



Connection and programming manual for

STAG 200 GoFast Controller



67R-01 7009
110R-00 7010



10R-05 8772
67R-03 7009
110R-04 7010 "M"

ver. 1.8

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1. Set-up

1.1. STAG 200 GoFast connection diagram

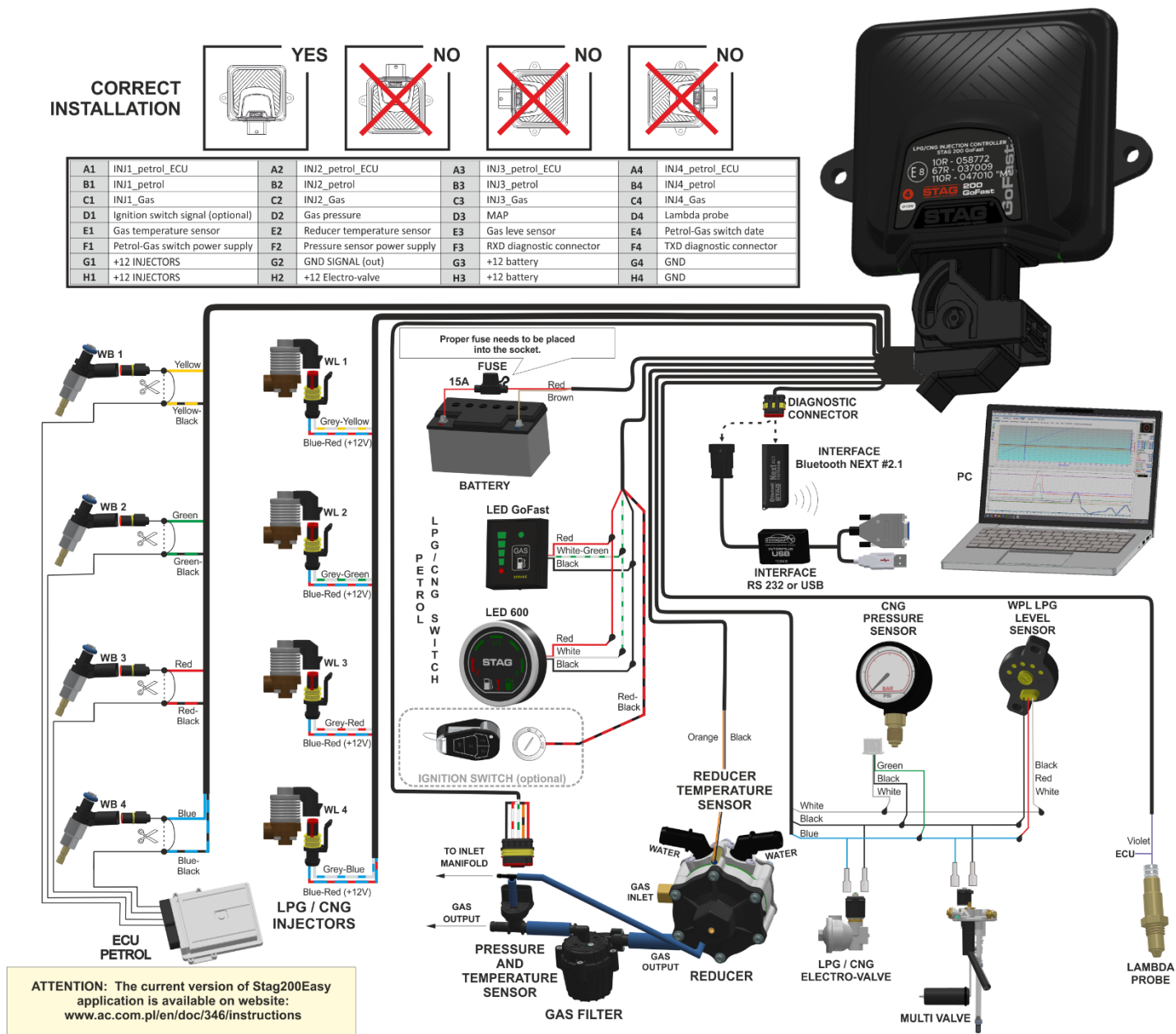


Fig. 1. STAG 200 GoFast connection to vehicle installation.

1.2. STAG 200 GoFast (version 3) connection diagram

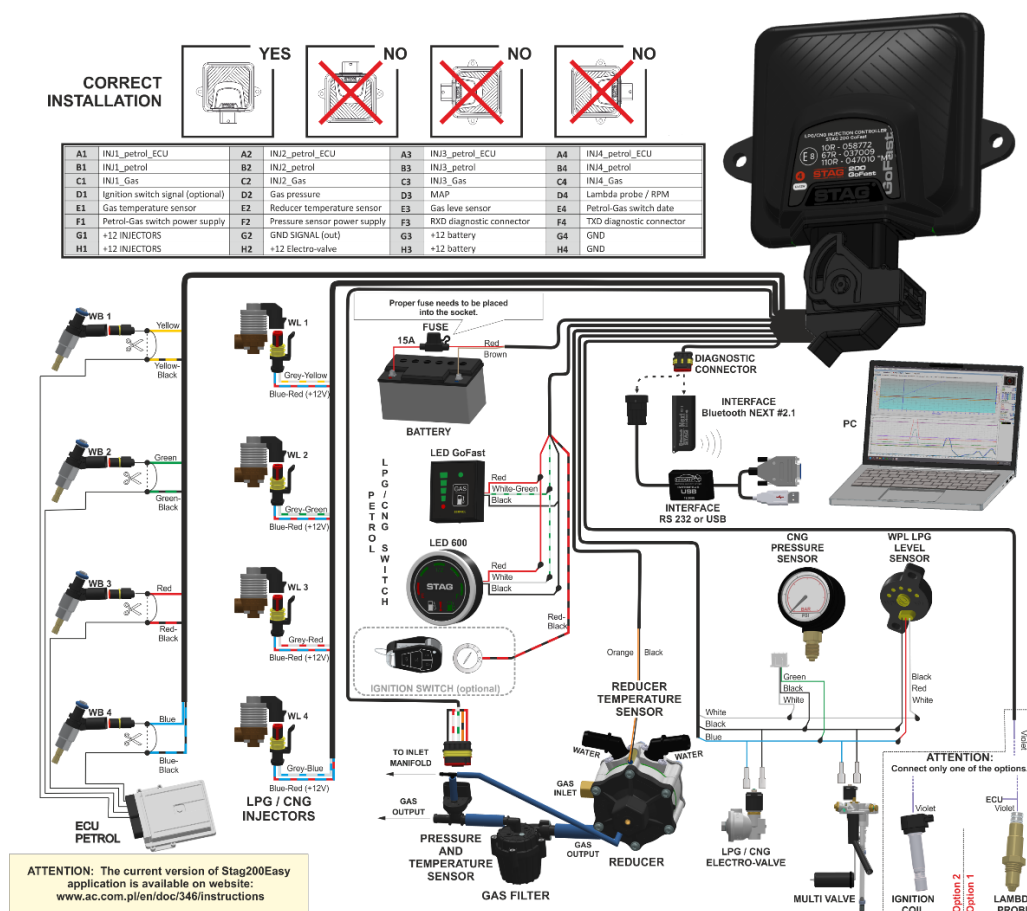


Fig. 1a. STAG 200 GoFast (version 3) connection to vehicle installation.

1.3. Selection of injector nozzles

Selection of proper injector nozzles largely depends on engine power rating. The table below presents nozzle diameter sizes depending on power per cylinder. In order to calculate the diameter of nozzles for a given engine, divide vehicle horsepower by the number of cylinders.

Nozzle diameter [mm] Pressure of reducer 1 [bar]	Power of cylinder 1 [hp]
1,7 - 1,8	11 - 16
1,9 - 2,2	17 - 28
2,3 - 2,5	29 - 34
2,6 - 2,8	35 - 40
2,9 - 3,0	41 - 48
3,1 - 3,2	49 - 55

Please note that the values provided in the table are used as a guideline only and may not always match the actual value.

2. Description of Stag 200 Easy diagnostic software

2.1. Start-up

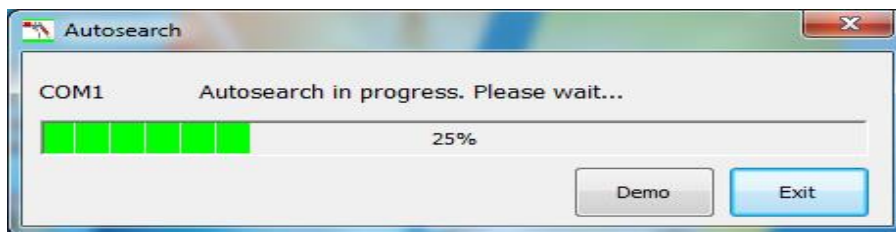


Fig. 2. "Automatic searching" window.

Auto-searching is initiated upon software start. If the controller is connected to the computer, the software establishes communication and starts the application automatically. For manual connection, press "Exit" and indicate the respective port for the application manually. Press "Demo" to test operation and functionalities of the software without controller connection. If communication with the controller is lost due to the disconnection of USB cable, it will be restored after reconnection.

In order to connect the application to the controller, use an USB RS232 interface cable or a Bluetooth adapter in the new version identified with an "arrow" symbol .

2.2. Demo mode

Press Demo in the auto-search window. The mode allows operating the software, as if the gas controller was connected. It is used to view the offered software functions. By default, the oscilloscope file with the multiplier is loaded.

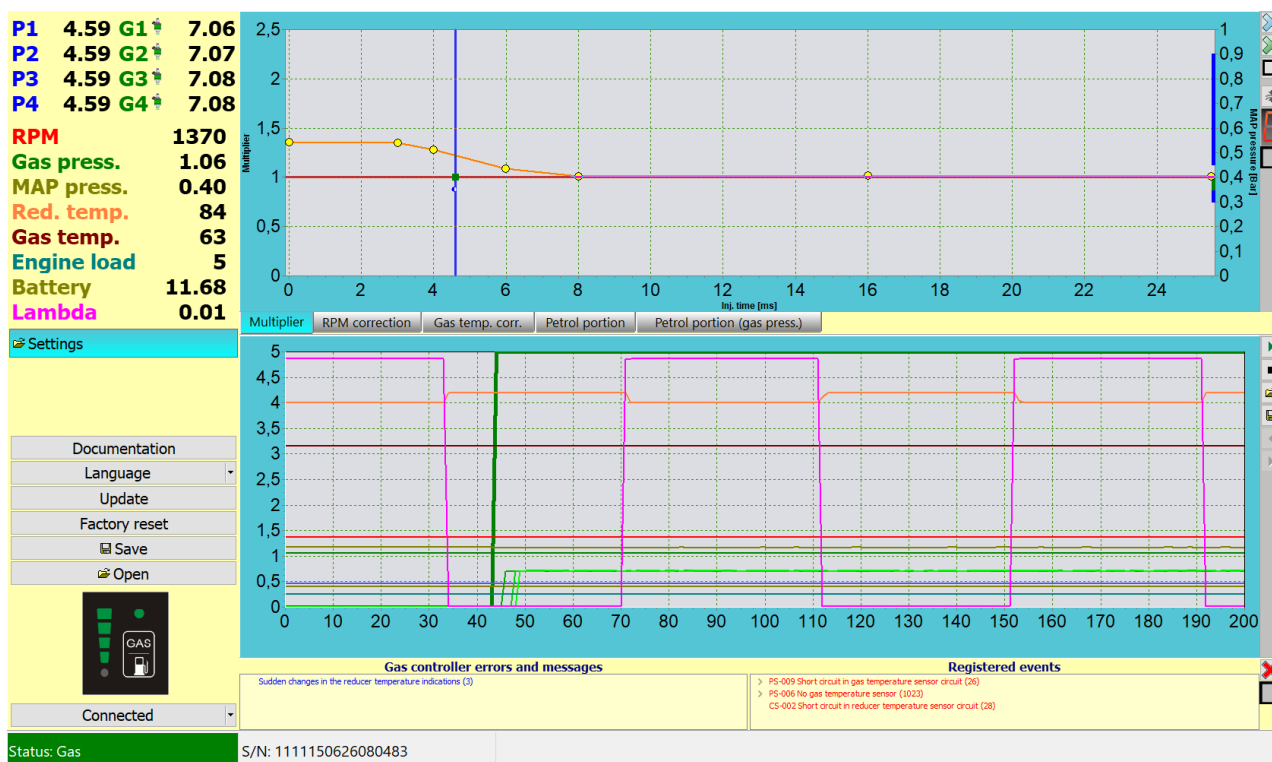


Fig. 3. Main window.

2.2.1. Signal monitoring window

P1	4.28	G1	5.55
P2	4.29	G2	5.55
P3	4.29	G3	5.54
P4	4.29	G4	5.57
RPM	1251		
Gas press.	1.05		
MAP press.	0.35		
Red. temp.	62		
Gas temp.	55		
Engine load	4		
Battery	14.98		
Lambda	4.96		

Fig. 4. Signal monitoring window.

The monitor presents signals read by the controller:

- **P1-P4** – petrol injection time [ms]
- **G1-G4** – gas injection time [ms]
- **RPM** – engine speed (calculated based on petrol injector pulses) [rpm]
- **MAP press.** – pressure in the intake manifold [Bar]
- **Gas press.** – gas pressure between the reducer and gas injectors [Bar], this is a differential pressure between the reducer outlet pressure and the intake manifold pressure
- **Red. temp.** – reducer temperature [°C]
- **Gas. temp.** – gas temperature downstream the reducer [°C]
- **Engine load** – currently calculated engine load [%]
- **Lambda** – oxygen sensor voltage [V]

Clicking on the signal value will call up the "Quick params" window. It is used for a quick view of the parameters.

Param.	Value
RPM	1251
Gas press.	1.05
MAP press.	0.35
Red. temp.	64

Fig 4a. „QUICK Params” window.

Signal values are displayed in the oscilloscope window. Clicking the description of the selected signal deactivates presentation in the oscilloscope window. The selected parameter is grayed and crossed.

P1	2.21	G1	4.02
P2	2.22	G2	4.00
P3	2.21	G3	4.03
P4	2.22	G4	4.01

Fig. 5. Signal monitoring window section.

Selected gas injector is switched off by clicking its icon. The injector icon is grayed and a respective gas injector is switched off throughout the software run. Upon gas injector switching off, a respective petrol injector is switched on.

G1	4.00
G2	4.01
G3	4.01
G4	4.01

Fig. 6. Signal monitoring window section.

2.2.2. Configuration and settings window

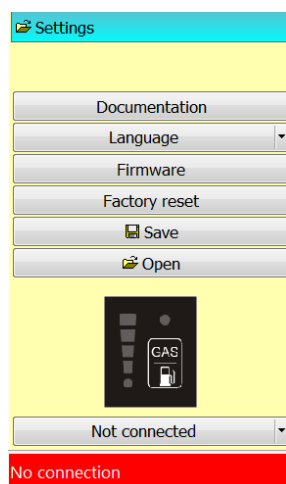


Fig. 7. Configuration and settings window.

Options available in the “Settings” window:

- **Documentation** – wiring diagram
- **Language** – selection of the application language
- **Firmware** – updating the controller and LED switch. Browse to select the firmware file and perform updating to the latest version for the controller. The same file is used to update the LED switch firmware. Select the file and press “Update”. If a new firmware version becomes available, a prompt will be displayed.

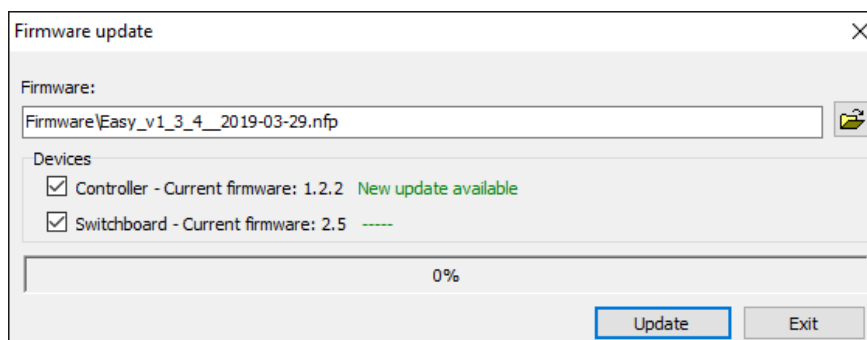


Fig. 8. Firmware update window.

- **Factory reset** – restoring controller factory settings.
- **Save** – saving controller settings on the disc; enter the name and save the file in a selected folder.
- **Open** – loading previously saved controller configuration settings.
- **LED switch** – the switch in the application works like the physical switch in the driver’s cabin. Clicking the button results in gas/petrol switching. Fuelling mode and gas level displays are provided. Modules with a rating of 10/A0 and higher allow you to choose between the LED-GoFast or LED-600 control unit. Modules with a lower rating only work with the LED-GoFast control unit.

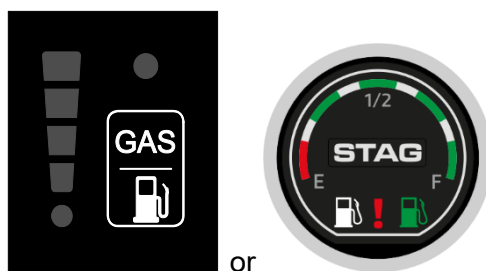


Fig. 9. LED switch.

- – displaying the list of computer COM ports used for controller communication; select the required port.
- No connection – displaying the controller status (no connection, connected, waiting for gas or failure).

2.2.3. Oscilloscope

The oscilloscope allows the user to monitor the signals in real time and to load previously saved oscilloscope files.

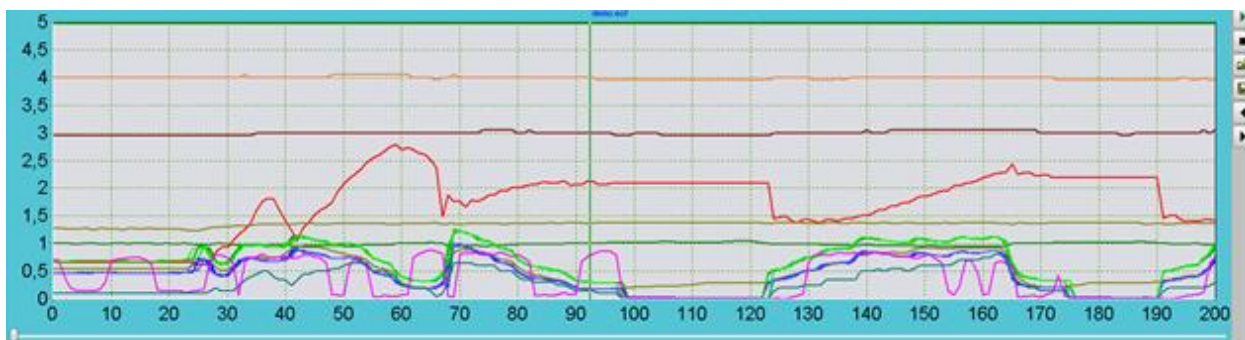


Fig. 10. Oscilloscope window.

- - erasing displayed curve data and restarting oscilloscope recording
- - stop, stops the oscilloscope recording
- - loading an oscilloscope file for review
- - saving an oscilloscope file on the computer disc
- - increasing/decreasing the oscilloscope scale

2.2.4. Multiplier map, rpm and correction of gas temperature

- Multiplier** – a window with the multiplier map for correct setting of gas dosing (orange curve). Yellow dots represent calibration points; select a point to define its value by using keyboard up/down arrow buttons. The horizontal axis represents petrol injection time and the vertical one on the left stands for the multiplier value. The right vertical axis indicates MAP pressure in the intake manifold. The blue curve represents the petrol map vs. MAP. The green curve represents the petrol map acquired when operating on gas vs. MAP. Individual point in the area of petrol maps (blue and green) represent locations, in which petrol injection pulses were acquired and based on which the controller makes displayed maps.

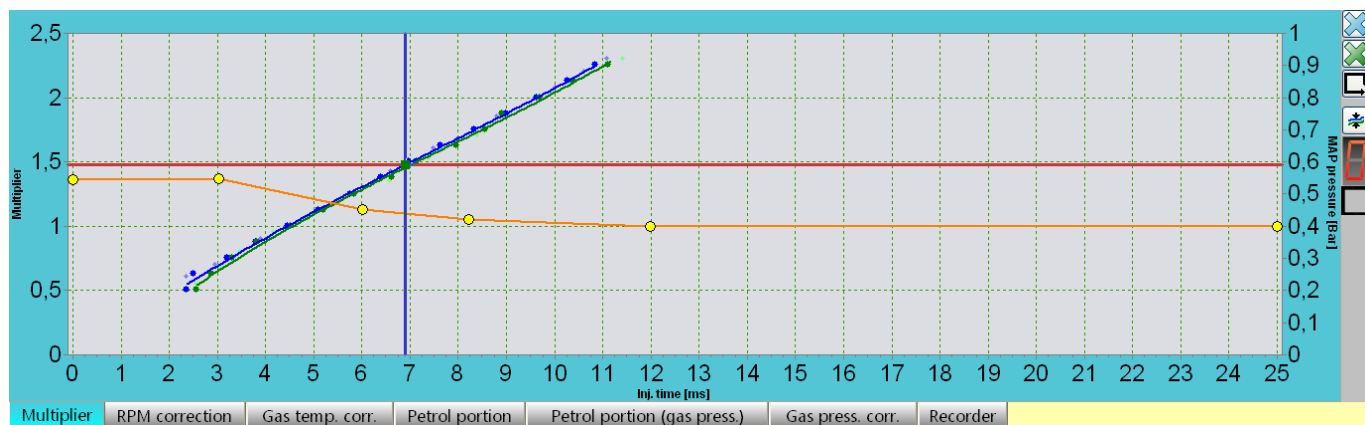


Fig. 11. Multiplier map window.

- RPM correction** – Rpm correction allows the correction as a function of rpm to be made by marking any area or point on the map and entering the required correction value. After selecting an area and pressing the “Enter” key, the target value should be entered. The target value can be also changed by using the arrow keys with the “Ctrl” key depressed (with steps of 1). When holding down the “Shift” key while using the arrow keys, changes are made in steps of 10. The values on vertical and horizontal axes can be edited by clicking on the selected value and entering a new value. The number of columns and rows can be deleted. To do this move the cursor to the selected map cell and delete a row (“Shift+Del”) or a column (“Left Alt+Del”). A row or column may be reinserted with the mouse right button by clicking on the selected location in a row or column. By clicking inside a map area both a row and a column are added simultaneously. The button on the right side of the map  is used to delete the corrections entered. The button  beneath serves to trace the cursor moving across the map. The button  below allows the user to configure the map based on the needs by specifying the target number of columns, maximum injection time and step. If petrol portion was set then this area is blue hatched additional.

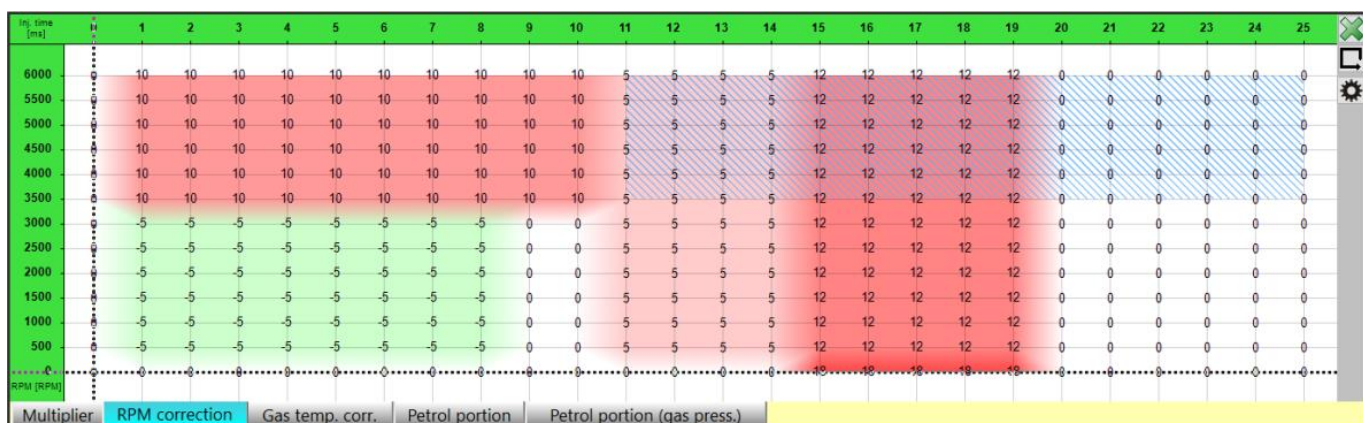


Fig. 12. RPM correction window.

- Gas temperature correction** – enables the required correction depending on gas temperature (horizontal axis) to be entered. The correction is made by setting the height of a selected point (yellow point). The button on the right side of the map allows the entered corrections to be deleted.

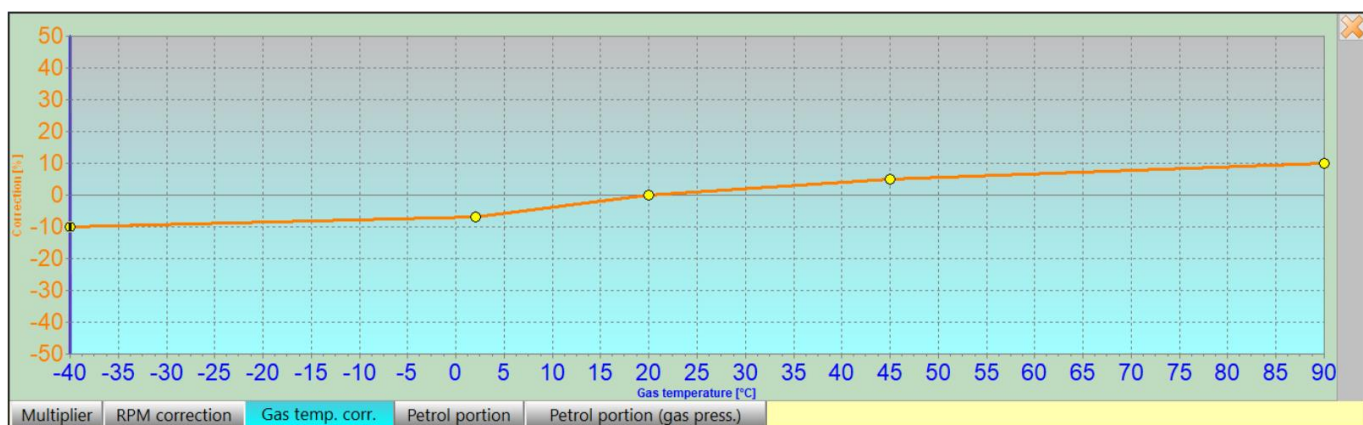


Fig. 13. Gas temperature correction window.

- Petrol portion** – "Petrol portion" tab - is possible to configure petrol injection time with simultaneous control of gas injectors. The petrol injection configuration is available on a 2D(two-dimensional) map, whose axes are engine RPM and petrol injection time. Analogous to the RPM correction maps, cursor direction of the engine operating point. Navigation on the map use gasoline perform in the same way as in the RPM correction map. Using the cursor keys (←, ↑, →, ↓), SHIFT and CTRL you can pick selected map fields and set the value. The map values determine the percentage of gasoline consumed when running on gas at a given area. The actual petrol injection time contains the values on the map of references to the petrol injection time at a given area. For example, 20% for a 20ms column means 4ms petrol injection time, 15% for a 20ms column means 3ms petrol injection time.

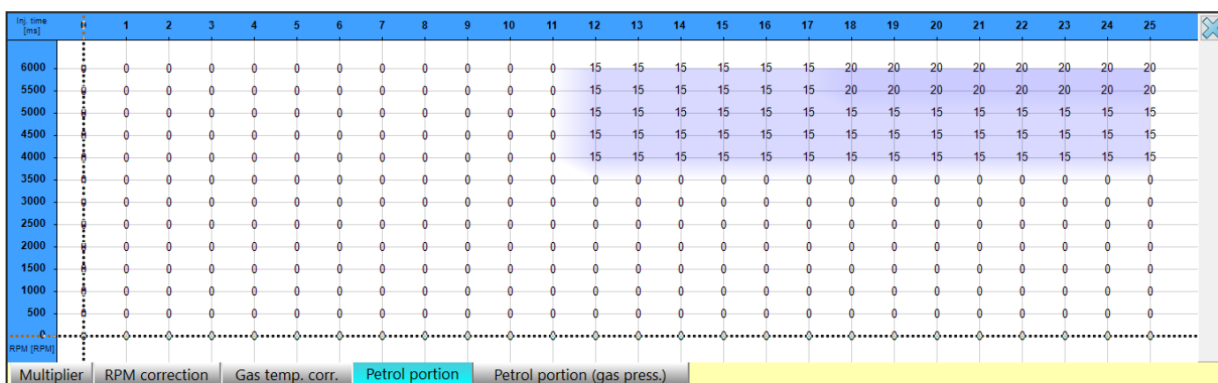


Fig. 14. Petrol portion window.

- **“Petrol portion (gas pressure)”** - 2D (two-dimensional) map that includes petrol portion based on a gas pressure. Gasoline maps based on a gas pressure is analogous to the multiplier map.

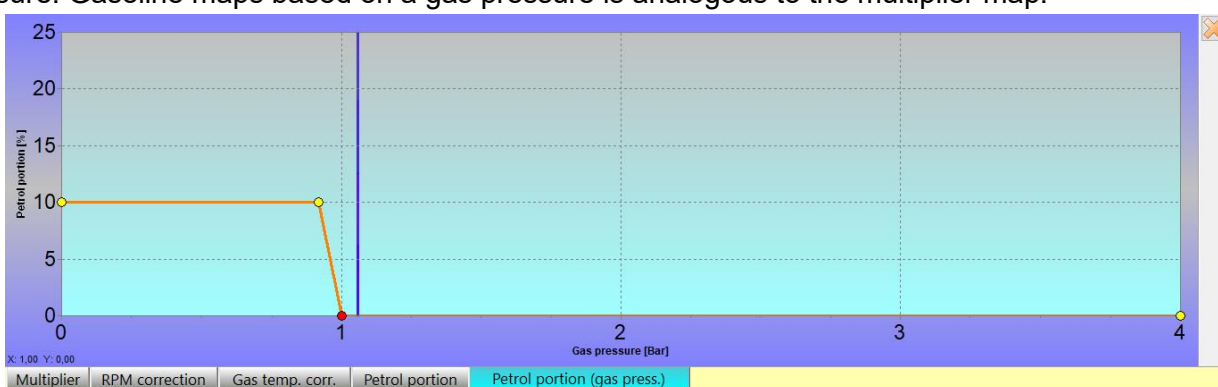


Fig. 15. Petrol portion (gas pressure) window.

2.2.5. Errors and alarm messages of the gas controller

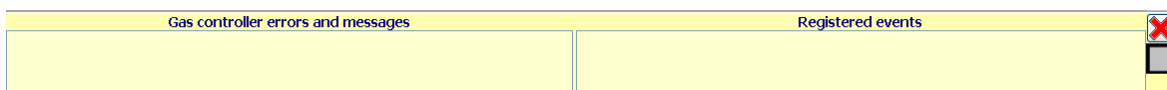


Fig. 16. Controller errors and alarm messages window.

The window shows current errors and messages reported by the controller. The errors are cleared with . If an error occurs, a "frozen frame" will be memorized, i.e. condition of error occurrence. In order to read the "frozen frame", expand the error description.

The table below contains a list of possible errors.

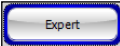
Error name	Description of remedy actions and error clearing
Setting error, check settings	Update the controller firmware to the latest version. If problem persists, restore default settings and configure the controller once again.
The controller has been restarted.	The battery or controller fuse was disconnected. If this error occurs frequently, check electrical connections at the battery.
Connection to the control unit has failed.	No power supply to the control unit or no connection to the controller. Check control unit connections in the driver's cab.
Communication with the control unit has been lost	Check connections at the control unit in the driver's cab.
Reducer temperature sensor missing	Reducer temperature sensor circuit is broken or sensor failed.
Gas temperature sensor missing	Gas temperature sensor circuit is broken or sensor failed.

	Check sensor connections (PS02 sensor connector).
Short circuit in reducer temperature sensor circuit	Wire insulation fault or sensor failure. Check wire harness.
Short circuit in gas temperature sensor circuit	Wire insulation fault or sensor failure. Check wire harness.
Low gas pressure	Gas pressure drop below the declared value. Gas high pressure hose bended, reducer failure, improper reducer, low gas level, pressure sensor failure, failure of one of gas cut-off solenoid valve coils or no coil connection.
High gas pressure	Reducer failure, pressure sensor failure.
Gas injector failure 1/2/3/4	Gas injector coil failure, short circuit in injector wire harness.
Gas injector missing 1/2/3/4	Injector circuit broken. Check electrical connections. Gas injector coil failure.
Peripherals power supply circuit failure	Power supply failure for the following components: control unit, PS02 sensor. Check wire harness.
Injector power supply circuit failure	Check gas injector wire harness.
Solenoid valve power supply circuit failure	Short circuit in solenoid valve power supply or gas cut-off solenoid valve coil failure. Check the cable installed under the vehicle floor between the rear solenoid valve to the solenoid valve under the hood. Check solenoid valve coils.
Solenoid valve missing	Solenoid valve power supply circuit broken or solenoid valve coil failure.
Low voltage at the power supply	Check the battery.
High voltage at the power supply	Check the battery charging system.

2.2.6. Settings

Fig. 17. Basic settings of the gas controller.

Description of functions:

-  **Expert/Standard** – application viewing modes; in the “Standard” mode only basic functions and settings can be viewed and the “Expert” mode activates the full functionality of the application.

-  **gas injector type** – select the type from a dropdown list,
-  **oxygen sensor type** – select the type of voltage probe or none,
-  **reducer temperature sensor** – type of reducer temperature sensor,
-  **gas level indicator type** – select the type of gas level sensor,
-  **engine type** – standard, turbo, valvetronic (selection of “valvetronic” results in deactivation of petrol and LPG map curves in the multiplier window – no negative pressure in the intake system),
-  **fuel type** – LPG or CNG,
-  **injection control** – standard, doubling. Doubling can be used if gas injection pulses are too short to allow full opening of the injector (e.g. semi-sequential engines). Switching the option on will result in doubled gas injection time for the operation to be more stable, however, injection will occur at every second petrol injection pulse. Example: For the standard setting, gas injector opening time based on the multiplier is 1,2 ms, injection pulses are performed at every command of the petrol injector. For the double setting, injection time is extended to 2,4 ms, but injection pulses will occur at every second petrol injector pulse.
-  **number of cylinders** – the number of engine cylinders,
-  **switching to gas** – specify condition for switching to gas: rpm, reducer temperature, cylinder switching (time between switching of gas injectors), reducer filling delay (time between solenoid valve opening and the first gas injection pulse), switching time (time elapsed from turning on the ignition to switch over to gas even if the other switching conditions are satisfied).
-  **switching to petrol** – switching to petrol occurs if one of the conditions is fulfilled: minimum gas temperature, minimum rpm, maximum rpm, minimum gas pressure, maximum engine load.
- **Autocalibration** – Press “Autocalibration” to display the automatic calibration window.

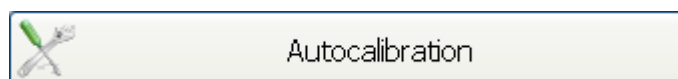


Fig. 18. Autocalibration button.

• Car and system info

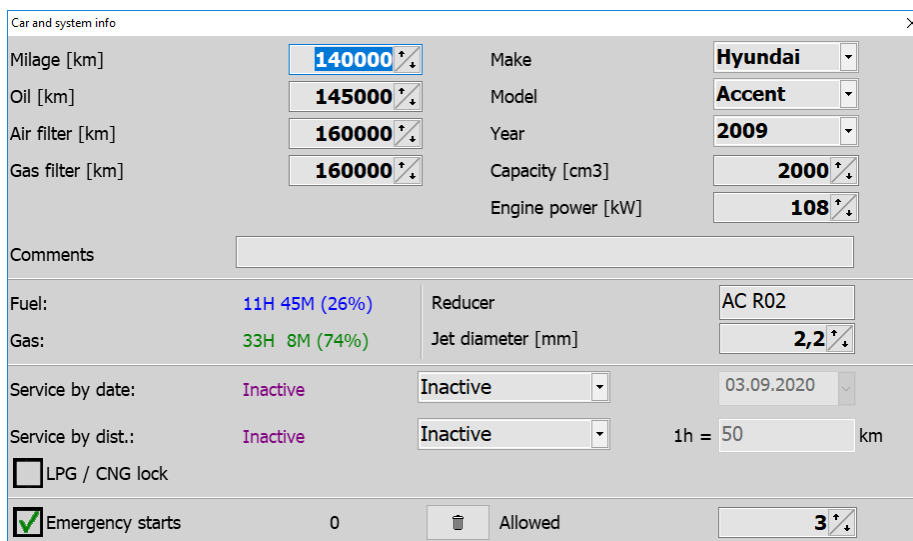


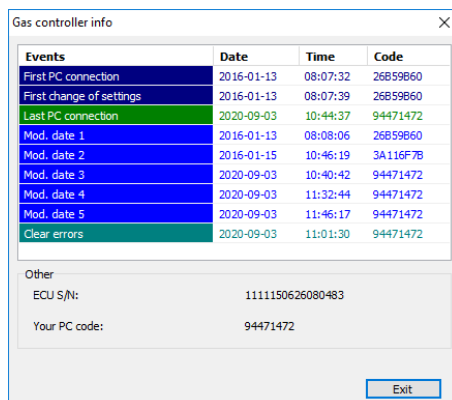
Fig. 19. Car and system info window.

The window is used to enter reminder notes related to the following: milage for the required change of the oil, air filter and gas filter. Information of the vehicle equipped with an autogas system. Additionally, petrol and LPG fueling time from the installation is displayed. Required service counter. Emergency starts control. For selected "Emergency starts", specify the number of allowed emergency starts. Leaving the option unchecked sets no limits to the number of emergency starts. Checked "Block LPG/CNG" option does not allow engine operation on gas when the required service date is exceeded.

Emergency start procedure:

- Turn the key to ON.
- Press and hold the LED switch button until a sound is made.
- Release the button.
- Start the engine.

• Gas controller info – the window contains information about the installed controller, for example: first connection to PC, first setting modification, last connection to PC, modification date 1-5, error clearing, controller serial number, code of PC being connected. The date and time of events along with the code of computer that made connection.



Events	Date	Time	Code
First PC connection	2016-01-13	08:07:32	26859860
First change of settings	2016-01-13	08:07:39	26859860
Last PC connection	2020-09-03	10:44:37	94471472
Mod. date 1	2016-01-13	08:08:06	26859860
Mod. date 2	2016-01-15	10:46:19	3A116F7B
Mod. date 3	2020-09-03	10:40:42	94471472
Mod. date 4	2020-09-03	11:32:44	94471472
Mod. date 5	2020-09-03	11:46:17	94471472
Clear errors	2020-09-03	11:01:30	94471472

Other

ECU S/N: 1111150626080483

Your PC code: 94471472

Exit

Fig. 20. "Gas controller info" window.

• Gas injectors settings

Gas injectors settings

Gas injectors corrections

I1	0 %	0 %
I2	0 %	0 %
I3	0 %	0 %
I4	0 %	0 %

Cycle counter

I1	40720
I2	40717
I3	40715
I4	40713

Injection sequence

☐ Injection advance 180°

	G1	G2	G3	G4
B1	☒	☐	☐	☐
B2	☐	☒	☐	☐
B3	☐	☐	☒	☐
B4	☐	☐	☐	☒

Fig. 21. Gas injectors settings window.

The window allows corrections of individual sections of the injectors. Example: If there is an assumption that the car operates incorrectly within one section (uneven engine running when switched between gas and petrol), try to increase/decrease the correction in selected sections to ensure optimum working conditions. Selection of correction adjustment ranges by “percentage” or “time”. This is an ultimate setting required only when there is no spare injector available. Such problems confirm gas injector failure and it should be replaced as soon as possible.

The “Injection sequence” matrix is used to configure gas injector control. B1-B4 (petrol injectors), G1-G4 (gas injectors). Default control settings are B1-G1, B2-G2, B3-G3, B4-G4. This means that petrol injector B1 is synchronized with G1 gas injector. An additional option of “injection sequence advance 180°” is a pre-programmed strategy for earlier injection of gas to the suction manifold. The function can be only activated when the injector emulation sequence agrees with the original sequence of injectors (the first injector is usually located on the timing gear side). For the autocalibration procedure, turn off the option and set “cylinder switching” on the gas switching tab to 0 ms or use higher rpm for switching to gas, e.g. 1300, to avoid problems when fuels are switched.

- Diagnostics** – this window offers testing capabilities for the actuating devices, gas injectors, solenoid valves, buzzer and switch panel LED diodes. Testing should be performed with the engine running. The test should be carried out with the engine switched off.

Diagnostics

☐ Injectors

☐ Solenoid valve

☐ Buzzer

☐ LED

Start Stop

Fig. 22. “Diagnostics” window

- | | | | | |
|------|------|------|------|---|
| 2,80 | 1,40 | 0,86 | 0,40 | ▼ |
|------|------|------|------|---|

Gas level indicator – set gas level indication by entering voltage values representing the empty and full tank. Current voltage value signal from the sensor is displayed in the monitor window. Next to the level thresholds also current sensor indication is displayed [V].
- RPM signal source** – specifies the point of connection for the RPM signal.

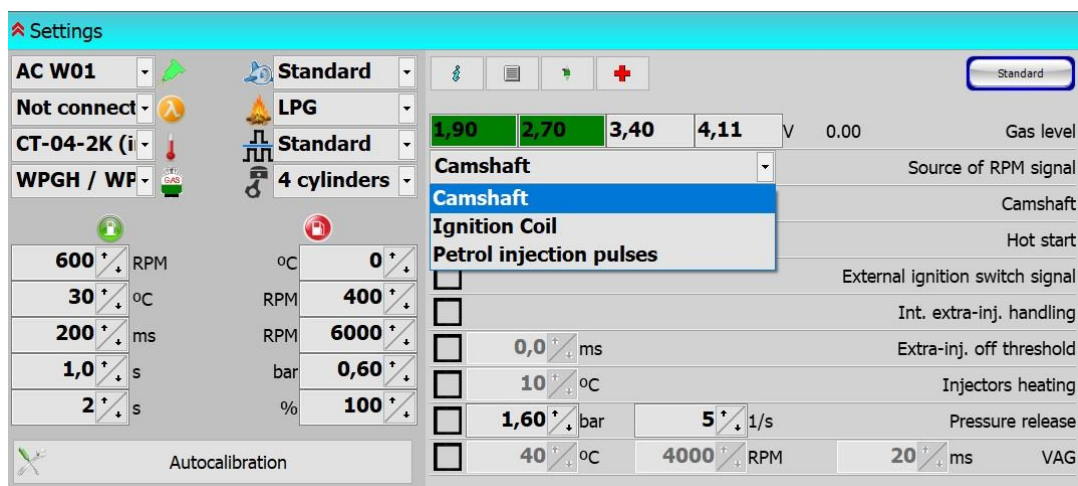


Fig. 23. RPM signal source

Available configurations:

- **Camshaft:** select this option if the camshaft position sensor is the source of RPM. It is very useful for cars where, after cut-off, the cylinders are stopped and there are no pulses on the ignition coil. If in such cases the coil were the source of the RPM pulses, the controller would read reduced or zero RPM values. CAUTION: it is permitted to connect the RPM measurement input to the digital camshaft position sensor only. Determine the number of pulses per revolution. It specifies the number of pulses from this sensor per one engine revolution. Adjust this value so that the controller is able to read the engine RPM properly. The second option to set is the RPM detection threshold value expressed in volts.
- **Ignition coil:** standard connection of the signal from the ignition coil. For proper reading set the number of cylinders as per one ignition coil and the RPM detection threshold value expressed in volts. Adjust the detection threshold value so that the controller is able to read the engine RPM properly. Example: For pulses from the engine control unit, which usually are around 5 [V], set the detection threshold at approximately 2.5 [V]. For pulses from the ignition coil set the RPM detection threshold at approximately 7 [V]. The exception is Nissan Micra – the values of ignition pulses from the control unit are approx. 1.4 [V]. In this case set the RPM detection threshold at 1.0 [V]. In some Renault Megane versions set the RPM detection threshold at 10 [V].
- **Petrol injection pulses:** in older cars it is not necessary to connect the RPM signal (brown wire) as the controller can calculate current RPM from the pulses. If the RPM reading is interrupted (i.e. when RPM varies significantly, but the engine operation is stable), determine the min. ignition pulse time (RPM sensitivity) which will enable extra injections to be filtered and the RPM reading to be stabilised.

CAUTION! The Ignition coil and Camshaft settings exclude the oxygen sensor voltage setting due to the use of a common wire. If the voltage sensor is set, the RPM signal source will be switched to the Petrol injection pulses. If the ignition coil or camshaft is set as the RPM signal source, the oxygen sensor will be switched off.

-  **RPM Sensitivity** – an auxiliary function used when rpm information for engines of short petrol injection times is misinterpreted, e.g. semi-sequential engines. The value should be chosen with the slider so that rpm are correctly interpreted when short injection pulses occur. The injection pulses below the value set with the slider will be omitted in rpm calculations.
- **Hot start** – checking the option allows engine start on gas, when the reducer is warmed up.
- **External ignition switch signal** – check the configuration mode of the ignition switch signal when the

option is displayed. Check the option, if the wire is physically connected to the ignition switch signal line.

- **Intelligent extra-injection handling** – this option is particularly helpful in Mazda (automatic detection of the running mode and activation of a respective control algorithm for operation of the gas injectors). The option can be also used in other cars with a high number of extra-injections resulting in more difficult setup of gas fueling. The “Extra-injections off threshold” cannot be used simultaneously.
- **Extra-injections off threshold** – an algorithm used to ignore injection pulses that are lower than set. The option of “Intelligent extra-injection handling” cannot be checked simultaneously.
- **Injectors heating** – option used to start gas injectors when operating on petrol and cold engine to warm up and prepare the injectors for working on gas. The option should be used as a last resort for worn out and contaminated gas injectors that perform poorly on cold engine. If heating improves injector performance, it should be replaced.
- **Pressure release** – an algorithm for overpressure reduction in the “cutoff” mode. Specify the limit of pressure resulting in pressure release and gas injector pulsing reduction. Gas pressure is reduced by injection of gas into the manifold until the pressure drops or “cutoff” mode ends. The algorithm can be used for poorly performing reducer, in which overpressure and subsequent injection of gas (e.g. when driving to a junction) results in engine stalling due to flooded with a rich or lean mixture (gas controller pressure correction generates so short gas injection pulses that physical opening of the gas injector is impossible).
- **VAG** – an option that is particularly useful in cars with long petrol injection pulses (e.g. 40 ms) on cold engine, which results in respectively longer gas injections and flooding the engine while accelerating, staggering or even stopping. Set correct gas injection (gas injection reduction) and reducer temperature as the limit for activation of the function (note: it is emulated temperature, i.e. estimated by controller calculations) experimentally. Set the maximum rpm level for activation of the function. If the function is required to be active all the time, set the maximum available temperature.

2.3. Autocalibration

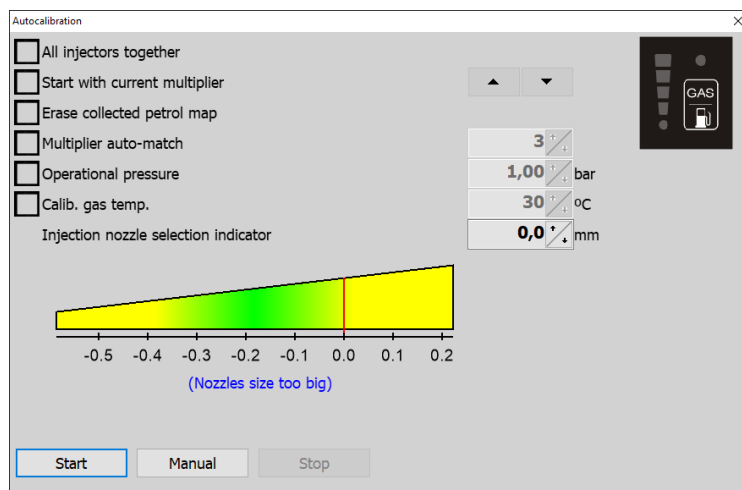


Fig. 24. Autocalibration window.

In order to autocalibrate the system, start the vehicle on petrol and warm up the engine to the working temperature of 60°C. All load points, e.g. air-conditioning and lights, should be off during the autocalibration process. Do not turn the wheel either to avoid fluctuations in engine load due to steering assistance. The vehicle should be in working order (no engine error codes). Check LTFT (long-term fuel trim) and STFT (short-term fuel trim) petrol corrections for deviation from normal conditions using an OBD diagnostic scanner. Press “Start” when engine working temperature is reached. Autocalibration progress is displayed on the status bar. The controller will switch to gas (each section of the injector) and adjust the multiplier on idle run. After the autocalibration is completed, adjust the multiplier on the road.

Note: If the rpm signal is interpreted incorrectly (e.g. in semi-sequential control), the autocalibration procedure adjusts an rpm splitting factor automatically. After autocalibration, rpm signals are read correctly.

Note: For engines running in the Full Group mode, the ignition switch wire must be connected.

Functions displayed in the autocalibration window:

- **All injectors together** – function used when switching to gas during autocalibration results in engine stalling upon the sequential switching of gas injectors.
- **Start with current multiplier** – checking the option allows the fitter to specify the initial multiplier for calibration (initial gas injection time). Use   buttons to set the required multiplier value. Verify the multiplier setting with the switch button (switching should be smooth and not resulting in significant changes in petrol injection pulsing, while keeping consistent dosing of fuel, which can be verified based on the Lambda probe reading or LTFT and STFT trims with an OBD scanner).
- **Erase collected petrol map** – checking the option after completed autocalibration will result in erasing the petrol map saved in the controller.
- **Multiplier auto-match** – a function facilitating multiplier setting; a number of automatic multiplier adjustments to be defined based on thee collected maps. This function can be enabled/disabled at any time.
- **Operational pressure** – a pressure value entered automatically during auto-calibration when the manual edit option is chosen.
- **Calibration gas temperature** – a gas temperature value entered during auto-calibration; it is possible to enter it manually by choosing such option.
- **Injection nozzle selection indicator** – an indicator of gas injector nozzle selection correctness. When this indicator is near the green field it should be assumed that gas injector nozzles are selected properly. When the indicator is moved to the left, the nozzle diameter should be reduced and conversely, when moved to the right, the nozzle diameter should be increased. Additionally, the actual nozzle size must be specified to configure the nozzle selection step.

If auto-calibration is impracticable, manual calibration function should be used. After pressing the “Manual” key, the options “Start from present multiplier”, “Operating pressure” and “Gas temp.cal.” are chosen automatically. The gas pressure and gas temperature values will be entered automatically when the engine is running for at least 5 seconds (the green progress bar appears). These values can be entered manually, too. The multiplier value to be chosen manually so that the petrol and gas injection times are identical. When such result is achieved the calibration can be considered as correct and complete.

2.4. Multiplier setup

After the autocalibration on idle is completed, adjust the multiplier in a test drive. Yellow points on the multiplier curve are used to adjust its level. Select a point and use the up/down arrow keys to set multiplier position for a given calibration point. Press the key once to switch to another point. Keep the Shift key pressed to change the value by 10. Keep the Ctrl key pressed and use a left/right arrow key to activate an adjacent calibration point.

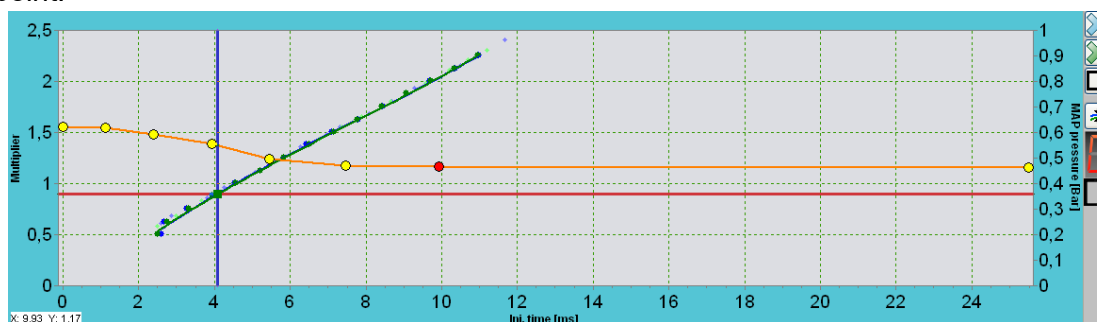


Fig. 25. Multiplier map view.

2.4.1. Setup with petrol and gas maps

Acquire all signals of the petrol map (blue line) and adjust engine load to teach the controller petrol injection pulses in individual points (acquire as many blue points as possible). The controller makes a map based on the sufficient number of points.

When the map is acquired, switch the controller to gas and acquire the map as described for petrol (green line).

Ideally, the maps should overlap. If there is a difference between the maps, lower the multiplier level for the gas map arranged too high or raise the points for the gas map being lower than the petrol map. Corrections should be made with small steps. After adjustments of the points clear the gas map with . Acquire the gas map once again to verify the correct multiplier, repeat the adjustment procedure, if necessary.

2.4.2. Setup with automatic multiplier adjustment

Acquire all signals of the petrol map (blue) and gas map (green) for all load points. The blue and green vertical bars on the right side of the multiplier window make map acquiring easier. The bar disappears as the mapping progresses. The green marker of the bar indicates that a map gas should be acquired for a given location and the blue marker represents the need to acquire the petrol map, conversely.

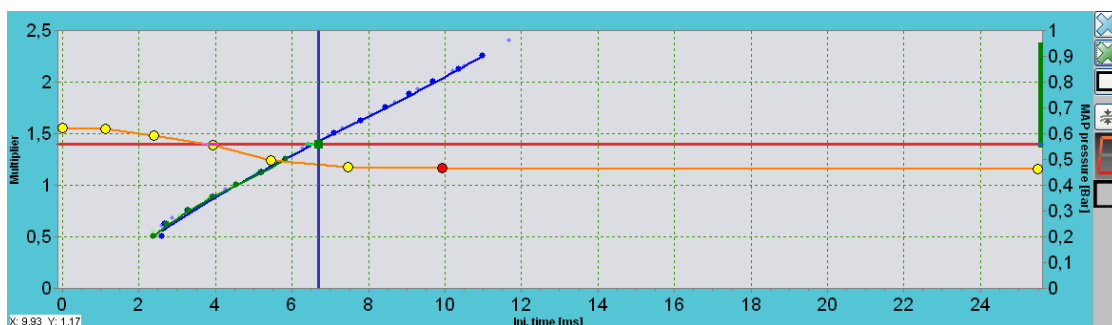


Fig. 26. Multiplier map view.

When both maps are acquired, the automatic multiplier adjustment function is activated.



Press the button to perform multiplier automatic adjustment. Based on the computed deviations the controller corrects the location of multiplier points. When automatic adjustment is completed, the gas map is deleted and a green bar appears to assist in indication of the gas map acquisition. A gas map should be acquired once again.

Automatic adjustment function can be used without limitations until appropriate setting is reached. As an additional aid the “automatic multiplier adjustment” function can be used. In the auto-calibration the anticipated number of automatic adjustments after the gas map is acquired should be indicated. The declared number of automatic adjustments is displayed when the algorithm is running.



Once the gas map is acquired, the algorithm decides on multiplier adjustment, decreases the counter's value by one, deletes the gas map and starts acquiring another gas map. This function will run until the counter's value reaches 0 or the user disables it.

2.4.3. Setup based on observation of petrol injection pulses

Calibrate each multiplier point by adjusting engine load so that the cursor is positioned close to the configured point. For the first phase chose a position on the calibrated point (adjust engine load to accelerate lightly) while running on petrol. When the conditions are stable, switch the controller to gas. Observe petrol injection pulses without changing the load. Correct the multiplier in a given point if there is a change in petrol injection time after switching. If petrol injection is shorter, lower the level of the point by a few steps, if petrol injection is longer, raise the multiplier. Perform calibration for as many points as possible (excluding the extreme points and the point positioned close to the longest injection pulses, approx. 13 ms as presented on the figure above to represent the maximum engine load range). Perform petrol/gas switching on each point until satisfactory results are obtained, i.e. no changes in injection time after switching (minimum deviation is



allowed). As an aid the “autoselection” function can be used; the function follows the current point on the multiplier line, thus manual selection of current points is not required.

2.4.4. Setup with an OBD scanner and STFT and LTFT trims of the ECU

Vehicles provided with an OBD connector can be set up using an OBD scanner to observe STFT and LTFT corrections while operating on autogas. The engine load should be set to move in the area of multiplier point being calibrated and observe STFT and LTFT corrections. The sum of both trims should be usually close to 0%. If STFT correction while running on gas is positive, raise the multiplier point until the sum of both trims is approx. 0%, if the STFT values are negative, lower the multiplier to make the sum of STFT and LTFT close to 0%. Perform calibration for as many points as possible (excluding the extreme points and the point positioned close to the longest injection pulses, approx. 13 ms as presented on the figure above to represent the maximum engine load range).

Example:

While running on gas with corrections at LTFT 3% and STFT 7%, raise the multiplier (STFT 7%) until the correction is about -3%. $STFT + LTFT = 0\%$. Minimum deviations are allowed.

Make sure that petrol corrections are proper while working on petrol, deviations exceeding +/-25% are not allowed, which can indicate engine failure and difficult or impossible setup (engine jerking while switching, increased gas consumption, etc.).

2.5. Setting of maximum load

Following the autocalibration on idle and multiplier configuration on the road, set the multiplier for the maximum load. Set the last but one multiplier point on the petrol injection curve, which represents the maximum time of petrol injection under the highest load. While driving on constant and steady speed, depress the accelerating pedal fully and while observing the Lambda indication in the application of the OBD scanner set the correct A/F ratio by changing the position of the multiplier at the maximum load point. If there is a voltage-type oxygen probe installed, adjust the multiplier so that probe indication is 0,8-0,9V. If the vehicle is equipped with a current-type probe, use the OBD scanner and adjust the multiplier to make the probe reading as for petrol.

2.6. Idle speed control

Following the operations described above, verify engine running on idle. Perform gas/petrol switching to verify if the curve points are correct for the idle run. Switching should be smooth and petrol injection time after switching should not change. If necessary, correct the multiplier point representing the injection pulse on idle run.

3. Tips for users and installers

3.1. LED switch operation

3.1.1. LED GoFast

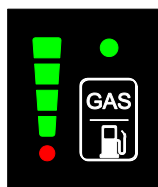


Fig. 27. LED switch.

The switch includes:



- **Gas level indicator.** Indicator diodes inform the driver about the current fuel level. The last red diode represents the “low fuel level” alarm.
- **Gas controller operating mode.** Activated status diode indicates that the engine runs on gas fuel. Flashing LED after the engine is started indicates either engine preheating or defect – the engine is running on petrol then. Inactive status diode indicates that the engine runs on petrol.



- **Fuel switch button.** Press the button to switch between gas and petrol fueling.

3.1.2. LED 600



Fig. 28 LED-600 switchboard

The LED-600 LPG/gasoline switch includes:

- LED indicator – displays the current LPG tank level. The low LPG level is indicated with the red LED coming on in the LED ring which features the four green LEDs for the tank level percentage.
- STAG logo switch actuator – operated to switch between the LPG and gasoline fuel supply,
- Status LEDs (fuel pump icons) – read the current operating status:
 - White fuel pump icon on, green fuel pump icon off – the engine operates on gasoline supply.
 - Green fuel pump icon flashes slowly (1/sec.), white fuel pump icon off – the engine operates on gasoline delivery; when the parameter settings are achieved, the LPG delivery system will automatically switch over to LPG supply.
 - Green fuel pump icon flashing normally (2/sec.), white fuel pump icon off – the LPG delivery system is switching over to LPG supply. This condition is transient and may last up to 10 seconds, depending on the actual engine performance parameters.
 - Green fuel pump icon flashing fast (4 sec. with modulated buzzing – FAILURE mode), white fuel pump icon off – the LPG/ LPG delivery system has detected an event which prevents further operation of the engine on LPG supply, e.g. the LPG tank is empty, there is an LPG delivery system fault, or the engine has been switched to gasoline supply.
 - Green fuel pump icon on, white fuel pump icon off – the engine operates on LPG supply.
- Fault LED – comes on to indicate an active fault in the LPG delivery system. Once the fault is on, the LED light remains steady (red). The LED can also provide notifications (by flashing in sync with the buzzer modulation).
- LED ring glow – a parade feature which is optional (the user may select an RGB colour). Operating statuses:
 - normal light (e.g. for the LPG mode),
 - shines with dimmed light (e.g. for PETROL mode),
 - off.

The following features are available with the LPG ECU connected to the LED-600 LPG/gasoline switch:

- LPG/gasoline switch buzzer volume control (4 volume levels).
- LED indicator brightness control (4 brightness levels) – available if Auto LED Brightness is enabled.
- Status LED indicator (the fuel pump icons) brightness control (4 brightness levels) – unavailable if Auto LED Brightness is disabled.
- The LPG/gasoline switch LED brightness can be adjusted to ambient light.
- The LED ring can be set to come on when the engine operates on gasoline supply.
- The LED ring can be set to come on when the engine operates on LPG supply.
- The LED ring parade light mode colour can be chosen from the RGB colour palette.

- The fault LED indicator can be set to provide notifications (light indications in sync with the buzzer modulation activated by the LPG/gasoline switch). If Buzzer is enabled, the fault LED indicator flashes in sync with the buzzer modulation; this is a convenience feature for the hearing impaired.
- Automatic LPG/gasoline switch type recognition. If the LED-600 LPG/gasoline switch is connected, the application will identify it as the LED-600.

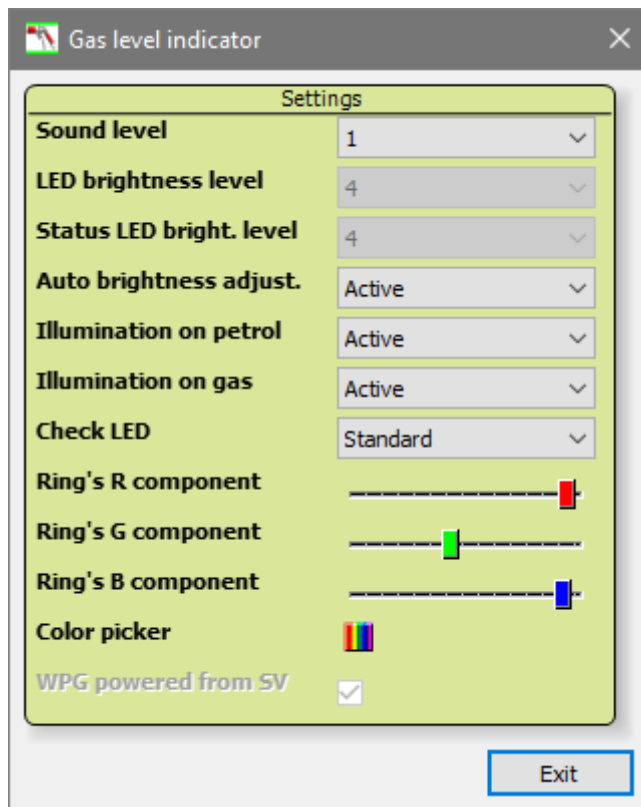


Fig. 29 LED-600 configuration window

The controller “remembers” the last fuel type setting before switching the ignition switch off.

3.2. Automatic calibration of LPG level indicator

The automatic calibration of LPG level indicator should be carried out when an empty tank is being filled with gas. The indicator type should already be set, but, if necessary, the procedure itself may change its type, e.g. from ascending to descending.

The calibration procedure is as follows:

- Press and maintain the switchboard push button,
- Switch off the ignition switch (during to three seconds after pressing push button),
- Depress the button when the switch initiates level indicator calibration.

Process of calibration is signaled on the LED in form of continuously increasing gas level.

When the tank filling is over, switch on the ignition switch, thus terminating the calibration procedure. Successful calibration is signaled by smooth ascending, followed by smooth descending of the gas level indication on the LED line from fuel reserve to maximum fuel level and back (twice). In the case of calibration failure, the level indication on the LED line will change five times from reserve to maximum.

3.3. Acoustic signals

The controller may emit the following acoustic signals:

- Three beeps if it had to switch over to petrol because of a too low level in LPG tank.
- Three short beeps and one long beep in case of a controller error.
- Two short beeps and one long beep each time the ignition switch has just been turned on is a warning that the system needs to be inspected.
- Three long beeps repeated every minute is a reminder that the engine is operating in emergency mode.

3.4. Emergency start on gas

In order to start the engine on gas (emergency mode, e.g. when the fuel pump fails), position the key in ignition mode, then press and hold the button on the switch. The LED will be switched on in a continuous light mode and a buzzer sound will be generated. When RPM is detected, the controller opens the solenoids and the engine is started on gas fuel.

It is not possible to switch to petrol in the emergency mode. The emergency mode is deactivated when the engine is turned off. Operation in the emergency mode is indicated with occasional buzzer sounds.

3.5. Installation notes

- The controller is not provided with an rpm signal wire. The rpm parameter is calculated based on the injection pulsing. In some cases, the rpm signal can be interpreted incorrectly after the installation of the controller. Following the autocalibration, rpm reading will be corrected.
- The controller does not require connection with the ignition switch wire. Following the installation, verify if the ignition switch signal is correctly interpreted. When the ignition switch key is turned, the LED switch in the cabin should be active and responsive to pressing of the fuelling mode button. When the ignition is off, the switch should be switched off (sometimes after up to 1 min). If the LED switch remains activated, connect the ignition switch with the wire provided in STAG harness.
Note: For engines running in the Full Group mode, the ignition switch wire must be connected.
- Reading the gas level with a WPGH sensor is possible only when the shut-off solenoid is activated, as the sensor requires voltage supply. Correct reading is possible only when operating on gas or with external supply to the solenoid valve.
- **Note: The petrol injector emulators should be connected properly. When emulations are made on the petrol injector inlet side will cause that both gas and petrol will be used simultaneously.**

If STAG system fuse is blown (no active diodes in the LED switch and no response to pressing the button) contact the STAG Authorized Service Point to remove the fault. Driving with a blown fuse may impact operation on petrol in extreme situations and under high load.