



Installation manual

PART 2/2

MANUFACTURER	GM
TYPE	(Based on Opel Zafira)
ENGINE DISPLACEMENT	2198cc
NUMBER OF VALVES	16
ENGINE CODE / NUMBER - OUTPUT	Z22YH - 110-114kW
FIRING ORDER	1-3-4-2
VEHICLE CATEGORIES	M
TRANSMISSION	MT/AT
VERSION	AFC-2.1 DI-LPG
TYPE VSI INJECTOR	KN9 - 63cc
TYPE INJECTION MODULE	Gen2 type 2
PETROL ECU MANUFACTURER / CODE	Siemens Simtec 81.1
MODEL YEAR:	2003-20012
SYSTEM APPROVAL NUMBER (R115)	E4-#115R-000028 / VSI-LPG 48
LOCATION R115 SYSTEM STICKER	right side, centre door post
ENGINE SET NUMBER	399/124632/A (E-kit) + MAP extension
MANUAL NUMBER	076/3303100
DATE	2019-11-01

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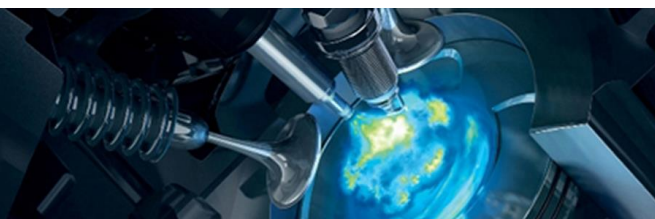


TABLE OF CONTENTS

Manual updates / revision	2
General instructions	3
Required equipment / tools / materials for installing a complete system	4
Vehicle check	4
Tightening moments / Symbols.....	5
Basic System Overview	5
VSI approval numbers	7
VSI component location overview.....	8
Mounting the Prins parts	9
Mounting the inlet manifold couplings.....	10
Overpressure / MAP connection	11
Mounting the VSI injector rail	12
LPG hoses	13
Mounting the fuel selection switch	14
Petrol Ecu.....	15
Basic Wiring Diagram	16
Electrical connections	17
Electrical connections	18
Electrical connections – Not used wires to insulate.....	19
Electrical connections – How to insulate not used wires	19
Electrical connections	20
Electrical connections	21
Electrical connections	22
Electrical connections	23
Checklist after installation	24
FOR EXPLANATION AND CIRCUIT DIAGRAMS SEE : INSTALLATION MANUAL GENERAL PART 1 / 2	



Manual updates / revision

Rev. nr	Rev. Date	Subject update
-	2019-11-01	Release



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.
- 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 and alarm system.
- Do not place the main fuse into the fuse holder before having completed the installation of the VSI system.
- The VSI computer has to be activated by means of the diagnosis software.
- In the unlikely event the AFC fails, it will automatically switch over to petrol. Never disconnect the AFC connector, unless you have removed the main fuse.
- When installing the VSI 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 the 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 100mm of the exhaust or similar heat source, unless such components are adequately shielded against heat.
- Remove any internal burrs after having shortened the LPG pipe.
(This guarantees the maximum flow through the pipe without pollution.)
- 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 an exterior filler into the body work).
- After having completed the installation, check the whole system for gas leakage; use a gas leak detection device. Also check for any 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'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.](#)

Please fill in the [warranty portal](#) completely 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 analyser
- 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 analyser)
- Check the condition of the ignition system (spark plugs, cables, coil)



Tightening moments / Symbols

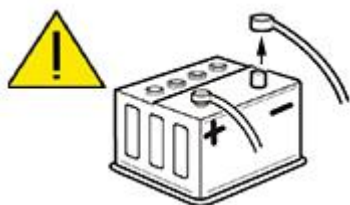
	Nm	Spanner mm
M5 x 0,8	6.5	8
M6 x 1,0	11.3	10
M8 x 1,25	27.3	13
M10 x 1	52	15-16-17
M10 x 1,5	54	15-16-17

LPG manifold nipple	1	3.5 Allen
Reducer nut - bracket	10	13
Lock-off nut	15	16
Fuel line nut – lock-off	20	13
Fuel line tank – lock-off	20	16
Filling hose connections	50	22

EXPLANATION OF SYMBOLS:

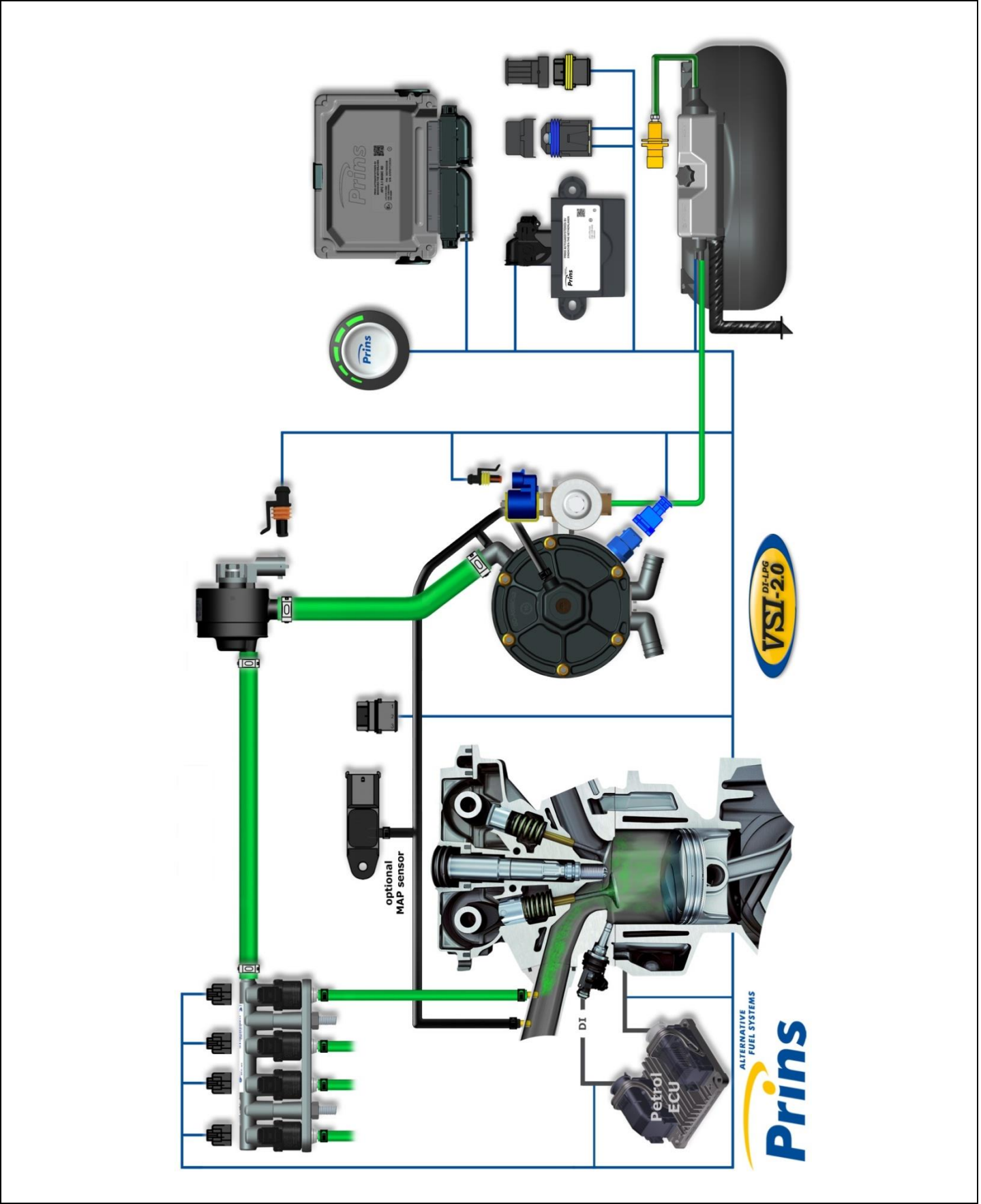


= IMPORTANT, CAUTION



= WEAR SAFETY GOGGLES









Basic System Overview




VSI approval numbers

	
<p>Reducer VSI LPG Prins : E4-67R-010054</p> <p>Lock-off valve OMB : E8-67R-014327</p> <p>Lock-off valve Valtek : E4-67R-010041</p>	<p>Injector rail Prins : LPG E4-67R-010093 CNG E4-110R-000021</p>
	
<p>Filter unit T1 / T2 Prins : LPG E4-67R-010096</p> <p>Filter unit Keihin: LPG E4-67R-010177</p>	<p>Injector Keihin KN9 : LPG E4-67R-010310 CNG E4-110R-000295</p>
	
<p>Prins AFC : E4-67R-010098 E4-10R-030507</p>	<p>Tubithor : LPG E13-67R-010145 CNG E13-110R-000017</p> <p>Rubia : LPG E4-67R-010068 CNG E4-110R-000003</p> <p>WinLas : LPG E37-67R-010140 CNG E37-110R-000012</p> <p>Thunderflex : LPG E24-67R-010018 CNG E24-110R-000040</p>

VSI component location overview
(example Opel Zafira B with VSI-1 DI)

<p>Reducer</p> 		<p>Rail(s)</p> 
<p>Filter</p> 		<p>AFC</p> 
<p>Petrol ECU</p> 		<p>Injection module</p> 
		<p>Fuse box</p> 

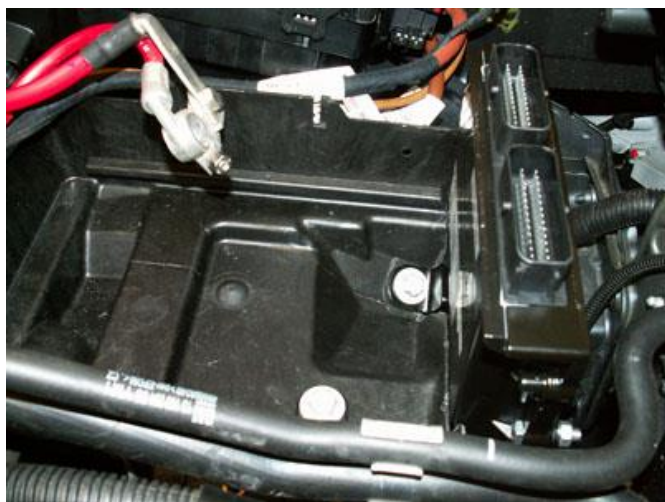
	<p>If applicable, R115 approval sticker : Right side centre door post</p>
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Mounting the Prins parts

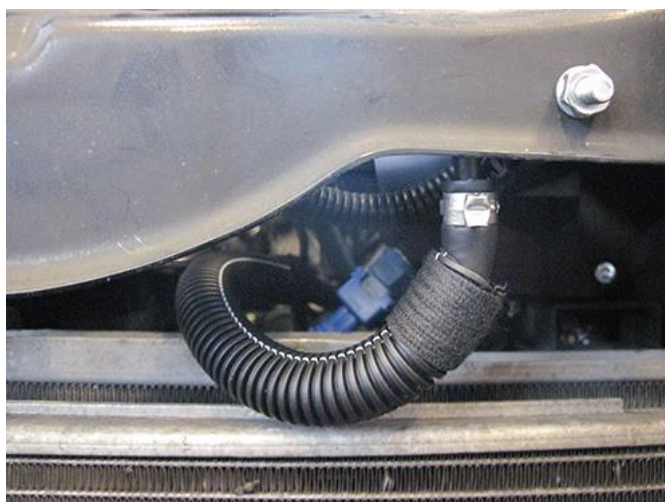
Example from Opel Zafira with VSI-1 DI



Reducer & Filter



AFC & Injection Module



MAP Sensor & Water Connections

Mounting the inlet manifold couplings

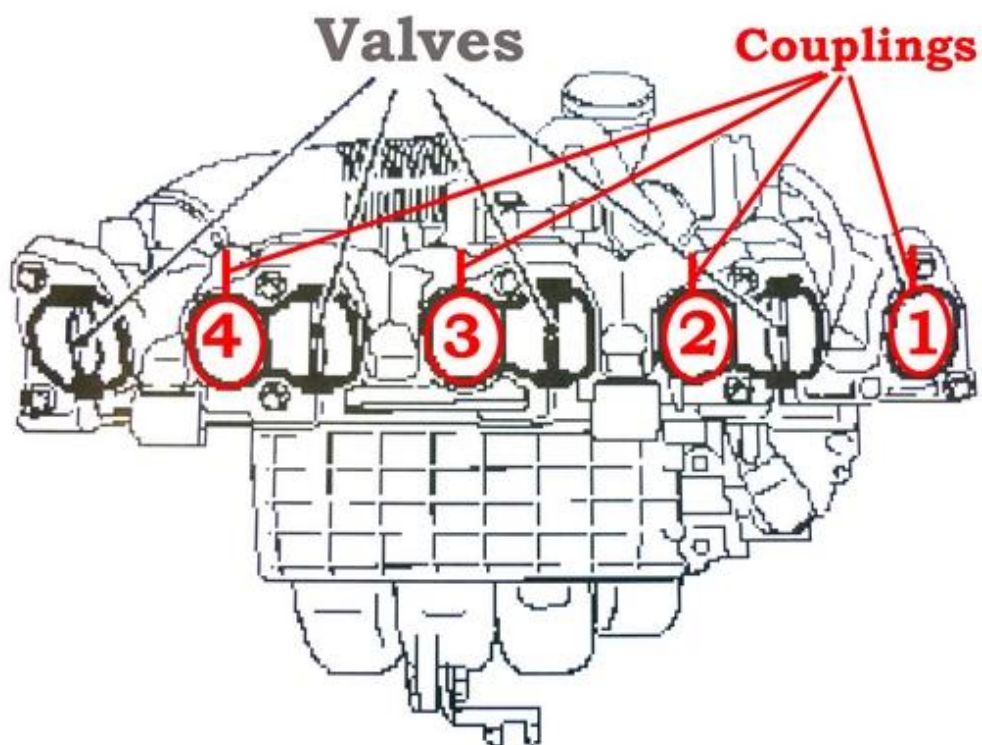
Remove the inlet manifold.

Drill **5** holes of **5mm** in the inlet manifold (also 1 for MAP). Cut **M6x1** thread in these holes.

Place the VSI couplings with a lock compound in the inlet manifold.

Watch out that the lock compound doesn't come inside the VSI couplings.

Place the inlet manifold back on the engine.

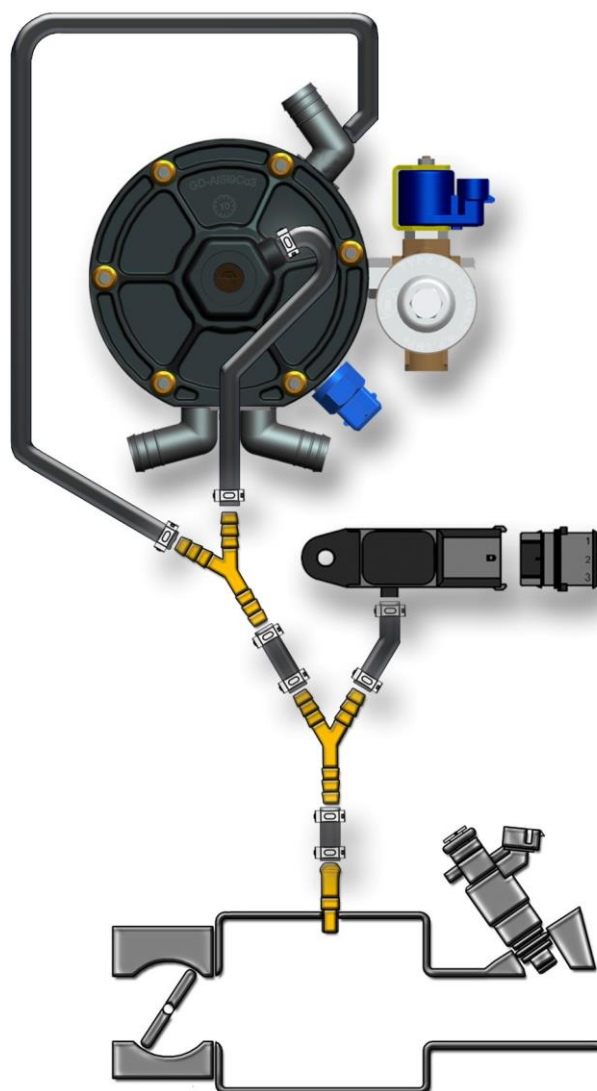


Injectors



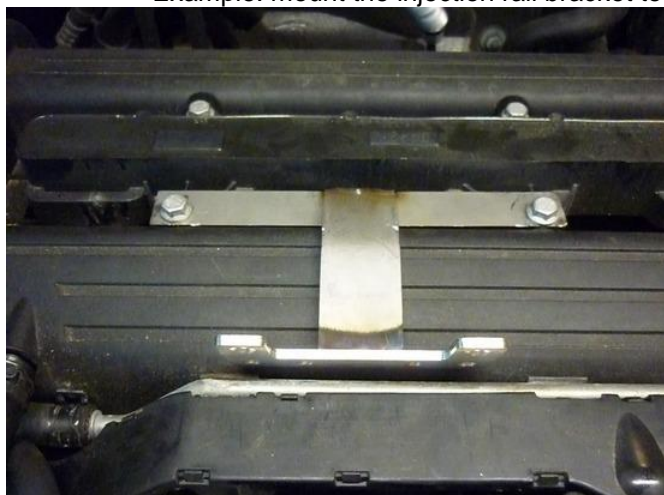
MAP/Overpressure

Overpressure / MAP connection



Mounting the VSI injector rail

Example: mount the injection rail bracket to the bolts from the ignition coils. Adapt cover.



LPG hoses

(Based on Zafira)

<i>Hose (Ø..mm)</i>	<i>From component</i>	<i>To component</i>	<i>Hose length (cm)</i>
16	Reducer	Prins filter unit	5.5
11	Prins filter unit	VSI injector rail	65
5	Reducer overpressure	Y-piece	25
5	Reducer MAP connection	Y-piece	13
5	Y-piece	Inlet manifold coupling (vacuum)	30
5	VSI injector 1	Inlet manifold coupling cyl.1	23
5	VSI injector 2	Inlet manifold coupling cyl.2	20
5	VSI injector 3	Inlet manifold coupling cyl.3	20
5	VSI injector 4	Inlet manifold coupling cyl.4	21

General info.

In Case of a *Keihin* filter : only use two **M6x10mm** bolts with spring washers.

Cut the LPG hoses on length.

Cut the nylon hoses on length, make sure that the inlet of the nylon hose faces the injector outlet.

Please observe that there is no damage or fouling to the hoses.



Mounting the fuel selection switch (based on Zafira)



When mounting the switch, only push on its sides.
Pushing the switch hard in the centre may result in damage to the switch.



original grummet outside

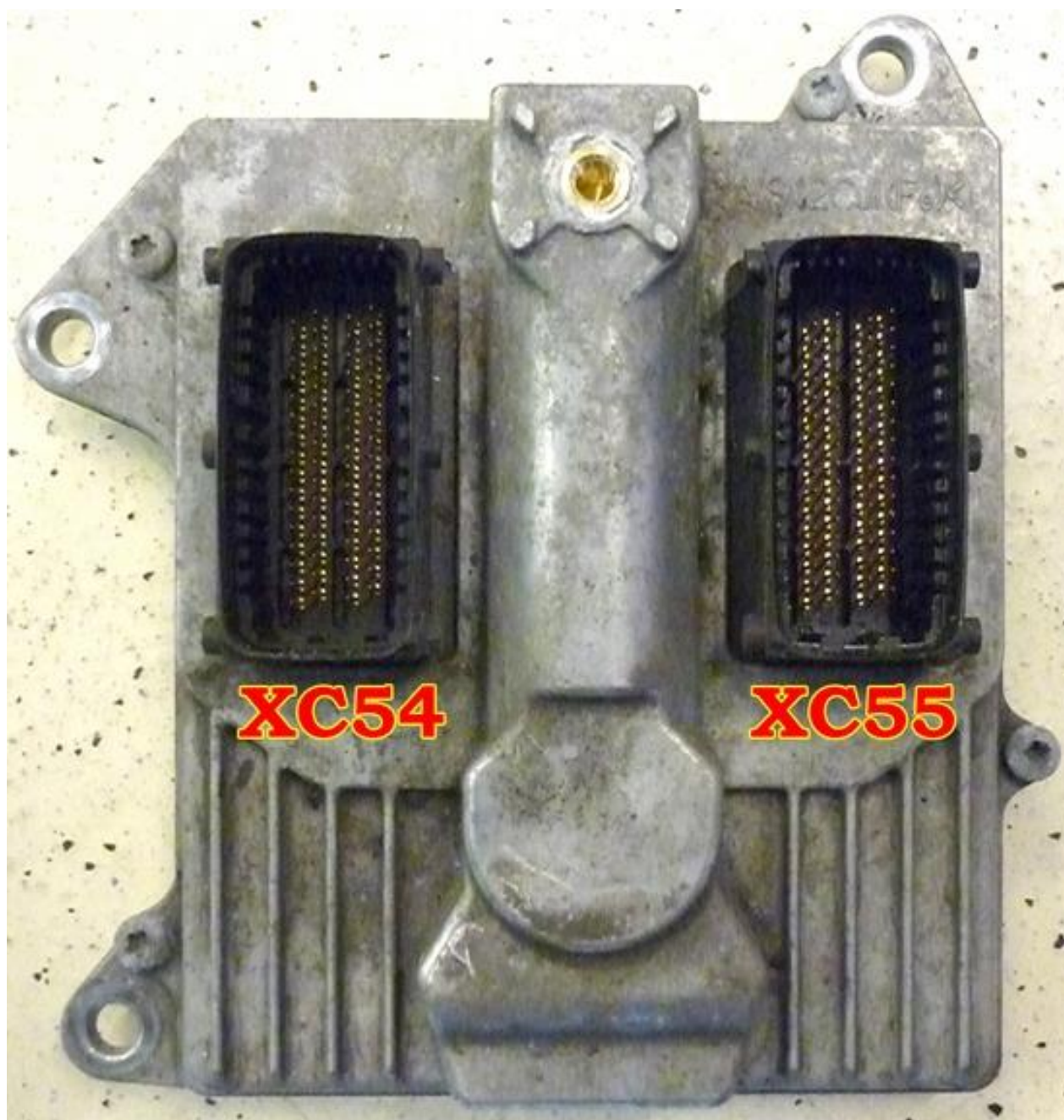


original grummet inside



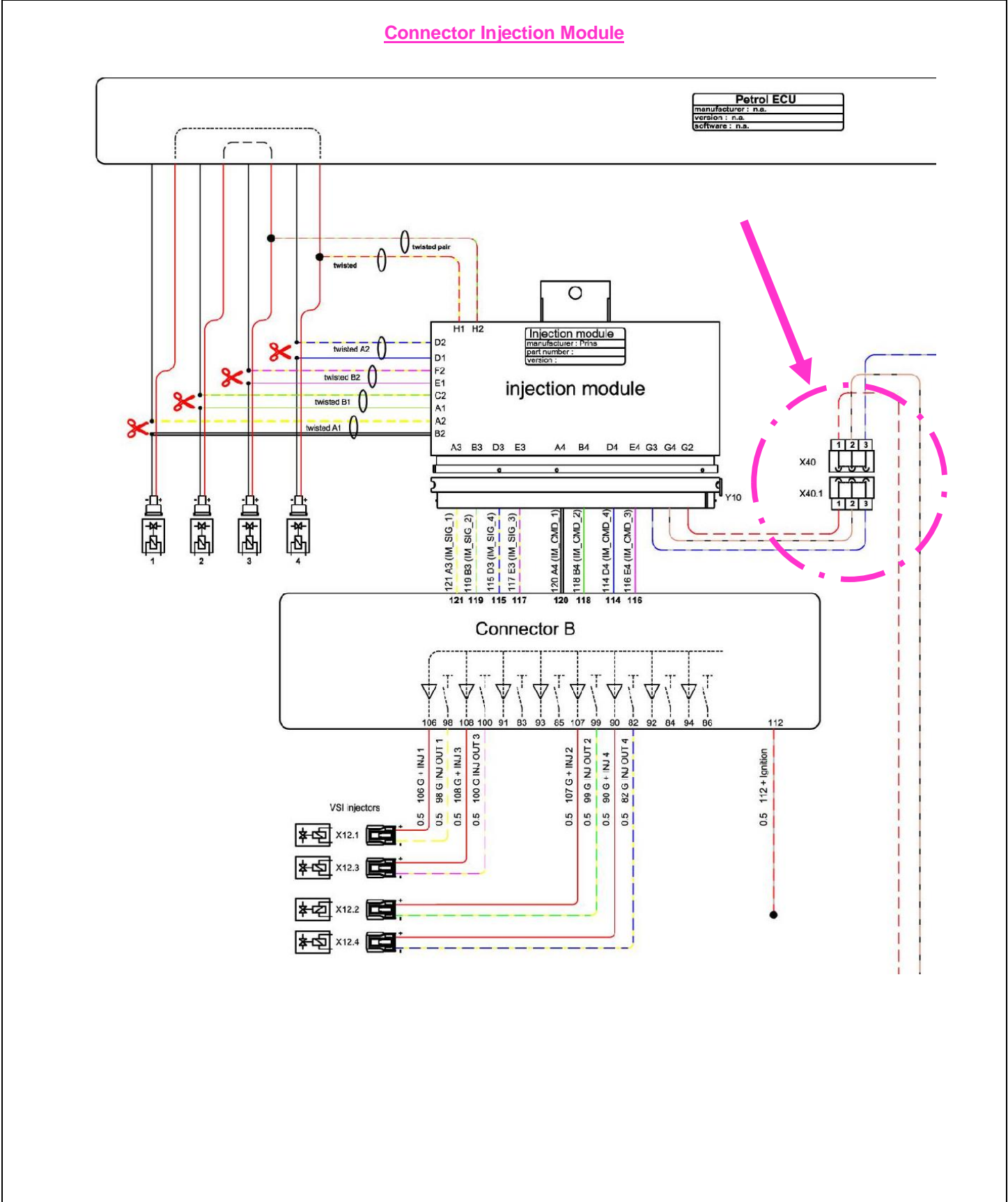
Mount the VSI-2.0 Switch. The VSI-1 switch is an example.

Petrol Ecu





Electrical connections

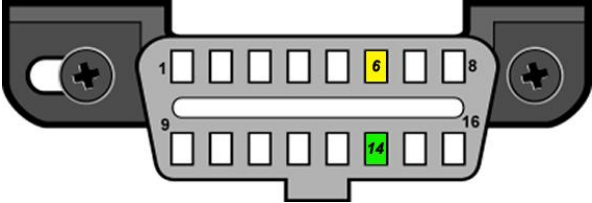
Check and measure the wiring in case of changes in the cars wiring colours.






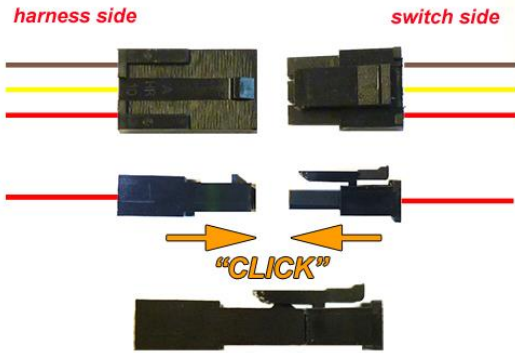
Electrical connections

Driver room

				Connect to EOBD diagnose connector.
51	CAN1 High		Yellow	Pin : 6
70	CAN1 Low		Green	Pin : 14



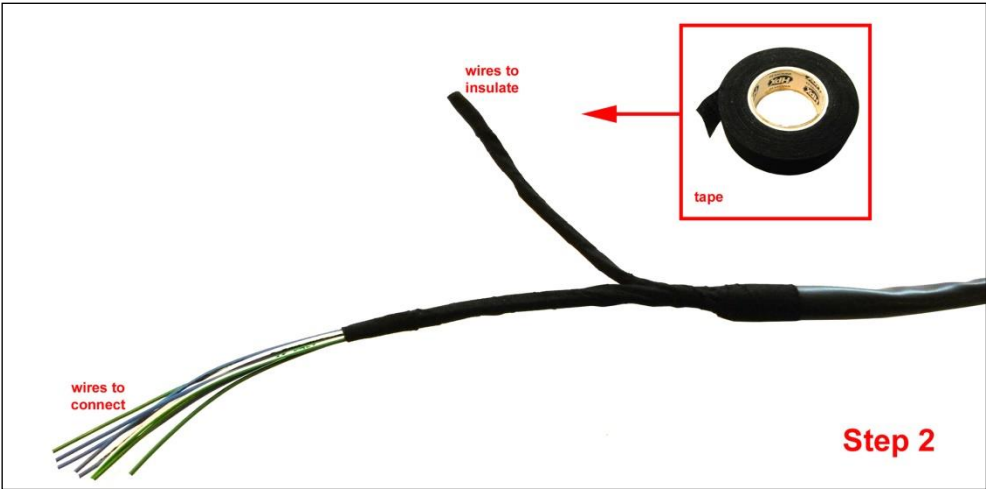
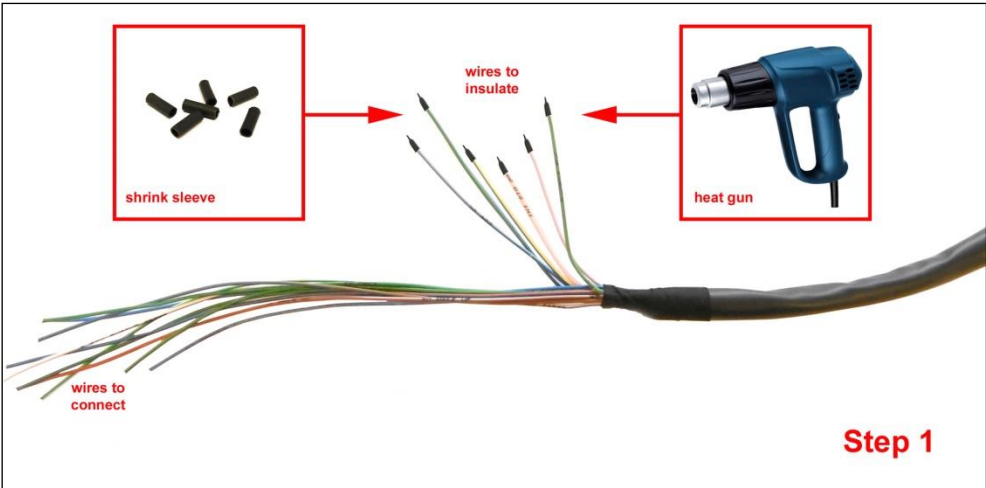
3-pole micro connector				Connect to the Prins fuel selection switch.
66	Ground fuel switch		Brown-black	
3	+12V fuel switch		Red-white	
49	LIN fuel switch		Yellow	



Electrical connections – Not used wires to insulate









10	DAC 2		Green	<i>Insulate</i>
19	AD4		Blue	<i>Insulate</i>
20	AD3		Blue-pink	<i>Insulate</i>
22	LSS1		Purple	<i>Insulate</i>
23	LSS2		Purple-green	<i>Insulate</i>
36	AD 6		Blue-brown	<i>Insulate</i>
38	AD7		Blue-light Blue	<i>Insulate</i>
39	AD8		Blue-red	<i>Insulate</i>
43	+12 Valve 2		Red-white	<i>Insulate</i>
50	DAC4		Green-blue	<i>Insulate</i>
56	DI2		Yellow-green	<i>Insulate</i>
60	DIG IN3		Yellow-pink	<i>Insulate</i>
61	DIG IN4		Yellow-blue	<i>Insulate</i>
62	C Ground		Brown-black	<i>Insulate</i>
74	DAC3		Green-pink	<i>Insulate</i>
<i>Insulate additional loose wires</i>				

Electrical connections – How to insulate not used wires



Electrical connections

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

98	98 G INJ OUT 1		White-yellow	Connector VSI-injector to cylinder 1. Timing belt/chain side
106	106 G + INJ 1		red	
99	99 G INJ OUT 2		Green-yellow	Connector VSI-injector to cylinder 2.
107	107 G + INJ 2		red	
100	100 G INJ OUT 3		Pink-yellow	Connector VSI-injector to cylinder 3.
108	108 G + INJ 3		red	
82	82 G INJ OUT 4		Blue-yellow	Connector VSI-injector to cylinder 4.
90	90 G + INJ 4		red	



Electrical connections

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



For measuring the petrol injectors :

Interrupt each petrol injector control wire (injector min)

Each VSI wire has a petrol injector / cylinder number printed on the wire, connect this wire to the corresponding petrol injector / cylinder.

Connect the **bicoloured** VSI measuring wire to the **ecu side** (wire code: ecu-lo).

Connect the **corresponding full coloured** VSI wire to the **petrol injector side** (wire code: inj-lo).

See diagrams: Installation manual general part 1 / 2.

Attention:

Each bicoloured measuring wire corresponds to a specific LPG injector and petrol injector / cylinder number. Do not interchange the wires.


Petrol injector cyl. 1			
INJ LO 1		White	Injector side
ECU LO 1		White-yellow	ECU side
IM pos. B2 / A2			Colour: Brown-green Location: petrol ecu, XC54 , pin 6
Petrol injector cyl. 4			
INJ LO 4		Blue	Injector side
ECU LO 4		Blue-yellow	ECU side
IM pos. D1 / D2			Colour: Brown-grey Location: petrol ecu, XC54 , pin 38
(cyl. 1-4)			
ECU HIGH A		Red-white	Injector side
IM pos. H1			Colour: Brown-yellow Location: petrol ecu, XC54 , pin 21
Petrol injector cyl. 2			
INJ LO 2		Green	Injector side
ECU LO 2		Green-yellow	ECU side
IM pos. A1 / C2			Colour: Brown-blue Location: petrol ecu, XC54 , pin 22
Petrol injector cyl. 3			
INJ LO 3		Pink	Injector side
ECU LO 3		Pink-yellow	ECU side
IM pos. E1 / F2			Colour: Brown-white Location: petrol ecu, XC54 , pin 54
(cyl. 2-3)			
ECU HIGH B		Red-green	Injector side
IM pos. H2			Colour: Brown-violet Location: petrol ecu, XC54 , pin 5










Electrical connections





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



Do not place the fuse in the holder before having completed the installation of the LPG system.



32	Ground sense1 Ground battery		Brown	Connect to the '-' of the battery; use a ring terminal or solder: Wire colour: Wire location: Battery ground
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
4	+12V Battery		Red	Connect to the '+' of the battery; use a ring terminal or solder: Wire colour: Red Wire location: +12V Battery
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3-pole connector				For measuring the inlet manifold pressure (MAP).
27	+5V Sensor			Connect the 3-pole connector to the Prins MAP sensor
37	C ground			
18	AD1			

17 & 25				High pressure petrol sensor signal interruption. Wire colour: Blue-white Wire location: petrol ecu, XC54 , pin 28
17	AD 2			Sensor side
25	DAC 1			Petrol ecu side

				High pressure petrol sensor supply 5V Wire colour: Black-white Wire location: petrol ecu, XC54 , pin 19
40	Wake-up			

				High pressure petrol sensor ground. Wire colour: Brown-white Wire location: petrol ecu, XC54 , pin 43
63	Ground Shift			

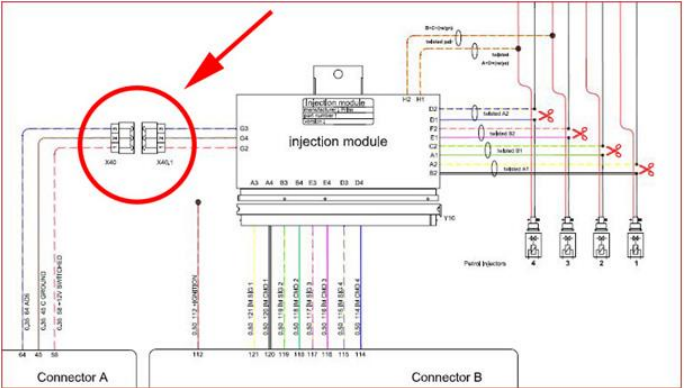
				For measuring the engine speed signal. Wire colour: Yellow-violet Wire location: petrol ecu, XC54 , pin 25
8	RPM			

112				Connect to +ignition / contact+ (+15). <i>Do not place the fuses in the holder before having completed the installation of the LPG system.</i> Wire colour: Black Wire location: petrol ecu, XC55 , pin 2
112	+ Ignition			



Electrical connections

Connectors in wiring loom

2-pole blue connector 15 T-ECT 34 Ground T-ECT	Grey Brown-black	<i>For measuring the engine coolant temperature (Tect).</i> Connect the connector to the reducer temperature sensor.
4-pole connector 35 Ground Psys 14 T-Gas 9 +5 Volt sensor 16 Psys	Brown-black Grey Red-blue Green	<i>For measuring gas pressure and temperature.</i> Connect the connector to the filter unit sensor.
2-pole connector 24 +12V reducer lock-off 31 C Ground	Yellow-green Brown-black	Connect the connector to the reducer lock-off valve.
4-pole connector 46 Service TxD 65 Service RxD 68 Ground PDT	Grey Grey Brown-black	Diagnose connector.
Tank wiring loom 2 +12V Tank relay 12 Tank level IN 26 Ground tank relay	red blue black	Connect to the tank lock-off. Connect the tank level gauge. Connect to the tank lock-off.
Wiring loom link 45 C ground 58 +12V switched 64 AD5	Brown-black Red-white Blue-grey	Connection from AFC connector A to connector B. 

Optional:

3-pole connector 11 + manometer 12 tank level in 33 ground manometer	red blue brown	Cut off connector and insulate wires
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Checklist after installation

1. Connect the Prins Diagnostic Tool and run the VSI diagnostic program.
Install the VSI fuse, turn the ignition key in the accessory position.
When working on the car, beware of moving and rotating parts in the engine compartment.
2. When commissioning the LPG system, you must activate the AFC with the diagnostic software.
When the AFC has not been activated, the switch will keep blinking.
To activate the AFC, select function *activate ECM* in the diagnostic software.
3. Check whether the program in the AFC matches with the car (dedicated engine set):
Refer the car description in the diagnostic software (Basic → Identification) and compare these with the set number.
4. The system will switch over to LPG as soon as the temperature of the coolant becomes higher than parameter 70 - Switch over ECT.
5. Check all components and connections for any gas leakage (use a LPG leak detector device or a fluid detection like soap). Caution for moving and rotating parts in the engine compartment!
6. Let the engine run warm on petrol >80°C.
Check if the reducer heats up.
Check the engine signals, petrol injection time, RPM, ECT, lambda, MAP signal and petrol pressure signal.
Let the engine run idle on LPG.
Adjust the reducer pressure.
Refer to *Basic → System* in the diagnostic software for the idle level value set.
Adjust the reducer pressure in such a way that the pressure measured (P-sys) equals the idle level value.
Turn the socket-head screw at the front of the reducer to adjust the pressure.
An error code will be generated whenever the pressure variation is too high.
7. Use the diagnostic software to check again all input and output signals.
8. Check the system for error codes and solve these, if required.
Check the petrol ECM for EOBD error codes.
Place the protection connector on the VSI communication connector.
9. Take a test drive and check the drivability on LPG and petrol.

