

EG Configuration Center

programming manual for

EG BASICO
EG AVANCE
EG SUPERIOR

sequential gas injection controllers

ver. 2.6.8 dated 2015-07-08

welcome to
the WORLD
OF **automotive**

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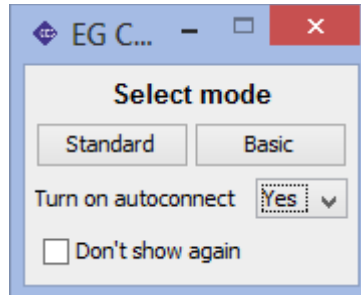


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1. First start of the program.

1.1. Establishing connection with ECU.



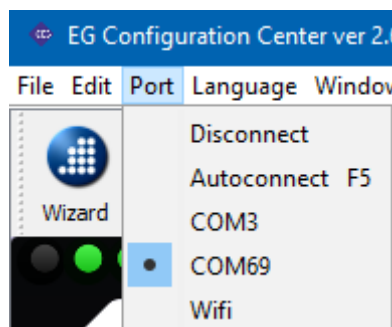
After first use of the software the window with question about selection of working mode will appear.

We can select from **"Standard"** and **"Basic"** software interface mode. Both modes are described in next chapters of this manual.

"Turn on autoconnect" - if enabled will automatically search all available ports and try to establish connection with the controller automatically. If we choose **"Yes"** the software will try to automatically connect with ECU. If we choose **"No"** it will be necessary to choose the port manually from the list of available COM ports to establish connection with ECU.

If we will enable **"Don't show again"** the software will remember our choice for method of connection and will apply it during its every start. This settings can be changed any time in "Preferences" widow.

"Autoconnect" function is searching for a controller starting from the lowest COM number found in the system. Therefore it is recommended to assign the lowest possible COM port index for connected diagnostic interface to establish connection more quickly. We can always cancel Autoconnect procedure by selecting **"Disconnect"** and select COM port manually.

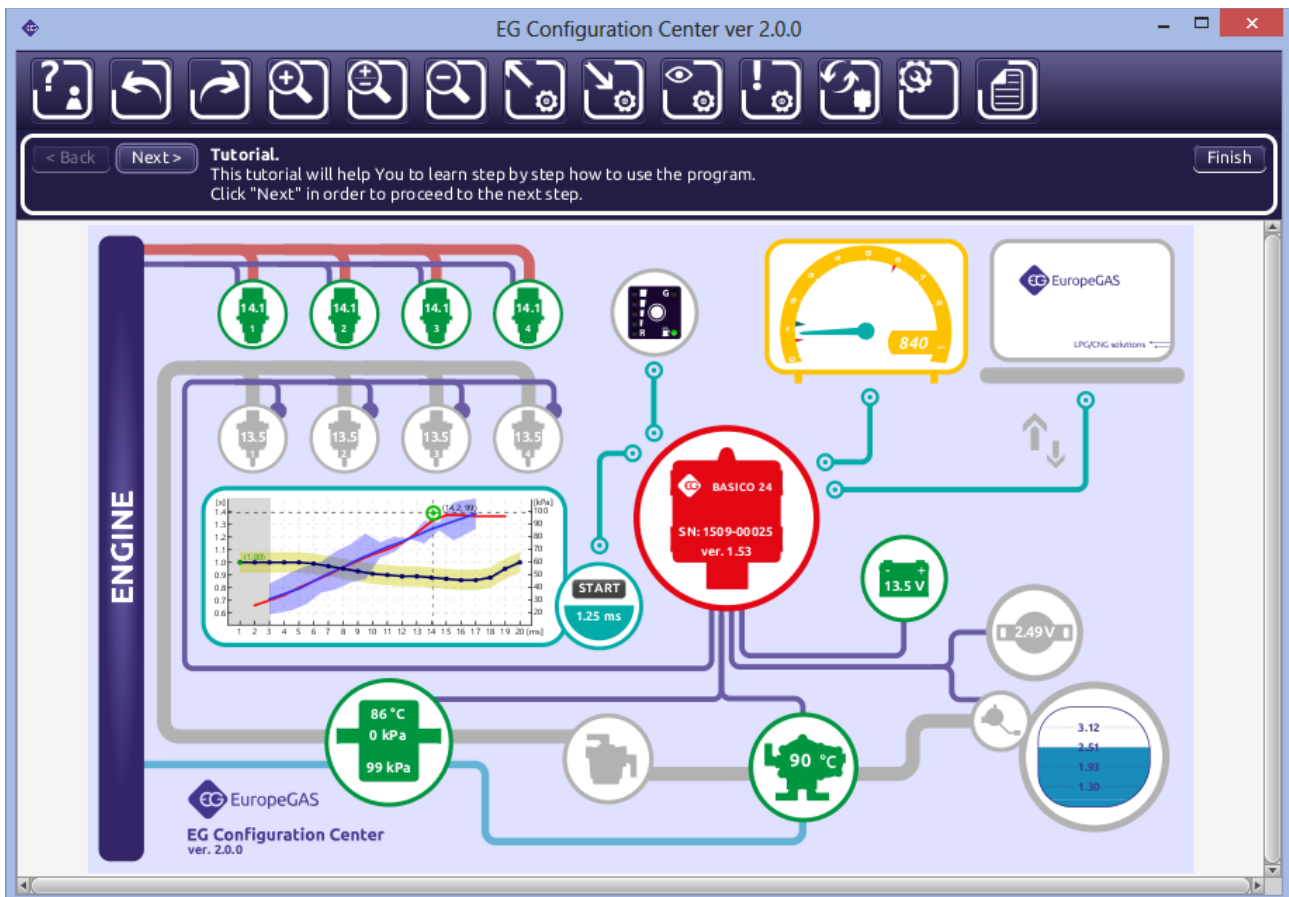
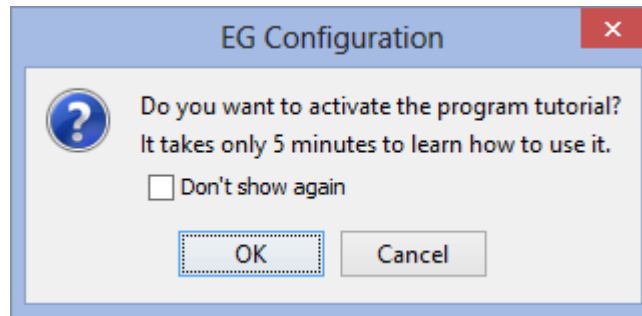




1.2. Basic Mode

By choosing basic mode we are starting simplified software interface based on installation diagram. This mode contains only the necessary functions required for correct calibration and system diagnosis. They are all grouped in single, user friendly tab.

After first start of Basic mode we will see window with proposal of work with integrated tutorial. This tutorial teach user step by step how to use the program.



We can restart tutorial anytime by clicking on first icon from the left on the Toolbar.

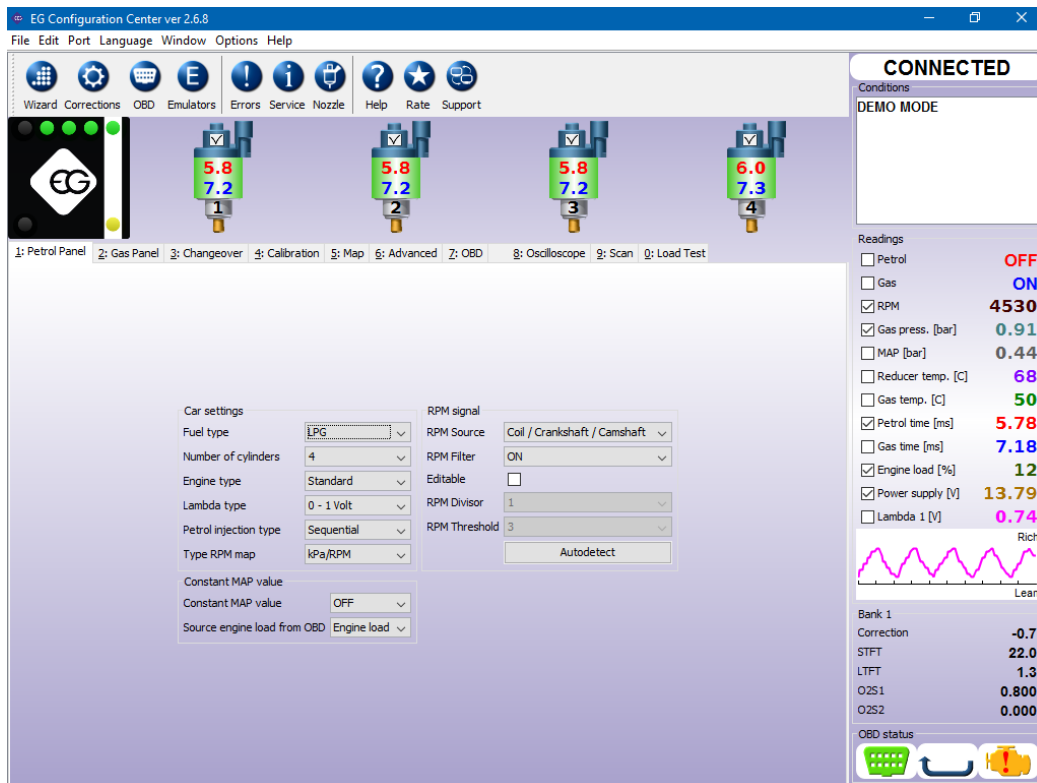


1.3. Standard mode

By choosing Standard mode we are starting traditional software interface containing all the options provided by the software for particular ECU.

- **Hint:** Software starts with standard set of options available by default. Some more advanced features are hidden. In order to show all the features available please go to: "Options->Preferences" and enable "Expert mode".

2. Main software window description



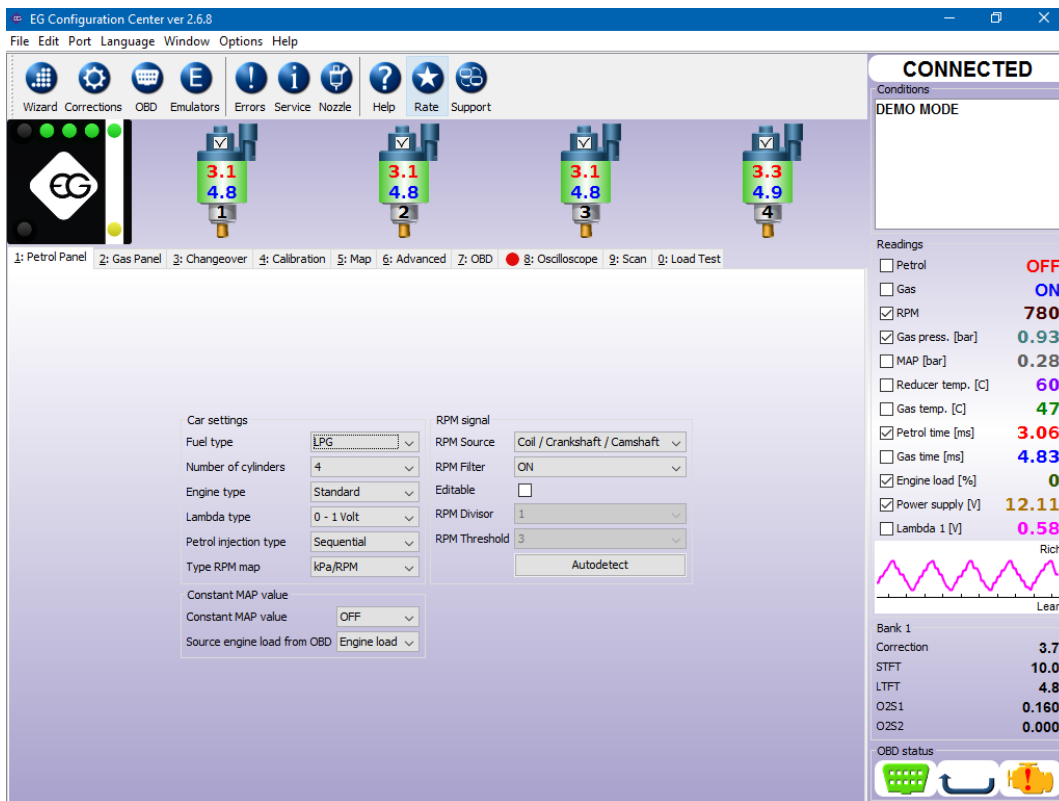
EG Configuration Center diagnostic software main window is composed of:

- Main menu bar located on the top of the window.
- Toolbar located below Main menu bar.
- Fuel type changeover switchboard visualization with fuel level indication diodes located in left top part of the window.
- List of active petrol/gas injectors with their injection opening times [ms] -middle top part of the window.
- Visualization of actual system parameters -middle right side part of the window.
- Panels with system parameters/settings -central part of the window.
- System status indication and conditions bar -top right corner of the window.

Hint: Balloon tips with explanation are being displayed every time when mouse cursor is being held over particular function in software window.



2.1. Petrol panel



2.1.1. Car settings

- **Fuel type** -Select on what fuel type car is running ["LPG", "CNG"].
- **Number of cylinders** – Select number of cylinders in the car -[1...8] -according to amount of petrol/gas injectors connected.
- **Engine type** –Select the engine type ("Standard" or "Turbo") in order to have the correct value of manifold pressure (MAP) on the vertical axis on the map calibration .
- **Constant MAP** –This feature should be turned ON if the vehicle's engine type is having constant manifold absolute pressure value (eg. Valvetronic, Valvematic, MultiAir etc.) It is necessary to have OBD connection established to use that function. On the vertical axis of the map calibration in place of reading manifold pressure MAP will be the value of MAF . For cars that do not have air flow meter , select the " engine load " then appears on the load expressed in%.
-
- **Lambda type** –Set proper voltage type oxygen sensor characteristics.
- **Petrol injection type** –For cars having petrol injectors controlled by full group strategy (all injectors controlled by single signal) or semi-sequential strategy (injector are being controlled by pairs) please change the "Petrol Injection type" from "Sequential" to "Full-group" or "Semi-sequential".



2.1.2. RPM Signal

- **RPM signal source** -Defines the source of RPM signal. If brown RPM wire from the harness is connected to ignition coil, crankshaft position sensor or camshaft position sensor signal we need to select proper signal source. If brown wire is not connected (or not present) please choose "Injector", "OBD" or "TAP" (if present).
- **RPM filter** –Filters the RPM signal to have smooth readout.
- **Rpm divisor** –Choose proper divider value to divide the RPM signal if the value read is not correct.
- **Autodetection** –Automatic detection of the RPM signal divisor and threshold.

2.2. Gas panel

The screenshot displays the EG Configuration Center software interface, version 2.6.8. The main window is titled "EG Configuration Center ver 2.6.8" and includes a menu bar (File, Edit, Port, Language, Window, Options, Help) and a toolbar with icons for Wizard, Correctors, OBD, Emulators, Errors, Service, Nozzle, Help, Rate, and Support. The interface is divided into several sections:

- Top Panel:** Shows four gas injectors with their respective RPM values: 16.0, 16.0, 16.0, and 16.2. Below them are four buttons labeled 1, 2, 3, and 4.
- Navigation Bar:** Contains tabs for 1: Petrol Panel, 2: Gas Panel (selected), 3: Changeover, 4: Calibration, 5: Map, 6: Advanced, 7: OBD, 8: Oscilloscope, 9: Scan, and 0: Load Test.
- Configuration Panel:** Includes settings for Gas injectors type (H2000/EG2000 Type A,B,C 1.9Ohm), Gas injectors order (1, 2, 3, 4), Adaptation pressure parameters (Minimum gas pressure: 0.60 [bar], Gas working pressure: 1.30 [bar]), and Sensors (Pressure sensor: ABS 400kPa, Reducer temp. sensor: 4.7 kOhm, Gas temp. sensor: 4.7 kOhm).
- Level sensor:** Shows a graph with a vertical bar at 121 and a horizontal line at 110. Other values shown are 90, 70, and 50. A "Reserve" button is also present.
- Readings Panel:** Lists various engine parameters and their values: Petrol (OFF), Gas (ON), RPM (3230), Gas press. [bar] (0.91), MAP [bar] (0.98), Reducer temp. [C] (55), Gas temp. [C] (54), Petrol time [ms] (16.05), Gas time [ms] (16.04), Engine load [%] (55), Power supply [V] (13.34), and Lambda 1 [V] (0.20). A graph shows the Lambda 1 reading fluctuating between Rich and Lean.
- Bank 1 Correction:** Shows values for STFT (20.0), LTFT (7.0), O2S1 (0.200), and O2S2 (0.000).
- OBD status:** Includes icons for a keyboard, a refresh button, and a warning icon.

- **Gas injector type** – Set proper gas injectors characteristics -[H2000/EG2000 type ABC 1,9 Ohm; H2100; EG2000 type A+ 1,3 Ohm; Keihin; BRC 1.9 Ohm; Rail IG1 3 Ohm; Rail IG5 3 Ohm; Magic Jet; Matrix; Matrix HD344/HD544; Rail IG3 Horizon 2 Ohm; Rail IG3 Horizon 2.8 Ohm; Reg OMLV Fast; Valtek 30 3 Ohm; Valtek 30/Rail IG1 2 Ohm; Valtek 30/Rail IG1 1 Ohm; Valtek 34; WGS 11/14/18/24; Tomasetto IT01; AEB INJ R4 I-Plus 2 Ohm; Barracuda; Tech Dragon; AC W01; AC W02; AC W03]
- **Gas injectors order** – By using this function we can reassign petrol injector emulators to any gas injector without changing physical connection. This



functionality is useful when mistake during electrical connections has been made (petrol emulator is not matched with correct gas injector). We can also advance the gas injectors sequence using this box.

To activate this function we have to set "**Activation**" to "ON".

2.2.1. Adaptation pressure parameters

- **Minimum gas pressure** –Minimum gas pressure value required to cause changeover back to petrol. It is the lowest value of gas pressure at which the system allows to drive on gas. If the gas pressure value will fall below this value, for time longer than value set in "*Pressure error time*" the car will change over to gasoline from too low gas pressure.
- **Gas working pressure** –It is the normal value of gas pressure during last autocalibration on idle. "*Working gas pressure*" and "*Minimum gas pressure*" values are updated automatically during every autocalibration. In case of manual change of reducer's pressure these values must be updated every time.

Attention:

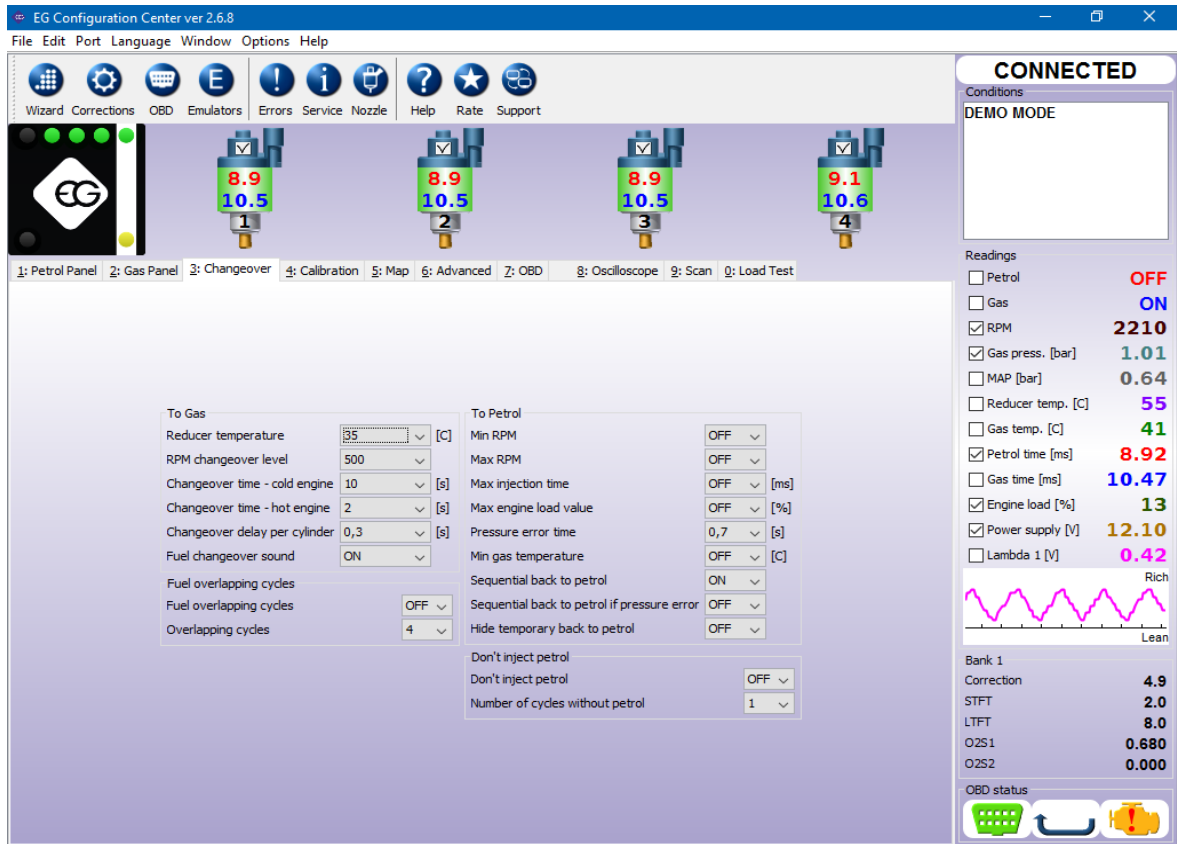
The system by default is making corrections of gas injection opening time according to working gas pressure value. Therefore it is necessary to have working gas pressure parameter value in the software agreeing to real value of gas pressure in the system.

2.2.2. Sensors

- **Pressure sensor type / Reducer temperature sensor / Gas pressure sensor type-** in case of using a Pressure sensor / Vacuum sensor / Reducer temperature sensor or/and Gas temperature sensor different from standard ones (**ABS400kPa** and **4.7kOhm** type sensors, which are provided with the ECU set and selected as default configuration) please change sensor type in a proper field.
- **Level sensor type** – select proper type LPG level sensor (default is 0-5V Hall) or CNG pressure gauge (default is 0-5V Hall) installed. If it is necessary to adjust original standard sensor characteristics of level sensor press "**Set min**" when gas tank is empty and "**Set max**" when gas tank is full. We can restore default values anytime by clicking "**Default**" button.
LED activation threshold values can be also modified manually by moving the sliders by clicking and dragging them with mouse cursor.



2.3. Changeover panel



2.3.1. To Gas

- **Reducer temperature** -Minimum value of reducer temperature required for opening the solenoid valves before first changeover to gas.
- **RPM changeover level** -Minimum value of RPM level to first changeover to gas.
- **Changeover time -cold engine** -Minimum value of time period from the moment of opening solenoid valves to the opening of first gas injector on cold engine.
- **Changeover time -hot engine** – Minimum value of time period from the moment of opening solenoid valves to the opening of first gas injector on hot engine.
- **Changeover delay per cylinder** -Time delay between turning on/off subsequent gas injectors during changeover from petrol to gas.
- **Sound when changeover to gas** -If turned "ON" buzzer gives sound during every switchover between from petrol to gas.
- **Fuel overlapping cycles** – enables simultaneous injection of the gas together with gasoline during changeover to gas. It is adjustable by setting desired number of overlapping cycles. It eliminates the feeling of transition to gas using long gas pipes.



2.3.2. To Petrol

- **Minimum RPM** -Minimum value of RPM level required for changeover back to petrol when car runs on gas. If actual RPM value is lower than this value the car will immediately changeover to gasoline mode. When the RPM value will go back above this value the car will go back to gas mode.
- **Maximum RPM** -Maximum value of RPM level required for changeover back to petrol when car runs on gas. If actual RPM value is higher than this value the car will immediately changeover to gasoline mode. When the RPM value will go back below this value the car will go back to gas mode.
- **Max load value** -Maximum value of petrol injection opening time at which car can still run on gas. If petrol injection time value will be higher than this value the car will changeover to gasoline mode. When the value of petrol injection time will fall back below this value the car will go back to gas mode.
- **Maximum load on the engine** - the function of switching the engine on gasoline based on calculated by the load controller. If the injection timing loop, and we're not sure of the mixture at high loads can be set, for example. 85 %, which switches the engine on petrol.
- **Pressure error time** -Time period during which the gas pressure could be lower than the "*Minimum pressure*" value. If the pressure will drop and stay below this value for time longer than this time period the car will change over to gasoline from too low gas pressure.
- **Minimum gas temperature** -Minimum value of gas temperature required for changeover back to petrol. If gas temperature will fall below that value during driving on gas the system will go back to gasoline mode and will not allow to go back to gas mode until the gas temperature will be greater than this value.
- **Sequential back to petrol** -Feature enables sequential switchover from gas to petrol with the `time delay between subsequent cylinders as set in "*Changeover delay per cylinder*".
- **Hide temporary back on petrol** -If turned "*OFF*", the LPG/CNG diode blinks during temporary switchover to gasoline.
- **Don't inject petrol** -delay of petrol injectors activation for defined number of cycles during changeover to petrol. It allows you to reduce the effect of "flooding" the engine during changeover from gas to petrol due to too long gas pipes.



2.4. Calibration



Map In "**Calibration**" bookmark is showing dependency of petrol injectors opening time [ms] on petrol (red points) and petrol injectors opening time on gas (blue points) related to value of manifold absolute pressure (vacuum) in the engine inlet manifold [kPa]. On the right side of Calibration bookmark there are indication of petrol (red colour) and gas map (blue colour) buffers [%].

Colour marker on the intersection of horizontal and vertical dashed lines shows the actual values of MAP and petrol injectors opening time.

Left vertical axis is reserved for Multiplier line values (blue horizontal line with point on each millisecond) which is being used for adjustment of gas injection opening time for all gas injectors.

The point of multiplier can be marked by clicking left mouse button and dragged up or down by moving mouse cursor while holding left mouse button. Multiplier points can be also modified by following keyboard shortcuts:

- ← -left arrow -Changes active point to previous one by 1 ms.
- → -right arrow -Changes active point to next one by 1 ms.
- ↓ -bottom arrow -Decreases the multiplier for particular petrol injection opening time. In example changing the multiplier value from 1,0 to 0,8 will cause shortening of gas injection opening time by 20%.



- ↑ -upper arrow -Increases the multiplier for particular petrol injection opening time. In example changing the multiplier value from 1,0 to 1,2 will cause elongation of gas injection opening time by 20%.
- Page Up –Moves the whole multiplier line up by 0,1.
- Page Down -Moves the whole multiplier line up by 0,1.

2.4.1. Autocalibration

- **Autocalibration start** – Starts the procedure of automatic calibration on idle.
- **Correction** –Shows common additive correction for all gas injectors.
- **Injection time** –Saved petrol injection time on idle during last autocalibration.
- **Simultaneous changeover all cylinders during autocalibration** –It's used to changeover all gas injectors simultaneously during autocalibration first changeover to gas.

2.4.2. Petrol map

- **Petrol Map continuous mode** –In this mode petrol map is continuously collected even when petrol map buffer is full.
- **Erase petrol map** –This button enables to erase petrol map.
- **Erase button lock**– This mode protects petrol map from accidental erasing by clicking „Erase petrol map“ button.

2.4.3. Gas map

- **Gas map continuous mode** -In this mode gas map is continuously collected even when gas map buffer is full.
- **Erase petrol map** –This button allows to erase gas map.

2.4.4. Adjustments

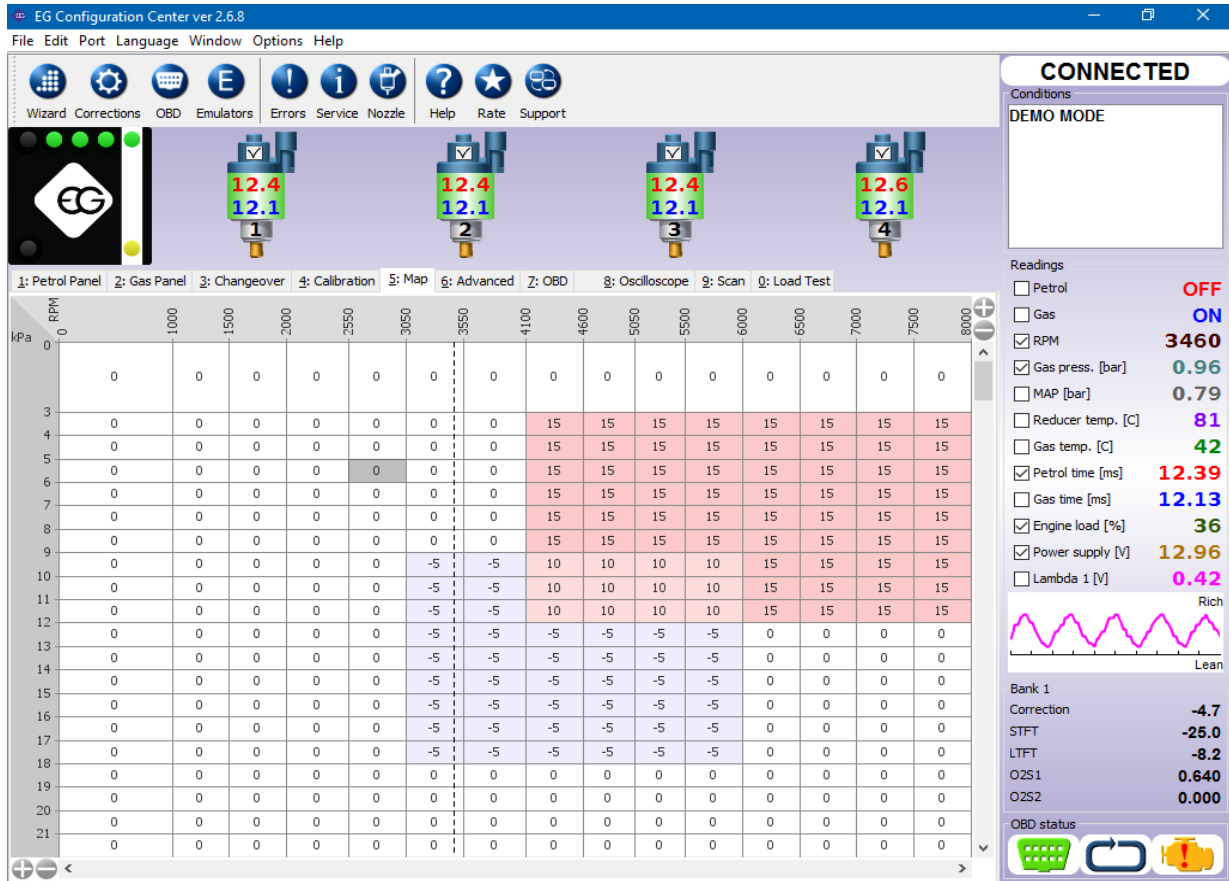
- **Calculate adjustments** -Calculates multiplier correction based on the petrol and gas maps deviation.
- **Erase adjustments** –This button enables to clear all the multiplier adjustments. (Restores the value of 1.0 for all points of the line multiplier).

2.4.5. Autoadaptation

- **Autoadaptation** -Makes possible to enable (ON) or disable (OFF) the autoadaptation feature. Autoadaptation calculates multiplier adjustments in case if petrol and gas maps are getting more distant from each other during the drive.
- **Max. change** –Defines the value of maximum change of each multiplier point during autoadaptation step.
- **Period [min]** -Defines length of time interval after which the software will do another multiplier adjustments calculation.
-



2.5. RPM Map



In this bookmark it is possible to adjust the composition of air/fuel mixture in specific ranges of petrol injection opening time <0...27 ms> depending on RPM level <0...8000 RPM>. These thresholds may be adjusted by clicking and dragging the line section at the height of the *ms* or *RPM* label.

Thanks to that map we can adjust mixture by shortening or elongating the gas injectors opening time in range from -50% up to +50%. RPM value on the map can be changed by drag and drop.

Editing of the cells on the map can be done in following way:

- By clicking and holding left mouse button we are marking the area on which we would like to enter the desired percentage correction of gas injectors opening time.
- By clicking on any of cells in area marked by us with right mouse button.
- Pop-up menu will show up, with following list of options available to apply to selected cells:
 - **"Clear all"** -Sets cells to the 0 value.
 - **"Increase 1%"** -Increases cell value by 1%.
 - **"Increase 5%"** -Increases cell value by 5%.
 - **"Increases 5 %"** -Decreases cell value by 5%.



-**"Decrease 5%"** -Decreases cell value by 5%.

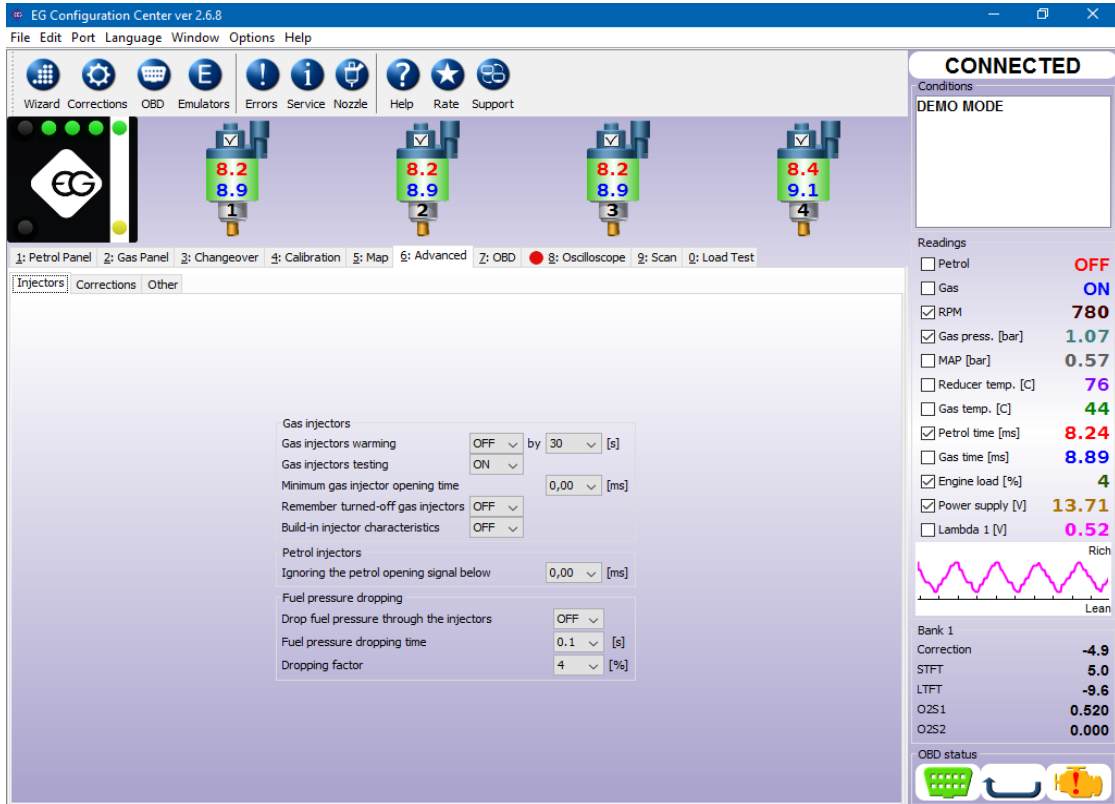
After selecting cells on the map it is also possible to modify their value on active map area with usage of following numerical keys:

- **"Page Up"** –Increases value by 5%.
- **"Page Down"** –Decreases value by 5%.
- **"+"** -Increases value by 1%.
- **"-"** -Decreases value by 1%.



2.6. Advanced

2.6.1. Injectors



2.6.1.1. Gas injectors

- **Gas injectors warming up** –If we will enable this feature by setting to ON we can set period of time for which the gas injectors coils should be electrically preheated, before first changeover to gas, by single pulses from ECU (properly shortened so they won't cause opening of injector) before first changeover to gas. Function works if the reducer temperature is not higher than "*Hot engine temperature*".
- **Gas injectors testing** –When this feature is enabled controller is checking the continuity of ECU and gas injector circuit. When the harness plug will loose contact or the coil will get damaged the system will automatically go back to petrol and signalize the error e.g. "*Gas injector 1 not connected*".
- **Minimum injector opening time** –This parameter forces the gas injectors be opened for opening time period not shorter that set value. If calculated injection opening time would be shorter than this value, the injectors are going to be opened for defined amount of time.
- **Remember off state gas injectors** –When this function is on software remembers turned off gas injectors during every next engine start.
- **Built-in injectors characteristic** –This function introduces the predefined



characteristics of selected gas injectors which, in case of proper components selection and assembling, eliminates necessity of doing multiplier corrections calculation.

2.6.1.2. Petrol injectors

- **Ignoring the petrol opening signal below** –This parameter sets the minimum threshold below which the petrol injectors opening time will be not read and not converted to gas injection opening time. This option should be enabled when petrol injection controller generates very short pulses on petrol injectors (from 0,3 [ms] up to 1,1 [ms]), which normally doesn't cause dosage of petrol fuel but after summation with all controllers corrections (e.g. additive, multiplier and map correction etc.) might cause unwanted gas injection. Default value "0.0" means that every pulse from petrol injector will be moved onto gas injectors.

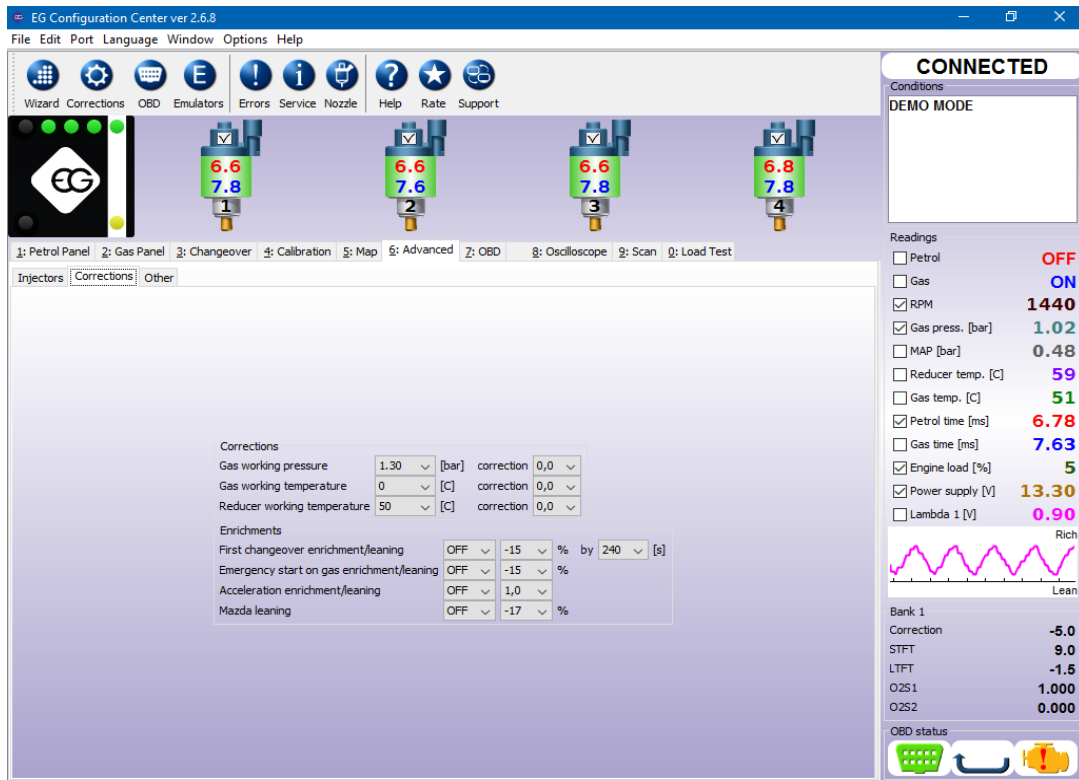
Attention: We shouldn't use that function unless that petrol injectors short pulses causes performance problems during driving on gas.

- **Dropping the fuel pressure** - controller sequentially switches the cylinders of gas supply to power gasoline so that the pressure on the fuel rail remained constant. We set the pressure at idle on petrol by OBD , switch on the gas , and so we set % of fuel that the pressure does not grow while working on gas. The time we set the drop so that did not feel like fuel switching .



2.6.2. Corrections

2.6.2.1. Corrections



- **Gas working pressure** –Stored value of gas pressure during last autocalibration on idle. Correction will be applied to calculated gas injection times when the pressure will increase above or decrease below this value
- **Gas working temperature** –Correction will be applied to calculated gas injection times when the gas temperature will increase above or decrease below this value
- **Reducer working temperature** –Correction will be applied to calculated gas injection times when the reducer's temperature will increase above or decrease below this value

2.6.2.2. Enrichment

- **First changeover enrichment/leaning** -Enables to enrich or lean the mixture after first changeover (on cold engine). After activating this feature it is possible to lean/enrich the mixture once after first changeover from petrol to gas. After first changeover to gas the gas injection opening time will be elongated/shortened by selected enrichment level (in %). During desired enrichment time (in sec.) the enrichment/leaning value will be decreasing/increasing down to 0%.

Attention: Function works when the reducer temperature is lower than “*Hot engine temp.*” and only after first changeover to gas from the moment of engine start.



- **Emergency start on gas enrichment/leaning** –Enables to additionally enrich or lean the mixture after emergency start on gas.
- **Acceleration enrichment/leaning** –Turn on/off extra enrichment of gas mixture only during rapid accelerations. We can define how much the mixture will be enriched during rapid acceleration by increasing value of "*Strength of extra enrichment*". As higher the that value is, as more powerful and longer the enrichment will be.
- **Mazda leaning** –Automatically detects change of petrol injection strategy from sequential to semi-sequential and it's shortening gas injection time according to Mazda leaning percentage [%] value during all the period of work in semi-sequential mode.

2.6.3. Other

The screenshot displays the EG Configuration Center software interface. The main window shows four injectors with their respective settings: Injector 1 (8.2, 9.2), Injector 2 (8.2, 9.2), Injector 3 (8.2, 9.2), and Injector 4 (8.4, 9.5). The interface includes a menu bar (File, Edit, Port, Language, Window, Options, Help) and a toolbar with icons for Wizard, Corrections, OBD, Emulators, Errors, Service, Nozzle, Help, Rate, and Support. The main area is divided into sections for Injectors, Corrections, and Other. The 'Other' section contains various settings such as Cut-off, Hot start, Emergency start, Start and Stop, and Petrol extra injection. The right sidebar shows a 'CONNECTED' status, 'Conditions' (DEMO MODE), and a list of Readings including RPM (2790), Gas press. (0.90), MAP (0.59), Reducer temp. (53), Gas temp. (44), Petrol time (8.21), Gas time (9.18), Engine load (14), Power supply (12.06), and Lambda 1 (0.52). A graph at the bottom of the sidebar shows a fluctuating signal between Rich and Lean. The bottom right corner features an 'OBD status' section with icons for a shopping cart, a refresh button, and a warning icon.



2.6.3.1. Cut-off

- **Leaning after Cut-off** –This function helps in reducing the gas pressure overgrowth effect.
- **Cut-off pressure** –Defines the value of threshold above which gas pressure is considered as too high and mixture leaning process will be activated.
- **Leaning cycles** –Use of this feature can lean the mixture when gas pressure would exceed "*Cut-off pressure*" for defined amount of subsequent gas injection cycles which length shall be reduced.
- **Leaning range** –Percentage of reducing gas injection opening time when gas pressure would exceed "*Cut-off pressure*" value.

2.6.3.2. Hot start

- **Hot start enabled** –Activates Hot Start function. When engine is hot the car starts directly on gas (without usage of petrol).
- **Hot engine temperature** –Defines temperature threshold of reducer temperature above which hot start is possible.
- **Hot start enrichment** –Activates function of enrichment/leaning during hot start. Function increases or reduces gas injection opening time for short time period after hot start.
- **Hot start enrichment level** –Defines percentage value of shortening / elongating gas injection opening time when hot start enrichment works <-50% ... +50%>.

2.6.3.3. Emergency start

- **Remember start on gas** –Remembers the state of emergency start on gas and repeats it without need of holding switch button pressed during every next engine start.

2.6.3.4. Start and Stop

- **Start and Stop system** –Function which should be activated for a regular continuous work on gas for vehicles equipped with Start and Stop system.

2.6.3.5. Petrol extra injection

- **Protection of valve seats** – Adds small amount of gasoline during gas injection, in order to protect the valve seats and valves. Gasoline injectors will be opened for 3.5 ms every time when RPM will exceed 3500 and gasoline injection will be longer than 8 ms. Gas injection time will be shortened accordingly to keep the stoichiometric mixture ratio.
- **Compensate weak reducer** – function can be use as temporary solution when reducer or injectors are getting close to their efficiency limit. Gasoline injectors will



be opened for 3.5 ms every time when RPM will exceed 3500 and gasoline injection will be longer than 8 ms. Gas injection time will not be shortened so the mixture will be more rich. When this feature is active we should adjust the multiplier lines above 8 ms so that the air-fuel mixture ratio when extra injection is active will be correct.

- **Others** -User can determine at what working conditions gasoline extra injection should be present. By enabling function "Don't shorten gas injection time" we can compensate weak regulator or weak injectors in the higher range of engine loads.

2.6.3.6. Switch function

- **Long switch button function** –Additional function which can be activated by long pressing (5 sec.) of switch button. Following functions can be assigned:
 - **calculate multiplier** -Calculates multiplier basing on deviation of both collected maps.
 - **system tuning** -Starts autocalibration process, erases petrol and gas maps, calculates multiplier after recollecting 100% of both maps. Then it enables autoadaptation process.
 - **none** –No action is assigned to this function.

2.6.3.7. Fuel pump

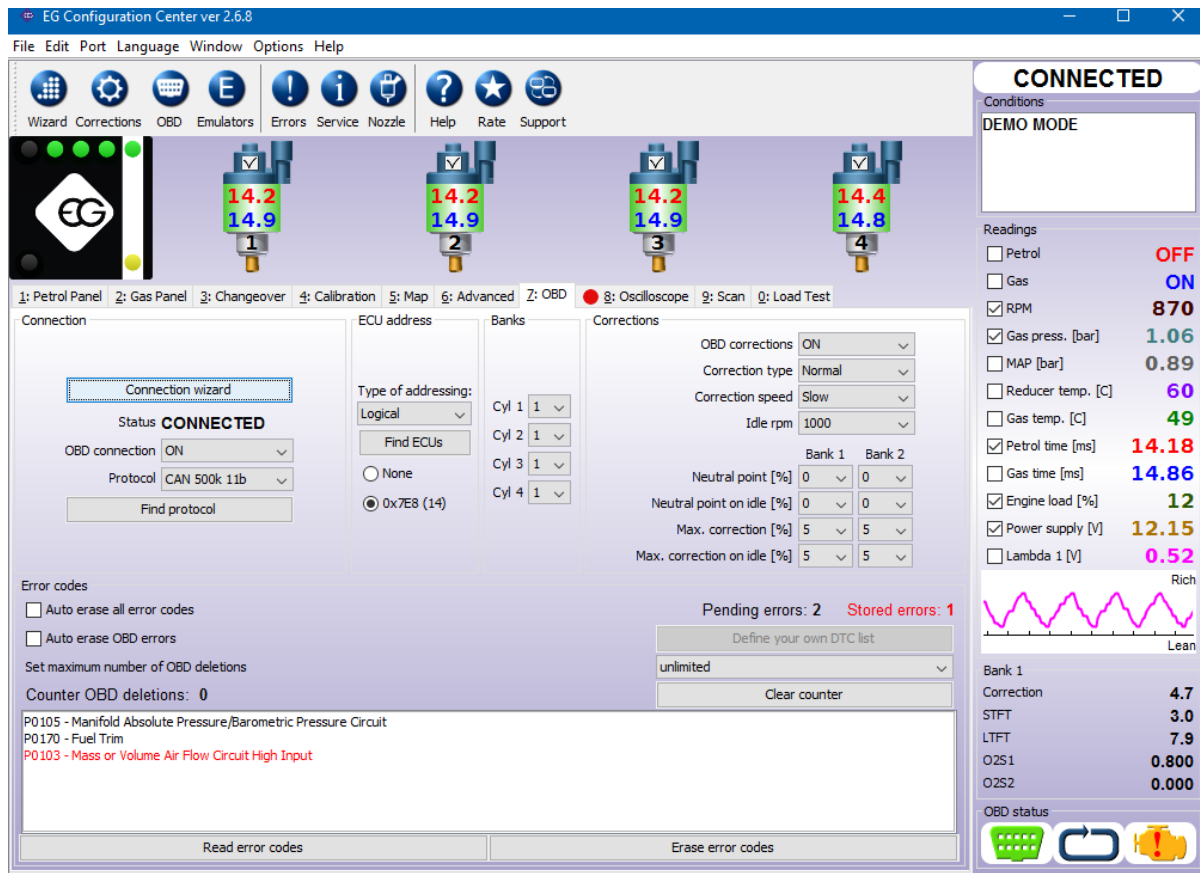
- **Fuel pump state** –Defines how the fuel pump deactivation works. Following methods are available:
 - **Always ON** –Fuel pump always works on both fuels,
 - **Always OFF** -Fuel pump is always disconnected and doesn't work on both fuels,
 - **Delay OFF** –Fuel pump becomes disconnected after programmed time delay.
- **Switch-off delay** -Programmable time delay after which fuel pump becomes disconnected. It is being counted from the moment of turning on all gas injectors.

Attention: Disconnecting the fuel pump must be done in accordance with the wiring diagram.



2.7. OBD

2.7.1. Connection



It is strongly recommended to click on the “**Connection Wizard**” button to establish connection with OBD smoothly. Connection Wizard is a tutorial which helpful in carrying out all the necessary actions needed to have connection with petrol ECU (eg. initialize connection, find OBD protocol, get ECU address, select PIDs to be read by gas ECU).

We can also perform all mentioned tasks manually using buttons located on the top-left side of OBD bookmark.

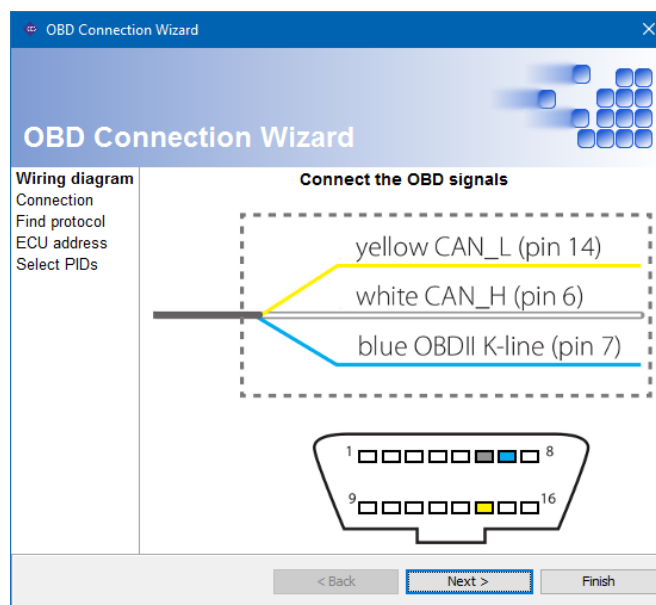
- **OBD connection wizard** -Starts tutorial which guides user step by step through the OBD configuration process.
- **OBD status** -Shows the current status of the connection to the OBD system.
- **OBD connection** – Makes available to set OBD connection to *OFF*, *ON* or *AUTO* (when car is started on Petrol Mode, the gas ECU is automatically releasing OBD line).
- **Protocols** -Enables to select type of protocol in accordance with connection made. There are following protocols available one the list:

-K-line protocols: ISO14230/KWP-2000 SLOW; ISO14230/KWP-2000 FAST; ISO9141; ISO9141-2.



-*OBD CAN protocols*: CAN-250kb-11bit; CAN-250kb-29bit; CAN-500kb-11bit; CAN-500kb-29bit.

- **Find protocols**-Searches automatically for type of OBD protocol supported by a car.
- **Type of addressing** –Select the correct type of addressing used in car: *logical* or *physical*.
- **Find ECUs** – Automatically searches for all available ECUs. Search results are displayed below along with ECUs addresses. The numbers in parentheses indicate the number of processes in the ECU at the moment. When there is more than one ECU we should try to select the ECU with the greatest number of processes.



Attention:

Frequency of refreshing the OBD parameters values is depending on amount of parameters selected for reading. When we want to use OBD corrections it is recommended to leave only Long Time Fuel Trims 1 [%] (and Long Time Fuel Trims 2 [%] in case of having 2 banks) parameter selected for quicker update of these parameters.

2.7.2. Error codes

- **Read error codes** -Reads Stored and Pending error codes from the OBD with the description of each code.
- **Erase error codes** -Erases stored error codes from the OBD. In some particular cases for successful erasing of OBD error codes we need to do it when the engine is off, and +12V from the key is being given to the controller (ACC position of the key).



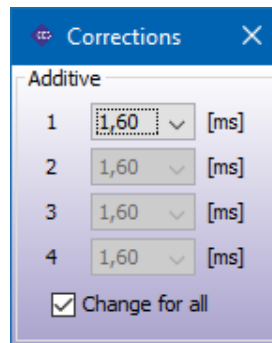
- **Auto erase fuel trim error codes** -Erase fuel trim error codes each time before starting the engine.
- **Auto erase all error codes** -Erase all error codes each time before starting the engine.

Attention: Enabling options "Auto erase fuel trim error codes" and "Auto erase all error codes" may cause engine damage. Turn this option on at your own risk.

2.7.3. Banks

Banks -The concept of banks is referring to "V" type engines. Cylinder marked as no. 1 should be always in bank no. 1. "V" type engines should always have one side assigned to bank no. 1 (cylinders with numbers from 1 to 3 in V6 engines or from 1 to 4 in V8 engines) and another side to bank no. 2 (cylinders with numbers from 4 to 6 in V6 engines or from 5 to 8 in V8 engines). To assign cylinders , start the engine and wait until the ECU connects to the OBD . The engine should work at idle and then perform the following procedure for all cylinders starting at 1 :

- in the " **Corrections** " disable "**change for all**" and doubling the corrections for the first cylinders
- to observe which of the two " Banks " STFT They go in the direction of the rich
- after finding why the " Banks " change STFT assign the injector to the corresponding " Bank "
- we change the correction value to the initial and repeat the entire procedure for all cylinders



2.7.4. Corrections

System reads the *Long Time Fuel Trim (LTFT)* values from vehicle's OBD and dynamically changes the amount of gas injected in a way which helps the LTFT to oscillate close to expected car's manufacturers default value (so called *Neutral point*). It is possible to set different neutral points for idling and higher revs conditions.

In example: if LTFT value keeps going in positive direction (increasing), it means that mixture is too lean and gas ECU is increasing the gas injection opening time to enrich the



mixture. Finally the LTFT are going in negative direction (decreasing). The introduced OBD corrections comes back to 0 value when when LTFT value is reaching *Neutral Point*.

- **OBD corrections** – Makes possible to enable (*ON*) or disable (*OFF*) the OBD corrections feature.
- **Correction type** -Set proper corrections type:
 - **Normal** -When air-fuel mixture goes lean the LTFT correction value increases,
 - **Reverse** -When air-fuel mixture goes lean the LTFT correction value decreases,
 - **Fiat** -For specific corrections used in Fiat brand vehicles.
- **Correction speed** -Speed of introduced OBD correction should be chosen adequately to speed of vehicle LTFT changes. We can set this parameter to *Slow* or *Fast* value.
- **Idle RPM** –Defines idling threshold above which vehicle's OBD changes its target LTFT neutral point.
- **Neutral point [%]** -Default vehicle's OBD value of LTFT parameter when engine is working on petrol in closed loop mode.
- **Neutral point on idle [%]** -Default vehicle's OBD value of LTFT parameter when engine is working on idle revolutions on petrol in closed loop mode.
- **Max. correction [%]** -Defines the limit of maximum OBD correction that can be introduced into gas injectors opening time.
- **Max. correction on idle [%]** -Defines the limit of maximum OBD correction that can be introduced into gas injectors opening time on idling.

Actual value of calculated OBD correction should be checked from time to time. Too big value of that correction mean that some mechanical part might be worn out and we should make some mechanical adjustments to some parts of sequential gas injection system.



2.8. Oscilloscope



Oscilloscope shows run of selected ECU signals. On the right side of main window we can select (by marking a tick) which ECU signals we would like to see on oscilloscope run. We can also visualize required OBD readouts by selecting them from OBD icon located on the left side of the Toolbar.

On the bottom right side of oscilloscope window we can find buttons to: change the units displayed on the right vertical axis (**C, kPa, V, RPM, ms** etc.).

On the bottom part of oscilloscope bookmark there are following buttons available (starting from the left side):

- **Record** -Starts recording and displaying selected signal values.
- **Preview** -Enables to preview and displays values of recorded signals in time moment selected by cursor.
- **Replay** -Plays recorded oscilloscope run in real time from the time moment selected by cursor.
- **Stop** -Stops recording and displaying oscilloscope run. We can rewind and check value of recorded signals anytime.
- **New** -Clears all recorded or loaded oscilloscope data from the screen.
- **Open from file** -Loads the oscilloscope run from "osc" file for preview.
- **Save to file** -Saves recorded oscilloscope run to "osc" file for further use.



2.9. Scan



Petrol and gas injection oscilloscope scanner is a tool useful for diagnostic purposes. With use of this scanner it is possible check: the order of the injection sequence, injectors overlapping occurrence, presence of shorts injection pre-pulses etc.

To perform scanning procedure please click "**Scan (F4)**" button while being in *Scan* bookmark or press **F4 key** anytime from any bookmark in the software.

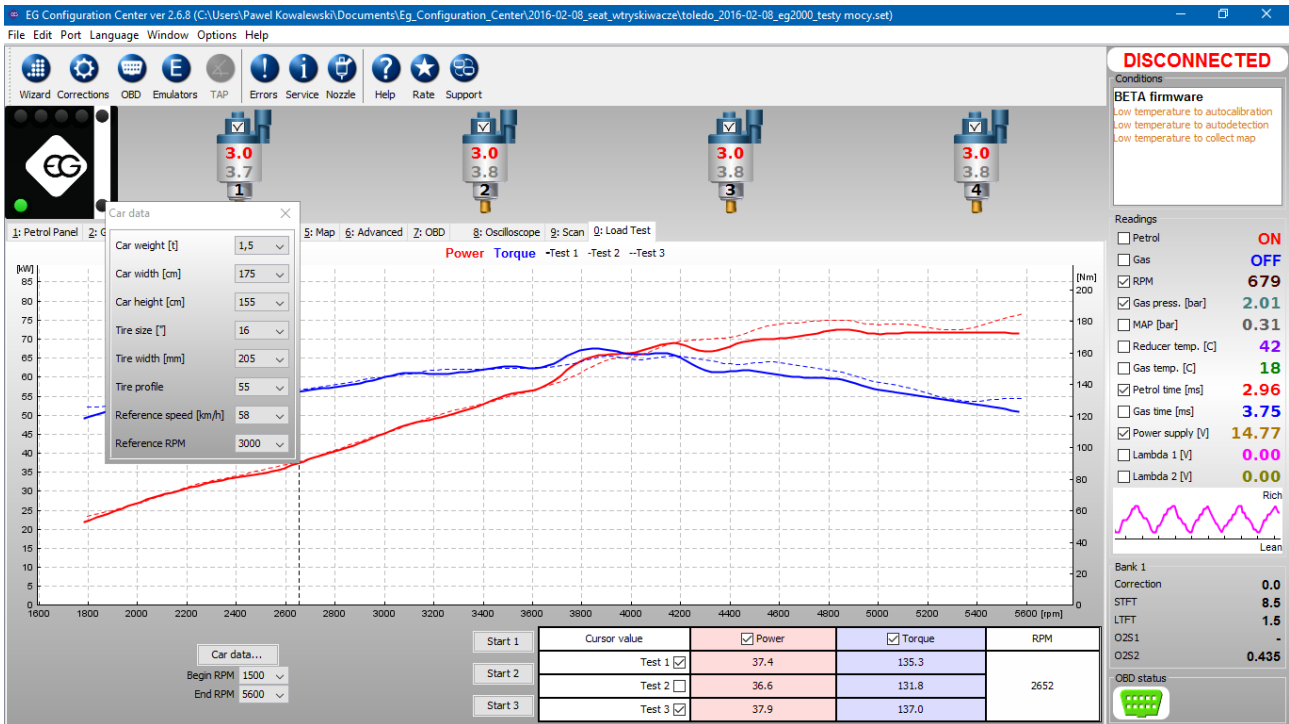
Screenshot with actual waveform from all injectors injection signals will appear on the screen. The red waveform refers to petrol injection and the blue waveform refers to gas injection on each cylinder.

2.10. Load test

Implemented Load Test module allows to measure the power and torque of the vehicle's engine during test drive.

All power and torque measurements, which are going to be compared between each other, needs to be done on the flat, straight road in the same driving conditions.

First we need to open "**Car data**" window and enter all the vehicles parameters. If any parameters will be not corresponding to the real data the result of the measurements also won't be reliable.



We should select gear 3rd and accelerate to speed which should be entered as **"Reference speed [km/h]"** and keep that speed constant. The engine RPM level reached while we are maintaining that speed should be entered as **"Reference RPM"**. After fixing this values we can lower the speed.

In **"Begin RPM"** field we should enter RPM value from which measurement will be started. In **"End RPM"** field we should select RPM value, after exceeding which, measurement will be finished.

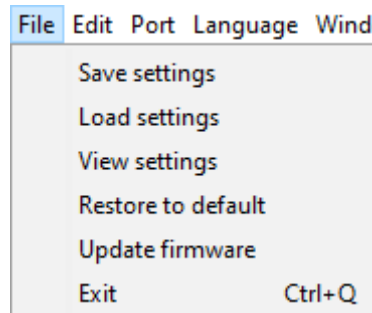
The measurement should be made on the same gear on which "Reference RPM" has been set (gear 3rd is recommended).

The RPM value in the moment of starting the measurement should be lower than "Begin RPM" value. We are starting the measurement by pressing **"Start 1"** button. We have to press the acceleration pedal to the maximum and hold it until we exceed "End RPM" value. The testing procedure will end automatically and the results will be displayed on the chart. By moving the cursor horizontally on the chart we can read and compare the values between each measurement results.

It is possible to save and hold in the ECU memory results of three measurements.



2.11. Main menu bar



2.11.1. File

- **Save settings** –Saves ECU settings to file.
- **Load settings** -Loads settings from saved file to ECU.
- **View settings** -Enabling to preview previously saved settings.
- **Restore to default** -Restores default manufacturer's settings.
- **Firmware update** -Updates firmware of gas ECU.
- **TAP -update firmware** –Updates firmware of Timing Advance Processor module (if present).
- **Exit** –Ends work with software.

2.11.2. Edit

- **Undo** –Cancels last action which has been done in the software. It is possible to undo up to last 20 actions made.
- **Redo** –Repeats last action made which has been undone in the software.

2.11.3. Language

This option allows to change displayed software's language.

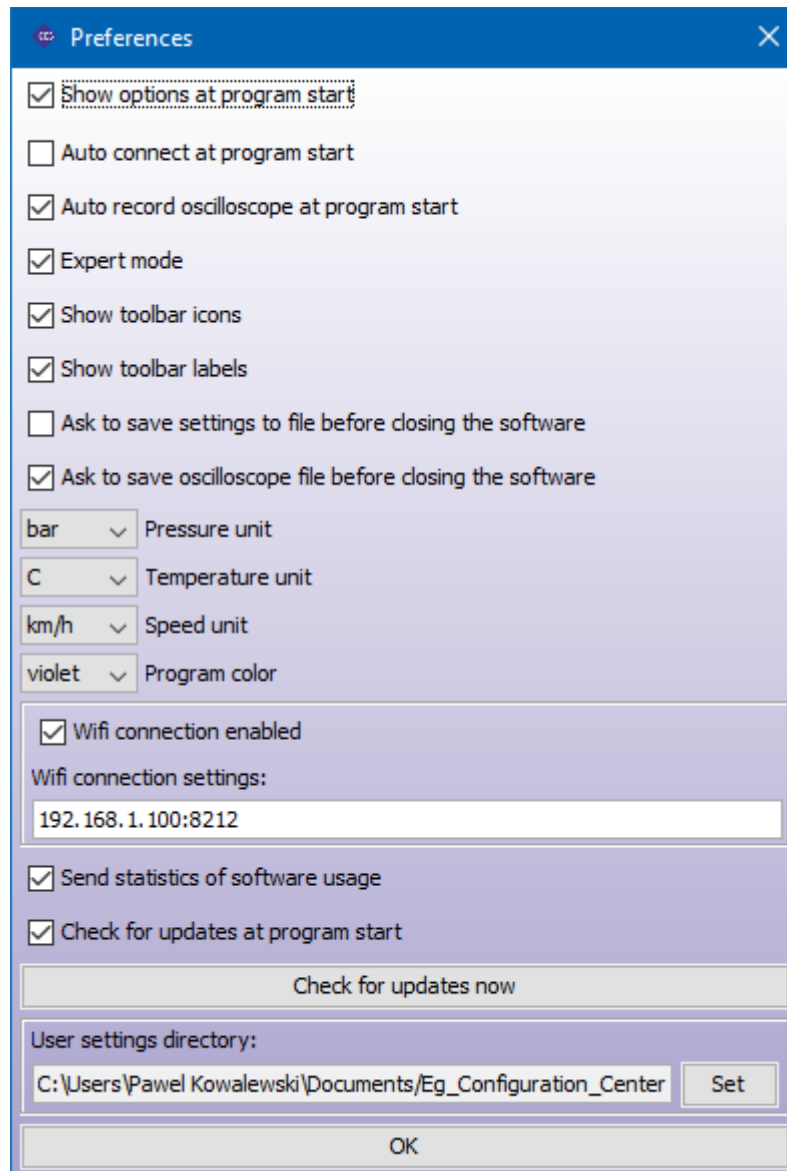
2.11.4. Window

Enables to select following features from the list instead of using the Toolbar: Wizard, Corrections, OBD, Emulators, TAP, Errors, Service, Nozzle.

2.11.5. Options

Here we can define our preferences regarding software behavior and appearance.

- **Show options at program start** -During each start of the software shows window with Mode selection and Autoconnect option.



- **Auto connect at program start** – Defines if program should establish connection with gas ECU automatically during every software start or not.
- **Auto record oscilloscope at program start** -Software automatically starts recording Oscilloscope signals during every start.
- **Show toolbar icons** –Toolbar icons can be visible or hidden.
- **Show toolbar labels** –Toolbar labels can be visible or hidden.
- **Pressure unit** -Type of pressure units displayed in the software: KPa, bar or psi.
- **Temperature unit** -Type of temperature units displayed in the software: Celsius or Fahrenheit.
- **Speed unit** -Type of speed units displayed in the software: kilometers per hour or miles per hour.
- **Expert mode** -Software is showing its all Extra-Advanced features.
- **Program color** -Changes main program window colour and layout.
- **WiFi connection enabled** -Allows to establish connection via dedicated WiFi diagnostic interface and displays connection settings.
- **Check for updates at program start** -Software is automatically checking



available updates during every start (active Internet connection required).

- **Send statistics of software usage** –Allows to send the anonymous statistic to the manufacturer for product development purposes.
- **Check for updates now** -Forces software to automatically check available updates (active Internet connection required).
- **User settings directory** -Defines path for keeping saved files.

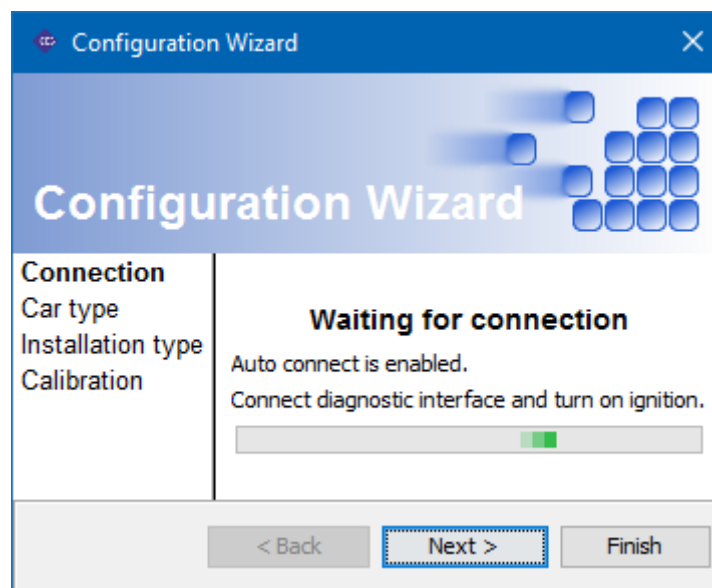
2.11.6. Help

- **Documentation** -Opens folder with user manual and wiring diagrams.
- **Shortcuts** -Shows list of available keyboard shortcuts.
- **Rate software** -Gives possibility to rate the software and send the issued assessment to manufacturer.
- **About us** -Shows information with manufacturer's contact data.

2.11.7. Toolbar



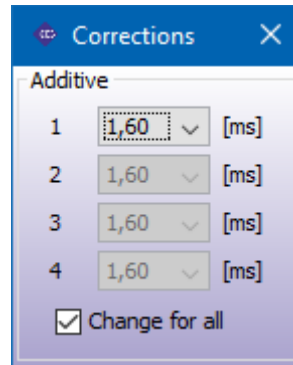
2.11.8. Wizard



Starts Configuration Wizard. It's a tutorial helpful in carrying out all the necessary actions needed for quick configuration of freshly installed system.



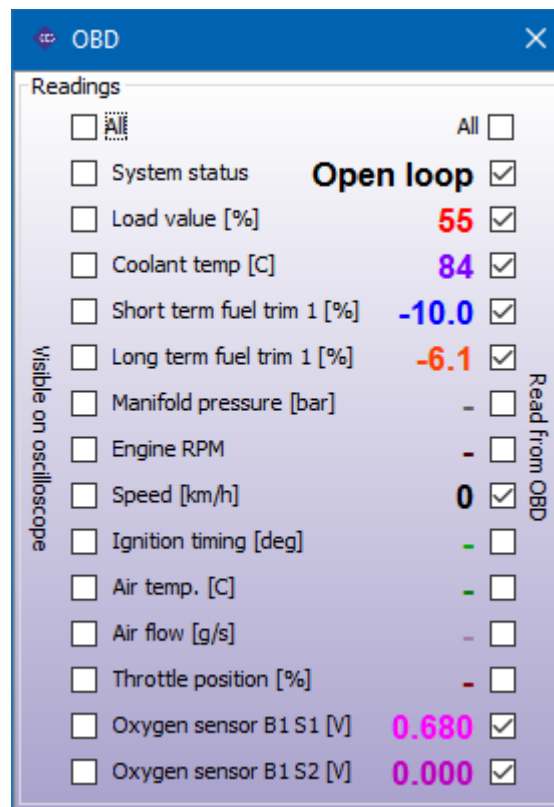
2.11.9. Corrections



Shows additive corrections window. Value of this correction [ms] is being added to petrol injection opening time when car is on gas. That value is being set by software automatically during autocalibration process.

When “**Common correction**” is ON then by modifying Correction #1 we can change that value for all remaining cylinders.

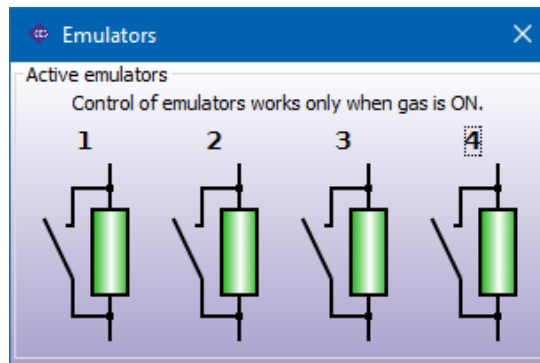
2.11.10. OBD



Shows window containing all available OBD readings and enables to choose the parameters for be read from OBD and to be visualized on the oscilloscope run.

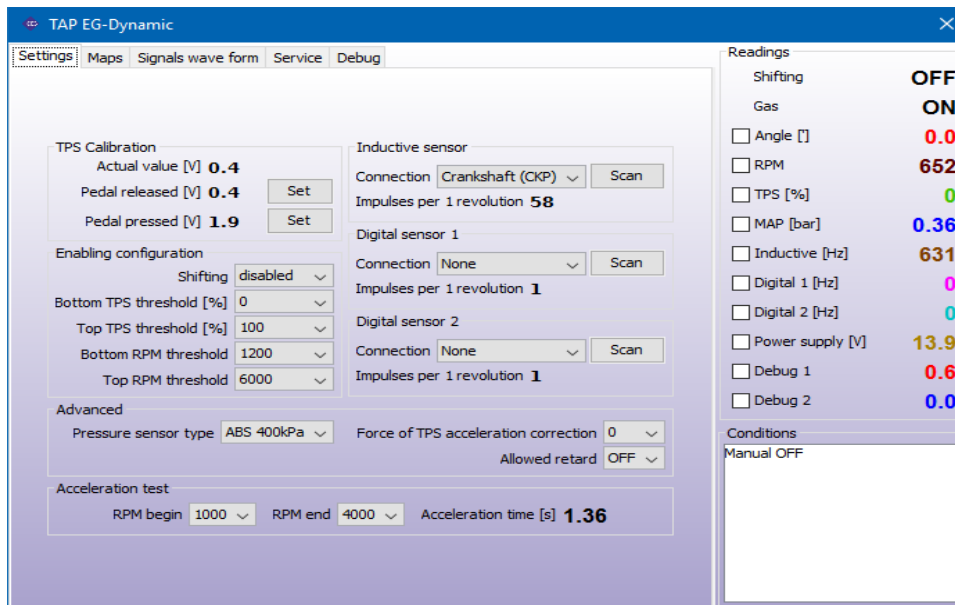


2.11.11. Emulators



Shows petrol injectors emulators diagnostic window. It is possible to close and open petrol injection emulation circuit for diagnostic purposes.

2.11.12. TAP



Shows interface and bookmarks related to configuration of built-in EG Dynamic Timing Advance Processor module.

To correct configuration we need to properly diagnose and connect the crankshaft position sensor and the camshaft position sensor (if present), are located. First, we set the sensor type:

- if the connector have two pins, it is an **inductive sensor type** (resistance value for a typical inductive sensor is approximately 1 kOhm)
- if connector has three-pins, it can be **inductive sensor type**(two pins sensor, the third pin ground. The resistance between the two pins of the sensor is approximately 1 kOhm, and the third pin from the ECU is connected to the ground)
- if connector has three-pins, it can be **digital sensor type** (ground, power supply, signal). One pin from the ECU is connected to ground, the other is power "+12V from the ignition key", the third one is a signal cable)



2.11.12.1. Description of signal connections

TPS signal:

Signal of Throttle position sensor or acceleration pedal sensor. Connecting that signal is required for proper calibration and detection of idle and cut-off conditions. TPS signal wire is the one on which voltage (regarding the ground) changes its value fluently (eg. from 0 to 5V) when we are pressing on the accelerator pedal when vehicle's ignition key is on.

Crankshaft position sensor signals:

Main and most important signal to connect is the crankshaft position sensor signal. Camshaft position sensor signal don't have to be connected if it is not necessary to do so. This kind of necessity might happen when the original ECM of the car is report errors related with not synchronizing the camshaft position signal while advancing the signal from crankshaft position sensor. At first we should identify the type of sensor. Inductive sensor -usually it has pins which goes to two lines covered by a screen. Resistance measured between these two lines is around 1000 Ohm. If there are three pins, two of them are connected to signal lines and third one is connected with screen which is the ground signal of vehicle's ECU.

Hint if possible we should find the place to cut into signal wires at where additional cover/screen insulation of signal wires is not present. First we should identify two signal wires, cut them and make serial connection by connecting proper pairs of wires from TAP device.

There are four wires used to cut into vehicle's inductive signal wires: yellow and white -channel A, green and brown -channel B. We should start with cutting only one signal wire at a time (let's name it 'signal wire A') and connect first pair of inductive signal wires from TAP device:

- yellow wire -should be connected with vehicle's inductive signal wire A input going from the inductive sensor
- white wire -should be connected with vehicle's inductive signal wire A output going to the petrol ECU Then we proceed with cutting second signal wire (let's name it 'signal wire B') and connect remaining pair of inductive signal wires from TAP device:
- green wire -should be connected with vehicle's inductive signal wire B input going from the inductive sensor
- brown wire -should be connected with vehicle's inductive signal wire B output going to the petrol ECU

Attention: If above connections will be made improperly we may be be not possible to start the vehicle.

Camshaft position sensor:

Digital sensor. Usually that kind of sensor have three lines signal, ground, power supply: +5V or +12V signal. We should cut only the signal wire and connect it serial to digital channel pair of wires.



Hint: The original wire of signal input from digital sensor should be always connected to the color wire with black stripe (blue- black or yellow-black color). The adequate color wire without stripe should always be connected to that part of original vehicle's sensor signal wire which goes to the petrol ECU (blue or yellow color). Otherwise it might cause problem with engine work

2.11.12.2. Readings

On the right panel we have actual value of all TAP working parameters:

- **Shifting** –This value is informing if the impulses are being advanced or delayed (ON) or not (OFF) at the present moment.
- **Gas** –This value is signaling on what fuel the car the car is actually running: on gas (ON) or petrol (OFF).
- **Angle [`]** -Angle value (in degrees) by which the current revolutions signal is being shifted.
- **RPM** –Rotary engine speed value.
- **TPS [%]** –Position of throttle position or accelerator pedal.
- **MAP [kPa]** –Actual value of the absolute pressure in the intake manifold.
- **Inductive [Hz]** -Current frequency of pulses for a signal from the inductive sensor.
- **Digital 1 [Hz]** -Current frequency of pulses for a digital sensor signal no. 1
- **Digital 2 [Hz]** -Current frequency of pulses for a digital sensor signal no. 2
- **Power supply [V]** -Power supply value. This value shouldn't be lower than 9V and not higher than 15V.

Conditions window located on the bottom right side of TAP window shows if any of TAP parameters is out of allowed working range or some signal is not read properly. It determines if ignition signal shifting can be done or not. E.g. we will receive proper message when the car is not in gas mode or the TPS signal is below minimum value programmed to start ignition shifting.

2.11.12.3. Settings

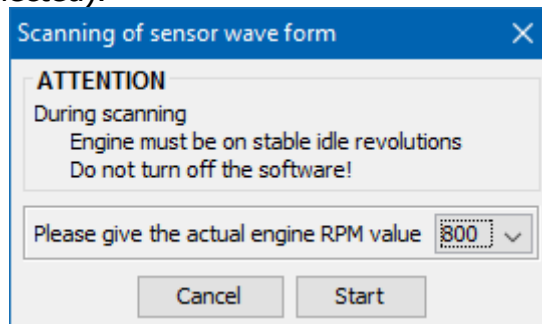
- **TPS Calibration** -Calibration of the minimum and maximum TPS input voltages for fully released and for maximally pressed accelerator pedal.
- **Enabling configuration** -Defines ranges in which TPS and RPM actual values must be inside with in order to shift ignition signal. Shifting can be set to: *automatic (default value), always enabled or always disabled.*
- **Advanced**
 - **Pressure sensor type** -Selects the type MAP sensor connected (default value is *ABS400kPa*).
 - **TPS acceleration correction** -The choice of TPS signal changes sensitivity. It's helpful in cases at which original ignition signal angle temporary increases significantly when accelerating. This allows to temporary increase the angle of signal shifting by extra value for the rapid accelerations to compensate this signal change. It works only when RPM value is less than 1500 RPM.



Attention: Default value of this parameter is "0". It is not recommended to increase value of that parameter if it is not necessary.

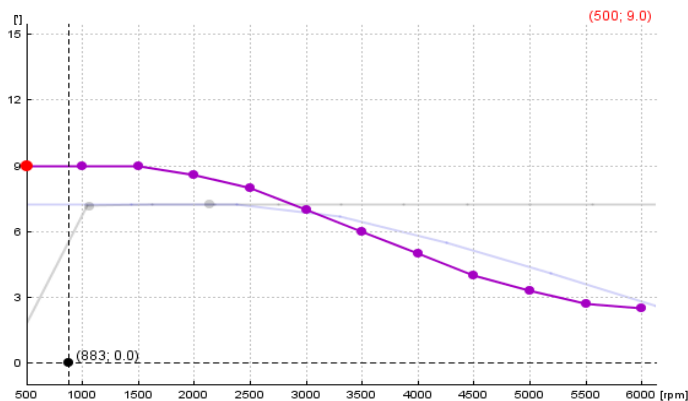
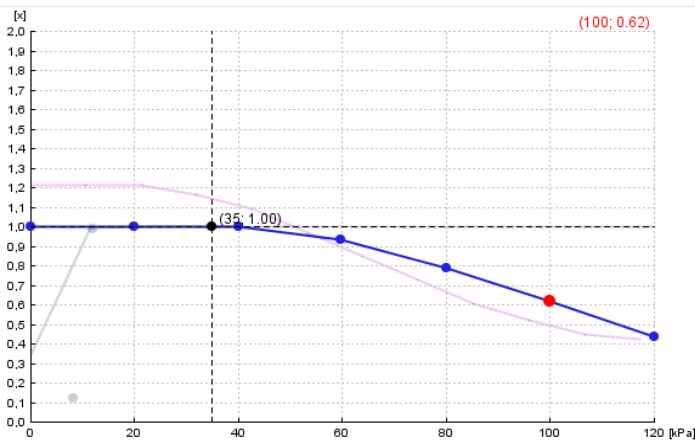
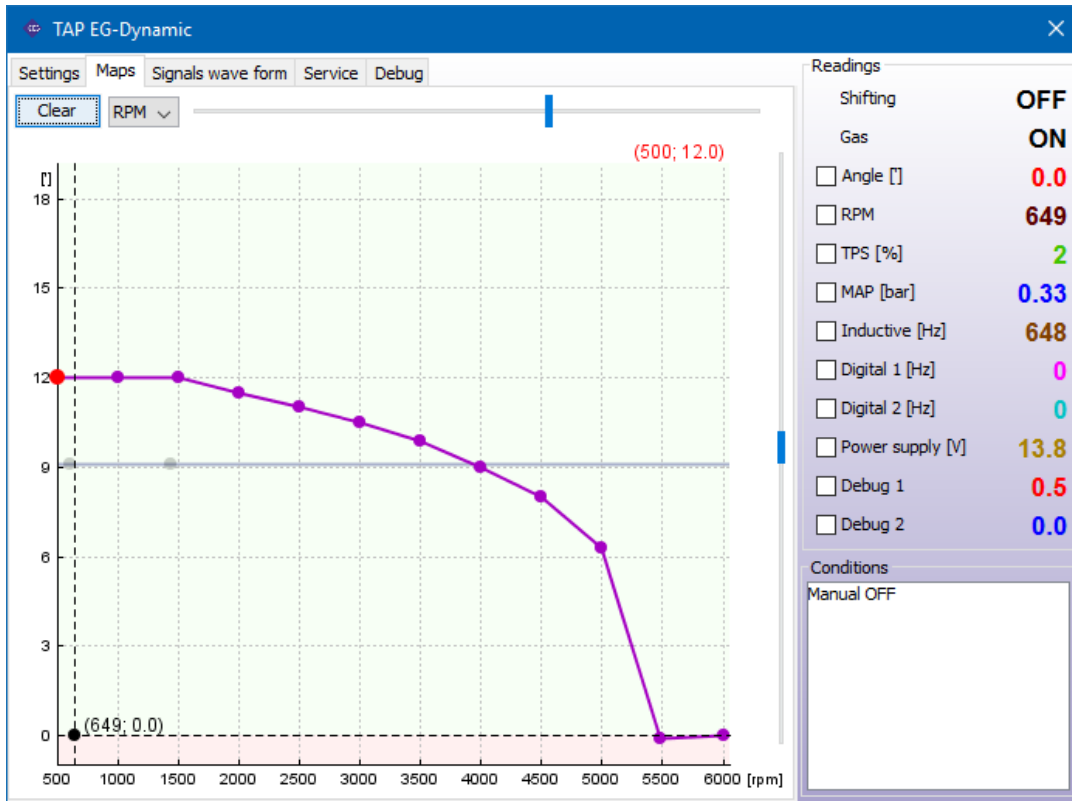
- **Allowed retard** –Allows shifting signal to have negative value. The ignition will be retarded instead of advanced. Default setting is OFF. Use this option only for conversion of CNG dedicated vehicles to LPG. Otherwise the vehicle engine may get damaged.
- **Acceleration test** -Automatically measures **Acceleration time [s]**. This time period is measured from the moment of reaching **RPM begin** value to the moment of reaching **RPM end** value.
- **Inductive sensor, Digital sensor 1, Digital sensor 2**
 - **Connections** -Type of sensor to which signal input has been connected.
 - **Impulses per 1 revolution** -Number of pulses per revolution detected during a scan run (control value).
 - **Scan** –Starts automatic scanning of the sensor signal wave. Should be carried out under stable conditions when the engine is running on idle. It is necessary to provide the actual value of engine rotary speed before starting scanning.

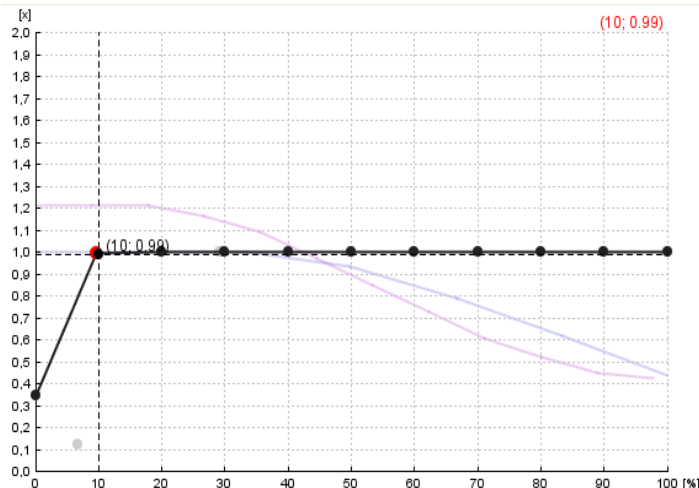
Attention: It is very important to always start scanning from the crankshaft sensor signal, and proceed to scanning of the camshaft sensors signals (if they have been connected).





2.11.12.4. Maps





Multiplier Correction (eg. 1.0 is 100%, 0.6 is 60% of original shifting offset) of the angle regarding the TPS signal value.

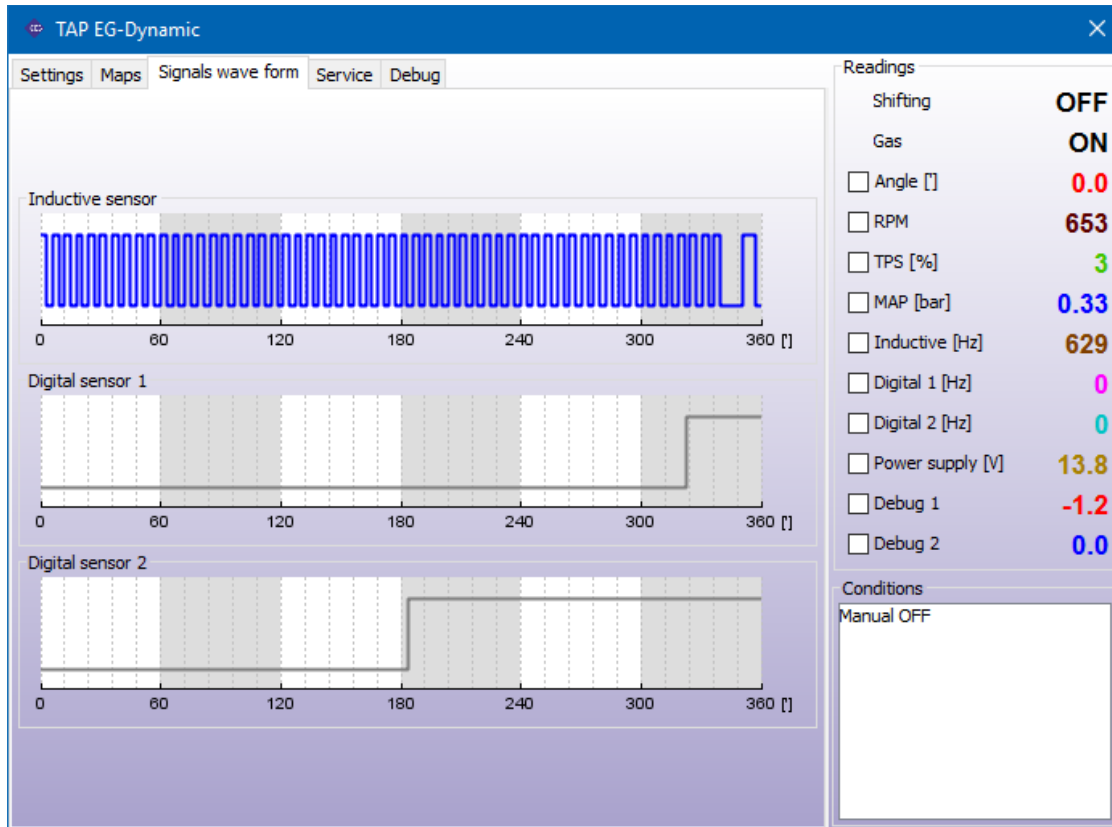
For idle conditions signal pulses shifting should be disabled, because it can lead to engines RPM waving in some type of vehicles. We can do it by lowering the multiplier line on the map or in the Settings panel.

Allowed shortcuts and controls for map modification:

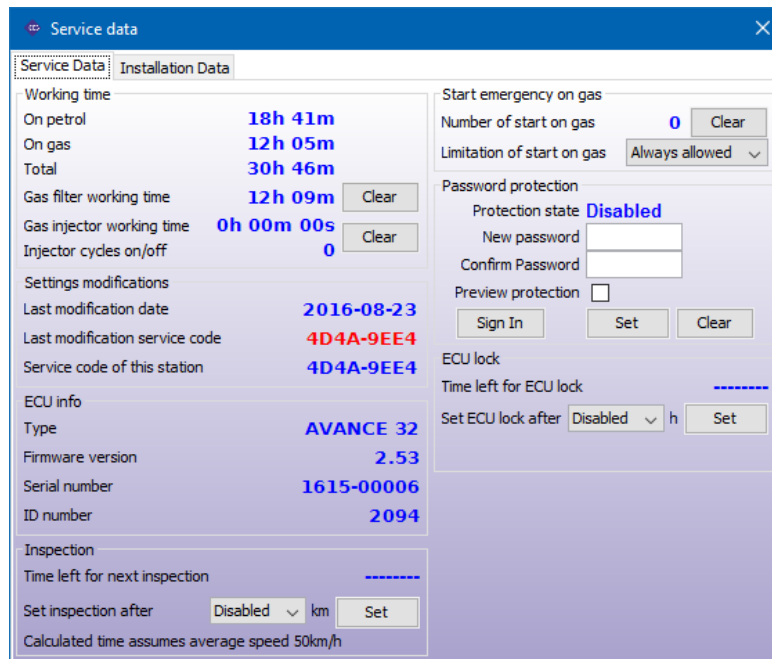
- *Pressing left mouse button and dragging* -Move the points in the X and Y axis.
- *Pressing right mouse button and dragging* -Move only points in Y axis.
- *Double clicking left mouse button* -Add or remove point.
- *Arrow left, arrow right* - selection of point.
- *Shift + arrow left, Shift + arrow right* -Selection of a group of points.
- *Ctrl + A* – selection of all the points.
- *Arrow up, Arrow down* -Moving points in the Y-axis.
- *Home, End* -Moving points in the Y-axis with a higher speed.
- *Ctrl + arrow up, Ctrl + down, Ctrl + left, Ctrl + right* -Moves points in the X and Y.
- *Insert* -Adds another point.
- *Delete* -Removes the selected point.
- *Page Up, Page Down* -Moves the whole multiplier line in the Y-axis.

2.11.12.5. Signals wave form

In this bookmark we can preview the shape of each scanned sensor signal wave.



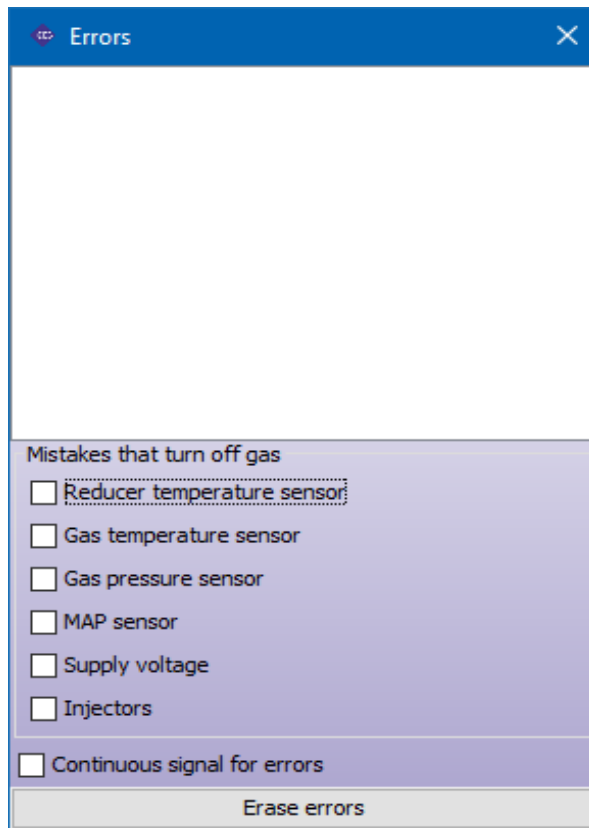
2.11.12.6. Service



This bookmark Device information and Advanced readings helpful in diagnostic purposes.



2.11.13. Errors



On the list we can find gas ECU Pending errors (black colour) and Stored errors (red colour). We can choose which errors must cause changeover to petrol and which mustn't (they will be only registered in ECU memory)
It is also possible to set continuous signal for errors (buzzer will be beeping continuously until switch button will be pressed).



2.11.14. Service Data

The screenshot shows a software window titled "Service data" with two tabs: "Service Data" (selected) and "Installation Data". The window is divided into several sections:

- Working time:** On petrol (18h 41m), On gas (12h 07m), Total (30h 48m), Gas filter working time (12h 11m) with a "Clear" button, Gas injector working time (0h 00m 00s) with a "Clear" button, and Injector cycles on/off (0).
- Settings modifications:** Last modification date (2016-08-23), Last modification service code (4D4A-9EE4), and Service code of this station (4D4A-9EE4).
- ECU info:** Type (AVANCE 32), Firmware version (2.53), Serial number (1615-00006), and ID number (2094).
- Inspection:** Time left for next inspection (-----), Set inspection after (Disabled) km with a "Set" button, and a note: "Calculated time assumes average speed 50km/h".
- Start emergency on gas:** Number of start on gas (0) with a "Clear" button, and Limitation of start o... (Always allowed) with a dropdown arrow.
- Password protection:** Protection state (Disabled), New password and Confirm Password input fields, Preview protection checkbox, Sign In, Set, and Clear buttons.
- ECU lock:** Time left for ECU lock (-----), Set ECU lo... (Disabled) h with a "Set" button.

In Service Data bookmark we can find useful information about ECU.

2.11.14.1. Working time

We can check for how long time period ECU was working **on petrol, on gas** and the both fuels **total** time. These three parameters are being automatically measured from the time of installation and can not be modified by end-user. **Gas filter working time** and **Gas injector working time** shows the time elapsed from moment of changing filters or injectors. We may clear these times by the pressing **clear** button. **Injector cycles on/off** counts gas injector opening cycles.

2.11.14.2. Settings modifications

Last modification date and **last modification service code** informs us when recently they ECU settings was modified and gives the PC service code which was used. Service code of this station is a unique computer code which we used to connection at the moment.



2.11.14.3. ECU info

Informs us which **Firmware version** is currently inside ECU and what is the type of this ECU. **Serial number** is a unique number assigned for this ECU. ID number is used for ECU model **identification**.

2.11.14.4. Inspections

- **Time left for next inspection** -Displays amount of time [hh:mm] left for the next service inspection.
- **Set inspections after** -Here we can set amount of kilometers left to drive before the service inspection will be signaled. We assume that 1 hour of system work is equal to driving 50 km.

Service time is being signaled by the buzzer only when "*Total working time*" value will exceed the value set in "*Set inspections after*" field. In such case, after every start of the car in Auto mode, the buzzer will sound for a short period of time, yellow diode will blink few times and car will automatically go back to Petrol mode. In such case we need to press button to go back to Auto mode every time when we want to drive on gas unless we will disable it or set another Service inspection.

2.11.14.5. Start emergency on gas

Number of start on gas -Shows how many times car owner is allowed to use emergency start of gas function. It is possible to set **limitation of start on gas** which may prevent from abusing of this feature by car owner.

2.11.14.6. Password protection

It is possible to prevent unauthorized end-users from changing ECUs settings by setting supervisor password. Password must be exactly 8 characters long and should contain only alphanumerical chars [A..Z, a..z, 0..9].

When supervisor password has been set then, after every try of establishing connection with ECU, software will ask user to enter password. Without giving valid password the access to configuration panels will be locked. User will be allowed to preview actual systems parameters, oscilloscope readings and data from Service bookmark but he won't be allowed to change any controllers data. **Preview protection feature** additionally prevents previewing the actual system parameters.

Password can be deactivated any time by using **Clear** button.

2.11.14.7. ECU lock

After exceeding programmed working time the ECU doesn't allow car owner to



drive on gas until he will go to authorized service station to unlock the ECU.

2.11.15. Installation data

The screenshot shows a software window titled "Service data" with a close button (X) in the top right corner. The window has two tabs: "Service Data" and "Installation Data". The "Installation Data" tab is active, displaying a form with the following fields and values:

Car model	seat		
Car engine	1,6		
Car mileage	218432		
Car VIN	WAUZZZ838291056		
Nozzles	2,2		
Auto service	xxx		
Owner	yyy		
Contact	rrr-rrr-rrr		
Assembly date	<input type="text"/>	<input type="text"/>	<input type="text"/> Set today's date
Warranty by	0 <input type="text"/> months	---	days left
Credit date	<input type="text"/>	<input type="text"/>	<input type="text"/> Clear --- days left
Other	<input type="text"/>		

On the right side of the form, it displays "Today is" followed by the date **2016-08-23**.

This bookmarks allows to store in ECU memory most important information about vehicle, vehicle owner, technical data, ECU installation date, remaining warranty period and other useful information.



2.11.16. Nozzle

The screenshot shows a software window titled "Injectors calculator" with a close button (X) in the top right corner. The window is divided into several sections:

- Parameters:** A list of input fields with dropdown menus:
 - Fuel type: LPG
 - Number of cylinders: 4
 - Power [HP]: 100
 - Injection type: Sequential
- Nozzle diameter:** A "Calculate" button followed by the result "1.8 mm".
- Hana injectors:** A "Calculate" button.
- For pressure under max load [bar]:** The value "1.00".
- Recommended injector type:** The text "TYPE C or GOLD 1,9 Ohm" is displayed in bold, with "GOLD 1,9 Ohm" in orange. To the right of the text is a small image of a brass injector nozzle.

Injectors nozzle calculator helps installer to choose appropriate type of injector and injector nozzle. Algorithm assumes that reducer's differential pressure has been set at 1 bar (for LPG reducer) or 1,8 bar (for CNG reducer).

We need to be aware that calculated values are only approximate values and it is strongly recommended to start drilling the injector nozzles from a little smaller diameter from calculated one by 0,2 mm.

2.11.17. Help

Opens folder with user manual and wiring diagrams.

2.11.18. Rate

Gives possibility to rate the software and send the issued assessment to manufacturer.



3. Usage of fuel changeover switch



Fuel changeover switch consists of:

- **Fuel changeover button** -Located in the center part of the switch. every single press of the button changes the type of selected fuel.
- **Gas mode LED** (yellow colour) -Located in the bottom right part of the switch. It shows current status of working on gas or waiting for changeover to gas.
- **Petrol mode LED** (green colour) -Located in the bottom left part of the switch. It shows current status of working on petrol.
- **Fuel state LED-s** -4 green LED-s and 1 red LED indicating gas reserve -located at the left side of the switch. 4 green LED-s shows amount of fuel level left in the gas tank. If all 4 green LED-s are ON simultaneously and red LED is OFF then the tank is full. If all 4 green LED-s are turned off and the red LED is ON, it means that the gas tank is almost empty.

Switch LED-s can indicate following states:

- Gas mode LED is OFF, Petrol mode LED is ON, the fuel state diodes of the diodes are all OFF -system is in Petrol mode.
- Gas mode LED is blinking once per second, Petrol mode LED is ON, the fuel state LED-s are ON -system awaits for reaching min. reducer temperature and other conditions required for changeover.
- Gas mode LED and Petrol mode LED are blinking alternately, the fuel state LED-s are OFF there are two possibilities:
 - system is signaling a malfunction (eg. too low gas pressure value), which is causing instant changeover to Petrol mode. The buzzer sound will be also present during this occurrence.
 - autocalibration process is running.
- Gas mode LED is ON, Petrol mode LED is OFF, the fuel state LED-s are ON -system is in Gas mode.

The system should be normally started on petrol and after reaching programmed conditions it should automatically changeover to gas. However it is possible to force an emergency start of gas -without usage of petrol (eg. when the petrol fuel pump has been damaged). To force emergency start on gas we should:

1. Press and hold the switch button before starting the engine.
2. Move the ignition key to ACC position,
3. Wait for opening of solenoid valve,
4. start the engine on gas,
5. release the switch button.



4. Firmware update procedure

For proper firmware update procedure the +12V ignition key wire from gas ECU harness needs to be connected to the place in which +12V voltage appears from the moment of turning on the ignition key to ACC position, do not drops below +9V during engine cranking and remains stable during all the time of engine's work. Voltage should drop to 0V shortly after turning off the ignition key.

4.1. Standard firmware update procedure

It is recommended to run firmware update procedure when engine is not running and ignition key is on.

ATTENTION: Don't loose the +12V from the key or don't try to disconnect diagnostic interface during firmware update process or as it might interrupt the communication between gas ECU controller and PC. In result controller can get damaged in a way that is not covered by the warranty repair.

1. We are turning on the ignition key to give +12V to the controller.
2. After successfully establishing connection with the diagnostic software we should choose from main menu: **File -> Update Firmware.**
3. We should select file with newest version of firmware file for our controller. After successful validation of firmware file we will be asked confirmation of update process from our side. We should confirm by clicking "Yes" button.
4. Present gas ECU configuration will be saved in settings file and update process will be started. On progress bar displayed on the screen we can observe update progress.
5. After finishing updating process message with information that firmware has been updated successfully will appear. We need to confirm it by pressing OK. It is not necessary to turn off and turn on power supply of the controller.

4.2. Emergency firmware update procedure

In case of standard method of firmware update will fail we should proceed with emergency firmware update procedure:

1. Disconnect with the controller and turn off the ignition key. Status in top right part of software window should be "*Disconnected*" and all LED-s on the switch should be OFF.
2. Select proper COM port on which diagnostic interface is present.
3. Choose from main menu **File -> Upload Firmware** and select firmware that You want to use for updating the ECU.
4. Follow the instruction displayed by the software.