



Automotive gas components



LPG-Methane Sly Injection

Technical Installation Manual

www.e-gas.it



Certified Quality System
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AUTOMOTIVE GAS COMPONENTS
EA SCOPE 2219 17/2

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INSTALLING THE SLY-INJECTION HARNESS

e-G@S INJECTION is constituted by general harness with standard automotive connectors and has been specifically designed to allow mechanical installers to easily connect the harness of the system and accurately position the cables.

The harness comprises a series of connectors

with a different design and number of electric contacts to allow them to be uniquely identified. These features minimise potential mistakes and allow even inexperienced users to complete the initial installation of the system.

TYPE AND FUNCTION OF HARNESS CONNECTORS

The wiring diagram in Figure 2 shows the location of each connector along with a reference number that is useful to determine the functions linked to each connector. The first step consists

in determining whether the selected harness can be installed on the vehicle, which requires knowing the number of cylinders fitted on the vehicle.

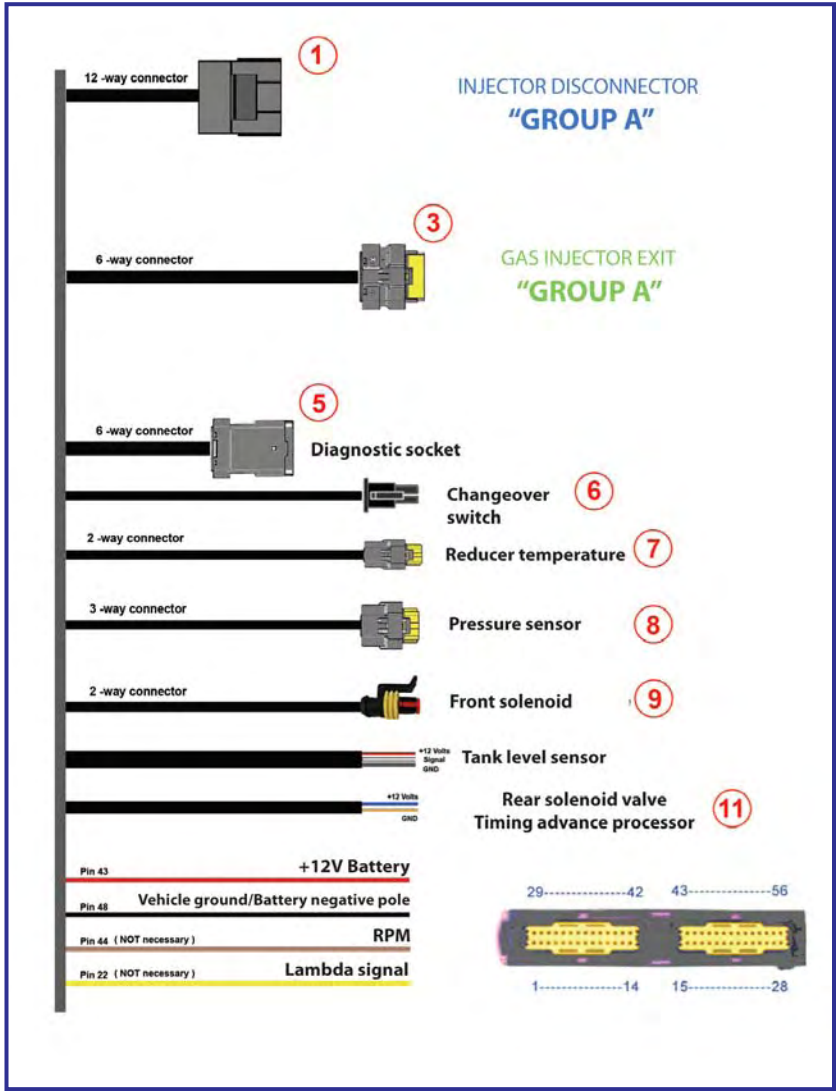
Table of harness connectors

Table 1

TABLE OF CONNECTORS		
1	Injector disconnection connector A	This connector needs to be connected to the injector disconnector through the 10-way accessory connector.
2	Injector disconnection connector B	This connector needs to be connected to the injector disconnector through the 10-way accessory connector.
3	GAS A injector connector	The 6-way connector needs to be connected to the GAS injectors of the Group A engine.
4	GAS B injector connector	The 6-way connector needs to be connected to the GAS injectors of the Group B engine.
5	ECU diagnostic socket	This 6-way connector can be used to perform ECU diagnostic operations using a PC or the e-G@S tester.
6	Switch	The 4-way connector needs to be connected to the rear of the switch supplied with e-G@S.
7	Temperature reducer	The 2-way connector can be used to connect to the temperature sensor on the reducer body.
8	Pressure sensor	The 3-way connector can be used to connect to the pressure sensor of the system plant.
9	Front solenoid valve	The 2-way connector needs to be connected to the front solenoid valve.
10	Level sensor	Can be used to configure a dedicated connector for the e-G@S sensor or to use color coding for the connection to a generic sensor.
11	Rear solenoid valve	This electric termination can be used to connect the rear valve to the LPG system and to the METHANE timing advance processor. Note: the blue wire is for +12V.

LPG - METHANE HARNESS, product code 425.380

(engine: 3 → 4 cylinders)

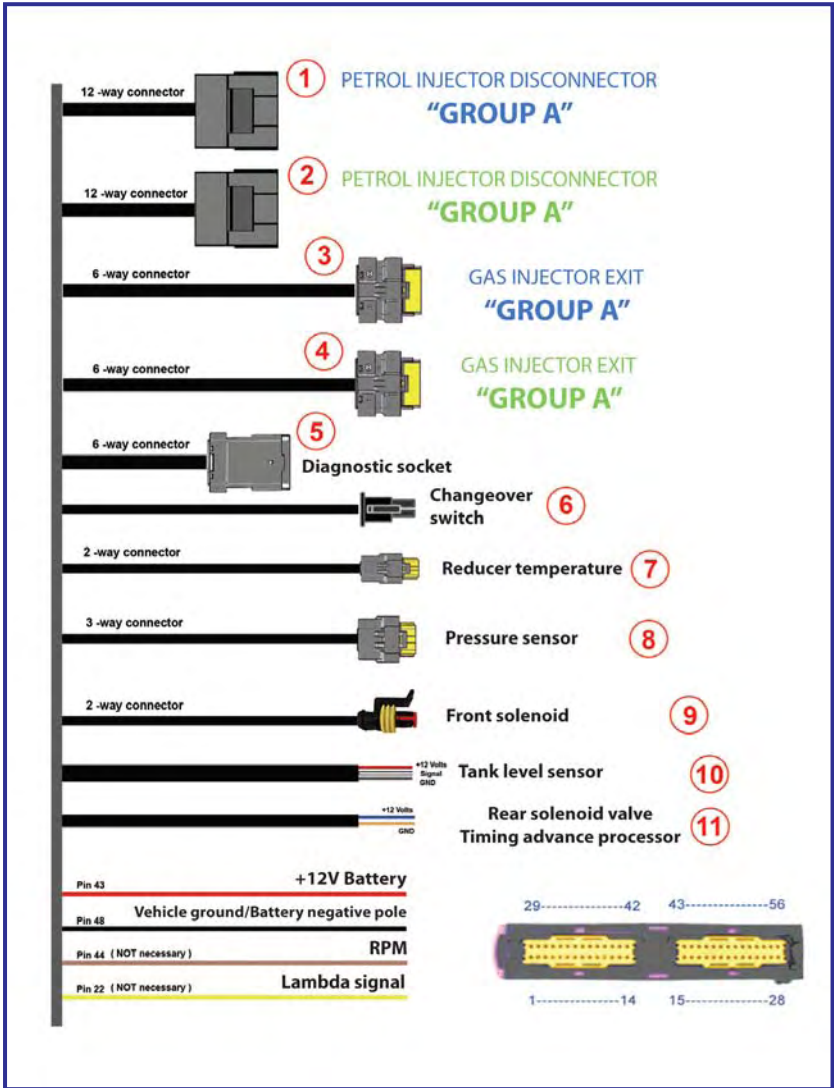


SLY-INJECTION SYSTEM

Figure 1: Connector 3 → 4 cylinders (product code 425.380)

LPG - METHANE HARNESS, product code 425.381

(engine: 5 → 8 cylinders)



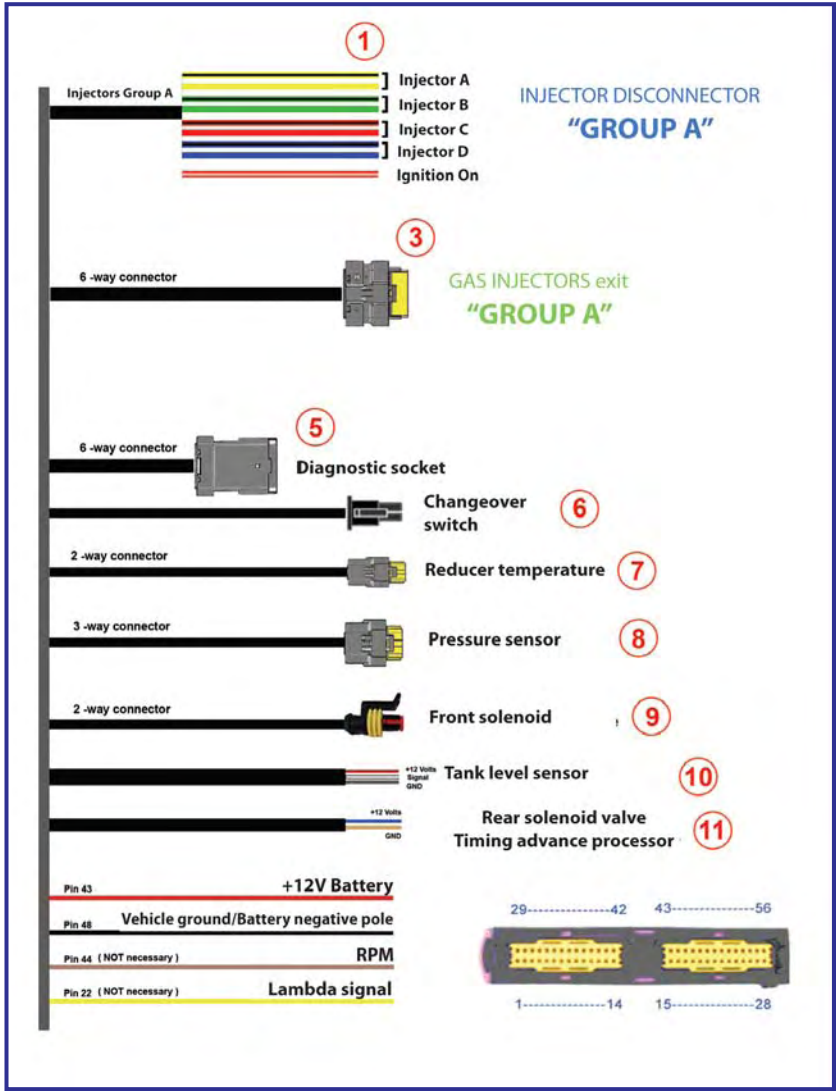
LPG - METHANE HARNESS, product code 425.381

SLY-INJECTION SYSTEM

Figure 1: Connector 5 → 8 cylinders (product code 425.381)

LPG - METHANE HARNESS, product code 425.382

(engine: 3 → 4 cylinders)

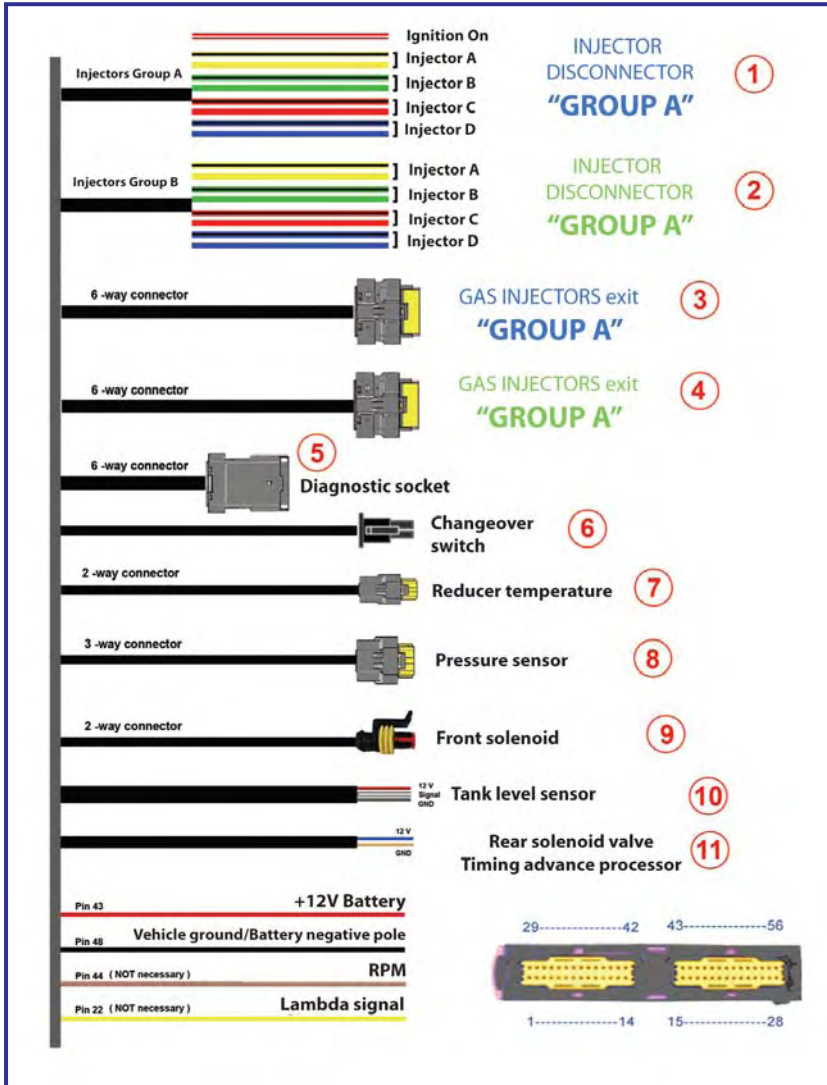


SLY-INJECTION SYSTEM

Figure 3: Connector 3 → 4 cylinders (product code 425.382)

LPG - METHANE HARNESS, product code 425.383

(engine: 5 → 8 cylinders)

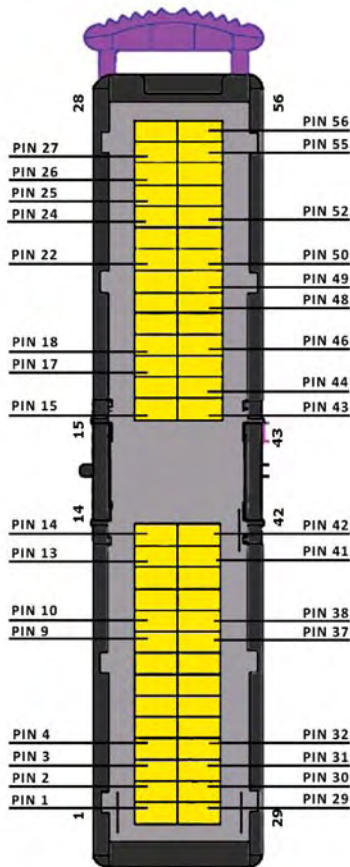


LPG - METHANE HARNESS, product code 425.383

SLY-INJECTION SYSTEM

Figure 4: Connector 5 → 8 cylinders (product code 425.383)

HARNESS PINOUT OF THE SLY-INJECTION SYSTEM FOR 4-CYLINDER ENGINES



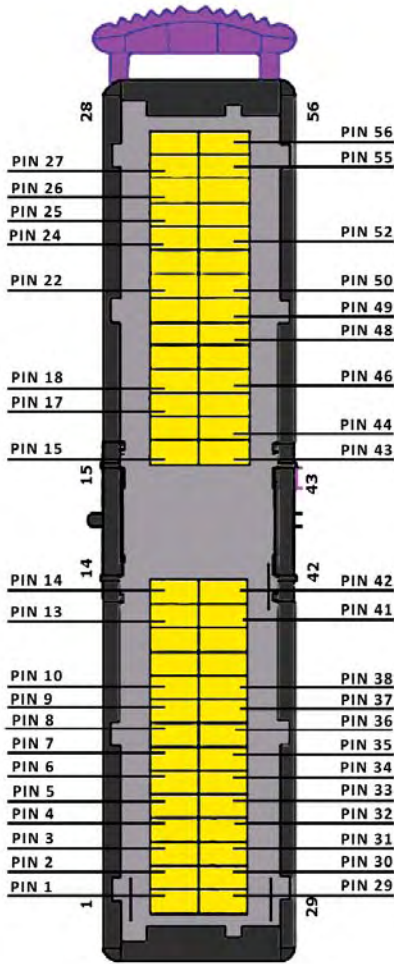
PIN-OUT reference

1. IN_INJA_1
2. IN_INJB_1
3. IN_INJC_1
4. IN_INJD_1
9. OUT_INJA_1
10. OUT_INJC_1
13. GND
14. KEY_COMMAND_+12VOLT_IN
15. GND
17. SWITCH_BUTTON
22. LAMBDA_IN
24. EV_GAS_POST / VAR. ANT.
25. KEY_POWER_+12VOLT_OUT
26. GND
27. LEVEL_SIGNAL
29. NEG_INJA_1
30. NEG_INJB_1
31. NEG_INJC_1
32. NEG_INJD_1
37. OUT_INJB_1
38. OUT_INJD_1
41. GND
42. EV_GAS_ANT
43. +12VOLT_IN
44. RPM_IN
46. KEY_POWER_+12VOLT_OUT
47. KEY_POWER_+12VOLT_OUT
48. GND
49. K_cn
50. L_cn
52. Vref
55. PRESS
56. TEMP

PINOUT DESCRIPTION (4 CYLINDERS)

1. IN_INJA_1	"PETROL Injector A Group 1"
2. IN_INJB_1	"PETROL Injector B Group 1"
3. IN_INJC_1	"PETROL Injector C Group 1"
4. IN_INJD_1	"PETROL Injector D Group 1"
29. NEG_INJA_1	"PETROL NEGATIVE Injector A Group 1"
30. NEG_INJB_1	"PETROL NEGATIVE Injector B Group 1"
31. NEG_INJC_1	"PETROL NEGATIVE Injector C Group 1"
32. NEG_INJD_1	"PETROL NEGATIVE Injector D Group 1"
9. OUT_INJA_1	"GAS Output Injector A Group 1"
37. OUT_INJB_1	"GAS Output Injector B Group 1"
10. OUT_INJC_1	"GAS Output Injector C Group 1"
38. OUT_INJD_1	"GAS Output Injector D Group 1"
17. SWITCH_BUTTON	"Switch control"
18. DATA LINE	"Switch data line"
22. LAMBDA_IN	"Lambda signal"
27. LEVEL_SIGNAL	"Level signal"
44. RPM_IN	"RPM"
55. PRESS	"Pressure sensor signal"
56. TEMP	"Temperature signal"
24. EV_GAS_POST / VAR. ANT.	"Rear solenoid valve / Timing advance processor control"
42. EV_GAS_ANT.	"Front solenoid valve"
49. K_cn	"Serial line"
50. L_cn	"Serial line"
43. +12VOLT_IN	"12V input"
52. Vref	"5V Output"
46. KEY_POWER_+12VOLT_OUT	"12V output"
47. KEY_POWER_+12VOLT_OUT	"12V output"
25. KEY_POWER_+12VOLT_OUT	"12V output"
14. KEY_COMMAND_+12VOLT_IN	"12V input key"
26. GND	"GND"
15. GND	
13. GND	
41. GND	
48. GND	

HARNESS PINOUT OF THE SLY-INJECTION SYSTEM FOR 8-CYLINDER ENGINES



PIN-OUT reference

1. IN_INJA_1
2. IN_INJB_1
3. IN_INJC_1
4. IN_INJD_1
5. IN_INJA_2
6. IN_INJB_2
7. IN_INJC_2
8. IN_INJD_2
9. OUT_INJA_1
10. OUT_INJC_1
11. OUT_INJA_2
12. OUT_INJC_2
13. GND
14. KEY_COMMAND_+12VOLT_IN
15. GND
17. SWITCH_BUTTON
22. LAMBDA_IN
24. EV_GAS_POST / VAR. ANT.
25. KEY_POWER_+12VOLT_OUT
26. GND
27. LEVEL_SIGNAL
29. NEG_INJA_1
30. NEG_INJB_1
31. NEG_INJC_1
32. NEG_INJD_1
33. NEG_INJA_2

PINOUT DESCRIPTION (8 CYLINDERS)

1. IN_INJA_1	"PETROL Injector A Group 1"
2. IN_INJB_1	"PETROL Injector B Group 1"
3. IN_INJC_1	"PETROL Injector C Group 1"
4. IN_INJD_1	"PETROL Injector D Group 1"
5. IN_INJA_2	"PETROL Injector A Group 2"
6. IN_INJB_2	"PETROL Injector B Group 2"
7. IN_INJC_2	"PETROL Injector C Group 2"
8. IN_INJD_2	"PETROL Injector D Group 2"
29. NEG_INJA_1	"PETROL NEGATIVE Injector A Group 1"
30. NEG_INJB_1	"PETROL NEGATIVE Injector B Group 1"
31. NEG_INJC_1	"PETROL NEGATIVE Injector C Group 1"
32. NEG_INJD_1	"PETROL NEGATIVE Injector D Group 1"
29. NEG_INJA_2	"PETROL NEGATIVE Injector A Group 2"
30. NEG_INJB_2	"PETROL NEGATIVE Injector B Group 2"
31. NEG_INJC_2	"PETROL NEGATIVE Injector C Group 2"
32. NEG_INJD_2	"PETROL NEGATIVE Injector D Group 2"
9. OUT_INJA_1	"GAS Output Injector A Group 1"
37. OUT_INJB_1	"GAS Output Injector B Group 1"
10. OUT_INJC_1	"GAS Output Injector C Group 1"
38. OUT_INJD_1	"GAS Output Injector D Group 1"
11. OUT_INJA_2	"GAS Output Injector A Group 1"
39. OUT_INJB_2	"GAS Output Injector B Group 1"
12. OUT_INJC_2	"GAS Output Injector C Group 1"
40. OUT_INJD_2	"GAS Output Injector D Group 1"
17. SWITCH_BUTTON	"Switch control"
18. DATA LINE	"Switch data line"
22. LAMBDA_IN	"Lambda signal"
27. LEVEL_SIGNAL	"Level signal"
44. RPM_IN	"RPM"
55. PRESS	"Pressure sensor signal"
56. TEMP	"Temperature signal"
24. EV_GAS_POST / VAR. ANT.	"Rear solenoid valve / Timing advance processor control"
42. EV_GAS_ANT.	"Front solenoid valve"
49. K_cn	"Serial line"
50. L_cn	"Serial line"
43. +12VOLT_IN	"12V input"
52. Vref	"5V Output"
46. KEY_POWER_+12VOLT_OUT	"12V output"
47. KEY_POWER_+12VOLT_OUT	"12V output"
25. KEY_POWER_+12VOLT_OUT	"12V output"
14. KEY_COMMAND_+12VOLT_IN	"12V input key"
26. GND	"GND"
15. GND	
13. GND	
41. GND	
48. GND	

HARNESS FOR 4- AND 8-CYLINDER ENGINES (LPG/METHANE)

e-G@S harness can be used to manage engines with 2-8 cylinders. Harness is available in two versions that can be respectively used for engines with 2-4 cylinders and 5-8 cylinders.

There are minimum differences between the two versions: the first version does not have connectors (2,4), while the second one represents the full version of the harness with all connectors included and must be used for engines with a maximum of 8 cylinders.

The first thing to determine during installation is therefore the type of engine where the GAS (LPG or methane) system will be installed. The number of cylinders of the engine enables to determine the most suitable harness, which can be selected using the following table.

NUMBER OF CYLINDERS		TYPE OF HARNESS INSTALLATION	
3 → 4	Cylinders	Harness for 4-cylinder engines	Product code 425.380
5 → 8	Cylinders	Harness for 8-cylinder engines	Product code 425.381
3 → 4	Cylinders	Harness (universal)	Product code 425.382
5 → 8	Cylinders	Harness (universal)	Product code 425.383

Harness Product code 425.380:

Harness with standard connectors designed for engines with 2-4 cylinders.

Harness Product code 425.381:

Harness with standard connectors designed for engines with 5-8 cylinders.

Harness Product code 425.382:

Harness with or without standard connectors, except for the petrol injector disconnect connector of Group A, which has been replaced with an electric connection with universal terminations for engines with 2-4 cylinders.

Harness Product code 425.383:

Harness with or without standard connectors, except for the petrol injector disconnect connector of Groups A and B, which has been replaced with an electric connection with universal terminations for engines with 5-8 cylinders.

Harness for LPG and METHANE

e-G@S INJECTION harness can be used for both types of fuels chosen for the changeover and does not require the use of different connectors or special configurations. This means that it is basically possible to use the same harness for LPG and METHANE injection systems.

The electrical installation differences are mini-

mum because the connections that transmit the control signal to the rear valve on the LPG tank become, for methane, the electric connection that controls the timing advance processor that is required for METHANE systems. Due to the absence of the rear valve on METHANE tanks, it is in fact necessary to use the electric connection to control the timing advance processor, when present.

CONNECTION: TANK LEVEL SENSOR

Locate the sheath that contains the three wires required for the connection of the level sensor placed on the GAS (LPG / METHANE) tank, which measures the amount of fuel inside the tank. There are substantially 2 types of commercial level indicators: “resistive” and “powered”.

Resistive level indicators only use two of the three wires in the sheath, while powered sensors use all three wires because they need an

external power supply.

The following sections provide both general and functional connection instructions, divided by type of level indicator.

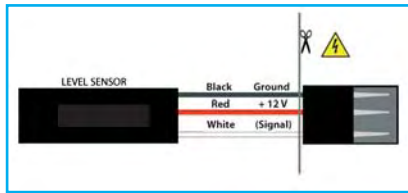
Resistive sensor

All models of harness (product codes 425.380, 425.381, 425.382 and 425.383) have an electric termination that groups the three wires of the level sensor. The sheath has a specific marking to simplify identification. After locating the cable, it is possible to start connecting the level indicator.

with a connector suitable for general harness. If you are using a generic level sensor, you will have to use the existing wiring and remove the relevant connector (see following figure) .

e-G@S level sensors are fitted as standard

Attention: before cutting the wires with scissors, disconnect the harness from the power supply or remove the 56-way harness board from the ECU in order not to damage the electronic board due to short circuits.



If the level indicator you have purchased from a generic manufacturer requires two wires only for connection, it surely is a **RESISTIVE** sensor. TO connect it to the general harness of e-G@S, cut the connector and connect the white and black wires. Do not connect the red wire, which must be insulated and removed.

Locate the black and white wires referring to the color coding and the wiring diagram of the signals (GND, Signal) and connect them to the sensor on the tank provided by your supplier.

Powered sensor

As the name itself suggests, powered sensors require a power supply that supplies voltage to the sensors. System e-G@S is designed to provide a power supply of +12V, which is appropriate for most commercial level sensors.

with the connection procedures of each type of level indicator, the following colours are always used as reference:

The power supply is located in the sheath that contains the three wires for the level indicator and corresponds to the red wire.

Although mechanical installers must be familiar



CONNECTION: TEMPERATURE SENSOR ON REDUCER (LPG / METHANE)

The temperature sensor located on the reducer enables to measure the operating temperature of the aluminum body and therefore also to continuously monitor the temperature variations to which it is exposed.

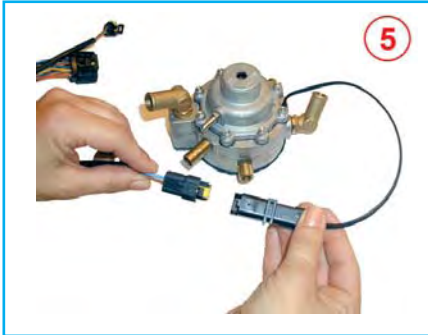


Figure 5: installation of the temperature sensor (LPG / METHANE)

Installation: locate, on the main harness (product codes 425.380 and 425.381), the 2-way male connector (female plug) and insert it into the connector at the end of the temperature sensor installed in the reducer body (see Figure 5).

The procedure is the same for both LPG and METHANE systems, except for the fact that the reducer of methane models differs from that of LPG models. The temperature sensor is however exactly the same for both systems.

CONNECTION: PRESSURE SENSOR (LPG / METHANE)

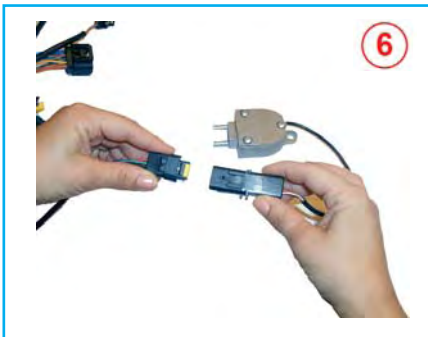


Figure 6: pressure sensor (LPG / METHANE)

The pressure sensor is a differential pressure sensor. If installed in LPG or METHANE systems, it enables to improve the vehicle carburation following the gas pressure variations that occur during normal operation.

Installation

Locate, on the main harness (product codes 425.380 and 425.381), the 3-way male connector (female plug) and connect it to the connector on the pressure sensor following the visual indications provided in Figure 6.

CONNECTION: CHANGEOVER SWITCH (LPG / METHANE)

The changeover switch connector shown in Figure 7 can be used for the connection to the changeover inside the vehicle.

Its correct installation is guaranteed by the special tab on the connector that enables it to be safely and firmly fixed to the changeover switch.

This ensures a firm fixing of the switch to electric terminations and preserves the installation over time on board of the vehicle.

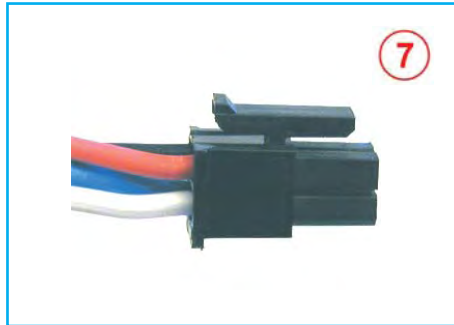


Figure 7: details of the changeover switch connector

Installation:

Locate, on the main harness (product codes 425.380 and 425.381), the 4-way microfit connector, the tab and the fixing point on the changeover switch as shown in Figure 8. Changeover button:

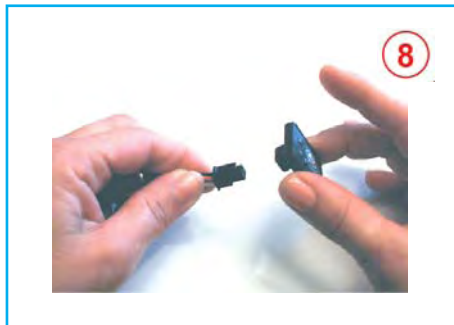


Figure 8: connection of the changeover switch connector

The changeover button is located towards the centre and can be pressed to run the vehicle on GAS or PETROL or alternatively to toggle between the GAS and Petrol modes.

It pressed, it enables to switch to GAS mode from the PETROL mode or vice versa.

Attention: if you are using a changeover switch with product code 425.375, you will hear an acoustic warning every time you press the changeover switch and the operation is completed. This feature is not however available on changeover switch with product code 425.374.

Luminous indicators and operating statuses

Vehicle running on PETROL

The red LED lights on the upper left part of the changeover switch.



It is important to understand that the changeover to GAS can be performed manually by pressing the changeover switch or automatically, because if the vehicle was running on GAS when it was switched off, it will automatically select this mode once it is switched on again.

During the changeover phase, the LEDs on the changeover switch light in sequence along with the red LED, depending on the occurrence of specific conditions (described below) that are required for the optimum operation of the GAS system.

Vehicle running on GAS

The green LED on the changeover switch lights along with the following combination of LEDs that provide information on the GAS level in the tank.

GREEN LED COMBINATIONS Vehicle running on GAS



4 green LEDs
Vehicle running on GAS with full tank



3 green LEDs
Vehicle running on GAS with 3/4 of the tank full



2 green LEDs
Vehicle running on GAS with 2/4 of the tank full



1 green LED
Vehicle running on GAS with 1/4 of the tank full

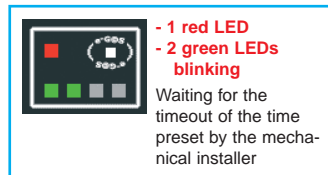


1 red LED (blinking)
Vehicle running on GAS with almost empty tank

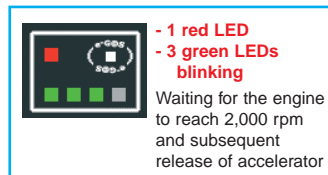
Changeover



- 1 red LED
- 1 green LED blinking
Waiting for the changeover temperature



- 1 red LED
- 2 green LEDs blinking
Waiting for the timeout of the time preset by the mechanical installer



- 1 red LED
- 3 green LEDs blinking
Waiting for the engine to reach 2,000 rpm and subsequent release of accelerator



- 1 red LED
- 1 green LED blinking
Waiting for the changeover temperature

Automatic changeover following the depletion of gas fuel

The ECU software enables to configure an automatic changeover when the gas tank is empty.

After detecting the absence of pressure in the engine feeding circuit, the software automatically switches to the petrol operating mode. The absence of gas is signaled on the changeover switch by the lighting of the LED rela-

ted to the petrol operating mode and the blinking red LED that signals the depletion of gas.

These indicators signal to that the vehicle has been switched to petrol (red LED) because of the depletion of the gas in the circuit (blinking red LED).

Forced GAS starting

Sly injection enables to start running the engine on GAS, LPG or METHANE. After starting the engine, it is however necessary to maintain the idle speed in order to allow the engine to reach the optimum operating parameters.

Procedure

Before turning the ignition key, press and hold the button down, then turn the ignition key to start the vehicle and wait for the engine to start.

INJECTOR SIGNAL

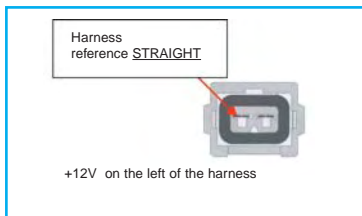


Figure 9: straight harness

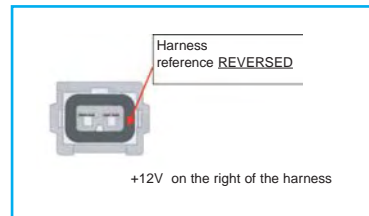


Figure 10: reversed harness

The injector emulator inside the ECU, which is connected to specific harness, can be used to stop the operation of the injectors and replace them with a dummy load in order to avoid annoying problems like the lighting of the Check engine indicator.

The acquisition of the vehicle injectors signal is very important and must be performed very carefully and professionally.

The injectors signal is acquired using the special harness supplied with KIT e-G@S SLY-INJECTION, which acquires the signal from the original vehicle connectors and transmits it to the ECU.

The ECU interprets the injectors signal and

uses it to determine whether to start the vehicle engine, stop the petrol flow and feed gas fuel (LPG/METHANE) to the vehicle engine.

To able to acquire the injection time signal, only one device is required:

INJECTOR DISCONNECTOR HARNESS

There are two types of INJECTOR DISCONNECTOR harness:

Straight harness

Reversed harness (identified by the red strip on the connector)

To select the harness, follow this procedure:

I - Disconnect ALL the connectors of all the injectors.

II - Switch the vehicle on.

III - Locate the side with +12 V voltage on the disconnected female connectors, as shown in the figures, in order to determine if voltage is supplied to the right or left side of the connector. If voltage is supplied to the left side, use the straight harness; if it is supplied to the right side, use the reversed harness.

Connection on harness side (product codes 425.380 and 425.381)

Figure 9 provides details on how to connect the injector disconnecter harness to the appropriate connector (1,2) on the ECU harness (product codes 425.380 and 425.381).

These automotive connectors significantly simplify the connection procedure while minimising potential mistakes. To quickly check if

the installation has been performed correctly, it is sufficient to check that the color coded wires match the terminations with the same colours on the connectors. In other words, the yellow wire must be connected to the yellow termination, the green one to the green one and so on.

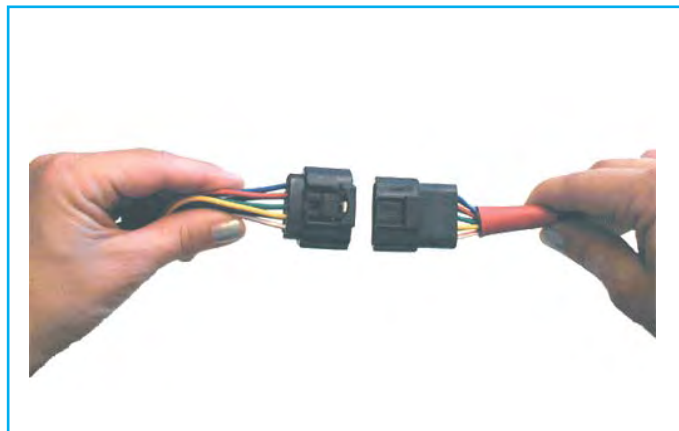


Figure 11:
detail of the injector
disconnecter con-
nector

425.382 HARNESS (UNIVERSAL FOR 4-CYLINDER ENGINES)









This harness differs from other versions because it does not have the two end connectors for each ECU injector. Due to the absence of the connector, wires are loose and it is therefore necessary to determine the installation sequence in order to understand which wires must be connected to injectors A, B, C and D.

To start, disconnect the original vehicle con-

nectors in order to locate the injector control and injector supply voltage signal. This means in other words that it is necessary to determine whether the harness is straight or reverse in order to correctly perform the required connections.

Universal injector disconnecter harness generally has 9 wires that must be connected as follows:

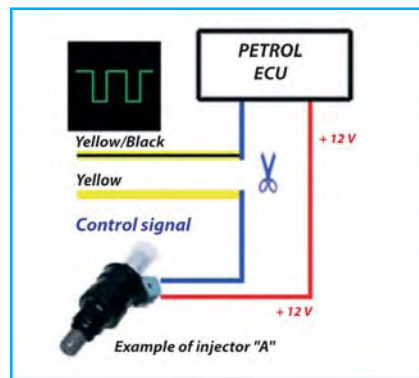
8 INJECTOR WIRES

INJECTOR A	Yellow		Acquisition of injector signal
	Yellow / Black		Transmission of signal to ECU
INJECTOR B	Green		Acquisition of injector signal
	Green / Black		Transmission of signal to ECU
INJECTOR C	Red		Acquisition of injector signal
	Red / Black		Transmission of signal to ECU
INJECTOR D	Blue		Acquisition of injector signal
	Blue / Black		Transmission of signal to ECU

The figure on the right shows how to connect the injector "A" of the general harness to the original petrol injector of the vehicle.

Locate the control signal of the injector, cut the wire and connect the two ends that remain after cutting the general harness.


Connect the YELLOW/BLACK wire to the cut wire that returns towards the original petrol ECU and the yellow wire to the wire that returns to the original petrol injector.



ATTENTION!

1 POWERED SIGNAL WIRE (IGNITION KEY ON)

This signal can be acquired from one of the power signals of the original vehicle injectors (+ 12 Volt) or from a traditional point like the fuse box provided that it does not supply voltage when the ignition is on.

Ignition ON	White / Red	
--------------------	-------------	---

INJECTOR DISCONNECTOR HARNESS (UNIVERSAL)

Injector disconnecter for 4-cylinder engines	Universal	Product code e-G@S	425.518
Injector disconnecter for 3-cylinder engines	Universal	Product code e-G@S	425.519









When installing the injector disconnecter harness, the installer may also choose to install universal harness. This harness does not have dedicated end connectors for each injector of the original ECU. Due to the absence of the connector, wires are loose and is therefore necessary to determine the installation sequence in order to understand which wires must be connected to injectors A, B, C and D.

To start, disconnect the original vehicle con-

nectors in order to locate the injector control and injector supply voltage signal. This means in other words that it is necessary to determine whether the harness is straight or reverse in order to correctly perform the required connections.

Universal injector disconnecter harness generally has 9 wires that must be connected as follows:

8 INJECTOR WIRES

INJECTOR A	Yellow		Acquisition of injector signal
	Yellow / Black		Transmission of signal to ECU
INJECTOR B	Green		Acquisition of injector signal
	Green / Black		Transmission of signal to ECU
INJECTOR C	Red		Acquisition of injector signal
	Red / Black		Transmission of signal to ECU
INJECTOR D	Blue		Acquisition of injector signal
	Blue / Black		Transmission of signal to ECU

ATTENTION!

WHEN USING UNIVERSAL HARNESS FOR 3-CYLINDER ENGINES, IT IS VERY IMPORTANT NOT TO CONNECT INJECTOR C, BUT ONLY THE REMAINING ONES.

1 POWERED SIGNAL WIRE

Ignition ON	White / Red	
-------------	-------------	---

To acquire the power signal from a different location as compared to the injector harness, cut the red-white wire on **CONNECTOR A** of harness with product code 425.380 and 425.381. and connect it to the selected igni-

tion source on the vehicle.

See connector **①** on pages 4 and 5.

Connection on the GAS (LPG / METHANE) injector side

Figure 12 shows the details of the reference connector available with the injector disconnecter harness. This connector has a strip with letter "A" that indicates that it must be connected to the GAS injector chosen as injector 'A'. The injector group has a label with the reference coding.



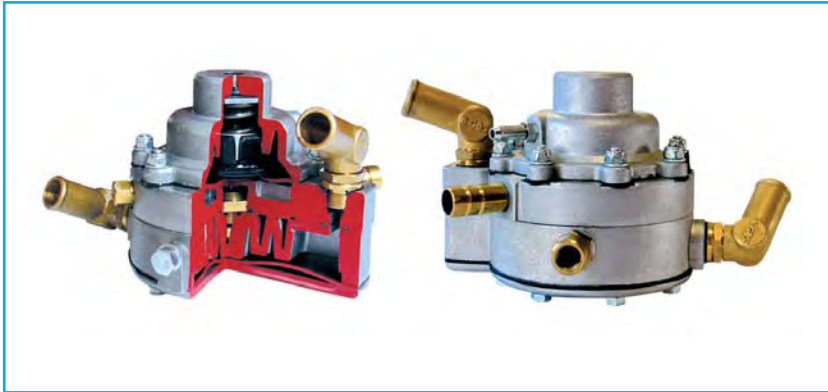
ATTENTION: the other connectors of the injector disconnecter harness do not have identification letters, because they are not required. After connecting connector A, it is in fact sufficient to connect in sequence injectors B, C and so on.

Table of product codes

<i>Injector disconnecter for 3-cylinder engines</i>	<i>Straight</i>	Product code e-G@S	425.514
<i>Injector disconnecter for 3-cylinder engines</i>	<i>Reversed</i>	Product code e-G@S	425.515
<i>Injector disconnecter for 4-cylinder engines</i>	<i>Straight</i>	Product code e-G@S	425.516
<i>Injector disconnecter for 4-cylinder engines</i>	<i>Reversed</i>	Product code e-G@S	425.517
<i>Injector disconnecter for 4-cylinder engines</i>	<i>Universal</i>	Product code e-G@S	425.518
<i>Injector disconnecter for 3-cylinder engines</i>	<i>Universal</i>	Product code e-G@S	425.519
Temperature sensor		Product code e-G@S	425.370
Pressure sensor		Product code e-G@S	425.114
<i>Harness for 4-cylinder CSG engines</i>		Product code e-G@S	425.380
<i>Harness for 8-cylinder CSG engines</i>		Product code e-G@S	425.381

INSTALLING THE MECHANICAL COMPONENTS

RG10 LPG reducer/vaporizer



The RG10 vaporizer/reducer has been specifically designed to be used with Sly-Injection.

Its special shape and the geometry of its ducts ensure an efficient thermal exchange, enable to supply high power engines and maintain the temperature of discharged gas stable.

The LPG passes through a coil inside the vaporizer body and is converted from liquid to gas prior to the reduction of pressure in order to guarantee a continuous and stable discharge flow.

The sealing components in Viton of the vaporizer/reducer, designed to handle the gas in gaseous form and at temperatures above 0°C, significantly reduce maintenance costs and are exposed to less deterioration in time.

The operating pressure may range from 0.6 to 1.8 bar. The supply pressure is precisely controlled in all the engine operating

phases.

The small and compact design enables its installation even in small engine compartments. The RG10 vaporizer/reducer can be used for engines with a maximum power of 150 Kw.

Key features

Reducer with one membrane stage to reduce pressure

Cast coil installed upstream from the high pressure valve to heat the LPG and convert it into gas

LPG discharge pressure adjustable from 0.6 to 1.8 bar

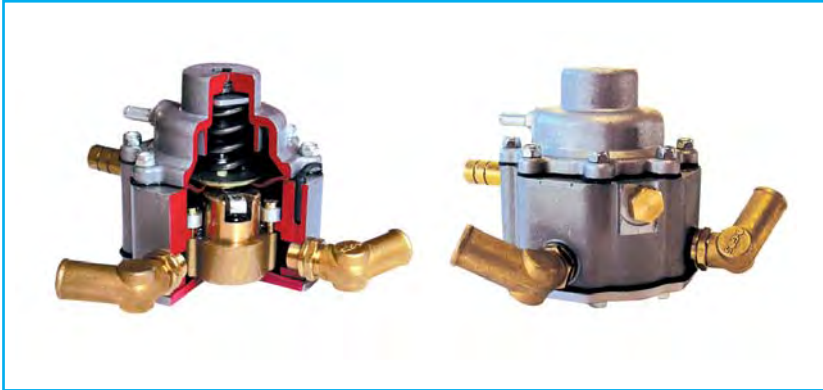
Internal circulation of the engine coolant to allow the thermal exchange with the gas

Built-in temperature sensor

Designed for engines with a maximum power of 150 Kw

INSTALLING THE MECHANICAL COMPONENTS

RM10 methane REDUCER (CNG)



The RM10 methane reducer has been specifically designed for Sly-Injection.

The operating pressure can be adjusted from 0.6 to 1.8 bar. The supply pressure is precisely controlled in all the engine operating phases.

The sophisticated balancing system with piston ensures a continuous and reliable operation with one reduction stage in all the supply pressure range, that is from approximately 200 bar (full cylinders) to 0 bar (empty cylinders).

This system offers the following main advantages: reduction of load losses, increase of methane flow rate and improvement of the engine power at high speeds.

The interior of the pressure reducer is cooled by the engine cooling water, which guarantees optimum temperatures in all operating conditions.

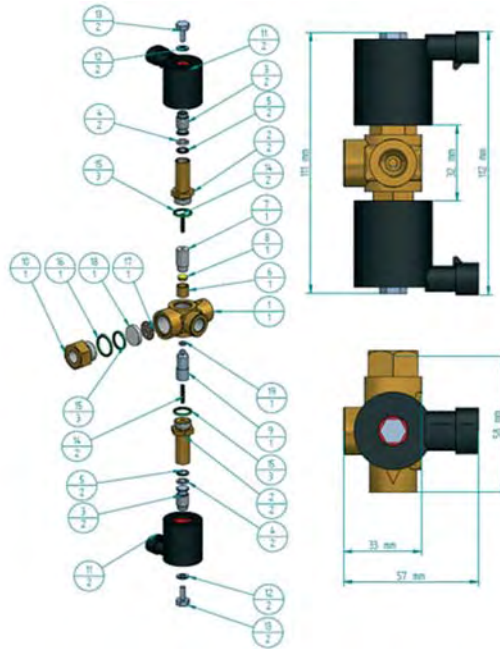
The small and compact design enables its installation even in small engine compart-

ments. The RG10 pressure reducer can be used for engines with a maximum power of 130 Kw.

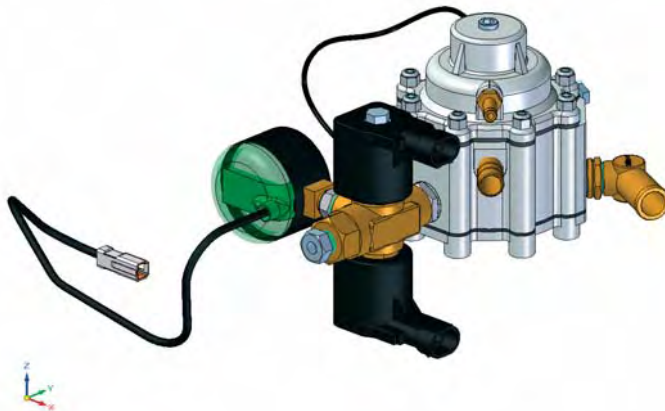
Key features

- Reducer with one membrane stage to reduce pressure
- Piston balancing on HP lever
- Methane discharge pressure adjustable from 0.6 to 1.8 bar
- Internal circulation of the engine coolant to allow the thermal exchange with the gas
- Built-in temperature sensor
- Designed for engines with a maximum power of 130 Kw

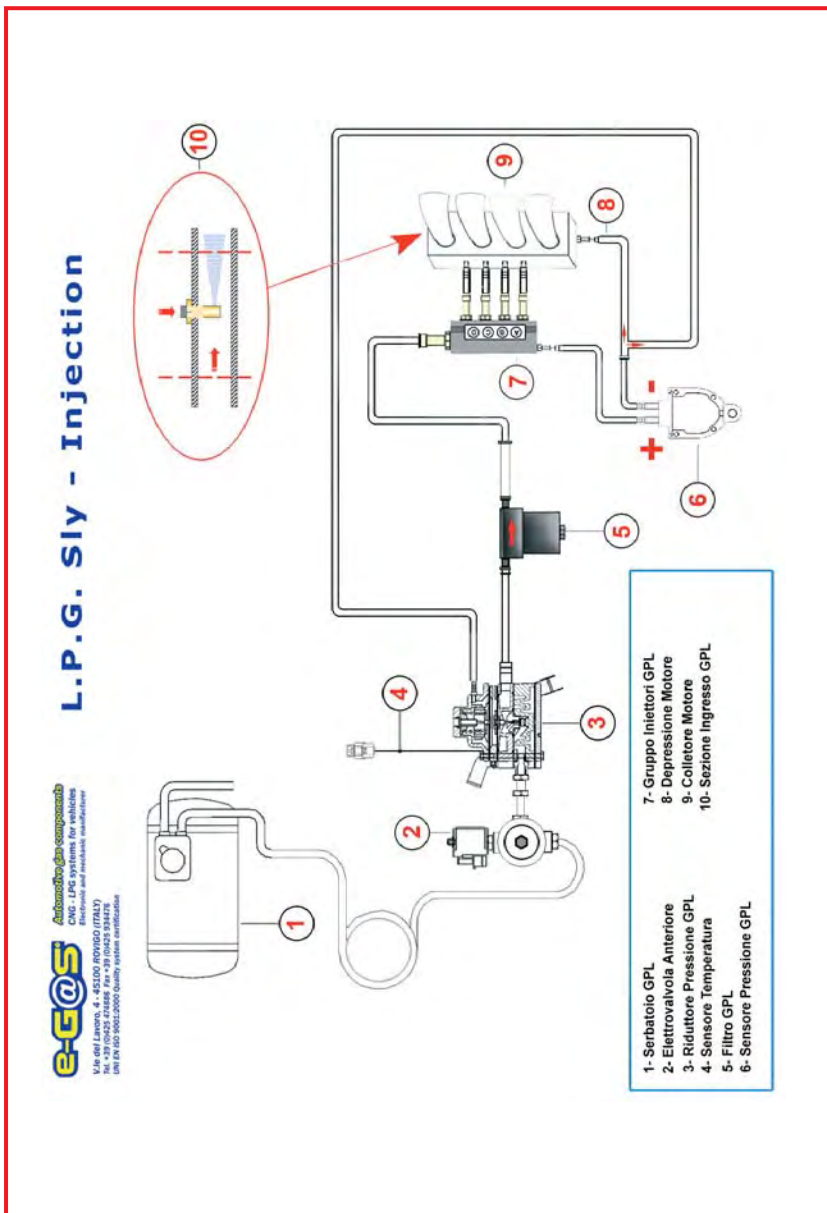
EVM01 METHANE SOLENOID VALVE



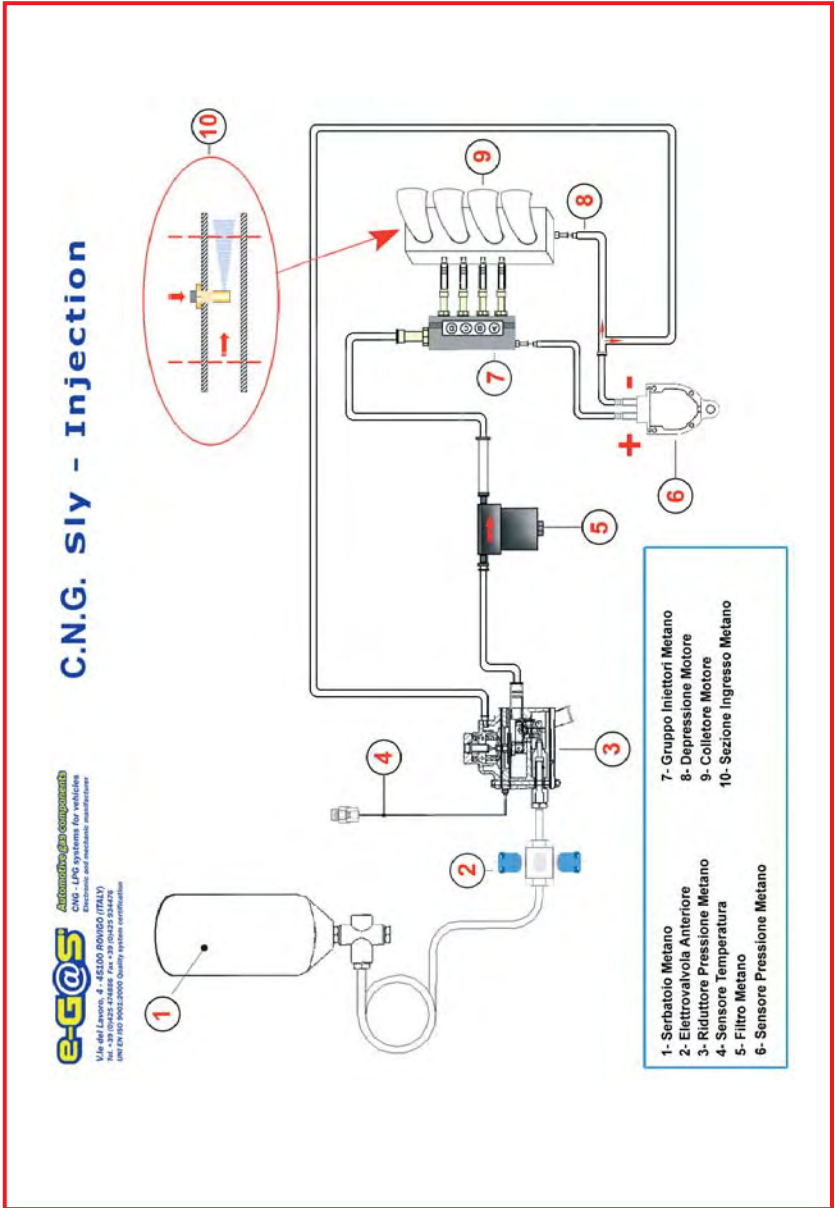
CONNECTION OF THE METHANE REDUCER SOLENOID VALVE - TYPE RM01



INSTALLATION DIAGRAM FOR LPG COMPONENTS



INSTALLATION DIAGRAM FOR METHANE (CNG) COMPONENTS



PRESSURE SENSOR FOR INJECTION SYSTEMS (e-G@S SLY INJECTION system)



e-G@S SLY INJECTION uses a differential pressure sensor that is enclosed in a special aluminum housing designed to protect the sensor from impacts and high mechanical stresses.

The housing has two small cylindrical ends on one side and an electric connector on the other side.

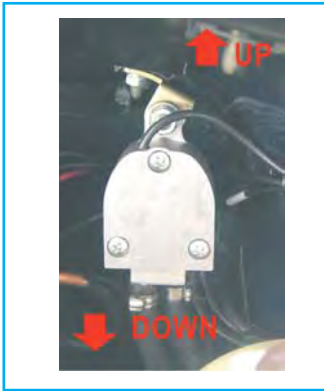
The two cylindrical ends enable the electronic device inside the housing to measure both the positive pressure on inlet “+” and the negative pressure on inlet “-”.

The two cylindrical ends, called “acquisition tubes”, that project from the aluminum housing are used to connect the pressure measuring tubes, while the harness with

the special 3-wire connector is designed to be inserted into connector CN5 of the CAB01 harness on the ECU side.

The housing and pressure sensor are shown in Figure 10, which also shows the location of the differential pressure inside the aluminum housing. Sealing is guaranteed by an aluminum cover that completely seals the housing, leaving only the electric connection on the outside.

Pressure references on the pressure sensor



The pressure sensor housing has two markings that refer to a specific cylindrical nozzle and that are identified with symbols “+” and “-“ respectively for the positive (P1) and negative pressure (P2).

Pressures are measured using the special tubes supplied with the installation kit, which have to be connected to the pressure difference measuring points respectively located in the following positions:

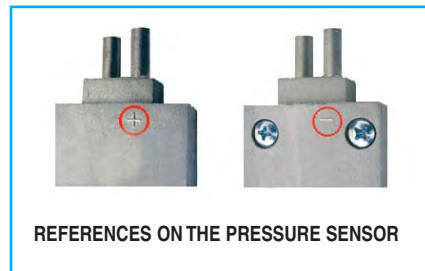
P1 = “+” = MATRIX INJECTOR GROUP (11)

P2 = “-” = VACUUM ON MANIFOLD

FITTING

To correctly fit the pressure sensor in place, it is sufficient to observe a few simple instructions:

- Place the pressure sensor on the highest point of the positive pressure outlet connected to the GAS injector.
- Place the pressure reducer vertically with the pressure tubes pointing downwards (Figure 13) in order to prevent the entrance of contaminants into the sensor detection points.



INSTRUCTIONS: if the PC calibration or tester interface displays a zero pressure, you may have accidentally reversed the positive and negative pressure inlets.

LPG FILTER



The filter placed in between the LPG/METHANE reducer is used to filter the impurities contained in the LPG or METHANE.

Impurities may originate from different sources and have different dimensions; for example they may be constituted by small metal fragments released during the installation of the system piping or metal residues present in the supply system. The use of this component further protects the GAS injector guaranteeing a safe and reliable operation.

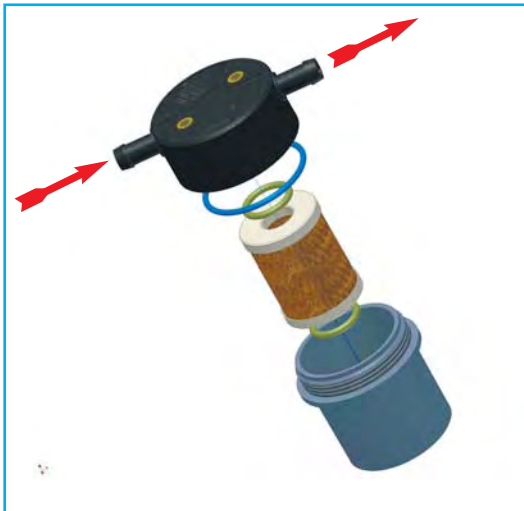
“FITTING”

The filter does not generally need to be firmly fixed to the vehicle structure nor protected from water sprays or excessive heat. It is generally installed inside the

ter vertically as compared to the ground, being carefully to correctly orient the upper and lower sections. The lower section is fitted with a cylindrical unit that contains the filtering element.

When the gas enters the filter from the top and passes through the lower cylindrical air space that acts as expansion vessel, the filtering element removes the larger contaminants, leaving the oil and gaseous residuals on the bottom of the cylindrical unit. This dual action ensures that the gas output from the filter does not contain large contaminants that could damage the rail injectors and minimises the presence of oil residuals and non combustible impurities.

The reference in the figure shows the GAS entrance direction: the GAS enters from the INLET point of the filter, is discharged from the outlet point and is then conveyed towards the GAS electronic injectors through a



system between the LPG/METHANE reducer and gas injector group.

It is however very important to place the fil-

special pipe.

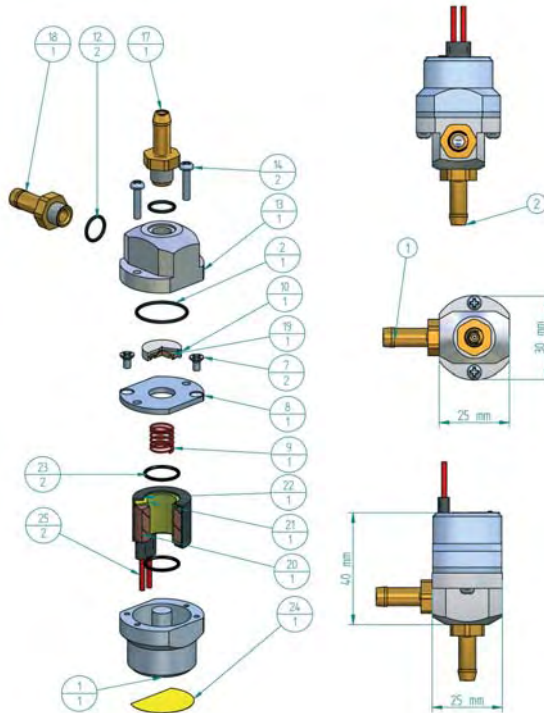
E-GAS INJECTOR

The INJ01 injector manufactured by E-GAS Srl is designed to power engines with a cylinder power of approximately 40 KW (*). Thanks to its extraordinary performances and reliability, this injector also guarantees maximum safety and reliability during changeover procedures. Model INJ01 can be used on all ECU models produced by E-GAS Srl, though it is necessary to contact the local office for information on specific requirements and on the settings of the calibration programs.

The following diagram shows the components of this inject and the assembly position.

(*). These data may be changed by the manufacturer at any time.

EXPLODED VIEW OF THE GAS INJECTOR



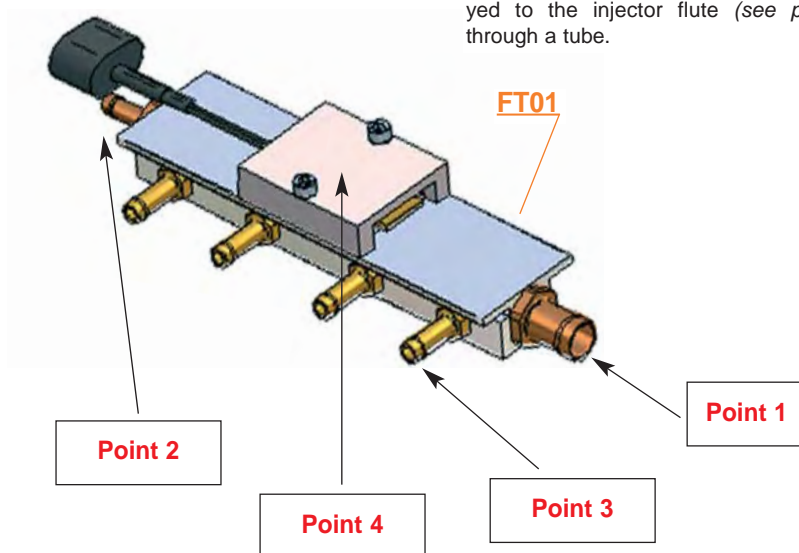
- ① → GAS INLET \varnothing 4 HOLE
- ② → GAS EXIT, CALIBRATED HOLE FROM \varnothing 1.4 TO \varnothing 4

GAS INLET AND OUTLET

INJECTOR FLUTE (FT01)

Injector flute with heater

This device enables to create an LPG or METHANE reservoir and convey it to single injectors using connections with pipes approved for the use of GAS. The gas comes from the reduction stage produced by the reducer, is filtered and then conveyed to the injector flute (see point 1) through a tube.

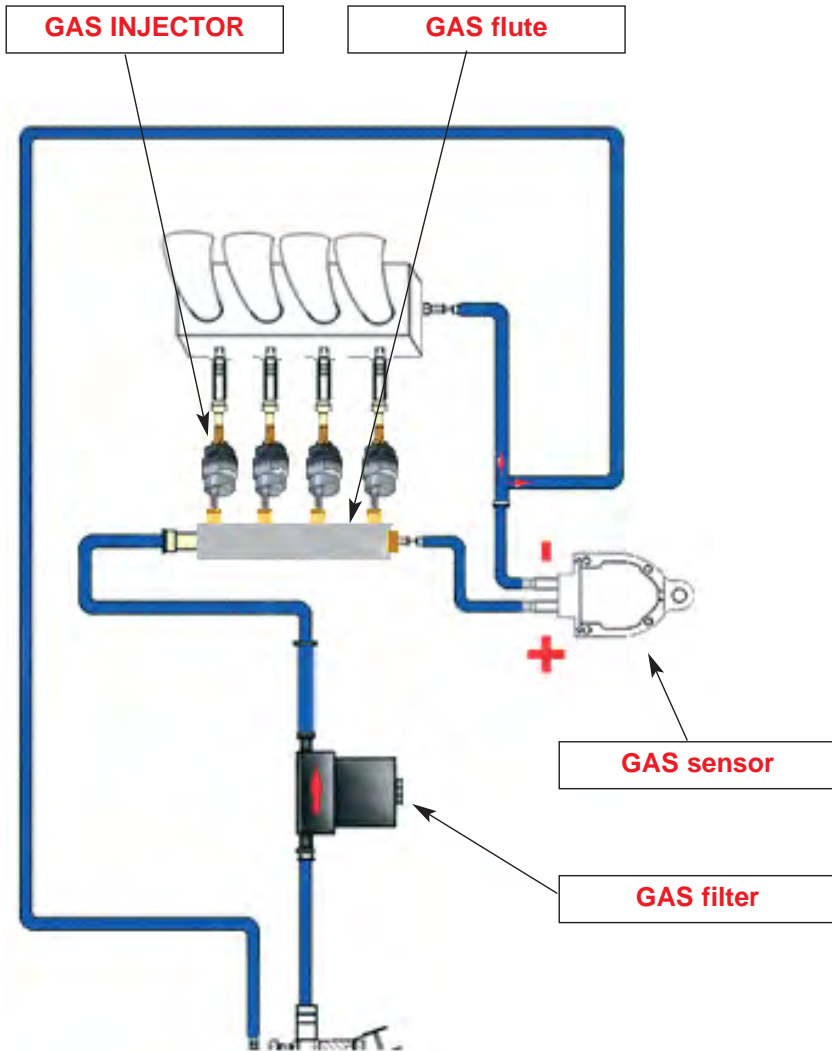


After passing through all the locations shown in **point 3**, the gas reaches the single injectors installed close to the engine suction manifold. The ECU then drives the injectors so that GAS is distributed inside the engine in accordance with the strategies implemented in the software and electronics.

Point 2 is the connection point that can be used for the pressure positive sensor.

Point 4 is the connection point that can be used for the connection of a gas heater that, if present, heats the whole flute through the screw fixture present on its flat area.

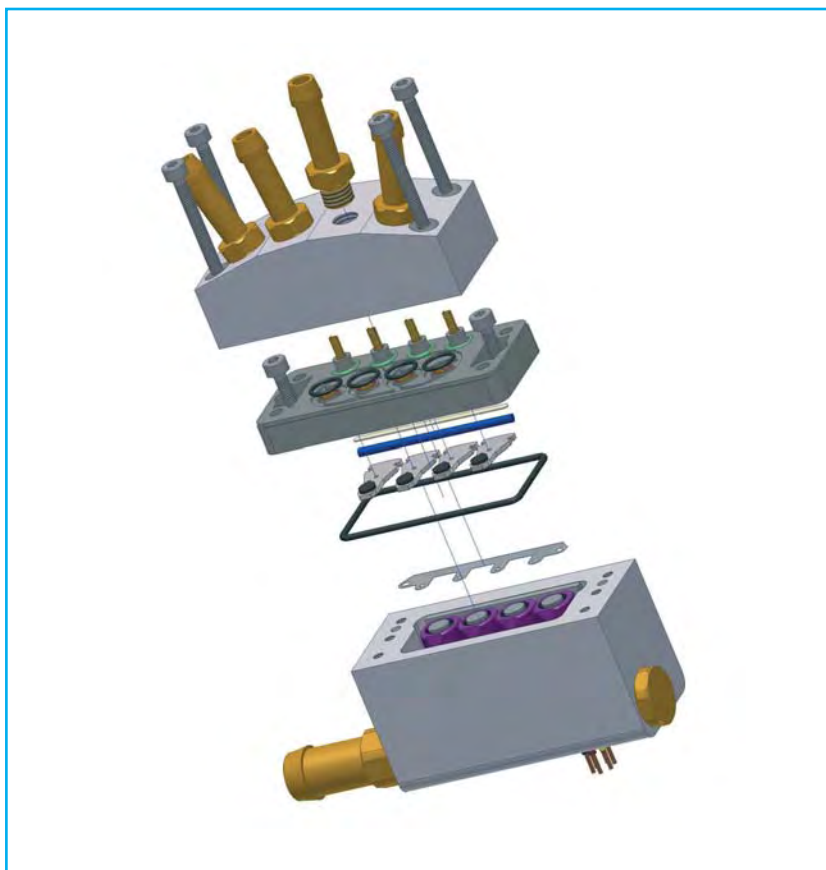
Diagram showing the location of the injectors and flute as compared to the pressure sensor and engine suction manifold



INJECTOR GROUP

The **injector group** is constituted by several injectors and in particular by one injector for each cylinder.

The opening time and sequence of the injectors are determined by the ECU in real time by using complex data algorithms supplied by the original petrol ECU.



PASSIVE INJECTORS FOR INJECTION SYSTEMS

Passive injectors are special metal nozzles that have to be installed in the plastic or aluminum manifold situated close to the petrol injectors.



Their function is to convey the gas towards the suction manifold that is closer to the head, where the air/fuel mixture is injected to allow the combustion inside the cylinders.

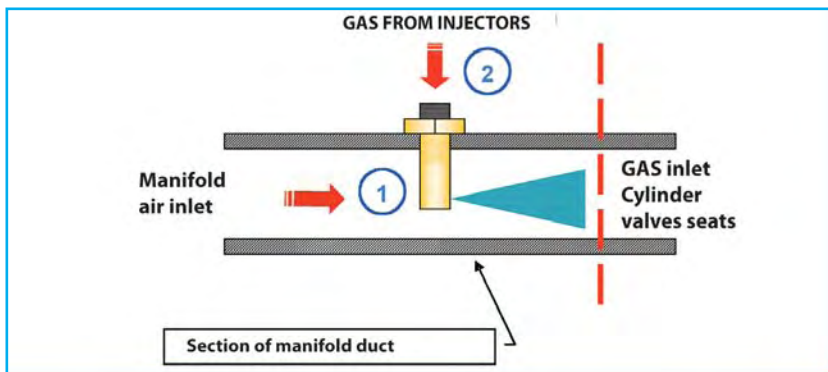
The positioning of these special passive injectors is one of the most critical steps of the installation phase of GAS systems because their location within the collector needs to be chosen very carefully. They should be ideally located so that the GAS injection is as close as possible to the location of the petrol injectors, in order to ensure that the engine reactions resulting from the GAS injection are similar or very similar to those that occur when petrol is injected and when the vehicle is running on petrol.

It is important to note that this is the greatest or more significant difference between LPG or

METHANE gas and traditional injection systems for internal combustion engines, in that these injection nozzles allow the GAS to be consistently distributed within the manifold. The fuel is mixed with air in a controlled manner within the manifold thanks to the inlet dynamics and within the interval of time specified for the original vehicle injection system. In traditional systems, the manifold is instead filled continuously and completely with GAS from an inlet that is placed upstream and that is generally situated at a large distance from the valve inlet. This configuration inevitably saturates the manifold suction nozzles with fuel mixture causing back flashes in the manifold along with severe damage especially if the vehicle manifold is made of plastic.

The figure provides a diagram of a section of an hypothetical suction manifold of an engine with traditional injection system fitted with passive injectors installed in the most convenient locations.

The selection of the injector locations is very important, because their correct installation not only optimises the system operation but minimises problems during the installation of KIT e-G@S Injection.



INSTALLATION

- Locate the areas on the walls with a smaller thickness and that are situated as close as possible to the injection point on the plastic or aluminum manifolds. The positioning of the M6 passive injectors is very important both for technical and functional reasons. Therefore, once the drilling point has been chosen, it is important to ensure that the drilling does not damage the original components of the vehicle like moving parts or the vehicle petrol injectors.
- Locate the drilling point for each GAS injector, then drill the holes using a \varnothing 5 mm drill bit. Remember to coat the drill bit with a small amount of grease prior to drilling so that the shavings adhere to the drill and do not fall into the manifold.

Thread the hole with a 6MA screw tap, remove the dirt or shavings and insert the passive injectors. During this operation, carefully observe the orientation of

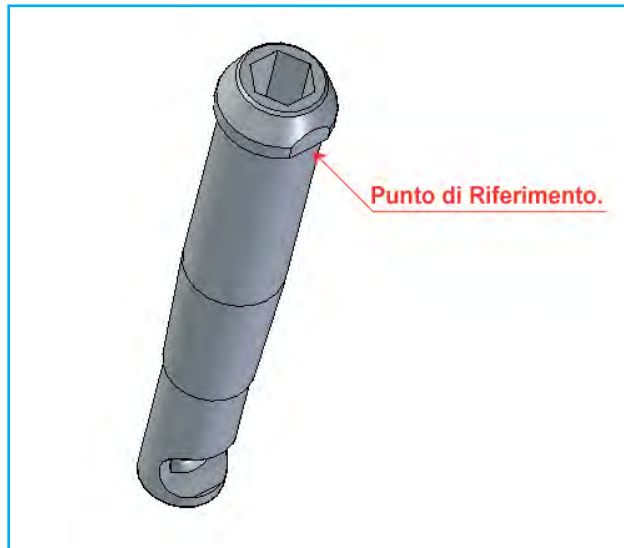
- the passive injectors verifying that the gas exit direction matches the injection direction of the original petrol injectors. The small moulding along the edge of the passive injector identifies the exact location of the gas exit hole.

Carefully remove all the shavings produced during the drilling and threading operations because their accumulation inside the manifold could damage the engine. Attention: the accumulation of shavings can be prevented by applying a light coating of grease to

- the drill bit and by frequently removing the shavings during the drilling and threading phases.

Carefully screw the passive injectors using a thread-locking compound and by inserting a 3.5 mm Allen wrench in the upper section of the passive injectors.

- Always verify that the exit hole of the passive injector faces the suction valves (see figure below).



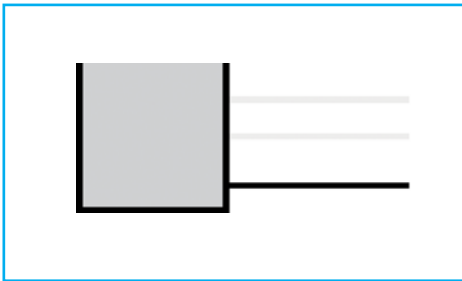
CONNECTING THE LAMBDA PROBE

The connection of a Lambda probe to SLY-INJECTION is an "OPTIONAL" operation and is not required to run the vehicle on GAS or METHANE.

The connection of the system through the yellow harness wire (*refer to the "Installation manual of electric equipment" pin_22 pages 4 and 5*) is useful when you need to observe, during the calibration and

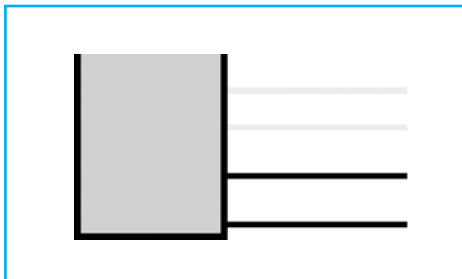
road test, the dynamic behaviour of the Lambda probe using the PC or terminal interface.

The sections that follow briefly describe the most common connectors used on vehicles, without specifically referring to their shape or color.



3-WAY CONNECTOR

Connect the black wire, "LAMBDA signal", of the connector to the yellow wire of the harness (*refer to the "Installation manual of electric equipment" pin_22, pages 4 and 5*).



4-WAY CONNECTOR

The 4-way connector is similar to the one shown in the figure. It has a LAMBDA signal wire that can be coded with three different colours, depending on the vehicle manufacturer. Regardless of the color, this wire must always be connected to the yellow harness wire (*refer to the "Installation manual of electric equipment" pin_22, pages 4 and 5*).

ATTENTION! The yellow wire must be connected to the wire of the original vehicle connector by simply acquiring the signal without interrupting it, that is without interrupting the electric continuity of the original vehicle wire. This ensures that the signal is always returned to the original vehicle ECU and does not affect the operation of the ECU.

CALIBRATING THE E-G@S SLY-INJECTION SYSTEM

The vehicle can be calibrated using a PC graphical interface, after installing the calibration program from the installation disc that can be ordered from the local distributor of SLY-Injection.

Insert the CD-ROM into the appropriate drive. Depending on the PC model, the program starts automatically and displays a wizard with detailed instructions on how to complete the desired operation.

During installation, it is possible to choose two different languages for the wizard that displays all the information you require to complete the operation. After the installation of the program, you will also be able to choose different communication languages

to customize your program after set-up.

A vehicle can be CALIBRATED with five simple steps that are described in sequence on the following pages.

Perform the steps described following the displayed instructions. Please note that during the first three steps, it is important to ensure that the vehicle is running on petrol and that only the red LED is visible on the changeover switch.

- Step 1:** *calibration of the engine speed*
- Step 2:** *calibration of the maximum injection time of the vehicle engine*
- Step 3:** *selection of the type of fuel used by vehicle through the (ADVANCED SETTINGS MENU), i.e. LPG or METHANE*
- Step 4:** *calibration of the vehicle GAS/PETROL conversion constant*
- Step 5:** *calibration of the GAS vehicle transitions*

Important: always verify that the vehicle is running on PETROL before performing steps from 1 to 3 of the calibration procedure.

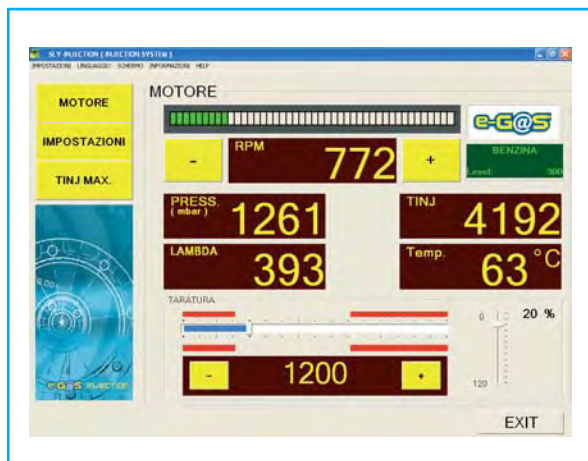


Figure 1:
"ENGINE" screen

Step 1: CALIBRATION OF THE ENGINE SPEED

The “ENGINE” screen, which displays automatically when you open the program or when you press the button in the upper left, displays the vehicle engine data; for example the GAS pressure, the injection time, the reducer temperature, the fuel level, etc. The layout of the “ENGINE” screen is shown in Figure 1 : “ENGINE” screen above.

The upper central section of Figure 1: “ENGINE” screen shows the vehicle speed

while it is running,

The engine speed is enclosed by two yellow buttons: “-” that reduces the engine speed read by the interface and “+” that increases the engine speed read by the interface, as shown in **Figure 2**.

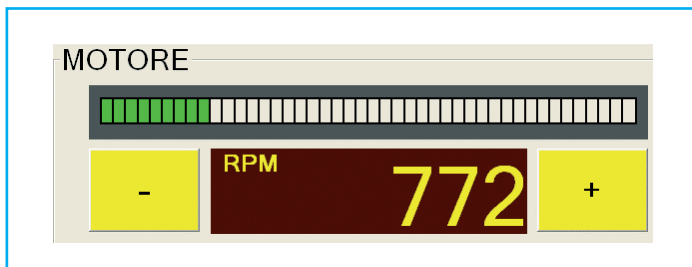


Figure 2: ENGINE SPEED

During the first minutes following the vehicle start-up and for approximately ten seconds, the system determines whether to read the speed from the “brown” wire of the general harness or from the vehicle injection time.

If the “brown” wire has been connected to a valid rpm signal, like the one produced by the vehicle coils or petrol ECU, the program automatically rebuilds the speed signal using this connection or otherwise uses the information provided by the injection signal.

to the large 56-way connector of the general harness after installation.

Tip

Current vehicles do not sometimes provide a reference for the engine speed on the dashboard. In this case, it is necessary to ensure that the engine idle speed displayed ranges between 800 and 900 rpm. If an indicator is present on the dashboard, it is sufficient to ensure that the data on the dashboard and calibration interface match.

Attention: if you decide not to use the “brown” wire, remember to cut it close

Step 2: CALIBRATION OF THE MAXIMUM INJECTION TIME OF THE VEHICLE ENGINE

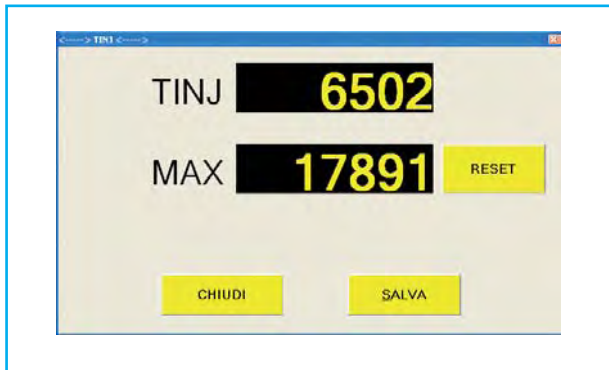
In the “ACQUISITION OF INJECTION TIMES” window, you can press the yellow button in the upper left to open the window where you can calibrate the maximum injection times. This operation enables to determine the type of injectors installed on the vehicle, because the algorithm is automatically selected by the program depending on the injectors installed.

The base algorithm has a different configuration for FULL GROUP, SEMI-SEQUENTIAL or SEQUENTIAL INJECTORS, which ensures excellent results for every existing engine configuration.

Attention: *the button flashes alternately in yellow and red until you complete this calibration step. The button stops flashing and permanently lights in yellow when you press “SAVE” after determining the maximum injection time.*

The screen that displays when you press ‘TINJ. MAX’ is the following:

Figure 3:
maximum injection time



Screen ‘TINJ. MAX’ contains two text boxes with a black background that display a scroll text with information on the instant injection time (box TINJ) and the maximum injection

time measured step by step (box MAX), as shown in Figure 3.

If you slightly press the accelerator pedal, you notice that the maximum injection time displays in box MAX.

The acquisition system enables you to acquire the maximum injection time with a minimum offset even after one fast acceleration or when the vehicle is running. You also obtain the same results if you start the vehicle at idle speed and accelerate to a higher gear.

After acquiring the maximum injection time, press “SAVE” to store the results in the ECU. If you do not wish to save the results, you can press “CLOSE” to close the window and return to the (ENGINE) calibration window without saving your data.

Button “RESET” can instead be used to reset the value of box MAX, but the one of the ECU. This button is sometimes useful to check the maximum injection time calculation several times. Even in this case, you will need to press “SAVE” to store the results.

Attention: *button “SAVE” saves the acquired value and closes the displayed window.*

Step 3: SELECTION OF THE FUEL USING THE (ADVANCED SETTINGS MENU), I.E. LPG OR METHANE

From screen “SETTINGS”, which can be opened by pressing the button on the upper left, you can access the screen shown in Figure 4: System Settings. Figure 4.



Figure 4: System Settings

In the central section of this screen you can select the type of fuel (*the default setting is LPG*) by simply clicking LPG or METHANE.

The algorithm of SLY-Injection enables to obtain excellent performances when the correct type of fuel is selected. If you select a different fuel as compared to the one used by the system, you will not be able to optimize the system.

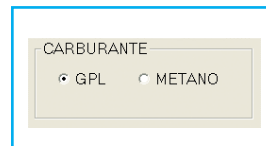


Figure 5: Fuel Type

Step 4: CALIBRATION OF THE VEHICLE GAS/PETROL CONVERSION CONSTANT

Step four is essential for the calibration of the vehicle. Therefore, it is important to carefully read all the following paragraph because it contains important engine information besides illustrating the recommended calibration procedure.

Before starting the calibration, always verify that the engine is running on petrol and locate the section situated next to the lower edge (see Figure 6) in the “ENGINE” screen (see Figure 1).

The calibration screen displays two buttons, **+** and **-**, that allow **+** to increase and reduce the calibration constant in steps of 100 every time you press the buttons.

In this example, the calibration constant is 1,200.

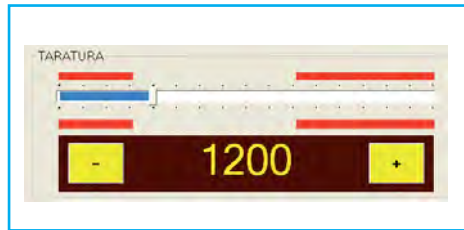


Figure 6: calibration of SLY-INJECTION

1) **Verify that the vehicle is running on PETROL** and wait a few minutes for the engine to reach a stable idle speed and its “**rated**” parameters, that is the optimum temperature and a stable injection time and speed. Allow the reducer temperature to reach at least **50°C**.

2) **Run the engine at idle speed** and disconnect all the accessories connected to the engine like the air conditioning unit and lights, in order to simplify the comparison of the GAS/PETROL injection time.

3) Visually **memorise** the PETROL injection time in the above-described conditions.

4) **Switch to the GAS mode**: to perform this operation, you can press the space bar on the keyboard to allow the system to automatically switch to this mode or the changeover switch. The green LEDs of the changeover switch will start to blink. As soon as these LEDs light, accelerate and decelerate to allow the system to change mode. As soon as the screen on the right displays LPG and METHANE confirming the change, **reduce the engine speed to idle**.

5) **Check the GAS injection time** and perform the necessary adjustments to set the calibration. If the vehicle is running “LEAN” after the changeover, which means that the injection time is greater than the one stored for the PETROL mode in the same load conditions (*that is without electric fan or sudden loads*), you will need to increase the calibration constant by pressing **+**; otherwise press **-**. It is initially advisable to use keys “**+**” and “**-**” that enable you to decrease or increase the value in steps of 100 points **-**; subsequently use the keys of the joystick to fine tune the adjustment. Carefully read the information contained in Table 1 that provides information on how to adjust the calibration constant depending on the “lean” or “rich” conditions found. To check the injection time, you need to quickly switch from the GAS to the PETROL mode and vice versa using the spacebar on the keyboard.

REFERENCE TABLE

(GAS time) < (Petrol time)	RICH engine	Reduce the constant
(GAS time) > (Petrol time)	LEAN engine	Increase the constant

Table 1: injection time references for the calibration constant

Optimum calibration is achieved when, regardless of the operating mode, the injection time in GAS mode matches the value for the PETROL mode.

To obtain matching values, it is necessary to adjust the calibration constant by using the “+/-” buttons to increase or reduce the value when the vehicle is running on GAS or the PC joystick, which is shown in Figure 6.

To check the calibration values, use modern instrumentation like a practical EOBD tester, which enables to check the

self-adaptive offset of the vehicle and verify that the variations in the GAS and PETROL modes do not differ significantly.

To obtain a good calibration, it is advisable to switch from GAS to PETROL several times, control that the injection time in both modes matches and adjust the calibration constant as described above.

USING THE JOYSTICK TO CALIBRATE THE SYSTEM

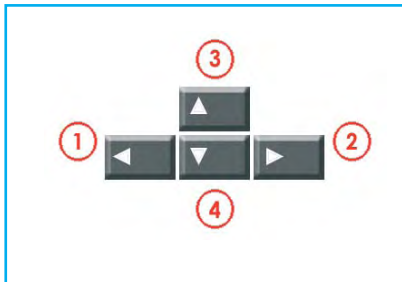


Figure 7: calibration joystick

Joysticks available on desktop and portable PC are generally similar to the one shown in Figure 7.

You can use a joystick with SLJ-Injection, when screen “ENGINE” shown in Figure 1 displays, to fine tune the system by using buttons 1 and 2 to increase or reduce the calibration constant by 10 points at a time.

Step 5: CALIBRATION OF THE GAS VEHICLE TRANSITIONS

SLY-Injection enables you to calibrate the transitions in terms of engine response by using the vertical slide shown in Figure 8.

Transitions are expressed in percentage values. Therefore a large value indicates an attenuation in terms of gas fuel supply.

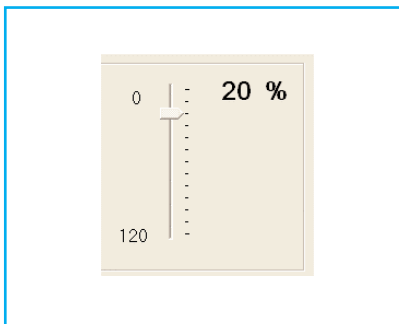


Figure 8: attenuation of SLY-INJECTION SYSTEM

This parameter is useful to improve the vehicle response to sudden accelerations when the vehicle is in use. By changing the value on the vertical bar of the calibration screen you can increase up to a maximum of 120% and reduce down to a minimum of 0% the attenuation of the GAS injector response.

The more you increase this value and the smaller is the amount of gas supplied during transitions. If you use buttons 3 and 4 of the joystick, you can increase or reduce the attenuation by 5 points at a time.

As a general rule this variable can be easily configured when the vehicle is running by starting the engine at low speed and accelerating.

Although the optimum value cannot be determined automatically, it is possible to can find it by observing the Lambda value and determining the “drivability” of the vehicle or using an EOBD tester.

Please remember that all vehicles tend to react with a “RICH” Lambda after sudden accelerations. Therefore, it is important not to set an excessively lean value in these conditions.

In doubt, determine the values taking into account the fuel used as shown below:

LPG	0% - 20%
METHANE	40% - 60%

ENGINE PARAMETERS

GAS sensor pressure



This useful screen enables you to monitor the system pressure when the vehicle is running both on GAS and PETROL.

Attention:

if the sensor has not been installed in the system (its installation is optional), you can disable it by pressing the corresponding button in the “SETTINGS” screen.

After the change, four dashes (“—”) appear on the display.



Engine injection time



This screen can be used to monitor the vehicle injection time in all operating conditions. The corresponding value is expressed in micro-seconds.

Engine Lambda signal



This screen can be used to monitor the trend of the Lambda signal, provided that it has been connected to the system by means of the appropriate wire. If the signal is not connected, the screen displays value zero.

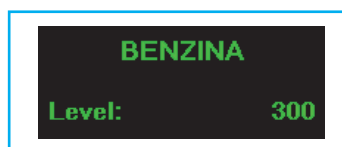
Attention:

the connection of the Lambda signal does not affect the calibration or operation of the vehicle, but only simplifies the work of mechanics during specific calibration operations.

Reducer temperature



Fuel tank level

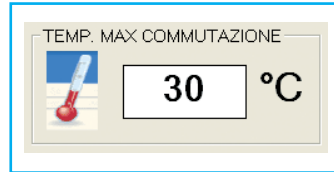


This screen can be used to monitor the level of the signal generated by the level sensor on the tank in mVolt. It is useful to determine the settings of the level sensor and the maximum/minimum limits.

SETTINGS PARAMETERS

MAXIMUM CHANGEOVER TEMPERATURE

The engine changeover temperature indicates the temperature that the system is expected to reach for the changeover to GAS to occur. The temperature is measured by the sensor situated on the reducer. If you double click the blank screen with the changeover temperature, you can enter a custom value from the keyboard and then press ENTER to set the new changeover temperature.



Default value: 30°C

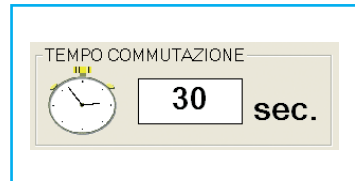
HOW TO ENTER A VALUE

Double click with the left button of the mouse the blank screen with the current temperature value. As soon as the background of the screen turns to red, you will be able to enter a custom value from the keyboard.

After entering the desired value, press "ENTER" to confirm the entry.

CHANGEOVER TIME

You can change this value and specify the interval in seconds, from when the vehicle is started, that has to expire before the vehicle can be switched to the GAS mode. If this interval of time has expired because it was necessary to wait for the changeover temperature, it is no longer applicable.



Default value: 30 s

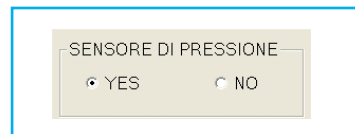
HOW TO ENTER A VALUE

Double click with the left button of the mouse the blank screen with the six seconds value. As soon as the background of the screen turns to red, you will be able to enter a custom value from the keyboard.

After entering the desired value, press "ENTER" to confirm the entry.

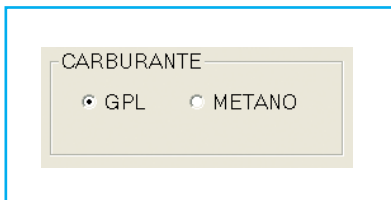
PRESSURE SENSOR

If the system you have installed comprises a pressure sensor (optional), you need to enable this screen and select "YES". If no sensor is present, select "NO".



Default value: YES

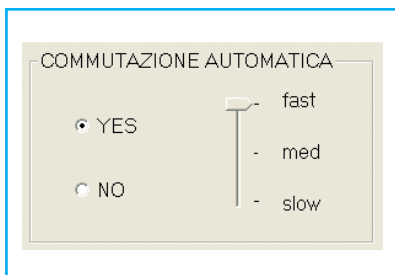
FUEL TYPE



You can use this option to select the type of fuel of your installation.

Select METHANE if you are using methane or LPG if you are using LPG.

AUTOMATIC CHANGEOVER



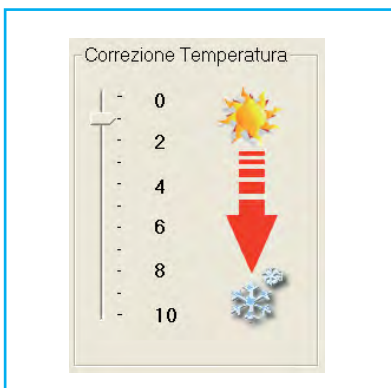
You can use this option to configure the system so that it automatically switches to PETROL when there no GAS left. The changeover is signaled by a fixed and blinking red LED on the changeover switch.

Select "YES" to enable this feature or "NO" to disable it.

It is generally advisable to enable this feature on Euro3 and Euro4 vehicles in order not to damage the original petrol system

when no fuel is available, because otherwise the vehicle would run in "LEAN" mode. If the automatic changeover feature is selected, it is also advisable to select the FAST setting to allow the vehicle to perform the changeover as soon as there is no fuel in the tank.

TEMPERATURE CORRECTION

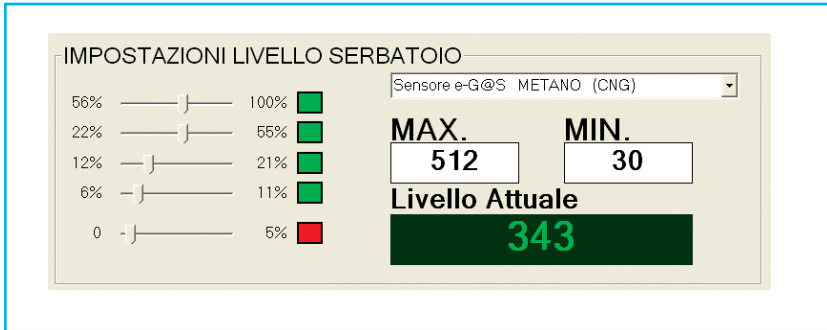


It is known that during the initial operating stage, specifically when the GAS vehicle is running on the METHANE, the carburation of the engine tends to be richer at least until the reducer reaches the operating temperature and is able to guarantee a correct gasification of the GAS.

- Select 0 to disable the temperature correction feature.

- Default value: 2

TANK LEVEL SETUP



It is important to pay specific attention to the configuration of the LEDs on the changeover switch and of the maximum/minimum levels of the tank indicator.

e-G@S can be used both with powered and non powered sensors and with straight and reversed sensors. Pane "Current level" shows the tank fuel level measured at a specific time, while panes "MAX" and "MIN" respectively show the maximum and minimum level of the selected sensor.

The figure above shows, next to each LED (green or red), the percentage of fuel present in the tank to which the ignition system is connected.

Example

When the tank is full, all the four LEDs on the changeover switch are on. When the level falls below 56%, the fourth LED on the changeover switch turns off, while the remaining three green LEDs remain on to indicate that the level of fuel in the tank is equivalent to 56% of the total capacity. The third LED on the changeover switch remains on until the fuel level falls below 22% and so on until the reserve value is reached.

This value indicates the total fuel level is below 5% of the total tank capacity, a condition that is also signaled by the lighting of an intermittent red LED on the changeover switch.

To complete the tank configuration, you

need to set the maximum and minimum values for the tank level, which change depending on models and sometimes even for the same model.

To help installers perform this operation, e-G@S has developed a self-learning software that is able to acquire the maximum and minimum levels read by the tank sensor during the use of the vehicle respectively after the first refueling and the first time the vehicle is left without GAS.

The software basically configures the optimum values during the first vacuum and full load condition of the vehicle.

How to set the maximum and minimum values manually

To set the values, click the blank screen that displays the maximum and minimum values, wait for the background to turn to red and enter the desired values. After entering the desired value, press "ENTER" to confirm the entry.

APPENDIX 1

Level sensor setup (LPG or METHANE)

The LPG or METHANE sensor has to be adjusted once the system installation has been completed to be able to view the exact amount of fuel in the tank on the changeover switch in the driver's compartment.

HOW TO ADJUST THE MINIMUM AND MAXIMUM VALUES MANUALLY



Figure 1: electric sensor level

Switch the vehicle on and select the PETROL or GAS mode. Open the program and select screen ENGINE that displays the pressure, speed and

ignition time.

The upper right section of this screen displays in real time the electric value transmitted by the level indicator in the current operating mode ('LEVEL:'). This value provides an electric indication of the amount of fuel left in the tank. You will later have to memorise this value in order to link it to the maximum and minimum values, as explained below.

MINIMUM VALUE

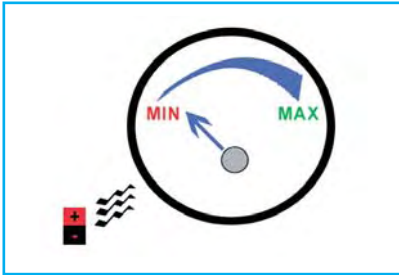


Figure 2: minimum VALUE

Physically place a magnetic object like a magnet on the tank indicator. Leverage the magnetic effect of the magnet to move the dial to the minimum value, as shown in Figure 2.

The display shows the electric value in the upper right section of the screen under LEVEL, as shown in Figure 1.

Visually memorise the value or write down on a piece of paper. This is the **MINIMUM** electric value of the sensor with the selected multiple valve installed.

MAXIMUM

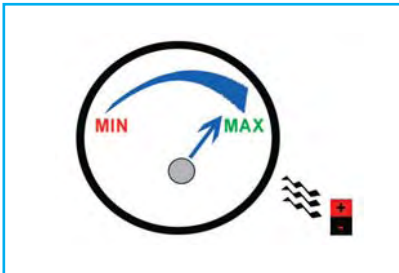


Figure 3: MAXIMUM value

Physically place a magnetic object like a magnet on the tank indicator. Leverage the magnetic effect of the magnet to move the dial to the MAXIMUM value, as shown in Figure 3. MAXIMUM VALUE..

The display shows the electric value in the upper right section of the screen under LEVEL, as shown in Figure 1.

Visually memorise the value or write down on a piece of paper. This is the **MAXIMUM** electric value of the sensor with the selected multiple valve installed.

Tank level setup



After obtaining the minimum and maximum electric values, enter them in the corresponding box in screen SETTINGS.

How to set the MAXIMUM and MINIMUM values manually

To set the values manually, right click the blank screen that displays the MINIMUM or MAXIMUM values, wait for the background to turn to red and enter the desired minimum and maximum value from the keyboard.

After entering the desired value, press "ENTER" to confirm the entry. The background of the box turns to white.

The figure above shows, next to each LED (green or red), the percentage of fuel present in the tank to which the ignition system is connected.

How to configure percentage values

Example

When the tank is full, all the four LEDs on the changeover switch are on. When the level falls below 56%, the fourth LED on the changeover switch turns off, while the remaining three green LEDs remain on to indicate that the level of fuel in the tank is equivalent to 56% of the total capacity. The third LED on the changeover switch remains on until the fuel level falls below 22% and so on until the reserve value is reached.

This value indicates the total fuel level is below 5% of the total tank capacity, a condition that is also signaled by the lighting of an intermittent red LED on the changeover switch.

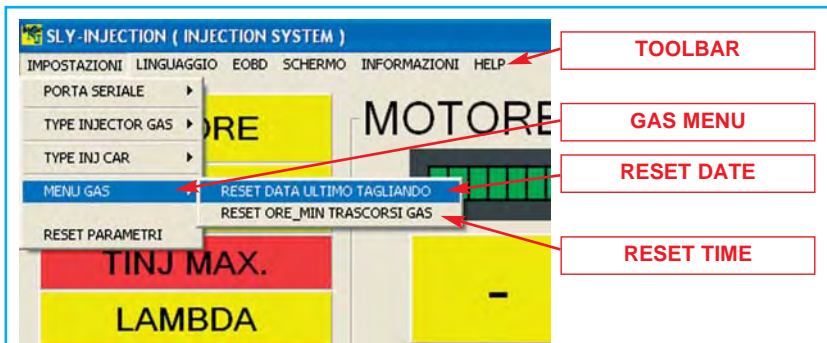
GAS MENU

DATA LOG and TIME LOG are two new features that can be used to store a date in day, month and year format and to memorise the actual operating time of the vehicle when running on gas.

When the GAS ECU has not yet been initialised, that is during the initial usage period, the gas DATE and TIME blink until the ECU is initialised at least one time from the corresponding menu.

(RESET DATE) INITIALIZE DATE:

If you are using a PC, you can perform this operation through the Gas Menu in the upper left section of the toolbar, under option Settings as shown in the following figure.



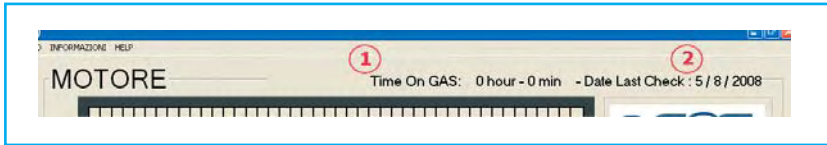
Click RESET DATE LAST CHECK with the left button of the mouse to save the value in the ECU and set a specific time reference.

This date, which can be used as reference, can either be the date of the last ordinary maintenance operation or the date of a specific event.

(RESET TIME) INIZIALITIZE TIME

In the same menu you can also select RESET TIME ON GAS, to allow the most recent versions of the software and ECU to automatically store the elapsed time in hours and minutes when the vehicle is running on gas. If you press RESET TIME ON GAS, you can reset the counter and start from zero. You can use this option at any time to effectively monitor the minutes and hours during which the vehicle has been running on gas.

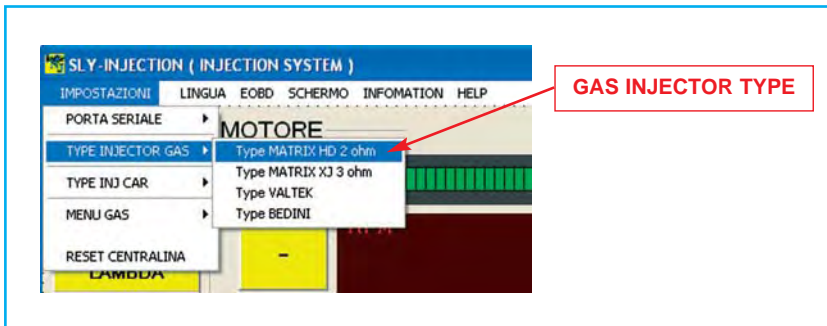
DETAIL (TIME ON GAS/DATE)



Detail 1 in the figure shows the hours and minutes during which the vehicle has been running on GAS. This information is useful to determine for how long the vehicle has been running on GAS. Detail 2 shows the date set by the installer as memo described above.

GAS INJECTOR TYPE

This menu, which can be selected from the toolbar in the Settings menu, can be used to specify which type of injectors the software must use during the piloting phase.



Attention!

In doubt, contact your local retailer or E-GAS srl, the manufacturer of the plant, for assistance.

The selection of a type of injector that does not match those installed could damage the injectors beyond repair or affect the operation of the installed and calibrated gas injection system. Contact your local distributor for more information.

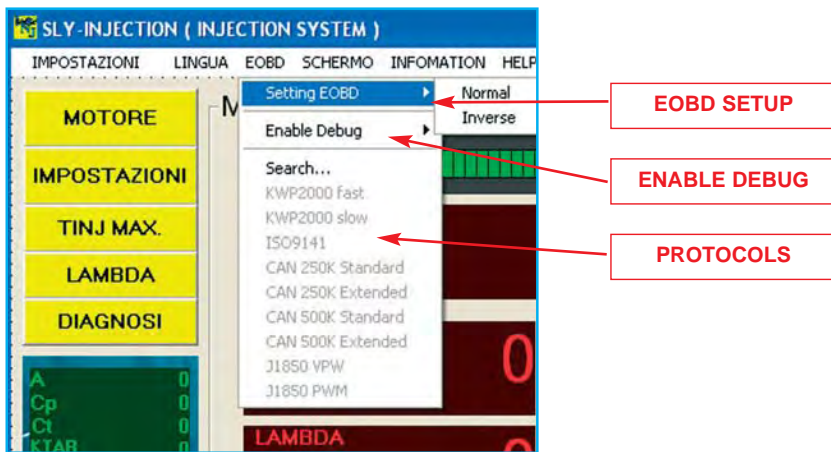
RESET ECU

This option can be used to reset the gas ECU to the default values set by the manufacturer, that is E-GAS srl.

Attention!

An hour glass displays when you select this option to indicate that you need to wait approximately 30 seconds for the process to complete. The hourglass disappears once the operation has been completed. Do not interrupt the reset operation while it is in progress.

EOBD MENU



EOBD SETUP

You can use this option to specify whether the petrol ECU of the vehicle is fitted with straight or reverse EOBD. The default setting for 99% of commercial vehicles is Straight. For information on how to change this setting and on the function of this setting, contact the Technical department of E-GAS srl.

ENABLE DEBUG

This option can be used to disable or enable the storage of the errors deleted by the SLY-Injection EOBD ECU from the GAS ECU memory before they are saved.

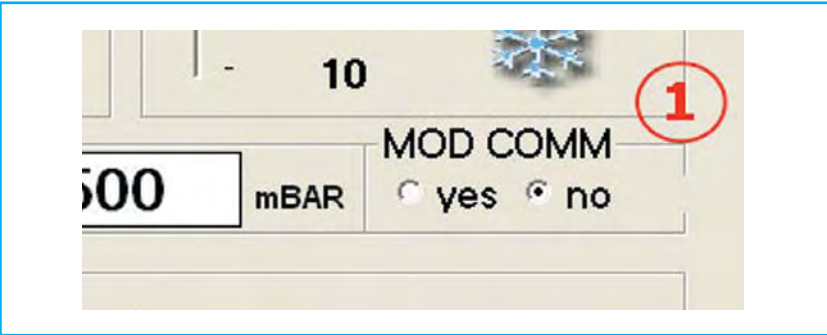
PROTOCOLS

This menu indicates if the ECU is a EOBD model and displays the protocol of the vehicle on which it is installed. Message Search... indicates that the gas ECU is still acquiring the protocol, which usually occurs after you connect the EOBD cable supplied in the KIT for the EOBD protocol of the vehicle.

The two protocol search positions and type of protocol are highlighted with a flag that displays before the Search....line or the name of the protocol in the list.

MODULAR CHANGEOVER

This feature is available only in the 2008 hardware release that is related to the 2008 production.



If set to 'YES', this feature enables to perform the changeover operation on two cylinders at a time when switching from the PETROL to GAS mode. It is useful to perform a more gradual changeover and to minimise the risk of the engine switching off in critical conditions, for example in presence of high slopes or sudden loads during the changeover phase. The changeover sequence, referred to engines with one or two groups of main

4-CYLINDER ENGINE (GROUP A)

The changeover occurs in sequence on the following injectors:

A-B, followed by injectors C-D

8-CYLINDER ENGINE (GROUP A - GROUP B):

The changeover occurs in sequence on the following injectors:

GROUP A: injectors A-B, followed by injectors C-D; then
 GROUP B: injectors A-B, followed by injectors C-D

CHANGEOVER PRESSURE



The parameter that can be defined by the user indicates the minimum pressure used by the system for the changeover from gas to petrol and basically enables the user to set the pressure threshold for the changeover to petrol.

CONTROLLING THE LAMBDA SIGNAL

The Lambda control performed by the e-GAS ECU software is based on short and long term considerations and aims at optimising the carburation of the vehicle when it is running on methane with low and medium engine loads and with high engine loads that corresponds to the power operation of the vehicle.

The trend of the analog signal produced by the Lambda probe is read and interpreted using two specific algorithms that analyze the waveform of the signal produced by the vehicle probe.

The aim of the analysis is to identify the two specific operating areas that describe the behaviour of the vehicle in **OPEN-LOOP** and **CLOSED-LOOP** mode.

The underlying idea is to convert the petrol operating logic into a similar logic when the vehicle is running on methane gas.

The system divides the global behaviour of the vehicle into two specific operating areas depending on the engine load.

When the engine load is low or average, the vehicle is expected to operate with a carburation that continuously searches for the Lambda-ONE value, so that it is always within the official standards specified by the manufacturer.

The software supports several types of Lambda probes and enables the user to use the calibration software with the ECU “core” value to set the average value of the Lambda signal that represents value LAMBDA ONE.

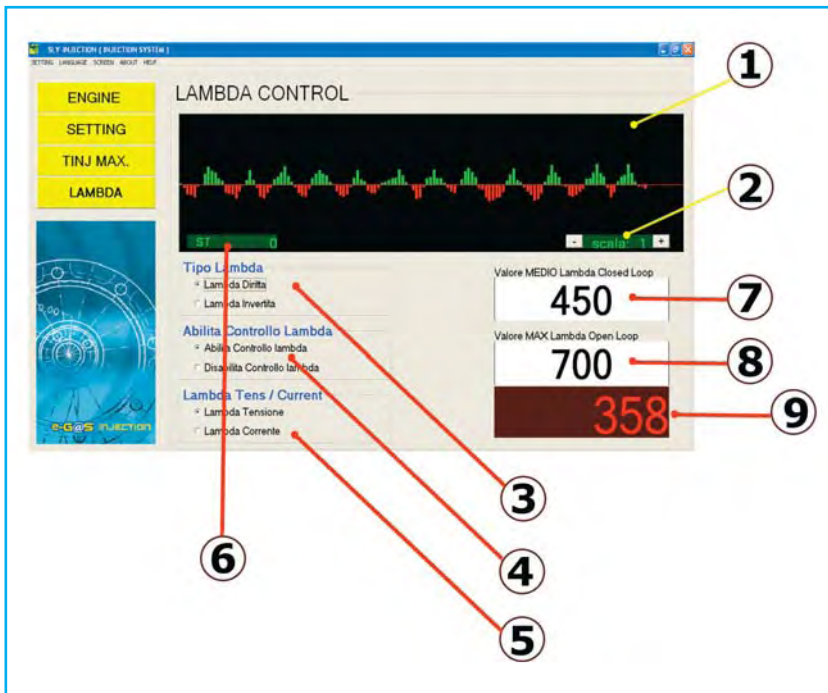
This consequently enables the user to find the optimum carburation with low and medium loads in accordance with the optimum search specifications set for carburation. The software also enables to calibrate the Lambda value to search in the high load or **OPEN-LOOP** area.

This option ensures an optimum carburation setting based on the settings specified by the user, who can set the desired Lambda value that the software has to search when the vehicle is running on gas and in the **OPEN-LOOP** in order to optimize consumption, guarantee compliance with standards and closely monitor the engine temperature.

CLOSED - LOOP

The following figure shows a typical Lambda signal during the engine monitoring phase. The signal alternates between a rich area 1 and a lean area 2, oscillating within the range of the max and min Lambda signals.

The average value between the maximum and minimum limits is the ideal changeover threshold, that is the threshold where the LAMBDA changeover should occur if the changeover is performed correctly.



Lambda algorithm settings

The following section explains how to set the components of the LAMBDA algorithm.

Lambda chart (POINT1)

The aim of this chart is to allow the user to immediately understand the behaviour of the vehicle Lambda signal when the vehicle is running on gas and petrol. The red bar that separates the two chart areas, while the green one corresponds to the level set by the user in point 7. Regardless of whether the engine is running in GAS or PETROL mode,

the Lambda values read by the EGAS ECU and displayed in point 9 are always within the correct range defined by the vehicle manufacturer.

EGAS enables to search for the value corresponding to Lambda one without setting a minimum and maximum value.

The box in point 0 displays the Lambda values (in millivolts) that correspond to the yellow signal wire of the general KIT SLY-INJECTION harness. However, the user has to set in box of point 7 the electric value in millivolts that corresponds to the value of Lambda1.

If this value is not available, perform the following procedure:

- 1- Set the vehicle in Petrol mode.
- 2- Enter in the box of point 7 a value that ensure a perfect distribution of the red and green bars on the chart, as explained in point 1. The green bars correspond to electric values that are above those entered in the box in point 7, while the red bars represent lower values. Therefore, the electric value inserted in the box of point 7 is the electric value of the probe that corresponds to Lambda1, that is the stoichiometric value of a correct carburation.
- 3- The operation is now completed.

Electric Lambda value in Closed LOOP mode corresponding to LAMBDA1 (POINT 7)

Enter in the corresponding text box the electric Lambda value that corresponds to LAMBDA 1, which is turn equivalent to the stoichiometric value of a correct carburation.

Electric Lambda value in Open LOOP mode corresponding to LAMBDA1 (POINT 8)

Enter in the corresponding text box the Lambda electric value in that corresponds to the Lambda value of the vehicle running at full power. To search for the value to enter, perform the following procedure:

- 1- Set the vehicle in Petrol mode.
- 2- Drive the vehicle along the road and accelerate with a high gear to place the vehicle in maximum load conditions. Then, check that the electric value specified in point 9 corresponds to the maximum value and enter a value decreased by 20% for LPG and by 40% for methane in the box of POINT 9.
- 3- The operation is now completed.

Scale factor **(POINT 2)**

Press + in the chart described in point 1 to enlarge the images in order to enhance

their visibility or - to reduce them.

Scale factor **(POINT 6)**

Displays the operating status of System 0 (rich)/System 1 (lean) in closed loop mode.

Type of probe **(POINT 5)**

Displays the type of Lambda probe installed.

- VOLTAGE: indicates that the probe is a traditional one with one, two, three or four wires.
- CURRENT: indicates that the probe has five wires, which optimises the measurement of the parameters. It is important to remember that if this probe is installed on the vehicle, the yellow wire of the KIT SLY-INJECTION harness does not have to be connected because the displayed values cannot be read by electric systems. The actual connection of the probe could alter the information transmitted to the PETROL ECU.

If the probe is a current model probe, the vehicle is quite recent and it is therefore possible to use KIT EOBD, which does not require direct connections to the vehicle current probe for reading purposes (that is it does not require the connection of the yellow wire).

Enabling of the Lambda signal control **(POINT)**

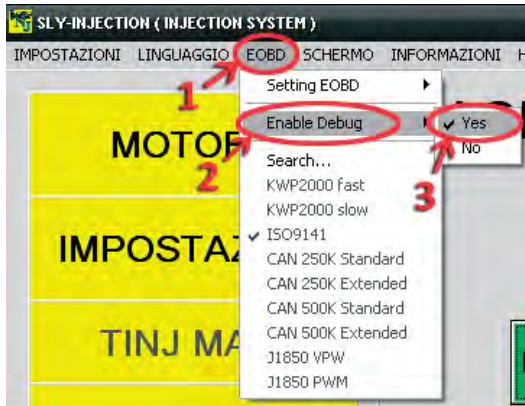
- Enable Lambda signal control: if this control is enabled, the program uses the ECU algorithms to obtain the configurations set in points 7 and 8.
- Disable Lambda signal control: the algorithms are not used and the system does not control the Lambda signal.

Straight or reversed PROBE **(POINT 3)**

- Straight probe: ordinary probe; higher values indicate that the fuel is rich, lower ones that it is lean (98%).
- Reversed probe: special probe; higher values indicate that the fuel is lean while the minimum values indicate that the carburation is lean.

ENABLING THE DEBUG FEATURE

This feature can be used to detect the errors found by SLY-INJECTION and EOBD when the corresponding connection on the vehicle socket is used. This operation is possible only if the DEBUG feature is selected. To enable the DEBUG select EOBD [1], Enable Debug [2] and click Yes [3].



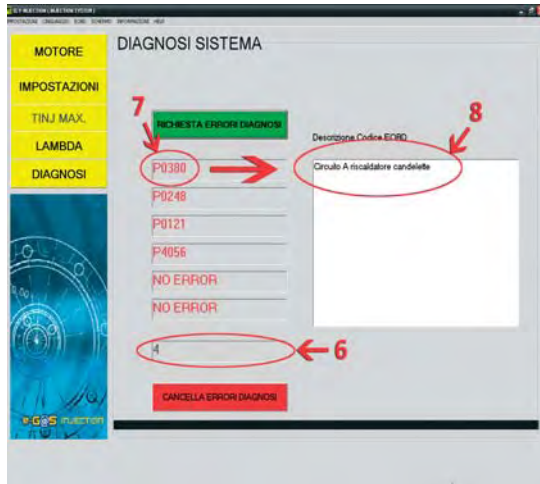
If the DEBUG feature is enabled, the SLY-INJECTION ECU stores the EOBD and system errors in its internal memory. To display them, click DIAGNOSIS [4] in the left menu, then DISPLAY DIAGNOSTIC ERRORS [5].

The errors are displayed with the corresponding codes shown in the boxes under the request button. The lower box [6] displays the number of errors, the boxes above the code of each error.



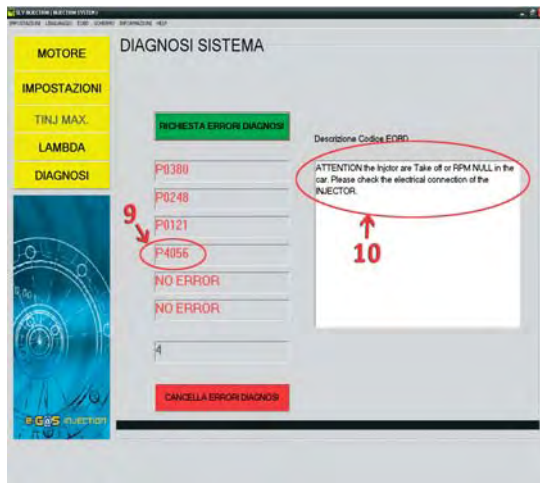
HOW TO DISPLAY THE DESCRIPTION OF AN ERROR CODE

To display the description of an error in the right box [8][10], click the corresponding code.



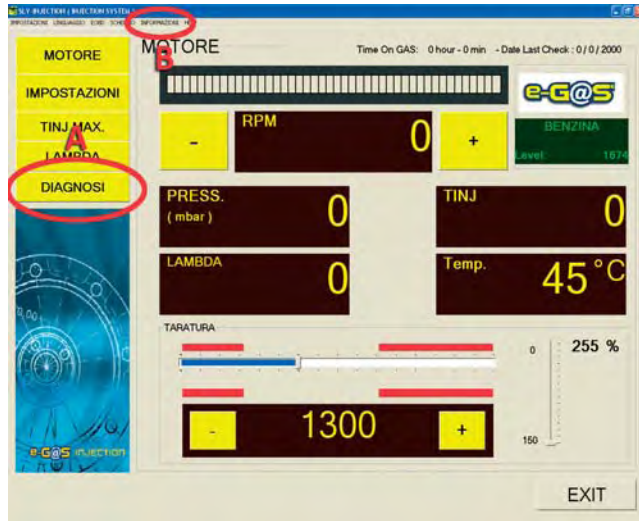
TYPES OF ERRORS DISPLAYED

Errors can be EOBD system errors (P0xxx) [7] or SLY-INJECTION system errors (P4xxx) [9]. The letters in front of each code number indicate the type of error to which the string refers.



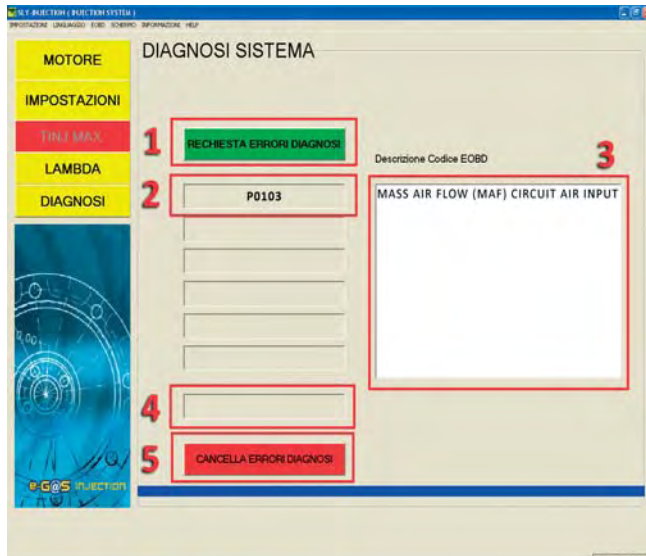
GAS SYSTEM DIAGNOSTIC ERRORS

MAIN SCREEN



A) DIAGNOSIS

To open the Diagnosis screen of the ECU, click "DIAGNOSIS", as shown in the highlight of the "MAIN SCREEN". The following screen displays:



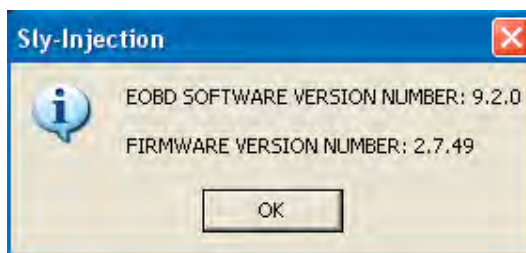
EOBD saves the errors that occur when the vehicle is operated with the SLY-INJECTION ECU before deleting them.

To display these errors, click "DISPLAY DIAGNOSTIC ERRORS" [1]. The lower text boxes [2] display the codes of all the errors found (in this example P0103). You also display the description of an error [3] by double clicking it. The last text box [4] displays the numbers of errors found. Click "DELETE DIAGNOSTIC ERRORS" [5] to delete all the errors stored in the ECU.

B) INFORMATION

Click the "INFORMATION" Menu to display the version of the program running on SLY-INJECTION and on the ECU.

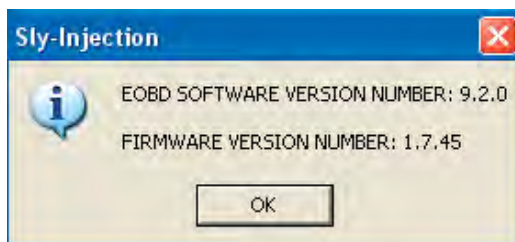
SLY-INJECTION EOBD ECU REV.2008



SLY-INJECTION LAMBDA ECU REV.2008

FIRMWARE description VERSION NUMBER (A.B.CC):

- A- Type of ECU: 1 = LAMBDA , 2 = EOBD
- B- ECU version: 7 = Rev. 2008
- C- Progressive number of software version



INSTRUCTIONS FOR THE CONNECTION OF EOBD

Available protocols

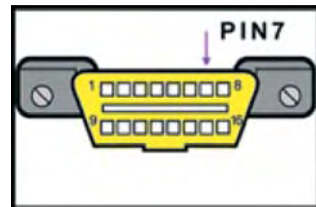
- KWP 2000 Fast
- KWP 2000 Slow
- ISO 9141
- CAN 250k STANDARD
- CAN 250k EXTENDED
- CAN 500k STANDARD
- CAN 500k EXTENDED

INSTRUCTIONS FOR THE CONNECTION OF EOBD - SERIAL LINE



Available protocols

- (2) KWP 2000 Fast
- (3) KWP 2000 Slow
- (4) ISO 9141

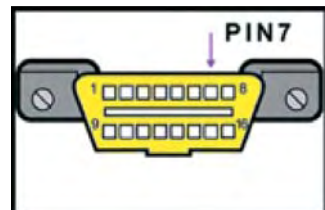


INSTRUCTIONS FOR THE CONNECTION OF EOBD - CAN LINE



Available protocols

- (5) CAN 250k STANDARD
- (6) CAN 250k EXTENDED
- (7) CAN 500k STANDARD
- (8) CAN 500k EXTENDED

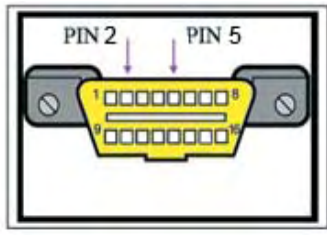


INSTRUCTIONS FOR THE CONNECTION OF EOBD - J1850 VPW



Available protocols

- (9) J1850 VPW

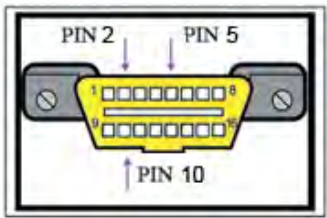


INSTRUCTIONS FOR THE CONNECTION OF EOBD - J1850 PWM



Available protocols

- (10) J1850 PWM



RESTORING THE SLY-INJECTION PROGRAM

To reset the Sly-Injection program, follow this procedure:

1. Insert the CD of the Sly-Injection software in the drive.
2. If the setup program does not start automatically, select "My Computer" and double click the CD icon.



3. After the program has been loaded, following screen displays: Select "Restore", then click "Next >";



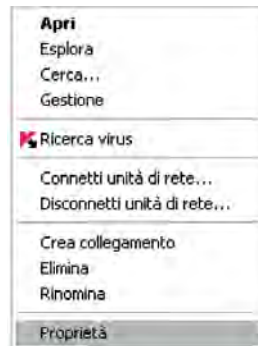
4. Wait for the setup to complete and click "End".

HOW TO CHANGE THE SERIAL PORT NUMBER (COM)

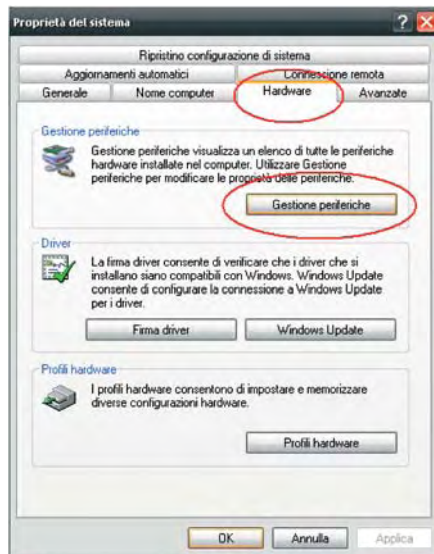
1. RIGHT click “My Computer” on the desktop;



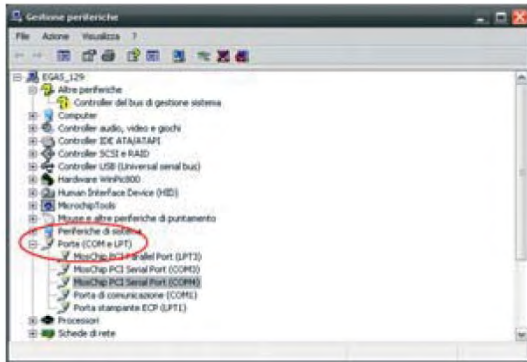
2. Double click “Control Panel” and select “Properties”.



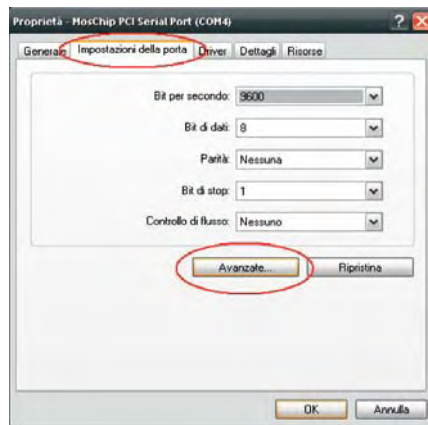
3. Select the “Hardware” tab and click “Device Manager”.



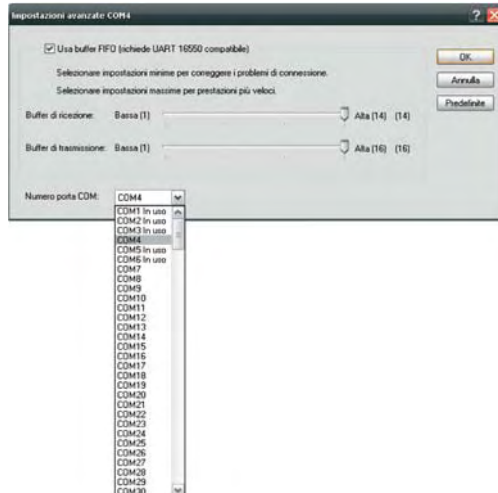
4. Select “Ports (COM and LPT)” and double click the port you wish to change.



5. Select “Port Settings” and click “Advanced...”.



6. Select the port you wish to use from the dropdown menu “COM Port Number”.



HOW TO CHANGE THE SERIAL PORT NUMBER (COM)

JAGUAR PETROL FUEL EMULATOR

PRODUCT CODE 1.019.C016

INSTALLATION

1. Measure the voltage on the sensor terminals using a multimeter. Verify that the vehicle is on and that the connector is inserted.
2. The wire that has to be connected to the green wire of the emulator has a voltage ranging from 2 and 3.5V, depending on the petrol pressure (it may differ on some vehicle models). Accelerate and verify that the value changes accordingly.
3. The voltage of the other wires should be respectively +5V and 0V (ground).
4. The output voltage increases when the vehicle is running on GAS. Adjust the trimmer until the voltage on the signal wire (white-blue) matches the voltage output by the sensor when the vehicle is running in petrol mode (see point 2).

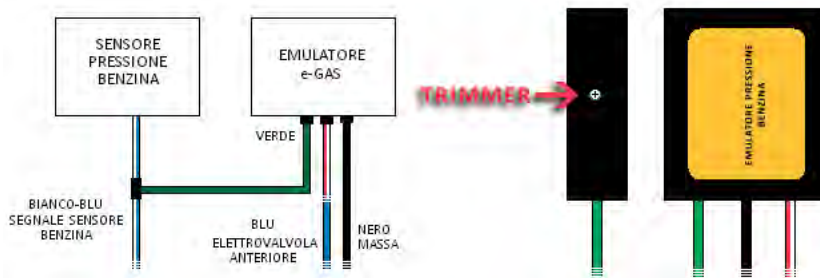
OPERATION

The emulator is designed to maintain the voltage on the petrol pressure sensor terminals stable on Jaguar vehicles when they are running on GAS in order to prevent the Check-Engine indicator from switching on. This problem originates from the increase of the pressure on the petrol injector rails, which occurs when the vehicles is running on gas, and from the consequent increase of the voltage on the signal wire (white-blue).

The emulator can be installed on the following vehicle models:

- Jaguar X-Type 2.5i V6 24v Multipoint '02 – XB (OBD) Engine code WB
- Jaguar X-Type 3.0i V6 Engine code WB
- Jaguar S-Type 3.0 V6 SPORT Engine code FB

INSTALLATION DIAGRAM



HEATING CIRCUIT

Red wire = 12 V battery with 10A fuse

Black wire = GROUND

Green wire = Pin 21 of 56-way GAS ECU connector

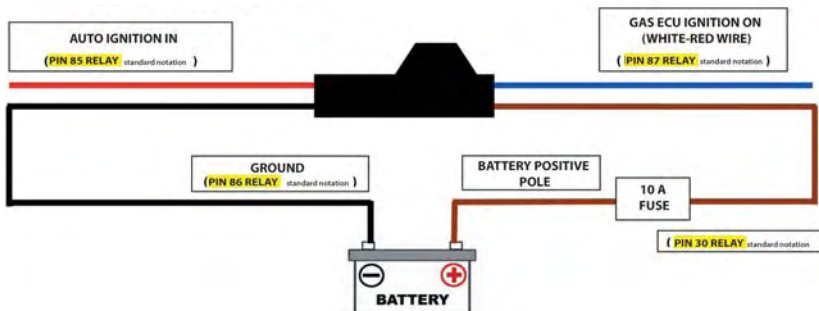
White wire = Ignition 1, take the wire of pin 14 of the 56-way GAS ECU connector



Product
code 425.113

IGNITION ON

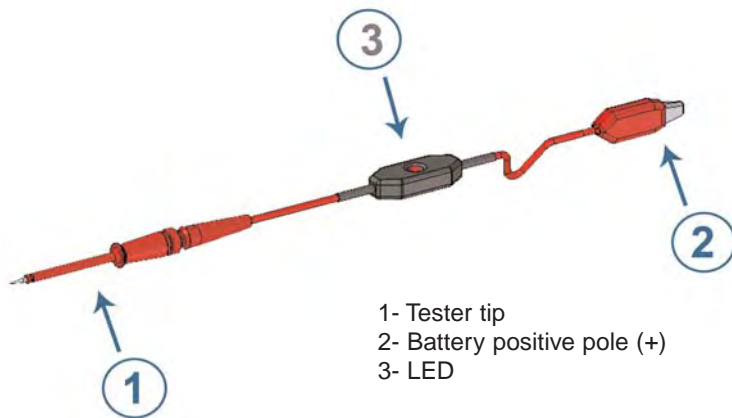
Product code 0.021.C009



INJECTOR SIGNAL DIAGNOSTICS

Description

This device enables to locate the position of the control signal of a petrol injector connected to one of the two wires of the original connector.



Procedure

Switch the vehicle engine on and locate the connector of one of the petrol injectors.

Connect terminal 1 to the positive pole of the battery and use tip 1 to test the electric connection of the wire chosen above in order to verify that the injector control signal is present in this location.

The LED on the device (see point 3) starts blinking when it is positioned on the control signal of the petrol injector, but remains off if the tip is positioned on the feeding position of the petrol injector.

Amplified RPM FILTER

RPMP FILTER This circuit amplifies and filters the impurities present in the romp signal acquired from the coil or from a generic signal of the vehicle.



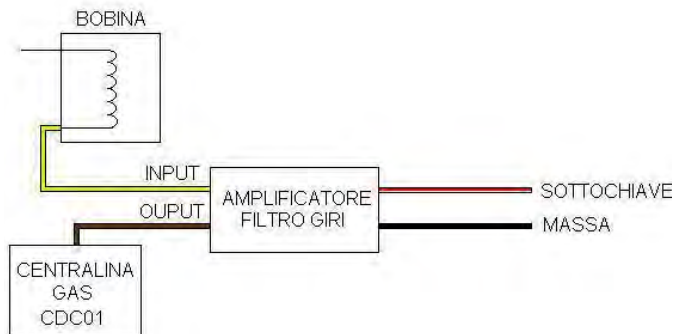
CONNECTIONS

Brown wire

Connect the output signal of the brown wire to the input brown signal of the device used to measure the amplified revolutions after the removal of signals.

Yellow wire

Connect the yellow signal wire to the coil or to the rpm signal wire that has to be cleaned.





Series of horizontal dotted lines for writing notes.



NOTES

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