

ALTERNATIVE
FUEL SYSTEMS

Prins



installation manual Engine Kit part 2/2

MANUFACTURER
TYPE
ENGINE DISPLACEMENT
NUMBER OF VALVES
ENGINE CODE / NUMBER - OUTPUT
VEHICLE CATEGORIES
TRANSMISSION
AFC VERSION / SYSTEM
PETROL ECU MANUFACTURER / CODE
HIGH PRESSURE PETROL PUMP
HIGH PRESSURE PETROL INJECTOR
MODEL YEAR:
SYSTEM APPROVAL NUMBER (R115)
LOCATION R115 SYSTEM STICKER
ENGINE SET NUMBER
MANUAL NUMBER
DATE

Hyundai // Kia
Santa Fe (DM) // Sorento
2400cc
16
G4KJ - 138kW
M1
MT
AFC-2.1 / DLM Gen3
CONTINENTAL SIM2K-250 39140-2GL0
0.261.520.308 / 35320 2G740 TYPE 10
0.261.500.xxx
2017
E4-115R-000017 / DLM-LPG 10
right side, centre door post
349/070224001/A
076/0991000
25-7-2017

Version 30-6-2016 D



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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 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 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.](#)

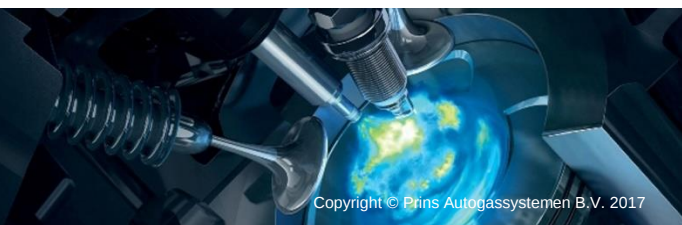
Register the system (with warranty card) on the [Prins warranty portal](#) within 14 days after installation.

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 no. 099/99928)
- Exhaust gas analyzer
- Multimeter
- Oscilloscope
- Prins diagnostic software
- Prins Diagnostic Tool
- Torque wrench (5-50Nm)
- Torque wrench (200-250Nm)
- Portable light
- Assortment drill bits Ø4 to 12 mm
- 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 analyzer)
- Check the condition of the ignition system (spark plugs, cables, coil)



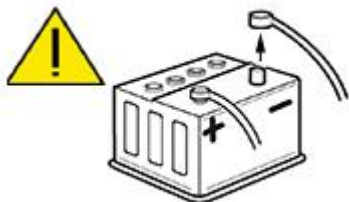
Tightening moments

	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

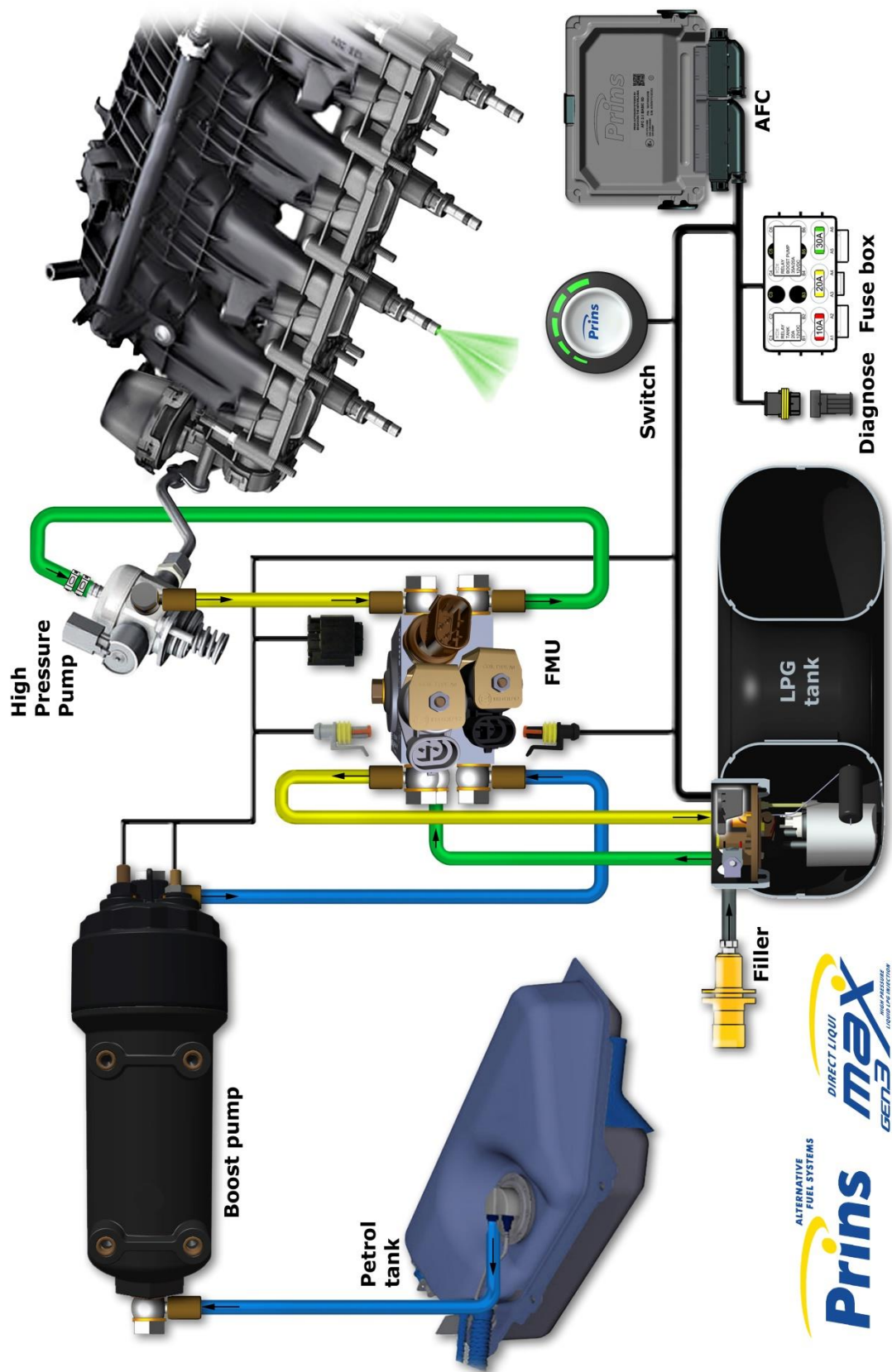


= WEAR SAFETY GOGGLES

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



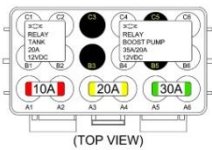
Fuel Management Unit



Boost pump



DLM component location overview

HPP pump 		Petrol ECU
FMU 		AFC 
Boost pump 		Fuse / relay box 

	R115 approval sticker : Right side centre door post
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Removal of the High Pressure Petrol Pump

REMOVAL

WARNING

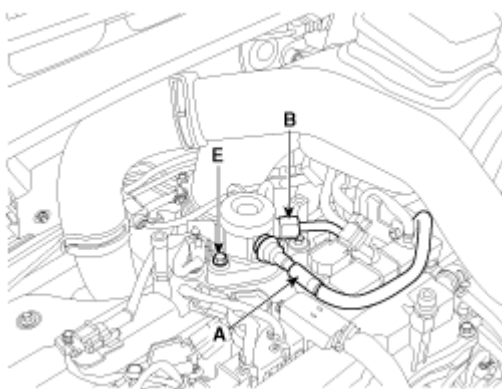
In case of removing the high pressure fuel pump, high pressure fuel pipe, delivery pipe, there may be injury caused by leakage of the high pressure fuel.

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

- Turn the ignition switch OFF and disconnect the battery negative (-) cable.
- 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.



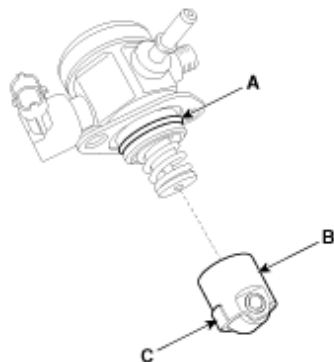
CAREFULLY store the removed petrol pump. Make sure no pollution can come into the pump.

Installation of the 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 Nm.

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 pump installation nut: 26.5 ~ 32.4 Nm.

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).



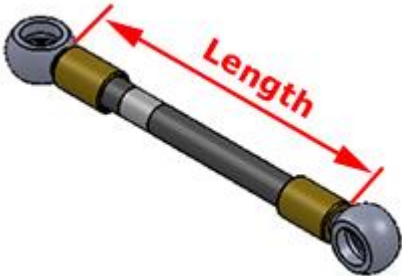
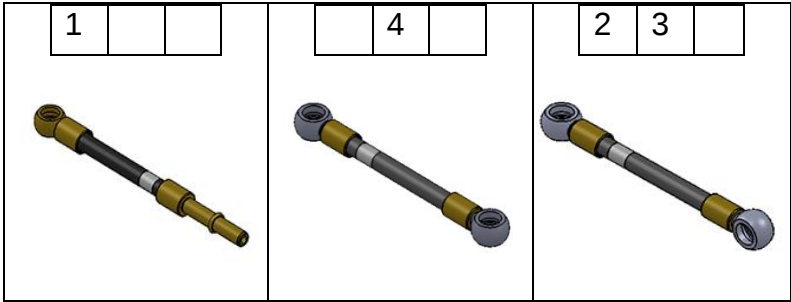
Adapted HPP



Tighten 20Nm

LPG / petrol fuel lines

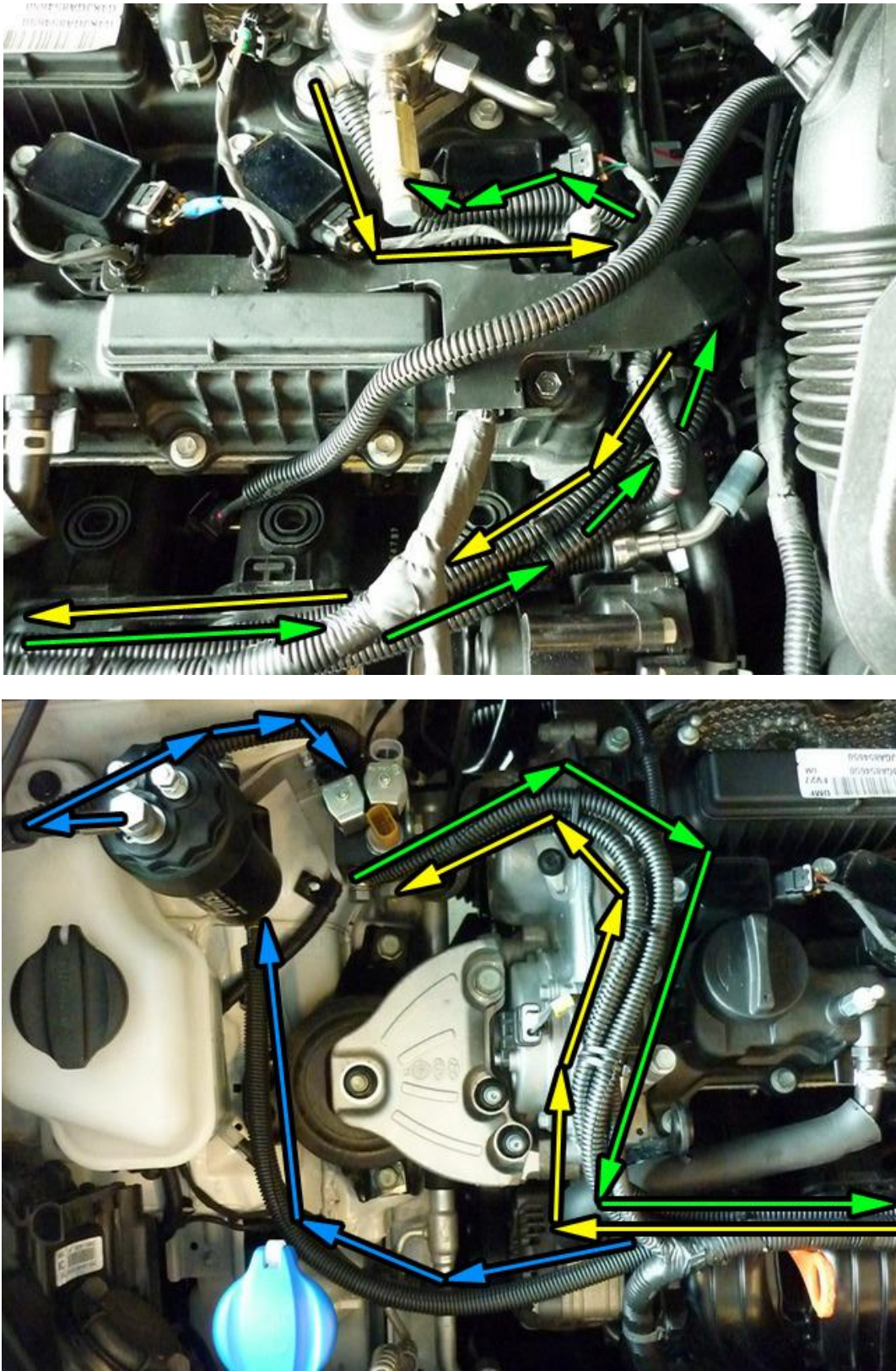
	Hose	from	to	Length (cm)
1	XD-4	Adapter original petrol hose	Boost pump in	85
2	XD-3	Boost pump out	FMU petrol supply	35
3	XD-3	FMU HPP supply	High pressure pump	110
4	XD-3	FMU HPP return	High pressure pump	115
5	XD fuel supply line	FMU LPG supply	Tank	500
6	XD fuel return line	FMU LPG return	Tank	500



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



High pressure petrol pump to FMU



Boost pump & FMU

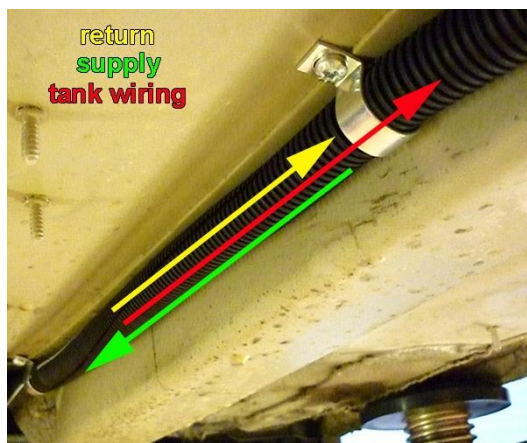


Connection of the fuel hose to the boost pump

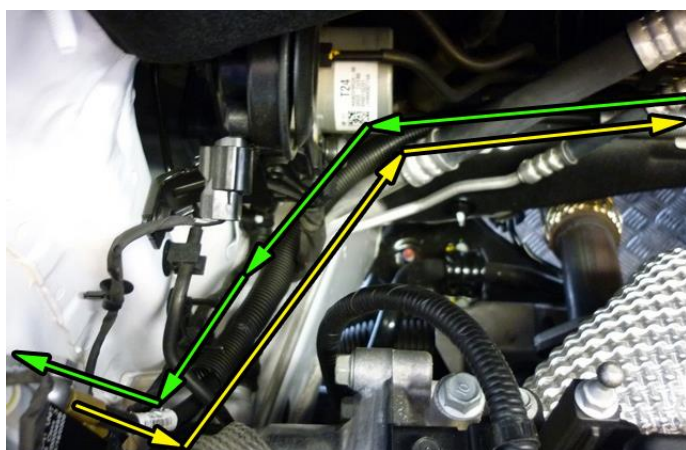


Supply hose – Return hose – Tank wiring

Protect the supply- and return hose together with tank-wiring using the Ø16mm split tube. Mount the “hose assembly” with clamps, with a maximum distance of 40cm.



Demo photo



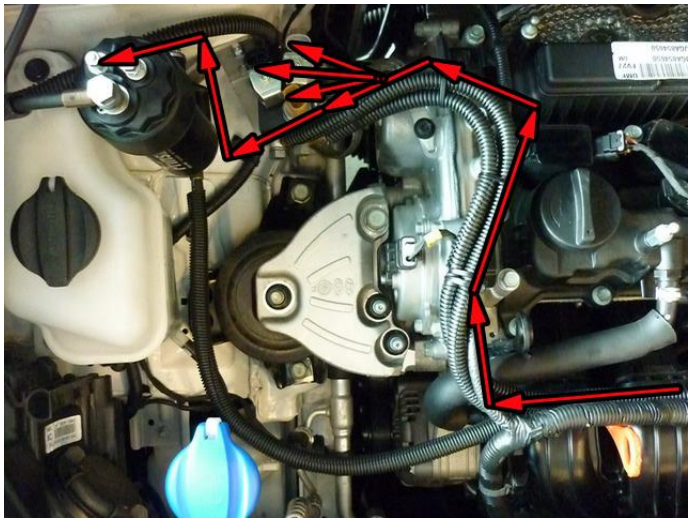
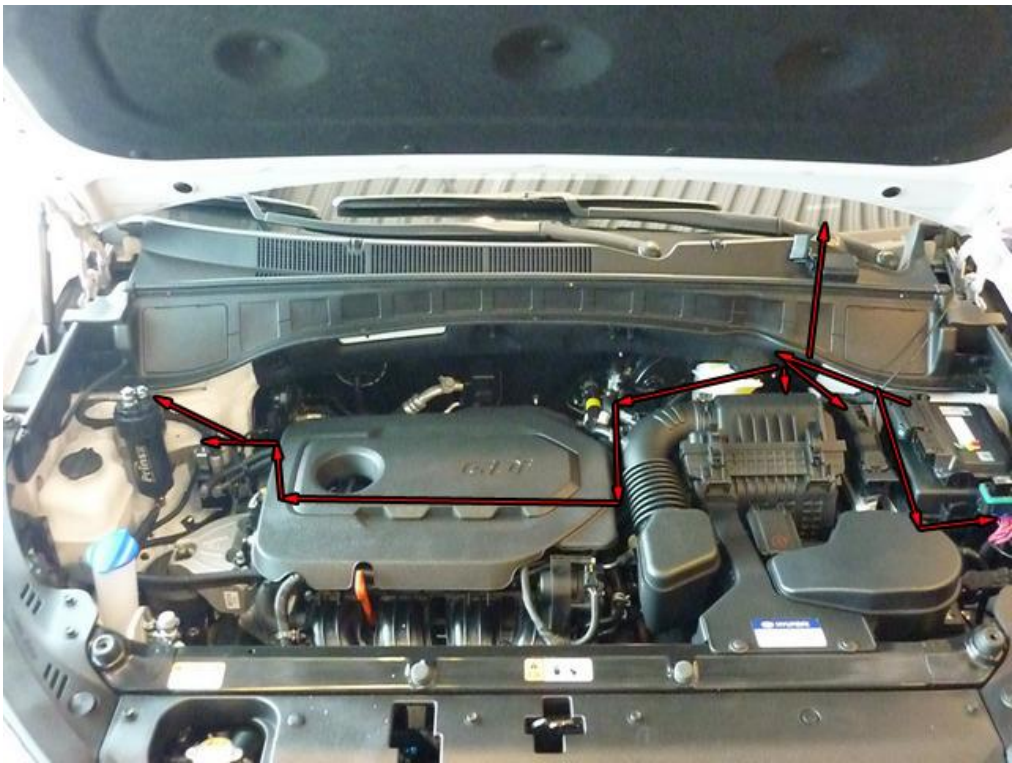
Mounting the AFC



Mounting the fuse / relay box



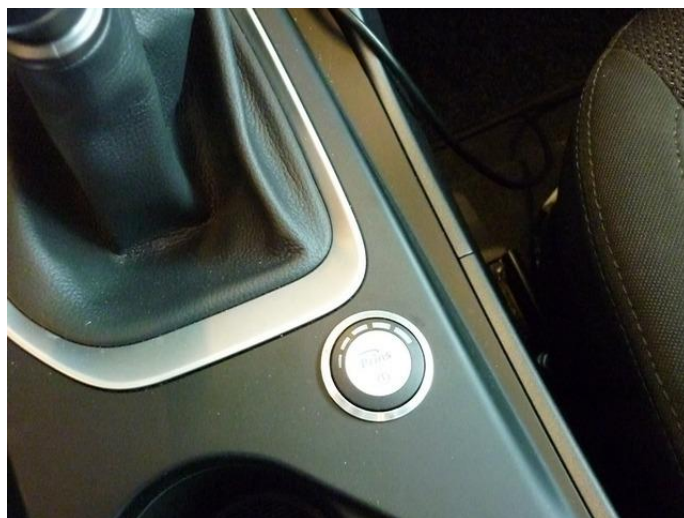
Wiring



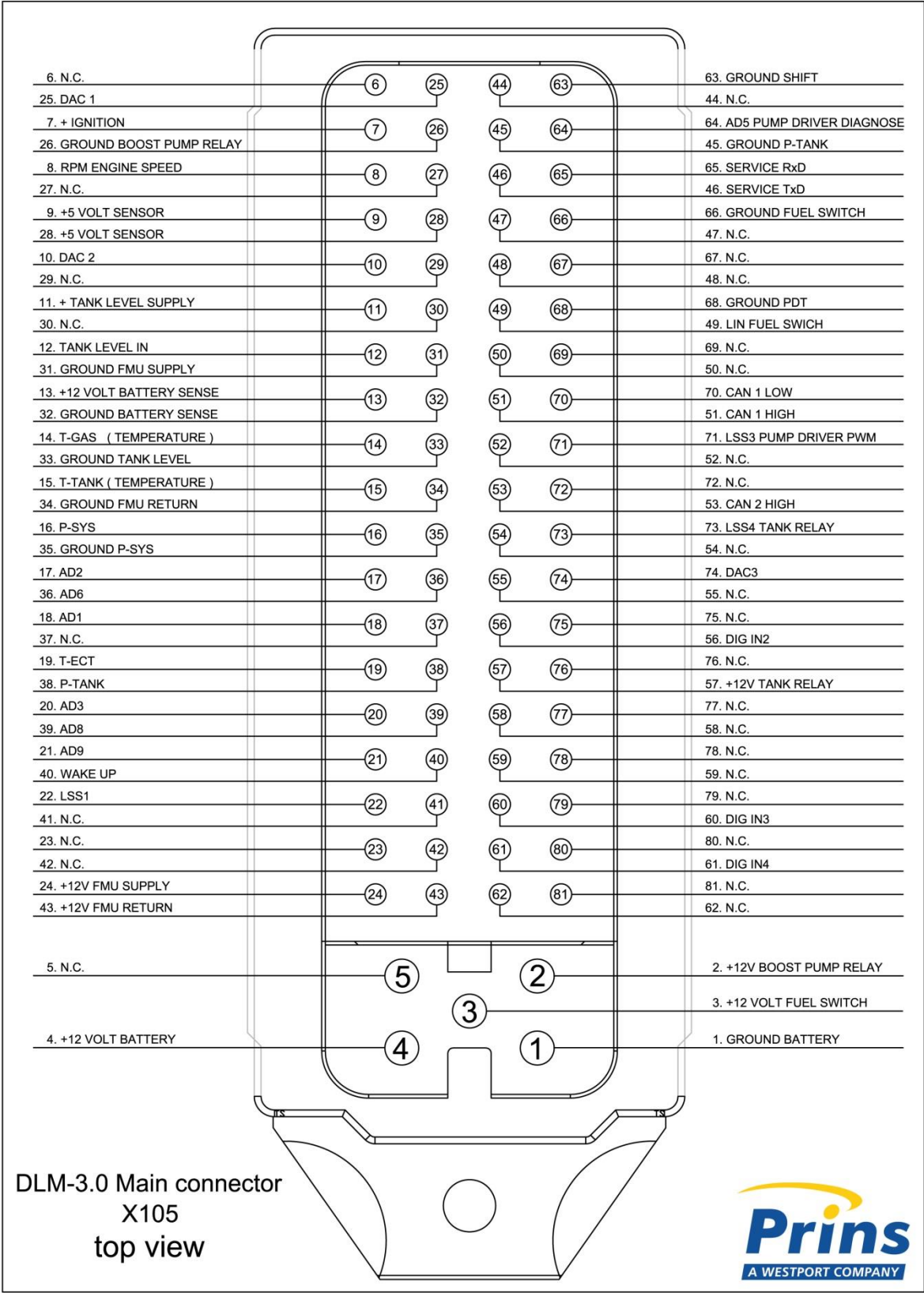
Mounting the fuel selection switch



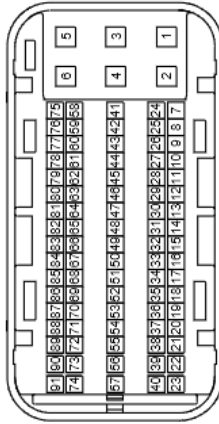
Drill Ø8.3mm, mount the switch.



Main Connector

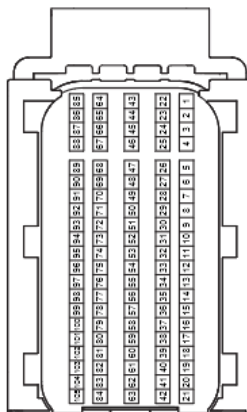


Petrol ecu connector pinning



C300-B

PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION
1	B	Ground	34	W	Start Relay	70	-	-
2	B	Ground	35	Gr/O	Ci/Fan Relay (High) Control	71	B/O	Ci/Fan Relay (Low) Control
3	W	Engine Control Relay	36	-	-	72	Y	VIS Control
4	B	Ground	37	-	-	73	B	Injector #1 (High) Control
5	W	Engine Control Relay	38	-	-	74	W	Injector #1 (Low) Control
6	W	Engine Control Relay	39	R	Injector #3 (High) Control	75	G	Memory Power
7	-	-	40	L	Injector #3 (Low) Control	76	-	-
8	R	Flexray (High)	41	G	ON/Start Input	77	G	C-CAN High
9	-	-	42	-	-	78	W	Vehicle Speed Input
10	L/B	Brake Test Switch	43	-	-	79	W/B	APT Sensor Supply
11	-	-	44	Y	O2 Sensor (Down) Ground	80	-	-
12	Br	[M/T] Clutch Switch	45	-	-	81	Br	APS. 2 Supply
13	G	Wiper 'P' Input	46	Br	APS. 2 Ground	82	L	APS. 2 Supply
14	L	IMMO. Data Line	47	Y	APS. 1 Ground	83	-	-
15	W	Alternator (Electronic Load Signal)	48	-	-	84	-	-
16	L/O	Engine Control Relay Control	49	-	-	85	-	-
17	-	-	50	G	APT Sensor Ground	86	L	CVT
18	G/O	PCSV Control	51	-	-	87	-	-
19	Gr	E-CVVT Relay Control	52	-	-	88	G	O2 Sensor (Up) Heater
20	-	-	53	-	-	89	Gr	O2 Sensor (Down) Heater
21	-	-	54	W	Engine Speed Signal	90	W	Fuel Pressure Regulator Valve (Low)
22	G	Injector #2 (High) Control	55	-	-	91	Br	Fuel Pressure Regulator Valve (High)
23	W	Injector #2 (Low) Control	56	G	Injector #4 (High) Control			
24	-	-	57	O	Injector #4 (Low) Control			
25	L	Flexray (Low)	58	B	O2 Sensor (Down) Signal			
26	-	-	59	-	-			
27	G/B	Brake Light Switch	60	O	C-CAN Low			
28	-	-	61	P	Start Switch			
29	-	-	62	-	-			
30	Gr	APT Sensor Signal	63	-	-			
31	-	-	64	R	APS. 2 Signal			
32	W	LIN Communication BUS	65	O	APS. 1 Signal			
33	G	Fuel Pump Relay Control	66	-	-			
			67	-	-			
			68	-	-			
			69	-	-			



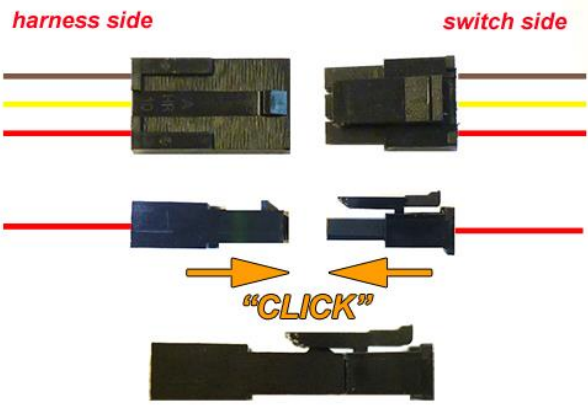
C300-A

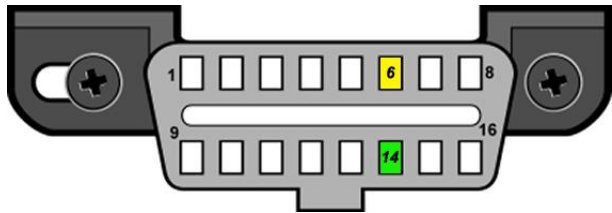
PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION
1	O	[AT] ATM Solenoid (V SOL 1)	36	-	-	71	W	[AT] Input Speed Signal
2	L	[AT] ATM Solenoid (LP VFS)	37	L	ECTS Ground	72	O	[AT] Output Speed Signal
3	B	[AT] ATM Solenoid (DC VFS)	38	Y	Rail Pressure Sensor Ground	73	-	-
4	P	[AT] ATM Solenoid (35R VFS)	39	Gr	Rail Pressure Sensor Signal	74	B	CMPS (Exhaust) Signal
5	-	-	40	-	-	75	W	Electronic Load Signal
6	-	-	41	Gr	IGN CYL 1 (W/O IMMO. or Smart Key)	76	-	-
7	Gr	[AT] Position Switch Code S1	42	G	IGN CYL 4 (W/O IMMO. or Smart Key)	77	Gr	Sensor Signal
8	R	[AT] Position Switch Code S2	43	B	Motor (+)	78	-	-
9	Gr	[AT] Up Shift	44	Br	Motor (-)	79	-	-
10	-	-	45	B	[AT] Ground	80	L	TPS 2 Signal
11	-	-	46	B	[AT] Ground	81	G	IAT. Sensor
12	-	-	47	-	-	82	L	MAP/MAF Sensor
13	-	-	48	Br	[AT] Oil TEMP. Sensor (-)	83	W	O2 Sensor (Up) V IP
14	-	-	49	O/B	CKPS Ground	84	L	O2 Sensor (Up) V G
15	-	-	50	W/B	CMPS (Exhaust) Ground	85	G	Memory Power
16	-	-	51	R	CMPS (Intake) Ground	86	B	E-CVVT MTR (-)
17	W	ECTS Signal	52	-	-	87	W	E-CVVT MTR (+)
18	-	-	53	-	-	88	L	E-CVVT Relay 'ON' Input
19	L	PWM Output	54	Br/B	Sensor Ground	89	W	ETC DC Motor (+)
20	R	IGN CYL 3 (W/O IMMO. or Smart Key)	55	-	-	90	R	ETC DC Motor (-)
21	W	IGN CYL 2 (W/O IMMO. or Smart Key)	56	-	-	91	-	-
22	L	[AT] ATM Solenoid (V SOL 2)	57	-	-	92	R	[AT] Oil TEMP. Sensor (+)
23	W	[AT] ATM Solenoid (UD VFS)	58	-	-	93	Y	[AT] Input Speed Supply
24	R	[AT] ATM Solenoid (26 VFS)	59	B	TPS Ground	94	Gr	[AT] Output Speed Supply
25	G	[AT] ATM Solenoid (OD VFS)	60	B	MAP/MAF & TIA Sensor GND	95	Gr	CKPS Signal
26	-	-	61	B/O	Knock Sensor (Shield)	96	Br	CMPS (Intake) Signal
27	-	-	62	W	Knock Sensor (Ground)	97	-	-
28	Br	[AT] Position Switch Code S4	63	G	Knock Sensor (Interface)	98	-	-
29	O	[AT] Position Switch Code S3	64	G	Memory Power	99	B/O	Sensor Supply
30	W	[AT] Select Switch	65	B	E-CVVT MTR (-)	100	P	TPS.1 Signal
31	P/B	[AT] Down Shift	66	W	E-CVVT MTR (+)	101	Y	TPS Supply
32	-	-	67	G	E-CVVT Relay 'ON' Input	102	Br	Rail Pressure Sensor (5V)
33	-	-	68	B	[AT] ATM Solenoid (SS A)	103	P	MAP/MAF Sensor Supply
34	-	-	69	G	[AT] ATM Solenoid (SS B)	104	O	O2 Sensor (Up) V RC
35	-	-	70	-	-	105	R	O2 Sensor (Up) V N

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

Electrical connections

Check and measure the wiring in case of changes in the cars wiring colours.

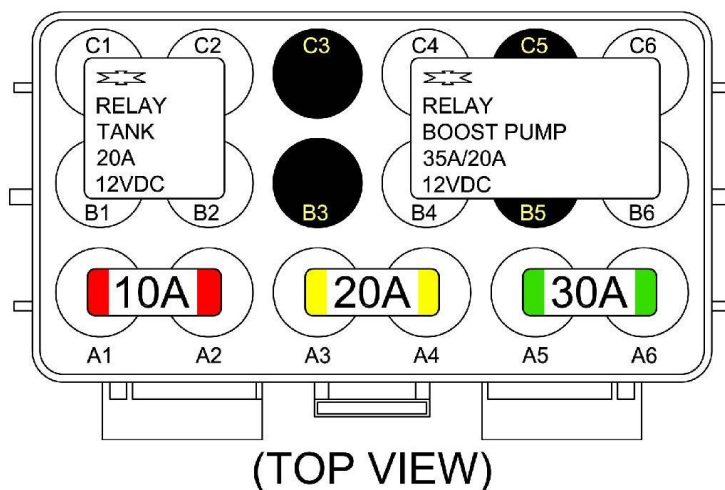
Insulate not used wires.

Wire text	clr	Wire colour	Connection
21 AD 9		Blue-purple	
22 LSS 1		Purple	
39 AD 8		Blue-red	
60 DIG IN3		Yellow-pink	
61 DIG IN4		Yellow-blue	
74 DAC 3		Green-pink	
17 AD 2		Blue-green	
10 DAC 2		Green	
56 DIG IN2		Yellow-green	

Electrical connections

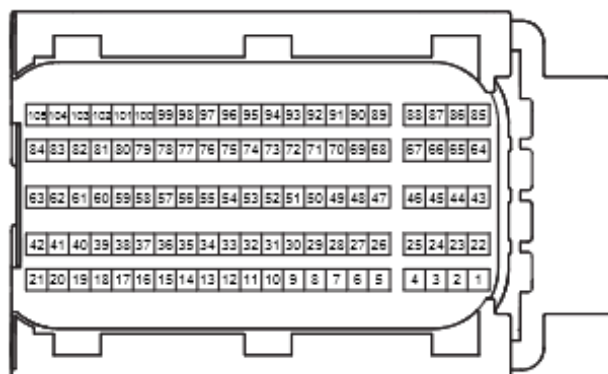
Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.

Wire text	clr	Wire colour	Connection
1			Connect to the '-' of the battery (-31); use a ring terminal.
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.
4 +12V BATTERY		Red	



Electrical connections

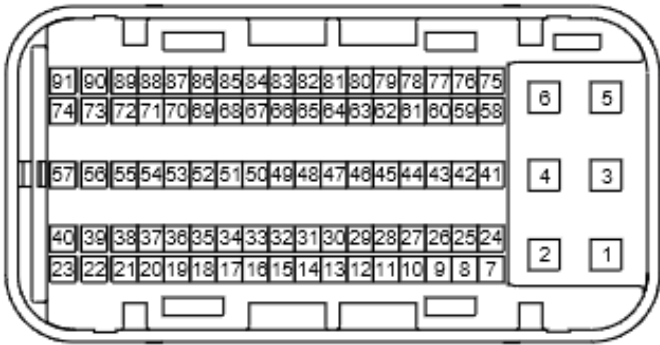
Check and measure the wiring in case of changes in the cars wiring colours.
Insulate not used wires.



Wire text	clr	Wire colour	Connection
			For measuring the engine coolant temperature. Wire colour : white Wire location : Petrol ecu C300-A Connector pin 17
19 T-ect		Grey	
			High pressure petrol sensor ground. Wire colour : yellow Wire location : Petrol ecu C300-A Connector pin 38
63 Ground Shift		Blue-orange	
36 & 25			High pressure petrol sensor signal interruption. Wire colour : grey Wire location : Petrol ecu C300-A Connector pin 39
36 AD 6		Blue-brown	Sensor side
25 DAC 1		Green-white	Petrol ecu side
			Analog in (sensor side) MAP sensor in. Wire colour : blue Wire location : Petrol ecu C300-A Connector pin 82
18 AD 1		Blue-white	
			For measuring the engine speed signal. Wire colour : brown Wire location : Petrol ecu C300-A Connector pin 96
8 RPM		Purple-white	
			High pressure petrol sensor 5Volt supply Wire colour : brown Wire location : Petrol ecu C300-A Connector pin 102
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.



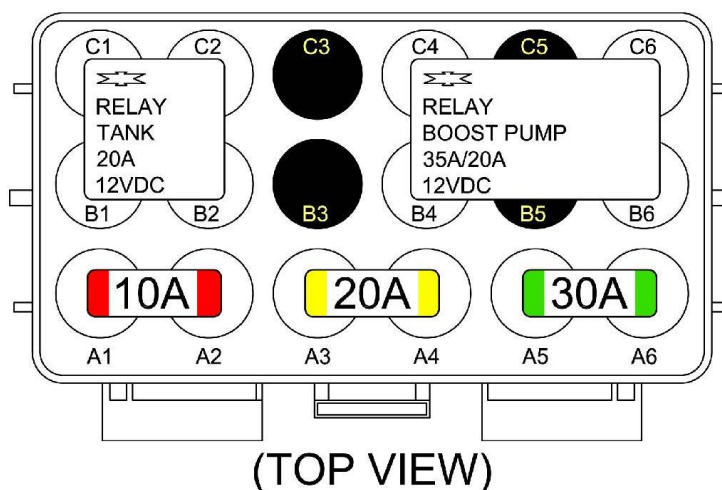
7			Connect to +ignition / contact+ (+15). Do not place the fuses in the holder before having completed the installation of the LPG system. Wire colour : green Wire location : Petrol ecu C300-B Connector pin 41
7	+IGNITION	Grey-white	

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	<i>Diagnose connector for service / diagnosis.</i> 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 Brown-black Red Red	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 Red	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



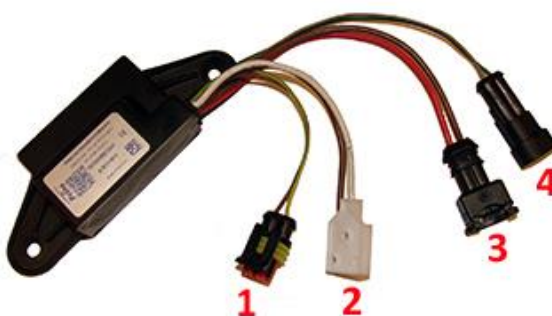
Electrical connections

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	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 Red	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 Brown	From tank pump driver From tank pump driver
3. 2-pole connector driver	Brown Red	From main ground From tank pump relay Ground pump driver +12V pump driver
4. 2-pole connector driver	Green Grey	From AFC pin 71 From AFC pin 64 LSS3 Pump driver PWM Pump driver diagnose



Prins safety stickers



Apply the sticker on an eye catching location.

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 ECU 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.

