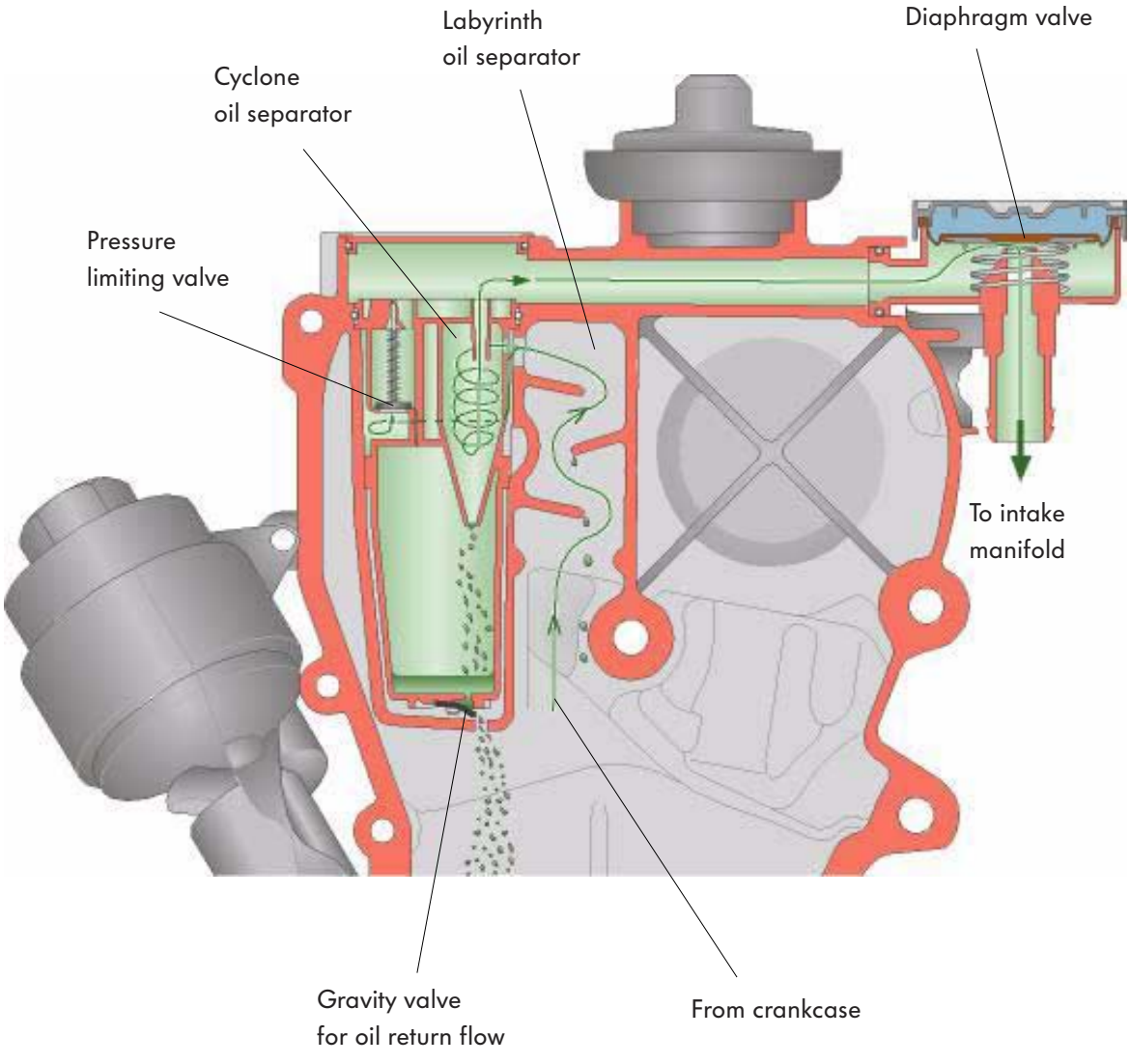
Crankcase ventilation outlet

The gases are drawn out of the crankcase by the vacuum in the intake manifold.

The oil is separated from the gases in the labyrinth and in the cyclone oil separator and drips back into the oil pan. The remaining gases flow through the diaphragm valve into the intake manifold. At this point, the gases are mixed with the inducted air and flow to combustion.

The pressure limiting valve opens if an overpressure exists in the crankcase. In this case, the gases also flow past the pressure limiting valve and the pressure is reduced.
An overpressure develops, for example, as a result of wear at the piston rings and cylinder walls. In this case, there is an increased flow of gases from the cylinder into the crankcase.

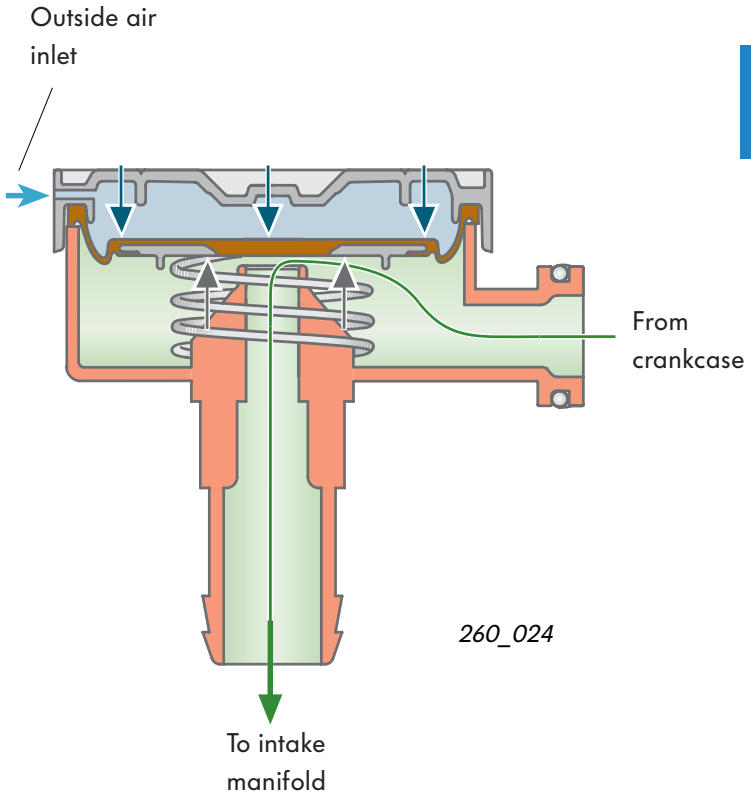


260_060

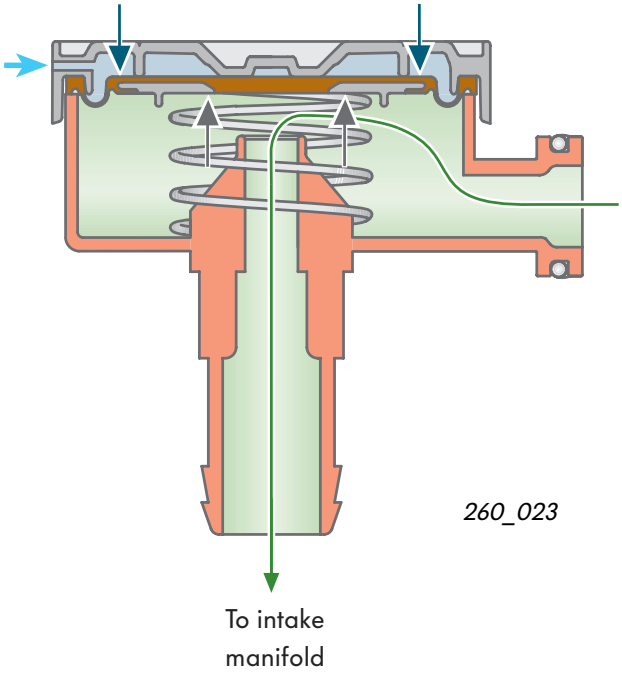
The diaphragm valve

ensures a uniform pressure level and good ventilation of the crankcase.
It is split into two chambers by a diaphragm. One chamber is connected to the outside air and the other to the intake manifold.

– At a high intake manifold vacuum (e.g. idling) the diaphragm is pulled against the force of the spring in the direction of the opening cross-section. As a result, less gas is drawn out of the crankcase.



– At a low intake manifold vacuum (e.g. full throttle) the spring pushes the diaphragm back. As a result, the cross-section is opened wide and more gas is drawn out of the crankcase.



Engine management system

System overview

Intake air temperature sender G42
and intake manifold pressure sender G71

Engine speed sender G28

Hall sender G40
(for camshaft position)

Throttle valve control unit J338
Throttle valve drive angle sender
G187 and G188 (el. throttle)

Accelerator pedal position sender G79
and G185

Clutch pedal switch F36

Brake light switch F and
Brake pedal switch F47

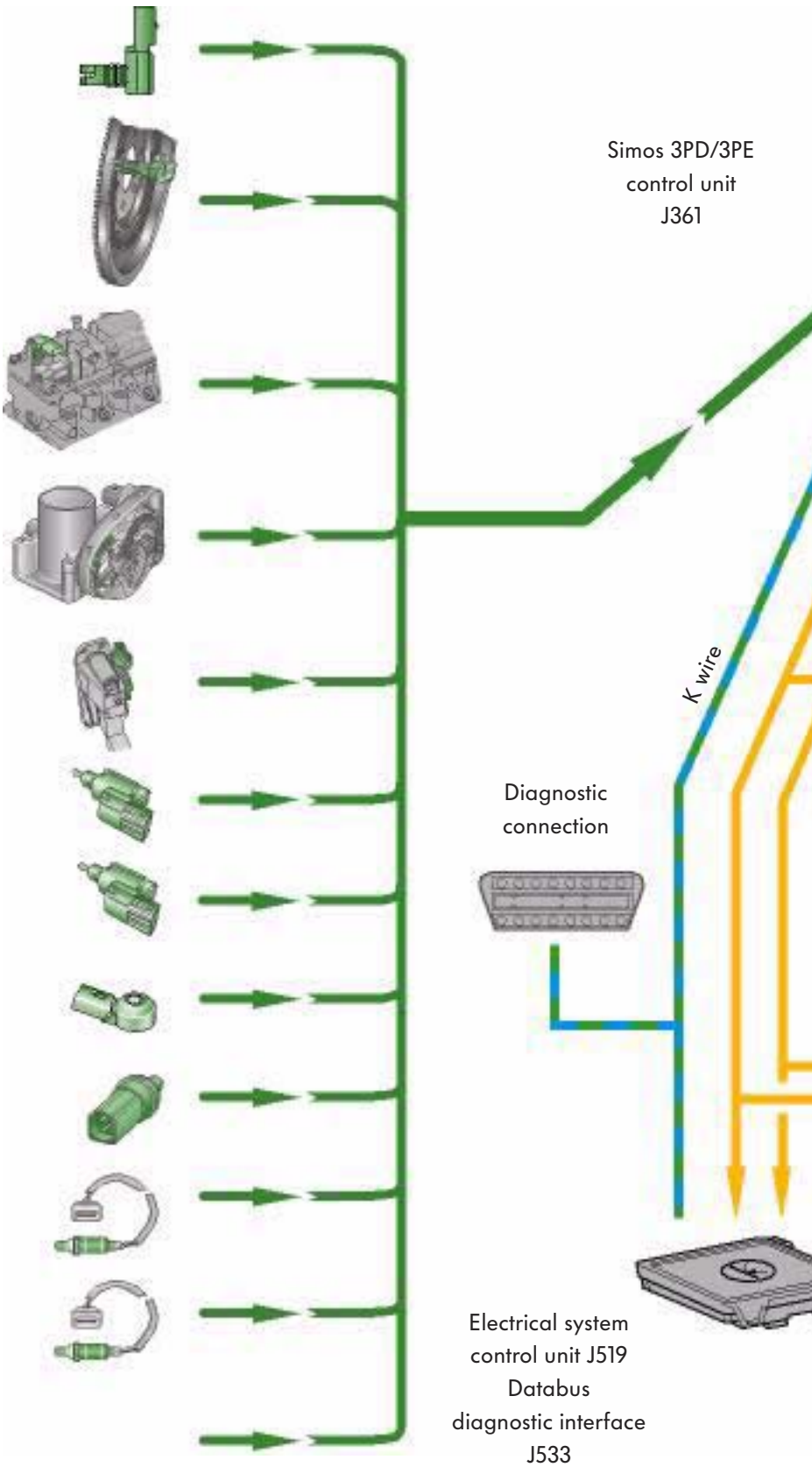
Knock sensor G61

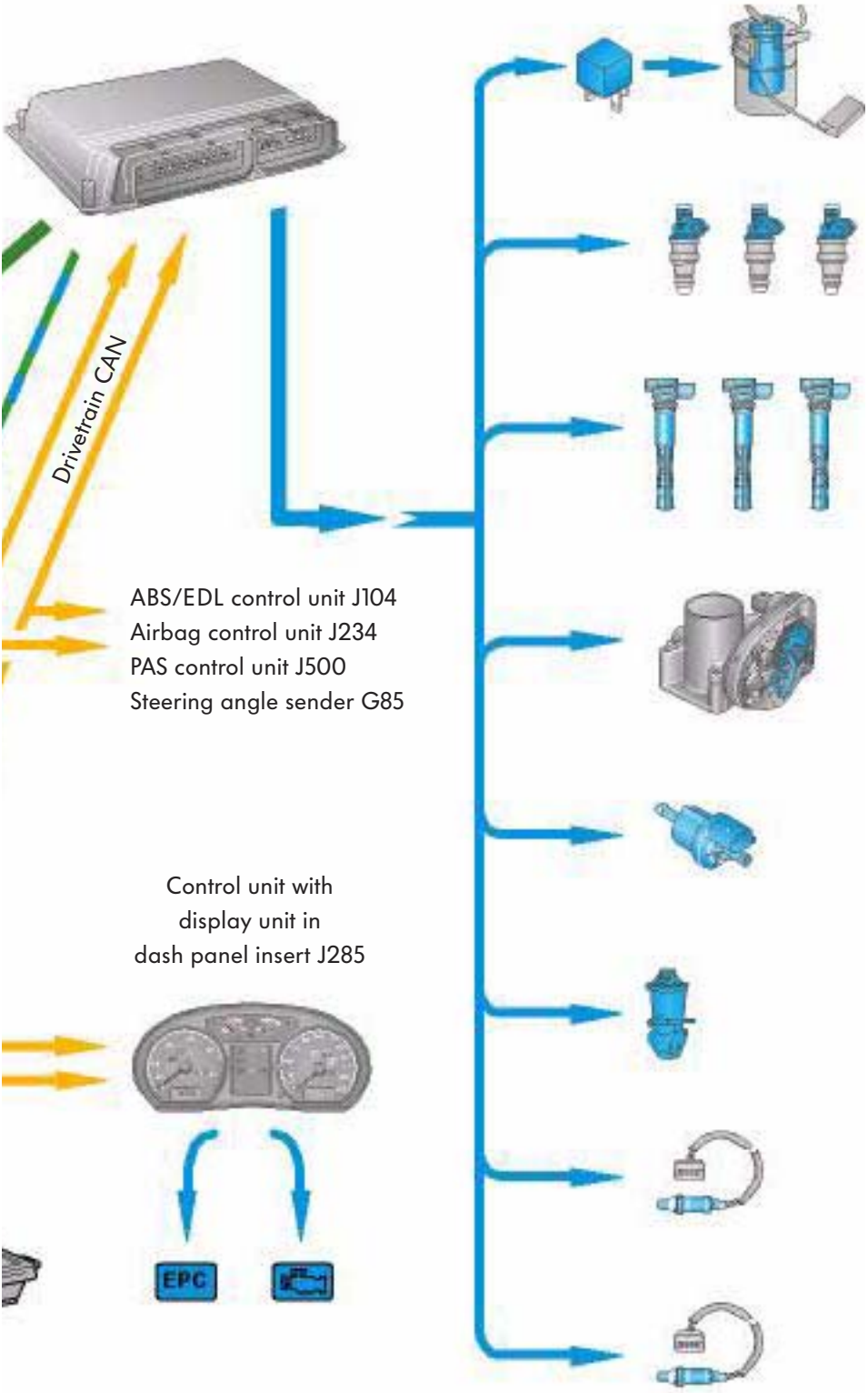
Coolant temperature sender G62

Lambda probe G39

Lambda probe downstream of cat G130

Additional signals:
Alternator terminal DFM
Vehicle speed signal
Switch for cruise control system (ON/OFF)





260_026

* only on engine with 4-valve technology

Engine management system

The engine control unit

is located on the engine side at the bulkhead and has 121 pins.
This installation position has been selected to provide easy access to the engine control unit, while at the same time protecting it from moisture.

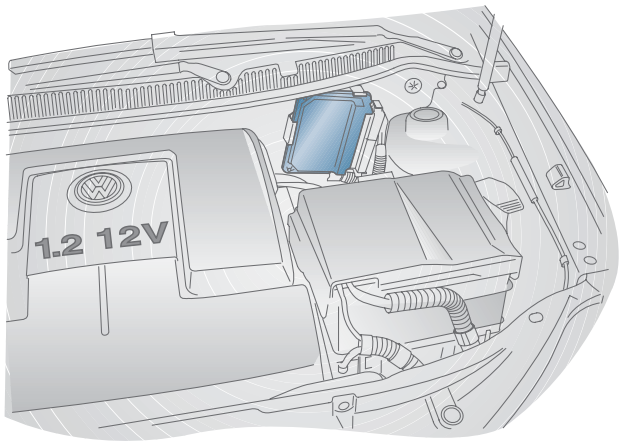
The engine management systems used are

– on the 1.2 ltr./40 kW engine the Simos 3PD and
– on the 1.2 ltr./47 kW engine the Simos 3PE.

Both are designed for single-spark ignition coils.

The difference between the two engine management systems relates to the differing lambda regulation.

– The 1.2 ltr./40 kW engine features two step-type lambda probes
– while the 1.2 ltr./47 kW engine uses one broadband and one step-type lambda probe.



260_032

The designations Simos 3PD and 3PE mean:

1.2 ltr./40 kW engine

Simos	Manufacturer Siemens
3	Version with electric power control
P	Load detected by intake manifold pressure sender
D	Development stage with single-spark ignition coils and two step-type lambda probes

1.2 ltr./47 kW engine

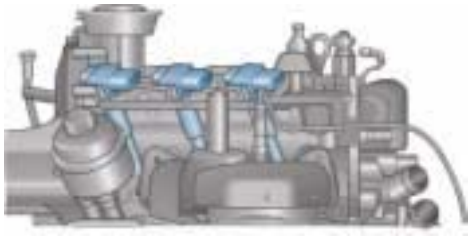
Simos	Manufacturer Siemens
3	Version with electric power control
P	Load detected by intake manifold pressure sender
E	Development stage with single-spark ignition coils, one broadband and one step-type lambda probe

The single-spark ignition coils

Both engines feature single-spark ignition coils with integrated power output stage.

Installation position

– on the 1.2 ltr./40 kW engine inserted into the side of the cylinder head and



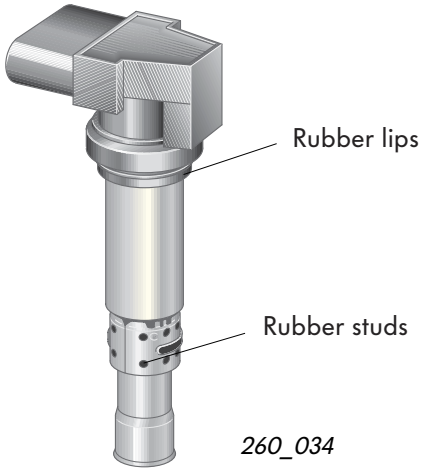
260_079

– on the 1.2 ltr./47 kW engine inserted into the middle of the cylinder head.

260_033

Effects in the event of failure

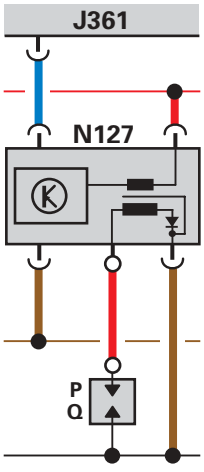
If a single-spark ignition coil fails, this is detected by the misfiring detection system.
The corresponding injector is then no longer actuated.



260_034

Electric circuit

J361 Simos control unit
N127 Ignition coil 2 with power output stage
P Spark plug connector
Q Spark plugs

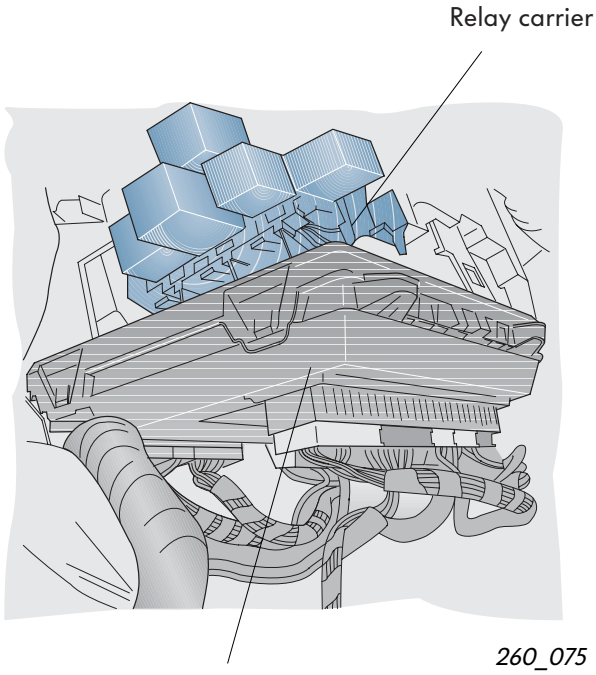


260_068

The fuel pump feed control

The 2002 Polo features a new fuel pump feed control.

Two parallel relays take the place of the individual fuel pump relay with integrated crash fuel shut-off. The fuel pump relay J17 and the fuel feed relay J643. Both relays are located on the relay carrier above the vehicle electrical system control unit J519.



260_075

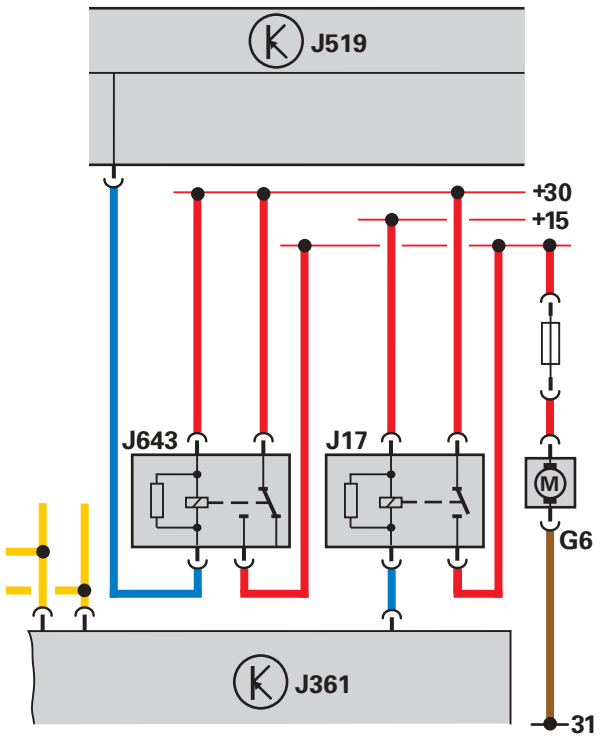
The fuel pump relay J17 is actuated by the engine control unit and the fuel feed relay J643 by the vehicle electrical system control unit.

Ignition (terminal 15) „off“

At ignition „off“, the fuel pump feed control is performed by the vehicle electrical system control unit J519 and by the fuel feed relay J643.

Ignition (terminal 15) „on“

At ignition „on“, the fuel pump feed control is performed by the engine control unit J361 and the fuel pump relay J17.



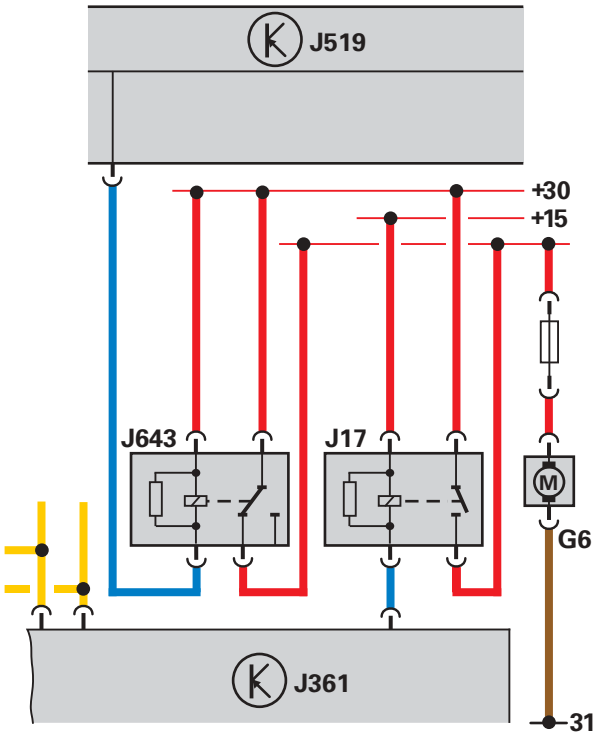
260_072

Ignition (terminal 15) „off“

When the ignition is off, the fuel pump feed control is activated if „driver door open“ is detected by the door contact switch. The vehicle electrical system control unit thereupon actuates the fuel feed relay and the fuel pump runs for about two seconds.

A timer switch in the vehicle electrical system control unit

- prevents the fuel pump from running constantly if the driver door is opened at short intervals.
- once again actuates the fuel pump if the driver door remains open for longer than 30 minutes.



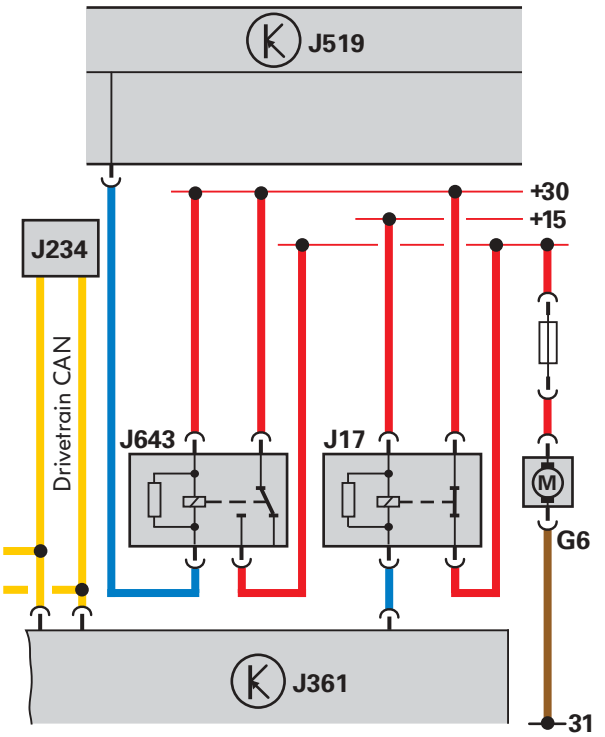
260_073

Ignition (terminal 15) „on“

If ignition is on, the engine control unit actuates the fuel pump relay and the fuel pump runs for about two seconds.
If the engine is started and an engine speed of more than 30 rpm is detected, the fuel pump relay is constantly actuated and the fuel pump is switched on.

The fuel pump relay continues to be actuated until

- terminal 15 „off“ is detected,
- engine speed is less than 30 rpm or
- a crash signal has been transmitted by the airbag control unit J234 to the engine control unit.



260_074

After a crash signal it is not possible to switch the fuel pump on again until the ignition has been switched off and on.

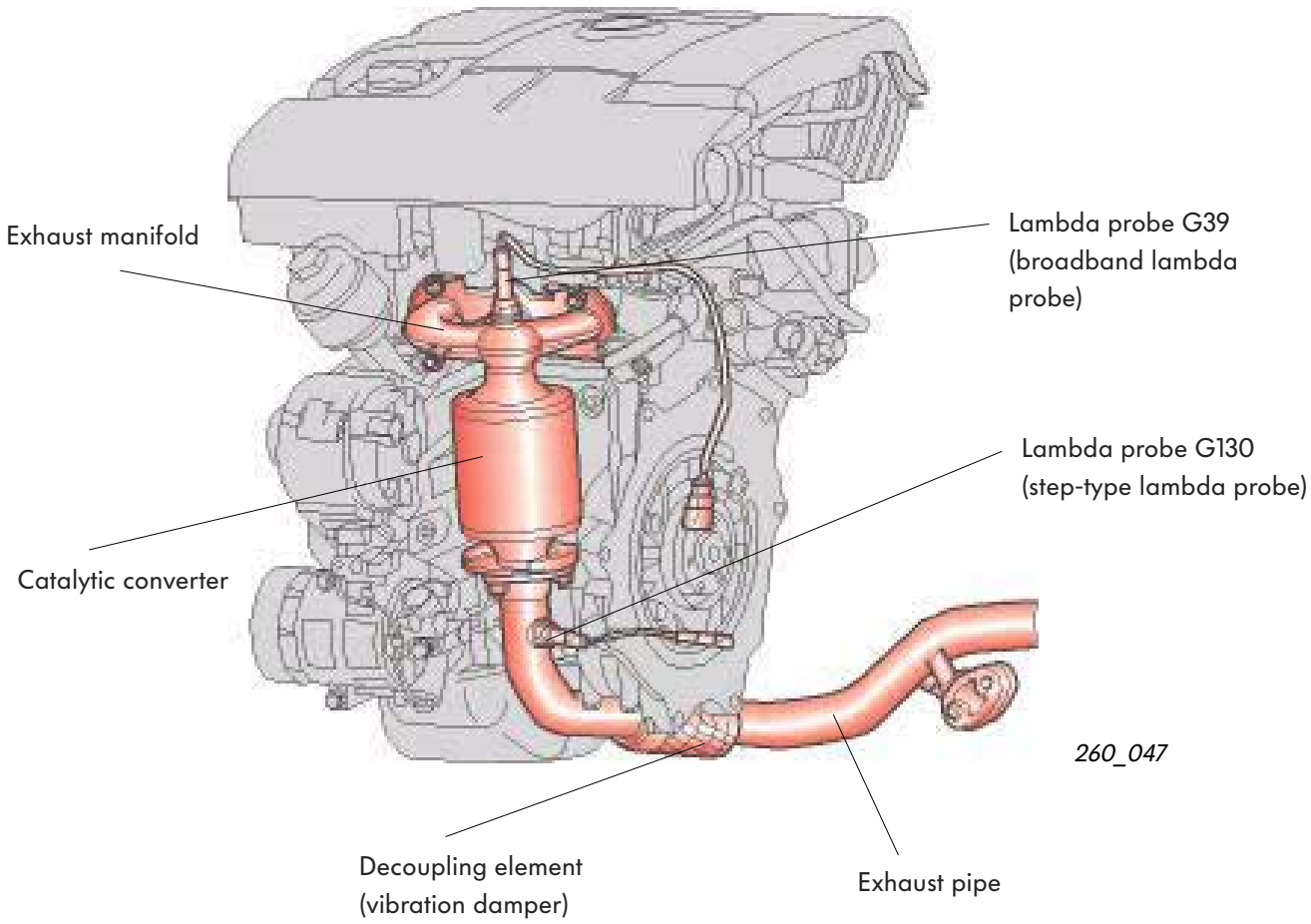
Exhaust post-treatment

The exhaust post-treatment features a large three-way catalytic converter. This is installed directly downstream of the exhaust manifold in the exhaust line.

The catalytic converter must heat up rapidly and thus be operational within a short time in order to comply with the EU4 emission standard. This is achieved by positioning the catalytic converter close to the engine.

Until now, though, the catalytic converter was too small in design, for space reasons, to alone comply with the emission standard. That is why a main catalytic converter was used in addition to the pre-catalytic converter.

On the 3-cylinder engines, the installation situation is more favourable as a result of the upright oil filter. The catalytic converter is positioned close to the engine and is now so generously dimensioned that it is able to comply by itself with the EU4 emission standard.



Emission control

This is performed by means of two lambda probes.

The pre-cat lambda probe

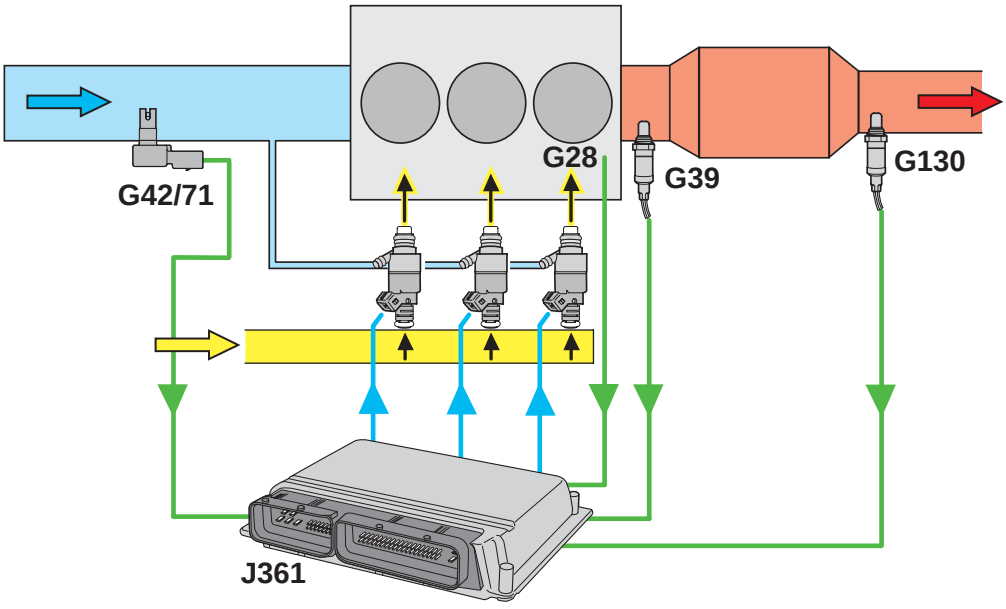
On the 1.2 ltr./40 kW engine a step-type lambda probe is used as the pre-cat lambda probe. On the 1.2 ltr./ 47 kW engine a broadband lambda probe is used.

The pre-cat lambda probe determines the oxygen concentration in the exhaust upstream of the catalytic converter. If deviation from $\lambda = 1$ occurs, the injection period is varied accordingly.

The post-cat lambda probe

On both engines a step-type lambda probe is used as the post-cat lambda probe.

The post-cat lambda probe is used for verifying the function of the catalytic converter. Adaptation of the pre-cat lambda probe G39 is also performed.



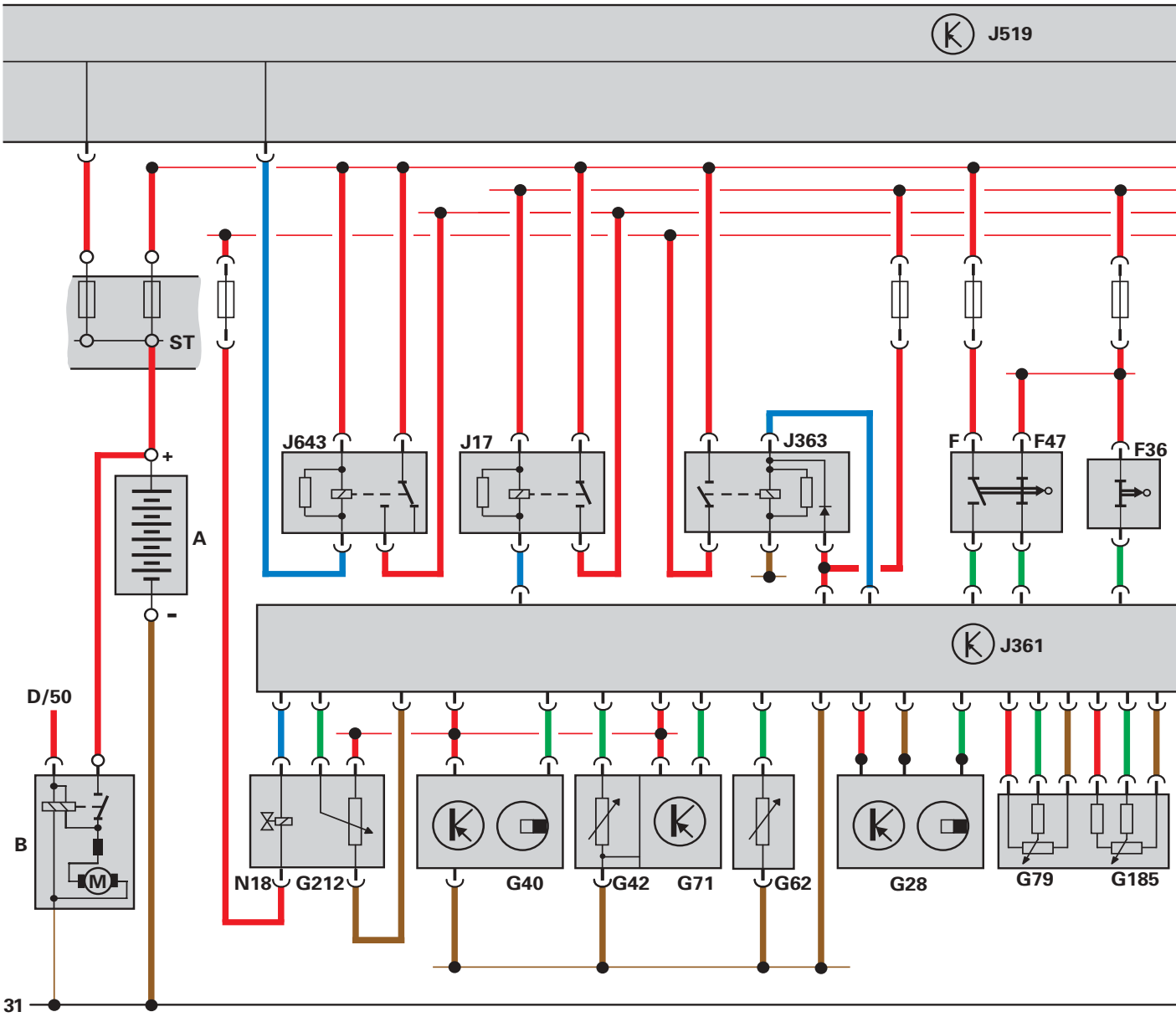
260_019

Legend:

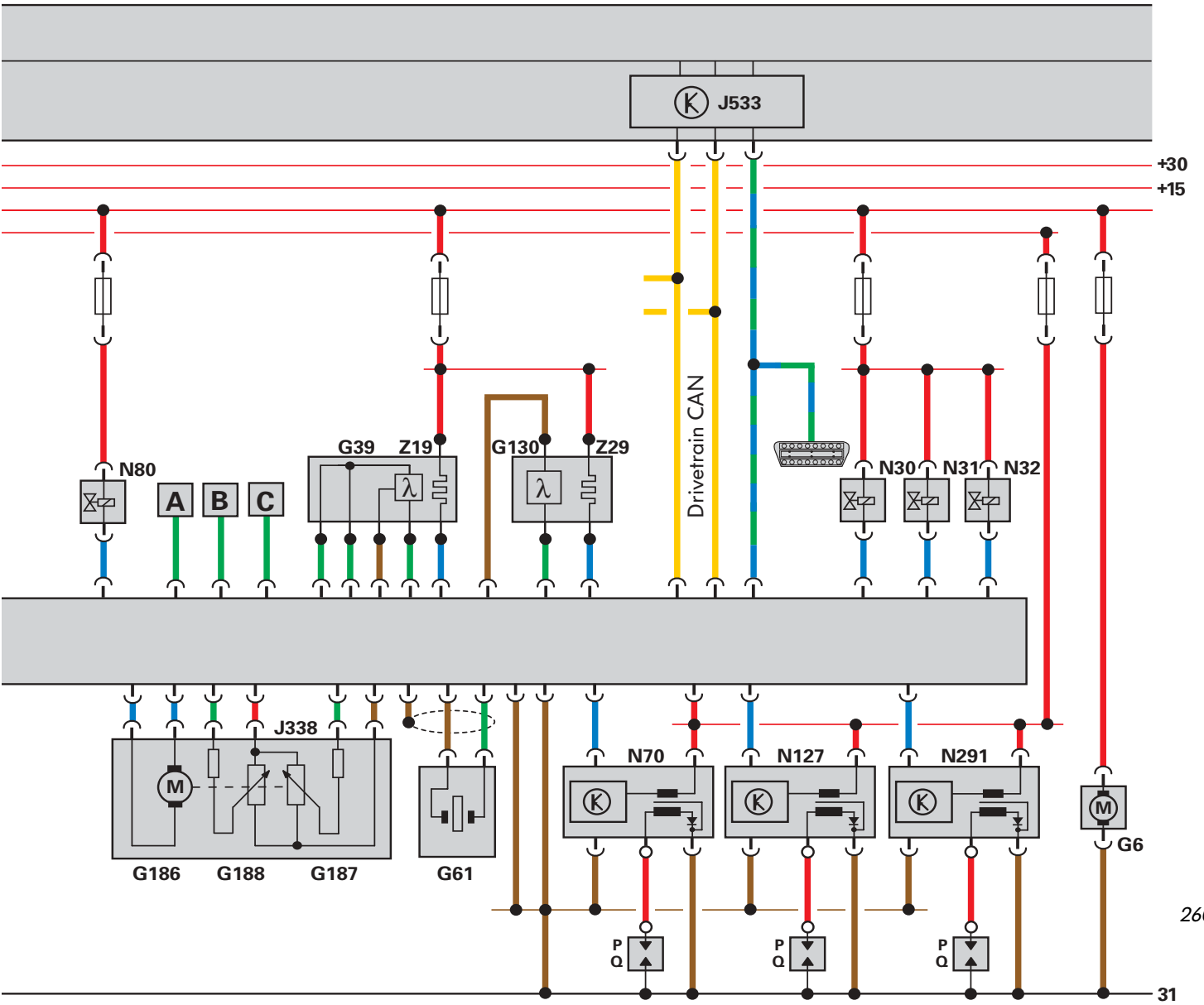
G28	Engine speed sender
G39	Lambda probe (pre-cat)
G42/71	Intake air temperature sender/ Intake manifold pressure sender
G130	Lambda probe (post-cat)
J361	Simos 3PD/3PE control unit

Engine management system

Function diagram



A Battery
B Starter
D/50 Ignition-start switch/terminal 50
F Brake light switch
F36 Clutch pedal switch
F47 Brake pedal switch
G6 Fuel pump
G28 Engine speed sender
G39 Lambda probe
G40 Hall sender
G42 Intake air temperature sender
G61 Knock sensor
G62 Coolant temperature sender
G71 Intake manifold pressure sender
G79 Accelerator pedal position sender
G130 Lambda probe downstream of catalytic converter
G185 Sender 2 for accelerator pedal position
G186 Throttle valve drive
G187 Angle sender 1 for throttle valve drive
G188 Angle sender 2 for throttle valve drive
G212 EGR potentiometer*
J17 Fuel pump relay
J338 Throttle valve control unit
J361 Simos control unit
J363 Power supply relay for Simos control unit
J519 Vehicle electrical system control unit
J533 Databus diagnostic interface



J643	Fuel feed relay
N18	EGR valve*
N30...32	Injectors, cylinders 1...3
N70	Ignition coil 1 with power output stage
N80	Activated charcoal filter solenoid valve
N127	Ignition coil 2 with power output stage
N291	Ignition coil 3 with power output stage
P	Spark plug connector
Q	Spark plugs
ST	Fuse carrier on battery
Z19	Heater for lambda probe
Z29	Heater for lambda probe 1, downstream of cat

* only on engine with 4-valve technology

Colour coding/Legend

= Input signal
= Output signal
= Bidirectional
= Positive
= Earth
= CAN databus
= Diagnostic connection

Additional signals

A	Alternator terminal DFM
B	Cruise control switch (ON/OFF)
C	Vehicle speed signal

Engine management system

Self-diagnosis

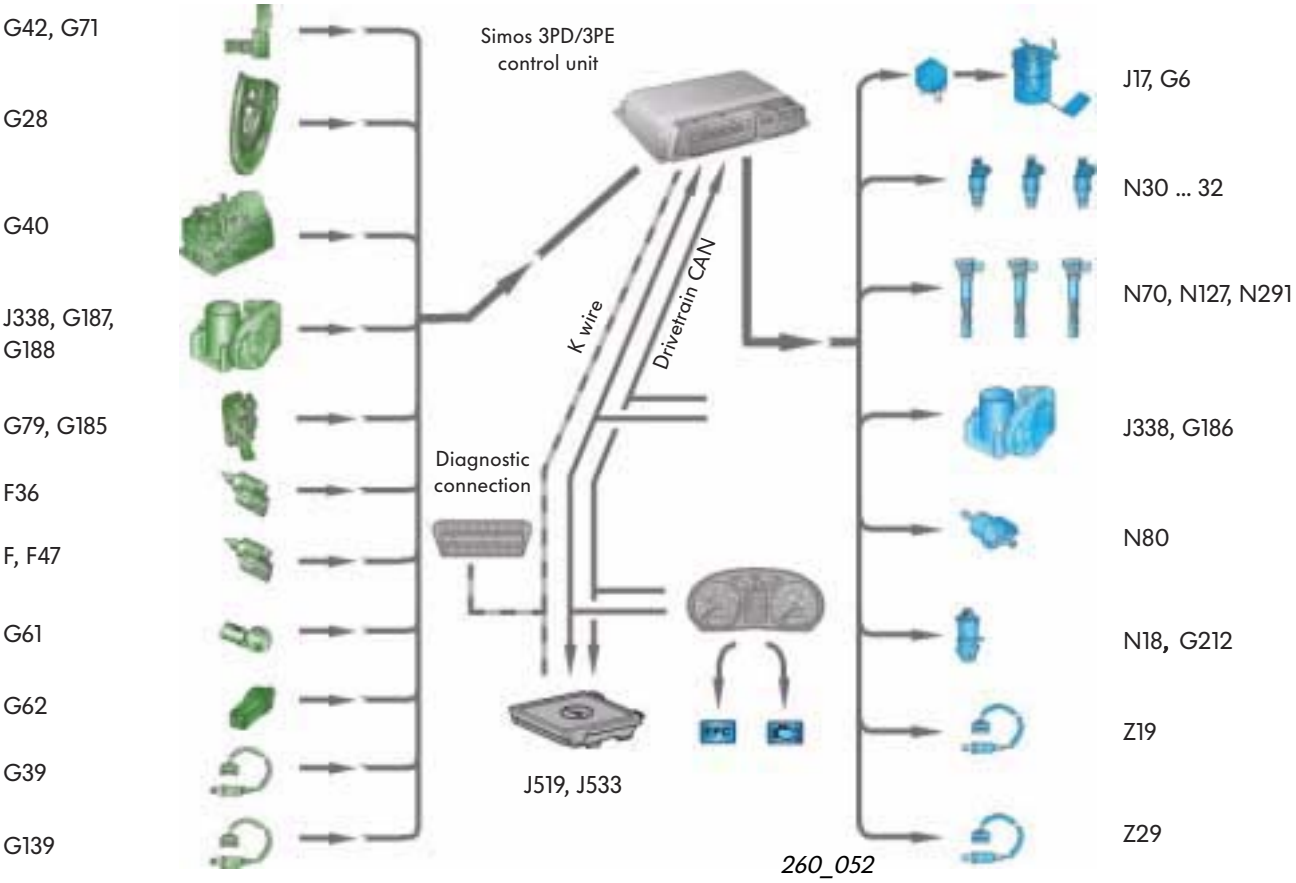
The sensors and actuators of both engines are tested as part of the self-diagnosis.
For diagnosis, please use the up-to-date workshop literature and the Vehicle Diagnostic, Testing and Information System VAS 5051 or the Vehicle and Service Information System VAS 5052.

260_053

260_041

Please note that Repair Group 01 is integrated in the „Guided fault finding“. It also contains the functions of „Read datablock“ and „Final control diagnosis“.

The colour-coded sensors and actuators are tested as part of the self-diagnosis and the guided fault finding.



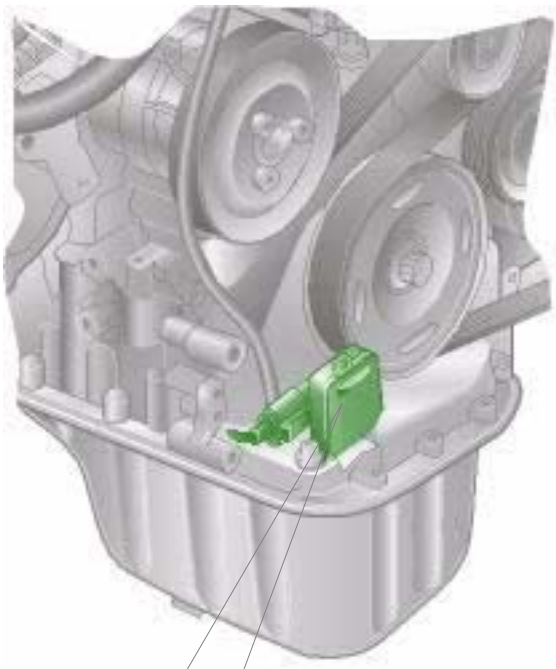
260_052

Extended service interval

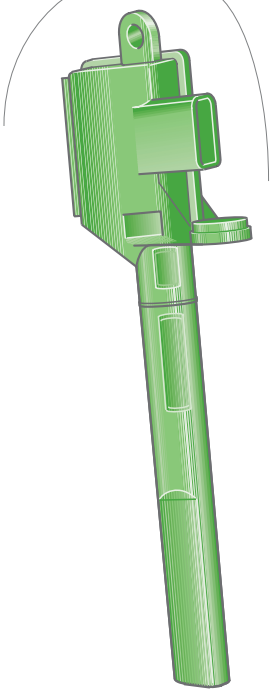
The extended service interval is a feature of both engines.

The service intervals of both engines can consequently be up to 30,000 km or up to 2 years, respectively.

There has been no change in terms of the function - compared to the present models which currently feature the extended service interval. Only the installation position of the oil level/oil temperature sender G266 has been modified for space reasons.
It is attached to the timing case at the belt side and projects into the oil pan.



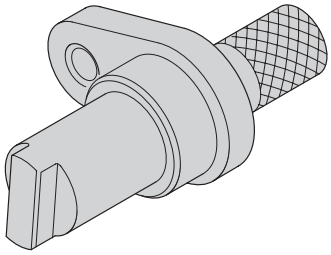
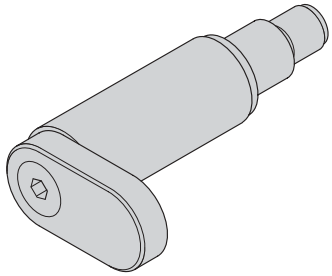
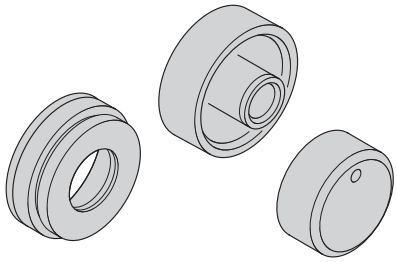
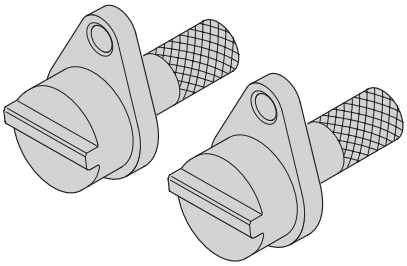
260_039



260_040

The work instructions for the extended service interval are described in detail in the „Maintenance“ manual for the particular model.
Please also make use of the workshop forms for the particular vehicle model.

Special tools

Designation	Tool	Use
T10120 Locating pin		For locking camshaft in place, 3-cylinder 2-valve engine
T10121 Locating pin		For locking crankshaft in place, 3-cylinder 2-valve engine and 4-valve engine
T10122 Assembly device		For replacing crankshaft seal at flywheel side, 3-cylinder 2-valve and 4-valve engine
T10123 Camshaft lock		For locking camshafts in place, 3-cylinder 4-valve engine

Test your knowledge

Which answers are correct?
There may be only one or even several correct answers!

1. Which statements regarding the chain drive are correct?

   A. There is one chain drive for driving the camshafts and one for driving the oil pump.
   B. The balancer shaft is chain-driven together with the oil pump by the crankshaft.
   C. The advantage of chain drives is that they do not require any maintenance.

2. Which statements regarding the split cylinder block are correct?

   A. The grey cast iron cylinder liners are cast in the top part of the cylinder block.
   B. Half of the crankshaft is accommodated in the top part of the cylinder block and the other half in the bottom part of the cylinder block.
   C. The bottom part of the cylinder block may be separated from the top part for repair purposes.

3. What is the task of the balancer shaft?

   A. Its task is to reduce oscillations and thus to improve engine running.
   B. It acts as a drive gear for the oil pump.
   C. It is used to drive ancillary components.

4. What are the advantages offered by cross-flow cooling in the cylinder head?

   A. The same temperature level prevails at all three cylinders.
   B. The knocking tendency is reduced because the combustion chamber walls are cooler.
   C. Large opening cross-sections result in a lower flow resistance and thus in a reduced power consumption of the water pump.

Test your knowledge

5. What is the new feature of the fuel system of the 1.2 ltr./47 kW engine?

   A. There is no longer a fuel return-flow line from the fuel rail to the fuel tank.
   B. The fuel pressure regulator is inserted into the filter and held in place by a retaining clip.
   C. The fuel pressure in the system is a constant 3 bar.

6. Which statements regarding the fuel pump feed control are correct?

   A. A relay with integrated crash fuel shut-off is installed for the fuel pump feed control.
   B. There are two relays, both of which are actuated by the engine control unit.
   C. There are two relays, one of which is actuated by the vehicle electrical system control unit and the second one by the engine control unit.

7. Which statements regarding the exhaust post-treatment and control are correct?

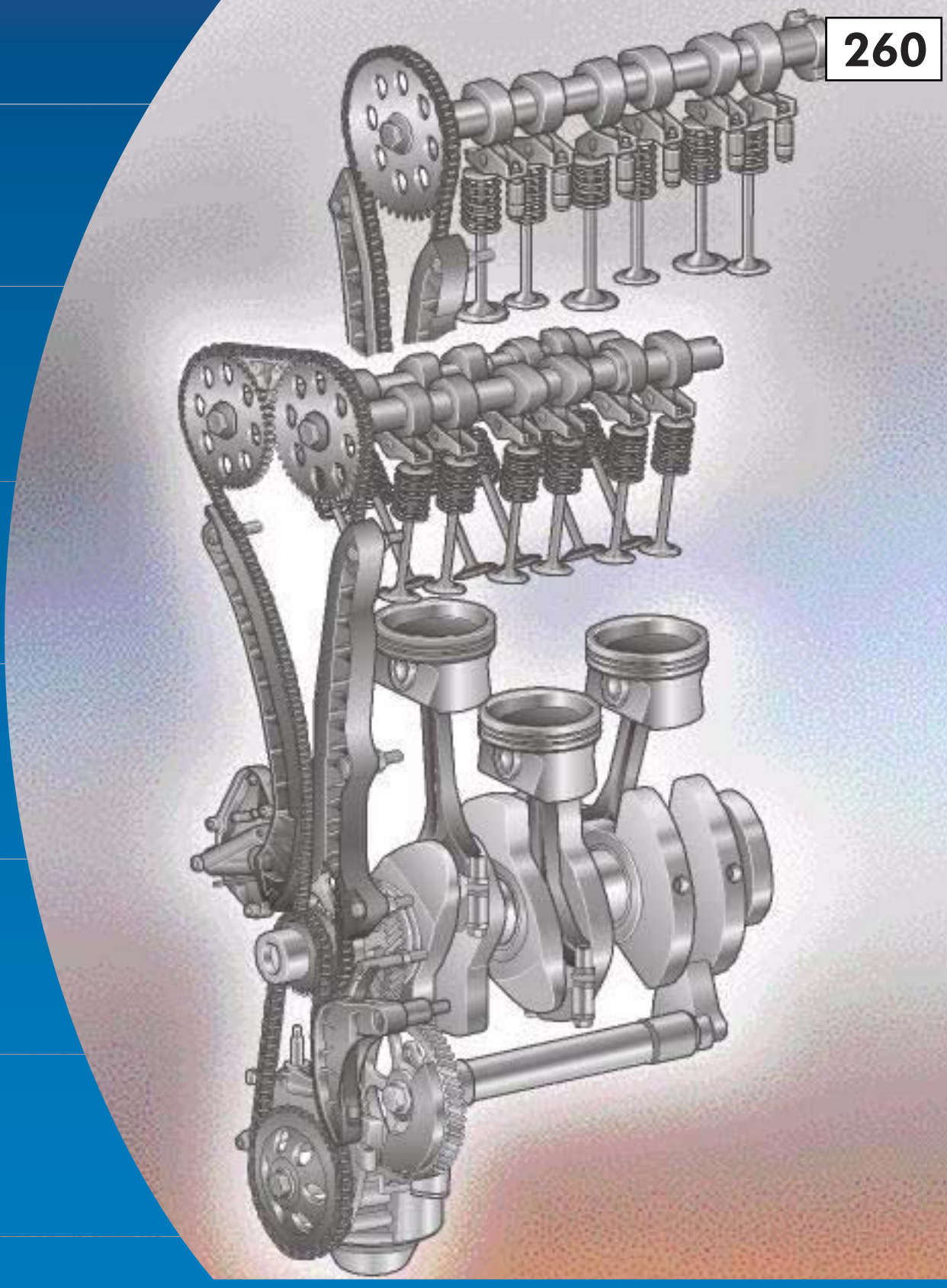
   A. Both engines have a pre-catalytic converter close to the engine and the main catalytic converter.
   B. The 1.2 ltr./40 kW engine has one catalytic converter and two step-type lambda probes.
   C. The 1.2 ltr./47 kW engine has one catalytic converter, a broadband pre-catalytic converter lambda probe and a step-type post-catalytic converter lambda probe.

Answers

1. A., C.; 2. A., B.; 3. A.; 4. A., B., C.; 5. A., B., C.; 6. C.; 7. B., C.

Service.

260



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