

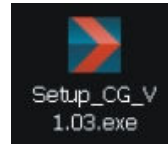
TAMONA

***ClickGas***

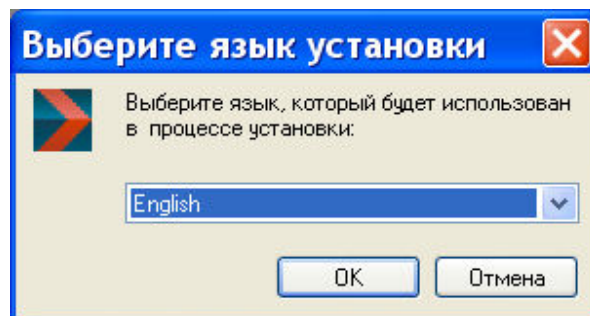
User manual

# ClickGas installation

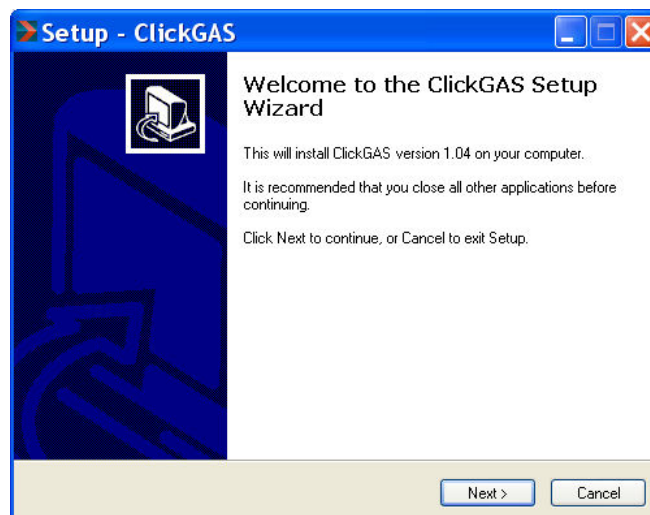
1) To start program installation, double-click the Setup\_CG.exe file. File located on CD and on [www.tamona.lt](http://www.tamona.lt) web-site.



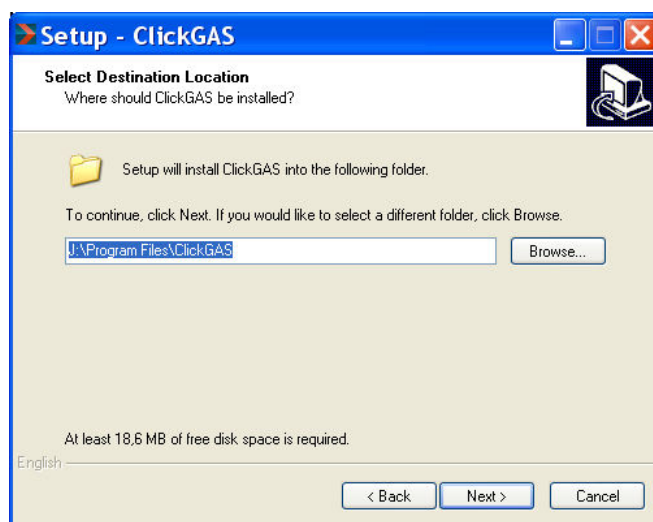
2) Choose the language for the installation process and click “OK”.



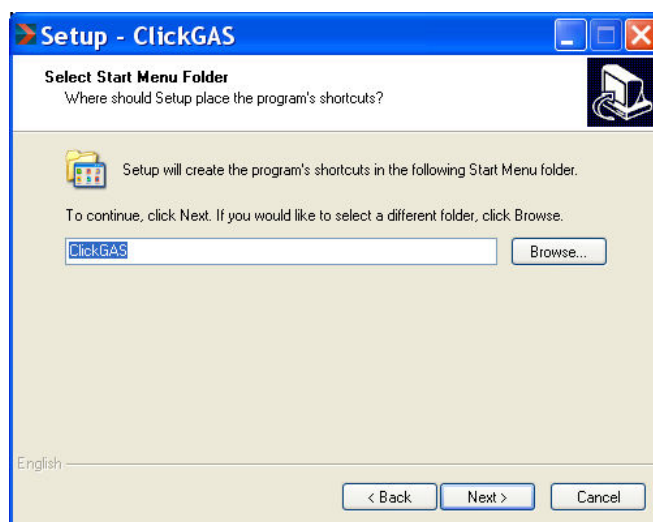
3) Setup wizard launch. To continue press “Next”.



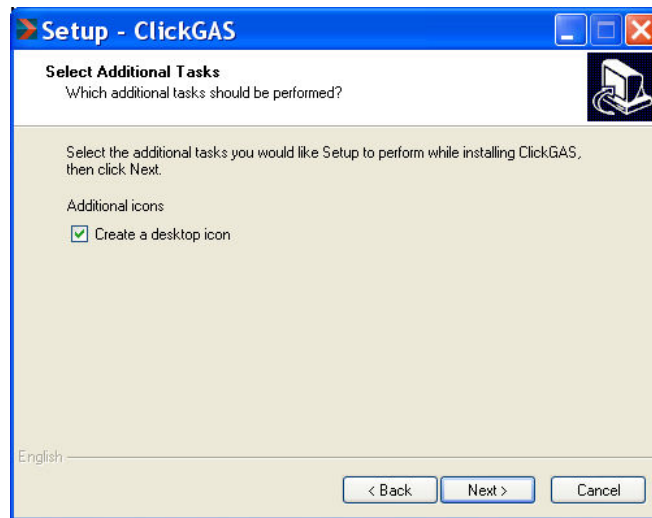
4) In “Select Destination Folder” window you can choose to install the program into default location or specify another folder by clicking “Browse” button. Then click “Next” to continue.



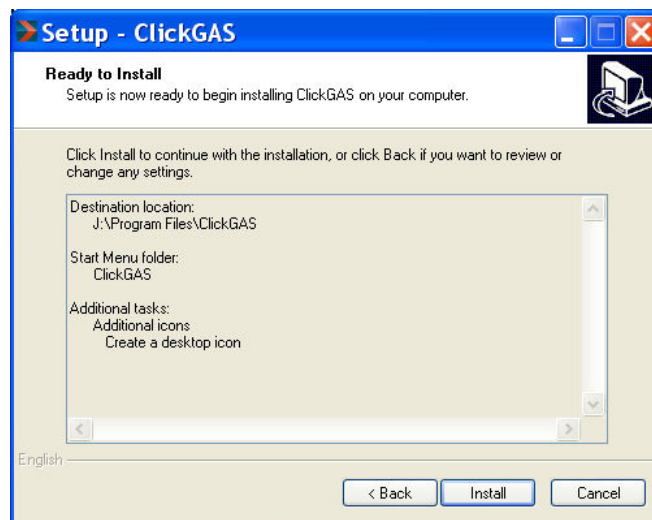
5) A name of “Start” menu folder. Specify a name of “Start” menu folder or leave default name. Then click “Next”.



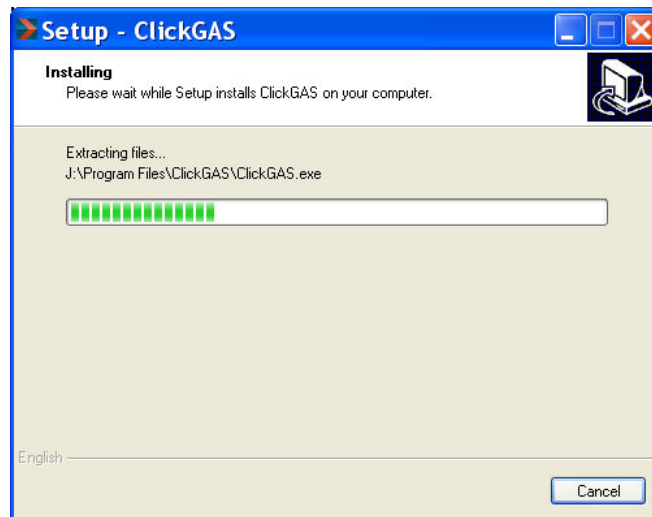
6) To create desktop shortcut, put tick at checkbox. Press “Next”.



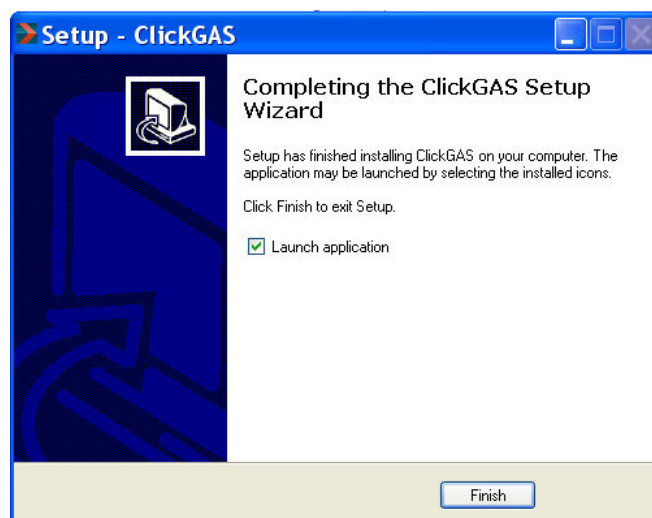
7) The program is ready to be installed. Press “Install”.



8) Program installation in progress.



9) Program successfully installed on computer. Place tick into checkbox to launch program immediately.



# Connection control units with a computer.

## Interface

An intermediary device – an adapter must be used to establish the connection of the control unit with a computer. There are two such devices: the COM port adapter and the USB adapter.

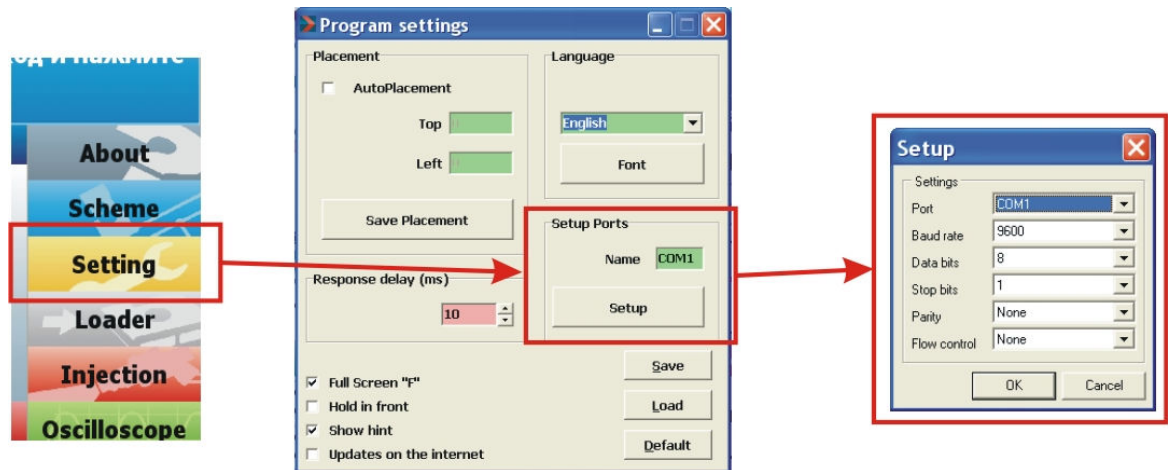


The first is simple to use and requires no driver installation on the computer. The second, USB adapter, is a COM -USB transformer, therefore, requires an additional driver on a personal computer. The driver is offered on the CD, and is also available on the website of the company. You will find the driver installation manual in the description of the USB adapter.

## Configuring the connection of the control unit and the computer.

To establish the connection of the control unit and the computer you have to connect the power to the control unit, connect the adapter to the diagnostic plug connection in your computer, install the driver (if the USB adapter is used), and run the program.

Then you must set the COM port settings as shown in the picture. To do this, click "Settings" and, in the opened window, under "Port", click the button "Settings". By selecting only the name of the port – the option "Port", click "OK". **DO NOT CHANGE any other settings.**



If a connection is established with the control unit, the bottom line of the indicator will display the name of the connected control unit, firmware version and other information. If there is no connection, there will be a message "No connection" instead of the name of the device in which case you need to go back to "Settings" and select a different port.

### Connection is present

|           |             |                |                   |              |                 |     |
|-----------|-------------|----------------|-------------------|--------------|-----------------|-----|
| COM1 Open | TG stream 6 | Version : 6.36 | Date : 2009.09.11 | Gas : 0,00 h | Petrol : 0,00 h | Gas |
|-----------|-------------|----------------|-------------------|--------------|-----------------|-----|

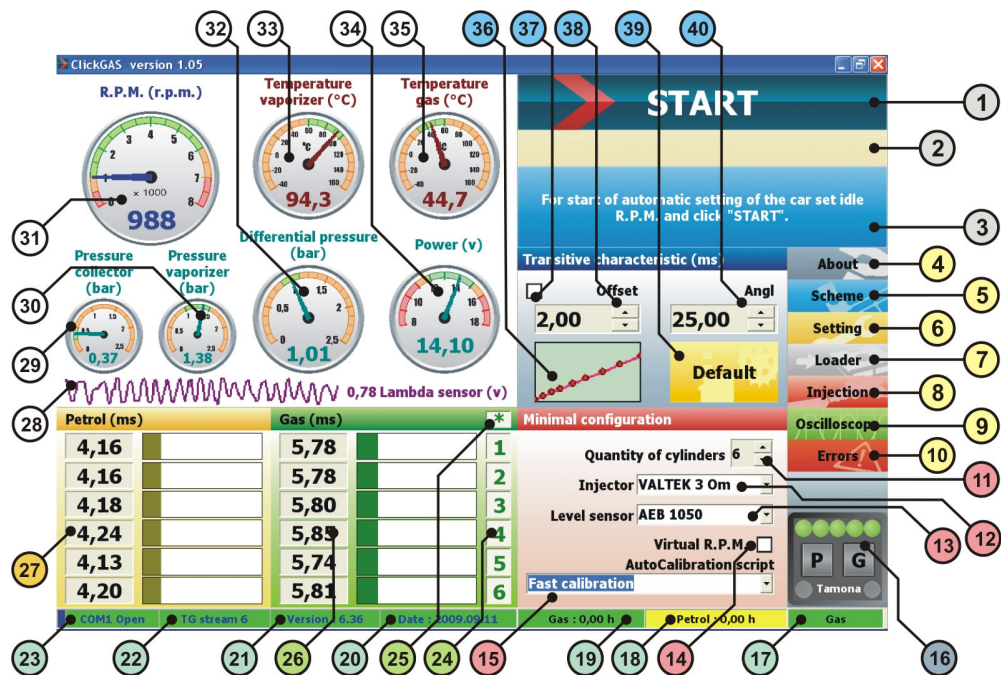
### No connection

|           |             |  |  |  |  |  |
|-----------|-------------|--|--|--|--|--|
| COM1 Open | Not connect |  |  |  |  |  |
|-----------|-------------|--|--|--|--|--|

Selected COM port in the settings can not be supported by the PC system (not provided in the system, not installed system drivers, and malfunction). In this case, the indicator displays the message "COM1 is closed". If the indicator alternately displays the message "COM1 is open" and "COM1 is closed", then one of the programs running in the computer also uses this port.

Configuring the connection of the computer with control unit using a USB adapter, except the installation of special drivers, is no different from the setting up of the COM port. After installing the USB adapter drivers, the system gets another COM port. This is a virtual COM port. Although the connection on the physical level is made through the USB port, the program communicates data like through the new COM port in the introduced system. This port's number can be higher than the number of "real" COM ports, such as COM9.

# About ClickGAS program.



1. Automatic setup start button.

2. Information field.

3. Display of tips.

## Block of control buttons.

4. **About us.** Technical support. Contact information. Update history.
5. **Diagram.** Wiring scheme of the gas equipment connection units.
6. **Setup.** Program setup.
7. **Loader.** Recording software (firmware) to the control unit.
8. **Injection.** Diagnosis of injection.
9. **Oscilloscope.**
10. **Errors.** Error reporting.

## Minimum configuration.

11. Selecting the number of cylinders
12. Selecting the type of injectors
13. Choosing a level sensor type in the gas tank
14. Virtual RPM.
15. Selection of calibration algorithm

## 16. Control panel.

## Indicator bar.

17. Engine operation mode.

18. Number of operation hours with petrol.
19. Number of operation hours with gas.
20. Software (firmware) version creation date of the connected device.
21. Software (firmware) version of the connected device.
22. Name of the connected device.
23. Number of the used COM-port.

#### **Module of gas injector indicators.**

24. Start buttons of each separate injector.
25. Switching on of all the gas injectors.
26. Pulse duration of gas injectors in milliseconds.

#### **27. Module of petrol injector indicators.**

#### **Module of indicators of the main system parameters.**

28. Oscilloscope record of the lambda sensor voltage (V).
29. Pressure in the manifold, absolute (bar).
30. Reducer outlet pressure, absolute (bar).
31. RPM indicator (rpm).
32. Differential pressure (bar).
33. Reducer temperature (°C).
34. Battery voltage (V).
35. Gas temperature (°C).

#### **Transitive characteristics.**

36. Schedule of the transitive characteristics.
37. – 38. Depending on the displayed "tick", the vertical shift of the zero point of the transitive characteristics or the whole line (offset).
39. Reset to factory settings.
40. Angle of the transitive characteristics.

## Automatic setup start button.

1. Automatic setup start button. After pressing the button the automatic system setup starts. During the automatic setup, the "STOP" button appears instead of the "START" button. Pressing the "STOP" button you can stop the setup at any time. Subsequent pressing of the "START" button will start the setup process again.

## Information field.

2. Information field. Additional information field of auto setup.

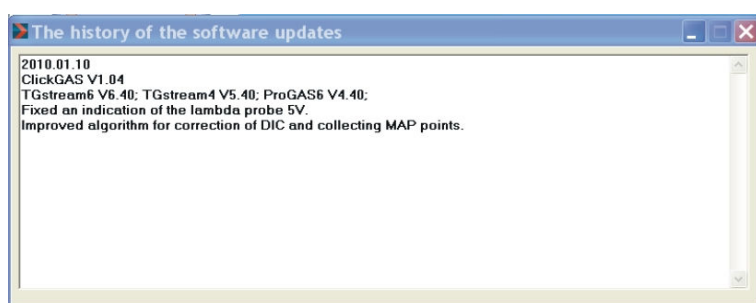
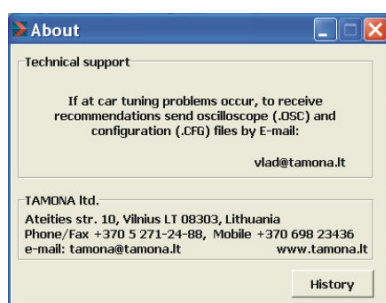
## Display of tips.

3. Display of tips. Output of messages about the auto setup stage, tips and recommendations.

## Block of control buttons.

### 4. About us.

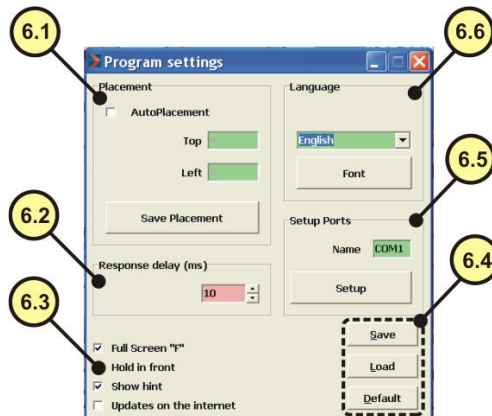
Technical support. Contact information. *ClickGAS* update history.



### 5. Diagram.

Review button of the diagram of connected devices. Quick call-off the scheme is carried out by pressing the keyboard "I" (Install).

## 6. ClickGAS software setup.



**6.1 Position.** When the option is activated, the programme window during the startup can be found in a user-selected location. To set the position, check the "AutoFit" position and uncheck the "Full Screen F" option, move the main program window to the desired location and click "Save position". During the next startup the window is automatically moved to the desired location.

**6.2 Delay.** Frequency of the program access to the connected module. Is recommended to use 60 ms. If the delay is insufficient, interruption of the connection between the computer and the module is possible. In this case, increase the delay.

### 6.3. Additional options.

**Full screen.** The main program window is stretched to full screen.

**The window is always on top.** The main program window is on top of other program windows.

**Popup tips.** Program tips.

**Update on the Internet.** Automatic update of the ClickGAS program on the Internet. By setting this option, every time upon startup the program checks for new versions of the module and ClickGAS programs. If there is a new version of the program, it is downloaded and installed. Meanwhile, this new installed version of the program will run until the next startup of the ClickGas. All changes to the new version from the previous will be described in the section "About Us" – "History".

### 6.4. Control buttons.

**"Save."** Saving the program settings in the SlickGAS.ini file.

**"Download"".** Download of the program settings from the SlickGAS.ini file.

**"Factory"** .Applying the factory settings of the program.

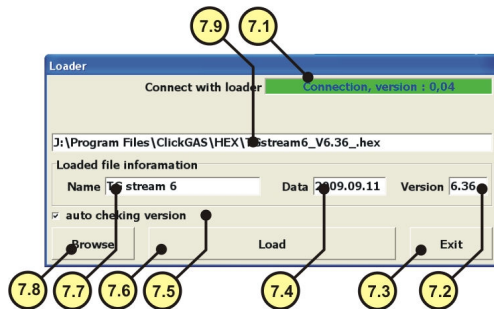
**6.5. Port.** The used port is displayed in the "Name" column. To change the port, click "Customize" and select the desired port in the open box. Leave the other options unchanged. If the connection with the module is established through the chosen port, the indicator bar in the main program window will display the connected device, program (firmware) version other information.

*For more information about the connection between your computer and module can be found in the section "Connection control units with a computer".*

**6.6. Language.** "English titles" – when the option for the activation of bookmark names is set, the scale of the oscilloscope and popup tips will be in English.

Below is the selection of the program language and program fonts.

## 7. Loader.



Program update function in the device. This feature allows you to change, if necessary, the internal software (firmware) of the connected device.

**7.1.** Communication with the loader. Displays information on the presence / absence of connection with the loader in the module.

**7.2.** Version of the downloadable firmware.

**7.3.** Exit from the loader.

**7.4.** Release date of the downloadable firmware.

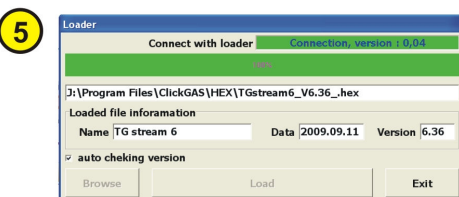
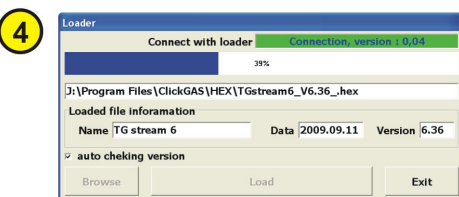
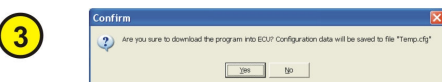
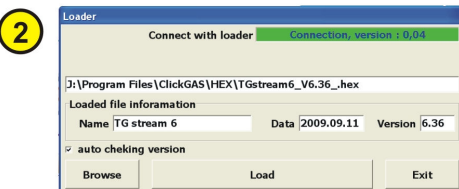
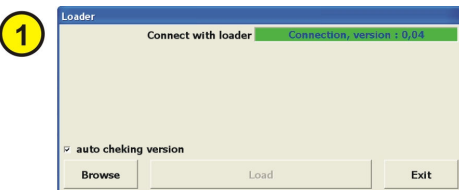
**7.5.** Auto control of downloadable files. This feature prevents the download of inappropriate firmware to the connected device.

**7.6.** Starting the process of downloading the firmware to the module.

**7.7.** Name of device for which the downloadable firmware is intended.

**7.8.** Firmware selection.

**7.9.** Full path of the firmware location on the disk.



### The sequence of actions necessary to change the firmware in the module.

1) To change the internal software (firmware) you must click the "loader" button in a module of the device. The loader box is then opened and automatic connection of computer is made with a special program-loader in the module of the device. Upon successful connection, a message "Connected" and the version number of the loader appears in the line "Communications with the loader".

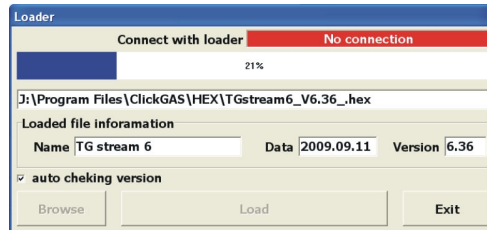
2) Before starting the process it is necessary to select the downloaded file. For this, press "Select". A standard dialog window opens where you will find a list of files (firmware) with the extension \*.hex. Then click "Open". Information about the downloadable firmware is displayed in the loader window, and includes: the full path of the firmware location downloaded on the disk, name of the device for which the firmware is intended, as well as the firmware version and date of release. To prevent the input of wrong firmware to the connected device, leave the "Auto control of downloads" on. Press the "Download" button to start the downloading process.

3) Now you will see the dialogue window offering to save all data of the module of the current firmware to the Temp.cfg file, to transfer eventually all data to the new firmware. Click "Yes" if there is a need to save data.

4) You will then begin the process of downloading firmware to the module. Download progress of the firmware is displayed on the bar.

5) Download completed successfully.

The sequence of actions needed in case of failure (breakdown, noise pickup, wire breakage) during the downloading process of the firmware to the module.

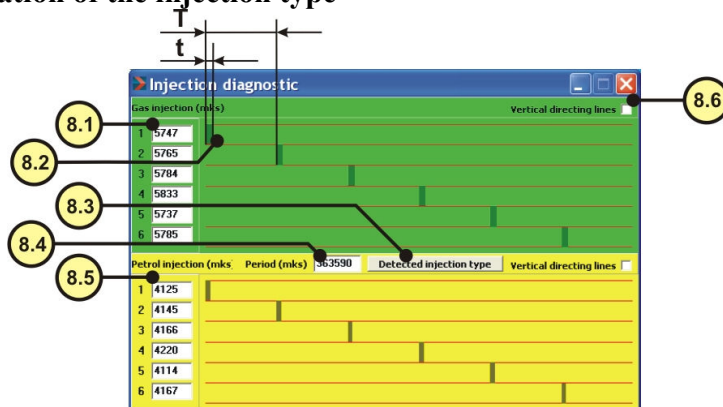


Eliminate the causes of failure during the firmware download and, if the connection is restored, then the program will continue the interrupted process of the firmware until it is successfully completed. If there is no connection with the module, you must perform of the following actions.

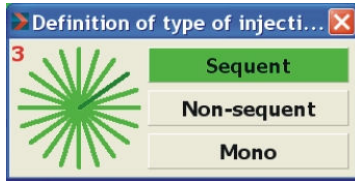
- 1) Press the "Exit" button.
- 2) Turn off the ignition of the car and wait for the full de-energization of the power switch.
- 3) Press the "Loader" button.
- 4) Turn on the car's ignition.
- 5) After automatically connection of the computer with a special program-loader in the module of the device, repeat the section *"The sequence of actions necessary to change the firmware in the module"*.

## 8. Injection.

### Automatic determination of the injection type

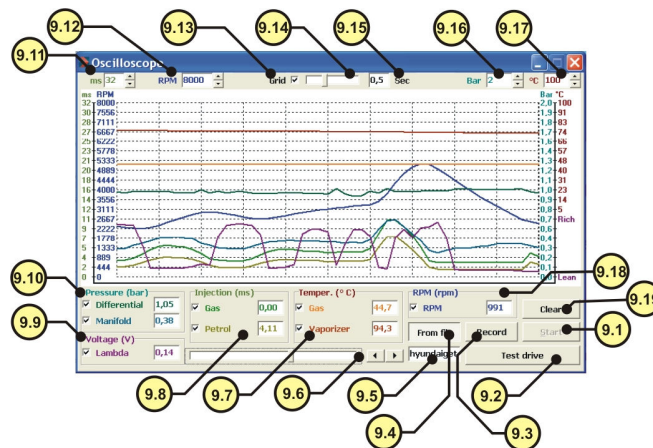


- 8.1. Duration of the gas injector pulse in microseconds (t).
- 8.2. Graphical representation of the pulse duration of the gas injector.
- 8.3. Automatic determination of the injection type.
- 8.4. Period of inclusions of the gas and petrol injectors (T).
- 8.5. Petrol injector pulse length in microseconds.
- 8.6. Guides.



To determine the type of injection, the control module must be connected to the petrol injectors. Then click "Determine the type of injection" (8.3).

## 9. Oscilloscope.



### Control buttons

- 9.1. Start oscilloscope display startup.
- 9.2. Test Drive. Programme of objective assessment of the car dynamics.
- 9.3. Record. Selecting and recording oscilloscope to a file.
- 9.4. From file. Open file with oscilloscope.
- 9.5. Filename. The name of the file to record / reproduce the oscilloscope.
- 9.6. Scroll of the recorded oscilloscope.
- 9.19. Erase. Clear the oscilloscope screen.

### Instantaneous values of system parameters

- 9.7. Reducer and gas temperature (°C).
- 9.8. Pulse length of the gas and petrol injectors (ms).
- 9.9. Lambda sensor voltage (V).
- 9.10. Differential pressure and the collector pressure (bar).
- 9.18. Number of engine rpm.

### Adjusting the scales of the oscilloscope.

- 9.11. Choosing a maximum display length of injector pulses (ms).
- 9.12. Selection of the maximum displayable number of the engine RPM.
- 9.13. Power On / Off.
- 9.14. Selecting the rotation (from 0.1 to 10 sec/div.).
- 9.15. The value of rotation (sec./div.).
- 9.16. Selecting the maximum displayed pressure (bar)
- 9.17. Selecting the maximum displayed temperature (°C)

## Possible options of work with an oscilloscope

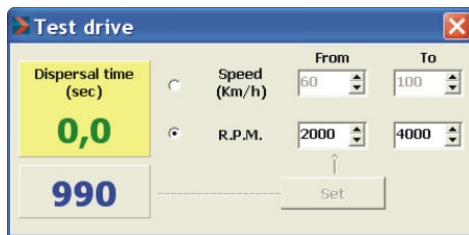
- 1) Oscilloscope display
- 2) Oscilloscope display and recording
- 3) Oscilloscope reproduction and appending

1) In this case, the oscilloscope is not recorded. To begin the oscilloscope display, click "Start", to stop click "Stop".

2) In this case, the oscilloscope is displayed and stored in the selected file. Before you start recording, select the file name to record the oscilloscope. To do this, click "Record". In opened dialog box, enter the file name. The record will be made to a file with the extension \*. osc. Click "Start" to begin the display and recording of the oscilloscope. The button "Record" will remain depressed, which means that the oscilloscope is being recorded. Record length is unlimited. The minimum recording time is 10 sec. To clear the selected file, click "Delete".

3) In this case, you can view and complete recording a previously received oscilloscope. To view a previously saved oscilloscope, click "From file" and select the file with the extension \*. osc. You can see the diagram by scrolling down (9.6). To finish recording the chosen file, click "Record", select the file you browse. In the dialog box, click "Yes", if you want to record a new oscilloscope (the displayed diagram is erased). Or click "No", to append a new oscilloscope to the old one.

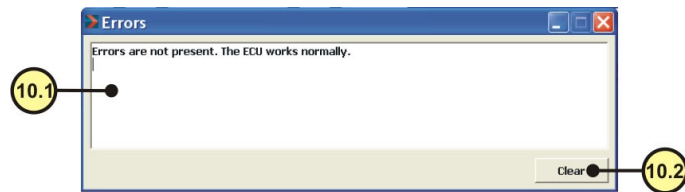
## 9.2. Test Drive.



This sub programme allows you to measure the dynamic characteristics of the car, and in particular the acceleration time in one gear (the 4th or the 5th), by comparing the engine power and traction characteristics of the motor under different system settings.

To do this, you can use the data of the vehicle speed or engine rpm. In the case of the vehicle speed it is necessary to fix the speed and RPM of the car by pressing "Select".

## 10. Errors.



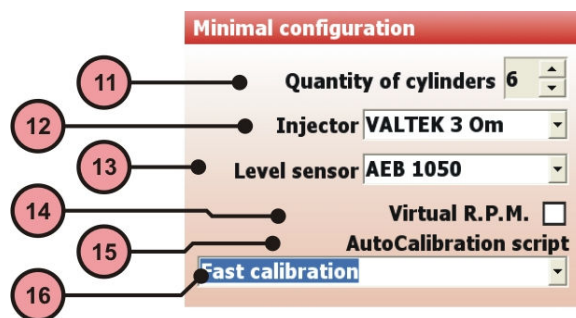
**10.1.** List of detected errors. If errors are not detected, the message "No errors, equipment is operating properly" is displayed.

### List of errors.

- 1) Faulty reducer temperature sensor.
- 2) Faulty gas. temperature sensor.
- 3) Malfunction of pressure sensor in the collector
- 4) Faulty reducer pressure switch
- 5) Adhesion of gas injectors (permanently open gas burner).
- 6) Gas leakage in the system (faulty sealing).

**10.2.** Clear the list of errors. Information about the first four errors is updated automatically. I.e. after correcting the error, the message about the fault is erased. The other two remain in the list and are erased with the "Erase" button.

## Minimum configuration.



**11.** Selection of the number of cylinders (4, 5 or 6).

**12.** Selecting the type of injectors.

- VALTEK 3  $\Omega$
- MATRIX
- REG
- MEMBRANE;
- ZAVOLI
- VALTEK 1  $\Omega$

- PLANIjet
- RAIL A
- KEIHIN
- RAIL H
- Tartarini EVO 07
- VALTEK 34
- CGS

### 13. Choosing a level sensor type in the gas tank

- RESERVE (no sensor, control panel does not show the gas level in the cylinder)
- AEB 1050
- HANA
- 90 – 0  $\Omega$
- AEB 806
- 0 – 90  $\Omega$

14. Virtual RPM. No need for physical connection. Number of rpm is set in the software on the first petrol injector.

### 15. Selection of auto calibration algorithm

- Default (factory)
- Mikas (for engines with MIKAS system)
- **Fast calibration** (- recommended).
- High R.P.M. calibration (calibration at idle run, transition from petrol to natural gas at high rpm).
- Another (own configuration)

## 16. Control panel.

### Variants of the switch operation.



**Automatic**

**"Automatic"**. The car starts up and runs on petrol (yellow LED is on and green LED is blinking in the left corner of the remote control). When all the conditions to switch to gas are met (gas reducer box temperature, pressure, RPM), the parameters of which are set in the service station at the time of setting the car, a transition to gas takes place (all the green LEDs are on and yellow LED is off). In the case of the minimum gas level in the cylinder at the time of transition for gas, the driver shall be warned by two short beeps and the red LED shall go on.



**Petrol**

**"Gas"**. The car runs on gas (only after the automatic change from the "Automatic" mode or using the forced start on gas, described below). Complete indication of the gas level in the tank is carried out. If during the operation of the vehicle in this mode, the gas level in the tank falls below a minimum, the driver will be warned by two short beeps (see the note), and in case of emergency transition to the petrol (running out of gas) – with continuously-intermittent signal that can be switched off by pressing the P button on the control panel.

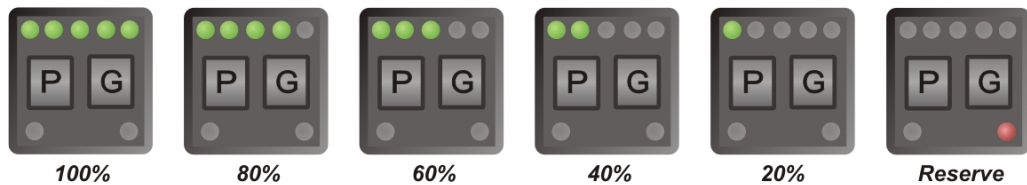


**LPG**

**"Petrol".** Car is started up and runs on petrol (the yellow LED is on).

### Level of gas level in the tank.

5 green and red LEDs are the indicators of the gas level in the tank (red – the minimum level).



## Indicator bar.



**17.** Engine operation mode. There are three modes of operation of the engine: "Petrol", "Gas" and "Automatic". The first two modes, respectively, the mode of the engine operation on petrol and gas, and the third mode – "Automatic" – means that the engine runs on petrol and the control panel waits for the conditions of transition to gas to be met.

**18.** Number of operation hours with petrol.

**19.** Number of operation hours with gas.

**20.** Software (firmware) version creation date of the connected device.

**21.** Software (firmware) version of the connected device.

**22.** Connected device. It is an indicator of the connection to the device. If the connection is established, it shows the name of the connected device. If the connection is not established, the indicator displays the message "No connection".

**23.** Number of the used COM-port. If the selected port is used by another device, the indicator displays the message "Port is closed".

## 18, 19. Additional dynamic display

**"Data transferred"** – the data has been transferred and is used in the system, but is not recorded in the device memory and will be lost after power off, i.e. ignition is off.

**"Reduce rpm"** – data is accepted by the device and is used for operation, but not recorded in the memory, because the RPMs are above 1300 rpm and there is no possibility to save them into memory. For complete saving in the device memory it is necessary to reduce the car RPM, or switch to petrol.

**"Data saved"** – data is fully recorded in the device memory and will not be lost after the power is off.

**"Engine on"** – engine is running.

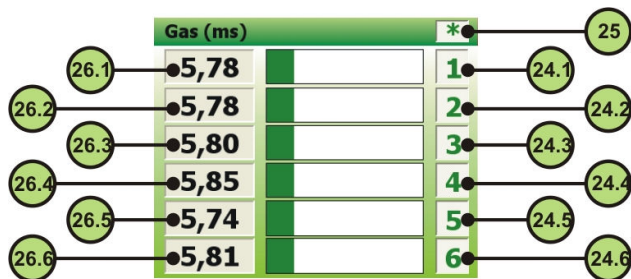
**"Engine off"** – engine is off.

**"Low pressure"** – differential pressure beyond the permissible.

**"Normal pressure"** – differential pressure is normal

**"Shot indication"** – indication of short additional injections (shots).

## Module of gas injector indicators.



### 24. Start buttons of each separate injector.

24.1. On/Off of the 1-st gas injector. Hot key – "Z"

24.2. On/Off of the 2-nd gas injector. Hot key – "X"

24.3. On/Off of the 3-rd gas injector. Hot key – "C"

24.4. On/Off of the 4-th gas injector. Hot key – "V"

24.5. On/Off of the 5-th gas injector. Hot key – "B"

24.6. On/Off of the 6-th gas injector. Hot key – "N"

### 25. Switching on of all injectors.

### 26. Pulse duration of gas injectors in milliseconds.

26.1. Pulse duration of the 1-st gas injector (ms).

26.2. Pulse duration of the 2-nd gas injector (ms).

26.3. Pulse duration of the 3-rd gas injector (ms).

26.4. Pulse duration of the 4-th gas injector (ms).

26.5. Pulse duration of the 5-th gas injector (ms).

26.6. Pulse duration of the 6-th gas injector (ms).

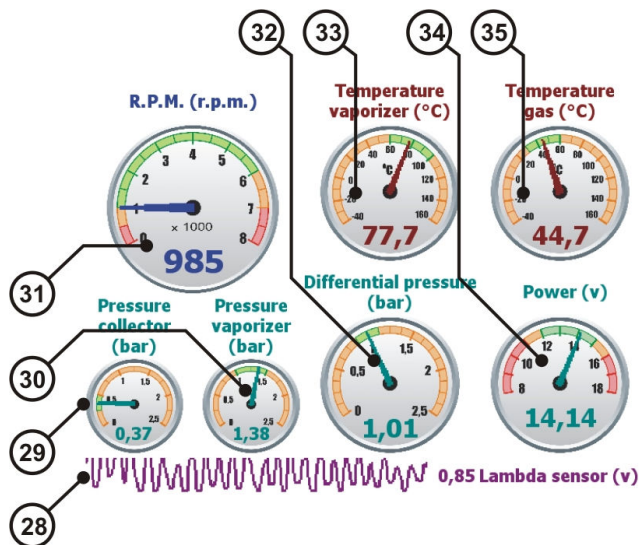
## Module of petrol injector indicators.

|      | Petrol (ms) |
|------|-------------|
| 27.1 | 4,16        |
| 27.2 | 4,16        |
| 27.3 | 4,18        |
| 27.4 | 4,24        |
| 27.5 | 4,13        |
| 27.6 | 4,20        |

### 27. Pulse duration of petrol injectors in milliseconds.

- 27.1. Pulse duration of the 1-st petrol injector (ms).
- 27.2. Pulse duration of the 2-nd petrol injector (ms).
- 27.3. Pulse duration of the 3-rd petrol injector (ms).
- 27.4. Pulse duration of the 4-th petrol injector (ms).
- 27.5. Pulse duration of the 5-th petrol injector (ms).
- 27.6. Pulse duration of the 6-th petrol injector (ms).

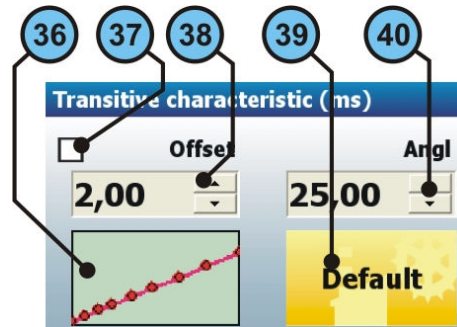
## Module of indicators of the main system parameters.



- 28. Oscilloscope record of the lambda sensor voltage (V).
- 29. Manifold pressure (bar).
- 30. Reducer pressure (bar).
- 31. RPM indicator (rpm).
- 32. Differential pressure (bar). Pressure difference between the pressure of the reducer (30) and the manifold pressure (31).
- 33. Reducer temperature (°C).

34. Battery voltage (V).  
35. Gas temperature (°C).

## Transitive characteristics.

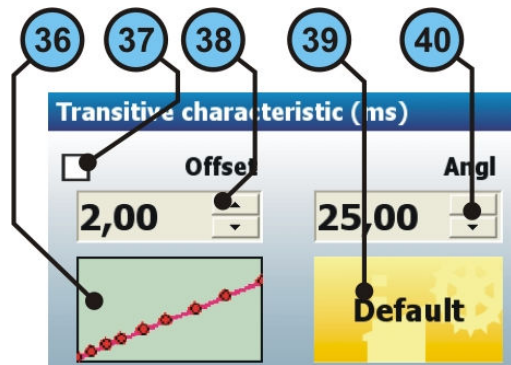


36. Schedule of the transitive characteristics. Y scale – pulse duration of the gas injector (ms). X scale – pulse duration of the petrol injector (ms).
37. – 38. Depending on the displayed "tick"(37), the vertical shift of the zero point of the transitive characteristics or the whole diagram (offset).
39. Reset of settings to factory settings.
40. Angle of the transitive characteristics.

# System auto setup

Before starting the auto setup process it is necessary to enter a minimum configuration.

1. Number of cylinders.
2. Type of injectors.
3. Types of gas level sensors.
4. Algorithm of auto setup.



All selected parameters and settings are immediately and automatically transmitted to the connected device. Now, after pre-setting the RPM at idle run, you can start automatic setup. Press the Start button. Then the system will operate in automatic mode. Status will be displayed on the screen. If equipment is installed correctly, all the components are in good working order and there are no defects in the petrol fuel system, then, after some time, the automatic set up will end. Please bear in mind that the auto setup is finished only with the idling setup. In most cases this is enough.

Corrections can be made manually.

When the rise is changed at idle run, see p. 38. Changing the angle on the power mode, see p. 40.

**The main condition for proper calibration: this is equity of petrol pulses during the operation on petrol and gas.**

### Auto setup messages.

|    | Auto setup phase                                                            | Message on successful completion of the phase                             | Error message                                                                                                                                                                                                                              |
|----|-----------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Setting the factory settings.                                               | Factory settings are set.                                                 | Configuration data is not transferred.                                                                                                                                                                                                     |
| 2  | Control of the connection of petrol injectors.                              | All petrol injectors are connected.                                       | No impulses from the petrol injector                                                                                                                                                                                                       |
| 3  | Checking temperature sensors.                                               | Temperature sensors are functioning normally.                             | Reducer temperature sensor's failure.<br>Gas temperature sensor's failure.                                                                                                                                                                 |
| 4  | Checking pressure sensors.                                                  | Pressure sensors are functioning normally.                                | Reducer pressure sensor's failure.<br>Manifold pressure sensor's failure.                                                                                                                                                                  |
| 5  | Pressure check in the reducer within the range...                           | Pressure in the reducer within the prescribed range.                      | Pressure in the reducer is outside the prescribed range. Check pressure sensor and the correctness of connection                                                                                                                           |
| 6  | Pressure check in the manifold within the range...                          | Pressure in the manifold within the prescribed range.                     | Pressure in the manifold is outside the prescribed range. Check the pressure sensor and the correctness of connection                                                                                                                      |
| 7  | Differential pressure check within the range...                             | Differential pressure within the prescribed range.                        | Differential pressure is outside the prescribed range. Check the connection and pressure in the reducer and manifold.                                                                                                                      |
| 8  | Tightness check.                                                            | The system is leak-proof.                                                 | The system is not leak-proof.                                                                                                                                                                                                              |
| 9  | Determination of the type of petrol injection.                              | Type of petrol injection is determined.                                   | Select the type of petrol injection manually.                                                                                                                                                                                              |
| 10 | Heating up of the reducer to the temperature                                | Required temperature of the reducer is reached                            |                                                                                                                                                                                                                                            |
| 11 | Determination of the divider and sensitivity threshold of engine rpm speed. | The divider and sensitivity threshold of engine rpm speed are determined. | Option of the divider and sensitivity threshold of engine rpm not found. Check the connection and set the idle speed.                                                                                                                      |
| 12 | Determination of the divider of engine rpm speed.                           | The divider of engine rpm speed is determined.                            | Option of the divider not found. Check the connection and set the idle speed.                                                                                                                                                              |
|    |                                                                             |                                                                           | Make manual settings and to proceed with auto setup, click "Continue" and click "Abort" to stop.                                                                                                                                           |
| 13 | Auto setup is pending.                                                      | Auto setup completed successfully.                                        | Auto setup intermitted.                                                                                                                                                                                                                    |
| 14 |                                                                             | Auto setup of the car successfully completed.                             | Auto setup completed.<br>It is recommended to reduce the diameters of the nozzles and repeat the auto-calibration.<br>Auto setup completed.<br>It is recommended to increase the diameters of the nozzles and repeat the auto-calibration. |
|    |                                                                             |                                                                           | Auto setup intermitted.                                                                                                                                                                                                                    |
|    |                                                                             |                                                                           | Auto setup intermitted.                                                                                                                                                                                                                    |

### Additional messages

- No vacuum and incorrectly configured pulse parameters of the RPM, or the engine is off.
- No connection with the device.

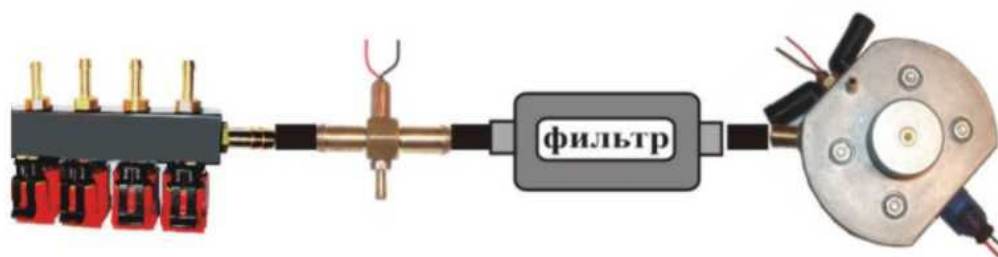
## Certain features of the equipment installation.

Installation of gas cylinder, multivalve, connecting hoses and gearbox is similar to other systems of gas equipment of the fourth generation. It is advised to install MAP sensor, temperature sensor, gas module's gas valves, gas filter and the computer block according to the following recommendations.

### Installation of computer.

1. Computer is installed in the engine compartment in a place protected from the effects of thermal air currents (in front of the radiator fan), and against water spray.
2. The case is oriented with the connectors down.
3. When connecting a connector make sure (before clicking) in their quality of connection.
4. Dress rubber housings (for ProGAS4 and ProGAS6).

**Mounting of the temperature and gas pressure sensor (cross-piece) and a gas filter** must be carried out according to the attached chart in the following sequence:



### Gas injectors Cross-piece Filter Reducing gear

**Temperature and gas pressure sensor (cross-piece)** is installed between the module of gas burners and gas filter in a place free from the passing air flow, both hot and cold. The cross-piece shall have no heat contact with the engine, or with a module of gas injectors.

**Filter** is installed between the reducing gear and cross-piece of gas temperature. In engines with a petrol injector shutdown mode at forced idling (CAT-OFF mode), it is recommended to choose a filter of minimum size. It is because during the transition of the reducing gear from the maximum performance mode to the minimum performance, the accumulation of high pressure in the filter and hoses is observed. The subsequent inclusion of the gas valves will occur with increased differential pressure that can lead to their malfunctions.

When installing gas nozzles you should strive for the minimum possible and the same length of connecting hoses to the threads of the intake manifold.

Complete electrical installation in accordance with the connection diagram.

Pay special attention to the connection of the common wire (weight) to "-" of the battery. In some cases (for example, instability of the readout of rpm pulses) it is possible to connect to the body or to the motor vehicle. **If the car has a master switch, connecting the negative end of the device to negative pole of the battery is strictly prohibited.**

The positive wire leading to the ignition key is allowed to connect to the positive end of the petrol injectors, provided that +12 volts is removed when you turn off the ignition.

Connect no more than three gas valves (valve in the reducing gear, valve in the multivalve and the other possible valve).

If it is absolutely necessary, the petrol fuel pump can be blocked. In this case, it is necessary to use a powerful relay with normally closed contacts. Connect the second output of the relay with the master switch.

**Choosing the diameter of nozzles.** Initially, nozzles “Valtek” 3 ohms and the like can be calculated by the formula:

**$D = \sqrt{P/10k}$** , where D – nozzle diameter in mm.

P- engine power in kW.

K- number of cylinders.

It is recommended to use a jet of smaller diameter than the calculated. The final criterion is the duration of gas pulse at idle run, in a steady mode and warmed up engine. It should be 5-5.5 ms.

**Differential pressure** is regulated in a reducing gear when the engine is running on gas. Differential pressure within 0.9 – 1.1 bar is considered normal. In the case of more powerful engines, you can raise it up to 1.1 -1.2 bar. Even higher pressure should be achieved if the methane is used as fuel.