Zenit Direct
SOFTWARE MANUAL

AG Centrum

Zenit Autogas Systems

Radom 2014

I. Connection of the Zenit Direct electronic control unit (ECU) with a PC and a diagnostic program.

1. Interface

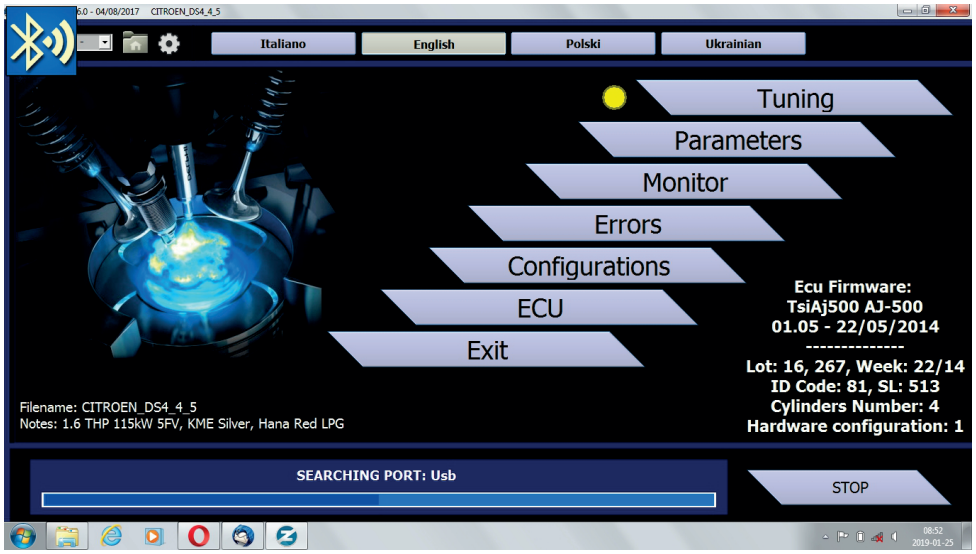
*An interface is required to connect the computer to the Zenit Direct control unit. All **USB** interfaces working with the Zenit Pro / Pro OBD and Zenit Compact control unit are compatible and also allow for the connection to the Zenit Direct control unit.*

The interface is to be connected to the computer and to the diagnostic connector of the Zenit Direct control unit.

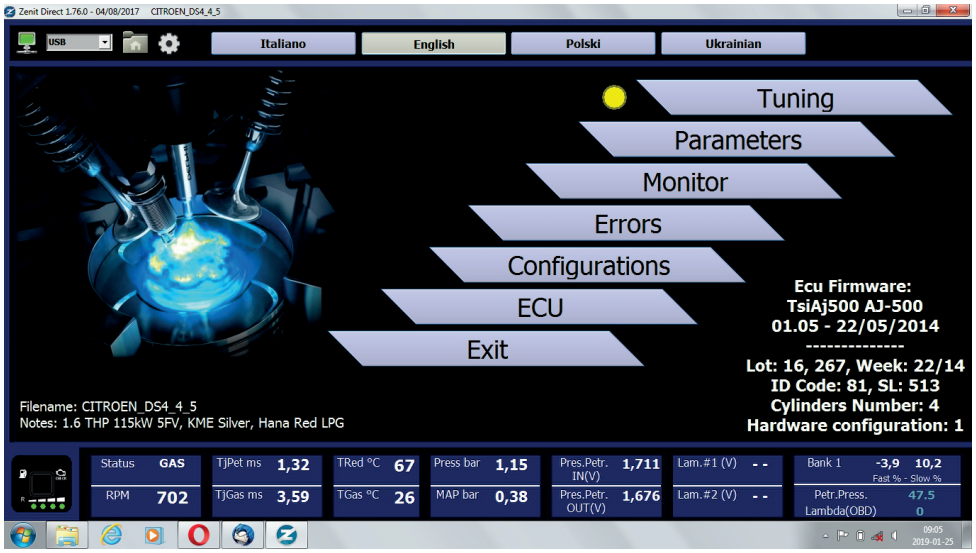
ATTENTION!!! The USB interface, like almost every device connected to the USB port, requires controllers installation. This process is usually performed once, the first time you connect the interface. It runs almost identically to the installation of any other devices of this type. A detailed description of controllers installation in Windows as well as the controllers themselves are available on our website www.agcentrum.pl

*After starting, the program automatically looks through all active COM ports and tries to establish connection with the control unit. **The ignition must be switched on during this time.***

Until the connection is made, the "CONNECTING" bar is visible at the bottom of the screen.

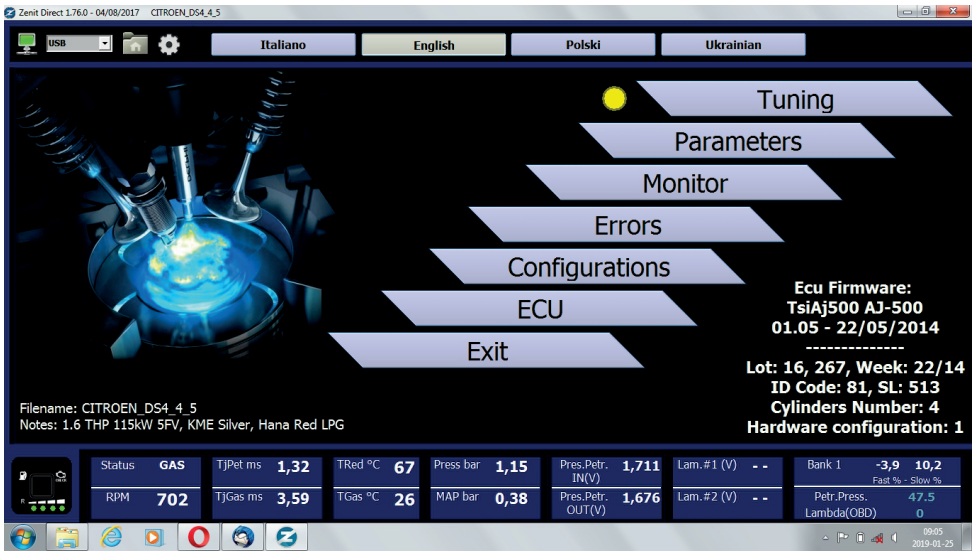


The view of the Zenit Direct main screen when connected:



II. DESCRIPTION OF Zenit Direct

1. Main window



*In the upper left corner of the main window there is a **monitor icon,** which is used to change the program mode from online to offline and the other way around. In addition, its colour indicates the softwareoperation status:*

- green - communication with the controller is established (online mode),
- flashing yellow - the software tries to establish communication with the controller,
- red - the software is not connected to the controller (offline mode).

In the next window, there is a name of the port, through which the software communicates with the controller - it is possible to select the port manually.

The catalog button with the house icon allows to return from any place to the main window of the program.

Clicking the gear icon (turns the colour to red) displays advanced settings for some options that are not visible in the standard view. The above buttons are visible regardless of the selected menu. In the middle of the upper part of the main window you can see buttons that allow to select the program language.

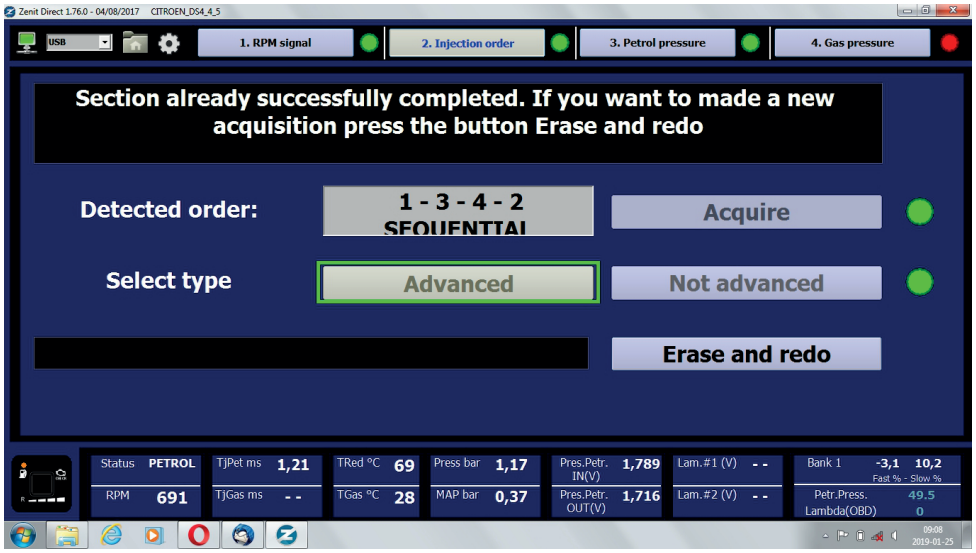
At the bottom there is an information panel, visible regardless of the selected tab, which allows to observe the basic parameters of the system.

The middle (main) part of the window contains buttons giving access to configuration options and information about the software of the controller as well as the currently loaded configuration file.

2. Calibration

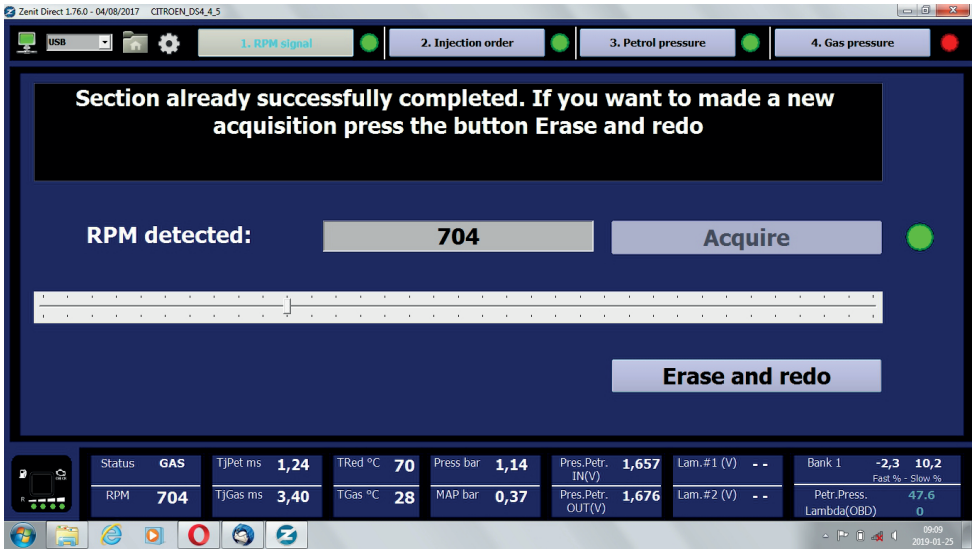
The Calibration *window sets basic calibration parameters of the installation, such as:*

2.1 Injection sequence - no interference required when a dedicated configuration file is loaded.



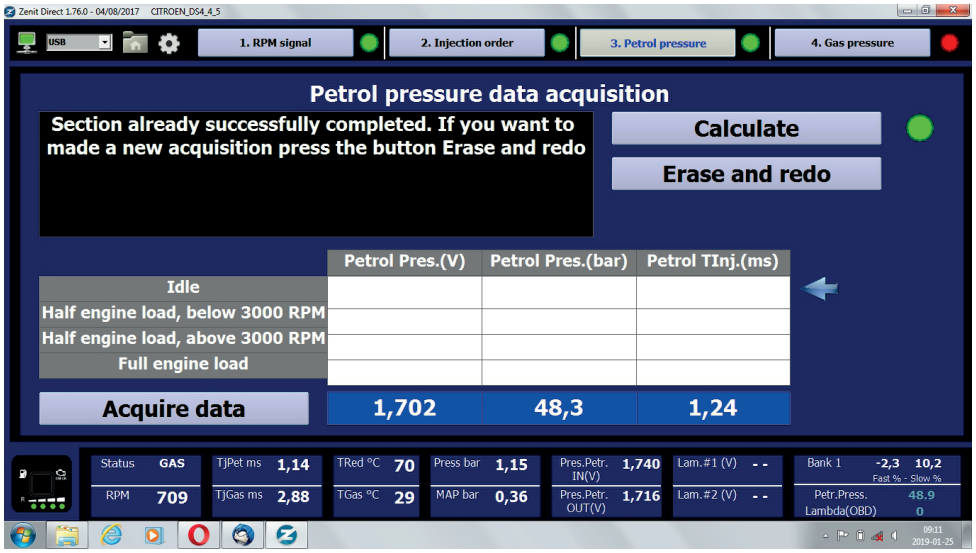
It allows for detection of the petrol injection sequence and setting whether the gas injection is to be first before the petrol injection or not.

2.2 RPM signal - no interference required when a dedicated configuration file is loaded.



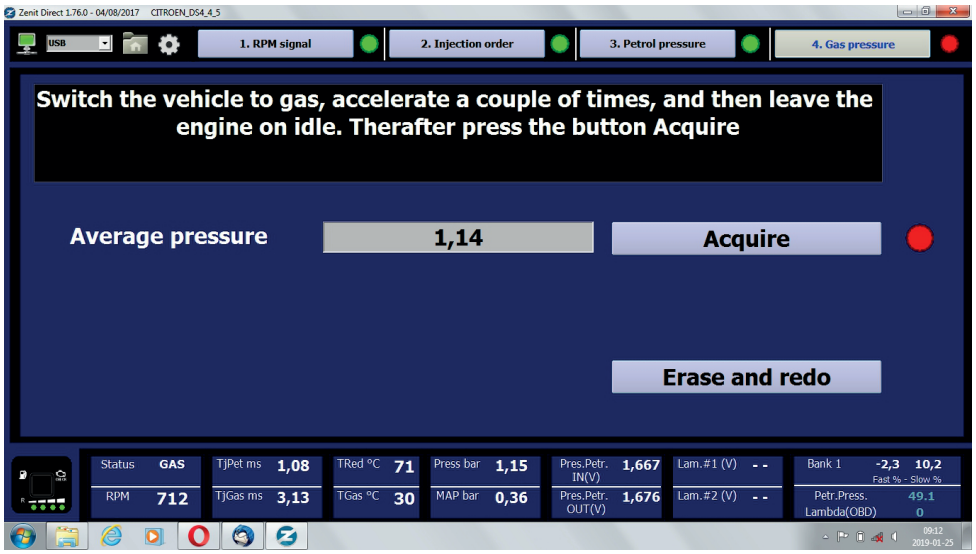
It allows you to set the sensitivity of the engine speed signal reading. Appropriate connection of the RPM cable and correct reading of the speed signal is necessary for proper work of the Zenit Direct system.

2.3 Fuel pressure - no interference required when a dedicated configuration file is loaded.



This option allows the system to be adapted to the characteristics of the engine's fuel pressure sensor. This is necessary for proper control of the gas dose

2.4 Gas pressure - no interference required when a dedicated configuration file is loaded.

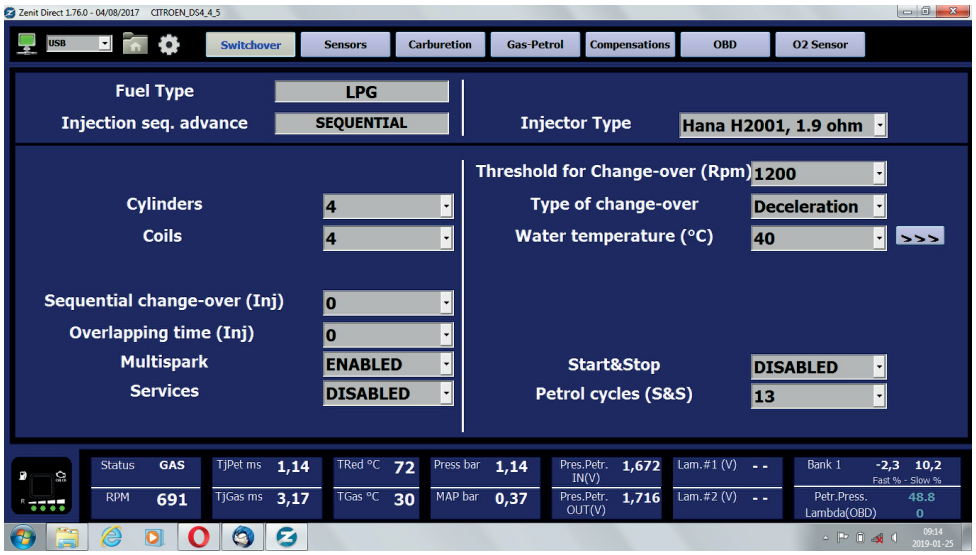


This tab allows to save the average gas pressure in the installation. This is necessary, e.g. for correct functioning of the pressure compensation.

3. Configuration

In the Configuration window you can find all the functions responsible for the correct configuration and setting of the Zenit Direct system.

3.1 Switching

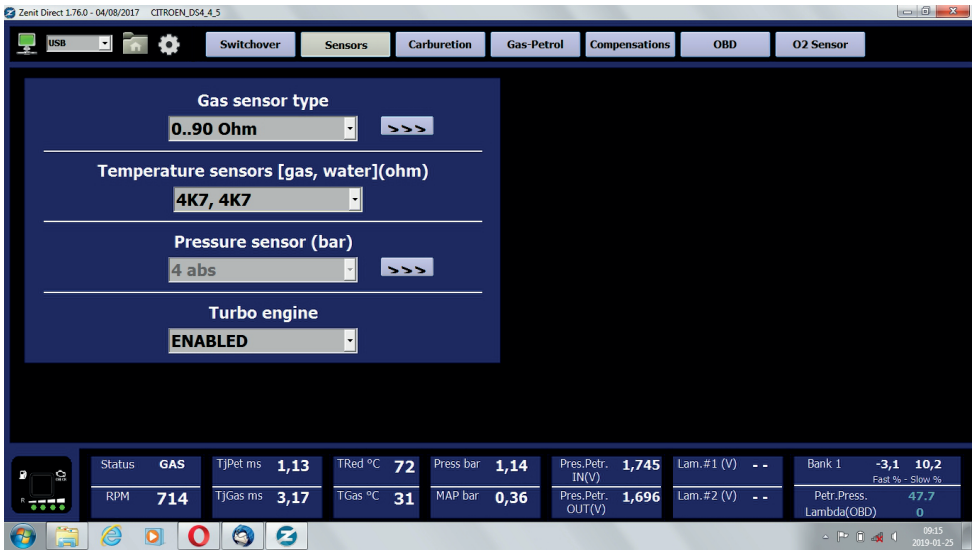


Fuel type - *information on the type of gas that is used in the installation. Currently, Zenit Direct is prepared to work only with LPG.*
Injection type - *displays the detected type of petrol injection.*
Cylinders - *enables selection of the number of engine cylinders, i.e. the number of active petrol injectors. The Zenit Direct control unit supports 1-, 2-, 3-, 4- cylinder engines.*
Coils - *section in which the number of engine coils is set, this number does not always match the actual number of coils, the value should be chosen so that the engine speed reading in the program is correct.*
Sequential switching - *number of petrol injector opening cycles followed by the switching of the next cylinder to gas. The higher the engine speed is, the faster the next cylinders will switch.* ***The function must be switched off (set to 0) in the case of a preceded gas injection sequence (Calibration-> Sequence of injection).***
Fuel application - *number of cycles for which both fuels will be applied at the time of switching. Used mainly when the transition to gas does not run smoothly. Recommended setting 0 - 1.* ***The function must be switched off (set to 0) in the case of a preceded gas injection sequence (Calibration-> Sequence of injection).***
Multispark – *the option enabling correct reading of RPM in the engines in which there is more than one ignition in the heating phase during one work cycle.*
External devices control - *after activating this option, switching on one of the voltage, controlling the solenoid valves, takes place when the gas injectors are activated. The blue wire is connected to solenoid valves - it works as a standard, i.e. it opens them earlier to fill the system. The blue-black wire transfers the voltage when the first gas injector is activated and it can be used to control external devices (e.g. an emulator or a variator). If the function is not active, the voltage appears earlier on both wires and we can use it to control each solenoid valve separately.*
Sensitivity - *a signal filter from petrol injectors. Below the set value, the injectors opening times will not be taken into account (elimination of petrol injections).* ***The filter is turned off for 0.1 value.***
The option is visible only after activating advanced functions (gear button).
Injectors type - *gas injectors selection field. An additional button on the right side, displays a window enabling activation of the correction for individual injectors. In the case when there are differences in work between individual banks or cylinders, they can be overcome by changing the value of* ***Fixed Correction.***

ATTENTION!!! Fixed correction does not replace calibration of gas injectors. In the case of differences between individual cylinders, first check the correctness of the mechanical calibration of the gas injectors (injector consumption causes a change in cost). The option is visible only after activating advanced functions (gear button).

Engine speed threshold (RPM) - *revolutions per minute of the engine crankshaft, above which the gas supply will be switched. The values can be selected in the range from 0 (switching at low speed) to 4000 (switching occurs after reaching 4000 rpm).*
Switch at – *the selection whether to switch to gas when the engine speed rises or falls.*
Reducer temperature - *selected in the range from* ***20*** *to* ***80°C.*** *This is the temperature at which the control unit will switch the engine to gas supply. Recommended setting min. 30°C. The additional button on the right, displays a table showing the switching temperature and the delay.*
The values can be modified by using the "+" and "-" keys on the computer keyboard.
Start & Stop - *applies to vehicles equipped with the function of switching off the engine at the moment of stopping (e.g. at the intersection). The first switching to gas takes place in a standard way (taking into account all configuration conditions). After activating the function, if the engine is automatically switched off during the drive (the Start & stop function works) and the ignition is on all the time, after pressing the clutch and restarting the engine, switching to gas will take place after a certain number of petrol cycles or when the function of the* ***number of petrol cycles S & S*** *is set to* ***0*** *- the engine will be directly started on the gas.*

3.2 Sensors



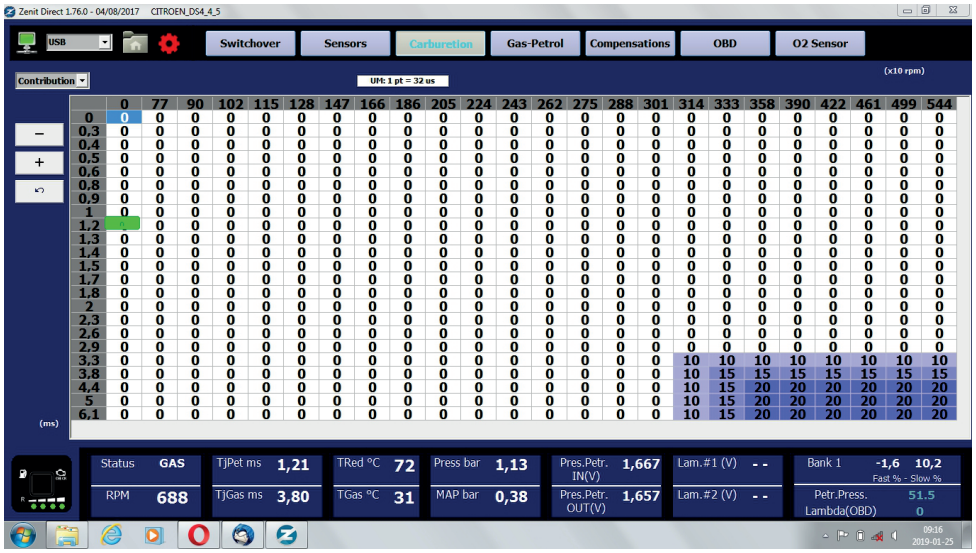
Type of the gas level sensor - *gives the possibility to choose the sensor type which is installed in the system. The button on the right side activates the calibration window of the gas level sensor. This calibration consists in setting the voltage thresholds above which the individual diodes should light up. For this purpose, move the slider to the left or right to set the required value.*
The Save Reserve *button allows to save the voltage threshold for the fuel reserve in the tank, and the Save Full button - for the full tank.*
The Default *button allows to restore the default settings.*
Type of temperature sensor [gas, reducer] – *gives the possibility to choose the right type of sensor installed in the system.* ***Recommended setting for sensors from completions: 4K7, 4K7.***
Type of pressure sensor - *selection of the right type of pressure sensor - at the moment Zenit Direct works with only one type of sensor.*
The button on the right side, displays a window with additional settings:
Switch automatically - *allows to choose whether the return to petrol after reaching the minimum pressure is to be done automatically or manually. If the* ***Active*** *option is selected, the control unit after reaching the* ***min. pressure*** *value waits the time specified by the* ***Delay*** *parameter and if the pressure is still below the minimum value set, the control unit switches the engine to the petrol supply. After choosing the option* ***Inactive*** *- the control unit does not take into account the gas pressure readings, i.e.: it does not switch automatically when the pressure falls down, the gas pressure compensation does not work.*

3.3 Regulation

This tab contains a map that allows to adjust the gas dose depending on the opening times of petrol injections and engine speed.

After loading the basic configuration suitable for a given engine, in most cases the system does not require additional adjustment. However, if STFT and LTFT corrections after switching to gas differ from those on petrol by more than 5%, the map may need to be adjusted. The gas dose can be changed by changing the value of the coefficient in the proper areas. Changes on the map can be made by checking the area of the fields and pressing the Enter key or by using screen buttons placed on the upper left side of the screen. Increasing the value of the coefficient - we increase the gas dose, reducing the value of the coefficient - we reduce the gas dose.

By expanding the menu located above the buttons supporting the map, we have the option of switching between the maps: ***Gas Dose*** *and* ***Petrol Rate.***



Typically, in the Zenit Direct system, an additional small dose of gasoline is injected into each gas cycle in order to protect the petrol injectors. With the help of the ***Petrol rate map,*** *if there is a need, we can increase the gasoline dose. This is done by increasing the value of the coefficient in the appropriate areas. Increasing the coefficient by 1 increases the gasoline dose by 32 us, i.e. 0,032ms, proportionally 10 = 0,32ms and 100 = 3,2ms. If we increase the petrol rate, the control unit automatically reduces the gas dose so that the mixture is not too rich.*

The Gas Dose and Petrol Rate map - properly prepared for a car (engine type) - is included in the dedicated configuration file and should not be modified if there is no obvious need.

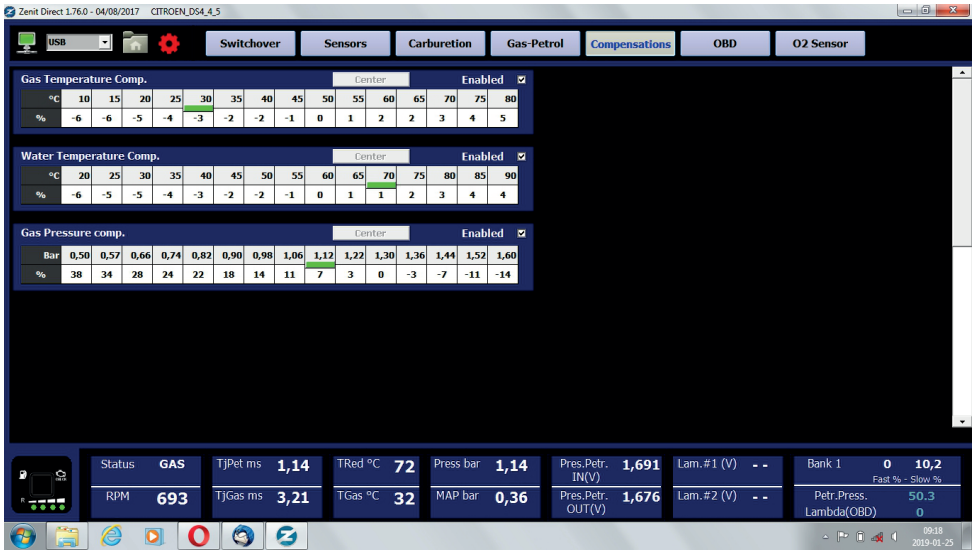
3.4 Power strategies

In this option, it is possible to set the switching only to gasoline supply for low and high revolutions (engine speed).

At low speed, *the system allows for switching to petrol in the set range of revolutions or descending to low revolutions on petrol and automatic return to gas after the injection of the appropriate number of gasoline cycles.*

The high speed *option gives the opportunity to work on gasoline in the set range of revolutions with additional condition for exceeding the required gasoline injection time.*

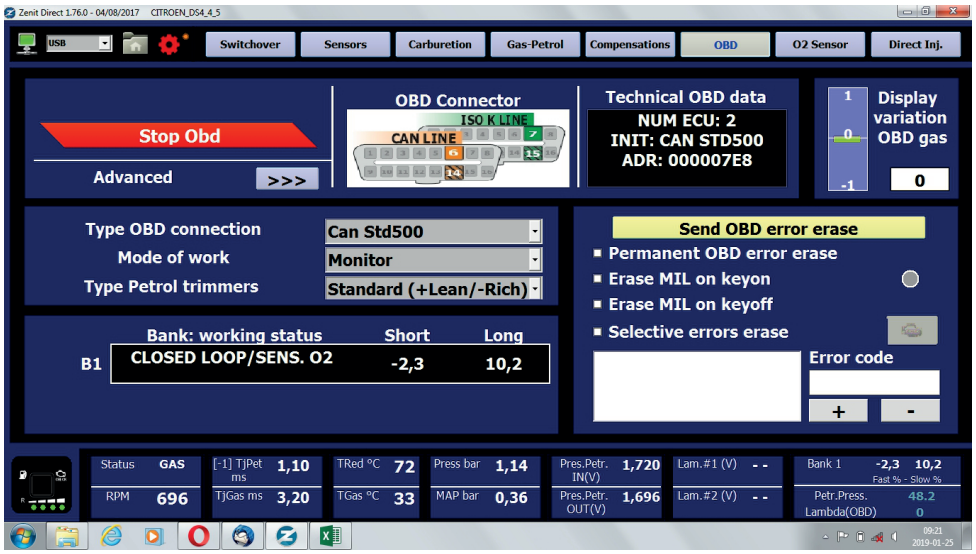
3.5 Kompensacje



*The **Compensations** tab contains tables that allow to reduce the impact of temperature and pressure changes on the gas-air mixture.*

At this point, we can check the condition of the compensation work and possibly turn it off (not recommended).

3.5 OBD



OBD type - *should be set automatically when activating the connection to the OBD system. It is also possible to manually change the communication protocol in case of problems with correct automatic detection.*
Work mode *– method of OBD operation;* ***Turned off -*** *all OBD functions are turned off;* ***Readings only -*** *the central unit connects to OBD and monitors (shows) the OBD parameters but the OBD adaptation does not work, i.e. the control unit does not update the OBD correction map and does not take it into account when calculating the gas dose;* ***Dynamic correction -*** *the control unit connects to the OBD system, reads the corrections and system status and on this basis updates the map of OBD corrections and corrects the gas dose;* ***Static correction -*** *the control unit does not connect to the OBD system and does not read the current parameters but corrects the gas dose according to the previously collected map of OBD corrections.*

ATTENTION: Recommended OBD work mode – Readings only.

Correction type - Normal *- a classical control system of fuel in which a positive correction means a tendency for a lean mixture and the need to increase the fuel dose, and a* ***negative correction*** *means a rich mix and the need to reduce the fuel dose; Reversed - a control system in which the corrections are reversed, i.e.: a positive correction means a rich mix, a negative correction means a lean mix (some VW cars);* ***Fiat -*** *system characteristic for some cars from the Fiat group, most often with the Magneti Marelli controller.*
Correction of the gas dose (%) *- shows graphically and numerically the average values of gas dose correction for various engine loads. In the OBD tab there is also the option of deleting the error codes from the OBD system of the vehicle and setting the rules for automatic deleting.*
The ***Advanced*** *button gives the access to additional functions of the OBD module (the option is visible only after the activation of advanced functions (the gear button)).*
The requested correction (%) - *the value indicating the base value of the mixture correction (i.e. the ideal one to acquire) which should be usually zero, sometimes in the cars with a high mileage, it should be checked how it works on petrol and in such cases it can be different from zero, for example: +5*
Tolerance - *this is the maximum difference between the currently read average correction and the value* ***"The requested correction (%)"*** *(at which) the adaptation does not introduce any additional corrections of the gas dose yet. For example, if* ***"the requested correction (%)"*** *is 10 and the range* ***"Tolerance"*** *is 5, the adaptation will be active if the OBD correction reading is less than 5 or greater than 15 and works so as to keep the correction in the range from 5 to 15%*
Load stabilization (s) - *the parameter defines for how long the vacuum pressure in the intake manifold should be stable, so that the system could store the sample in memory.*
Load threshold (%) - *load threshold (vacuum pressure expressed in percentage) above which the OBD adaptation will work. The load threshold prevents the map from being collected at very low loads, e.g. when braking the engine. Just before switching off the petrol injectors in some cars, large correction values are read even though the mixture is normal. After activating this function, such situations will not be taken into account when correcting the mixture.*
Threshold of engine speed (RPM) - *the adaptation will be active only when the engine speed is above the set value, e.g. if the value 1024 is selected, the system will not perform the OBD corrections at idle.*
Maximum correction of the gas dose (%) - *the maximum correction of gas injectors opening times.*
Reading delay (s) - *in order to prevent accidental change of the value corrections on the OBD corrections map, collecting the new data will be possible only after exceeding the set time.*
Tuning time (h) - *time intended for "learning", after this time the system switches from "Dynamic correction" to "Static correction" mode. Selecting the "Continuous" option means that this function is not active and the control unit will correct the gas dose by the whole time of operation according to OBD.*

4. Monitor

4.1 Monitor

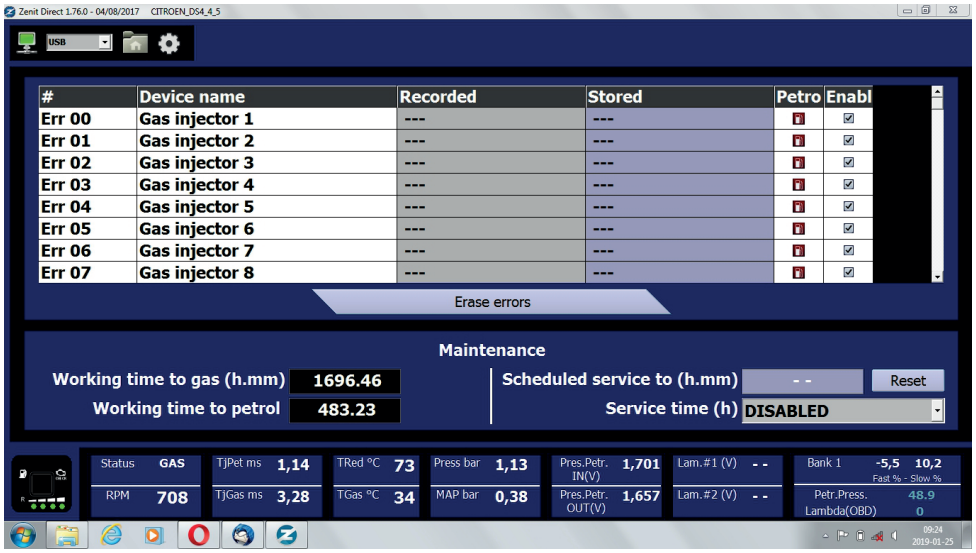
This tab allows to monitor the most important parameters and active functions of the system.

4.2 Recorder

The recorder *allows for simultaneous tracking of seven parameters and readings from the OBD system within a time function. The readings are made on a regular basis at the speed selected by the operator. The position of the lines of the individual charts and their scales can be freely changed. To do this, select the parameter you want to change - by pressing its name - and appropriate buttons set the required position. The active function has a highlighted area (under its name) in a color appropriate to the line of its graph.*

The recorder is a very useful diagnostic tool, thanks to which the operator can easily assess the condition and work of the entire installation. The course of the tracking functions can be saved on the disk for later analysis.

5. Diagnostics



The sequential gas injection system Zenit Direct has an internal diagnostic tool that identifies and remembers possible errors occurring during the system operation. In the diagnostics tab, you can read the saved and current errors and delete them after removing the cause.

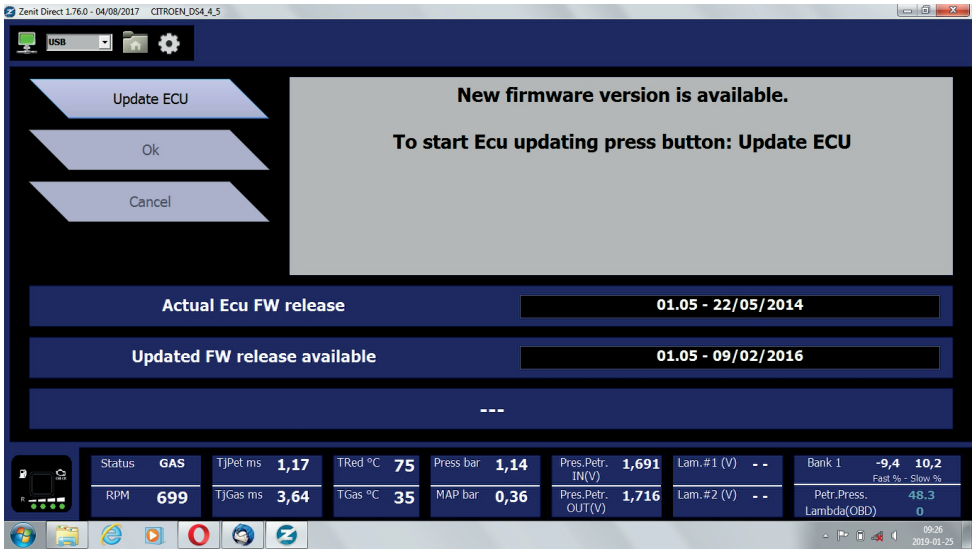
It is possible to choose which errors in the system are supposed to cause switching to gasoline and which of them are to be monitored and reported by the system.

In this window, the system also displays information about the time spent on gas and petrol. It is also possible to set up service reminders for the vehicle user about the upcoming periodic inspection.

6. Files

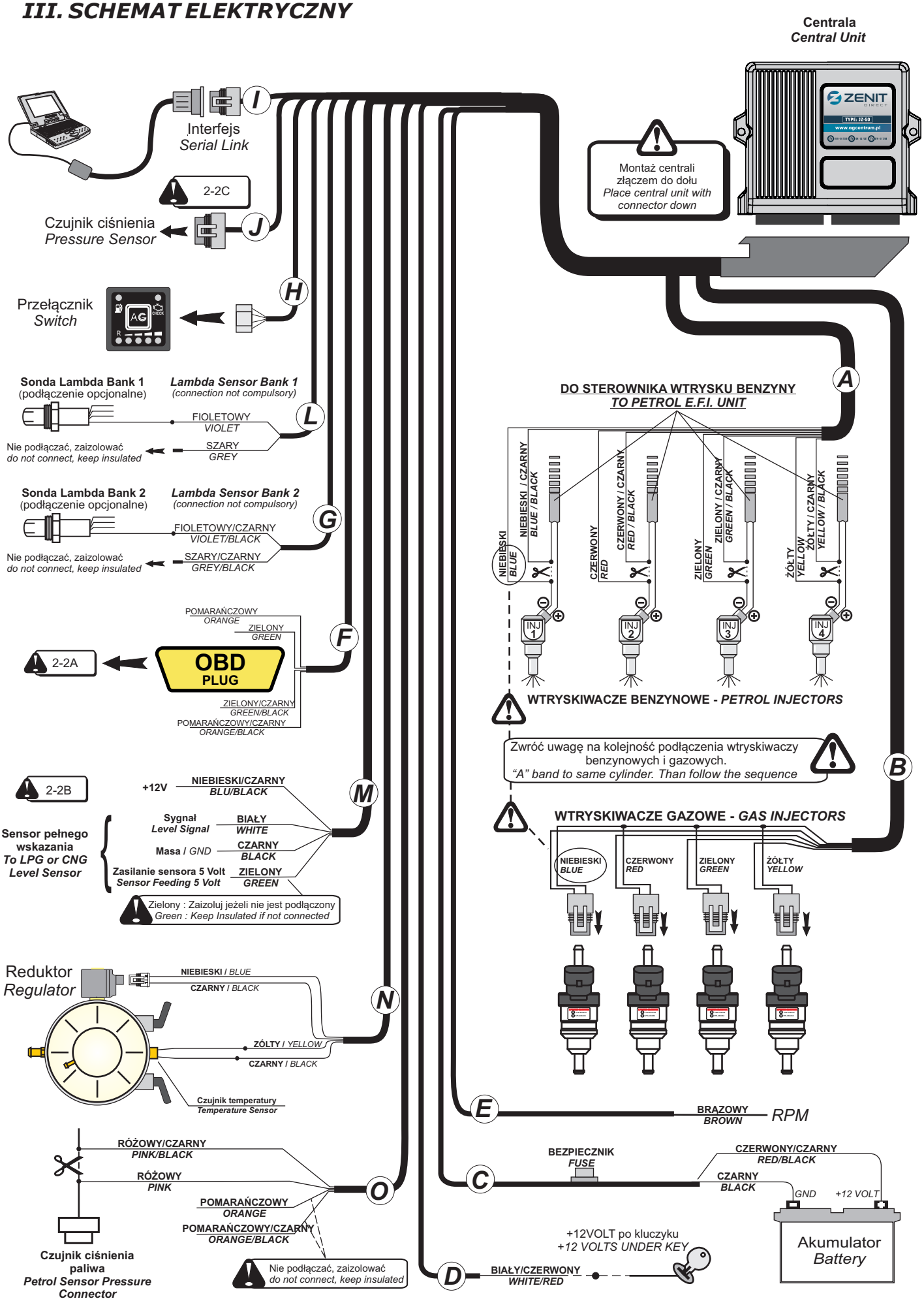
The window allows to save the control unit configuration to a file, load the configuration from a file and save it to the control unit and restore the factory default settings (Reset ECU)

7. Centrala



The Zenit Direct system software allows the control unit to update the firmware software. For the successful update, stable power conditions must be ensured. A special wizard guides you through the update process step by step.

III. SCHEMAT ELEKTRYCZNY

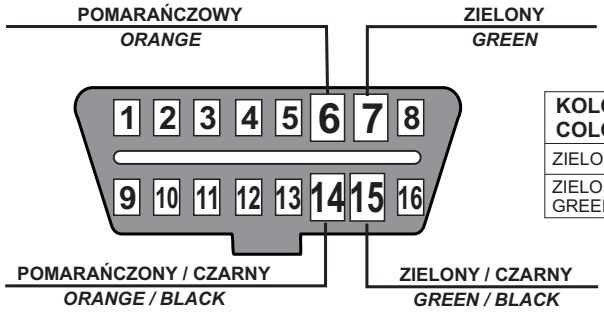


PODŁĄCZENIE DO GNIAZDA OBD
CONNECTION TO OBD PLUG

2 - A

CAN

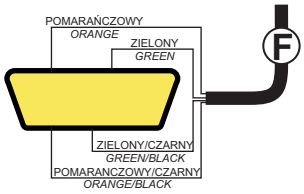
KOLOR COLOR	PIN
POMARAŃCZOWY/ *ORANGE*	6
POMARAŃCZ/CZARNY *ORANGE/BALCK*	14



(WIDOK OD FRONTU)
(FRONT VIEW OBD VEHICLE CONNECTOR)

ISO

KOLOR COLOR	PIN
ZIELONY/GREEN	7
ZIELONY/CZARNY GREEN/BALCK	15



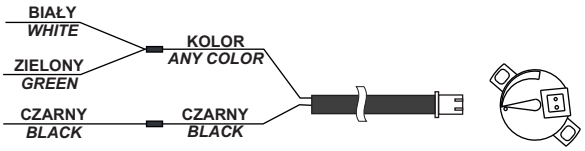
System moze pracowac bez podlaczenia do gniazda OBD w trybie 'OBD nie podlaczone'
If you not connect the ODB plug, the ECU works as a system not OBD

Należy podłączyć przewody do wszystkich aktywnych pinów w złączu, pozostałe przewody zaizolować.
N.B. In case some contacts in the OBD connector are not present, keep the relevant cables insulated

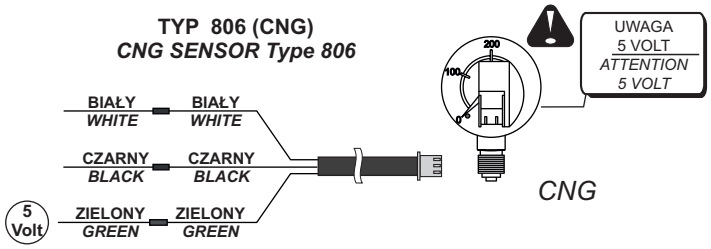
PODŁĄCZENIE SENSORA PEŁNEGO WSKAZANIA
LEVEL SENSORS WIRING DIAGRAM

2 - B

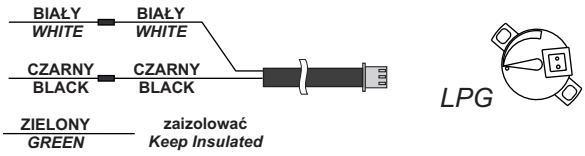
TYP 0..90 OHM
0..90 OHM LPG LEVEL SENSOR



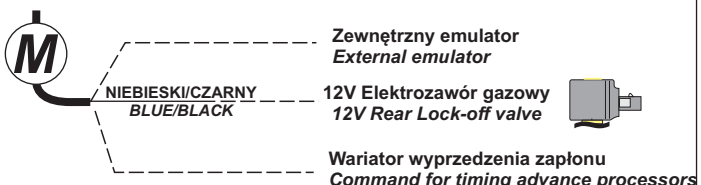
TYP 806 (CNG)
CNG SENSOR Type 806



TYP 1050 (LPG)
LPG SENSOR Type 1050



STEROWANIE ZEWNĘTRZNYMI URZĄDZENIAMI
SERVICES WIRING DIAGRAM

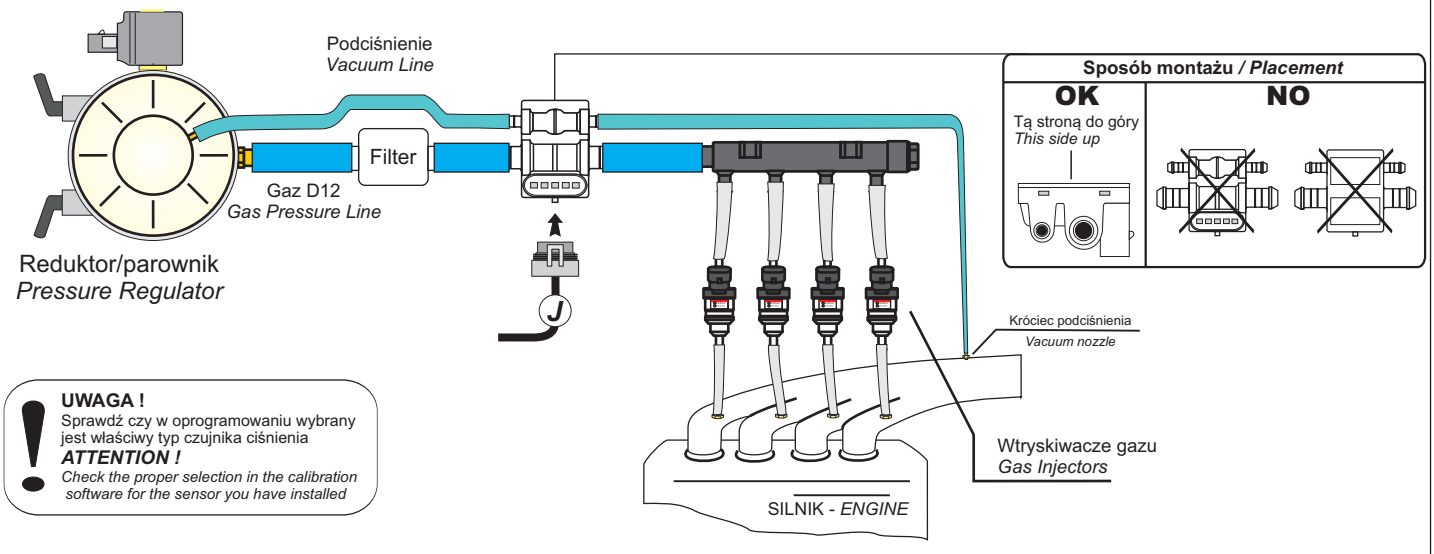


Przykłady zastosowania; WYBIERZ TYLKO JEDNĄ Z OPCJI
Possible connections; CHOOSE ONLY ONE FUNCTION

PODŁĄCZENIE CZUJNIKA CIŚNIENIA GAZU
PRESSURE SENSOR INSTALLATION

2 - C

Montaż z dala od źródeł ciepła (kolektor wydechowy, katalizator, itp.)
Install away from heat sources (exhaust, catalyst, etc...)



UWAGA !
Sprawdź czy w oprogramowaniu wybrany jest właściwy typ czujnika ciśnienia
ATTENTION !
Check the proper selection in the calibration software for the sensor you have installed