KME autogas systems

MANUAL

PROGRAM AND CONFIGURATION

Sequential gas injection system for **NEVO-SKY** family

NEVO-SKY MODEL 2 DIRECT

NEVO-SKY MODEL 2 MAX

NEVO-SKY SUN

NEVO-SKY JET ECO

NEVO-SKY JET BASIC

NEVO-SKY JET OBD

NEVO-SKY JET EXPERT

Software version: NEVO-SKY-5.0.2.2

Full compatibility with gas controller firmware 5.1C r1 (DIRECT), 5.2C r1 (MAX), 5.3C r1 (SUN) and 5.4C r1 (JET ECO) and 5.5C r1 (JET)

ver. 1.0.9 | 17-09-2020

Table of contents

1 Introduction

Configuration software for NEVO-SKY system is free and need no license key to be downloaded, installed or run.

If USB interface will be used to communicate PC with the gas controller, the latest drivers (delivered with the software or other) should be also installed.

After connecting communication interface and launching, the program should automatically connect to the gas controller through COM or USB interfaces. After that you can move to changing basic parameters and configure installation.

It is recommended to use original KME interfaces for communication with KME gas controllers (USB OPTIC FTDI, AVATAR SKY).

2 Program Interface

2.1 Starting view

After launching the program, the starting window is shown on screen (**Fig. 2.1**). During launching, the program tries to automatically connect to the controller.

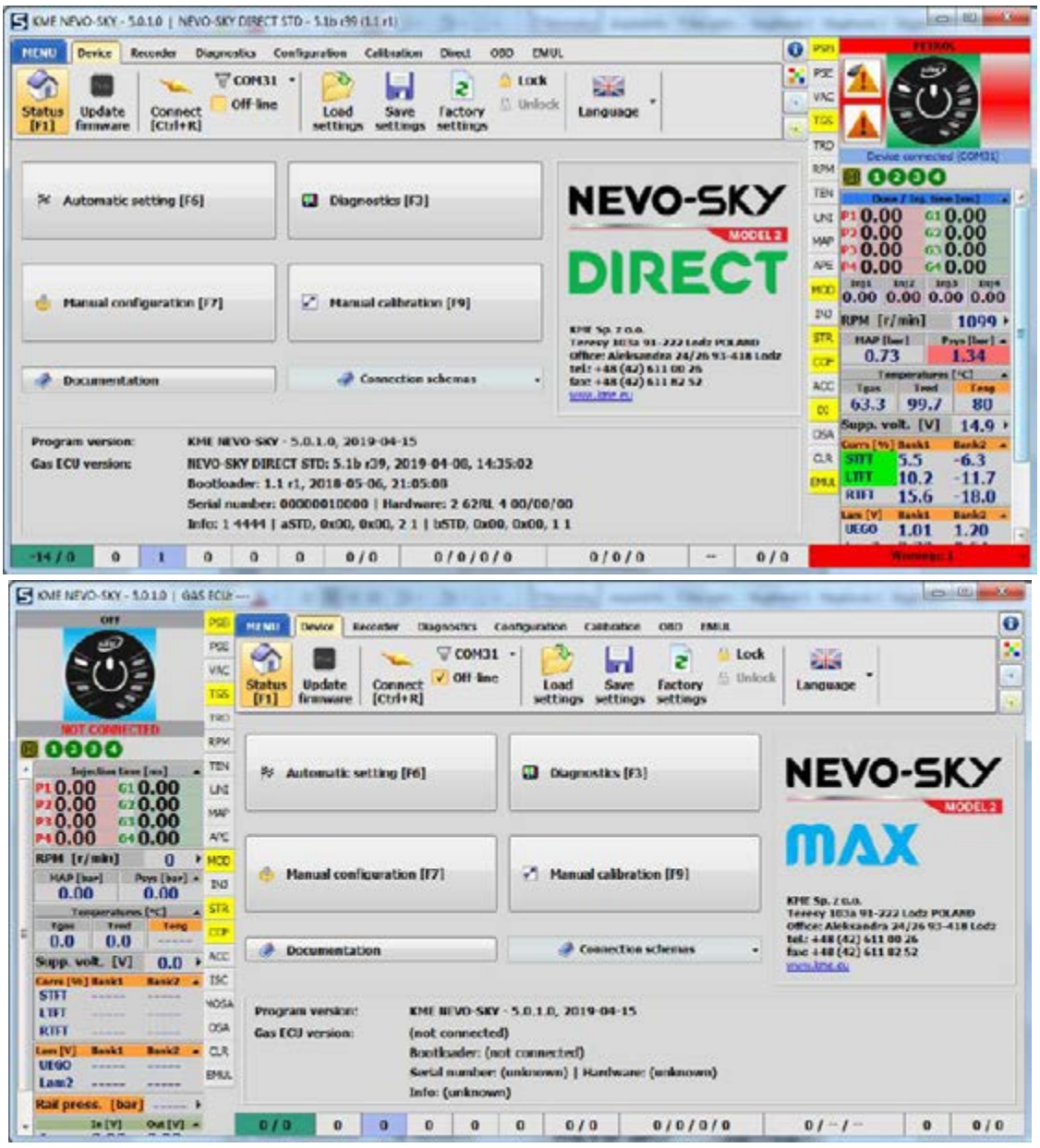


Fig. 2.1 Main window after launching the program (MAX, DIRECT)

Components of main window:

- ***Tabs*** – (Device, Recorder,…) – allowing switching between different program windows.
- ***Ribbon*** – field under the tabs containing functions and windows assigned to the various tabs.
- ***Main window*** – located under the Ribbon.
- ***Readings panel*** – located on the right or left side of main window (can change in the *MENU/Options*). It contains current reading of the main parameters (**Fig. 2.2)**. Values colored in red are beyond the value for proper work of gas injection system. When some parameter is colored in olive it means the value is close to the correct value limit for proper work of system. Vaporizer temp. is red when value is below switch-over level, olive between the temperature of switch-over to gas and 50˚C (not all functions are active then). It is blue when over 50˚C, because then all of the functions and procedures work properly. **Gas pressure is always red when running on petrol**. Yellow highlighting of the Gas injection time indicates active injector correction for specific injector.

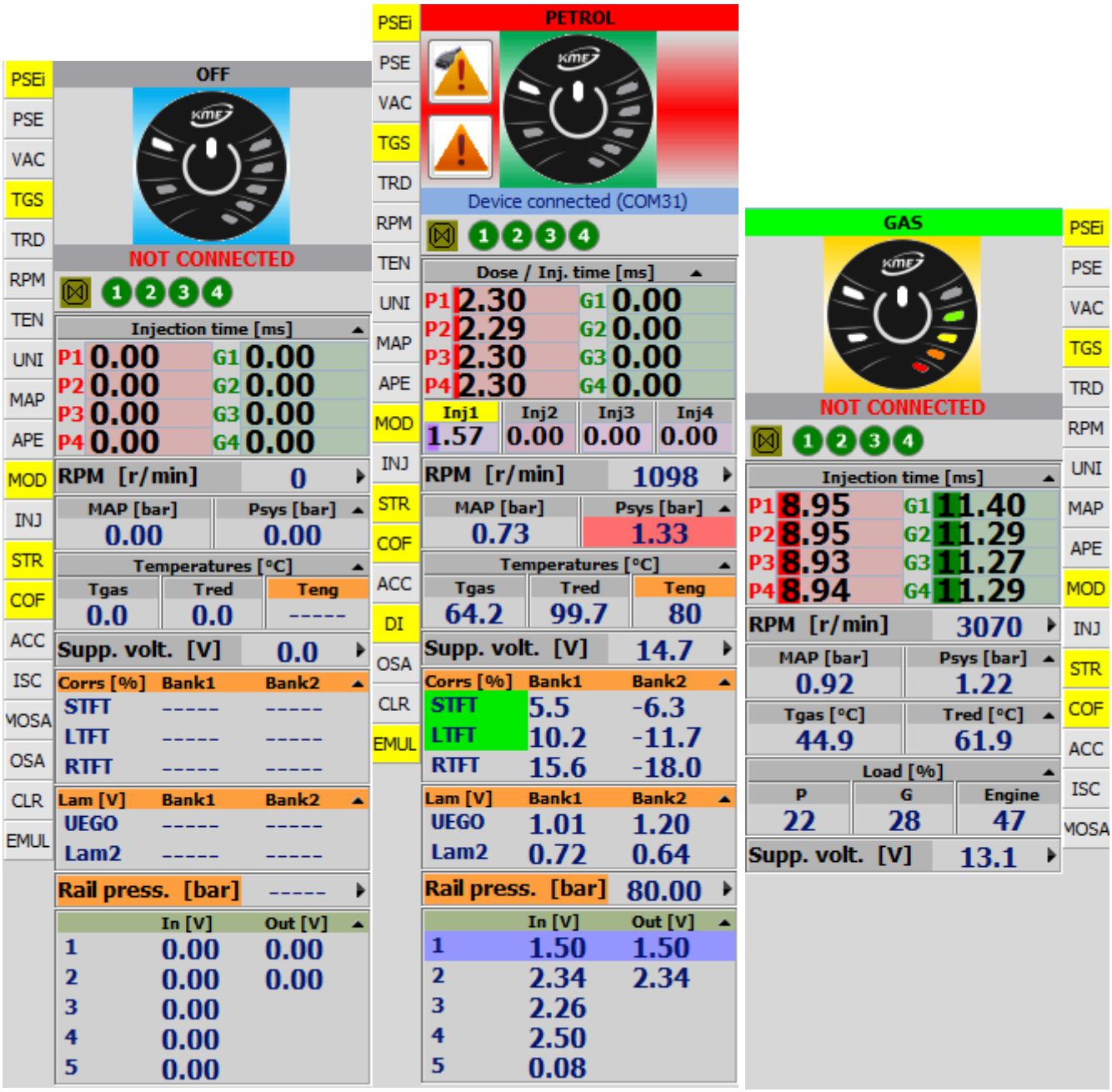


Fig. 2.2 Readings side panel with FUNC bar which indicates activity of chosen functions of gas ECU (from the left seen MAX, DIRECT and SUN)

The occurrence of certain situations in the gas controller is signaled in the readings side panel by changing the color of the panel header "**Dose / Inj. time". [ms]**". These are important situations for the proper work of the system and their occurrence should be monitored.

THE APPEARANCE OF SOME OF THE FOLLOWING SITUATIONS MAY CAUSE PROBLEMS WITH WORK ON GAS OR EVEN LEAD TO DAMAGE OF THE GAS OR PETROL CONTROLLER.

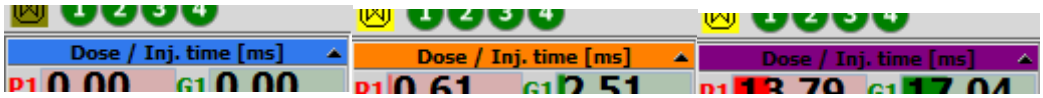


Fig. 2.3 Side panel signaling

After right-clicking, a description of the colors as below in **Fig. 2.4** will appear. To facilitate, the same signaling is on the model pages, maps, correction maps and linear corrections.

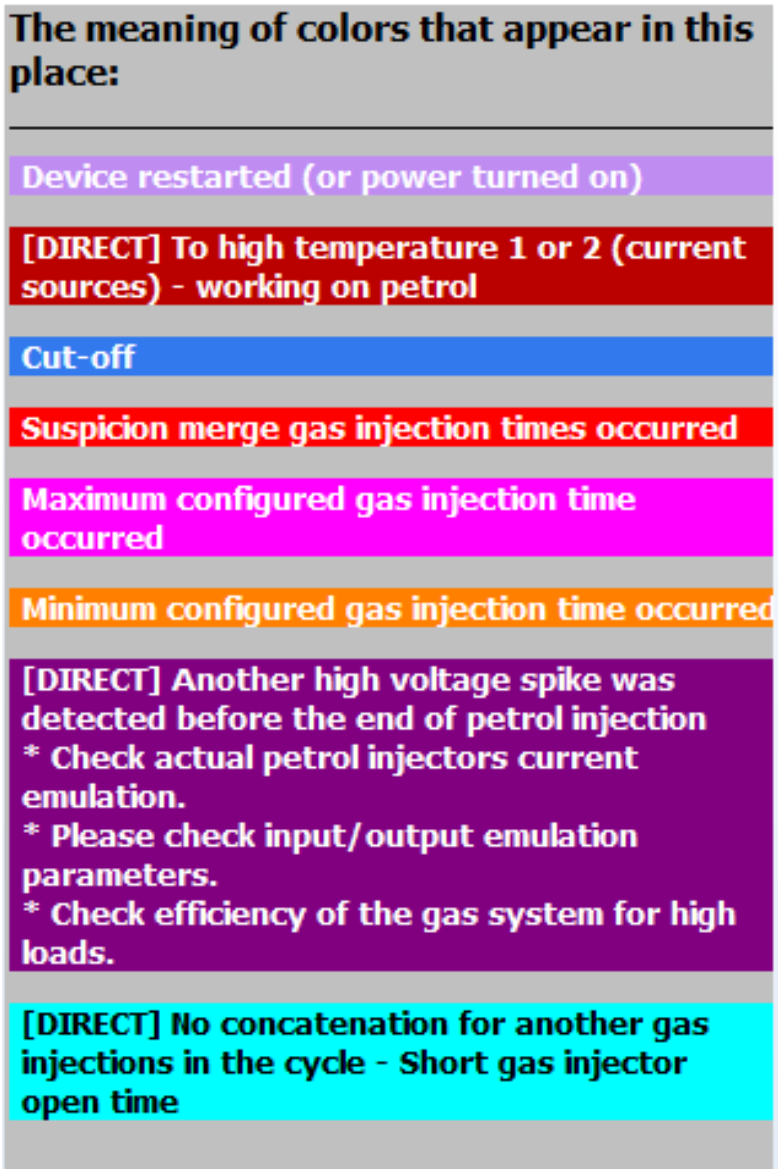


Fig. 2.4 Color meaning descriptions

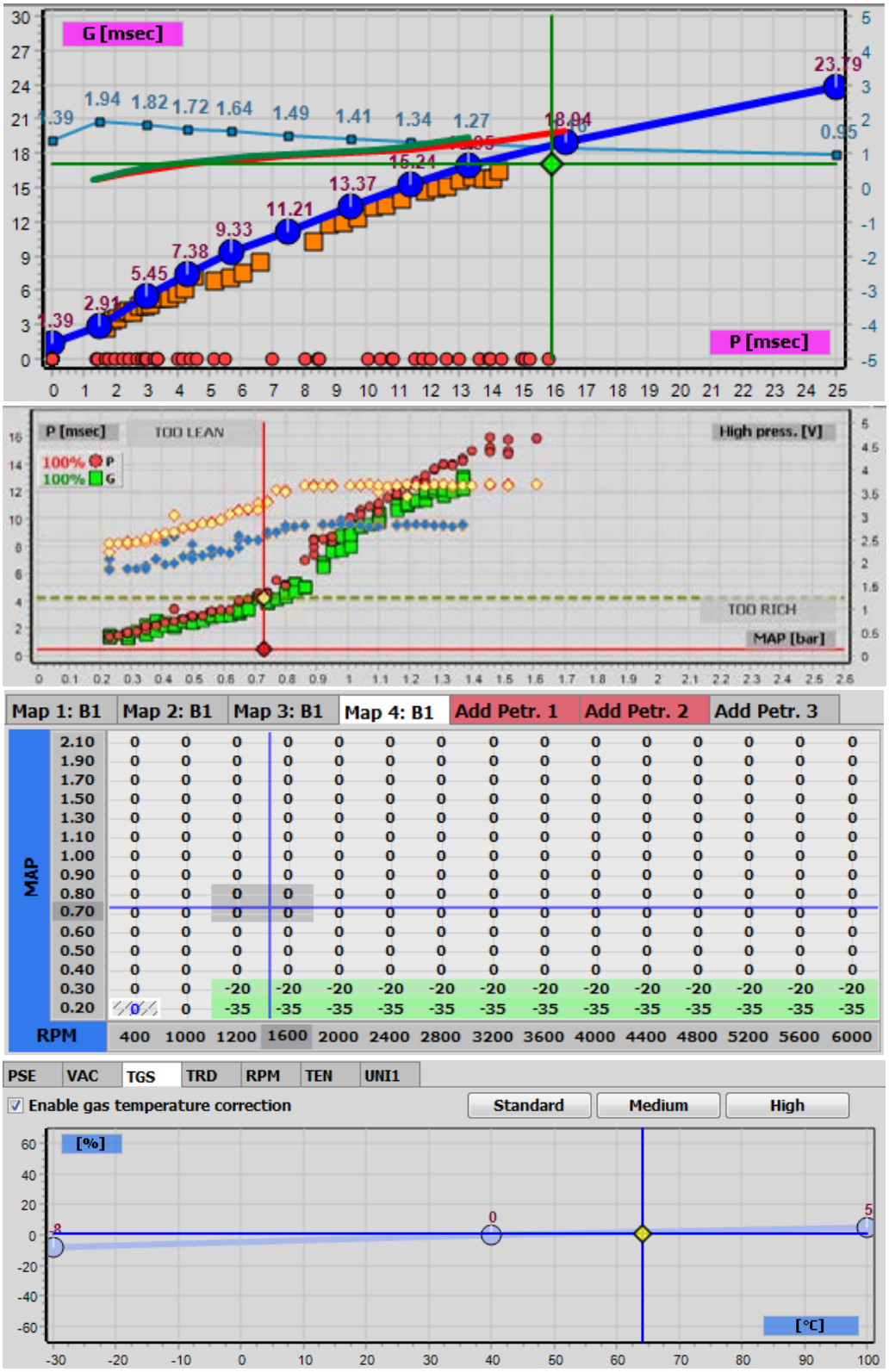


Fig. 2.5 Signaling on calibration tabs

The readings side panel, virtual driver's control panel and status bar are visible in all program tabs.

Readings sidebar is divided into following parts:

- "**FUNC**" bar which indicate activity of chosen gas ECU functions.
  Highlighting of some indication with yellow means the particular function is active now. Additionally, when MOSA and OSA adaptation are active they're highlighted in pink.
  Designation of Auto Clear errors function (CLR) will change colors to indicate it's working, analogously to colors in Auto Clear tab.

FUNC description:

PSEi ***PSEI*** – gas pressure correction – internal
PSE ***PSE*** – gas pressure correction
VAC ***VAC*** – vacuum correction
TGS ***TGS*** – gas temperature correction
TRD ***TRD*** – reducer temperature correction
RPM ***RPM*** – RPM correction
TEN ***TEN*** – engine temperature correction
UNI ***UNI*** – universal correction
MAP ***MAP*** – corrections map
APE ***APE*** – adding petrol
MOD ***MOD*** – model calibration
INJ ***INJ*** – injectors corrections
STR ***STR*** – activate strategies (activate switching to petrol with automatic return to gas)
COF ***COF*** – cut-off mechanism
ACC ***ACC*** – acceleration corrections
DI ***DI*** – direct injection (available in SKY DIRECT only)
ISC ***ISC*** – correction during changing injection system (indirect injection gas ECU only)
MOSA ***MOSA*** – map adaptation (MOSA - Map On-board System Adaptation) (indirect injection gas ECU only)
OSA ***OSA*** – OBD adaptation (OSA - OBD System Adaptation)
CLR ***CLR*** – automatically clear OBD errors
EMUL ***EMUL*** – emulations

Left click on any designation cause auto switching to view with configuration of particular functionality.

- ***Virtual panel*** – virtual equivalent of the panel located in the driver's cabin. It shows panel indications (colored LEDs) and can be used to switch petrol / gas.
- ***Gas controller status bar*** – located above the virtual panel bar showing the current status of the gas controller: "**OFF**" (in the absence of connection and during the update), "**IGNITION**" (driver switched on but no RPM signal), "**PETROL**" (work on petrol), "**WAIT**" (waiting for the conditions for switching to gas supply), "**GAS**" (work on gas), "**GAS (auto-return)**" (working on petrol due to the "auto-return" strategy or error to which the assigned is the action "Switch to petrol with auto-return"), "**SLEEP**" (driver switched on, but the ignition signal has disappeared, the ECU is powered directly from the battery, this condition will only occur when the controller was connected to the PC software at the moment of the ignition), or some functions require operation after the engine has been switched off, e.g. EPP), "**MALFUNCTION**" (switched to petrol after an error to which "Switch to petrol" action is assigned).
- ***Program status bar*** – located under a virtual panel a bar showing the program status, e.g.: NOT CONNECTED, controller connection, off-line operation, performing an update, detection of an older version of the program on a PC or the controller software, device blocked. Under the right mouse button, a menu appears with the options as on **Fig. 2.6.**

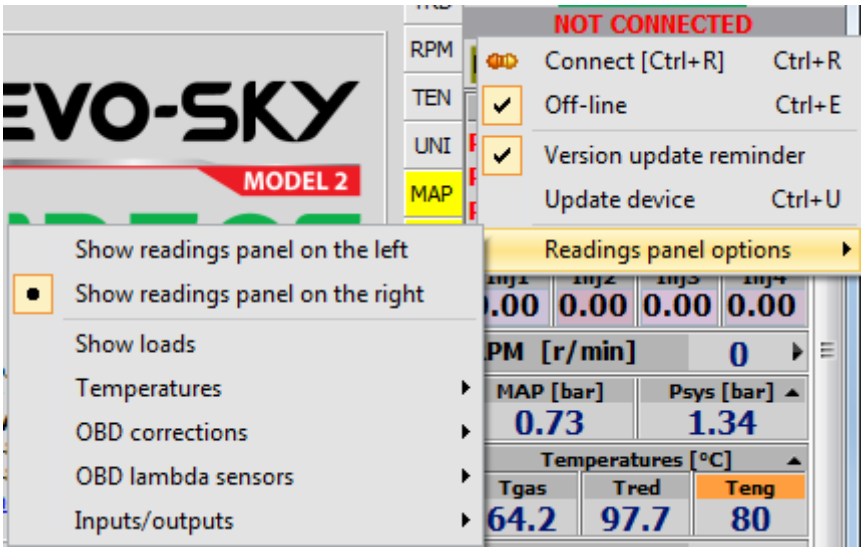


Fig. 2.6 Readings panel options

If the driver logs errors, a flashing triangle with an exclamation point will be displayed next to the driver's panel (**Fig. 2.7**). Clicking on it will bring the diagnostic codes to the window in the Diagnostics tab. A similar triangle will appear if an error has been registered by OBD.

Clicking the right mouse button in these triangles clears the errors.

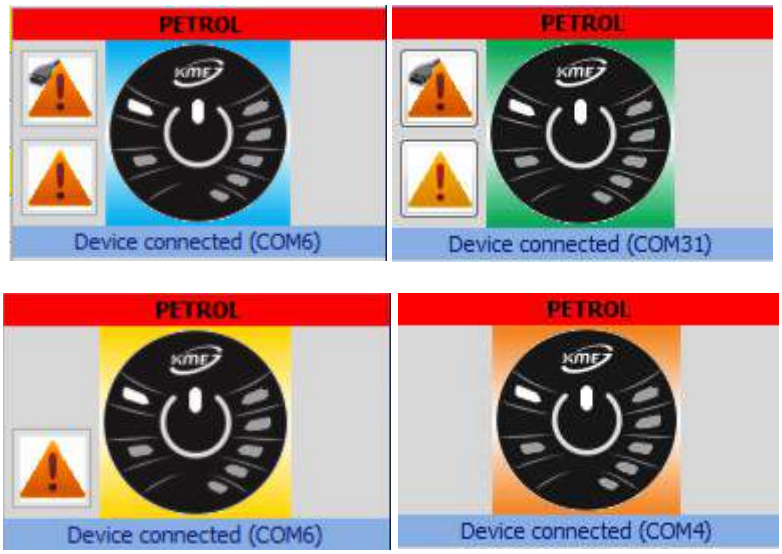


Fig. 2.7 A virtual panel with a status bar and a triangle informing about registration of errors by the gas controller and OBD (MAX, DIRECT, SUN and JET view differ in the background color of the panel) and the status bar.

- **Correction bar** – located at the bottom of the window. Shows current corrections for individual modules. Color shows which module is currently active. Clicking in the module shows module settings widow.

Fig. 2.8 Correction bar

2.2 System warnings

The program has been equipped with an **advanced expert system** for automatic detection of irregularities in the settings and operation of the gas system. This system generates warnings, the presence of which is signaled by a red color and blinking icon under the reading strip and blinking colors (red-orange) and the icon next to the virtual driver's panel.

Each occurrence of the warning causes the sound signaling to be activated, so as not to miss the moment of warning.

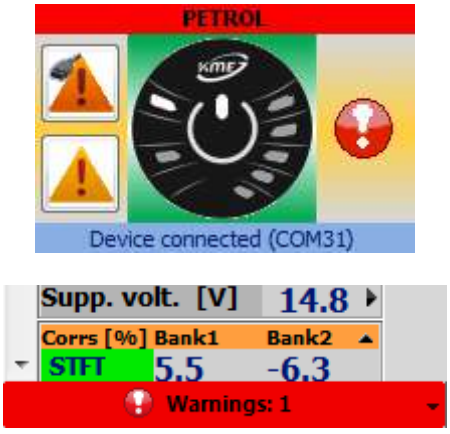


Fig. 2.9 Visualization of the presence of warnings on the sidebar

After pressing the button with the word "Warnings: X" below the bar of readings a window presenting the list of currently registered problems will be shown (**Fig. 2.10**). After clicking on a given warning, a window with details of the detected irregularity will be shown (**Fig. 2.11**).

Fig. 2.10 Some of the warnings generated by the program

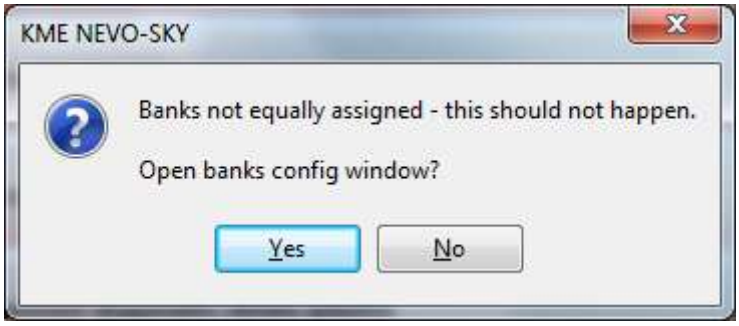


Fig. 2.11 Window with details of the warning

Warnings are divided into three types: ***configuration, event and update*.**

Configuration warnings inform you of suspicious system settings. In case of some of these types of warnings, the system will propose to correct the value itself.

To use the recommended settings in this situation, click the "**Use recommended settings**", "**Correct values**" button (**Fig. 2.12**). In such a situation, the system will select the best possible configuration based on the current controller settings and information from OBD.

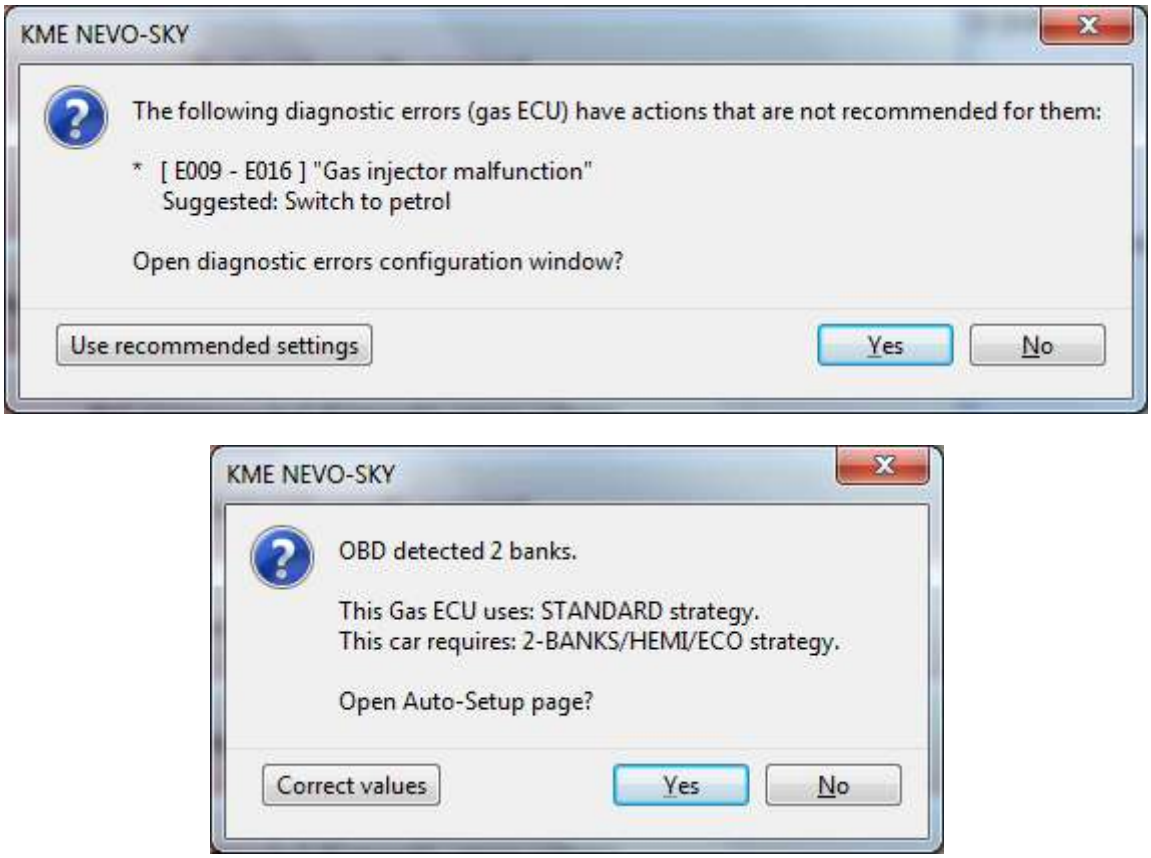


Fig. 2.12 Automatic suggestions for correcting the driver configuration

Event warnings inform you of a situation that, according to the system data, should not take place. Such situations include mostly suspicious values of some parameters, e.g. (suspected high pressure values, suspiciously short raw injection times, lack of compliance of analog input 3 with the nominal EZP value at idle).

When the conditions for detecting a suspicious situation occur, the system remembers the time of occurrence and the frozen frame. Due to the fact that such situations can be

repeated many times and take a short period of time, the program automatically counts their occurrences. All saved data will be displayed when you click on this type of warning (**Fig. 2.13**).

The occurrence of these warnings is most often associated with incorrect connection of wires (e.g. gasoline injectors or analog inputs) or improperly selected pressure emulation. The system suggests checking the appropriate cables or taking other actions, depending on the situation.

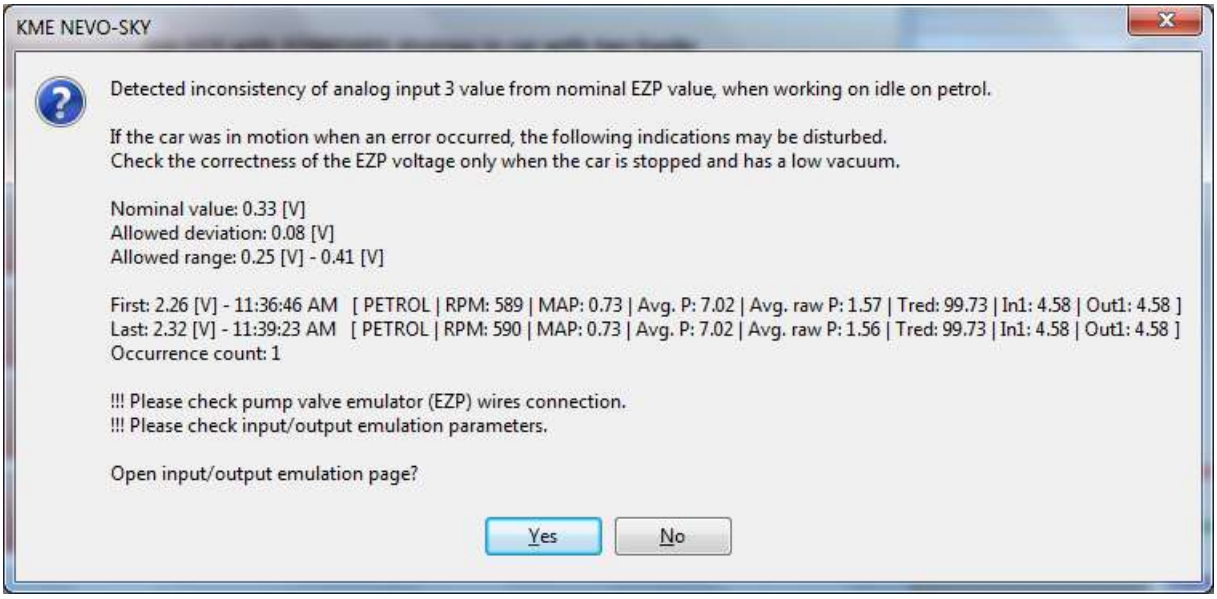


Fig. 2.13 Event warning window with error frame and number of occurrences

Update warnings indicate availability of a newer version of PC software or driver software. They are highlighted in blue (**Fig. 2.14**). It is recommended to use the latest versions of the PC program and driver.

If the system does not report any other warnings than updates, the blinking icons will also be in blue instead of red (**Fig. 2.15**).

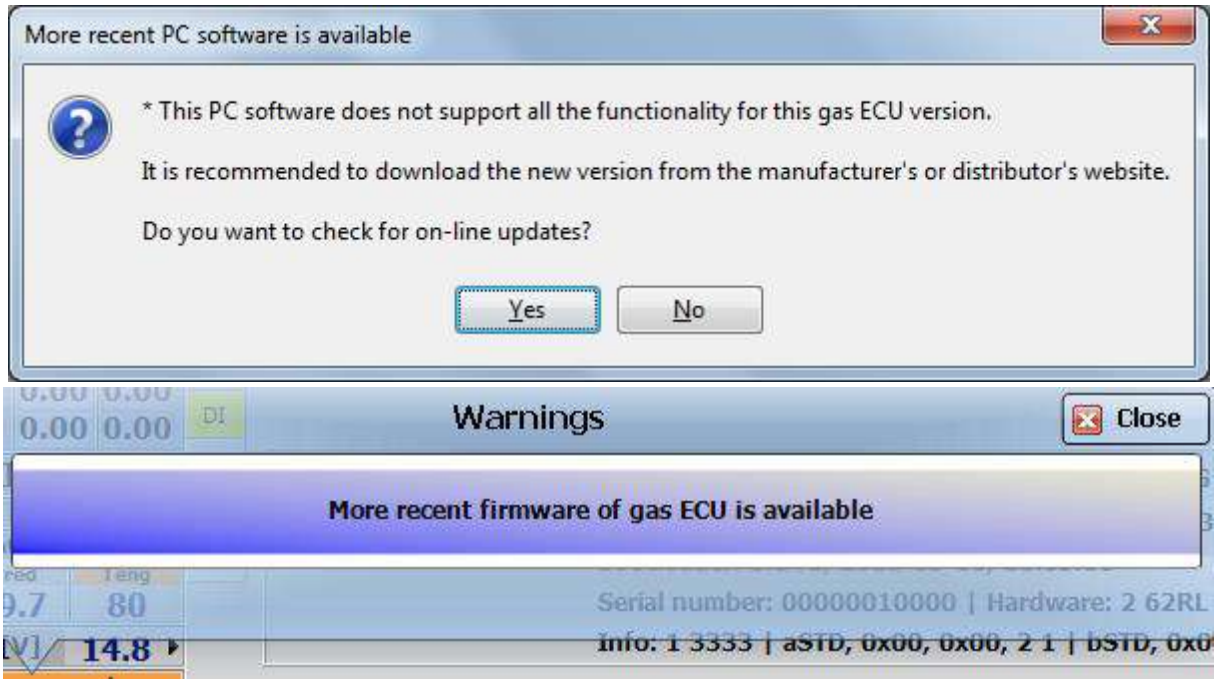


Fig. 2.14 Information about the availability of a newer version of the program

Fig. 2.15 Update warning icons

2.3 Menu button

The button next to the Device tab, highlighted in blue. After pressing it, the menu is expanded, which contains additional options, functions from the Device tab and links to other program elements.

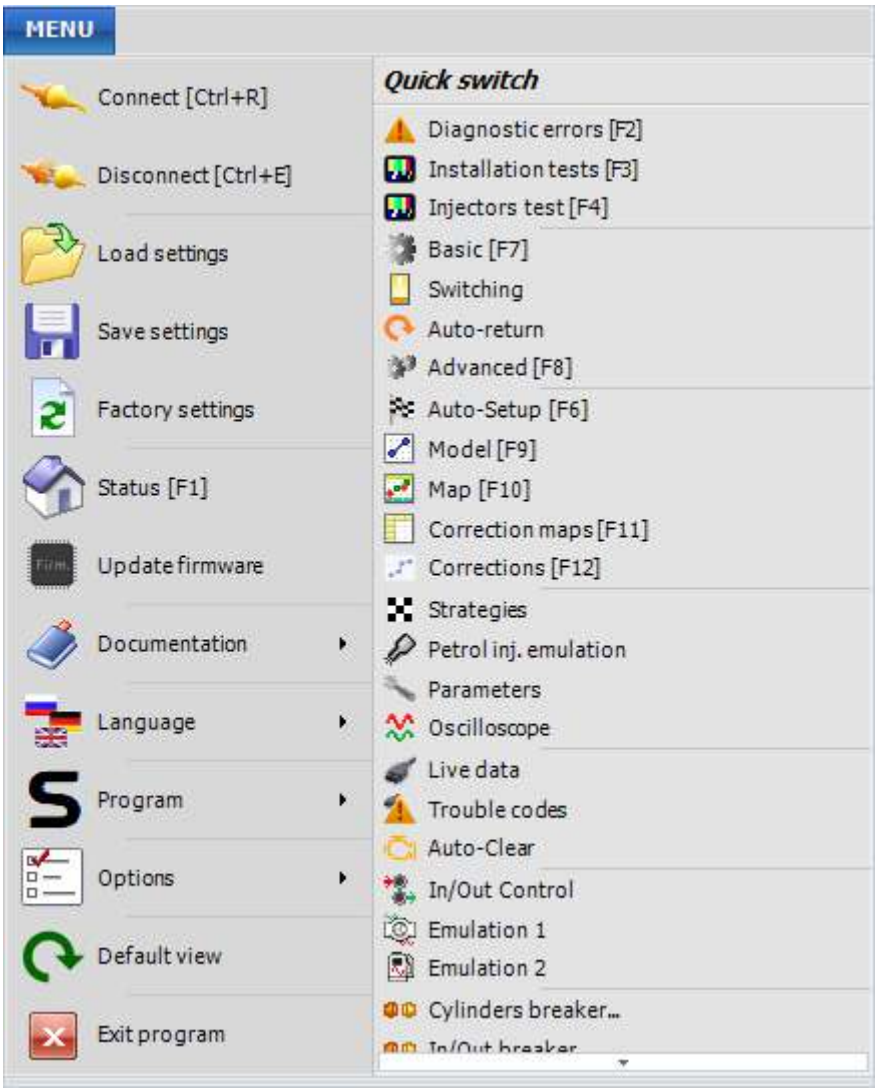


Fig. 2.16 Drop-down menu

- "**Connect [Ctrl+R]**", "Disconnect [Ctrl+E]", "Read settings", "Save settings", "Factory settings", "Status [F1]", "Update firmware", "Documentation", "Language" - options and links also available from the Driver tab.
- "**Program**" - view of the program interface in offline mode and "On line updater".

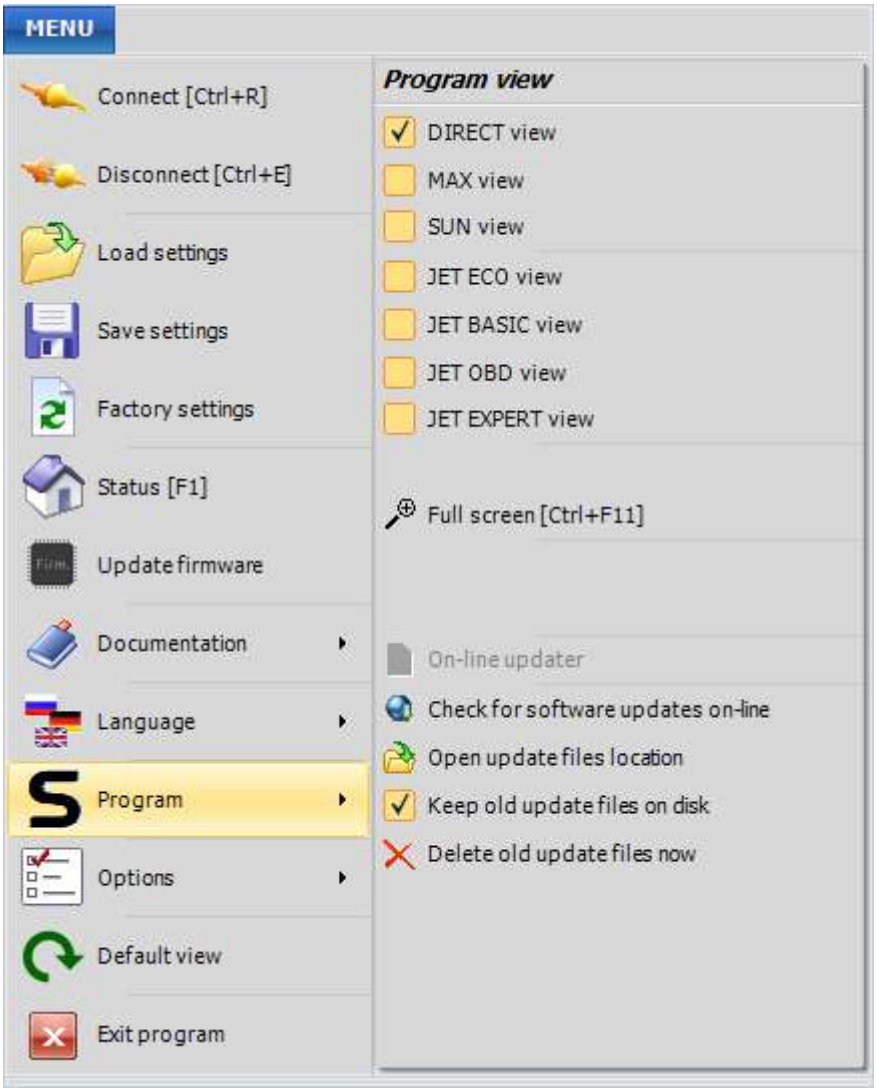


Fig. 2.17 "Program" submenu with additional program options

- ***DIRECT view*** – program view for direct injection gas ECU DIRECT
- ***MAX view*** – program view for indirect injection gas ECU MAX
- ***SUN view*** – program view for indirect injection gas ECU SUN
- ***JET ECO view*** – program view for indirect injection gas ECU JET ECO
- ***JET BASIC view*** – program view for indirect injection gas ECU JET BASIC
- ***JET OBD view*** – program view for indirect injection gas ECU JET OBD
- ***JET EXPERT view*** – program view for indirect injection gas ECU JET EXPERT
- ***Full screen*** – turn on / off the full screen mode of the program (without the title bar and lower task bar)
- ***Check for software updates on-line*** – manual check of the program updates, Internet connection required.
- ***Open update files location*** – opens the folder with update files

- ***Keep old update files on disk*** – unchecking this option will delete update files after they have been installed.
- ***Delete old update files now*** – manual delete of downloaded update files.

- "**Options**" – a drop-down list with additional program options (**Fig. 2.18**).

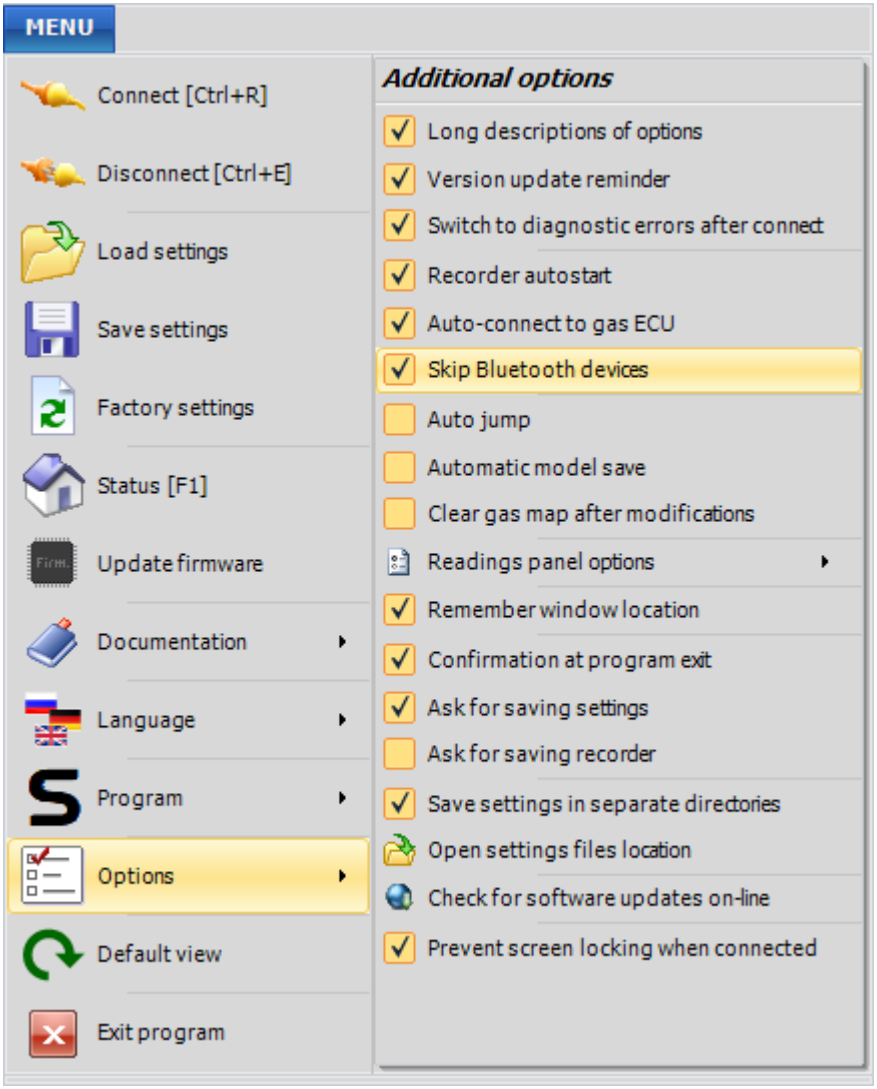


Fig. 2.18 Podmenu „Opcje” z dodatkowymi opcjami programu

- ***Long description of options*** – displaying descriptions explaining the configuration options in the so-called balloons.
- ***Update reminder*** – displaying a message after connecting with the controller about the availability of a newer version of the firmware or PC software.

- ***Switch to error code page after connection*** – selecting this option automatically switches to the error code page if errors are registered in the controller at the moment of connection.
- ***Recorder Auto start*** – automatic start of the recorder after connection with the controller.
- ***Connect automatically with the gas controller*** – the program will try to connect to the controller as soon as it is started.
- ***Skip Bluetooth devices*** – during automatic driver search, the program will skip Bluetooth devices
- ***Auto jump*** – automatically sets the active model point / correction map to the current one, in order to calibrate the car faster.
- ***Automatic model saving*** – automatically saves the model after changing it
- ***Delete gas map after changing settings*** – automatic resetting of the gas map after changing the model or adjustments
- ***Readings panel options*** – menu containing options related to readings panel
- ***Save the location and size of the window*** – it remembers the position and size of the window between successive launches of the program.
- ***Confirmation when closing the program*** – unchecking the option will result in no request to close the program.

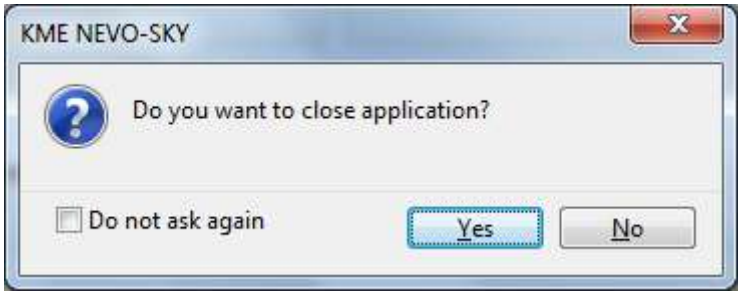


Fig. 2.19 Question about closing the application

- ***Ask for saving settings*** – unchecking the option will result in no request to save the driver settings when closing the program or trying to connect to a new, different driver.

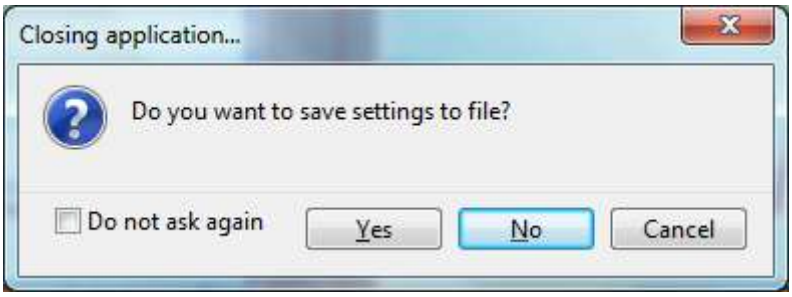


Fig. 2.20 Question about saving driver settings to a file.

- ***Ask for saving recorder*** – unchecking the option will result in no request to save the recorder's buffer file.

Fig. 2.21 Question about writing the recorder to a file

If you check the "Do not ask again" option in the dialog box, you will deselect the appropriate item in the options.

- ***Save settings in separate directories*** – it automatically splits the directory with settings into DIRECT / MAX / SUN subdirectories, and automatically switches between them when connected to the controller.
- ***Open location of settings files*** – opens the folder in which the gas controller settings are saved by default.
- ***Check the availability of updates via the Internet*** – manually check the program updates, internet connection required.
- ***Prevent blocking the screen when the connection is active*** – preventing blanking and locking the screen and blocking the computer when the PC software is connected to the gas controller.

- "**Default view**" – after confirming and restarting the application, all application settings will return to the default values (**Fig. 2.22**)

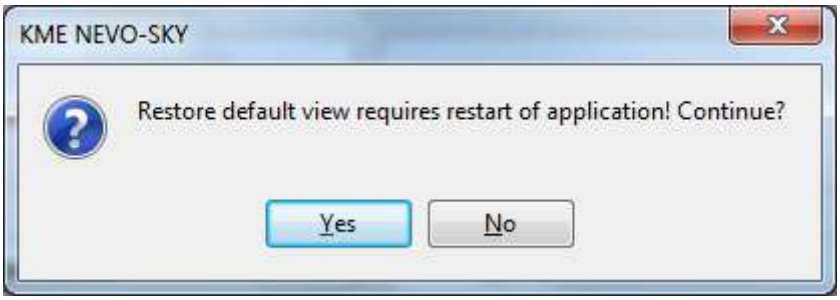


Fig. 2.22 Query to restore the default view of the application

- "**End program**" – closes the application.

2.4 Device tab

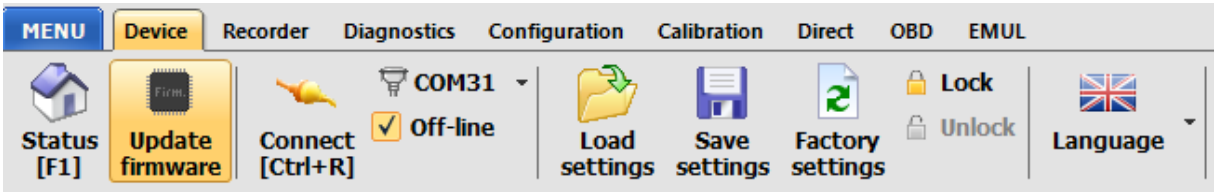


Fig. 2.23 Controller tab

Bar elements on the Device tab are divided into groups:

- **Controller**
  - ***Status*** [F1] – displayed after starting the program, shows the current status of the controller and program: software version, hardware version, serial number, and shortcut keys to the most important functions (**Fig. 2.24**).
    - *Automatic setting* [F6] – going to the settings detection and auto calibration (Calibration → Auto Setup).
    - *Diagnostics* [F3] – going to installation tests (Diagnostics → Installation tests).
    - *Manual configuration* [F7] – moving to manual configuration of basic settings (Configuration → Basic).
    - *Manual calibration* [F9] – changing to manual model setting (Calibration → Model).
    - *Documentation* – opening the folder containing the documentation for the SKY gas system.
    - *Installation connection diagrams* –opening a file containing assembly diagrams of installations from the SKY family.
  - ***Update firmware*** [Ctrl+F1] – opens the driver software update window.
- ***Connection***
  - ***Connect*** [Ctrl+R] – allows automatic searching of the COM port to which the communication interface is connected and establishing communication with the controller.
  - ***Port: COMx*** – selection of the COM communication port.
  - ***Off-line*** [Ctrl+E] – enable / disable Off-line mode, i.e. work without establishing communication with the controller.
- **Operations**
  - ***Load settings*** [Ctrl+O] – allows you to load a configuration into the controller that previously has been saved to a file on a PC.

- ***Save Settings*** [Ctrl+S] – allows you to save the current controller configuration to
  a file on a PC.
- ***Factory settings*** [Ctrl+D] – allows you to restore the controller's default settings. Controller configuration will be lost. The function also removes the lock from the controller.
- ***Lock / Unlock*** - allows you to install a security lock on the controller to prevent configuration changes. The password can only consist of four digits. After securing, it is not possible to change the controller settings. Only readings of current values are possible. Unlocking the controller is possible after entering the access password or after restoring the factory settings (Start → Factory settings).

- **Program**
  - ***Language*** - choosing the language of the program.

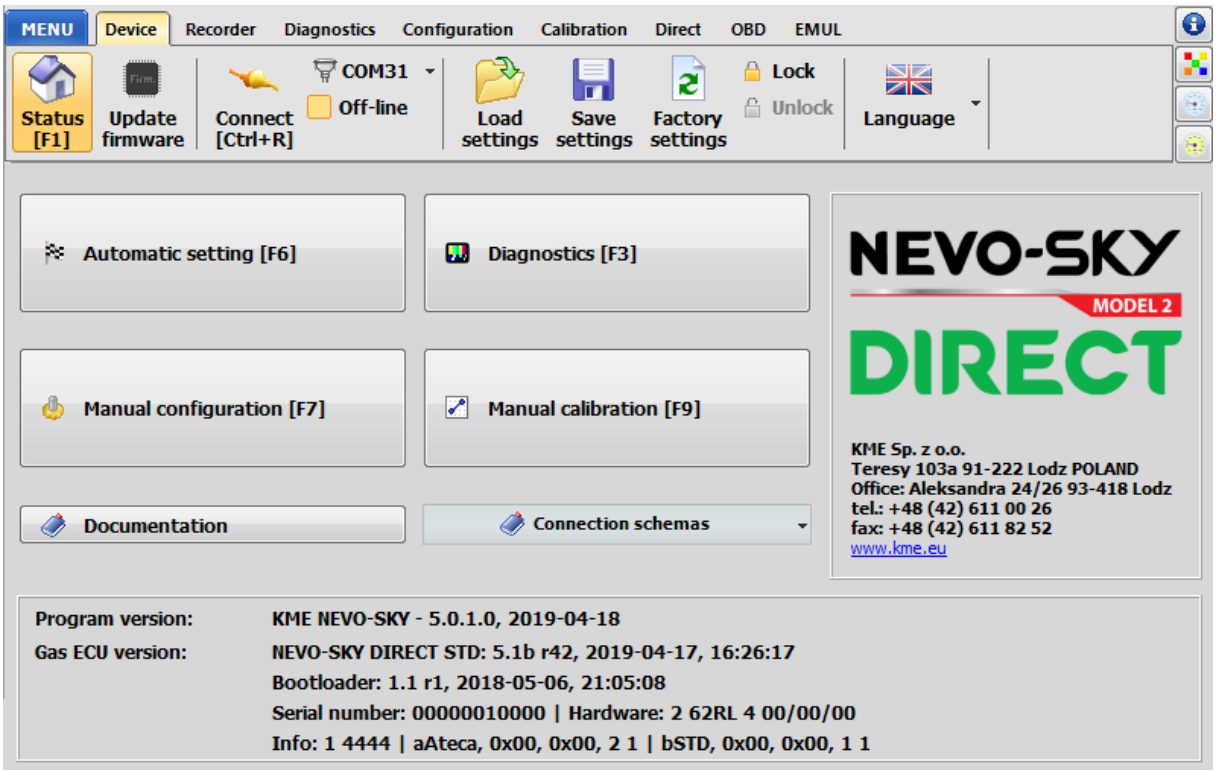


Fig. 2.24 Status page

2.4.1 Updating the controller software

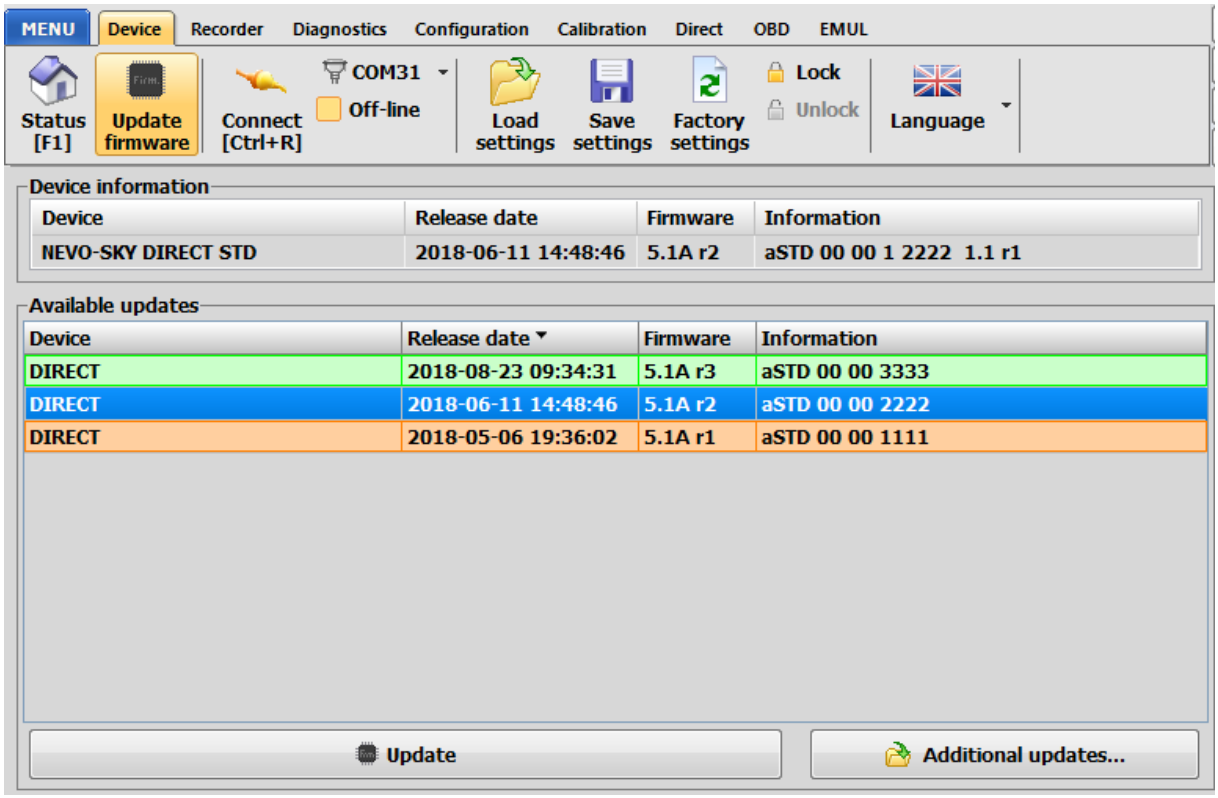


Fig. 2.25 Update firmware page

The update allows you to change the software in the controller and save the factory settings of the newly loaded version to the device. Therefore, it is recommended that you save the old settings to the file before performing the update, as long as these settings are needed later. The controller update window is shown in **Fig. 2.25**. In the frame "**Device Information**", the current version of the driver and the date of compilation of its program are visible. In the frame below a list of available updates is displayed. The orange background will bear versions older than the one in the device, and the newer green ones.

The update should be carried out as follows:

- If the update you want to upload is not on the list, but it is on your computer, you should click "Additional updates" and select the update file to be uploaded to the controller. The file will be displayed on the list of available updates with the designation "*" for the bootloader version. The added files are not remembered when the program is restarted.

- Select a file from the list and press the "**Update**" button, a window will appear confirming the version to which the driver will be updated and the speed at which it will be updated. Select "**Yes**".

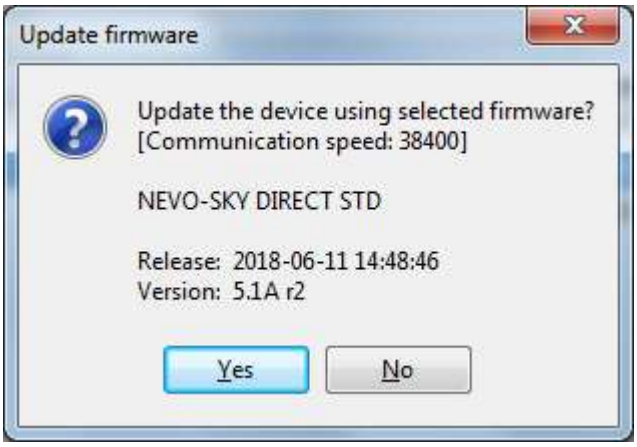


Fig. 2.26 Window with confirmation of performing the update

Next, a window will appear asking you to save the current controller settings to the file. If you want to save the settings, but you did not do it before, select "**Yes**".

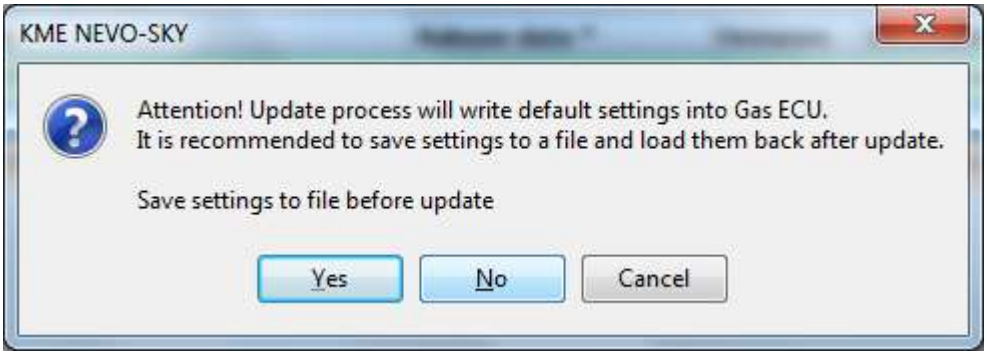


Fig. 2.27 Window asking for saving settings before performing the update

- The current progress of the update is shown on the bar and in percentages, the status bar shows information about performing the update, and the LEDs on the driver's panel light up one by one.

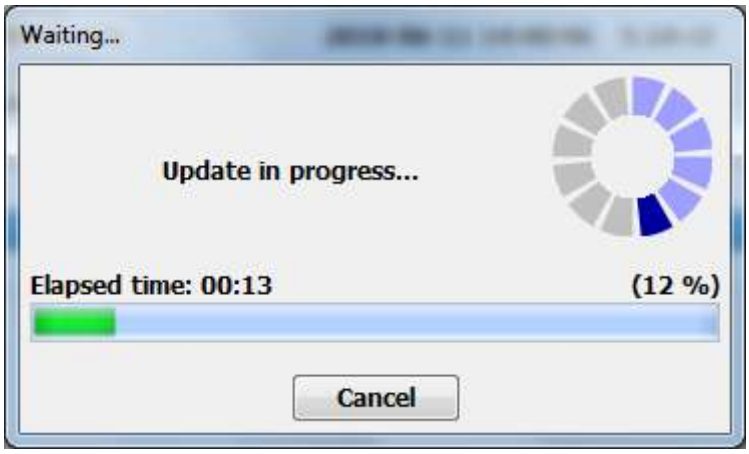


Fig. 2.28 Update progress bar

Fig. 2.29 Information about performing the update in the program status bar

- If there is a communication error during updating, please reconnect to the controller. Breaking communication during the update will not cause a "fault" of the controller

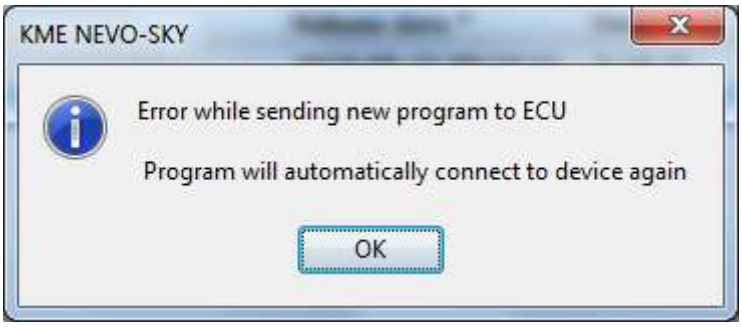


Fig. 2.30 Error message when updating the driver

After restoring the lost connection, the window **Fig. 2.31** may appear. Click "**Yes**" and repeat the driver software update process.

The window informing about an error in the update may also appear in case of shorted transmission lines to ground. This may be caused by a harness failure or by using a non-original interface.

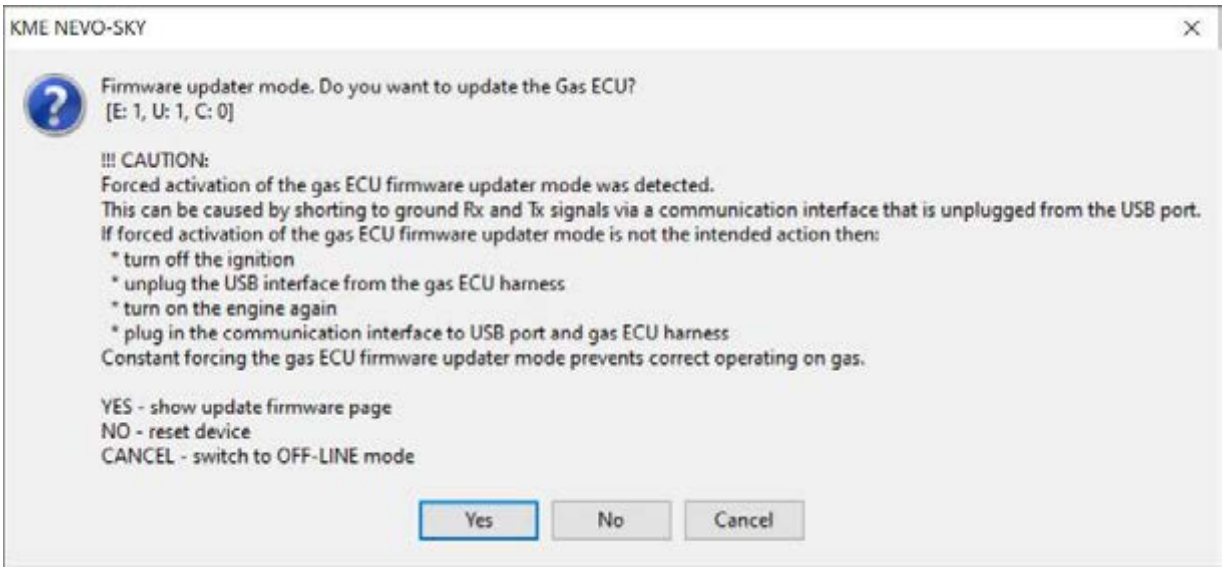


Fig. 2.31 Pop-up window after restoring communication with the controller in the update mode

- After successful completion of the controller update, the program will inform the user, click "**OK**".

2.5 Recorder tab

The function allows the gas system operation parameters to be recorded in time. Parameter values are presented in numerical form and a graph as a function of time. The blue vertical line determines the time moment for which numerical values are displayed. After stopping the recorder, it is possible to set a blue line and thus read the parameter values at any time during the recorder's work. The "Save buffer" button allows you to save waveforms from the recorder to the file. It is possible to read and display previously registered waveforms. Parameters that are displayed can be freely changed. Click on the parameter name to show a menu with a selection of all available operating parameters.

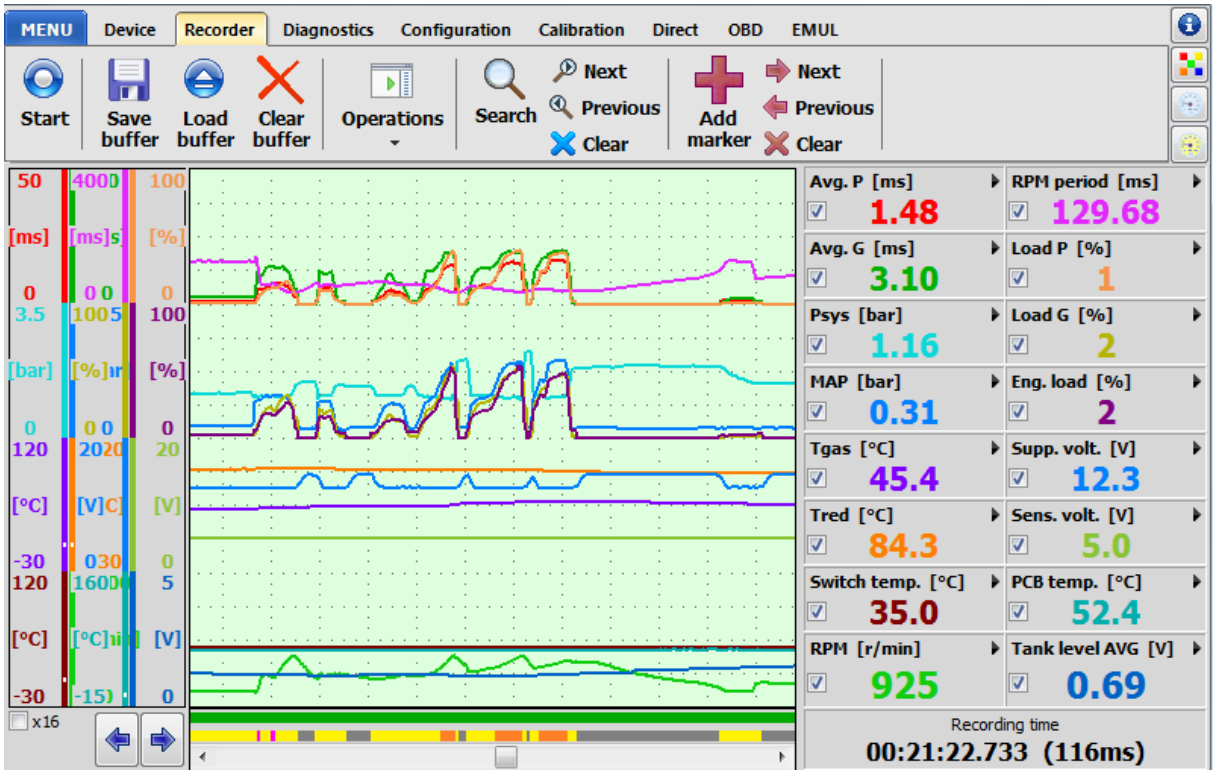


Fig. 2.32 Recorder window

Under the Operations drop-down bar (**Fig. 2.33**), the are recorder settings:

- ***Extended view*** – switches between displaying 8 and 16 parameters of the recorder
- ***Show background*** – changes the background color from grey to the colors corresponding to the current state of the gas controller (petrol, gas, waiting, etc.)
- ***Show grid*** – shows the grid in the window of the recorder, which can help determine the value of the waveform

- ***Value panel*** – shows a panel with current values and waveform names
- ***Scale panel*** – shows a panel with ranges and units of displayed waveforms
- ***Full graphs range*** – all waveforms are displayed on the entire screen of the recorder
- ***Recorder autostart*** of the recorder – automatic start of the recorder after connection with the controller.
- ***Load variables view from file*** – load variable display settings from previously saved DVR
- ***Next sample*** [Shift+Alt+Right] – go to the next recorder sample
- ***Previous sample*** [Shift+Alt+Left] – go to the previous recorder sample
- ***Zoom in (horizontally)*** [Shift+Alt+X] – enlarges the charts on the recorder (only horizontally)
- ***Zoom out (horizontally)*** [Shift+Alt+Z] – enlarges the graphs on the recorder (only horizontally)
- ***Small recorder window…*** [Ctrl+F10] – shows the window of the recorder, which can be displayed anywhere in the program, without blocking the main window

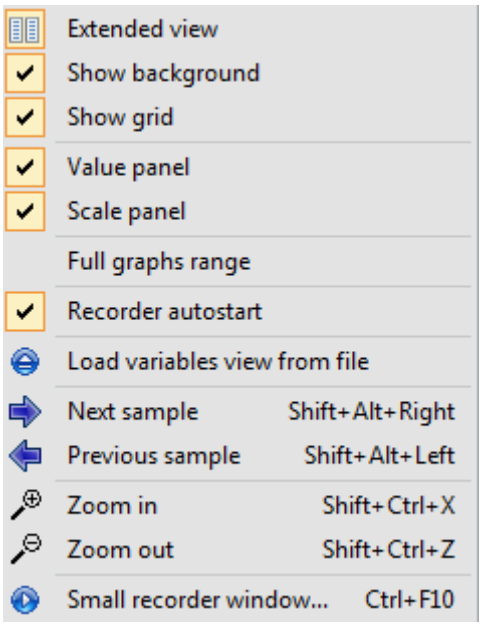


Fig. 2.33 Recorder options

To open the search window on the Recorder tab, click the "**Search**" button or use the keyboard shortcut **Ctrl+F**.

Searching in the recorder (**Fig. 2.34**) is based on adding criteria on the basis of which the analyzer's course should be analyzed, and then clicking "**Search**". You can add several search conditions and you can select whether all conditions are to be met or not. In the

frame on the right, all the found places of the recorder will be displayed, in which the search conditions are met.

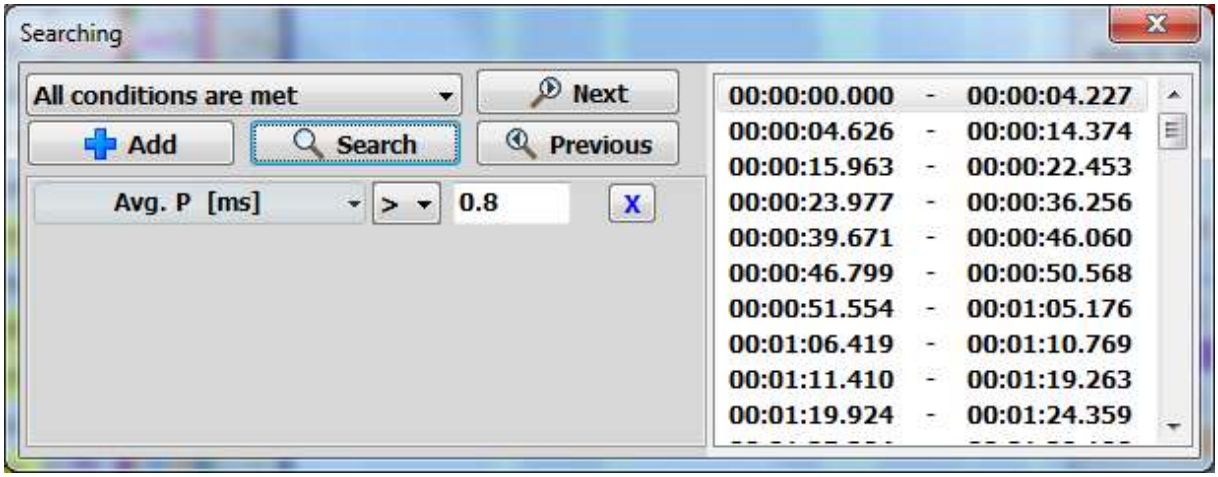


Fig. 2.34 Search window

Use the "**Back"** and "**Next**" buttons to move between successive search results and the "**Delete**" button to clear the search results.

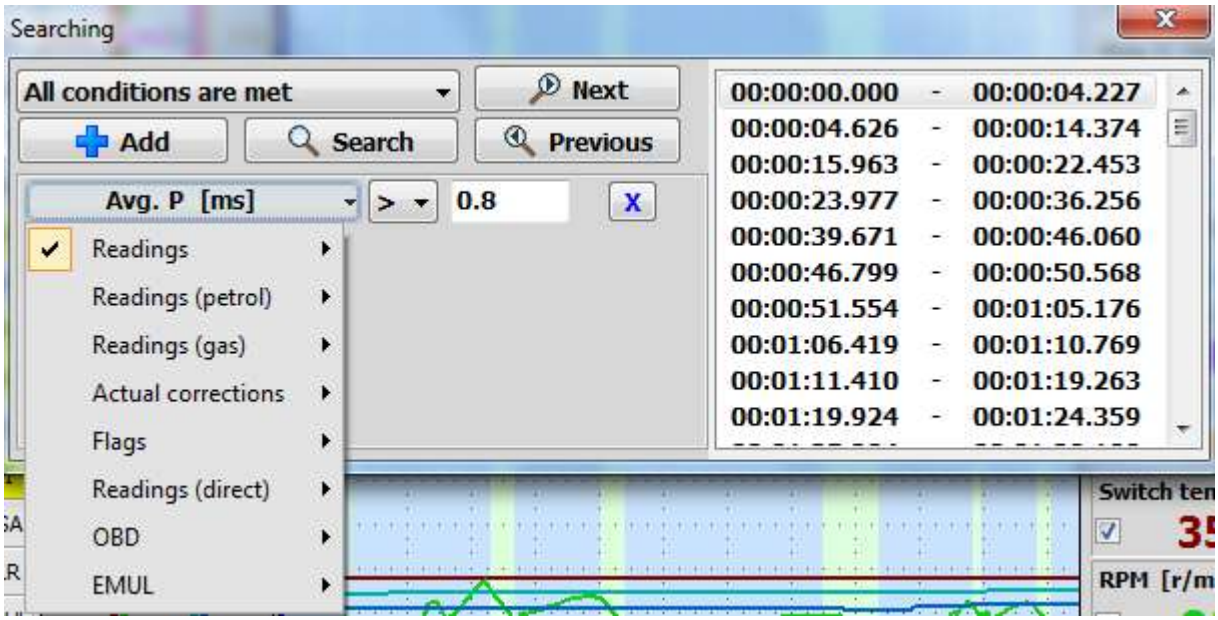


Fig. 2.35 Selection of search parameters

The menu for selecting the search parameters looks the same as for selecting parameters for displaying on the recorder. You can delete the condition with the blue "**X**" button.

Markers may be helpful when using the recorder. The marker is added after pressing the **space bar** (anywhere in the program) or by clicking the "**Add marker button**".

Fig. 2.36 Operation buttons on tags

The marker placed in the recorder is displayed as a vertical line, and determines the time of the recorder at the time the marker is added. It may facilitate later analysis of the recorder's waveforms, when during the drive you want to mark the time of occurrence, e.g. the occurrence of an error in OBD.

Use the "**Next**" [Alt+Right] and "**Back**" [Alt+Left] buttons to navigate the added tags, and the "**Delete**" [Alt+M] button deletes all previously added tags.

In the bar below the chart view, the recorder displays additional information in the form of two bars. The upper bar contains information about the state of the gas system at a given moment, while on the bottom bar there is information about the number of gasoline injections on one cylinder during one work cycle.

2.6 Diagnostics tab

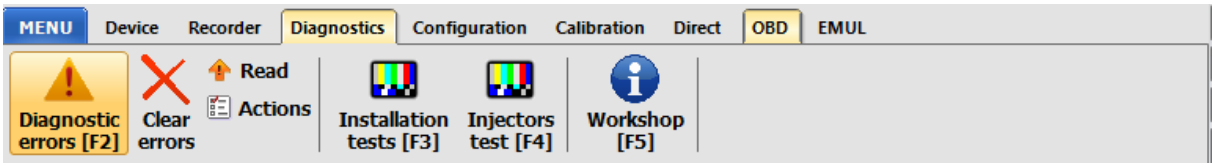


Fig. 2.37 Diagnostics Tab

The diagnostics tab contains functions that allow you to check the correctness of the installation, the correct functioning of individual components and the diagnosis of faults and failures. Bar elements on the Diagnostics tab are divided into groups:

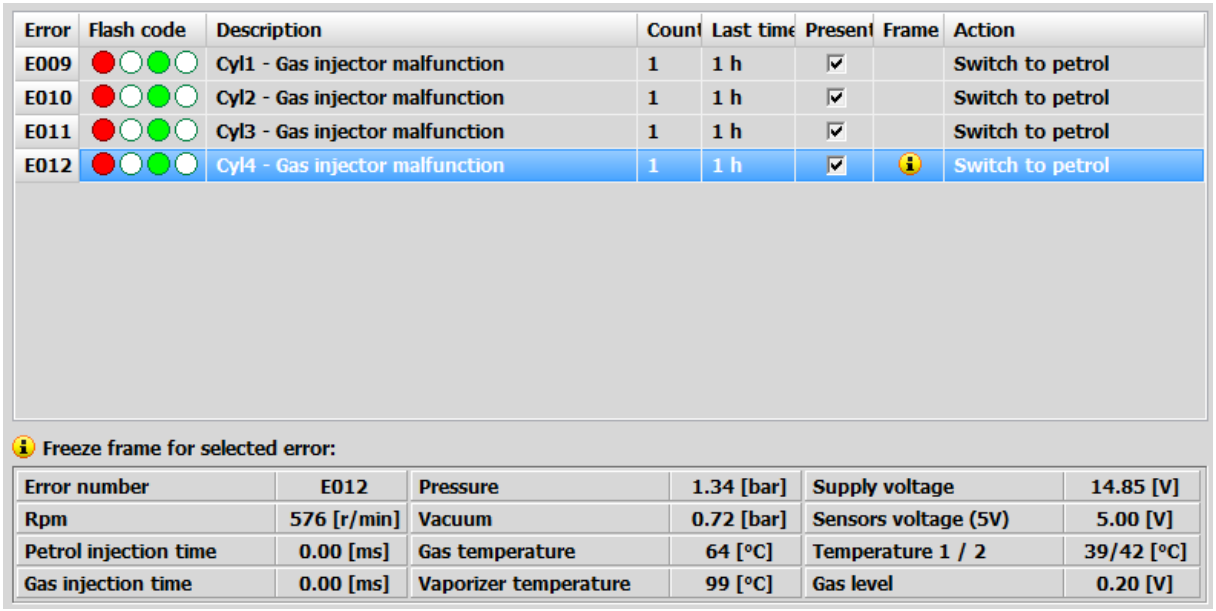
2.6.1 Diagnostic errors [F2]

The controller has a self-diagnosis system that allows detecting and remembering errors occurring during operation and defining the conditions under which an error occurred. The errors have their own light codes which are displayed on the driver's panel using gas level diodes. The window displays the registered error codes together:

- ***Flash code,***
- ***Description,***
- ***Count,***
- ***Last time,***
- ***Present* – information about the current error status,**
- ***Frame* – frozen frame,**
- ***Action*.**

After selecting the chosen error at the bottom of the window, a frozen frame containing the values of the selected operating parameters at the moment of the error appears (**Fig. 2.38**). A frozen frame is saved for only one error if it occurred at the same time. In the case of errors E017, E018 and E024 an additional temperature error message of the reducer will be displayed in the error code window. In case of existing one of these errors, check the temperature sensor itself and the pressure sensor (measuring module).

List of error codes (code, description, code of light) available in the file EN_User_manual.pdf



Error	Flash code	Description	Count	Last time	Present	Frame	Action
E009		Cyl1 - Gas injector malfunction	1	1 h	☑		Switch to petrol
E010		Cyl2 - Gas injector malfunction	1	1 h	☑		Switch to petrol
E011		Cyl3 - Gas injector malfunction	1	1 h	☑		Switch to petrol
E012		Cyl4 - Gas injector malfunction	1	1 h	☑		Switch to petrol

Freeze frame for selected error:

Error number	E012	Pressure	1.34 [bar]	Supply voltage	14.85 [V]
Rpm	576 [r/min]	Vacuum	0.72 [bar]	Sensors voltage (5V)	5.00 [V]
Petrol injection time	0.00 [ms]	Gas temperature	64 [°C]	Temperature 1 / 2	39/42 [°C]
Gas injection time	0.00 [ms]	Vaporizer temperature	99 [°C]	Gas level	0.20 [V]

Fig. 2.38 Table of registered errors with a frozen frame of the selected error

To delete the current errors of the gas controller click "**Clear errors**" [Alt+F2]. To read current errors from gas controller click "**Read**" [Alt+F3]

2.6.1.1 Actions [Ctrl+F2]

In the actions window the codes are described and it is possible to set actions for individual types of errors. The available actions are: no signaling (no change to petrol), switching to petrol and switching to petrol with auto-return to gas.

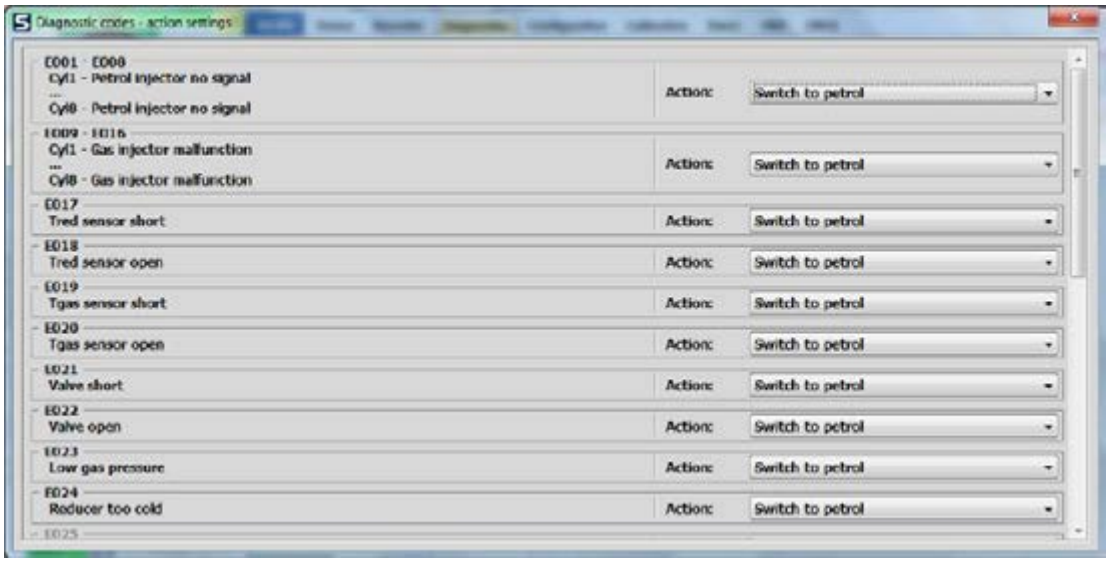


Fig. 2.39 Window for setting actions for individual errors

In the case of double clicking on an error in the table of registered errors, the action window will open, scroll to the selected error and color its frame to navy blue (**Fig. 2.40**).

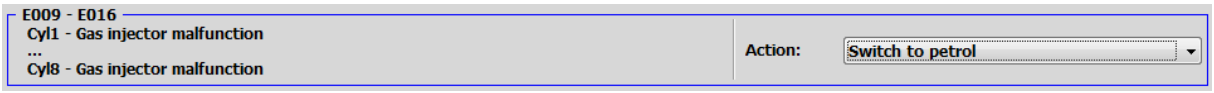


Fig. 2.40 The action window opened after double clicking on the registered error

If for some error an action is assigned which, according to the manufacturer, may cause a malfunction of the gas system, the frame around the error will be red (**Fig. 2.41**).

Fig. 2.41 Action not recommended for gas controller fault

Fig. 2.42 Error action of petrol injectors with the active HEMI / ECO option

2.6.2 Installation tests [F3]

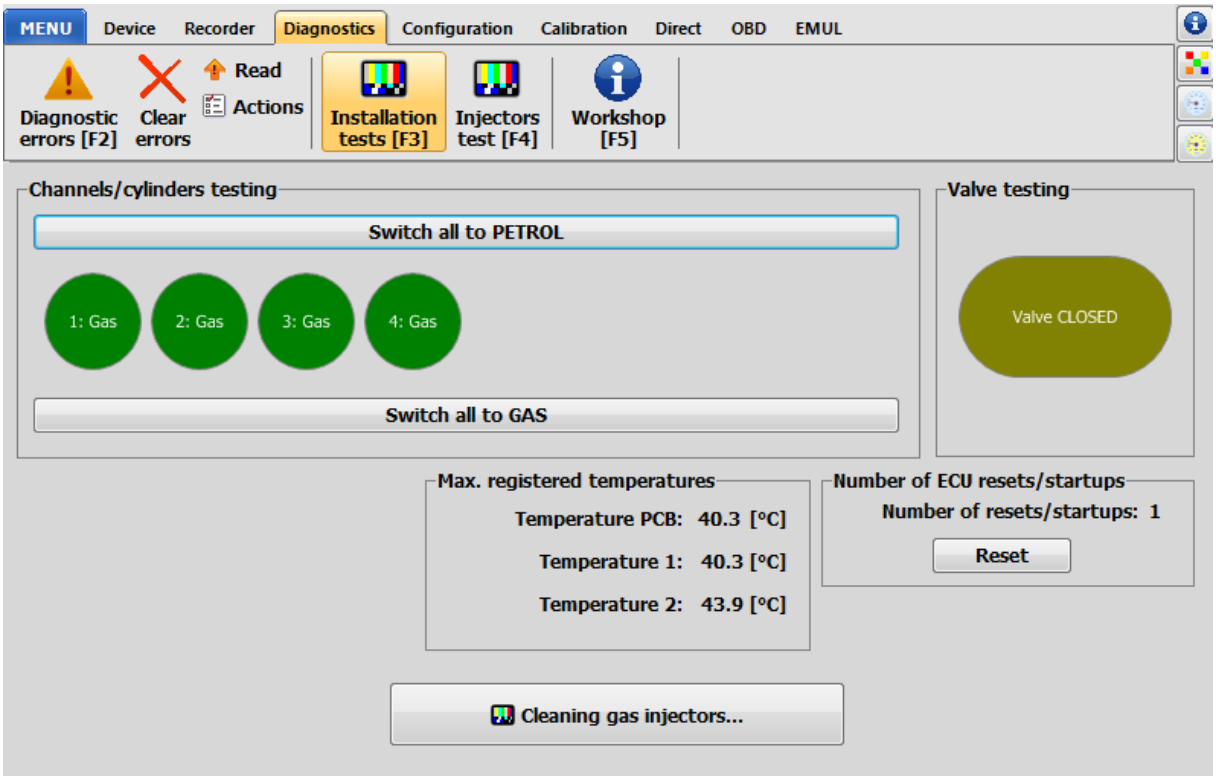


Fig. 2.43 Installation tests window, DIRECT controller view

The function allows checking the order of connection of cylinders, detection of inefficient or damaged cylinders. It also allows you to check the correct operation of gas valves.

Channel / cylinder testing procedure:

1. Switch the system to gas.
2. Press the "**Switch all to PETROL**" button.
3. Starting from the first cylinder, switch the gas channels one by one (always only one cylinder on the gas). If the engine is running unevenly it means a problem on the cylinder (incorrect gas injector slippage, incorrect connection of the gas injector, wrong gas injector operation).
4. Repeat the procedure for each cylinder.

Valve testing procedure:

1. Switch the system to gas.
2. Press the yellow button in the "**Valve testing**" frame.

3. Check if the gas pressure (Psys) drops evenly.

Closing the valve while working on gas allows you to simulate an empty gas tank. It can be used to select the appropriate parameters for returning to petrol at low pressure (see: **2.7.3 Switching configuration [Ctrl+F8] → Switching to petrol)**.

Cylinder and valve switching can also be operated from the controls under the virtual driver panel (). By clicking the right mouse button in this place, a menu will appear where we can switch all injectors to petrol/gas.

Fig. 2.44 Gas injectors and valve switch

2.6.2.1 Cleaning gas injectors

The injectors cleaning procedure (additional cleaning liquid required), individually activates the gas injectors. It is possible to adjust the time between switching cylinders and the time between cycles (**Fig. 2.45**) so that the motor can run without major problems during the procedure.

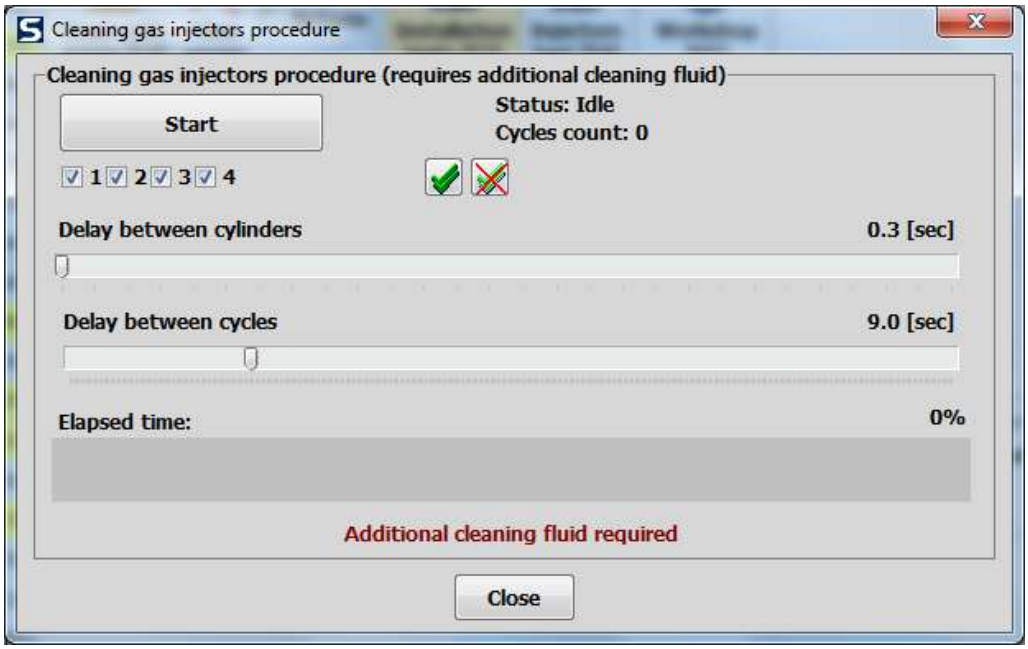


Fig. 2.45 Window for cleaning gas injectors

2.6.2.2 Number of emergency starts on gas (indirect only)

The controller has the option of emergency start on gas. Emergency gas start procedure (a reducer temperature> 0 ° C is a must).

The maximum number of emergency gas starts is configurable (default is 50). The "**Reset**" button allows you to reset the number of emergency starts directly on the gas.

ATTENTION! This function may be inactive in the event of a + 12V "after ignition" power failure during the procedure.

ATTENTION! In the emergency engine start mode some functions of the controller (including switching mechanisms) may not work on the gas.

ATTENTION! This function is not available in the NEVO-SKY DIRECT system.

For more information please read the file EN_User_Manula.pdf

2.6.2.3 ECU temperature

The current temperature of the controller is displayed in the readings window. Diagnostics → Installation tests tab displays the highest recorded temperature during controller operation. This allows you to evaluate the conditions in which the controller works.

2.6.3 Gas injectors test [F4]

The function allows to detect differences in the efficiency of gas injectors installed in the car without having to remove them from the car.

Before starting the test, warm up the engine and make sure that the injectors have been installed in the correct order. It is important to provide the same engine load as possible throughout the entire test. Variable load - for example turning of the steering wheel, operation of emergency lights, activation or deactivation of air conditioning or traffic lights during the test may distort its results or discontinue the procedure.

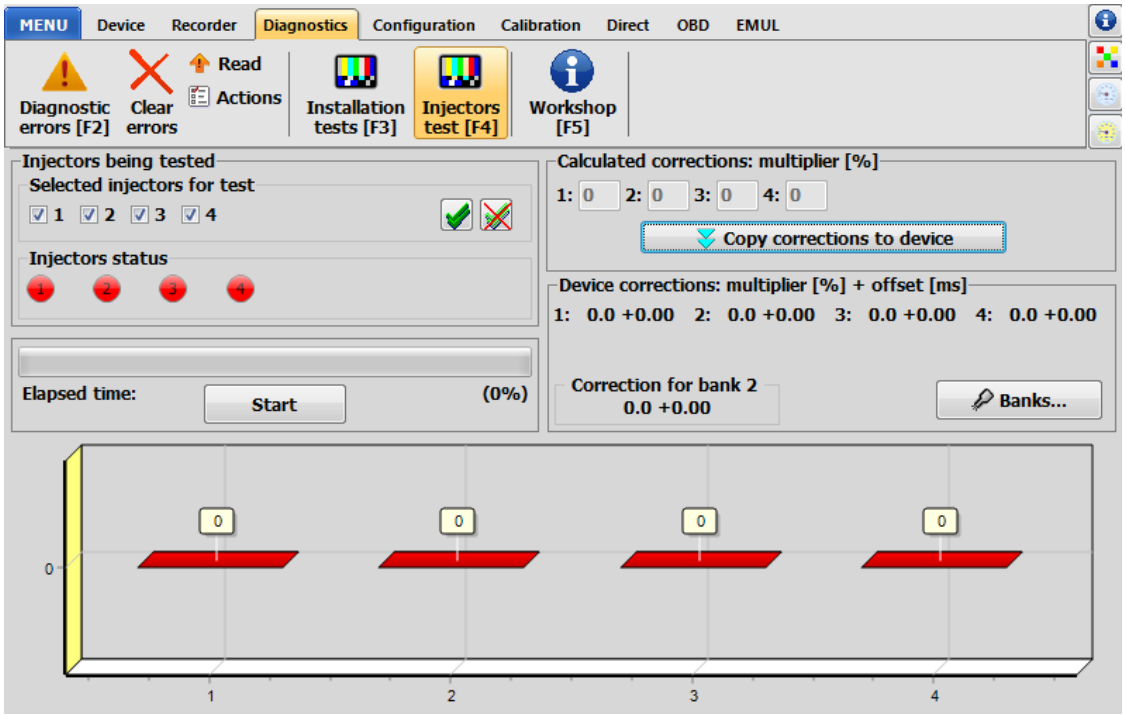


Fig. 2.46 Injector Test page

Injector testing procedure:

1. Check that all cylinders have been correctly mounted and have not been mistaken in order.
2. Start the engine.
3. Allow the car to idle on the gas for about 5 minutes to stabilize the conditions (gas temperature, reducer temperature).
4. Open the injectors testing window [**F4**] (**Fig. 2.46**), select the cylinders to be tested (at the beginning of the tests, select all), press the "**Start**" button.
5. Wait for the end of the test. During the test, a progress bar is visible.
6. After the test is completed, the result of the test and correction will be displayed. The result of the test gives a comparison of injector performance in a particular system.
7. Corrections should be rewritten by clicking "**Copy corrections to device**". The method is not accurate and may not be sufficient to apply the calculated adjustments in each case.

2.6.4 Workshop [F5]

The information for the workshop regarding the controller, the date of the first modification of the settings with the computer code and the computer code with which the controller is currently connected (**Fig. 2.47**). There is also information about the controller's working time (on gas, on gas, total working time), a list of changes, modification dates and computer codes on which gas controller settings were changed.

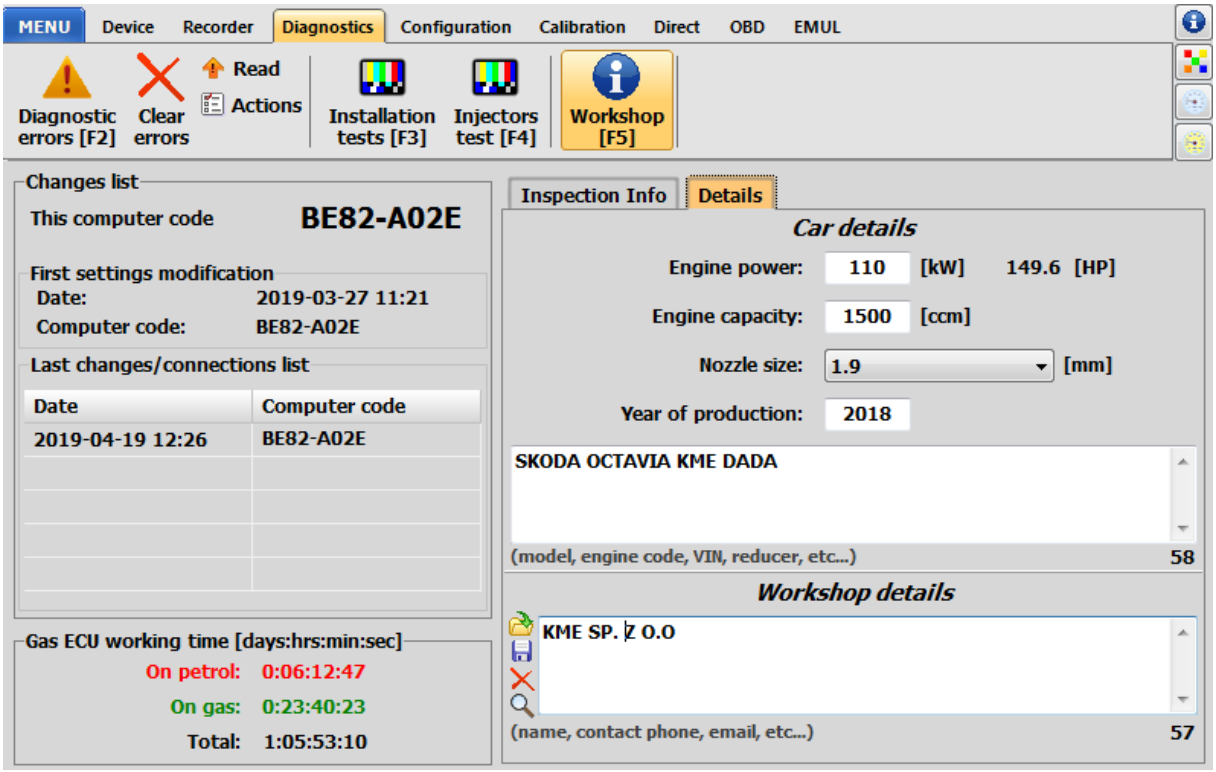


Fig. 2.47 Workshop page

In the "**Details**" tab, enter the car's data and information about the workshop installing the gas installation.

Using the icons next to the Workshop information field it is possible to save the entered information in a file on a computer disk. The saved entry can be easily loaded. This data can also be deleted or displayed.

2.6.4.1 Inspector reminder

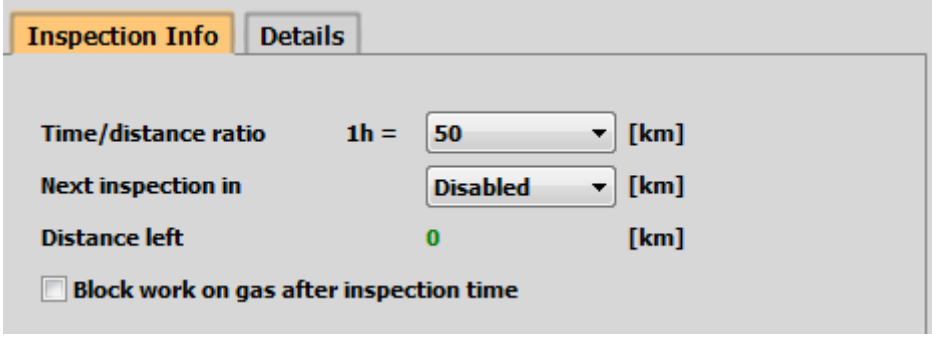


Fig. 2.48 Overview tab on the Workshop page

In the "**Inspection tab**", it is possible to set an approximate mileage, after which the system will enter the information mode about the need to perform the inspection. To do this, set the average speed (Time / distance ratio, e.g. 1h = 50km) and the distance at which the controller should start to inform the driver about the need to perform a periodic inspection. In this mode, each time the controller is started, the controller will signal the need for a review - **using ten buzzer sounds issued by the driver's panel**.

IMPORTNT!!! Buzzer sounds may be disable. Make sure the buzzer sound is enabled (**2.7.1 Driver's panel configuration [Ctrl+F7]).**

The option "**Block work on gas after inspection time**" results in the gas controller not being able to operate after the inspection time has elapsed. The function was created to enforce money from dishonest clients, when the installation is bought in instalments and the lender is a workshop. It is not recommended to activate this function in another case. If this function is activated, it is recommended to lock the controller.

Please remember to inform the driver about the LOCK working on gas.

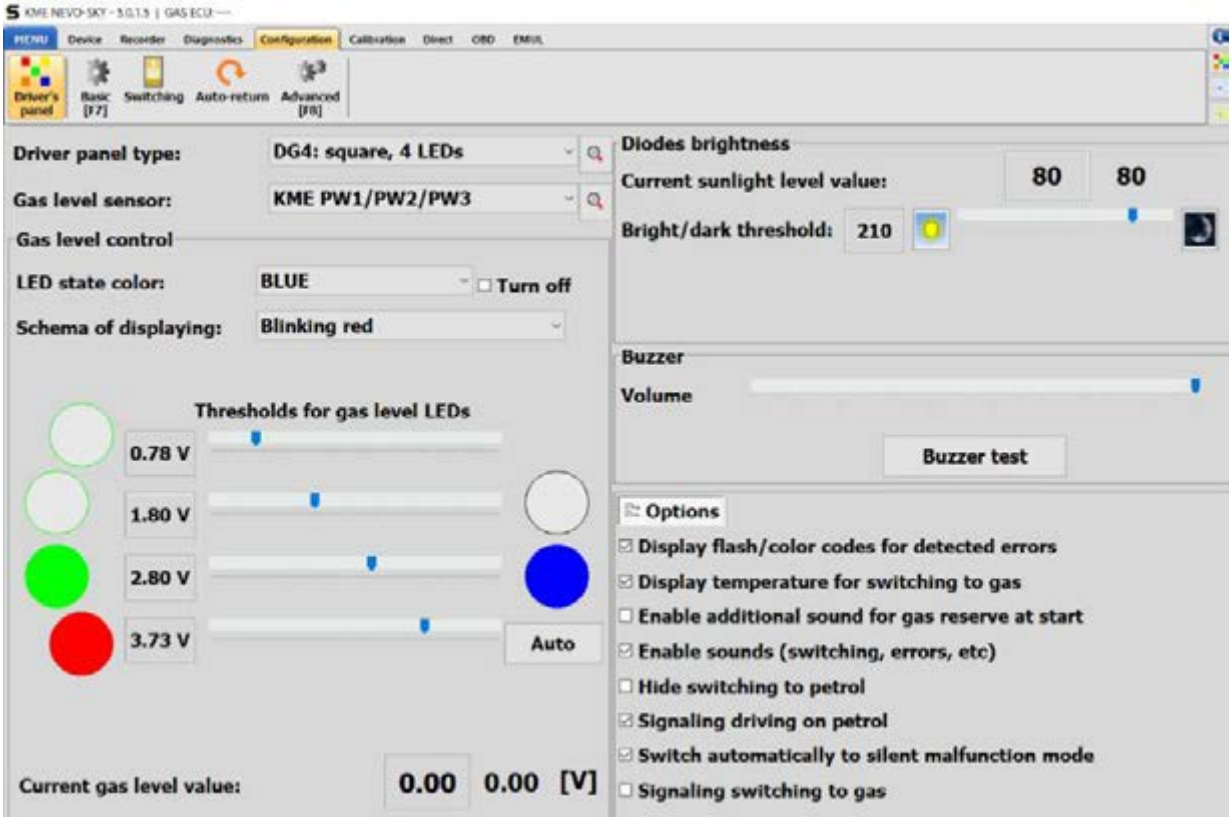
To reset "Distance left" select any "Next inspection in".

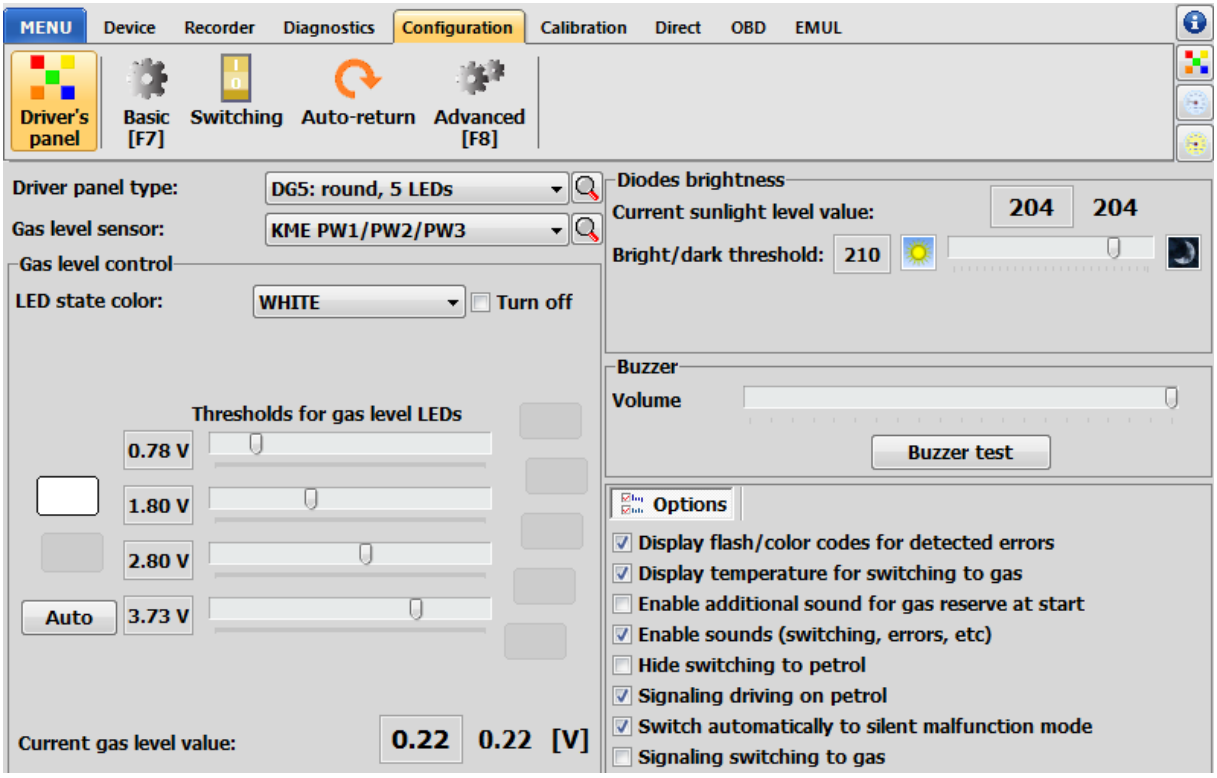
2.7 Configuration tab

In the Configuration tab, windows and functions responsible for the configuration of the gas system and the driver's panel have been placed.

2.7.1 Driver's panel configuration [Ctrl+F7]

The Configuration \ Driver's Panel window shown in **Fig. 2.49** allows you to change the settings of the driver's panel. Below are the screenshots for the three types of driver panels DG4, DG5, DG7.





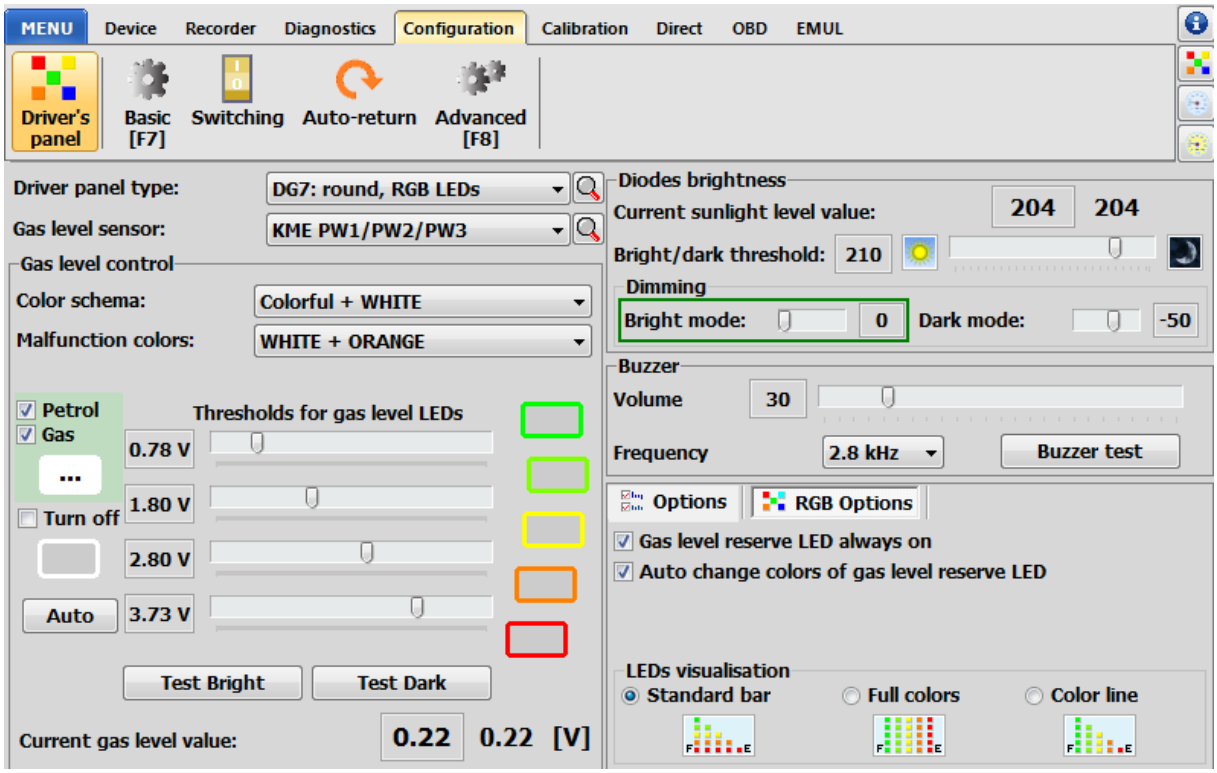


Fig. 2.49 Driver configuration panel windows in various configurations

The Driver's panel configuration window has options:

- ***Driver's panel type*** - selection of the driver's panel type:
  - DG4 - square, 4 LEDs
  - DG5 - round, 5 LEDs
  - DG7 - round, 5 RGB LEDs
- ***Gas level sensor*** - selection of the gas level sensor installed.
- ***Color of the status LED*** - you can choose whether to show gas on the DG4 panel: blue or red diode. For DG5 panel: white or orange. For DG7 RGB panel - depending on the color scheme.
  Option **Disable** - the status LED can be turned off.
- ***Display scheme*** *(only for DG4 panel)* - it is possible to select whether the state before the reserve is to be signaled by blinking of the red diode or simultaneous lighting of red and green. It is also possible to select the display scheme: 4 levels, displaying only 4 levels on 4 LEDs.
- ***Malfunction colors*** *(only for DG7 panel)* - you can choose whether the panel is to display colors in panel style DG4, DG5, use the default multicolor scheme (white color of status LED, gas level diodes in colors from red (reserve diode) to green), or you can define the color of each diode yourself.
- ***Malfunction colors*** *(only for DG7 panel)* - you can select the color scheme for the RGB panel when the controller is in a failed state. Available options are: "WHITE + ORANGE" (according to DG5) and "BLUE + RED" (compatible with DG4).
- ***Link gas level LEDs***  *(only for DG7 panel and color scheme "Self-defined colors")* - if the option is enabled (a padlock is displayed on the button), the color selection at any gas level diode will cause the selected color to be set on all gas level LEDs and on the reserve diode. NOTE: if the previously selected colors on the gas level LEDs were not the same, after enabling this option, all the LEDs will be set to the color as the first LED above the reserve LED had.
- ***Backlight LED*** *(only for DG7 panel)* - possibility to set the color of the backlight diode, and enable / disable when the controller is on gas / petrol.
- ***Auto*** - automatic calibration mode of the gas level indicator. More read in the file EN_User_manual.pdf.
- ***Thresholds for gas level LEDs*** - it is possible to set the thresholds for further LEDs lighting up depending on the gas level indication.
- ***Test Bright/Dark*** *(only for panel DG7)* - buttons allow you to see how the panel will be lit in "**light**" mode or "**dark**" mode.
- ***Current gas level valuel*** - 2 values are displayed: on the left the currently read value, on the right the average value.

- ***Current sunlight level value*** - 2 values are displayed: on the left the currently read value, on the right the average value.
- ***Bright/Dark threshold*** - the LEDs of the driver's panel have two levels of lighting. With this slider you can set the brightness level for which the LEDs switch over. The more the slider is moved to the right, the darker it must be to make the LEDs shine with less intensity. At the extreme right position, the diodes always shine brightly.
- ***Dimming*** *(only for DG7 panel)* - allows you to set how many percentages should be dimmed in "bright" and "dark" mode. The value can be adjusted from 0 to 80%. The extreme left position of the slider means no darkness.
- ***Buzzer volume*** - the volume of the buzzer can be set using the slider.
- ***Buzzer frequency*** *(only for DG7 panel)* - frequency change affects the tone of the buzzer.
- ***Displaying error codes in the trouble state*** - by selecting this option, error codes are displayed on the LEDs after a failure.
- ***Displaying the temperature to be switched*** - when the system is waiting for a changeover, as the temperature of the reducer increases, the number of gas-level LEDs increases.
- ***Additional sound signaling of the gas reserve at the start*** - after reaching the reserve while working on gas, the system will generate a sound informing about a low gas level.
- ***Sound signaling*** - when the option is cleared, the panel buzzer is inactive. This also applies to system failures. Should be used as a last resort.
  Please remember to inform the car driver about TURNING OFF this option.
- ***Hiding switching to petrol*** - when the option is active, the driver's panel does not signal the system transition to gasoline supply with automatic gas return.
  Please remember to inform the car driver about TURNING OFF this option.
- ***Drive indication on petrol*** - if the system starts on petrol, it generates three sounds at equal intervals.
  Please remember to inform the car driver about TURNING OFF this option.
- ***Switch automatically to a silent mode of failure*** - if this option is checked, then after an error signaled by a buzzing squeeze, the gas controller will automatically turn off the squeal after 5 seconds.
- ***Gas switching signal*** - if this option is checked, the buzzer will emit a short beep before the first gas injection starts.
- ***Gas level reserve diode always on*** *(only for DG7 panel)* - if this option is selected then the reserve diode will remain on even when the tank is full. Deselecting the option will cause the reserve diode to glow only when the gas in the tank runs out.

- ***Automatic change colors of gas level reserve LED*** *(only for the DG7 panel)* - if this option is checked, the reserve diode will automatically change color when the gas level is greater than the reserve state.
- ***Diode visualization*** *(only for DG7 panel)* - it is possible to change the visualization of the gas level as below:

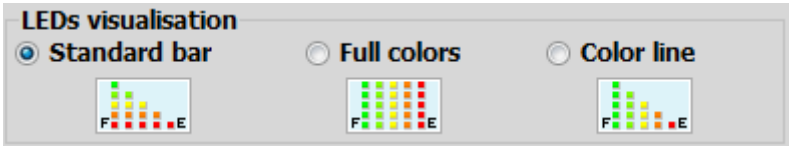


Fig. 2.50 Visualization of LEDs

When a different type of panel is selected than the one currently connected to the installation, a window may appear that informs about another panel type detected (**Fig. 2.51**).

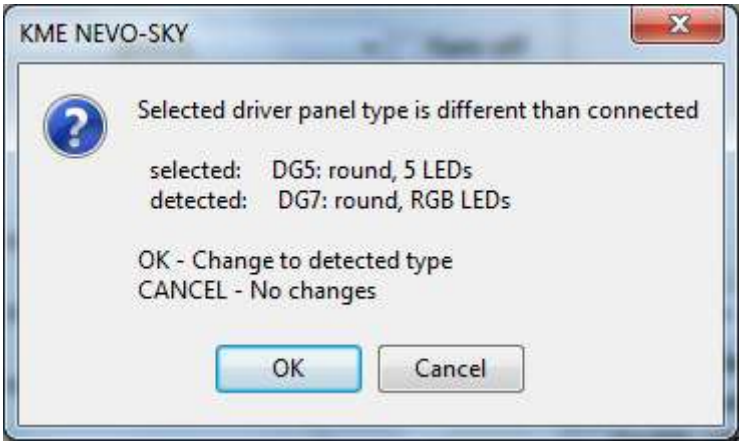


Fig. 2.51 Information window about detected panel type

2.7.2 Basic configuration [F7]

In this window you will find the necessary and the most important parameters needed to properly set up the installation in the car.

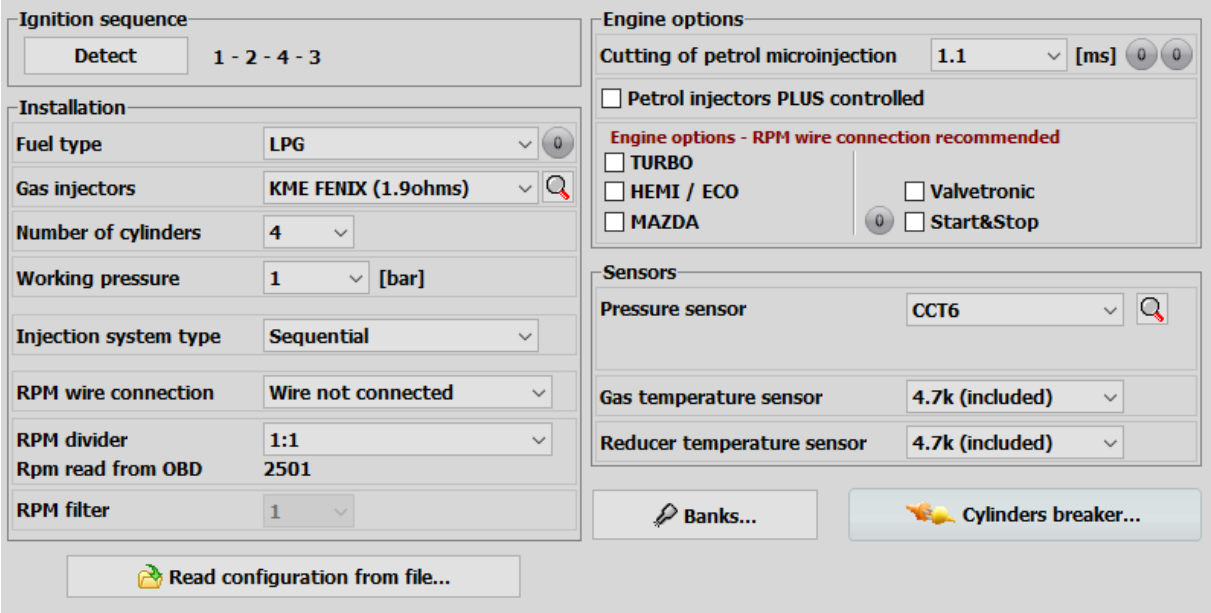


Fig. 2.52 Basic configuration window (MAX view)

Description of available options:

- **Ignition sequence**: Shows the current ignition sequence next to the button to determine the ignition sequence. The "not yet detected" message will appear if the ignition sequence is unknown.
- **Installation**:
  - ***Fuel type*** – determine the type of alternative fuel (LPG or CNG).
  - **Gas injectors** – select the type of gas injectors installed. It is important to choose the right type of gas injectors. A bad type of injectors can cause serious problems in the system and Auto-calibration.
  - ***Number of cylinders*** – enter amount of cylinders.
  - ***Injection system type*** – choose the car's injection system type.
  - ***RPM wire connection*** – determine whether the controller should read RPM values from the petrol injectors (indirect injection controller only) or from the RPM source. A signal from the camshaft sensor is also available. In this case, enter the current engine speed read from the rev counter in the field and press

the divider button, which will automatically align the system with the camshaft position sensor. You can also use the "Determine with OBD" button which will automatically read the current revolutions from the petrol controller and apply them to the calibration of the shaft position sensor (OBD connection required). The connection of the rotation cable is recommended.

RPM cable not connected (indirect injection controller only) – mark only if we cannot connect the rotation cable to the correct signal in the car. Then the controller can determine the RPM value based on the signals from the petrol injectors.

IMPORTANT! In case of problems with system calibration or bad operation, it is recommended to connect the revolution cable (e.g. when the program will not read the revolutions).

Lack of accurate RPM readings can cause imprecise and incorrect operation of certain functions based on the values of revolutions such as: correction maps, enrichment injection, cold vag, etc.

The connection possibilities for the rotation wire are shown in the **Table 2**.1:

Table 2.1 RMP possible connection methods

Wire not connected	Inaccurate value of the RPM read from petrol injectors. It is not recommended for Turbo, Mazda, Hemi, Start&Stop and Valvetronic engines. Choose this option, when the RPM wire is not connected.
RPM signal	The exact value of the RPM read from ignition coil or Hall sensor. Sometimes signal from the coil can disappear during cut-off state (e.g. a Valvetronic engines) and then connect the RPM wire to the camshaft sensor.
Signal „engine running"	Inaccurate value of the RPM read from petrol injectors. Wire can be connected to any signal giving information that the engine is running (e.g. inductive sensors). **Do not connect the RPM wire directly to petrol injectors because this will automatically switch to petrol when cut-off due to loss of signal.**
Camshaft sensor	The exact value of the RPM read from of the camshaft sensor.

  - ***RPM divider / Ignition system*** – choose the RPM divider or ignition system type. RPM value shown next to ignition system type allows to verify the choice. If the type is correct, shown RPM value should be the same as shown on the car tachometer.
  - ***RPM filter*** – the number of samples taken of RPM to calculate the current average value.
  - ***Working pressure*** – value of pressure for which the corrections are 0%.
  - ***Reducer temperature sensor*** – choose the type of reducer temperature sensor.
  - ***Pressure sensor*** – choose the type of pressure sensor.
- **Engine options**:
  - ***Gasoline injection cut-off*** *(indirect injection controller only)* – this option is used in engines where, after the basic injection, there are still short fuel injections called " secondary injection". If the engine has gasoline secondary injection and this option is unmarked, petrol injection times are undulating and have small and large values. Small values mean the time of the secondary injection. Choose the time of the secondary injections at a slightly higher level than those seen in the readings.
    Since 5.2(5.3/5.5)C r1 version there is additional signalization in form of 2

indicators. The first one informs, that petrol injection was ignored because it was shorter that microinjection cut-off threshold. Second one informs that PROBABLY detected microinjection, that's time was higher than cut-off threshold. Those signalizations allow to more precisely determine the correc5t level of

- ***Gasoline injectors controlled with PLUS signal*** *(indirect injection controller only)* – Used in cars where petrol injectors are controlled by + 12V signals (active positive signal).
- ***TURBO*** – activates additional functionality for Turbo engines taking into account the values of overpressure (boost pressure) for many algorithms of the gas controller.
- ***MAZDA*** *(indirect injection controller only)* – option provided for engines changing the type of injection system from sequential to half-sequential or full group, which is often the case in Mazda cars.
- ***HEMI / ECO*** *(work despite the lack of a signal from the gasoline injector)* – it should be marked for engines that can turn off half of their cylinders in order to reduce gasoline consumption.
- ***Valvetronic*** – activates additional functionality for Valvetronic engines (without vacuum). Allows the system to operate without connected vacuum to the regulator (only engines without turbo).
- ***Start & Stop*** – option for cars that stop the engine automatically when they are stationary and start it immediately when starting, causing the engine to restart only on gas.

- **Sensors**:
  - ***Pressure sensor*** – type of pressure sensor installed.
  - ***Gas temperature sensor*** – selection of the gas temperature sensor from the list of available.
  - ***Reducer temperature sensor*** – selection of the reducer temperature sensor from the list of available.

2.7.2.1 Banks configuration

After pressing the "**Banks ...**" button, the program opens the window shown in **Fig. 2.53**. The window gives the possibility of introducing an additional correction for selected cylinders, assigning cylinders to banks (**necessary when activating OSA adaptation in two-bank engines and applying corrections maps to the bank 2**) and introducing a correction for bank 2.

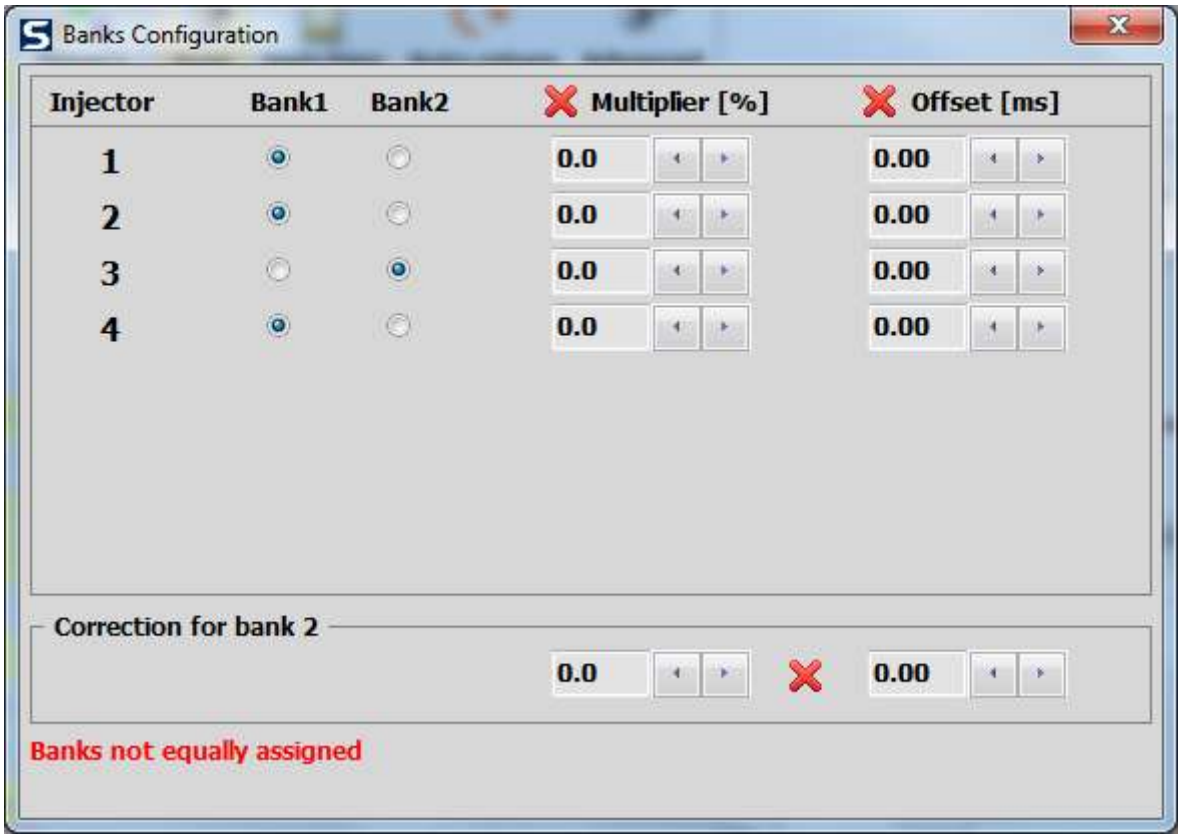


Fig. 2.53 Bank configuration window

Correction for bank 2 is used to equalize the work of banks in two-bank engines that have two lambda probes in front of the catalyst. Select the injectors that belong to the second bank, and give the correction value by which the gas injection time values for the gas injectors in the other bank will be changed.

To determine which bank the cylinder belongs to, switch the system to gas, mark any one cylinder (for example the first one) as belonging to bank 2 and enter any correction for bank 2 (for example +3 ms). Then check whether the short-term correction of the first or second bank is changing. If the correction of the first bank has changed, it should be assumed

that the chosen cylinder belongs to bank 1. If, however, the correction of bank 2 has changed, it should be recognized that the chosen cylinder belongs to the second bank. In this way, all cylinders should be tested. Alternatively, the **cylinder breaker** can be used for the test (**only witch OBD)**.

If the system detects settings related to the assignment of cylinders to banks that seem to be incorrect, it will display appropriate warnings at the bottom of the window. An example can be seen in **Fig. 2.54**.

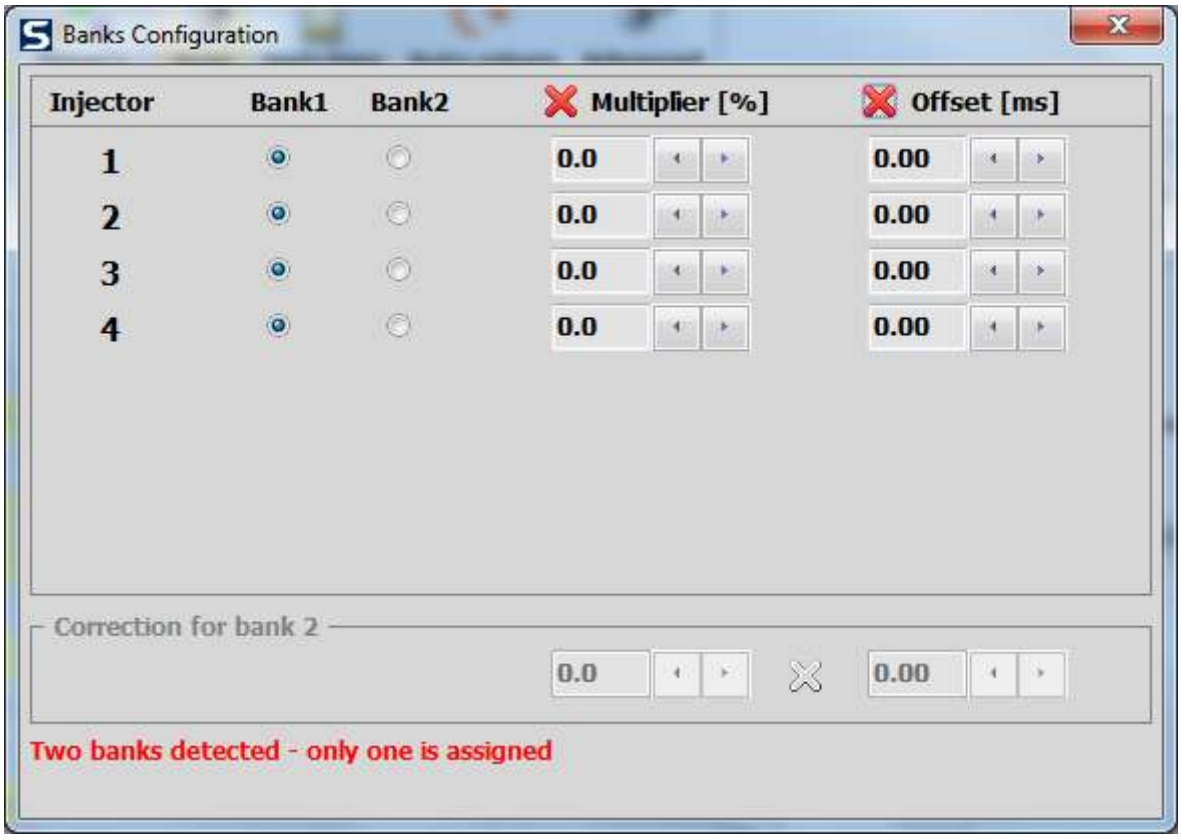


Fig. 2.54 Banks warning

2.7.2.2 Cylinders breaker (only with OBD) [Ctrl+F6]

Cylinder breaker allows you to completely cut the gasoline injector while working on gasoline. It should be used only to verify the correct connection of the gas controller to the gasoline injectors. To check the connection via the disconnector, a connection to the OBD is required, and the engine running. After disconnecting the appropriate cylinder, an error should occur in the OBD from the disconnected petrol injector (**Fig. 2.55**). In this way, check all cylinders one by one, deleting the previous OBD errors.

!!! WORK AT A PETROL IS REQUIRED !!!

For DIRECT systems, it is absolutely necessary to properly connect the petrol controller gas injectors to the appropriate cylinders in relation to the OBD diagnostics (1-1, 2-2, 3-3, 4-4).

In the case of dual-mode cars (DI + MPI) it may be necessary to first enable ECN emulation (**chapter 2.12 EMUL tab**) and check the option "Force emulation on gasoline" to force the car to work on the idle system on petrol (available from the **5.1A r3** driver version).

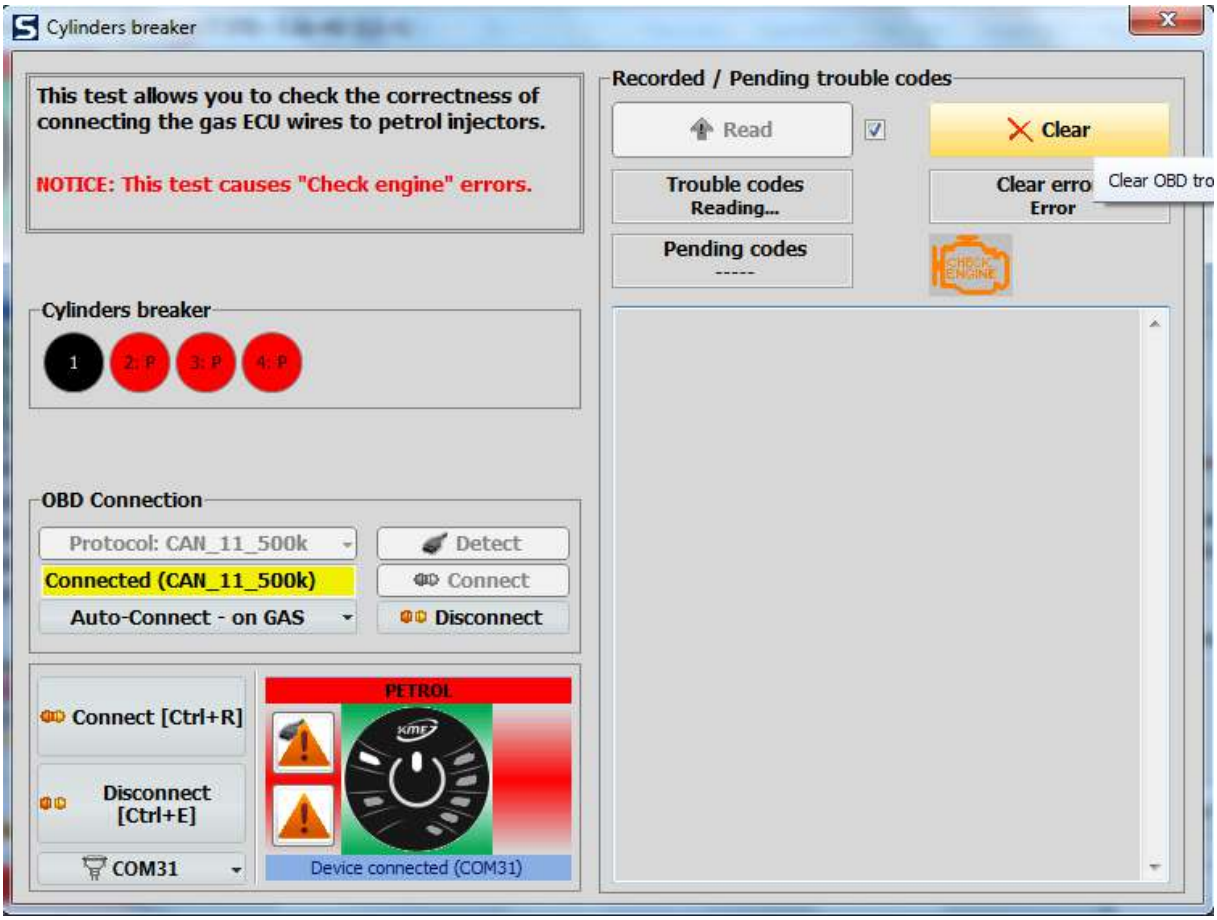


Fig. 2.55 Cylinder disconnector window

!!! ATTENTION !!!

In some cars the cylinder breaker may not cause an OBD fault, even after a longer period of operation with the cylinder turned off (e.g. cars from the RENAULT / NISSAN / DACIA group). In this case, check the connection by manually disconnecting the gasoline injector circuit. To confirm, you can use the ignition coil plugs.

2.7.3 Switching configuration [Ctrl+F8]

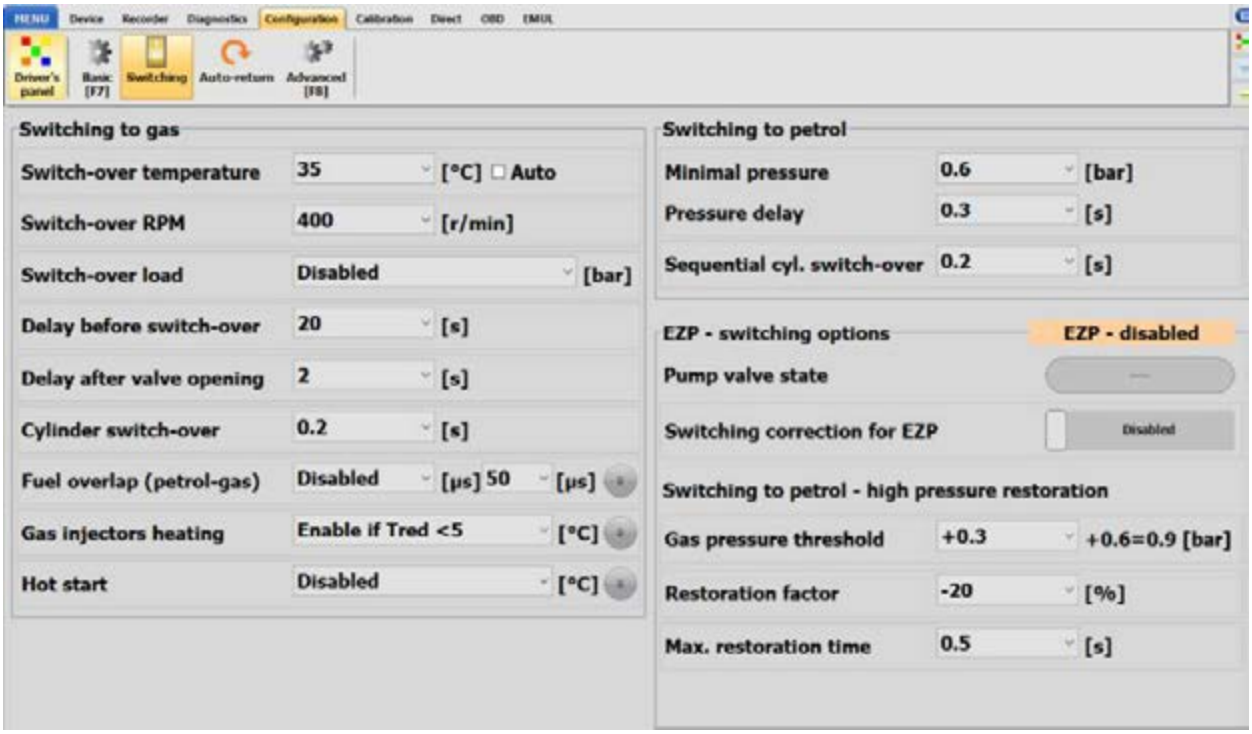


Fig. 2.56 Switching window

- **Switching to gas**:
  - ***Switching-over temperature*** – temperature value of the regulator, which must be reached so that the controller can switch to gas.
  - ***Auto*** – automatic calculation of the optimal switching temperature depending on the gas temperature (the system automatically reduces the switching temperature when Tgas <15C in proportion to Tgas). The car switches faster in the winter to gas.
  - ***Switch-over RPM*** – RPM value, after exceeding which, the controller can switch to gas.
  - ***Switch-over load*** – vacuum value below which gas switching can occur. The mechanism allows you to set the switching conditions so that the change for gas takes place with the engine unloaded.
  - ***Delay before switch-over*** – the minimum time that must elapse between starting the car and switching the system to gas supply.
  - ***Delay after valve opening*** – earlier about the earlier opening of the gas valves before starting the switching of the cylinders to the gas supply.
  - ***Cylinder switching-over*** – this is the delay between switching on subsequent channels (cylinders) - gas injectors. A value of 0 means that all cylinders switch to gas at the same time.

- ***Fuel overlap (petrol-gas)***
  - *Indirect injection* – overlapping of petrol and gas injections with the possibility to set the number of cycles and gas injection time. This option is useful when the distance from the gas injectors to the collector is long and the switching of cylinders to gas is felt. The duration of the phase application cycle should be determined experimentally. It depends on the speed of the injectors and the length of the hoses.
  - *Direction injection* – adding fuel while switching to gas. Useful if jerking is felt when switching to gas. Specify the initial gasoline addiction and the steps which it is expected to decrease in each cylinder cycle.
- ***Gas injectors heating*** – causes the gas injectors to warm up before switching to gas, if at the moment of starting the system the temperature of the reducer was smaller than the one selected.
- ***Hot start*** – while starting the car for a temperature above the selected system starts on gas.

- **Switch to petrol when**:
  - ***Minimal pressure / Pressure delay*** – determine the pressure value and the time after which the controller is to return to petrol and signal the end of gas in the tank. On vehicles with an automatic transmission, or when a strong jerk is felt during the operation of the function, reduce the time or if it does not work - raise the pressure threshold, e.g. up to 0.8 bar.
  - ***Sequential cylinder switch-over*** – this is the delay between switching on subsequent channels - petrol injectors. This delay allows for a more stable transition to gasoline. The value "**Disabled**" means that all cylinders switch to petrol at the same time.
- **EZP** - switching options (direct injection driver only):
  - ***Switching correction for EZP*** – mechanism implemented using universal correction 1. Cars tuned with EZP will have a too rich mixture when switched to gas until the fuel pressure drops to low values. This correction allows to shorten gas times for high petrol pressure values. More details in chapter **2.8.5 Corrections [F12].**
  - ***Switching to petrol – high pressure restoration*** – cars with EZP have low petrol pressure when working on gas. There may be significant jerks or pressure errors when returning to the gasoline supply (end of gas, auto-return, on user's demand). To prevent this, rebuild the gasoline pressure before changing it is needed. The following setting allow the petrol pump to be activate earlier.
    - *Gas pressure threshold* – the set value will be added to the "Minimum pressure" parameter. If the gas pressure drops below this sum, the petrol high pressure pump will be automatically activated.
    - *Restoration factor* – restoration of high pressure may fail if the petrol controller thinks that it currently has expected level of pressure. To

effectively rebuild pressure, you need to lower the emulation value (analog output 1) so that the gasoline controller, when noticing a pressure drop, starts controlling the pump more aggressively to rebuild gasoline pressure. This parameter allows you to specify the percentage by which you can lower the emulation value.

Warning: The undervalued output will ignore the minimum EZP emulation value!

Warning: This parameter is active both for switching due to end of gas, auto-return and user request!

- *Max. restoration time* – parameter used when switching to petrol when the auto-return function is activated or when the user presses button on the panel. At the start of the switching procedure, the high pressure pump will be activated and the switching will be delayed until the car reaches a high pressure equal to the emulated value. This delay will never exceeded the "**Max. restoration time**".

2.7.4 Auto-return configuration [Ctrl+F9]

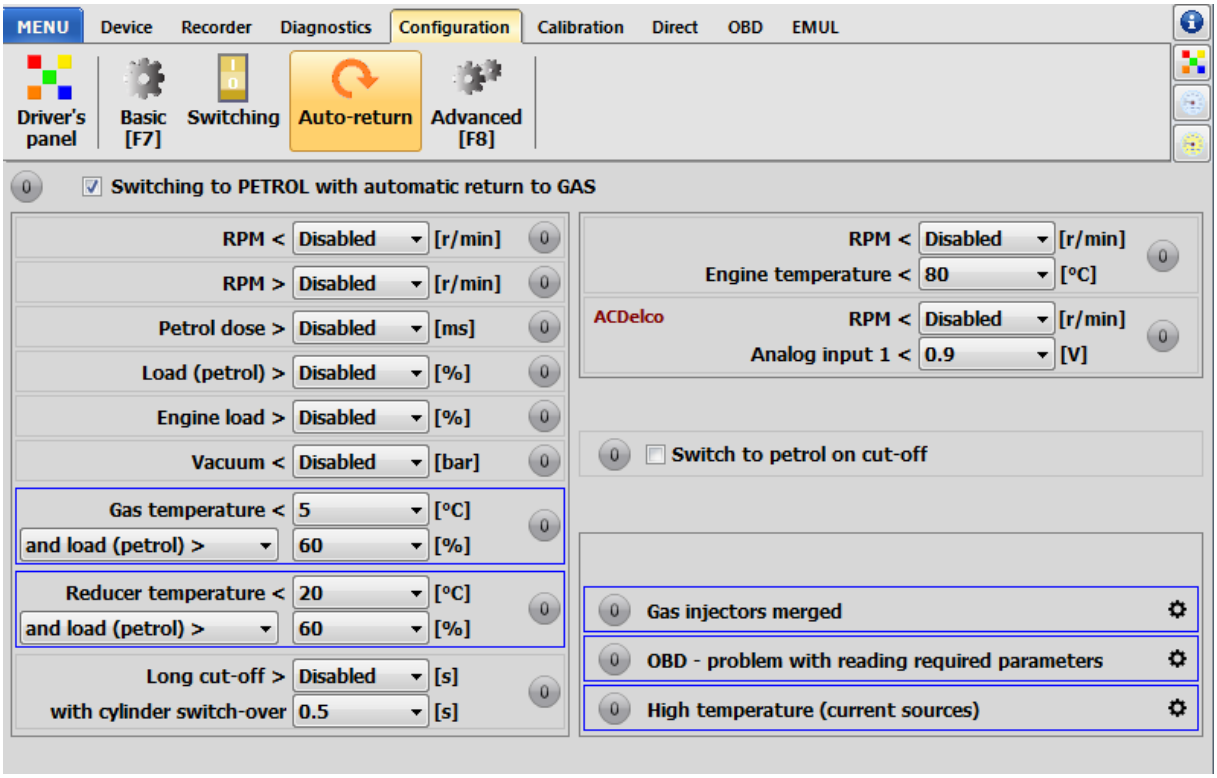


Fig. 2.57 Auto-return window

The Auto-return window has the so-called Strategies that allow switching the system to petrol with automatic gas return depending on the occurrence of specific conditions. These options are designed to protect the engine against gas under adverse conditions. "**Automatic gas return**" means that if the conditions forcing the changeover to petrol disappear, there will be an automatic return to work on gas. Strategies are available after selecting the option "**Activate strategies**" - from the driver version 5.1A r3 / 5.2A r3 the strategies are active by default. If the software detects that key "**auto-return**" strategies are disabled, it will inform the user in the form of a warning. The frames around active strategies will have a blue color to easily identify which ones are active.

- **Switch to petrol with automatic gas return when**:
  - ***RPM <*** – set the lower RPM threshold below which the controller will switch to petrol. This function should only be used as a last resort, when the car is not working properly on gas on the idle and no other methods allows to make correct adjustment. As the RPM increases, the system will automatically return to gas.

- ***RPM >*** – set the upper RPM threshold above which the controller will switch to petrol. At lower RPM, the system will automatically return to gas.
- ***Petrol dose >*** – gasoline injection time, above which the petrol shift will occur.
- ***Load (petrol) >*** – set the load threshold, (see indication on the side bar of readings) after exceeding, which the system will switch to petrol. This function should be used only as a last resort, when working incorrectly with large injection times. Prior to this, the injection times should always be adjusted by selecting the appropriate nozzles (more on calibration in section 2.8.7). At lower loads, the system will automatically return to gas.
- ***Engine load >*** – set the load threshold, (see display on the side bar readings) after exceeding, which the system will switch to petrol.
- ***Vacuum <*** – vacuum, below which system is switching to petrol. This option is helpful for cars that go out when you approaching a crossroad.
- ***Gas temperature < and load (petrol / engine) >*** – gas temperature threshold below which the controller will switch to petrol, while the load is higher than the set level. If the gas temperature is low and the load is high, the controller switches to gasoline with automatic gas return. This function prevents you from driving on involuted gas during very high and long-lasting loads. Recommended function for motors with power above 300 HP. At lower loads, the system will automatically return to gas.
- ***Redactor temperature < and load (petrol / engine) >*** – set the temperature threshold of the regulator, below which the controller will switch to petrol in the case when the load is higher than the set level. If the temperature of the reducer is low and there is a high load, the controller switches to gasoline with an automatic return to gas. Recommended function for motors with power above 300 HP. At lower loads, the system will automatically return to gas.
- ***Long cut-off > with cylinder switch-over*** – this is an option that avoids any problems occurring when leaving the cut-off state. When this option is enabled, the system will be temporarily switched to gasoline supply during a long cut-off time. It is possible to configure the duration of the cut-off state, after which the system will switch to petrol and the time after which subsequent cylinders will switch to petrol after returning from the cut-off state.
- ***RPM < and Engine temperature <*** – set the lower engine RPM and temperature threshold (read from OBD) below which the controller will switch to petrol. This function should only be used as a last resort, in the event that the car is not operating properly on gas at idle, when it is cold and no other methods allow correct adjustment. When the RPM or temperature increases, the system will automatically return to gas.

- ***RPM < and Analog input 1 <*** (direct injection controller only) – the function switching over to petrol when the petrol pressure drops below the set value. It should be used, for example, on some cars with ACDelco petrol controllers, which perform an idling test by reducing the petrol pressure to low values. When the value of the analog input increases again, the car will automatically switch back to gas.

- **Switch to petrol on cut-off** (direct injection controller only) – it switches to petrol as soon as a cut-off is detected and automatically returns to gas after 1 cycle of operation when petrol injections reappear.
- **Controller errors** – at the bottom of the page additional information is displayed, for gas controller errors, for which you can assign the action "Switch to petrol with auto-return":
  - Petrol injectors merged (indirect injection controller only)
  - Gas injectors merged
  - OBD – problem witch reading required parameters
  - High temperature (current source) (direct injection controller only)

2.7.5 Advanced configuration [F8]

The tab allows advanced driver configuration.

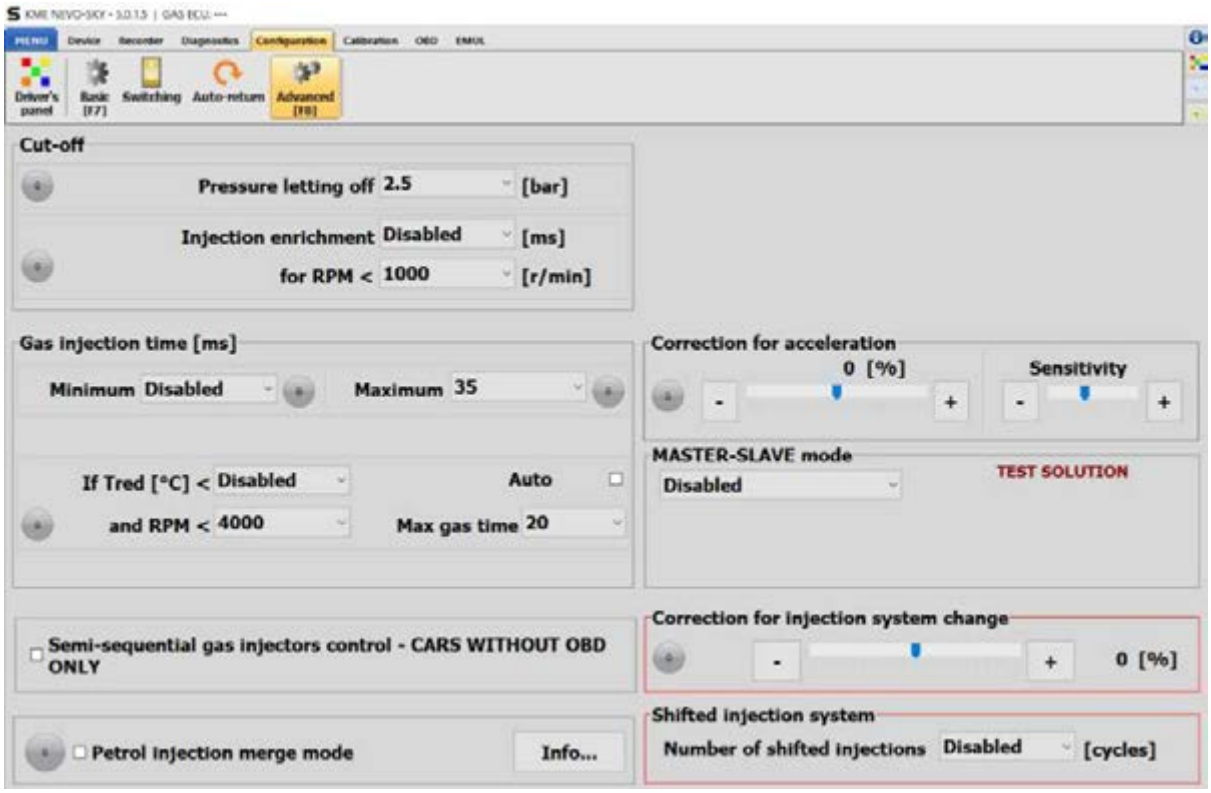


Fig. 2.58 Advanced controller configuration window (view for the MAX controller)

Next to some options there is a white circle with the number "0" in the middle (**Fig. 2.59a**). This means that the function is not active at the moment, even though it is turned on. At the moment of transition into the active state as a result of the occurrence of certain conditions, the circle changes its color ("lights up") and in the middle it shows the number "1" (**Fig. 2.59b**). This allows you easy and quickly determine the impact of changes made to the controller configuration. The colors are different for different functions.

Fig. 2.59 a) wheel of inactive function; b) the circle of the active function

Description of options:

- ***Cut-off*** (set of functions that work only on cut-offs)
  - **Pressure letting off** – pressure control during Cut-Off. It is necessary to choose the pressure at which the mechanism for dropping excess gas and regulates the pressure to ensure proper operation of the injectors after the Cut-Off state has disappeared.
  - **Enrichment injection [...] ms for RPM < [...]** – this option can be used in the case when the engine works poorly on gas (e.g. it goes out) after leaving the Cut-Off state. When this option is enabled, during the cut-off period, the gas injectors will open cyclically for a specified time if the RPM's are smaller than those entered in the program. This option is useful in 8 valve motors. **For proper operation of this mechanism, it is necessary to properly connect the RPM cable (shaft or RPM signal) in order to be able to read them during the cut-off period.**
- ***Gas injection time*** – here you can specify the minimum and maximum time that the gas injector has to open (even if a smaller or larger opening time is calculated based on the model and adjustments). In indirect injection controllers, you can set the maximum injection time depending on the temperature of the reducer and RPM (so-called "cold VAG"). The Auto option automatically calculates the maximum gas injection depending on the engine speed.
- ***Correction for acceleration*** – correction that is activated during acceleration.
  - **Percent** – correction value.
  - **Sensitivity** – leftmost position: detection of practically every acceleration, extremely right position: detection of only very dynamic and rapid acceleration.
- ***Correction when changing the type of injection system*** (only in indirect injection controller) – in some engines (often found in Mazda cars), there is a dynamic change in the type of injection system from sequential to fullgroup or half-sequential. Then, in extreme cases when driving on gas, incorrect engine operation may occur due to improper selection of the mixture. To avoid this, a correction (usually negative) should be applied when changing the type of injection system. If this option is active (different from "0"), the injection times will be corrected when detecting changes in the injection system type.
- ***Semi-sequential gas control – ONLY CARS WITHOUT OBD*** (only in indirect injection controllers) – the option enables the use of free gas injectors in fullgroup engines (having short gasoline injection times). It allows you to change the control of gas injectors from fullgroup to semi-sequential (it allows the use of larger nozzles and longer gas injection times). It can only be used in engines without OBD diagnosis.

- ***Shifted injection system*** (only in the indirect injection controller) – the gas injection time and the moment of release is calculated on the basis of petrol injection from the cylinder, in which ignition takes place by the selected number of cycles earlier. Using this option helps some cars with ripping during acceleration. **IMPORTANT! For the function to work properly, the ignition sequence must be detected.**
- ***Petrol injection merge mode*** (only in the indirect inject controller) – This functionality allows the correct operation of the car on the gas supply during the occurrence of the constant time (continuous opening) of gasoline injection.

The gas controller, by the appropriate interpretation of the petrol injection times, states that they have merged and automatically switches to the gas control mode in terms of RPM impulses. The engine runs on gas all the time and there is no need to switch it to gasoline when injection times are merged. After detecting that the gasoline injectors are no longer merged, the gas returns automatically to the standard way. Work in this mode is signaled by lighting up in a program of a red circle with the number 1 in the middle, next to the option.

!!! ATTENTION: For proper work at petrol injection merge mode it is needed TO CONNECT THE RPM wires to the ignition coil or Hall sensor and to select the appropriate type of ignition system for proper service of gasoline merging. Activation of the option "**Petrol injection merge mode**" forces the change of the option "**RPM wire connection**" to "**RPM signal**".

By controlling the gas on RPM pulses and not the gasoline injection times (they are merged), we are unable to properly detect the occurrence of fuel cut off by the petrol controller (in this way it prevents the engine from reaching too high rpms).

!!! ATTENTION: For engine safety, switching on the option "**Petrol injection merge mode**" activates the strategy "**Switch to gasoline with automatic back to gas when RPM> 6000**" (it is possible to change the value of RPM).

It is necessary to ensure the efficiency of the gas system (reducer, injectors) at such a level that the gas injectors do not merge or it happens after the petrol inj. time has merged (this may result in too lean mixture). The best situation is when the gas injection times are shorter than petrol injection times.

!!! ATTENTION: After entering the merging mode, the gas controller may register errors "**Petrol/gas injectors still open**", but it prevents switching the entire system to petrol.

- ***MASTER-SLAVE mode*** - mechanism synchronizing the work of two SKY controllers in one car. One of the controllers should be set to MASTER from the selectable field and the other to SLAVE. The control of the PETROL/GAS operating mode by the user will

only be possible using the driver panel connected to the MASTER controller. This mode can be used, for example, to mount installations in dual-system cars (DI+MPI) in the DIRECT+MAX or DIRECT+SUN configuration.

To better synchronize the controllers' work, it is possible to synchronize the gas and reducer temperature from the MASTER controller to the SLAVE controller. The controller that is set as SLAVE cannot automatically connect to OBD (therefor mechanisms such as the auto-clear, adaptation or correction of the engine temperature).

Controllers that are set as MASTER or SLAVE can work on gas only when the communication with each other is established or when connected with PC software. In any other situation, after switching to gas, a MASTER-SLAVE communication error will be noted, whose default action is to return to petrol.

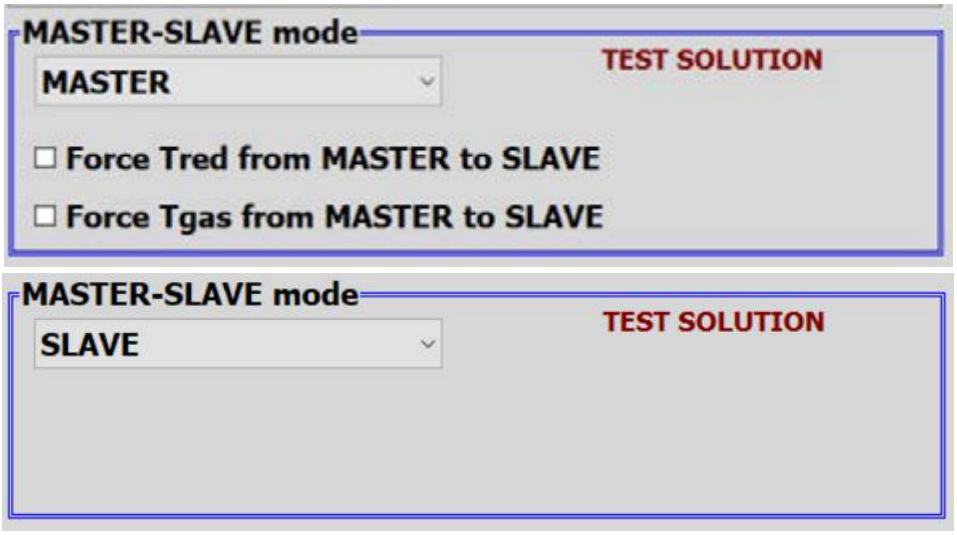


Fig. 2.60 MASTER-SLAVE options on the advanced configuration tab

2.8 Calibration tab

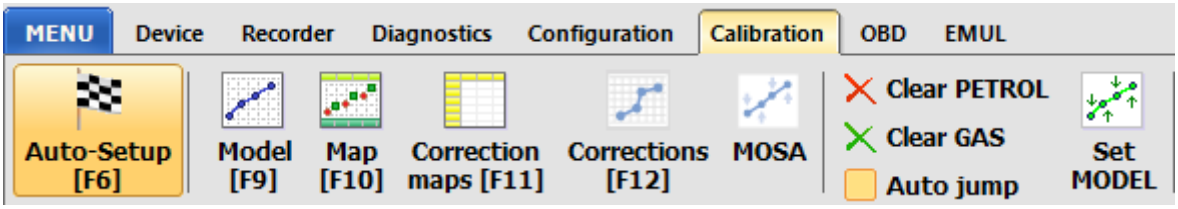


Fig. 2.61 Calibration tab

The Calibration tab contains windows and functions responsible for the calibration of the gas system. Bar elements on the Calibration tab:

- ***Auto Setup*** [F6] – going to automatic setup detection and Auto-Calibration.
- ***Model*** [F9] – shows in the program window an editable model (gas injection time as a function of petrol injection time for zero corrections).
- ***Map*** [F10] – shows gas and petrol maps collected in the program window.
- ***Correction maps*** [F11] – shows available modifiable corrections maps to the model.
- ***Corrections*** [F12] – shows available modifiable adjustments to the model.
- ***MOSA (indirect controller only)*** – shows the MOSA adaptation settings window.
- ***Clean PETROL*** – a button that allows you to delete collected points of the gasoline map.
- ***Clean GAS*** – a button that allows you to delete collected points of the gas map.
- ***Auto jump*** – automatically sets the active model point / correction map to the current one, in order to calibrate the car faster
- ***Set the model*** [Alt + *F*9] – the function that automatically sets the model to coincide with the settings automatically calculated on the basis of the collected maps. Deleting an outdated gas map is done automatically.

2.8.1 Auto Setup [F6]

Before starting the Auto Setup procedure, set the basic required parameters in the Parameters 1, Parameters 2, Direct tabs (only for the controller with direct injection). The options available on these subpages are duplicated from other parts of the program and are discussed in detail.

At the end, on the Start tab you can choose which functions will be performed:

- ***Auto-configuration*** – sets the basic configuration parameters necessary for the proper operation of the system (number of cylinders, source of RPM, type of injection system). The procedure can be carried out at a reducer temperature higher than 50° C.
- ***Auto-calibration*** – allows the correct selection of gas controller parameters and initial setting of the installation parameters, preparing the car for the road test. The procedure can be carried out at a reducer temperature higher than 50° C. Autocalibration has two options:
  - *Offset* – depending on the type of injector,
  - *Switch all cylinders at the same time* – perform calibration on all cylinders at the same time.

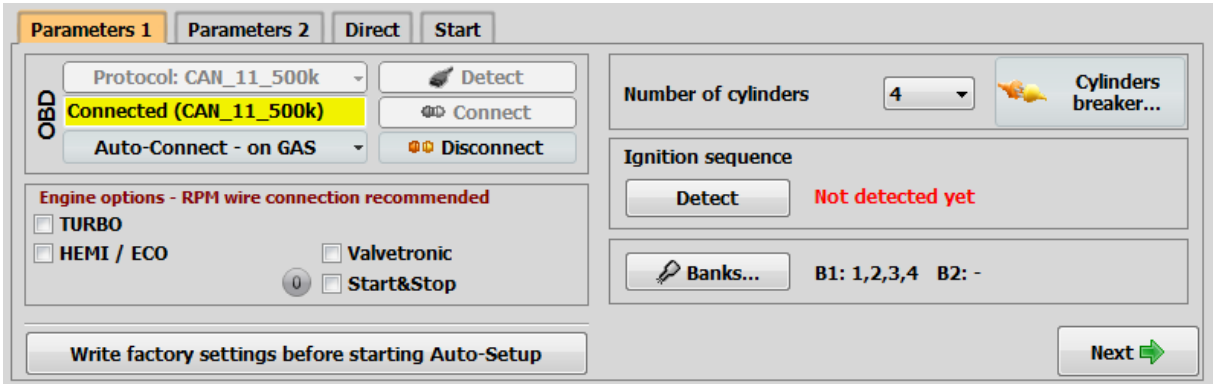


Fig. 2.62 "Parameters 1" tab on the Auto-Setup page

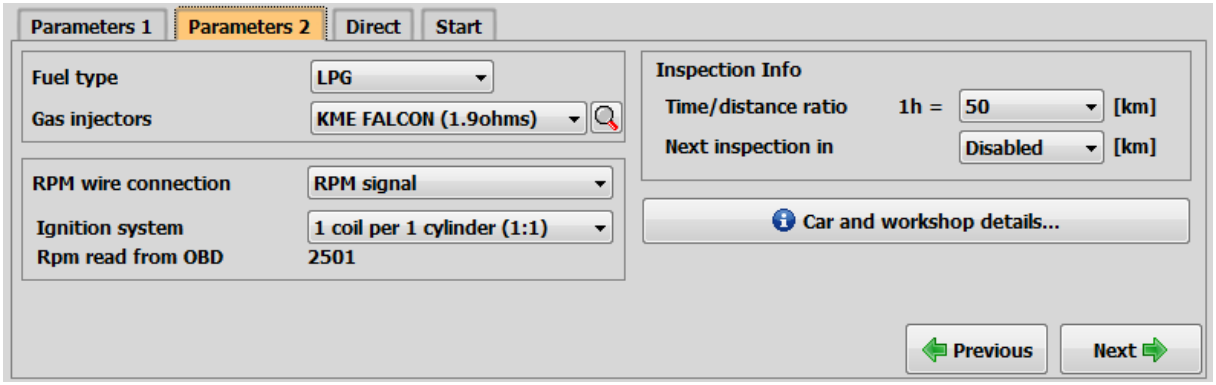


Fig. 2.63 "Parameters 2" tab on the Auto-Setup page

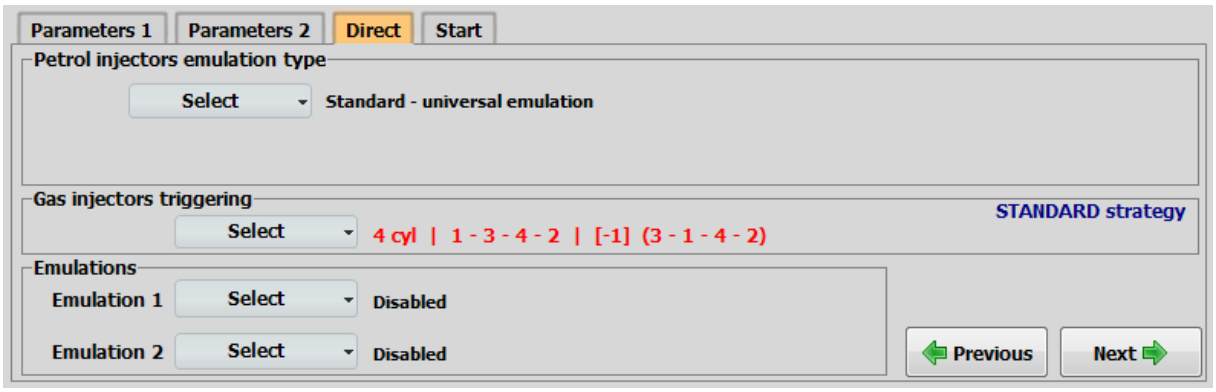


Fig. 2.64 "Direct" tab on the Auto-Setup page

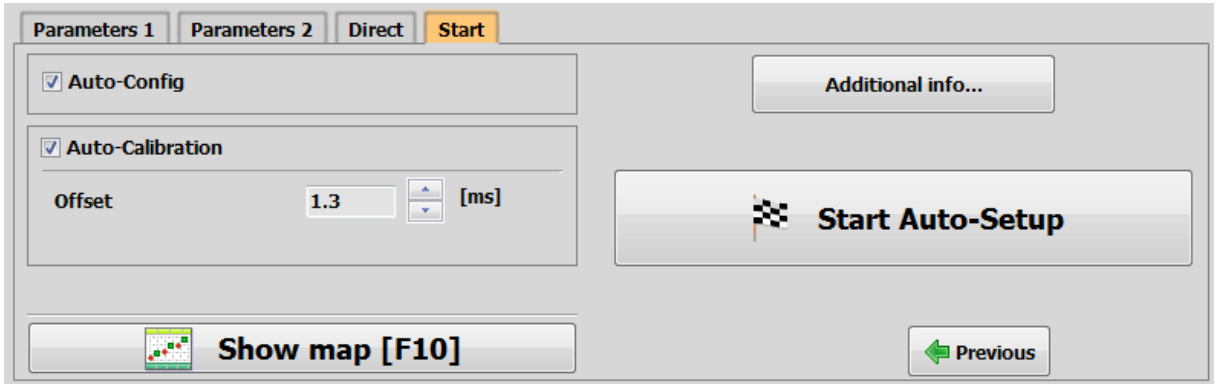


Fig. 2.65 "Start" tab on the Auto-Setup page

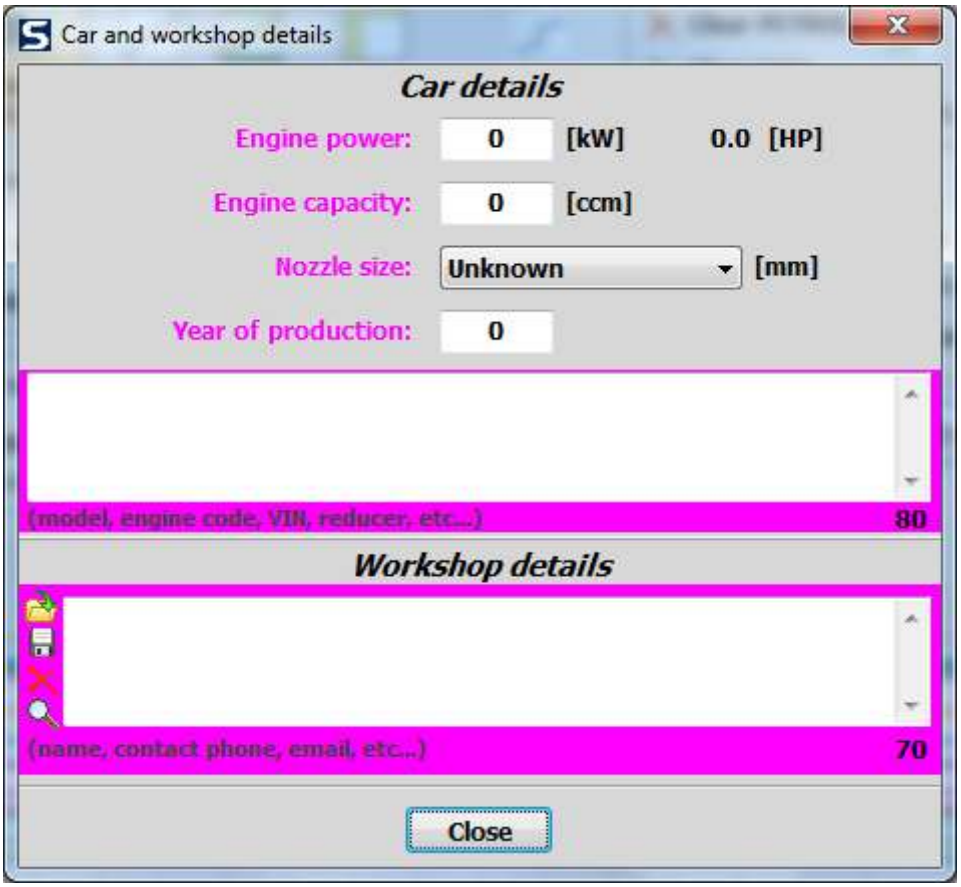


Fig. 2.66 Information window about the car and the workshop

In cars with direct injection, before entering the Auto-Setup procedure, basic information about the vehicle and workshop are required (**Fig. 2.66**). The window contains information duplicated from the Workshop tab. You can open them manually with the "**Car and workshop details**" button located on the "**Parameters 2**" tab of the Auto-Setup page.

At the bottom of the Auto-Setup window there is a recorder that also works during the Auto-Setup procedure. Its size can be changed by "grabbing" the cursor over the blue bar above the recorder. The settings for displayed waveforms are the same as the main recorder, and the icons on the left side of the recorder are for search and marker support.

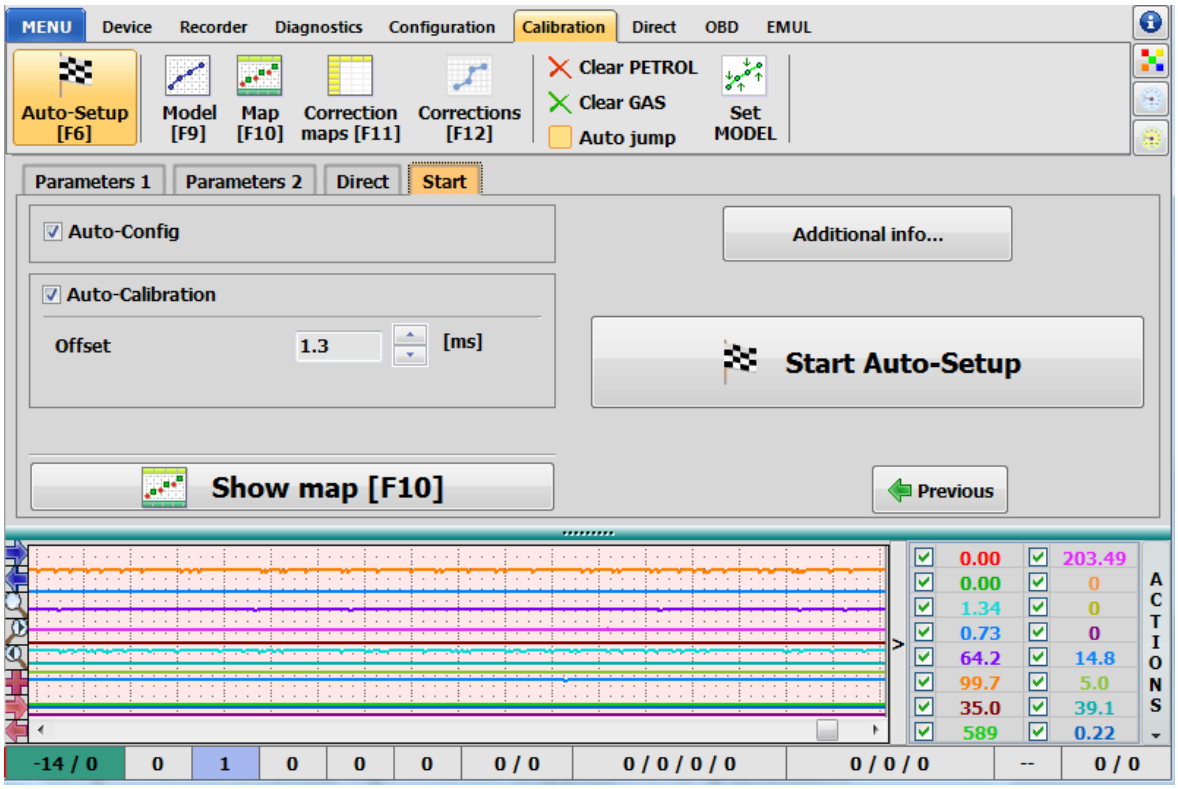


Fig. 2.67 Auto-Setup window

During the execution of individual stages of the Auto Setup procedure, a progress window is displayed with information about the current phase of the entire process (**Fig. 2.68**).

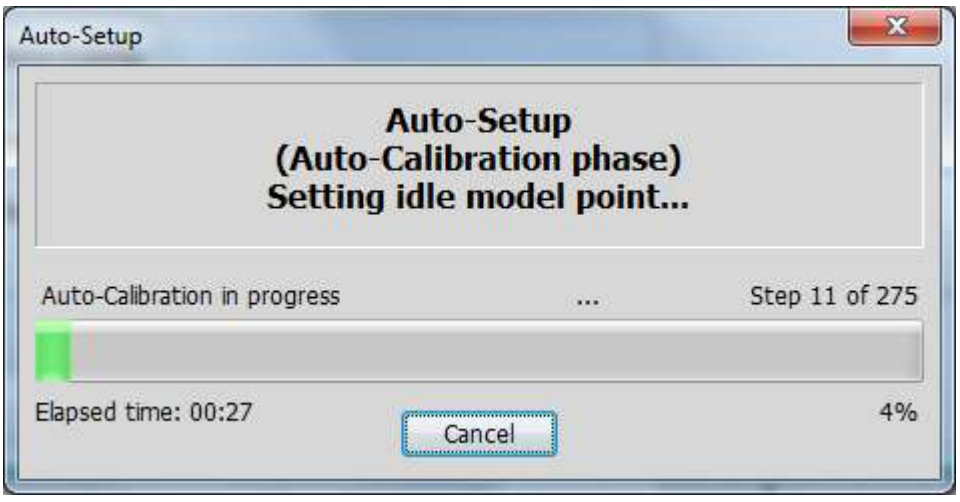


Fig. 2.68 The Auto Setup procedure progress window

After successful completion of the entire procedure, the user is informed about it (**Fig. 2.69**).

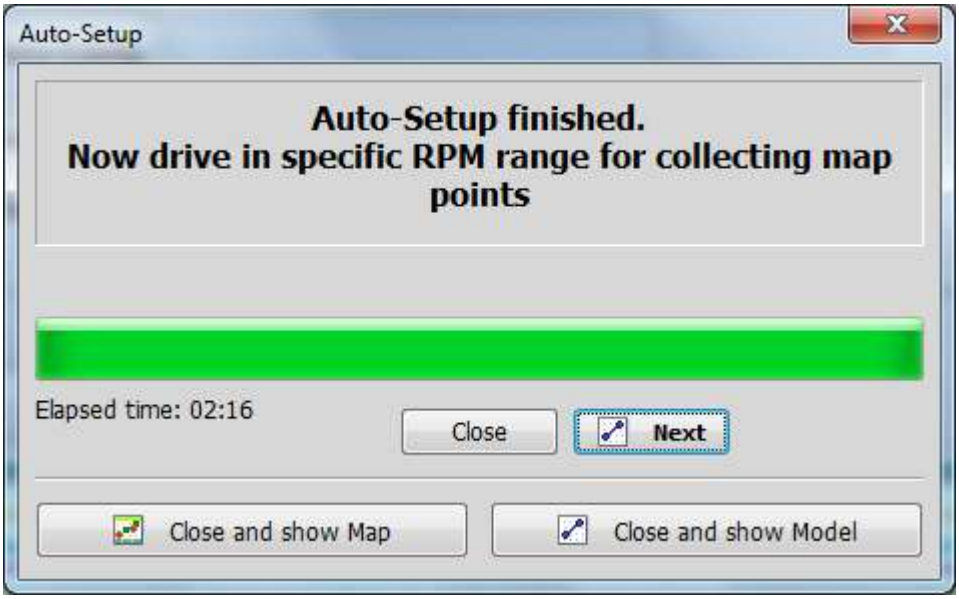


Fig. 2.69 A window with information about successful completion of Auto-Setup

After the autocalibration process, one of the following messages may appear:

- ***The nozzles are too large*** - the diameter of the nozzles may be too large under certain conditions. The controller will not be able to adjust the gas dose over the entire engine load range. Collect the maps and decide to change the nozzles to smaller ones. There may be problems with stable work on idle
- ***The nozzles are too small*** - the diameter of the nozzles, e.g. under full load conditions, may be too small. The nozzles should be changed to a larger one, because with too small nozzles, the injection time may be merged, which will lead to the changeover to gasoline supply. Nozzles too small (and hence a large slope of the model) are dangerous for the engine, due to the inability to control the mixture in the high load ranges.

When Auto-setup is successful, the message shown in **Fig. 2.70** will appear in the Map and Model windows. It means that the system performs verification of settings made during the Auto-setup. To end the verification mode, please follow the instructions in the message.

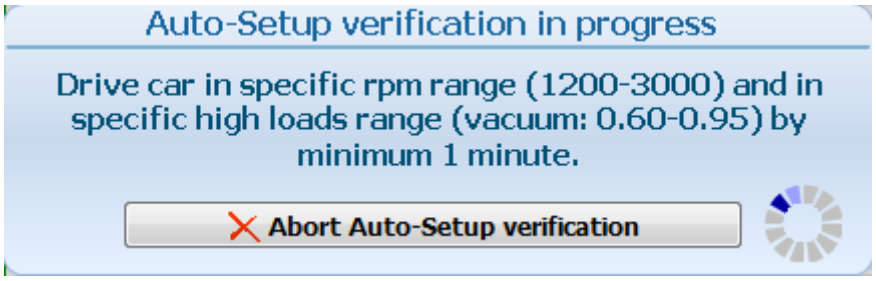


Fig. 2.70 A message informing about the ongoing process of verification of settings

2.8.2 Model [F9]

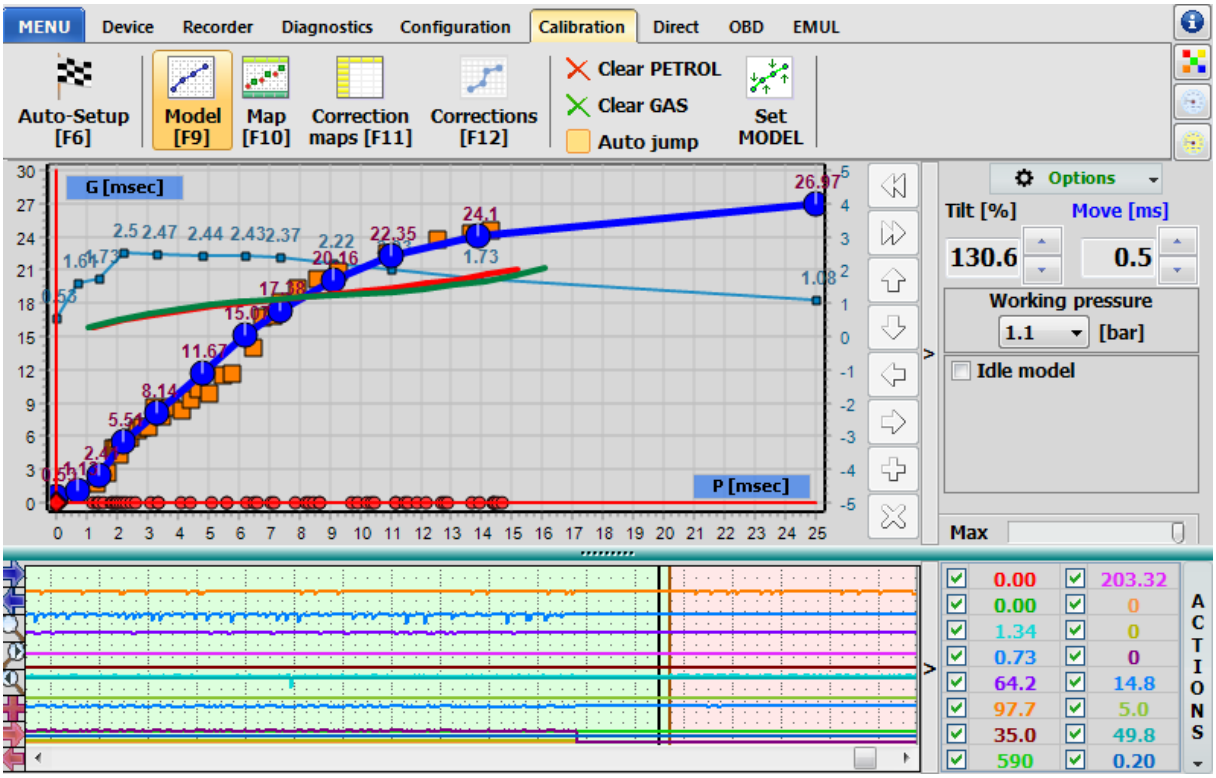


Fig. 2.71 Model window in the Calibration tab

The Model [F9] window (**Fig. 2.71**) allows manually adjust gas system. The model is a function converting petrol injection times (B [ms]) to gas injection times (G [ms]). The chart is represented by blue points and segments connecting them. Above each point is a number indicating the gas time of a given point in ms. It is possible to insert up to 15 model points, which gives a lot of freedom to model (the optimal number of model points is about 8). The chart of the model also includes a multiplier graph that facilitates the manual calibration of the system. The model also displays trend lines showing the mapping of collected map points

(red for the gasoline map, green for the gas map). Trendlines will appear only after collecting several points of the map. Displaying the multiplier and trend line can be turned off at any time in the Options menu. The momentary point of the system's operation is represented by a diamond-shaped point, the color of which depends on the current work on gas / petrol. It is possible to set the petrol model's time scale with the **Max slider**. In the case of the verification process, the message from **Fig. 2.70** is displayed instead of the model.

The navigation buttons on the right side of the model are used to change the position of model points, especially for touch devices.

The record of the changed model can be saved to the controller in 2 ways. If the "**Automatic model save**" option is checked, each change will be automatically saved (gas map will NOT be deleted in this mode after saving).

Another way is to manually save it to the controller by clicking **Enter** or the "**Save**" button. After making any manual changes to the model, a message appears informing about the out-of-date gas map and its automatic deletion after saving the changed settings (**Fig. 2.72**).

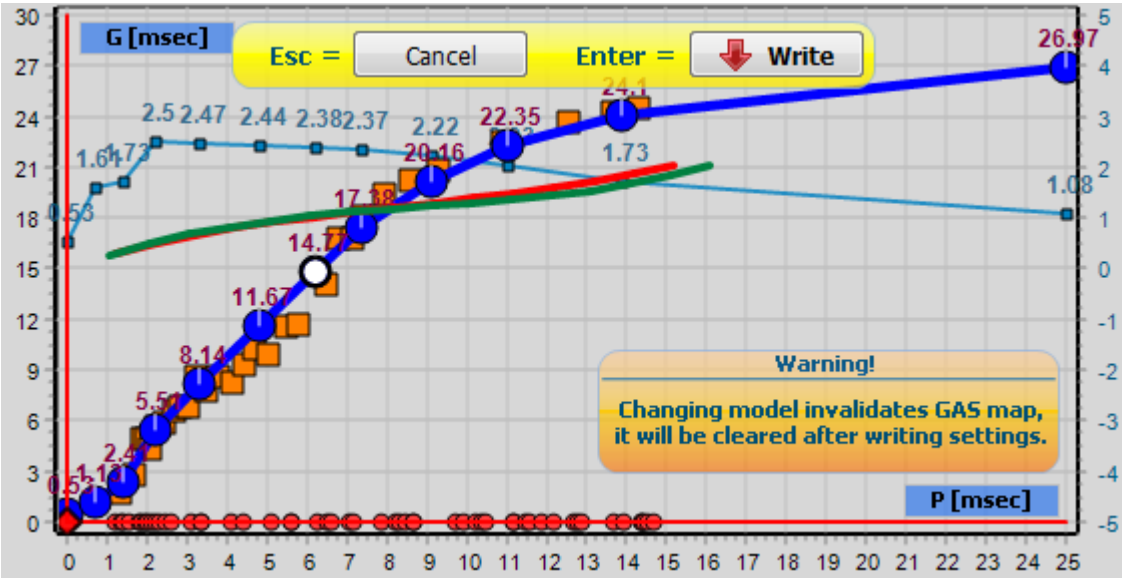


Fig. 2.72 Information about deleting the map after saving the model

Additional model options allow you to show the multiplier and trend line, enable the option to automatically save the model, load the model from the file, or restore the default. For controllers with direct injection it is also possible to show a window with correction for subsequent injections.

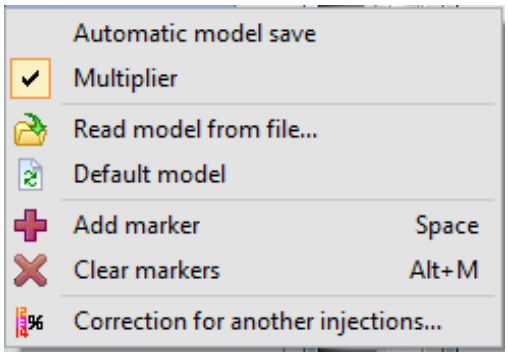


Fig. 2.73 Model options

Description of the options (service method) available in the Calibration tab → Model:

- **You can mark a point by clicking on it or in its area with the mouse.**
- **When the point is selected, it turns white.**
- **You can change the model using the keyboard as follows:**
  - The position of the marked point can be moved using the keyboard arrows.
  - To select the next or previous point, press **Ctrl+left /right arrow**.
  - Delete the selected point using the **Del** key.
  - Pressing the **Ins** key adds a new point halfway between the selected point and the next one.
  - To save changes in the model, press the **Enter** key (only without the option "Automatic model save").
  - To undo any changes to the model, press **Esc** key (only without the option "Automatic model save").
- **You can change the model using the mouse as follows:**
  - By clicking on the model area with the right mouse button you can add a model point
  - by clicking the left mouse button on a given point and dragging it, you can change its coordinates on the model. (note: you cannot change the order of points in this way, i.e. you cannot drag the point for the next or previous one)
  - clicking on a given point while holding down the **Ctrl** key removes the point.
- **Calibration of the model:** The model can be modified with the mouse or with parameters in the Model panel.
  - ***Tilt*** - a parameter that allows you to change the slope angle of the model's characteristics, you can also use the **PgUp** keys to increase the slope and **PgDn** to reduce the slope of the model. The addition of the Shift key changes the slope with a larger step. Points change in percentage.

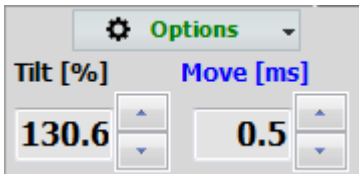


Fig. 2.74 Buttons for model calibration

The recommended slope for individual power groups is shown in the table (only for indirect injection):

Table 2.2 Recommended tilt for controllers with indirect injection

Power Group	Recommended slope
Turbo sequence	-5 – 5 %
Sequence	0 – 15%
Semi sequence	10 – 25%
Fullgroup	15 – 30%

Nozzles	Slope value
Nozzles can be to large	<-20 %
Propper nozzles	-20 – 25%
Nozzles can be to small	> 25%

For DIRECT systems, you shouldn't be suggested with tilt, which can be up to 150%, depending on the calculated gasoline dose (the dose depends on the high pressure pump system and the petrol injector opening times). It is important that the gas injection times do not exceed the rotation period (there was no merge of injections).

If, at high RPM (e.g. 6000RPM), the gas injection time is merged (injection times reach 20ms), the nozzles should be replaced with larger ones, which will allow lowering the inclination (gas injection times) and avoiding injection problems. You can also raise the gas pressure. Merging gas injectors is dangerous for engines, especially for turbo engines.

- **Move** – a parameter that allows you to change the position of all model points in the vertical direction by a given value in milliseconds. Supported with the keyboard shortcut **Ctrl+PgUp/PgDn**. Adding the **Shift** key to this combination moves the value higher.

- **Idle calibration** – the chart also shows an additional idle running model consisting of two points (P1 – work w/o load on idle, and P2 – full load on idle), which is used during engine operation calibration idling (RPM below 1200) (**Fig. 2.75**). Points P1 and P2 are represented by two green squares connected by a green line.

  Correction maps work better for setting the idling, more on which in chapter **0 Correction maps [F11]**.

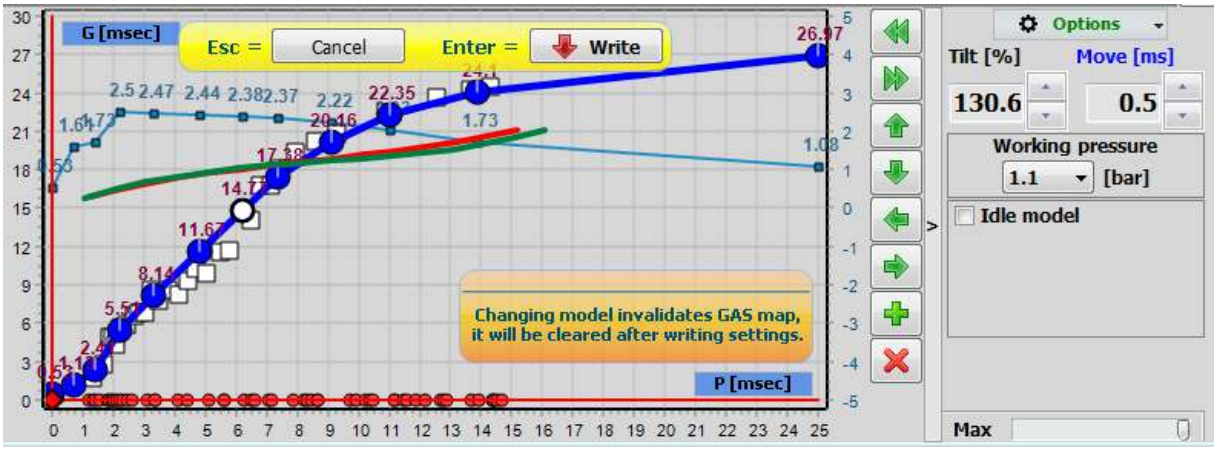


Fig. 2.75 Model with idle calibration

In the model's graph, apart from the model points (blue) there are also small red circles representing the gasoline map pattern (**Fig. 2.76**) and orange squares (**Fig. 2.77**) showing the suggested set points of the model through which the model should pass. The number of set points depends on the gas and gas maps collected. The gasoline map pattern and set points are invisible when the "Automatic model save" option is selected.

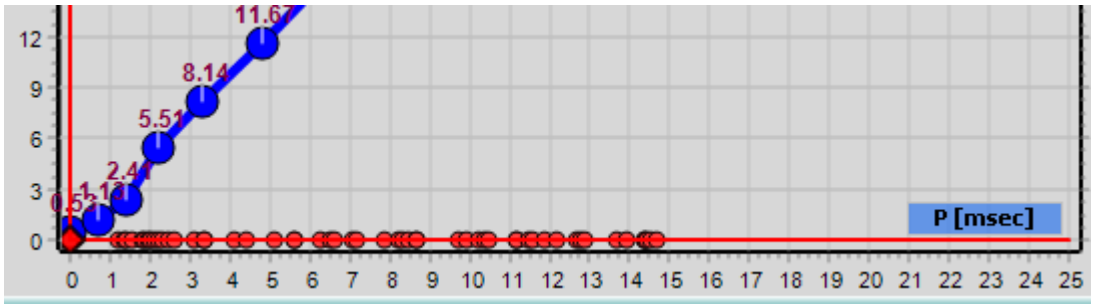


Fig. 2.76 Gasoline model on the chart

Fig. 2.77 Gasoline model and set points on the diagram

If you have a gasoline map and settings, you can use the "**Set MODEL**" function, which will automatically move the model to the suggested position. The exact calibration process of the gas installation, collecting maps and setting the model in the road test has been described in section **2.8.7 Road test- collecting maps**.

2.8.3 Map [F10]

During the test drive, the controller collects working points while driving on petrol and after switching while driving on gas. Map points accumulate only after reaching the temperature of the reducer above 40 ° C (if the temperature is lower, a large red message appears on the map chart) and if the engine speed is in the appropriate, selected range. The collected points are saved in the controller and presented in the graph (**Fig. 2.78**). Petrol map points are drawn in red (red circles), while gas points in green (green squares). The chart also contains information on the number of collected points of individual maps in the form of percentages - reaching 100% informs about gathering the maximum possible number of points. If the verification process is in progress, the message from **Fig. 2.70** appears on the map. The verification process must be completed so that the system begins to accumulate gas map points. The Direct controller also displays gasoline pressure maps, for petrol operation (yellow diamonds) and for gas work (blue diamonds).

Fig. 2.78 Map window in the Calibration tab

Description of options available on the Map:

- ***RPM range*** - use this option to select the range of RPM in which data will be collected during a road test.
- ***Collecting accuracy*** - allows you to change the algorithm of collecting map points. The greater the accuracy, the slower the map collects and vice versa. A more accurate map collection allows for more precise calibration.

In the Map options drop-down box (**Fig. 2.79**), you can find the following settings:

- ***Sounds for RPM*** – the option activates the sound signal from the PC (the computer must have the loudspeaker on), if the motor is in the correct (selected) speed range and the temperature of the reducer will be greater than 40 ° C.
- ***Clear gas map after modification*** – automatic erasing of the gas map after changing the model (even in the automatic recording mode), linear corrections and correction maps.
- ***Show base map*** – show basic gasoline and gas maps (injection times)
- ***Show high pressure maps (Input 1)*** (direct injection controller only) – shows **REAL** high pressure fuel rail points accumulated on gasoline and gas
- ***Show high pressure emulation map (Output 1)*** (direct injection controller only) – shows the **EMULATED** high pressure fuel rail points accumulated on gasoline and gas. Gasoline and gas Input 1 and Output 1 maps should match perfectly
- ***Show high pressure pump valve map (Input 3)*** (direct injection controller only) – shows map of high pressure pump control (required EZP connection)
- ***Block petrol*** – when this option is selected, no new map points will be collected on petrol.
- ***Limit Pcol points*** – limits the number of collected points for a given vacuum (Pcol / MAP).
- ***Rotating map*** – causes map points to accumulate cyclically. When the map is full, new points are replaced by the oldest ones.
- ***Collect maps only in closed loop (OBD)*** – causes collecting map points only in closed loop (only with OBD) wince C r1 version.
- ***Add marker*** [Space] – add a recorder tag
- ***Delete markers*** [Alt+M] – remove all tags from the program
- ***Correction for subsequent injections*** (direct injection controller only) – show the correction window for another injections

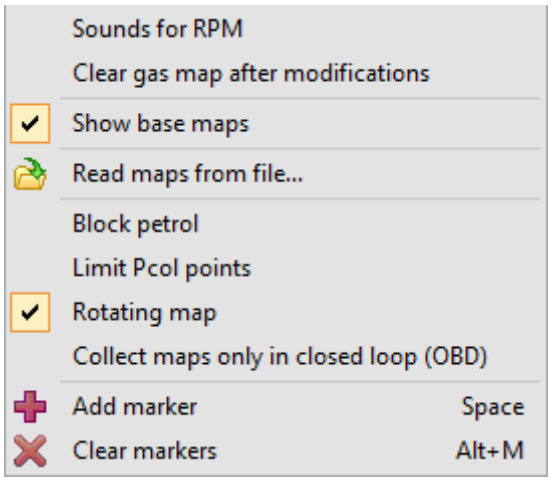


Fig. 2.79 Map options window

2.8.4 Correction maps [F11]

If linear adjustments are insufficient to fine tune the system (for example, if at some high speed the corrections should be different for small loads and others for large ones) then you can depend on the time of gasoline injection / dose using the correction map.

The controller has four general correction maps, each of which can be assigned to one or two banks. With the help of a correction map it is possible to introduce more advanced adjustments. Available ranges are:

- ***Avg. B / Dose*** – Average petrol injection time / Petrol dose (MAX / DIRECT)
- ***Avg. B (w.) / Dose (w.)*** – Average petrol injection time (Wide) / Petrol dose (Wide) (MAX / DIRECT)
- ***RPM*** – RPM
- ***RPM (w.)*** – RPM (wide)
- ***MAP*** - Vacuum
- ***MAP (w.)*** - Vacuum (wide)
- ***Psys*** – Gas pressure
- ***Psys (w.)*** – Gas pressure (wide)
- ***Pred*** – Vaporizer pressure
- ***Tgas*** – Gas temperature
- ***Tred*** – Vaporizer temperature
- ***Teng*** – Engine coolant temperature

- ***Avg. raw B.*** – Average raw gasoline injection time (direct injection controller only)
- ***Input 1*** – Analog input 1 / High pressure sensor voltage (indirect/direct)
- ***Output 1*** – Analog output 1 / High pressure emulation voltage (indirect/direct)
- ***Input 2*** – Analog input 2
- ***Output 2*** – Analog output 2
- ***Input 3*** – Analog input 3 / High pressure pump valve voltage. (indirect/direct)
- ***Input 4*** – Analog input 4
- ***Input 5*** – Input analog 5

The ranges with the note "(w.)" / "(wide)" allow adjustment for larger parameter values, but with less step accuracy. For example, the range "RPM - Rotation" can be set in steps of 25, up to 6375 RPM, and "RPM (W.) - RMP (wide)" in steps of 50, up to 9900 RPM.

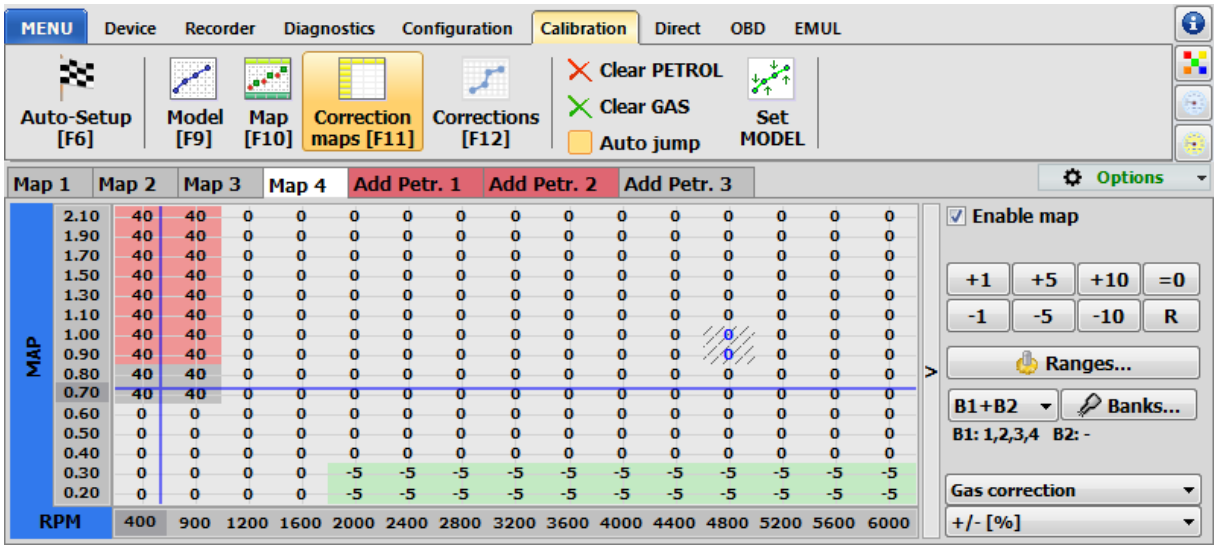


Fig. 2.80 Correction maps

To enable correction maps, select Enable map. To make adjustments on the corrections map, use the mouse to select the area in which the adjustments are to be made and then press the buttons on the right side of the map (+1, -1, +5, -5, = 0) to change in all selected fields the value of the correction by the value that the particular button corresponds to.

Changing correction is also possible using the **Ctrl+up/down arrow keys**.

Note: adjustments on the correction map should change as smoothly as possible. To avoid step corrections and "jerking the car", the gas controller always includes 4 values from the correction map, the closest to the work point. In the program, these 4 points are distinguished by a gray background of cells in the table. In addition, to facilitate the

adjustment of the installation, a blue cross is shown and its intersection point indicates the current work point for the selected ranges of the correction map.

The resultant correction for the instantaneous work point changes smoothly with the changes of the real range values, it is visible on the correction bar (**Fig. 2.81**) on a yellow background.

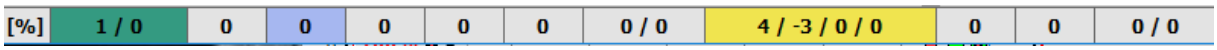


Fig. 2.81 Current correction values on the correction bar

You can change the parameters and ranges of horizontal and vertical axes on each correction map. To do this, click on the Ranges button, and then select the appropriate parameter from the drop-down list (**Fig. 2.82**). By clicking on the gear icon in the window of ranges, we can change the ranges of values of the selected parameter (**Fig. 2.83**). A great simplification in the optimal selection of values is the option Distribute, which calculates intermediate values between set values of min. and max. Press the Apply button to confirm the value changes.

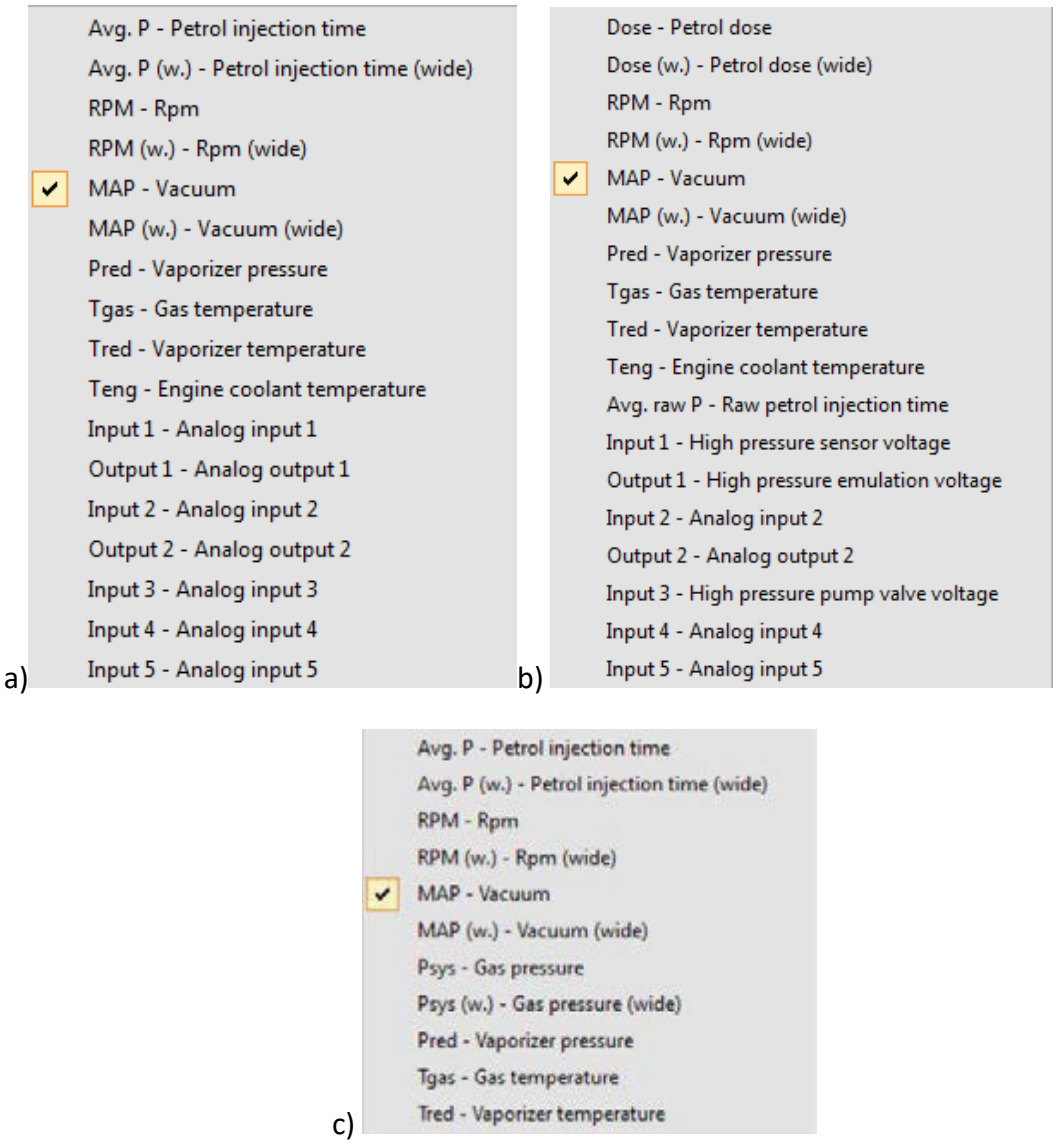


Fig. 2.82 Selection of correction map parameters for the controller a) DIRECT, b) MAX, c) SUN

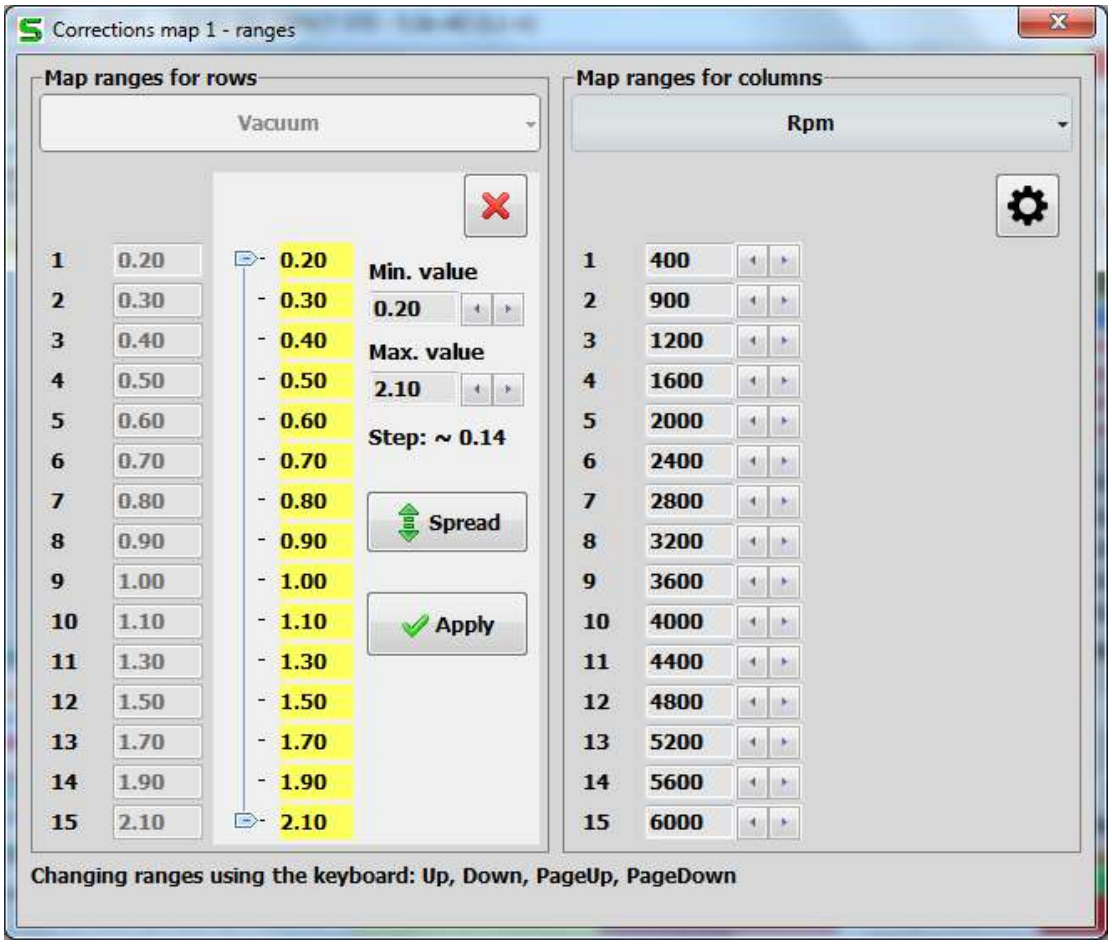


Fig. 2.83 Changing ranges of correction maps

Under the Options drop-down menu are the following functions:

- ***Smoothing*** – smooth adjustment of the values on the map of corrections around the edited point
- ***Inverted axes*** – selecting this option will change the display of maps so that the smallest axis values will be in the bottom left corner.
- ***Copy settings*** – copies the currently selected map to another map, overwriting its existing values.
- ***Copy ranges*** – copies the current range to another map, e.g. to easily adjust the gas dose at the point of adding gas
- ***Read selected correction maps from file*** – read the correction maps themselves from previously saved settings file. In submenu it is possible to select specific map to read from file, all load them all
- ***Transform*** – changes rows and columns. This changes the view of the map without changing its operation.
- ***Add marker*** [Space]– add a recorder tag

- ***Clear markers*** [Alt+M]– remove all tags from the program
- ***Correction for anather injections*** (direct injection controller only) – show the correction window for another injections

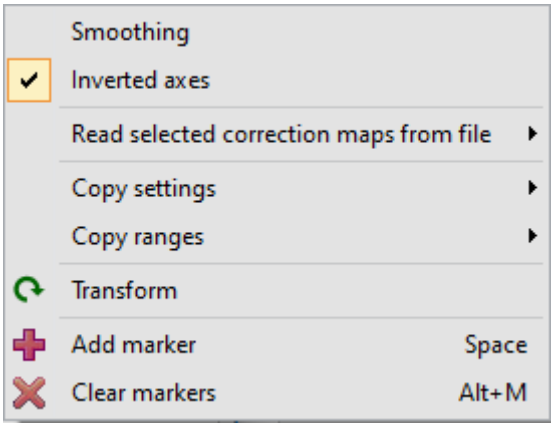


Fig. 2.84 A drop-down list of correction map options

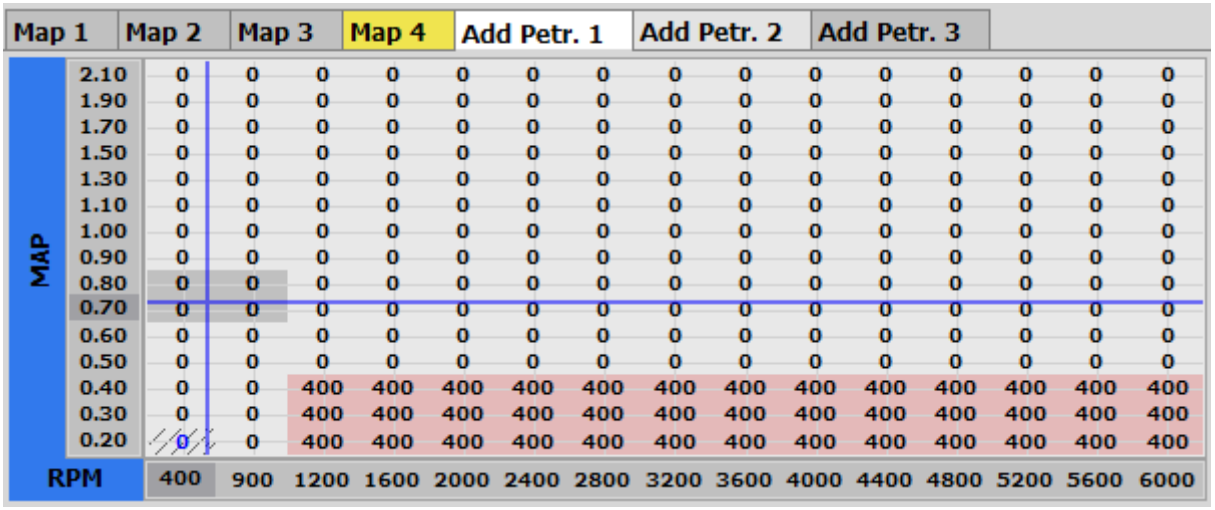
The correction map options are visible on the panel next to the map:

- ***Enable map*** – enable / disable the correction map. Disabling the map does not reset its value.
- ***+1, +5, +10, = 0, -1, -5, -10*** – change the value of selected map cells.
- ***R*** – reset / reset the value of the entire correction map.
- ***Ranges*** – a window for selecting values and ranges of columns and rows (**Fig. 2.82**, **Fig. 2.83**).
- ***B1, B2, B1 + B2, Banks*** – selection of banks to which the map applies, bank configuration window.
- ***Gas times correction*** – selection of the correction map type.
- ***+/- [%]*** – correction map values.

For gas controllers, an additional map of adjustments for the addition of gasoline (Add Benz) is available (**Fig. 2.85**). The map settings and options are the same as the other maps, but differ in terms of the values set on the map:

- **+ [%]** (MPI)
- **delay of cut [µs]** (DIRECT)

and always acting on both banks. It cannot be copied to other maps.



Map 1	Map 2	Map 3	Map 4	Add Petr. 1	Add Petr. 2	Add Petr. 3

MAP \ RPM	400	900	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000
2.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.40	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400
0.30	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400
0.20	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400

Fig. 2.85 Suggested map of adding gasoline for the Direct driver

Remember that adding gasoline automatically reduces gas times in the work area where adding is active. If the car does not run smoothly in the place where petrol is added, then one of the corrections maps 1-4 should be used so that the car can be adjusted in a given place.

In **Fig. 2.85** you can see, the suggested map for adding gasoline in order to release high pressure. It is very important that in certain areas of work where excessively high pressure (overgrowth) occurs when driving on gas, add petrol to reduce this pressure. Longer, too high values of high pressure can lead to OBD / Check Engine errors, automatic engine shutdown or even a serious gasoline injection system malfunction.

If EZP emulation is active, the problem of hypertrophic pressure does not occur (the high pressure pump does not work). Due to the low fuel pressure, to add gasoline with active EZP gave a noticeable effect, you need to set them to high values. In most cases, additional corrections will be required on the map of corrections in the area of addition work.

In the direct injection controller it is possible to add gasoline without subtracting gas using the "**Do not subtract gas time**" option. This option disables the mechanism of shortening the gas time after adding petrol, which allows easier adjustment in the areas of adding gasoline with active EZP, where the change in the petrol proportion has little effect on the composition of the mixture.

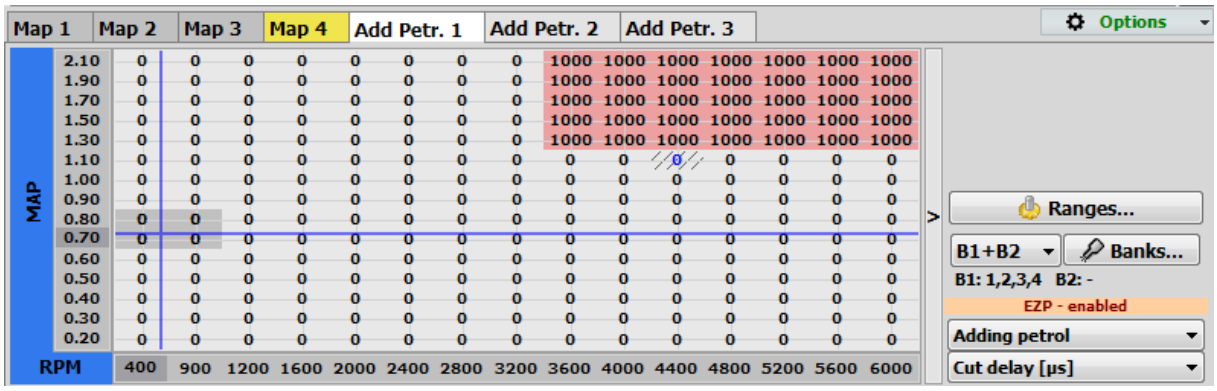


Fig. 2.86 Adding gasoline with active EZP in Direct injection

The currently selected correction map tab is highlighted in white. Tabs of disabled maps have a dark gray color (**Fig. 2.87** Map 4). The tab of the enabled correction map, which has all points set to 0%, is light gray (**Fig. 2.87** Map 2). If the correction map has some values set then the tab's color is:

- Yellow for regular correction maps 1-4 (**Fig. 2.87** Map 1)
- Red for adding petrol map (**Fig. 2.87** Add. Petr.)

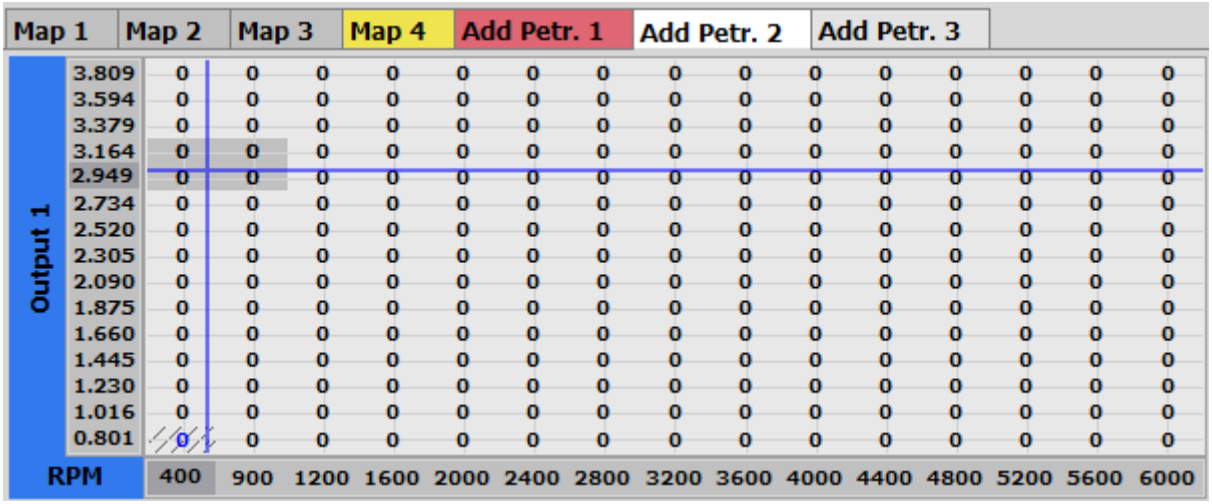


Fig. 2.87 Colors of the tabs

2.8.5 Corrections [F12]

In the Corrections window (**Fig. 2.88**), linear adjustments for the gas dose are available depending on the following parameters:

- ***PSE*** – additional correction for gas pressure, enables adjustment of the built-in correction for gas pressure.
- ***VAC*** – correction for vacuum, introduces a correction of the gas dose depending on the current vacuum value.
- ***TGS*** – correction for gas temperature. Verification of the correction can be carried out on a cold engine (Tred <20 ° C) comparing the time of petrol on gasoline and gasoline time on gas. One should choose such adjustments that the difference between the time of petrol on petrol and gasoline time on gas in such conditions would be as small as possible.
- ***TRD*** – correction for the temperature of the reducer, adjusts the gas dose depending on the current temperature of the reducer.
- ***RPM*** – adjustment for RPM, adjusts the gas dose depending on the current engine speed.
- ***TEN*** – correction for the engine temperature, adjusts the gas dose depending on the current engine temperature read from the OBD (requires connection to the OBD and availability of the coolant temperature).
- ***UNI1*** and ***UNI2*** – universal correction allowing to select one of the additional parameters: any analog input or output, reducer pressure, average petrol injection time / average gasoline dose, average raw injection time (Direct drivers only)

Fig. 2.88 Linear corrections window

Each correction can be turned on / off by checking the option Enable correction ..., and restore its standard settings with the Standard button. The activation of a given correction is visible by highlighting the relevant field on the FUNC bar next to the reading panel, changing the color on the current correction values bar, and changing the tab color in the Corrections window.

For corrections to the gas temperature and the temperature of the regulator, you can select predefined correction values (small / medium / large).

All corrections can have from 2 to 10 points, the position of which can be changed using the mouse, keyboard or buttons on the right side of the correction chart. Editing correction points using the mouse and keyboard is analogous to editing the Model points (**section 2.8.2 Model** [F9]).

2.8.5.1 Correction for switching for EZP

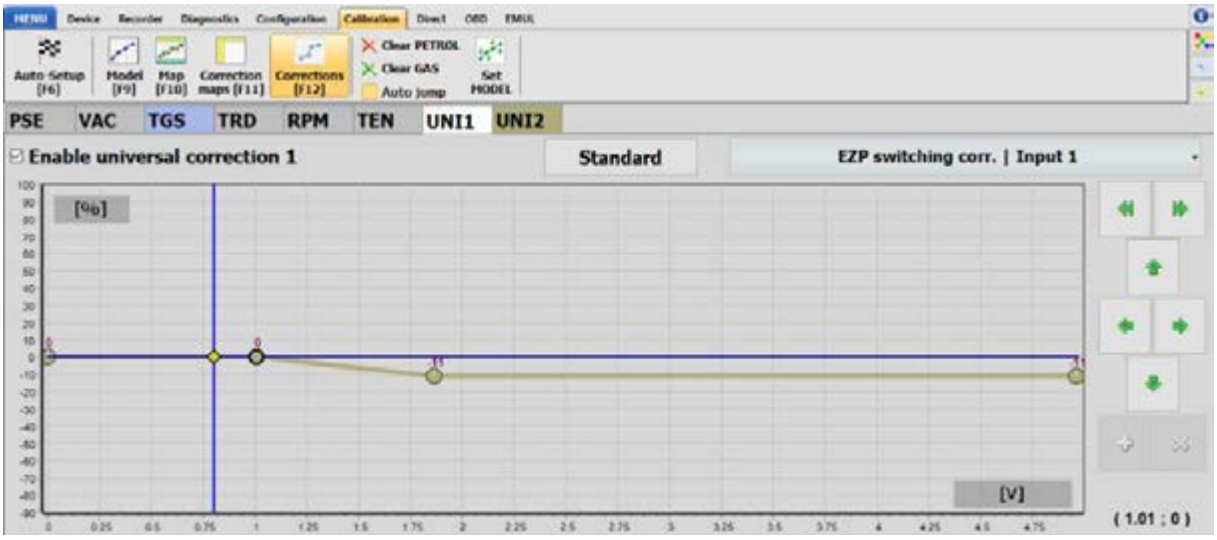


Fig. 2.89 Correction for switching for EZP

The switching correction for EZP is a special universal correction mode 1 adapted to facilitate the selection of the correction value for switching fuels from EZP.

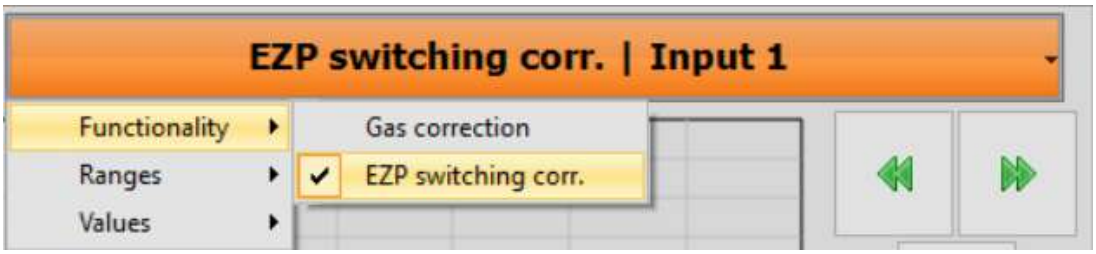


Fig. 2.90 turning on EZP correction

To enable it, from the menu visible in **Fig. 2.90**, in the "Functionality" submenu, select the "EZP switching corr. "

Correction properties and calibration recommendations:

- First point cannot be changed (correction always 0%)
- Second point can only be moved horizontally, the correction for it will always be 0%. Choose its location so that the pressure value when working on gas is between points 1 and 2 (see blue vertical line **Fig. 2.89**)
- Third point should be chosen experimentally by observing OBD and gasoline dose adjustments during switching. It is recommended to initially place this

point at the level of the idle run on gasoline, and then adjust its position for a given car.

- Fourth point will default to the same correction value as third point. You can move the last point below third point to apply a more aggressive correction for higher petrol pressure values.
- You cannot add or remove points
- You cannot apply a positive correction

2.8.6 MOSA adaptation (indirect only)

MOSA adaptation – Adaptation acc. map – allows the gas system to automatically adapt to changing engine operating conditions, for example when driving on gas of inferior quality. The task of MOSA is not to automatically calibrate the gas system, but only to supervise its proper operation.

Turning on the adaptation should be preceded by a road test to ensure that the set model allows driving in all load ranges. The MOSA mechanism operates while driving on gas and introduces corrections based on the injection times read from the controller. The adaptively modified model cannot deviate from the original model by more than the set Max. correction (max. 25%), therefore the adaptation cannot be the only driver calibrating mechanism. The MOSA table contains the developed MOSA corrections, as well as the color levels of the adaptation learning in a given range Load\RPM (color according to the scale to the right of the table). Under the table there is a table with a list of gas and gas map points collected for specific ranges of RPM.

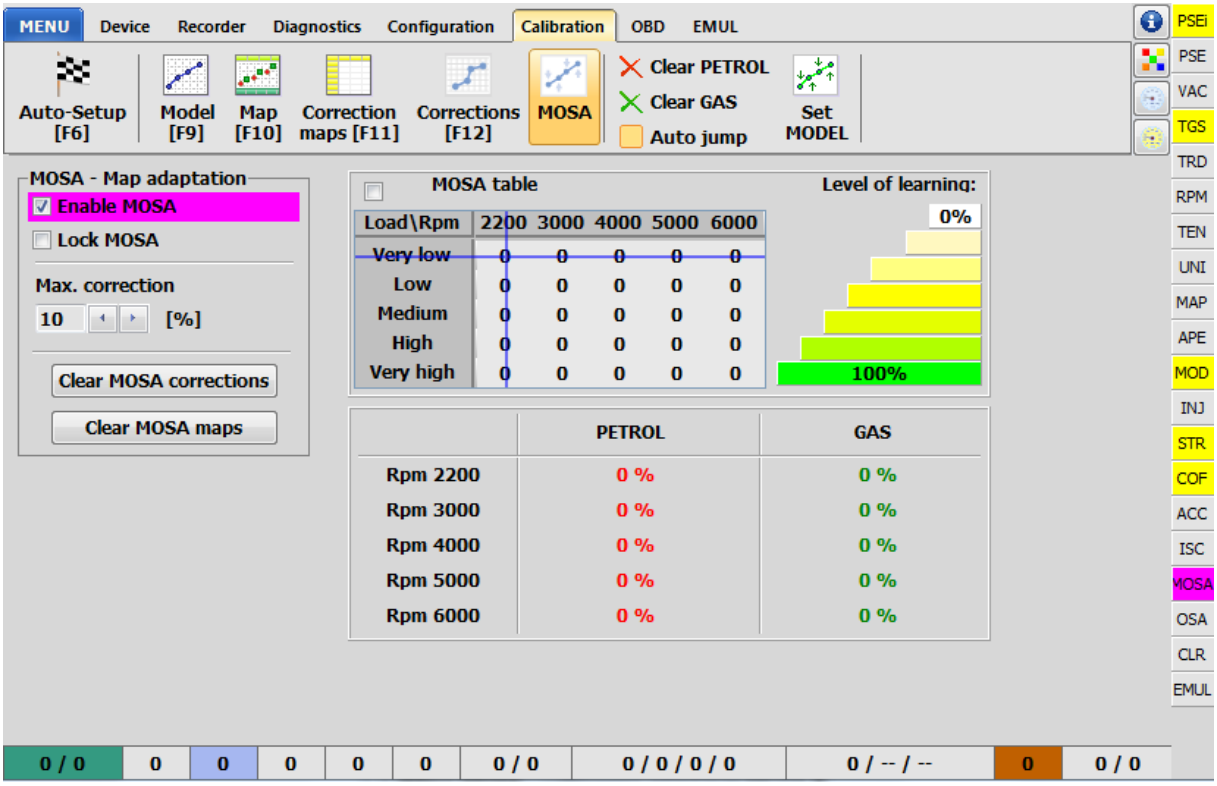


Fig. 2.91 MOSA adaptation window

Functions of the MOSA mechanism:

- ***Enable MOSA*** – activates the MOSA adaptation.
- ***Block MOSA*** – blocks the further update of the MOSA correction table.
- ***Max. correction*** – maximum correction of the model.
- ***Delete corrections MOSA*** – deletes all information collected so far by adaptation (it deletes only the MOSA correction table, does not delete maps).
- ***Delete MOSA maps*** – deletes maps collected for the needs of adaptation (it deletes only petrol and gas maps for various revolutions, does not delete the MOSA correction table).

2.8.7 Road test- collecting maps

The road test should be as follows:

1. Select the RPM range for collecting map points. The road test is performed in a limited, one speed range. Select the range of revolutions that will be most often used during later driving.

NOTE: Both the gasoline map and the gas map must be made on one, the same selected speed range. The speed range should not exceed 1500 RPM. If the range of 1500 - 3000 RPM has been selected, both the gasoline and gas map should be collected at such RPM. After changing the speed range, clean the gas and gas maps and collect new maps for the new range.

After changing the RPM range for collecting maps, you must save the changes.

2. Remove gas and petrol maps.
3. Switch the controller to petrol.
4. Collect the gasoline map.

Ride on gasoline, maintaining the speed of rotation in the selected RPM range. Collecting the map will be more efficient if we maintain:

Table 2.3 Sample test range for 2250-2750 RPM

	Parameter	Duration
Gasoline	2nd gear 2250-2750 RPM	1-2 min
Gasoline	3rd gear 2250-2750 RPM	1-2 min
Gasoline	4th or 5th gear 2250-2750 RPM	1-2 min

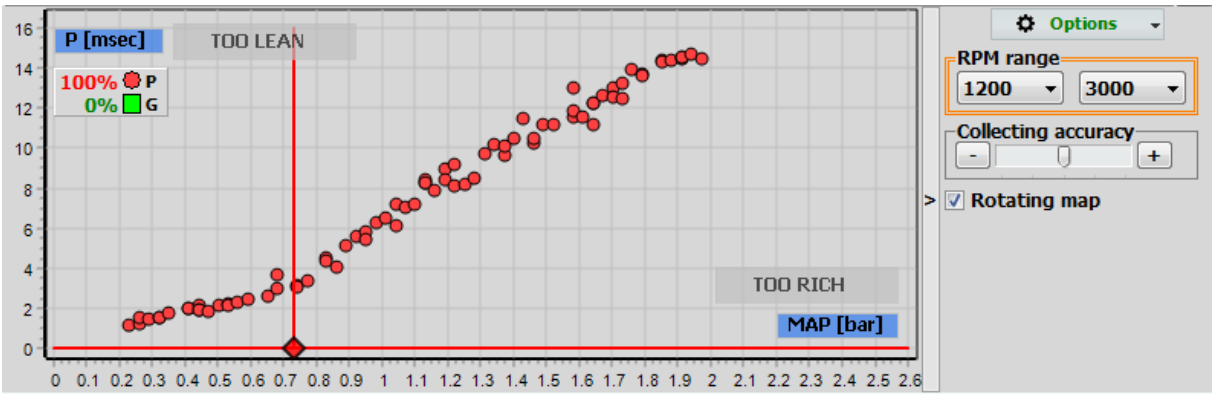


Fig. 2.92 An example of a collected gasoline map

The duration can be corrected paying attention to the fact that on each run a few points (about 5) have accumulated, evenly distributed, in the whole range of loads. The gasoline map after collecting may look like for example in **Fig. 2.92**, while the pattern visible in the Model window, as in **Fig. 2.93**.

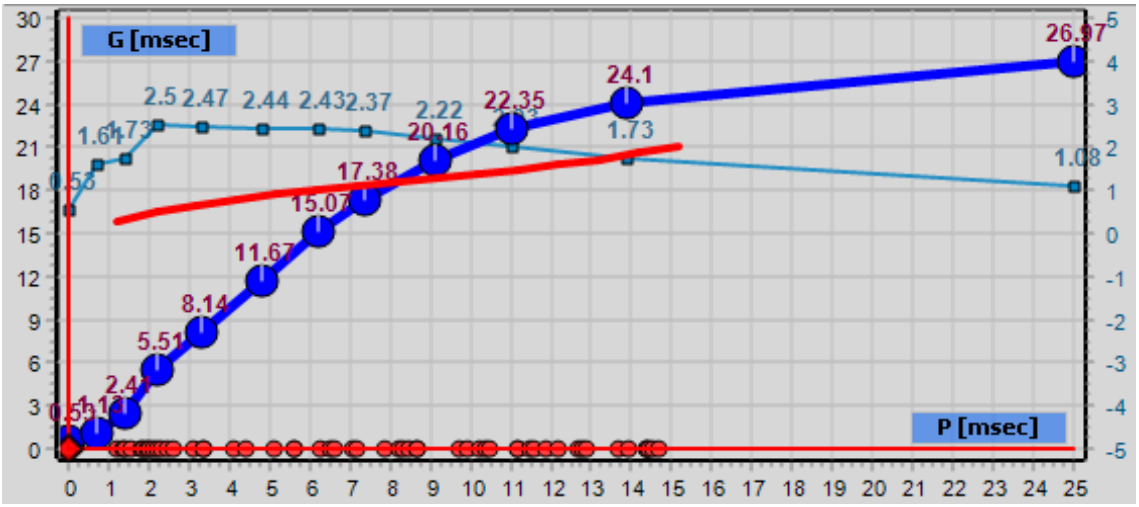


Fig. 2.93 The petrol model on the chart for the collected gasoline map

5. Switch over the controller for gas supply.
6. Collect gas map.

Ride on gas, maintaining the speed of rotation in the selected speed range. For example, for the range 2250-2750 RPM:

Table 2.4 Sample test range for 2250-2750 RPM

	Parameter	Duration
GAZ	2nd gear 2250-2750 RPM	1-2 min
GAZ	3rd gear 2250-2750 RPM	1-2 min
GAZ	4th or 5th gear 2250-2750 RPM	1-2 min

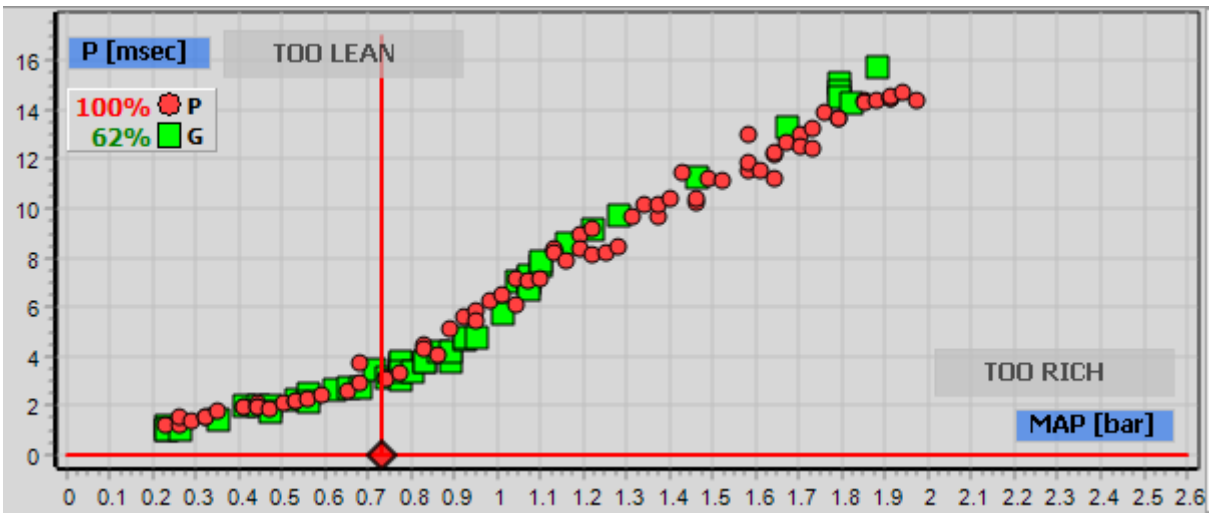


Fig. 2.94 An example of a collected gas map and a previously collected gasoline map

The duration can be corrected paying attention to the fact that in every gear there are several points (about 5), evenly distributed, in the whole range of loads. The gas map after collecting may look, for example, as in **Fig. 2.94**, while the set points visible in the chart in the Model window, as in **Fig. 2.95**.

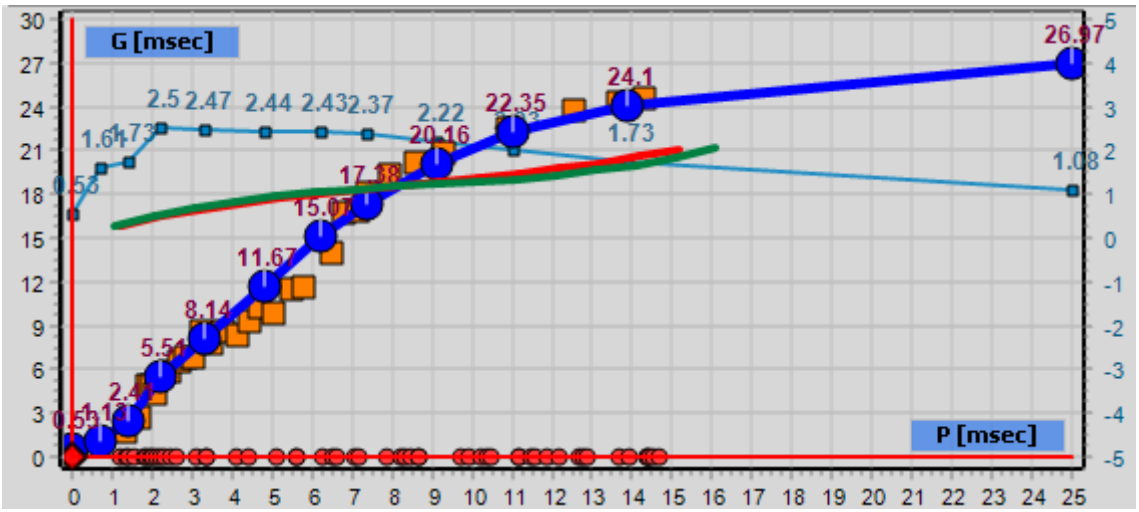


Fig. 2.95 The gasoline model and set points for the collected gasoline and gas maps, presented in the chart

7. If the gas injectors used in the system were used for the first time during auto-calibration, check whether their properties did not change significantly after the first gas ride (some injectors "arrange" after short-term use, so the initial auto-calibration may be unreliable) In order to check the correctness of the first auto-calibration, compare the gasoline time at idle speed on gas (**Fig. 2.96**) with the idling time on petrol (**Fig. 2.97**).

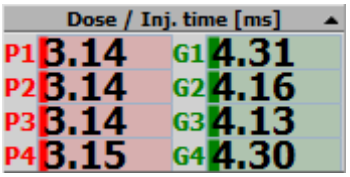


Fig. 2.96 Times of gasoline and gas while running on gas

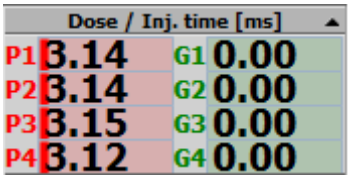


Fig. 2.97 Petrol times while running on petrol

If these times differ significantly (difference above 0.1-0.2 ms), you must do the autocalibration again and collect the gas map.

8. After collecting the maps (on gasoline and gas), press the "Set model" button. The program will ask whether to set the model and remove the gas map (**Fig. 2.98**).

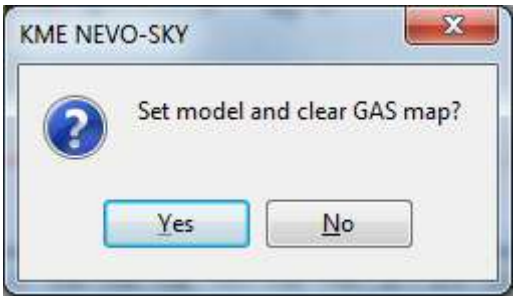


Fig. 2.98 Window confirming the model setting and deleting the gas map

If you click YES, the map points will be automatically recalculated and the optimal model will be determined. The program will move the model points automatically (so that they coincide with the orange points). At the same time, the gas map will be deleted and the setpoints will disappear. The new model will be automatically saved to the controller.

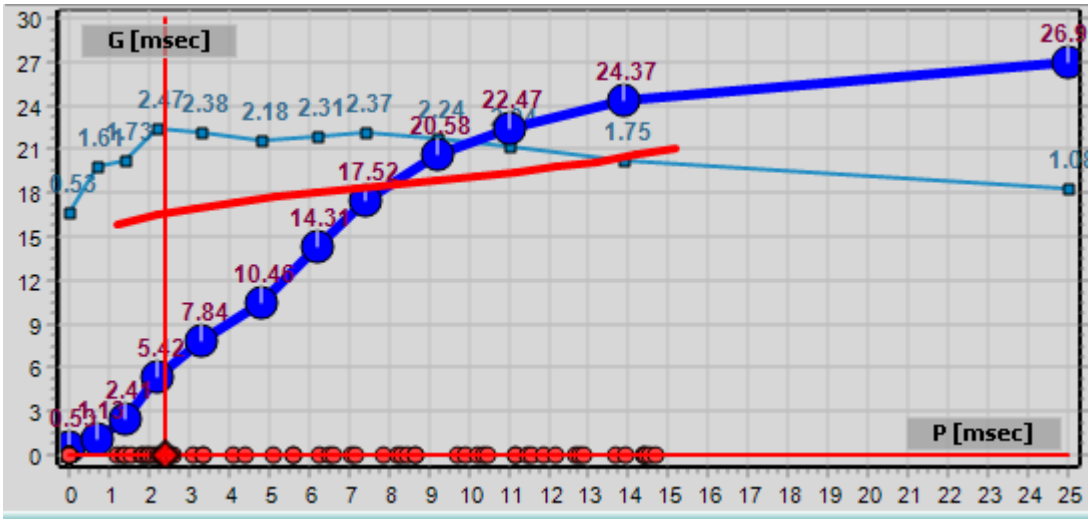


Fig. 2.99 Model changed using the Set Model function

9. Repeat the procedure to achieve full coverage of the gas and gasoline map points (**Fig. 2.100**).

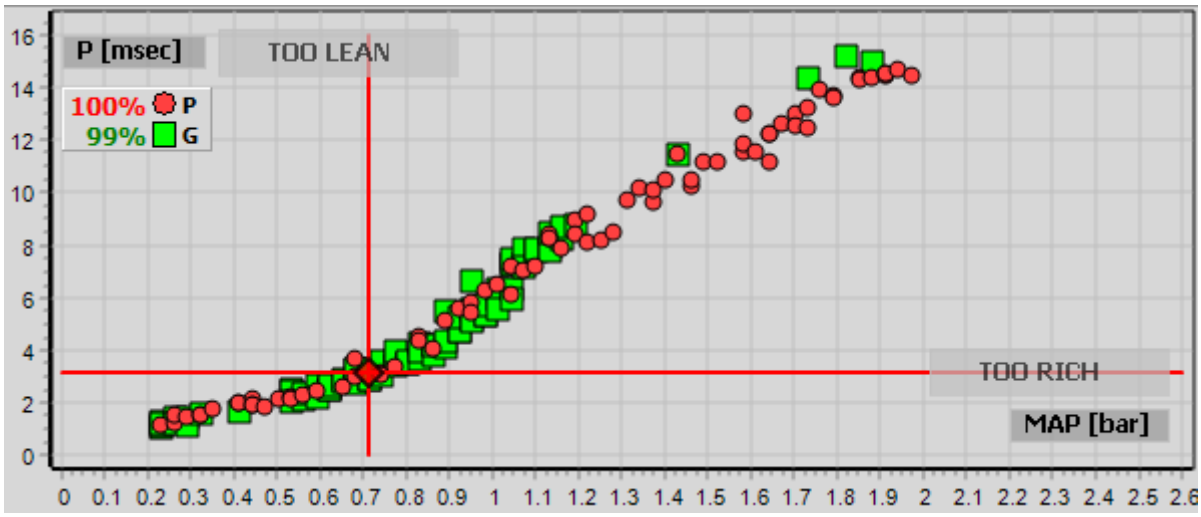


Fig. 2.100 Overlapping gasoline and gas maps

10. After applying any additional manual modifications to the model (using the keyboard, mouse or tilt and shift parameters), the changes should be saved to the gas controller using the "**Save**" button. In addition, save a copy of the settings on your computer using the "**Save settings**" option [Ctrl+S].

2.9 Direct tab

Tab with settings only for the DIRECT type of gas controller. It contains functions and options dedicated for cars with direct injection engines. Some options from this tab are also available in Auto-Setup options for DIRECT gas ECU.

2.9.1 Strategies

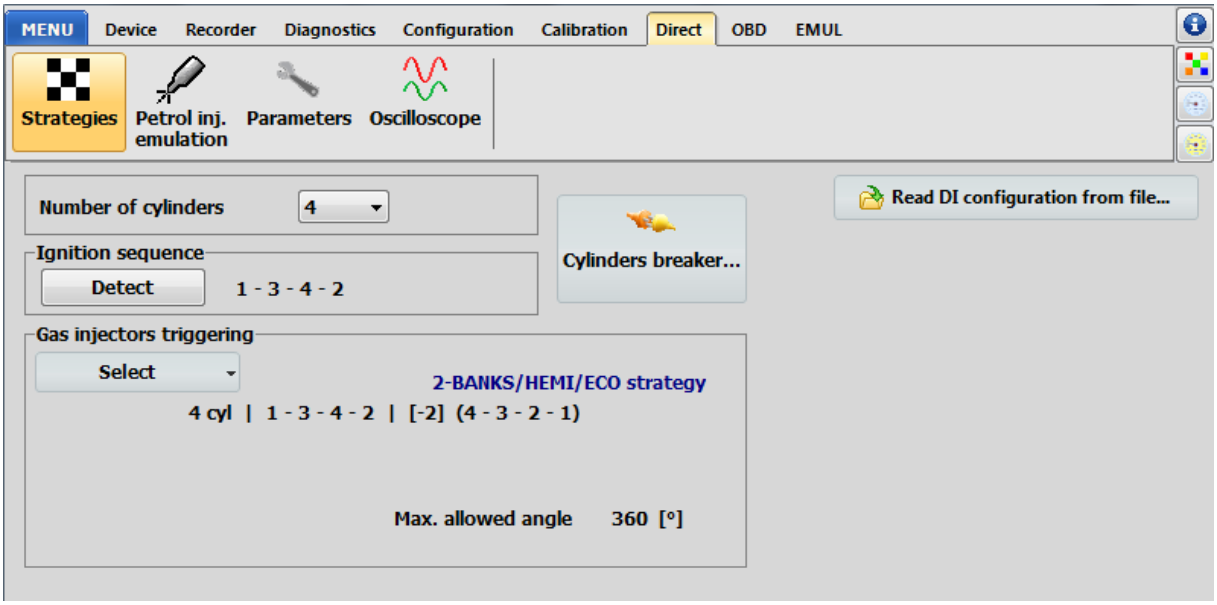


Fig. 2.101 Strategies on the DIRECT tab

On the **Strategies** page [Shift+F9] (**Fig. 2.101**) there are basic settings for the DIRECT driver:

- ***Number of cylinders*** – setting doubled from the Configuration tab -> Basic page.
- ***Ignition sequence*** – starts the procedure of detecting the ignition sequence of the petrol injectors. The procedure starts automatically after changing the number of cylinders.
- ***Triggering gas injectors*** – allows to choose a strategy for triggering gas injectors. Selecting an option that may not work properly for a given sequence will be indicated by the red color of the selected order.
- ***Cylinders breaker*** – opens the cylinders breaker window (see **chapter 2.7.2.2**).
- ***Read DI configuration from a file*** – allows to load only the configuration related to direct injection from a previously saved settings file.

Ignition sequence:

A properly detected ignition sequence is **REQUIRED** for the proper works on gas. The majority of four-cylinder engines have the sequence of ignition: 1-3-4-2 . Occasionally it may happen that the sequence is 1-2-4-3. The occurrence of such a sequence may also mean a mistake of connecting the wires for the petrol injectors and swap the cylinders 2 and 3 or 1 and 4.

In case of wrong connection - simultaneous swap of 1 and 4 and 2 and 3 (in order from the gearbox, not from the timing gear) - the gas system will detect the correct sequence of 1-3-4-2 but incorrect connection of the injectors may cause problems on gas (e.g. jerking engine, large gasoline consumption, etc.)

After connecting the petrol injectors, it is absolutely necessary to check the correctness of the connection using the "Cylinders breaker" tool.

Gas injectors triggering:

Gas injectors triggering is a strategy for selecting the moment and maximum time of opening a gas injector. Gas injectors trigger should be selected according to the ignition sequence. The default strategy is "STANDARD strategy". It ensures the most accurate control on gas. However, it cannot be used in engines with 2 banks, or engines that disconnects half of their cylinders to save fuel (HEMI/ECO mode). In such cars, the 2-BANK/HEMI/ECO strategy should be applied.

The strategy of gas injectors triggering is automatically selected after changing the number of cylinders / detecting the ignition sequences.

Cars with a Boxer engine (e.g. Subaru) have a non-standard injection order: [1 - 3 - 2 - 4]. It is required to change the connection of the hoses with gasoline injectors in the gas controller harness. Swap all cylinder lines 2 and 4 with each other. After swapping these connections, the following ignition sequence should be detected: [1 - 3 - 4 - 2]. **BOTH PETROL AND GAS CHANNELS MUST BE REPLACED**.

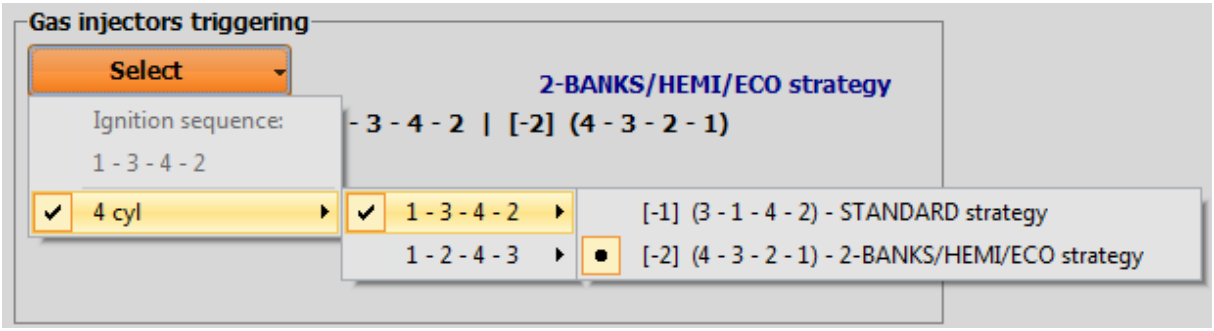


Fig. 2.102 Menu for selecting gas injector triggering

2.9.2 Petrol injectors emulation [Shift+F10]

On the Petrol inj. emulation tab, we choose the type of petrol injectors emulation while system is working on gas. Apart from standard emulation, we have a choice of emulations suitable for specific producers and types of engines. Emulations are divided into brands and types of engines. Moreover, there is additional information displayed for selected engine types.

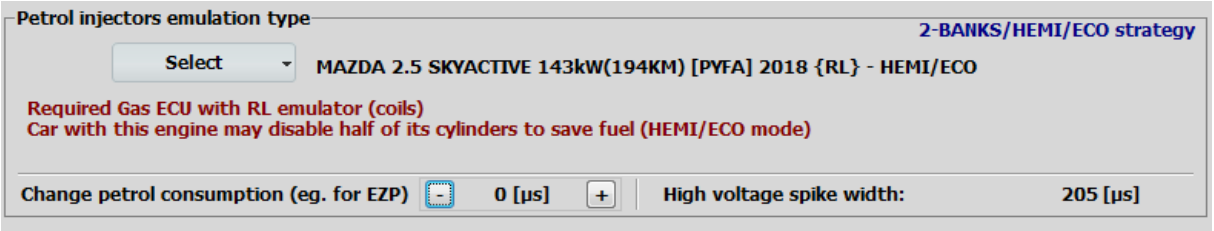


Fig. 2.103 Additional information for selected engine types

“Change petrol consumption (e.g. for EZP)” allows on additional influence on petrol injector cutout delay. This functionality is intended primarily for cars with EZP, in which petrol consumption can be dangerously low (<0.8l/100km). The adjustment is made in steps of 50us using the +/- buttons.

The engines are divided into brands to make it easier to find the right emulation. If the engine is not on the list, choose one of standard emulations Standard, Standard v2.0 or Standard Japan.

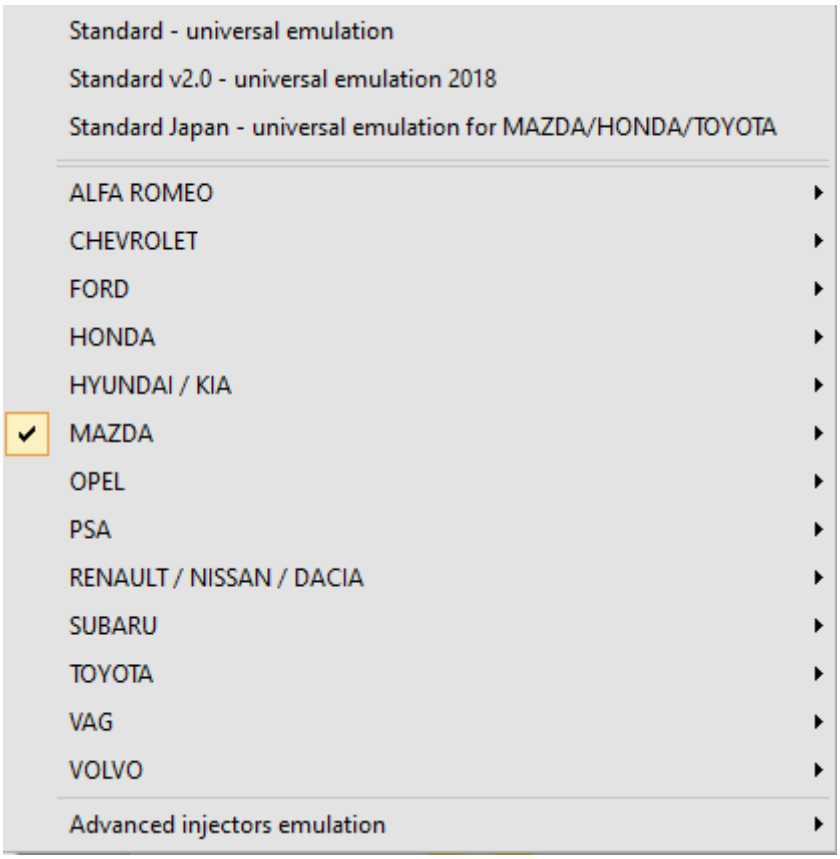


Fig. 2.104 Menu of petrol injectors emulation

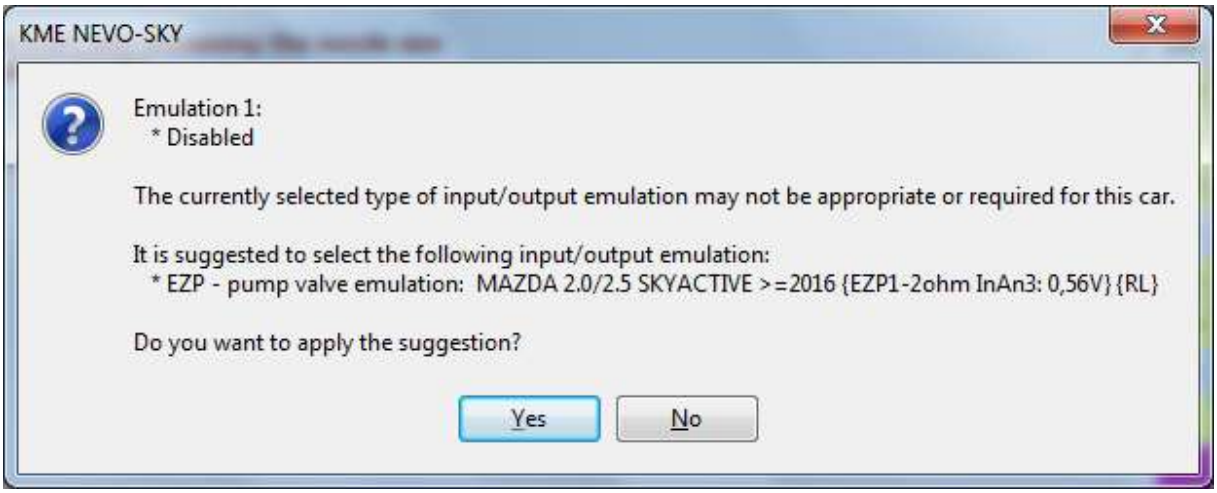


Fig. 2.105 In/Out emulation suggestion

After selecting the petrol injectors emulation, the program may suggest recommended additional emulations required for a given engine (**Fig. 2.105**).

There is also an advanced emulation tab to use exclusively by users who obtain knowledge of how to use it only in critical situations.

THE MECHANISM IS INTENDED ONLY FOR ADVANCED USERS. YOU ARE ACTIVATING THIS MECHANISM AT YOUR OWN RESPONSIBILITY.

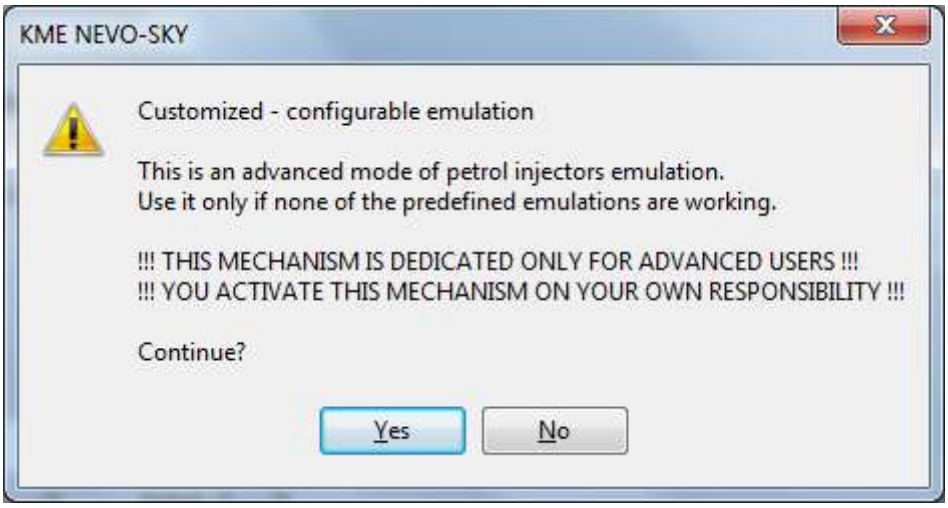


Fig. 2.106 Message about choosing customized emulation

After selecting customized emulation, we have possibility to manually set the manually setting emulation points, this option should be used when none of the available emulations does not work.

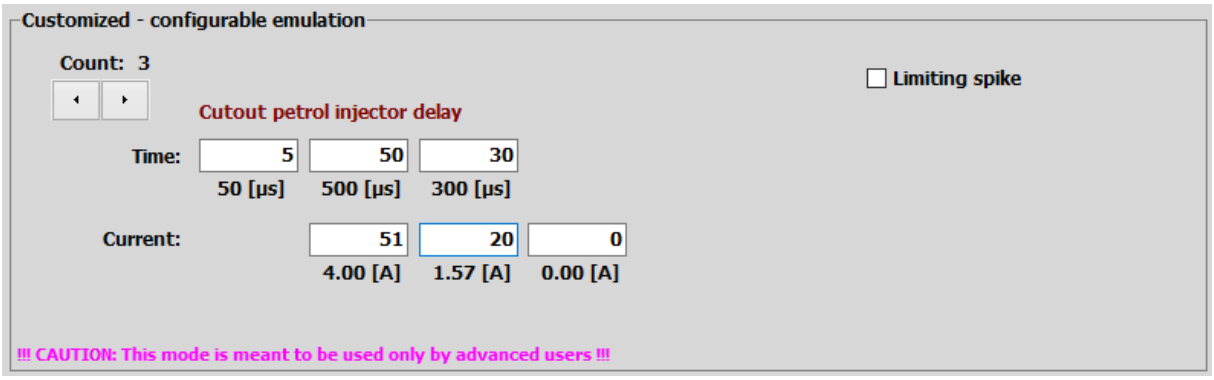


Fig. 2.107 Petrol injectors emulation window with the selected emulated adjustment

WRONG EMULATION MAY CAUSE THE GAS CONTROLLER OVERHEATING, ITS DAMAGE AND EVEN DAMAGE TO PETROL ECU.

The high voltage spike width is a parameter of the petrol injector signal measured by the gas controller.

2.9.2.1 Limiting high voltage spike

Since the 5.1B r2 firmware version, it is possible to reduce the petrol share by using a mechanism called "**Limiting high voltage spike**".

It works by closing the gasoline injector earlier. The use of this mechanism is associated with reduced petrol consumption, which can lead to high pressure errors. To eliminate them, it may be necessary to add petrol after stopping the car (ranges: RPM/OUTPUT 1 – by default on second adding petrol map) or other non-standard ranges (e.g. MAP/OUTPUT 1). ECW may also be helpful, as by lowering the actual pressure on the rail it facilitates the opening of the petrol injector and high pressure letting off (only cars with analog high fuel pressure sensor).

LIMITING HIGH VOLTAGE SPIKE MAY NOT WORK IN EVERY CAR, OR MAY REQUIRE PRECISE SELECTION OF INJECTOR EMULATION PARAMETERS.

In order to activate the simplified mechanism of limiting high voltage spike it is necessary to select one of three standard emulations:

- ***Standard*** – universal emulation
- ***Standard v2.0*** – universal emulation 2018
- ***Standard Japan*** – universal emulation for MAZDA/HONDA/TOYOTA

These 3 emulations are the ones that most often work in cars. They allow proper emulation in the vast majority of 3 and 4 cylinder engines with direct injection.

After selecting emulation type, activate limiting spike. To do this, click on the slider marked with arrow in **Fig. 2.108**. It can be done only while working on petrol on idle.

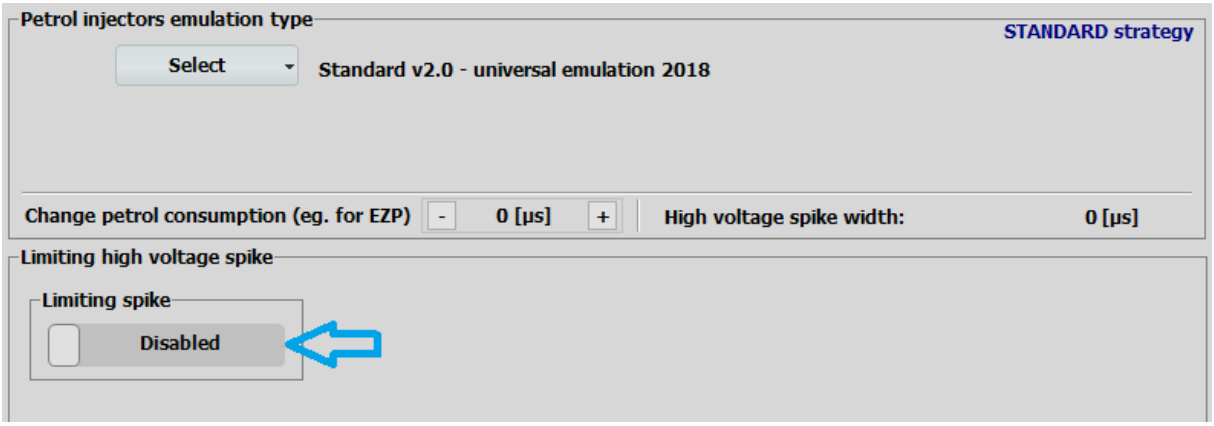


Fig. 2.108 Activation of limiting spike

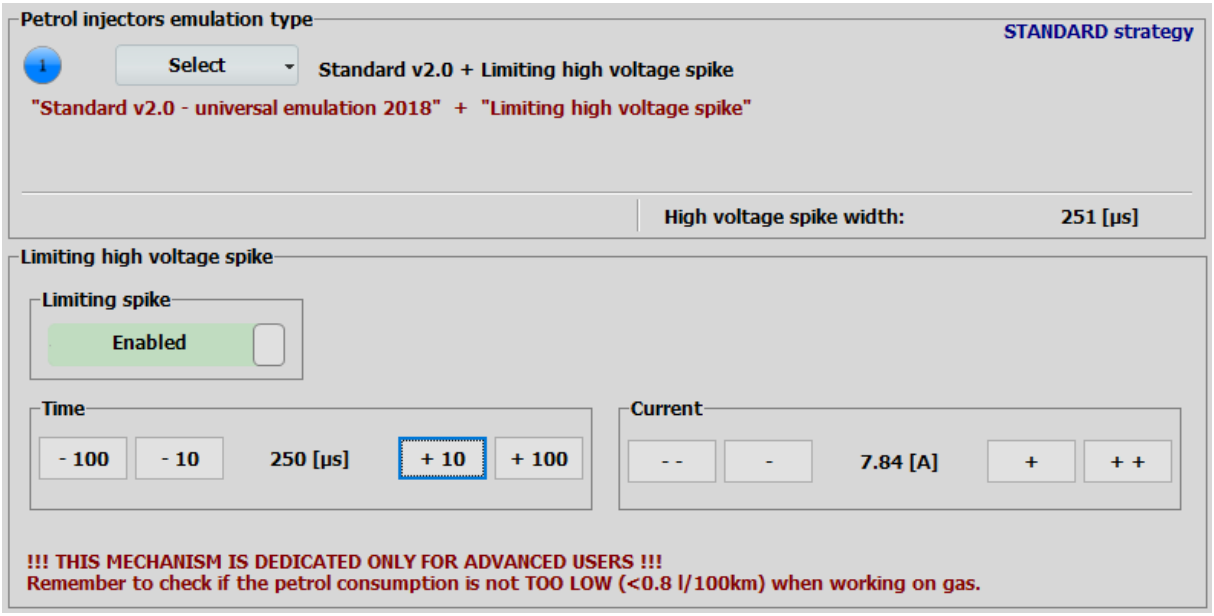


Fig. 2.109 Limiting spike after activation

At the moment of activation, the program will set the "**Time**" parameter in such a way that the limiting spike equals the width of high voltage spike on idle – and more simply, so that the spike is not limited.

The next stage will be choosing the parameters to ensure the petrol flow at a minimum level, but large enough to maintain constant cooling of the injectors, fuel rail pressure letting off and stable working of the car on gas.

To this, modify the Time parameter. The selection of the Time parameter depends on the engine construction, i.e. the used petrol injectors, high pressure pump and their control.

A simple experiment can be setting the “time” value and then pumping the fuel rail at idle (e.g. strong gas addition, starting and stopping immediately…) while working on gas. If after pumping the fuel pressure (input 1) does not drop steadily, it means that the set “time” value is too low and should be increased.

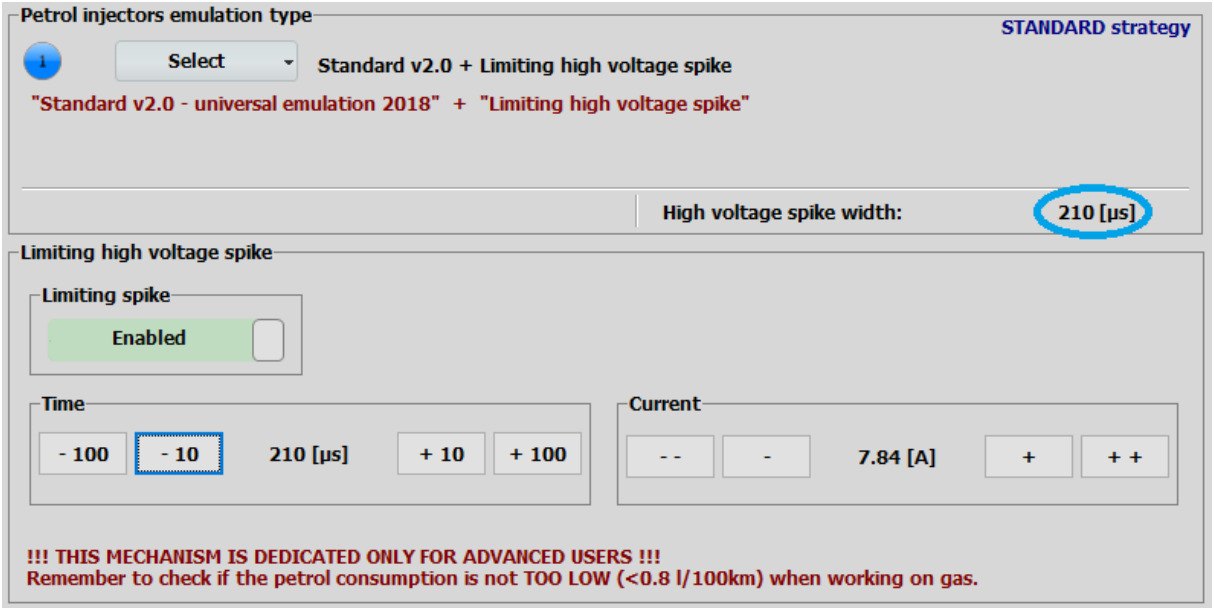


Fig. 2.110 Spike width after limiting and switching to gas

CAUTION: AFTER ACTIVATION OF THE MECHANISM AND SWITCHING TO GAS AT IDLE, THE ENGINE CAN STOP DUE TO TOO LEAN MIXTURE.

Some engines have VARIABLE high voltage spike. This means that the width of the spike during driving can increase depending on the fuel pressure orengine load. In such cases, it may turn out that the time parameter must be equal to the spike width at idle or even above that value.

It is impossible to specify the universal value that the time parameter should have. For example, for many cars, the width of the spike while working on petrol is constant and oscillates around 250-400us. In some of them, shortening it by up to 20us will cause the petrol injector to stop opening, while in other cars it can by safely shortened by up to 50us or more.

The efficiency of limiting spike is easily verified during test drive. If, after activating the mechanism, OBD corrections and maps show a lean mixture than before, it means that petrol share has been reduced.

There is also available “Current” parameter which determines how high the current is to force limiting spike. In most cases it will not be necessary to change this parameter, the default value is universal for vehicles from different manufacturers. For some cars, however, it may turn out that the spike has not been limited due to low current (it should be increased then) or the car is unstable due to too high current (it should be decreased).

If the car does not work properly after limiting spike (injector circuit errors, the appearance of so-called “next spike”), it is possible that the emulation parameters are inappropriate. Then choose another of the 3 standard emulations and activate limiting spike again. If this does not help, it may be necessary to properly map the current in advanced mode or not to limit the spike and use different mechanism to reduce petrol consumption (EZP, ECW).

The mechanism should be used with caution. It may turn out that too much limiting will cause such a reduction in petrol consumption that the car almost does not use petrol on the highway, and thus, does not cool and does not clean petrol injectors.

2.9.3 Parameters

The "Parameters" page allows you to make changes to the moment of the gas injection depending on the rpms and to correct the gas mixture when engine is working on more than one injection in the one cycle.

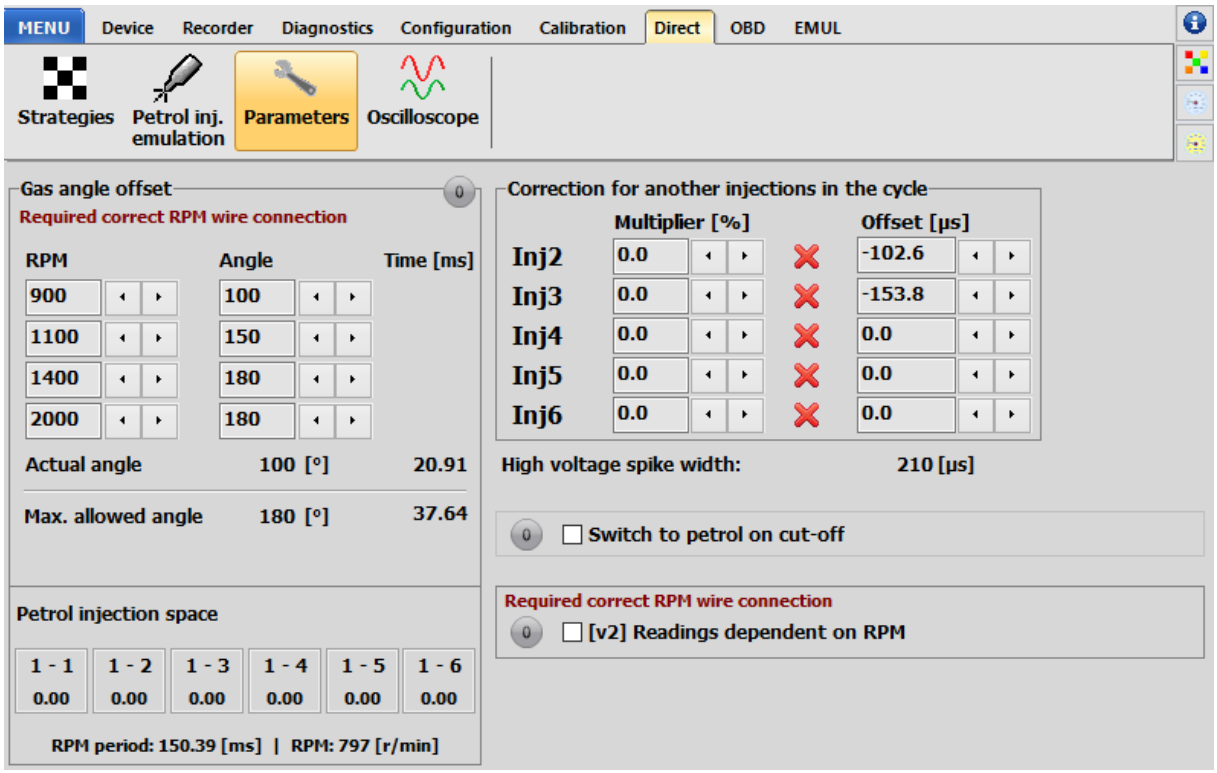


Fig. 2.111 Parameters page in Direct tab

- ***Gas angle offset*** – the option allows to change the moment of gas injection in relation to petrol injection. It allows the moment of gas injection to depend on engine revolutions (requires the correct RPM signal). The smaller angle, closer to the petrol injection gas will be injected. For high engine loads and long gas times, a small angle can result in insufficient time for complete injection of the gas dose. The actual angle is calculated linearly and its value is displayed below. The maximum angle depends on the strategy of triggering gas injectors.
- ***Petrol injection space*** – information about the time elapsed from the beginning of the first injection to the second, third, fourth, fifth and sixth respectively (measured on the same cylinder). Useful information when selecting the value of angular gas shift when there is a problem with short and unconnected gas injections.

- ***Correction for anather injections in the cycle*** – in the direct injection engines often there may be more than one injection of gasoline per cylinder in one cycle of engine operation. The correction allows you to enter a percentage or offset correction for the time of gas injection during operation in the 2, 3, 4, 5, 6 injections per cycle mode. Typically, when working on a larger number of injections per cycle, the mixture is too rich and negative adjustments (offset) should be made.
  After setting the Model [F9] (which should be set when engine is working on one injection per cycle), adjust the correction values for others injections in the cycle so that the OBD corrections are correct.
- ***Switch to petrol on cut-off*** – switching to petrol after detection of cut-off, return to gas after one cycle of work on gasoline.

2.9.3.1 Choice of gas injector release strategy and angle shift

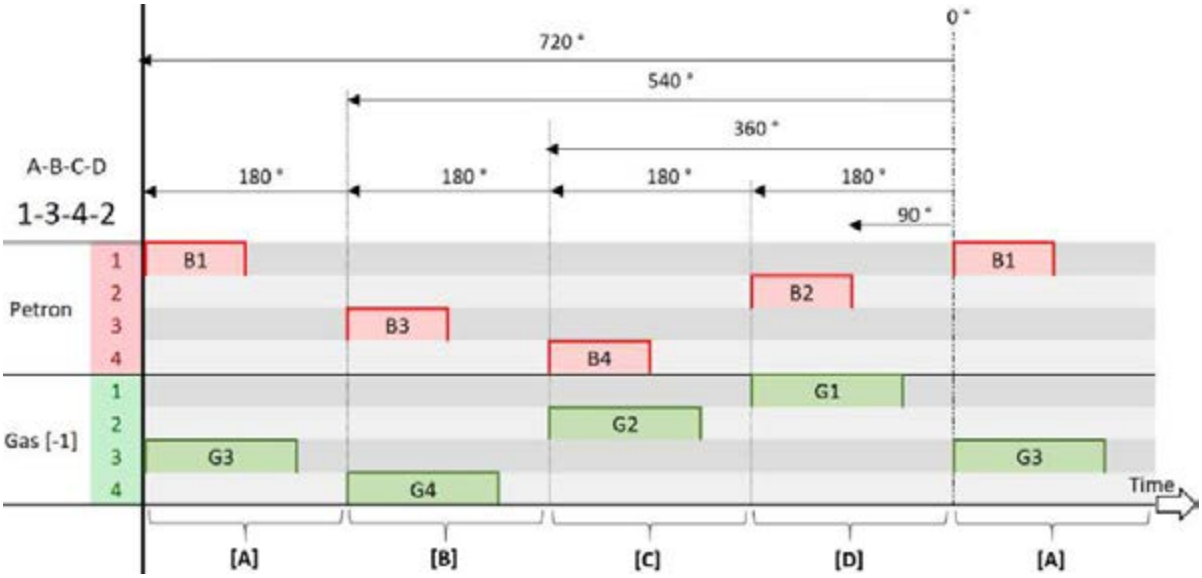


Fig. 2.112 Visualization of gas injector triggering in strategy [-1] for firing sequences 1-3–4–2

Fig. 2.112 shows the release of gas injectors using the [-1] strategy, also known as the **STANDARD strategy**. This is the default gas release strategy. It offers the fastest response to a change in the fuel demand of the engine, as the gas injection time is calculated based on the previous raw petrol injection time. In this situation, **GASOLINE** injection on the **FIRST** cylinder triggers the **GAS** injector from the **THIRD** cylinder, and the gas injection time on the third cylinder is calculated on the basis of the injection time from the first cylinder. Further, gasoline injection on cylinder number 3 triggers the gas injector and is the basis for calculating the

injection time for the fourth cylinder, gasoline from the fourth releases gas on the second, and gasoline from the second gas on the first.

The figure assumes that the current angular displacement is 180°, i.e. the maximum possible for the STANDARD strategy.

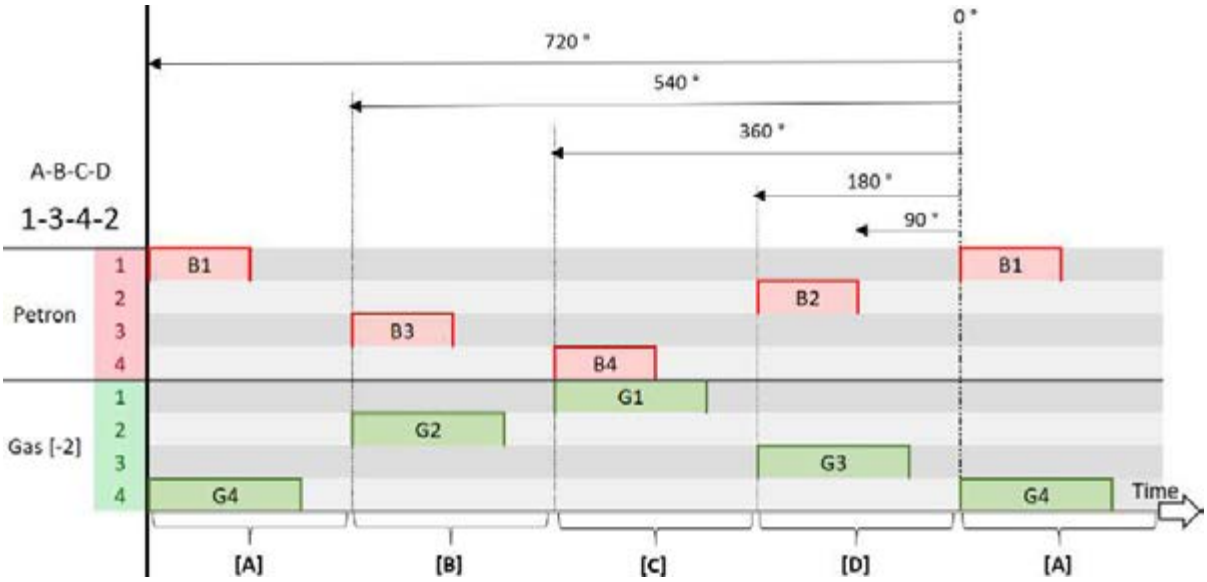


Fig. 2.113 Visualization of gas injector triggering in strategy [-2] for firing sequences 1-3–4–2

Strategy [-1] cannot always be used. In two-bank cars (TOYOTA 2.0 / 2.4 FSE, ALFA ROMEO JTS, some VAG 1.4TSI ACT) or those with a cylinder deactivation system (VAG 1.4TSI ACT, VAG 1.5TSI ACT, MAZDA 2.5 SKYACTIVE [PYFA] from the end of 2018 year) it is necessary to use strategy [-2], also known as **strategy 2-BANKI / HEMI / ECO**, presented in **Fig. 2.113**. In its case, the gas injection time is calculated not from the previous cylinder, but from 2 cylinders backwards. This results in less control precision than when using strategy [-1], but allows the gas system to operate in a two-cylinder, ECO/HEMI mode. Despite the reduced precision in control, strategy [-2] offers greater flexibility in setting the angular offset which allows to solve the problem of short unconnected gas injections times and also the lack of time for gas feeding.

In this strategy, the gas injection time for the fourth cylinder is calculated based on the first and the time for the first based on the fourth cylinder. Put simply, the second cylinder controls the third and the third controls the second.

This strategy is necessary in the case of cars with 2 banks in OBD, because after applying the strategy [-1] there will be a situation where the doses intended for bank 1 will be administered to bank 2 and vice versa. In a short time it will lead to a significant equality in

times of injection between banks, uneven engine operation and also the appearance of OBD errors

As you can see, if the engine deactivates cylinders 2 and 3, then cylinders 1 and 4 can stay on gas because they control each other. Similarly, if you turn off 1 and 4 then the car will continue to run on gas, because cylinders 2 and 3 control each other.

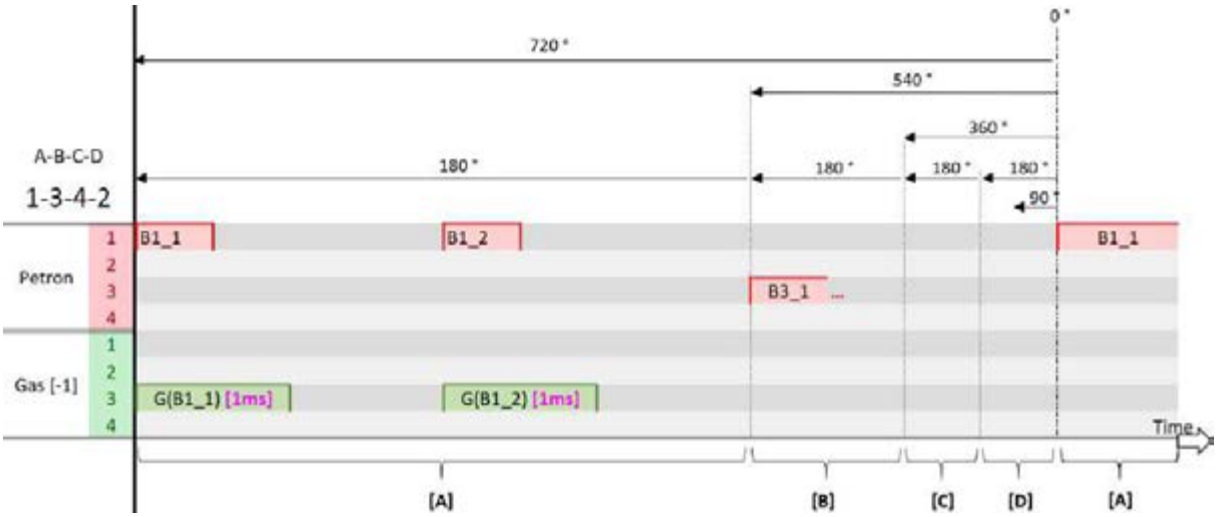


Fig. 2.114 Angular shift visualization (short gas times)

Fig. 2.114 presents a situation in which two distant gasoline injections generate 2 short gas times. Slow gas injectors will not open at all for such short gas times, and fast injections may turn out to be unstable. If this happens in the car, it will most likely lead to jerking and unstable operation of the car.

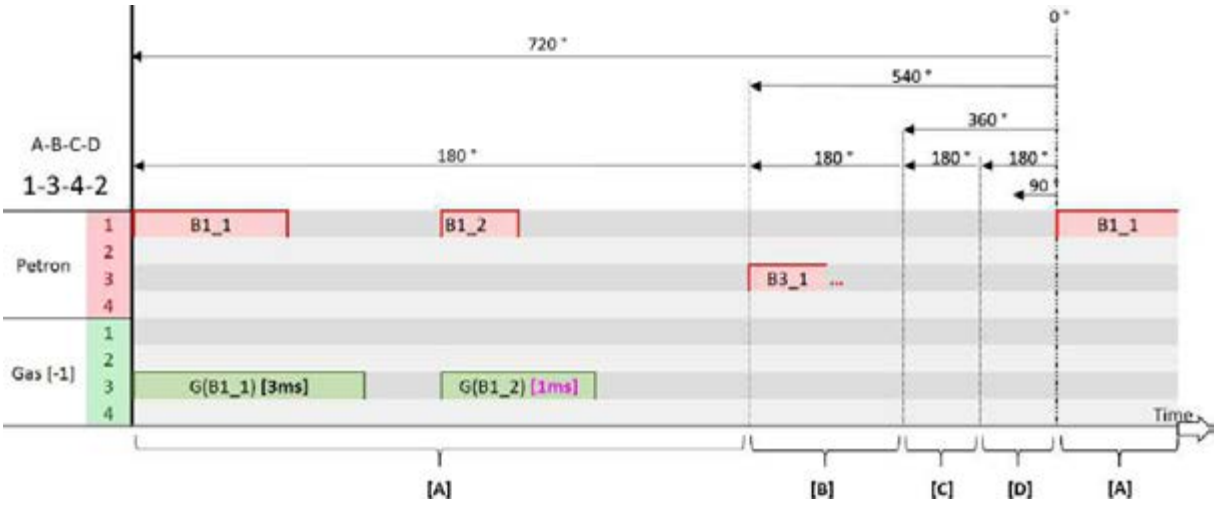


Fig. 2.115 Angular shift visualization (one short gas time)

Fig. 2.115 presents a situation similar to the previous one, much more common in cars. Here, the first gas injection was long enough for the injector to open stably, but the second was too short. In such a situation jerking or working on a too lean mixture may occur.

Occurrence of the above situations will be signaled on the sidebar, model, map, correction maps and linear corrections in light blue color displayed on some panels (**Fig. 2.116**).

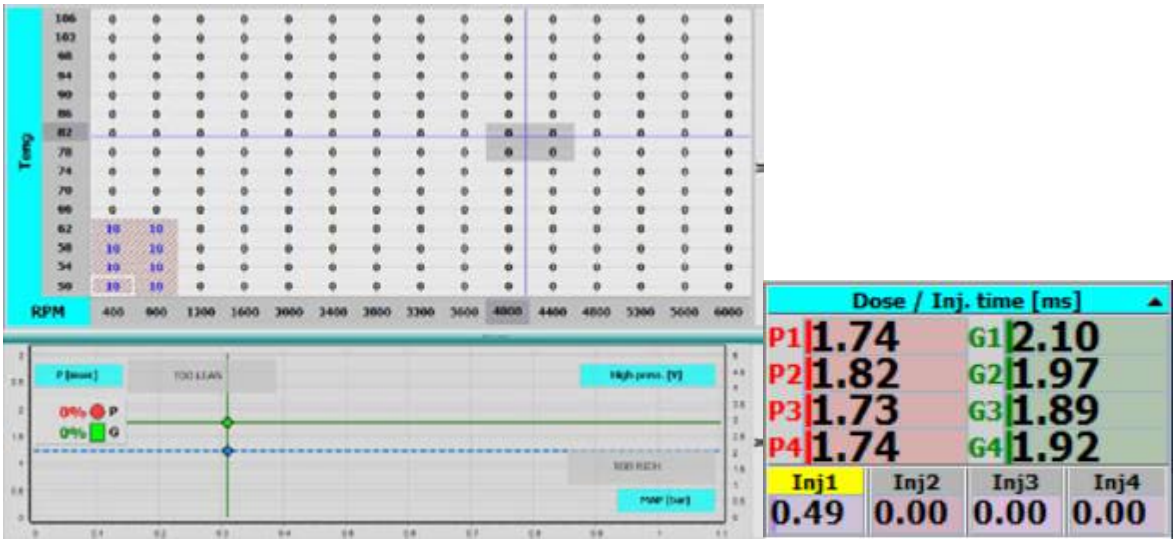


Fig. 2.116 Signaling short gas times resulting from unconnected injections

Combating these situations using the mechanism of minimum gas injection time can be fatal, as it will lead to two long gas times, which will result in working on a too rich mixture, and even overfilling the engine to such an extent that misfire will occur.

You can try to eliminate this problem by reducing the efficiency of the gas system (smaller nozzles, lower gas pressure), but this can lead to low performance under load. The alternative is to adjust the angular gas shift.

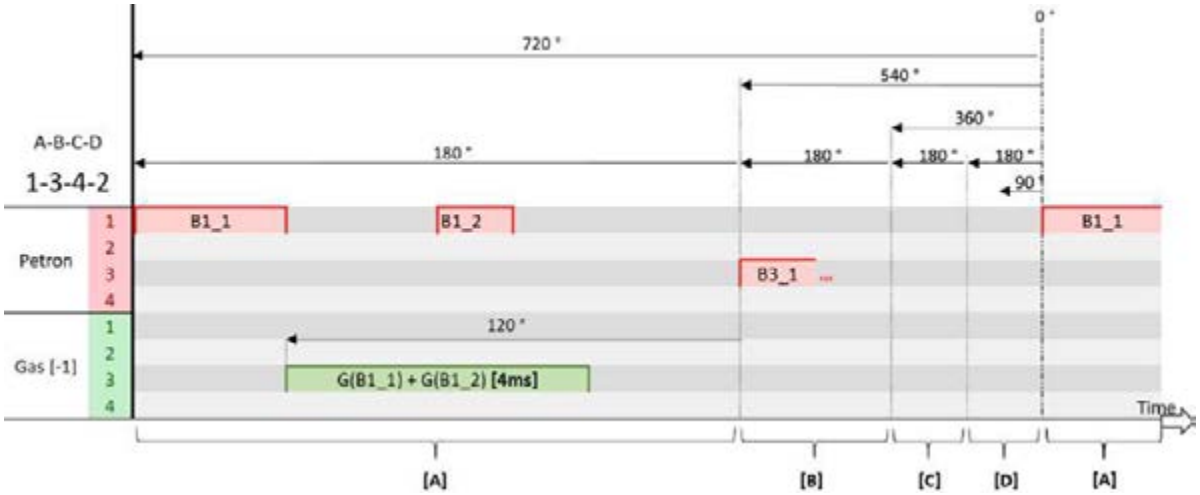


Fig. 2.117 angle 120° in strategy [-1]

As can be seen in **Fig. 2.117**, the angle reduction has allowed for such control where only one gas injection is created, long enough for the injector to open stably. However, it should be remembered, that excessive reduction of the angle can lead to a situation in which, with a sudden change in the demand for fuel, the system will not be able to feed the right amount of gas to the cylinder, as shown in **Fig. 2.118**.

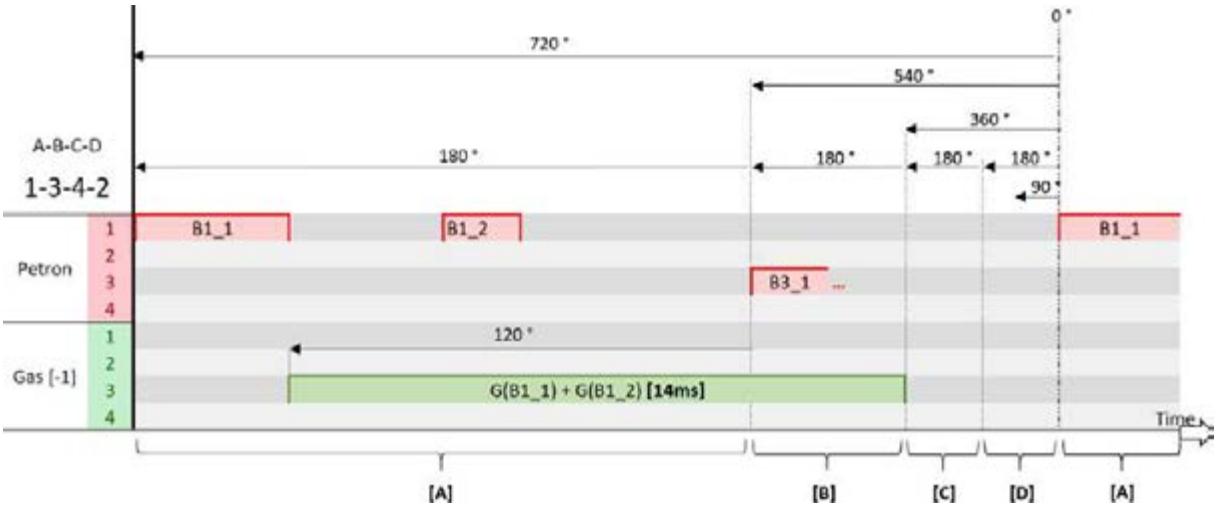


Fig. 2.118 No time to supply gas when the angle is too small

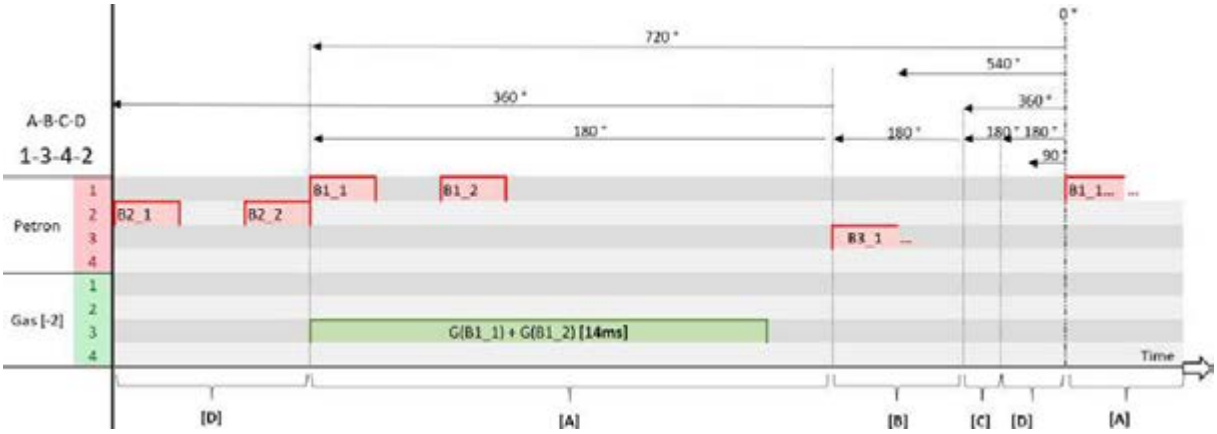


Fig. 2.119 Visualization of strategy [-2] and angular gas shift

Fig. 2.119 shows how to effectively use the strategy [-2]. Thanks to the 180 ° angle you have enough time to feed gas. It is also much smaller than the maximum 360 °, which means that the gas injector was not opened at the beginning of the gas injection, but a little later. Thanks to this, it is easiest to achieve a balance between a small enough angle to connect the gas injection and a large enough one to always be able to feed all the fuel before closing the suction valve

It should be remembered that these advantages of strategy [-2] are at the expense of reduced control precision. Each car can react in different ways. Accurate and correct gas time regulation in various conditions, using correction maps taking into account dynamic states (e.g. MAP / DOSE), can help to overcome these differences.

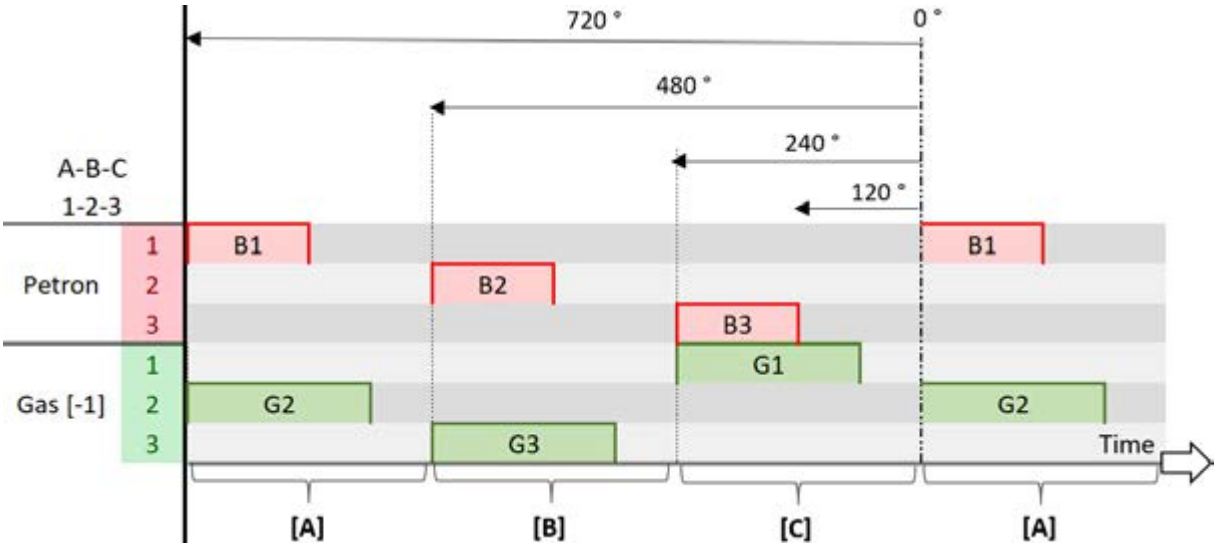


Fig. 2.120 Visualization of gas injector triggering in strategy [-1] for the firing order 1-2-3

With 3 cylinders, the situation is slightly different than in 4 cylinders. When using strategy [-1], the maximum allowable offset is 240 °

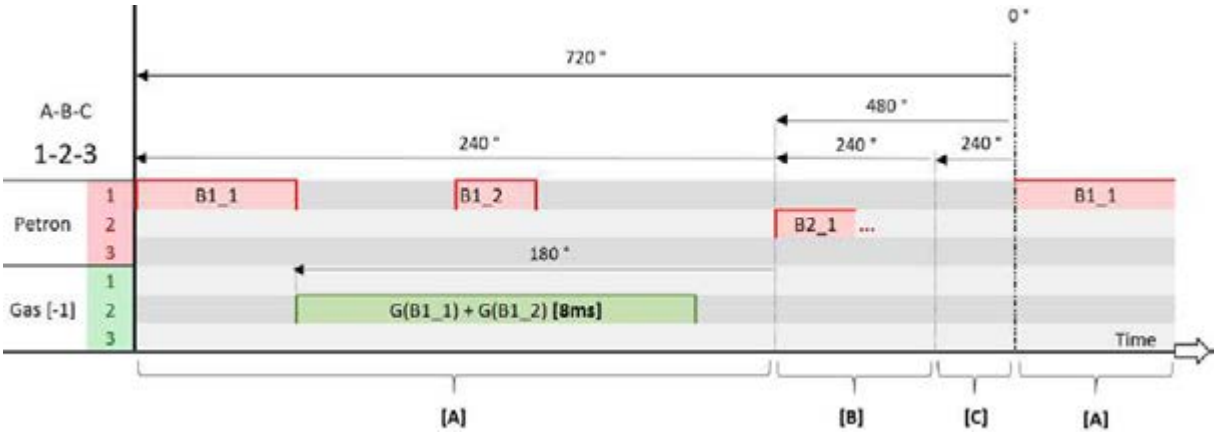


Fig. 2.121 Strategy visualization [-1] in a three-cylinder engine with ignition sequences 1-2-3

The above figure (**Fig. 2.121**) shows the operation of strategy [-1] in a 3-cylinder car using the default 180 ° angle. As you can see, this shift already delays the opening of the gas injector by default, which makes it easier to combine individual injections in the cycle.

To eliminate problems with short and multiple injections it is recommended to use fast gas injectors (e.g. KME HAWK).

2.9.4 Oscilloscope

The oscilloscope is a diagnostic tool that helps in the proper connection of gasoline injectors, and in the analysis of the current and voltage of the petrol injector. The basic unit of time is µs.

The main window of the oscilloscope is divided into three parts:

- ***Waveform window*** – recorded waveforms are displayed.
- ***Cursor values*** – for each of the recorded waveforms, the values of time and the time difference from vertical cursors, as well as the values of voltages / currents and their differences for horizontal cursors are displayed.
- ***Settings*** – advanced settings of the oscilloscope, and selecting and starting the measurement configuration.

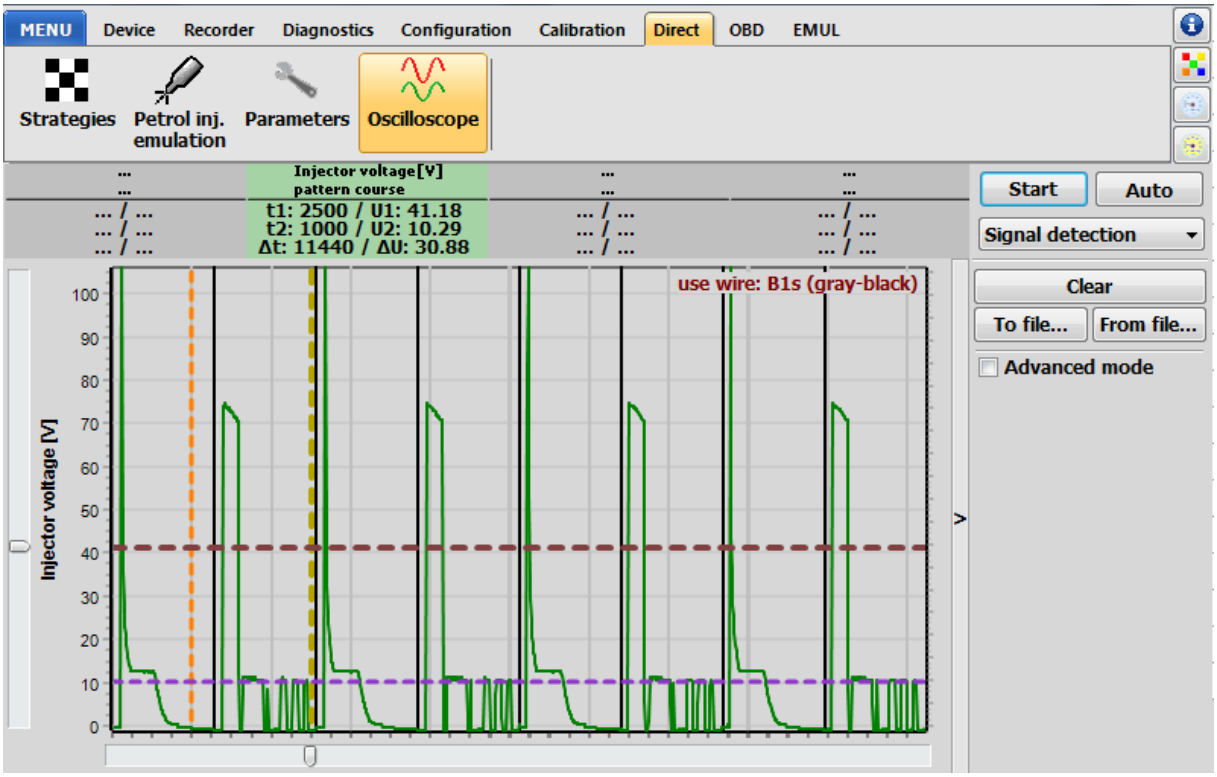


Fig. 2.122 Oscilloscope window with recorded waveforms

Options available in the oscilloscope:

- ***Start*** – start collecting waveforms.

- ***Auto*** – start collecting waveforms in a continuous mode. After displaying the currently collected data, collection of new data begins. Old waveforms are replaced with newly collected ones.
- ***Injector current/Injector voltage/Signal detection/Pump valve/Manual*** – selection of the oscilloscope measurement mode:
    - **Signal detection** (**Fig. 2.122**) – voltage waveforms from the first petrol channel are collected, divided into 8 sections. The mode used to determine which injector wire should be cut.
    - ***Injector current*** – collecting the petrol injector current waveform. For correct measurement, it is necessary to properly connect the gasoline injector.
    - ***Injector voltage*** – collecting the petrol injector voltage waveform. In some cars (mainly from the USA) it may not be possible to collect this waveform, due to petrol ECU construction.
    - ***Pump valve*** – collecting the fuel pump valve voltage waveform or other voltage waveforms in the range of 0-20V (analogue input 5).
    - **Analog input 1** – collecting voltage waveform in the 0-5V range from the high pressure sensor (analog input 1). It is easy to determine if the sensor is analog or digital and to confirm the signal from the high pressure sensor.
    - **Analog input 2** – collecting voltage waveform in the 0-5V range from the analog input 2.
    - **Analog input 3** – collecting voltage waveform in the 0-5V range from the analog input 3.
    - **Analog input 4** – collecting voltage waveform in the 0-5V range from the analog input 4.
    - ***Manual*** – manual measurement mode that allows you to decide what to measure on which channel with settings in advanced mode.
- ***Clear*** – clearing all registered waveforms.
- ***To file…*** – save to file the current waveforms.
- ***From file…*** – load from file previously saved waveforms.
- ***Advanced mode*** – advanced oscilloscope settings:
    - **Options** – additional options of the waveform window:

      - Show legend – shows the legend in the upper left corner. The legend allows you to hide the chosen waveforms from the view.

      - Show cursors – cursors allow measurement of recorded waveforms. They can be moved with the mouse, by grabbing and dragging, or by selecting, using the arrows on the keyboard.

      - Edit offsets – allows you to move the selected waveforms in the timeline. The waveform to be moved should be selected by clicking on its value window. The

offset is set with a slider below the waveforms, and the current time offset value is displayed in the red square (**Fig. 2.123**).

- Left axis/Right axis – selection of the displayed value on the left / right axis in the waveform window.

- **Type of measurement** – selection of the values measured on channel 1 and on channel 2. The choice is the current of the petrol injector 1, the petrol injector voltage or the analogue input 5.
- **Trigger** – determining the voltage/current level at which the oscilloscope will start recording the waveform. In the case of a signal whose value does not exceed the triggering value, the oscilloscope will not register the expected waveform.
- **Step** – the time interval between collecting further signal samples. Increasing this value reduces the accuracy of the measurement, while increasing the total recording time of the waveform.
- **Offset** – a value that defines the time shift of the recorded waveform.
- **Time** – the value determining how much time above the trigger value the waveform should have to be detected correctly. A smaller value of this time will increase the sensitivity of the oscilloscope to short pulses.

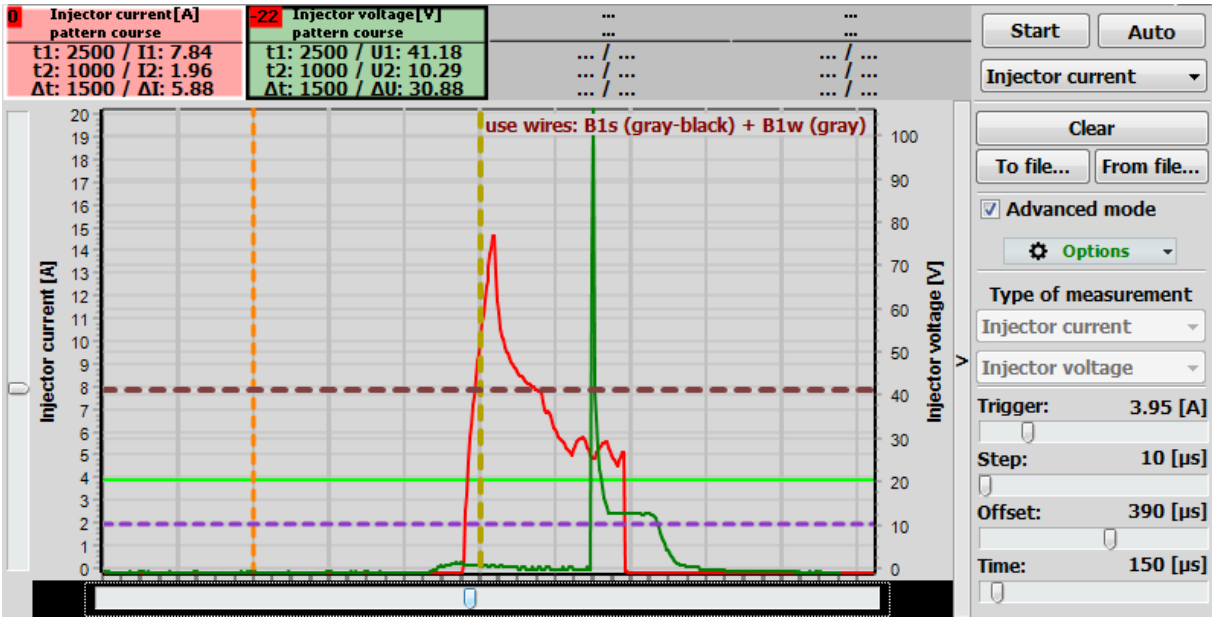


Fig. 2.123 Editing the time offset on the waveform

2.11 OBD tab

The gas controller has the ability to communicate with the gas controller using the OBDII diagnostic interface. The use of such communication is:

- reading parameters from the OBDII system and their visualization in the program for more precise regulation,
- reading and checking (including erasing) registered and pending errors of the petrol controller,
- automatic adjustment and adaptation of the gas system with the use of fuel corrections reads from the OBD (OSA - OBD System Adaptation).

OBD communication can be established using protocols that are used in most cars manufactured after 2001:

- ISO9141,
- KWP2000slow,
- KWP2000fast,
- CAN_11bitID_500kbps,
- CAN_29bitID_500kbps,
- CAN_11bitID_250kbps,
- CAN_29bitID_250kbps.

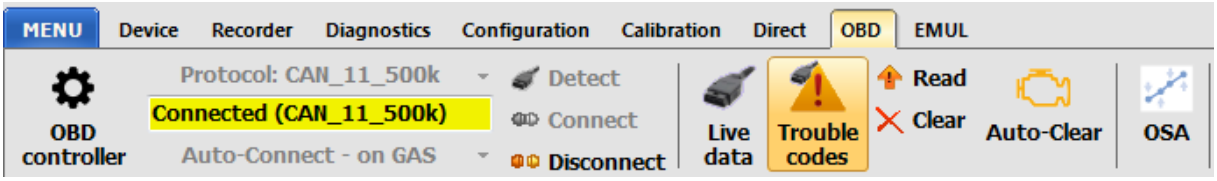


Fig. 2.124 Ribbon elements for the OBD tab

Ribbon elements for the OBD tab:

- ***OBD controller*** – information about the connection with the car controller (**Fig. 2.124**).
- ***Protocol*** – allows to specify the protocol by which the controller is to connect to OBD.
- ***Detect*** – allows automatic detection of the protocol.
- ***Connect*** – connects with the OBD using the chosen or the detected protocol.
- ***Disconnect*** – disconnects with OBD.

- ***Auto-connect*** – allows to specify whether and when the gas ECU is to be automatically connected to the OBD system. If the option is enabled, the system waits 30 seconds from the appearance of power and then connect automatically. Available modes are:
    - **Disabled** – the gas ECU will not automatically connect to the OBD
    - **Always** – OBD connection with the controller will be established automatically when it detects the start of the engine.
    - **On GAS** – OBD connection with the controller will be established automatically only when the system is in gas mode. On petrol there will be no attempt to communicate with OBD.
- ***State bar*** – indicates current OBD connection status.
- ***Live data*** [Shift+F1] – opens a window with current readings of all OBD parameters.
- ***Trouble codes*** [Shift+F2] – opens the error window read from OBD.
- ***Read*** [Shift+Ctrl+F2] – reads trouble codes from petrol ECU.
- ***Clear*** [Shift+Ctrl+F3] – clears ECU trouble codes.
- ***Auto-Clear*** [Shift+F3] – opens the configuration window for the automatic erase of selected OBD errors.
- ***OSA*** [Shift+F4] – opens a window with OBD adaptation settings

!!! WARNING: In cars with flap on the OBD connector, the flap should be removed before connecting OBD module wires.

2.11.1 OBD controller

This page displays information about currently detected OBD controllers. In case of automatic connection to the wrong OBD controller (e.g. from the gearbox), you can select the specific controller with which the connection will be established. To do this, connect to the OBD and click "**Connect only to this OBD controller**" with the appropriate driver detected. The option "**Connect only to the selected OBD controller**" will be automatically selected. A characteristic feature of a petrol controller is that it has the most PIGs among of the available controllers.

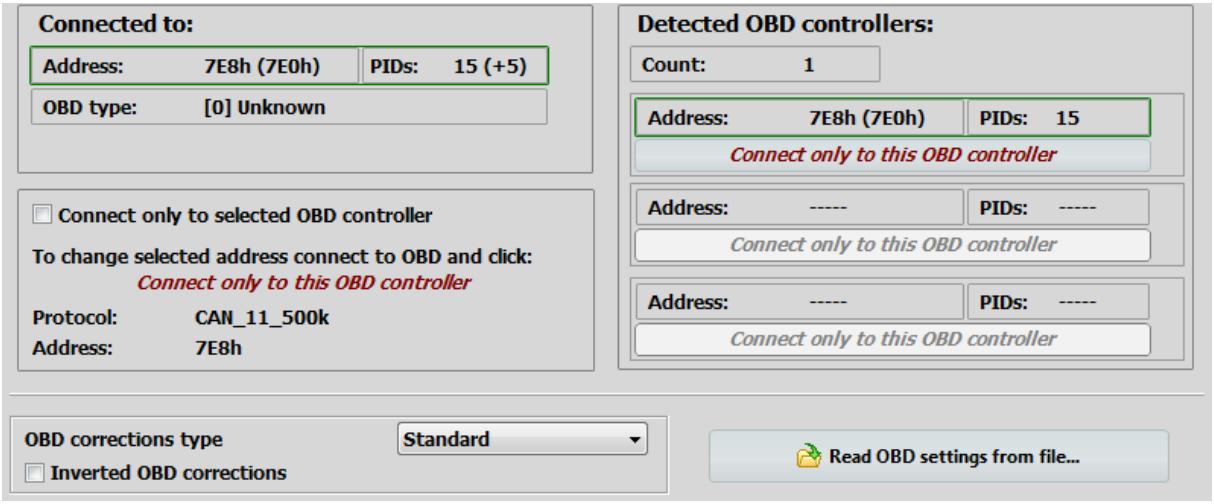


Fig. 2.125 Window with information about OBD controllers

The type of OBD corrections can also be chosen on this tab:

- ***Standard*** – standard range of corrections from -100 to 100 (in many modern cars the maximum values can be from -25 to 25, but the standard type of corrections will allow their proper interpretation).
- ***Divided by 4*** – corrections in the range -100 to 100 divided by 4 correspond to the standard range of adjustments.
- ***Fiat*** – a non-standard range of corrections mainly used in older Fiat cars.
- ***Inverted OBD corrections*** – if this option is selected, the LTFT and STFT gasoline correction mark is interpreted inversely than normal. The normally positive correction value is treated as a necessity to increase the fuel dose (lean mixture). In the case of inverted corrections - the positive value of the corrector enforces reduction of the fuel dose, thus introducing negative corrections in the gas controller (rich mix). Inverse LTFT and STFT corrections are very rare in some cars with Magneti Marelli drivers (e.g. VAG group, e.g. VW Golf 4 1.6l 2002).

2.11.2 Live data [Shifr+F1]

Live data page allows you to monitor parameters from OBD. Next to each value there is a check box, turning on which causes cyclic reading of the chosen value and displaying it. If some of the values cannot be switched on, it means that the value cannot be read from the OBD interface of the connected car (it is not supported in this car).

Next to the values read from the wideband oxygen sensor (UEGO) is placed a button to choose whether the reading is to take place with current or voltage sensors.

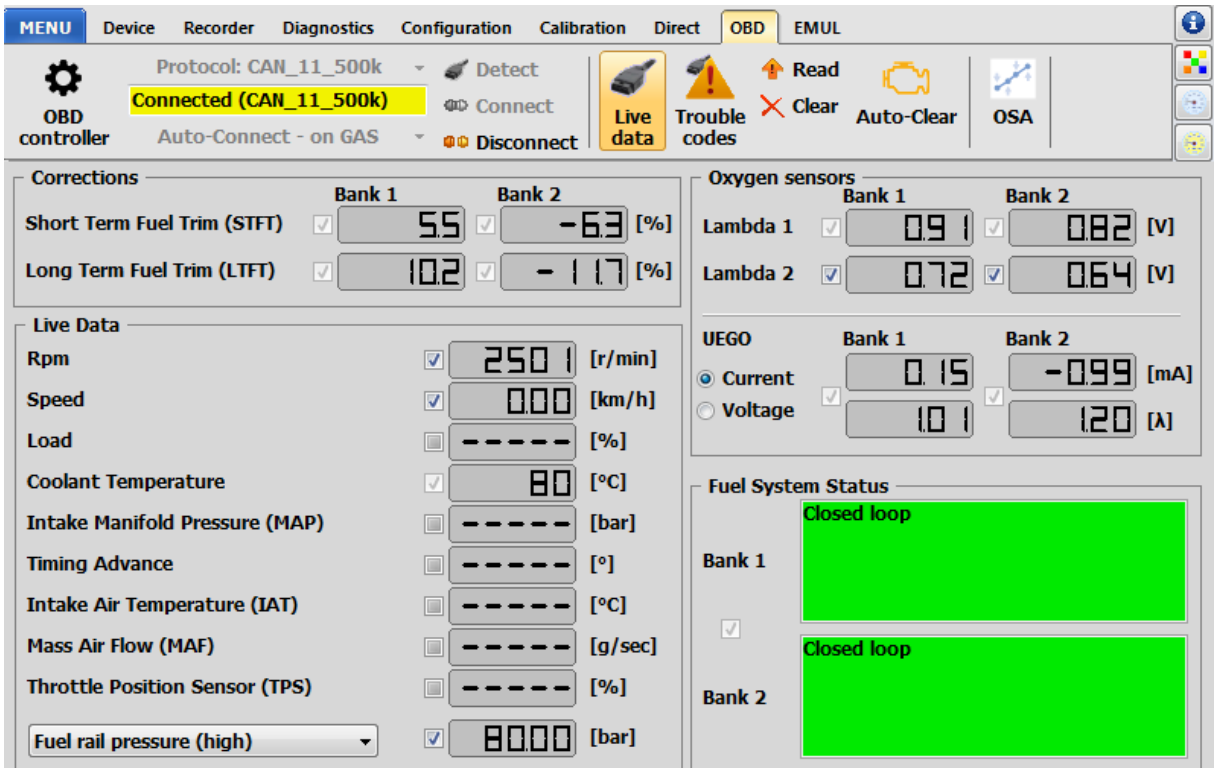


Fig. 2.126 OBD Live data window

2.11.3 Trouble codes [Shift+F2]

This window provides functionality of reading and deleting trouble codes (check engine) of the petrol controller. To read recorded and pending trouble codes press the Read button. To delete all trouble codes, the Clear button is used. The appearance of an registered OBD error is also signaled by an exclamation mark on the left side of the virtual driver's panel in the side bar of the readings.

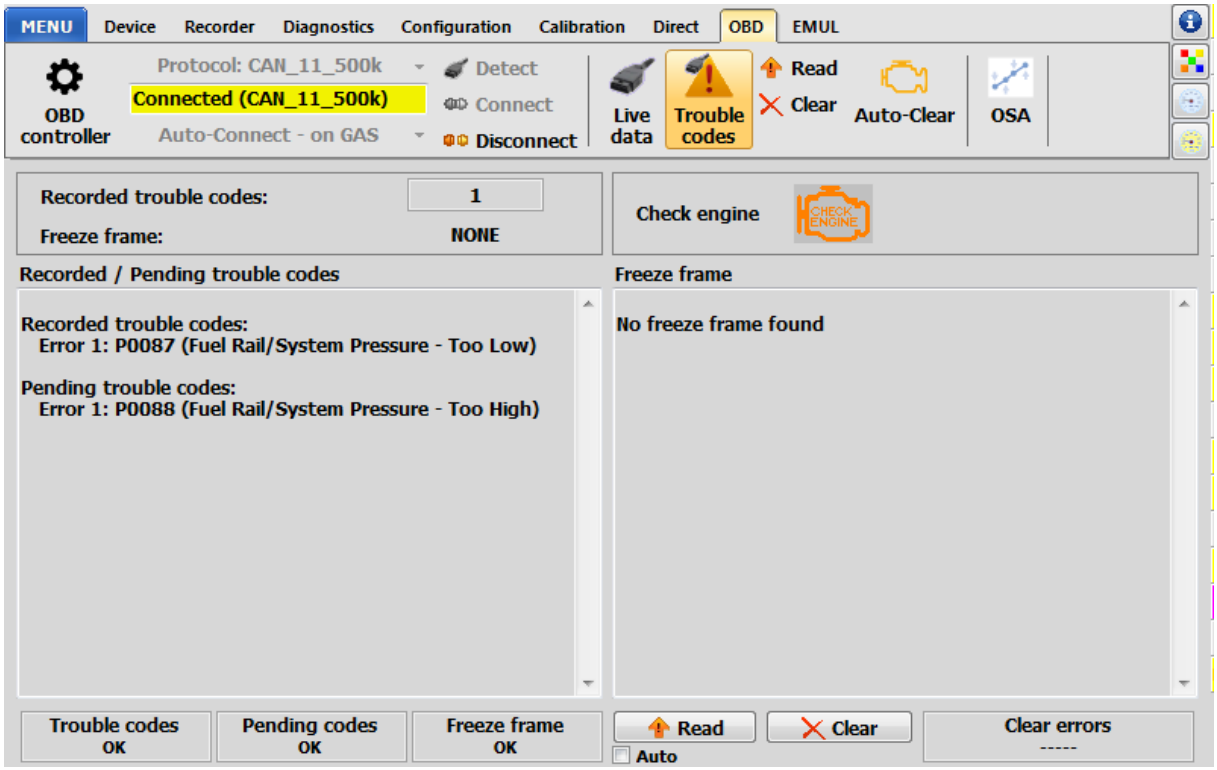


Fig. 2.127 OBD Trouble codes window

2.11.4 Auto-Clear [Shift+F3]

The Auto-Clear tool is mechanism of automatic clearing OBD trouble codes. It has 2 work modes, which can be extended by additional options. Those modes are:

- **Auto-Clear – disabled**: tool is inactive.
- **Auto-Clear – basic mode:** this mode allows user to select up to 20 trouble codes, which will be cleared if gas ECU detects them. If a code outside the list of selected errors is encountered, the mechanism will not clear errors.
- **Auto-Clear – advanced mode:** this is an extension of basic mode. The difference in operation is that in the advanced mode, up to 10 additional trouble codes, that the user has not selected, will be cleared. This allows you to protect yourself from any errors that the workshop calibrating the installation has not encountered. The number of clears of a single additional trouble code is limited to 50. Advanced mode is available from version 5.1B r2 (DIRECT) / 5.2B r2 (MAX).

The Auto-Clear tool allows to select up to 20 OBD errors to be automatically deleted at the moment of occurrence (already as pending errors). The list of errors that can be selected is shown on the left, while on the right, the error codes selected for clearing are shown. Next to each selected error code is additionally shown the counter how many times the error has been deleted. In a separate Direct card, errors dedicated to cars with direct petrol injection are available.

On the left side of the window you can see a list of error codes that can be selected. They were divided into 2 parts:

- **Basic** – errors occurring in both direct and indirect injection cars
- **DIRECT** – errors that are more common in direct injection engines

On the right side there are error codes selected by the user and those additionally detected in advanced mode. Next to each error code, the counter shows how many times the error has been cleared.

With the "**-> Select ->**" button, we add the selected errors to the selected codes list. Use the "**Remove all**", "**Remove selected**" buttons to remove errors from the list of selected codes. There are also error sets for selected types of cars that can be selected from the Templates drop-down list.

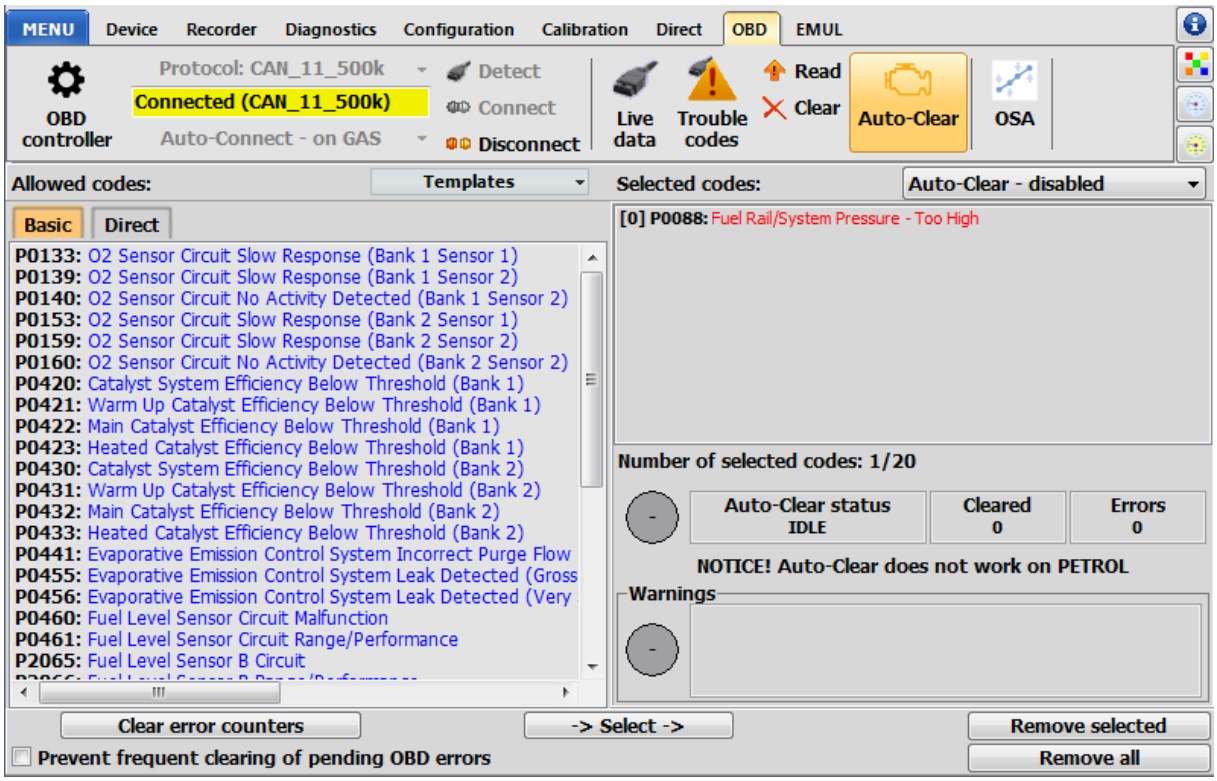


Fig. 2.128 OBD Auto-Clear window

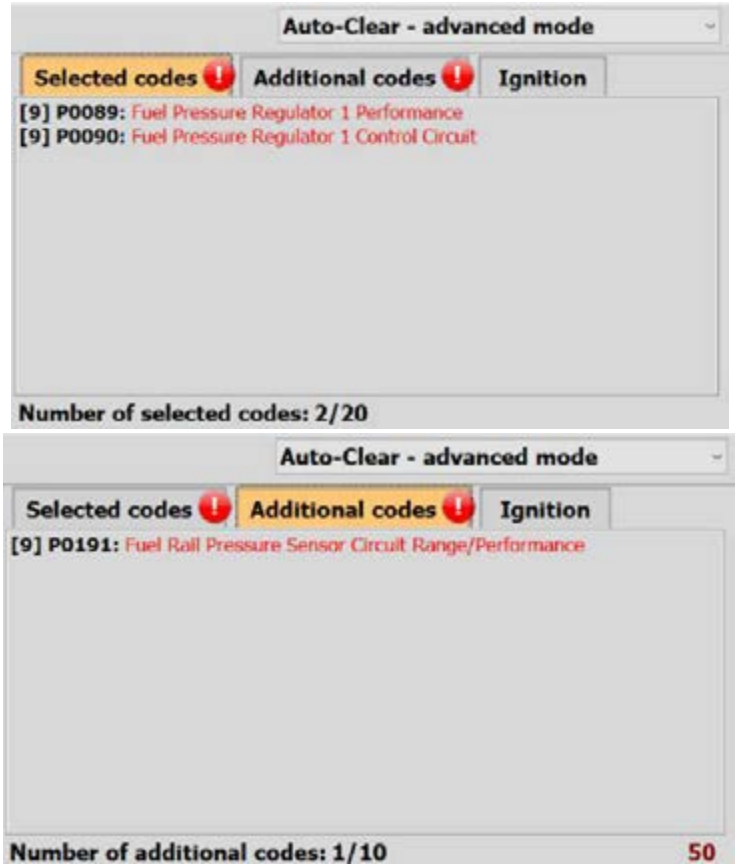


Fig. 2.129 additional error code (not selected by the user) deleted in the advanced mode

The "**Selected codes**" tab contains codes selected by the user, while "**Additional codes**" contains codes not selected by the user, which were deleted automatically in the advanced mode.

The Ignition" tab, from the firmware version 5.1B r2 (DIRECT) /5.2B r2 (MAX), an additional ignition reset option is available. This mechanism consists in sending the OBD error clearing code once to the petrol controller, each time the controller detects ignition and there are no errors in the OBD. This option is useful e.g. in 1.2 / 1.6 TCe engines of the "**RENAULT / NISSAN / DACIA**" group, which sometimes enter emergency mode, but OBD do not report any errors.

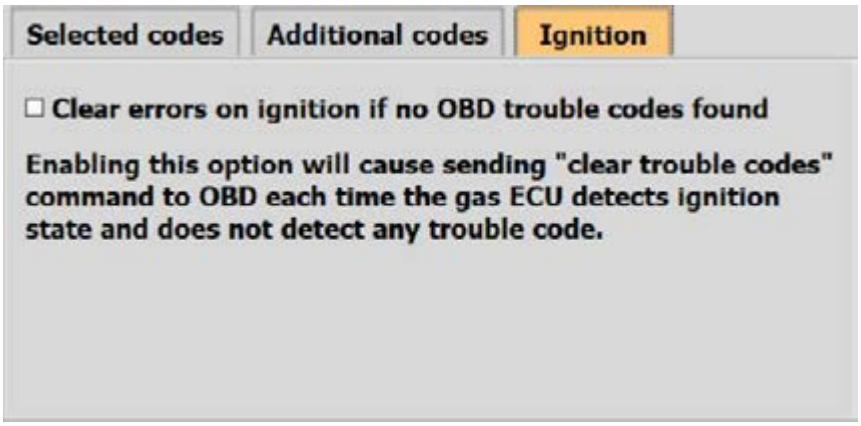


Fig. 2.130 additional mechanism of auto-clear on ignition

In the bottom left corner of the page there is the option "**Prevent frequent deletion of pending OBD errors**". It is used to limit the reset of pending errors, if such deletion would take place too often on a running engine and the error does not occur on the board (e.g. error of the LOW pressure sensor in VAG DUAL cars with ECN emulation).

Below the list of selected errors additional information are available:

- **Auto-Clear status** – information about actual state (e.g. deleting, reading, waiting).
- **Cleared** – number of successfully performed error clearing operations.
- **Errors** – the number of errors that occurred during the Auto-Clear tool operation.
- **Warnings** – additional information for the program user (e.g. notification of other errors than those selected on the list).

To start the mechanism, select the item "Auto-Clear - enabled". By activating the Auto-Clear tool, the gas controller will automatically connect to the OBD system while working on gas and delete errors if errors appear on the list.

In basic mode if in the petrol controller, apart from the errors selected , other errors appear, the errors will not be erased. In this situation, errors can be only deleted manually.

The automatic error clearing mechanism will work only when the engine is running on gas mode. In the state of petrol, Auto-Clear tool does not work.

Pressing the button in the bottom left corner "**Clear error counters**" will delete the following information:

- Number of occurrences of errors
- Number of successful procedure of delating
- Number of errors during the work of Auto-Clear tool
- Additional error codes detected in advanced mode

At the top of the page is the "**Templates**" button (**Fig. 2.131**). There are predefined sets of validator error codes that appear in specific groups of cars.

Fig. 2.131 menu with Auto-clean templates

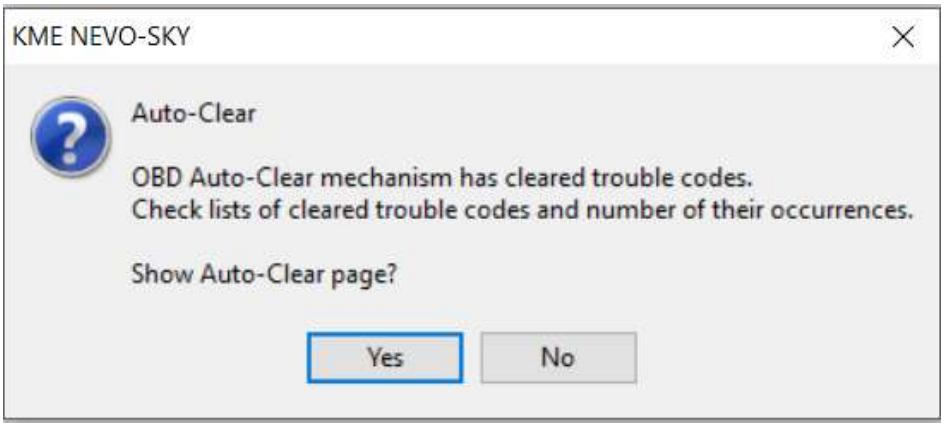


Fig. 2.132 information about deleted errors

After connecting with the gas controller, in which the Auto-clear mechanism has cleared errors, a message will be displayed to notify about the occurrence of such a situation and enable quick switching to the Auto-Clear page.

2.11.5 OSA adaptation (OBD System Adaptation) [Shift+F4]

Description of the functions available in the OSA window:

- ***OBD corrections type*** – a doubled option from the OBD controller page.
- ***Enable OSA*** – enabling this option activates adaptation based on OBD data. The OSA adaptation modifies the gas dose based on information retrieved from the diagnostic interface of the petrol controller. Correction of the mixture can be realized on the basis of short-term STFT and also long-term correction - LTFT. In theory, the STFT correction is responsible for temporary adjustment of the mixture, while the LTFT correction changes slowly and depends on the long-term working conditions of the engine, such as environmental conditions.
- ***Reset*** – resets the OSA corrections.
- ***Adaptation type*** – allows select the method of adaptation: based on RPM and petrol times or based on RPM only or fast STFT control or fast RTFT control.
- ***Min. RPM*** – option allows determining the minimum revolutions at which the OBD adaptation is performed. This function can be used when fuel corrections do not change at idle.

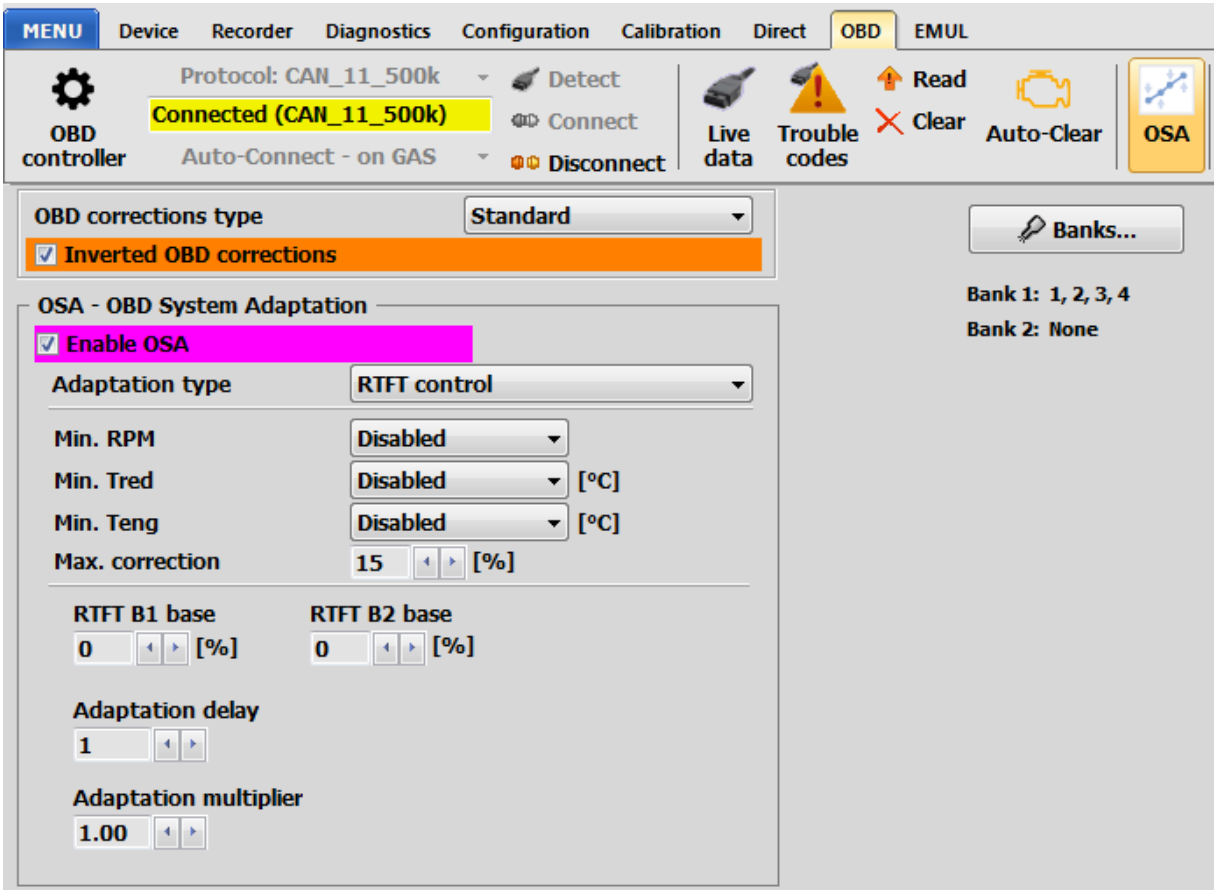


Fig. 2.133 OBD adaptation (OSA) window

- ***Min***. ***Tred*** – option allows to specify the minimum reducer temperature above which the adaptation can be performed. The function can be useful when fuel trims do not change at work on a cold engine.
- ***Min***. ***Tsiln.*** – the option allows determining the minimum engine temperature (read from OBD) above which the adaptation works. This function can be used when the fuel correctors do not change when working on a cold engine or when they differ significantly from those on a warm engine.
- ***Max. correction*** – is the maximal value of the correction that can be set as a result of the adaptation.
- ***Inverted OBD corrections*** – checking this option causes that the LTFT and STFT petrol correction sign are interpreted inversely than normal. Normally, the positive value of the corrector is treated as the need to increase the fuel dose (lean mixture). In the case of inverse corrections - a positive value of the corrector forces a reduction in the fuel dose, and thus introducing negative corrections in the gas controller (rich mixture). Reverse LTFT and STFT corrections are very rare in some VAG cars, e.g. VW Golf 4 1.6l 2002 (Magneti Marelli driver).

- ***STFT base*** – this is the STFT value that the OBD adaptation algorithm seeks to achieve.
- ***STFT range*** – it is the maximal difference of the read value and STFT base at which the adaptation does not yet changes corrections. For example, if STFT base is 10 and the STFT range is 5, the adaptation is active if the STFT correction from OBD is smaller than 5 or larger than 15. In that case the adaptation tries to bring the STFT in range from 5 to 15. The range is displayed with the green font.
- ***LTFT controlling*** – (recommended) the option modifies the algorithm of the adaptation to consider also the value of the long term fuel trim.
- ***LTFT base*** (***B1*** and ***B2***) – just like in the case of STFT base – LTFT base is the value that the adaptation aims to when changing gas corrections. In case of the two-bank cars, it is necessary to correctly choose cylinders that are in the second bank.
- ***LTFT range*** – just like the STFT range, the LTFT range defines the range in which adaptation by LTFT makes no more changes, as it has accomplished its aim.
- ***RTFT base*** (***B1*** and ***B2***) (only RTFT control) – just like the LTFT base - this is the RTFT value that the OBD adaptation algorithm strives to achieve. In the case of two-bank cars, for the adaptation to work correctly, it is necessary to mark which cylinders belong to which bank (the "**Banks**" button opens a special configuration window).
- ***Adaptation delay*** (only STFT / RTFT control - from version 5.1B r1 / 5.2B r1) – the mechanism allows you to determine in how many steps the adaptation should aim at the correction given by the car. This is useful in cars that very quickly change corrections from negative to positive and vice versa (e.g. Renault 1.33T 2018).
- ***Adaptation multiplier*** (only STFT / RTFT control - from version 5.1B r1 / 5.2B r1) – the option allows you to specify the factor by which the correction given by the petrol controller should be multiplied before use. This function is useful when applying a correction given by a car is insufficient or too aggressive in a given car.
- ***Banks*** – open Banks configuration window (chapter **2.7.2.1 Banks configuration**).
- ***OSA ranges…*** (indirect injection only) – (based on RPM only) modification of range values in OSA tables.

2.12 EMUL tab

The EMUL tab contains options for analog inputs and outputs, + 12V outputs and emulation channels. There are following cards on this tab:

- ***In/Out Control*** – main card displaying current values read by analogue inputs and generated on analog outputs, emulation relay status and outputs settings +12Vout

- ***Emulation 1/Emulation 2*** – configuration tabs for individual emulations for channel 1 (In1/Out1) and for channel 2 (In2/Out2).

2.12.1 In/Out Control [Shift+F5]

To analog inputs, we can connect and read voltage signals in the range of 0 - 5V. For input 5 in the range 0 - 20V. The values of analog inputs and outputs are displayed on the right side and on the sidebar panel. For each input, we can choose one of the types from the drop down list. The selected input type affects the background color of the analog value (green - lean, red - rich, gray - analog value):

- ***Analog 0 – 5 V*** (Analog 0 – 20 V only for Input 5)
- ***Lambda 0 – 1 V***
- ***Lambda 0 – 5 V***
- ***Lambda 5 – 0 V***
- ***Lambda 0,8 – 1,6 V***

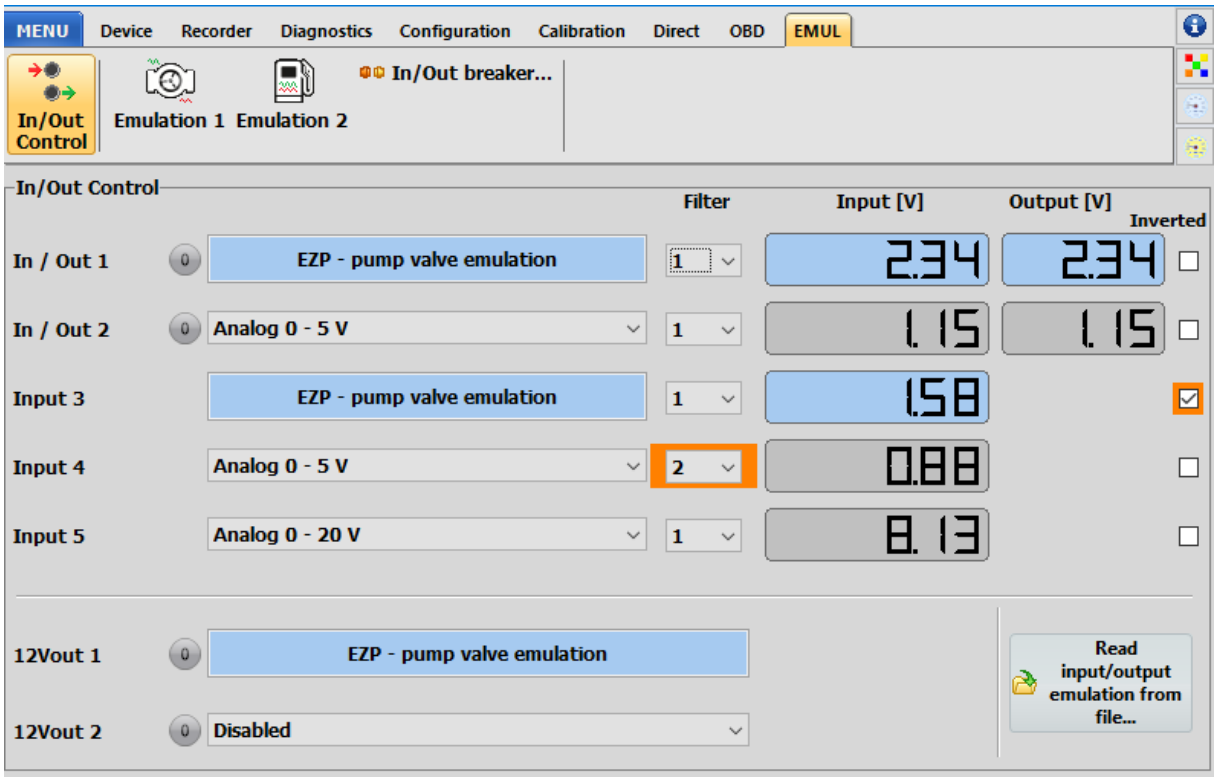


Fig. 2.134 In/Out Control window

The filter of analogue input is used to eliminate interference that may affect the instantaneous input value. A higher filter value results in less sensitivity to dynamic input changes and higher interference filtering.

For an analog inputs/outputs 1 and 2, additional indicators are displayed which define the current status of the input/output relay. Gray color with a value of 0 means shorting of the input with the output and direct transfer of voltage. The red color with the value 1 means an open relay and output voltage depending on the active emulation.

From version 5.1B r2 / 5.2B r2, a reverse interpretation mechanism of the analog input signal is available. The option is activated separately for each analog input by the field on the right side of the input and output configuration window. The mechanism should be used in cars with a reverse gasoline high pressure sensor (one that indicates a lower voltage with increasing pressure) or with EZP reverse control (the value at analog input 3 decreases with increasing load

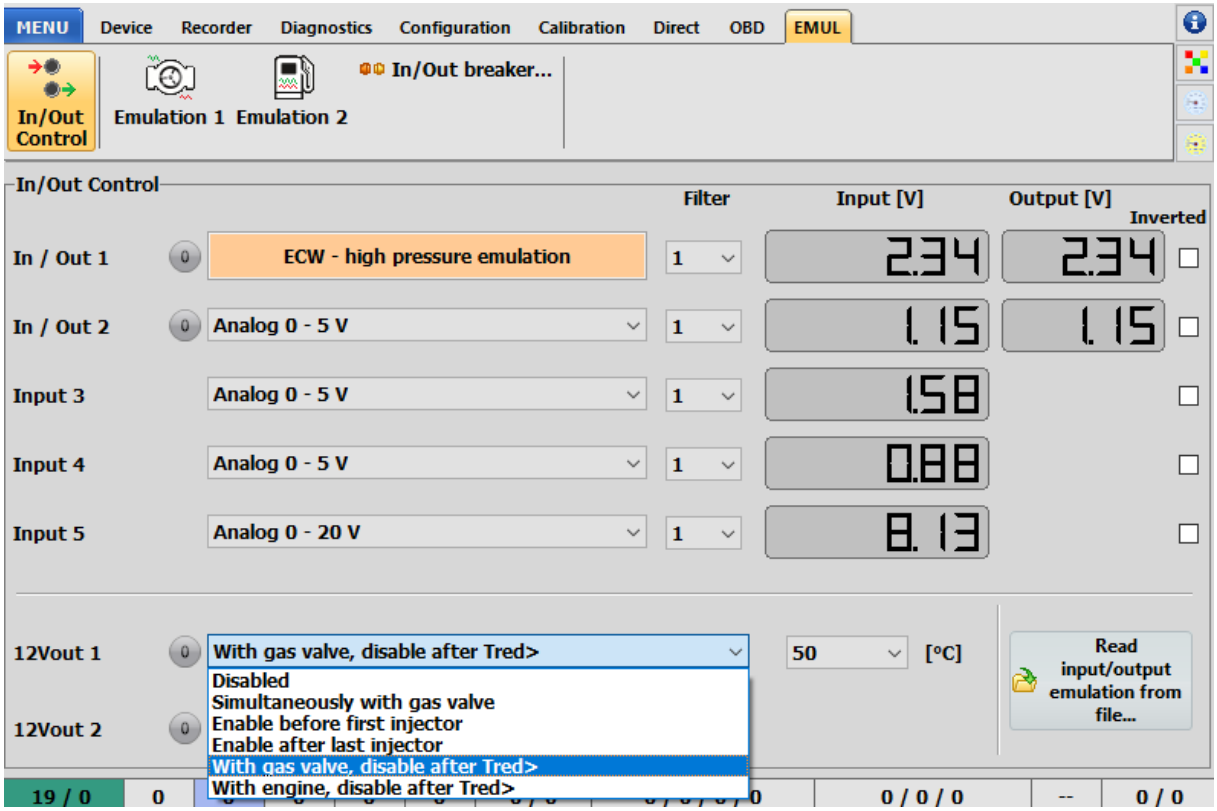


Fig. 2.135 Window with settings of analog inputs and controlled output 12Vout

The **12V outputs** are a controllable two-state outputs - the output has a voltage of 0 or 12 V (low-current max. 150-200mA). Actual outputs status is indicated by indicators analogous for In/Out 1. The output has several operating modes:

- ***Disabled*** - the output is always in the off state.
- ***Simultaneously with the gas valve*** - the output is set to high state simultaneously with the opening of the gas valve.
- ***Enable before first injector*** - output set to high state before switching the first cylinder to gas.
- ***Enable after last injector*** - output set to high after switching all cylinders to gas.
- ***With gas valve, disable after Tred >*** - the output is set to high at the same time when the gas valve, and to low when the reducer temperature is reached (e.g. for "cold VAG").
- ***With engine, turn off when Tred >*** - the output is set to high after starting the engine even when the system has not yet switched to gas, and to low when the reducer temperature is reached.

Regardless of the operating mode, the output goes low when the controller is switched over to the petrol.

The 12 V output is low-load, the suggested maximum load current is 150-200 mA. It is intended for controlling other external systems using a relay, e.g. for cutting off the petrol fuel pump when working on gas.

2.12.2 Emulation 1 [Shift+F6]

Configuration options of emulation type and parameters, for channel 1 (Input1/Output1) of the controller. The following types of emulation are available:

2.12.2.1 ELN – linear emulation (indirect only)

ELN - linear emulation – emulation only for indirect injection controllers. Linear emulation with the possibility of setting 5 emulation points. Points can be changed with the mouse, or buttons at the appropriate values.

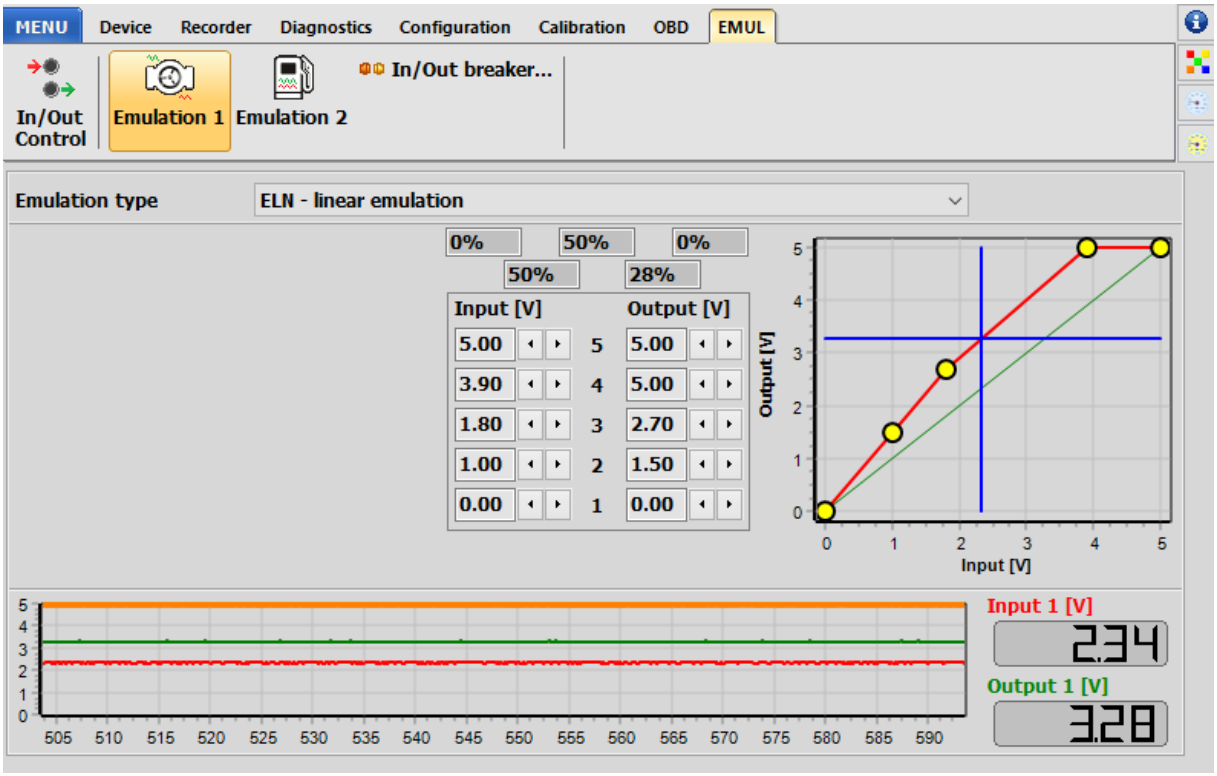


Fig. 2.136 Linear emulation settings window in the MAX controller

2.12.2.2 ECW – high pressure emulation (direct only)

ECW – high pressure emulation – emulation only for DIRECT controllers. Emulation of the fuel rail high pressure sensor. Emulations for selected engine types can be chosen from the drop-down list or manual mode is available.

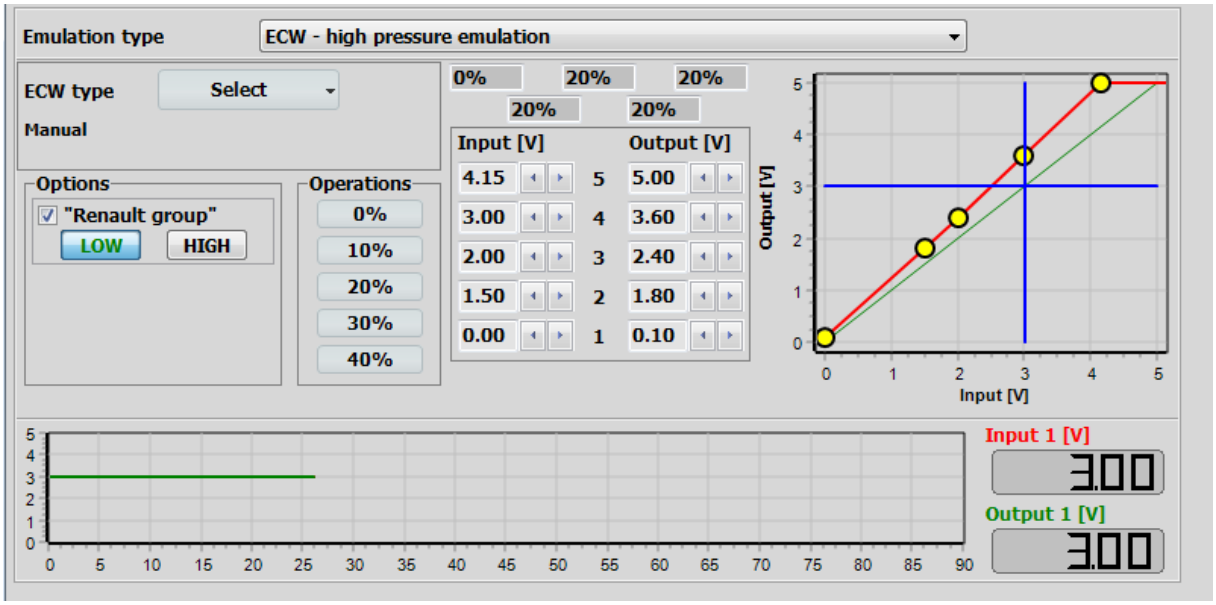


Fig. 2.137 Manual mode for ECW

Manual ECW emulation allows accurate adjustment of high pressure emulations for a specific car if none of the defined emulations work.

We make the change of ECW emulation points in the same way as for linear emulation. For ease of editing, you can use a quick emulation setting of 0, 10, 20, 30 and 40%.

For setting purposes, we recommend choosing 30% and then perform a test drive. Do not use negative emulation, that is, where the red line runs below the green.

If the car comes from the RENAULT group (RENAULT/NISSAN/DACIA), it is recommended to use the EZP emulation. In the case of using ECW emulation for these cars, select the "Renault Group" option and choose the aggressiveness of this function.

2.12.2.3 EZP – pump valve emulation (direct only)

EZP – pump valve emulation – emulation only for DIRECT controllers. The emulation uses an external EZP emulator adapted to the type of motor and connected in addition to the analogue input 3 and the output of +12V out1. Type of EZP emulation should be selected from an available list of defined engine types or using manual emulation mode.

!!! THIS EMULATION REQUIRES THE CONNECTION OF THE ADDITIONAL EXTERNAL EMULATOR !!!

!!! REMEMBER TO CHECK IF THE PETROL CONSUMPTION IS NOT TOO LOW (<0.8L / 100km) WHILE WORKING ON GAS !!!

TOO LOW PETROL CONSUMPTION CAN DAMAGE PETROL INJECTORS!!

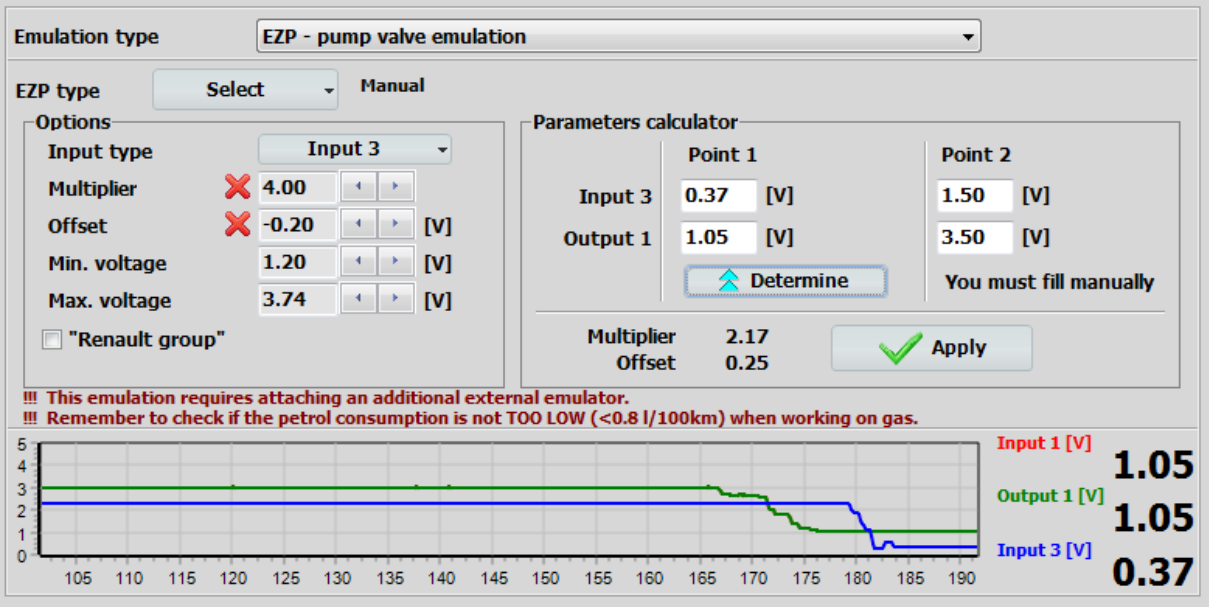


Fig. 2.138 Manual mode for EZP emulation

Perform test drive on gasoline before setting the EZP settings. Make sure to drive under three conditions:

- **Idling**
- Slow driving
- Rapid **acceleration**, from low to high RPM's, without shifting gear (e.g. at 3th gear)

The "EZP Type" tab has several settings prepared for a specific engine type and fuel pump type. To properly select the EZP type, check the value of **input 3** (InAn3) on the previously saved recorder and select the corresponding profile. If EZP emulation for a given engine is not available, but the value of input 3 matches your case, you can try to use such a model.

If none of the developed emulations match your input 3, EZP emulation must be selected manually. **WARNING!** This procedure requires experience.

The procedure for manual setting:

- Find the idle moment on the recorder and enter in the "**Point 1**" column the value of **Input 3** and **Input 1**. You can also use the **Determine** button.
- Find on the recorder the moment of the highest value of **Input 1 with the minimum value of Input 3**. Enter in the "**Point 2**" column the value of **Input 3**, and the corresponding value of **Input 1**
- Click **Apply** button
- Perform test drive and if necessary change **Multiplier** or **Offset**

If the car comes from the RENAULT group (RENAULT/NISSAN/DACIA), select the "**Renault Group**" option and choose the aggressiveness of this function.

From the firmware version 5.1B r1 in manual mode, you can choose whether emulation should take place on the basis of input 3 or on the basis of vacuum. This choice is determined by changing the "**Input type**" parameter. From version 5.1B r2 it is also possible to select “In3*MAP”.

2.12.2.4 CWO emulation – high pressure from OBD (direct only)

CWO emulation – high fuel pressure from OBD –- emulation only for Direct controllers. Pressure emulation based on high pressure read from OBD. Applied for engines with digital high pressure sensors. **In this case, it is not recommended to connect the analog input and output wires (gray-orange and gray-green) to the sensor.**

This emulation requires a connection to OBD and a reading of the fuel rail pressure (high).

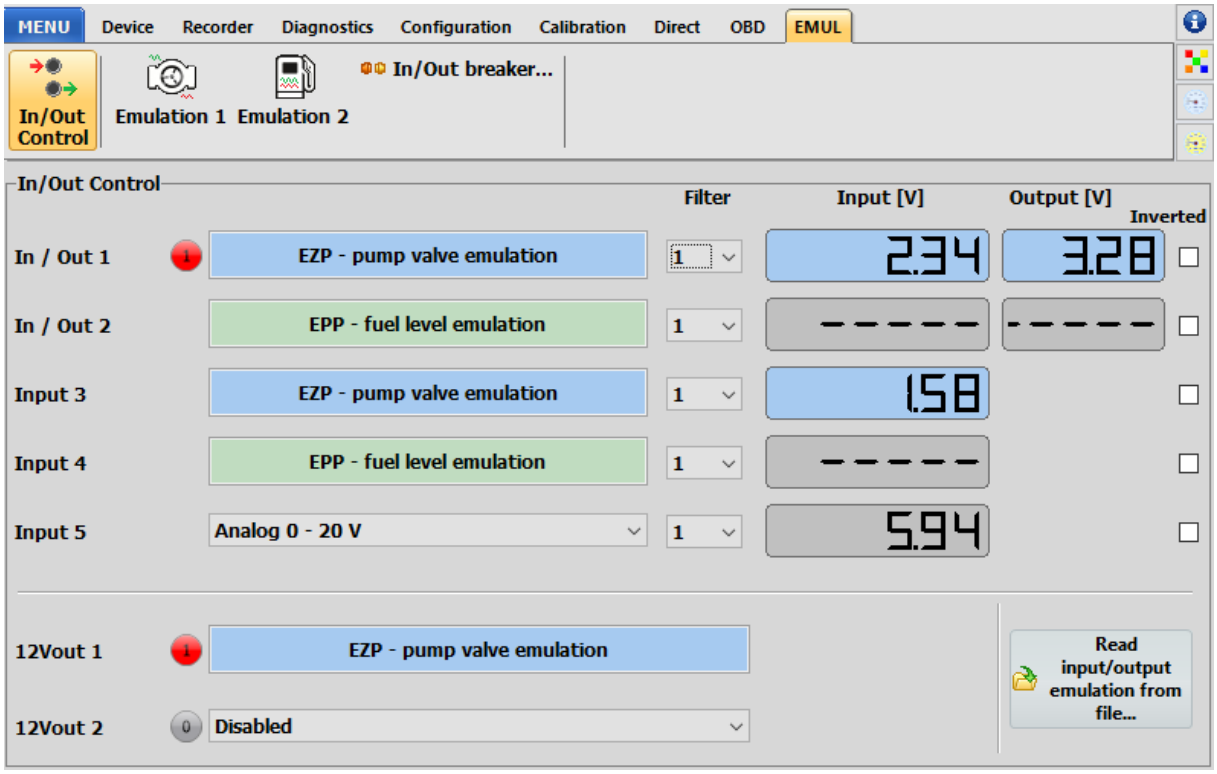


Fig. 2.139 The In/Out Control tab after enabling the EZP emulation

2.12.3 Emulation 2 [Shift+F7]

Configuration options of the emulation type and parameters, for channel 2 (Input2/Output 2) of the controller. The following types of emulation are available:

2.12.3.1 ELIN – linear emulation

ELN – linear emulation – linear emulation with the possibility of setting 5 emulation points. Points can be changed with the mouse, or buttons at the appropriate values.

2.12.3.2 EPP – fuel level emulation

EPP – fuel level emulation – this is an emulation intended for cars that calculate the actual fuel level from the time of petrol injection. After a long ride on gas the actual amount of fuel in the tank will be significantly different from the value indicated on the dashboard. Emulation for proper operation requires correct connection of the +12V after ignition. There are 4 types of fuel level emulations to choose from:

- **Universal**
- **HONDA (v3.0)** – corresponds to an external EPP2-Honda emulator
- **HONDA (v3.1)**
- **PSA, LEXUS (v3.0)** – corresponds to an external EPP2-PSA emulator
- **PSA, LEXUS (v3.1)**

2.12.3.3 ECN – low pressure emulation (direct only)

***ECN* – low pressure emulation** – only for VAG DUAL. Low pressure emulation is used in vehicles with a dual injection system (indirect + direct) from the VAG group. Those cars often at idle only work on with the indirect system, and with higher load switch to the direct system. This emulation causes disconnection of the intermediate system and operation on the direct system in the whole load range. In order to be able to collect a petrol map for small loads, it may be necessary to select the option "Force emulation on petrol". Selecting this option will activate ECN emulation on petrol, but **only if the PC software is connected to the gas controller.**

2.12.4 In/Out breaker

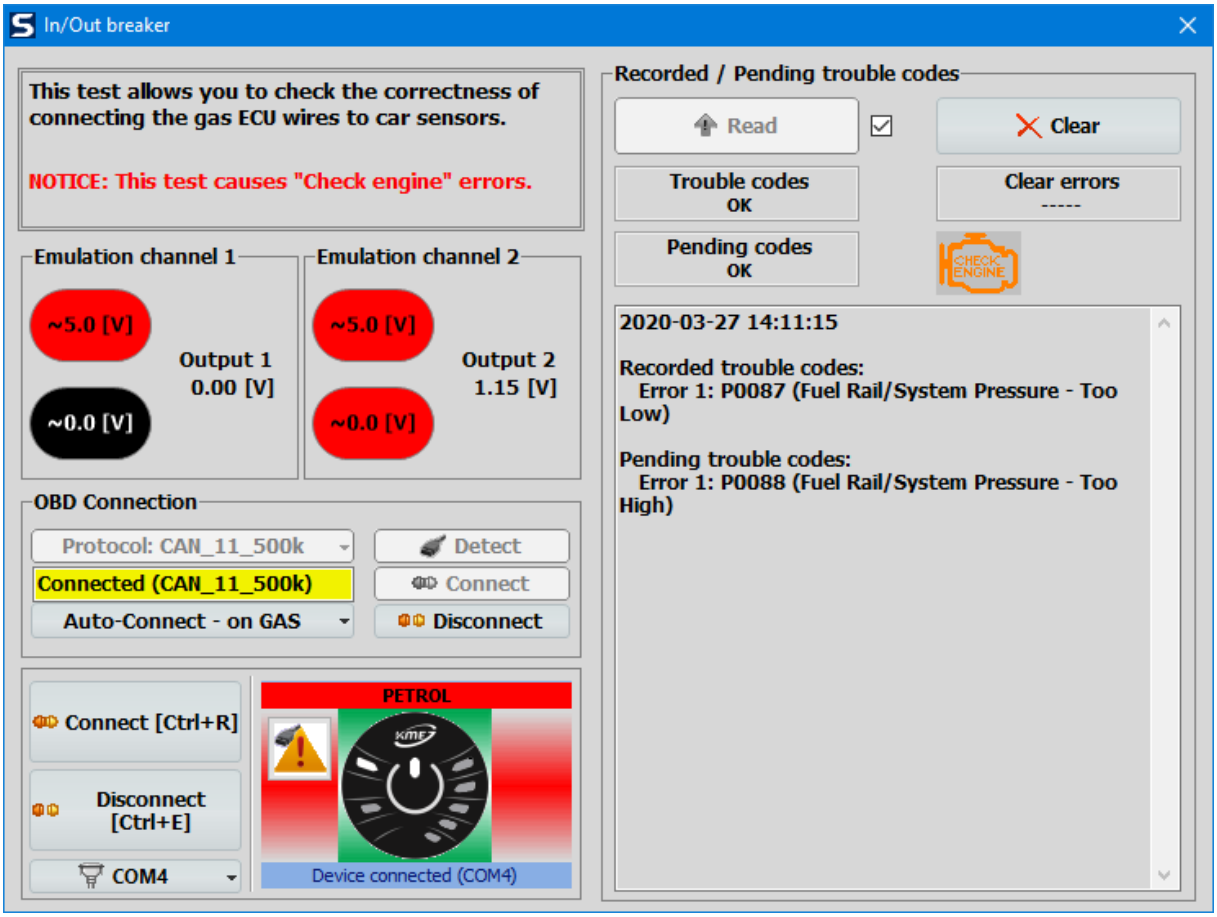


Fig. 2.140 In/Out breaker

In/Out breaker is a tool that allows checking the correctness of connecting emulation channels. Sometimes, during assembly, the mistake may occur and wrong signal wire is cut. This situation most often happens in direct injection cars and high fuel pressure sensor.

!!! REQUIRED WORKING ON IGNITION OR PETROL !!!

This mechanism allows forcing high or low voltage value on the emulation channel. Setting those states should lead to showing trouble codes in OBD system related to the circuit of the appropriate sensor. This mechanism allows forcing high or low voltage signal on emulation channel. Setting those states should lead to showing trouble codes in OBD system related to the circuit of the appropriate sensor. If another sensor error occurs instead (e.g. a high pressure sensor was to be connected, and there are errors related to the low pressure sensor / fuel pump / boost pressure / temperature sensor circuit), it means that the wrong cable has been cut and the assembly needs to be corrected.

!!! CAUTION !!!

Performing this diagnostic when engine is working may lead to shutting down the engine.

2.13 Live readings windows

These are additional windows in which all the most important operating parameters of the gas system are presented in a very clear manner. The Readings window is designed to facilitate reading parameters from a greater distance. There are two reading windows available:

- ***Big readings*** (**Fig. 2.141**) – contains from 4 to 24 selected parameters, you can call them by clicking on the blue clock icon located on the right side of the ribbon or by pressing the keyboard shortcut Ctrl+F4.
- ***Small readings*** (**Fig. 2.142**) – a window containing 5 selected parameters, triggered by the keyboard shortcut Ctrl+F3 or by clicking on the yellow clock icon located on the right side of the ribbon.

By clicking on the parameter name in the readings window, a drop-down list will appear displaying the available parameters to displaying, the option to restore the default appearance of the read window and selecting the appearance of the current parameter value. In the large readings window it is also possible to select a parameter layout with the choice of the number of columns and rows of visible parameters.

Fig. 2.141 Big readings window

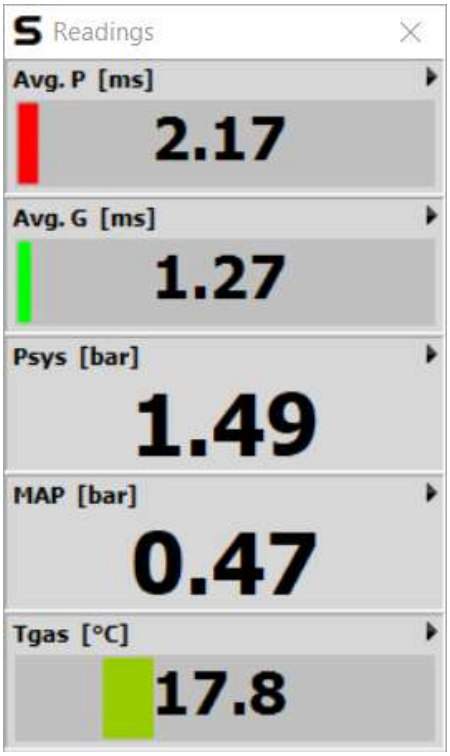


Fig. 2.142 Small readings window

3 Keyboard shortcuts

3.1 Switching between pages \ program tabs

- ***F1*** **–** Device\Status
- ***Ctrl+F1*** **–** Device\Update firmware
- ***F2*** **–** Diagnostics\Diagnostic errors
- ***F3*** **–** Diagnostics \Installation tests
- ***F4*** **–** Diagnostics \Injectors test
- ***F5*** **–** Diagnostics \Workshop info
- ***F6*** **–** Calibration\Auto-Setup
- ***F7*** **–** Configuration\Basic
- ***Ctrl+F7*** **–** Configuration \Driver's panel
- ***F8*** **–** Configuration \Advanced
- ***Ctrl+F8*** **–** Configuration \Switching
- ***F9*** **–** Calibration \Model
- ***F10*** **–** Calibration \Map
- ***F11*** **–** Calibration \Correction maps
- ***F12*** **–** Calibration \Linear corrections
- ***Shift+F9*** **–***Direct*\Strategies for DIRECT controller
- ***Shift+F10*** **–***Direct*\Petrol injectors emulation for DIRECT controller
- ***Shift+F11*** **–** *Direct**Parameters* – advances configuration for DIRECT controller
- ***Shift+F12*** **–** *Direct*\Oscilloscope
- ***Shift+F1*** **–** OBD\Live data
- ***Shift+F2*** **–** OBD\Trouble codes
- ***Shift+F3*** **–** OBD\Auto-Clear
- ***Shift+F4*** **–** OBD\OSA – OBD System Adaptation
- ***Shift+F5*** **–** EMUL\In\Out Control
- ***Shift+F6*** **–** EMUL\Emulation 1
- ***Shift+F7*** **–** EMUL\Emulation 2

3.2 Opening windows

- ***Ctrl+F2*** **–** Action settings for error codes
- ***Ctrl+F3*** **–** Small readings window
- ***Ctrl+F4*** **–** Big readings window
- ***Ctrl+F5*** **–** Banks configuration
- ***Ctrl+F6*** **–** Cylinders breaker
- ***Ctrl+F*** **–** *Searching window*

3.3 Recorder tool handling

- ***Shift+Ctrl+S*** – Save the recorder's buffer to a file
- ***Shift+Ctrl+O*** – Load the recorder's buffer from the file
- ***Shift+Ctrl+D*** – Clear the recorder buffer
- ***Shift+Alt+(Left/Right)*** – Scroll the recorder one sample to the left/right
- ***Space*** – Add marker
- ***Alt+(Left/Right)*** – Scrolls the recorder between markers left/right
- ***Alt+M*** – Delete all markers
- ***Shift+Ctrl+X*** – Zoom in of the recorder (horizontally)
- ***Shift+Ctrl+Z*** – Zoom out of the recorder (horizontally)
- ***Ctrl+F10*** – Small recorder window

3.4 Operations on the ECU

- ` – Petrol / gas switching (with delays)
- ***Ctrl+`*** – Immediate petrol / gas switching
- ***Alt+F9*** – Set MODEL

3.5 Other

- ***Ctrl+R*** – Connect to the controller
- ***Ctrl+E*** – Disconnect from the controller
- ***Ctrl+S*** – Save the settings to a file
- ***Ctrl+O*** – Load settings from a file
- ***Ctrl+D*** – Factory settings
- ***Ctrl+F11*** – Full-screen mode

4 Lists

4.1 Figures

4.2 Tables