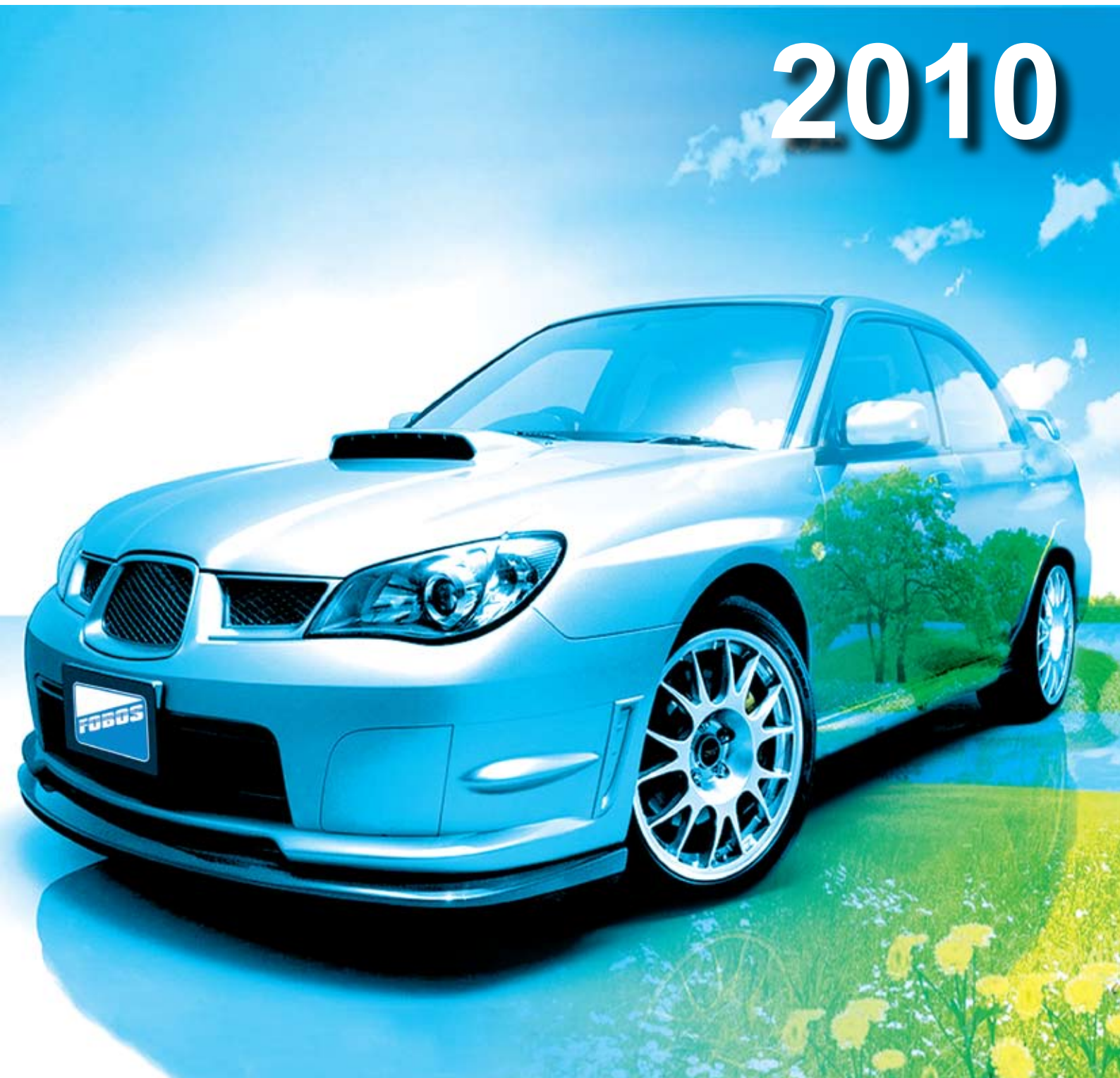
FOBOS
GAS EQUIPMENT

2010



The range of products by Fobos Auto Ltd aims to cover the entire range of prices – budget, medium and premium class. In fact, three basic LPG systems are being developed, all of them highly reliable due to the fact that the options for hardware protection have been improved and there is now full diagnostics for each component of the system. This is being controlled by integrated technologies for diagnostics and virtual demonstration. All the products by Fobos Auto are designed in a way to diminish any waste of time and money.

The powerful instruments of the software allow full control, fine adjustments and flexibility and also help the automobile repair shop workers to manage various challenges put forward by the growing number of new and modern automobile models.

The efficiency of the products offered by Fobos Auto comes as a result of the experience and continuous research in the field of petrol injection systems and their conversion into gas systems. Thanks to the high level of integration, the systems have become popular in a number of countries.

The range of products offered by Fobos Auto stand out on the market for LPG equipment and accessories since we use certified high quality components and units for the automobile industry.

The precise mixture of air/gas is monitored by a gas ECU, which analyzes the changes in the signals fed by the petrol ECU, the value of the voltage supplied, gas temperature and pressure and M.A.P. pressure.

How the system works

The liquefied gas from the tank is being passed down a pipe to the LPG valve and after that to the reducer-vaporizer. The gas pressure is lowered and the gas itself begins to vaporize (for LPG). A fine filter cleanses the gas from hard fragments. The fuel is injected separately in each cylinder, by means of electric gas injectors, which control the content of the fuel mixture. This principle is world known as “COMMON RAIL”.

The ECU is monitoring the condition of the petrol injectors and adapts itself. The way the system works is being changed simultaneously in accordance with the work of the engine, and the gas temperature and pressure.

The petrol/gas switching is done automatically when the gas temperature reaches the value which was previously set, and there is the option for limiting the rpm value. If the gas has run out, the system will switch over to petrol so that the engine will always have some supply of fuel.

The electric circuits of the Fobos Gas injection system are attached to the main electrical installation by coming into contact and not by breaking up the contact. This ensures the correct functioning of all the systems of the automobile and prevents the accumulation of mistakes in the basic ECU. The Fobos Gas injection system is an intelligent system, it controls and protects its own electrical circuits from short circuit and keeps track of any cut off circuits thus avoiding any possibility of incorrect installation. The system is highly adaptive, which makes it extremely compatible, highly reliable and dynamic.

The Fobos Gas injection system is also unique with its three operational modes – standard, economical and with increased power, suitable for differing styles of driving. When in standard mode, the settings are the same as those in petrol mode, the economical mode is suitable for taxi automobiles, and turbo – for sports driving.

Settings:

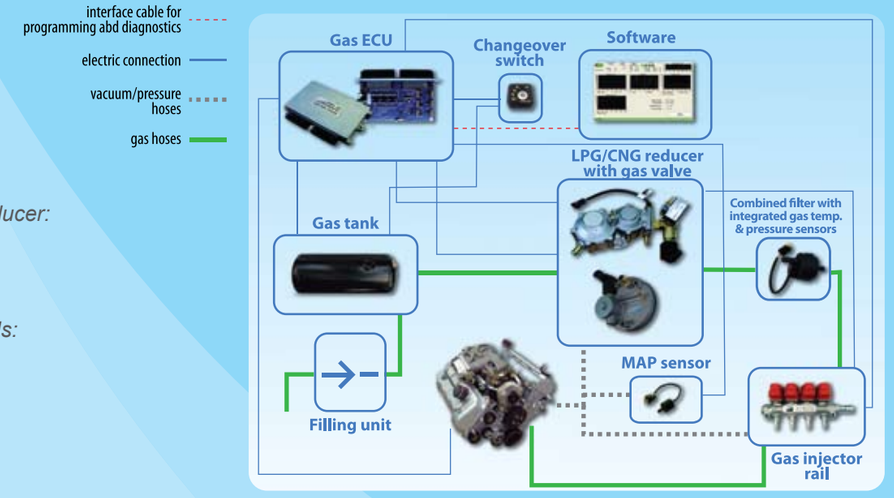
Number of cylinders:
3,4,5,6,7 and 8

Working pressure of the reducer:
0.9-1.8 DP

Maximum power with one reducer:
147kw/320PS

Feeding electrical voltage:
6.5 -18V

Impedance of the injector coils:
1-24 ом



Fobos gas injection system components

Fobos 1 gas ECU

FOBOS 1 ECU is designed in a way to work in a busy environment. The body consists of a robust, air-proof aluminum frame.

What distinguishes our system from its competitors is high reliability, due to the use of high-technology components that were designed especially for automotive use.

The main signals used in the process of control are: temperature of the cooling flow inside the reducer, temperature and pressure of the gas after the reducer, R.P.M., condition of the petrol injectors, pressure inside the intake manifold, two oxygen sensors, pressure inside the accumulator, gas/petrol switch over and the amount of gas inside the tank.

The inbound and outbound settings are being monitored by specially designed software which configures a number of functions.

Main advantages:

• The absence of electro mechanic switch, which commutes power chains, ensures problem free work of the system; and factors such as aging of the material and the counts of switching over wouldn’t matter.

• Staying alert for possible faults and writing them down in the memory of the system – similar to the petrol computers with codes for mistakes.

• The possibility to change the firmware of the gas computer allows the users to have full access to new versions. The diagrams used are compatible with fast injectors with resistance under 1 Ohm.

• Built in protection against short circuit and overvoltage at the input and output and overheating in the chains of the electro mechanic components, as well as overheating of the ECU itself, ensures fault detection under 2%.

Technical parameters:

Certified by homologation R67-01 for LPG and R110 for CNG.

Three versions: **3-4 cylinders, 3-6 cylinders and 3-8 cylinders.**

Ability to upgrade the firmware online.

Range of operation:
from -40°C up to +125°C

Fobos gas injection system components

Fobos 2 ECU

Based on Fobos 1, maintaining its complete functionality however only compatible with 3 and 4 cylinder aggregates.

The body consists of a robust, air proof plastic box.

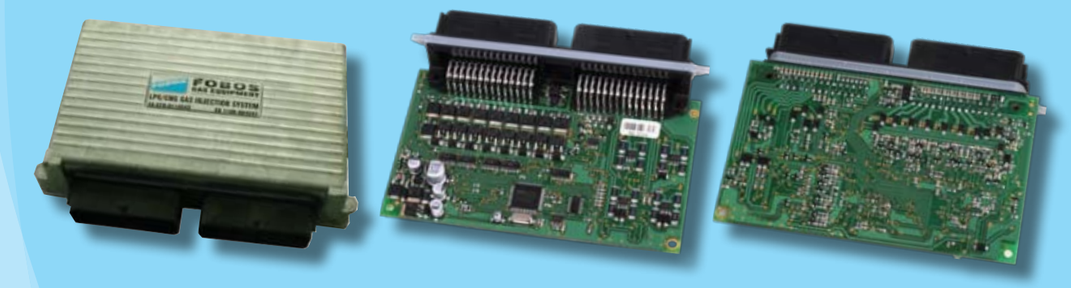
Range of operation from -40°C up to +125°C. Two 24 pin connectors by FCI have been used.

Fobos 3 ECU

Based on Fobos 1 and maintaining the same functions, however only compatible with 3 and 8 cylinder aggregates. CAN controller has been added which enables communication with OEM Can-bus.

This is a highly intelligent electronic unit for control, settings and diagnostics, which monitors the work of the engine and adjusts the injector time simultaneously. Synchronized with the basic automobile ECU and is learning from it.

The whole body is alluminium with range of operation from -40°C up to +125°C. One 56 pin connector by FCI has been used.



Fobos 4 ECU

Based on Fobos 2, with a much smaller box and only one 24 pin connector of FCI, maintains full functionality and supports 3 and 4 cyl. aggregates.

Change-over switch

A miniature button switch, fiitted inside the automobile coupe and easy to reach. When the switch is pressed, the system changes from petrol to gas and vice versa. Whether the car is running on petrol or gas is indicated by two colour LED lights and a sound signal. The automatic switch allows two modes of operation – manual and automatic. When in manual mode, the system switches over betwen petrol and gas when the switch is pressed by hand. When in automatic mode, the car starts on petrol by default and switches over to gas when the pre-defined settings have been reached (temperature or R.P.M.). The switch also displays the amount of gas in the tank.

Fobos gas injection system components

Harness

The harness of FOBOS gas injection system consists of a bundle of insulated tubing and FCI and AMP connectors. Every single cable is wrapped up in insulated tubing. The base of the harness is 56 and 24 pin FCI connector. All connectors are certified for automotive use.

The main purpose of the harness is to build an electrical chain between the components of the system inside the automobile.

LPG, CNG reducer

For the engine to function properly, the liquified fuel in the tank, LPG or CNG, needs to be transformed into gas by means of vaporization, and after that its pressure is reduced down to the value of the atmospheric pressure. These functions are performed by the reducer-vaporizer, which consists of a heating unit and a one level membrane pressure reducer. It has an integrated temperature sensor, which provides the necessary data to the gas ECU in order for the switch over to take place.

Valve

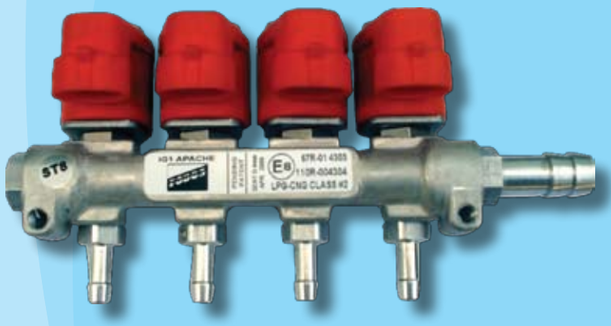
Very often integrated within the reducer itself. This is a normally closed stop valve, which follows an electromagnetic principle, and its function is to stop the gas flow from the tank when the gas system is switched off or the engine has accidentally stopped. It is fitted onto the tube which passes gas into the reducer. It usually has a gas filter as well which must be replaced every 10 000 km in order for the gas injection system to function properly.

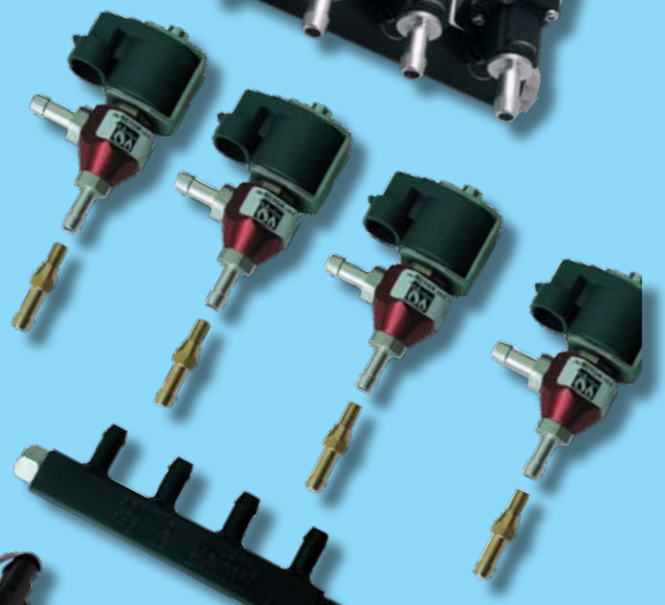
Fobos gas injection system components

Injectors

Their purpose is to feed each cylinder with an exact amount of gas individually.
The coils are 1.5 Ohm with opening time 2.1 miles per second and being so fast makes them suitable for any kind of automobile. They are fitted onto an injector rail and are controlled by the gas ECU on the basis of peak and hold principle. This type of control allows a more precise control over the fuel delivered into the injectors and prolongs the life of the injector unit, which makes them extremely reliable, easy and inexpensive to maintain.

All the possible types – basic, V-type and boxer engines have been provided for.





Fuel injection nozzle opening
1.5,1.6,1.7,1.8,1.9,2,2.1,2.2,2.3,2.4,2.5,
2.6,2.7,2.8,2.9,3,3.1,3.2,3.3,3.4,3.5,
Working pressure of the gas injectors: 0.8-4bar

Fobos gas injection system components

Combined filter of the vaporized gas with integrated gas temperature and pressure sensors

It comprises:

**A dismantling body*

**Integrated filter element, made of polythene and produced by the Polish company Certools, certified in accordance with R67-01 and 110R-01 standards*

**Temperature sensor which monitors the temperature of the vaporized gas*

**A sensor for the vaporized gas pressure which monitors the pressure within the system and delivers the necessary data to the gas ECU*

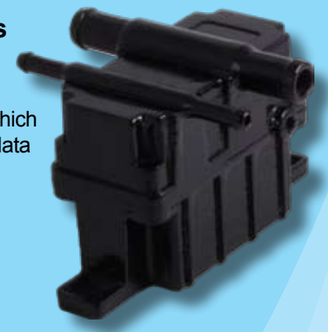
It is fitted behind the reducer and in front of the injector rail so that it can pick up any impurity which could somehow damage the injectors or deteriorate their work

M.A.P. sensor

Consists of a plastic body and pressure sensor. It monitors the pressure inside the intake manifold.

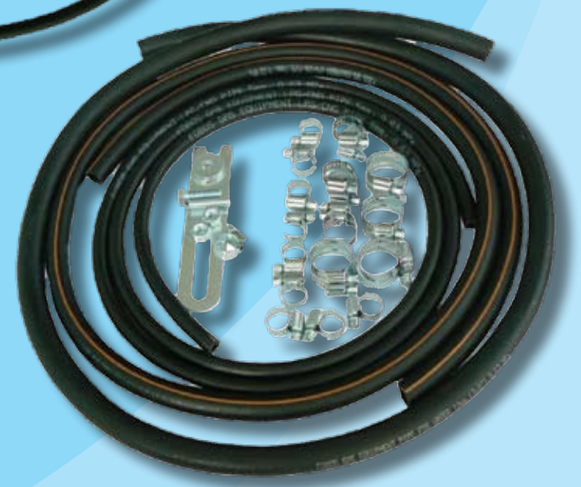
Combined sensor for gas pressure, M.A.P., gas temperatute and DP

A temperature sensor which monitors the temperature of the vaporized gas, and a sensor for the fluxional pressure of the vaporized gas, which monitors the pressure within the system and provides the nessecary data to the gas ECU.



Sensor for the reducer temperature

Hosepipes and accessories



Software

Software

The software for the Fobos Gas injection system is unique with its ability to install and adjust each value of the system according to the preferences of the client and the specifics of the automobile. Thus a more flexible and precise regulation is ensured.

Attention is paid to the self-diagnostic functions of the system and the diagnostics of the vehicle which aim to make the diagnostics of all the system components fast and accessible.

A system with codes for mistakes is established, similar to that of the petrol ECU.

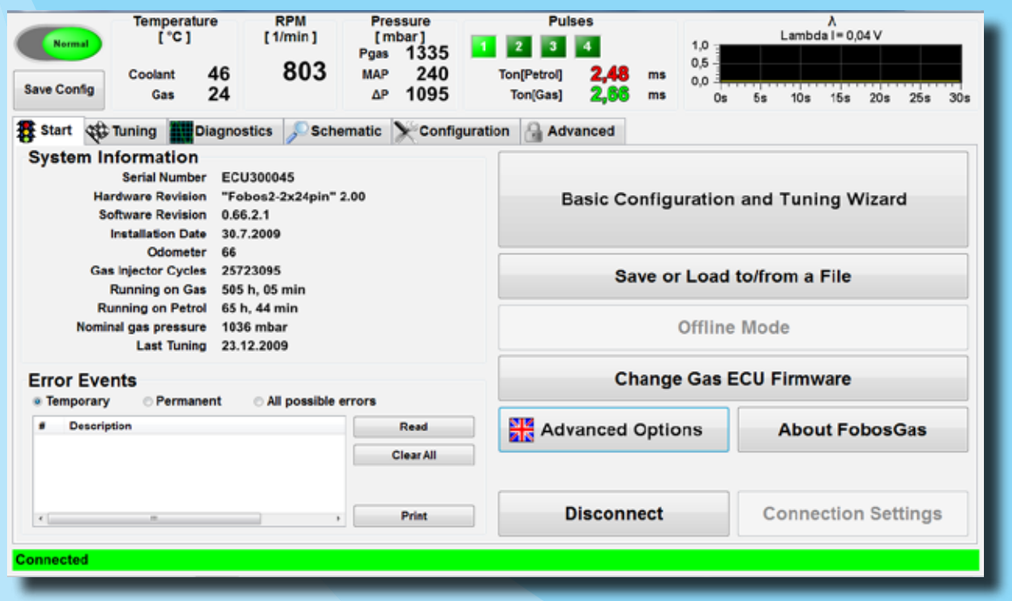
Possible faults:

1.Low gas pressure
2.Low reducer temperature
3.Very low RPM
4.No signal from the ECU
5.Malfunctioning gas pressure sensor
6.Malfunctioning MAP sensor
7.Malfunctioning reducer temperature sensor
8.Malfunctioning gas temperature sensor
9.The automobile starts on gas
10. Malfunctioning button
11.Overheating of a gas injector driver
12.Overheating of the gas ECU
13.Failure of the +5V pressure of the sensors
14.Failure of the pressure of the gas injectors and valve
15.Malfunctioning sensor of the reducer temperature (short circuit)
16.Gas Valve Trouble
17.Individual Gas Injector Trouble (short circuit)
18.Individual Gas Injector Trouble (open circuit)
19.Switch-over To Gas due to time-out

The software of the system is extremely flexible and enables the driver to regulate the system according to individual preferences, thus meeting the expectations of even the most exacting clients providing for standards Euro 3 and Euro 4. It has been designed according to the strictest requirements in the field of gas injection systems.

By downloading the appropriate firmware the system can be made to operate independently, not in series. In this way the fuel will be supplied according to the configured settings and engine environment.

The START page provides some basic information about the system installed on the vehicle, diagnostic trouble codes of the supported failures and gives a possibility to load existing well known settings and/or to begin a new configuration session.



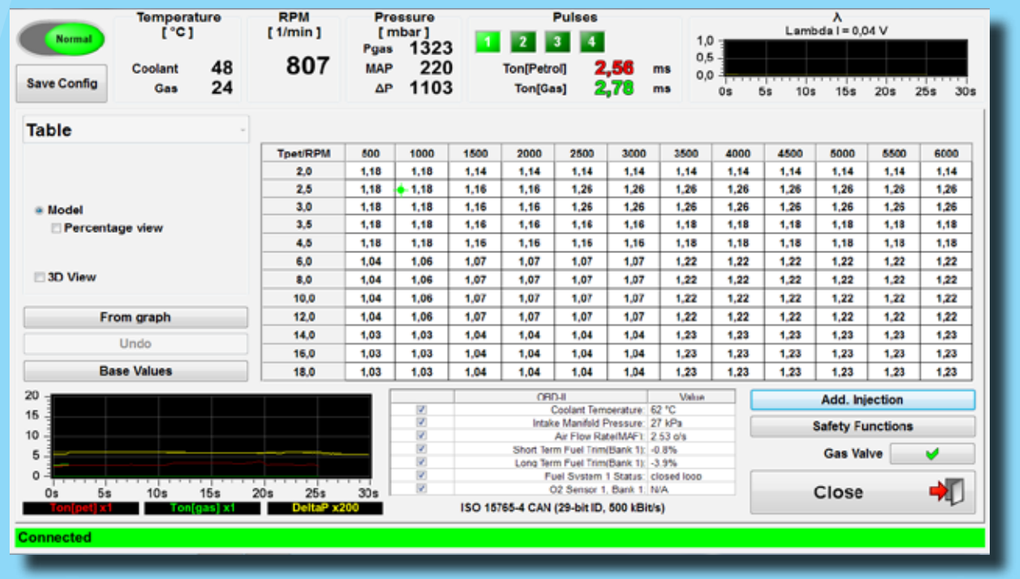
Software

The specified SYSTEM CONFIGURATION should correspond with the equipment installed on the vehicle.

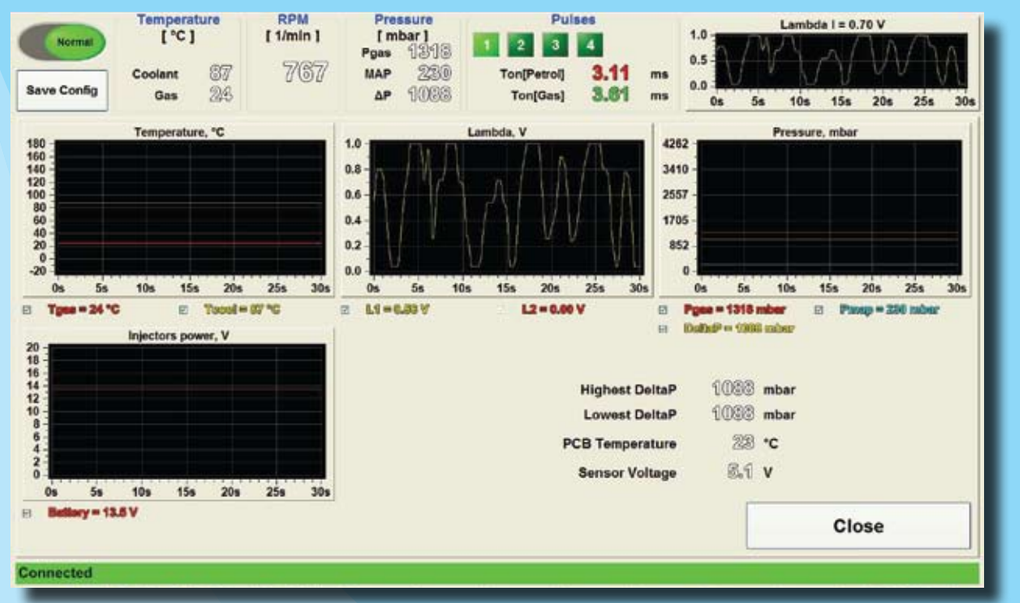
The FINE TUNING operation is available in two independent modes:

- SIMPLE mode - the response depends only on petrol injectors opening time;
- ENHANCED mode – the output is a function of two arguments – petrol injectors opening time together with engine RPM.
- The major OBD-II parameters can be monitored continuously while the operation is in progress.
- A set of real-time corrections depending on the environment is applied as well.

Software

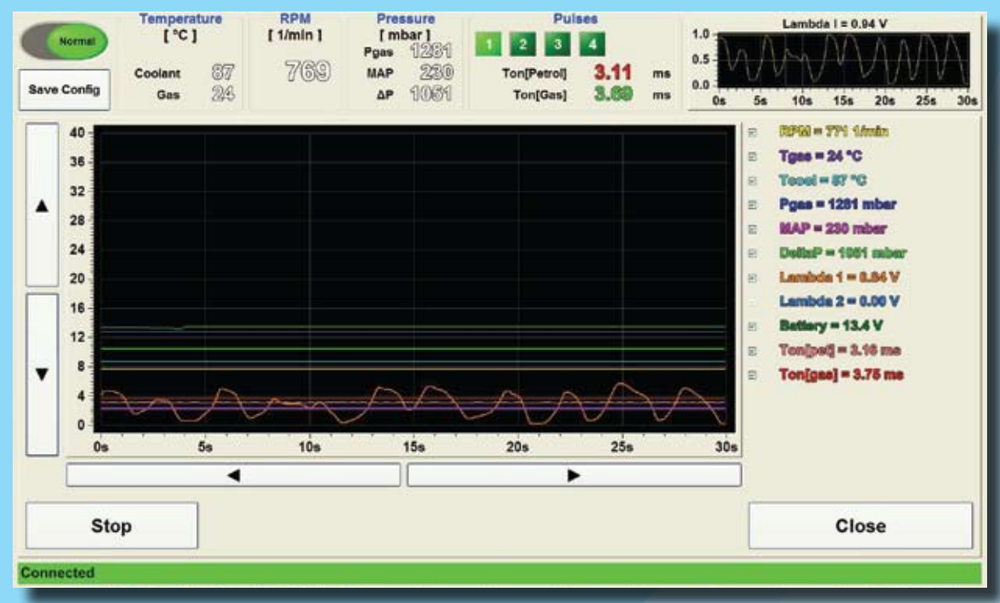


Attention is paid to the diagnostic and the self-diagnostic functions of the system which aim to make the use of the software faster and more accessible.



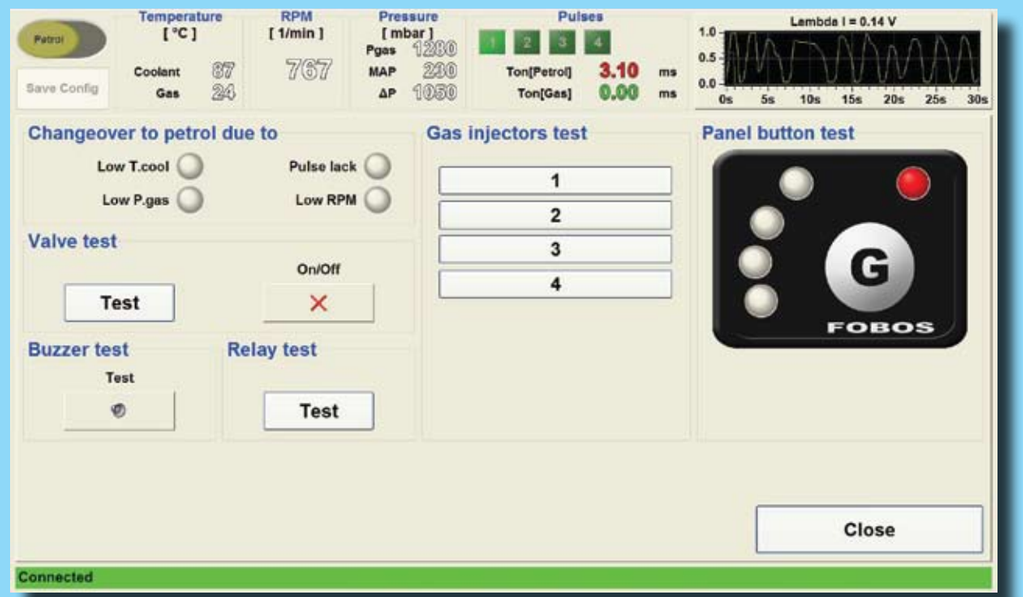
Software

Control, monitoring and log capabilities.

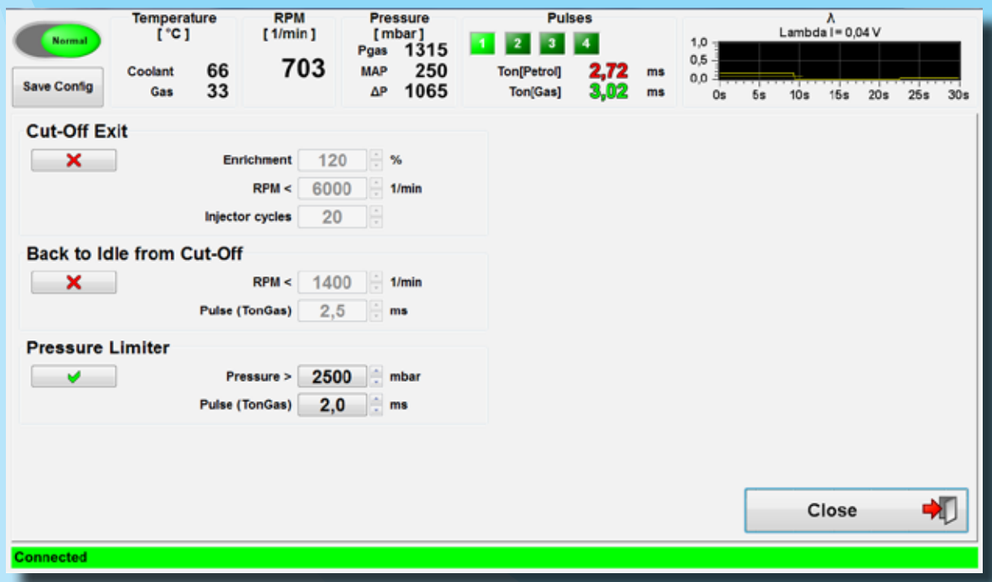


Software

The self-diagnostics plays an important part in detecting faulty components.
A few different tests have been developed:
• Testing the electro mechanical components –
this test is carried out when there is some uncertainty about the correct functioning of the gas injectors, gas valve and/or buzzer – each component is being fed with 10 consecutive impulses.
• Testing the electric connections –
all the components are being fed with signals and then their performance is carefully monitored.
• Testing the petrol injectors connectivity.

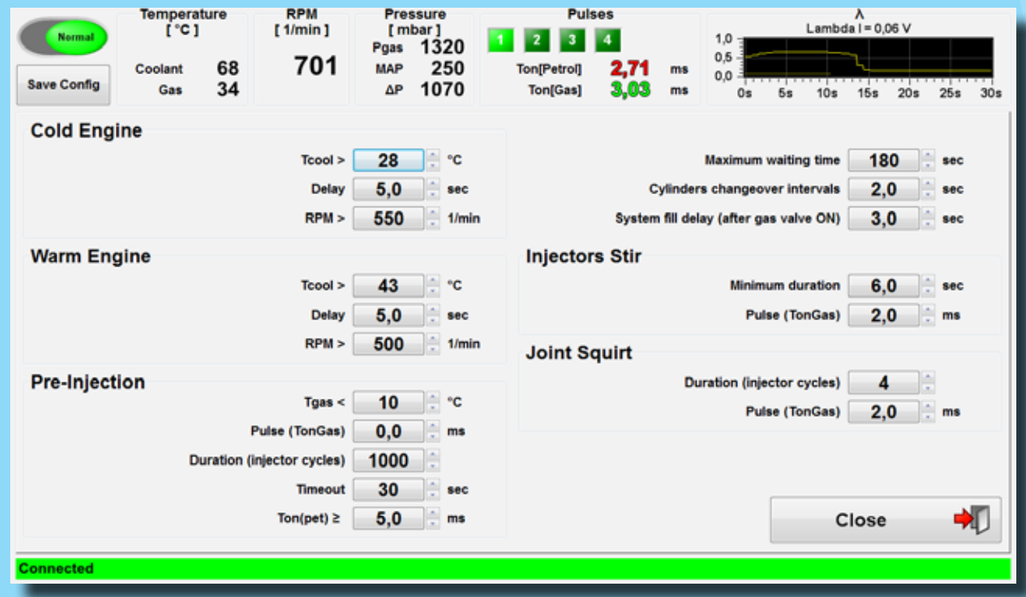


A set of features concerning different injection strategies during on and immediately after CUT-OFF is introduced:
• enrichment on cut-off exit;
• pre-injection on reducing RPM during cut-off;
• relieve the gas pressure in the rail (contribute to gas reducer pressure regulator to get back in range).



Software

The “SWITCHOVER to GAS” page gives an opportunity to specify a set of parameters that controls different phases of the procedure:
• awaiting conditions (cool/warm engine);
• pre-injection (exhausts the “cold gas” and/or “unwanted air” in the fuel supply tract);
• stirring gas injectors (warming-up gas injectors);
• joint cycles (petrol and gas simultaneously);



There are several parameters that define how the vehicle to change back to PETROL depending on driving conditions

Accessories

Filter

- A dismantling body
- Integrated filter element made of polythene
- Fitted behind the reducer and in front of the injector rail so that it can pick up any impurity which could damage the injectors or worsen their work.

Multivalve

EasyGas multivalve approved according to the European E67 directions, can be exclusively installed on ring-shaped tanks. It is manufactured also in the versions for ring-shaped tanks. EasyGas Multivalve is equipped with all the safety device and all the functions contemplated in the new European Set of Rules such as; refueling valve with automatic 80% filling limiting device, excessflow valve, on-off solenoid valve, 27 Bar safety valve with low-melting element, level gauge.

0 – 90 ohm resistive level indicator

Electronics

Universal 4 and 6 cylinder emulator for automobiles with injection systems

- Suitable for various injection system types
- Operation covering positive and negative type of injectors feeding
- Highly reliable and weather proof
- Relays and connections produced by Tyco Electronics

Gas/petrol switch over relay time

Suitable for carburetor and mono injection type of automobiles
Protective function covering the system in case of an emergency cut off of the engine: The gas valves are automatically switched off up to 4 seconds after an emergency engine cut off to avoid any gas leakage even if the ignition key is turned on.
Smooth adjustment of the time needed for initial gas supply covering a wide range of 0 to 8 seconds which enables the engine to start on gas effortlessly.
Anti-noise protection protecting all input and output exits with filtrating groups.
The harness joins the commutator with a highly reliable connection which helps make the installation easier.

Electronics

Automatic gas/petrol switch over

- three modes of operation – petrol, gas, automatic
- integrated injector emulator
- integrated oxygen sensor emulator
- trimmer for switch over rpm adjustment
- three integrated relays:
  1. gas valve
  2. injectors disconnection
  3. oxygen sensor emulation

Automatic gas/petrol switch over with a level indicator

- three modes of operation – petrol, gas, automatic
- integrated injector emulator
- integrated oxygen sensor emulator
- trimmer for switch over rpm adjustment
- three integrated relays:
  1. gas valve
  2. injectors disconnection
  3. oxygen sensor emulation
- four LED lights for visual presentation of the gas level
- compatibility with resistance sensors 0-90 Ohm and pressure sensors AEB type

Automatic gas/petrol switch over with a level indicator

- three modes of operation – petrol, gas, automatic
- trimmer for switch over rpm adjustment
- three integrated relays:

1. gas valve
2. injectors disconnection

- four LED lights for visual presentation of the gas level
- compatibility with resistance sensors 0-90 Ohm and pressure sensors AEB type

Change-over switch lpgpetrol for vacuum reducer compatible for carburattors cars

Lambda sonda emulator

Lambda emulator 1-5v frequency 1-2.5hz

The company was established in 1992 as a sole trader which basic activity was to repair taxi fiscal devices and to install car alarm systems.

In 1993 it started producing car alarm systems and protective systems.

In 1997 the company entered a new field – sale and maintenance of fiscal equipment. Then, in 1999, the range of company activities was broadened and a new multimedia unit was established to sell and rent out video and audio equipment and parts.

In 2001 the company began to sell and install automobile gas injection systems and later on, in 2004, it launched its own production of electronics for gas injection systems.

Due to the growing market demand, in 2005 the company started to develop and integrate within the production process its own brand of a gas injection system which injects the gas directly into the cylinders.

Nowadays, Fobos Auto Ltd has the following main activities:
- Production of automobile gas injection systems
- Production of electronic modules for gas injection system control
- Production of mechanical modules and components used in gas injection systems
- Import and export, wholesale trade and retail of gas injection systems and their components
- Installation and maintenance of LPG and CNG gas injection systems
- Full service
- Automobile audio systems
- Security systems for automobiles and office premises

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