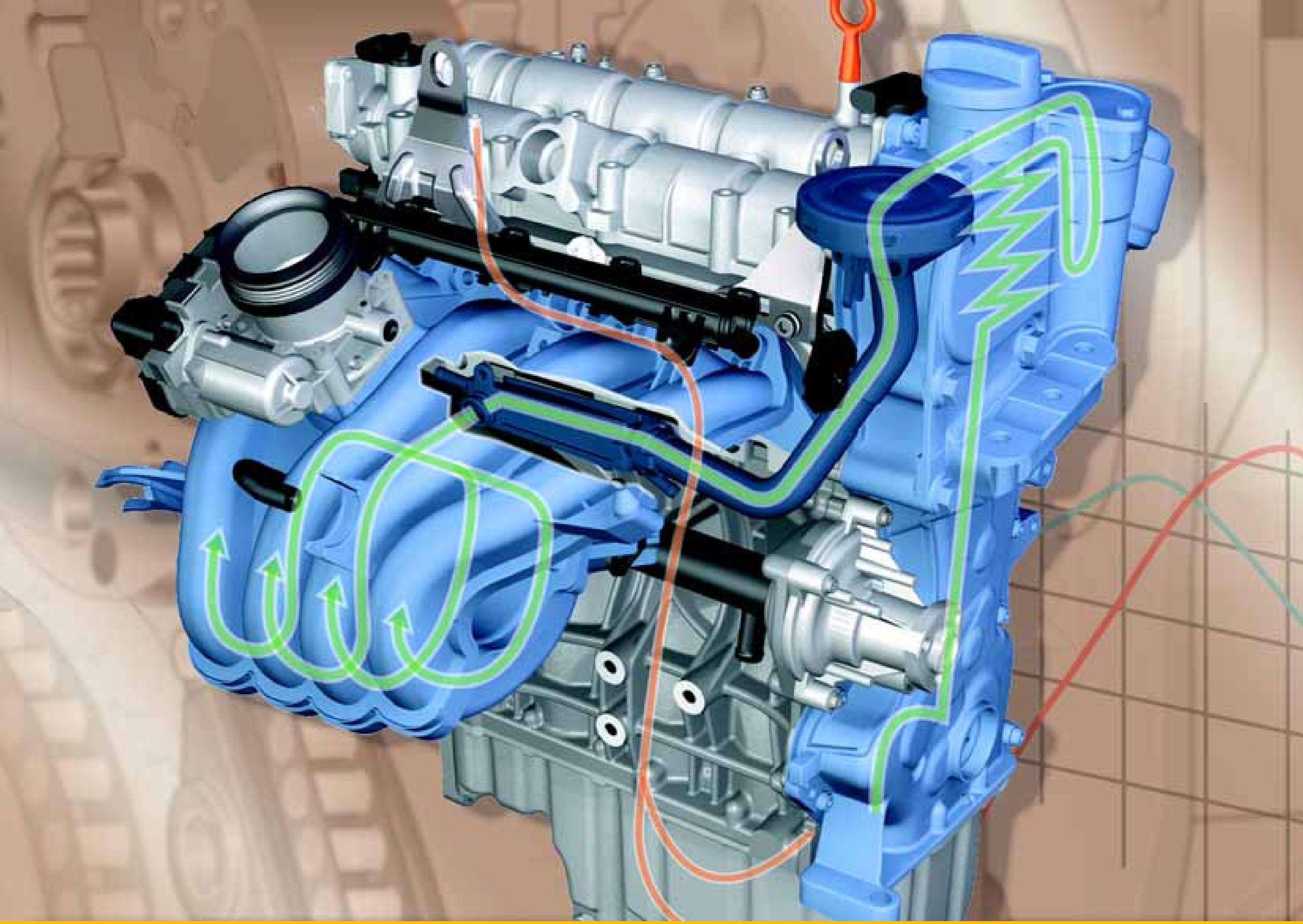


1.6 L 16v 77kW Engine

Self Study Program No. 113

SEAT
service

The 1.6 L 16v 77kW engine was fitted on SEAT models with the launch of the Ibiza 02 and Cordoba 03.

The highlight was the fitting of variable intake manifold timing to optimise the delivery of engine torque at different engine rpm levels.

The lubrication circuit is supplied by a self-adjusting pressure dependant pump and it has an integrated forced oil vapour breathing system.

A new feature is the incorporation of a coolant circuit in two separate sections, one for the cylinder head and one for engine block.

Each section is connected to the radiator through an independent thermostat.

The engine management system is the Motronic 2.5.20, whose functions together with the sensor and actuators allow compliance with the EU IV legislation.

D113-01

Note: *The precise checking, adjustment and repair information is contained in Repair Manual and in the VAS 5051.*

Contents

CHARACTERISTICS

D113-02

The 1.6L **four cylinder 16 valve** engine belongs to the EA III family.

From a construction viewpoint, it is very similar to the 1.2L 12 V engine, with one extra cylinder. The bore and stroke of the cylinders are similar to those of the 1.2 L engine.

The engine **block**, **timing cover** and **sump** are made from cast **aluminium**.

The cylinder head has 16 valves and is fitted with two camshafts and uses the **smooth valve** operating (SMO) technique. It is also fitted with a variator on the inlet manifold camshaft.

Both camshafts are connected to the crankshaft by a maintenance-free **chain**.

The oil pump is operated by another chain, driven from the dual crankshaft gear.

The timing cover has the housing for the oil filter and the components involved in the oil vapour recovery.

The sump is bolted to the block and the timing cover.

A **dual type coolant circuit** containing two thermostats is fitted and contains one circuit for the block and one for the cylinder head. The water pump is driven by a poly V belt.

TECHNICAL DATA

Engine letters .... BTS

Capacity .... 1598 cm^3

Bore x Stroke .... 76,5 x 86,9 mm

Compression ratio 10,5:1

Max. Torque .... 153 Nm at 3.800 rpm

Max. power.......................... 77 kW at 5.600 rpm

Injection ignition system Motronic 7.5.20
Firing order 1-3-4-2

Octane rating .... mín. 95 octane[1]

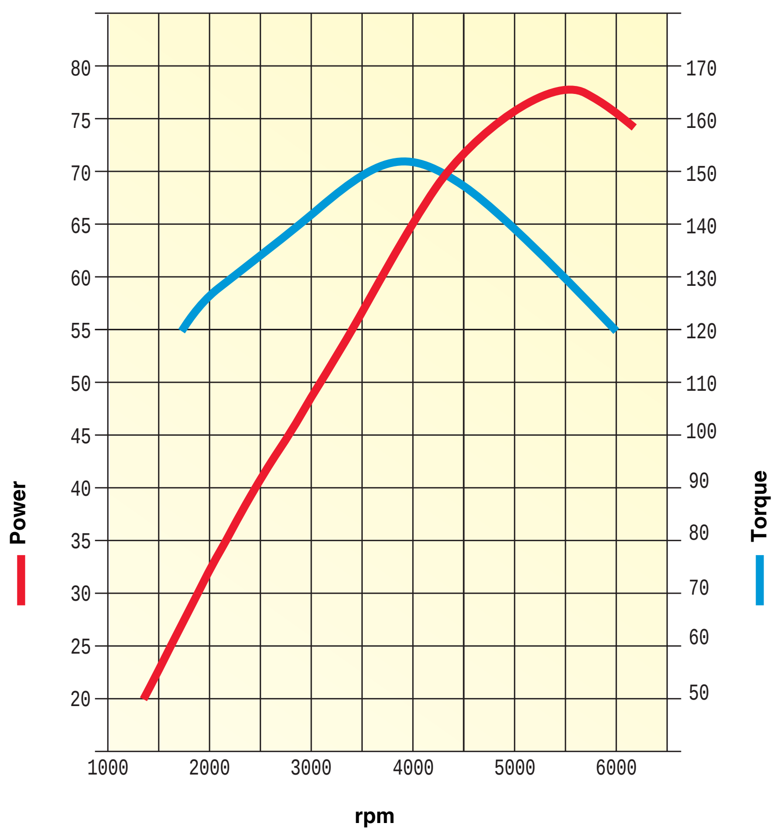
Exhaust gas legislation .... EU IV

[1] In exceptional cases it is possible to use petroll with a 91 octane rating, but a power loss will have to be tolerated.

This is a long stroke engine with a torque output above 120 Nm. Between 1700 and 6000 rpm and a maximum torque output of **153 Nm at 3,800 rpm**.

The maximum power of **77 kW** is developed at **5,600 rpm**.

This elasticity in torque output is achieved as a result of the engine layout (bore and stroke) and the use of a continuously regulated variable intake system.



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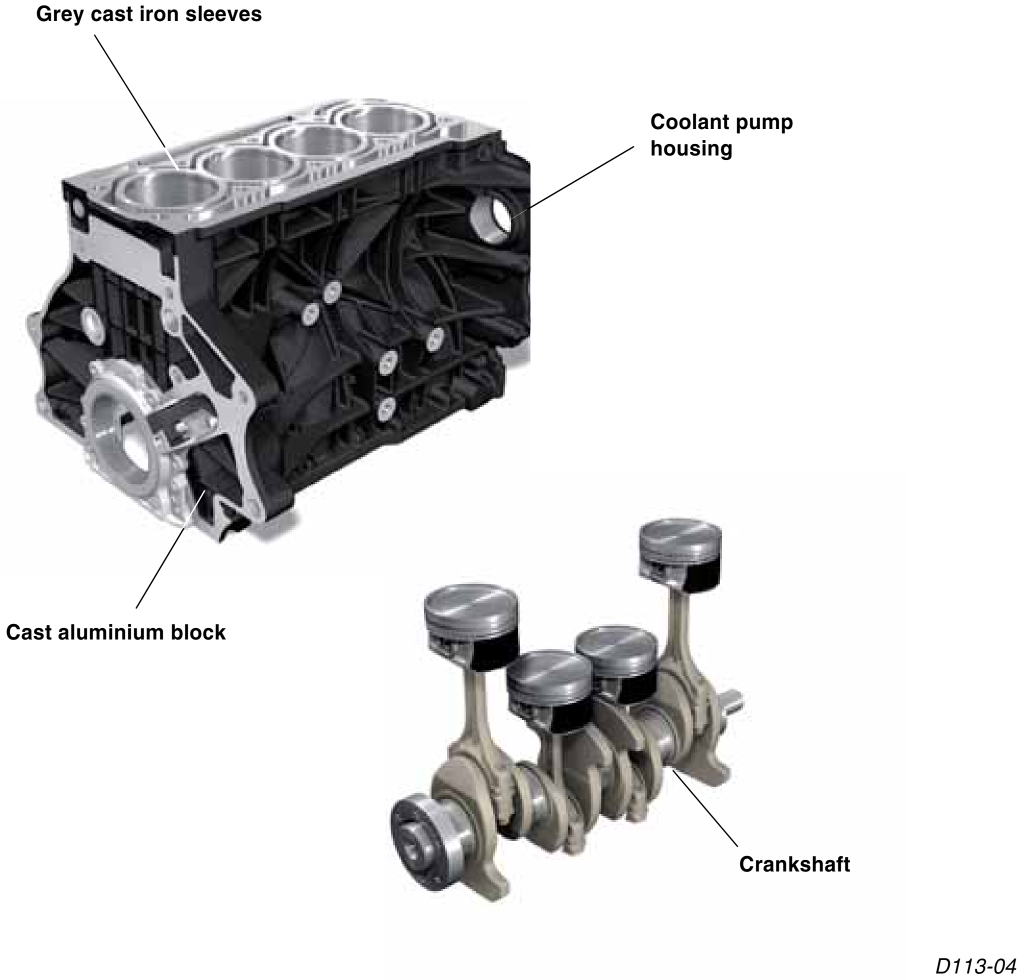


ENGINE BLOCK AND CRANKSHAFT

The **engine block** is made from cast aluminium. The sleeves are grey cast iron, thus providing high wear resistance. The sleeves can be machined to two different oversize dimensions.

The coolant pump is located in the block and is driven by a poly V belt.

The oil pump is attached to the lower part of the block with three bolts. The pump is driven by a chain from the interior dual crankshaft gear.

The crankshaft is mounted using five main bearing caps on the block.

The **bearing caps** perform a dual function of **supporting the crankshaft** and reinforcing the engine block. Therefore they **cannot be removed** and have to be replaced together with the engine block and the crankshaft.

The seal cover is fitted at the flywheel end of the crankshaft and it carries the generator gear for the engine rpm sensor.

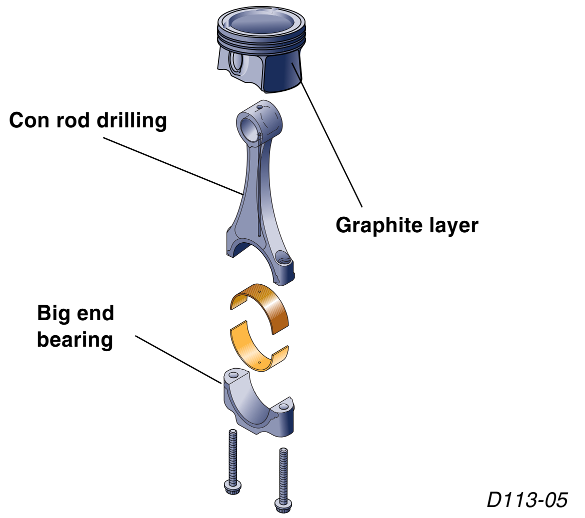
PISTONS AND CON-RODS

The pistons are made from aluminium alloy and the skirts are covered with a graphite layer to improve their resistance.

The con rods are drilled to allow oil passage to the gudgeon pin.

The big end bearing and the con rod are manufactured as a single unit and are separated using the fracture technique.

Two oversize pistons are available to enable the sleeves to be machined.



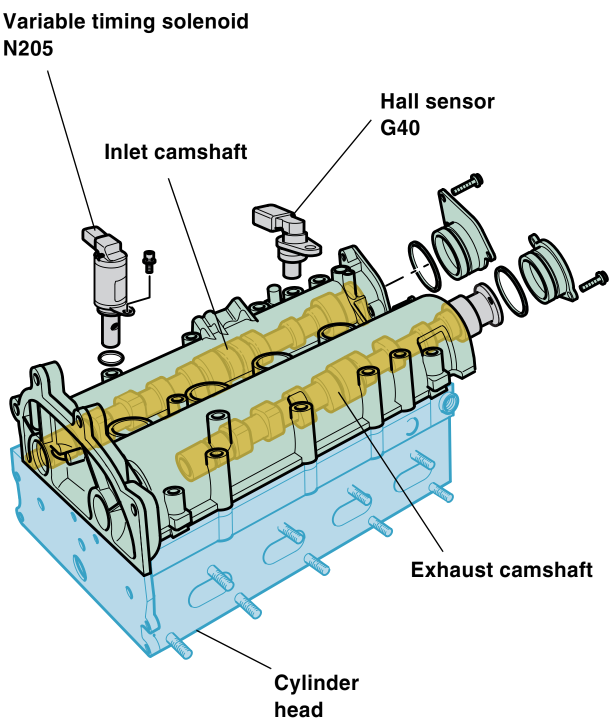
D113-05

CYLINDER HEAD

The cylinder head is a cross flow type with the **smooth valve** operating (SVO) system.

The camshafts rotate in the mechanised bearings in the rocker cover. The camshafts are passed into the rocker cover from the opposite side to the timing, after removing the plugs. The inlet manifold camshaft has the signal generator gear for the hall sensor.

The hall sensor and the variable timing solenoid are fitted on the rocker cover.



D113-06

TIMING

The timing is located on the opposite side from the flywheel and is composed of a single chain, a hydraulic tensioner, two guide blocks and three gears, one on the crankshaft and two on the camshafts.

The **chain** transmits movement from the crankshaft gear to the gears on the camshafts.

The **hydraulic tensioner** ensures correct tension on the chain without the need to make any adjustments.

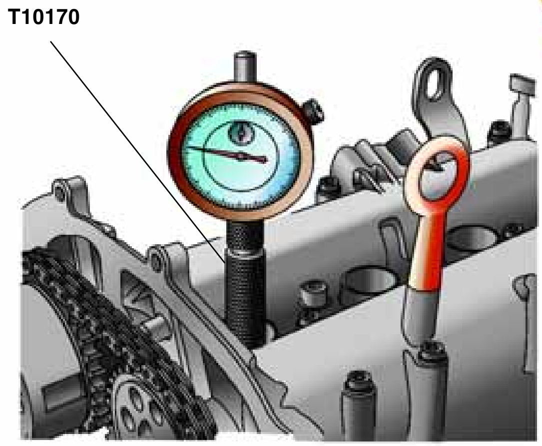
The pressure for chain adjustment is generated by the oil pressure and a spring ensures minimum tension during engine starting.

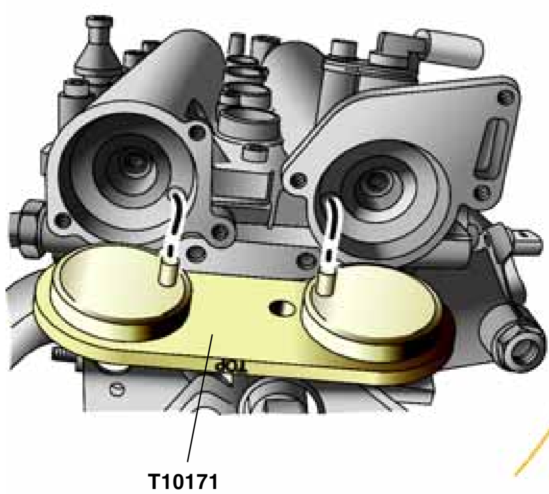
The **guide blocks** prevent oscillations in the chain during engine operation.

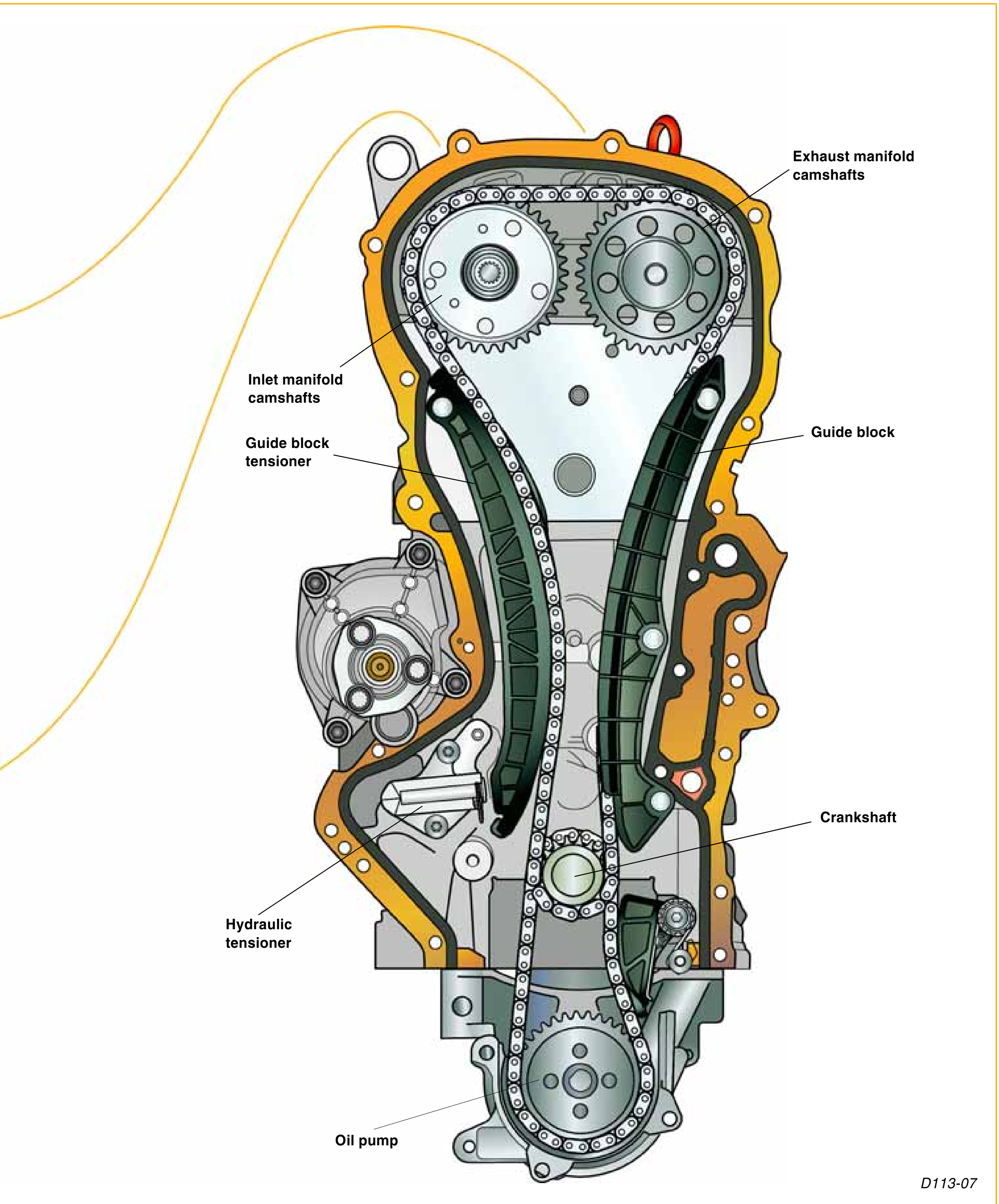
To adjust the timing it is necessary to synchronise the camshafts and place the crankshaft at TDC for cylinders 1 and 4.

The camshafts are synchronised using the tool T10171, and a DTI gauge has to be placed in the plug hole of cylinder 1 to determine the TDC point of cylinder 1, since the crankshaft gear has no adjustment mark.

To lock the tensioner piston, a pin T40011 has to be placed in its support orifice while pressing the guide block.






Exhaust manifold camshafts
Inlet manifold camshafts
Guide block
Guide block tensioner
Crankshaft
Hydraulic tensioner
Oil pump
D113-07

INLET MANIFOLD

The inlet manifold is made from plastic.

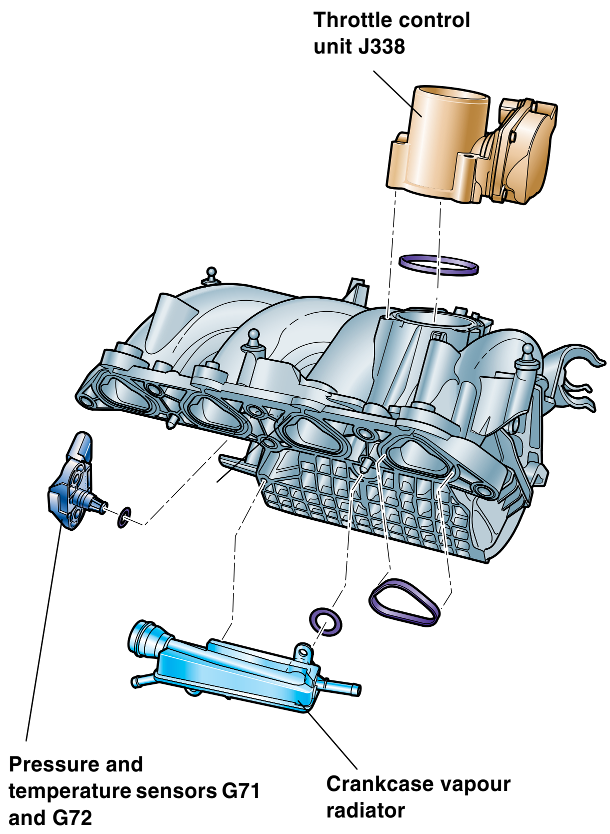
Its layout consists of one central conduit branching off into 4 separate runners placed at 90º in relation to the main conduit.

The mounting area of the throttle control unit also contains the connection for the vapour from the carbon canister (also known as an active charcoal filter).

The space between the engine block and inlet manifold contains the radiator for the engine block or more commonly known crankcase vapours.

The temperature and pressure sensors for the intake air G71 and G72 are located at the opposite side from the connection for the brake servo vacuum.

The carbon canister solenoid N80 is located on the manifold.



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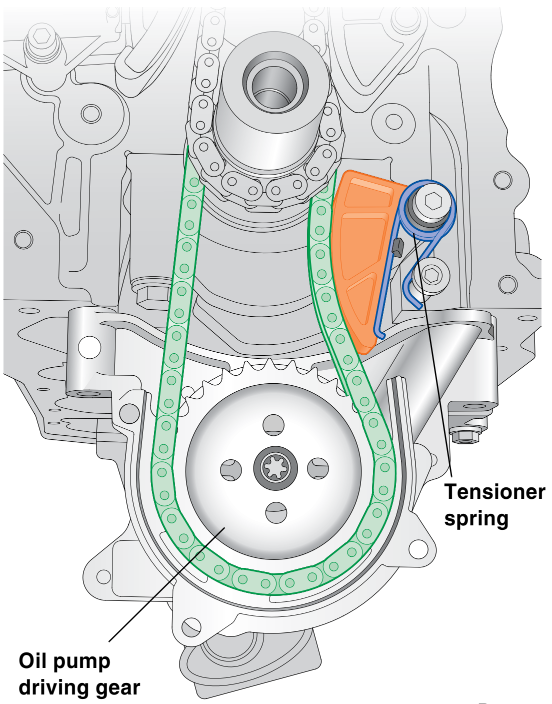


D113-09

OIL PUMP

The oil pump is driven from the crankshaft by a chain and an automatic tensioner to ensure optimum tension during engine operation.

The pump is a **regulated** duo centric type, thus ensuring a stable **oil pressure of around 3.5 bars**.

The advantages which it provides in relation to the unregulated type are:

– Reduction of 30% of power required from the engine.

– Reduced oil wastage due to reduction in oil flow volume.

– Less foam formation due to constant pressure levels.

It is composed of an internal and external rotor, a ring and a regulating spring.

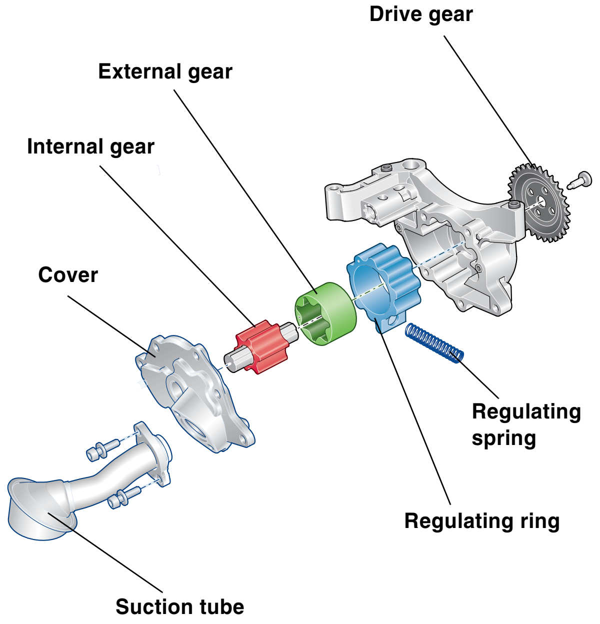
The outside of the pump housing is composed of the cover, the suction tube and the drive gear.

The internal gear is rotated by the pump drive gear and the external gear is driven by the internal gear.

The regulating spring defines the position of the regulating ring, when the outlet pressure is less than 3.5 bars, the regulating ring rests on the pump body stop due to the spring pressure.

The movement of the regulating ring causes an increase in the oil entry volume, leading to increased suction flow and thus higher outlet pressure from the pump.

If the outlet pressure exceeds 3.5 bars, the oil will move the regulating ring and compress the spring, reducing the volume of oil drawn in to the pump and consequently the outlet pressure.



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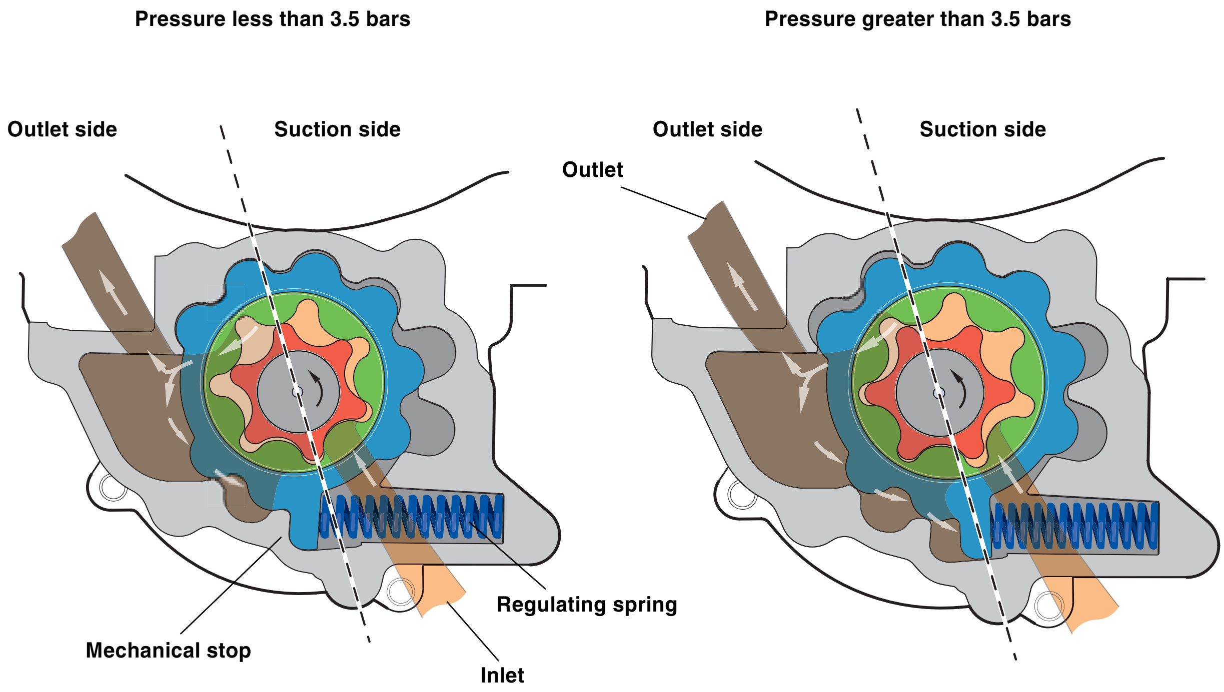


D113-11

COOLANT CIRCUIT

Inside the engine, the cooling circuit is **divided into two parallel circuits**, one to cool the **block** and another to cool the **cylinder head**, and each circuit is regulated by an independent thermostat.

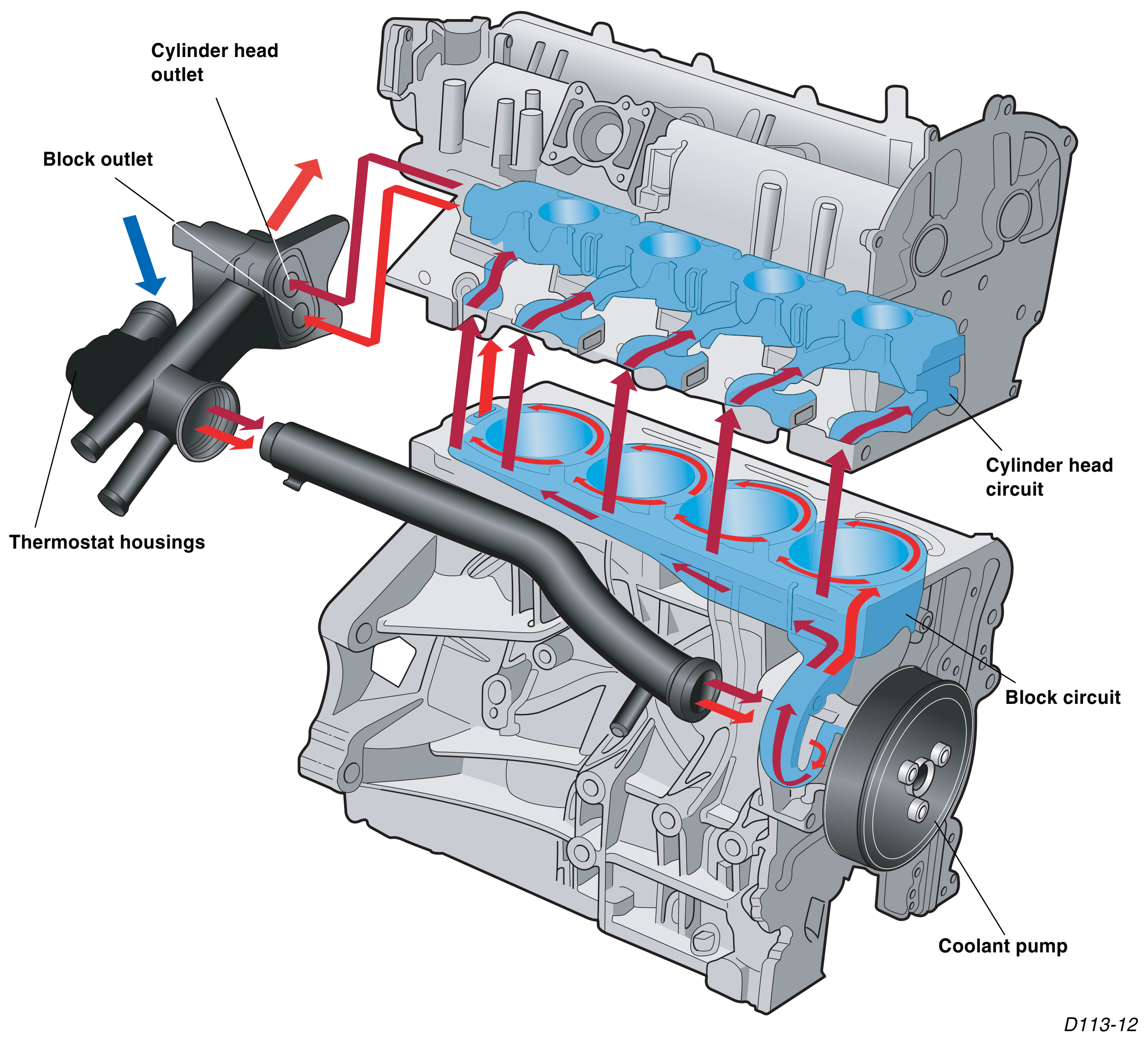
The thermostat in the cylinder head opens when the coolant temperature reaches 87 °C, thus connecting the circuit (pump, cylinder head, heat exchanger, and pump) with the radiator.

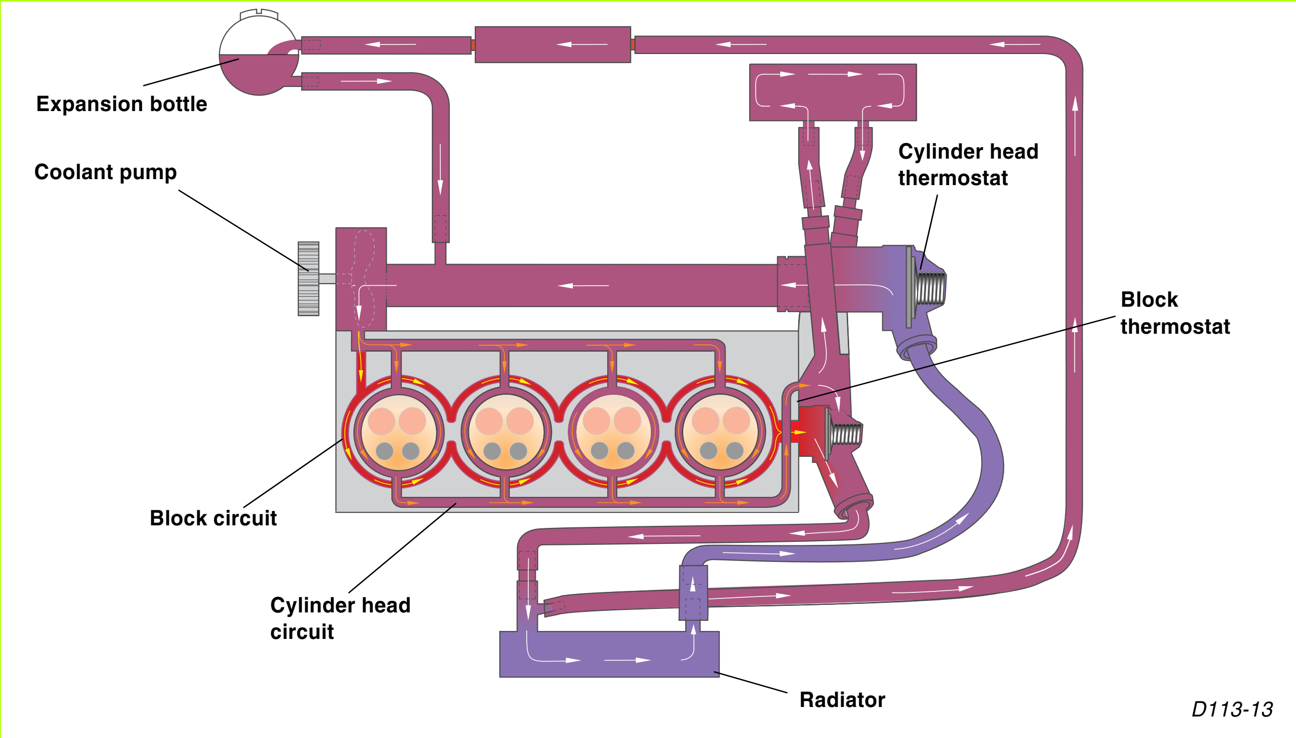
The other thermostat opens at 103 °C and connects the block with the rest of the circuit.

The use of two thermostats, one for each circuit, makes it possible to keep a higher temperature in the block than in the cylinder head.

The high temperature in the block reduces the friction on the crankshaft.

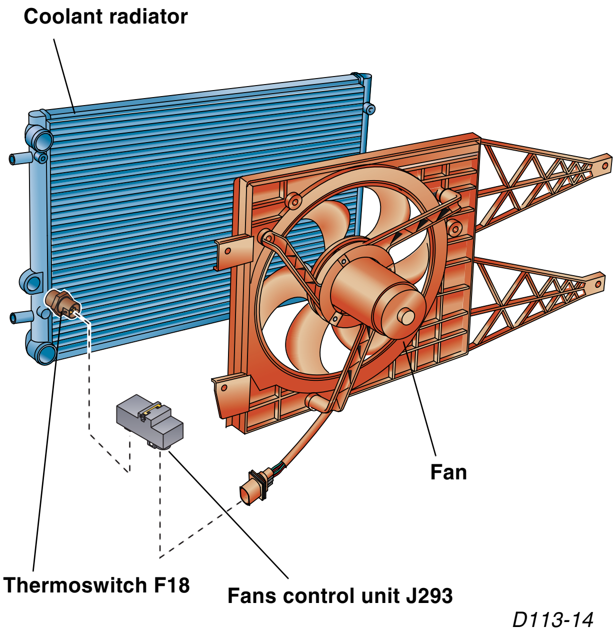
A lower temperature in the cylinder head improves cylinder filling and reduces engine knocking.





At temperatures below 87 °C, both thermostats are closed and the coolant does not circulate through the radiator or the engine block.
When the temperature exceeds 87 °C, the thermostat in the cylinder head opens and the coolant passes to the radiator.

When the coolant temperature exceeds 103 °C, the engine block thermostat will also open.



COOLANT TEMPERATURE FAN

The radiator is cooled by a dual speed electric fan.

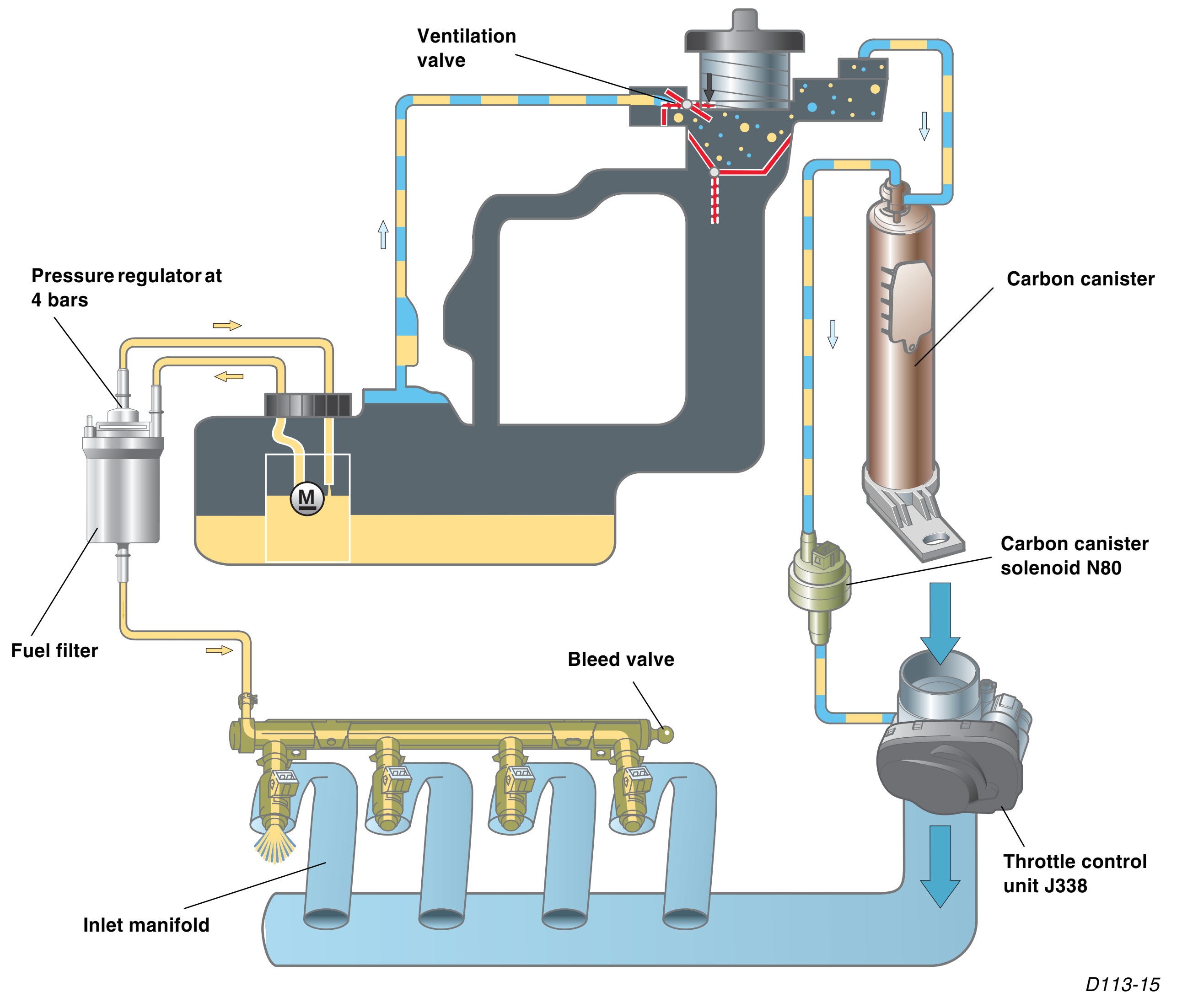
The fan is activated by the fan control unit J293, when the contacts close in the thermoswitch F18 or when the air conditioning is switched on.

The first speed is engaged when the contacts 1 close at a coolant temperature between 92°C and 97 °C. The contacts open again between 84°C and 91 °C.

The second speed is activated when the contacts 2 close at a temperature between 99°C and 105 °C and disconnects between 91°C and 98 °C.

The control unit for the fans is located beneath the front left side member on the Ibiza 02. The thermoswitch F18 is attached to the radiator.

FUEL CIRCUIT



FUEL SYSTEM

The **pump** is located inside the tank and provides a **fuel** flow of 1080 cm 3 under a pressure of 3 bars.

The pump is supplied by the engine control unit when the engine is running and by the on board network control unit for 2 seconds after opening the drivers door. This ensures that the circuit will be pressurised when the engine is started. The pressure regulator is attached to the **fuel filter** and both are located on the right side of the fuel tank.

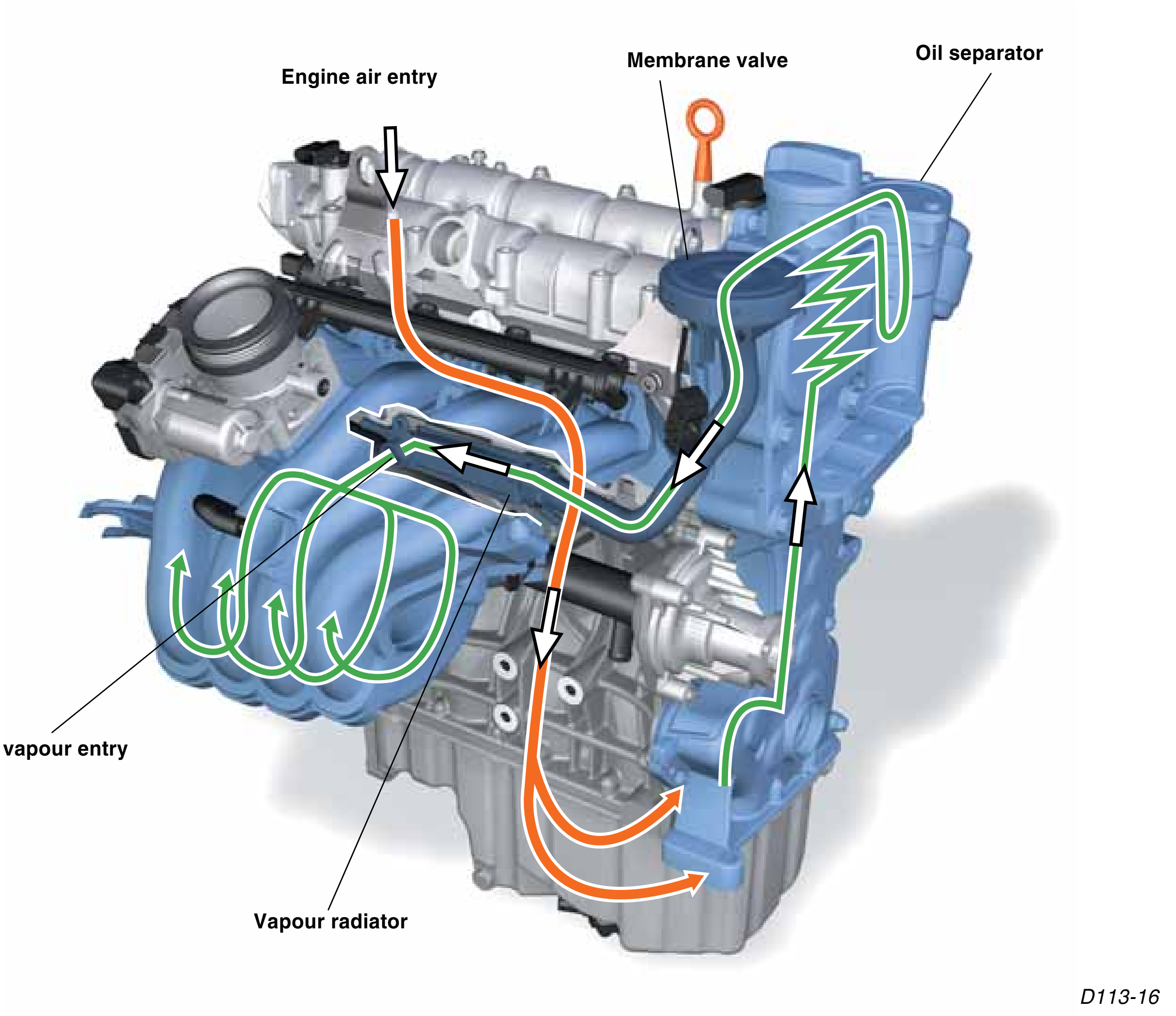
The filter and regulator are supplied as separate parts.

The **pressure regulator** ensures that the outlet pressure from the filter does not exceed 4 bars, above which it will open the return line to the tank.

The four injectors are joined to the fuel rail which is fitted with a bleed valve at one end. To bleed the circuit, it is necessary to use the adaptor VAG 1318/20 and the 20-1.

The **carbon canister** is located behind the right side wheel arch cover plate and the solenoid for the canister is fitted on the inlet manifold. This solenoid is governed by the engine control unit.

ENGINE BLOCK BREATHING



The engine is fitted with a **forced breathing system** to avoid the accumulation of vapours in the block.

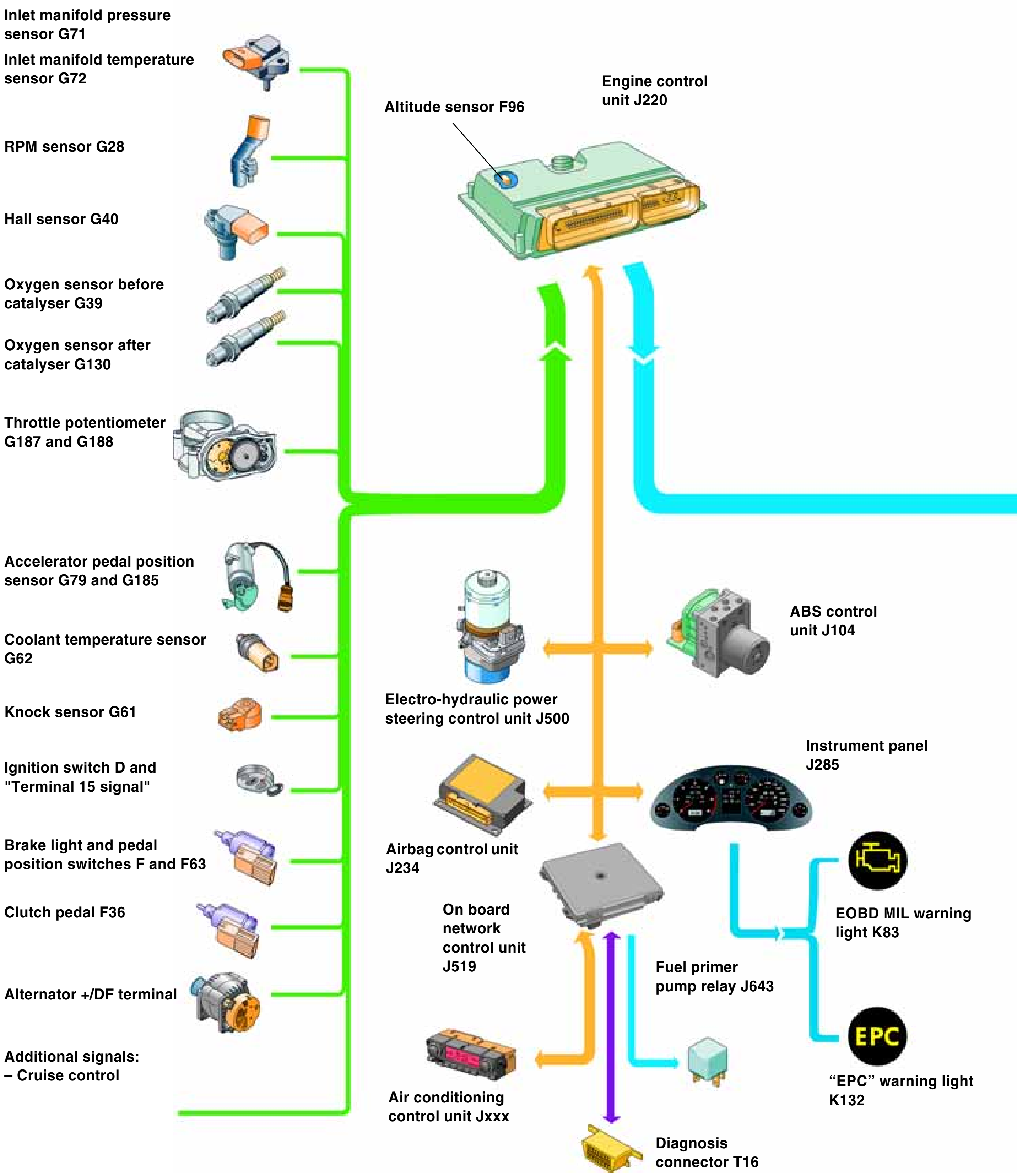
The forced breathing system ensures continuous circulation of air inside the engine, from the cylinder head to the sump. The vapours are drawn from the engine and passed to the lower part of the rocker cover from where they pass up to the oil separator.

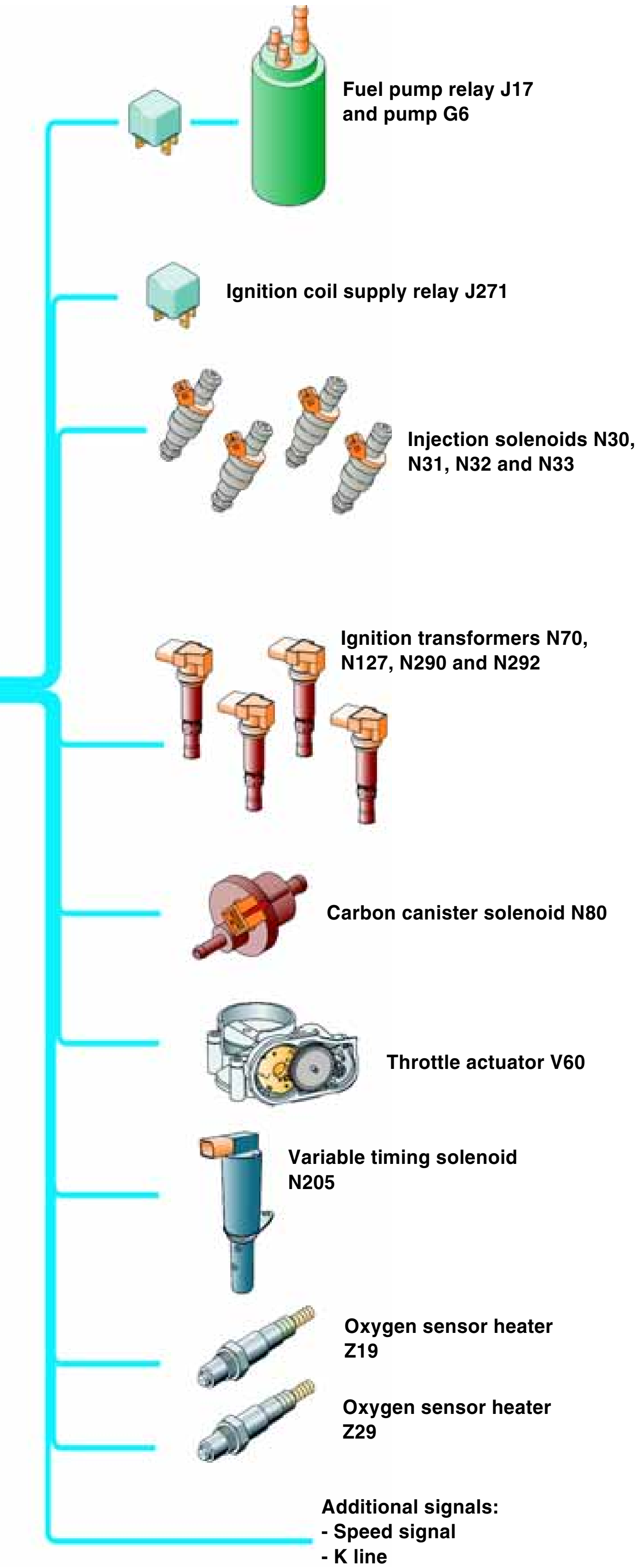
In the oil separator, the oil vapours condense as droplets and pass back to the sump and uncondensed vapour passes through a membrane type valve to the oil vapour radiator on the block and from there to the inlet manifold.

The oil vapour radiator is connected to the coolant circuit. The vapours are heated in the radiator thus preventing condensation during their passage from the membrane valve to the inlet manifold.

Note: *For more information on the crankcase breathing, consult the Self Study Program No. 89, 1.2L 12V Engine.*

SYNOPTIC CHART





D113-17

The engine **control unit** has 80 pins and it is located in the engine compartment.

The **Motronic 7.5.20** engine management system assumes the following functions:

FUEL INJECTION
– Calculation of injection volume.
– Sequential injection.
– Lambda setting.
– Deceleration cut off.
– Correction during acceleration under full load.
– Limitation of maximum rpm.
– Rapid catalyser heating.
– Selective cylinder injection cut off.

IGNITION
– Control of ignition advance angle.
– Lambda setting.
– Dwell angle control.
– Selective cylinder knock control.
– Rapid catalyser heating.

IDLE STABILISATION
– Adjustment of idling.
– Cut off dampening.
– Digital idle stabilising.

CARBON CANISTER SYSTEM
– Adjustment of fuel vapour passage.
– Correction using lambda readings.

VARIABLE TIMING
– Adjustment of the variable timing.

EOBD
– Control of the warning light.
– Control of the lambda adjustment.
– Catalyser monitoring.
– Carbon canister circuit monitoring.
– Combustion monitoring.

SELF DIAGNOSIS
– Monitoring of sensors and actuators.
– Emergency functions.
– Basic setting or adaptations.
– Equipment specific coding.

Note: *For more information on the specific EOBD functions, consult the Self Study Program No. 82, 2.8L V6 24V Engine.*

The main task during fuel injection is the **dosage of the injected volume** required to ensure a stoichiometric air/fuel mixture. This mixture can also be further altered to perform functions such as acceleration enrichment, catalyser heating or deceleration cut-off.

The fuel injection is cut off by the airbag control unit (CAN-Bus message) when an impact occurs which causes any airbag module to deploy.

CALCULATION OF INJECTION VOLUME

The engine control unit calculates the **amount of fuel** to be injected based on the real volume of air drawn in. This real volume of air is determined by the engine control unit based on two **basic signals**: engine **rpm** and **pressure** in the **inlet manifold**.

The air mass drawn in also depends to a lesser extent on the atmospheric pressure, air intake temperature, the coolant temperature and the position of the inlet camshaft.

Therefore based on the engine rpm and the pressure in the inlet manifold, the control unit will make the basic calculation of the injected volume. It will then make corrections to this volume based on the information from the other parameters.

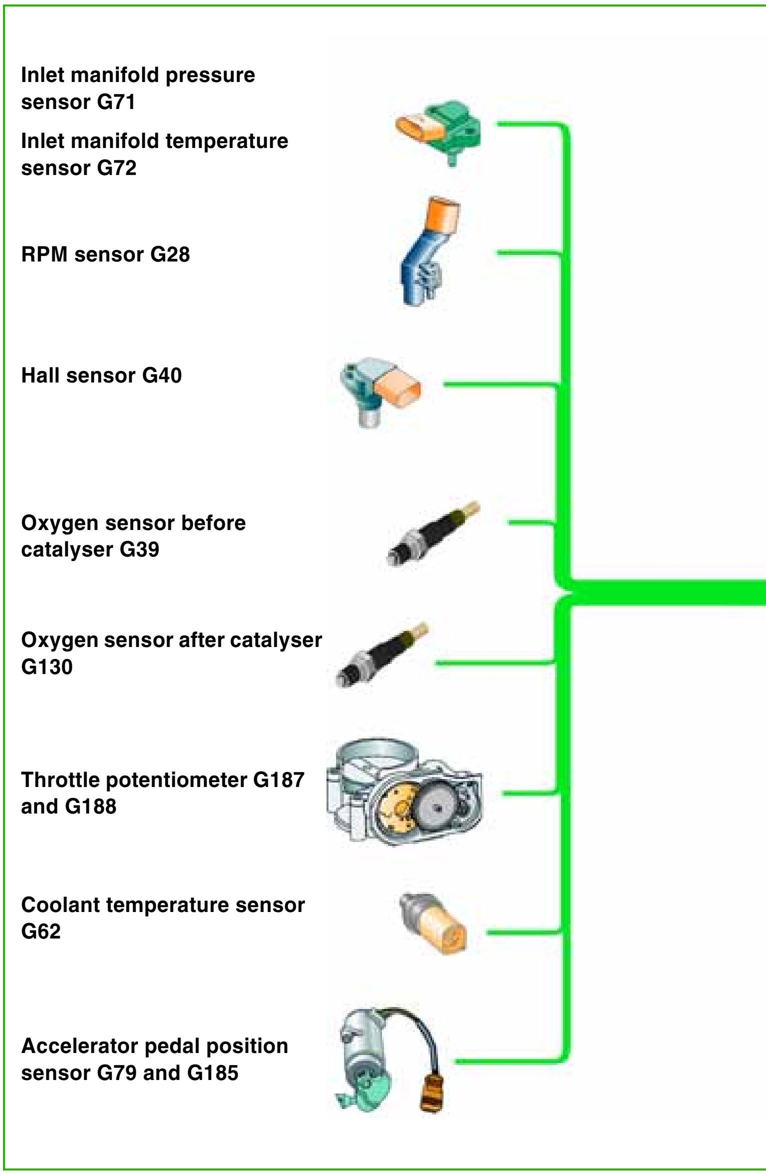
SEQUENTIAL INJECTION

The fuel is injected in a sequential manner. This means that the fuel is injected into each inlet manifold during the intake stroke of the corresponding cylinder.

The control unit recognises the intake stroke of each cylinder with the signal from the hall sensor and the rpm sensor.

LAMBDA ADJUSTMENT

The control unit makes a final correction to the injected volume based on the values registered by the oxygen or lambda sensor G39 before the catalyser. The sensor has the ability to detect the excess or lack of oxygen in the exhaust gases and thus determine if the mixture is weak or rich

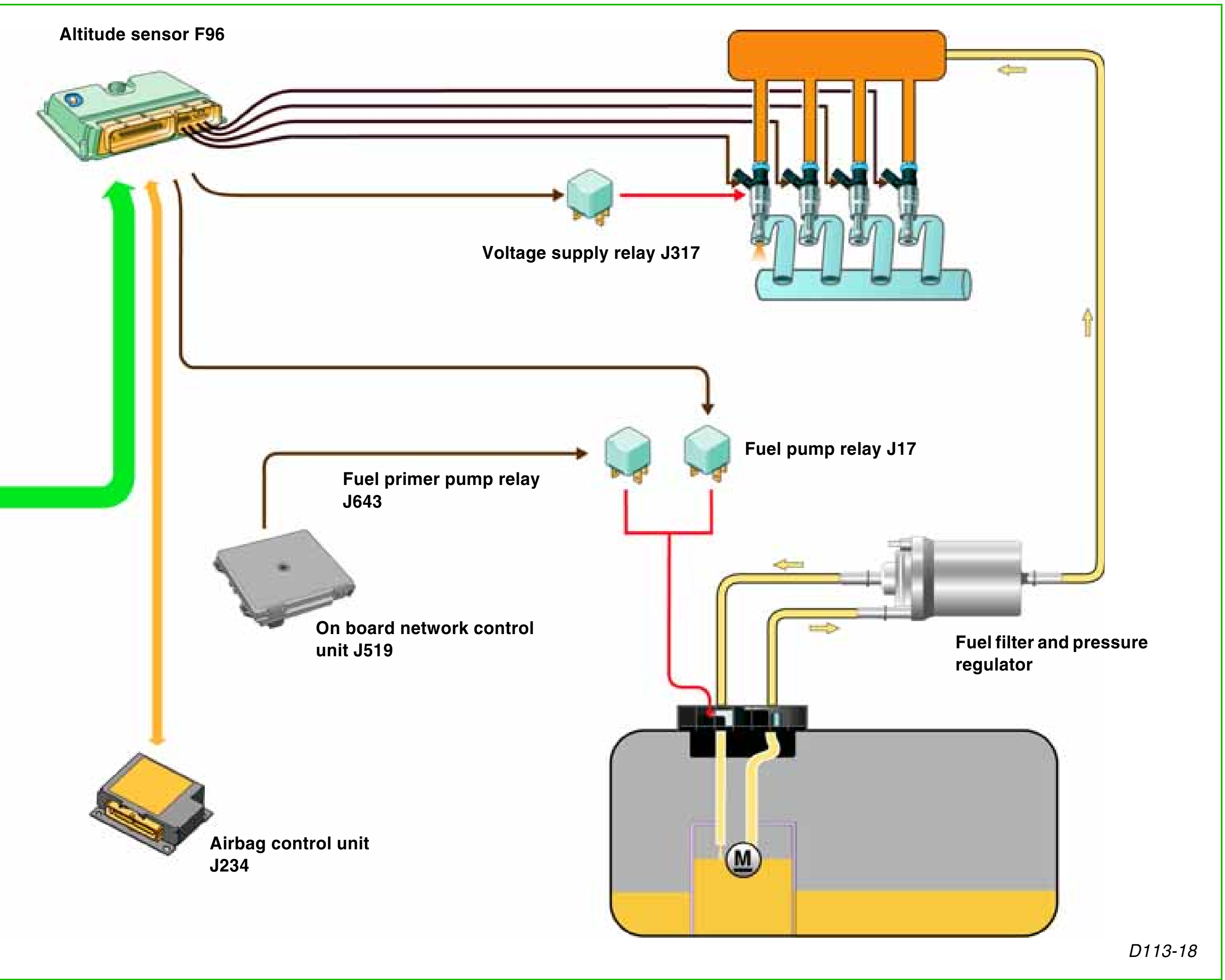


This correction is designed to adapt the fuel volume to provide a lambda value as close as possible to 1 (complete combustion).

The lambda adjustment can be carried out when the coolant temperature is greater than 40 °C and that of the sensor is above 300 °C.

The lambda adjustment is deactivated in the following situations:

– During starting.
– During acceleration.
– Under full load.
– During deceleration cut-off.
– During maximum rpm limitation actions
– During emergency operation (sensor failure).



The injection values corrected by the lambda sensor are memorised in the control unit and used to correct the injection volume, calculated by the control unit for subsequent operating situations. The memorised values are auto-adaptable based on engine operating conditions.

On the other hand, the control unit uses the signal of the lambda sensor G130 after the catalyser to complete the two functions:

– Check the condition of the catalyser.

– Correct possible measurement errors of the lambda sensor G39.

The control unit checks the condition of the catalyser by comparing the signals from both sensors. When the catalyser is operating correctly, the second sensor should register values much closer to lambda 1 than the sensor before the catalyser.

On the other hand, it is capable of correcting possible reading deviations from the lambda sensor G39 before the catalyser by comparing its signal with that from the sensor after the catalyser for the same exhaust gas composition.

DECELERATION CUT-OFF

The control unit **cuts off** the **injection flow** when it detects a **high engine rpm** and at the same time it senses that the **throttle** is in the **idle** position.

The rpm when injection is restarted depends on the coolant temperature. At high temperatures (operating temperature), the injection restarts at 1200 rpm, and at low temperature the injection restart point will be at a much higher rpm.

If the compressor is operating, the point of injection restart will be increased.

ACCELERATION CORRECTION UNDER FULL LOAD

The amount of fuel injected will be increased during acceleration and under full load.

When the control unit detects that the signal from the throttle potentiometer increases suddenly, it recognises this situation as acceleration. The control unit consequently corrects the amount of fuel injected and creates a rich mixture.

The enrichment under full load is performed above a certain degree of throttle opening.

LIMITATION OF MAXIMUM RPM

The maximum rpm limitation is performed in general by **closing** the **throttle,** consequently **reducing the amount of fuel injected**.

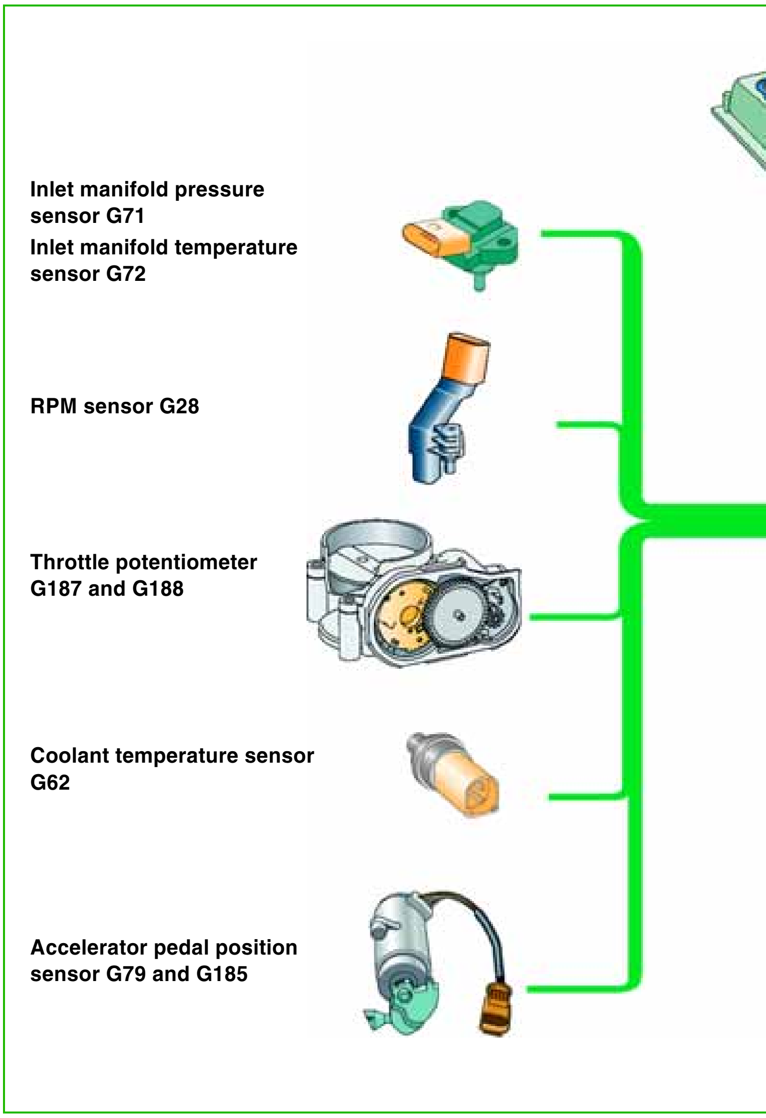
The control unit can also delay the ignition advance and use random injection pulse cancellation to limit the maximum rpm.

RAPID CATALYSER HEATING

The control unit **weakens** the **mixture** after **cold starting** to increase the exhaust gas temperature. It also delays the ignition.

This method is used to enable a temperature for correct catalyser operation to be reached more quickly.

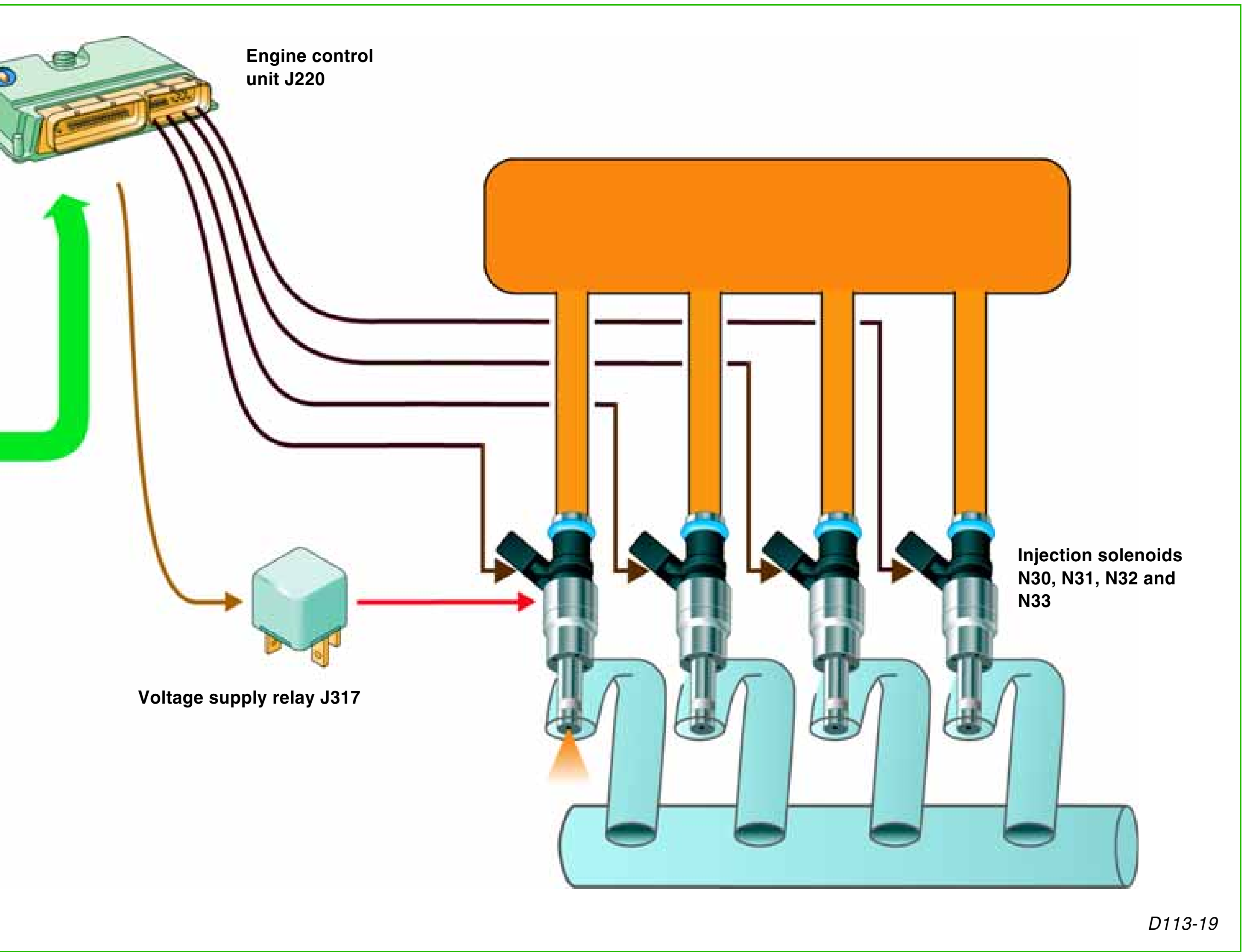
A poor mixture slows the combustion since the flame propagation speed is reduced. This slower combustion together with the ignition delay creates an increase in exhaust gas temperature.



SELECTIVE CYLINDER INJECTION DEACTIVATION

The control unit deactivates the fuel injection under certain circumstances in order to reduce engine torque.

During gear changing (only on automatic gearboxes), torque is reduced at the precise moment of gear engagement. This leads to a smoother gear change.



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In the event of **failure of the throttle position sensors**, the throttle will remain in the at-rest position (slightly open) and the idle speed will be approximately 1650 rpm. The control unit will reduce the rpm by deactivating the injection in two cylinders in a random fashion. When the accelerator is pressed, the injection will be reactivated in all the cylinders. During deactivation of the injection, the lambda adjustment will be cancelled and the values registered by the sensor will be very low due to the poor mixture.

Combustion failure is detected by the control unit by comparing the instantaneous acceleration of the crankshaft (rpm sensor) with the combustion phases of each cylinder (hall sensor). This enables the cylinder which is not firing to be detected. The elimination of injection in this cylinder prevents the deterioration of the catalyser and the emission of noxious gases.

IGNITION

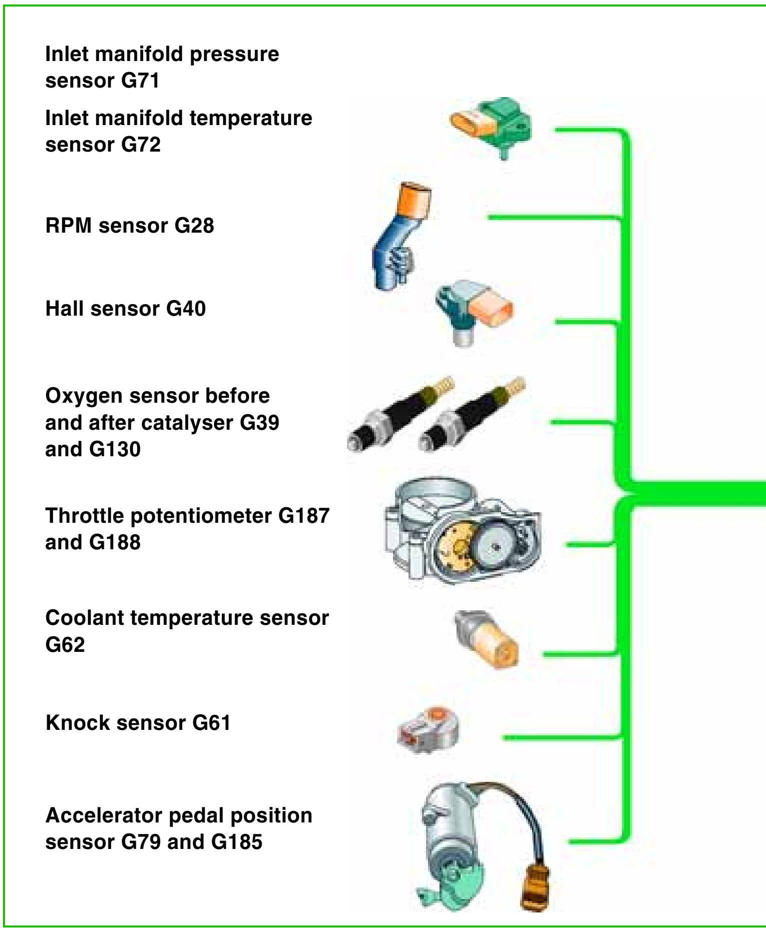
The ignition takes place at the precise moment when the combustion can produce optimum engine operation.
The optimum ignition advance is corrected to provide engine protection or driving improvement functions.

CONTROL OF IGNITION ADVANCE ANGLE

The control unit calculates the exact ignition point based on two basic signals: the engine rpm and load (air mass drawn in).
The corrective signals used are the air intake temperature, the coolant temperature and the lambda value. The signal from the knock sensor is also used to modify the ignition advance if poor combustion is detected.
The adjustment of ignition advance is also used for other functions such as rapid catalyser heating, digital idle stabilising, reduction of engine torque during gear change or limitation of maximum rpm.
The control unit energises each final power stage separately, controlling the charging time (the greater the air mass the greater the charging time), and the precise moment of spark production.
As the engine rpm increases, the control unit increases the ignition advance, since as the engine rotates faster the combustion angle increases. If the combustion does not take place at the right moment, the engine efficiency will be reduced. A very advanced combustion could cause the engine to rotate in the opposite direction and a very late combustion could lead to a power loss and also to burned exhaust valves. The setting of the optimum combustion point is known as the fine tuning.
As the air mass increases, the pressure and temperature in the combustion chamber will increase leading to faster combustion. Consequently the combustion angle is reduced. The control unit will then reduce the ignition advance as the load increases.

LAMBDA SETTING

The speed of flame propagation (progression through the fuel and air mixture) will depend on the richness of the mixture. The richer the



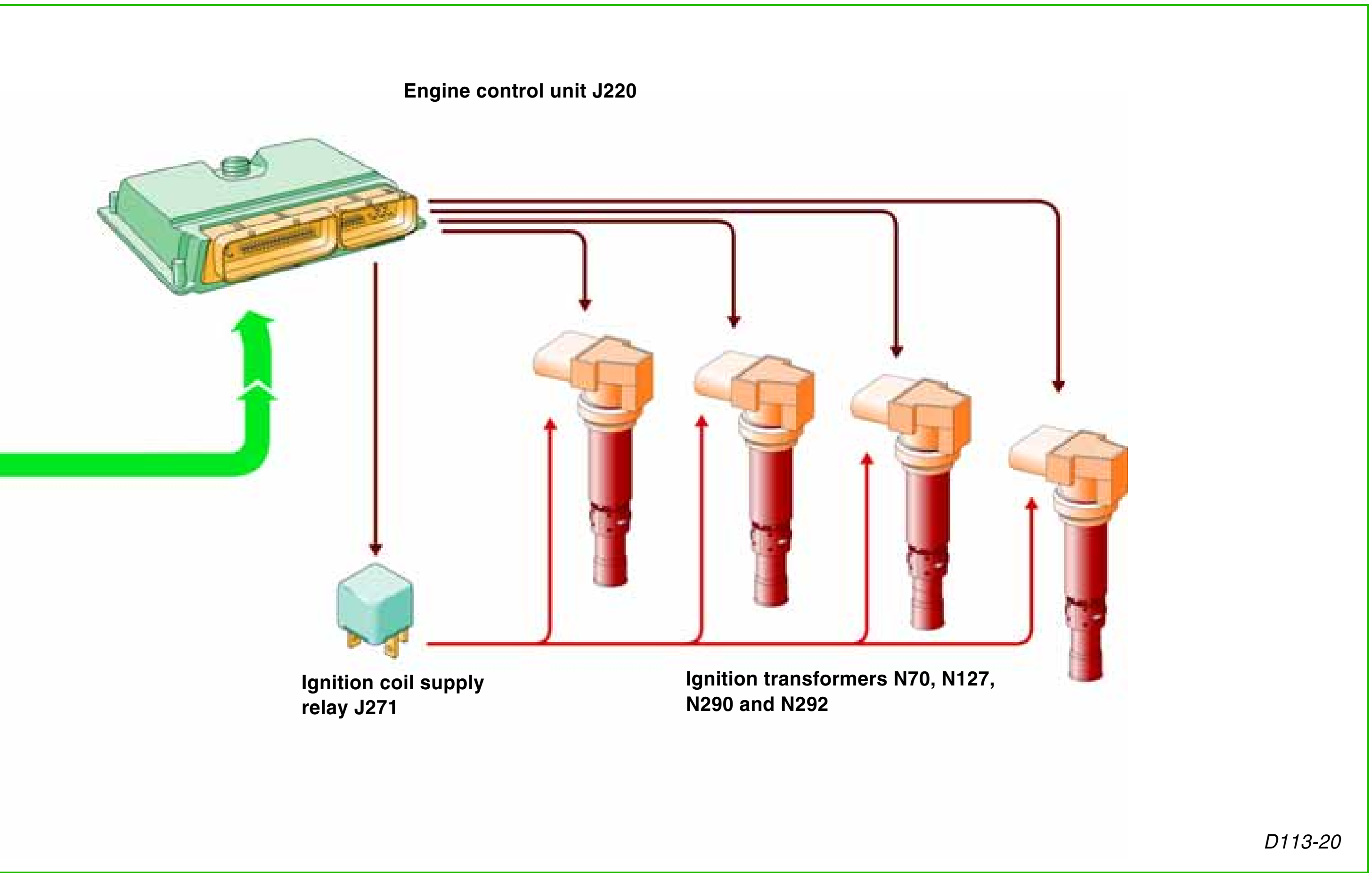
mixture (lambda value <1) the faster the flame propagation and therefore the lesser the combustion angle and ignition advance, in other words, the ignition advance will need to be reduced.

DWELL ANGLE CONTROL

The control unit sets the dwell angle or in other words the charging time of the ignition transformer to obtain correct spark production.

SELECTIVE CYLINDER KNOCK CONTROL

Knocking is caused when the air fuel mixture in the combustion chamber detonates. Detonation takes place when the temperature and pressure in the unburned mixture exceed than the anti detonation properties of the fuel. However the most important of these two factors is the pressure. These pressure and temperature



levels are only reached when the engine is running above 40% load level and with a coolant temperature greater than 60 °C.

To avoid or eliminate detonation, the control unit will delay ignition. This ensures that the pressure increase due to combustion will be partly compensated by the pressure drop due to the downward travel of the piston. This travel leads to an increase in the combustion chamber volume and therefore a reduction in pressure.

The control unit detects the cylinder where knocking occurs by comparing the acceleration phase of the crankshaft (signal from the rpm sensor) with that of the cylinder which provoked the acceleration (hall sensor signal) the moment the knock sensor detected the detonation.

When the detonation is detected, the control unit will delay the ignition in that cylinder.

RAPID CATALYSER HEATING

During the catalyser warming up phase, the control unit not only provides a poorer mixture but also delays the ignition to increase the exhaust gas temperature and thus facilitate catalyser warming up.

IDLE STABILISATION

The engine control unit governs the opening of the throttle to set a stable idling speed in line with the engine operating conditions and battery charging requirements.

IDLE RPM ADJUSTMENT

The idling speed is only adjusted when the control unit detects that the throttle is in the idle position. This position is detected by the throttle position sensors.

The control unit compares the engine rpm with the theoretical idling value. The theoretical value depends on the coolant temperature, the air conditioning operation and the load on the alternator. These latter signals are registered and sent respectively by the air conditioning control unit and the on board network control unit to the engine control unit.

If there is a difference between the theoretical and real value, the control unit sets a new value for throttle opening. Consequently it then energises the throttle actuator to set the new position. It then compares the signal from the position sensors with the calculated value, and corrects the position if required.

CUT OFF DAMPENING

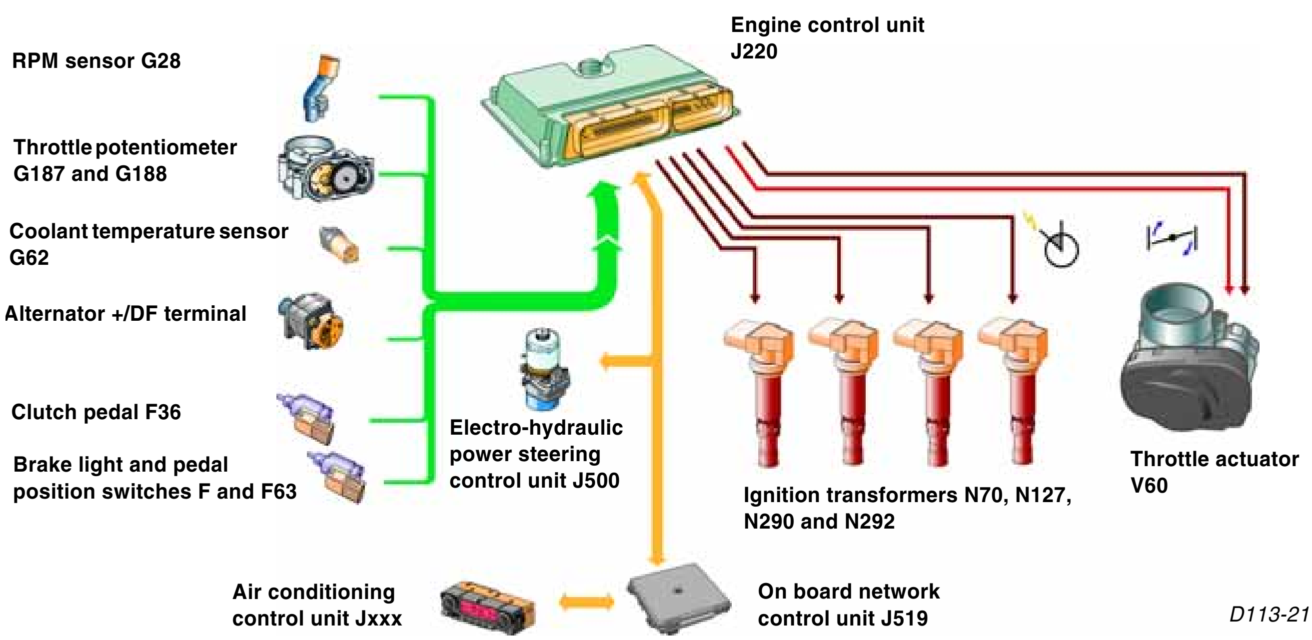
The cut off dampening is designed to prevent sudden deceleration of the vehicle when the accelerator pedal is released.

To perform this function, when the throttle reaches the idling position, it reopens slightly during engine deceleration and then closes slowly until idling rpm is established. This function is governed by the engine control unit by energising the throttle actuator. The cut off dampening is not performed when the clutch signal F36 is detected or the brake F63 is activated.

DIGITAL IDLE STABILISING

The control unit slightly changes the ignition advance to compensate for small variations in the idling speed, without the need to change the throttle position.

A greater ignition advance will lead to an increase in idling speed and a delay will reduce it.



CARBON CANISTER SYSTEM

This system is designed to prevent the vapours generated in the fuel tank from passing to the atmosphere or accumulating in the tank.

The system is composed of a carbon canister and a solenoid.

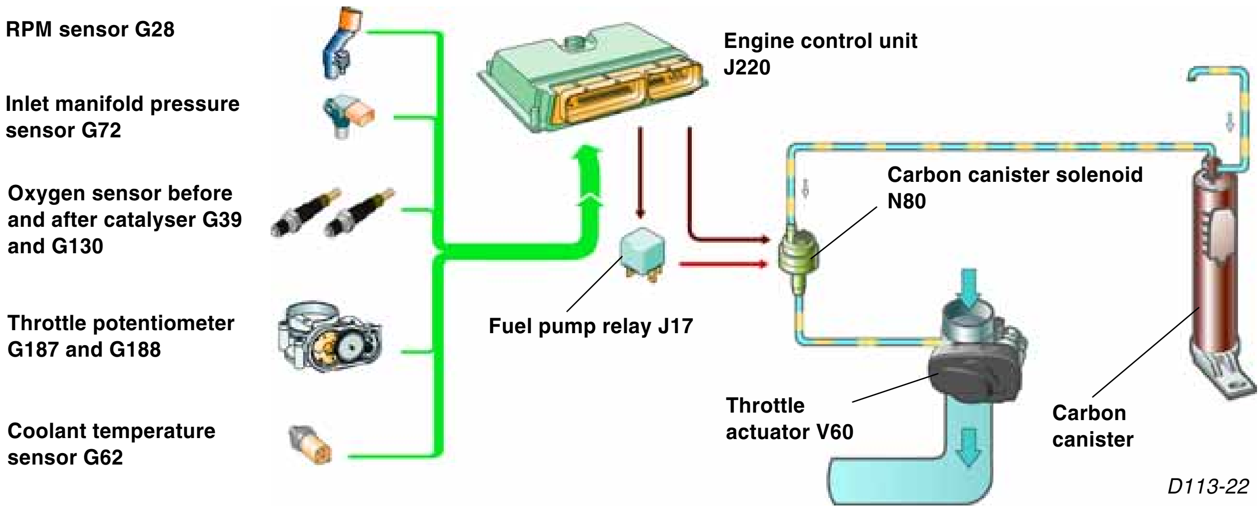
When the solenoid is energised, the vapours pass into the inlet manifold after the throttle valve, and are burned during the combustion process.

REGULATION OF FUEL VAPOUR PASSAGE

The fuel vapour passage is adjusted according to the engine load, rpm, coolant temperature and the inlet air temperature. The vapour volume passed to the manifold is corrected based on the reading obtained from the lambda sensor, used to determin the level of filter saturation.

The vapour will be passed to the manifold when the coolant temperature is above 40 °C and the air inlet temperature is greater than –10 °C.

The amount introduced will be regulated by controlling the energising period of the solenoid and by a pulse width modulation of the solenoid signal. The time interval could vary between 4 and 15 minutes, and between each energising interval there is a rest period of 70 seconds. The pulse width of the signal is also varied according to degree of filter saturation, the load and engine rpm. At full load and high rpm, the pulse width proportion is close to 100%, whereas at low load and low rpm, the pulse width is very small.



LAMBDA VALUE CORRECTION

The engine control unit makes a correction to the calculated energising values (time and pulse width proportion) for the carbon canister based on the lambda sensor signal.

The control unit evaluates the enrichment caused during introduction of the vapours in the burned mixture by comparing the signal emitted from the lambda sensor during 70 seconds in the at rest condition with that emitted when the fuel vapours are introduced. This allows the unit to determine the level of reservoir saturation and consequently adapt the duration of the solenoid energising signal.

This corrective action enables an average fuel tank saturation level to be maintained.

VARIABLE TIMING

The objective of the variable timing on this engine is to provide **optimum engine torque** during the different engine operating phases.

The variable timing on this engine is achieved by the fitting of a variator which allows the timing to be modified by up to 20º of the camshaft, which is equivalent to 40º of crankshaft rotation for the valve opening period.

The position of the variator is determined by the variable timing solenoid and this is governed by the engine control unit using a pulse width modulated signal.

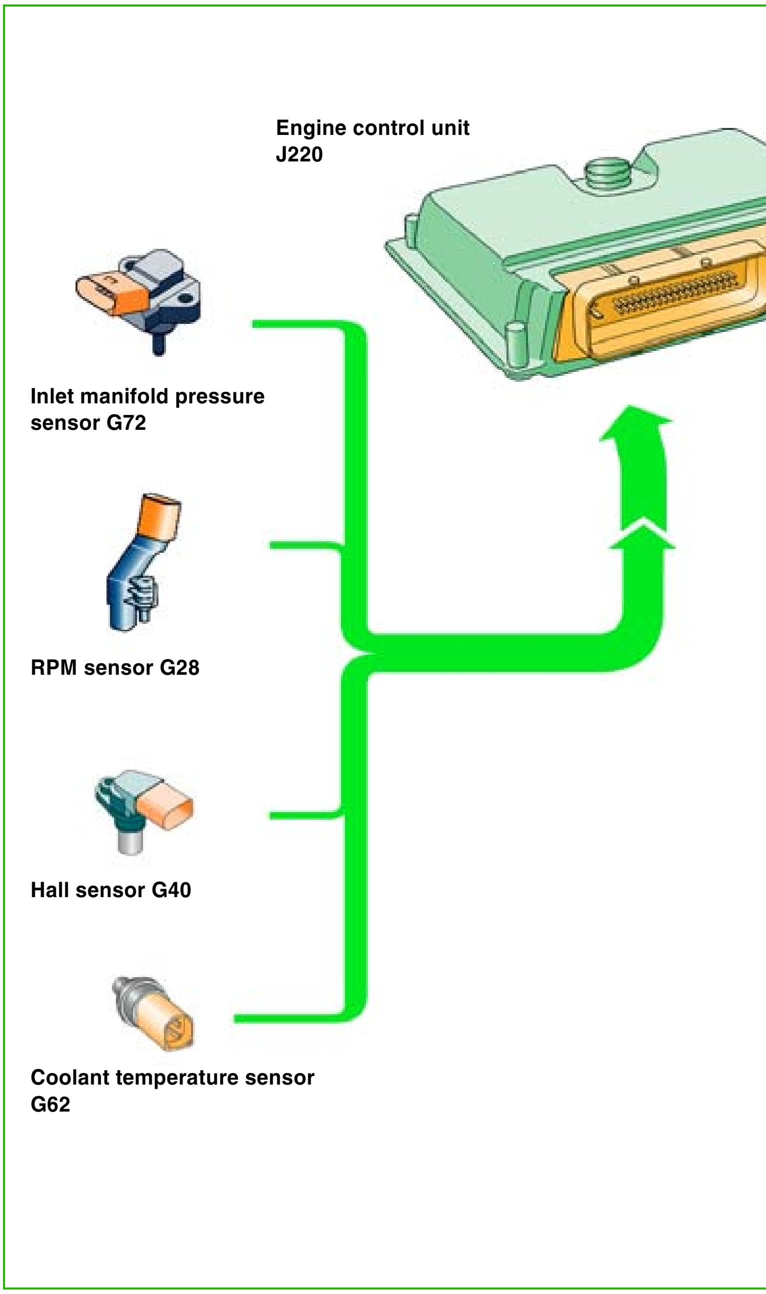
The control unit determines the negative proportion according to the two basic signals of rpm and air mass drawn in to the engine. It then uses coolant temperature as a correction signal.

The unit uses the hall signal, G40, as a retro-information signal to check the operation of the variable timing.

BASIC POSITION

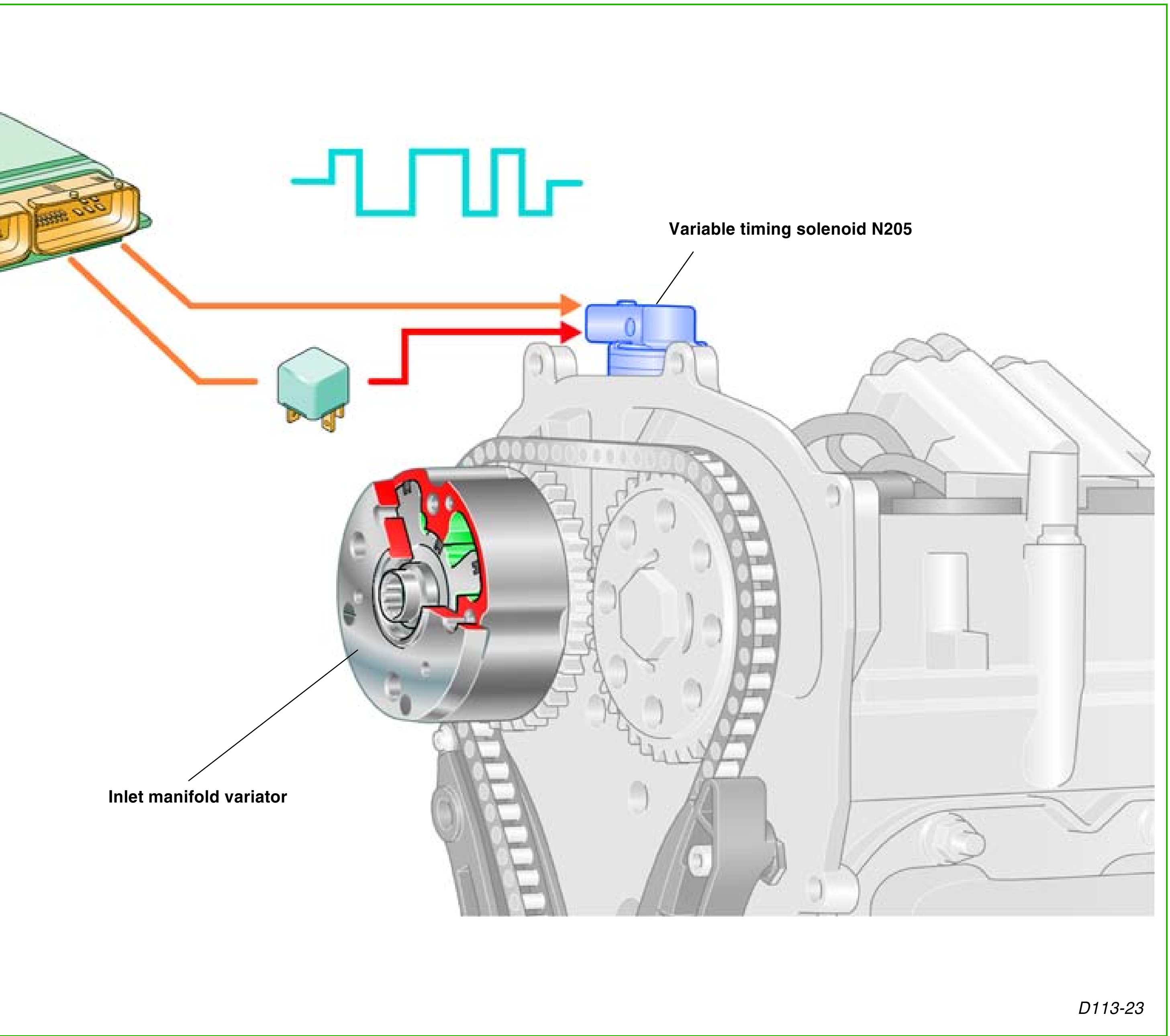
When the engine is idling at speeds below 1800 rpm and under low load conditions, the engine control unit will not energise the variable timing solenoid and the variator will remain in the at rest position.

In this situation, the opening of the inlet valves will take place after TDC, thus providing more stable idling.



ENGINE TORQUE POSITION

When the engine is running at speeds above 1800 rpm and under load, the control unit will progressively increase the negative pulse width proportion used to energise the variable timing solenoid.



In this situation, the variator will change the position of the inlet manifold camshaft and advance the opening and closing point of the valves.

The advanced opening of the inlet valves will optimise cylinder filling.

In other words a good cylinder air fill is obtained and this is essential to provide maximum engine torque delivery.

If a fault occurs on the variable timing system, the camshaft will remain in the basic position, thus leading to a reduction of engine torque.

EOBD

The EOBD's main function is **to monitor the components related to the emission of exhaust gases**.

The sensors and actuators monitored by the EOBD system are:

– Injection solenoids.
– Ignition coils.
– Oxygen sensor before catalyser
– Oxygen sensor after catalyser
– Engine RPM sensor.
– Hall sensor.
– Coolant temperature sensor.
– Air inlet temperature sensor.
– Inlet manifold pressure sensor.
– Carbon canister solenoid.
– Variable timing solenoid.
– Altitude sensor.
– Engine control unit.
– Throttle position sensors.
– Accelerator pedal position sensor
– Brake position sensors.

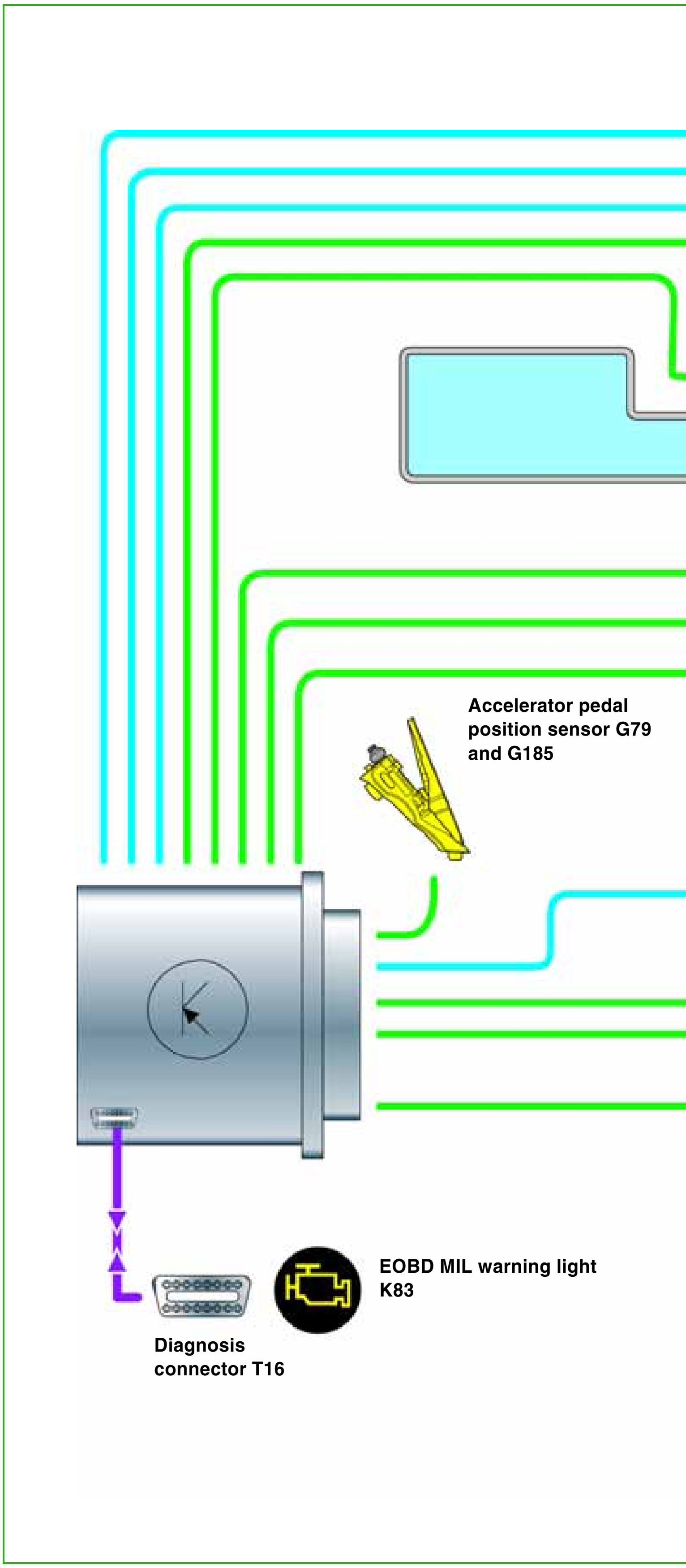
The EOBD also checks the following functions:

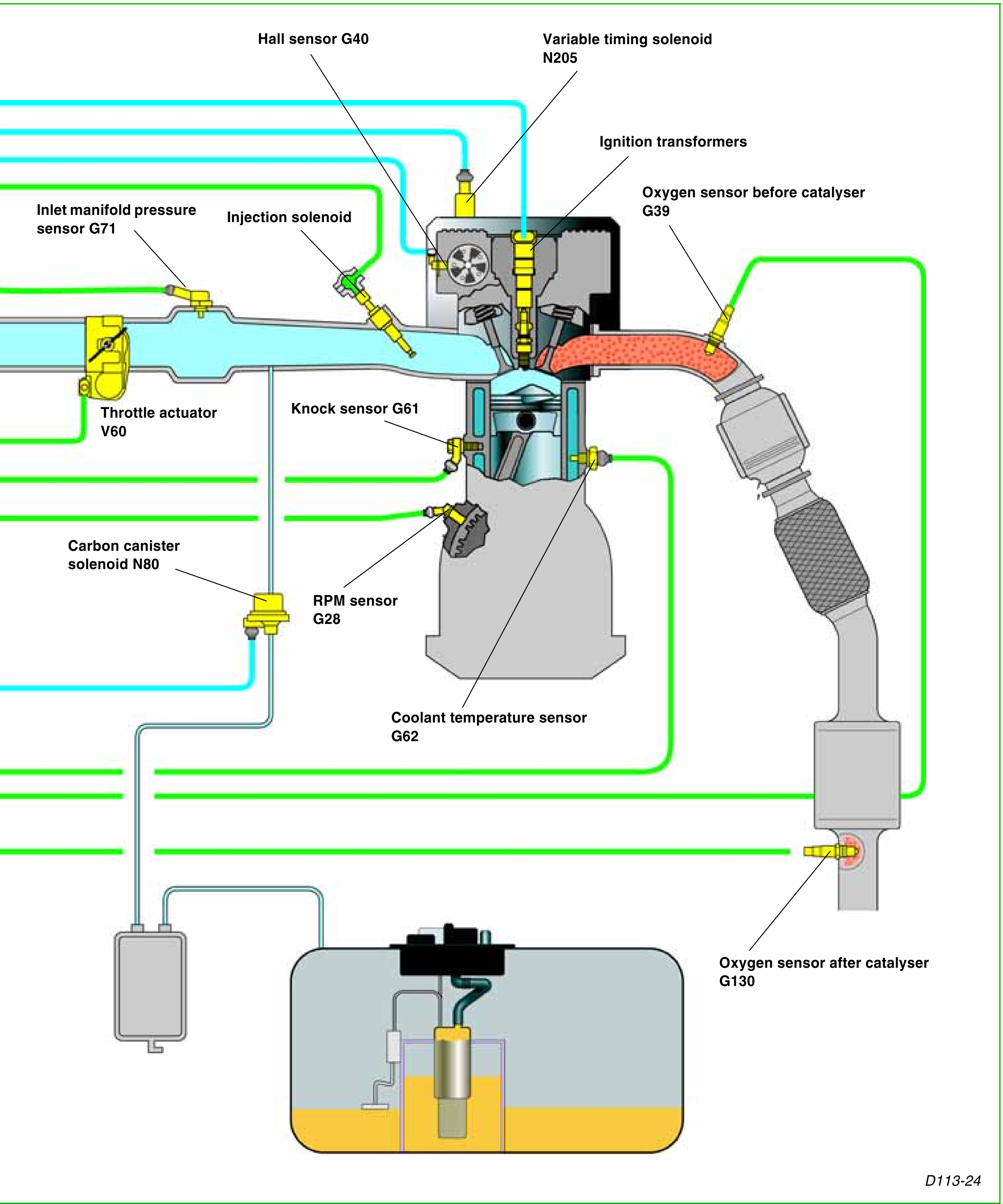
– Lambda adjustment.
– Catalyser monitoring
– Monitoring of the carbon canister circuit
– Combustion monitoring.

If a fault or poor operation is detected in any of the sensors or actuators being monitored, the engine control unit will memorise this fault and bring on the EOBD warning light located in the instrument panel.

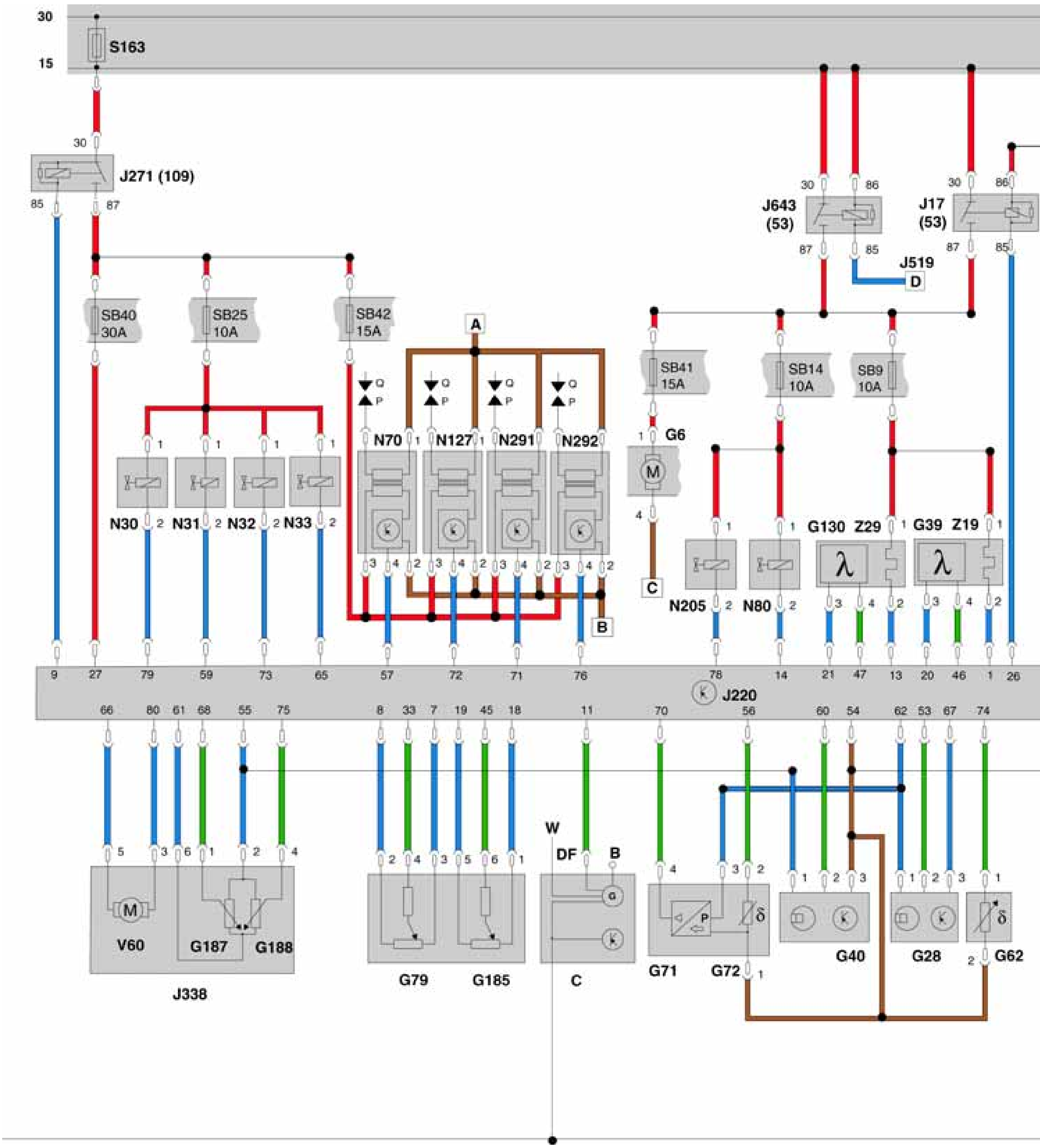
If the EOBD warning light flashes, this means that the fault could damage the catalyser and if it remains on permanently, it indicates that the fault has an effect on the exhaust gases emissions.

In both cases it is necessary to reduce the vehicle speed and take the vehicle to the workshop.





Hall sensor G40
Variable timing solenoid N205
Ignition transformers
Oxygen sensor before catalyser G39
Inlet manifold pressure sensor G71
Injection solenoid
Throttle actuator V60
Knock sensor G61
Carbon canister solenoid N80
RPM sensor G28
Coolant temperature sensor G62
Oxygen sensor after catalyser G130
D113-24


30
15
S163
J271 (109)
SB40 30A
SB25 10A
SB42 15A
A
N70
N127
N291
N292
N30
N31
N32
N33
B
G6
SB41 15A
C
J643 (53)
J17 (53)
J519
D
SB14 10A
SB9 10A
N205
N80
G130
Z29
G39
Z19
J220
V60
G187
G188
J338
G79
G185
W
DF
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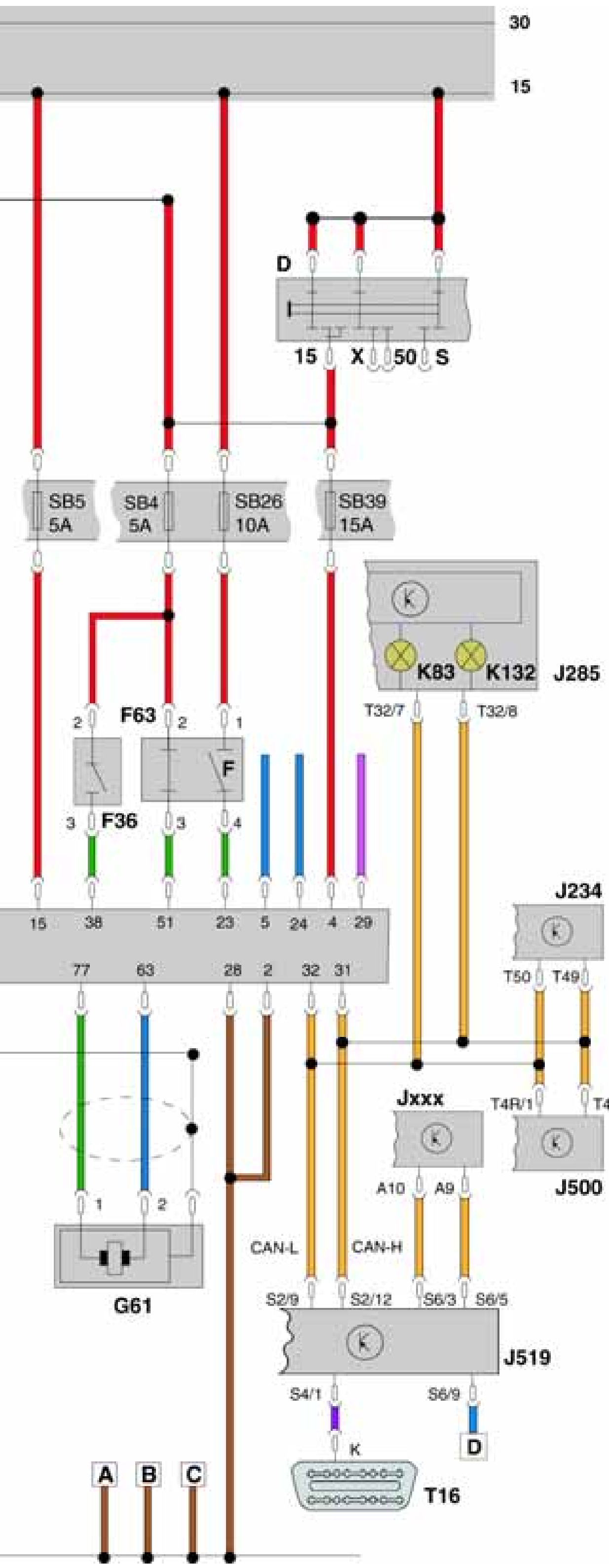
G71
G72
G40
G28
G62



D113-25

COLOUR CODES

- Input signal
- Output signal
- Positive supply
- Earth
- Bi-directional signal
- CAN-Bus

LEGEND

C	Alternator.
D	Ignition switch.
F/F63	Brake switches.
F36	Clutch pedal switch.
F96	Altitude sensor
G6	Fuel pump.
G28	Engine RPM sensor.
G39	Oxygen sensor before catalyser.
G40	Hall sensor.
G61	Knock sensor.
G62	Coolant temperature sensor.
G71	Inlet manifold pressure sensor.
G72	Inlet manifold air temperature sensor.
G79	Accelerator pedal position sensor.
G130	Oxygen sensor after catalyser.
G185	Accelerator pedal position sensor.
G187	Throttle potentiometer 1.
G188	Throttle potentiometer 2.
J17	Fuel pump relay.
J104	ABS control unit.
J220	Engine control unit.
J234	Airbag control unit.
J271	Main supply relay, borne 30.
J285	Instrument panel.
J500	Electro-hydraulic power steering control unit.
J519	On board network control unit.
J643	Fuel primer pump relay.
Jxxx	Air conditioning control unit.
K83	Diagnosis/excess pollution.
K132	"EPC" warning light.
N30	Injection solenoid on cylinder 1.
N31	Injection solenoid on cylinder 2.
N32	Injection solenoid on cylinder 3.
N33	Injection solenoid on cylinder 4.
N70	Ignition transformer 1.
N80	Carbon canister solenoid valve.
N127	Ignition transformer 2.
N205	Variable timing solenoid.
N291	Ignition transformer 3.
N292	Ignition transformer 4.
T16	Diagnosis connector.
V60	Throttle actuator.
Z19	Oxygen sensor heater.
Z29	Oxygen sensor heater after catalyser.

ADDITIONAL SIGNALS

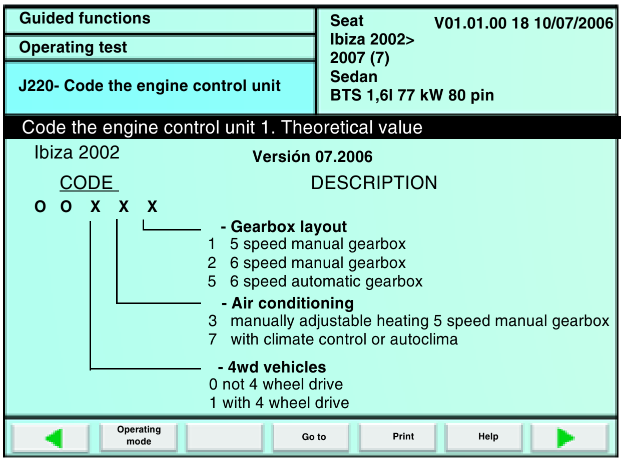
Terminal 24	Cruise control.
Terminal 5	Speed signal to the radio.
Terminal 29	K line.

Whenever a fault is present in the system, it is necessary to carry out a self-diagnosis of the engine control unit using the “Guided fault finding” procedure. If there is no fault in the system, it is possible to use the “Guided functions” option.

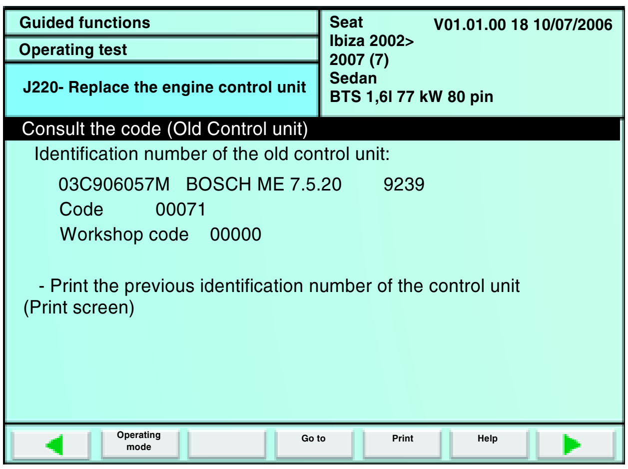
D113-26

CODE THE ENGINE CONTROL UNIT

The coding of the engine control unit using this function is only valid if the control unit has not been replaced but some original vehicle equipment has been changed. For example if the vehicle was fitted with heating and an air conditioning system was retrofitted.



D113-27



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REPLACEMENT OF THE CONTROL UNIT

This function is carried out in 4 stages.

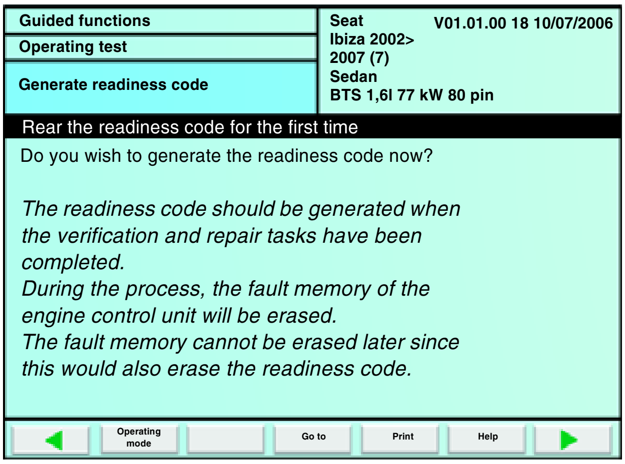
1. Reading of the old control unit parameters.
2. Coding of the new control unit.
3. Adaptation of the immobiliser
4. Adaptation of the throttle to the control unit.

GENERATION OF READINESS CODE

The readiness code is generated when this has been consulted and determined that it is not correct.

To start the process, some prerequisites for coolant and inlet air temperature have to be complied with.

The engine rpm should be maintained at a fixed level while the basic settings are being carried out. The rpm setting tool VAG 1788/10 should be used to retain the accelerator at a set position.



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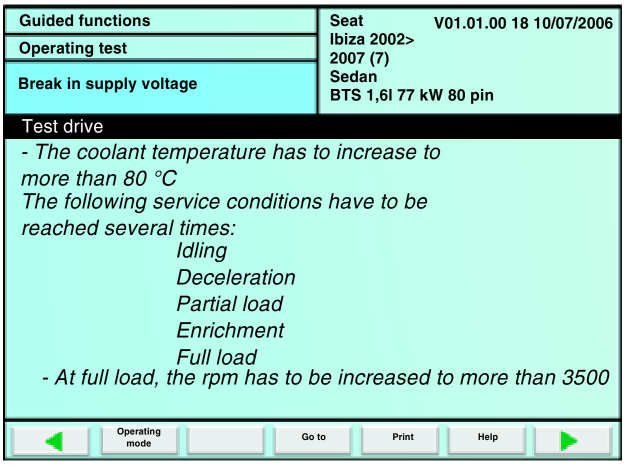
VOLTAGE CUT OFF

When the voltage supply is cut off, the control unit will loose its learned values, the basic settings and readiness code.

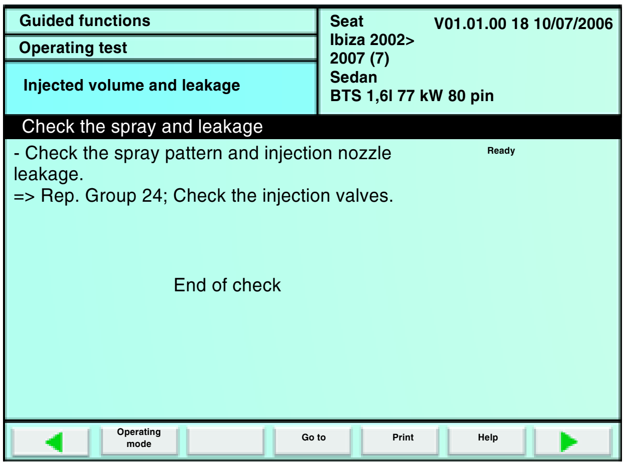
This guided function indicates the steps to be followed to enable the control unit to recover these values.

On the one hand, the throttle unit is adapted to control unit and afterwards a test drive is proposed, as shown in the picture on the right.

The objective of the test drive is to generate the readiness code.



D113-30



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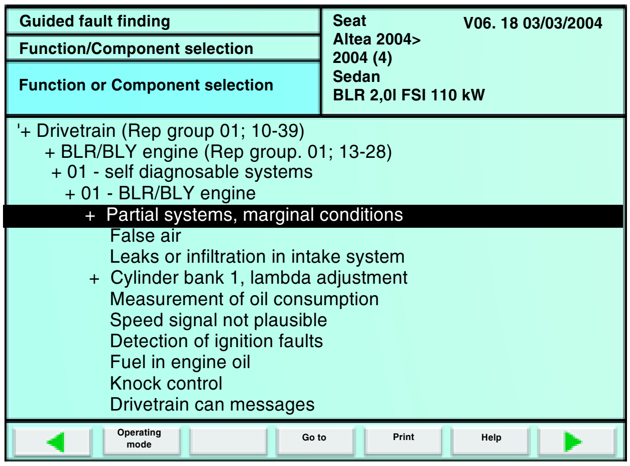
FUEL INJECTION AND LEAKAGE

This function of the VAS allows the repair group 24 to be consulted to check the injection characteristics and leakage.

CHANGE OF FUEL TYPE

This function makes it possible to check components involved in the combustion such as the ignition coils, the injectors and the rpm sensor. If no fault is detected, the fuel tank should be emptied and refilled with the correct fuel. In some countries fuel may be of poor quality and lead to combustion problems which are detected by the control unit.



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SEAT

service

ING113CD