



**SIGAS**  
CNG SEQUENTIAL INJECTION  
**24 34 36 38**

Sequential Gas Injection System  
Installer's Manual  
4, 5, 6, 8 cylinders  
LPG



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## General Features

SIGAS is a sequential gas multipoint injection system for the conversion of vehicle engines. Unlike 2nd or 3rd generation equipments, with a two stage vaporizer and a mixer which delivers gas according to the vacuum caused by the regulator, in the SIGAS system, the gas is injected under pressure from the injectors into the intake manifold, copying the functioning of the original fuel. The main advantages are attributed to the absence of restriction in the intake manifold because this is a system that does not alter the vehicle performance with the original fuel, to the absence of backfires, even in the worst possible conditions, and the total absence of emulations, because it is a system with real time operation.

## Components - Location and Operation

The multi-valve is fixed on the coupling neck of the LPG tank, which has temperature and pressure safety devices, and also closes the pressure circuit with a solenoid when the NGV system is not active or the vehicle is stopped. The multi-valve is coupled by the connectors to the pressure pipe, which lays from the bootspace of the car or the the solenoid valve, which is located in the engine bay. This valve allows the closure of the segment that connects the tank with the valve by means of a solenoid, it shuts off the gas passage to the regulator when the system is not in use. So, both the multi-valve and the LPG engine bay solenoid are shut off during petrol operation or when the engine is not running. Only when switched to LPG, these valves allow the LPG passage and therefore reaching much higher safety standards. From the solenoid, the pressure regulator is connected, which will have 1 to 1.5 bar pressure in its outlet, depending on the calibration and configuration, (15 to 23 p.s.i.), and feeds the injector rail. This injector rail is commanded by the ECU of the SIGAS System when switched to LPG, allowing the necessary fuel supply for the engine in each intake cycle. This way, in addition to avoiding the undesirable consequences of backfires, a more precise and accurate engine performance is achieved. The injector rail is connected by hoses, to the nozzles placed in the intake manifold, close to the intake valve, to reduce as much as possible the response time of the system.

## Administration Operation

The SIGAS ECU (Electronic Control Unit) uses the parameters of the original injection system of the vehicle by using each petrol injector pulse as main factor, by shutting them off, and then uses its own compensations, such as the gas and regulator temperature by means of the injector rail temperature sensor, gas pressure and absolute pressure of the intake manifold. So, the ECU and the original engine injection continue operating similarly, being the gas system an additional element for the fuel mass conversion (from petrol into gas) and the original ECU keeps operating as it would with petrol. No emulations are required; the fuel supply system of the vehicle continues operating in real time with the dynamic compensations without alterations.

## Requirements for the assembly and each component

An installed and operating LPG equipment is expected to meet the highest requirements regarding safety, functionality and durability.

Safety is ensured by the material quality and the strict compliance with inspection and installation standards. Functionality is guaranteed by the design and the correct location of components, meeting our own requirements and those of the vehicle, together with correct fuel administration and tuning. Durability is ensured by the aforementioned facts, and by adding top notch maintenance and/or repairing service, which includes the right tools and know how.

## Characteristics of the Conversion Kit



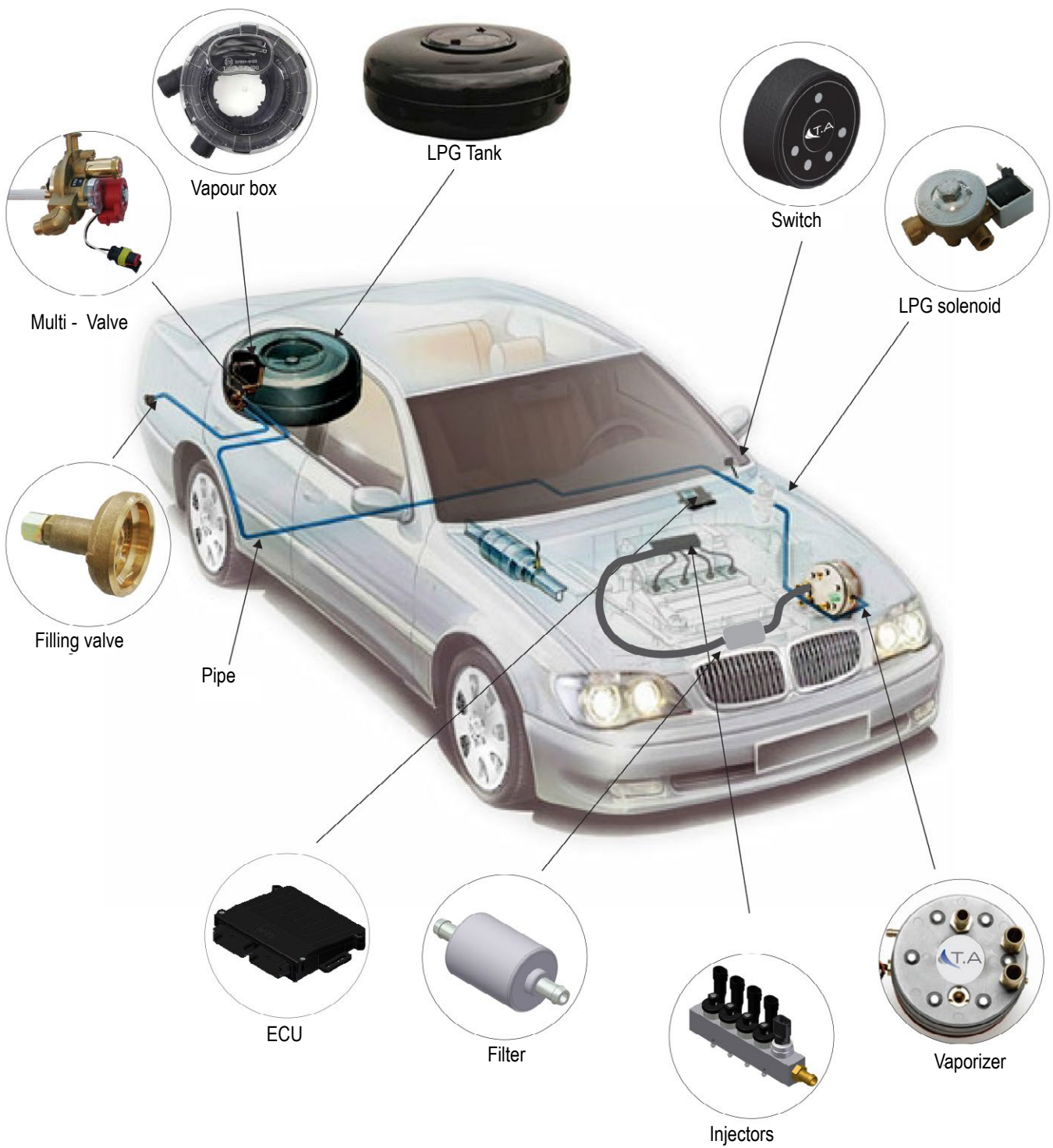
### Components

- |                                |                                  |
|--------------------------------|----------------------------------|
| 1. GLP Vaporizer               | 9. Main wiring harness           |
| 2. LPG Engine-bay solenoid     | 10. Venting hoses                |
| 3. Filling valve               | 11. Hose kit (water-gas)         |
| 4. SIGAS ECU                   | 12. pipe 6mm                     |
| 5. Switch with level indicator | 13. pipe 8mm                     |
| 6. Injector Rail               | 14. Supports/brackets            |
| 7. PTS Sensor                  | 15. Mounting/fitting accessories |
| 8. Gas filter                  | 16. Reducer temperature sensor   |

(\*) The components and its location may differ due to technical update, country laws and regulations. The present manual is for description and orientation for the installer.

Check for technical update bulletins from TA that could inform about product improvement or change.

## LPG General Lay-out



## General inspection of the Unit to be Converted

The inspection prior to conversion will avoid problems related with previous failures, but after the conversion has taken place, such failures are difficult to detect accurately.

The general recommendations are the following:

- a) Check the general condition of the vehicle structure, and make sure it is robust and that the conversion kit components can be safely fixed, e.g.: cylinders, high pressure piping, filling valve and pressure regulator. Under no circumstances, the LPG installation will weaken the vehicle structure, which should be strengthened only when necessary.
- b) Check that the mechanical and electrical condition of the engine ensures an acceptable performance with gasoline and therefore, with LPG. Please check the high voltage wires and its components.
- c) Those units which do not meet the above mentioned items must be repaired before starting the conversion or the vehicle owner should be warned about this situation.
- d) Perform an injection scanning to ensure the adequate system performance because SIGAS depends directly on the original fuel supply system.

## Installation-Location for Components

### 1 - In the Engine Bay:

- a) LPG Vaporizer
- b) Water connections and pipes.
- c) LPG Solenoid
- d) Injector rail
- e) Gas filter
- f) Regulator-filter-injector rail connection hose
- g) Injector intake manifold connection hose

### 2- In the vehicle interior:

- a) Switch with fuel indicator
- b) SIGAS2.4 ECU (it can be fixed in the engine bay, but as it is a 85°C tolerance, must be located away from heat sources that can reach up to this temperature). Vehicle cockpit still is our strong recommendation.
- c) Timing Advance Processor (optional, same as previous item).

### 3 - Inside the trunk (cars), inside the truck body or under the chassis (heavy duty vehicles):

- a) LPG tank /s and support, with support and multi-valve.
- b) Venting system (the system to be used will depend on regulations)
- c) The pipe connects the cylinder with the LPG solenoid (in the engine bay), and between it and the vaporizer. The pipe connection routing must be made under the vehicle body and the connecting sections of the different elements must not have splices.



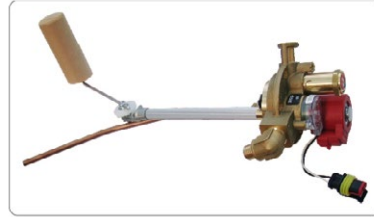
## Multi - valve

LPG tanks have a standard coupling where a multi-valve is going to be fitted. Its function is to control inlet-outlet of the LPG from/to tank. Besides, blocks the filling when 80% of level has been achieved. Also blocks the outlet if an accidental breakage of the pipeline has happened. Allows to check LPG level by a gauge, and by means of the electronic on it, can be sent to the switch and level indicator to visualize the LPG level while driving.

The multi-valve has to be installed following the instructions and matching type with application (toroidal, cylinder,

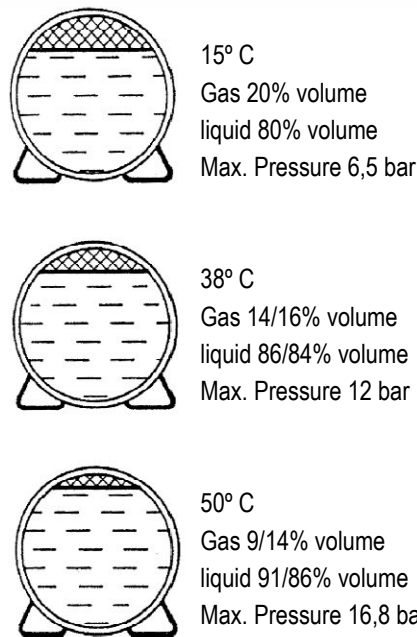
0o, 30o, 60o, 90o) in order to work properly. Otherwise can fill up too much LPG or not fill at all. The installer has to check on the first filling the correct behaviour of it.

The vapour box matches with the multi-valve and fixes to it, to connect to the venting system.

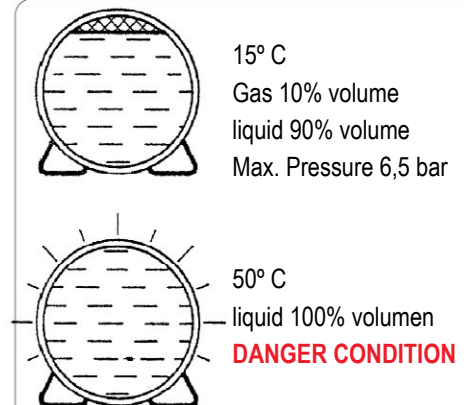


it has:

- Manual operation closure valve
- Filling up control (not allowing to fill it over 80% for safety reasons)
- Seals, venting system, and safety devices



**fig. 6.1** - Pressure variation on a 60 Lts LPG tank, filled up to 80% of its total capacity, and due to temperature changes from 15°C (while filling ) to 50° C.

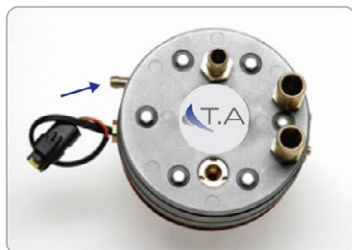


**fig. 6.2** - Pressure variation on a 60 Lts LPG tank, filled up to 90% of its total capacity, and due to temperature changes from 15°C (while filling) to 50° C.

Models of the multi-valve can change due to technical update, laws and regulations of each country. Check product manual, installation manual of the multi-valve to be applied, and current country regulations and laws

## Installation- LPG Vaporizer

By using the heating connection from the engine coolant, vaporizes LPG to obtain it on gas stage. Has to be fixed on the engine bay avoiding to be exposed to excessive heat (from exhaust, for example) and away from mobile parts or the battery. Special attention shall be paid to its mounting. Gas outlet will always be upwards. Near the pressure regulator screw, is the nozzle for vacuum compensation. On the edge, is the PRV device.



Zeta Vaporizer.  
Blue arrow points PRV Device



Vaporizer and LPG Solenoid, installed on a Honda CRV. Vaporizer on green, solenoid in light blue.

## Installation LPG Solenoid

It is a electromagnetic device with a filter that closures the LPG flow to reach the vaporizer when engine is running on petrol or stopped. When opened (running on LPG) the gas in liquid state passes through the filter, and then to the vaporizer. If the vehicle stops, this valve closes and remains in that state until a next restart and petrol to LPG change has been made. Pay attention to the body, which has a mark pointing the proper mounting ("this side up")



## Installation Filling valve

The filling valve is used to fill LPG tank. It is connected to the multi-valve by a 8mm pipe. Can be installed near the Petrol filling cap, or in a protected part of the vehicle. (See laws and regulations of each country).





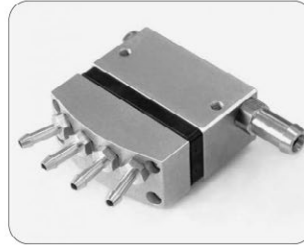
## Installation - Injector rail

Special attention must be paid to the fixing of the rail, following the order of injectors. If the wiring was installed with the end marked as "1" in the first injector of the left, the injector "1" of the injector rail must be fixed, with its corresponding hose, to that inlet duct, as the system injects the fuel according to the reading of the injection time of the original ECU.

In order to keep the sound proof of the vehicle, the injector rail must be fixed to the intake manifold or to another part which accompanies the engine motion, and avoiding to fix it to the vehicle body, which would increase the sonority of the injector assembly. To improve vehicle normal operation it is recommended to use the connectors that allow the shorter hoses e.g. the straight connectors included in the kit, or the adjustable optional connectors (the length of the hoses must be balanced, a variation of 10% to 20% is acceptable between hoses).



IG-1 Injector rail



HD-344 Injector rail



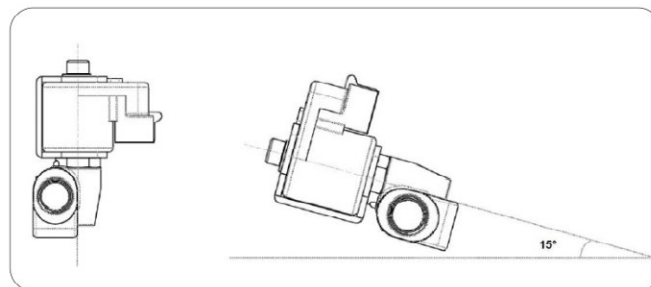
IN-03 My09 Injector rail

In the three models the concept applies for them all. Closest possible to the manifold, fixed to the engine not to chassis, and flow/gicleurs/jets accurate for the engine (see next pages for info).

On the left, IG-1 type, center Matrix HD 344, and IN-03 MY09 on the right.

The three uses a PTS sensor (PTS 4.5 Bar) to measure pressure and temperature of the gas, and informing that to the ECU, will do volume calculation.

Installation and mounting: The recommendation is to install it with the outlet nozzles pointing downwards. As maximum from the horizontal line, 15° slant down. This should avoid oil accumulation inside of the injectors, which may cause incorrect behaviour. Besides, the injector rail should be fixed in a higher level that the nozzles on the manifold.



Injection rail mounting: Gas outlet pointing downwards. Or as maximum, 15 degrees slant.

## Installation - Calibrated Nozzles IG-1 Injector rail

To be able to provide the right fuel supply, there are two elements which allow a starting point regarding the amount of fuel, according to the engine in which the system is being installed. The calibrated nozzles, available in different sizes, will be installed in each of the outlets of the injector rail, before fixing the hoses. In small displacement and low power engines, the size to be used is 1.50mm, being 2.50mm for the maximum power tolerated, with 1 intermediate point (1.50mm, 2.00mm, and 2.50mm). The other decisive point is the gas pressure (DeltaP), which can be set from 1000 to 1500 mbar ( see calibration manual for info).



## Selection of the calibrated nozzle

Although practice will determine the right conversion, as a general rule, and based on practice, the following basic table will guide the beginning of the conversion.

The power shown is PER CYLINDER, which means in a 4 cylinder engine, that produces 120 HP, is considered  $120/4 = 30$  HP per cylinder.

Presion (Delta P) in mbar			
Nozzle ( □ )	1000		1500
	HP		
1.50	14	□	23
2.00	21	□	31
2.50	27	□	41

**MIN Injection time:** 4.50ms (idle without loads, all accesories off)

**Working pressure:** Pressure (DeltaP) limit is 1750 mbar



IG-1 Injector rail installed on a VVT-i engine

## Installation - Calibrated Nozzles HD 344 Injector rail

To be able to provide the right fuel supply, there are two elements which allow a starting point regarding the amount of fuel, according to the engine in which the system is being installed. The calibrated nozzles, available in different sizes, will be installed in each of the outlets of the injector rail, before fixing the hoses. In small displacement and low power engines, the size to be used is 1.50mm, being 2.50mm for the maximum power tolerated, with 1 intermediate point (1.50mm, 2.00mm, and 2.50mm). The other decisive point is the gas pressure (DeltaP), which can be set from 1000 to 1500 mbar ( see calibration manual for info).



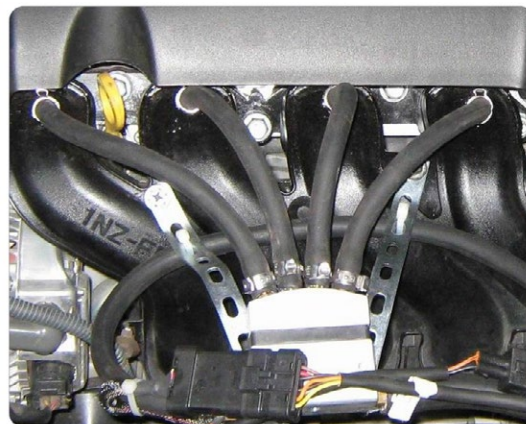
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		Presion (Delta P) in mbar		
		1000		1500
Nozzle ( □ )			HP	
E 1.75		8	□	13
D 2.25		12	□	19
C 2.75		17	□	25
B 3.50		21	□	31
A 4.00		27		39

**MINInjectiontime2.50ms** (idlewithoutloads,allacesoriesoff)



HD-344 Injector rail installed on a VVT-i engine

## Installation - IN-03 MY\_09 Injector rail

The IN-03 My09 injector rail is the assembly of the four individual injector into the rail. It is important to remember that the PTS sensor has to be included on the set.



These injectors are identified by type and color: Normal (blue) 17-33 HP. Max (orange) 31-45 HP, and Supermax (yellow) 42-53 HP. The assembly and dimensions are the same for all.

The pressure (DeltaP) for this injectors is between 1000 and 1500 mbar

The power shown is PER CYLINDER, which means in a 4 cylinder engine, that produces 120 HP, is considered  $120/4 = 30$  HP per cylinder.

**MINInjectiontime3.50ms** (idlewithoutloads,allacesoriesoff)



IN03 MY 09 Injector rail installed on a Peugeot/Citroën Tu3 intake manifold

## Installation - Gas Filter

As the injector rail is the most sensitive element of the assembly to foreign objects or impurities from the fuel flow, the gas filter shall be installed between the regulator and the injector rail. The gas filter is fixed with clamps, and vibration effects on other engine components must be avoided, sostraps/zip ties must be used for fixing the gas filter, or adequate fixing locations must be found in the engine bay. The clamps that guarantee the imperviousness are mentioned in "Characteristics of the Conversion Kit."





## Installation - Gas supply to the intake manifold

As explained above, SIGAS is a gas injection system, so injection takes place in the intake manifold. Before making any modifications, the location of the gasoline injectors must be observed, and such location must be imitated with the gas nozzles.

Firstly, the raccords or connectors must be installed. So, the intake manifold must be dismantled and this must be performed in a clean and adequate place. Remove all the screws and cables connected to the intake manifold. Once they are removed, the best fitting place for the raccords or connectors must be found, according to the shape of the intake manifold, and, as a general rule, they should be fixed as close as possible of the cylinder head pipes to avoid gas accumulation in the routing of the intake manifold, and therefore, the delay due to distance difference.

Perforations must be made with a drill bit keeping the symmetry of all the ducts, and then a tap threader or threading machine must be used to thread the connectors according to the size of the connectors.

There will be a nozzle per cylinder, in addition to another two in the plenum (before the cylinder division), one for the vacuum compensation, and the other one connected to the PRV device on the vaporizer.

Once the nozzles are in the intake manifold, the hose will be connected between the nozzles and the injector rail, and they must be fixed with Inox-track clamps.



Perforating the intake manifold



Threading



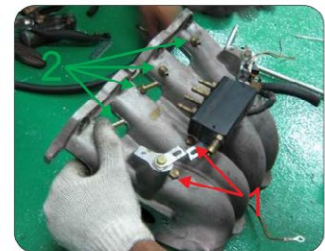
Installed nozzles (in this case, orientable)



Installed pressure intake nozzle



Fixed and connected rail



Incorrect perforations (1) Vs.  
Correct perforations (2)



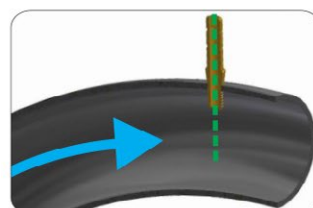
Original injector location



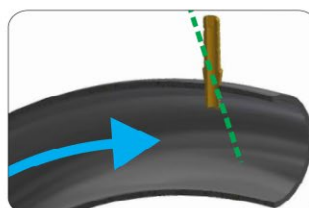
Fixed and connected rail



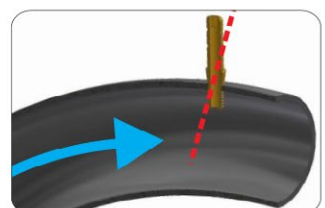
Fixed and connected rail



Nozzle on the manifold (cut view)  
pointing air flow direction and angle  
of the nozzle (90°)



Nozzle on the manifold (cut view)  
pointing air flow direction and angle  
of the nozzle (75°)



Wrong operation: against air flow

(\*) The images of the type of rail may differ due to model upgrade.

### Installation - Switch with Level indicator

The switch must be fixed in a an easily visible place for the driver, and such place must allow the operation of the switch with the opposite hand to the one used for engine ignition.

For the electrical connection, follow the instructions of the installation diagram.

Solder the electrical connections with tin, without damaging the insulation of conductors. Insulate the splices with heat shrink cable.

The switch must be fixed properly, using the accessories provided in the kit, and avoiding the use of additional elements such as adhesives, which could affect the right functioning and would void the warranty.

Paid special attention to the wiring. Leaving it hanging in long distances, will lead the connector to fail due to mechanical stress. By using cable/zip ties, fix it properly.



### Installation - ECU (Electronic Control Unit)

The ECU must be fixed far from heat sources, e.g. exhaust manifold, and it must be easily accessible. It must be fixed with screws to avoid possible vibrations, noise and bumps.

The diagnosis and programming inlet must be visible and the protection cap placed.

Although the SIGAS 2.4 ECU is water proof and tolerates 85°, as well as its connector, we recommend to install it inside the vehicle interior, if possible.



### Installation - Timing Advance Processor

The TAP device (model and type according to the kind of vehicle) will be installed, if possible, in the vehicle interior, as well as the ECU, protected from water and excessive heat. If this is not possible, and the advance variator is installed in the engine bay, it must be installed in an area protected from high temperatures and possible splashes of water due to washing, rain, or flooded areas. Please, follow the additional instructions from the manufacturer for connection and set up.





## Installation - Tank and support

When mounting the tank on the trunk/bootspace, venting mouthpieces and pipes will be installed. They will vent to the exterior any possible leakage on the multi-valve, vapour box, or pipe connections, avoiding as much as possible remaining LPG vapours on the trunk.

The support will be fixed to the body ensuring the absence of vibrations or excessive flexor factor on the body. For this, "mirrors" will be mounted under the car, in the opposite side of the floor.

As a standard, at least 4 3/8" bolts and nuts (with mirrors) will be used. Check laws and regulations of each country.



LPG tank with multi-valve, vapour box, and venting system, on trunk/bootspace



LPG tank with multi-valve, vapour box, on trunk/bootspace



Toroidal LPG tank installed under chassis, on the spare tire compartment.

## Installation - Pipe

All the pipes connected to tank/s, or to the rest of the equipment must have the "curls" to avoid breakage in case of displacement due to accidents. Those "curls" should be located as close as possible to the ends of the connection. The "curl" will have a diameter not smaller than 50 mm and a minimum of one turn and the distance between turns must be 2 mm.

The "curls", omegas, and curves must be shaped in such a way that in case of deformation of the vehicle due to impacts on the front or the side closest to the "curls", they tend to extend thus preventing the constriction or breakage, with the fuel leakage this would cause.

The fixing of the piping under the chassis must be made with the clamps provided in the kit, and the clamps must be placed at least every 500 mm. Please follow these guidelines for the routing:

- Avoid the proximity to the mobile parts of the vehicle, for example, control rods, axle shafts, cardans, etc.
- Keep distance from exhaust pipes and catalytic converters.

Avoid contact with sharp edged parts of the vehicle body.

- Try to copy the routing of the fuel and brake lines, because these lines are usually protected from possible impacts.



Pipes installed in a free slot of the original holders of the vehicle



Pipe secured with the clamps provided in the kit.

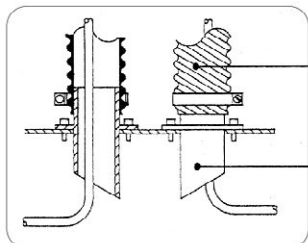


Curl

## Installation - Venting System

Venting pipes should be installed to guarantee a constant air flow when the vehicle moves.

The venting pipes must be fixed near the vapour box, and special attention must be paid to avoid the discharge of the venting on the outlet of the combustion gases, and the location of the venting pipes must not allow partial or total valve obturation due to mud accumulation or to mud guards. Hoses will be connected to the mouthpieces and to vapour box when applicable (see regulations and laws of each country)



Venting system diagram



Venting pipes seen from below



Venting system

## Overview

a) The installation of a LPG conversion kit must be performed in such a way that the LPG components do not interfere with the normal vehicle maintenance.

For example, access to sparks, hydraulic liquid, brakes, etc.

b) The elements installed must allow easy repairing and maintenance.

c) The components of the conversion kit must be fixed appropriately and protected from mistreatment and must not hinder the original features of the vehicle.

d) When installing the LPG kit, special attention must be paid to the protection of the LPG kit from elements that may be projected by the vehicle when in motion or in case of breakages of mobile parts of the vehicle.

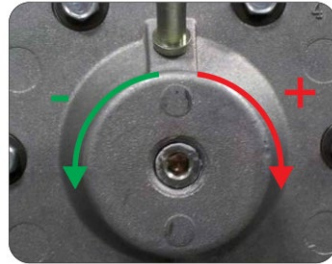
e) It is extremely important that the pipe that connects the multivalve with the filling valve and the engine compartment is adequately fixed with clamps every 500 mm (maximum) and that the fixing of the piping under the vehicle body is performed in the most protected areas from aggressions from internal elements of the vehicle or external aggressions.

f) These installation standards must be complied with according to the inspection criteria for vehicles converted to LPG, and the following goals must be met:

- Safety
- Functionality
- Durability

## Vaporizer - Characteristics - Calibration

The vaporizer can deliver LPG on gas state to a pressure between 1000 and 1500 mbar. Has two connections for heating (which will be connected to the coolant system, and will obtain the heat from it, the flow of coolant has to be constant and permanent). The pressure regulation bolt is allen 4mm, on one side of the reducer, opposite to gas outlet. By turning it clockwise, pressure increases. By turning it anti-clockwise, it decreases. Remember that to decrease or increase pressure, to see real values, engine must be running on LPG. More information related to this, can be found on the calibration manual.



## Vaporizer - Temperature Sensor

Temperature sensor will be installed on the vaporizer, turning it by hand to metallic end. Then, 15° to 25° turn by a 10mm spanner. Overtight may damage the sensor. It is important to highlight that sensor is not in contact with coolant, so it does not need any teflon tape, sealant or glue, neither more torque or tightening that what is explained here.

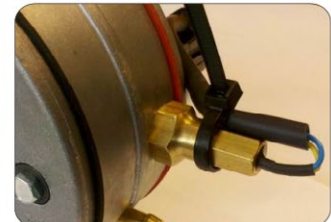
To avoid damage on the sensor cable, use a cable tie-wrap to avoid excessive vibrations on it, as shown on the last picture. se indica en la última foto.



TA Temperature sensor



Sensor Installed. Metallic end,  
15° to 25° tightened.



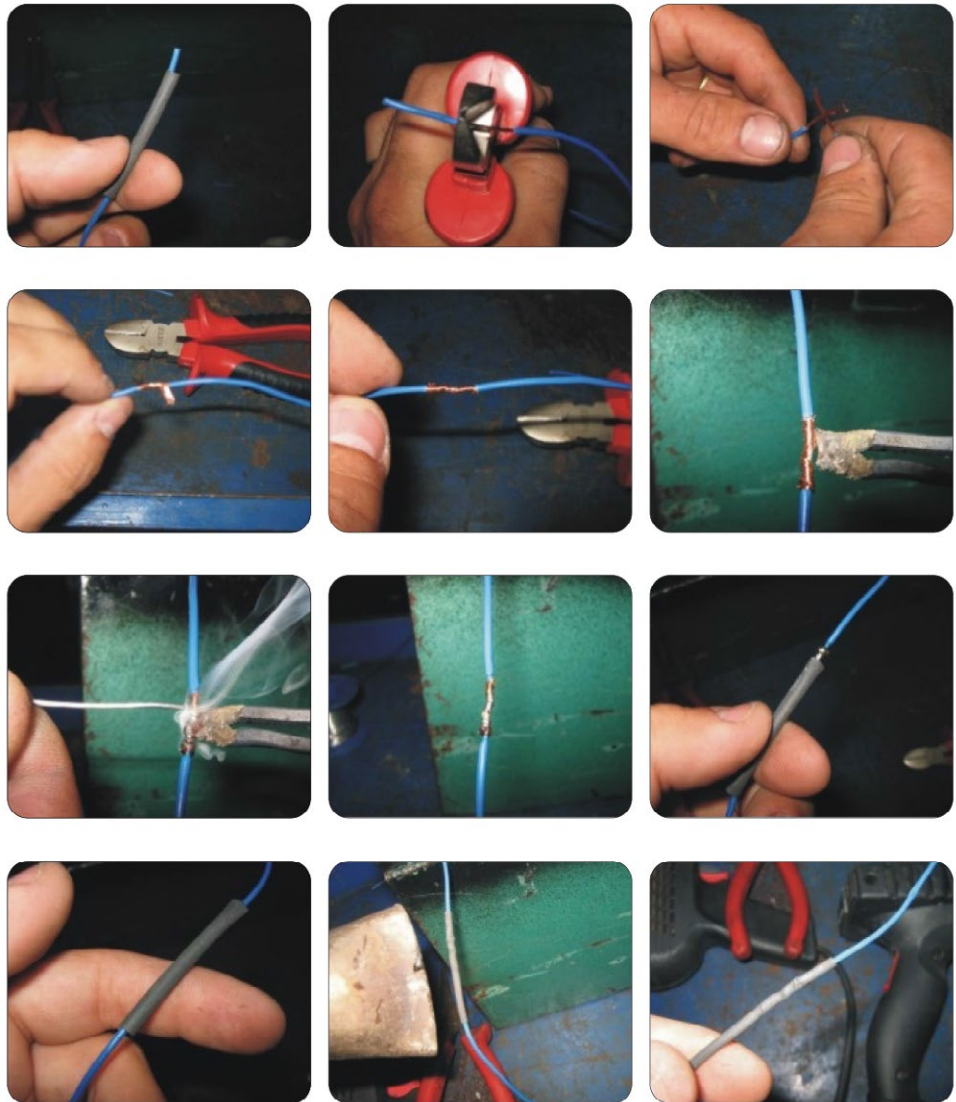
Cable tie-wrap on the cable, to avoid  
vibration and cable damage.

## Installation - Wiring

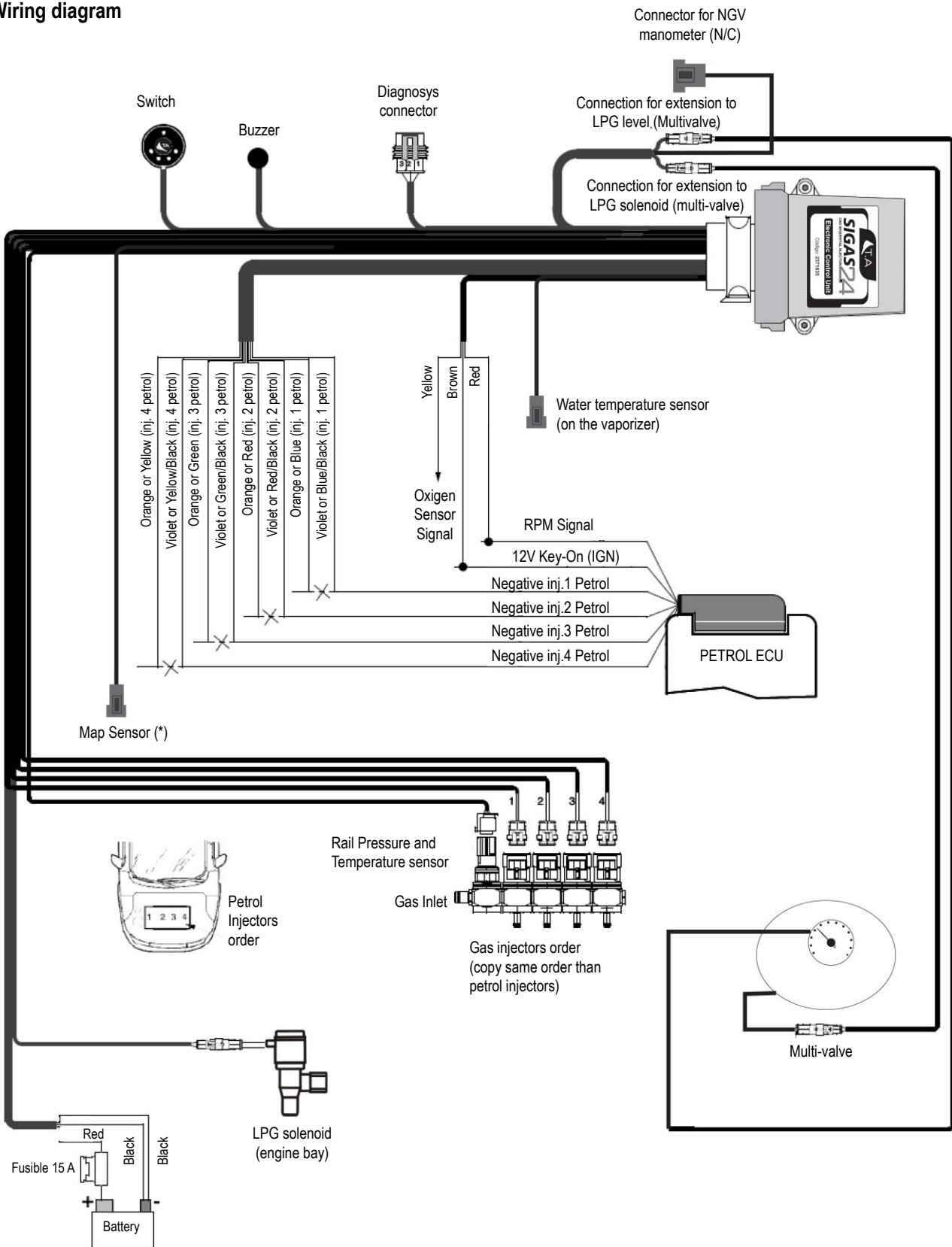
The harness and wiring must be routed neatly and avoiding areas which may jeopardize its durability. Wiring mobile parts, proximity to heat sources or areas of the vehicle that need periodic servicing must be avoided.

These premises must be followed, ruled by common sense, to guarantee reliability, safety and quality. In passages such as from the engine bay to the vehicle interior or similar, please use the existing rubber cable gland, or if the flame arrester is perforated, please replace it. Never leave the cable unprotected in contact with metallic surfaces, which will wear away the insulating protectors and produce a short circuit.

The cable-terminal connections must be soldered with tin, and if possible, insulated with heat shrink cable, ensuring the insulation and strength of the connection, as well as the continuity.



## Wiring diagram



Key-On (IGN) connection: Not recommended to use + from the coil or distributor. It is advised to use a key-on wire from switch or similar. Negative (ground) connection: signals ground (thin) and the power ground, must reach the terminal by separate. Merging them into one wire could cause malfunction or damage.

RPM Signal: Not recommended to take this signal from coil. Strongly recommended to use CKP Signal for this.

(\*) MAP Signal can be taken electrically by connecting the white wire from MAP connector to the OEM MAP variable signal wire, acquiring idle and engine stopped value, as explained on calibration and tuning manual ( EI-01051 - Calibration and Tuning Sigas - 22301051.pdf ), Page 22.

On the case of a non-using MAP vehicle (MAF, for example) the Sigas MAP (4060026) will be connected to be used permanently on the car.

IT IS NOT RECOMMENDED TO RUN THE SYSTEM WITHOUT A MAP VALUE.



## Wiring Diagram

### SIGAS 3.4 / 3.5 / 3.6 / 3.8

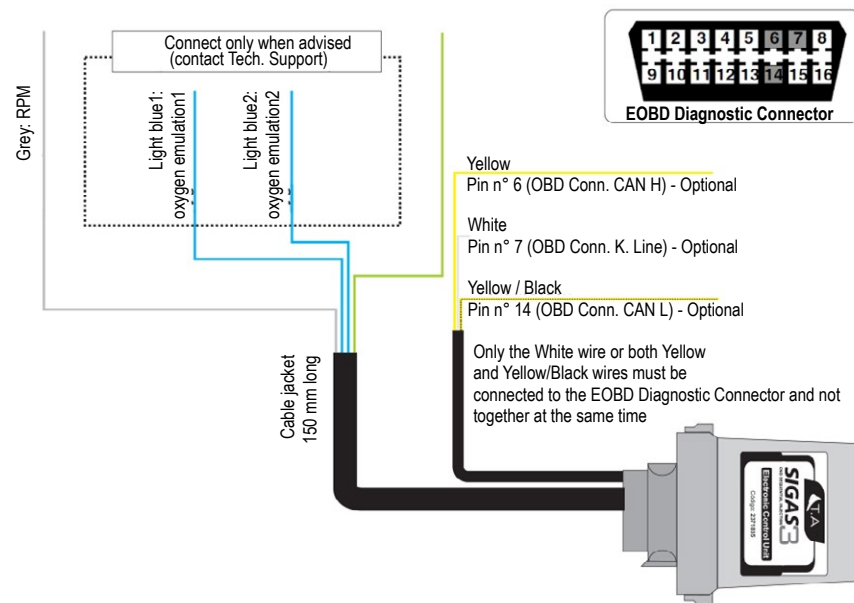
The main difference on the Sigas 3.xx wiring diagram (besides the extra cylinders in the case of 3.5, 3.6 and/or 3.8) are:

- **Connection to On Board Diagnosys** (K-Line,CAN-BUS) that can be connected for monitoring (it is not needed for the system to work, but it can provide extra information useful for the installation and/or tuning)

(See Calibration Manual for more info)

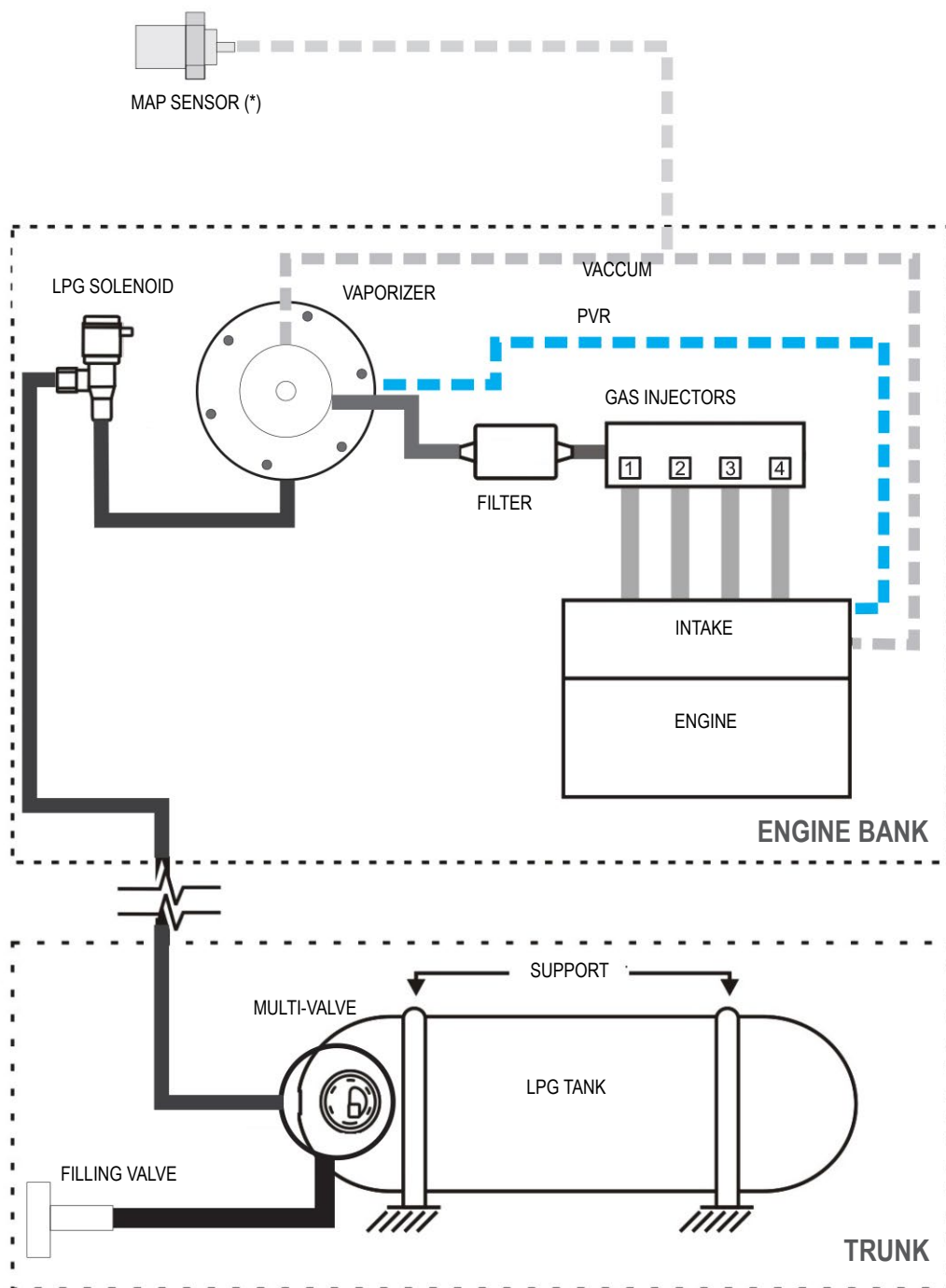
- **RPM:** on the 3.xx Sigas systems the RPM wire (grey) is on a cable jacket 150mm long from main connector (ECU) with the wire for TAP Activation and oxygen sensor emulation (only to be connected when advised by Tech Support)

- **Oxygen sensor connection:** On Sigas for 6 and 8 cylinders, the wiring has two wires to connect to oxygen sensors. (Marked as "1" and "2", in the case of two oxygen sensor present, can be connected one to each- bank.





## Pneumatic Diagram SIGAS 2.4 / 3.4 / 3.5

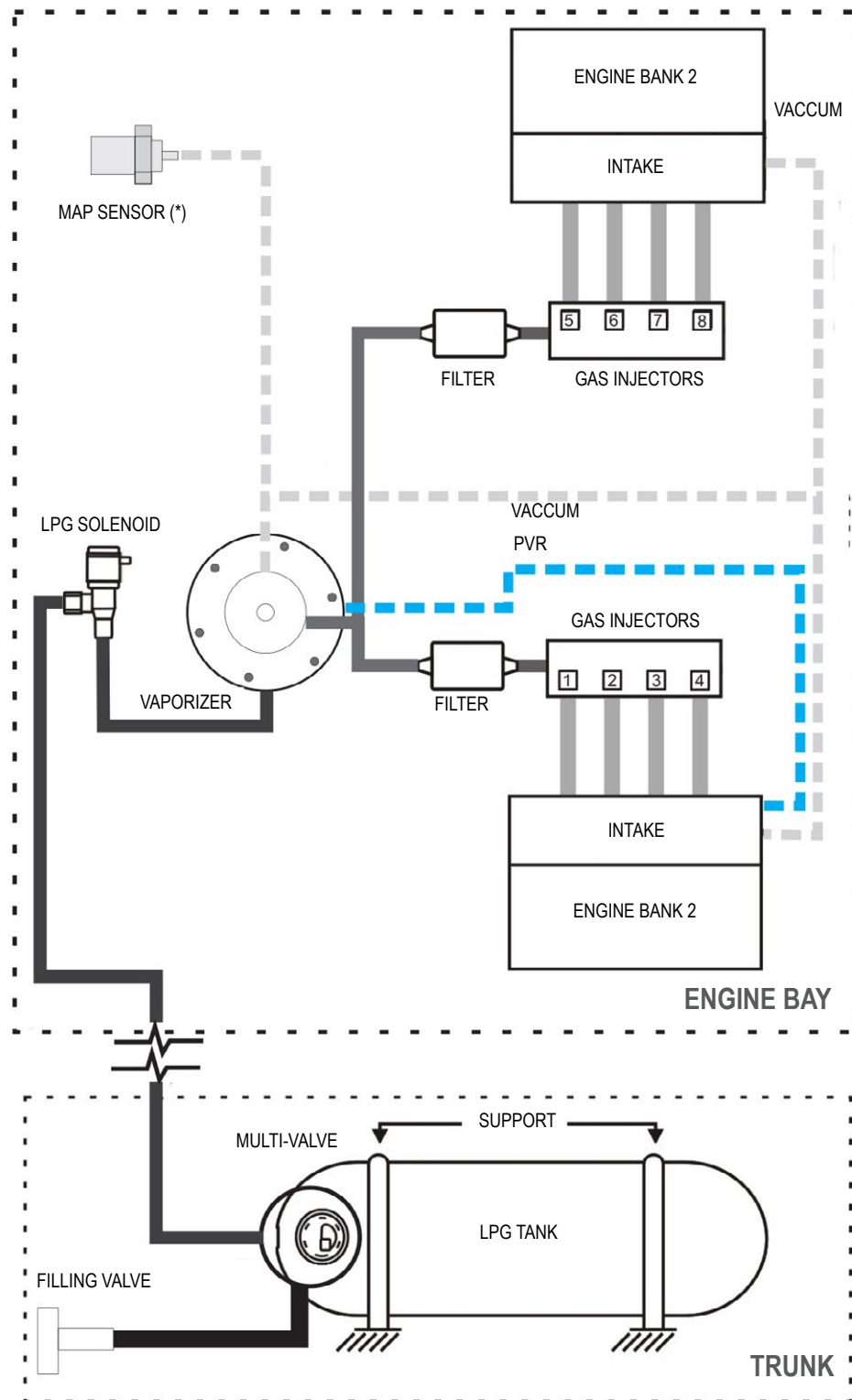


(\*) MAP Signal can be taken electrically by connecting the white wire from MAP connector to the OEM MAP variable signal wire, acquiring idle and engine stopped value, as explained on calibration and tuning manual ( EI-0105I - Calibration and Tuning Sigas - 2230105I.pdf ), Page 22.

On the case of a non-using MAP vehicle (MAF, for example) the Sigas MAP (4060026) will be connected to be used permanently on the car.

IT IS NOT RECOMMENDED TO RUN THE SYSTEM WITHOUT A MAP VALUE.

## Pneumatic Diagram SIGAS 3.6 / 3.8

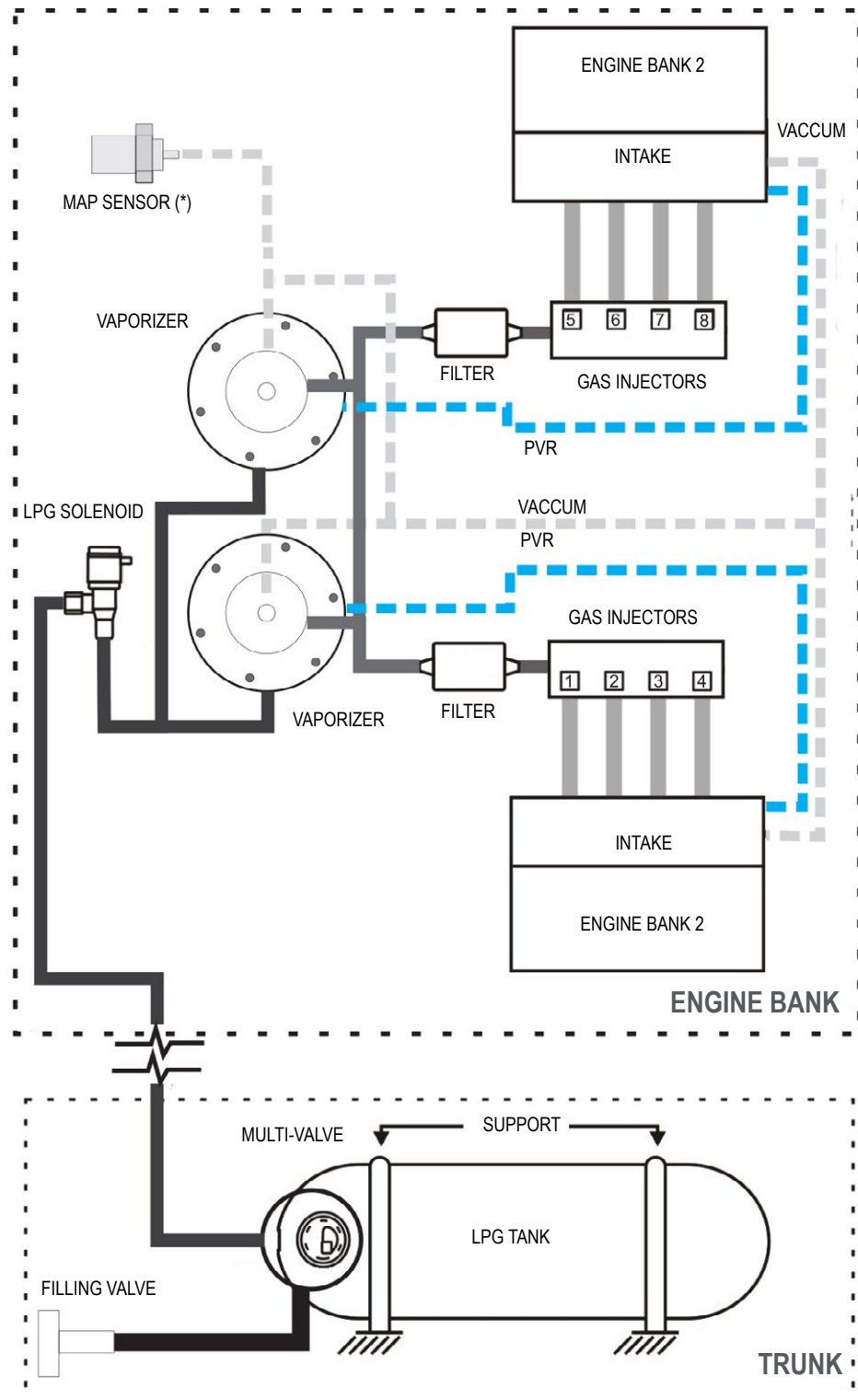


(\*) MAP Signal can be taken electrically by connecting the white wire from MAP connector to the OEM MAP variable signal wire, acquiring idle and engine stopped value, as explained on calibration and tuning manual ( EI-0105I - Calibration and Tuning Sigas - 2230105I.pdf ), Page 22.

On the case of a non-using MAP vehicle (MAF, for example) the Sigas MAP (4060026) will be connected to be used permanently on the car.

IT IS NOT RECOMMENDED TO RUN THE SYSTEM WITHOUT A MAP VALUE.

# Pneumatic Diagram SIGAS 3.8 with two vaporizers (over 200HP)



(\*) MAP Signal can be taken electrically by connecting the white wire from MAP connector to the OEM MAP variable signal wire, acquiring idle and engine stopped value, as explained on calibration and tuning manual ( EI-0105I - Calibration and Tuning Sigas - 2230105I.pdf ), Page 22.

On the case of a non-using MAP vehicle (MAF, for example) the Sigas MAP (4060026) will be connected to be used permanently on the car.

IT IS NOT RECOMMENDED TO RUN THE SYSTEM WITHOUT A MAP VALUE.

## Installation - Verification Safety

### Imperviousness Test

#### Initial Pneumatic Test :

Pressure:	Up to 10 bar (normal LPG filling, normal pressure)
Time:	10 minutes.
Elements to be tested:	high pressure piping and threaded connections
Fluid used:	Inert gas (nitrogen)

#### TEST AND METHOD:

The whole circuit must be subjected to pressure and testing time, checking the imperviousness in all the connection points with neutral soap foam.

Once the test is finished, clean with water and reconnect venting system.

### Impacts

a) Check that the vaporizer, LPG solenoid and the filling valve are installed at least at 150 mm from the front or rear lines of the vehicle body, as deemed necessary according to proximity, and far from elements that could affect them.

b) Check that the "curls", omega shaped clamps, and curves of the high pressure piping have a diameter not inferior than 50mm, and that they can be enlarged in case of deformation caused by frontal impacts or impacts on the nearest side of the vehicle.

c) The best location for those "curls" and omega shaped clamps with no particular requirements is near each connection point.

d) Check that the high-pressure pipe and other components are installed in such places in which, in the event of breakage of any mobile part of the vehicle, they would not be affected. (Transmission, suspension, steering gear, etc.).

e) The high-pressure pipe must be firmly fixed every 500mm (maximum) under the vehicle floor and the high pressure pipe must be installed in the most protected areas from the impact of elements that may be projected or due to the short distance between the chassis and the floor.

## Installation - Verification Safety

Movement and Vibration	<p>a) Check that all the connections made with high pressure pipes have “curls” that have at least one turn and that such turn has an open passage, and the turns must be at least 2 mm apart.</p> <p>b) Check that the cylinder base and the cylinders are firmly fixed to each other and to the vehicle body.</p>
High temperature	<p>Check that none of the elements, especially those that carry gas, are placed at a distance not inferior than 50 mm from the system of combustion gases exhaust.</p>
Chemical agents	<p>Check that the vaporizer the piping protected with metallic cover, the optional devices, etc. are far enough or protected from emanations or splashes of acid from the battery or brake fluid that could be spilled during replacement.</p>
Electric System	<p>a) Check the electrical installation, ensuring the firmness of connections, the adequate insulation and reliability of the entire installation, regarding high temperature and mechanical agents.</p> <p>b) Check that the gas pipes or pipes with metallic protection are fixed far from the positive terminal of the battery or protected from it or from any element with electricity which is not insulated.</p>
Venting System	<p>a) Check that the venting system does not exhaust on the exhaust components or on any other element that could generate combustion.</p> <p>b) Check that the location of the venting pipes does not cause the total or partial obturation of the venting pipes, due to mud accumulation or to mud guards.</p>

Revision: 01 - Fecha: 13/03/2014 - Done: Julián A. Palermo - Approved: Ing. Andrés A. Carella  
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