GENERAL MANUAL

OF INSTALLATION

LPG SYSTEM

WITH ELECTRONIC INJECTION IN GASEOUS PHASE

WITH "MASTER/SLAVE" FUNCTIONING

Retrofit System

TYPE:

BORA LPG

GENERAL MANUAL

Part I

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Dear installer,

ZAVOLI srl wishes to thank you for your choice and inform you on a few points regarding phased sequential injection of **LPG or CNG** in gaseous phase ***BORA LPG***. It is a highly developed injection system, result of experience and continuous research of **ZAVOLI** within the manufacturing field of equipment for LPG and CNG systems for automotives, installable on multipoint petrol injection vehicles.
Thanks to the high degree of integration, ***BORA LPG*** can guarantee higher performances without sacrificing ease of assembly.

The purpose of this installation manual is to clearly and exhaustively guide you through system assembly, help you understand its functioning and scrupulously comply with its entire installation and configuration process.

ZAVOLI sends you best regards and reminds you that the **After-Sales Technical Assistance Centre** is at your complete disposal for any inconvenience.

RETROFIT KIT *BORA LPG*

INSTALLATION MANUAL

FIRST PART

The installation manual of the BORA LPG retrofit kit is divided into two parts. The first part contains all information of general nature, the second part contains a collection of the specific installation sheets of each individual vehicle.

MAIN TABLE OF CONTENTS

(FIRST PART)

MAIN TABLE OF CONTENTS

1. DESCRIPTION OF THE *BORA LPG* RETROFIT KIT

1.1. The *BORA LPG* Retrofit System

The new Zavoli srl system is for gas sequential electronic injection fuelling in gaseous phase with “Master/Slave” functioning for controlled ignition engines. The retrofit kit is available with different configurations for better adaptation to every specific requirement. The main components of the retrofit kit that can be supplied:

- Control unit
- Main wiring
- Change-over Switch
- *ZETA* Regulator – vaporiser
- Gas injectors *PAN-JET*
- SENSATA Gas pressure sensors
- Filters
- LPG Solenoid valve
- Piping for system hydraulic-pneumatic connection
- Smallware for system assembly.
- Use, maintenance and warranty manual for the system user

Fig.1.1-1

1.2. Features of the *BORA LPG* Retrofit Kit

The ***BORA LPG*** system is realised by means of the most recent designing techniques, an accurate study of the used materials, leading to full quality control on production, enabling installation on advanced generation GAS system vehicles. Therefore, the system is designed in full compliance with the most recent European technical Standards and approved according to regulations UNECE R67-01 – UNECE R115-00. The modern electronic management of Gas ECU, makes the system non intrusive in that it does not amend the original petrol and gas fuelling systems to the engine. The ***BORA LPG*** retrofit system is defined, on the basis of its functioning principles, a "Master/Slave" type system, in that its electronic control unit, Gas ECU (slave), is able to change-over the control strategy of the Petrol ECU (master) to GAS.

1.2.1 Until reaching the *BORA LPG*

During the years the gas fuelling systems have suffered significant changes due to a revolutionary phenomenon of the engine fuelling systems that has in the last ten years, determined the definitive disappearance, for petrol engines, of the old carburettor fuelling systems, to the advantage of the more modern electronic injection systems, more reliable, safe and less polluting, a very important aspect for the entire population.
In the old generation systems, commonly called "of traditional type", the fuel dosing device is made of a mixer that sees to the continuous gas supply, which entity is determined only by the existing depression in the engine inlet manifold and by the position of one of the regulator screws or of a step-by-step motor.
A traditional type system has revealed to be inadequate to equip the modern vehicle provided with the most sophisticated electronic solutions for carburetion control.
This is why electronic injection for gas also has been essential.
The first systems of this type did not, in fact, give a real solution to the problem having a logic substantially similar to that of traditional systems, in that fuel injection happened with continuous flow ("non master/slave" type system), very different from the phased sequential with which the original control unit manages the engine.
until reaching the ***BORA LPG*** kit with "Mater/slave" sequential type fuelling management, that translates in:

- Reliability.
- Performances.
- Greater respect for the environment.

1.2.2 Reliability

Another fundamental aspect regarding the conversion of vehicles with gas systems.
The risk of unwanted mix combustions accompany the use of gaseous fuel for its natural tendency to easily and widely diffuse, the greater the possibility that it can store itself inside the engine inlet manifold.
In particular functioning conditions, such phenomenon can often cause self-ignition of the load with consequent damages to the manifold.
The above is history, in that, as said, the ***BORA LPG*** injection system realises a *sequential* type injection; the amount of injected gas for each engine cycle is that strictly necessary for individual ignition and is introduced inside the manifold through a *sequence* of impulses, perfectly synchronised with the engine *phases*. This prevents any gas storage as the injection nozzles are installed immediately upstream of the inlet valves.

1.2.3 Performances

With the use of old generation, traditional type, systems a drop in performances was inevitable. By adding a device (mixer), upstream of the inlet manifold, that reduces the air passage section, with consequent fluid dynamics load loss meaning a more or less sensitive drop of engine performances, both with petrol and LPG fuelling during normal functioning.
The ***BORA LPG*** retrofit kit manufactured by ZAVOLI does not in any way alter the original engine fuelling circuit, therefore its petrol performances. For the same reasons, performances with gas fuelling are significantly higher compared to those achieved with traditional type systems.
In view of the above, the retrofit kit can be considered of "non-intrusive" type compared to the original engine fuelling system.
A system with "master/slave" functioning confers elasticity and quick response to the engine, thus drastically reducing the classic acceleration delays typical of old generation gas systems.

1.2.4 Greater respect for the environment

Zavoli srl has always been very attentive and respectful of the anti-pollution regulations.
The European anti-pollution Standards establish increasingly restrictive limits for toxic substances to exhaust. Currently in force is the EURO 5. All newly registered vehicles within the member states must be compliant with such Directive, even if fuelled with alternative ecological fuel which LPG and CNG.
These fuels are a lot less polluting than petrol in that they contain a reduced amount of damaging substances.
In addition to petrol, toxic additives are added to increase the number of octane, something which is not present in the above alternative ecological fuels. Therefore, a vehicle converted to gas has always a minor environmental impact when using this fuel.
The precise gas dosing control realised by the ***BORA LPG*** retrofit kit, allows fuelling with a stoichiometric mix, to have the right mix strength fuelling the engine in its every situation, fundamental to obtain greater reduction of the polluting agents in the exhaust,

to guarantee an excellent catalyst functioning such to have maximum decrease of the statutory polluting agents (CO, HC, NOx).

1.3. WARNINGS

1.3.1 In case of maintenance or repair stop

In case of bodywork stop for repainting in kiln, pre-emptively remove the LPG tank.
In case of repair of vehicle mechanical, electrical, bodywork parts, it is at the discretion of the operating personnel to evaluate the removal or movement of gas system parts.
Attention: for safety reasons, the movement or removal of parts or of the entire gas system, must only be carried out by a Zavoli authorised installer.

1.3.2 Environmental functioning conditions

The system is designed to work with environmental temperatures between **–30 °C and +60 °C**.

1.3.3 After an accident

The system must always be checked by a ZAVOLI authorised installer.

1.4. Functioning strategies of the Retrofit System

The BORA system is standard with the petrol system, meaning it ensures that during gas functioning it is still the petrol control unit to determine the amount of fuel to send to the engine. It can also be said that BORA is a "passive system" or "slave", or that BORA works as "interpreter" between the petrol system and the gaseous fuel management. The BORA system functioning is based on the fact that the BORA control unit is connected to clamp or clamps of the petrol control unit piloting the injectors (fig. 1). In this way, it recognises the petrol injection time (Ti). (During gas functioning, the injectors signal will be recognised by the presence of injectors emulation integrated in the same system). Thanks to Ti and to engine revs signal, the BORA control unit calculates the petrol capacity that the original control unit intends to supply to the engine, converts it in gas capacity and realises it by opportunely piloting the gas injectors. This is a very important choice because to enable the petrol control unit to be constantly working and to itself pilot the gas dosing, allows to clearly and transparently realise functions such as stoichiometric control, enrichment in full load and cut-off in release according to the criteria envisioned by the manufacturing company, limiting of the maximum rotary speed, consistent management of petrol steam dispelling, correct communication with air conditioning system, etc. All this without faulty error codes arising.

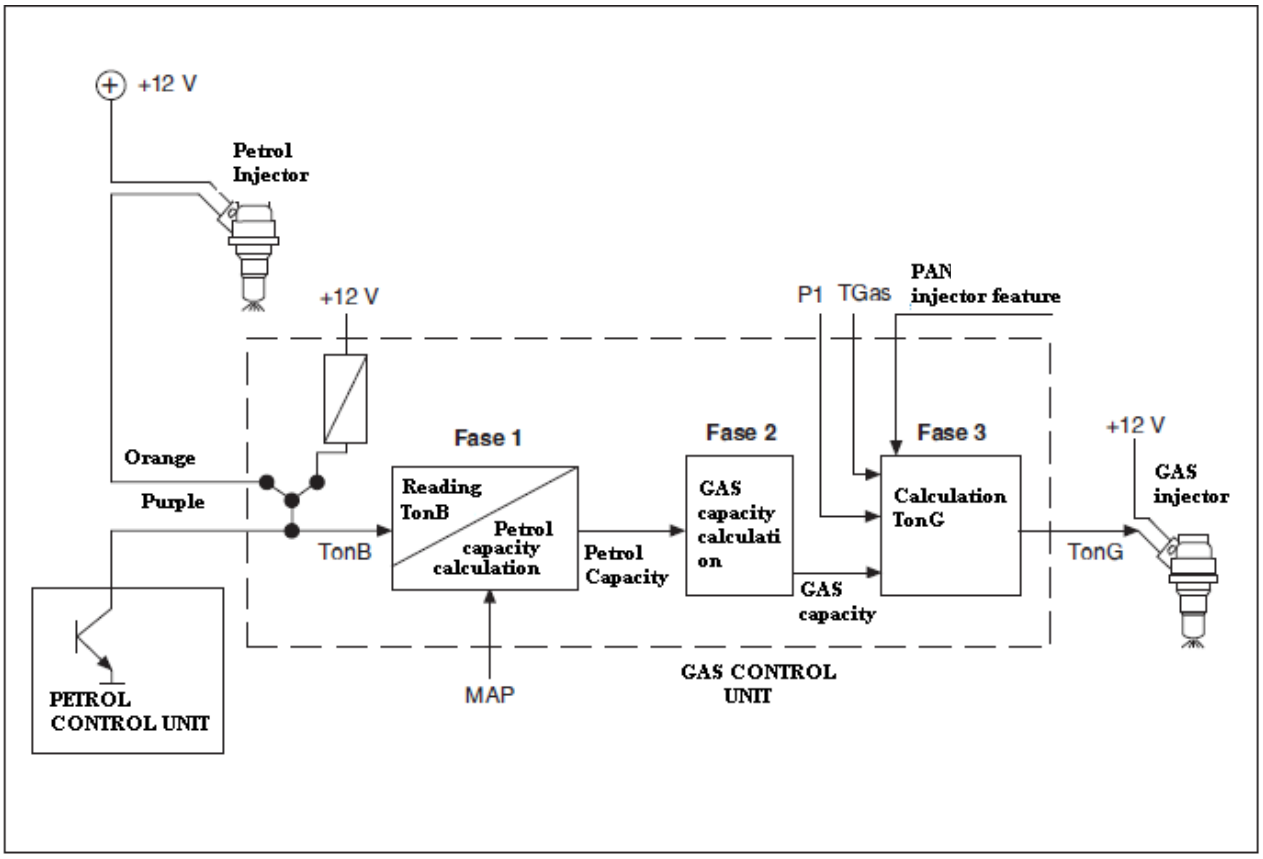


Fig.1.4-1

Master/Slave type functioning layout

Everything remains unvaried with regard to the petrol system, therefore, the eventual appearance of an error message during petrol or gas functioning, is to be considered real and credible. Furthermore, if the vehicle has petrol functioning problems, they also occur in gas functioning. All this is necessary when wanting to also submit gas functioning to the strictest OBD anti-polluting Standards. The low impedance gas injectors are piloted in *peak & hold* mode, bearing in mind the gas physical parameters (temperature and absolute pressure) read by the control unit.
It is important to highlight how Ti is a precise and precious parameter as it is the result of sophisticated calculations implemented by the petrol control unit on the basis of a complete and specific sensor. Given that the gas temperature and pressure conditions can vary depending on the use conditions of the vehicle, the system has adequate temperature and absolute pressure sensors located on the gaseous fuelling of the injectors and on the inlet manifold. The control unit can adjust its calculations in real time and, in particular, can correctly work also in the presence of substantial adrift from said parameters.
The regulators used in the various configurations tend to maintain a practically constant pressure differential between the gas outlet pressure and the inlet manifold, as it happens with many petrol systems. This contributes to optimising the system functioning, but is not essential, in that the control electronics act faster than happens in terms of pressure regulation. For example, following sudden acceleration, the pressure in the regulator rises using a fraction of a second. During this time, the control unit fulfils various calculation cycles and sees to compensating each
delay of mechanical nature. As it can be imagined, the control unit, as well as the general functioning program of the system, must contain the specific car model data on which it is installed (it is a complex set of maps and other mapping-calibration parameters). The personal computer is also used as diagnosis instrument to check the good system functioning or to identify any anomalies.

Avoid the petrol tank emptying completely. For both the L.P.G. version and the CNG version, it is always necessary to keep an amount of petrol equal to 1/4 or 1/2 tank and periodically refuel it. Please note the importance of always having petrol in the tank also because it is necessary to regularly work the vehicle with petrol, in order to maintain the entire original fuelling system perfectly efficient.

In case the vehicle cannot start with petrol (e.g. problems with the petrol pump, etc.), it is possible to start it with GAS and to do this, see par. "change-over switch functioning".

1.5 General description of the components

The ***BORA LPG*** retrofit kit is made of components located on the vehicle as represented in figures 1.5-1.

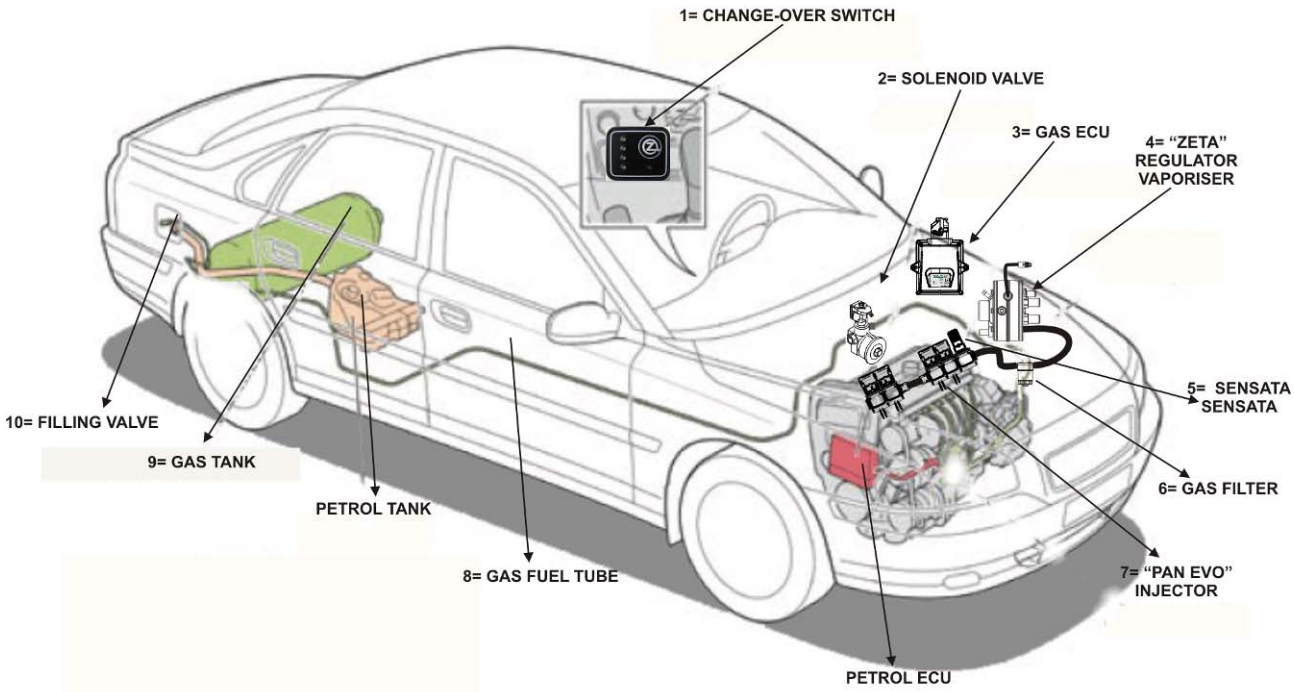


Fig.1.5-1

BORA LPG RETROFIT KIT MAIN COMPONENTS KEY	
POSITION	**DESCRIPTION**
1	CHANGE-OVER SWITCH
2	SOLENOID VALVE
3	GAS ECU
4	ZETA REGULATOR VAPORISER
5	SENSATA SENSOR
6	GAS FILTER
7	PAN-JET INJECTORS
8	GAS FUEL TUBE
9	GAS TANK
10	FILLING VALVE

1.5.1 ZETA Regulator/Vaporiser

The kit is equipped with regulator/vaporiser called **ZETA**, for managing the working pressure and is available in two versions, **ZETA N** (normal) and **ZETA S** (super). The regulator shown in figure 1.5.1-1, is compact-sized and takes up very little space.

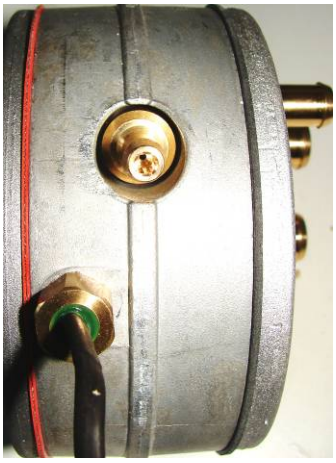
1.5.1-1

It is the device in which the gas changes from liquid state to gaseous state, with consequent pressure reduction.
The gas coming from the tank reaches the regulator in liquid state. Here it undergoes pressure reduction following lamination, switching from liquid to gaseous state.
For such transformation to be completed, it is necessary to bring heat taken from the engines' cooling liquid. It also has a pressure relief valve and an integrated water temperature sensor.
Therefore the single stage type **ZETA** regulator, is equipped with a thermal exchange surface such to allow complete gasification even during most extreme use situation (e.g. low ambient temperature, high load for long journeys). For the kit to function correctly, maintain the pressure difference constant between regulator output and engine inlet manifold. As upon increasing of the engine load, the absolute pressure in the inlet manifold increases (called MAP, Manifold Absolute Pressure), therefore, if the regulator outlet pressure is constant the pressure difference would decrease, as would the supplied gas capacity. This is realised by means of a "compensation" circuit, using a rubber tube as communication between the chamber containing the contrast spring and the engine inlet manifold.
All connections on regulator are at the front, figure 1.5.1-1, gas inlet, gas outlet, valves for water circulation, whereas at back, figure 1.5.1-2 are the fixing screw, the depression valve and in the central part is the screw used to regulate the pressure (use a 4 Allen wrench).

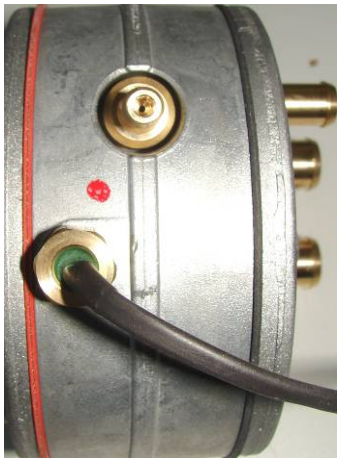
1.5.1-2

Figure 1.5.1-2 indicates the overpressure valve that must be connected to inlet manifold, according to prescriptions of chapter 2.

To recognise whether the regulator is ZETA N (figure 1.5.1-3) or ZETA S (figure 1.5.1-4), check the mark near the water temperature sensor. The presence of an N identifies the normal regulator, whereas an S identifies the super regulator. As well as by the S, the super regulator is recognised by a red seal.



1.5.1-3



1.5.1-4

IMPORTANT:

The pressure of the **ZETA N** regulator must be **1.2** atm, whereas that of the **ZETA S** regulator, must be **1.5**, remember to select the used regulator on the program.

1.5.2 GAS ECU

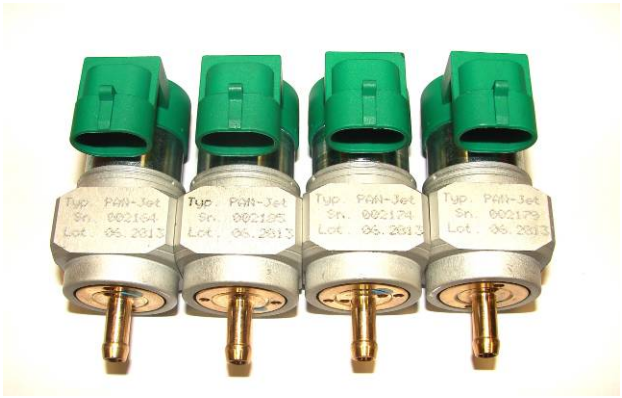
1.5.2-1

1.5.2-2

The control unit works as operational control unit controlling the entire system. It is fully realised with automotive components, suitable for supporting the temperature of the engine compartment, even if it must not be installed near scorching devices such as the exhaust manifold. It holds recently conceived components, provided with
greater data processing speed compared to most original petrol control units. The memory holding the program and calibration data is not volatile, therefore, once programmed, the BORA control unit can even be disconnected from the battery without loss of data. It can be repeatedly programmed, for example it can be transferred from one vehicle to another and re-programmed. Certain data acquisition channels are realised so that they
can be connected to different signals from one vehicle model to another (e.g. TPS, MAP, etc.). The task of the control unit is to collect and process all information and consequently check the various system functions.
The Sequent system is able to guarantee best integration at electronic and communication level (through K and CAN BUS serial line), keeping the petrol control strategies unvaried and precisely and quickly "translating" the injection times of the petrol control unit in corresponding gas injection times, automatically adapting to the pressure and temperature variations of the same gas.
Arranged with an efficient and functional diagnosis system on each sensor and actuator of the system, it is suitable for satisfying the OBD regulations.
The control unit is contained inside a fully watertight robust aluminium and plastic body shell, able to support very high temperatures and to protect the electronics inside it from external atmospheric agents and from the mechanical stresses it is submitted to, from the electro-magnetic radiations radiated from the engine electric components or from other sources (transmitters, repeaters, mobile phones, etc.).
Note that the control unit has been designed to resist to prolonged short circuits, towards battery mass and towards positive, on each of its input/output wires (except power supplies and masses).
This allows not to ruin the control unit even when in presence of the more common wiring errors (reverse polarity, incorrect connection of one or more wires, etc.).
Connection to wiring happens through a single connector containing all signals necessary for the various functions performed, limited to the piloting of maximum 4 injectors. Integrated inside the control unit are the following functions, before obtained through installation of different external components:
• “**modular**” function for the interruption and emulation of injectors,
• the control unit contains the main **adapters for lambda probes “in current” and “powered”**, to be assembled externally in the other systems.

1.5.3 Gas Injectors

Two types of injectors can be combined with the ***BORA*** retrofit kit.
The first is the rail **PAN-JET**, figure 1.5.3-1, whereas the second is the injectors rail **IG1**, figure 1.5.3-2.
The injectors dose the gas coming from the regulator for the individual cylinders opportunely piloted by the gas ECU. Functioning is of electro-magnetic type, made of one or more coils piloting a shutter for the flow opening and closing.
The injector is connected, by means of a fitting, to tube inlet coming from the regulator and, by means of a calibrated nozzle or jets, depending on the used injector type, to tube outlet connected to inlet manifold, near the inlet valve. The section of the outlet nozzle to injectors is opportunely chosen depending on the specific power class of the engine.
The injectors must be installed as close as possible to the inlet manifold leg, using rubber tubes of equal length, and the connection distance between the injectors and the fixing point of the injection nozzle must be as reduced as possible.



1.5.3-1

1.5.3-2

1.5.4 Gas temperature and pressure sensors

1.5.4-2

This sensor 1.5.4-2 with compact body and already integrated with connector, is available in the version with P1 pressure sensor and gas temperature sensor.
The gas temperature and pressure measurement is more accurate with this sensor and allows
quickly intervening in gas carburetion corrections.

1.5.4.1 Manifold Absolute Pressure Sensor (Map)

1.5.4.1-1

This sensor (pict. 1.5.4.1-1) is light, small and easy-to-fix to the car body. It has a pressure sensor suitable for both aspirated and turbo-CNG engines, allowing an accurate setting on every kind of vehicle.

1.5.5 System hydraulic-pneumatic piping and fittings

The piping is the end part of the retrofit kit fuelling circuit. The gas flows through it near the inlet valve. Its location defines the physical point where gas is delivered to individual cylinder. From here derives the importance of scrupulously complying with the installation methods described below. Connection between the injectors outlet tubes and the inlet manifold, happens by means of brass fittings to be fixed on the inlet manifold.

The retrofit kit is correlated by the following tube diameters, depending on use:

- Diameter 15 water tube with relative joints and strips. Take water from a point where constant flow is guaranteed.
- Diameter 5 tube used for depression connection to regulator.
- Diameter 5 tube, used for connection from injectors to injection fitting on inlet manifold.
- Diameter 10 tube, used for connection between regulator and injectors.

1.5.6 Main wiring

The instructions below are generally valid and essential for good understanding of the system.
The control units connect with the remainder of the electric system of the BORA LPG system (power supplies, masses, signals, sensors, actuators, etc.) containing all signals necessary for the various functions.
Most of the wires are terminated on pre-wired connectors, thus making it very easy to connect the system elements to the control unit. Also, the conductors are split in more sheaths to simplify installation and acknowledgement
of the various wires.

All connections relating to unterminated wires on connector must be carried out by means of adequate insulation and correct soldering iron. Absolutely avoid carrying out connections by simply wrapping the wires or using other barely reliable systems.

1.5.7 Change-over switch

1.5.6-1

It is a change-over switch with separate buzzer, with 4 green LED level indicator to indicate the gas level and
eventual error signals and by a two colour LED (green-red) to indicate functioning with gas or with petrol.
Unlike the change-over switches until now supplied, the One-Touch change-over switch has one position. The fuel variation is acknowledged every time the button is pressed.
The control unit recognises and memorises the fuel state (gas or petrol) the moment the vehicle is switched off, so that the same state is proposed upon subsequent ignition. Therefore, if upon switch-off the vehicle is in gas state, the gas state is memorised upon ignition (the same for petrol state).

1.5.8 LPG solenoid valve

The liquid LPG on-off solenoid valve coming from the tank and going to the regulator, is compact-sized and takes up very little space.
It is installed directly on to the regulator or upstream of the same. It is a normally closed device that prevents the passing of the LPG when not electrically powered. Also, the filters replacement and/or cleaning, happens without disconnecting the fuelling tubes.

1.5.8.1 Standard LPG Solenoid valve

The liquid LPG on-off solenoid valve coming from the tank and going to the regulator, is compact-sized and takes up very little space. It is installed immediately upstream of the regulator (the basic version of Figure 1.5.9.1-1 the connection to the reducer takes place via the junction of the copper tube diameter 6, for all versions super connection is of diameter 8 Figure 1.5.9.1-2) in compliance with regulation UNECE R67-01. The solenoid valve is made an electro-magnet that opens the valve when activating a shutter, enabling LPG passage. It is a normally closed device that prevents the LPG passage when not electrically powered. Also, the filters replacement and/or cleaning, happens without disconnecting the fuelling tubes.

1.5.9.1-1

1.5.9.1-2

1.5.8.2 “ET98 NORMAL”WP LPG solenoid valve

The LPG solenoid valve is of Water Proof type (with watertight connectors), figure 1.5.9.2-1.
Improvements have been made to the filtering system inside the LPG solenoid valve, particularly the iron-magnet particles.
Given the injectors functioning precision, the use of this type of solenoid valve is compulsory.

1.5.8.3 “ET98 SUPER”WP LPG solenoid valve

The ET98 Super solenoid valve, figure 1.5.9.3-1, is an LPG on-off device necessary and conceived to give higher performances compared to previous. An improved coil allows a more efficient opening force. This allows having
greater passage sections with consequent greater LPG flow.
In this case also, the solenoid valve has been conceived to allow fuelling of engines with higher power, maintaining a high filtering degree. Equipped with Water Proof connectors, the solenoid valve body is brass coloured without superficial coating, whereas the coil is red.

1.5.9.2-1

1.5.9.3-1

1.5.9 Gas filter in gaseous phase

It is a cartridge filter located after the regulator-vaporiser and allows withholding all those impurities (oil, wax, etc.) on which it would not be possible to act otherwise and that would jeopardise the injector functioning. Routine maintenance of the cartridge filter is essential for long lasting efficient filtering.

1.5.10-1

1.5.10-2

1.5.10 Tanks and Accessories

The retrofit kit is designed to function with an LPG tank with gas withdrawal in liquid phase. The tank must be provided with the accessories as listed in relative approval certificate in compliance with Standard UNECE R67-01.
Often certain accessories listed below are grouped in individual multifunctional component called "multi valve", assembled on appropriate tank ring nut:

- Air lock (only in case of accessories located inside the vehicle).
- On-off solenoid valve.
- LPG filling valve (connection for refuelling).
- Filling limit valve at 80% of tank.
- Excess flow valve.
- Overpressure valve.
- Thermal cut-off (if envisioned by tank approval).
- Level indicator sensor (device for detection of LPG level inside tank).

1.5.11 High safety standards

The gas systems offer a very high level of safety, equal to the corresponding petrol fuelling system, both during normal use and in case of accident. To guarantee high safety standards, established by the European approval regulations UNECE R67-01 and R115-00, the system must be equipped with the devices described below.

1.5.11.1 Air lock

It is an air-tight container used when the tank is installed inside the passenger compartment, it acts as conveyor of eventual outgoing LPG exhausts from the overpressure valve or leaks from components connections. The ventilation housing must directly communicate with the atmosphere outside the vehicle, through flexible pipes and air nozzles.

1.5.11.2 On-off solenoid valve

The system is equipped with two LPG on-off solenoid valves:
- Solenoid valve on multi valve or tank valvular unit.
- Solenoid valve upstream of regulator.

Both automatically isolate the tank from the remainder of the system. The valves are automatically closed in the following cases:
- With engine off.
- During petrol functioning.
- In case of intervention of "Safety car" function.

1.5.11.3 Filling limit valve

The valvular unit or multi valve is equipped with a valve that, during gas refuelling, automatically limits filling to 80% of the available volume. The liquid LPG volume tends to significantly increase with the temperature as it has a high volumetric thermal expansion coefficient. The filling limit is used to guarantee the presence of a sufficient gaseous volume inside the tank to allow volumetric expansion, caused by any increases of the ambient temperature. Without such volume, following a temperature increase, the pressure inside the tank would quickly increase until causing the intervention of the overpressure valve.

1.5.11.4 Excess flow valve

It is a mechanical valve that, in case of accident the tank gas outlet piping is broken, automatically activates to block the gas leaking.

1.5.11.5 Overpressure valve

It is a valve in the valvular unit or in the multi valve, that intervenes in case the pressure inside the tank reaches the intervention threshold, equal to 27 bar ±1 bar, due to ambient temperature increase. It is a spring activated mechanical valve in communication with the gaseous phase of the tank and it can exhaust outside the vehicle, directly into the atmosphere or indirectly through the "air lock". Exhaust is limited to the short period necessary for the pressure value inside the tank to drop below the intervention threshold of the same valve. When the pressure inside the tank reaches the value below the intervention threshold, the valve closes returning to ready for intervention condition.

1.5.11.6 Thermal cut-off

Safety device in the valvular unit or in the multi valve, that activates in case the vehicle temperature rises (e.g. start of a fire), ensuring that the gas inside the tank leaks out, thus limiting the risk of explosion of the tank. Once the intervention temperature of (120 ± 10) °C is reached, the "fuse" melts allowing regular and complete emptying of the tank. It is an irreversible type device ("one-shoot").

2. INSTALLATION INSTRUCTION

The installation instruction in this chapter are of general nature. For specific instructions regard each individual vehicle, refer to the specific installation sheets contained in part II of the manual.

2.1 Preparation for the installer

Before installing the ***BORA LPG*** RETROFIT KIT, the technical personnel of the installation workshops must attend a training course, exclusively authorised or held by ZAVOLI srl.

2.2 Check and Recommendations

Before installing the system, consult the specific installation sheets in part II of the manual; it is a good rule to check the functioning of the petrol vehicle. In particular, carefully check the state of:

- Air filter efficiency.
- Ignition system (cables, spark plugs, coils).
- Lambda probe efficiency.
- Catalyst efficiency.
- The absence of malfunctionings relating to emissions, of the petrol engine, can be detected using diagnosis instruments.

Carry out the necessary amendments and adjustments and, if necessary, replace the components.

2.3 Equipment and consumption material necessary for installation

⇒ Gas exhaust analyser
⇒ Hydraulic ramp
⇒ Bench vice
⇒ Pipe cutter for copper pipe
⇒ Pipe cutter for rubber tube
⇒ Assorted tools spanners
⇒ Male M6x1
⇒ Tap wrench
⇒ Various sized screw drills (from Ø 1.5 to Ø 12 mm)
⇒ Boring machine
⇒ Cordless drill
⇒ Cup wheel cutters Ø 75mm, Ø 32mm
⇒ Multimeter
⇒ Personal computer
⇒ Management/configuration software of the ***BORA LPG*** retrofit kit complete with relative communication interface device.
⇒ Diagnosis instruments for vehicles.
⇒ Soldering iron
⇒ Grease

⇒ Heat shrink tubing
⇒ Insulating tape
⇒ Thread-locking sealer
⇒ Alloy for soft soldering
⇒ Leaks detecting liquid
⇒ Anti-corrosion products

2.4 MECHANICAL INSTALLATION

Described in this manual is the installation of the BORA LPG Retrofit kit components, according to conformities prescribed and reported in the UNECE R67-01 Regulation and the UNECE R115-00 Regulation.
The installation of all retrofit kit components must guarantee the best protection against damages caused by the vehicle mobile parts movements, by impacts with load during run or during vehicle load and unload operations, by impacts with ballast, etc.
After having made the holes (e.g. for fixing of regulator or for cable passage), the metal surface must be treat with and anti-corrosion product.
Fix all flexible piping using the provided strips, ensuring there are no contacts or frictions with other mechanical parts.
No kit component must be positioned at less than 100 mm from the engine exhaust pipes or other heat sources. The possibility of reducing such distance, despite being envisioned by circular, must be accompanied by an application study (point 1l attachment 1 and prescription of paragraphs 17.1 and 17.2 of Regulation ONU ECE R67-01).
The tank assembled under the plane must have a minimum distance from the road surface of 200 mm (with vehicle in running order), and must, in any case, be protected by steel sheet in the front and side areas.

2.4.1 ZETA Regulator/Vaporiser

The following general installation criteria is to be considered valid for both LPG and CNG versions.
The **ZETA** regulator must be securely fixed to the bodywork and such not to be object of vibrations during functioning. With engine under stress, the regulator must not bump against any other device.
The regulator must be installed with the temperature sensor upwards. We recommend containing the length of the pipe connecting the regulator to the injectors (MAX 700 mm) and assemble the regulator so that it is easily accessible in case of adjustment or repair interventions.
Connection with the piping from the tank must be by means of a copper pipe (figure 2.4.1-1A) if the **ZETA** regulator type **"N"** is used. In case of using **ZETA** regulator type **"S"**, connection happens by tightening the solenoid valve on to the gas inlet fitting of the regulator, Fig. 2.4.1-1B.

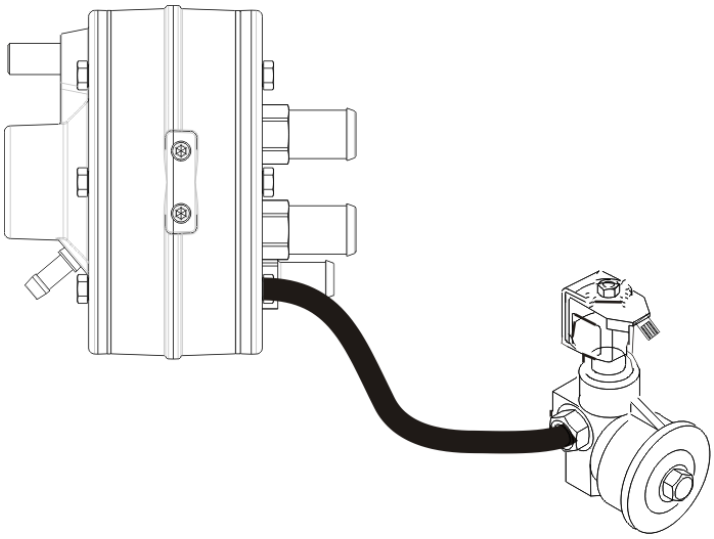


Fig. 2.4.1.-1A

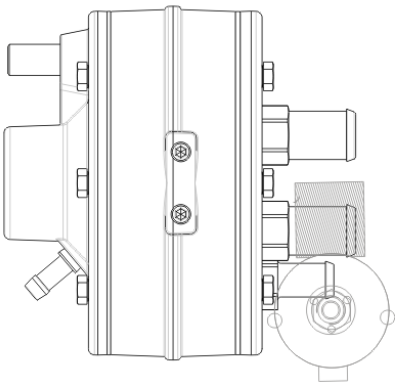


Fig. 2.4.1.-1B

The tract of copper pipe from the solenoid valve to the ZETA regulator, must not pass through very hot engine compartment areas. The installer must avoid uncomfortable areas in order to be able to easily carry out any maintenance interventions.

For complete gasification of the LPG, withdraw heat from the engine cooling liquid. The water connection happens in parallel compared to the heating circuit of the passenger compartment, figure 2.4.1-2. Connection is carried out by interrupting the flow and return piping of the passenger compartment heating circuit. Two "Ts" must be used, one on exchanger flow and the other on exchanger outlet.

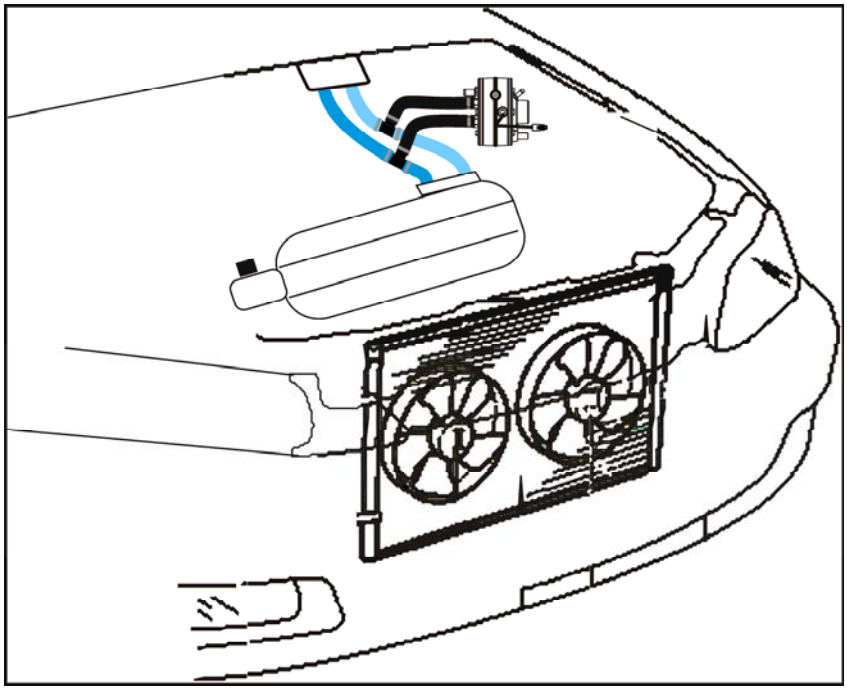


Fig. 2.4.1 -2

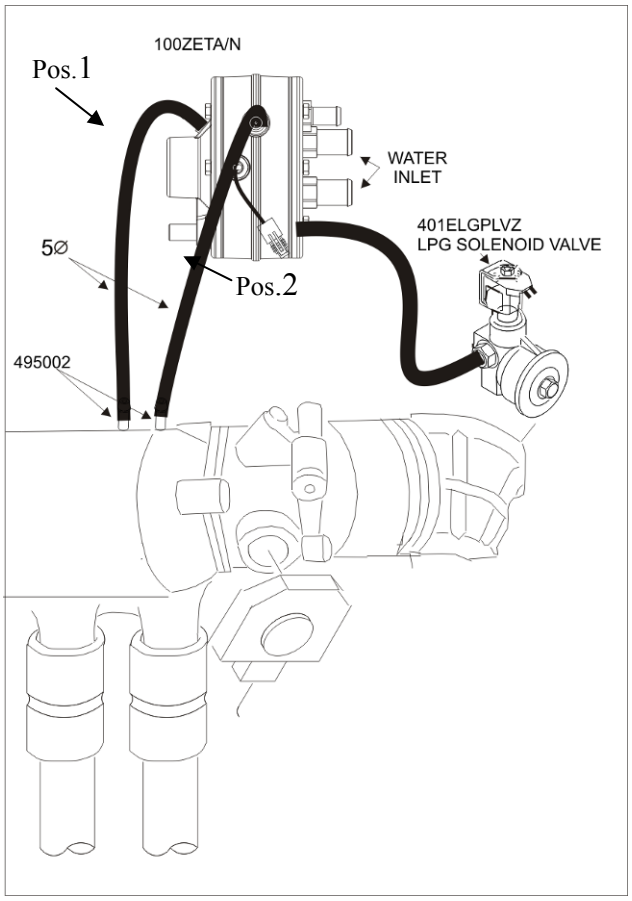


Fig. 2.4.1 -3

For correct functioning of the **ZETA** regulator, as prescribed in previous chapter, compensation must be carried out of the pressure connecting the regulator (figure 2.4.1-3 pos. 1) with the inlet manifold. Such connection happens using a Ø 5 mm rubber tube, one tube end is connected to the regulator fitting, the other end to a provided fitting, to be installed prior perforating and threading on the inlet manifold. The position of the hole must be exactly downstream of the butterfly valve and upstream of the ducts of the inlet manifold directed to the individual cylinders; the tube length must not exceed 700 mm, figure 2.4.1-3.
As well as the compensation fitting, the regulator is supplied with an overpressure valve (figure 2.4.1-3 pos. 2) which must also be connected to the inlet manifold through a Ø 5 mm rubber tube. With the same connection procedure as above.
To guarantee seal of the threaded connection, before assembly, apply thread-locking liquid on the fitting shank. During tightening of the fitting, ensure the thread-locking liquid does not drip, causing blocking of the nozzles. We therefore recommend injecting compressed air jets inside the nozzles at end of operations.

We recommend that all perforating, masking, tightening of the fitting and manifold cleaning is carried out with inlet manifold dismantled. In case it is not possible to dismantle the inlet manifold, use all possible precautions to minimise the risk of damaging the engine (e.g. grease the nozzles before working, frequently remove the chippings during working).

2.4.2 Connection piping

The pipes must be joint with the fittings supplied inside the kit. Junctions of welded, soldered or stapled tubes are not admitted. The tubes (stiff or flexible) inside the passenger compartment or the luggage compartment, must not be longer than minimum indispensable, the piping must follow the shortest path among the possible ones.
Connections between the tubes must be enclosed by the "air lock" or equivalent protection that conveys any gas leaks into the external atmosphere and cannot be positioned inside the passenger compartment or the luggage compartment.
In case of holes in steel sheet for passage of flexible or stiff tubes, protective material must be applied on the holes edges.
To correctly install the connection tubes, prevent them coming into contact with the bodywork or engine sharp edges, blunt objects and mobile parts (e.g. transmission belts, shock absorbers, exhaust manifold, etc.) and, therefore, producing continuous frictions until wearing of the same. Another rule for correct installation is that the tubes must not be excessively tensioned or be folded, thus reducing the section. Once the kit is installed, all junctions of the liquid or gaseous LPG circuit must be checked during normal gas

functioning of the vehicle, using leaks detecting liquid. The retrofit kit has rubber tubes and copper pipes.
The copper pipes supplied in the Kit must be cut to measure by the installer, using appropriate pipe cutter. Once the pipe is cut, "trim" the inside hole to avoid blocking due to cut residue.
Connections with the copper pipe happen by means of fittings with pressure screws and double cone nose cap. During assembling, manually tighten the pressure screw by at least one turn, thus avoiding damage to threading during the fastening operation. Tighten enough to guarantee seal.
The rubber tubes supplied in the Kit must be cut to measure by the installer using appropriate pipe cutter. After having cut them to size, eliminate any cut residue that might jeopardise functioning of the connected components. It is essential to clean inside the tube before definitive assembly using a jet of compressed air. The connection of the tubes on the relative fittings must be realised using the provided strips.

2.4.3 LPG solenoid valve

The liquid LPG on-off solenoid valve coming from the tank and going to the regulator, is compact-sized and takes up very little space. It is installed immediately upstream of the regulator (in basic version, figure 1.5.9-1, connection to regulator happens by means of joining the 6 diameter copper pipe. For 5-8 cylinders version, the solenoid valve is connected directly to regulator, figure 1.5.9-2, and for all super versions, connection is the same as for 5-8 version, except that the diameter of the fuelling pipe is not 6 but 8, figure 1.5.9-3).

2.4.4 Filters in gaseous phase

Ensure connecting the pipe coming from the regulator with the filter inlet fitting, and the pipe going to the injectors with the filter outlet fitting. The piping connecting the regulator to the filter is made of rubberised fabric and must be connected on the fittings using the provided metal strips.

2.4.5 Injectors

The injectors must be installed securely and as close as possible to the inlet manifold, in that it is very important that the length of the connection pipes from the injectors going to the inlet manifold, do not exceed 150 mm of length. The injectors and relative "Calibrated jet" are mainly chosen based on the specific engine power (power per cylinder in kw/cylinder).

2.4.5.1 Rail PAN-JET 4 cylinders injectors with sensor (2+2) assembly kit

New System Bora "Kit Code – 610MKI2+2/B"

Figure 2.4.5-1 describes the operations for correct assembly, in progressive number.

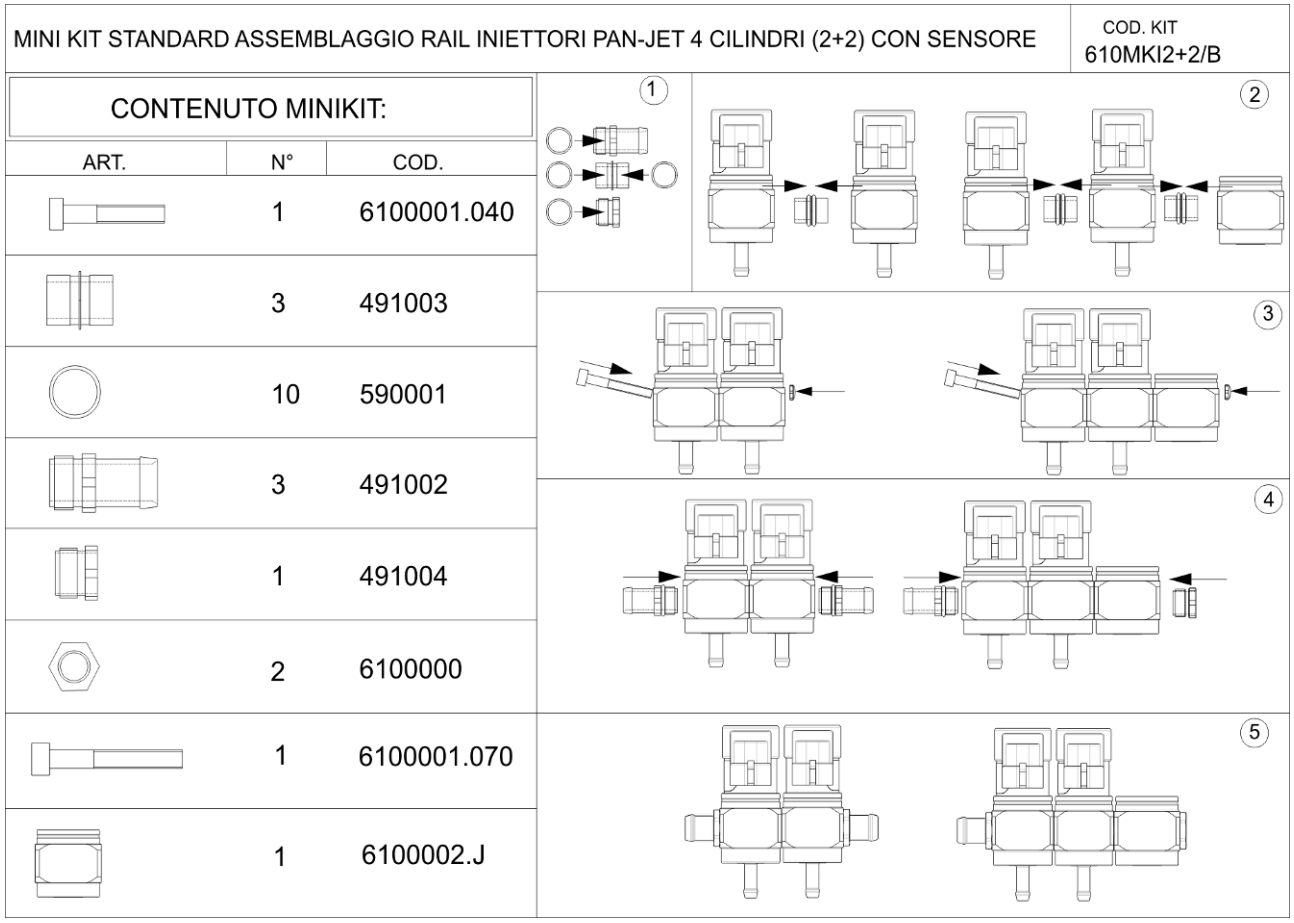


Fig. 2.4.5.1-1

2.4.5.2 Rail PAN-JET 3 cylinders injectors with sensor (3X1) assembly kit

New System Bora "Kit Code – 610MKI3/B"

Described below are the operations for the correct assembly, according to progressive number of Figure 2.4.5.2-1.

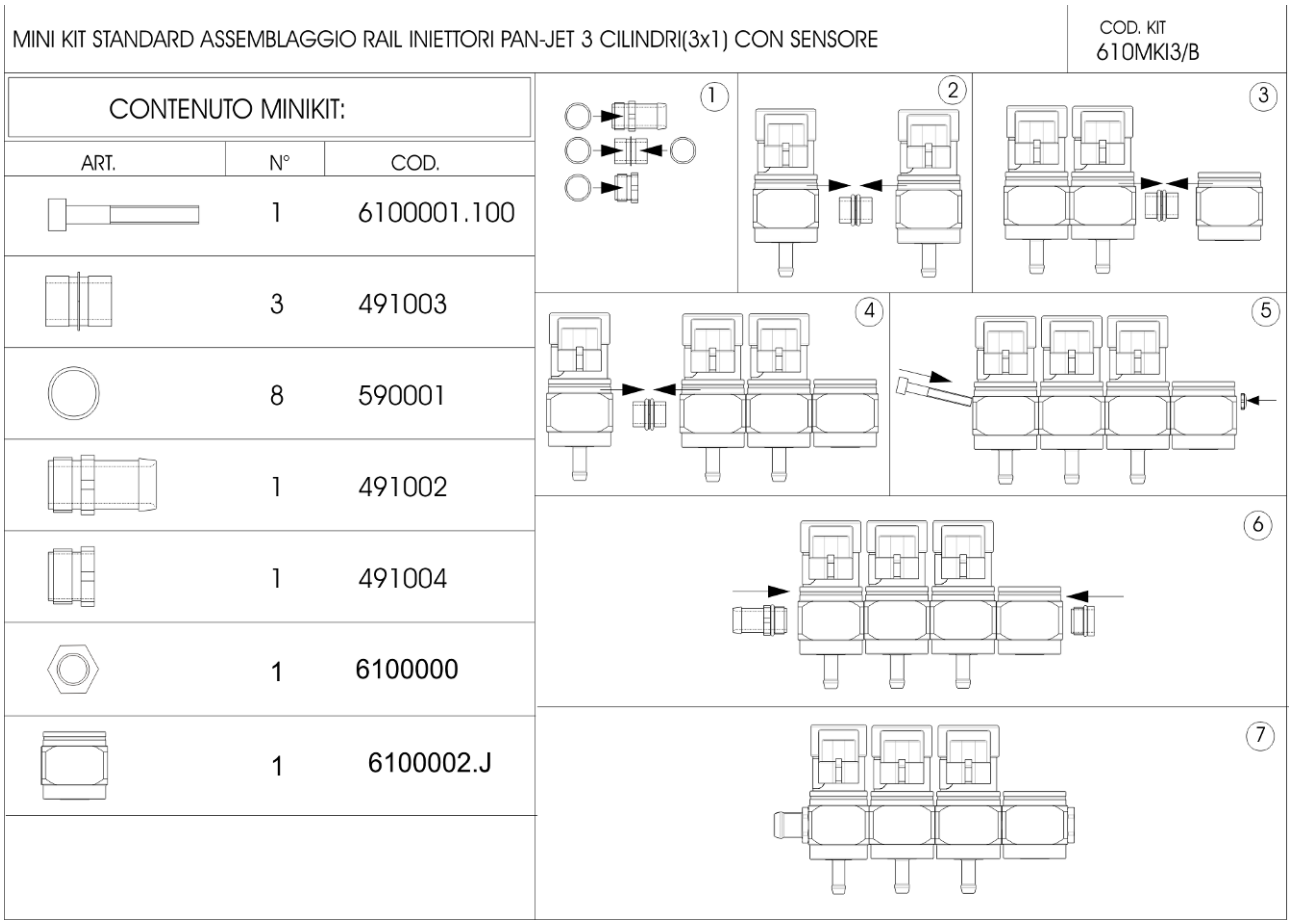


Fig. 2.4.5.2-1

2.4.5.3 Rail PAN-JET 5 cylinders injectors with sensor (3+2) assembly kit

New System Bora "Code Kit – 610MKI2+3/B"

Described below are the operations for the correct assembly, according to progressive number of Figure 2.4.5.3-1.

MINI KIT STANDARD ASSEMBLAGGIO RAIL INIETTORI PAN-JET 5 CILINDRI(2+3) CON SENSORE

COD. KIT
610MKI2+3/B

CONTENUTO MINIKIT:

ART.	N°	COD.
	2	6100001.070
	4	491003
	12	590001
	3	491002
	1	491004
	2	6100000
	1	6100002.J

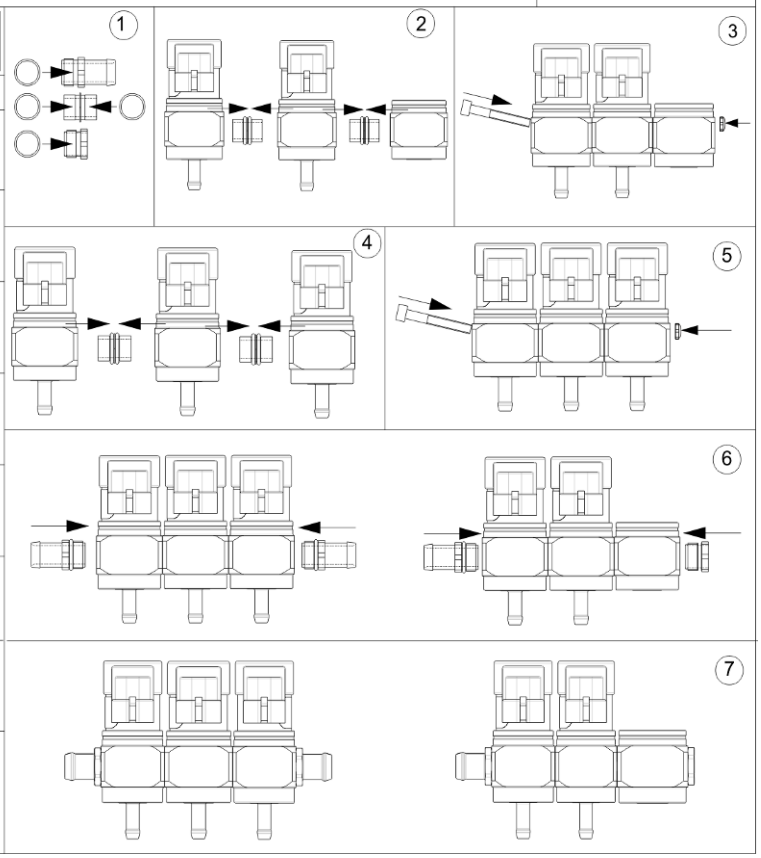


Fig. 2.4.5.3-1

2.4.5.4 Rail PAN-JET 6 cylinders injectors with sensor (3+3) assembly kit

New System Bora "Code Kit – 610MKI3+3/B"

Described below are the operations for the correct assembly, according to progressive number of Figure 2.4.5.4-1.

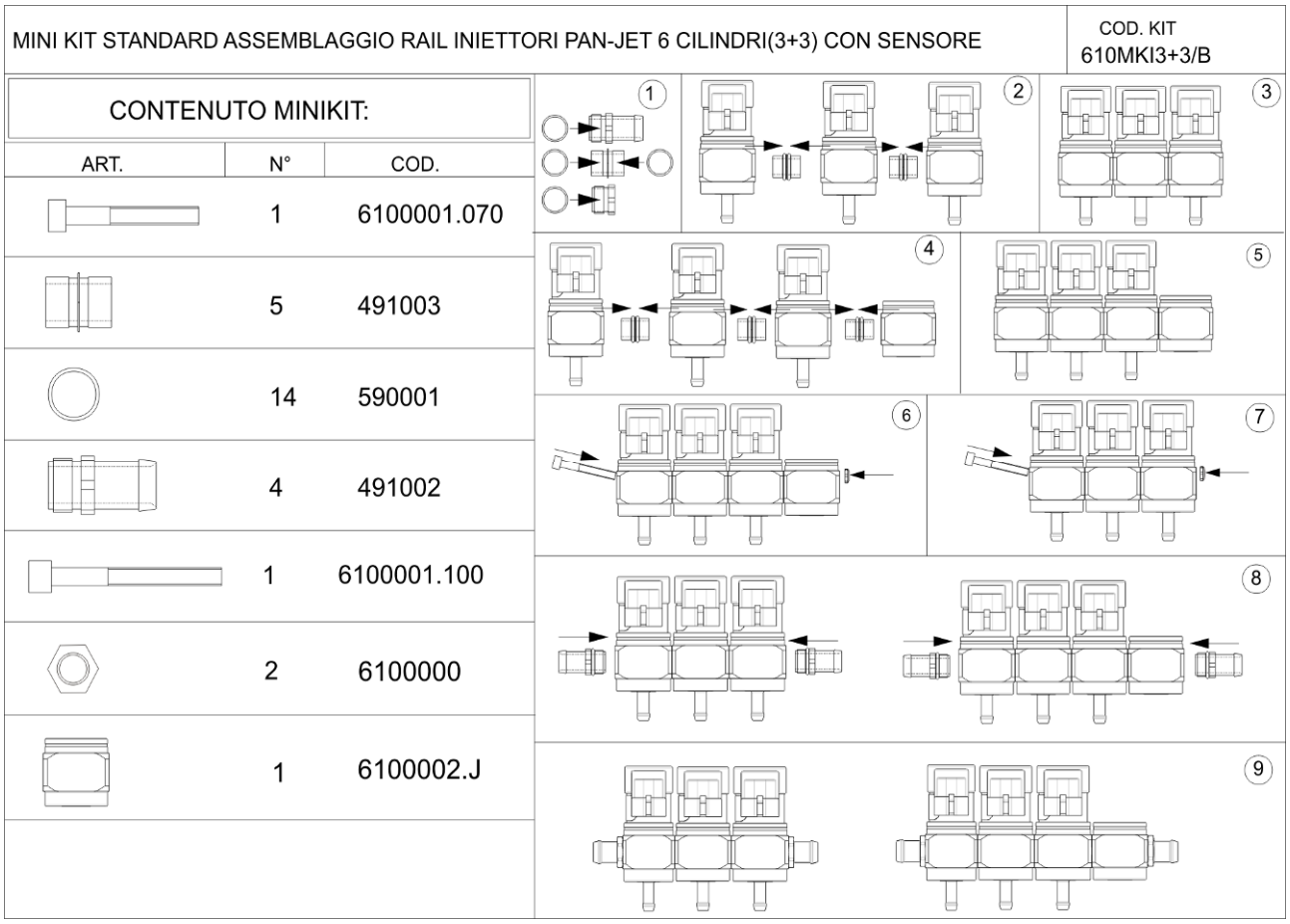


Fig. 2.4.5.4-1

2.4.5.5 Rail PAN-JET 8 cylinders injectors with sensor (4x2) assembly kit

New System Bora "Code Kit – 610MKI2X4/B"

Described below are the operations for the correct assembly, according to progressive number of Figure 2.4.5.5-1.

MINI KIT STANDARD ASSEMBLAGGIO RAIL INIETTORI PAN-JET 8 CILINDRI(2x4) CON SENSORE

COD. KIT 610MKI2x4/B

CONTENUTO MINIKIT:

ART.	N°	COD.
	3	6100001.040
	5	491003
	18	590001
	8	491002
	4	6100000
	1	6100002.J
	1	6100001.070

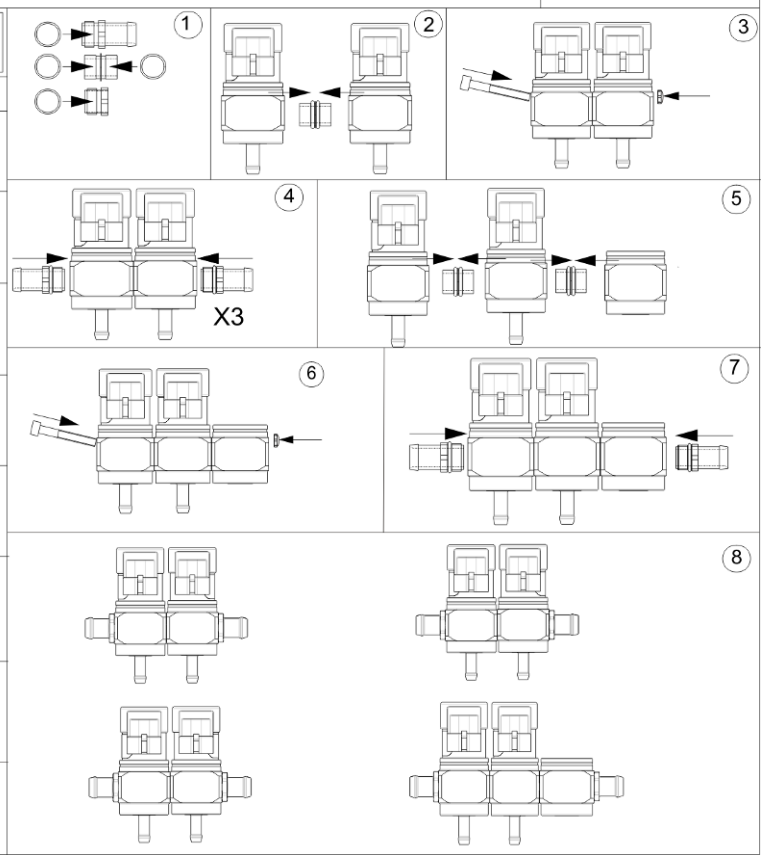


Fig. 2.4.5.5-1

2.4.5.6 Rail PAN-JET 4 cylinders injectors with sensor (1x4) assembly kit

New System Bora "Code Kit – 610MKI1x4/B"

Described below are the operations for the correct assembly, according to progressive number of Figure 2.4.5.6-1.

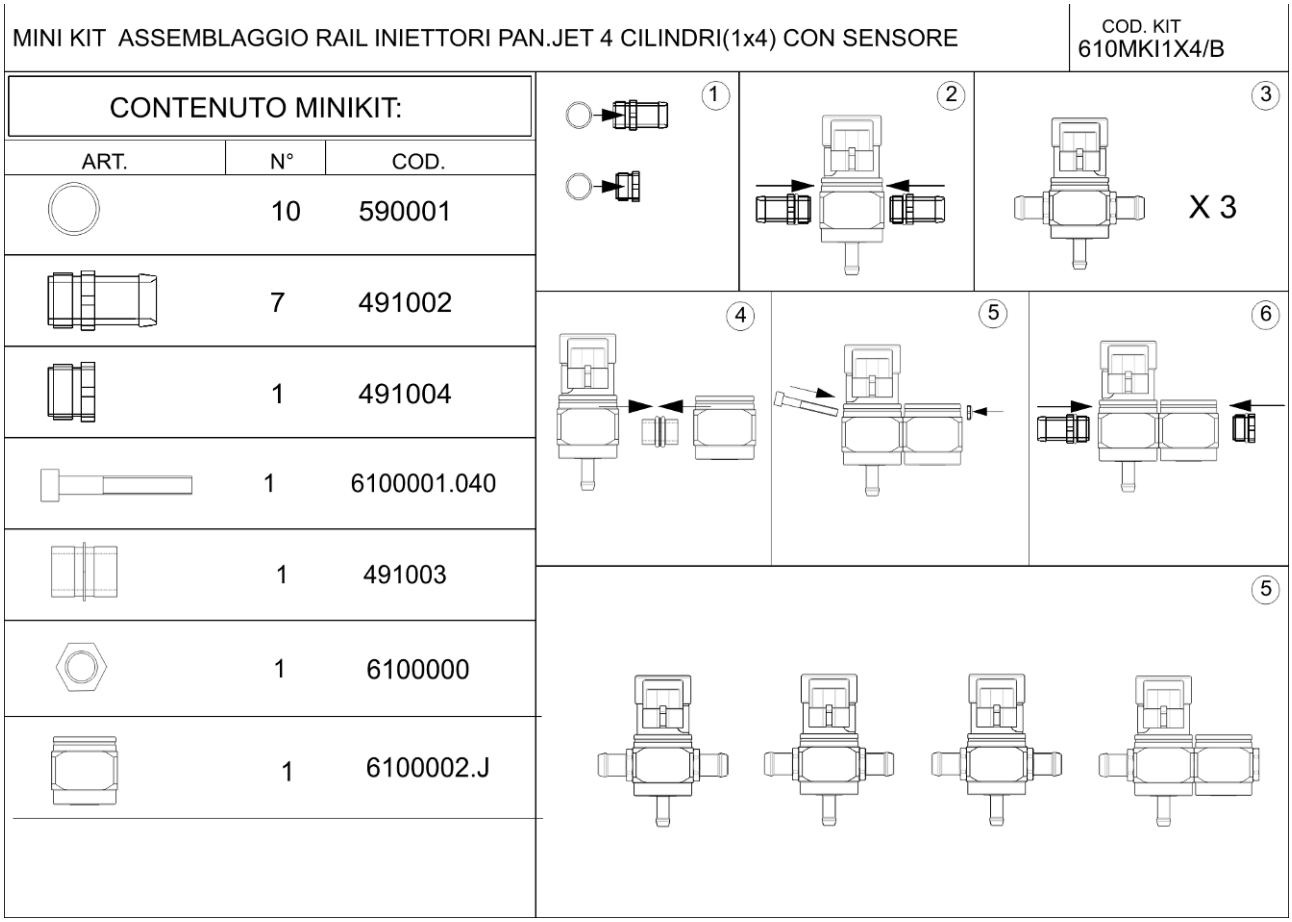


Fig. 2.4.5.6-1

We recommend paying attention to any bends in the inlet manifold-injectors connection pipes, ensuring such bends are "smooth", with wide bending range, so that there are no "crushings" (choking) preventing the correct functioning of the system.

2.4.6 Injection nozzles installation

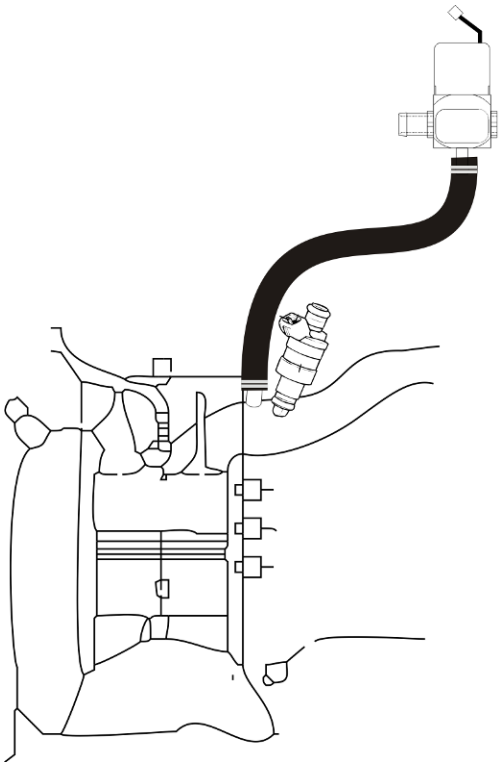


Fig 2.4.6-1

This section of the manual constitutes one of the most important phases of the entire work.
We recommend clearly identifying all manifold points that must be
perforated, before starting perforation. Perforation must happen very close to the engine head, figure 2.4.6-1, but keeping the same distance on all manifold legs and the same direction of the nozzles. Each nozzle must be perpendicular to the inlet duct axis or form an angle such to direct the flow towards the engine and not towards the butterfly. After having accurately marked the perforation holes using a felt-tip marker, before starting perforation, use the screw drill to check that there is nothing preventing the correct perforation of all legs, according to the wanted direction. Before perforating the manifold, also check that the chosen position of the nozzles allows disposing the connection pipes to the injector,so that their lengths do not exceed the maximum admitted (150 mm). Punch mark and then perforate. Perforation must be made using Ø 5 mm screw drill, threading using M6 male. Given the extremely delicate operation, due to the risk that the perforation chippings may deposit inside the manifold therefore be sucked by the engine during functioning.
We recommend perforating, masking, greasing the point during the last phase of wall perforating, so that chippings remain stuck to the point. Also, slowly perforate the last part of the wall so that chippings are very fine: thus better sticking to the point and, should some fall inside, not cause damages. Also during M6 threading it is necessary to grease, remove and clean the male. Pay utmost attention in correctly introducing the nozzles, avoiding excessive tightening to prevent stripping them. We recommend always using an adequately sized spanner during fastening. Do not amend the internal diameter of the nozzles or their external shape. To guarantee watertightness of the threaded connection, before assembly, apply thread-locking liquid on the fitting shank. During tightening of the fitting, ensure the thread-locking liquid does not drip, causing blocking of the nozzles. We therefore recommend injecting compressed air jets inside the nozzles at end of operations.

We recommend that all perforating, masking, tightening of the fitting and manifold cleaning is carried out with inlet manifold dismantled. In case it is not possible to dismantle the inlet manifold, use all possible precautions to minimise the risk of damaging the engine (e.g. grease the nozzles before working, frequently remove the chippings during working).

2.4.7 Tanks and accessories fixing prescriptions

The tank must be installed on the vehicle in compliance with the installation requisites in Regulations UNECE R67-01 and R115-00.
Main requisites:
1. Tank installation must be compliant with the prescriptions reported in the specific installation sheet of the vehicle.
2. The tank must be permanently installed on the vehicle and never in the engine compartment.
Protective material, such as felt, leather or plastic, must be interposed between the fuel tank and the fixing strips.

1. In case the tank is installed underneath the vehicle plane, it must distance at least 200 mm from the road surface, with vehicle in running order. Regulation envisions being able to go below this quota, as long as a real and proper protection structure is installed, suitably studied for individual application.
2. The tank must be anchored to the vehicle body shell using appropriate fixing structure. The following assembly conditions must be complied with.

    - The tank must be bound using at least two strips to the fixing structure;
    - the strips must guarantee that the tank does not slide, rotate or be moved from its seat;
    - the fixing structure must envision at least 4 bolts;
    - if the ends of the anchoring structure to the vehicle body shell are in correspondence with the single shim steel sheets, use a suitably sized back-up washer.

The sizes of the strips, the bolts and the back-up washers must be chosen according to that specified in the following table. Such table is valid if the strips and back-up washers are in EN 10025-S232 steel and the bolts in class 8.8 steel.

Tank capacity (litres)	Minimum sizes of the washers or plates (mm)	Minimum sizes of the strips (mm)	Minimum sizes of the bolts (mm)
Up to 85	Ø 30 × 1.5 Ø 25 × 2.5	20 x 3 30 x 1.5	8
85 – 100	Ø 30 × 1.5 Ø 25 × 2.5	30 x 3 20 x 3 *	10 8 *
100-150	Ø 50 × 2 Ø 30 × 3	50 x 6 50 x 3 **	12 10 **
Over 150	They must comply with the requisites of Regulation N. 67, series of amendments 01, in LPG tanks and Regulation N. 110 in CNG tanks		

* In this case, the tank must be fixed using at least three strips
** In this case, the tank must be fixed using at least four strips

1. If the tank is installed behind a seat, minimum total distance of 100 mm in longitudinal direction of the vehicle must be respected. Said distance can be shared between the tank and the rear panel and between the seat and the tank.
2. In case of cylindrical tanks installed "longitudinally" compared to the vehicle axis, the fixing structure must have a "beam" positioned in front of the tank, on the running direction side. For “longitudinally” installed tank compared to vehicle axis, means that its longitudinal axis can form an angle between 0° and 30° with the vehicle longitudinal axis.

The above "beam" must satisfy the following three requisites:

- It must have the same thickness as the remainder of the fixing structure.
- It must be fixed as close as possible to the tank bottom.
- It must be at least 30 mm high and the upper surface must protrude at least 30 mm compared to the lower part of the tank casing.

2.4.8 Air lock

The air lock must communicate with the external environment by means of one or more openings that must assure a free area (subtracted the space taken up by pipes and wires) of 450 mm^2 (point 3i attachment 1). The inlet openings must face downwards and never the wheelhouse or heat sources (point 3h attachment 1 and prescription of paragraphs 17.7 – 17.8 – 17.9 – 17.10 – 17.11 – 17.12 of the ece/onu n.67/01 regulation).

2.4.9 Filling Valve

The filling valve must be positioned outside the vehicle. The filling valve must be installed so that it cannot rotate and be protected from dirt and water.

2.4.10 BORA LPG System rear part alternative components list

2.4.10.1 Stako cylinders tanks list

CODE	SIZE	APPROVAL	
27CE01200010	200X382 l. 10	E20*67R01*0182*	E20*67R01*0421*
27CE02200015	200X550 l. 15	E20*67R01*0183*	E20*67R01*0421*
27CE03200020	200X717 l. 20	E20*67R01*0184*	E20*67R01*0421*
27CE04200025	200X884 l. 25	E20*67R01*0185*	E20*67R01*0421*
27CE05200030	200X1052 l. 30	E20*67R01*0186*	E20*67R01*0421*
27CE06200035	200X1219 l. 35	E20*67R01*0187*	E20*67R01*0421*
27CE07200040	200X1387 l. 40	E20*67R01*0188*	E20*67R01*0421*
27CE08200045	200X1554 l. 45	E20*67R01*0189*	E20*67R01*0421*
27CE00244024	244X600 l. 24	E20*67R01*0190*	E20*67R01*0423*
27CE00244036	244X860 l. 36	E20*67R01*0191*	E20*67R01*0423*
27CE00244042	244X1000 l. 42	E20*67R01*0192*	E20*67R01*0423*
27CE00244052	244X1200 l. 52	E20*67R01*0193*	E20*67R01*0423*
27CE09270025	270X514 l. 25	E20*67R01*0194*	E20*67R01*0424*
27CE10270030	270X607 l. 30	E20*67R01*0195*	E20*67R01*0424*
27CE11270035	270X699 l. 35	E20*67R01*0196*	E20*67R01*0424*
27CE12270040	270X792 l. 40	E20*67R01*0197*	E20*67R01*0424*
27CE13270045	270X884 l. 45	E20*67R01*0198*	E20*67R01*0424*
27CE14270050	270X977 l. 50	E20*67R01*0199*	E20*67R01*0424*
27CE15270055	270X1069 l. 55	E20*67R01*0200*	E20*67R01*0424*
27CE16300040	300X646 l. 40	E20*67R01*0201*	E20*67R01*0425*
27CE17300045	300X720 l. 45	E20*67R01*0202*	E20*67R01*0425*
27CE18300050	300X793 l. 50	E20*67R01*0203*	E20*67R01*0425*
27CE19300055	300X867 l. 55	E20*67R01*0204*	E20*67R01*0425*
27CE20300060	300X940 l. 60	E20*67R01*0205*	E20*67R01*0425*
27CE21300065	300X1014 l. 65	E20*67R01*0206*	E20*67R01*0425*
27CE22300070	300X1088 l. 70	E20*67R01*0207*	E20*67R01*0425*
27CE23315035	315X531 l. 35	E20*67R01*0208*	E20*67R01*0426*
27CE24315040	315X599 l. 40	E20*67R01*0209*	E20*67R01*0426*
27CE25315045	315X667 l. 45	E20*67R01*0210*	E20*67R01*0426*
27CE26315050	315X734 l. 50	E20*67R01*0211*	E20*67R01*0426*
27CE27315055	315X802 l. 55	E20*67R01*0212*	E20*67R01*0426*
27CE28315060	315X869 l. 60	E20*67R01*0213*	E20*67R01*0426*
27CE29315065	315X937 l. 65	E20*67R01*0214*	E20*67R01*0426*
27CE30315070	315X1004 l. 70	E20*67R01*0215*	E20*67R01*0426*
27CE31315080	315X1139 l. 80	E20*67R01*0216*	E20*67R01*0426*
27CE32315090	315X1274 l. 90	E20*67R01*0217*	E20*67R01*0426*
27CE35360040	360X478 l. 40	E20*67R01*0218*	E20*67R01*0427*
27CE36360050	360X582 l. 50	E20*67R01*0219*	E20*67R01*0427*
27CE37360060	360X686 l. 60	E20*67R01*0220*	E20*67R01*0427*
27CE38360070	360X789 l. 70	E20*67R01*0221*	E20*67R01*0427*
27CE39360080	360X892 l. 80	E20*67R01*0222*	E20*67R01*0427*
27CE40360090	360X996 l. 90	E20*67R01*0223*	E20*67R01*0427*
27CE41360100	360X1099 l. 100	E20*67R01*0224*	E20*67R01*0427*
27CE43360110	360X1203 l. 110	E20*67R01*0225*	E20*67R01*0427*
27CE47400090	400X847 l. 90	E20*67R01*0226*	E20*67R01*0428*

The Stako cylindrical tanks must be combined to air lock for cylindrical tanks with approval n.: E13 67R-010043.

2.4.10.2 STAKO TOROIDAL 0° TANKS LIST

CODE	SIZE	APPROVAL	
27TE05565G35	565X180 l. 34	E20*67R01*0231*	E20*67R01*0439*
27TE00580039	580X200 l. 40	E20*67R01*0233*	E20*67R01*0441*
27TE01580045	580X225 l. 46	E20*67R01*0235*	E20*67R01*0444*
27TE10600040	600X190 l. 39	E20*67R01*0237*	E20*67R01*0440*
27TE11600042	600X200 l. 42	E20*67R01*0239*	E20*67R01*0441*
27TE12600047	600X220 l. 47	E20*67R01*0241*	E20*67R01*0443*
27TE07600048	600X230 l. 49	E20*67R01*0243*	E20*67R01*0445*
27TE08600052	600X250 l. 54	E20*67R01*0245*	E20*67R01*0447*
27TE09600057	600X270 l. 59	E20*67R01*0247*	E20*67R01*0448*
27TE06630G40	630X190 l. 43	E20*67R01*0257*	E20*67R01*0440*
27TE02630045	630X204 l. 47	E20*67R01*0249*	E20*67R01*0442*
27TE03630050	630X225 l. 50	E20*67R01*0251*	E20*67R01*0444*
27TE04630G60	630X250 l. 60	E20*67R01*0253*	E20*67R01*0447*
27TE15650050	650X200 l. 50	E20*67R01*0259*	E20*67R01*0441*
27TE16650056	650X220 l. 55	E20*67R01*0261*	E20*67R01*0443*
27TE17650062	650X240 l. 61	E20*67R01*0263*	E20*67R01*0446*
27TE18650070	650X270 l. 70	E20*67R01*0265*	E20*67R01*0448*

2.4.10.3 Stako toroidal 0° tanks list (w/out closed hole feet)

CODE	SIZE	APPROVAL
27TEE5580E45S	580x200 l. 45	E20*67R01*0452*
27TEE5580E51S	580x225 l. 51	E20*67R01*0455*
27TEE5600E44S	600x190 l. 44	E20*67R01*0451*
27TEE5600E47S	600x200 l. 47	E20*67R01*0452*
27TEE5600E53S	600x220 l. 53	E20*67R01*0454*
27TEE5630E51S	630x204 l. 51	E20*67R01*0453*
27TEE5630E58S	630x225 l. 58	E20*67R01*0455*
27TEE5630E66S	630x250 l. 66	E20*67R01*0458*
27TEE5650E54S	650x200 l. 54	E20*67R01*0452*
27TEE5650E61S	650x220 l. 61	E20*67R01*454*
27TEE5650E67S	650x240 l. 67	E20*67R01*0457*
27TEE5650E77S	650x270 l. 77	E20*67R01*0459*
27TEE5720E95S	720x270 l. 95	E20*67R01*0459*

2.4.10.4 Stako toroidali 30° tanks list

CODE	SIZE	APPROVAL	
27TE56518035	565X180 l. 34	E20*67R01*0232*	E20*67R01*0439*
27TE58020039	580X200 l. 40	E20*67R01*0234*	E20*67R01*0441*
27TE58022545G	580X225 l. 46	E20*67R01*0236*	E20*67R01*0444*
27TE60019040	600X190 l. 39	E20*67R01*0238*	E20*67R01*0440*
27TE60020042	600X200 l. 42	E20*67R01*0240*	E20*67R01*0441*
27TE60022047	600X220 l. 47	E20*67R01*0242*	E20*67R01*0443*
27TE60023048	600X230 l. 49	E20*67R01*0244*	E20*67R01*0445*

27TE60025052	600X250 l. 54	E20*67R01*0246* E20*67R01*0447*
27TE60027057	600X270 l. 59	E20*67R01*0248* E20*67R01*0448*
27TE63019043	630X190 l. 43	E20*67R01*0440*
27TE63020445	630X204 l. 47	E20*67R01*0250* E20*67R01*0442*
27TE63022550	630X225 l. 53	E20*67R01*0252* E20*67R01*0444*
27TE63025060	630X250 l. 60	E20*67R01*0254* E20*67R01*0447*
27TE63027065	630X270 l. 65	E20*67R01*0448*
27TE65020050	650X200 l. 50	E20*67R01*0260* E20*67R01*0441*
27TE65022056	650X220 l. 55	E20*67R01*0262* E20*67R01*0443*
27TE65024062	650X240 l. 61	E20*67R01*0264* E20*67R01*0446*
27TE65027070	650X270 l. 70	E20*67R01*0266* E20*67R01*0448*
27TE68023060	680X230 l. 60	E20*67R01*0445*
27TE68024064	680X240 l. 64	E20*67R01*0446*
27TE68025066	680X250 l. 66	E20*67R01*0447*
27TE68027073	680X270 l. 73	E20*67R01*0448*
27TE72023073	720X230 l. 73	E20*67R01*0445*
27TE72024077	720X240 l. 77	E20*67R01*0446*
27TE72025080	720X250 l. 80	E20*67R01*0447*
27TE72027088	720X270 l. 88	E20*67R01*0448*

The Stako toroidal 0° and 30° tanks must be combined to air lock for Stako toroidal tanks with approval n.: E13 67R-010324

2.4.10.5 Step toroidal 0° tanks list

EXTERNAL				
PRODUCT CODES	**TYPE**	**DIMENSION**	**L**	**HOMOLAGATION**
		--570-		
ST570E038	**ST.200**	**570X200**	**38**	**E20 67R-010858**
ST570E043	**ST.220**	**570X220**	**43**	**E20 67R-010859**
ST570E045	**ST.230**	**570X230**	**45**	**E20 67R-010860**
ST570E047	**ST.240**	**570X240**	**47**	**E20 67R-010861**
ST570E049	**ST.250**	**570X250**	**49**	**E20 67R-010862**
ST570E054	**ST.270**	**570X270**	**54**	**E20 67R-010863**
		--580-		
ST580E040	**ST.200**	**580X200**	**40**	**E20 67R-010858**
ST580E044	**ST.220**	**580X220**	**44**	**E20 67R-010859**
ST580E048	**ST.230**	**580X230**	**48**	**E20 67R-010860**
ST580E050	**ST.240**	**580X240**	**50**	**E20 67R-010861**
ST580E052	**ST.250**	**580X250**	**52**	**E20 67R-010862**
ST580E055	**ST.270**	**580X270**	**55**	**E20 67R-010863**
		--600-		
ST600E041	**ST.200**	**600X200**	**41**	**E20 67R-010858**
ST600E047	**ST.220**	**600X220**	**47**	**E20 67R-010859**
ST600E049	**ST.230**	**600X230**	**49**	**E20 67R-010860**
ST600E052	**ST.240**	**600X240**	**52**	**E20 67R-010861**
ST600E054	**ST.250**	**600X250**	**54**	**E20 67R-010862**
ST600E059	**ST.270**	**600X270**	**59**	**E20 67R-010863**
		--630-		
ST630E047	**ST.200**	**630X200**	**47**	**E20 67R-010858**

ST630E052	ST.220	630X220	52	E20 67R-010859
ST630E055	ST.230	630X230	55	E20 67R-010860
ST630E058	ST.240	630X240	58	E20 67R-010861
ST630E060	ST.250	630X250	60	E20 67R-010862
ST630E067	ST.270	630X270	67	E20 67R-010863
--650-				
ST650E051	ST1.200	650X200	51	E20 67R-010864
ST650E056	ST1.220	650X220	56	E20 67R-010865
ST650E060	ST1.230	650X230	60	E20 67R-010866
ST650E063	ST1.240	650X240	63	E20 67R-010867
ST650E066	ST1.250	650x250	66	E20 67R-010868
ST650E071	ST1.270	650x270	71	E20 67R-010869
--680-				
ST680E055	ST1.200	680x200	55	E20 67R-010864
ST680E061	ST1.220	680X220	61	E20 67R-010865
ST680E064	ST1.230	680X230	64	E20 67R-010866
ST680E068	ST1.240	680X240	68	E20 67R-010867
ST680E070	ST1.250	680X250	70	E20 67R-010868
ST680E077	ST1.270	680X270	77	E20 67R-010869
--720-				
ST720E061	ST1.200	720X200	61	E20 67R-010864
ST720E069	ST1.220	720X220	69	E20 67R-010865
ST720E073	ST1.230	720X230	73	E20 67R-010866
ST720E076	ST1 240	720X240	76	E20 67R 010867
ST720E080	ST1.250	720X250	80	E20 67R-010868
ST720E089	ST1.270	720X270	89	E20 67R-010869

2.4.10.6 STEP TOROIDAL 0° TANKS LIST

INTERNAL				
PRODUCT CODES	TYPE	DIMENSION	L	HOMOLAGATION
--550-				
ST550I031	ST.180	550X180	31	E20 67R-010857
ST550I036	ST.200	550X200	36	E20 67R-010858
ST550I040	ST.220	550X220	40	E20 67R-010859
ST550I041	ST.230	550X230	41	E20 67R-010860
--570-				
ST570I034	ST.180	570X180	34	E20 67R-010857
ST570I038	ST.200	570X200	38	E20 67R-010858
ST570I043	ST.220	570X220	43	E20 67R-010859
ST570I045	ST.230	570X230	45	E20 67R-010860
ST570I047	ST.240	570X240	47	E20 67R-010861
ST570I049	ST.250	570X250	49	E20 67R-010862
ST570I054	ST.270	570X270	54	E20 67R-010863
--580-				
ST580I038	ST.180	580x180	38	E20 67R-010857
ST580I040	ST.200	580X200	40	E20 67R-010858
ST580I044	ST.220	580X220	44	E20 67R-010859
ST580I048	ST.230	580X230	48	E20 67R-010860
ST580I050	ST.240	580X240	50	E20 67R-010861
ST580I052	ST.250	580X250	52	E20 67R-010862
ST580I055	ST.270	580X270	55	E20 67R-010863

--600--				
ST600I040	ST.180	600x180	40	E20 67R-010857
ST600I041	ST.200	600X200	41	E20 67R-010858
ST600I047	ST.220	600X220	47	E20 67R-010859
ST600I049	ST.230	600X230	49	E20 67R-010860
ST600I052	ST.240	600X240	52	E20 67R-010861
ST600I054	ST.250	600X250	54	E20 67R-010862
ST600I059	ST.270	600X270	59	E20 67R-010863
--630-				
ST630I044	ST.180	630X180	44	E20 67R-010857
ST630I047	ST.200	630X200	47	E20 67R-010858
ST630I052	ST.220	630X220	52	E20 67R-010859
ST630I055	ST.230	630X230	55	E20 67R-010860
ST630I058	ST.240	630X240	58	E20 67R-010861
ST630I060	ST.250	630X250	60	E20 67R-010862
ST630I067	ST.270	630X270	67	E20 67R-010863
--650-				
ST650I051	ST1.200	650X200	51	E20 67R-010864
ST650I056	ST1.220	650X220	56	E20 67R-010865
ST650I060	ST1.230	650X230	60	E20 67R-010866
ST650I063	ST1.240	650X240	63	E20 67R-010867
ST650I066	ST1.250	650x250	66	E20 67R-010868
ST650I071	ST1.270	650x270	71	E20 67R-010869
--680-				
ST680I055	ST1.200	680x200	55	E20 67R-010864
ST680I061	ST1.220	680X220	61	E20 67R-010865
ST680I064	ST1.230	680X230	64	E20 67R-010866
ST680I068	ST1.240	680X240	68	E20 67R-010867
ST680I070	ST1.250	680X250	70	E20 67R-010868
ST680I077	ST1.270	680X270	77	E20 67R-010869
--720-				
ST720I061	ST1.200	720X200	61	E20 67R-010864
ST720I069	ST1.220	720X220	69	E20 67R-010865
ST720I073	ST1.230	720X230	73	E20 67R-010866
ST720I076	ST1.240	720X240	76	E20 67R-010867
ST720I080	ST1.250	720X250	80	E20 67R-010868
ST720I089	ST1.270	720X270	89	E20 67R-010869

2.4.10.7 Ultra Step toroidal 30° tanks list

ULTRA				
PRODUCT CODES	TYPE	DIMENSION	L	HOMOLAGATION
--570-				
ST570U041	SU.200	570X200	41	E20 67R-010882
ST570U046	SU.220	570X220	46	E20 67R-010883
ST570U048	SU.230	570X230	48	E20 67R-010884
ST570U051	SU.240	570X240	51	E20 67R-010885
ST570U053	SU.250	570X250	53	E20 67R-010886
ST570U058	SU.270	570X270	58	E20 67R-010887
--580-				
ST580U043	SU.200	580X200	43	E20 67R-010882
ST580U047	SU.220	580X220	47	E20 67R-010883
ST580U051	SU.230	580X230	51	E20 67R-010884

ST580U053	**SU.240**	**580X240**	**53**	**E20 67R-010885**
ST580U054	**SU.250**	**580X250**	**54**	**E20 67R-010886**
ST580U059	**SU.270**	**580X270**	**59**	**E20 67R-010887**
--600-				
ST600U044	**SU.200**	**600X200**	**44**	**E20 67R-010882**
ST600U050	**SU.220**	**600X220**	**50**	**E20 67R-010883**
ST600U053	**SU.230**	**600X230**	**53**	**E20 67R-010884**
ST600U055	**SU.240**	**600X240**	**55**	**E20 67R-010885**
ST600U058	**SU.250**	**600X250**	**58**	**E20 67R-010886**
ST600U063	**SU.270**	**600X270**	**63**	**E20 67R-010887**
--630-				
ST630U049	**SU.200**	**630X200**	**49**	**E20 67R-010882**
ST630U055	**SU.220**	**630X220**	**55**	**E20 67R-010883**
ST630U058	**SU.230**	**630X230**	**58**	**E20 67R-010884**
ST630U062	**SU.240**	**630X240**	**62**	**E20 67R-010885**
ST630U064	**SU.250**	**630X250**	**64**	**E20 67R-010886**
ST630U071	**SU.270**	**630X270**	**71**	**E20 67R-010887**
--650-				
ST650U053	**SU1.200**	**650X200**	**53**	**E20 67R-010888**
ST650U060	**SU1.220**	**650X220**	**60**	**E20 67R-010889**
ST650U063	**SU1.230**	**650X230**	**63**	**E20 67R-010890**
ST650U066	**SU1.240**	**650X240**	**66**	**E20 67R-010891**
ST650U069	**SU1.250**	**650x250**	**69**	**E20 67R-010892**
ST650U076	**SU1.270**	**650x270**	**76**	**E20 67R-010893**
--680-				
ST680U057	**SU1.200**	**680x200**	**57**	**E20 67R-010888**
ST680U064	**SU1.220**	**680X220**	**64**	**E20 67R-010889**
ST680U068	**SU1.230**	**680X230**	**68**	**E20 67R-010890**
ST680U071	**SU1.240**	**680X240**	**71**	**E20 67R-010891**
ST680U074	**SU1.250**	**680X250**	**74**	**E20 67R-010892**
ST680U083	**SU1.270**	**680X270**	**83**	**E20 67R-010893**
--720-				
ST720U065	**SU1.200**	**720X200**	**65**	**E20 67R-010888**
ST720U072	**SU1.220**	**720X220**	**72**	**E20 67R-010889**
ST720U076	**SU1.230**	**720X230**	**76**	**E20 67R-010890**
ST720U081	**SU1.240**	**720X240**	**81**	**E20 67R-010891**
ST720U083	**SU1.250**	**720X250**	**83**	**E20 67R-010892**
ST720U093	**SU1.270**	**720X270**	**93**	**E20 67R-010893**

2.4.10.8 Step cylinders tanks list

CYLINDER				
PRODUCT CODES	**TYPE**	**DIMENSION**	**L**	**HOMOLAGATION**
--244-				
SC244B022	**SC.244**	**244X503**	**22**	**E20 67R-010870**
SC244B027	**SC.244**	**244X615**	**27**	**E20 67R-010870**
SC244B031	**SC.244**	**244X727**	**31**	**E20 67R-010870**
SC244B037	**SC.244**	**244X840**	**37**	**E20 67R-010870**
SC244B041	**SC.244**	**244X950**	**41**	**E20 67R-010870**

		--270-		
SC270B026	**SC.270**	**270X524**	**26**	**E20 67R-010871**
SC270B031	**SC.270**	**270X615**	**31**	**E20 67R-010871**
SC270B036	**SC.270**	**270X705**	**36**	**E20 67R-010871**
SC270B041	**SC.270**	**270X797**	**41**	**E20 67R-010871**
SC270B047	**SC.270**	**270X886**	**47**	**E20 67R-010871**
SC270B052	**SC.270**	**270X977**	**52**	**E20 67R-010871**
SC270B057	**SC.270**	**270X1069**	**57**	**E20 67R-010871**
		--300-		
SC300B041	**SC.300**	**300X648**	**41**	**E20 67R-010872**
SC300B046	**SC.300**	**300X708**	**46**	**E20 67R-010872**
SC300B052	**SC.300**	**300X768**	**52**	**E20 67R-010872**
SC300B055	**SC.300**	**300X850**	**55**	**E20 67R-010872**
SC300B064	**SC.300**	**300X960**	**64**	**E20 67R-010872**
SC300B072	**SC.300**	**300X1088**	**72**	**E20 67R-010872**
		--315-		
SC315B032	**SC.315**	**315X460**	**32**	**E20 67R-010873**
SC315B035	**SC.315**	**315X500**	**35**	**E20 67R-010873**
SC315B041	**SC.315**	**315X560**	**41**	**E20 67R-010873**
SC315B046	**SC.315**	**315X623**	**46**	**E20 67R-010873**
SC315B050	**SC.315**	**315X690**	**50**	**E20 67R-010873**
SC315B055	**SC.315**	**315X753**	**55**	**E20 67R-010873**
SC315B061	**SC.315**	**315X820**	**61**	**E20 67R-010873**
SC315B069	**SC.315**	**315X924**	**69**	**E20 67R-010873**
SC315B080	**SC.315**	**315X1070**	**80**	**E20 67R-010873**
		--360-		
SC360B050	**SC.360**	**360X564**	**50**	**E20 67R-010874**
SC360B064	**SC.360**	**360X662**	**64**	**E20 67R-010874**
SC360B070	**SC.360**	**360X758**	**70**	**E20 67R-010874**
SC360B080	**SC.360**	**360X860**	**80**	**E20 67R-010874**
SC360B090	**SC.360**	**360X960**	**90**	**E20 67R-010874**
SC360B101	**SC.360**	**360X1060**	**101**	**E20 67R-010874**
SC360B112	**SC.360**	**360X1160**	**112**	**E20 67R-010874**
SC360B122	**SC.360**	**360X1260**	**122**	**E20 67R-010874**
		--400-		
SC400B092	**SC.400**	**400X803**	**92**	**E20 67R-010875**
SC400B103	**SC.400**	**400X886**	**103**	**E20 67R-010875**
SC400B113	**SC.400**	**400X966**	**113**	**E20 67R-010875**
SC400B121	**SC.400**	**400X1049**	**121**	**E20 67R-010875**
SC400B132	**SC.400**	**400X1130**	**132**	**E20 67R-010875**
SC400B142	**SC.400**	**400X1213**	**135**	**E20 67R-010875**

The Step cylindrical tanks must be combined to air lock for cylindrical tanks with approval n.: E13 67R010043.

2.4.10.9 Tugra Makina toroidal 0° tanks list

CODES	DIMENSION				HOMOLOGATION
Internal type	mm		l	kg	E37 67R 01
TI 520 180	520	180	26	13	E37 67R 01 0030
TI 550,180	550	180	30	15	
TI 580,180	580	180	34	17	
TI 600,180	600	180	37	18,5	
TI 520,200	520	200	30	15	E37 67R 01 0050
TI 550,200	550	200	34	17	
TI 580,200	580	200	39	19,5	
TI 600,200	600	200	42	21	
TI 630,200	630	200	44	22	
TI 650,200	650	200	50	25	
TI 680,200	680	200	54	27	E37 67R 01 0109
TI 520,225	520	225	34	17	E37 67R 01 0015
TI 550,225	550	225	40	20	
TI 580,225	580	225	44	22	
TI 600,225	600	225	48	24	
TI 630,225	630	225	52	26	
TI 650,225	650	225	58	29	
TI 680,225	680	225	62	31	E37 67R 01 0112
TI 520,240	520	240	37	18,5	E37 67R 01 0001
TI 550,240	550	240	43	21,5	
TI 580,240	580	240	48	24	
TI 600,240	600	240	52	26	
TI 630,240	630	240	56	28	
TI 650,240	650	240	62	31	
TI 680,240	680	240	68	34	E37 67R 01 0113
TI 520,250	520	250	39	19,5	E37 67R 01 0002
TI 550,250	550	250	45	22,5	
TI 580,250	580	250	50	25	
TI 600,250	600	250	54	27	
TI 630,250	630	250	60	30	
TI 650,250	650	250	66	33	
TI 680,250	680	250	71	35,5	E37 67R 01 0110
TI 520,270	520	270	42	21	E37 67R 01 0019
TI 550,270	550	270	49	24,5	
TI 580,270	580	270	55	27,5	
TI 600,270	600	270	59	29,5	
TI 630,270	630	270	65	32,5	

TI 650,270	650	270	72	36	
TI 680,270	680	270	76	38	E37 67R 01 0111

2.4.10.10 Tugra Makina toroidal 30° tanks list

Code	DIMENSION		L		HOMOLOGATION
Internal type	mm		l	kg	E37 67R 01
TI 520 180	520 mm	180	26	13	E37 67R 01 0030
TI 550,180	550mm	180	30	15	
TI 580,180	580mm	180	34	17	
TI 600,180	600mm	180	37	18,5	
TI 630,180	630mm	180	40	20	
TI 650,180	650mm	180	44	22	
TI 520,200	520 mm	200	30	15	E37 67R 01 0050
TI 550,200	550mm	200	34	17	
TI 580,200	580mm	200	39	19,5	
TI 600,200	600mm	200	42	21	
TI 630,200	630mm	200	44	22	
TI 650,200	650mm	200	50	25	
TI 680,200	680mm	200	54	27	E37 67R 01 0109
TI 520,225	520 mm	225	34	17	E37 67R 01 0015
TI 550,225	550mm	225	40	20	
TI 580,225	580mm	225	44	22	
TI 600,225	600mm	225	48	24	
TI 630,225	630mm	225	52	26	
TI 650,225	650mm	225	58	29	
TI 680,225	680mm	225	62	31	E37 67R 01 0112
TI 520,240	520 mm	240	37	18,5	E37 67R 01 0001
TI 550,240	550mm	240	43	21,5	
TI 580,240	580mm	240	48	24	
TI 600,240	600mm	240	52	26	
TI 630,240	630mm	240	56	28	
TI 650,240	650mm	240	62	31	
TI 680,240	680mm	240	68	34	E37 67R 01 0113
TI 520,250	520 mm	250	39	19,5	E37 67R 01 0002
TI 550,250	550mm	250	45	22,5	
TI 580,250	580mm	250	50	25	
TI 600,250	600mm	250	54	27	
TI 630,250	630mm	250	60	30	
TI 650,250	650mm	250	66	33	
TI 680,250	680mm	250	71	35,5	E37 67R 01 0110
TI 520,270	520 mm	270	42	21	E37 67R 01 0019
TI 550,270	550mm	270	49	24,5	

TI 580,270	580mm	270	55	27,5	
TI 600,270	600mm	270	59	29,5	
TI 630,270	630mm	270	65	32,5	
TI 650,270	650mm	270	72	36	
TI 680,270	680mm	270	76	38	E37 67R 01 0111

The Tugra Makina toroidal tanks must be combined to air lock for Tugra Makina toroidal tanks with approval n.: E13 67R010018.

2.4.10.11 Tugra Makina cylinders tanks list

Code	DIMENSION		CAPACITY		HOMOLOGATION
Internal type	mm		l	kg	E37 67R 01
C20370	Ø200	385	10	5	E37 67R 01 0051
C20544		560	15	7,5	
C20605		640	17	8,5	
C20716		730	20	10	
C20825		830	23	11,5	
C20885		910	25	12,5	
C20910		930	26	13	
C201010		1030	29	14,5	
C201060		1060	30	15	
C201230		1245	35	17,5	
C24327	Ø244	330	12	6	E37 67R 01 0052
C24365		400	15	7,5	
C24490		505	20	10	
C24596		600	24	12	
C24600		620	25	12,5	
C24750		730	30	15	
C24815		845	35	17,5	
C24865		870	36	18	
C24960		960	40	20	
C24980		1010	42	21	
C241050		1070	45	22,5	
C241060		1095	46	23	
C241160		1180	50	25	
C241200		1230	52	26	
C27498	Ø270	520	25	12,5	E37 67R 01 0053
C27589		610	30	15	
C27681		700	35	17,5	
C27772		790	40	20	
C27863		880	45	22,5	
C27955		970	50	25	
C27975		990	51	25,5	
C271005		1040	54	27	

C271025		1055	55	27,5	
C271035		1110	58	29	
C271125		1150	60	30	
C30640	Ø300	645	40	20	E37 67R 01 0054
C30714		720	45	22,5	
C30787		795	50	25	
C30861		870	55	27,5	
C30902		915	58	29	
C30922		945	60	30	
C30972		975	62	31	
C30987		1020	65	32,5	
C301052		1075	69	34,5	
C301057		1090	70	35	

2.4.10.12 Tugra Makina cylinders tanks list

Code	DIMENSION		CAPACITY		HOMOLOGATION
Internal type	mm		l	kg	E37 67R 01
C31439	Ø315	470	30	15	E37 67R 01 0055
C31474		500	32	16	
C31526		535	35	17,5	
C31594		600	40	20	
C31664		670	45	22,5	
C31731		740	50	25	
C31744		775	53	26,5	
C31798		805	55	27,5	
C31865		870	60	30	
C31904		935	65	32,5	
C31954		965	67	33,5	
C31999		1000	70	35	
C311011		1040	73	36,5	
C311039		1070	75	37,5	
C311104		1135	80	40	
C36570	Ø360	585	50	25	E37 67R 01 0056
C36620		635	55	27,5	
C36660		675	59	29,5	
C36670		685	60	30	
C36700		725	64	32	
C36720		735	65	32,5	
C36770		785	70	35	
C36795		815	73	36,5	
C36810		840	75	37,5	
C36870		890	80	40	
C36920		940	85	42,5	
C36970		990	90	45	
C361020		1040	95	47,5	
C361065		1090	100	50	
C361120		1155	105	52,5	

CP36670	Ø360	670	60	30	E37 67R 01 0020
CP36720		720	65	32,5	
CP36770		770	70	35	
CP36870		870	80	40	
CP36970		970	90	45	

The Tugra Makina cylindrical tanks must be combined to air lock for cylindrical tanks with approval n.: E13 67R010043.

2.4.10.13 IMZ toroidal E/E tanks list

Tanks Mod L96 I.E./E.E 0°

TOROIDAL 0° - INTERNAL EXTERNAL / EXTERNAL EXTERNAL

DIAMETER	HEIGHT	CAPACITY	HOMOLOGATION
580	200	LT. 44	E8 67R-01 3913
580	220	LT. 48	E8 67R-01 3914
600	200	LT. 46	E8 67R-01 3913
600	220	LT. 52	E8 67R-01 3914
600	240	LT. 56	E8 67R-01 3915
600	270	LT. 63	E8 67R-01 3916
630	200	LT. 50	E8 67R-01 3913
630	220	LT. 55	E8 67R-01 3914
630	240	LT. 62	E8 67R-01 3915
630	270	LT. 70	E8 67R-01 3916
650	200	LT. 55	E8 67R-01 3917
650	220	LT. 61	E8 67R-01 3918
650	240	LT. 67	E8 67R-01 3919
650	270	LT. 76	E8 67R-01 3920
720	200	LT. 68	E8 67R-01 3917
720	220	LT. 77	E8 67R-01 3918
720	240	LT. 84	E8 67R-01 3919
720	270	LT. 94	E8 67R-01 3920

2.4.10.14 IMZ toroidal I/I tanks list

Tanks Mod.L200/B I.I. 30°

TOROIDAL 30° - INTERNAL/ INTERNAL

(mounting kit including base as shown below)

DIAMETER	HEIGHT	CAPACITY	HOMOLOGATION
580	200	LT. 40	E8 67R-01 3734
580	220	LT. 44	E8 67R-01 3735
600	200	LT. 42	E8 67R-01 3734
600	220	LT. 48	E8 67R-01 3735
600	240	LT. 52	E8 67R-01 3736
600	270	LT. 58	E8 67R-01 3737
630	200	LT. 45	E8 67R-01 3734
630	220	LT. 51	E8 67R-01 3735
630	240	LT. 57	E8 67R-01 3736
630	270	LT. 64	E8 67R-01 3737
650	200	LT. 50	E8 67R-01 3734
650	220	LT. 56	E8 67R-01 3735
650	240	LT. 61	E8 67R-01 3736
650	270	LT. 71	E8 67R-01 3737

720	200	LT. 62	E8 67R-01 3734
720	220	LT. 68	E8 67R-01 3735
720	240	LT. 76	E8 67R-01 3736
720	270	LT. 86	E8 67R-01 3737

2.4.10.15 NUOVA G.G.L. cylinders tanks list

CYLINDERS TANKS

TIPO 244 E7 R67-01 53110128							
Code	**De** mm.	**L** mm.	**Cap** lt.	**A** (m^2)	q_1 (m^3/min)	Q_2 (m^3/min)	$q_1 + q_2$ (m^3/min)
SCG 01	244	600	24	0,493	5,969	1,346	7,315
SCG 02	244	730	30	0,593	6,945	1,619	8,564
SCG 03	244	860	36	0,693	7,891	1,892	9,783
SCG 04	244	1000	42	0,800	8,878	2,184	11,062
SCG 05	244	1200	52	0,953	10,247	2,602	12,849
TIPO 270 E7 R67-01 53110129							
Code	**De** mm.	**L** mm.	**Cap** lt.	**A** (m^2)	q_1 (m^3/min)	Q_2 (m^3/min)	$q_1 + q_2$ (m^3/min)
SCG 06	270	720	35	0,652	7,507	1,780	9,287
SCG 07	270	800	40	0,720	8,143	1,966	10,108
SCG 08	270	870	45	0,779	8,686	2,127	10,813
SCG 09	270	980	51	0,872	9,528	2,381	11,908
SCG 10	270	1060	55	0,940	10,133	2,566	12,699
SCG 11	270	1100	58	0,974	10,432	2,659	13,091
TIPO 300 E7 R67-01 53110130							
Code	**De** mm.	**L** mm.	**Cap** lt.	**A** (m^2)	q_1 (m^3/min)	Q_2 (m^3/min)	$q_1 + q_2$ (m^3/min)
SCG 50	300	600	36	0,617	7,174	1,684	8,858
SCG 12	300	800	50	0,805	8,923	2,198	11,121
SCG 13	300	870	55	0,871	9,519	2,378	11,896
SCG 14	300	920	58	0,918	9,938	2,506	12,444
SCG 15	300	950	62	0,946	10,186	2,583	12,768
SCG 16	300	1080	69	1,069	11,259	2,918	14,178
TIPO 315 E7 R67-01 53110131							
Code	**De** mm.	**L** mm.	**Cap** lt.	**A** (m^2)	q_1 (m^3/min)	Q_2 (m^3/min)	$q_1 + q_2$ (m^3/min)
SCG 17	315	770	53	0,818	9,041	2,233	11,274
SCG 18	315	870	60	0,917	9,929	2,503	12,432
SCG 19	315	960	67	1,006	10,712	2,746	13,459
SCG 20	315	1050	73	1,095	11,484	2,989	14,473
TIPO 360 E7 R67-01 53110132							
Code	**De** mm.	**L** mm.	**Cap.** lt.	**A** (m^2)	q_1 (m^3/min)	Q_2 (m^3/min)	$q_1 + q_2$ (m^3/min)
SCG 30	360	675	60	0,837	9,218	2,286	11,504

SCG 21	360	720	64	0,888	9,671	2,424	12,095
SCG 22	360	810	73	0,990	10,573	2,703	13,275
SCG 23	360	900	80	1,091	11,449	2,978	14,428
SCG 24	360	1000	90	1,204	12,413	3,287	15,700
SCG 25	360	1100	100	1,318	13,369	3,598	16,967
SCG 60	360	1260	118	1,498	14,855	4,092	18,947

Nominal Capacity: Tolerance ± 3%

2.4.10.16 NUOVA G.G.L. toroidal tanks list

TOROIDAL TANKS

TIPO 180 E7 R67-01 3064 02								
EXTERNAL 0°	**INTERNAL 30°**	**De** mm.	**H** mm.	**Cap.** lt.	**A** (m^2)	**Q_1** (m^3/min)	**q_2** (m^3/min.)	**$q_1 + q_2$** (m^3/min)
TE 01	TI 01	550	180	30	0,662	7,601	1,807	9,408
TE 02	TI 02	580	180	34	0,736	8,291	2,009	10,300
TE 03	TI 03	600	180	37	0,768	8,585	2,097	10,682
TE 04	TI 04	630	180	41	0,837	9,213	2,285	11,498
TE 05	TI 05	650	180	45	0,899	9,769	2,454	12,223
TE 06	TI 06	680	180	49	0,920	9,956	2,512	12,467
TE 07	TI 07	720	180	55	1,062	11,199	2,899	14,098
TIPO 200 E7 R67-01 3064 03								
EXTERNAL 0°	**INTERNAL 30°**	**De** mm.	**H** mm.	**Cap.** lt.	**A** (m^2)	**Q_1** (m^3/min)	**q_2** (m^3/min.)	**$q_1 + q_2$** (m^3/min)
TE 08	TI 08	550	200	34	0,717	8,115	1,957	10,072
TE **09**	TI **09**	580	200	40	0,774	8,640	2,113	10,753
TE 10	TI 10	600	200	**42**	0,818	9,041	2,233	11,274
TE 11	TI 11	630	200	47	0,888	9,671	2,424	12,095
TE 12	TI 12	650	200	51	0,935	10,088	2,553	12,641
TE 13	TI 13	680	200	57	0,970	10,397	2,648	13,045
TE 14	TI 14	720	200	63	1,070	11,268	2,921	14,189
TIPO 220 E7 R67-01 3064 04								
EXTERNAL 0°	**INTERNAL 30°**	**De** mm.	**H** mm.	**Cap.** lt.	**A** (m^2)	**Q_1** (m^3/min)	**q_2** (m^3/min.)	**$q_1 + q_2$** (m^3/min)
TE 15	TI 15	550	220	38	0,764	8,549	2,086	10,634
TE **16**	TI **16**	580	220	44	0,815	9,014	2,225	11,239
TE 17	TI 17	600	220	47	0,860	9,420	2,348	11,768
TE 18	TI 18	630	220	53	0,931	10,053	2,542	12,595
TE 19	TI 19	650	220	57	0,983	10,511	2,684	13,195
TE 20	TI 20	680	220	63	1,030	10,922	2,812	13,733
TE 21	TI 21	720	220	70	1,130	11,784	3,085	14,869

TIPO 240 E7 R67-01 3064 05								
EXTERNAL 0°	**INTERNAL 30°**	De mm.	H mm.	Cap. lt.	A (m^2)	q_1 (m^3/min)	q_2 (m^3/min.)	$q_1 + q_2$ (m^3/min)
TE 22	TI 22	550	240	42	0,794	8,823	2,168	10,990
TE **23**	TI **23**	580	240	**48**	0,863	9,447	2,356	11,803
TE 24	TI 24	600	240	52	0,908	9,849	2,479	12,328
TE 25	TI 25	630	240	59	0,981	10,494	2,678	13,172
TE 26	TI 26	650	240	63	1,034	10,956	2,823	13,779
TE 27	TI 27	680	240	70	1,080	11,354	2,948	14,303
TE 28	TI 28	720	240	78	1,180	12,210	3,221	15,431
TIPO 270 E7 R67-01 3064 06								
EXTERNAL 0°	**INTERNAL 30°**	**De** mm.	**H** mm.	**Cap.** lt.	**A** (m^2)	**q_1** (m^3/min)	**q_2** (m^3/min.)	**$q_1 + q_2$** (m^3/min)
TE 29	TI 29	550	270	48	0,872	9,528	2,381	11,908
TE **30**	TI **30**	580	270	55	0,942	10,150	2,572	12,722
TE 31	TI 31	600	270	60	0,980	10,485	2,675	13,160
TE 32	TI 32	630	270	67	1,055	11,138	2,880	14,019
TE 33	TI 33	650	270	72	1,110	11,612	3,030	14,643
TE 34	TI 34	680	270	80	1,150	11,954	3,140	15,094
TE 35	TI 35	720	270	90	1,270	12,968	3,467	16,435
TIPO 300 E7 R67-01 6674 03								
EXTERNAL 0°	**INTERNAL 30°**	**De** mm.	**H** mm.	**Cap.** lt.	**A** (m^2)	**q_1** (m^3/min)	**q_2** (m^3/min.)	**$q_1 + q_2$** (m^3/min)
TE 41	TI 41	580	300	65				
TE 42	TI 42	600	300	68				
TE 43	TI 43	630	300	78				
TE 44	TI 44	650	300	81				
TE 45	TI 45	680	300	92				
TE 46	TI 46	720	300	100				

Nominal Capacity: Tolerance ± 3%

TUS Code: Higher capacity : > 3 ÷ 7 LT

2.4.10.17 F.lli Ghezzi tanks list
Toroidal ring with internal

Design type 180	550	180	32	E13 67R-010227
	580	180	35	E13 67R-010227
	600	180	37	E13 67R-010227
	630	180	42	E13 67R-010227
	650	180	45	E13 67R-010227

Design type 200	550	200	35	E13 67R-010228
	580	200	40	E13 67R-010228
	600	200	43	E13 67R-010228
	630	200	48	E13 67R-010228
	650	200	51	E13 67R-010228

Design type 220	550	220	39	E13 67R-010229
	580	220	44	E13 67R-010229
	600	220	48	E13 67R-010229
	630	220	53	E13 67R-010229
	650	220	57	E13 67R-010229

Design type 240	550	240	43	E13 67R-010230
	580	240	49	E13 67R-010230
	600	240	53	E13 67R-010230
	630	240	59	E13 67R-010230
	650	240	63	E13 67R-010230

Design type 270	550	270	49	E13 67R-010231
	580	270	55	E13 67R-010231
	600	270	61	E13 67R-010231
	630	270	66	E13 67R-010231
	650	270	72	E13 67R-010231

2.4.10.18 F.lli Ghezzi tanks list
Toroidal ring with external

Design type 180	550	180	36	E13 67R-010227
	580	180	40	E13 67R-010227
	600	180	42	E13 67R-010227
	630	180	45	E13 67R-010227
	650	180	49	E13 67R-010227

Design type 200	550	200	40	E13 67R-010228
	580	200	45	E13 67R-010228
	600	200	48	E13 67R-010228
	630	200	52	E13 67R-010228
	650	200	56	E13 67R-010228

Design type 220	550	220	45	E13 67R-010229
	580	220	49	E13 67R-010229
	600	220	53	E13 67R-010229
	630	220	58	E13 67R-010229
	650	220	62	E13 67R-010229

Design type	550	240	50	E13 67R-010230

240	580	240	55	E13 67R-010230
	600	240	58	E13 67R-010230
	630	240	65	E13 67R-010230
	650	240	70	E13 67R-010230

Design type 270	550	270	56	E13 67R-010231
	580	270	62	E13 67R-010231
	600	270	66	E13 67R-010231
	630	270	73	E13 67R-010231
	650	270	79	E13 67R-010231

2.4.10.19 F.lli Ghezzi tanks list
Cylinders tanks

Type Diameter 200	200 x 600	16	E13 67R-010073
	200 x 800	22	E13 67R-010073
	200 x 900	25	E13 67R-010073
	200 x 1000	28	E13 67R-010073
	200 x 1100	31	E13 67R-010073
	200 x 1200	34	E13 67R-010073

Type Diameter 244	244 x 600	24	E13 67R-010072
	244 x 710	29	E13 67R-010072
	244 x 840	36	E13 67R-010072
	244 x 1000	42	E13 67R-010072
	244 x 1100	46	E13 67R-010072
	244 x 1200	50	E13 67R-010072

Type Diameter 270	270 x 520	24	E13 67R-010071
	270 x 720	36	E13 67R-010071
	270 x 880	45	E13 67R-010071
	270 x 970	50	E13 67R-010071
	270 x 1050	54	E13 67R-010071
	270 x 1150	60	E13 67R-010071

Type Diameter 300	300 x 600	37	E13 67R-010070
	300 x 740	46	E13 67R-010070
	300 x 900	58	E13 67R-010070
	300 x 960	62	E13 67R-010070
	300 x 1100	70	E13 67R-010070
	300 x 1160	74	E13 67R-010070

Type Diameter 315	315 x 770	53	E13 67R-010069
	315 x 870	60	E13 67R-010069
	315 x 960	67	E13 67R-010069
	315 x 1070	75	E13 67R-010069
	315 x 1170	83	E13 67R-010069

Type Diameter 360	360 x 720	64	E13 67R-010068
	360 x 800	70	E13 67R-010068
	360 x 900	80	E13 67R-010068
	360 x 950	85	E13 67R-010068
	360 x 1000	90	E13 67R-010068
	360 x 1050	95	E13 67R-010068
	360 x 1100	100	E13 67R-010068

2.4.10.20 Saka LPG Tanklari toroidal I/I tanks list
Toroidal INTERNAL / INTERNAL tanks

Product Code	Description	Diameter	Height	Liter	Homologation
SKT550I030	550X180 30LT Internal Toroidal Tank	550	180	30	**E7 67R 014695 06**
SKT550I034	550X200 34LT Internal Toroidal Tank	550	200	34	**E7 67R 014695 07**
SKT550I038	550X220 38LT Internal Toroidal Tank	550	220	38	**E7 67R 014695 08**
SKT550I042	550X240 42LT Internal Toroidal Tank	550	240	42	**E7 67R 014695 09**
SKT550I048	550X270 48LT Internal Toroidal Tank	550	270	48	**E7 67R 014695 10**
SKT570I033	570X180 33LT Internal Toroidal Tank	570	180	33	**E7 67R 014695 06**
SKT570I037	570X200 37LT Internal Toroidal Tank	570	200	37	**E7 67R 014695 07**
SKT570I042	570X220 42LT Internal Toroidal Tank	570	220	42	**E7 67R 014695 08**
SKT570I046	570X240 46LT Internal Toroidal Tank	570	240	46	**E7 67R 014695 09**
SKT570I053	570X270 53LT Internal Toroidal Tank	570	270	53	**E7 67R 014695 10**
SKT580I038	580X180 34LT Internal Toroidal Tank	580	180	34	**E7 67R 014695 06**
SKT580I040	580X200 40LT Internal Toroidal Tank	580	200	40	**E7 67R 014695 07**
SKT580I044	580X220 44LT Internal Toroidal Tank	580	220	44	**E7 67R 014695 08**
SKT580I050	580X240 50LT Internal Toroidal Tank	580	240	50	**E7 67R 014695 09**
SKT580I055	580X270 55LT Internal Toroidal Tank	580	270	55	**E7 67R 014695 10**
SKT600I037	600X180 37LT Internal Toroidal Tank	600	180	37	**E7 67R 014695 06**
SKT600I043	600X200 43LT Internal Toroidal Tank	600	200	43	**E7 67R 014695 07**
SKT600I047	600X220 47LT Internal Toroidal Tank	600	220	47	**E7 67R 014695 08**
SKT600I052	600X240 52LT Internal Toroidal Tank	600	240	52	**E7 67R 014695 09**
SKT600I060	600X270 60LT Internal Toroidal Tank	600	270	60	**E7 67R 014695 10**
SKT630I042	630X180 42LT Internal Toroidal Tank	630	180	42	**E7 67R 014695 06**
SKT630I048	630X200 48LT Internal Toroidal Tank	630	200	48	**E7 67R 014695 07**
SKT630I053	630X220 53LT Internal Toroidal Tank	630	220	53	**E7 67R 014695 08**
SKT630I059	630X240 59LT Internal Toroidal Tank	630	240	59	**E7 67R 014695 09**
SKT630I067	630X270 67LT Internal Toroidal Tank	630	270	67	**E7 67R 014695 10**
SKT650I045	650X180 45LT Internal Toroidal Tank	650	180	45	**E7 67R 014695 06**
SKT650I051	650X200 51LT Internal Toroidal Tank	650	200	51	**E7 67R 014695 07**
SKT650I057	650X220 57LT Internal Toroidal Tank	650	220	57	**E7 67R 014695 08**
SKT650I063	650X240 63LT Internal Toroidal Tank	650	240	63	**E7 67R 014695 09**
SKT650I072	650X270 72LT Internal Toroidal Tank	650	270	72	**E7 67R 014695 10**
SKT680I049	680X180 49LT Internal Toroidal Tank	680	180	49	**E7 67R 014695 06**
SKT680I057	680X200 57LT Internal Toroidal Tank	680	200	57	**E7 67R 014695 07**
SKT680I063	680X220 63LT Internal Toroidal Tank	680	220	63	**E7 67R 014695 08**
SKT680I070	680X240 70LT Internal Toroidal Tank	680	240	70	**E7 67R 014695 09**
SKT680I080	680X270 80LT Internal Toroidal Tank	680	270	80	**E7 67R 014695 10**
SKT720I055	720X180 55LT Internal Toroidal Tank	720	180	55	**E7 67R 014695 06**
SKT720I063	720X200 63LT Internal Toroidal Tank	720	200	63	**E7 67R 014695 07**
SKT720I070	720X220 70LT Internal Toroidal Tank	720	220	70	**E7 67R 014695 08**
SKT720I078	720X240 78LT Internal Toroidal Tank	720	240	78	**E7 67R 014695 09**
SKT720I089	720X270 89LT Internal Toroidal Tank	720	270	89	**E7 67R 014695 10**

The Saka toroidal tanks must be combined to air lock for Saka toroidal tanks with approval n.: E7 67R01469506.

2.4.10.21 Saka LPG Tanklari toroidal E/E tanks list
Toroidal EXTERNAL / EXTERNAL tanks

Product Code	Description	Diameter	Height	Liter	Homologation
SKT550E030	550X180 30LT External Toroidal Tank	550	180	30	**E7 67R 014695 06**
SKT550E034	550X200 34LT External Toroidal Tank	550	200	34	**E7 67R 014695 07**
SKT550E038	550X220 38LT External Toroidal Tank	550	220	38	**E7 67R 014695 08**
SKT550E042	550X240 42LT External Toroidal Tank	550	240	42	**E7 67R 014695 09**
SKT550E048	550X270 48LT External Toroidal Tank	550	270	48	**E7 67R 014695 10**
SKT570E033	570X180 33LT External Toroidal Tank	570	180	33	**E7 67R 014695 06**
SKT570E037	570X200 37LT External Toroidal Tank	570	200	37	**E7 67R 014695 07**
SKT570E042	570X220 42LT External Toroidal Tank	570	220	42	**E7 67R 014695 08**
SKT570E046	570X240 46LT External Toroidal Tank	570	240	46	**E7 67R 014695 09**
SKT570E053	570X270 53LT External Toroidal Tank	570	270	53	**E7 67R 014695 10**
SKT580E038	580X180 34LT External Toroidal Tank	580	180	34	**E7 67R 014695 06**
SKT580E040	580X200 40LT External Toroidal Tank	580	200	40	**E7 67R 014695 07**
SKT580E044	580X220 44LT External Toroidal Tank	580	220	44	**E7 67R 014695 08**
SKT580E050	580X240 50LT External Toroidal Tank	580	240	50	**E7 67R 014695 09**
SKT580E055	580X270 55LT External Toroidal Tank	580	270	55	**E7 67R 014695 10**
SKT600E037	600X180 37LT External Toroidal Tank	600	180	37	**E7 67R 014695 06**
SKT600E043	600X200 43LT External Toroidal Tank	600	200	43	**E7 67R 014695 07**
SKT600E047	600X220 47LT External Toroidal Tank	600	220	47	**E7 67R 014695 08**
SKT600E052	600X240 52LT External Toroidal Tank	600	240	52	**E7 67R 014695 09**
SKT600E060	600X270 60LT External Toroidal Tank	600	270	60	**E7 67R 014695 10**
SKT630E042	630X180 42LT External Toroidal Tank	630	180	42	**E7 67R 014695 06**
SKT630E048	630X200 48LT External Toroidal Tank	630	200	48	**E7 67R 014695 07**
SKT630E053	630X220 53LT External Toroidal Tank	630	220	53	**E7 67R 014695 08**
SKT630E059	630X240 59LT External Toroidal Tank	630	240	59	**E7 67R 014695 09**
SKT630E067	630X270 67LT External Toroidal Tank	630	270	67	**E7 67R 014695 10**
SKT650E045	650X180 45LT ExternalToroidal Tank	650	180	45	**E7 67R 014695 06**
SKT650E051	650X200 51LT External Toroidal Tank	650	200	51	**E7 67R 014695 07**
SKT650E057	650X220 57LT External Toroidal Tank	650	220	57	**E7 67R 014695 08**
SKT650E063	650X240 63LT External Toroidal Tank	650	240	63	**E7 67R 014695 09**
SKT650E072	650X270 72LT External Toroidal Tank	650	270	72	**E7 67R 014695 10**
SKT680E049	680X180 49LT External Toroidal Tank	680	180	49	**E7 67R 014695 06**
SKT680E057	680X200 57LT External Toroidal Tank	680	200	57	**E7 67R 014695 07**
SKT680E063	680X220 63LT External Toroidal Tank	680	220	63	**E7 67R 014695 08**
SKT680E070	680X240 70LT External Toroidal Tank	680	240	70	**E7 67R 014695 09**
SKT680E080	680X270 80LT External Toroidal Tank	680	270	80	**E7 67R 014695 10**
SKT720E055	720X180 55LT External Toroidal Tank	720	180	55	**E7 67R 014695 06**
SKT720E063	720X200 63LT External Toroidal Tank	720	200	63	**E7 67R 014695 07**
SKT720E070	720X220 70LT External Toroidal Tank	720	220	70	**E7 67R 014695 08**
SKT720E078	720X240 78LT External Toroidal Tank	720	240	78	**E7 67R 014695 09**
SKT720E089	720X270 89LT External Toroidal Tank	720	270	89	**E7 67R 014695 10**

2.4.10.22 Saka LPG Tanklari toroidal ULTRA tanks list
Toroidal Ultra tanks

Product Code	Description	Diameter	Height	Liter	Homologation
SKT550U033	550X180 33LT Ultra Toroidal Tank	550	180	33	**E7 67R 014695 06**
SKT550U037	550X200 37LT Ultra Toroidal Tank	550	200	37	**E7 67R 014695 07**
SKT550U042	550X220 42LT Ultra Toroidal Tank	550	220	42	**E7 67R 014695 08**
SKT550U046	550X240 46LT Ultra Toroidal Tank	550	240	46	**E7 67R 014695 09**
SKT550U053	550X270 53LT Ultra Toroidal Tank	550	270	53	**E7 67R 014695 10**
SKT570U036	570X180 36LT Ultra Toroidal Tank	570	180	36	**E7 67R 014695 06**
SKT570U040	570X200 40LT Ultra Toroidal Tank	570	200	40	**E7 67R 014695 07**
SKT570U046	570X220 46LT Ultra Toroidal Tank	570	220	46	**E7 67R 014695 08**
SKT570U050	570X240 50LT Ultra Toroidal Tank	570	240	50	**E7 67R 014695 09**
SKT570U058	570X270 58LT Ultra Toroidal Tank	570	270	58	**E7 67R 014695 10**
SKT580U041	580X180 41LT Ultra Toroidal Tank	580	180	41	**E7 67R 014695 06**
SKT580U043	580X200 43LT Ultra Toroidal Tank	580	200	53	**E7 67R 014695 07**
SKT580U048	580X220 48LT Ultra Toroidal Tank	580	220	48	**E7 67R 014695 08**
SKT580U054	580X240 54LT Ultra Toroidal Tank	580	240	54	**E7 67R 014695 09**
SKT580U060	580X270 60LT Ultra Toroidal Tank	580	270	60	**E7 67R 014695 10**
SKT600U042	600X180 42LT Ultra Toroidal Tank	600	180	42	**E7 67R 014695 06**
SKT600U046	600X200 46LT Ultra Toroidal Tank	600	200	46	**E7 67R 014695 07**
SKT600U051	600X220 51LT Ultra Toroidal Tank	600	220	51	**E7 67R 014695 08**
SKT600U056	600X240 56LT Ultra Toroidal Tank	600	240	56	**E7 67R 014695 09**
SKT600U065	600X270 65LT Ultra Toroidal Tank	600	270	65	**E7 67R 014695 10**
SKT630U045	630X180 45LT Ultra Toroidal Tank	630	180	45	**E7 67R 014695 06**
SKT630U051	630X200 51LT Ultra Toroidal Tank	630	200	51	**E7 67R 014695 07**
SKT630U057	630X220 57LT Ultra Toroidal Tank	630	220	57	**E7 67R 014695 08**
SKT630U063	630X240 63LT Ultra Toroidal Tank	630	240	63	**E7 67R 014695 09**
SKT630U072	630X270 72LT Ultra Toroidal Tank	630	270	72	**E7 67R 014695 10**
SKT650U048	650X180 48LT Ultra Toroidal Tank	650	180	48	**E7 67R 014695 06**
SKT650U054	650X200 54LT Ultra Toroidal Tank	650	200	54	**E7 67R 014695 07**
SKT650U061	650X220 61LT Ultra Toroidal Tank	650	220	61	**E7 67R 014695 08**
SKT650U067	650X240 67LT Ultra Toroidal Tank	650	240	67	**E7 67R 014695 09**
SKT650U077	650X270 77LT Ultra Toroidal Tank	650	270	77	**E7 67R 014695 10**
SKT680U052	680X180 52LT Ultra Toroidal Tank	680	180	52	**E7 67R 014695 06**
SKT680U060	680X200 60LT Ultra Toroidal Tank	680	200	60	**E7 67R 014695 07**
SKT680U067	680X220 67LT Ultra Toroidal Tank	680	220	67	**E7 67R 014695 08**
SKT680U074	680X240 74LT Ultra Toroidal Tank	680	240	74	**E7 67R 014695 09**
SKT680U085	680X270 85LT Ultra Toroidal Tank	680	270	85	**E7 67R 014695 10**
SKT720U058	720X180 58LT Ultra Toroidal Tank	720	180	58	**E7 67R 014695 06**
SKT720U066	720X200 66LT Ultra Toroidal Tank	720	200	66	**E7 67R 014695 07**
SKT720U074	720X220 74LT Ultra Toroidal Tank	720	220	74	**E7 67R 014695 08**
SKT720U082	720X240 82LT Ultra Toroidal Tank	720	240	82	**E7 67R 014695 09**
SKT720U094	720X270 94LT Ultra Toroidal Tank	720	270	94	**E7 67R 014695 10**

2.4.10.23 Saka LPG Tanklari cylinders tanks list
Cylinders tanks

Product Code	Description	Diameter	Height	Liter	Homologation
SKC244B020	Ø244X503 20LT Cylinder Tank	244	503	20	**E7 67R 014695 01**
SKC244B025	Ø244X615 25LT Cylinder Tank	244	615	25	**E7 67R 014695 01**
SKC244B030	Ø244X727 30LT Cylinder Tank	244	727	30	**E7 67R 014695 01**
SKC244B035	Ø244X840 35LT Cylinder Tank	244	840	35	**E7 67R 014695 01**
SKC244B040	Ø244X950 40LT Cylinder Tank	244	950	40	**E7 67R 014695 01**
SKC244B045	Ø244X1052 45LT Cylinder Tank	244	1052	45	**E7 67R 014695 01**
SKC270B036	Ø270X720 36LT Cylinder Tank	270	720	36	**E7 67R 014695 02**
SKC270B040	Ø270X790 40LT Cylinder Tank	270	790	40	**E7 67R 014695 02**
SKC270B045	Ø270X885 45LT Cylinder Tank	270	885	45	**E7 67R 014695 02**
SKC270B050	Ø270X980 50LT Cylinder Tank	270	980	50	**E7 67R 014695 02**
SKC270B055	Ø270X1069 55LT Cylinder Tank	270	1069	55	**E7 67R 014695 02**
SKC270B060	Ø270X1100 60LT Cylinder Tank	270	1100	60	**E7 67R 014695 02**
SKC300B050	Ø300X800 50LT Cylinder Tank	300	800	50	**E7 67R 014695 03**
SKC300B055	Ø300X835 55LT Cylinder Tank	300	835	55	**E7 67R 014695 03**
SKC300B060	Ø300X940 60LT Cylinder Tank	300	940	60	**E7 67R 014695 03**
SKC300B065	Ø300X1050 65LT Cylinder Tank	300	1050	65	**E7 67R 014695 03**
SKC300B070	Ø300X1080 70LT Cylinder Tank	300	1080	70	**E7 67R 014695 03**
SKC315B032	Ø315X460 32LT Cylinder Tank	315	460	32	**E7 67R 014695 04**
SKC315B035	Ø315X498 35LT Cylinder Tank	315	498	35	**E7 67R 014695 04**
SKC315B040	Ø315X560 40LT Cylinder Tank	315	560	40	**E7 67R 014695 04**
SKC315B045	Ø315X623 45LT Cylinder Tank	315	523	45	**E7 67R 014695 04**
SKC315B050	Ø315X690 50LT Cylinder Tank	315	690	50	**E7 67R 014695 04**
SKC315B060	Ø315X820 60LT Cylinder Tank	315	820	60	**E7 67R 014695 04**
SKC315B065	Ø315X937 65LT Cylinder Tank	315	937	65	**E7 67R 014695 04**
SKC315B070	Ø315X1004 70LT Cylinder Tank	315	1004	70	**E7 67R 014695 04**
SKC360B040	Ø360X480 40LT Cylinder Tank	360	480	40	**E7 67R 014695 05**
SKC360B050	Ø360X584 50LT Cylinder Tank	360	584	50	**E7 67R 014695 05**
SKC360B060	Ø360X686 60LT Cylinder Tank	360	686	60	**E7 67R 014695 05**
SKC360B070	Ø360X786 70LT Cylinder Tank	360	786	70	**E7 67R 014695 05**
SKC360B080	Ø360X893 80LT Cylinder Tank	360	893	80	**E7 67R 014695 05**
SKC360B090	Ø360X994 90LT Cylinder Tank	360	994	90	**E7 67R 014695 05**
SKC360B100	Ø360X1100 100LT Cylinder Tank	360	1100	100	**E7 67R 014695 05**
SKC360B110	Ø360X1200 110LT Cylinder Tank	360	1200	110	**E7 67R 014695 05**
SKC360B120	Ø360X1304 120LT Cylinder Tank	360	1304	120	**E7 67R 014695 05**

The Saka cylinders tanks must be combined to air lock for Saka cylinders tanks with approval n.: E7 67R01469501

2.4.10.24 GZWM LPG Tanklari toroidal I/I tanks list
Toroidal INTERNAL / INTERNAL tanks

Product Code	Description	Diameter	Height	Liter	KG	Homologation
ZTW 566/180	566X180 33 LT Internal Toroidal Tank	566	180	33	22,90	**E20 67R-010437**
ZTW 580/200	580X200 39 LT Internal Toroidal Tank	580	200	39	24,60	**E20 67R-010410**
ZTW 580/220	580X220 43,50 LT Internal Toroidal Tank	580	220	43,50	26,30	**E20 67R-010411**
ZTW 580/250	580X250 50 LT Internal Toroidal Tank	580	250	50	28,40	**E20 67R-010552**
ZTW 600/190	600X190 39 LT Internal Toroidal Tank	600	190	39	24	**E20 67R-010409**
ZTW 600/200	600X200 41,50 LT Internal Toroidal Tank	600	200	41,50	25,50	**E20 67R-010410**
ZTW 600/220	600X220 45 LT Internal Toroidal Tank	600	220	45	27,30	**E20 67R-010411**
ZTW 600/250	600X250 54 LT Internal Toroidal Tank	600	250	54	28,80	**E20 67R-010552**
ZTW 600/270	600X270 59 LT Internal Toroidal Tank	600	270	59	31	**E20 67R-010689**
ZTW 630/200	630X200 45 LT Internal Toroidal Tank	630	200	45	27,10	**E20 67R-010410**
ZTW 630/220	630X220 51 LT Internal Toroidal Tank	630	220	51	28,10	**E20 67R-010411**
ZTW 630/250	630X250 59 LT Internal Toroidal Tank	630	250	59	31	**E20 67R-010552**
ZTW 630/270	630X270 64 LT Internal Toroidal Tank	630	270	64	32,30	**E20 67R-010689**
ZTW 650/200	650X200 50 LT Internal Toroidal Tank	650	200	50	25,10	**E20 67R-010410**
ZTW 650/220	650X220 56 LT Internal Toroidal Tank	650	220	56	26,70	**E20 67R-010411**
ZTW 650/250	650X250 65 LT Internal Toroidal Tank	650	250	65	32,40	**E20 67R-010552**
ZTW 650/270	650X270 70 LT Internal Toroidal Tank	650	270	70	34,50	**E20 67R-010689**
ZTW 720/250	720X250 78 LT Internal Toroidal Tank	720	250	78	35	**E20 67R-010785**
ZTW 720/270	720X270 85 LT Internal Toroidal Tank	720	270	85	37	**E20 67R-010786**
ZTW 720/300	720X300 96 LT Internal Toroidal Tank	720	300	96	39	**E20 67R-010787**

The GZWM toroidal tanks must be combined to air lock for GZWM toroidal tanks with approval n.: E7 67R-010390.

2.4.10.25 GZWM LPG Tanklari toroidal E/E tanks list
Toroidal EXTERNAL / EXTERNAL tanks

Product Code	Description	Diameter	Height	Liter	KG	Homologation
ZTZ 566/180	566X180 33 LT External Toroidal Tank	566	180	33	22,30	**E20 67R-010437**
ZTZ 580/200	580X200 39 LT External Toroidal Tank	580	200	39	24,10	**E20 67R-010410**
ZTZ 580/220	580X220 43,50 LT External Toroidal Tank	580	220	43,50	26,20	**E20 67R-010411**
ZTZ 580/250	580X250 50 LT External Toroidal Tank	580	250	50	28,10	**E20 67R-010552**
ZTZ 600/200	600X200 41,50 LT External Toroidal Tank	600	200	41,50	25,70	**E20 67R-010410**
ZTZ 600/220	600X220 45 LT External Toroidal Tank	600	220	45	27	**E20 67R-010411**
ZTZ 600/250	600X250 54 LT External Toroidal Tank	600	250	54	28,50	**E20 67R-010552**
ZTZ 600/270	600X270 59 LT External Toroidal Tank	600	270	59	31	**E20 67R-010689**
ZTZ 630/200	630X200 45 LT External Toroidal Tank	630	200	45	27,10	**E20 67R-010410**
ZTZ 630/220	630X220 51 LT External Toroidal Tank	630	220	51	28	**E20 67R-010411**
ZTZ 630/250	630X250 59 LT External Toroidal Tank	630	250	59	29,80	**E20 67R-010552**
ZTZ 630/270	630X270 64 LT External Toroidal Tank	630	270	64	32	**E20 67R-010689**

ZTZ 650/200	650X200 50 LT External Toroidal Tank	650	200	50	25	**E20 67R-010410**
ZTZ 650/220	650X220 56 LT External Toroidal Tank	650	220	56	26,40	**E20 67R-010411**
ZTZ 650/250	650X250 65 LT External Toroidal Tank	650	250	65	32,20	**E20 67R-010552**
ZTZ 650/270	650X270 70 LT External Toroidal Tank	650	270	70	34,30	**E20 67R-010689**

2.4.10.26 GZWM LPG Tanklari toroidal ULTRA tanks list
Toroidal Ultra tanks

Product Code	Description	Diameter	Height	Liter	KG	Homologation
ZTP 580/200	580X200 41,50 LT Ultra Toroidal Tank	580	200	41,5	25,80	**E20 67R-010613**
ZTP 580/220	580X220 46,50 LT Ultra Toroidal Tank	580	220	46,5	27,70	**E20 67R-010614**
ZTP 580/250	580X250 54 LT Ultra Toroidal Tank	580	250	54	28,70	**E20 67R-010615**
ZTP 600/200	600X200 45,50 LT Ultra Toroidal Tank	600	200	45,5	27,00	**E20 67R-010613**
ZTP 600/220	600X220 51 LT Ultra Toroidal Tank	600	220	51	28,50	**E20 67R-010614**
ZTP 600/250	600X250 59 LT Ultra Toroidal Tank	600	250	59	30,50	**E20 67R-010615**
ZTP 600/270	600X270 65 LT Ultra Toroidal Tank	600	270	65	32,00	**E20 67R-010690**
ZTP 630/200	630X200 49 LT Ultra Toroidal Tank	630	200	49	28,60	**E20 67R-010613**
ZTP 630/220	630X220 55 LT Ultra Toroidal Tank	630	220	55	30	**E20 67R-010614**
ZTP 630/250	630X250 64 LT Ultra Toroidal Tank	630	250	64	32	**E20 67R-010615**
ZTP 630/270	630X270 71 LT Ultra Toroidal Tank	630	270	71	34	**E20 67R-010690**
ZTP 650/200	650X200 54 LT Ultra Toroidal Tank	650	200	54	30	**E20 67R-010613**
ZTP 650/220	650X220 61 LT Ultra Toroidal Tank	650	220	61	32,60	**E20 67R-010614**
ZTP 650/250	650X250 71 LT Ultra Toroidal Tank	650	250	71	34,20	**E20 67R-010615**
ZTP 650/270	650X270 77 LT Ultra Toroidal Tank	650	270	77	36,30	**E20 67R-010690**
ZTP 720/250	720X250 84 LT Ultra Toroidal Tank	720	250	84	37,50	**E20 67R-010788**
ZTP 720/270	720X270 92 LT Ultra Toroidal Tank	720	270	92	40,50	**E20 67R-010789**
ZTP 720/300	720X300 103 LT Ultra Toroidal Tank	720	300	103	43,50	**E20 67R-010790**

2.4.10.27 GZWM LPG Tanklari cylinders tanks list
Cylinders tanks

Codice	Descrizione	Diametro	L.	Litri	KG	Omologazione
ZC 200/15	Ø200X584 15 LT Cylinder Tank	200	584	15	7,6	**E20 67R-010549**
ZC 200/20	Ø200X714 20 LT Cylinder Tank	200	714	20	9,6	**E20 67R-010549**
ZC 200/25	Ø200X880 25 LT Cylinder Tank	200	880	25	11,6	**E20 67R-010549**
ZC 200/30	Ø200X1050 30 LT Cylinder Tank	200	1050	30	13,5	**E20 67R-010549**
ZC 200/35	Ø200X1215 35 LT Cylinder Tank	200	1215	35	15,5	**E20 67R-010549**
ZC 200/40	Ø200X1380 40 LT Cylinder Tank	200	1380	40	17,5	**E20 67R-010549**
ZC 244/25	Ø244X600 25 LT Cylinder Tank	244	600	25	10	**E20 67R-010550**
ZC 244/30	Ø244X710 30 LT Cylinder Tank	244	710	30	11,6	**E20 67R-010550**
ZC 244/35	Ø244X820 35 LT Cylinder Tank	244	820	35	13,2	**E20 67R-010550**
ZC 244/40	Ø244X930 40 LT Cylinder Tank	244	930	40	14,8	**E20 67R-010550**

ZC 244/45	Ø244X1040 45 LT Cylinder Tank	244	1040	45	16,4	**E20 67R-010550**
ZC 244/50	Ø244X1150 50 LT Cylinder Tank	244	1150	50	17,9	**E20 67R-010550**
ZC 244/55	Ø244X1260 55 LT Cylinder Tank	244	1260	55	19,5	**E20 67R-010550**
ZC 244/60	Ø244X1370 60 LT Cylinder Tank	244	1370	60	21,1	**E20 67R-010550**
ZC 270/30	Ø270X605 30 LT Cylinder Tank	270	605	30	11,7	**E20 67R-010490**
ZC 270/35	Ø270X695 35 LT Cylinder Tank	270	695	35	13	**E20 67R-010490**
ZC 270/40	Ø270X785 40 LT Cylinder Tank	270	785	40	14,4	**E20 67R-010490**
ZC 270/45	Ø270X875 45 LT Cylinder Tank	270	875	45	16	**E20 67R-010490**
ZC 270/50	Ø270X966 50 LT Cylinder Tank	270	966	50	17,4	**E20 67R-010490**
ZC 270/55	Ø270X1060 55 LT Cylinder Tank	270	1060	55	19	**E20 67R-010490**
ZC 300/40	Ø300X647 40 LT Cylinder Tank	300	647	40	14,5	**E20 67R-010619**
ZC 300/45	Ø300X719 45 LT Cylinder Tank	300	719	45	16	**E20 67R-010619**
ZC 300/50	Ø300X791 50 LT Cylinder Tank	300	791	50	17,5	**E20 67R-010619**
ZC 300/55	Ø300X863 55 LT Cylinder Tank	300	863	55	19	**E20 67R-010619**
ZC 300/60	Ø300X935 60 LT Cylinder Tank	300	935	60	20,5	**E20 67R-010619**
ZC 300/65	Ø300X1007 65 LT Cylinder Tank	300	1007	65	22,5	**E20 67R-010619**
ZC 300/70	Ø300X1085 70 LT Cylinder Tank	300	1085	70	22,5	**E20 67R-010619**

2.5 Electric connections

The instructions below are generally valid and essential for good understanding of the system.
The control units connect with the remainder of the electric system of the BORA system (power supplies, masses, signals, sensors, actuators, etc.) containing all signals necessary for the various functions.
Most of the wires are terminated on pre-wired connectors, thus making it very easy to connect the system elements to the control unit. Also, the conductors are split in more sheaths to simplify installation and acknowledgement of the various wires.
All connections relating to unterminated wires on connector must be carried out by means of adequate insulation and correct soldering iron. Absolutely avoid carrying out connections by simply wrapping the wires or use other barely reliable systems.

2.5.1 Gas ECU

Gas ECU must be fixed to the vehicle frame. Use the fixing holes realised on the aluminium body shell avoiding submitting the structure to excessive stresses (e.g.: do not fix the control unit on to a convex surface, wanting to fully tighten the bolts and level everything). Figure 2.5.1-1 highlights the correct assembly position of the Gas ECU. Avoid excessively hot areas and subject to strong thermal irradiation. Despite the control unit being watertight, avoid installation in areas subject to continuous dripping in case of rain, so that water does not filter and stagnate in the wiring and relative sheaths. It is important that the cable from the Gas ECU and that connects with the computer, is placed in an easily accessible place and protected from the cap by possible water infiltrations.

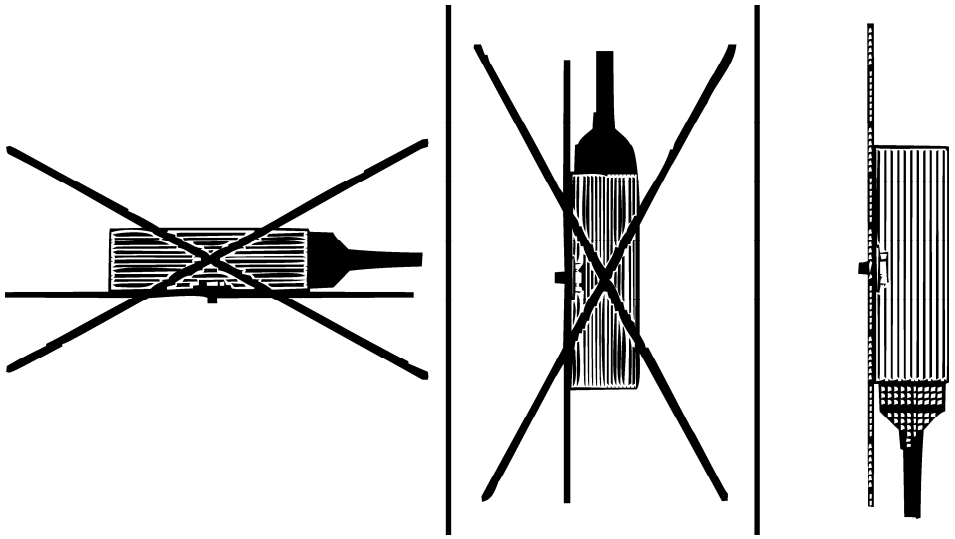


Fig. 2.5.1-1

The Gas ECU box must never be opened, in particular with engine running or panel switched on, to avoid irreparable damages.
ZAVOLI srl declines every responsibility for damages to things and persons deriving from the tampering with the device by unauthorised personnel, with the consequent loss of the warranty.

2.5.2 Main wiring

As the wiring is a complex electric components, made of a significant number of thin wired joined to stiff connectors, it must be handled with care during installation.

During installation be careful to:

- Arrange the wiring at a suitable distance from the spark plugs cables.
- When the wiring crosses a hole in the steel sheet, mount cable glands on the sharp edges of the hole, prior their trimming.
- Connect the ground wires somewhere that guarantees good electric contact (battery negative).
- The ignition power supply wire (positive) must be connected to a power supply source that guarantees a constant voltage of 12 V.
- do not force the connectors coupling, they are of "polarised" type, meaning provided with single coupling direction. In connections without connector (lambda signals, ignition, battery positive and negative), the connection must be carried out with soft soldering (soldering iron) and suitably insulated according to the supplied general installation prescriptions.
- Position the fuse so that it is easily accessible.
- Warn the customer that, in case of rupture of the gas system fuse, the system restores connections of the devices to which it is connected. We recommend not replacing the fuse with another with higher amperage, as this can cause irreparable damages.

A schematic representation of the main wiring with relative connections to kit components and to certain components of the vehicle, is reported in figure 2.5.2-1 for version with 3 cylinders wiring, figure 2.5.2-2 for version with 4 cylinders, with relevant key.

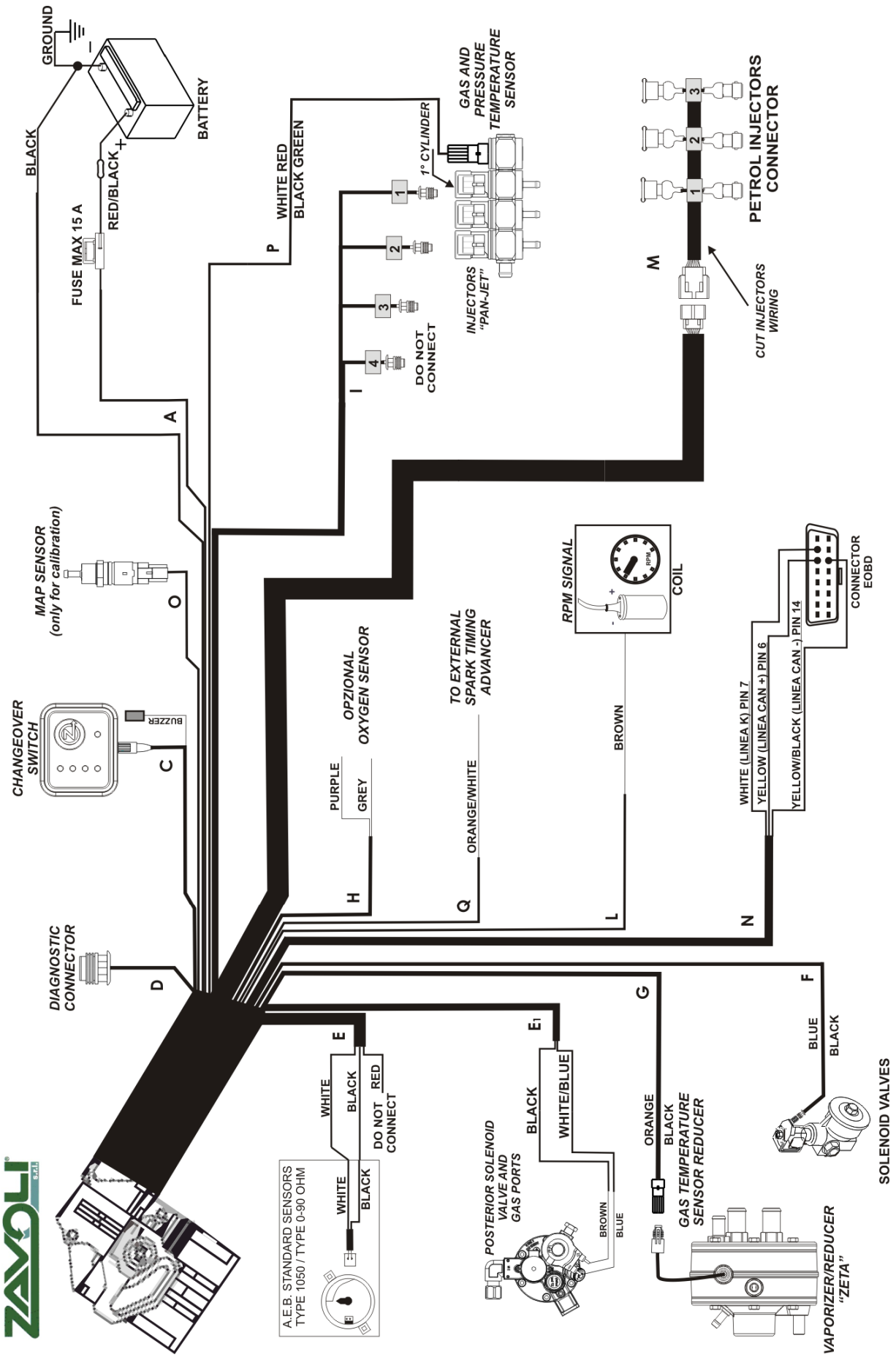

GROUND
BATTERY
BLACK
RED/BLACK
FUSE MAX 15 A
A
P
WHITE RED
BLACK GREEN
1° CYLINDER
GAS AND PRESSURE TEMPERATURE SENSOR
INJECTORS "PAN-JET"
DO NOT CONNECT
I
M
PETROL INJECTORS CONNECTOR
CUT INJECTORS WIRING
MAP SENSOR (only for calibration)
O
CHANGEOVER SWITCH
BUZZER
C
DIAGNOSTIC CONNECTOR
D
OPZIONAL OXYGEN SENSOR
PURPLE
GREY
H
TO EXTERNAL SPARK TIMING ADVANCER
ORANGE/WHITE
Q
RPM SIGNAL
COIL
BROWN
L
WHITE (LINEA K) PIN 7
YELLOW (LINEA CAN +) PIN 6
YELLOW/BLACK (LINEA CAN -) PIN 14
CONNECTOR EOBD
N
E
WHITE
BLACK
RED
DO NOT CONNECT
A.E.B. STANDARD SENSORS
TYPE 1050 / TYPE 0-90 OHM
WHITE
BLACK
E1
BLACK
WHITE/BLUE
POSTERIOR SOLENOID VALVE AND GAS PORTS
BROWN
BLUE
G
ORANGE
BLACK
GAS TEMPERATURE SENSOR REDUCER
F
BLUE
BLACK
SOLENOID VALVES
VAPORIZER/REDUCER "ZETA"
ZAVOLI srl ISG-3C-NWBNLPG-PNV-002.01-E Del 30/09/2013

Fig. 2.5.2-1

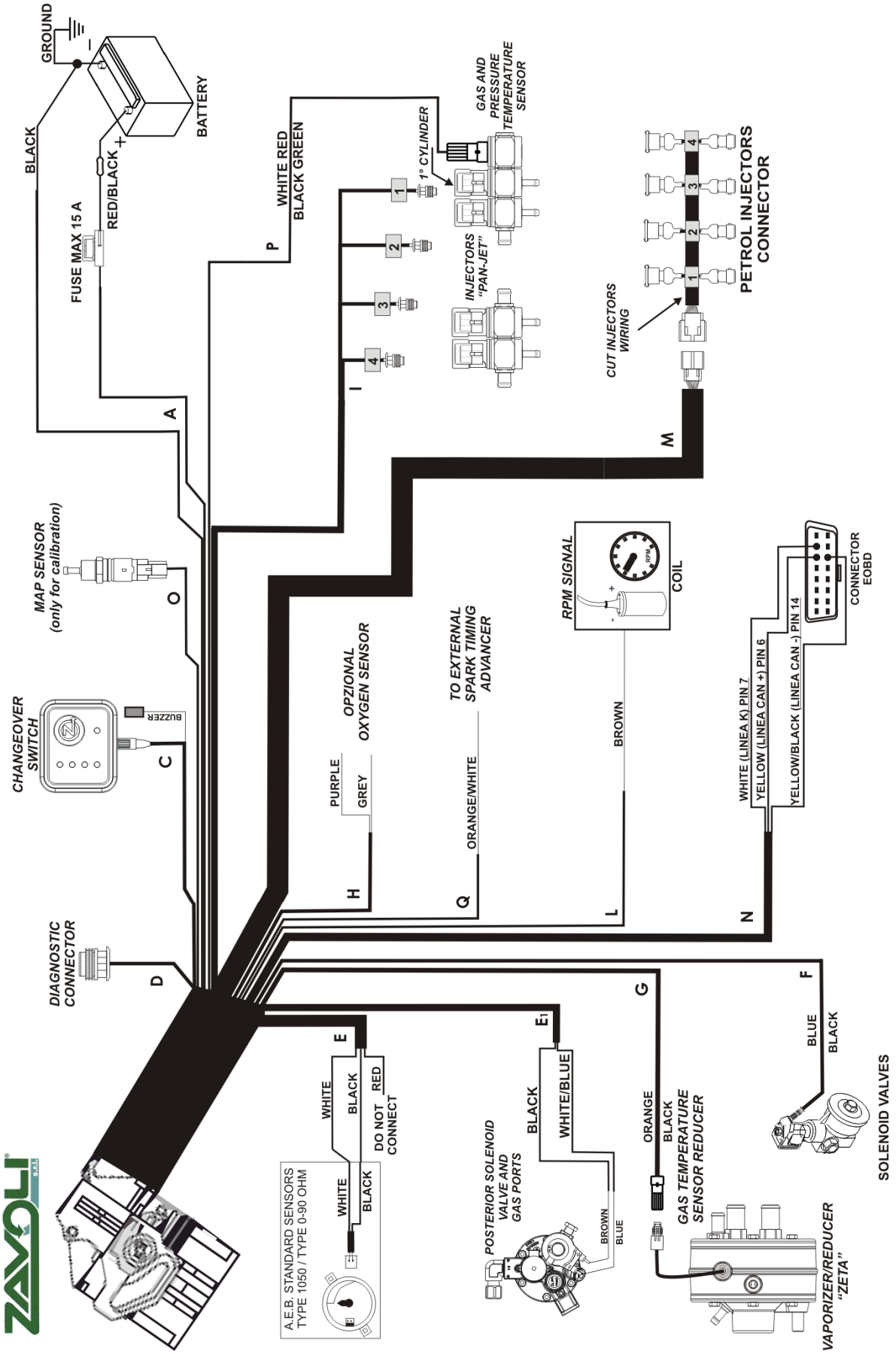
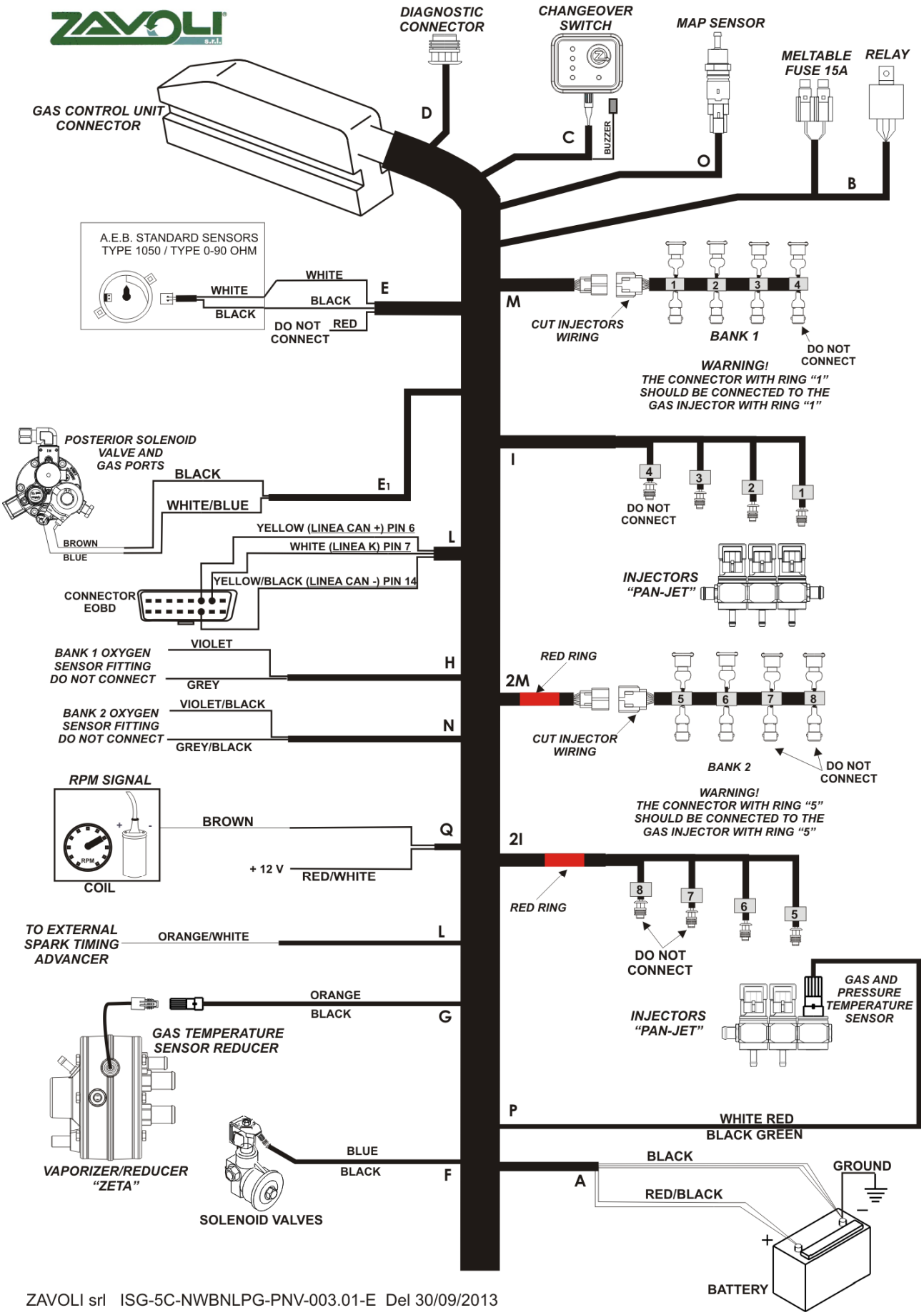

GROUND
BATTERY
BLACK
RED/BLACK
FUSE MAX 15 A
WHITE RED
BLACK GREEN
1° CYLINDER
GAS AND PRESSURE TEMPERATURE SENSOR
INJECTORS "PAN-JET"
CUT INJECTORS WIRING
PETROL INJECTORS CONNECTOR
MAP SENSOR (only for calibration)
CHANGEOVER SWITCH
BUZZER
OPZIONAL OXYGEN SENSOR
PURPLE
GREY
TO EXTERNAL SPARK TIMING ADVANCER
ORANGE/WHITE
RPM SIGNAL
COIL
BROWN
WHITE (LINEA K) PIN 7
YELLOW (LINEA CAN +) PIN 6
YELLOW/BLACK (LINEA CAN -) PIN 14
CONNECTOR EOBD
DIAGNOSTIC CONNECTOR
A.E.B. STANDARD SENSORS TYPE 1050 / TYPE 0-90 OHM
WHITE
BLACK
DO NOT CONNECT
RED
POSTERIOR SOLENOID VALVE AND GAS PORTS
WHITE/BLUE
BROWN
BLUE
ORANGE
GAS TEMPERATURE SENSOR REDUCER
BLUE
BLACK
SOLENOID VALVES
VAPORIZER/REDUCER "ZETA"
ZAVOLI srl ISG-4C-NWBNLPG-PNV-001.01-E Del 30/09/2013

Fig. 2.5.2-2

3-4 CYLINDERS MAIN WIRING DESCRIPTION

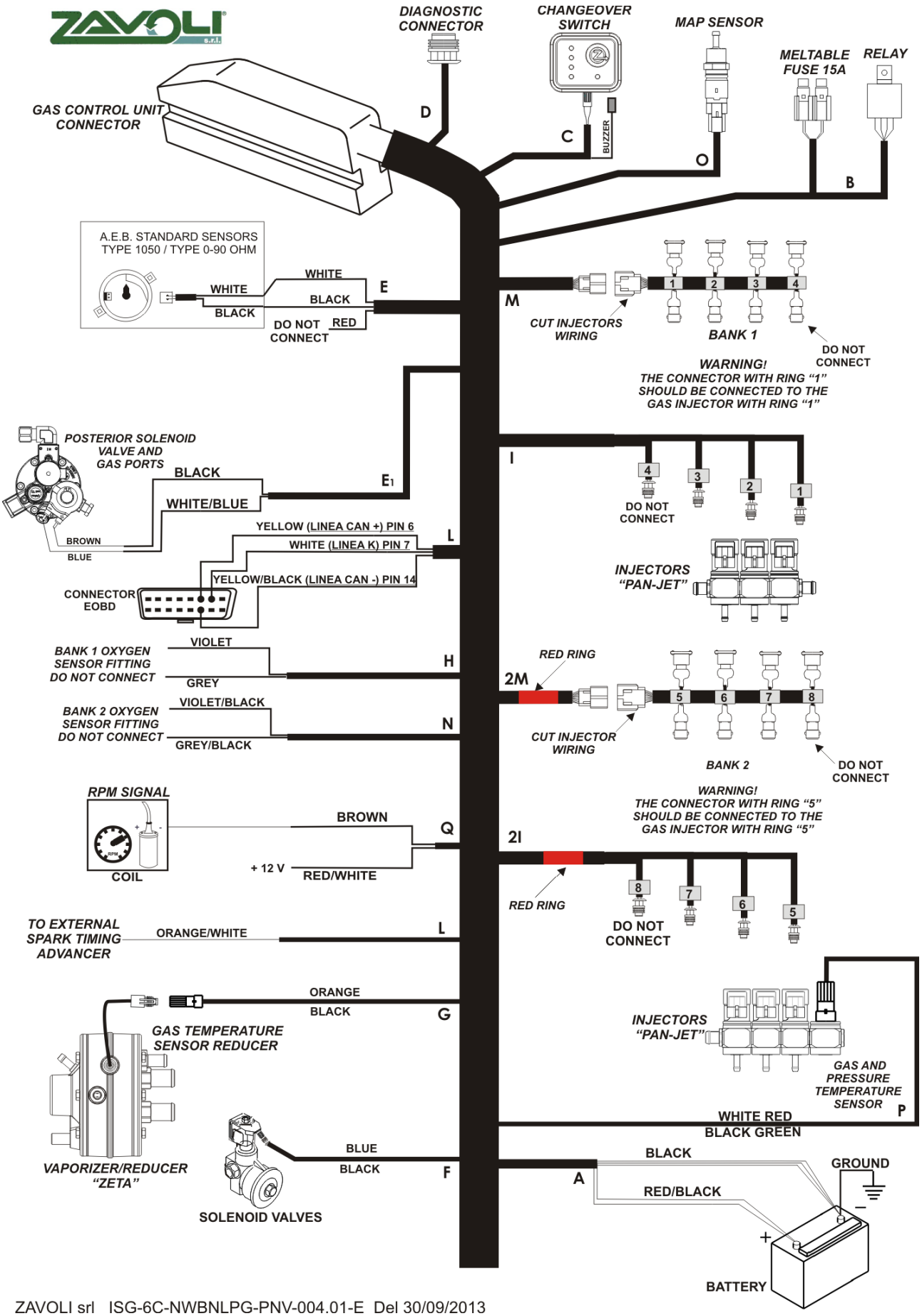
PIN	DESCRIPTION	SIGNAL	COLOUR
1A	PETROL INJECTOR CIL. 1	→	BLUE
1B	PETROL INJECTOR 1 CONTROL	←	BLUE/BLACK
1C	GROUND SENSOR	→	BLACK
1D	LAMBDA 1 INPUT	←	PURPLE
1E	POWER SUPPLY VARIATOR EXTERNAL	→	ORANGE/WHITE
1F	POWER SUPLLY SENSOR	→	RED
1G	GAS INJECTOR 1	→	YELLOW
1H	GAS INJECTOR 2	→	ORANGE
1J	GAS INJECTOR 3	→	RED
1K	GAS INJECTOR 4	→	BROWN
1L	GROUND DIAGNOSTIC	←	BLACK
1M	GROUND BATTERY	←	BLACK
2A	PETROL INJECTOR CIL. 2	→	RED
2B	PETROL INJECTOR 2 CONTROL	←	RED/BLACK
2C			
2D			
2E	GROUND SENSOR TEMP. WATER	←	BLACK
2F	POWER SUPPLY CHANGEOVER SWITCH	→	RED
2G	CHANGEOVER SWITCH CONTROL	→	GREEN
2H	CONTROL DIAGNOSTIC	→	GREEN
2J	SIGNAL LEVEL SENSOR	←	WHITE
2K	SIGNAL SENSATA SENSOR	←	WHITE
2L	GROUND BATTERY	←	BLACK
2M	POWER SUPPLY DIAGNOSTIC	→	RED

PIN	DESCRIPTION	SIGNAL	COLOUR
3A	PETROL INJECTOR CIL. 3	→	GREEN
3B	PETROL INJECTOR 3 CONTROL	←	GREEN/BLACK
3C	LINEA CAN (CAN +) COMUNICATION	↔	YELLOW
3D	LINEA CAN (CAN -) COMUNICATION	↔	YELLOW/BLACK
3E	GROUND LEVEL SENSOR	←	BLACK
3F	POWER SUPPLY LEVEL SENSOR	→	RED
3G	LAMBDA 1 OUTPUT	→	GREY
3H	SIGNAL SENSATA SENSOR	←	GREEN
3J	SIGNAL MAP SENSOR	←	WHITE
3K	LINEA K-LINE COMUNICATION	↔	WHITE
3L	POWER SUPPLY BATTERY	→	RED/BLACK
3M	POWER SUPPLY BATTERY	→	RED/BLACK
4A	PETROL INJECTOR CIL. 4	→	YELLOW
4B	PETROL INJECTOR 4 CONTROL	←	YELLOW/BLACK
4C	GROUND SOLENOID VALVE	←	BLACK
4D	GROUND MULTIVALVE	←	BLACK
4E	SIGNAL + 12V	←	RED/WHITE
4F	POWER SUPPLY MAP SENSOR	→	RED
4G	RPM-INPUT	←	BROWN
4H	SIGNAL WATER TEMPERATURE	←	ORANGE
4J	POWER SUPPLY SOLENOID VALVE	→	BLUE
4K	POWER SUPPLY SOLENOID VALVE	→	BLUE/BLACK
4L	POWER SUPPLY INJECTOR	→	RED/GREEN
4M	POWER SUPPLY INJECTOR	→	RED/GREEN



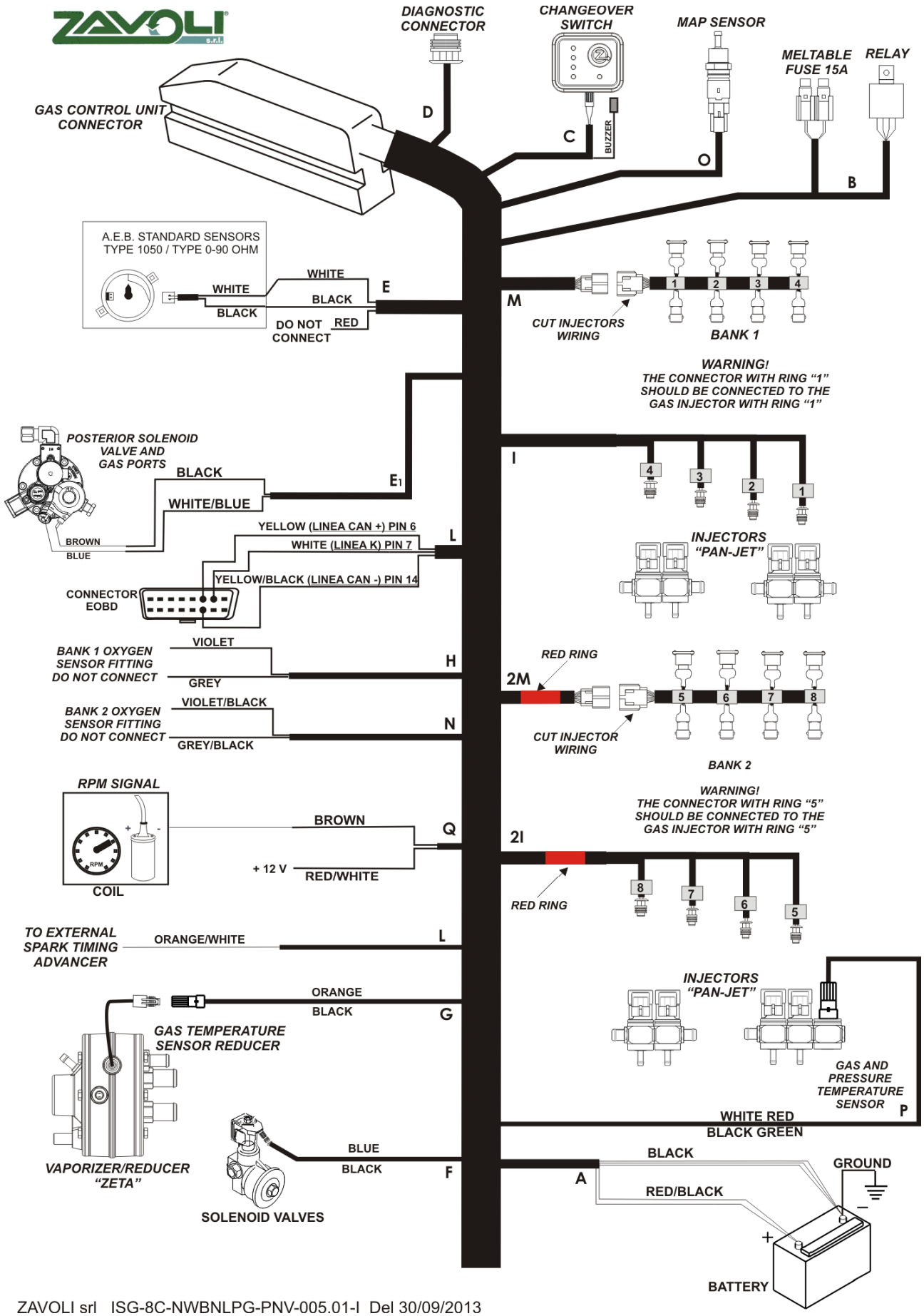
ZAVOLI srl ISG-5C-NWBNLPG-PNV-003.01-E Del 30/09/2013

Fig. 2.5.2-3



ZAVOLI srl ISG-6C-NWBNLPG-PNV-004.01-E Del 30/09/2013

Fig. 2.5.2-4



ZAVOLI srl ISG-8C-NWBNLPG-PNV-005.01-I Del 30/09/2013

Fig. 2.5.2-5

5-6-8 CYLINDERS MAIN WIRING DESCRIPTION

PIN	DESCRIPTION	SIGNAL	COLOUR
1	SIGNAL WATER TEMPERATURE	⇦	ORANGE
2	POWER SUPPLY SENSOR	⇨	RED
3	SIGNAL SENSATA SENSOR	⇦	GREEN
4			
5	LAMBDA 1 INPUT	⇦	VIOLET
6	LAMBDA 2 INPUT	⇦	VIOLET/BLACK
7			
8	EXTERNAL CONTROL RELAY FOR ACTUATORS	⇨	WHITE/GREEN
9	CONTROL DIAGNOSTIC	⇦	GREEN
10	LINEA CAN (CAN +) COMUNICATION	⇦⇨	YELLOW
11	RPM-INPUT	⇦	BROWN
12	POWER SUPPLY DIAGNOSTIC	⇨	RED
13	LINEA K-LINE COMUNICATION	⇦⇨	WHITE
14	GROUND SOLENOID VALVE	⇦	BLACK
15	GAS INJECTOR 1	⇨	YELLOW
16	GAS INJECTOR 2	⇨	ORANGE
17	GAS INJECTOR 3	⇨	RED
18	GAS INJECTOR 4	⇨	BROWN
19	GROUND BATTERY	⇦	BLACK
20	INJECTOR RECIRCULATION	⇦	GREEN
21	GAS INJECTOR 5	⇨	YELLOW
22	GAS INJECTOR 6	⇨	ORANGE
23	GAS INJECTOR 7	⇨	RED
24	GAS INJECTOR 8	⇨	BLACK
25	PETROL INJECTOR CIL. 1	⇦	BLUE
26	PETROL INJECTOR CIL. 2	⇦	RED
27	PETROL INJECTOR CIL. 3	⇦	GREEN
28	PETROL INJECTOR CIL. 4	⇦	YELLOW
29	SIGNAL MAP SENSOR	⇦	WHITE
30	SIGNAL SENSATA SENSOR	⇦	WHITE
31	SIGNAL LIVEL SENSOR	⇦	WHITE
32			
33	LAMBDA 1 OUTPUT	⇨	GREY

PIN	DESCRIPTION	SIGNAL	COLOUR
34	LAMBDA 2 OUTPUT		GREY/BLACK
35			
36			
37	POWER SUPPLY VARIATOR EXTERNAL		ORANGE/WHITE
38	LINEA CAN (CAN -) COMUNICATION		YELLOW/BLACK
39	GROUND DIAGNOSTIC		BLACK
40	SIGNAL + 12V BANK 1°		RED/WHITE
41	SIGNAL + 12V BANK 2°		RED/WHITE
42	GROUND MULTIVALVE		BLACK
43	PETROL INJECTOR 1 CONTROL		BLUE/BLACK
44	PETROL INJECTOR CIL. 1		BLUE
45	PETROL INJECTOR 2 CONTROL		RED/BLACK
46	PETROL INJECTOR CIL. 2		RED
47	GROUND BATTERY		BLACK
48	INJECTOR RECIRCULATION		GREEN
49	PETROL INJECTOR 3 CONTROL		GREEN/BLACK
50	PETROL INJECTOR CIL. 3		GREEN
51	PETROL INJECTOR 4 CONTROL		YELLOW/BLACK
52	PETROL INJECTOR CIL. 4		YELLOW
53	PETROL INJECTOR 5 CONTROL		BLUE/BLACK
54	PETROL INJECTOR 6 CONTROL		RED/BLACK
55	PETROL INJECTOR 7 CONTROL		GREEN/BLACK
56	PETROL INJECTOR 8 CONTROL		YELLOW/BLACK

2.5.3 Solenoid valves connections

No end of the solenoid valve is permanently connected to mass, but a wire comes from +12V battery (through fuse and relay), whereas the other is controlled by the control unit.
Avoid connecting the solenoid valve ends directly to mass: this would cause a short-circuit that would burn the wiring fuses and/or jeopardise the correct functioning of the system.
Separate piloting wires have been envisioned for the front and rear solenoid valve. This separation allows the control unit to understand whether, and eventually which, of the two solenoid valves is burnt or in short-circuit. Therefore, the solenoid valves must not be connected in parallel: this would jeopardise the diagnosis function of the control unit.

2.5.4 Power supplies and masses from battery

Contained in the sheath indicated with an “A” see figure above are two red wires and three black wires that must be connected to the car battery: the red wires to positive and the black to negative. It is important to connect the wires as they are, letting them individually reach the battery clamps, without joining the same coloured wires in a single wire or connecting them together along the wiring.
Masses must always be connected to battery negative, and not to body work, engine mass or other masses on the vehicle.

2.5.5 Fuses and relay

The two fuses equipping the BORA system, are represented at sheath “B” output by 15A and 5A. Wiring is supplied with two fuses of correct amperage, introduced in correct place. Do not invert their position. Fuse 5A must be inserted in fuse holder with small section wires, whereas fuse 25A must be inserted in fuse holder with larger section wires.
A relay is also represented at sheath "B" output, used by the system to interrupt the battery positive reaching the actuators.
Once connections are terminated, we recommend suitably fixing and protecting the fuses and relay.

2.5.6 Onetouch change-over switch

The 5 poles “C” multipolar cable inside the wiring, terminated on 4-ways connector, is used to connect the control unit to the One-Touch change-over switch inside the passenger compartment.
The cable 2-ways connector, is used to connect the control unit to the buzzer that, due to reduced dimensions, for this type of change-over switch, is separate.

2.5.7 Diagnosis valve

The computer connection to the control unit is based on a diagnosis valve directly coming out from wiring “D”. It is the diagnosis valve with 3-ways connector (female port on wiring), equipped with protection plug. The diagnosis valve is usually near the connector of the control unit.
For connection with PC, use appropriate cable code 800DE512114 or USB cable code 800DE512522.

2.5.8 Level sensor

The level sensor of the resistive type is connected to the wiring using the wires black and white will find that the inside (sheath "E") 3-way. Otherwise if you mount a level sensor of pressure sensible goes also connected to the red wire.

2.5.9 Solenoid valves

The solenoid valves are connected to wiring through pre-wired connectors connected to the wires inside sheaths "E1" and "F".
The front solenoid valve must be connected to sheath "F" connector, whereas the rear one must be connected to sheath "E1" connector.

2.5.10 Injectors disconnection wiring

ATTENTION: the +12 volt injectors on certain vehicles may be timed therefore, after a few seconds from panel switch-on, it could fail. We recommend checking polarity of all injectors wiring manifolds, to ensure they are all equally polarised.

In certain cases, during injectors disconnection wiring installation, the possibility of using manifolds of the supplied wiring may be required, in that the petrol injectors manifolds may be incompatible with those of the supplied emulators wiring.
In such case, the wires must be directly connected with appropriate universal wiring.
An example is shown in figure 2.5.3-1 and figure 2.5.3-2;
naturally, for correct installation, refer to the installation sheet of the specific car.

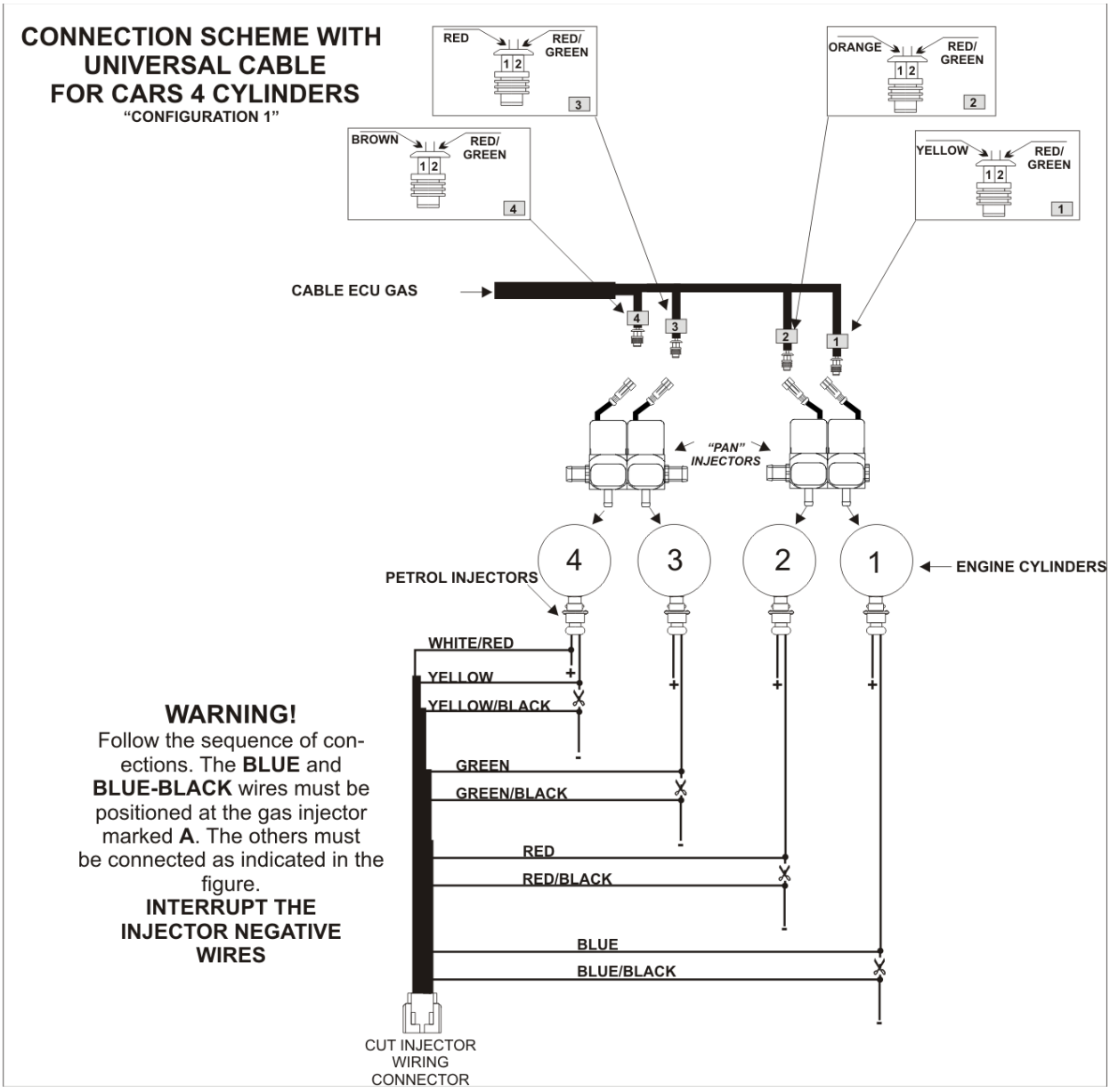


figure 2.5.3-1

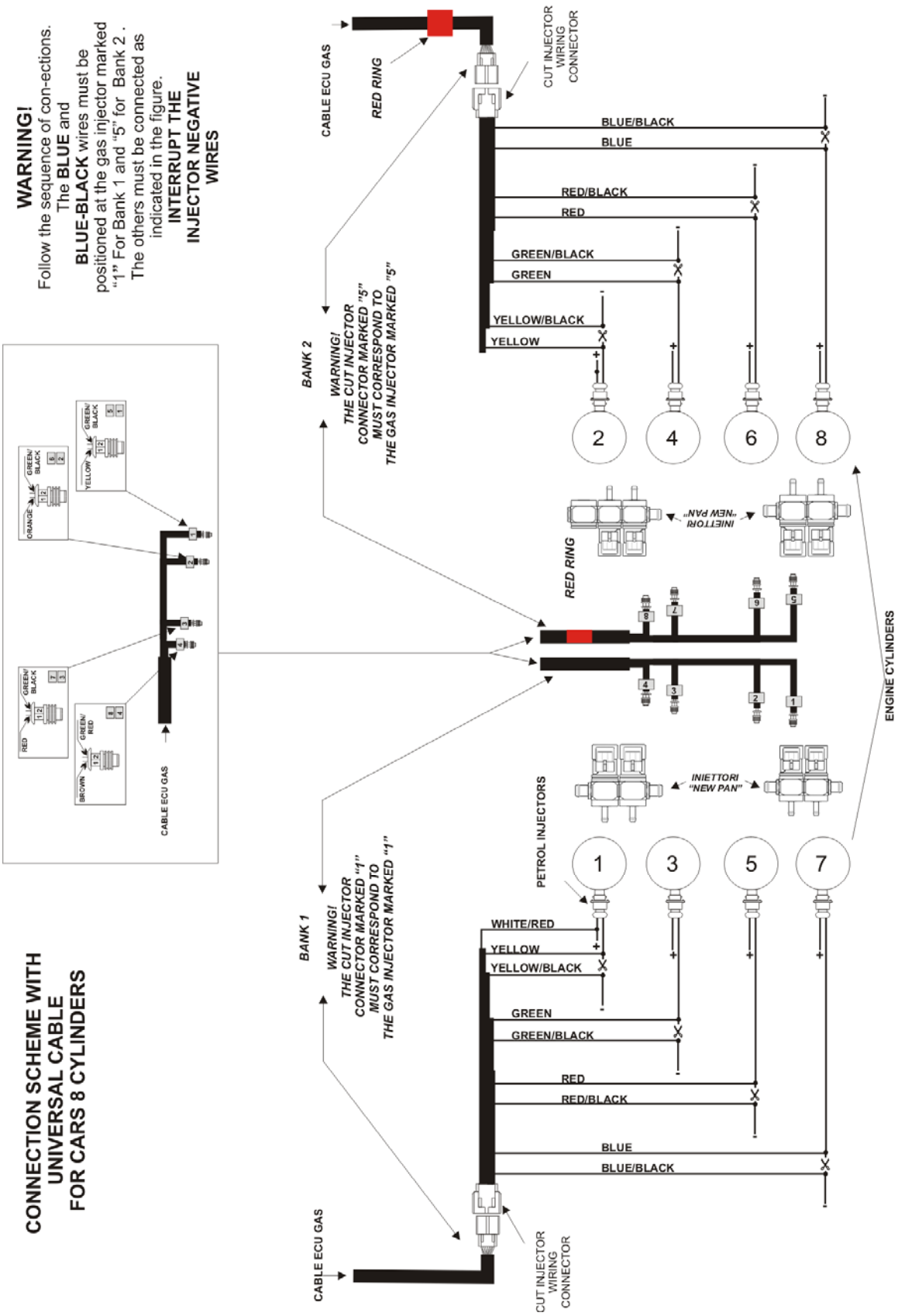


Fig. 2.5.3-2

To install this wiring, cut the negative wires of the petrol injectors, following the order reported in figures 2.5.3-1 and 2.5.3-2.

The direction of your connections is very important. BLACK wires should be heading toward the petrol injection control unit, while the other wires should be pointing toward the injectors.

2.5.11 Connection of the Gas Injectors

In order to install the gas injector cables correctly, please follow the order of the emulator cables very carefully. Gas injector outlets and cables are individually identified by letters (1, 2, 3, 4). For 5-6-8-cylinder vehicles, cables include two extra connectors and two extra sheaths (marked by two red bands) to allow for the second bench to be connected. The sheaths of the gas injector cables are identified by letters 5, 6, 7 and 8. In the above charts, the individual connectors of the emulator cables for the petrol injectors are identified in the same way (fig. 2.5.3-1). Remember to always identify each individual connector exactly – refer to the color of the wires connected to it.

- *1-band sheath:* it must be connected to the gas injector on the petrol injector (disconnected) through the BLUE and BLUE/BLACK wires of the injector cut-off device.

- *2-band sheath:* it must be connected to the gas injector on the petrol injector (disconnected) through the RED and RED/BLACK wires of the injector cut-off device.

- ***3-band sheath:* it must be connected to the gas injector on the petrol injector (disconnected) through the GREEN and GREEN/BLACK wires of the injector cut-off device.**
- ***4-band sheath:* it must be connected to the gas injector on the petrol injector (disconnected) through the YELLOW and YELLOW/BLACK wires of the injector cut-off device.**

The main wiring system for 5-6-8-cylinder vehicles includes two Red bands (see fig. 2.5.2-5), which should be connected to Bench n.2. Connect the first one to the connector for the injector cut-off cables, and the other to the connector sheath. For the connection of other gas injectors, these cables must always be connected to their corresponding connectors.

2.5.12 Lambda probe signal

The VIOLET wire is in sheath “H”, to be **eventually** connected to the wire of the Lambda probe signal, located before the catalyst. Such wire must not be cut but only stripped, welded with BORA LPG wiring wire and insulated.
Connection of the VIOLET wire allows quicker self-adjustment by the control unit and is very useful in cases where self-mapping phase requires a further refining of the map.

2.5.13 Positive ignition

The White/Red wire contained in sheath "M" of the BORA LPG system, must be connected to the positive ignition signal of the original system.
Such wire must not be cut but only stripped, welded with BORA LPG wiring wire and insulated.

2.5.14 Gas temperature and pressure sensor

The gas temperature and pressure sensor. Connection with wiring happens through appropriate 4-ways connector (male port on wiring) on which the 4 wires contained in the wiring "P" sheath are terminated.

2.5.15 MAP absolute pressure sensor

The newly conceived MAP pressure sensor is connected to wiring through opportune pre-wired connector, connected to wires contained in sheath "O".

2.5.16 EOBD diagnosis valve connection

Through the sheath "N" wires, it is possible to pick-up signals from the EOBD diagnosis valve for better system integration with the strategies of the petrol injection.
The White wire or the Yellow and Yellow/Black wires must be connected to the EOBD diagnosis valve and not all three simultaneously.

2.5.17 Additional connections

Outlet of the sheath "Q" are the wire Orange / White (the drive External), in wiring 5-6-8 cyl. there is also the Red / White + 12v the second bank.
These links are to be made only on special vehicles, under reporting of technical ZAVOLI.

2.5.18 Change-over switch installation

The One-Touch change-over is available in two versions, with or without the circular frame. This is why the assembly operations must be the following: built-in fixing: make a 23 mm hole and introduce the change-over switch without its circular frame, external fixing: make a 14 mm hole allowing cable passage and glue the change-over switch with its circular frame.

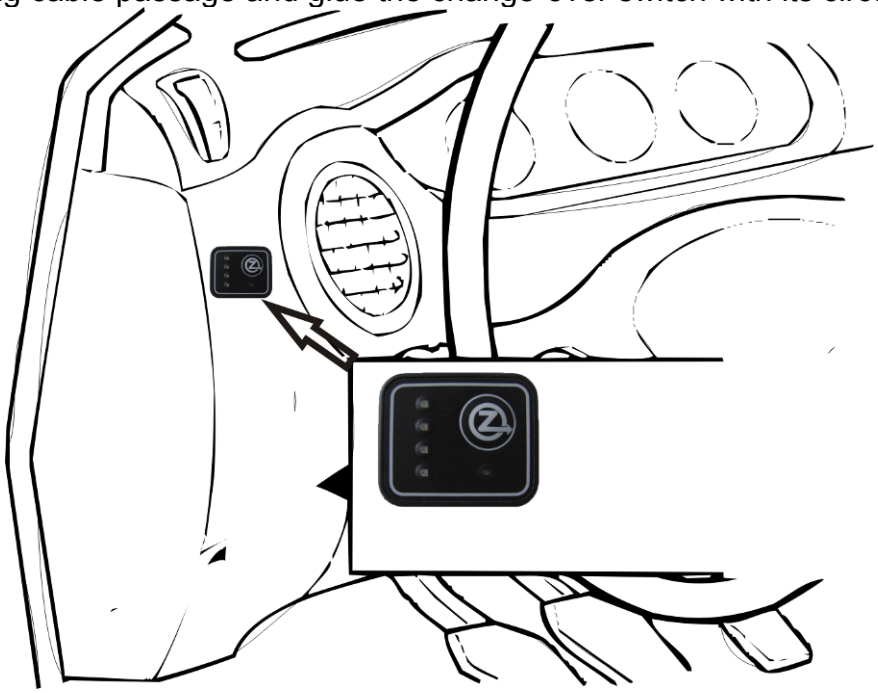


Fig. 2.5.5-1

2.5.19 Approval mark

Once the retrofit kit installation is completed, apply a plate, figure 2.5.6-1, permanently on the vehicle reporting legible and indelible approval data of the kit and of its main components. The plate must be applied in compliance with the installation specifications, reported on the installation sheet of the individual vehicle.

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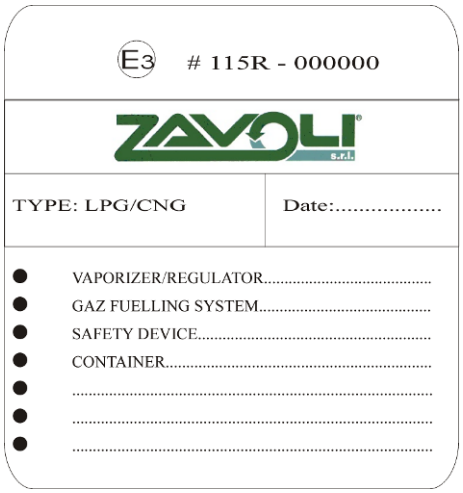

Fig. 2.5.6-1

3 START-UP PROCEDURE

3.1 Start-up and change-over

This vehicle is equipped with change-over switch with buzzer, integrating a gas level indicator with 4 green LED. The change-over switch called "one touch" has only one position. The fuel to be used (gas or petrol) is chosen every time the button is pressed.
The control unit recognises and memorises the fuel state (gas or petrol) the moment the vehicle is switched off, so that the same state is proposed upon subsequent ignition.

3.2 Petrol fuel state

The user is informed of this state by the red round LED on. No information on the gas level is displayed, meaning the four green level LED are off.

3.3 Gas fuel state

In this position the vehicle starts with petrol. The red round LED is on, as are the gas level LED in equal number to the gas level present inside the tank.
Once the pre-set change-over conditions are reached, the vehicle automatically changes to gas. The user is informed of the occurred change-over by the round LED, that from orange becomes green.

3.4 Gas-petrol automatic change-over

The system is able to recognise the impossibility of correctly fuelling the engine due to gas exhaustion or low gas fuelling pressure. In such situation, with the button in "gas fuel state", an automatic passage from gas to petrol is implemented (in such situations, the vehicle can work for short periods with petrol). The system automatically goes back to functioning with gas if it acknowledges to be able to correctly fuel the engine. On the contrary, the system acknowledges not to be able to fuel the engine with gas, the driver is warned by a repeated buzzing and by the switching on of the red LED on the change-over switch. The buzzer can be deactivated by pressing the "petrol fuel state" button. It is now necessary to refuel and position the button in gas fuel state to again obtain the normal vehicle running with gas.

3.5 Diagnostic

In case of LPG system malfunctioning, detected by the same system diagnostic, the change-over switch buzzer will emit three sounds every 50 seconds together with a flashing of the red petrol fuel state LED. In such situation, the vehicle runs with petrol. To interrupt the sound and flashing sequence, press the change-over switch. Contact a Zavoli after-sales assistance centre for diagnosis and solution of the eventual fault.

3.6 Level indicator

The indication of the amount of gas present inside the tank happens through gradual switching on of the four green LED on the change-over button.
As the amount of gas available is consumed, the LED gradually switch-off.
The reaching of the gas fuel reserve is signalled by the flashing of the first green LED. As well as indicate the level, the four LED also indicate the vehicle functioning state: with petrol the

LED are off and with gas the LED are on, in proportional number with the amount of gas available.

3.7 Configuration of the Retrofit Kit *BORA LPG*

Once kit installation is completed, configuration must be carried out to guarantee correct functioning of the gas system.
Configuration happens with the use of suitable interface software. Refer to specific instruction manual for correct use of software. Furthermore, configuration must be checked every time maintenance interventions are carried out on the system.

3.8 Useful information for the system user

When installing the vehicle, the installer must:

- Train the user on the basic system use procedures.
- Hand the gas system user manual in the retrofit kit to the user.

4. MAINTENANCE AND TROUBLESHOOTING PROGRAM

The maintenance of the ***BORA LPG*** kit devices, as well as other vehicle components, is essential to guarantee the efficiency and safety of the gas system. The maintenance interventions extend the duration and functionality of all devices, contributing to the reduction of management costs of the vehicle. Normally the maintenance costs specific for the gas system are very contained compared to the saving in fuel costs deriving from the use of gas instead of petrol.

Recording of the maintenance coupons on the manual supplied to the user is required to enable the latter to use the offer warranty. Therefore, the installer performing the coupon will record the various performed maintenance interventions on the user manual (in appropriate spaces reserved for "recording of maintenance interventions" in the last pages).

4.1 System maintenance

The perfect functioning of the system is assured by routine maintenance to be carried out by a **ZAVOLI s.r.l.**, approved garage, in the pre-established intervals.
The first check (free) must be carried out after 1000Km.
The following checks will have an interval of 20.000Km each and will entail the routine maintenance. The omitting of the pre-established coupons entails the lapsing of the product warranty.
Periodically carry out the checks as indicated in the User Manual.

ROUTINE MAINTENANCE						
Description of the interventions to be carried out	**Thousands of Miles**					
	1	**20**	**40**	**60**	**80**	**100**
Visual check of the system	√	√	√	√	√	√
Junction fittings seal check	√	√	√	√	√	√
Gas and water piping check	√	√	√	√	√	√
Electric connections check	√	√	√	√	√	√
Regulator pressure check	√	√	√	√	√	√
Fastening check of the tank fixing strips		√		√		√
Gas fuelling system parameters check (with self-diagnosis connector)	√	√	√	√	√	√
Gas filters replacement		√	√	√	√	√
Regulator inspection					√ (*)	
Gas injectors inspection			√ (*)		√ (*)	

(*) the indicated journey is to be considered **recommended**.

The routine maintenance interventions may be subject to alterations. For example, the replacement of the LPG filters, the injectors inspection, the regulator inspection, may be requested at shorter time intervals than those envisioned. This may be due to the use of gas with high impurity content, such to cause premature clogging of the system components.

Reported as an example in Fig. 4.1-1 the fac-simile of the first two maintenance coupons modules.

1st Free Maintenance coupon ***1.000 Km*** *from Installation*		
Performed Work:	***YES***	***NO***
Visual check of the system	☐	☐
Junction fittings seal check	☐	☐
Gas and water piping check	☐	☐
Electric connections check	☐	☐
Regulator pressure check	☐	☐
Fastening check of the tank fixing strips	☐	☐
Gas f□elling system param□ters check (with self-□iag□osis connector)	☐	☐

2nd Maintenance coupon ***20.000 Km*** *from Installation*		
Perfo med Work:	***YES***	***N***
Visual check of the □yst□m	☐	☐
Junction fitt□ngs seal check	☐	☐
Gas and water piping check	☐	☐
Electric connections check	☐	☐
Regulator pressure check	☐	☐
Fastening check of the tank fixing strips	☐	☐
Gas fuelling system para□eters check (with s□lf-diagnosis connector□	☐	☐
Gas filters replac□ment	☐	☐

Other interventions:	
DATE:_____- Km:_____-	Stamp and Signature:

Other interventions:	
DATE:_____- Km:_____-	Stamp and Signature:

Fig. 4.1-1

4.2 Zavoli After-Sales Technical Assistance request

Should the installer require support by the ZAVOLI after-sales assistance network, it is essential that the **"after-sales assistance request form**" be sent firstly, filled in its every part. All form requested data is essential to satisfy the after-sales assistance request.

4.3 Troubleshooting

Problem symptom	Cause	Solution
After approx. 10 sec from start-up the change-over switch switches off	The revs signal (black wire) is incorrectly connected	Check connection
The change-over switch does not light-up.	The fuse on red wire is burnt.	Replace the fuel with one of equal capacity.
	Incorrect wiring installation. Petrol injectors exclusion.	Assemble adequate wiring.
	The change-over switch cable is damaged.	Replace or repair wiring.
	The change-over switch is faulty.	Replace the change-over switch.
The engine switches off during Petrol/Gas change-over.	Empty gas tank.	Check the presence of gas inside tank.
	No gas to gas injectors.	Check correct opening of the gas solenoid valve.
	No power supply.	Check presence of 12v ignition.
The petrol injection time is not displayed by the software.	The injectors disconnection wiring has been incorrectly installed.	Check that the wires have been connected in correspondence of the injectors negative.
The engine does not work with all gas cylinders.	Gas injectors connectors connection.	Check that the gas injectors connectors have not been interrupted or removed from the gas ECU connectors or from the gas injectors connectors.
	Obstructed injection nozzle fitting.	Check whether the injection nozzle fitting is obstructed or if the connection pipe is obstructed or choked.
	Calibrated fitting on injectors.	Check whether all calibrated fittings on injectors are of the same diameter.
	Gas ECU injectors control problem.	Check that the gas ECU sends the correct signal to the injectors.

<table>
<tr><td rowspan="6">MI light on (EOBD)

The MI light on signals functioning anomalies that affect the polluting emissions. Each anomaly is memorised by the EOBD and can be subsequently detected by means of suitable diagnosis instrument that is connected to appropriate petrol ECU "diagnosis valve". The functioning anomalies affecting the emissions during gas functioning causing a switch-back, are memorised in the gas ECU and can be subsequently detected by means of Alisei management software connected to gas ECU. Knowing the various anomalies it is possible to determine the solution to use to eliminate them. Some of these anomalies that might occur even during gas system functioning are listed at the side.</td><td>“No ignitions” or codes P0300, P0301, P0302, etc. The most probable causes determining the "no ignition" in the cylinders can be:</td><td>Non correspondence between injectors sequence and relative injectors emulator connectors sequence.</td></tr>
<tr><td></td><td>Insufficient gas fuelling to engine that also causes the "poor mix" anomaly.</td></tr>
<tr><td rowspan="4">"Carburetion error" or code (P0170); "poor mix" or codes (P0171, P0173); "rich mix" or codes (P0172-P0174).
Such functionings, in particular, "rich mix" and "poor mix", are concomitant with an excessive difference between the values of certain "parameters" ("injection times" and "lambda correctors” (*), detectable with the diagnosis instruments) in gas functioning, compared to those in petrol functioning. Usually, during correct functioning, the values of such parameters in gas functioning must be similar to those in petrol functioning.
When one or more of such malfunctionings are detected, the most probable causes can be:</td><td>Excessive length of the pipes between injectors and injection nozzles. The length of the injection pipes must always be the minimum possible. Maximum admitted length, 150 mm.</td></tr>
<tr><td>Obstructions due to injection pipes bends.</td></tr>
<tr><td>Incorrect position of the injection nozzle coupling holes, made on the inlet manifold. Where possible, the holes must be made as close as possible to the engine inlet valves, with slight inclination towards the same valves.</td></tr>
<tr><td>Bad gas filters state, both in liquid phase and in gaseous phase.</td></tr>
<tr><td></td><td>Inadequate injectors calibrated nozzles. Usually, for the vehicle in question, in case of "poor mix", they are underdimensioned (small), in case of "rich mix" they are overdimensioned (large).</td></tr>
</table>

		These conditions can be detected by connecting to gas ECU through Alisei management software and looking at the correction coefficients in the "map" window. Coefficients too high, small calibrated nozzles, in opposite case coefficients too low, large calibrated nozzles.
(1)ATTENTION: depending on the used diagnosis instruments, the "lambda correctors" assume other names like "immediate mix adaptors", "immediate mix regulators", etc.		

5. Glossary of the terms and acronyms used in the manual

Terms	Meaning
Wiring	It is the set of cables that go from the connector to which the control unit is connected to reach all other electric system points of the system.
CAN Bus	Communication system between control units and devices assembled on the vehicle.
Catalyst	Device assembled on to the exhaust duct with the aim of reducing the polluting emissions.
CO, HC, NOx	CO (carbon monoxide), HC (unburned hydrocarbons), NOx (nitrogen oxides) are the gaseous pollutants currently regulated in the anti-pollution regulations.
Change-over switch	It is the device inside the passenger compartment enabling the driver to choose the type of wanted fuel (gas or petrol).
Connector	Device with the aim of connecting wiring parts with others or with electric devices.
Cut-off	Electronic fuel saving device that automatically interrupts supply of petrol when the accelerator pedal is completely lifted and the engine runs above a certain speed.
Diagnosis	Causes identification based on the malfunctionings and instrumental and technical reviews.
Display	Screen, video, that visually represents the data supplied or processed by electronic equipment.
Duty Cycle	It is the ratio in a rectangular wave form between the high level duration and the period of the same wave form. In formulas, if Ton is the high level duration and Toff is the duration of the same level, then Tp = Ton + Toff is the period and DC = Ton/Tp = Ton/(Ton+Toff) is the Duty Cycle.
ECU (CONTROL UNIT)	Electronic Control Unit, electronic module in charge of checking the functioning parameters and send controls to mechanically operational systems.
Electro-injector	See injector
Solenoid valve	Electro-mechanical device with the aim of interrupting the liquid flow.
EOBD	(European On Board Diagnostic), Monitoring system of all or certain inputs and control signals of the control unit. If it is detected that one or more signals are out of the pre-fixed limits, malfunctioning of the system or correlated systems is detected, signalled and memorised.
LPG	Gas from Liquefied Petroleum. It is a fuel, a mix of hydrocarbons, made mainly from butane and propane in variable proportions between them. Such mix in moderate pressure and ambient temperature condition is in liquid state.
Sequential injection	Multipoint injection system, characterised by independent activation of each injector compared to others in synchrony with the opening of the inlet valve of the relative cylinder.
Injector	Device with the aim of supplying dosed amounts with good

	pressured fuel precision, injecting it in the inlet manifold.
ISO	(International Organisation for Standardisation) it is an international Standards defining organism, represented by national bodies, producing global industrial and commercial Standards.
Retrofit kit	Agreement to UNECE regulation is the set of components constituting the gas system, each realised in compliance with the UNECE R67-01 regulation.
Led	Initials identifying luminous diodes (Light Emitting Diode).
MAP	(Manifold Absolute Pressure), Absolute pressure that governs the engine inlet manifold.
Master/slave	If the gas ECU is able to translate the control strategy of the petrol ECU so as to be able to use it for gas system functioning.
MI (Malfunction Indicator)	Luminous light signalling the anomalous functioning to the driver of one of the components relating to the emissions or the same OBD system.
One-shoot	One-shot. The one-shot devices can only be used once, then they must be replaced.
Ignition positive	It is a positive power supply wire coming from the battery, intercepted downstream of the vehicle ignition key.
Battery positive	Pole with electric power greater than vehicle battery. Usually at a voltage between 8 and 16V compared to mass.
Absolute pressure	It is the measured pressure compared to absolute vacuum pressure having null value.
RPM	Revolutions per minute. Usually used to indicate the rotary speed of the engine shaft.
Lambda probe	Also called oxygen sensor supplying the control unit controlling engine fuelling, information relating to amount of oxygen in the exhaust gases. In this way the electronics can maintain an excellent composition of the air-petrol mix.
Diagnosis instrument	Device compliant with Standard SAE J 1978 that, connected to the original diagnosis valve of the vehicle, is able to detect malfunctioning codes memorised by the OBD. Such instrument is also know as OBD II SCAN TOOL or TESTER DIAGNOSTIC.
Switch-back	It is the automatic change-over function from gas to petrol worked by the gas ECU in case of fault of a gas system component affecting the polluting emissions.
UNECE	United Nation Economic Commission for Europe. It is an international organisation committed to promoting the sustainable economic development between its member countries. In this regard, it supplies the international legal instruments for the trade, transport and environmental sectors.
Butterfly valve	Valve regulating the air capacity pumped by the engine. It is usually controlled by the accelerator pedal but becoming increasingly frequent to be controlled directly by the petrol control unit.