one allows you to view the signal **structure** (to distinguish between signal and noise frequency) and the second one allows you to view the knock **volume level** (time).

<u>**Placing knock sensor**</u>

To correctly detect a knock signal, follow the instructions below about how and where place the sensors:

1. Fit sensor directly on engine body.
2. Place sensor nearer to the dead center of the first cylinder.
3. Stay away from valves: their noise could alter detection.
4. Fasten sensor with bolt.
5. If the detection is performed on a two banks engine, place one sensor next to the first cylinder of each bank.
6. If the detection is performed on a single bank engine, but you want to use two sensors, place a sensor next to the first cylinder and one next to the last cylinder.

Before start to measure you can test if signals are *good*, performing the knock sensors **Calibration** test.
Figure 18 shows <u>the most suitable location</u> where to fit the knock sensor on engine because nearer to the cylinder dead center, where you can precisely detect the dangerous knock.

Figure 18: knock sensor correctly placed.

Figure 19 shows <u>the less suitable location</u> where to fit the knock sensor on engine because too far from the cylinder dead center.

Figure 19: knock sensor incorrectly placed.

Main electronic on board sensors diagnosis

Stekio is provided with 6 analog inputs that you can utilize to connect signals from electronic sensor installed on board your vehicle; remember that to link with stock oxygen sensors, Stekio already have two dedicated inputs.

To link with on board (stock) sensors you have to use the MultiLink cable which is provided with two rows of clamps (**Figure 20**).
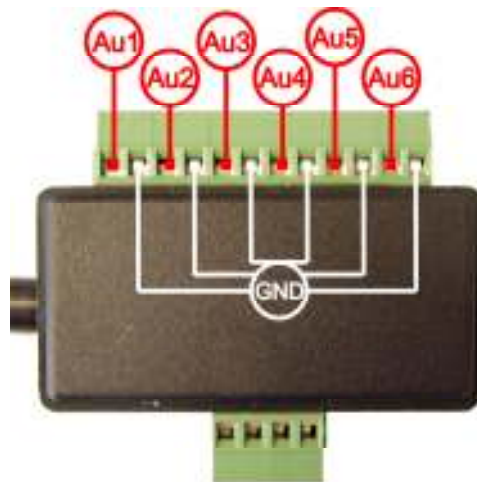
Figure 20: MultiLink cable, rows of clamps analog inputs.

Auxiliary inputs are designed to accept an electric signal with a range between 0 and +5 Volt; read the section *Linking to the main electronic on board sensors* of the current chapter to know how link signals to Stekio.

To activate analog inputs to be displayed on device screen, use *STKpro user software*.

Linking to the main electronic on board sensors

Before link electronic on board sensors signals to Stekio it is better verify if the generated signal has a range between 0 and +5 Volt; before attaching wires to the rows of clamps it is better check with Voltmeter which terminal connect the wires.

Main electronic on board sensors present three contacts: a supply (5 Volt), a ground reference (0 Volt) and a signal (0-5 Volt).

To perform a rapid control:

1. Configure your Voltmeter to accept a direct current (DC) and put one pin to the battery negative pole.

2. Put a Voltmeter pin on each of the three sensor contact.

3. The contact which presents 0 Volt is the ground reference (GND); connect that to the row of clamps of **STK MultiLink cable**.

4. The contact which presents 5 Volt is the sensor supply voltage contact; don't connect it. <u>If measured voltage is grater than 5 Volt, sensor is not compatible to device electric features.</u>

5. The last contact is the signal contact (0-5 Volt); connect that to the row of clamps of **STK MultiLink cable**.

If you cannot execute the previous procedure we non to connect of clamps to on board sensors by any means: you could irreparably damage sensors.

Programmable analog output

Stekio is equipped with a programmable analog output that serve to replicate one among the signals that can be collected by Stekio; you can use the analog output to connect to a device provided of an analog input (0 +5Volt), for example a dyno.

<u>**How to configure the programmable analog output**</u>

Below it is explained the procedure to configure the programmable analog output to be connected to any device provided of an analog input (0 +5 Volt); we suggest you to check that the device you want to connect the analog output is actually provided with an input 0+5 Volt to avoid damages. <u>Before start the procedure, connect Stekio to PC using USB cable.</u>

1. Execute STKpro software from the desktop icon or the file *Stekio.exe* placed in the folder *C:\Programs\AlienTech\STKpro*.

2. Click on the **Link** button and choose a language from Language panel that appears at the right top of **STKpro** software main window.

3. Click on the button **Signals displaying** that that appears at the bottom of **STKpro** software main window opens the new **Settings** window which presents the panel **Analog output** that contains the signals list. Now just choose the signal which you want to be replicated on the output.

4. Prepare the **MultiLink Cable** connecting to the row of clamps due wires (better if it was a shielded cable) one for <u>signal</u> (**OUT**) and one for ground reference (**GND**), as illustrated in **Figure 21** and then to a device equipped analog input.
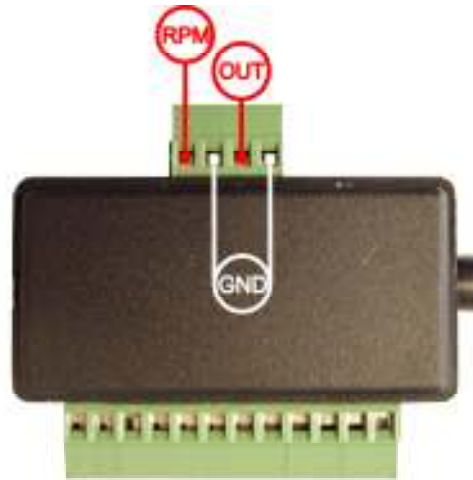
Figure 21: MultiLink cable, row of clamps RPM and analog output.

5. Click on the **Apply** button to transfer the new configuration to Stekio memory le new configuration analog output; now just connect **MultiLink Cable**.

Starting a new measurement, Stekio will allow generating the selected analog signal.

Chapter 3 – STKpro user software operation

This chapter contains the information that concerns STKpro user software that will help you using Stekio in all its features. We suggest you to carefully read the current chapter in order to rapidly learn to configure device for your work.

We remember that with STKpro software you can review data loggings stored inside Stekio memory, perform a real-time data capturing from sensors and watch them directly on PC monitor using the cable USB and save data on the hard disk. Every parameter which controls the device operation <u>can be changed only by STKpro user software</u>.

STKpro software main window

The STKpro main window is simple to understand and to use because are already present all the buttons that allow you to rapidly configure Stekio per for your work. In **Figure 22** is illustrated the main window that is sorted in three panels those highlight the three main features of STKpro software.

1. **Stekio Panel**.

2. **Data Panel**.

3. **Settings Panel**.

Figure 22: STKpro.

Below will be described the features related to the buttons grouped inside three panels of STKpro main window and will also explained each windows that could be opened clicking on every button.

Stekio panel Buttons

The *Stekio panel* (**Figure 23**) appears at the top left of the STKpro main window and it groups the following buttons:

1. **Link**.

2. **Product information**.

3. **Change language**.

4. **Flags and automatically align to Stekio selection**.

Figure 23: Stekio panel, buttons.

1 – Link

The *Link* button (**Figure 23, detail 1**) serves to verify the USB communication with the device. The software also verifies if device needs to be updated.

2 – Product information

After pressed *Link* button, the information about your Stekio will appear below the button (**Figure 23, detail 2**); that information could be requested if you need technical assistance.

3 – Change language

Change Language button (**Figure 23, detail 3**) serves to change the language of the device graphic user interface. The button opens a list that includes the available languages for the device. The process could last many seconds and Stekio must be linked to your PC using USB cable.

4 - Flags and automatically align to Stekio

The *Flags* (**Figure 23, detail 4**) those appear in the STKpro software main window allow you changing the STKpro software language. If active, the selection *Automatically aligns to Stekio* (**Figure 23, detail 4**) causes the software to show the same language stored inside Stekio memory.

Buttons of Data panel

Data panel (**Figure 24**) appears at the right top of the main window of STKpro software and it groups the following buttons:

1. **Performed recordings**.

2. **Real-time capture**.

3. **Operating parameters**.

Figure 24: Data panel, buttons.

1 - Performed recordings

The *Performed recordings* button opens the window <u>Performed recordings</u> (**Figure 25**) that allows you to load and save recordings stored inside Stekio memory or load a recording stored inside computer memory. The features related to every buttons are listed below.
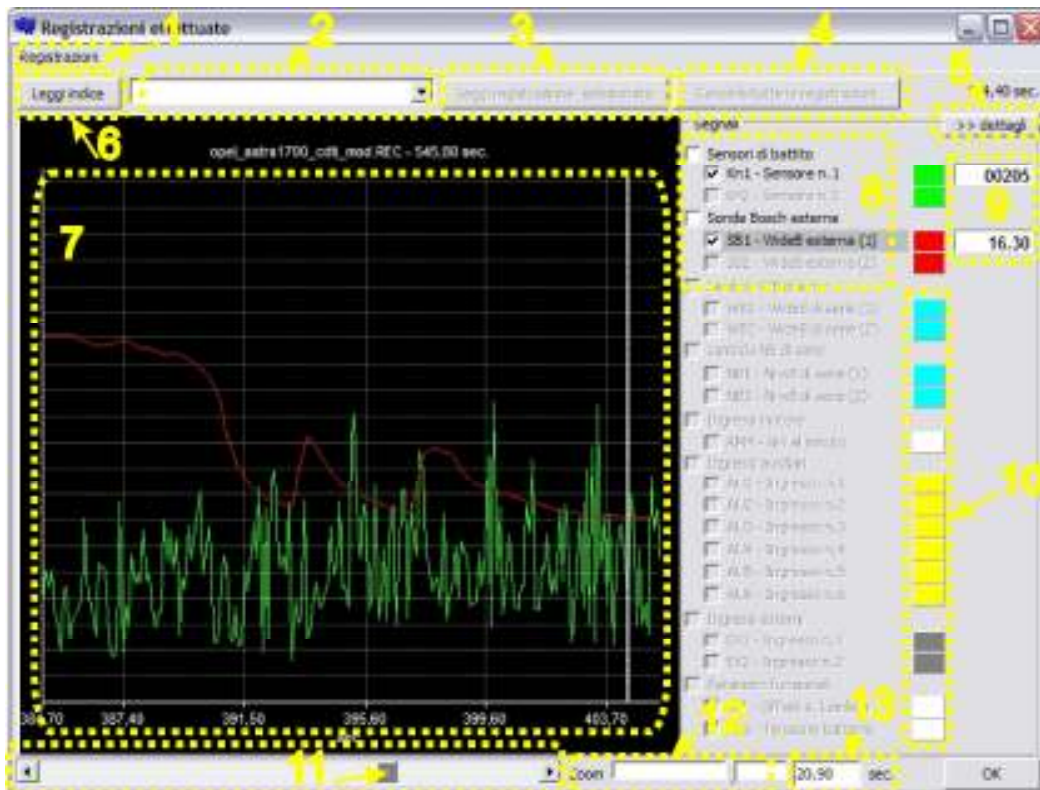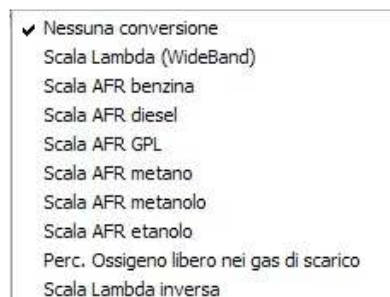

Figure 25: Performed Recordings window.

1. **Recordings Menu**: it groups the main features you can perform to a recording; items *Load recording* e *Save recording* serve to load a recording from Stekio or save it into PC memory.

2. **Recordings list**: it contains the index of the recordings stored inside Stekio memory.

3. **Read selected recording**: the button allows you choosing one among the listed recording and after the whole data flow will appear in the graphic area.

4. **Clear all recordings**: the button erases all the performed recordings stored inside Stekio memory.

5. **Details**: it allows to reduce or to expand the active signals legend panel and also the colored square next to each signal.

6. **Read index**: the button allows you to read the index of all the recordings stored inside Stekio memory.

7. **Graphic area**: the graphic area shows the tracks of the active signals with time information on the horizontal axis.

8. **Active signals list**: when you start a real-time data logging, the active signals are in black and they show a numeric value.

9. **Active signal numeric value**: it represents the instantaneous value of the captured signal; some signals can be represented using different conversion scales (**Figure 26**).

10. **Active signal color**: each track on graphic area has it own color that can be changed using the color window (**Figure 28**).

11. **Cursor**: it allows scrolling the whole data flow.

12. **Zoom**: it allows to reduce or to expand the horizontal time width of a selected recording.

13. **Seconds**: it represents the temporal *Zoom* width; the temporal window is set at 30 seconds and it can reach the minimum of 1 second.

A right click with mouse on the numeric value that appears next to an active signal opens the selectable conversion scales list showed in **Figure 26.** Remember that not every signal have different conversion scale.

Nessuna conversione
Scala Lambda (WideBand)
Scala AFR benzina
Scala AFR diesel
Scala AFR GPL
Scala AFR metano
Scala AFR metanolo
Scala AFR etanolo
Perc. Ossigeno libero nei gas di scarico
Scala Lambda inversa

Figure 26: conversion scales list.

A left click with mouse on the numeric value that compare next an active signal opens the Modify track window (**Figure 27**) that allows you to change the vertical position and the width of a track showed in the graphic area; the features that can be applied to a selected track are listed below.

1. **Vertical Offset**: serves per to move up or down the vertical position for selected track.

2. **Width**: serves to expand or reduce the vertical range for the selected track.

3. **Cancel**: it serves return to the previous window (Performed recordings) without saving changes.

4. **Clear**: it serves to restore the default values for Vertical offset and Width (Vertical offset to 0 and Width to 0).

5. **Close**: it serves return to the previous window (Performed recordings) saving changes.

Figure 27: Modify track window.

A left click with mouse on the colored square next to an active signal, it wills opens a new windows that allows you to change the color of signal track (**Figure 28**). This feature become useful if your recording includes signals those belong to the same group; for example, data logging the signals belong to Auxiliary inputs group, the graphic should presents 6 track with the same color.

In that case the Color window will helps you to sort the 6 signals.

Figure 28: Color window.

2 - Real-time capture

The *Real-time capture* button opens the window Real-time capture (**Figure 29**) that allows you displaying on your computer monitor the data flow received from Stekio; in the end of a real-time data logging you can save your recordings inside PC memory and review them later using the Performed recordings window. Remember that a real-time data logging it is necessary that Stekio is linked to PC using the supplied USB cable. It is very important remember that Stekio must always be supplied from cigar lighter socket, <u>because USB supply voltage is not sufficient to perform measurements</u>.
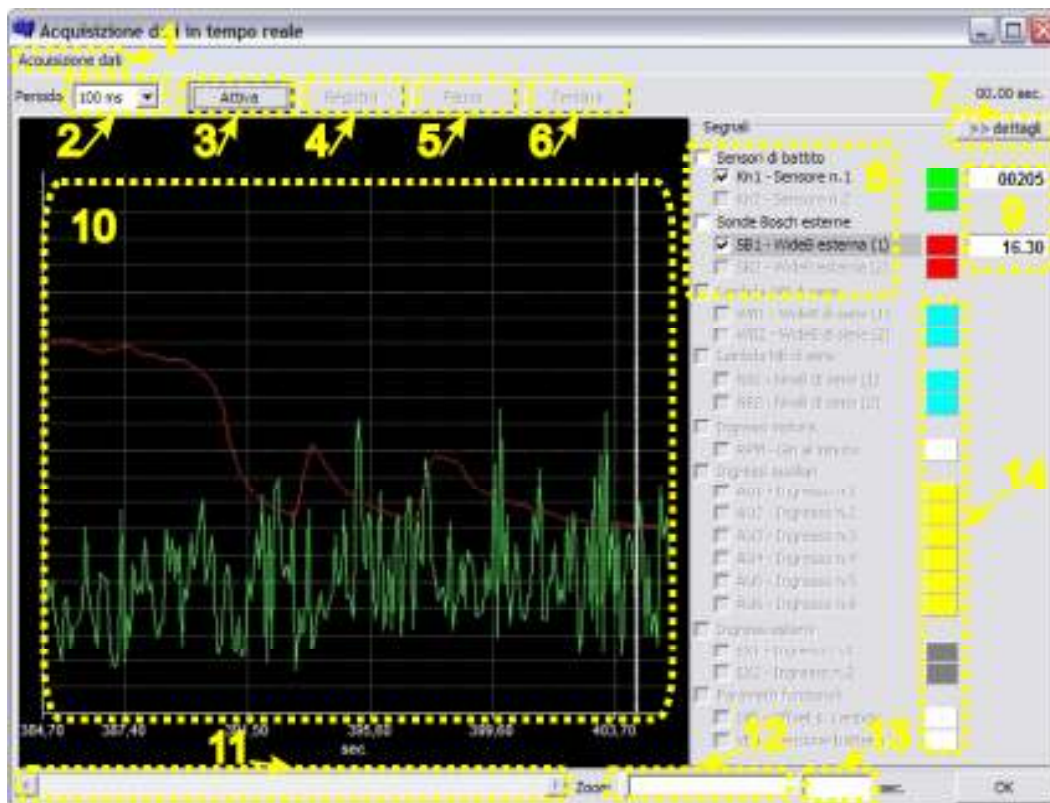
Figure 29: Real-time capture window.

The features related to buttons are listed below.

1. **Capture data menu**: it groups the main features you can perform during a real-time data logging; items *Activate* and *Stop* starts and stop an USB data communication and *Save recording* allows you to store data flow on your computer memory.

2. **Time**: the list *Time* serves to choose the sampling rate: minimum 100ms, maximum 500ms.

3. **Activate**: it serves to start the USB data communication between Stekio and the computer.

4. **Record**: it serves to record the USB data communication between Stekio and the computer.

5. **Pause**: it serves to temporary suspend the USB data communication between Stekio and the computer.

6. **Stop**: it serves to stop the USB data communication between Stekio and the computer. After the STKpro software will asks you if you want to save the data flow on PC memory.

7. **Details**: it allows to reduce or to expand the active signals legend panel and also the colored square next to each signal.

8. **Active signals list**: when you start a real-time data logging, the active signals are in black and show a numeric value.

9. **Active signal numeric value**: it represents the instantaneous value of the captured signal; some signals can be represented using different conversion scales (**Figure 30**).

10. **Graphic area**: the graphic area shows the tracks of the active signals with the time information on the horizontal axis.

11. **Cursor**: it allows scrolling the whole data flow.

12. **Zoom**: it allows to reduce or to expand the horizontal time width of current real-time capturing graphic.

13. **Seconds**: it represents the temporal *Zoom* width; the temporal window is set at 30 seconds and it can reach the minimum of 1 second.

14. **Active signal color**: each track on graphic area has it own color that can be changed using the color window (**Figure 31**)

A right click with mouse on the numeric value that appears next to an active signal, it will open the selectable conversion scales list that is showed in **Figure 30**.

**Figure 30: Conversion scale list.**

A left click with mouse on the colored square next to an active signal, it wills opens a new windows that allows you to change the color of signal track (**Figure 31**).

Figure 31: color window.

3 – Operating parameters

The *Operating parameters* button opens the window Operating parameters (**Figure 32**) that allows you to change some operating parameters. Also serves to check the number of errors occurred during Stekio operation.
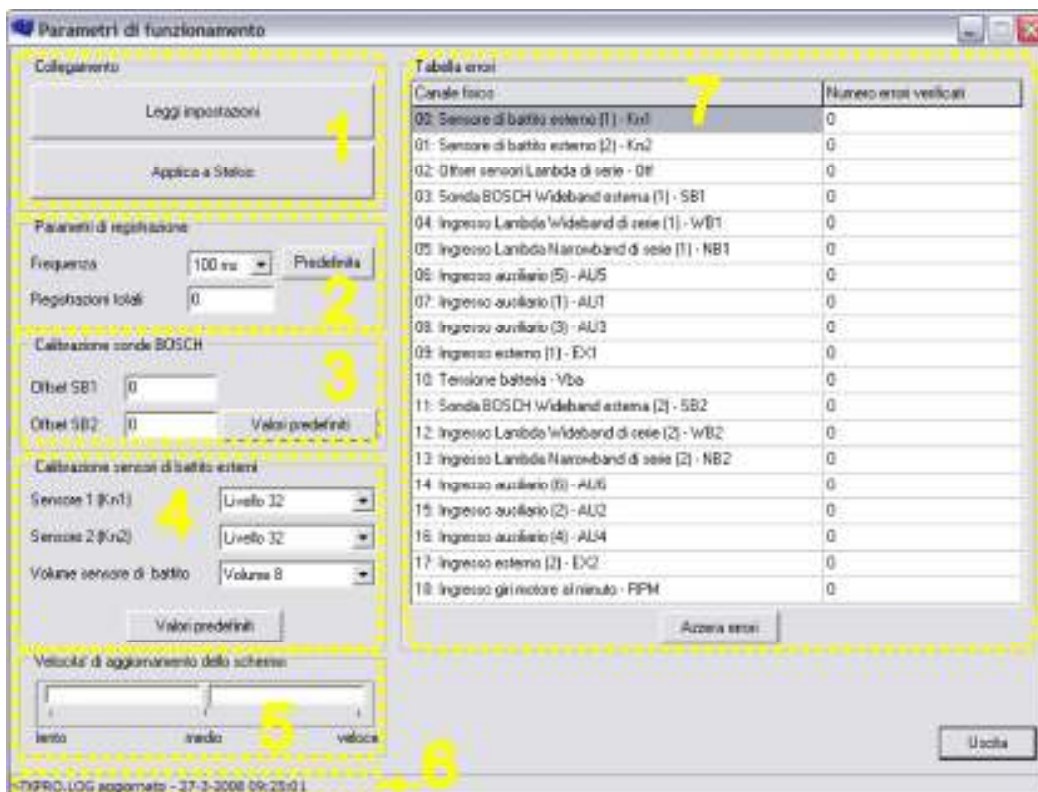
Figure 32: Operating parameters window.

The features related to buttons are listed below.

1. **Link panel**: the panel groups two buttons *Read settings* and *Apply to Stekio* those serve to request the current operating parameters and transfer changes made in that window.

2. **Recording parameters panel**: the panel group information about the total number of recording stored by Stekio; it is also possible to change frequency of signals sampling rate during a recording (data logging) or reload the default values by clicking the button Default.

3. **External BOSCH probes calibration panel**: the panel shows the current calibration value of oxygen sensors connectable to Stekio. It is possible to reload the calibration default values by clicking the Default values button.

4. **External knock sensor panel**: the panel shows the current calibration value of knock sensors connectable to Stekio. It is possible to reload the calibration default values by clicking the Default values button.

5. **Speed of screen refresh**: the cursor changes the LCD display refresh speed that is speed with the screens are updated on Stekio display during a measurement session.

6. **Log**: every time you click the button Read settings STKpro software provide to update an internal log file. If you need technical assistance, you may be required to send the file *STEKIO.LOG*.

7. **Error table**: the table shows the number of errors occurred during device operation. It is possible to clear the *Error table* clicking the *Clear errors* button and then *Apply to Stekio*.

Settings panel buttons

The *Settings panel* (**Figure 33**) appears at the bottom of STKpro software main window and it groups the following buttons:

1. **Universal Lambda cable and knock sensor cable**.

2. **External BOSCH probes**.

3. **MultiLink Cable**.

4. **Signals displaying**.

**Figure 33: Settings panel buttons.**

The first three buttons in that panel <u>are related to the main cables connectable to Stekio</u>.
If you want to perform a measurement using only one cable, those three buttons will allow you saving time to configure signals parameter.
If you want to utilize more than one cable at the same time or you want to customize the screen during a measurement session you have to click the Signal displaying button.

1 – Universal Lambda cable and knock sensor

The *Universal Lambda cable and knock sensor* button opens the window <u>Universal Lambda cable and knock sensor</u> (**Figure 34**) that allows you to rapidly configure the parameters of the signals collectable by that cable.
The features related to buttons are listed below.

1. **Lambda sensor**: it allows you to enable the Universal Lambda input (stock oxygen sensor).

2. **Screen preview**: the panel shows the screen preview of Stekio display during a measurement session.

3. **Sensor type**: the panel contains the selection of the stock oxygen sensor type.

4. **Fuel scale**: it serves to choose one conversion scale (AFR or Lambda scales) which you want to represent the numeric value of fuel mixture.

5. **Knock sensor**: it serves to specify the number of probes connected to the cable (up to two external knock sensors).

6. **Data log Panel**: the panel contains two selections applied to every selected signals; Record on Stekio and Real-time capture.

7. **Summary of choices**: it serves to verify selections you have chose to configure Stekio for the next measurement session.
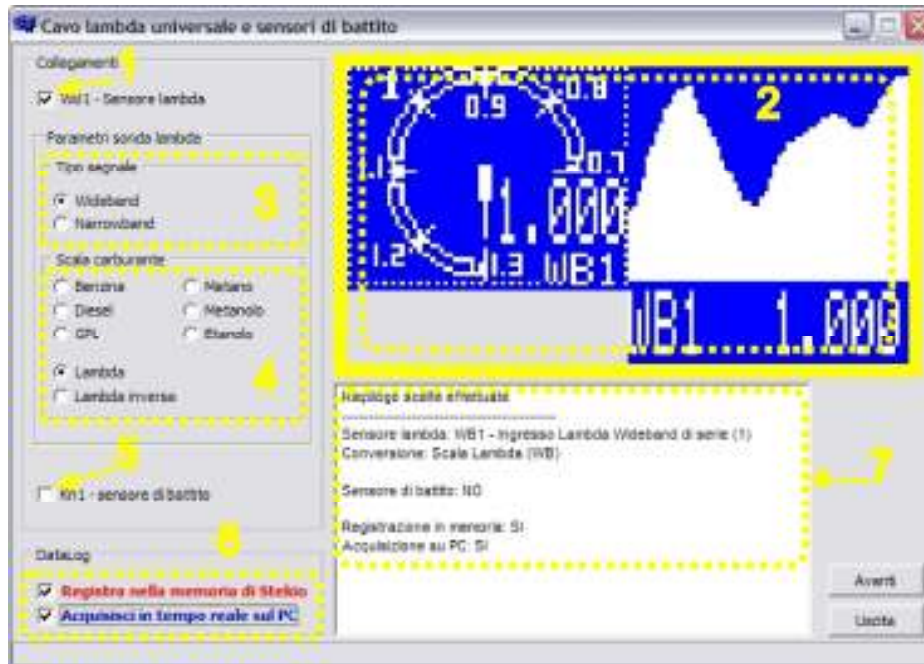
Figure 34: Universal Lambda cable and knock sensor window.

2 - External BOSCH probes

The *External BOSCH probes* button opens the window BOSCH probes settings (**Figure 35**), that allows you to rapidly configure the parameters of the two BOSCH sensors connectable to the cable.
The features related to buttons are listed below.

1. **BOSCH probes selection**: it serves to specify the number of probes connected to the cable (up to two external BOSCH oxygen sensors).

2. **Screen preview**: the panel shows the screen preview of Stekio display during a measurement session.

3. **Fuel scale**: it serves to choose one conversion scale (AFR or Lambda scales) which you want to represent the numeric value of fuel mixture.

4. **Full screen**: the selection allows you to enable the full screen view.

5. **Data log Panel**: the panel contains two selections applied to every chosen signals; Record on Stekio and Real-time capture.

6. **Summary of choices**: it serves to verify selections you have chose to configure Stekio for the next measurement session.
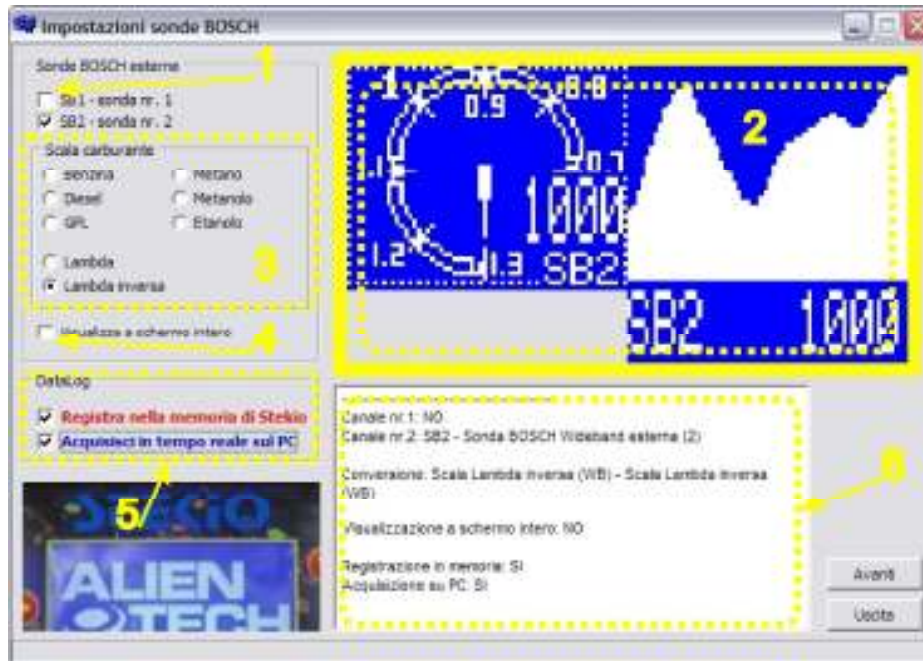
Figure 35: BOSCH probes settings window.

3 - MultiLink cable

The *Multilink cable* button opens the window <u>MultiLink cable</u> (**Figure 36**), that allows you to rapidly configure the parameters of the collectable signals.
The features related to buttons are listed below.

1. **Channel selections**: it allows you enabling up to two Universal Lambda inputs (stock oxygen sensors) and up to two knock sensor inputs provided in the *MultiLink cable*.

2. **RPM input**: enables the RPM input.

3. **Auxiliary inputs**: to individually enable each auxiliary input (0 +5 Volt).

4. **Lambda probes parameters panel**: the panel contains the selection of the stock oxygen sensor type and the numeric conversion scales.

5. **Screen preview**: the panel shows the screen preview of Stekio display during a measurement session.

6. **Analog output**: the signals list serves to choose which signal you want to be outputted at the analog output.

7. **Data log Panel**: the panel contains two selections applied to every selected signals; Record on Stekio and Real-time capture.

8. **Summary of choices**: it serves to verify selections you have chose to configure Stekio for the next measurement session.

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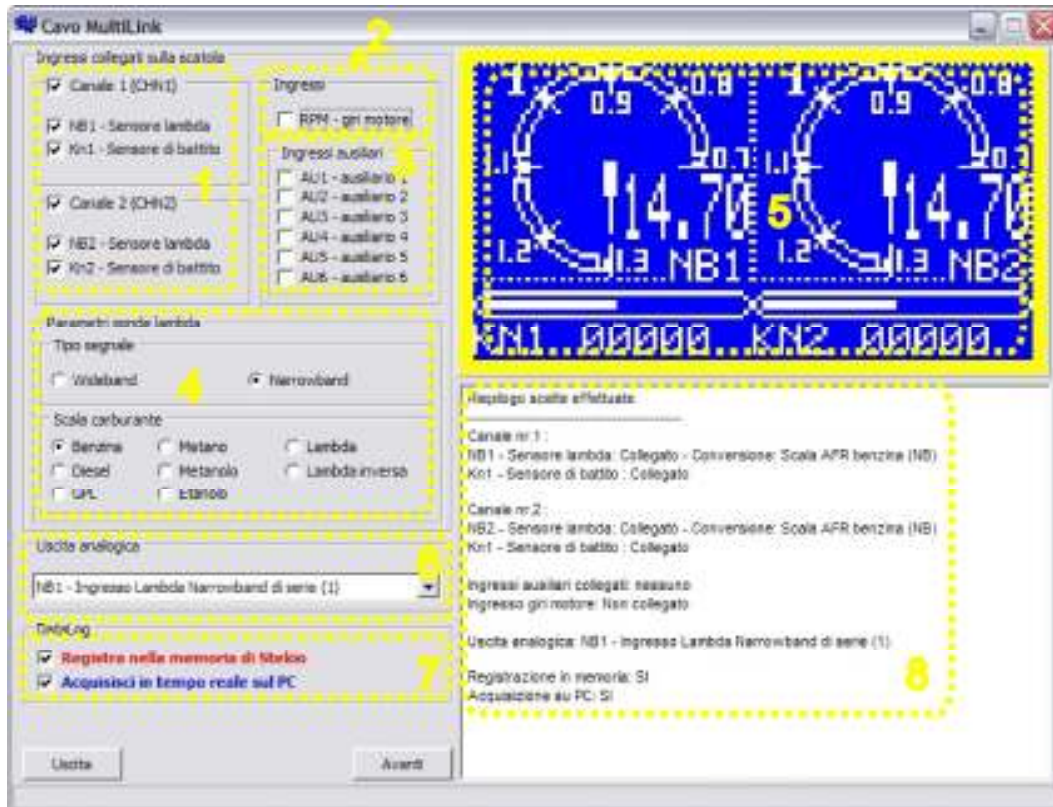
Figure 36: MultiLink cable window.

4 – Signals displaying

The *Signals displaying* button opens the window <u>Settings</u> (**Figure 37**) that allows you to enable signals those can be captured by the cables supplied with the device.
The features related to buttons are listed below.

1. **Display left half**: the button opens a new window that allows you to customize the graphic visualization for the selected signal in the left half LCD screen.

2. **Display right half**: the button opens a new window that allows you to customize the graphic visualization for the selected signal in the right half LCD screen.

3. **Selection REC**: it serves to enable recording (Stekio data logging) for the selected signal.

4. **Selection R/T**: it serves to enable real-time capturing (PC data logging) for the selected signal.

5. **Button "..."**: the button opens a new window that allows you to load a file .sts, per to download it inside Stekio memory or to modify the file configurations.

6. **Signals list**: on the window left side are listed every signals Stekio can collect.

7. **Full screen**: the button allows you to select the full screen view.
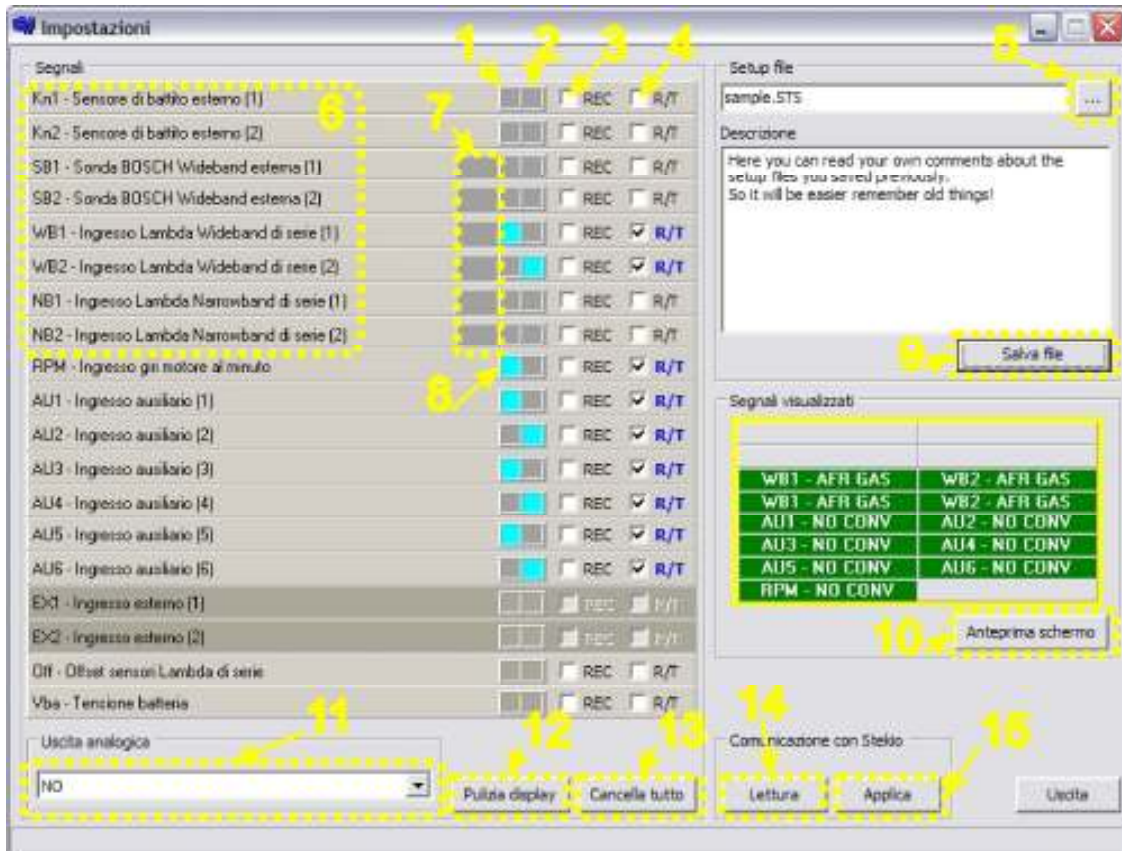
Figure 37: Settings window.

8. **Activated signal**: the azure square means that the signal is active to be displayed during a measurement session.

9. **Save file**: the button opens a new window that allows you to save the current graphic configuration in a file .sts, in order to reload it later.

10. **Screen preview**: the button opens a new window that shows the screen preview of Stekio display during a measurement session.

11. **Analog output**: the signals list serves to choose which signal you want to be outputted at the analog output.

12. **Clean display**: the button serves to clear only the current selections those concern signals displaying on LCD screen.

13. **Clear all**: the button serves to clear the current selections for displaying, recording e real-time capturing previously chose.

14. **Read**: the button serves to read the current graphic configuration stored inside Stekio memory.

15. **Apply**: the button serves to download inside Stekio memory the current graphic configuration.

Customizing screen window

As explained in the previous list, at point **1** and **2** (**Figure 37, details 1 e 2**), it is possible assign one graphic visualization for the left and one for the right part of the display (**Figure 38**) to each signal.
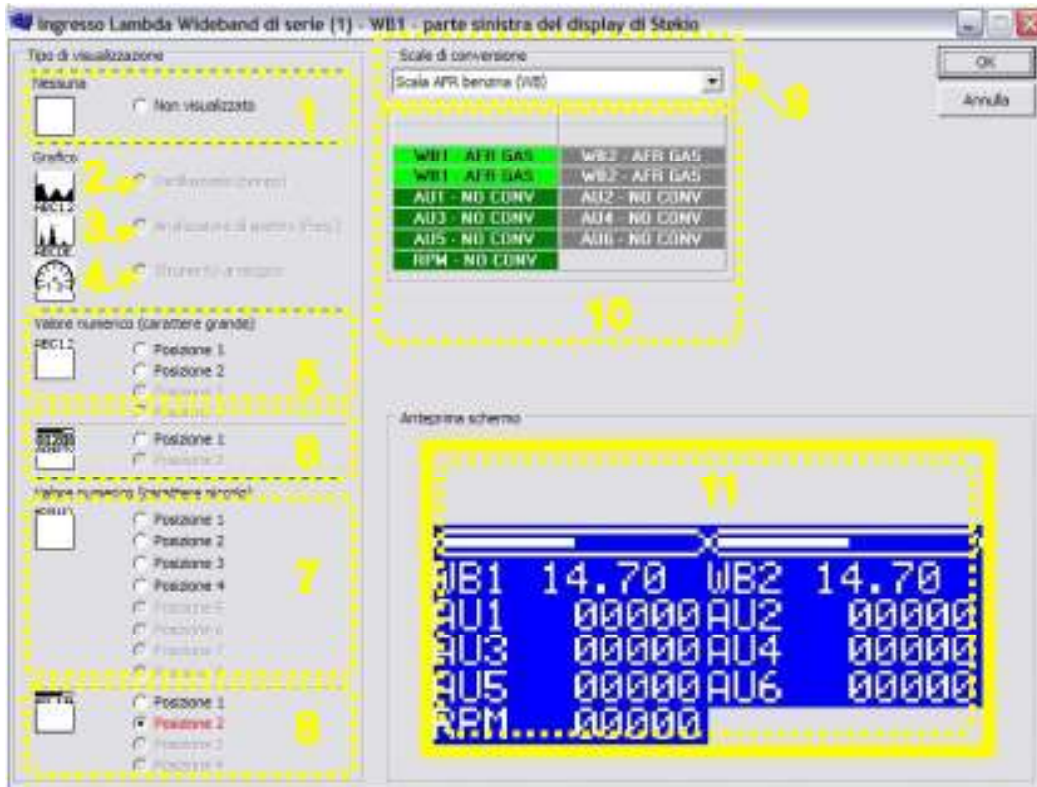
Figure 38: Customize Stekio screen during measurement session window.

Below are explained all the selections listed in the window, those can be configured to customize Stekio screen during a measurement session:

1. **Not displayed**: the signal is not displayed.

2. **Oscilloscope (time)**: the signal is displayed on a 2 dimensions graphic (x = time, y = width) which represents the signal time trend.

3. **Spectrum analyzer**: the signal is displayed on a 2 dimensions graphic (x = frequency, y = width axis) which represents the frequency signal structure. This graphic visualization is only available for knock sensors signals.

4. **Analog Gauge**: the signal is displayed as a moving needle on graduated circular scale.

5. **Numeric value (big font)**: the signal is displayed on two rows those contain the signal name and the numeric value.

6. **Numeric value (big font) and status bar**: the signal is displayed on four rows; the first row contains a status bar, the second and the third contain the numeric value and the fourth one contains the signal name.

7. **Numeric value (small font)**: the signal is displayed on one row which contains the signal name and the numeric value.

8. **Numeric value (small font) and status bar**: the signal is displayed on two rows; the first row contains a status bar and the second one contains the signal name and the numeric value.

9. **Conversion scales**: the list allows you to choose the conversion scale which you prefer to represent the numeric value of a signal during measurement session; not every signal has the opportunity to change their conversion scale.

10. **Data conversion scales**: the panel shows signals information those are activated for visualization, but in place of the screen preview, it is showed the related conversion scale name and the dimensions (rows) on LCD display.

11. **Screen preview**: the panel shows the screen preview which Stekio will display during a measurement session.