



*Quality, innovation and customer care, it's in our nature*



## **Installation manual Dedicated PART 2/2**

MANUFACTURER	Ford
TYPE	C-Max Ecoboost 110Kw
ENGINE DISPLACEMENT	1600
NUMBER OF VALVES	16
ENGINE CODE / NUMBER	JQDA / JQDB
VEHICLE CATEGORIES	M
TRANSMISSION	mt
VERSION	Direct LiquiMax-2.0
PETROL ECU MANUFACTURER / CODE	Bosch MED 17.0
HIGH PRESSURE PETROL PUMP	Bosch HDP-5-PE BM5G 0261.520.(076)/(077)
HIGH PRESSURE PETROL INJECTOR	Bosch
MODEL YEAR:	2011
SYSTEM APPROVAL NUMBER ( R115 )	E4-115R-000009 / DLM-LPG 02
LOCATION SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	347/070001/A
MANUAL NUMBER	076/0703400
DATE	2014-04-03



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**FOR EXPLANATION AND CIRCUIT DIAGRAMS SEE : INSTALLATION MANUAL GENERAL PART 1 / 2**



## General instructions

- The installation of the system shall be done in accordance with the installation manual provided by Prins Autogassystemen.
- This manual is based on Dutch regulations, always install the system in accordance to the local regulations.
- For an optimal functioning of the Direct LiquiMax system, maintain a clean and organized work environment during installation and maintenance to prevent pollution of the LPG components.
- Always download the “general manual 1/2 “ from our website for basic instructions and diagrams.
- Always disconnect the battery when installing the LPG system. Make sure the ignition key is outside the car. Be aware of central door locking, radio / telephone memory code, alarm system.
- Wear safety goggles when working on petrol filled system / connections ( pressurized petrol )
- Do not place the main fuse into the fuse holder before having completed the installation of the system.
- The AFC has to be activated by means of the Prins diagnosis software.
- Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the wiring harness, ensure that it does not run near any of the ignition components.

Solder and insulate all electrical connections.

The wires in the loom are provided with numbers and text. The text on the wire explains the function of the wire. The wire harness is not model specific, therefore it may be necessary to adjust the length of the wires. Ensure maximum care is taken when connecting wiring.

Make professional joints using solder and shrink sleeve. Do not stretch the wiring harness.

- No component of the LPG-system shall be located within 100 mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- If holes have to be drilled (wear safety glasses) for installing brackets, etc., the drilled holes must always be treated with an anti-corrosion agent, after the chips have been removed ( especially when mounting a exterior filler into body work).
- After having completed the installation, check the whole system for LPG leakage; use a LPG leak detection device. Also check for leak of engine coolant, petrol and air.
- Fitting and maintenance is only allowed by Prins Autogassystemen selected LPG engineers.
- Failure to follow the instructions in this manual can result in a poor or non-working LPG installation or a dangerous situation.
- For maintenance instructions and filter registration see owner manual.
- Prins Autogassystemen is not responsible for any damages to people or objects as a result of changes to Prins products.
- Check our website regularly for diagrams, certificates, updates, info-bulletins and product information.

Register ( warranty card ) the system on the Prins warranty portal .



## Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox ( wrenches, screwdrivers, cutters, pliers, ratchet, sockets )
- Car lift
- Portable computer : operating on Windows 98, W2000 or XP.
- Internal memory : 16 Mb or more
- Memory HD space : 5MB
- Screen : 256 colours, advise colours 16 bits or more
- Com port : 1 free COM port 1 or COM port 2 with a 9 or 25 pins connector
- Vehicle fuel system scan tool or OBD scan tool Prins ( part nr. 099/99928 )
- Exhaust gas analyser
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins serial interface
- Torque wrench ( 10Nm )
- Torque wrench ( 200-250Nm )
- Portable light
- Assortment drill bits 4 to 12 mm
- Assortment cutters ( ø 20, 30, 50, 70 mm )
- Portable drill or pneumatic drill
- Thread cutting device ( male M6x1, M8x1, M10x1 )
- Socket 46mm
- Air gun
- Vacuum cleaner
- Safety goggles
- Hot air gun
- Soldering iron, soldering tin
- Wire-stripping pliers
- Adhesive tape
- Adhesive sealant
- Thread locking compound
- Anti-corrosion agent / black body coating
- Gas leak detection device or foam leak spray
- Shrink sleeves
- Engine coolant

## Vehicle check

- Check the vehicle drivability on petrol
- Check the fuel system for error codes ( scan tool )
- Check if the catalytic converter is in good condition ( exhaust gas analyzer )
- Check the condition of the ignition system ( spark plugs, cables, coil )



### Tightening moments

	Nm	SW
M 4 x 0,7	3,3	7
M 5 x 0,8	6,5	8
M 6 x 1,0	11,3	10
M 7 x 1,0	14,5	11
M 8 x 1	24,5	13
M 8 x 1,25	27,3	13
M 10 x 1	52	15-16-17
M 10 x 1,5	54	15-16-17
( filtered )Banjo bolt	10	14
Supply line connection	15	13
Fuel module Allen bolts	20	7
Filler hose connection	50	22

#### EXPLANATION OF SYMBOLS :



= IMPORTANT,  
CAUTION

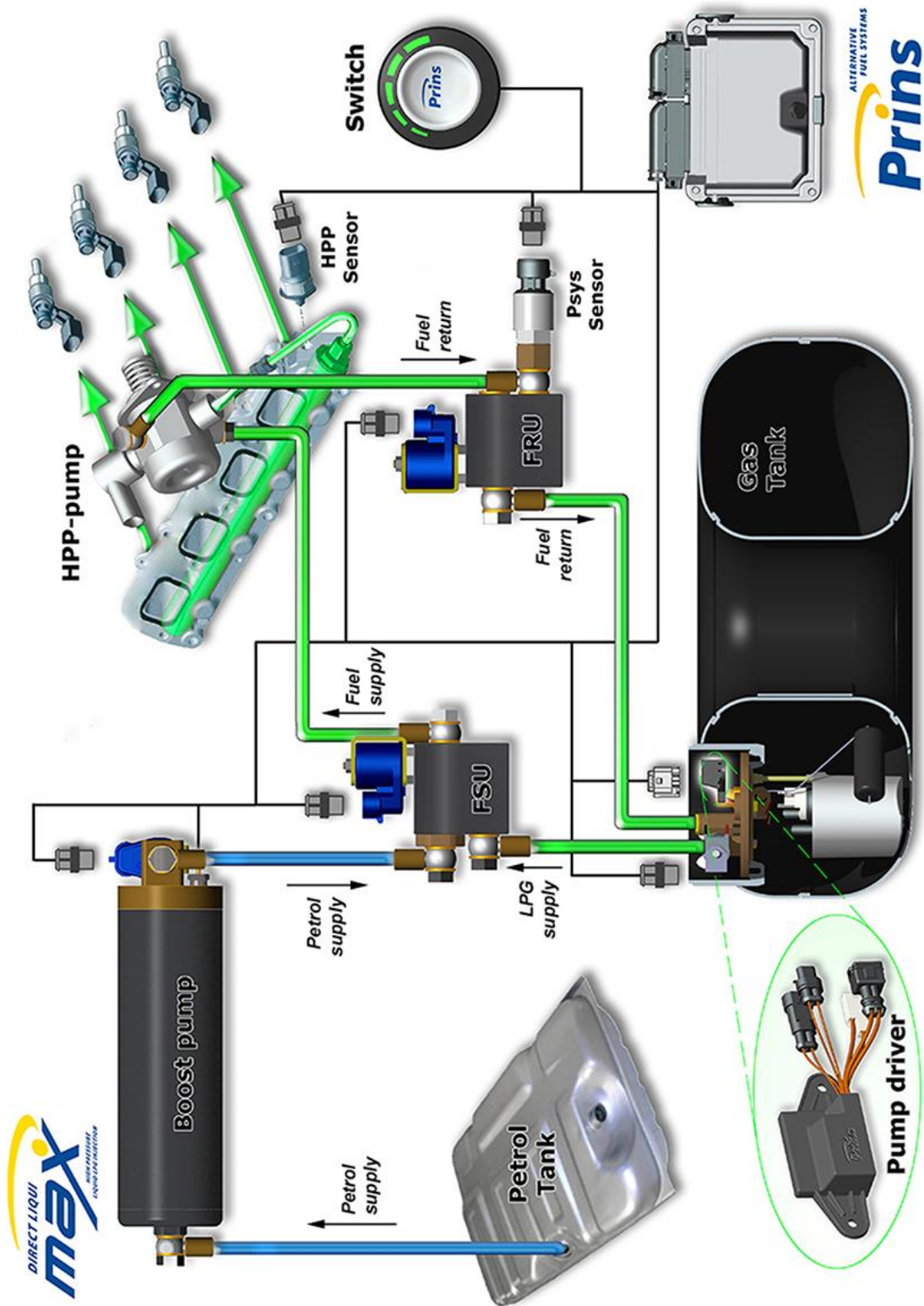


= WEAR SAFETY GOGGLES



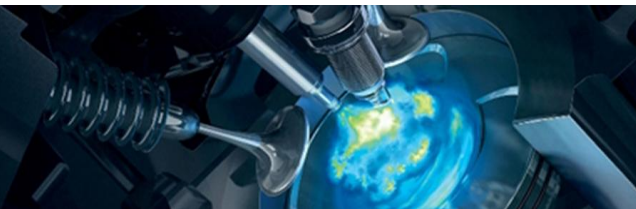
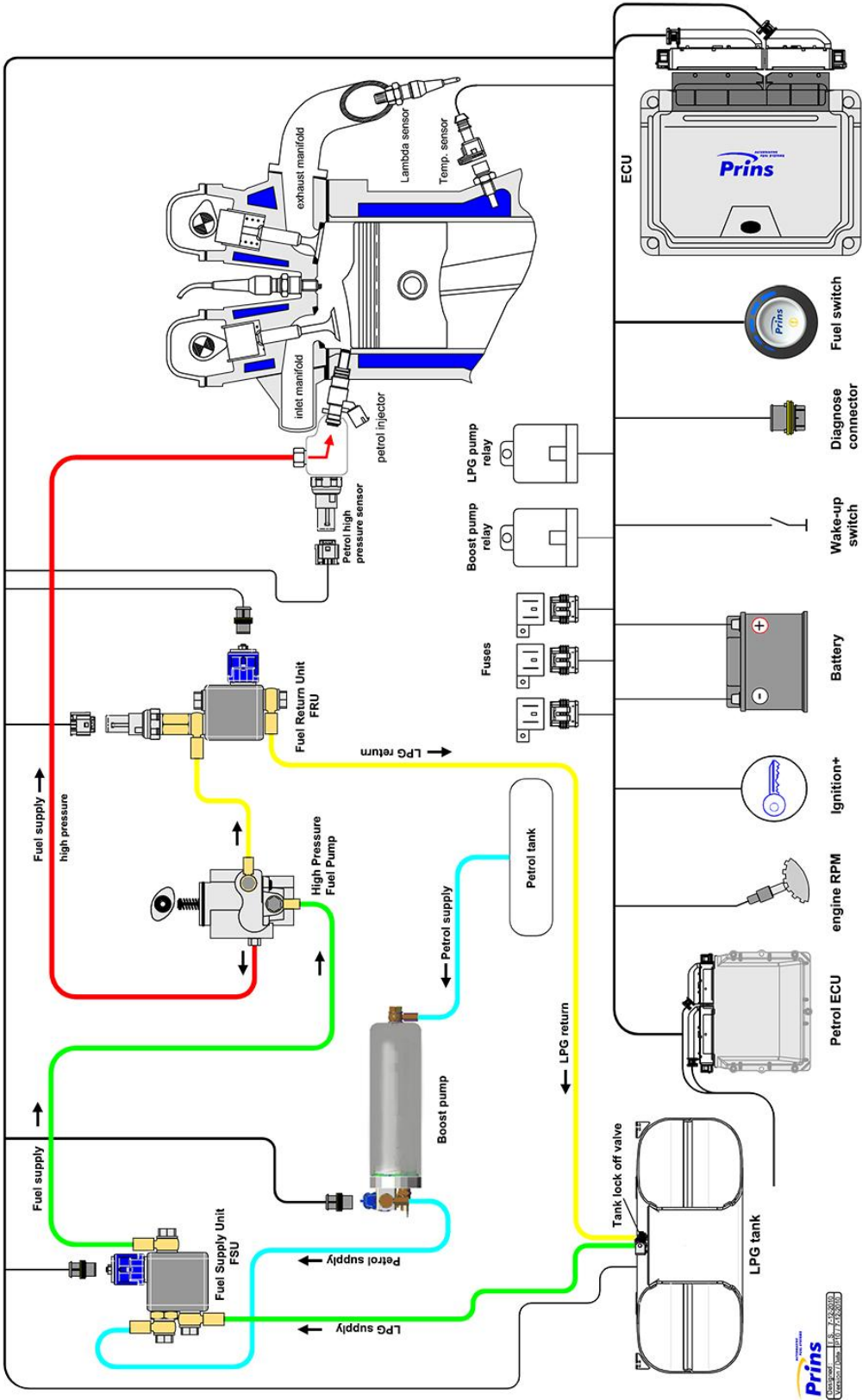


Direct LiquiMax



Overview Direct LiquiMax

overview Direct Liqui Max



## Direct LiquiMax parts / approval numbers

 <p>1<sup>st</sup> generation</p>  <p>2<sup>nd</sup> generation</p>	 <p>1<sup>st</sup> generation</p>  <p>2<sup>nd</sup> generation</p>
<p>Fuel Supply Unit : E4-67R-010269</p>	<p>Fuel Return Unit : E4-67R-010270 Pressure Sensor : E4-67R-010051</p>
	
<p>Boost pump</p>	<p>High Pressure Pump : E4-67R-010266 High Pressure Rail : E4-67R-010267 High Pressure Injectors : E4-67R-010309</p>
	 <p>XD-3 LPG</p>  <p>XD-4 LPG</p>
<p>Prins ECU : E4-67R-010098 E4-10R-030507</p>	<p>Fuel lines series XD : E4-67R-010247 XD3 E4-67R-010247 XD4</p>





Mounting and connection points



A : High pressure petrol pump	L : R115 Approval sticker
B : Fuel Supply Unit : FSU	M : Grommet
C : Fuel Return Unit : FRU	N : Gas system fuses
D : Boost pump	P : T-ect
E : AFC	Q : Low pressure petrol sensor signal
F : Boost pump relay	R : MAP, Analog 3
G : Tank relay	S : Analog 2
H : Petrol ECU	T : Analog 4
I : Engine speed signal RPM	V : Digital input 3
J : “+” ignition	W : Wake-Up
K : High pressure petrol sensor signal	X : Digital input



L:  
R115 approval sticker :  
Right side centre door post



## Removal of the Bosch High Pressure Pump

### -REMOVAL-

#### -WARNING-

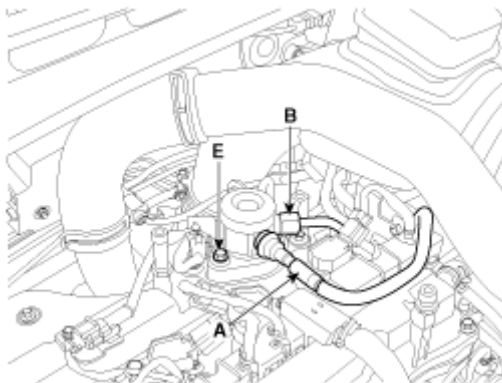
In case of removing the high pressure fuel pump, high pressure fuel pipe, delivery pipe, there may be injury caused by leakage of the high pressure fuel.

Don't do any repair work right after engine stops ( HOT engine ).

- Turn the ignition switch OFF and disconnect the battery negative (-) cable.
- Wear safety goggles.
- Disconnect the fuel pressure regulator valve connector
- Disconnect the High Pressure fuel feed pipe (B)
- Remove the Low Pressure fuel pipe / hose (A).
- Remove the installation bolts (E), and then remove the high pressure fuel pump from the cylinder head assembly.

#### CAUTION:

Unscrew in turn the two bolts in small steps (0.5 turns). In case of fully unscrewing one of the two bolts with the other bolt installed, the housing surface of the cylinder head may break because of tension of the pump spring.



**CAREFULLY** store the removed petrol pump. Make sure no pollution can come into the pump.

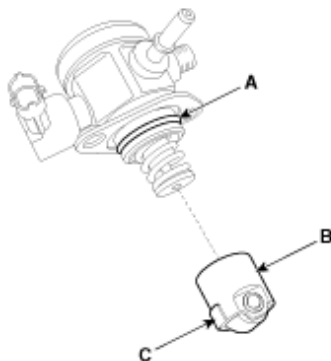


## Installation of the Bosch High Pressure Pump

### INSTALLATION

Before installing the high pressure fuel pump, position the roller tappet ( **B&C** ) in the lowest position by rotating the crankshaft. Otherwise the installation bolts may be broken because of tension of the pump spring.

Apply engine oil to the O-ring ( **A** ) of the high pressure fuel pump, the roller tappet ( **B** ), and the protrusion ( **C** ). ( roller tappet, only if removed from cylinder head )  
Also apply engine oil to the groove on the location where the protrusion ( **C** ) is installed.



### Installation bolts:

When tightening the installation bolts of the high pressure fuel pump, tighten and turn the bolts in small step ( 0.5 turns ) after tightening them with hand-screwed torque.

**High pressure fuel pump installation bolt:** 12.8 ~ 14.7 N.m

### Fuel pipe:

First hand-tighten the nut(s) fully until they are not fastened any more in order to have them inserted in place and then completely tighten to the specified torque using a torque wrench.  
If not tightening the bolts or nuts in a straight line with the mating bolt holes or fittings, it may cause a fuel leak due to broken threads.

**High pressure fuel pipe installation nut:** 26.5 ~ 32.4 N.m

Installation is reverse of removal.





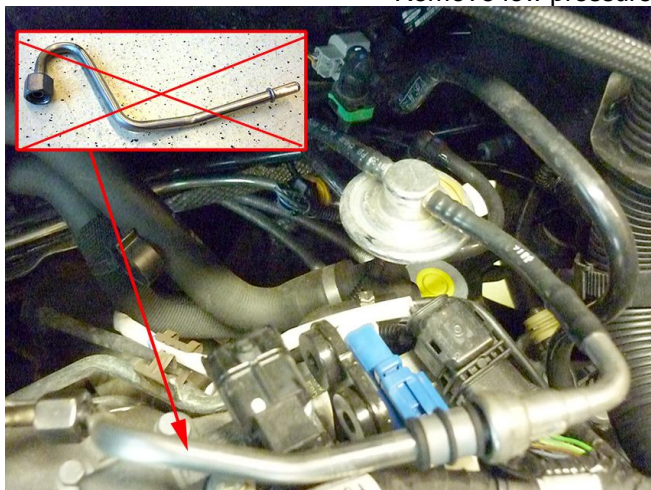
## High pressure pump installation



Replace the high pressure pump for the adapted high pressure pump.  
( Follow the workshop manual of the car )



Remove low pressure petrol line ( not used )



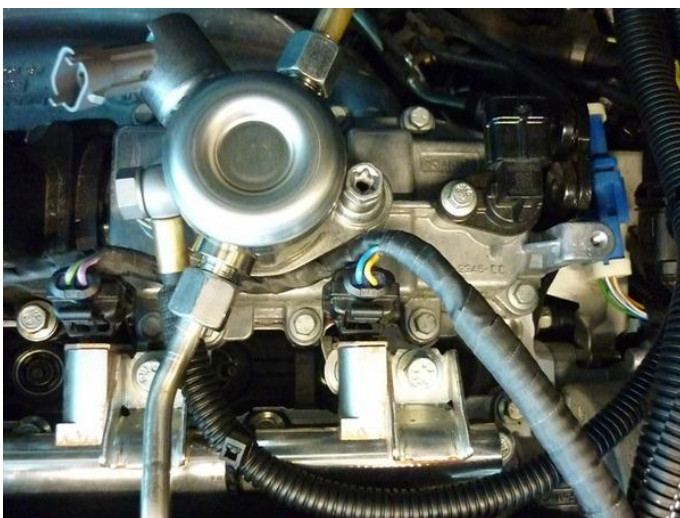
Install a new ( shorter ) bolt.





## High pressure pump return

Replace the high pressure pump for the adapted high pressure pump.  
( Follow the workshop manual of the car )





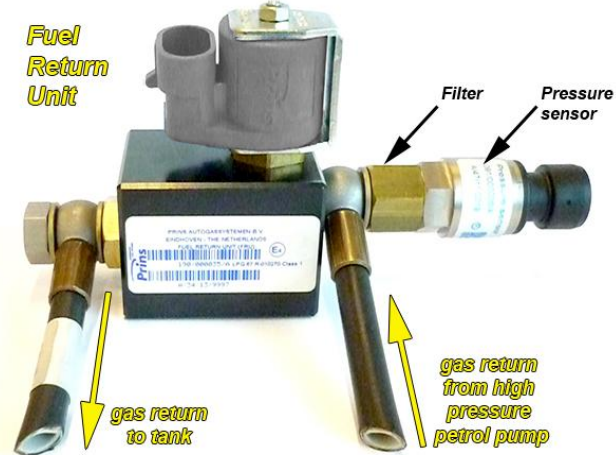
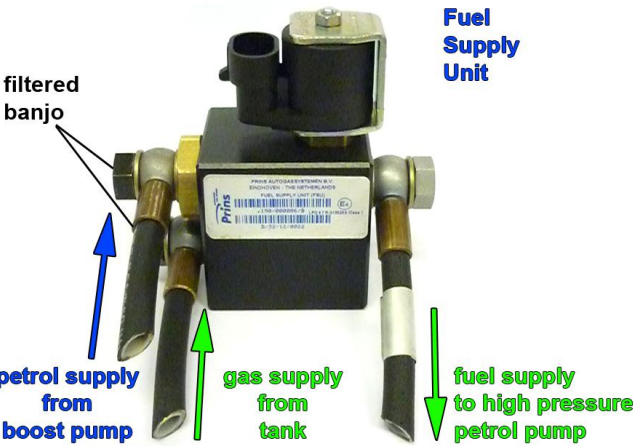
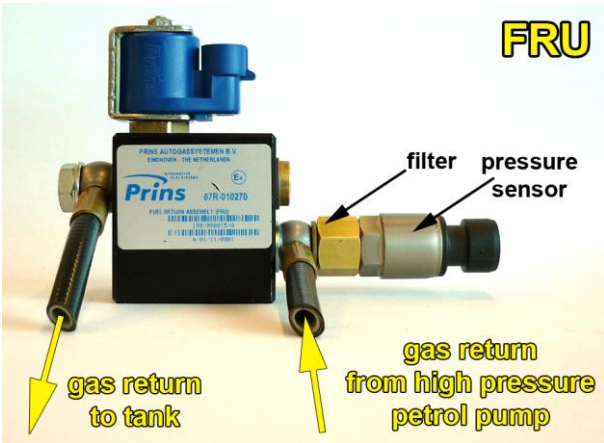
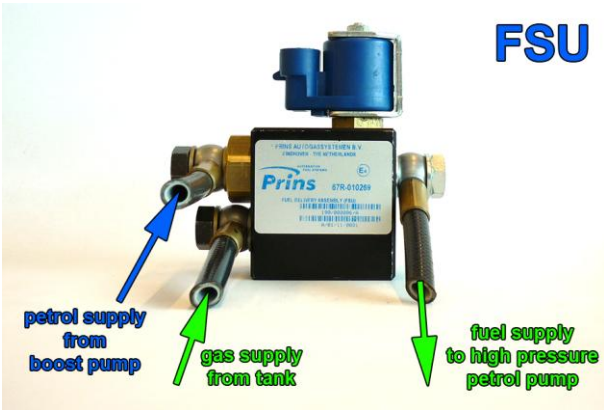
## High pressure pump



Remove bolt ( cut away )



Fuel Supply Unit / Fuel Return Unit



Black filtered banjo will only be used on inlet connections !

Filter inside sensor banjo





### Boost pump / FRU / FSU bracket





### Boost pump without Start-Stop coolant interior heating pump:

No coolant interior heating pump:



One side M8 washer plate





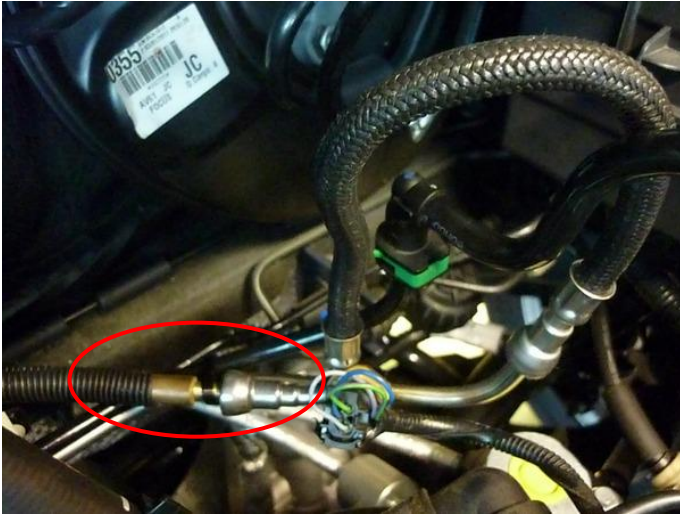
### Boost pump with Start-Stop coolant interior heating pump:





## Connection of the fuel hose to the boost pump.

Connect the fuel hoses with an adapter to the boost pump.



Original hose connected to the boost pump inlet ( petrol supply line with Low Pressure petrol sensor )



Inlet of banjo eye facing firewall



petrol supply hose under coolant hose connections



High pressure pump inlet hose

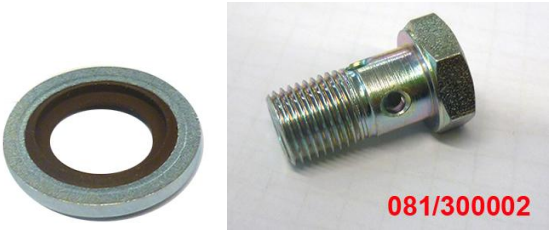


LPG / petrol fuel lines

Hose	from	to	Length ( cm )
XD-3	Adapter original petrol hose	Petrol boost pump	45
XD-3	Fuel supply unit	High pressure petrol pump	60
XD-3	Petrol boost pump	Fuel supply unit	25
XD-3	Fuel return unit	High pressure petrol pump	110
	Fuel return unit	High pressure petrol rail	n.a.



Install the fuel line using two bonded seal washers and banjo bolt :



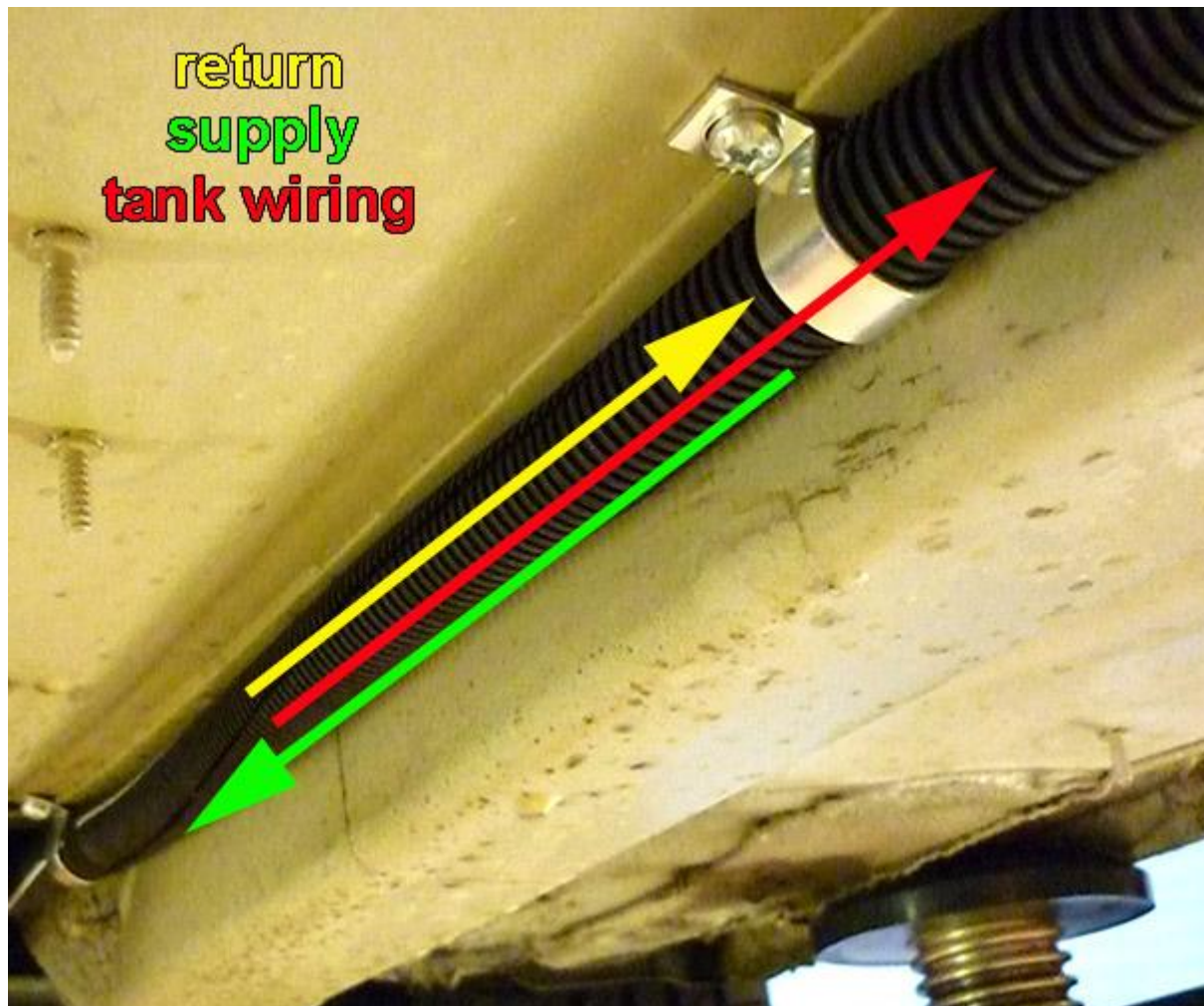
**Filtered banjo:** ( FSU supply inlets / boost pump inlet : black filtered banjo ) :



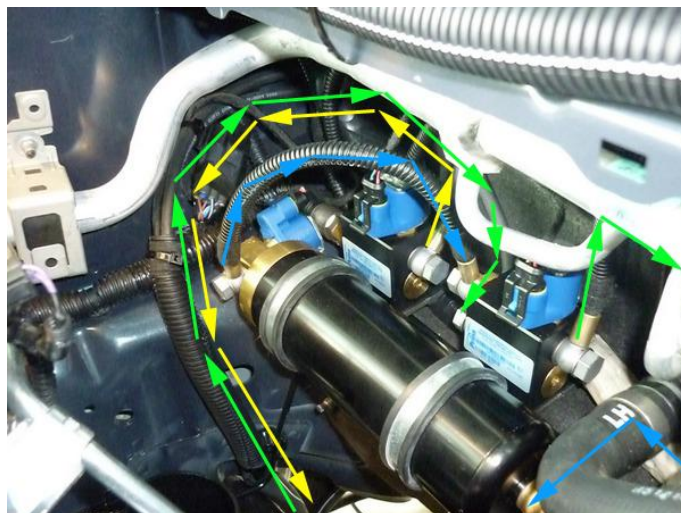


### Supply hose – Return hose – Tank wiring

Protect the supply- and return hose together with tank-wiring using the Ø16 split tube.  
Mount the "hose assembly " with clamps, with a maximum distance of 40cm.



## Hose routing





### Mounting the AFC without Start-Stop battery ( small )



## Mounting the AFC with Start-Stop battery ( large )





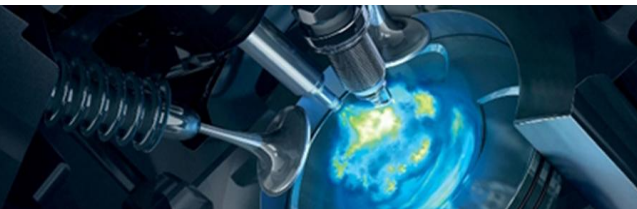
Wiring AFC / relay location



Ground



Battery+



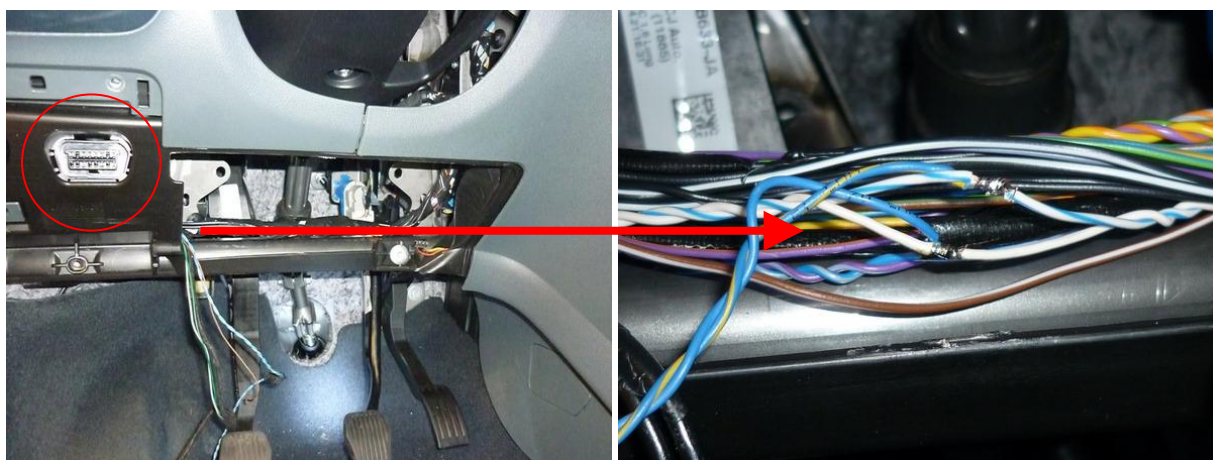


## Wiring grommet

Wiring inside : \* switch / \*CAN wiring / \* pwm wiring, 115 yellow-red wire.



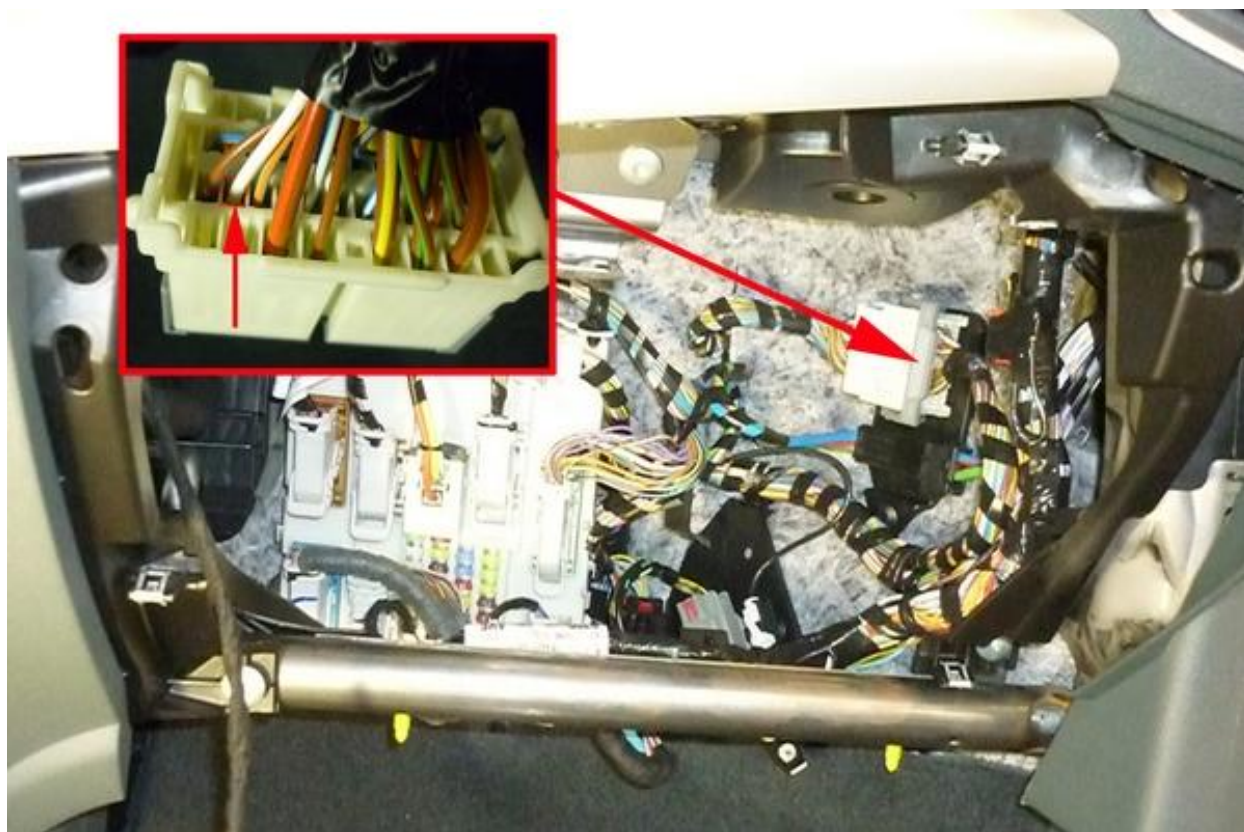
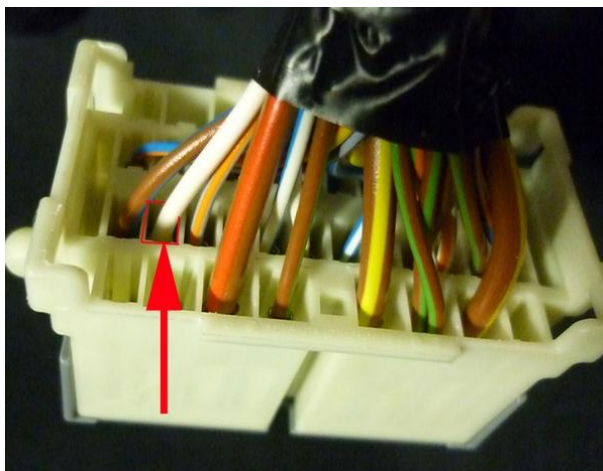
Wiring grommet in wiper box



EOBD ( CAN )



## PWM signal





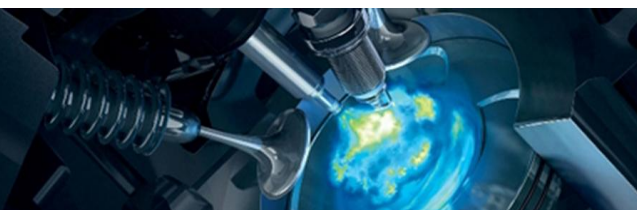


Mount the switch.

## Mounting the fuel selection switch

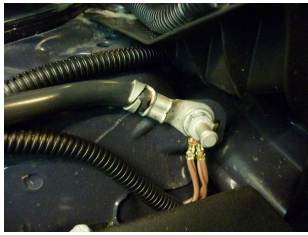



Drill Ø8.2mm



## Electrical connections

**Check and measure the wiring in case of changes in the cars wiring colours.  
Insulate not used wires.**





Wire number / code	Wire colour	Connection	
1-32 MAIN GND ecu MAIN GROUND SENSE MAIN GND pump driver MAIN GND boost pump	brown	Connect to the '-' of the battery ( -31 ) ; use a ring terminal. Wire location : battery ground	
4 – 13 – 44 +12V BATT sense +12V BATT fused +12V BATT boost pump +12V BATT pump driver	red	Connect to the '+' of the battery ( +30 ) ; use a ring terminal. Do not place the fuse in the holder before having completed the installation of the LPG system. Wire location : battery	
7      +12V IGNITION	grey - white	Make a connection to ignition + / contact + ( +15 ). Do not place the fuse in the holder before having completed the installation of the LPG system. Wire colour : green Wire location : 3-pole connector ignition coil.	





## Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.  
Insulate not used wires.

Wire number / code	Wire colour	Connection	
18 Analog 1 25 Simulation 1	Blue-red Green-grey	High pressure petrol sensor signal interruption Sensor side. ECU side. Wire colour :blue-brown, pin 2 Wire location :right side rail	
19 Analog 4	Blue-white	High pressure petrol sensor ground Wire colour :green-purple, pin 1 Wire location :right side rail	
121 Wake-up	Red-grey	High pressure petrol sensor 5Volt supply Wire colour : grey, pin 3 Wire location : 3-pole connector, petrol pressure sensor. right side rail	
17 Analog 2 10 Simulation 2	Blue-black Green-black	Low pressure petrol sensor petrol interruption Sensor side. ECU side. Wire colour :blue-brown, pin 2 Wire location : Low petrol pressure line left side engine in petrol line	
119 Digital input 2 23 Digital Simulation	Yellow-grey Green-red	Digital Airflow signal interruption Sensor side. ECU side. Wire colour :blue-green, pin 5 Wire location : Air filter box, MAF, airflow sensor.	
<b>inside</b> 115 Digital input 4	Yellow-red	Petrol fuel pump driver ( PWM in ) Wire colour : white. Wire location : see page 27.	
117 Digital input 3	Yellow-black	insulate	
6 Lambda1 WB	Orange	insulate	
42 Lambda2 WB 10KΩ	Orange-white	insulate	
97 Digital input 5	Yellow-orange	insulate	
113 Digital input 6	Yellow-purple	insulate	



## Electrical connections

**Check and measure the wiring in case of changes in the cars wiring colours.  
Insulate not used wires.**

Wire number / code	Wire colour	Connection
27 +5V sensor 37 C ground 20 Analog 3 MAP*	Red Brown Blue  Red Brown Blue	<i>For measuring the inlet manifold pressure.</i>  insulate insulate Wire colour : yellow, pin 3 Wire location : intake manifold, MAP sensor
* cut off connector: <u>Only</u> use blue signal wire 20		
8 RPM	Purple-white	<i>For measuring the engine speed signal.</i> Wire colour :purple Wire location : cam sensor, pin 2
15 T-ect	Grey	<i>For measuring the engine coolant temperature.</i> Wire colour : yellow Wire location : coolant sensor, left side





## Electrical connections

**Check and measure the wiring in case of changes in the cars wiring colours.  
Insulate not used wires.**

### Engine room

Wire number / code	Wire colour	Connection
<i>3-pole connector</i>		Connect the 3-pole connector to the Psys sensor positioned into the Fuel Return Unit.
35 C Ground pin A	Brown	Sensor wire pin A
9 +5V sensor pin B	Red	Sensor wire pin B
16 Psys pin C	Green	Sensor wire pin C
14 T-LPG	Grey	Not used, insulate.
<i>2-pole connector Boost Pump</i>	Red	Connect the 2-pole connector to the lock-off valve of the Boost Pump.
106 + Lock-off Boost Pump	White-yellow	
98 Ground lock-off		
<i>2-pole connector FSU</i>	Red	Connect the 2-pole connector to the lock-off valve of the Fuel Supply Unit
108 + Lock-off FSU	Pink-yellow	
100 Ground lock off		
<i>2-pole connector FRU</i>	Red	Connect the 2-pole connector to the lock-off valve of the Fuel Return Unit
90 + Lock-off FRU	Blue-yellow	
82 Ground lock off		
<i>4-pole diagnose connector</i>		Diagnose connector for service / diagnosis
46 Service TxD	Grey	Connector pin 1
65 Service RxD	Grey	Connector pin 2
68 C ground	Brown	Connector pin 4
<i>Boost pump relay</i>		
107 + relay boost pump	Red	Pin 86 of the boost pump relay
99 GND relay boost pump	Green-yellow	Pin 85 of the boost pump relay
+12V fused BATT	Red	Pin 30 of the boost pump relay
+12V Boost pump	Red	Pin 87 of the boost pump relay

### Driver room

<i>3-pole micro connector</i>		
66 Ground fuel switch	Brown	Connect the 3-pole connector to the Prins fuel selection switch.
3 +12V fuel switch	Red	
49 LIN fuel switch	yellow	
51 CAN-High	Blue-yellow	EOBD connector pin 6
70 CAN-Low	Blue	EOBD connector pin 14

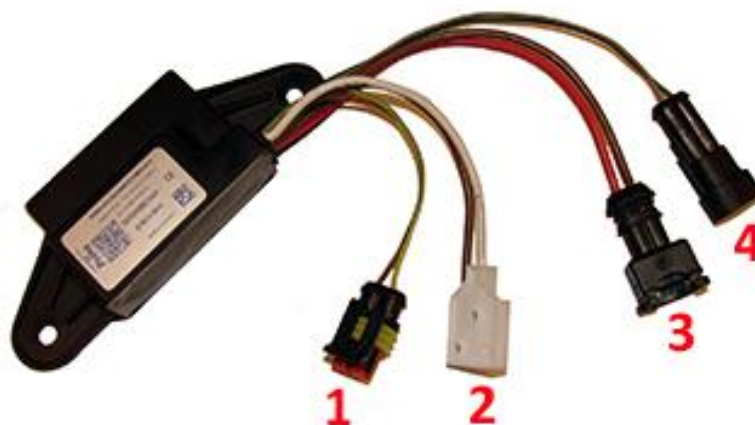


## Electrical connections

**Check and measure the wiring in case of changes in the cars wiring colours.  
Insulate not used wires.**

### LPG tank housing

3-pole tank level connector 40 Ground tank gauge 12 Tank level in 11 + tank level supply	Brown Blue Red	Connect the 3-pole connector to the tank level sensor. Connector pin 1 Connector pin 2 Connector pin 3
1. 2-pole connector tank lock-off	Green-yellow Brown	Pump driver to lock-off power Pump driver to lock-off ground
2. 3-pole fusite	Red Brown -	1. Pump power 2. Pump ground 3. not used
3. 2-pole connector tank pump	Red 2.5mm <sup>2</sup> Brown 2.5mm <sup>2</sup>	Pump driver power Pump driver ground
4. 2-pole connector	Grey Green	Pump driver diagnose Pump driver control



Wiring tank relay 2 + tank relay 26 Ground tank relay +12V BATT fused +12V pump driver	Red Green-yellow Red 2.5mm <sup>2</sup> Red 2.5mm <sup>2</sup>	Pin 86 of the tank relay Pin 85 of the tank relay Pin 30 of the tank relay Pin 87 of the tank relay
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## Checklist after installation

1. Install the system fuses.  
Turn on ignition.  
Connect the Prins interface wire and run the Prins diagnosis program.  
When working on the car, beware of moving and rotating parts in the engine compartment ( even when the engine is not running !! ).
2. When commissioning the LPG system, you must activate the AFC with the diagnosis software.
3. Check whether the program in the AFC matches with the car ( dedicated engine set ):  
See "Identification" in the diagnosis program.
4. Check all components and connections for any LPG leakage, use a LPG leak detector device or a fluid detection like soap. Also check for petrol leakage. Make sure the solenoid valves are in open position.  
No evidence of leakage is permitted.  
Caution for moving and rotating parts in the engine compartment !
5. Use the diagnosis software to check again all input and output signals.
6. Check the system for error codes and solve these, if required.  
Check the petrol MMS for EOBD error codes.  
Place the protection connector back on the diagnose connector.
7. Make a test drive and check the cars drivability on LPG and petrol.

