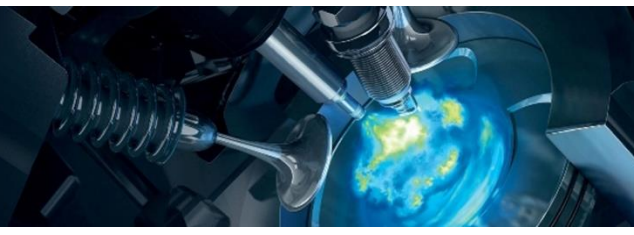
ALTERNATIVE FUEL SYSTEMS

Prins

installation manual
Engine Kit
part 2/2

ANUFACTURER	Hyundai // **Kia**
TYPE	Tucson (TL) // **Sportage**
ENGINE DISPLACEMENT	1591
NUMBER OF VALVES	16
ENGINE CODE / NUMBER	G4FD (1.6) - 97kW / G4FJ (1.6T) - 130kW
VEHICLE CATEGORIES	M
TRANSMISSION	AT/MT
AFC VERSION	AFC-2.1
PETROL ECU MANUFACTURER / CODE	Kefico 39110-2BRN0 / CPEGD 2.20.3
PETROL ECU MANUFACTURER / CODE	Kefico 39118-2BCH0 / CPEGD 2.20.3
PETROL ECU MANUFACTURER / CODE	Kefico 39199-2BBD0 / CPEGD 2.20.3
HIGH PRESSURE PETROL PUMP	Kefico 35320-2B410 / Kefico 35320-2B420
HIGH PRESSURE PETROL INJECTOR	Kefico
MODEL YEAR:	2018 -
SYSTEM APPROVAL NUMBER (R115)	E4-115R-000017 / DLM-LPG 10
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER G4FD 2018-	349/070316021/A / **349/075216021/A**
ENGINE SET NUMBER G4FJ 2018-	349/070316031/A / **349/075216041/A**
MANUAL NUMBER	076/0911000-2
DATE	2019-08-13



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

Manual updates / revision

Rev. nr	Rev. Date	Subject update
1	2019-04-16	Start with revision management
2	2019-08-13	Manual updated – Page wake-up (wire 56, DI2, yellow-green) removed.

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 Gen3 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.
- When working on the car, beware of moving and rotating parts in the engine compartment (even when the engine is not running !!).
- Always **disconnect the battery when installing / servicing** 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 the 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 is 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 debris has been removed (especially when mounting an exterior filler into body work).
- After having completed the installation, check the whole system for LPG leakage; use a gas 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 see owner’s 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 the system (with warranty card) on the Prins warranty portal within 14 days after installation.
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Required equipment / tools / materials for installing a complete system

- Complete workshop toolbox (wrenches, screwdrivers, cutters, pliers, ratchet, sockets)
- Car lift
- Portable computer
- 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 (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits 4 to 12 mm
- Forstner Ø32mm drill
- Assortment cutters (Ø20, 30, 50, 70 mm)
- Portable drill or pneumatic drill
- Thread cutting device (male M6x1, M8x1, M10x1)
- 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

Vehicle check

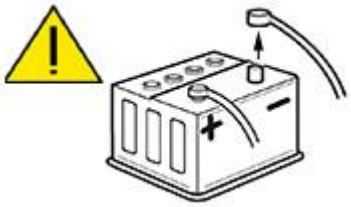
- Check the vehicle drivability on petrol
- Check the fuel system for error codes (scan tool)
- Check if the catalytic converter is in good condition (exhaust gas analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)

Tightening moments

		Nm	Spanner mm
M 5 x 0,8		6.5	8
M 6 x 1,0		11.3	10
M 8 x 1,25		27.3	13
M 10 x 1,5		54	15-16-17
Banjo bolt		10	14
Supply line connection tank		15	13
Fuel module Allen bolts tank		20	7
Filler hose connection tank		50	22
Boost pump M6 mounting bolts		10	10
FMU M6 mounting bolts		10	10
High pressure petrol fuel line		24-35	17
Quick-release		20	19

EXPLANATION OF SYMBOLS :

= IMPORTANT, CAUTION

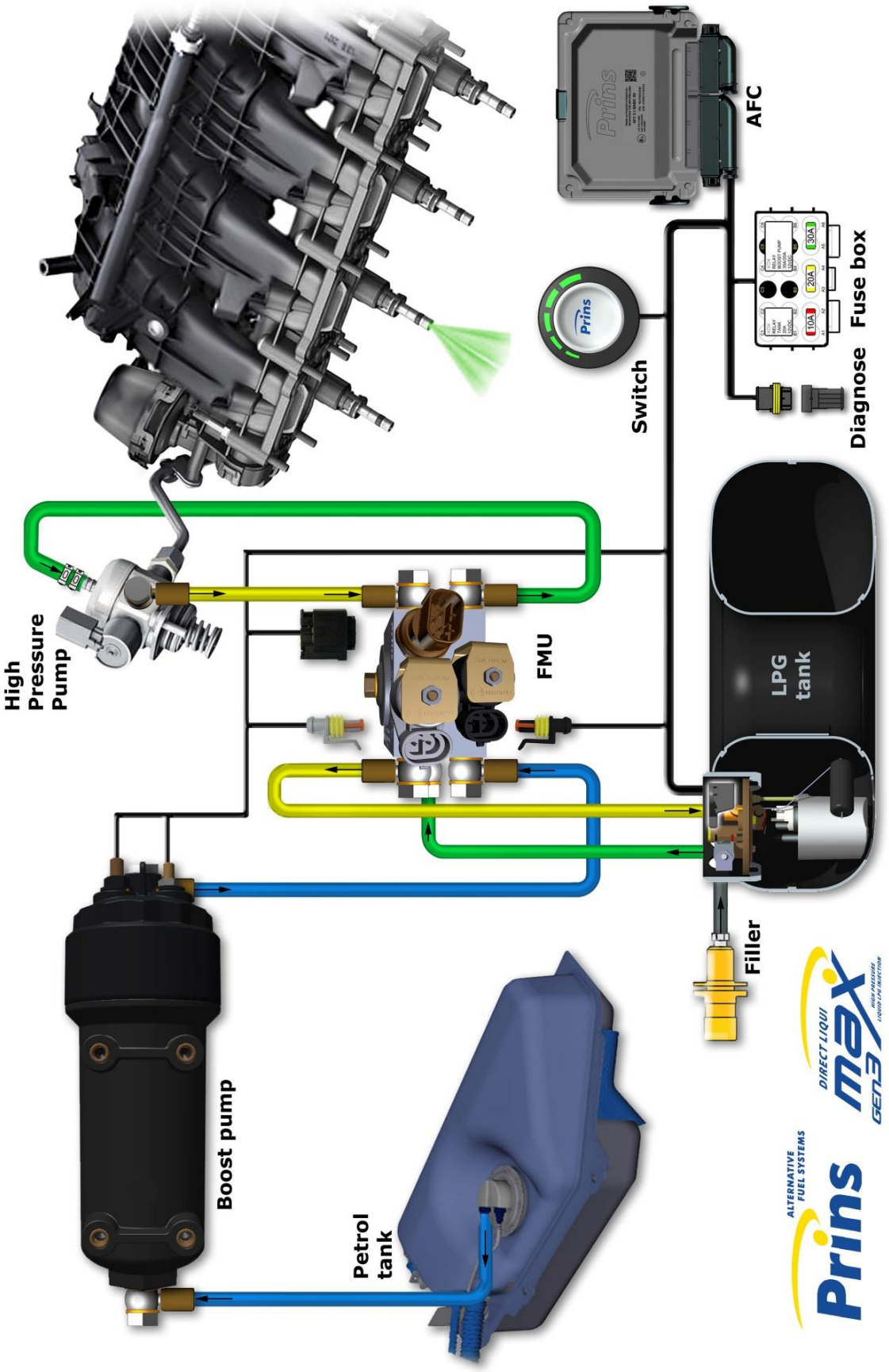


= WEAR SAFETY GOGGLES

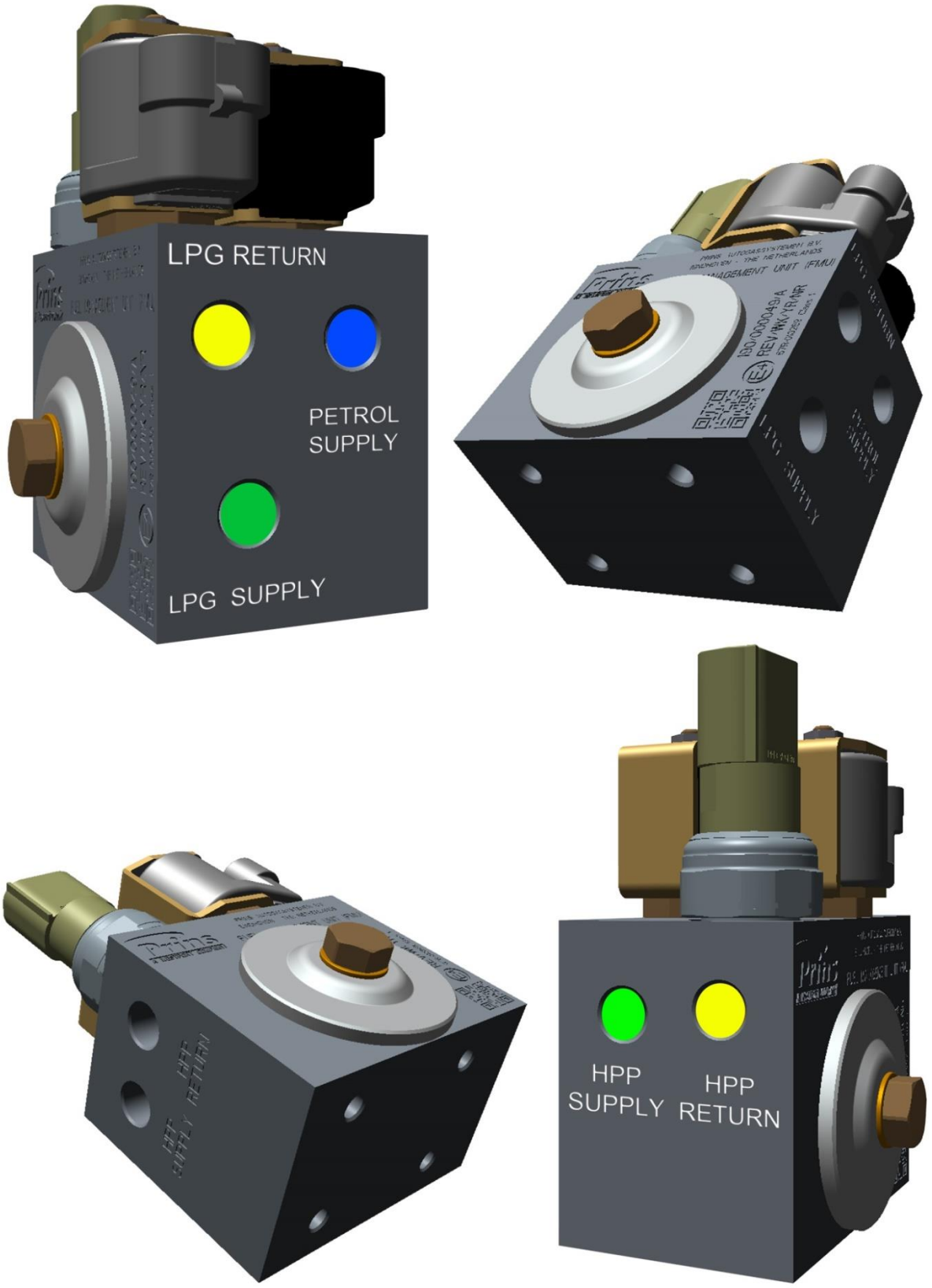
Direct LiquiMax parts / approval numbers

	
Fuel Management Unit : E4-67R-010269	Boost pump
 	
Prins AFC: E4-67R-010098 E4-10R-030507	High Pressure Pump : E4-67R-010266 High Pressure Rail : E4-67R-010267 High Pressure Injectors : E4-67R-010309
	
	Fuel lines XD- series : E4-67R-010247

Overview DLM Direct Injection



Fuel Management Unit connections



Fuel Management Unit

Boost pump

DLM component location overview

(overview from G4FJ)

HPP pump

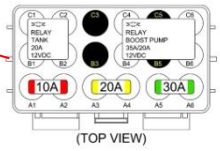
Petrol ECU

FMU

AFC

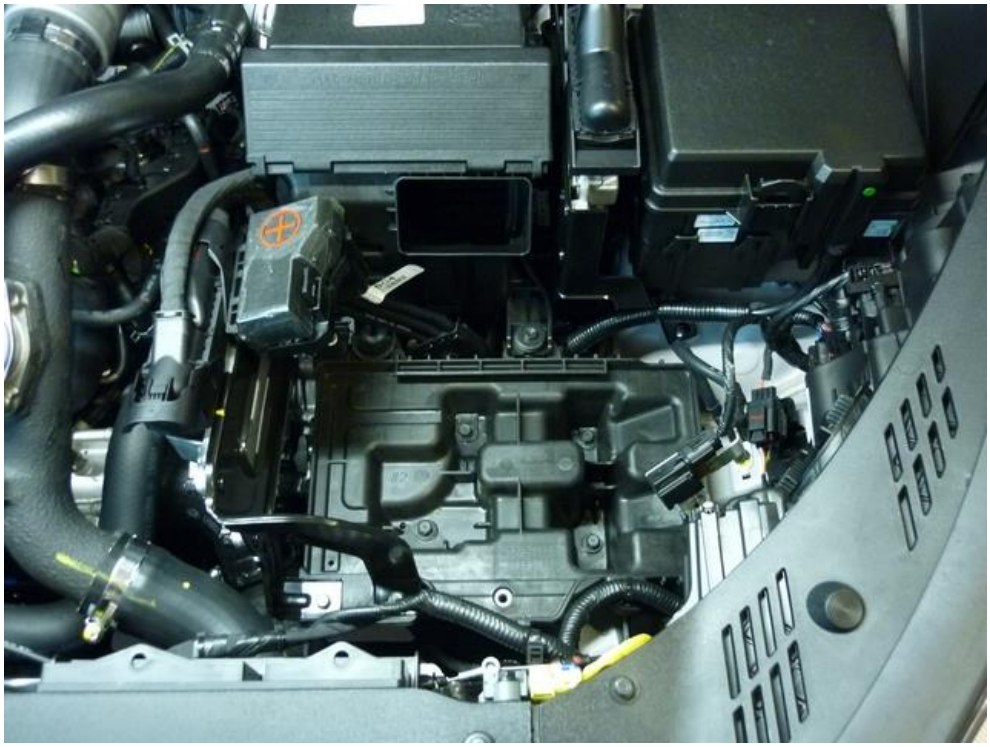
Boost pump

Fuse / relay box

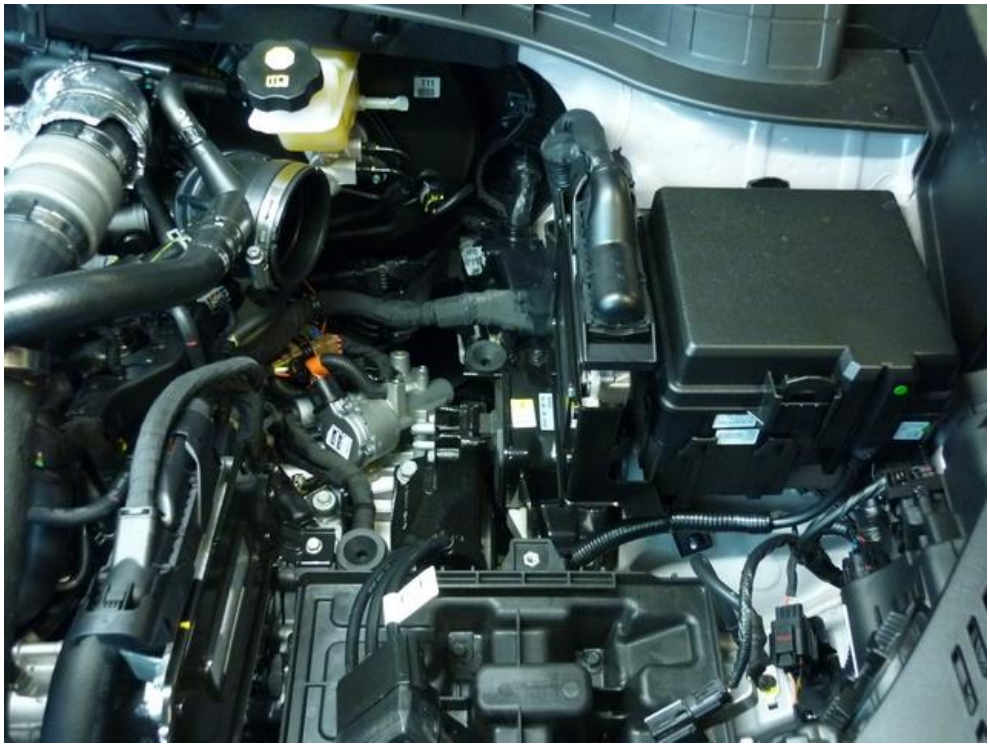


R115 approval sticker :
Right side centre door post

Prepare



Remove the battery



Remove the air filter box

Removal of the High Pressure Petrol Pump

-REMOVAL-

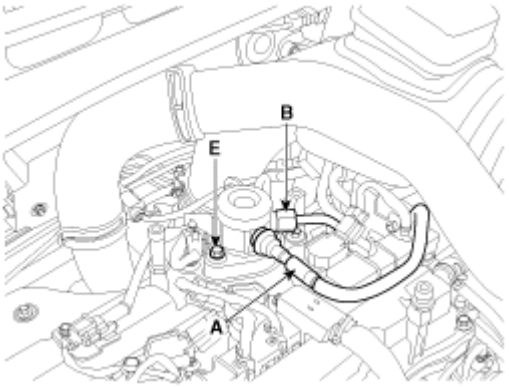
-WARNING-

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.
- Ware 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.



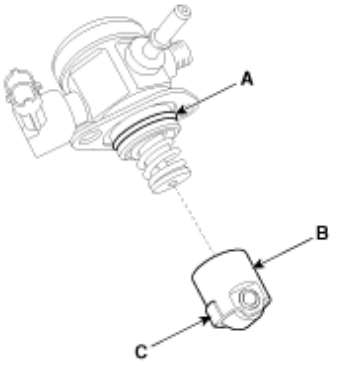
CAREFULLY store the removed petrol pump. Make sure no pollution can come into the pump.

Installation of the Bosch High Pressure Petrol 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.



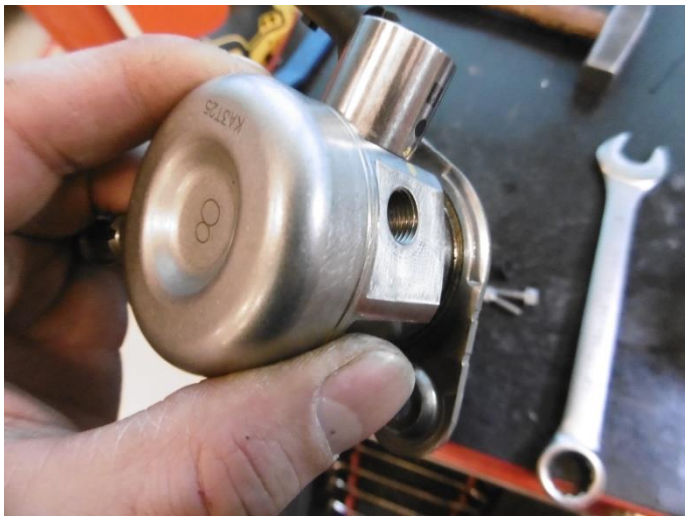
Installation bolts:
When tightening the installation bolts of the high pressure fuel pump, tighten and turn the bolts in small step (0.5 turns) after tightening them with hand-screwed torque.
High pressure petrol pump installation bolt: 12.8 ~ 14.7 N.m

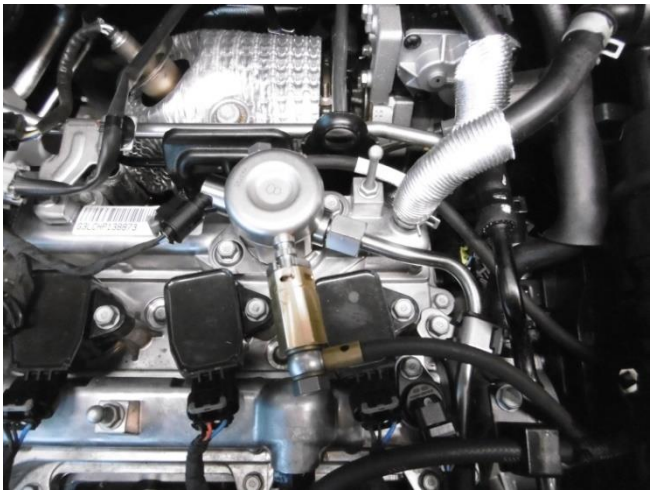
Petrol pipe:
First hand-tighten the nut(s) fully until they are not fastened any more in order to have them inserted in place and then completely tighten to the specified torque using a torque wrench.
If not tightening the bolts or nuts in a straight line with the mating bolt holes or fittings, it may cause a fuel leak due to broken threads.
High pressure petrol pipe installation nut: 26.5 ~ 32.4 N.m

Installation is reverse of removal.

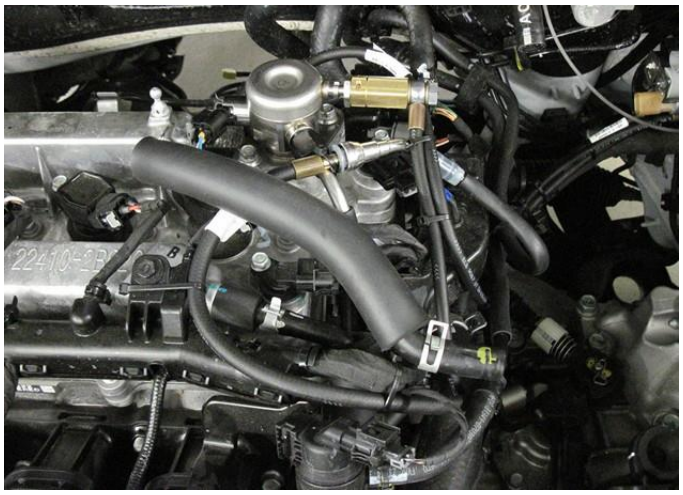
High pressure petrol pump installation

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





Pump 1



2 pump overview options

pump 2

Tighten 20Nm

Prepare grommet for wiring

Wiring inside: Switch + CAN + 56DIG + 17AD2 + 10DAC2.

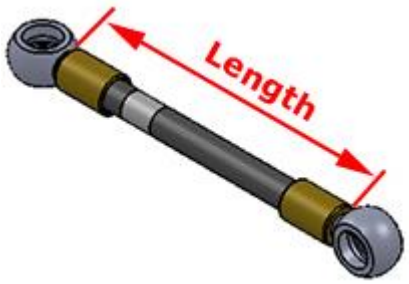
Prepare for switch wiring AND low pressure wiring

*** Extend with black & red wire from extra 2-core cable**

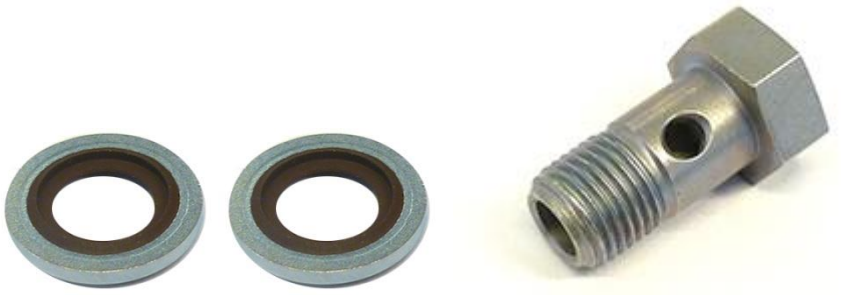
17 & 10 Extend *				*Low pressure petrol sensor signal interruption. BACK SEAT, INSIDE* Wire colour: **blue** or **white** Wire location: under cover back seat, pin **2**
17 AD 2		Blue-green		Sensor side
10 DAC 2		Green		Pump Driver side

LPG / petrol fuel lines

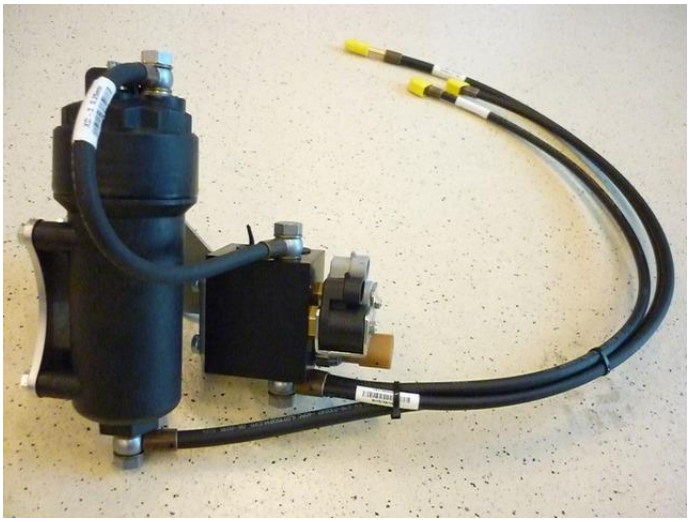
Hose		from	to	Length (cm)
1	XD-4 quick Ø8	Adapter original petrol hose	Petrol boost pump	85
2	XD-3	FMU supply	High pressure petrol pump	65
3	XD-3	Petrol boost pump	FMU supply	25
4	XD-3	FMU return	High pressure petrol pump	65

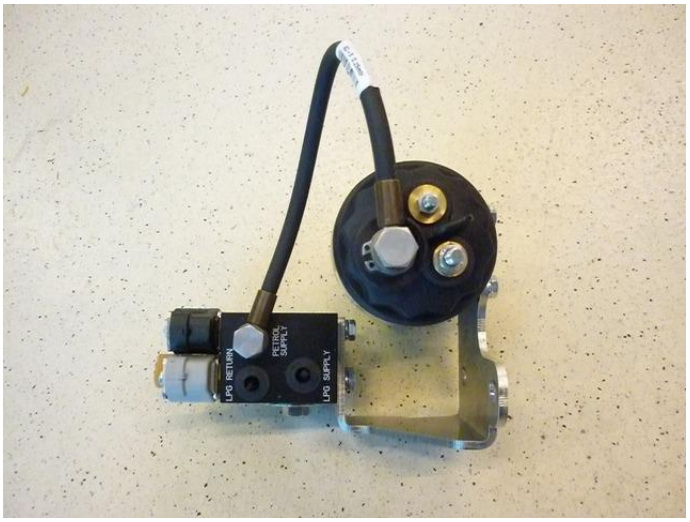


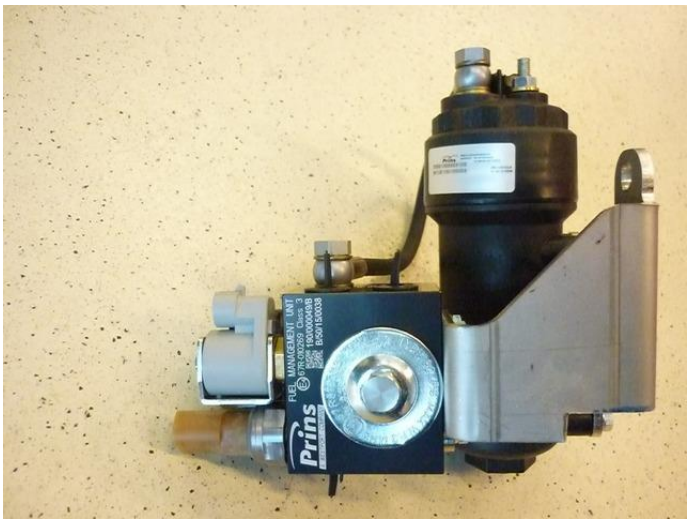
Install the fuel line using two bonded seal washers and banjo bolt :



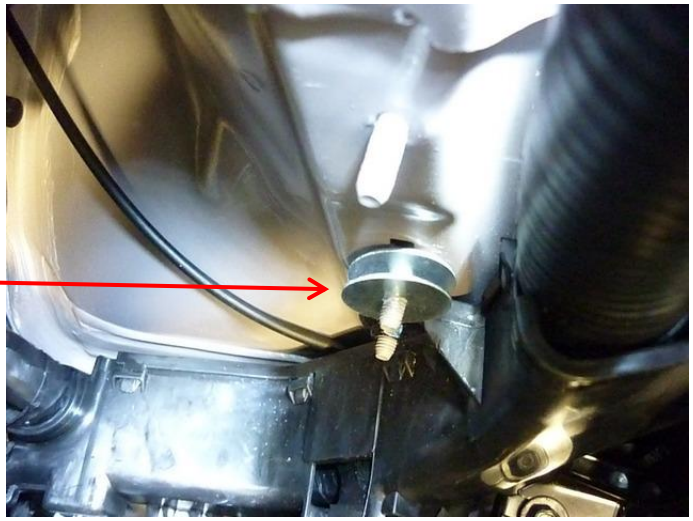
Boost pump assy



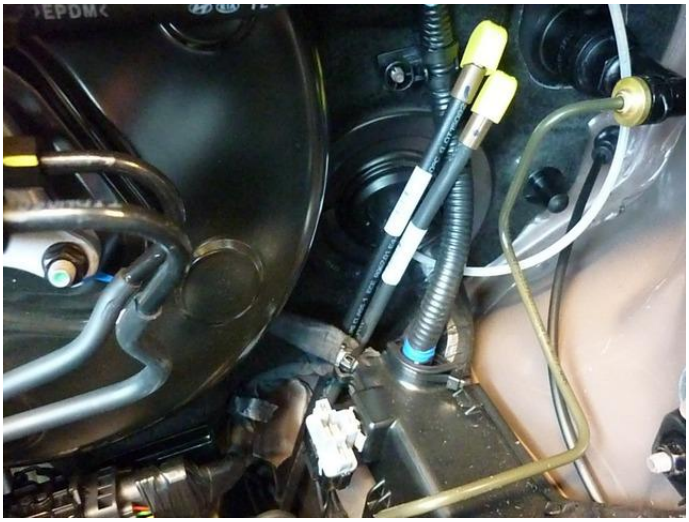


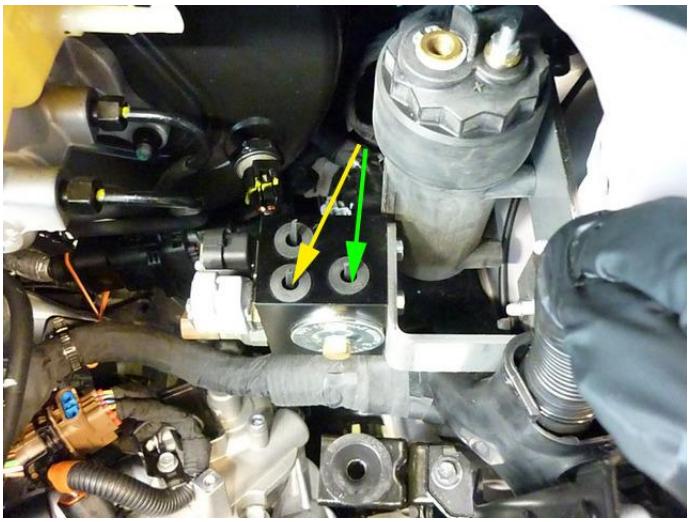


Mounting the fuel lines

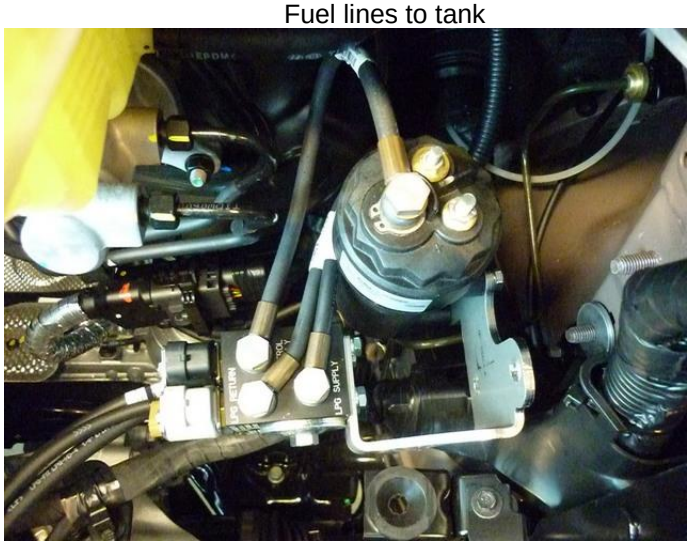


2x washer (M6-Tucson / M8-Sportage)



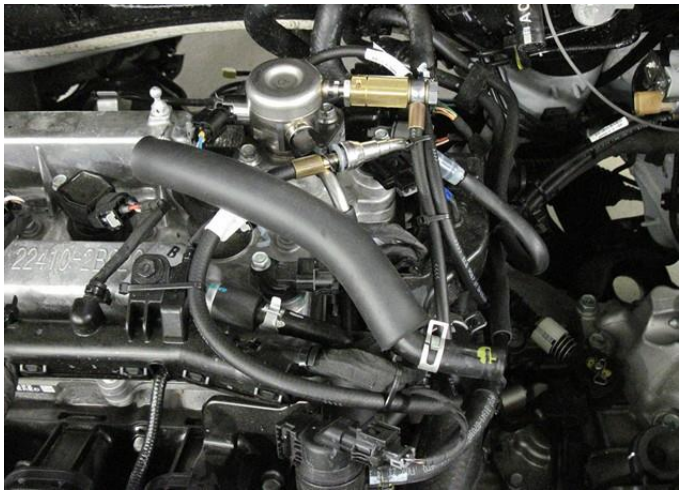


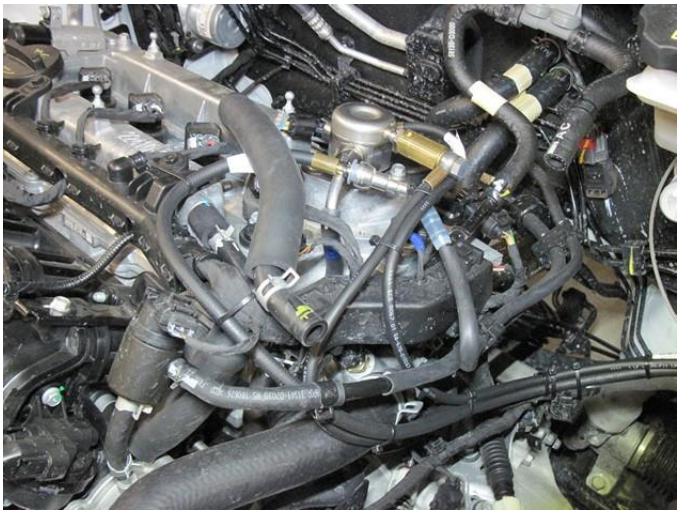
Fuel lines to tank

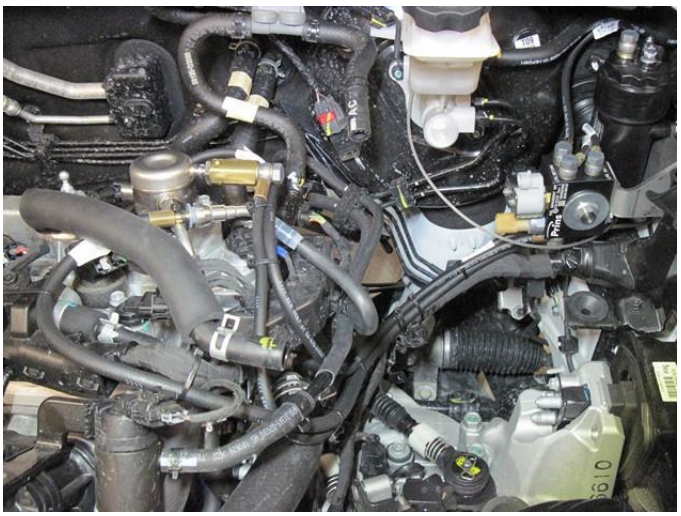


Mounting the FMU / boost pump hoses – option pump 1

Mounting the FMU / boost pump hoses – option pump 2

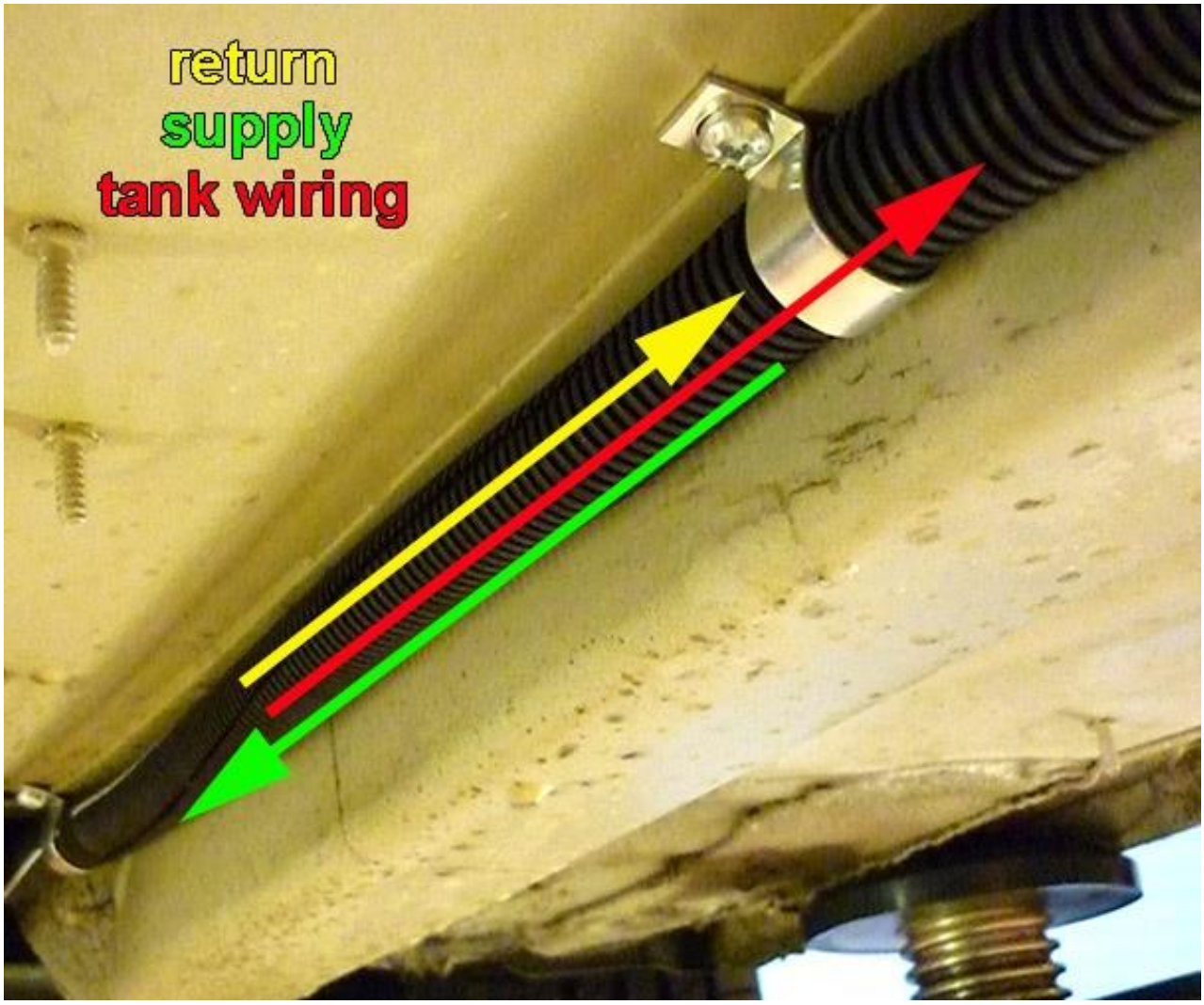






Supply hose – Return hose – Tank wiring

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.

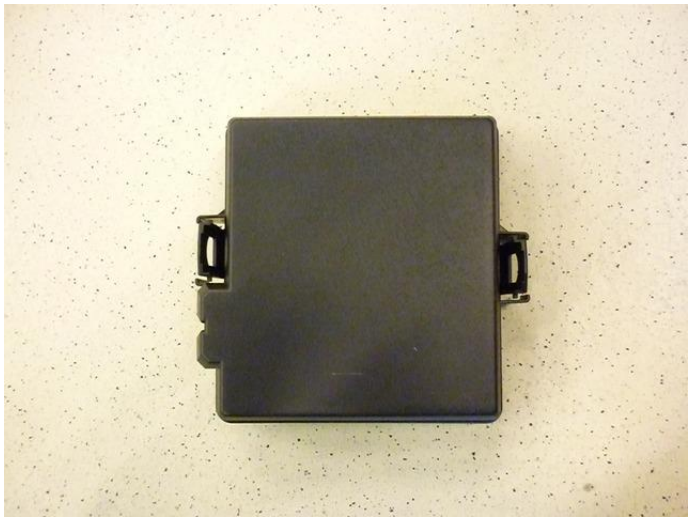


Demo photo

Hose routing

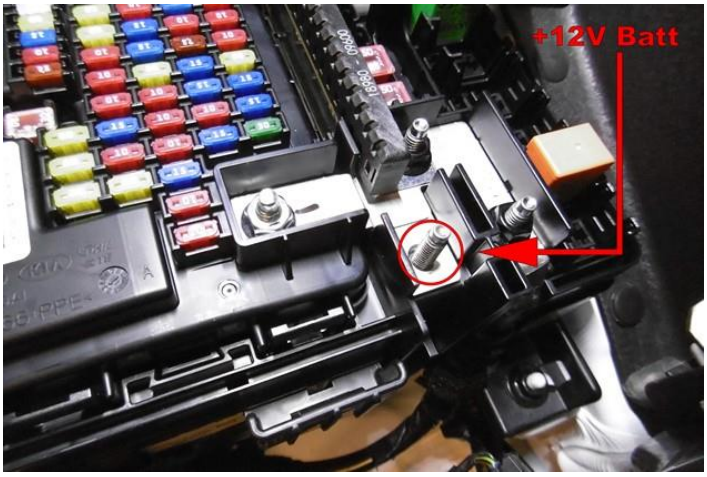
See tank fitting instruction.

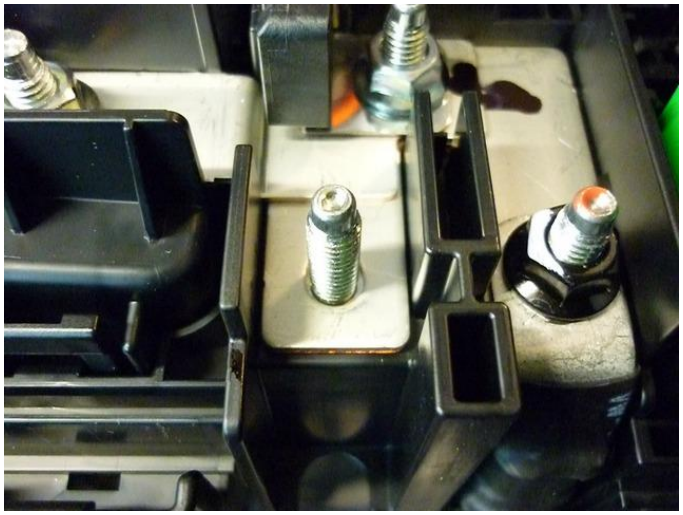
Mounting the AFC-2.1



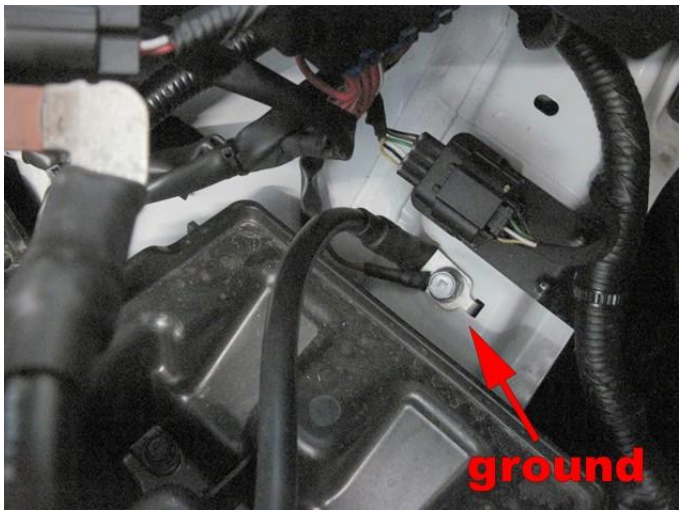
Mounting the AFC-2.1

+12V Batt / Ground

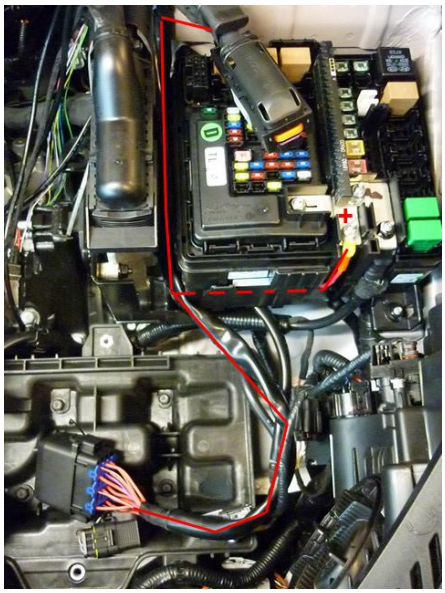




Ground option 1

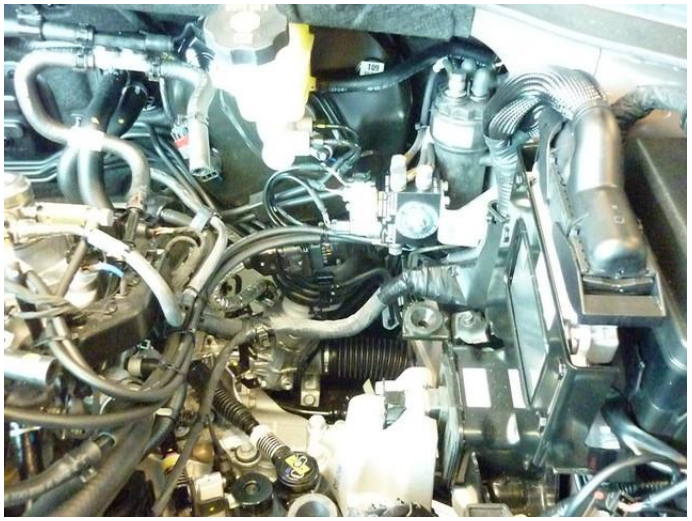


Ground option 2

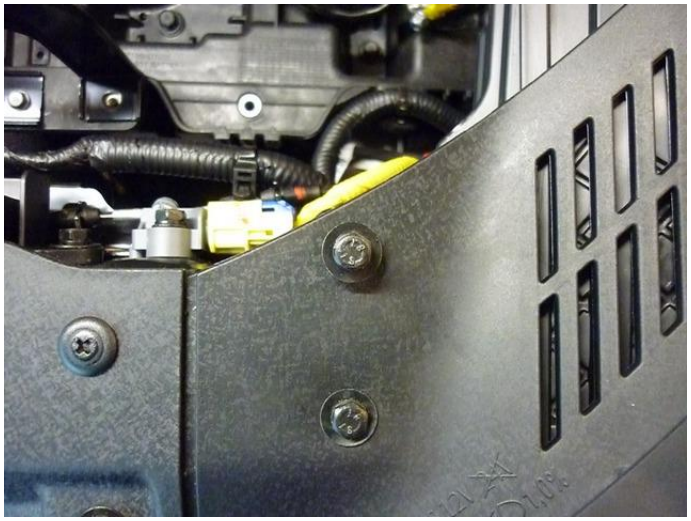


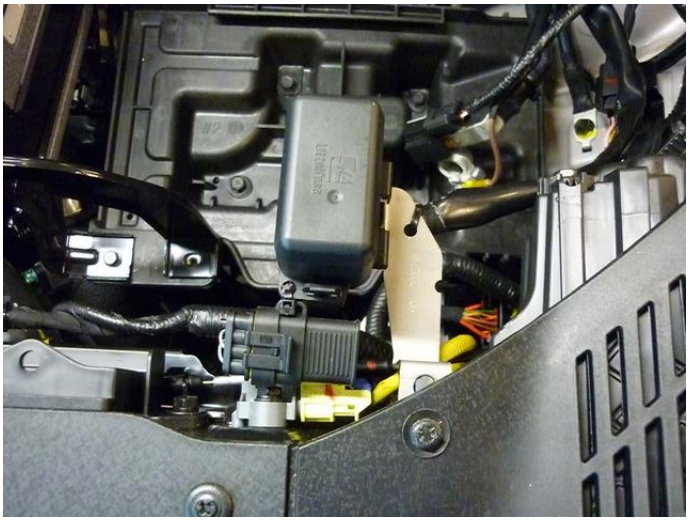
Wiring routing

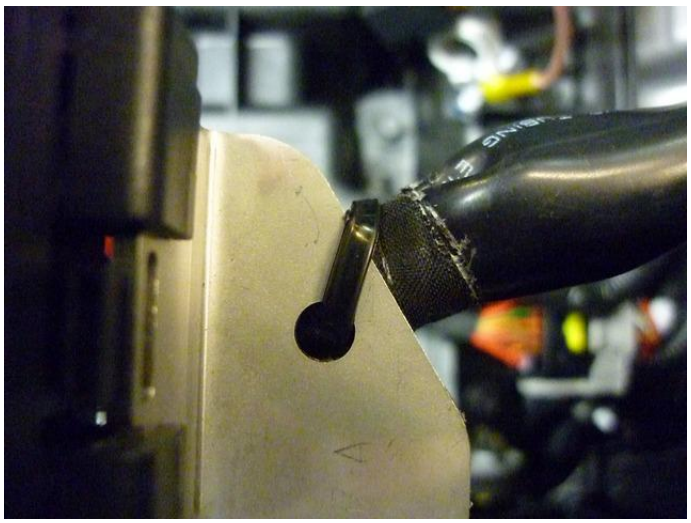
Wiring

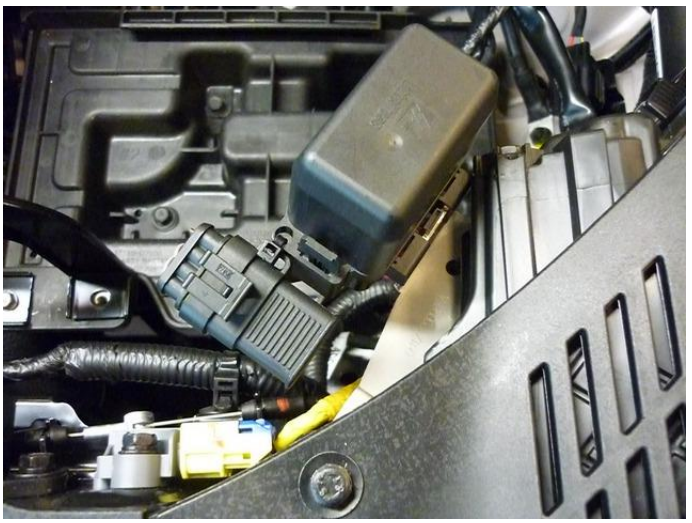


Mounting the fuse / relay box 1.6 G4FJ

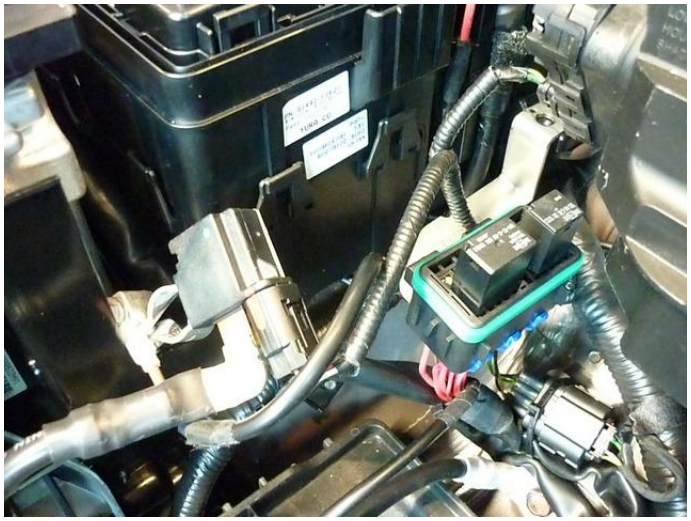


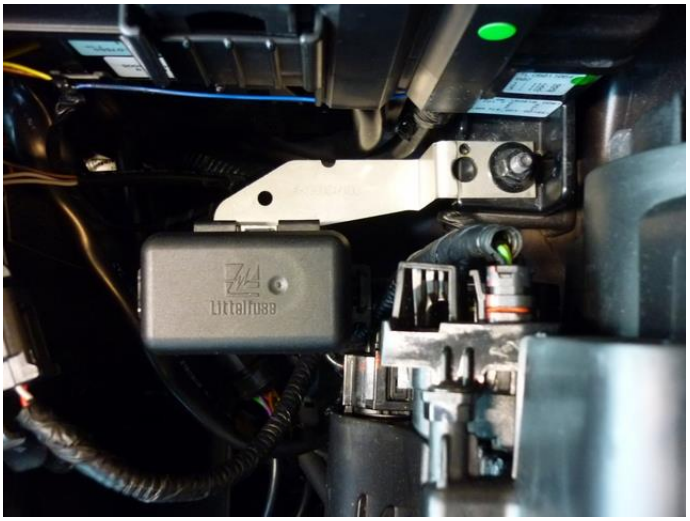






Mounting the fuse / relay box 1.6 G4FD





Mounting the fuel selection switch - Tucson

Mount the switch, drill Ø8,3mm.

or

Mounting the fuel selection switch – Tucson 2019

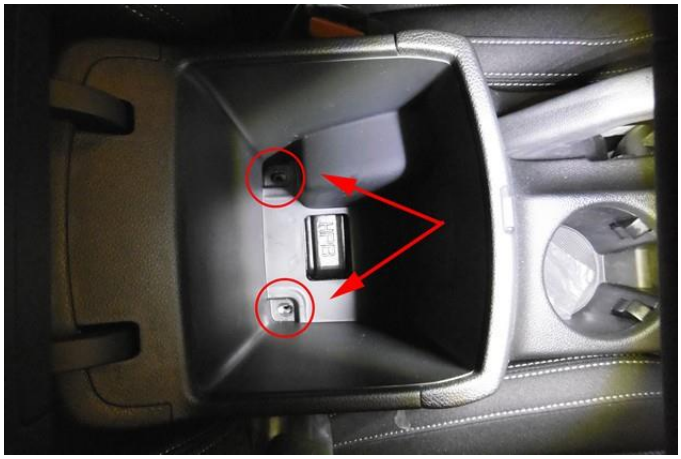
Mount the switch

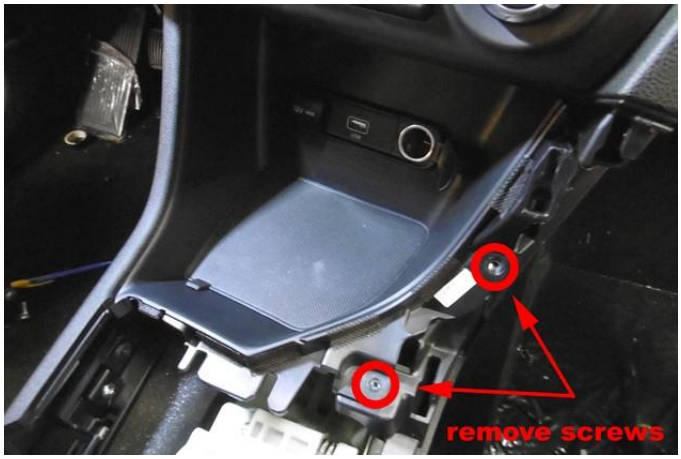
Mounting the fuel selection switch – Sportage option 1

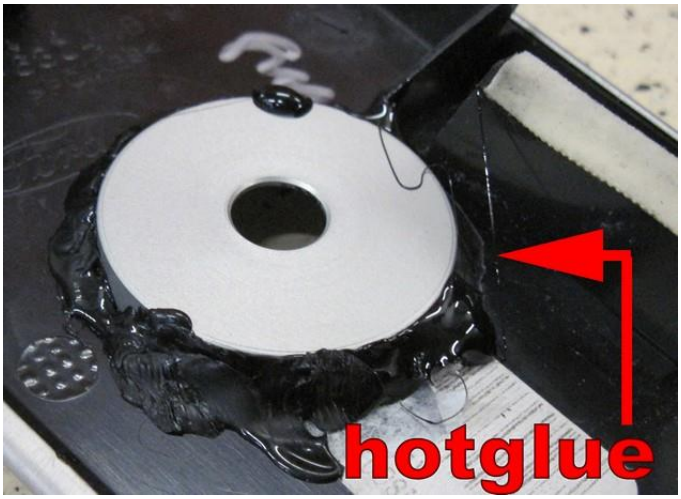
Mount the switch, drill Ø8,3mm.

Beware of the electronics behind the plugs.

Mounting the fuel selection switch – Sportage option 2

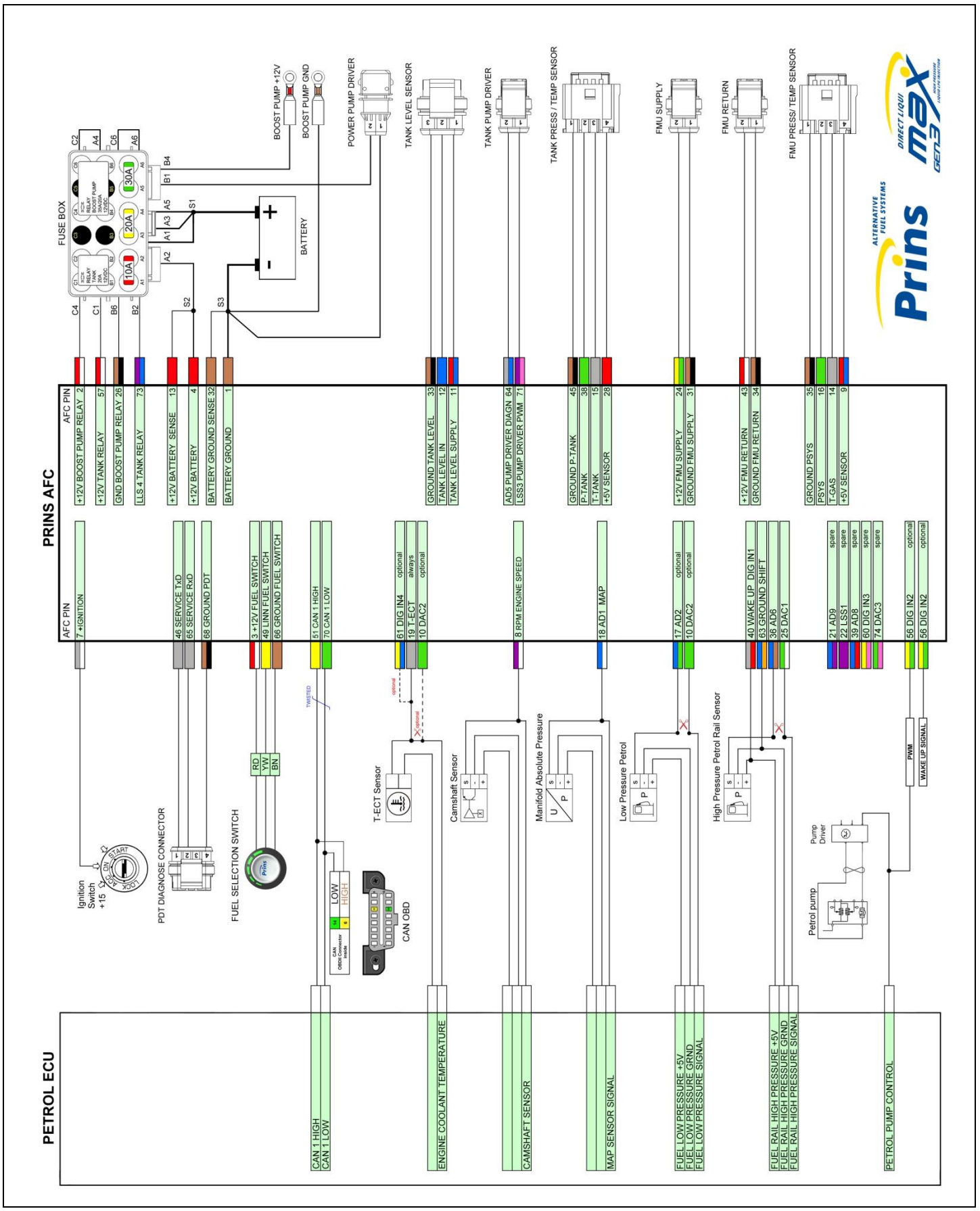






Fixate the ring with hot glue

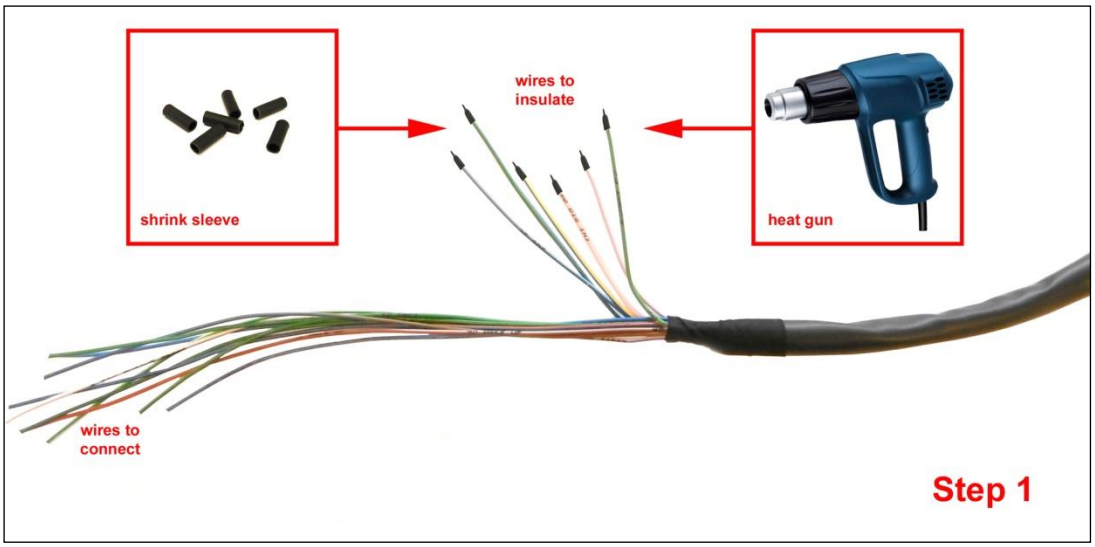
Basic DLM Gen3 wiring diagram

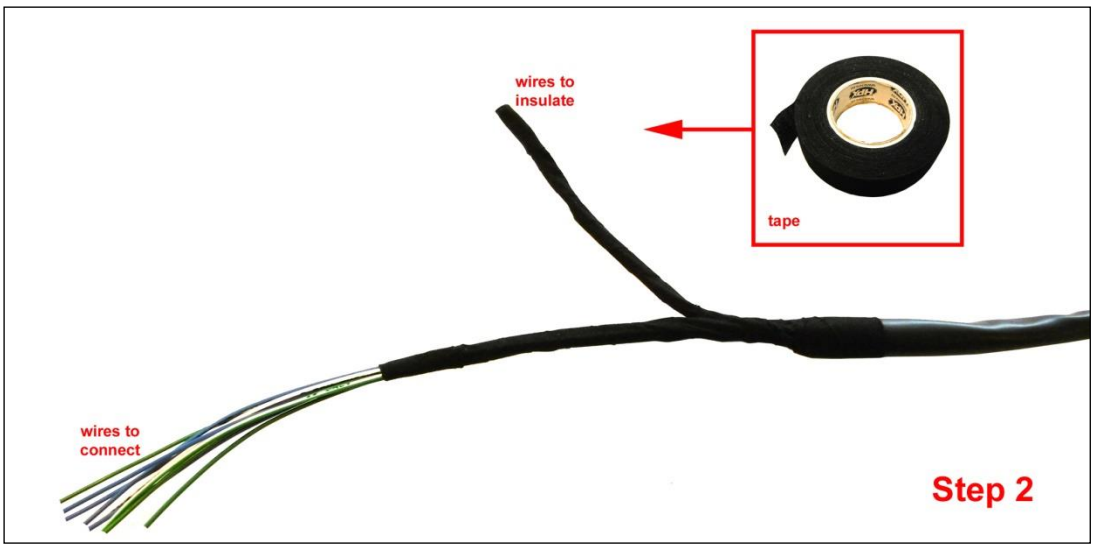


Electrical connections – Insulate

Wire text	*clr*	*Wire colour*	*Connection*
21 AD 9		Blue-purple	
22 LSS 1		Purple	
39 AD 8		Blue-red	
56 DIG IN2		Yellow-green	
60 DIG IN3		Yellow-pink	
61 DIG IN4		Yellow-blue	
Insulate additional loose wires			

How to insulate wires

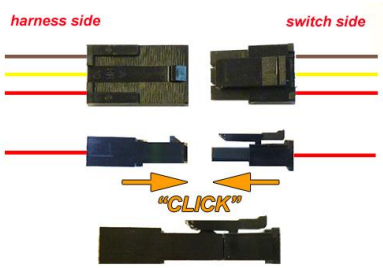


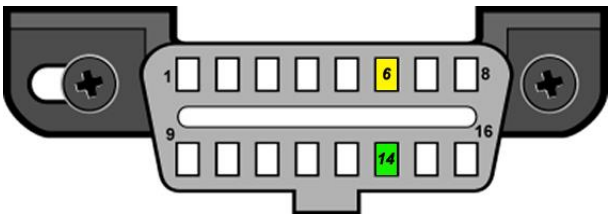


Electrical connections

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

Driver room

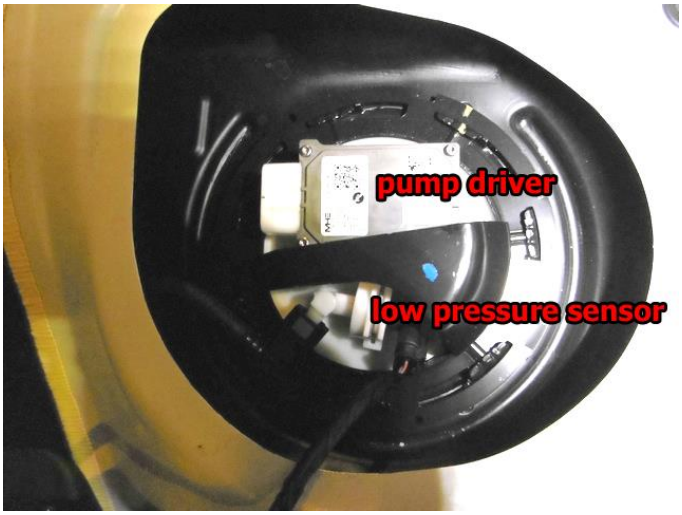
Wire number / code	***Wire colour***	***Connection***
3-pole micro connector 66 Ground fuel switch 3 +12V fuel switch 49 LIN fuel switch	 Brown-black Red-white Yellow	Connect the 3-pole connector to the Prins fuel selection switch.
		

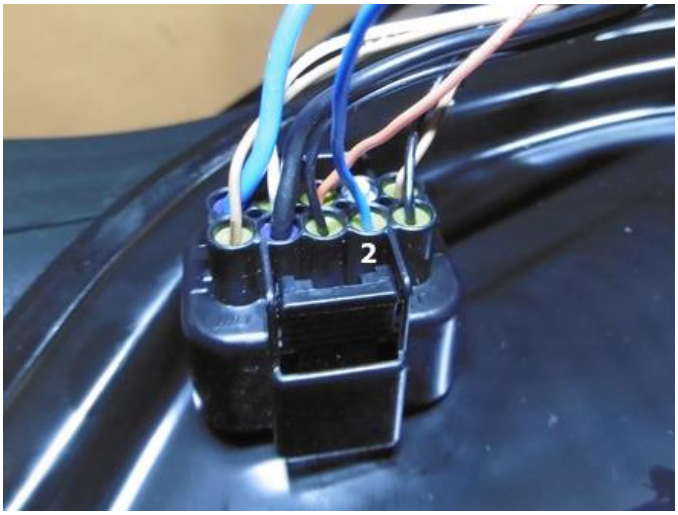
51 CAN-High		Yellow	EOBD connector pin 6
70 CAN-Low		Green	EOBD connector pin 14
			

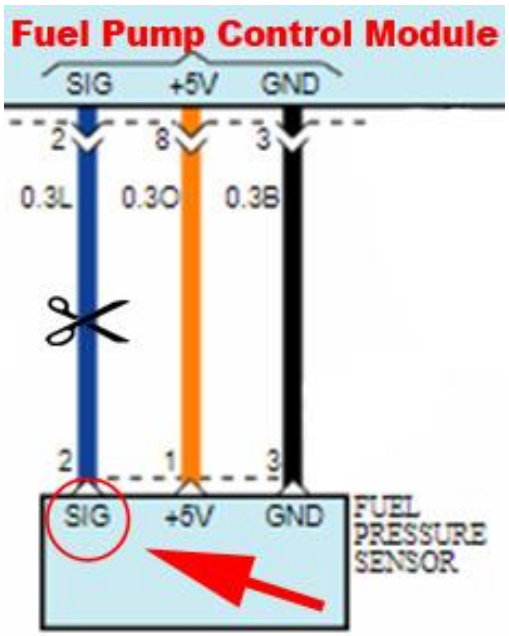
Wiring low pressure sensor - under back seat

Driver room

17 & 10 ***Extend wires***				*Low pressure petrol sensor signal interruption. BACK SEAT, INSIDE* Wire colour: **blue** or **white** Wire location: **under** cover **back seat**, pin **2**
17 AD 2		Blue-green		Sensor side
10 DAC 2		Green		Pump Driver side



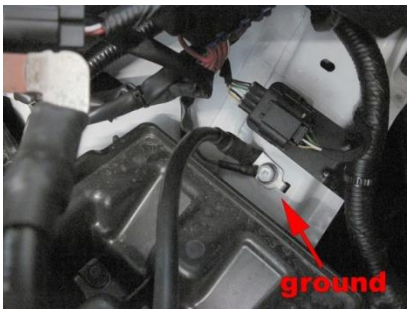




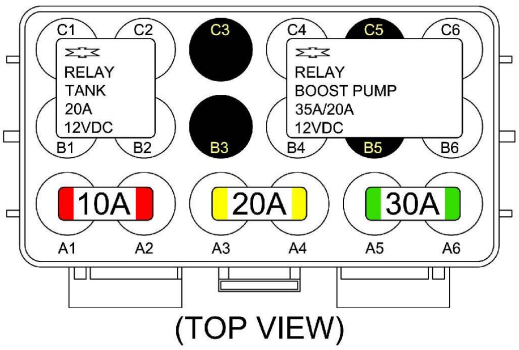
Extend wires 10 & 17 and connect to the low pressure petrol sensor signal on the petrol tank.

Electrical connections

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

Wire text	*clr*	*Wire colour*	*Connection*
1			*Connect to the '–' of the battery (-31);* use a ring terminal.  or 
1 BATTERY GROUND		Brown	

4			*Connect to the '+' of the battery (+30);* use a ring terminal. **Do not place the fuses** before having completed the installation of the lpg system.  or 
4 +12V BATTERY		Red	



(TOP VIEW)

Electrical connections

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

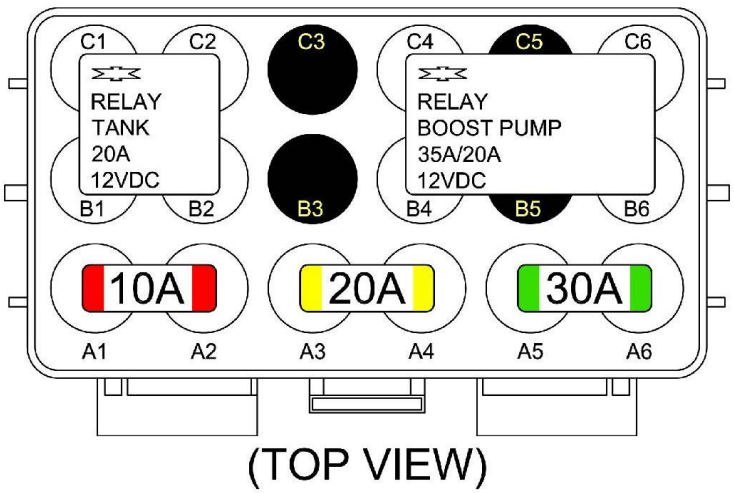
Wire text	*clr*	*Wire colour*	*Connection*
			For measuring the engine coolant temperature. Wire colour: **Yellow-orange / red /** or **White** Wire location: petrol ecu, **60**-pole connector, pin **7**
19 T-ect		Grey	
ONLY G4FJ			*Boost pressure sensor signal interruption.* Wire colour: **Brown or white-black** Wire location: petrol ecu, **60**-pole connector, pin **9**
20 AD 3		Blue-pink	Sensor side
74 DAC 3		Green-pink	Petrol ecu side
			For measuring the engine speed signal. Wire colour: **Grey-black** or **Grey** or **Black-orange** Wire location : petrol ecu, **60**-pole connector, pin **56**
8 RPM		Purple-white	
7			*Connect to +ignition / contact+ (+15).* Wire colour: **Green-orange** or **Pink** or **Black-green** Wire location : petrol ecu, **94**-pole connector, pin **29**
7 +IGNITION		Grey-white	
			Analog in (sensor side) MAP sensor in. Wire colour: **Green-black** / **Brown / Grey** or **Purple** Wire location: petrol ecu, **94**-pole connector, pin **57**
18 AD 1		Blue-white	
			High pressure petrol sensor ground. Wire colour: **Blue** Wire location: petrol ecu, **94**-pole connector, pin **36**
63 Ground Shift		Blue-orange	
36 & 25			*High pressure petrol sensor signal interruption.* Wire colour : **Grey-orange** or **Green** Wire location : petrol ecu, **94**-pole connector, pin **78**
36 AD 6		Blue-brown	Sensor side
25 DAC 1		Green-white	Petrol ecu side
			High pressure petrol sensor 5Volt supply Wire colour: **White** Wire location : petrol ecu, **94**-pole connector, pin **87**
40 Wake-up		Grey-red	

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
4-pole FMU P/T sensor 1. 35 Ground P-Sys 2. 16 P-Sys 3. 14 T-Sys 4. 9 +5V sensor	 Brown-black Green Grey Red-blue	Connect the 4-pole connector to the P/T sensor.
2-pole black connector FMU 24 +12V FMU supply 31 Ground FMU supply	 Yellow-green Brown-black	Connect the 2-pole connector to the black lock-off valve of the Fuel Management Unit
2-pole grey connector FMU 43 +12V FMU return 34 Ground FMU return	 Red-white Brown-black	Connect the 2-pole connector to the grey lock-off valve of the Fuel Management Unit
4-pole diagnose connector 46 Service TxD 65 Service RxD 68 Ground PDT	 Grey Grey Brown-black	Diagnose connector for service / diagnosis Connector pin 1 Connector pin 2 Connector pin 4
Boost pump relay 2 +12V boost pump relay 26 Ground BP relay +12V fused BATT +12V Boost pump	 Red-white Purple-blue Red 2.5mm2 Red 2.5mm2	 Pin 86 of the boost pump relay C4 Pin 85 of the boost pump relay B6 Pin 30 of the boost pump relay C6-A5 Pin 87 of the boost pump relay B4
Wiring tank pump driver relay 57 +12V tank relay 73 LSS 4 tank relay +12V BATT fused +12V driver	 Red-white Purple-blue Red 2.5mm2 Red 2.5mm2	 Pin 86 of the driver relay C1 Pin 85 of the driver relay B2 Pin 30 of the driver relay C2-A4 Pin 87 of the driver relay B1



(TOP VIEW)

Electrical connections

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

Lpg tank housing

Wire number / code	*Wire colour AFC*	*Connection*
3-pole tank level connector 1. 33 Ground tank level 2. 12 Tank level in 3. 11 + tank level supply	 Brown-white Blue Red-blue	Connect the 3-pole connector to the tank level sensor.
4-pole Tank P/T sensor 1. 45 Ground P-Tank 2. 38 P-Tank 3. 15 T-Tank 4. 28 +5V sensor	 Brown-black Green Grey Red	Connect the 4-pole connector to the P/T sensor.
2-pole Steering Diagnose connector 1. Ground pump driver 2. +12V pump driver	 Brown 2.5mm^2 Red 2.5mm^2	Connect the 2-pole connector to the driver, connector 3.
2-pole Steering Diagnose connector 1. 71 LSS3 Pump driver PWM 2. 64 Pump driver diagnose	 Purple-pink Blue-grey	Connect the 2-pole connector to the driver, connector 4

Pump Driver			
1. *2-pole connector tank lock-off*	Green-yellow Brown	From tank pump driver From tank pump driver	
2. *3-pole connector tank pump*	Red 2.5mm^2 Brown 2.5mm^2	From tank pump driver From tank pump driver	
3. *2-pole connector driver*	1. Brown 2.5mm^2 2. Red 2.5mm^2	From main ground From tank pump relay	Ground pump driver +12V pump driver
4. *2-pole connector driver*	1. Green 2. Grey	From AFC pin 71 From AFC pin 64	LSS3 Pump driver PWM Pump driver diagnose

Prins safety stickers

Checklist after installation

1. Install the system fuses.
   Turn on ignition.
   Connect the Prins Diagnostic Tool and run the Prins Diagnostic 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 gas leak detector device or a fluid detection like soap. Also check for petrol leakage.
   Check all made connections and XD-hose crimps for petrol / LPG 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.