HPI 07

High Performance Injection system

LPG

CNG

EN

INSTALLATION MANUAL

INDEX

CHAPTER 1: FUNCTIONING PRINCIPLES

1.1 General Description

1.2 Input signals

1.3 Output signals

1.4 The components of the system

CHAPTER 2: INSTALLATION

2.1 Tools and Equipment for the conversion

2.2 Installer's technical knowledge

2.3 Before proceeding with the installation
- 2.3.1 Procedure to calculate the correct nozzle diameter

2.4 Installation of the components
- 2.4.1 Pressure Regulator: ML04-XJ Lpg or NGV04-XJ Cng;
- 2.4.2 Lpg SV-06 Cut-Off valve
- 2.4.3 Cng Apus High Pressure valve
- 2.4.4 JMU injection Rail & Nozzles
- 2.4.5 Gaseous Filter FIL-05
- 2.4.6 Sequential control unit ECU07
- 2.4.7 Map sensor
- 2.4.8 Electric connections

2.5 Checks
- 2.5.1 Check in phase of acceptance of the vehicle
- 2.5.2 Check during the installation of the kit
- 2.5.3 Check at the end of the installation on the vehicle
- 2.5.4 Check at the end of the Autocalibration procedure

CHAPTER 3: TROUBLE SHOOTING

3.1 Installation

3.2 Petrol/Gas switch

3.3 Idle operation

3.4 Return to idle

3.5 Out-of-idle rpm through slow acceleration

3.6 Acceleration at medium/high RPM

3.7 Full load & low RPM

3.8 Power functioning of the engine

3.9 Various

3.10 Errors Diagnostic

CHAPTER 1: FUNCTIONING PRINCIPLES OF EMMEGAS SEQUENTIAL HPI07

1.1 GENERAL DESCRIPTION

The Emmegas HPI07 is based on the latest generation of sequential injection technology for Petrol / Lpg or Cng conversion of the vehicles and the functioning is based on the same principles used by the gasoline ECU of the vehicle

The amount of required fuel is adjusted for each cylinder, independently and moment-to-moment: the principle through which the ECU of gas determines the effective times of injection in the gas injectors is based on the acquisition, during the running with gas, of the petrol injection times; this means that the control of the engine is based on the petrol control unit while the gas control unit simply converts the petrol signals into gas signals. This precise, synchronized injection strategy optimizes performance, consumption, provides a stable response and eliminates the risk of backfiring

The HPI07 includes the latest technology, is easy to install and will not interfere with the OE settings of the vehicle. Available in version for 3-4, 5-6-8, cylinders, the HPI07 is based on a simple and user-friendly installation software with easy steps for configuration and diagnostics. The intelligent auto-calibration function shows working parameters for gasoline under different conditions, mapping for the highest efficiency in either Lpg – Cng.

The calculation of the gas injection times is based on a series of parameters, besides the times of injection of gasoline, monitored by the Emmegas ECU07, such as:

gas pressure / gas temperature / water temperature / rpm / battery tension

Particularly, with the objective of maintaining a perfect coherence with the petrol system, the ECU07 Emmegas carries out the injection of the gas in the same cylinder where is registered the corresponding petrol injection time.

During the maintenance of the vehicle, it is possible to monitor the functioning of the gas parameters and to check the diagnostic connecting a computer with the EMMEGAS ECU-07 by the relevant USB interface.

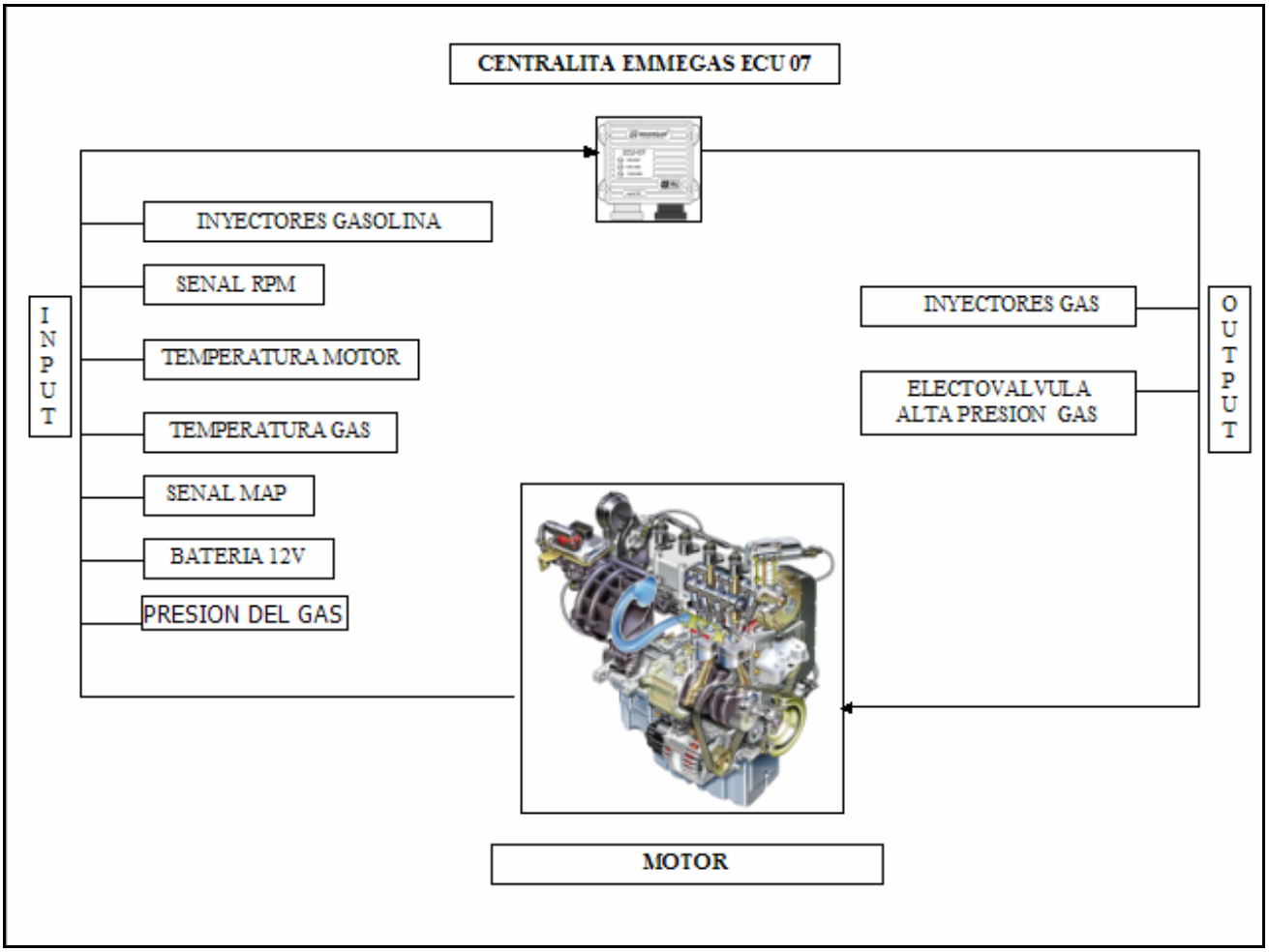


Fig.1: HPI07 Functioning Diagram

1.2 INPUT SIGNALS:

- **Petrol injection time**

The system uses the petrol injection times as main parameters for the calculation of the amount of Gas that should be injected into the engine: the Emmegas ECU07 converts the petrol injection times into gas injection times.

- **RPM**

The RPM signal is one of the two basic parameters necessary to calculate the gas injection times. It is also used to control if the engine is on or off. The RPM signal is detected through a cable connected to the ignition coil of the vehicle.

- **Engine Temperature**

The temperature of the cooling liquid is necessary in order:
- to control the petrol – gas switch
- to correct the gas injection times

- **Gas Temperature**

The temperature of the gas is necessary in order to correct the gas injection time; this correction is also essential to compensate for the variations of density during the running of the engine on the basis of outside temperature variations.

- **Gas Pressure**

When the gas pressure increases, the density also increases so, it is necessary to have compensation into the gas injection time on the basis of the pressure variations.
The signal of the gas pressure is also used in order to determine when to switch from gas to petrol when the gas tank is empty or in case the pipes are obstructed.

- **MAP**

The MAP signal is necessary in order to continuously compensate the gas flow on the basis of the gas pressure into the rail and vacuum into the engine

- **Battery 12v**

This 12V signal is necessary for the electric power of the system

1.3 OUTPUT SIGNALS

- **Gas injection times**

The Emmegas ECU07 generates the gas injection times on the basis of the petrol injection time in order to determine the correct amount of gas to be injected in to the engine.

- **Cut-Off Gas valve**

The gas control unit controls the Cut-Off valve present before the pressure regulator.

By the switch / indicator the driver visualizes the following information:
- the type of fuel that is used during the running;
- the quantity of Gas available in the tank;
- the eventual check engine need in case of malfunctioning of the gas system

All the functions are accessible through a personal computer connected to the ECU07 with its relevant interface, so that it will be possible to program the ECU07 and to diagnose eventual functioning errors.

1.4: THE COMPONENTS OF THE SYSTEM

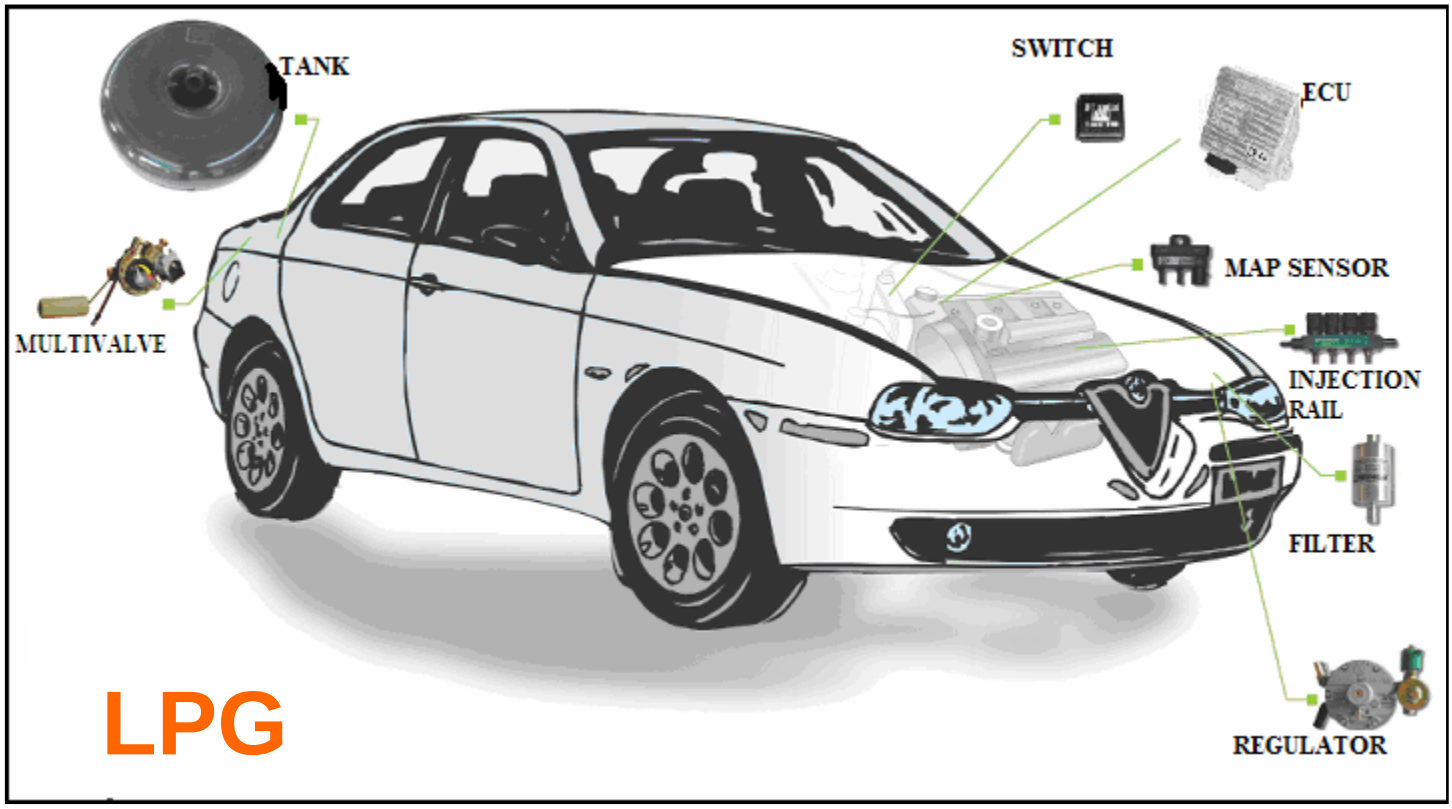


Fig.2: HPI07 Lpg components

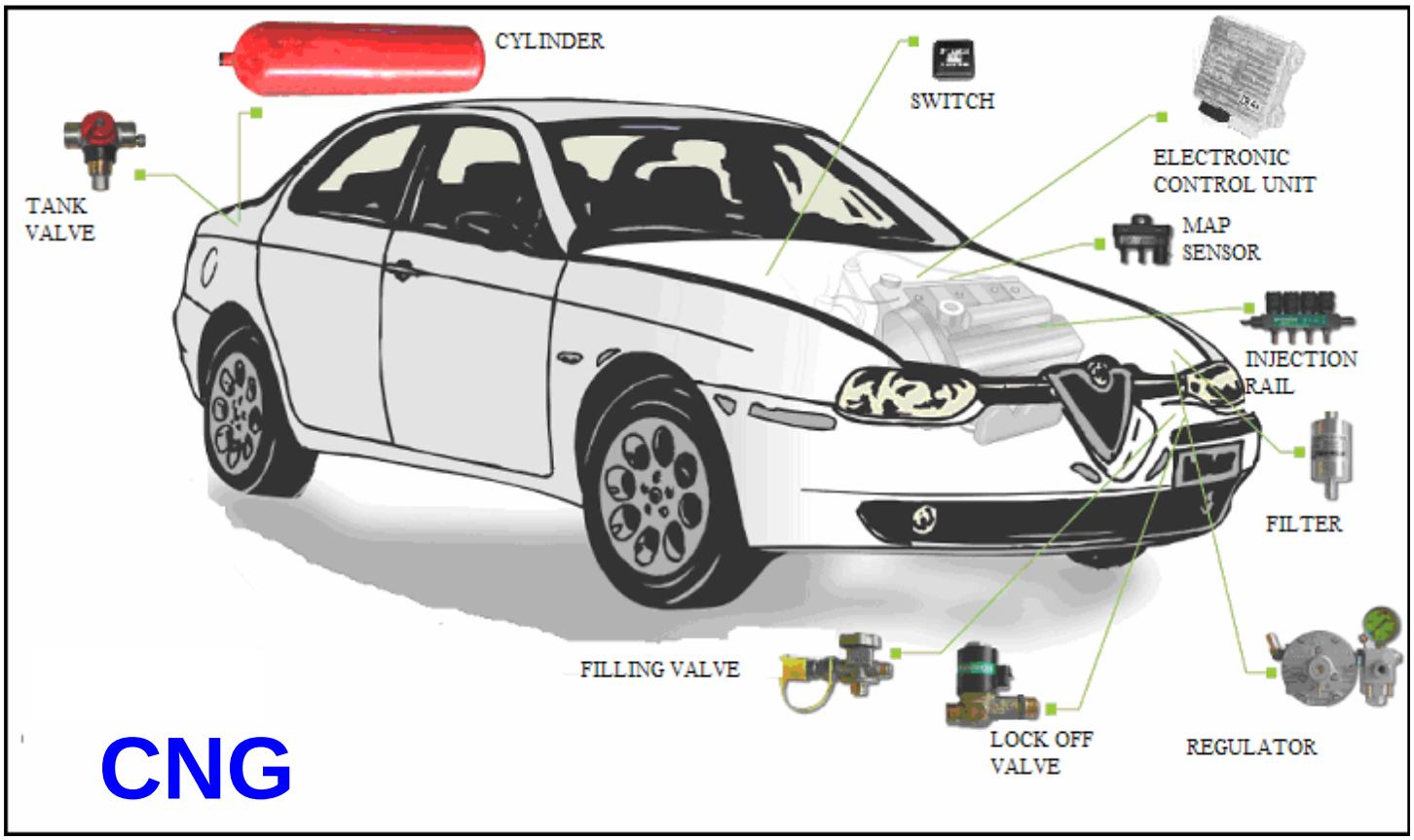


Fig. 3: HPI07 Cng components

CHAPTER 2: INSTALLATION

2.1 TOOLS AND EQUIPMENT REQUIRED FOR THE CONVERSION

- Set of allen keys
- Set of screwdrivers
- Milling machine, diameter 30 mm
- Tap wrench & taps
- Meter
- Work bench with bench vice
- Digital Multimeter
- Air compressor
- Hydraulic pump, gauge and accessories for the hydraulic test of the gas pipes
- Exhaust Gas Analyzer
- Personal computer
- Wire stripper
- Lift
- Electric welder
- Gas detector, as alternative you can use a commercial fluid for the detection of leakages (WITHOUT ammonia, corrosive or chemical agents)
- Oscilloscope
- Electric drill with a series of drills from 4 to 10 mm
- OBD scan tool (Emmegas code 117214)
- Various workshop materials (grease, radiator liquid, Adhesive tape, Sealer for threads)

2.2 TECHNICAL KNOWLEDGE OF THE INSTALLER

The installer should have attended an Emmegas technical training in order to have full knowledge of the installation, calibration and diagnostic of the system

2.3 BEFORE PROCEEDING WITH THE INSTALLATION

Confirmation of correct operation of the following parts of the vehicle is required:

- Air filter
- Spark plugs, Cables, Coil (by the oscilloscope)
- Valves and Exhaust system
- The catalytic converter and lambda sensor should be under operational conditions
- Full diagnosis of the vehicle

If necessary, proceed with the replacement of the faulty components and start the installation only when all the above parts are in good conditions

2.3.1 PROCEDURE FOR THE CALCULATION OF THE CORRECT NOZZLE DIAMETER

The first step of fundamental importance in order to avoid troubles in the phase of autocalibration and during the functioning of the vehicle is to choose the correct dimeter of nozzles of the conversion kit; it is important to follow the procedure hereunder:

1) DIVIDE the displacement of the engine by the number of cylinders: this is the unitary cylinder displacement to which corresponds a determined diameter of the nozzles
(example: 1.600 cc : 4 cylinders = 400 cc -->> Ø 2,25 mm)

2) DIVIDE the power of the engine by the number of cylinders: this is the unitary cylinder power to which corresponds a determined diameter of the nozzles
(example: 120 hp : 4 cylinders = 30 hp -->> Ø 2,25 mm

3) If BOTH the results (unitary displacement and power) correspond to the same line, the corresponding nozzle must be used

4) if both the results correspond to the same diameter but the values are very NEAR TO THE SUPERIOR LIMITS, it is necessary to use the following nozzle with bigger diameter

5) if the results DO NOT CORRESPOND to the same line, it is always necessary to choose the bigger diameter resulting from displacement or power calculations

NOZZLES Ø / VEHICLE DISPLACEMENT & POWER correspondence table
TABELLA di corrispondenza Ø UGELLI / CILINDRATA E POTENZA VEICOLO

Ø	Engine displacement divided by the number of cylinders Cilindrata diviso per il N°dei cilindri cm^3		Power divided by the number of cyliders Dividere la Potenza per il N°dei cilindri CV/Hp	
1,5 mm	= =	300	= =	16
1,8 mm	> 300	375	> 16	23
2,25 mm	> 375	500	> 23	32
2,5 mm	> 500	650	> 32	39
2,7 mm	> 650	> 800	> 39	46
3,5 mm	> 800		> 46	

The total displacement and the total Power must be divided dy the number of the cylinders.
A > if the two results belong to the same line, use the corresponding nozzle;
B > if further to the item A, the two results are on the upper boundary, use the bigger hole diameter of the next line;
C > if the two results belong to different lines, use the nozzle with the bigger hole diameter.
Note > the conversion Factors "kW<=>CV" are: **1kW=1,36CV ; 1CV=0,735kW**

2.4 INSTALLATION OF THE COMPONENTS

- Install all the components into the engine compartment on the basis of the below indicated 4 (Fig. 4), 6 (Fig. 5) or 8 (Fig. 6) cylinder **diagrams** and relevant instructions

- **Fix the components directly to the body** of the vehicle or, indirectly, by means of the fixing accessories present in the kit

- Set the components **far from the ventilation system** of the vehicle

- **Do not install the components at a distance less than 20 cm from the exhaust system** of the engine. If it is not possible, it will be necessary to interpose a metal protection or equivalent material, with a thickness not less than 1 mm.; anyway, the component has to be positioned at a distance of at least **10 cm** from the exhaust system.

- Be sure of **not creating elbows or narrow curves** in the connection of pipes and hoses

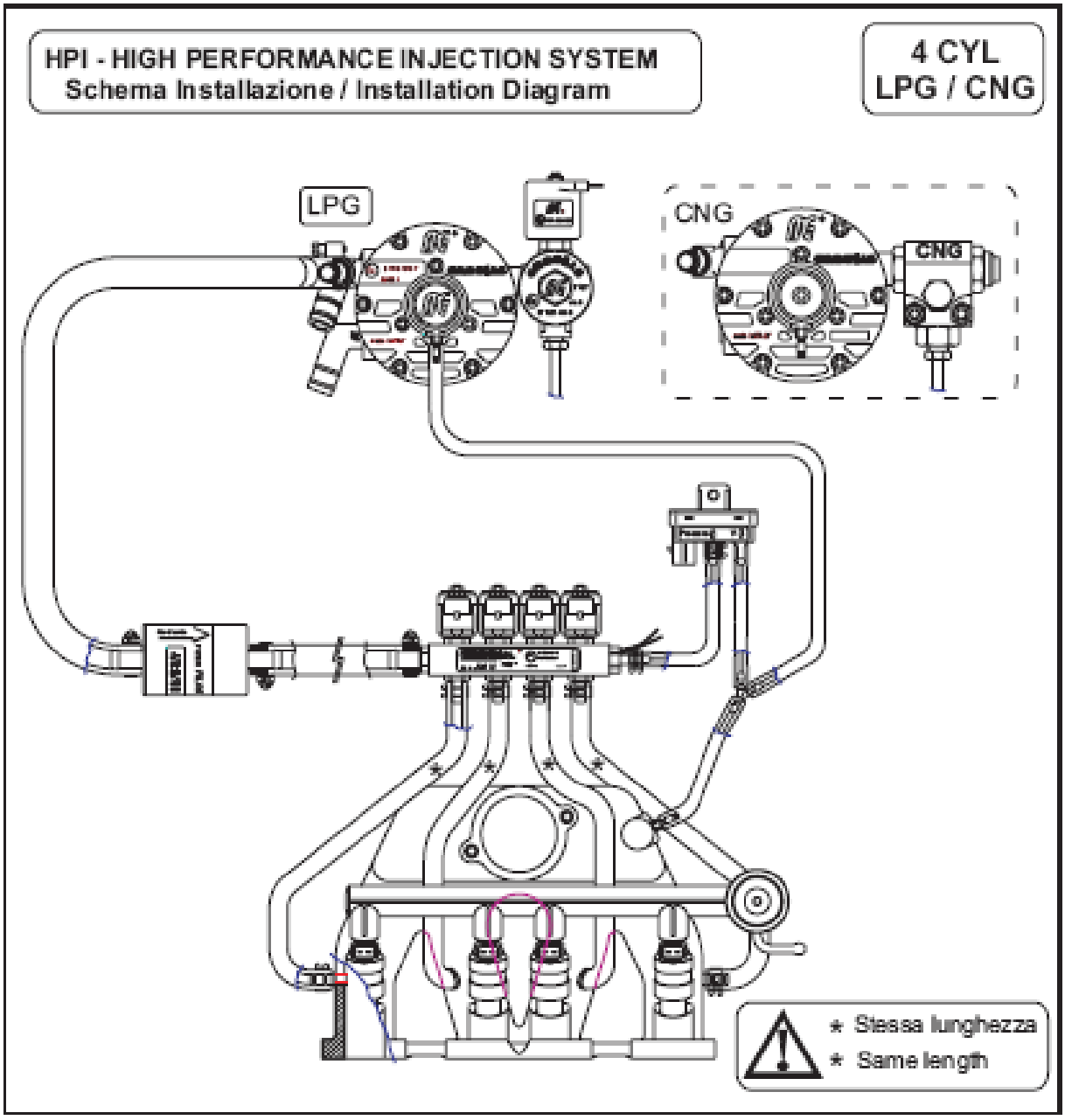


Fig. 4: 4 cylinder Installation Diagram

Fig. 5: 6 cylinder Installation Diagram

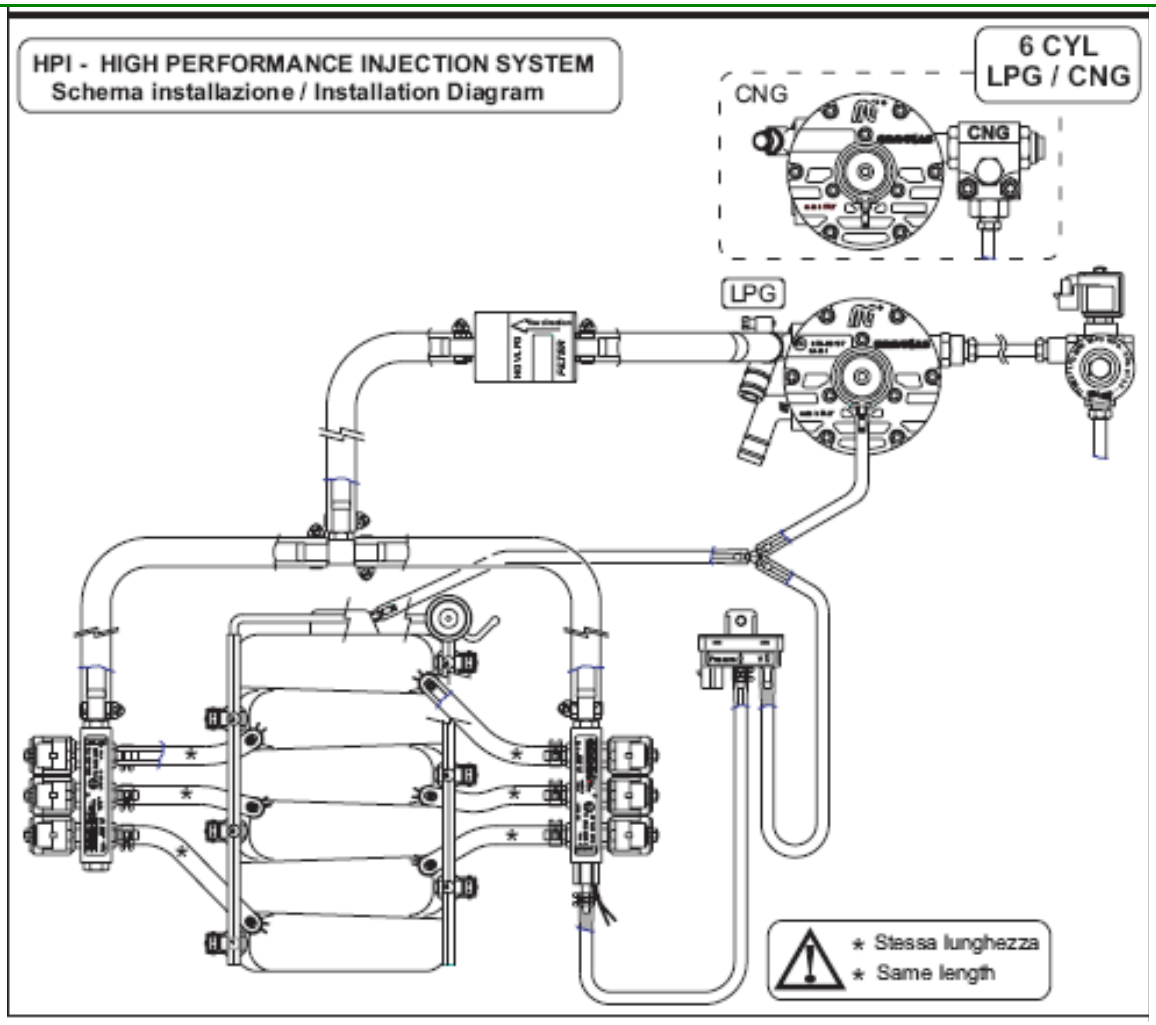
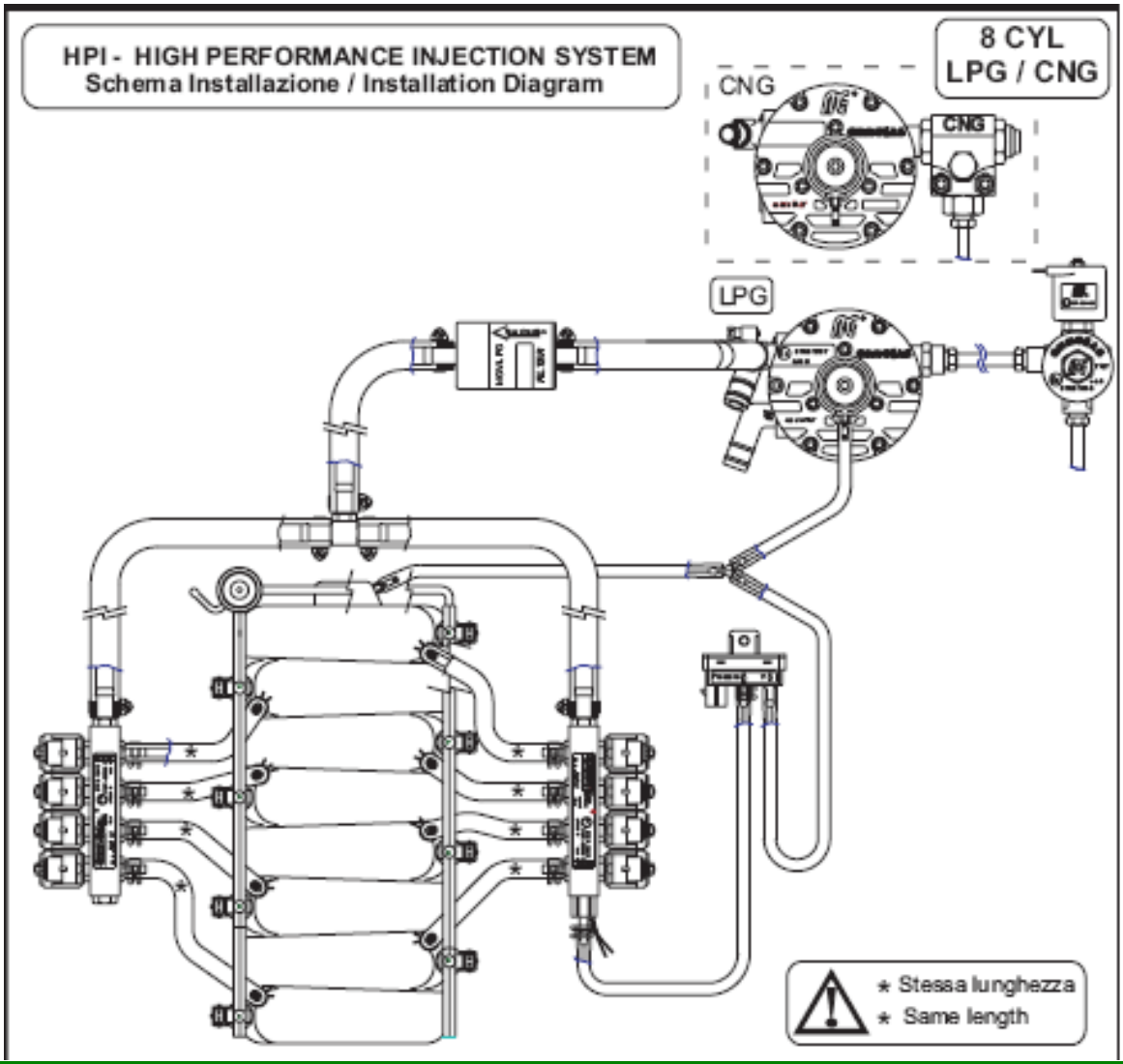


Fig. 6: 8 cylinder Installation Diagram



2.4.1 PRESSURE REGULATOR: ML04-XJ Lpg or NGV04-XJ Cng

For the installation of the pressure regulator, refer to the follwoing instructions:

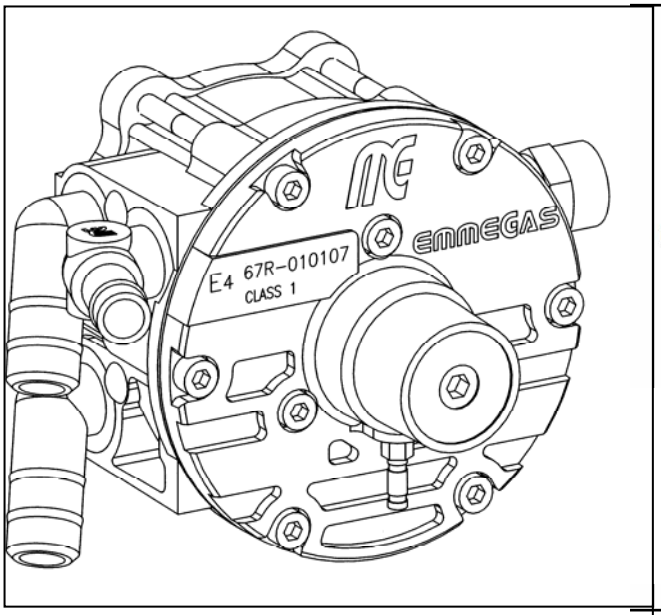


Fig.7: Lpg Pressure Regulator ML04-XJ
(w/o in-built valve version)

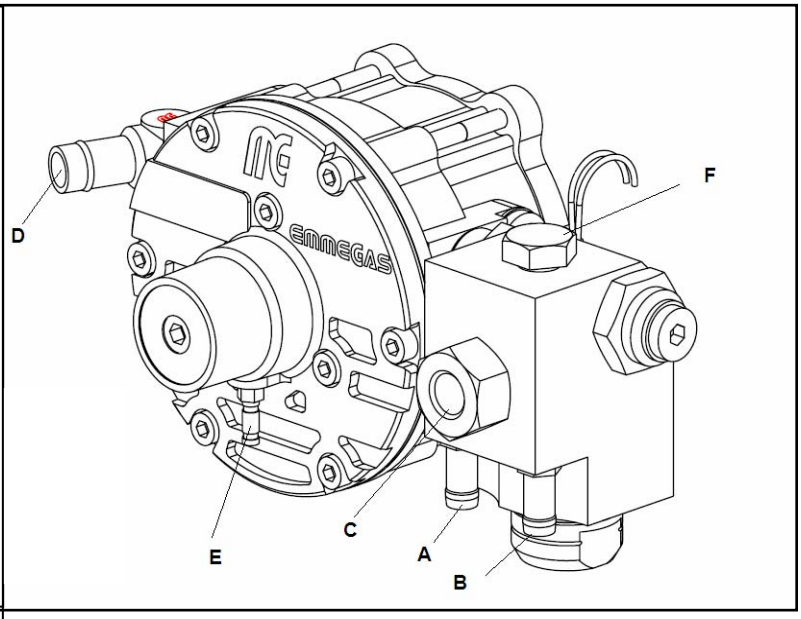


Fig.8: Cng Pressure Regulator NGV04-XJ

- Install the regulator in a position which allows easy **maintenance**

- Fix the regulator to the **body** of the vehicle (not to the engine, not to other components fixed to the engine) and in a **vertical** position, if possible (nose pointing up)

- It is also advisable to position the regulator **below the radiator level**

- **Clean carefully the gas pipes and tank** before the installation, in order to avoid the storage of dirt inside the regulator.

- Place the **water hoses** and fix them by the relevant fastener present in the kit; the other end of the water hose should be connected in parallel with the heating system of the vehicle, by the 'T' connectors; it is important not to form elbows neither narrow curves in those connections

- Connect the **gas pipe** into the relevant gas inlet, using its nipple and bicone present in the kit

- Connect the **gas hose** into the relevant gas outlet, fixing the same by the fastener present in the kit

- Connect the **compensation hose** (ø 4mm) to the compensation connection

- Only for the Cng installation, screw the **Manometer** in its seat by the relevant washer

- If necessary, adjust the pressure on the basis of the following parameters:

Lpg Pressure Regulator ML04-XJ
between 1,1 ÷ 1,2 Bar

Cng Pressure Regulator NGV04-XJ
between 1,8 ÷ 1,9 Bar

and consider the following intervals as correct tolerance pressure range:

Lpg between 0,6 ÷ 1,4 Bar

Cng between 1,2 ÷ 2,4 Bar

To **increase the pressure, turn clockwise** the register on the front cover of the regulator

To **decrease the pressure, turn anti-clockwise** the above mentioned register

2.4.2 LPG SV-06 CUT-OFF VALVE

The SV-06 Lpg Cut-Off valve is:

- incorporated to the ML04-XJ regulator version 4 cylinders, but it is

- separated (and it has to be installed separately) in the 6 and 8 cylinder versions of the regulator.

In the second case, to install the valve, the following indications should be observed:

- Install the valve **before** the reducer, in a position which allows easy maintenance

- Fix the valve to the **body of the vehicle** by its bracket; never fix it to the engine or to some components fixed to the same

- Pay attention to the **gas flow**, as indicated by the arrow printed on the valve

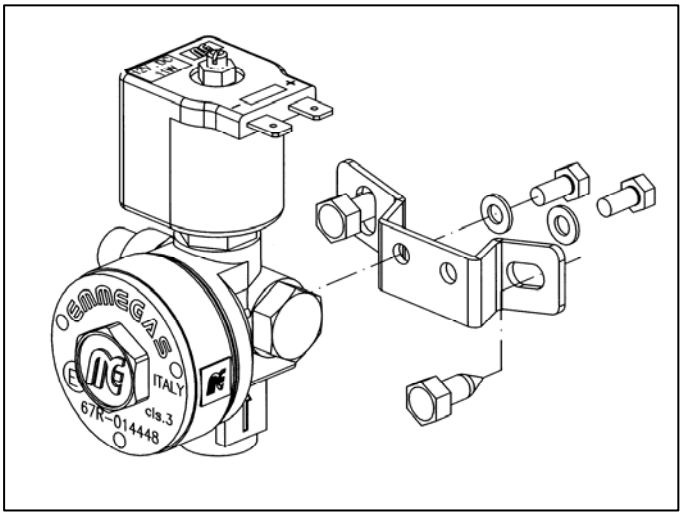
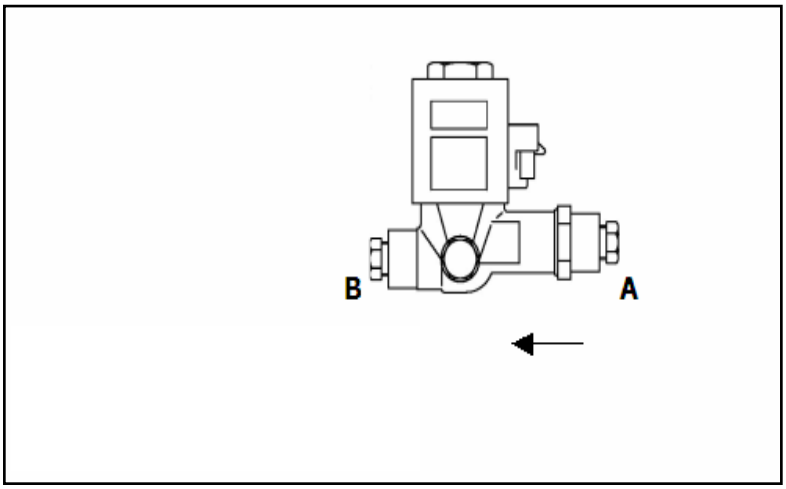


Fig.9: Lpg SV-06 Cut-Off Valve

2.4.3 CNG APUS HIGH PRESSURE VALVE

To install the Cng Apus High Pressure valve, refer to the following instructions:



- Install the valve **between the reducer and the filling valve**, in such a way that the maintenance will be facilitated.

- Fix the valve to the **body of the vehicle** by its bracket; never fix it to the engine or to some components fixed to the same

- Pay attention to the **gas flow**, as indicated by the arrow printed on the valve

Fig.10: Cng Apus High Pressure Valve

2.4.4 JMU INJECTION RAIL & NOZZLES

The JMU Injection rail is available in 2 / 3 / 4 cylinder versions; for the installation it is necessary to follow the hereunder instructions:

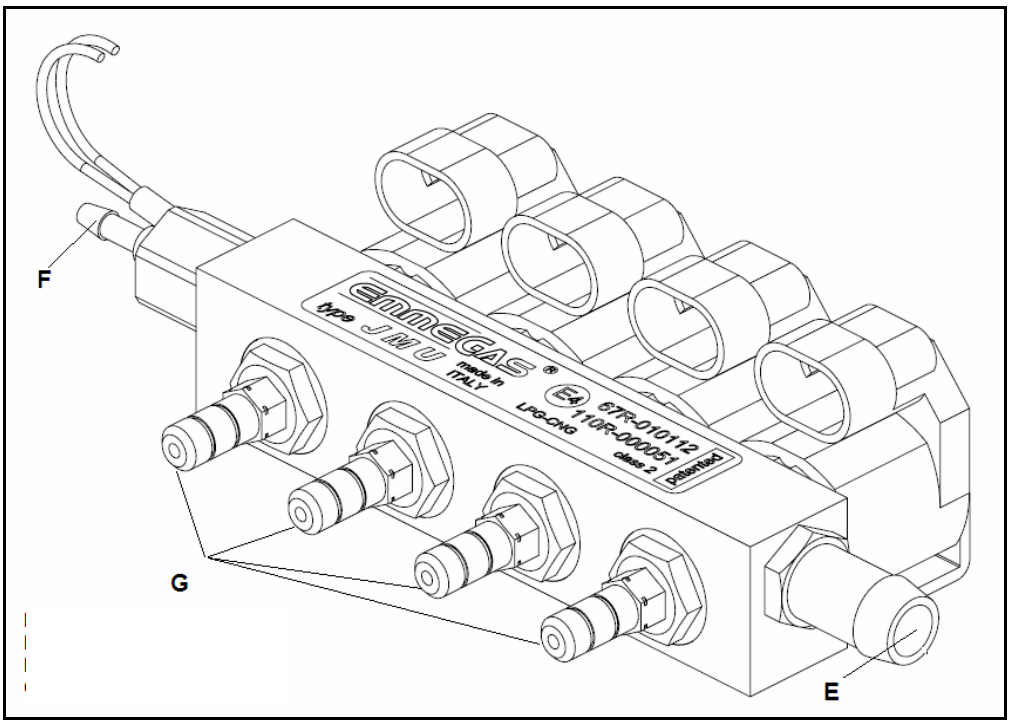


Fig.11: JMU injection Rail

- Position the rail **as close as possible to the intake manifold** of the vehicle, so that the connection hoses (ø internal 6 mm) will be the shortest possible and they can be easily connected to the nozzles without making elbows.

- Install the rail by its brackets and, if possible, in **vertical position** (never put the coils upside-down)

- From the inlet gas side (position 'E') must be connected the **hose coming from the the filter** (ø internal 12 mm); in the opposite side, where there is the pressure sensor (position 'F') it is necessary to connect the **compensation hose** (ø 4 mm) to the Map Sensor (see Fig.11)

- Into the output side of the Rail (position 'G') it is necessary to connect the hoses (internal ø 6 mm) up to the nozzles into the intake manifold: **the distance of each hose must be less than 25 cm** and all 4, 6 or 8 hoses have to be of the **same lenght**

- The injection raíl and the nozzles should be perfectly **fixed** and **connected** by their relevant fasteners

- Install the **nozzles** into the intake manifold **as near as possible to the petrol injectors** and with the **same inclination** as represented hereunder (not at 90°):

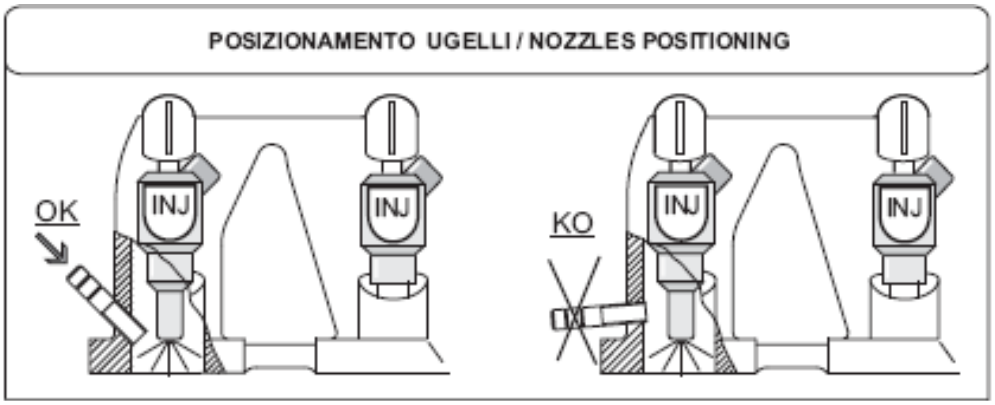


Fig.12: nozzles positioning

2.4.5 FILTER FIL-05

For the installation of the filter, follow the hereunder instructions:

- Position:
  - o as **close** as possible to the **rail** (no more than **25 cm distance**) and at the same time
  - o not **too far** from the **regulator** (no more than **70 cm distance**)

- **Do not position the gas hoses too close to the hot parts** of the engine, so that the gas will not be heated

- Install the gas hoses as represented on page 8/9: the hose ø 12 mm **from the reducer** in the entrance of the filter (pos. **'A'**) and the tube ø 12 mm **to the raíl** in the exit of the filter (pos. **'B'**)

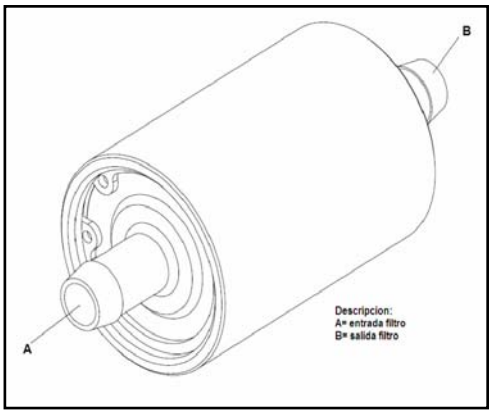


Fig.13: Filter Fil-05

- Inside the filter there is a **paper cartridge** which has to be periodically **replaced** (see User Manual)

2.4.6 ECU07 CONTROL UNIT

For the installation of the Control Unit, follow the hereunder instructions:

Fig.14: Emmegas ECU07 Control Unit

- The ECU07 can be positioned into the **engine compartment** or into the **passenger compartment**

- If installed into the engine compartment, it must be fixed in **vertical position** and as **far as possible from sources of heat**, as, for example, the exhaust of the vehicle, the radiator, etc. and protected from **water infiltrations**

- Position the ECU07 in such a way that it will be easy to operate on the **connectors**

- Insert the connectors inside their lodgments on the ECU07 (grey with grey and black with black) and with their levers totally extracted; once inserted, **lock the connectors** by pressing the levers

2.4.7 MAP SENSOR

For the Map Sensor installation, follow the hereunder instructions:

- Fix the Map Sensor to the **body of the vehicle** (not to the engine or components fixed to the engine) and in an **position higher than the regulator**

- To connect the **entrance P** (position B) directly to the pressure sensor **output of the rail**

- To connect the **entrance V** (position A), to the **compensation connector of the reducer** and to the **vacuum of the intake manifold** (see diagrams page 8 and 9)

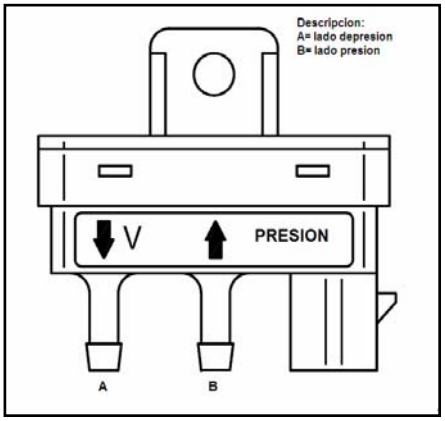


Fig.15: Map Sensor

2.4.8 ELECTRIC CONNECTIONS

All the necessary electric connections have to be done with the two different looms of the ECU07 control unit; in the following pages are presented the diagrams for the 4, 6 and 8 cylinder vehicles.

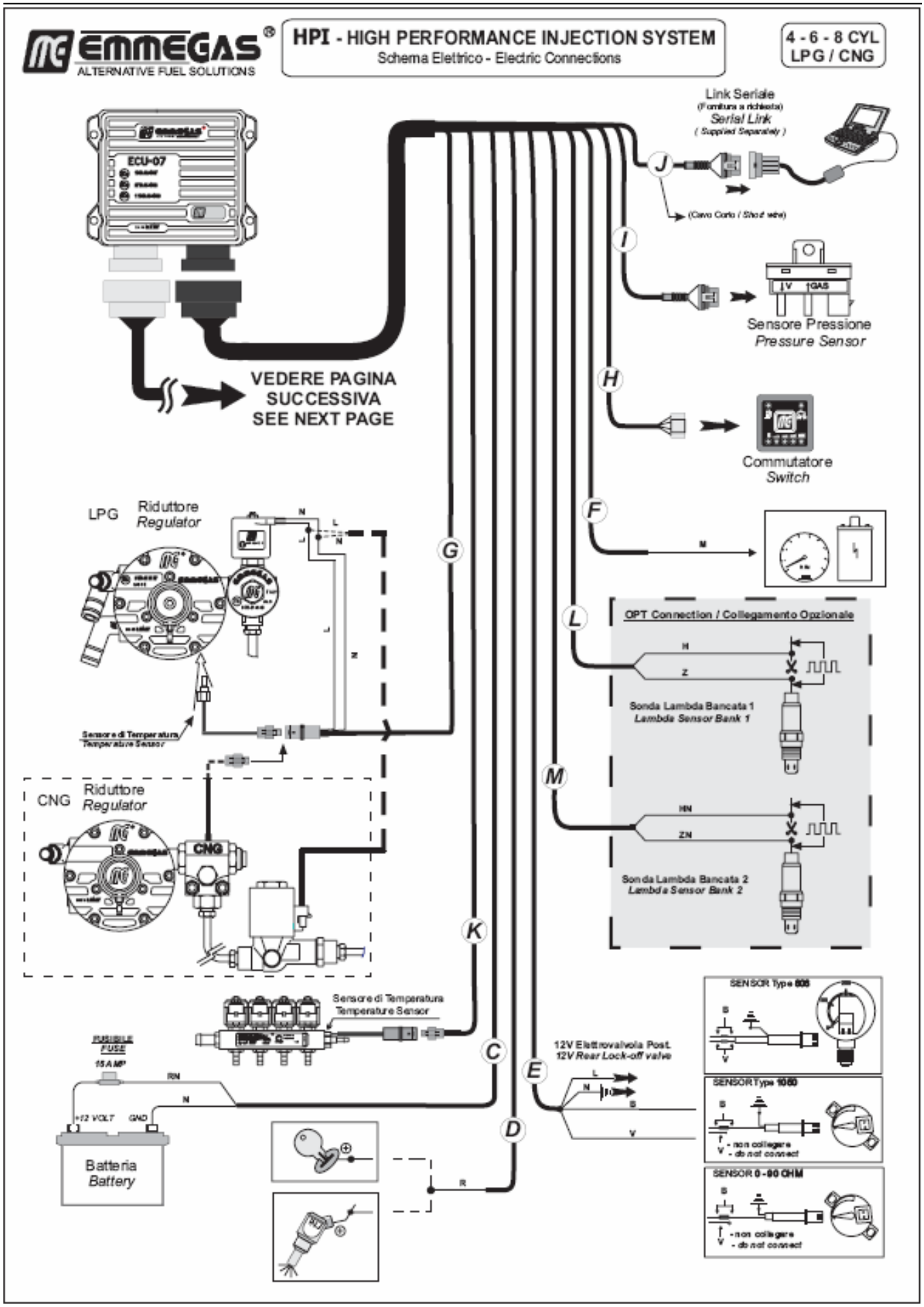


Fig.16: General Electric Diagram (black connector)

WIRE COLOURS CORRESPONDENCE TABLE / TABELLA CORRISPONDENZA COLORE FILI

	I	GB	ES	TR	PL	D	F
A	Azzurro	—	–		--	--	—
B	Bianco	White	Blanco	Bexaz	Biala	Weiß	Blanc
C	Arancio	Orange	Naranja	Turuncu	Pomarańczowa	Orange	Orange
G	Giallo	Yellow	Amarillo	Sari	Żółta	Geld	Jaune
H	Grigio	Grey	Gris	Gri	Szara	Grau	Gris
I	Blu	Blue	Azul	Mavi	Niebieska	Blau	Bleu
M	Marrone	Brown	Marrón	Kahverengi	Brązowa	Braun	Marron
N	Nero	Black	Negro	Siyah	Czarna	Schwarz	Noir
R	Rosso	Red	Rojo	Kirmizi	Czerwona	Rot	Rouge
S	Rosa	Pink	Rosa	Pembe	Różowa	Rosa	Rose
V	Verde	Green	Verde	Yesil	Zielona	Grün	Vert
Z	Viola	Violet	Violeta	Mor	Fioletowa	Violett	Violet
RN	Rosso - Nero	Red - Black	Rojo - Negro	Pembe-Sinai	Czerwona-Czarna	Rot - Schwarz	Rouge - Noir
VN	Verde - Nero	Green - Black	Verde - Negro	Yesil-Siyah	Zielona-Czarna	Grün - Schwarz	Vert - Noir
MN	Marrone - Nero	Brown - Black	Marrón - Negro	Kahverengi-Siyah	Brązowa-Czarna	Braun - Schwarz	Marron - Noir
SN	Rosa - Nero	Pink - Black	Rosa - Negro	Pembe-Siyah	Różowa-Czarna	Rosa - Schwarz	Rose - Noir
HN	Grigio - Nero	Grey - Black	Gris - Negro	Gri-Siyah	Szara-Czarna	Grau - Schwarz	Gris - Noir
GN	Giallo - Nero	Yellow - Black	Amarillo - Negro	Sari-Siyah	Żółta-Czarna	Gelb - Schwarz	Jaune - Noir
ZN	Viola - Nero	Violet - Black	Violeta - Negro	Mor-Siyah	Fioletowa-Czarna	Violett - Schwarz	Violet - Noir

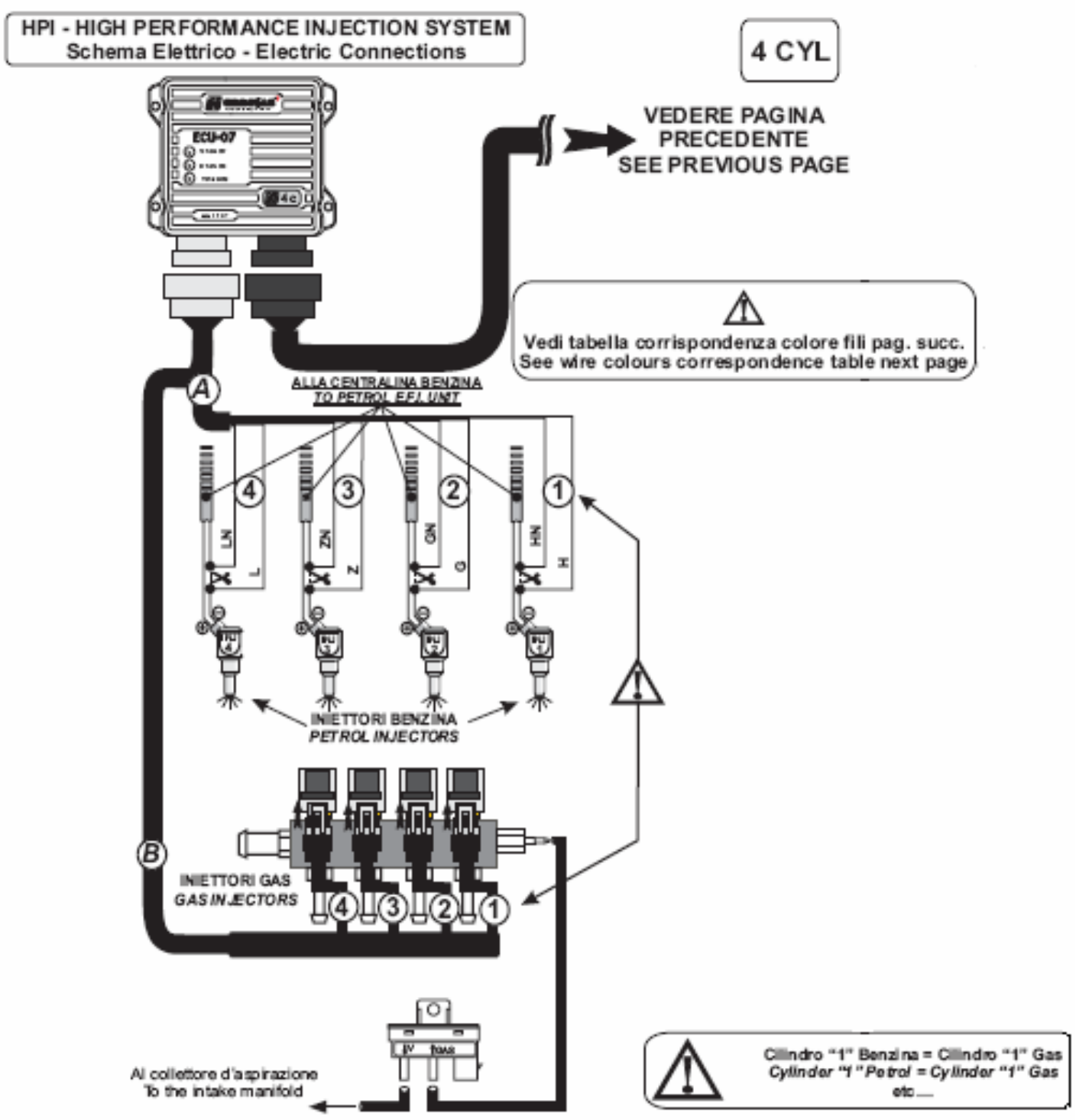


Fig.17: 4 cylinder Electric Diagram (gray connector)

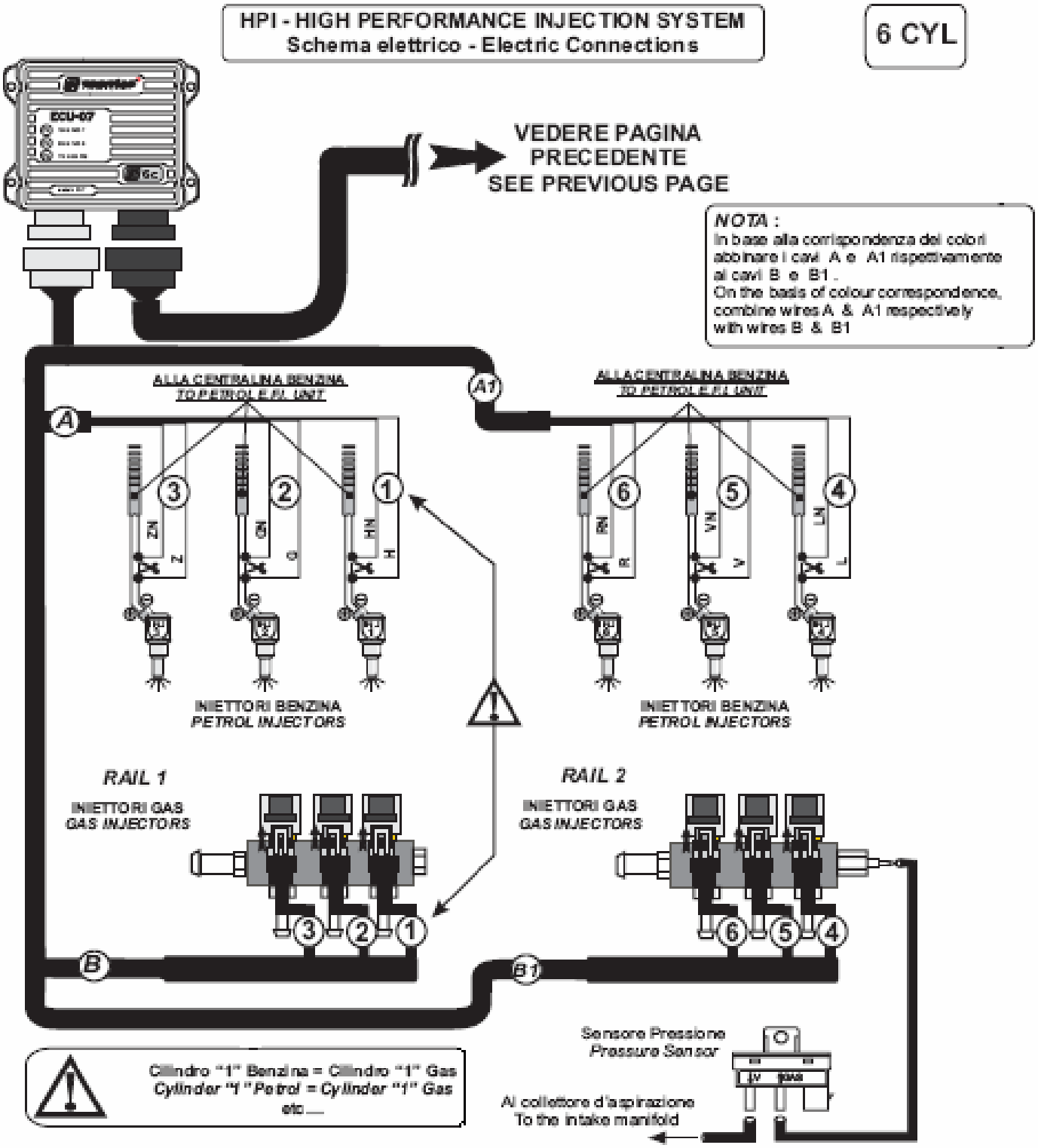


Fig.18: 6 cylinder Electric Diagram (gray connector)

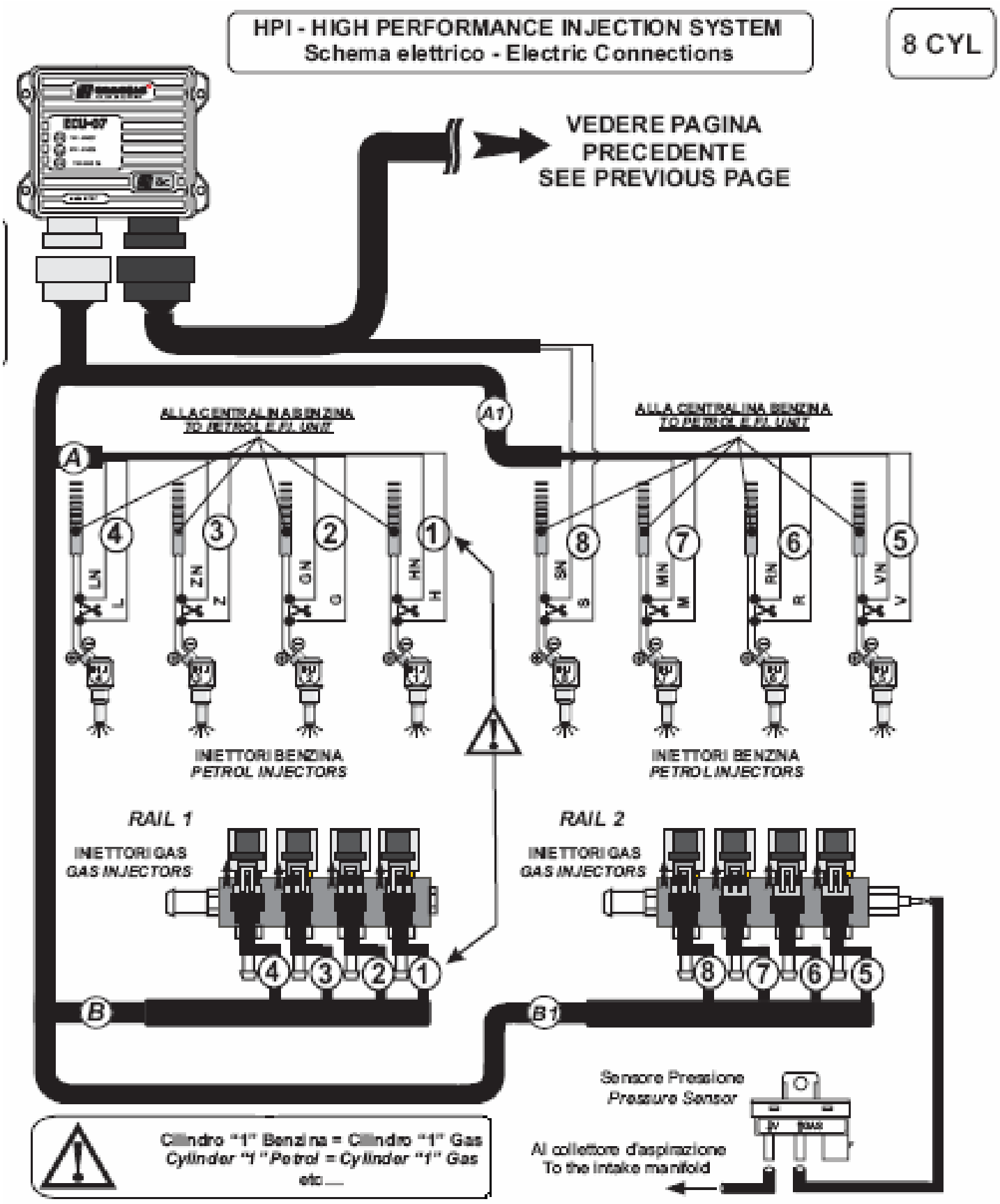


Fig.19: 8 cylinder Electric Diagram (gray connector)

2.5 CHECKS

Once the installation has been finished, the proper operation has to be checked on both petrol and gas, to check if the petrol correctors work properly and according to the set parameters.

2.5.1 CHECK IN PHASE OF ACCEPTANCE OF THE VEHICLE

" Check the ignition system:
- correct resistance of the **high tension cables**
- check if there are any signs of **current discharge** in the ceramic insulator of the spark plugs and if the electrodes are wornout
- Check the **coils**

" Check the **air filter** (if it is very dirty, replace it)
" Correct operation of the **vehicle on petrol**.
" Diagnostic control of the **car pilot lights** (on the dashboard, all the pilot lights have to be off)
" By the "scan tool" check the **diagnostic** of the vehicle and particularly the fast and the slow **petrol correctors** (within +10% and -10%).

2.5.2 CHECK IN PHASE OF INSTALLATION OF THE KIT

" Check the **positioning of the mechanical components** of the kit to avoid they get in contact with the moving elements of the engine.
" Check the heating **water circuit of the reducer**: the level of the cooling liquid has always to be below the highest point (to avoid air bubbles).
" Check the installation of the **electrical components** is protected from any possible water infiltrations and is far from ant heating sources (do not position the control unit close to the exhaust manifold of the engine).
" Check the **electrical connections are completely insulated** and they cannot become sources of false contacts or short circuits; check that all the connections have been carried out by a tin welding.
" To place the **nozzles**, drill and tap the manifold into the point which is **closest to the intake valves and to the petrol injectors**
" After having installed the injector nozzles into the intake manifold (plastic/aluminum), check carefully that there aren't any **shavings or residuals** inside them.

2.5.3 FINAL CHECK AT THE END OF THE CONVERSION OF THE VEHICLE

" Check the **temperature of the reducer**, just to be sure there is a good flow of hot water after the engine has been running (and only after the thermostat has opened).
" Check the **electrical connections** are not sources of short circuits or contacts which can cause damage to the wire.
" Check the **high and the low pressure gas** conduits of the installed system do not have any leakages (check the connections and the bands by a Gas Analyzer).
" Verify the **water circuit** of the regulator is watertight.
" Carry out an accurate air purging of the **cooling circuit** of the engine.
" Check the resistance of the **intake manifold**, verifying that no suction nor any disconnections of the vacuum pipes have occured.

2.5.4 CHECK AT THE END OF THE CALIBRATION

" At idle, check the **gas operation** of the engine: it is necessary there aren't any vacuum, thrust nor exhaust..
" Check the **exhaust emissions** by the gas analyzer (CO and HC)
" Check the **Gas calibration map** doesn't affect the parameters of the carburetion on petrol (refer to page no. 13 of the HPI07 programming Manual)

CHAPTER 3: TROUBLE SHOOTING

3.1 INSTALLATION

MALFUNCTIONING	REASON	SOLUTION
Connection not possible with the ECU07	The USB interface is not connected to the ECU07 or to the Laptop	Connect the interface
	The RED or BLACK wires of the ECU07 are not connected to the power or the fuse is out of order	Connect the wires and / or replace the fuse
	The interface 'drivers' have not been downloaded into the laptop	Download and install the 'drivers' by the CD or from the web site www.emmegas.net
	The interface does not communicate with the ECU07	The interface could be damaged, replace it
	ECU07 damaged	Replace the ECU07
During the auto-tuning the following message is visualized: "**Impossible to continue, check installation"**	Diameter of the rail nozzles too big or too small	Install the nozzles of adeguate diameter, to be calculated on the basis of table present on page 7

3.2 PETROL/GAS SWITCH

The functioning of the engine with gas is possible if the hereunder conditions are satisfied:

- achievement of **RPM minimum limit** for the change, page "Configuration", window "Switch at (RPM)" of HPI07 software
- achievement of **Water Temperature minimum limit** for the change, page "Configuration", window "Temperauture (°C)" of HPI07 software
- overcoming of "**Forced petrol time (s)**" into page "Configuration"

MALFUNCTIONING	REASON	SOLUTION
The vehicle **does not switch to gas**	Wrong Cut-injector connections	Check the cut-injector connections.
	The ECU07 diagnostic found some mistakes	Check the eventual signalizations into the 'ERROR' page, solve the trouble and cancel the error
	RPM limit for the change too high	Check the value programmed and decrease the same
	The ECU07 does not receive any RPM signal	Check the connection of brown wire; in case, install a RPM amplifier
	The gas injectors do not open	Replace the rail
After the switch to gas, the **engine turns off**	The tank or regulator cut-off valves do not open	Check the electric connection or replace the cut off valves
	The "Injector Delay" value into Configuration page is too low	Increase the value
After the switch to gas, the **engine switch again to petrol**	Pressure of regulator too low	Dirty Filter
		Adjust pressure of regulator
		Replace Map Sensor

3.3 IDLE OPERATION

MALFUNCTIONING	REASON	SOLUTION
Unstable Idle, RPM increase and decrease	Too different values into the Map	Conform the values of Map into the Idle operation area
At idle and with the air conditioning turned on, the **carburation is lean**	Too low values into the Gas Map	At idle and with the air cond. turned on , increase the values of the Map until the correct carburation is achieved
At idle, the **engine turns off**	Pressure of the regulator too high	At idle, adjust pressure at values indicated on page 10
	Rail damaged	Replace the rail
	Rail replaced but then no new auto-tuning	Proceed with new auto-tuning
At idle, **RPM** is too **high** or too **low**	Air infiltration from vacuum circuit	Check the compensation hoses and connections

3.4 RETURN TO IDLE

MALFUNCTIONING	REASON	SOLUTION
Engine turns off in acceleration after running without accelerations	The carburation is too rich	Decrease the values of the Map into the return-to-idle area
Engine turns off when **RPM decrease** from high values	Too big diameter of nozzles	Replace the nozzle with adequate diameter
Unstable engine functioning	Too big distance between rail and nozzles into the intake manifold, wrong position of nozzles	Check the installation, position again the Rail on the basis of instructions of page 12, in case, position again the nozzles into the intake manifold in a position closer to the valves

3.5 OUT-OF-IDLE RPM THROUGH SLOW ACCELERATION

MALFUNCTIONING	REASON	SOLUTION
Irregular engine functioning; **Gas injection time** is around **3m**s	Lean Carburation; The Rail is functioning into a Map area with no correct values	Increase the values of the Map
The engine **switch to Petrol**, the switch buzzer and flashes	Low pressure of gas in the tank, low quantity of gas in the tank	Fill the tank
	Pressure of regulator too low	adjust pressure at values indicated on page 10

3.6 ACCELERATION AT MEDIUM/HIGH RPM

MALFUNCTIONING	REASON	SOLUTION
Delay between the push of accelerator pedal and consequent acceleration of the vehicle	Carburation Map not correct	Adjust the carburation, proceed with a new auto-tuning
	Too big distance between rail and nozzles into the intake manifold, wrong position of nozzles	Check the installation, position again of the Rail on the basis of instructions of page 12, in case, position again the nozzles into the intake manifold in a closer position to the valves
	Response of the engine not adeguate during the gas functioning	Only for CNG application, check if is available a suitable Timing Advance Processor

3.7 FULL LOAD & LOW RPM

MALFUNCTIONING	REASON	SOLUTION
At low RPM, **the engine runs irregularly**, with jerking.	Extra injections from petrol ECU.	Into "Configuration" page, adjust the 'Sensibility' value
	Only for CNG application and if installed, the Timing Advance Processor is programmed with too advance degrees	Decrease the advance degrees of Timing Advance Processor.

3.8 POWER FUNCTIONING OF THE ENGINE

MALFUNCTIONING	REASON	SOLUTION
The vehicle **looses power**, the carburation is lean	Values of the Map into power area are too low	Increase the values of the Map into the power area and test the vehicle on the road
	Too high gas pressure from the regulator	Repair / Replace the regulator
After a determined period of functioning at full power, the engine **switches to petrol**	Too low gas pressure of the regulator	Proceed with following checks: - gas filter, - pressure of regulator - gas level into the tank - possible elbow or narrow curves into the low and high pipes and hoses
Fuel consumption out of usual values	Some areas of the Map are too rich	Decrease the values of the Map into the area of interest

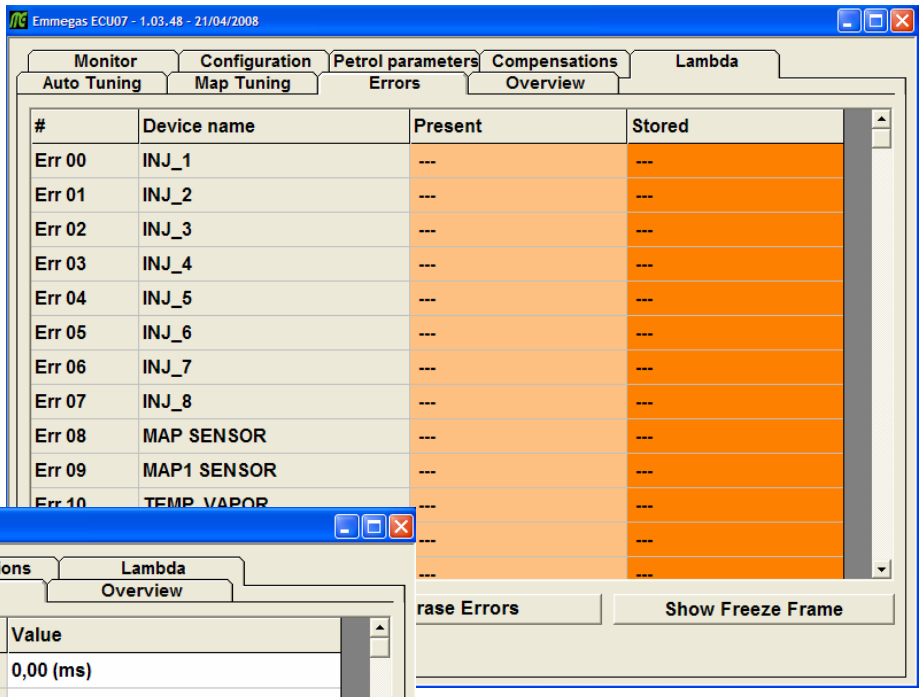
3.9 VARIOUS

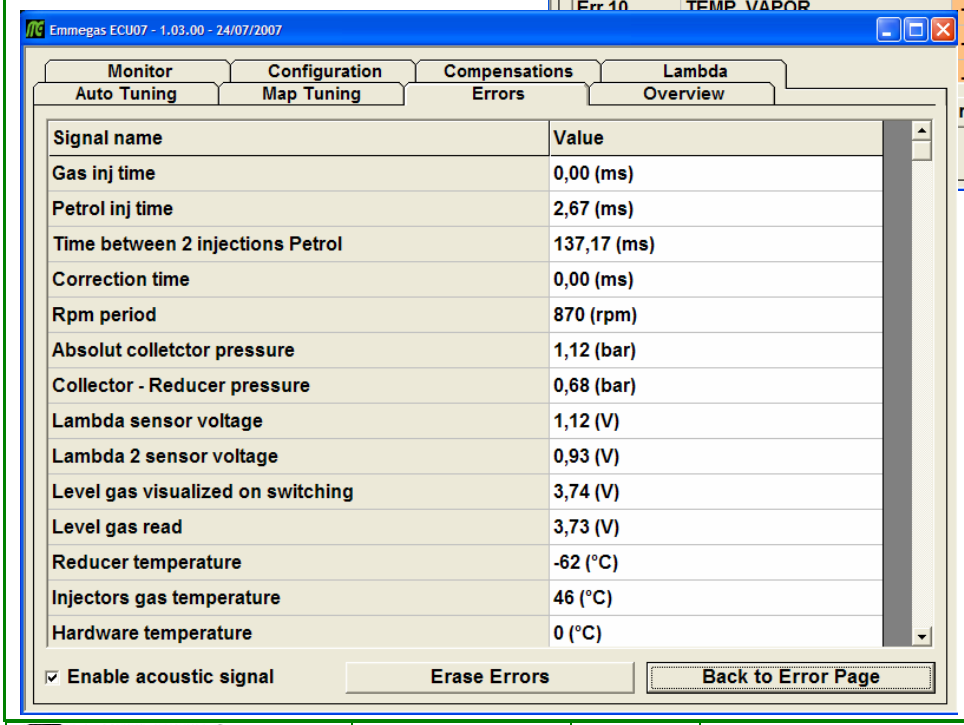
MALFUNCTIONING	REASON	SOLUTION
Switch not illuminated	The fuse of red/black wire is burnt	Replace the fuse with another of same capacity
	Wire of the switch is damaged	Repair the wire
	The Switch is damaged	Replace the Switch
The vehicle **runs in a irregular way**, sometimes the engine turn off and driving is not proper in all conditions	One gas injector (or more) is not working properly	Check the rail and, if necessary, repair it or replace it
		Replace the ECU07
	Wrong electric connection between Cut-Injector wire and corresponden-ting Gas Injector wire (1 with 1, 2 with 2, etc)	Check the electric connection and the correspondance
At all RPM level, the **carburation is too rich** and there is no way to adjust it	The rail is damaged	Replace the Rail
	Too high gas pressure from the regulator	Adjust the pressure (see page 10) and, if not possible, replace the regulator

3.10: ERRORS DIAGNOSTIC

The errors visualization of HPI07 sequential ECU is organized as follows:

- **Error List:** shows the list of all the errors, pointing out if they are current errors or memorized (occurred during a previous running with gas)





- Show Freeze Frame: the ECU07 pass to the Freeze Frame modality showed aside;
In the Freeze Frame modality is presented the list showing the status of the vehicle during the last error (instead of the list of errors)

NOTAS

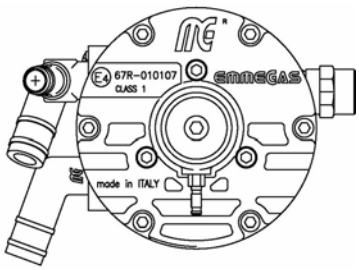
CHAPTER 3 : DESCRIPTION OF THE COMPONENTS OF THE SYSTEM

3.1 Double stage pressure regulator NGV 04-XJ;
3.2 Single stage pressure regulator ML04-XJ;
3.3 Gaseous filter FIL-05;
3.4 Injection rail JMU;
3.6 Timed sequential Electronic Control Unit ECU 07;
3.7 Change-over switch/indicator SWI-07;
3.8 Cableado;
3.9 Cng Cut-off valve APUS;
3.10 Lpg cut-off valve SV-06;
3.11 Map sensor.

3.1 REDUCTOR DE PRÉSION ML04-XJ

El reductor ML04-XJ es un reductor mono-estadio de membrana, compensado, con intercambiador de calor agua-gas y válvula de seguridad interna.
La presión se reduce hasta 1,1 – 1,2 bar, que es la presión que el gas tiene cuando llega a los inyectores.
La característica principal de este reductor es el sistema de reducción por pistón y resortes, sin el empleo de palancas.
Esto permite obtener un mayor flujo de gas, pronta respuesta en aceleracion y en caso de necesidad de potencia desde el motor, y estabilidad al minimo.

Especificaciones técnicas:

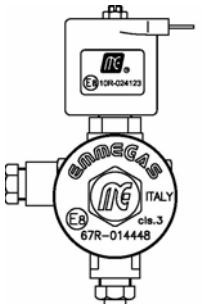


Cuerpo y Tapa:	Aluminio fundido en presión
Membrana:	Goma epicloridrina
Presión maxima:	67,5 bar
Presión en entrada:	20 bar
Presión de funcionamiento:	1,1 ÷ 1,2 bar (ajustable)
Temperatura de funcionamiento:	-40°C ÷ +120°C
Potencia maxima:	220 HP / 160 Kw; para potencias superiores, utilizar dos reductores.
Versiones:	- 4 Cilindros (con electrovalvula incorporada) - 6 y 8 Cilindros (con electrovalvula separada) todas las versiones tienen un Sensor de Temperatura.
Sistema de reducción:	por pistón (sin palancas)
Homologación:	E4 67R-010107 Class 1

3.2 ELECTROVÁLVULA SV-06

Esta componente cierra el flujo del gas – en alta presiòn - cuando el motor se apaga o el sistema se vuelve a gasolina.

Especificaciones técnicas:

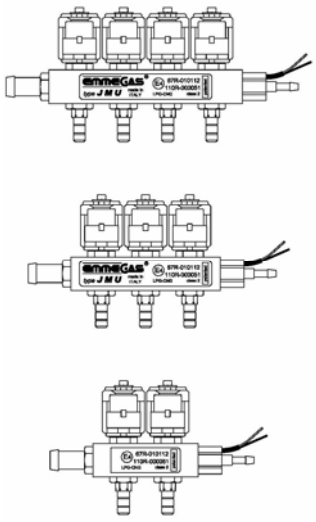


Cuerpo:	Latón CW614N
Presión maxima:	67,5 bar
Presión maxima en entrada:	14,0 bar
Temperatura de funcionamiento:	- 40°C ÷ +120°C
Flujo maximo:	160 Lt/h
Bobinas:	12V – 11W
Cartucho en papel:	- m.p.s. 12,5 µm - superficie: 96cm^2 (reemplazable)
Homologaciones:	E8 67R-014448 Class 3

3.3 RAIL DE INYECCIÓN JMU

El Gas Licuado, procedente del filtro, entra por el empalme entrada gas y alimenta los inyectores. Dosificado adecuadamente, el gas sale de los inyectores a través de los difusores y llega, tramite una conexión, al colector de aspiración y, por tanto, al motor. La ECU07 Emmegas dirige los inyectores, los cuales están conectados a la misma mediante los cableados. En el rail se encuentra tambien un sensor que detecta la presión y la temperatura del gas en el rail mismo.

Especificaciones técnicas:



Cuerpo:	Aluminio extrudido anodizado
Presión maxima:	4,5 bar
Presión en entrada:	2,5 bar
Presión de funcionamiento:	0,5 ÷ 2,5 bar
Temperatura de funcionamiento:	-20°C ÷ +120°C
Bobinas:	6V – 3Ω
Versiones:	- 2 inyectores - 3 inyectores - 4 inyectores Todas las versiones tienen el sensor temperatura y Presión.
Difusores:	Ø (mm): 1,8 – 2,25 – 2,5 – 2,7 – 3,5
Homologación:	E4 67R-010112 Class 2

Para un funcionamiento optimal del rail de inyección, es necesario calcular el diametro de los difusores que se instalan en el vehiculo según el procedimiento siguiente.

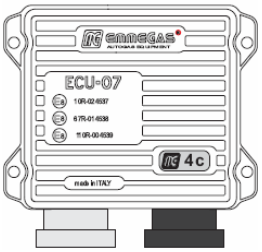
3.4 CENTRALITA EMMEGAS ECU 07

La centralita Emmegas Ecu 07 ha sido projectada, desarrollada y industrializada internamente en Emmegas. Respecto a la competencia tiene algunas especificaciones tecnicas y de funcionamiento particulares, es decir:

- Señal de auto-aprendizaje gasolina cilindro por cilindro;Autocalibración al minimo;
- Ajuste mapa por sectores o libre;
- Posibilidad impostar un retraso cilindro por cilindro durante la conmutación gasolina/gas;
- Cableado "corta inyectores" integrado en el cableado principal;

- Auto-adaptación durante el empleo del vehículo;
- Programación facil y intuitiva de los parametros de funcionamiento a gas;
- No invasivo para la electrónica del vehículo;Aplicabilidad universal para sistemas Glp y Gnc con motores 3-4-5-6-8 cilindros;Espia de diagnóstico sobre el conmutador;Versión completa del software (sin vencimiento) con mapa completo, sin necesidad de llave, y con posibilidad descargar software desde el web.

Especificaciones técnicas:



Cuerpo y Tapa:	Aluminio fundido en présion.
Señales en entrada:	-Temperadura del reductor y del rail; - señal electrica desde el sensor MAP - señales electricas enviadas por la centralita a gasolina a los inyectores gasolina; -RPM del motor.
Señales en salida:	- Señales electricas enviadas a los inyectores gas; - control eléctrico de la electroválvula alta presión.
Funciones principales:	- Inyección secuencial; - emulación impedances incorporada; - supervisión continua y diagnóstico de inyectores gas; - diagnóstico y strategias de auto-test; - sensor de presión; - adaptable a todos los tipos de inyectores
Calibración:	- Autocalibración cilindro por cilindro; - adjuste mapa y memorización para manejar los diferentes inyectores; - creación de un database para guardar las diferentes configuraciones; - software de programación y de supervisión compatible para Windows.
Características electricas:	0 ÷ 12 V ; 4 A
Versiones:	3-4 ; 5-6; 8 cilindros.
Homologaciónes:	E8 10R-024537 - E8 67R-014538

3.5 CONMUTADOR/INDICADOR SWI-07

En el conmutador del nuevo sistema HPI 07 está presente:

- el led gasolina (luz naranja): si está encendido significa que el vehículo funciona con gasolina;
- el led de chequeo (luz roja): si está encendido significa que hay posibles malfuncionamientos del sistema a gas;
- la serie led (en verde): indica el nivel de gas (subdividido en cuartos) presente en el cilindro;
- la espia "R" (en rojo): indica que el cilindro está en reserva de gas.

Especificaciones técnicas:

Cuerpo:	En plástico, pequeño tamaño, illuminado.

	Características principales:	-Permite la selección del carburante; -indicador nivel gas; -indicador de carburante en uso; -indicador de diagnóstico; -cambio automático a gasolina en caso de bajo nivel de gas o de malfuncionamientos; -alarma sonora en caso de cambio forzado a gasolina.

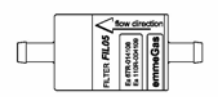
Aquì abajo se encuentra el imagen del "Manual Usuario" con todas las especificaciones de funcionamiento del conmutador/indicador.

Fig.4 Manual Usuario del sistema HPI 07

3.6 FILTRO EN FASE GASEOSA FIL-05

La función del filtro es de filtrar el Gas Licuado en fase gaseosa; La entrada del filtro está conectada a la salida del reductor de presión con un tubo cuyo diámetro interno es de 12 mm.
El filtro contiene un cartucho filtrante cuya función es la de obtener un filtrado eficaz en la dirección del flujo del gas desde el exterior hacia el interior. La salida del filtro está conectada con la entrada del rail de los inyectores mediante un tubo de 12 mm de diámetro interno.

Especificaciones técnicas:



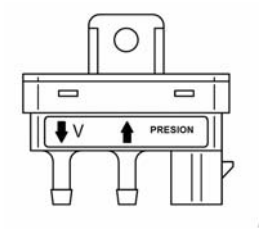
Cuerpo:	Aluminio
Presión maxima:	4,5 bar
Presión en entrada:	2,5 bar
Temperatura de funcionamineto:	-20°C ÷ +120°C
Cartucho:	Reemplazable
Cartucho en papel:	- m.p.s. 12,5 µm - superficie: 246cm^2
Homologación:	E8 67R-014108 Class 2

3.7 SENSOR MAP

El sensor map es un sensor de presión diferencial y por eso detecta y analiza continuamente dos diferentes valores, es decir:

1) la presión del reductor en base a la depresión que está en el colector de aspiración, permitiendo la corrección de la presión de erogación del gas en base a la altitud, basandola entonces sobre la presión atmosférica.
2) la presión de erogación del gas en el rail de inyección, modificando por lo tanto los tiempos de inyección en base a la presión de alimentación y permitiendo la conversión a gasolina cuando la presión del gas no está suficiente.

Especificaciones técnicas:



Cuerpo:	Nylon
Temperatura de funcionamineto:	- 20°C ÷ +120°C
Presion sensor 1	2,5 bar
Presion sensor 2	4 bar
Homologaciónes:	E8 67R-01 4228 Class 2 E8 10R-024732