



## Audi RS 6

Self-Study Programme 431

The Audi RS models from quattro GmbH are the ultimate in sportiness, complemented by powerful and elegant design, exclusive equipment and perfect quality.

The new Audi RS 6 will only be available as an Avant to start with, with the unrivalled combination of 580 bhp and a maximum 1,660 litres of luggage space. The Audi RS 6 redefines the concept of high performance in the business class. With its 426 kW (580 bhp), it is the most powerful model in the current Audi range and with the exception of pure racing cars like the Le Mans-winning Audi R10 TDI, it is the most powerful Audi of all time. By the same token, it completely outclasses all its competitors in the luxury performance category.

A newly developed V10 engine with FSI direct injection and twin turbochargers, permanent quattro four-wheel drive and sports suspension with Dynamic Ride Control DRC sets the standard for high-performance cars in the luxury class.



431\_015

After reading the Self-Study Programme, you will be able to answer the following questions:

- What are the differences between this engine and the 5.2l V10 engine?
- How does the cooling system with all its radiators, coolers and thermostats work?
- What function does the air filter port in the turbocharger oil return line serve?
- What should be noted regarding the ceramic brake?
- Which modifications to the RS 4 have been incorporated into the Dynamic Ride Control (DRC) system?

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The Self Study Programme teaches the design and function of new vehicle models, new automotive components or new technologies.


**The Self Study Programme is not a Repair Manual.**  
**All values given should be considered as guidelines, and refer to the software version valid at the time of preparation of the SSP.**

For information about maintenance and repair work, always refer to the current technical literature.

Reference



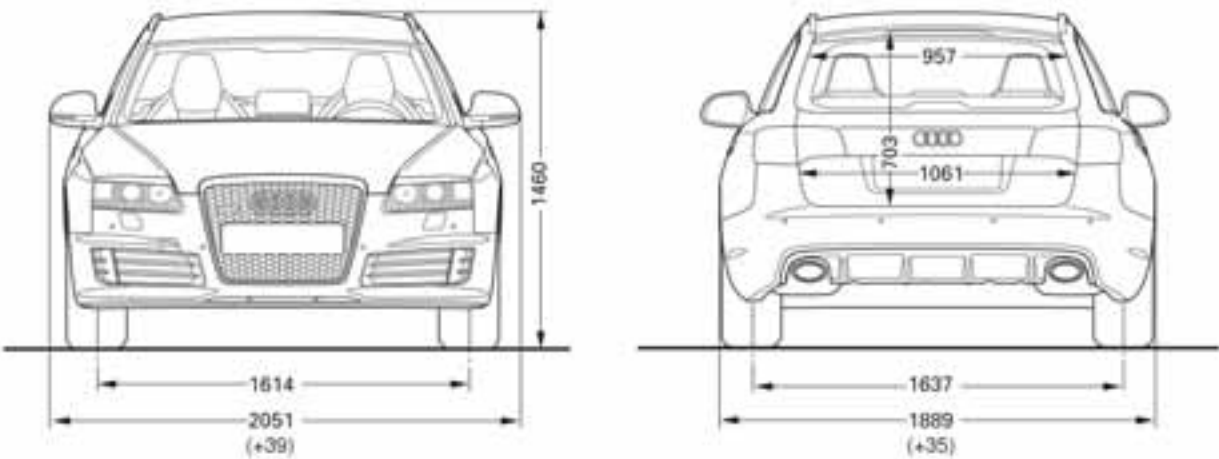
Note



# Introduction

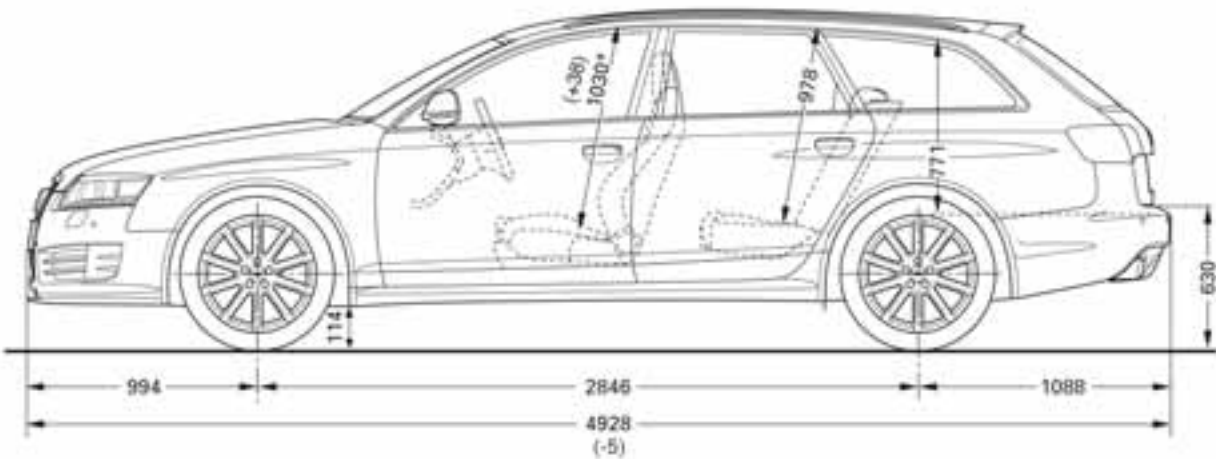
## Dimensions of the Audi RS 6 Avant

The values given in square brackets are deviations from the Audi A6 Avant.



431\_001\_1

Max. headroom for driver and front passenger has been increased to 1030 mm.



431\_001\_2

\* Max. headroom

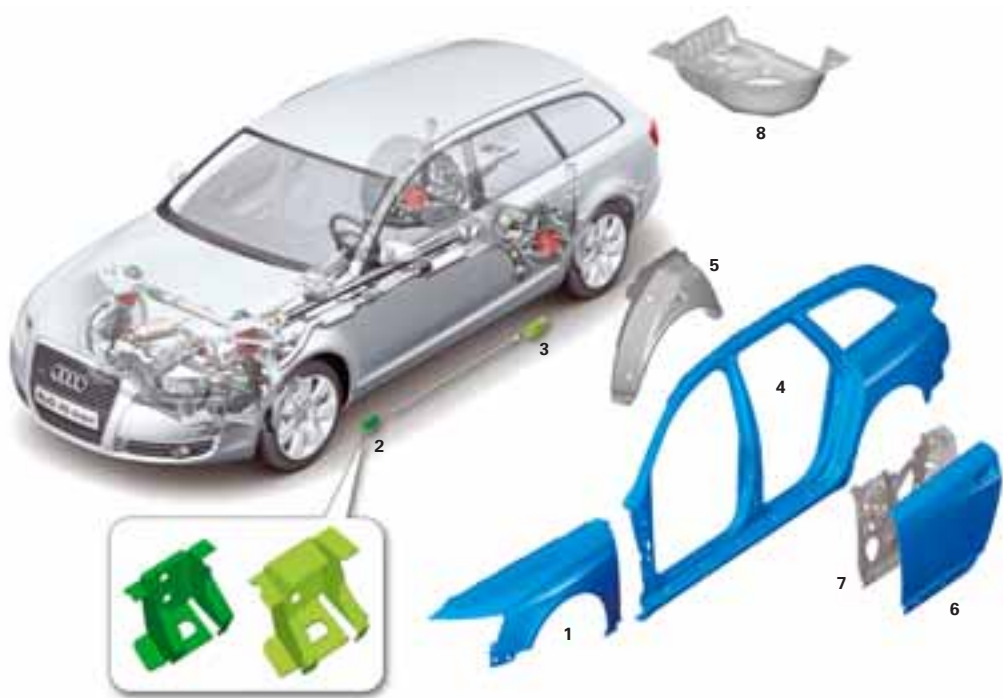
Specifications in millimetres  
Dimensions refer to kerb (unladen) weight of vehicle



5

Audi RS 6 Avant

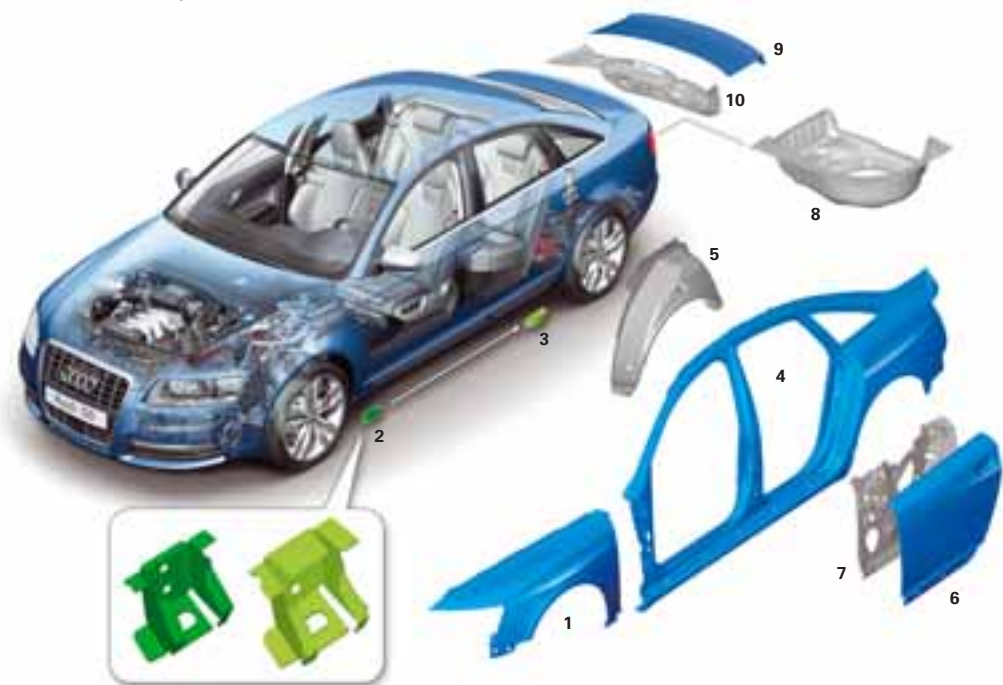
Body modifications compared to Audi A6 Avant



431\_018

Audi RS 6 saloon

Body modifications compared to Audi S6 saloon



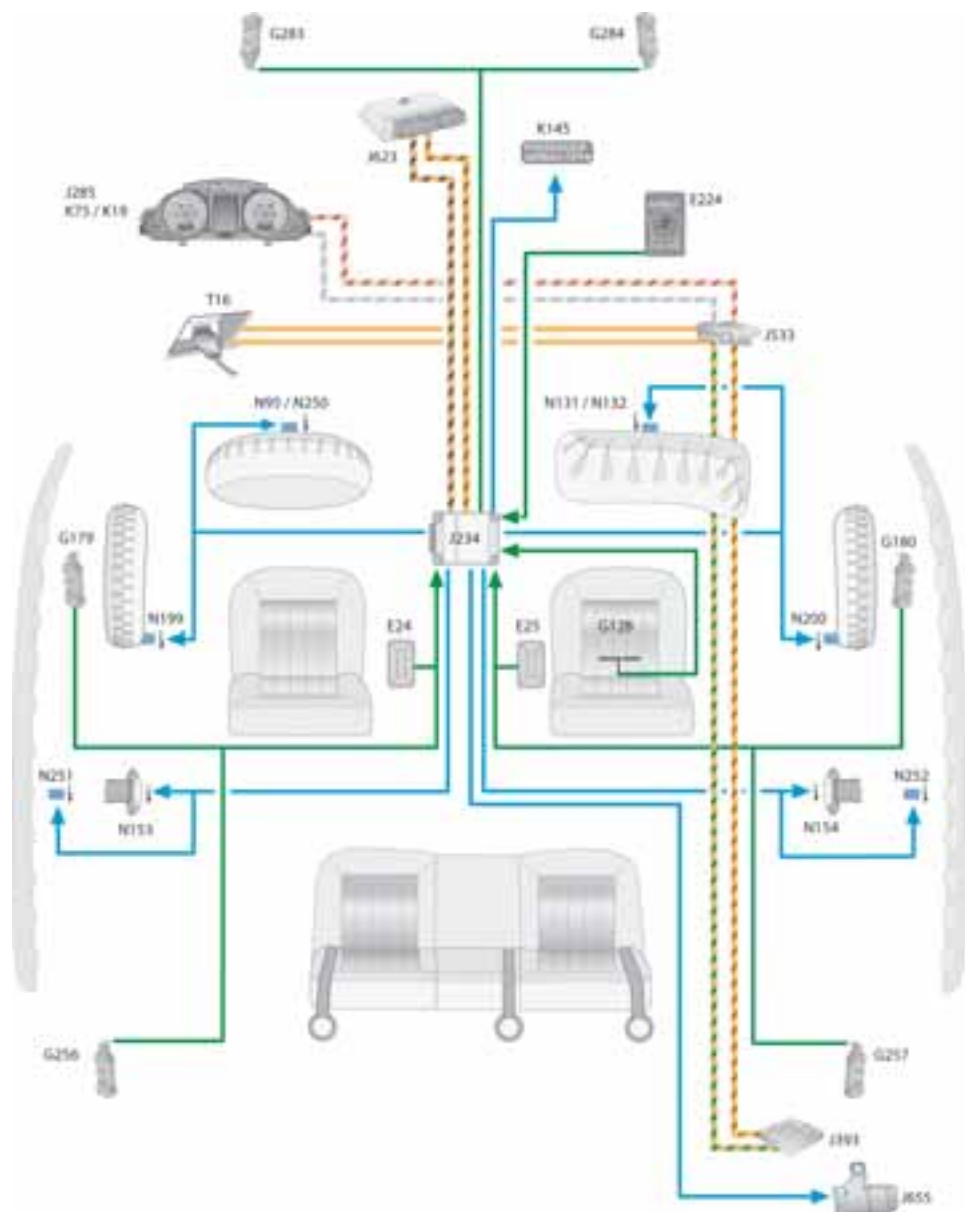
431\_019

Legend:

- |  |   |
|--|---|
| 1 Wing, front left and right             | 6 Door outer panel, rear left and right |
| 2 Jack support pad, front left and right | 7 Door inner panel, rear left and right |
| 3 Jack support pad, rear left and right  | 8 Boot floor panel, rear                |
| 4 Sidewall frame, left and right         | 9 Tailgate panel, exterior              |
| 5 Wheel arch, rear left and right        | 10 Tailgate panel, interior             |



The Audi RS 6 has the same occupant protection features as the Audi A6 Avant.



431\_070

Legend:

E24	Driver side belt switch	K19	Seat belt warning system warning lamp
E25	Front passenger side belt switch	K75	Airbag warning lamp
E224	Airbag disabling key switch, front passenger side	K145	Passenger airbag off warning lamp (PASSENGER AIRBAG OFF)
G128	Seat occupancy sensor, front passenger side	N95	Airbag igniter, driver side
G179	Side airbag crash sensor, driver side (front door)	N131	Front passenger side airbag igniter 1
G180	Side airbag crash sensor, front passenger side (front door)	N132	Front passenger side airbag igniter 2
G256	Rear side airbag crash sensor, driver side	N153	Driver seat belt tensioner igniter -1-
G257	Rear side airbag crash sensor, front passenger side	N154	Front passenger seat belt tensioner igniter -1-
G283	Driver side front airbag crash sensor	N199	Side airbag igniter, driver side
G284	Front passenger side front airbag crash sensor	N200	Side airbag igniter, front passenger side
J234	Airbag control unit	N250	Driver side airbag igniter -2-
J285	Control unit with display in dash panel insert	N251	Driver side curtain airbag igniter
J393	Convenience system central control unit	N252	Front passenger side curtain airbag igniter
J533	Data bus diagnostic interface		
J623	Engine control unit	T16	16-pin connector (diagnostic port)
J655	Battery cut-off relay		

5.0l V10 FSI biturbo

Technical features

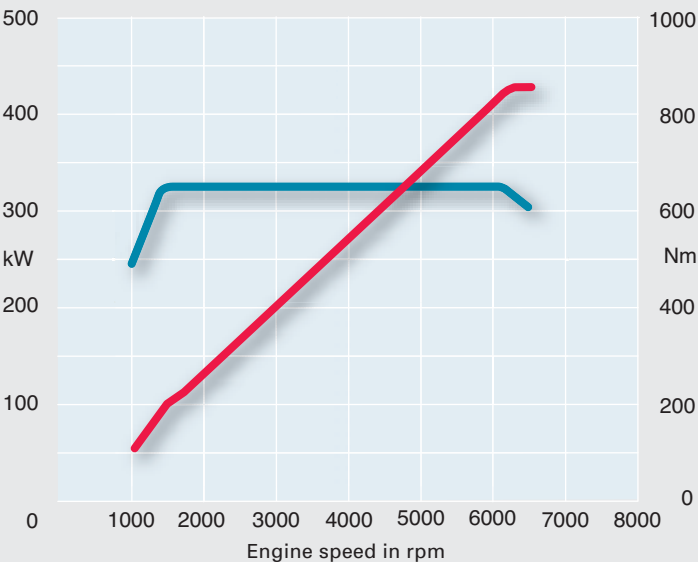
- Ten-cylinder petrol engine with aluminium block
- Cylinder head with dual overhead camshafts (DOHC)
- Roller cam followers with hydraulic valve clearance adjustment
- Variable intake and exhaust camshaft adjustment
- Maintenance-free, chain-driven timing gear
- Demand-controlled low and high pressure fuel system
- Homogeneous direct injection



431\_009

Torque/power curve

- Max. torque in Nm
- Max. power in kW



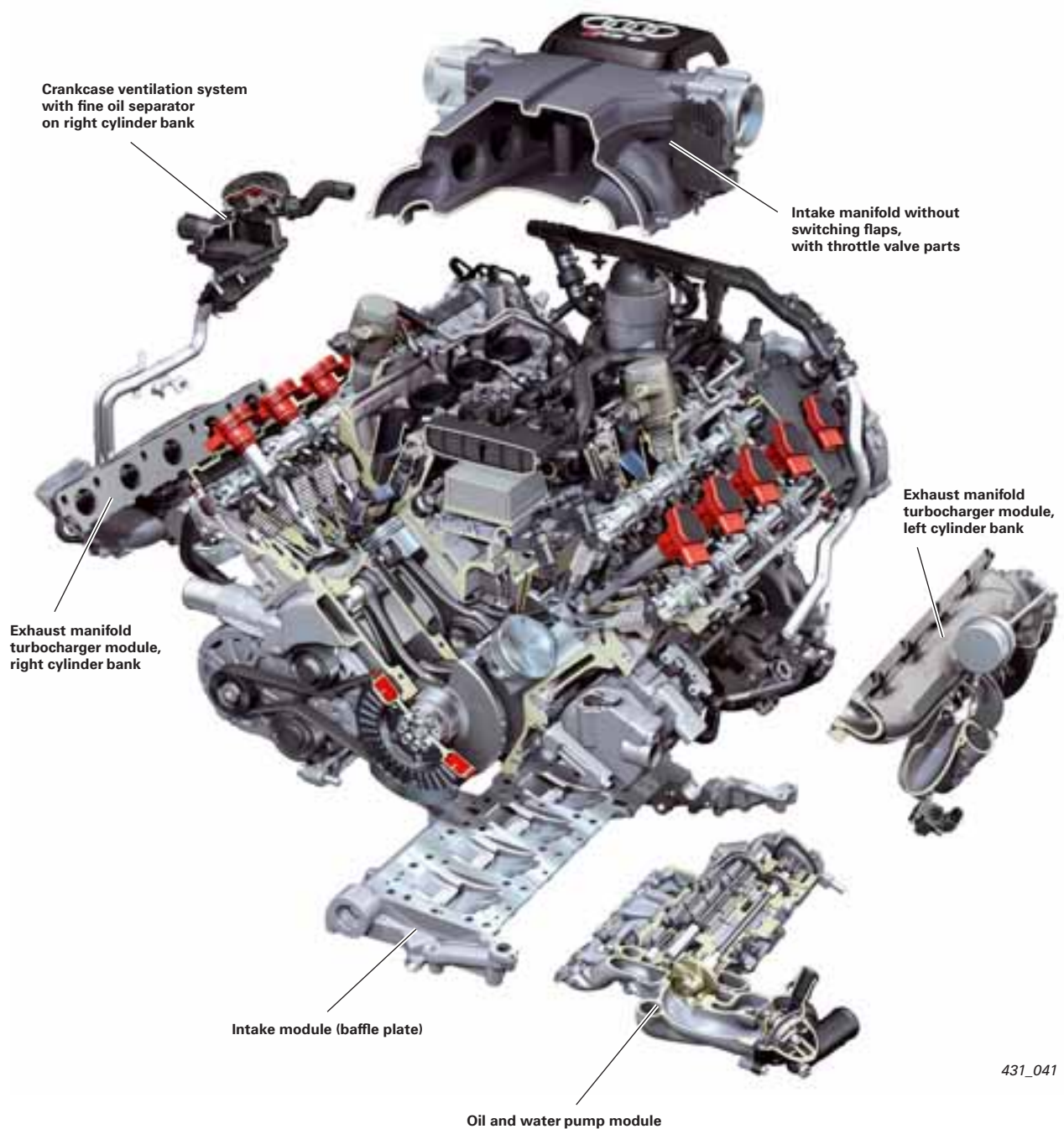
Specifications of the Audi RS 6

Engine code	BUH
Engine type	Ten-cylinder petrol engine with petrol direct injection, biturbo charging and closed-loop fuel system
Displacement in cm <sup>3</sup>	4991
Max. power in kW (bhp)	426 (580) at 6250 – 6700 rpm
Max. torque in Nm	650 at 1500 – 6250 rpm
Bore in mm	84.5
Stroke in mm	89
Compression ratio	10.5 : 1
Cylinder spacing in mm	90
Firing order	1 - 6 - 5 - 10 - 2 - 7 - 3 - 8 - 4 - 9
Engine management	Bosch ME9.1.2
Exhaust emission control	Single-pipe manifold with 4 integrated main catalytic converters close to the engine, each with 1 pre-catalyst sensor and 1 post-catalyst sensor
Exhaust emission standard	EU 4



## Differences with regard to engine components of 5.2l V10 FSI engine (SSP 376)

- No balancer shaft
- Change in displacement due to modified crankshaft with shorter stroke
- Crankshaft with continuous crank pin
- Dry sump lubrication system
- Oil and water pump module
- Modified crankcase ventilation system with heating
- Exhaust manifold turbocharger module



431\_041

## Cylinder block/crank mechanism

The cylinder crankcase with 90° v-angle uses a bedplate design and, thanks to a length of 685 mm and width of 80 mm, sets new standards for compactness and overall length.

The top part of the cylinder crankcase is a homogeneous monoblock made from AISi17Cu4Mg by low-pressure chill casting. The typical properties of this combination of materials are high strength, very low cylinder distortion and good heat dissipation.

Cylinder crankcase



Ladder frame (bedplate)

The AISi12Cu1 bedplate has been reinforced by using cast-in GGG50 inserts attached with four screws through which the bulk of the power flow is directed. These inserts also reduce thermal expansion and play in the main crankshaft bearings at high temperatures.



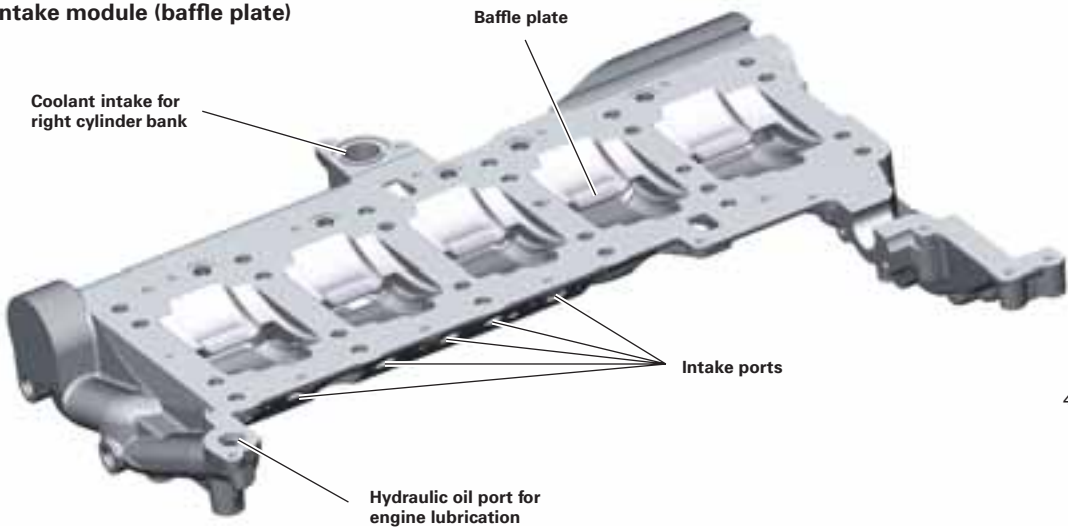
Cast iron insert for crankshaft main bearing

431\_046

Instead of an oil pan, the engine has an intake module which is connected directly to the external oil pump via intake ports.

This intake module does not have a large oil reservoir, rather serves as a baffle plate and collects the out-flowing oil due to the rotation of the crankshaft.

Intake module (baffle plate)



431\_074

## Crankshaft

For strength reasons, the crankshaft has been designed as common-pin-type crank pin, and not a split-pin type like on the 5.2l V10 engine.

Crankshaft with common pin on 5.0l V10 engine



431\_044

compared to split pin on 5.2l V10 engine

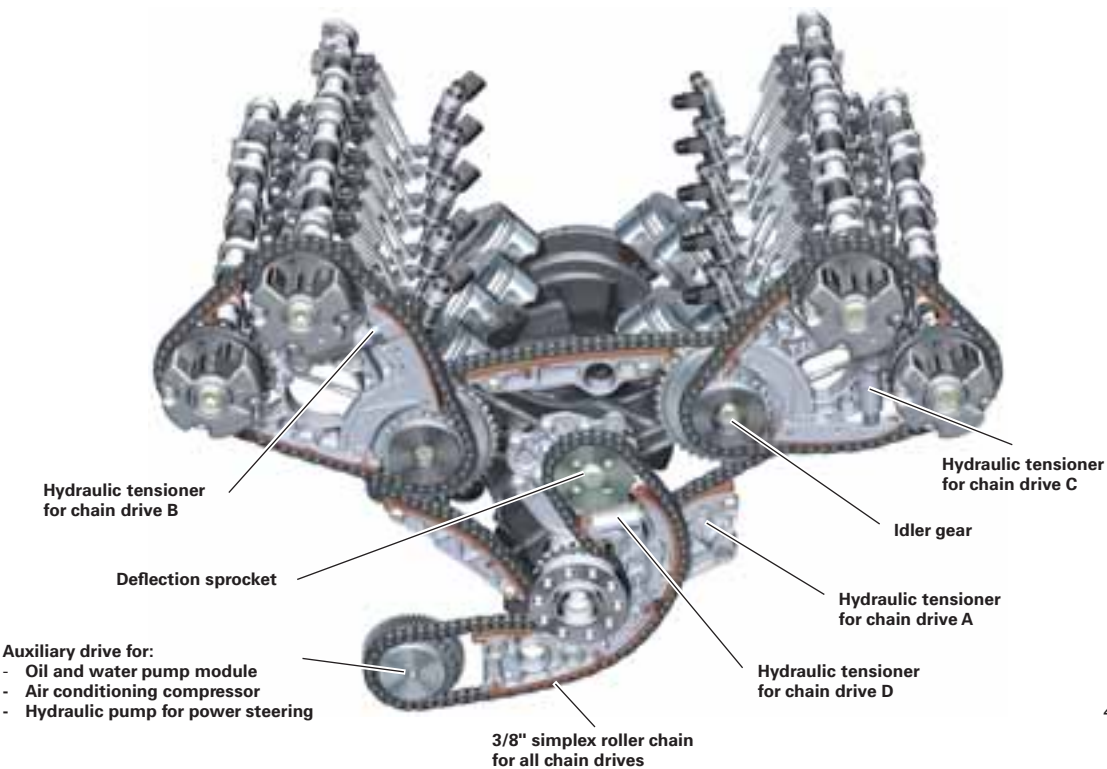


431\_066

## Chain drive

Chain drive is provided by four 3/8" roller chains working on two planes. Chain drive A acts as a distributor drive interconnecting the crankshaft and the idler gears. Chain drives B and C act as cylinder head drives interconnecting the idler gears and each of the camshafts.

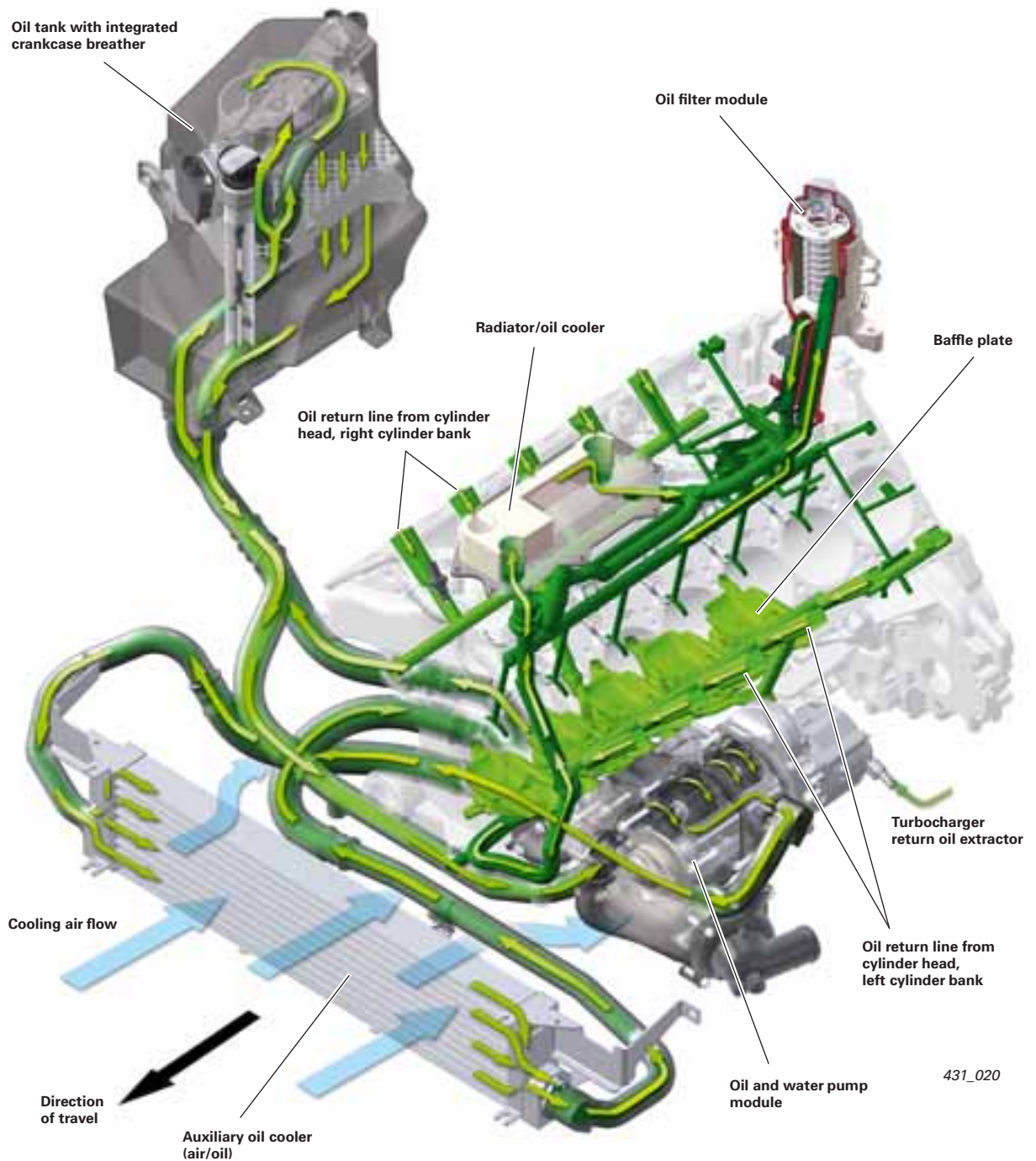
Chain drive D acts as an ancillary unit drive, and drives the oil and water pump module, the air conditioning compressor and the power steering pump. Four hydraulic tensioners with non-return valves are used as a tensioning system. Like the chains, they are designed for lifetime use.



431\_042



## Oil circulation system



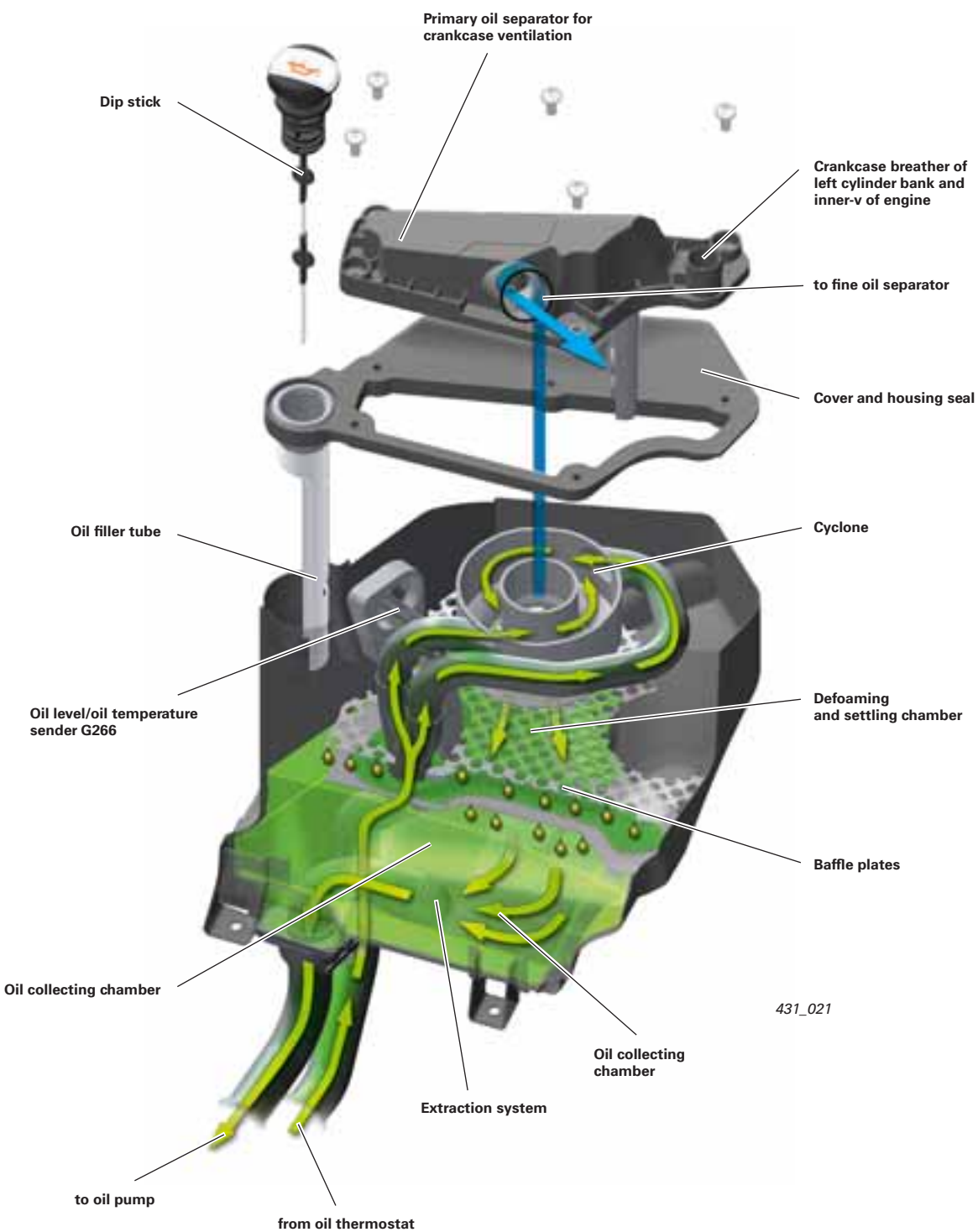
A dry sump lubrication system is used to ensure a reliable supply of pressurised oil to the engine in all driving situations and when cornering at high speeds.

Since the engine has an intake module, and not an oil pan, the recirculated oil must be extracted from the bearings, the cylinder heads and the chain housing by means of suction.

The extracted oil is pumped into the oil reservoir via an oil thermostat by the oil pump module.

The oil is again extracted from the oil reservoir and pumped under pressure into the engine oil circuit by the oil pump module. Depending on the position of the oil thermostat, the oil is pumped to the oil cooler either directly or via the auxiliary oil cooler (air/oil).

Oil reservoir



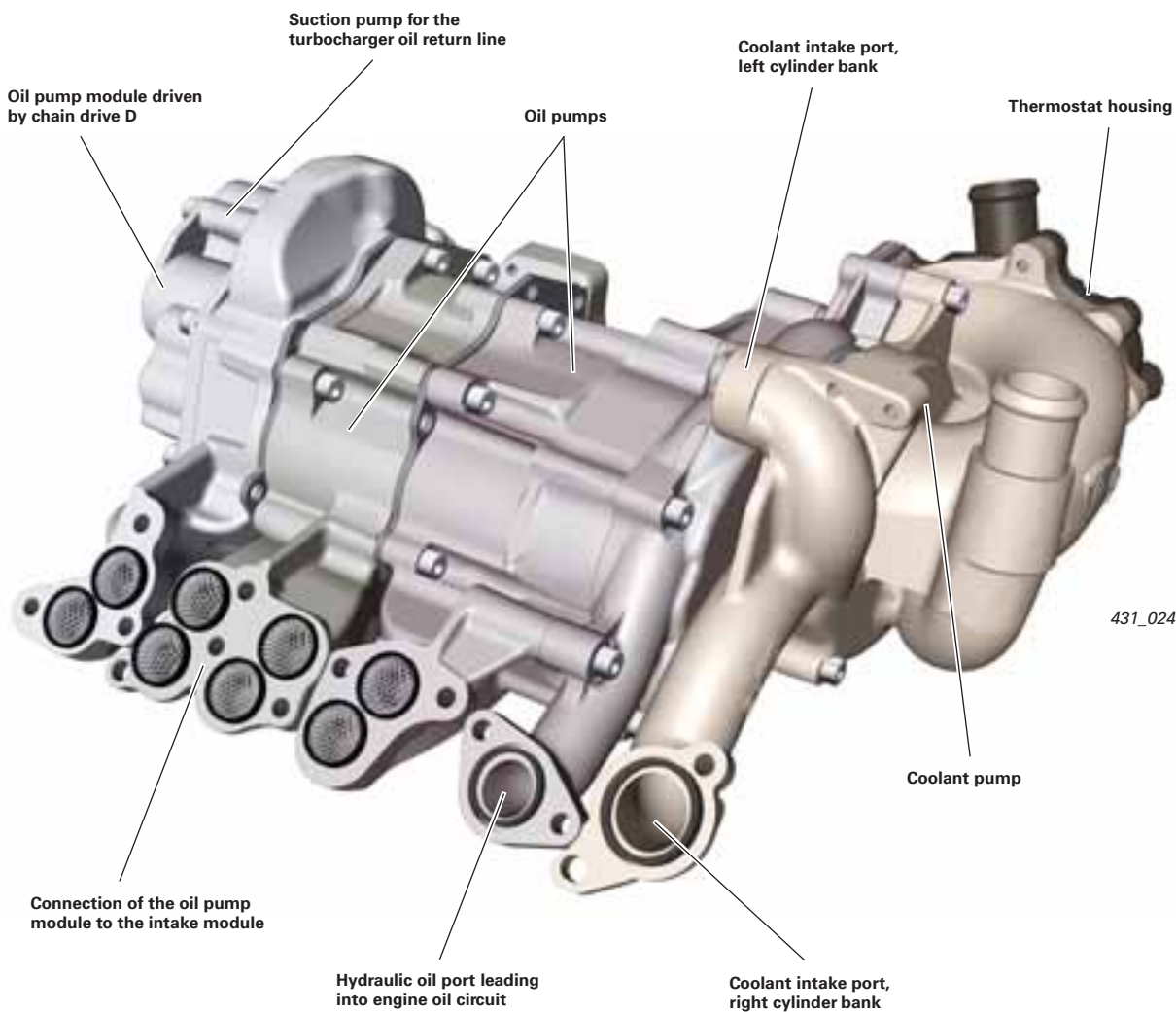
The oil which is pumped into the oil reservoir by the oil pump module flows into a dual-flow oil pipe which leads to a cyclone. When the oil is admitted into the cyclone, it is set into rotation and simultaneously degassed.

When the oil flows out of the oil reservoir, it passes through baffle plates, where it is defoamed and allowed to settle. The rising blow-by gases flow into the oil separator at the top of the oil reservoir. The oil filler tube, the dip stick and the oil level and oil temperature senders G266 are integrated in the oil reservoir.

## Oil pump

The oil pump module is external to the engine and driven via chain drive D. It consists of the suction and feed pump for filling the oil reservoir, the suction and pressure pump for supplying oil to the engine, and the suction pump for the recirculating turbocharger oil.

The oil pump and the coolant pump collectively form a unit and can only be replaced as such. Only the thermostat housing with integrated coolant thermostat can be replaced separately.

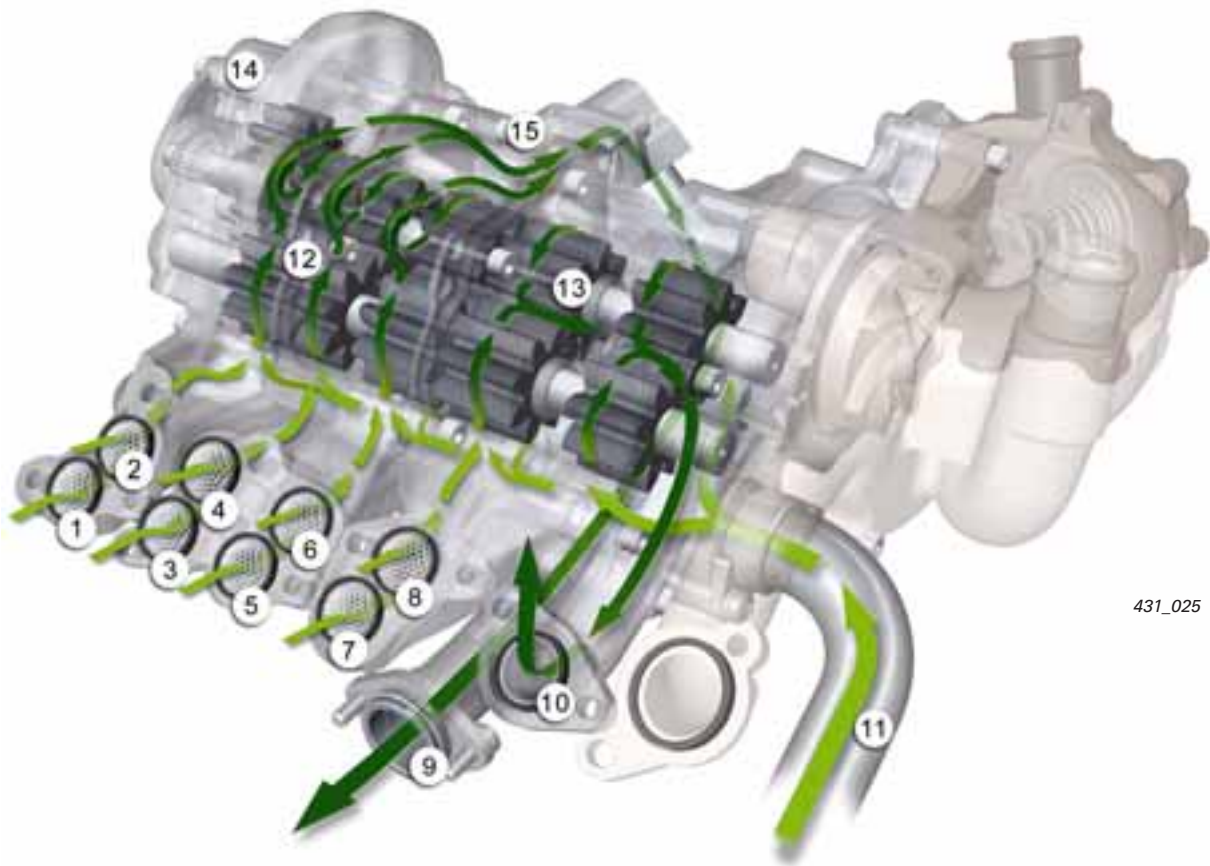




**Oil flow**

In the suction pump, the oil returning from the lubrication points is drawn off as it passes through the suction module and pumped into the oil reservoir.

In the pressure pump, the cooled oil is extracted from the oil reservoir and pumped into the engine oil circuit.



431\_025

**Legend:**

- |   |   |
|---|---|
| ① Crankshaft chamber 5 (K5)                               | ⑨ to oil thermostat                                   |
| ② Chain case return line                                  | ⑩ to main oil port                                    |
| ③ Oil return line from cylinder head, right cylinder bank | ⑪ from oil reservoir                                  |
| ④ Oil return flow from cylinder head, left cylinder bank  | ⑫ Suction pump  |
| ⑤ Crankshaft chamber 4 (K4)                               | ⑬ Pressure pump                                       |
| ⑥ Crankshaft chamber 3 (K3)                               | ⑭ Suction pump for oil return from both turbochargers |
| ⑦ Crankshaft chamber 2 (K2)                               | ⑮ Crankcase divider                                   |
| ⑧ Crankshaft chamber 1 (K1)                               |   |

Oil pressure at idle min. 1.5 bar; at 2000 rpm min 3.5 bar.

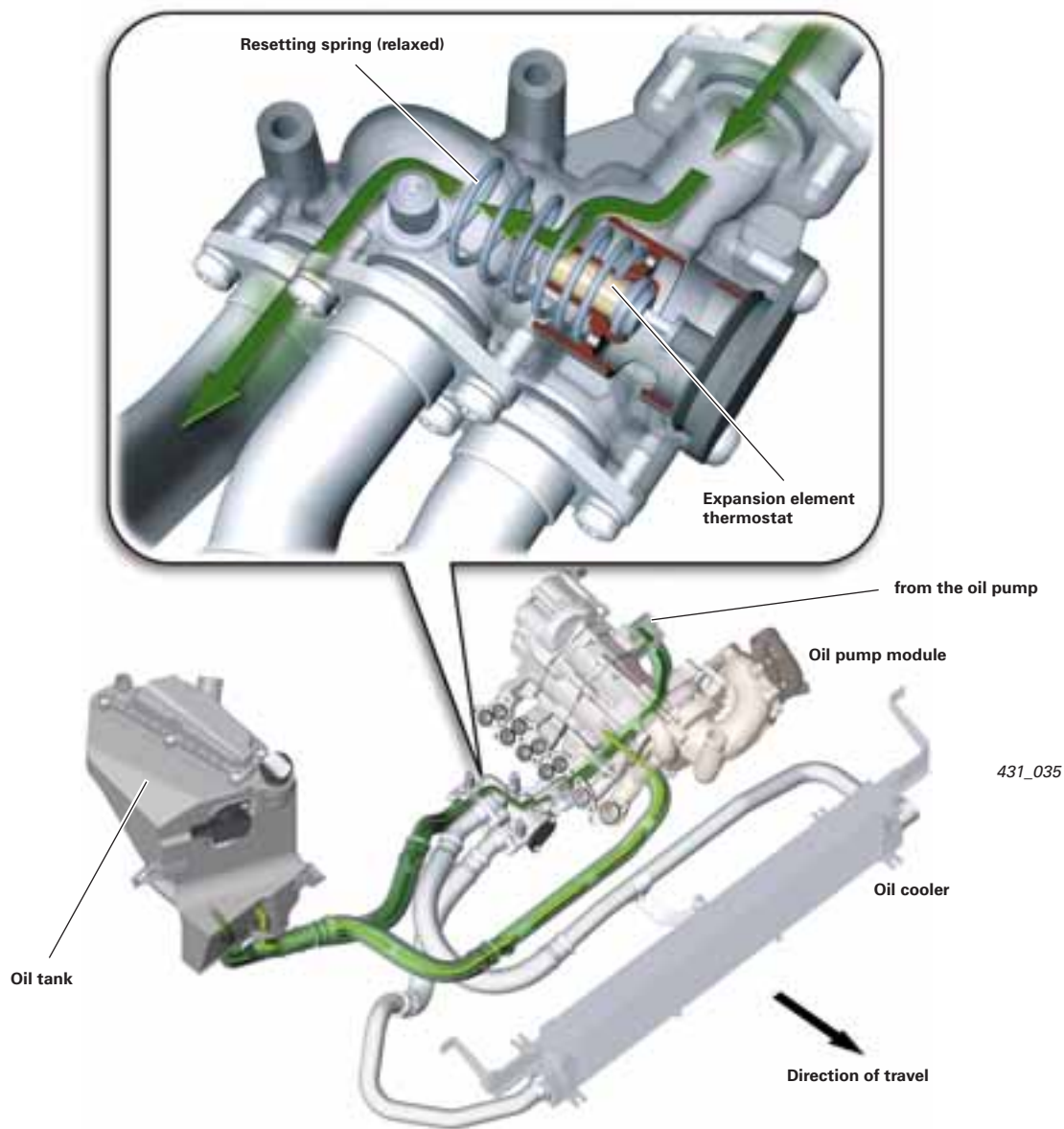
# Engine mechanicals

## Oil thermostat

To ensure better cooling, an auxiliary oil cooler is integrated in the oil circulation system. Oil either flows through it or bypasses the auxiliary oil cooler, depending on its temperature.

The auxiliary oil cooler is controlled by an oil thermostat installed on the underside of the engine.

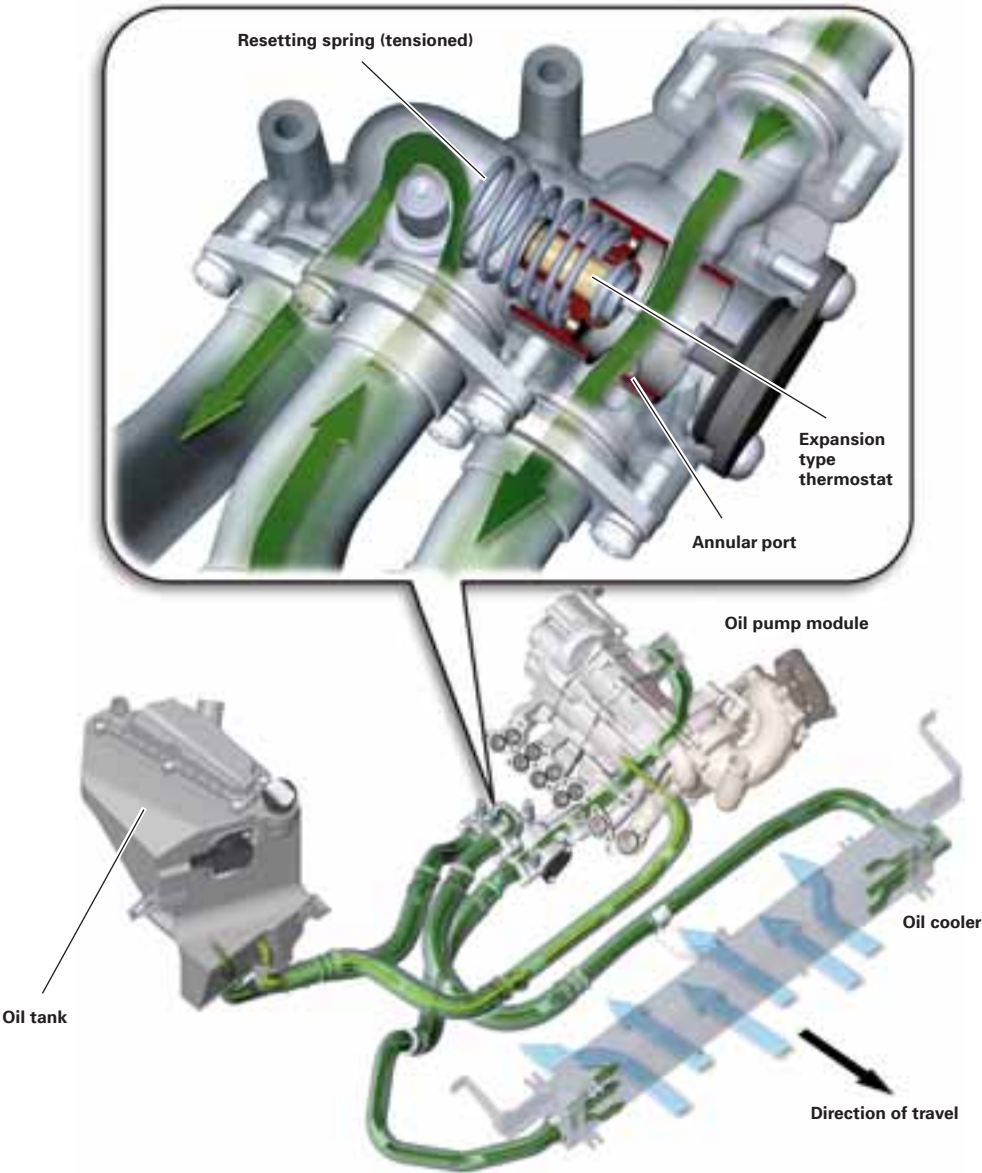
### Thermostat closed



When the engine is cold or the engine lubricating oil is cold, the recirculating, extracted oil is pumped into the oil thermostat housing. When the thermostat is in a relaxed state, it seals off the inlet leading to the oil cooler, whereby the oil in the thermostat housing is redirected to the oil reservoir.

In combination with the heat exchanger (oil/water) in the inner-v of the engine, the engine lubricating oil is heated to operating temperature more quickly.

Thermostat open

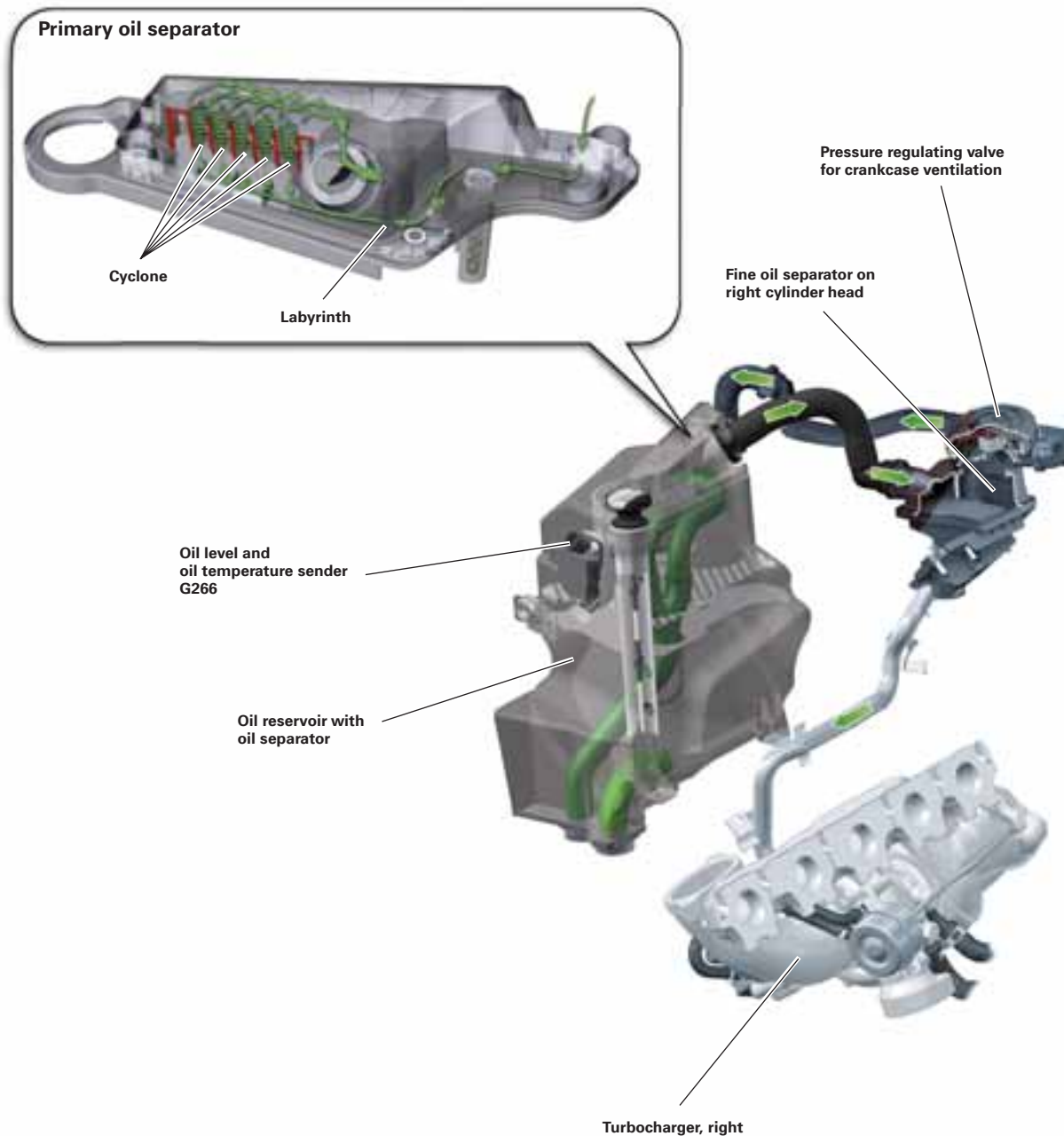


When the temperature of the oil exceeds 100 °C, the oil thermostat opens the inlet to the oil cooler. An expanding element in the thermostat expands under heating and exerts pressure against the thermostat housing. Due to the pressure of the expanding element, the thermostat is displaced against the force of the spring, opening the annular channel and simultaneously closing off the inlet leading directly to the oil reservoir.

The oil flows through this annular port and into the oil cooler, returning from here to the oil thermostat housing and entering the oil reservoir. In the oil cooler, the engine lubricating oil is cooled by the air stream generated by the vehicle as it moves.

## Crankcase ventilation

The blow-by gases produced by combustion are extracted from the left rocker cover in the inner-v of the engine and routed to the primary oil separator of the crankcase breather, which is mounted on the oil reservoir.

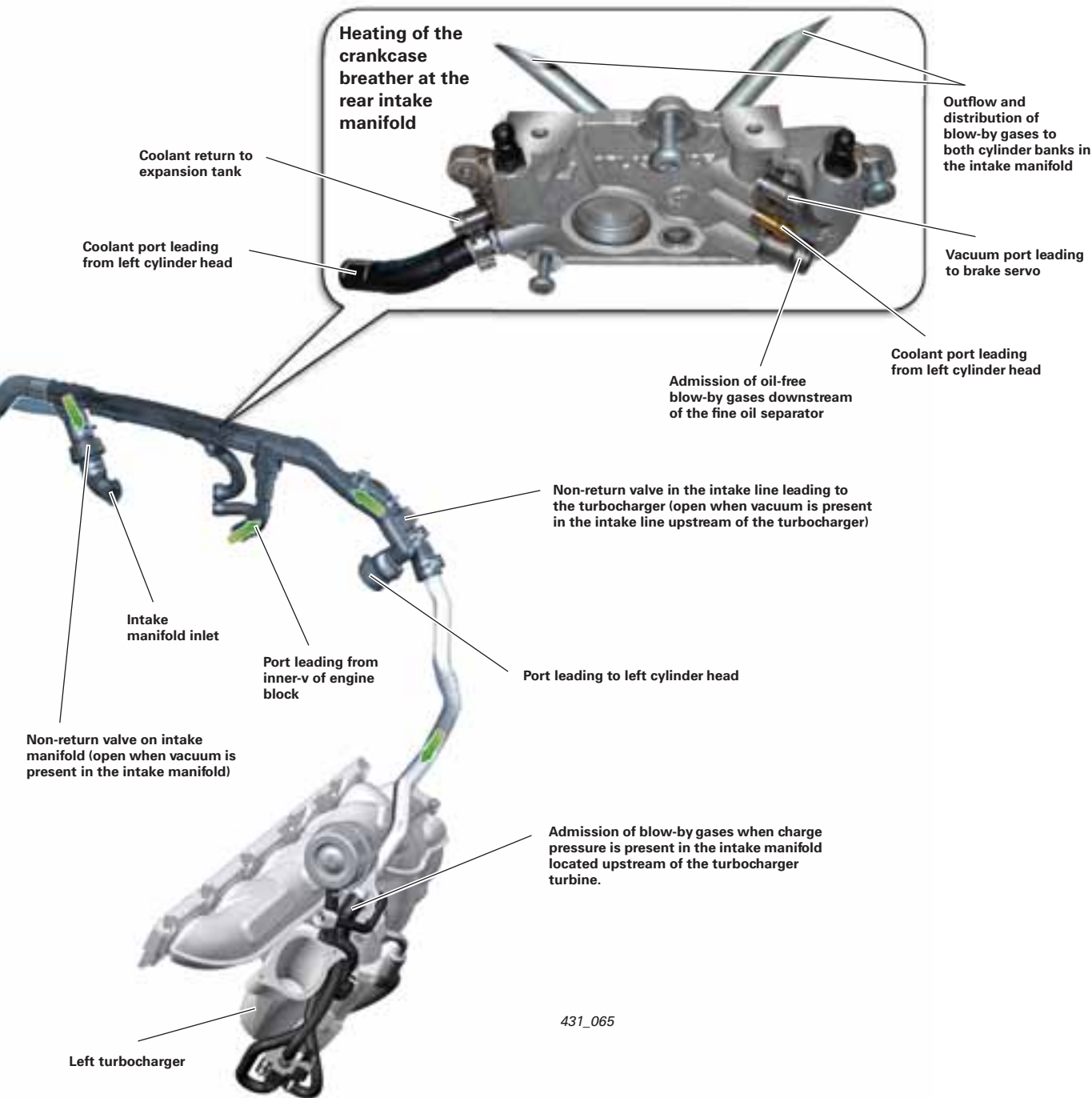


After the blow-by gases have been admitted into the primary oil separator, they pass through a labyrinth and then through ten cyclones where the coarse oil droplets are separated from the blow-by gases. The gases then flow into the fine oil separator on the right rocker cover.

The blow-by gases from the right cylinder bank are also admitted into this fine oil separator, after which they are directed into the combustion chamber together with the other blow-by gases. Since both vacuum and charging pressure (over-pressure) are alternately present inside the intake manifold in turbocharged engines, the oil-free blow-by gases must flow into the combustion chamber through different ports.



To prevent the admitted blow-by gases from freezing at high flow rates, the inlet port on the intake manifold is heated with coolant from the cylinder heads.

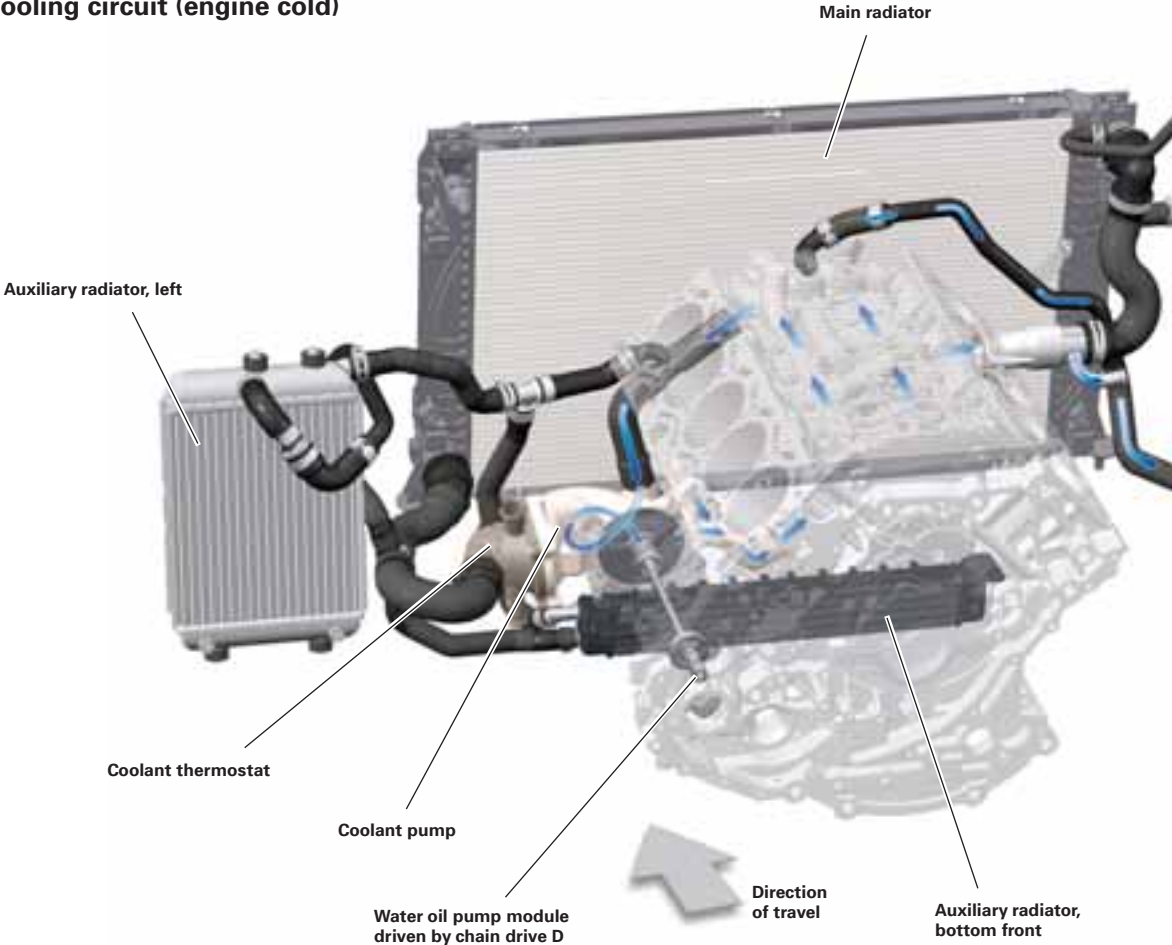


When the engine is idling and running at part throttle, a non-return valve on the intake manifold is opened by vacuum, allowing the blow-by gases to be drawn in. At the same time, the two non-return valves on the turbochargers are closed.

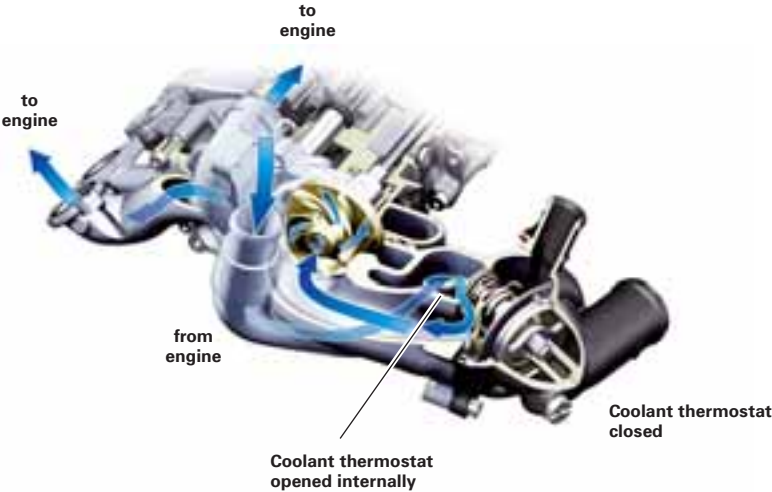
When the engine is running at full throttle and charge pressure is present in the intake manifold, the non-return valve on the intake manifold is closed and the non-return valves on the intake end of the turbocharger are opened. The oil-free blow-by gases now flow into the pressureless section of the turbocharger and are directed to the combustion chamber via the charge air line leading to the intake manifold.

## Cooling system

### Secondary cooling circuit (engine cold)

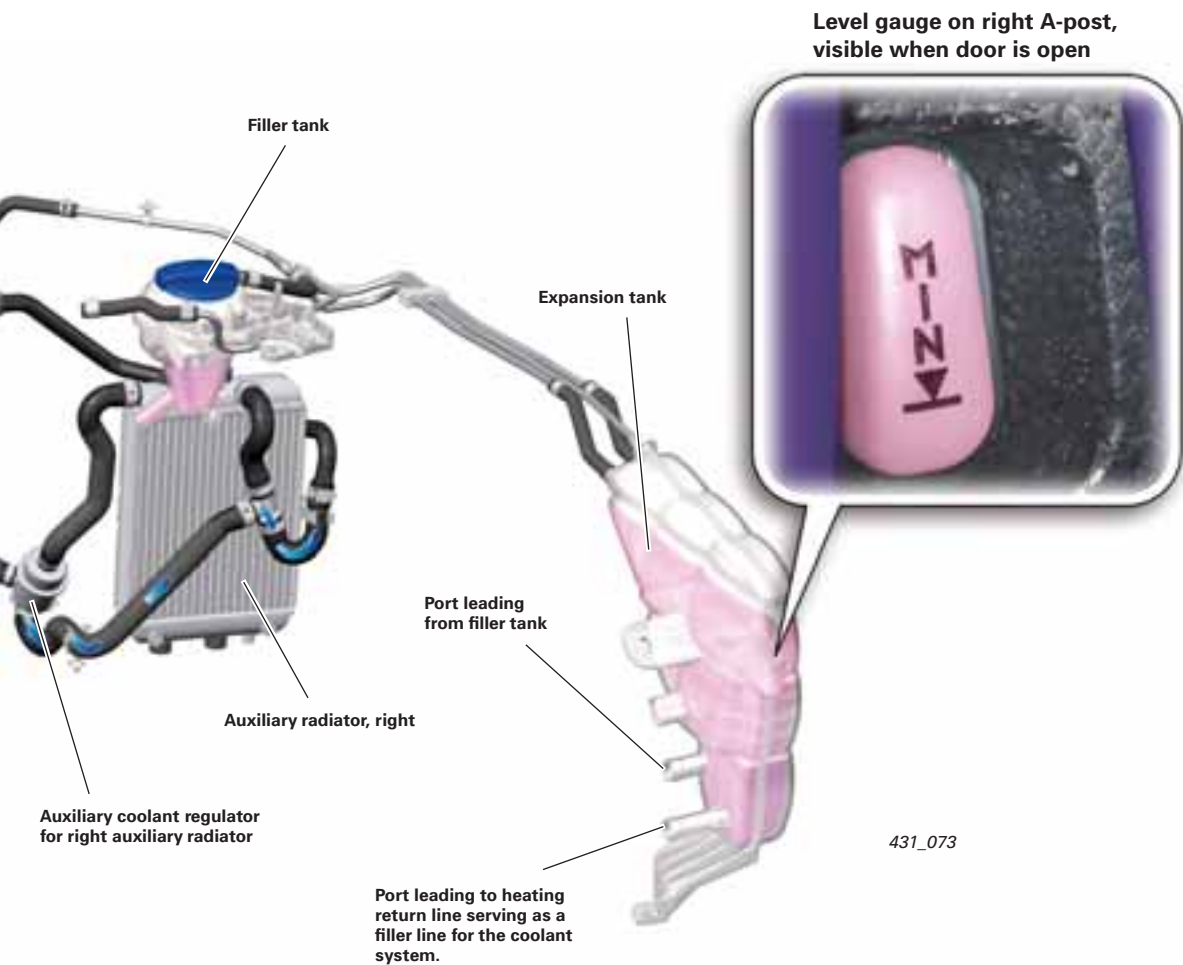


When the coolant thermostat is closed, the supply from the inner-v of the engine to the coolant pump is opened internally. Coolant flows directly to the coolant pump and back into the engine cooling system. This is the secondary cooling circuit, in which components such as the engine oil cooler (water/oil), the alternator, the turbocharger and the heating system heat exchanger are integrated.



431\_053





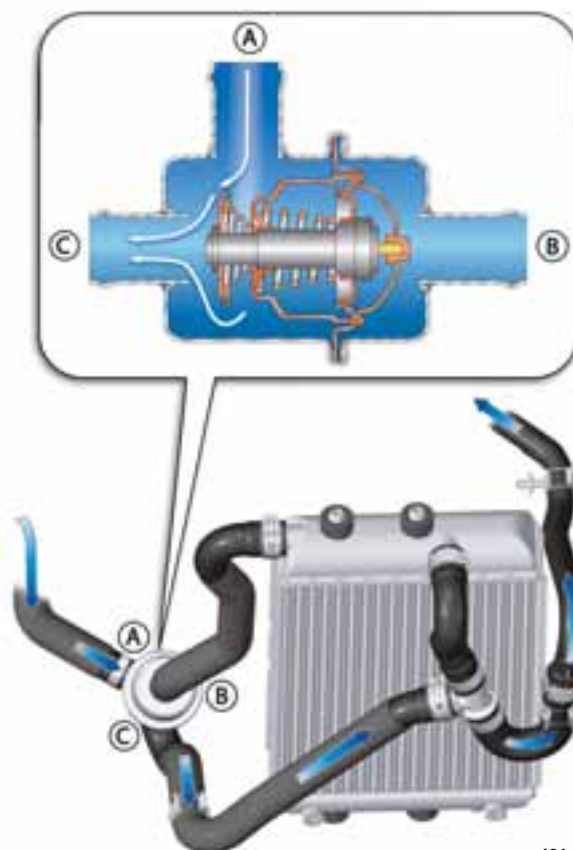
431\_073

### Auxiliary coolant regulator for right auxiliary radiator

When it is in a cold state, the auxiliary coolant regulator for the right auxiliary radiator is closed. Coolant flows from A to C to the main radiator, bypassing the auxiliary radiator.

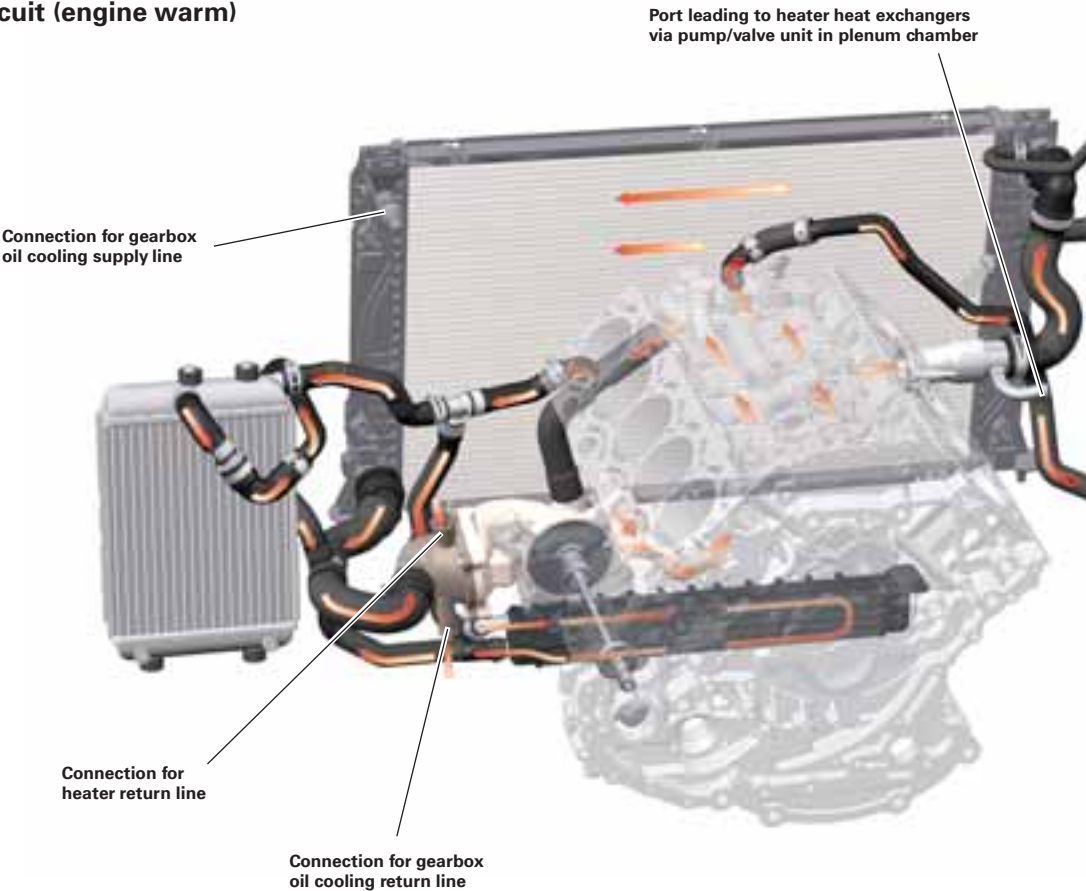
#### Legend:

- (A) Coolant flows from oil the cooler (water/oil) in the inner-v of the engine
- (B) closed
- (C) Coolant bypasses the auxiliary radiator (short-circuit line)

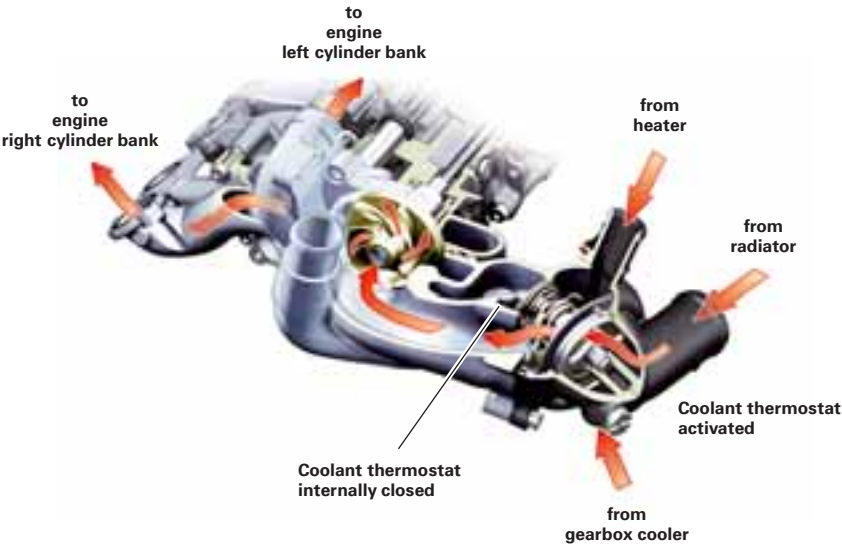


431\_055

## Primary cooling circuit (engine warm)



When the coolant thermostat is open (at a temperature of 87 °C or higher), the inlet from the inner-v of the engine to the coolant pump is closed internally. Coolant passes through the main radiator and, after cooling down, flows to the coolant pump. The coolant from the inner-v of the engine is now directed via a branch line to the left auxiliary radiator. This means that the auxiliary radiator is thermostat-controlled both on this side and on the right-hand side. The main radiator and the left auxiliary radiator are integrated in the primary cooling circuit at the centre and on the right, creating a large cooling surface which serves to regulate the coolant temperature.



431\_058



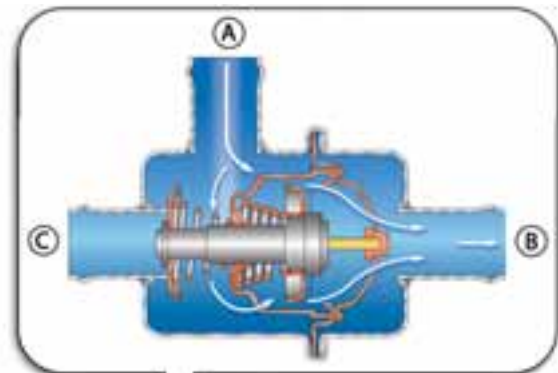
Level gauge on right A-post visible when door is open



431\_031

### Auxiliary coolant regulator for right auxiliary radiator

When the coolant temperature exceeds 90 °C, the auxiliary coolant regulator opens, allowing coolant to flow unrestricted from A to B. The coolant now passes through the right auxiliary radiator and into the main radiator.



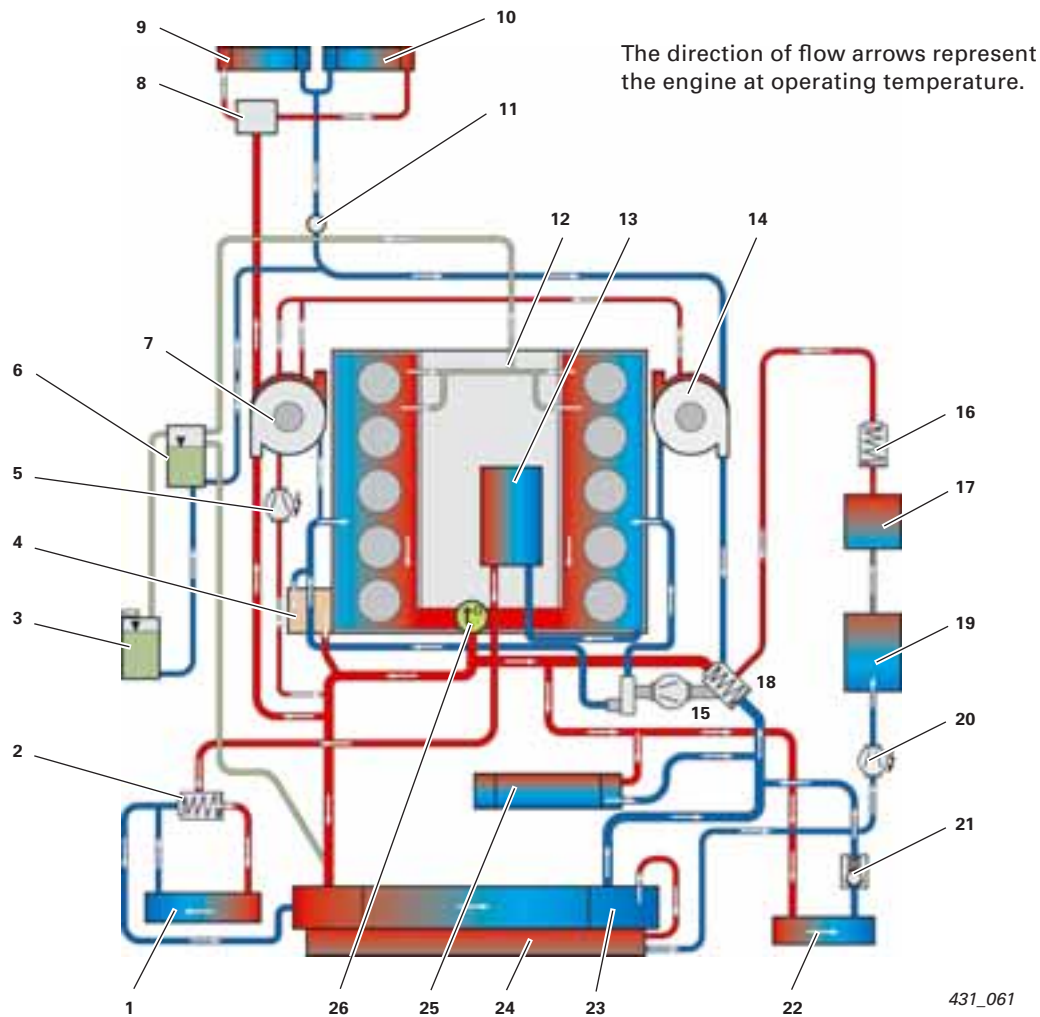
### Legend:

- (A) Coolant flows from oil the cooler (water/oil) in the inner-v of the engine
- (B) Coolant flows into the auxiliary radiator via the coolant thermostat
- (C) closed



412\_054

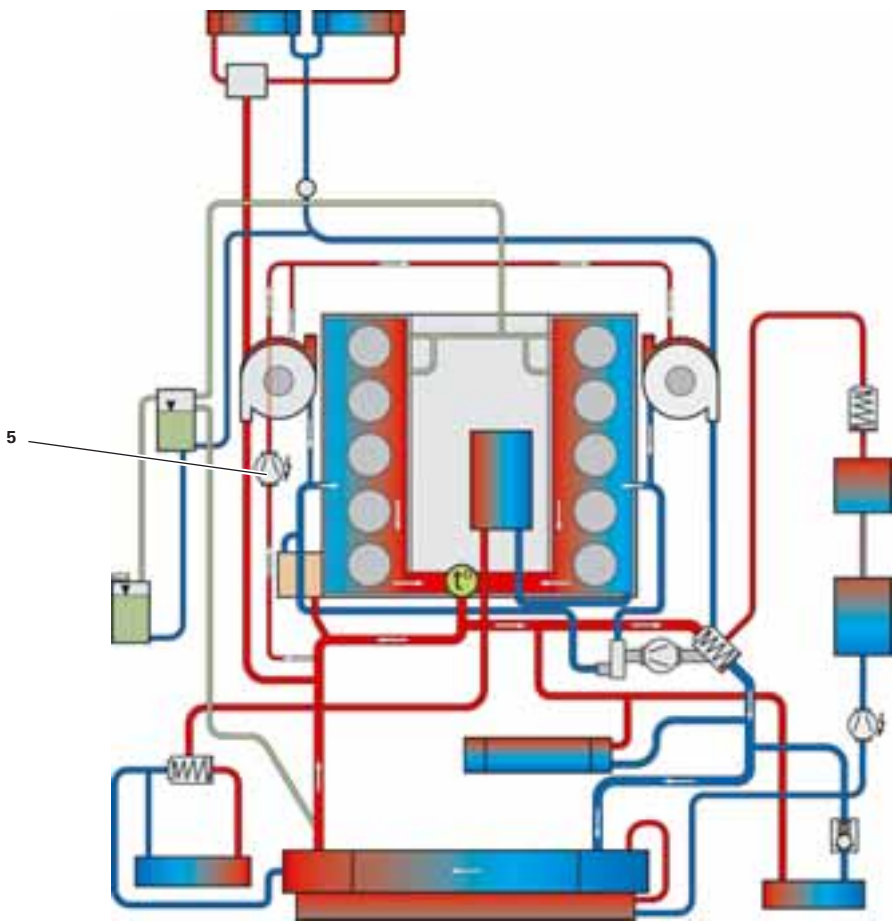
**Cooling circuit diagram**  
(engine at operating temperature)



**Legend:**

- |   |  |
|---|--|
| 1 Right auxiliary radiator                      | 14 Left exhaust gas turbocharger                       |
| 2 Auxiliary coolant regulator                   | 15 Coolant pump  |
| 3 Filler tank                                   | 16 Auxiliary coolant regulator for gearbox oil cooling |
| 4 Alternator                                    | 17 Oil cooler for transfer case (water/oil)            |
| 5 Coolant run-on pump V51                       | 18 Coolant thermostat                                  |
| 6 Coolant expansion tank                        | 19 ATF cooler (water/oil)                              |
| 7 Right exhaust gas turbocharger                | 20 Recirculation pump 2, V403                          |
| 8 Pump/valve unit                               | 21 Non-return valve                                    |
| 9 Right heater heat exchanger                   | 22 Left auxiliary radiator                             |
| 10 Left heater heat exchanger                   | 23 Main radiator                                       |
| 11 Vent screw                                   | 24 Gearbox radiator (water/air)                        |
| 12 Crankcase breather heater on intake manifold | 25 Bottom auxiliary radiator                           |
| 13 Top engine oil cooler (water/oil)            | 26 Coolant temperature sender G62                      |

Diagram showing the cooling system in run-on mode



431\_076

To protect the turbocharger from damage due to heat build-up after shutting off the hot engine, the engine control unit J623 (master) activates the timer-controlled run-on pump V51 via the auxiliary water pump relay J151.

Depending on the coolant temperature, the pump runs for 540 seconds and runs on for up to 800 seconds.

The run-on pump (reversing the normal direction of coolant flow) feeds the coolant from the main radiator via the turbocharger into the engine block, and then recirculates it through the main radiator via the open coolant thermostat.

This circulation process dissipates the collected heat from the turbochargers by utilising the large surface area of the radiator and the radiator fan run-on function.

If this does not happen, the hot oil can coke up in the turbocharger bearings and damage the floating bearings of the turbine shaft.



# Engine management

## System overview

### Sensors

Intake manifold pressure sender G71  
Intake manifold temperature sender G72

Accelerator pedal position sender G79  
Accelerator pedal position sender 2, G185

Engine speed sender G28

Knock sensors 1+2, G61, G66

Fuel pressure sender G247

Hall sender G40  
Hall sender 3, G300

Throttle valve module J338  
Throttle valve drive angle sender 1+2  
(electric power control) G187, G188

Coolant temperature sender G62

Charge pressure sender G31

Fuel pressure sender, low pressure G410

Intake manifold flap potentiometer G336

Lambda probe G39  
Lambda probe after catalytic converter G130

Brake light switch F  
Brake pedal switch F47

Auxiliary signals:  
Cruise control system on/off  
Terminal 50  
Wake up door contact from convenience system  
central control unit J393

Charge pressure sender 2, G447

Fuel pressure sender 2, G624

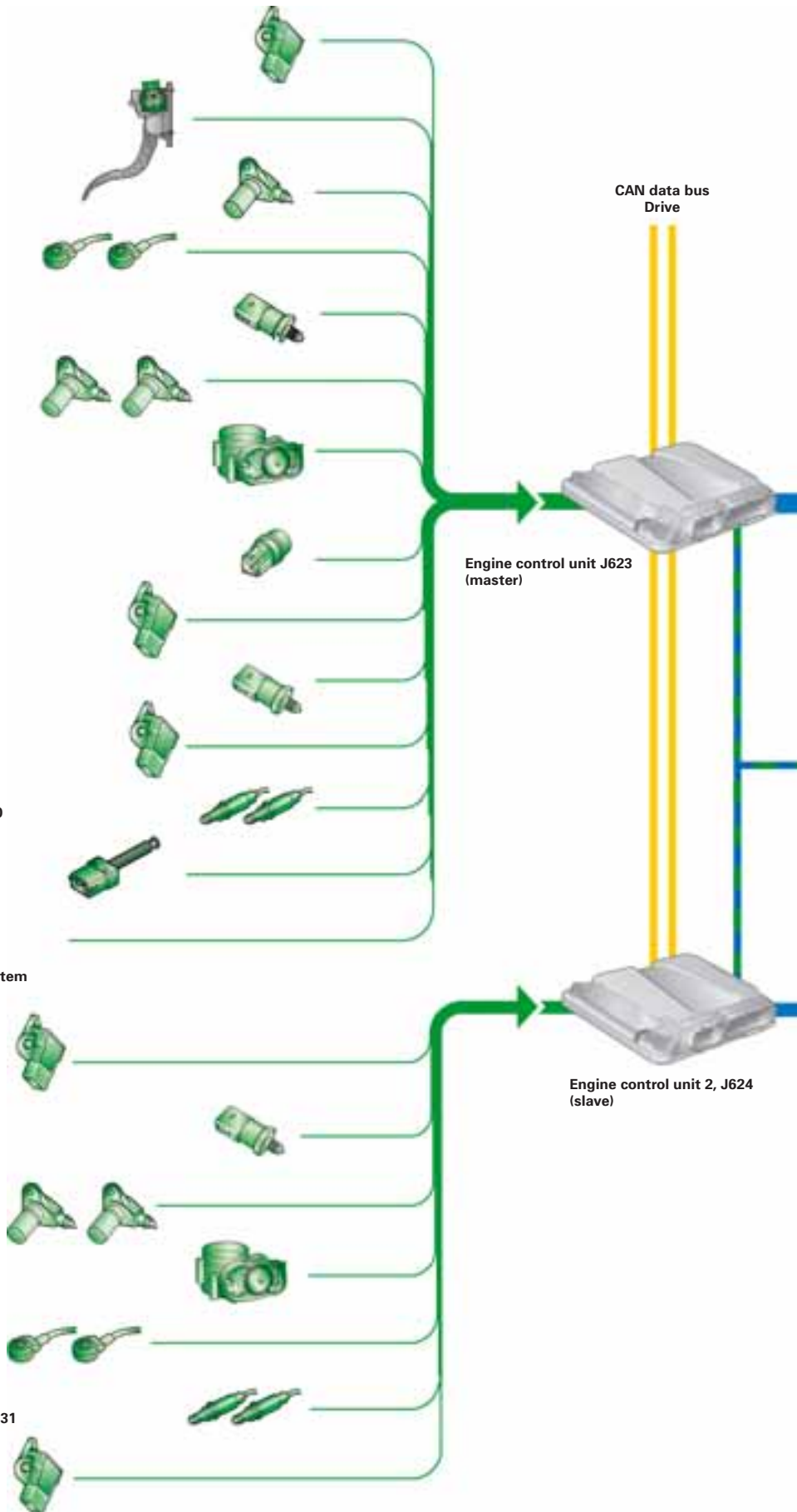
Hall sender 2, G163  
Hall sender 4, G301

Throttle valve module 2, J544  
Angle senders 1+2 for throttle valve  
drive 2, G297, G298

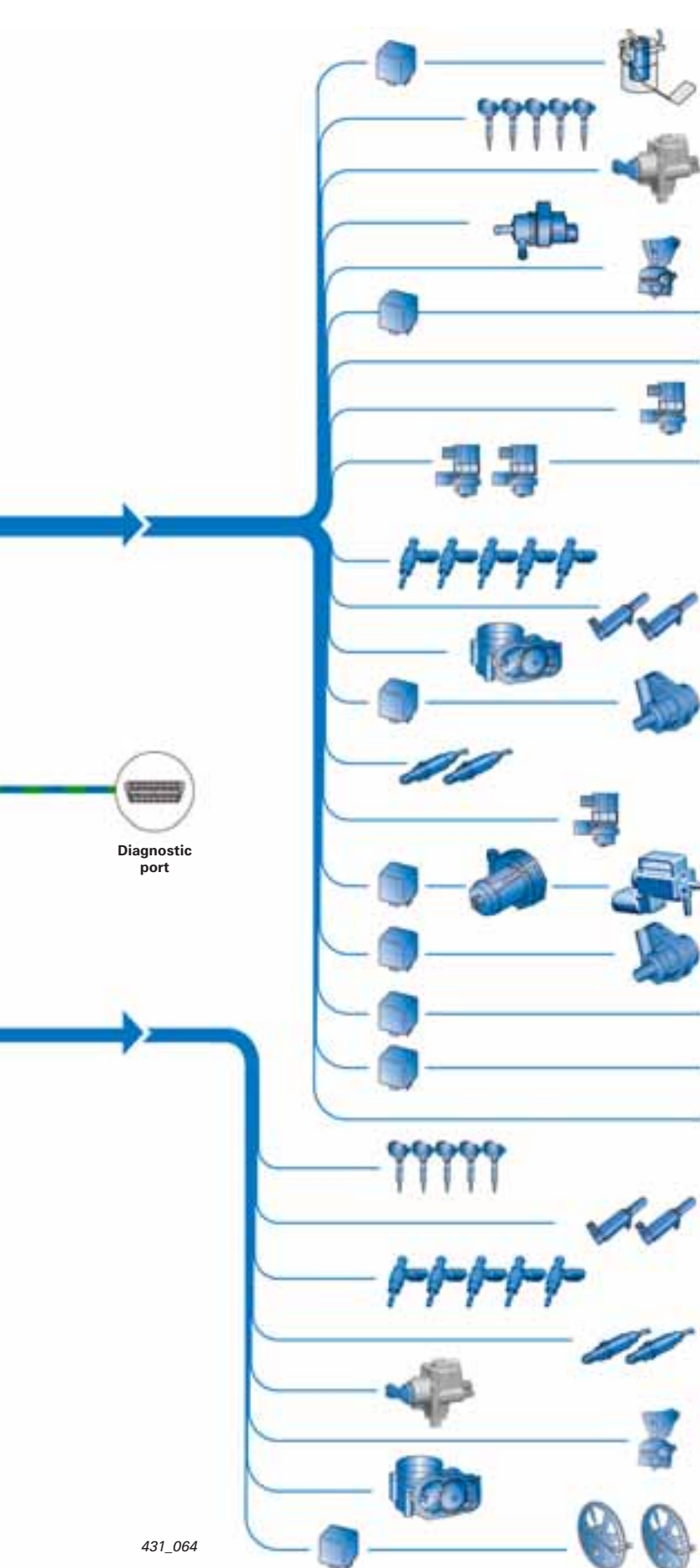
Knock sensors 3+4, G198, G199

Oxygen sensor 2, G108  
Oxygen sensor 2 after catalytic converter G131

Intake manifold flap 2 potentiometer, G512







## Actuators

Fuel pump control unit J538  
Fuel pump (pre-supply pump) G6

Ignition coils N70, N127, N291, N292, N323  
Cylinders 1 – 5

Fuel metering valve N290

Activated charcoal filter solenoid valve 1 N80

Electro/hydraulic engine mounting solenoid valve,  
right N145

Starter motor relay J53  
Starter motor relay 2 J695

Fuel system diagnostic pump (USA) V144

Intake manifold flap valve N316

Charge pressure control solenoid valve 1+2, N75, N274

Injectors, cylinders 1 – 5  
N30 – N33, N83

Inlet camshaft timing adjustment valve -1- N205  
Exhaust camshaft timing adjustment valve 1 N318

Throttle-valve drive for electric power control G186

Continued coolant circulation relay J151  
Coolant run-on pump V51

Lambda probe 1 heater, Z19  
Lambda probe 1 heating, after catalytic converter Z29

Variable intake manifold change-over valve N335

Secondary air pump relay J299  
Secondary air pump motor V101  
Secondary air inlet valve N112

Auxiliary coolant pump relay J496  
Recirculation pump 2, V403 (gearbox oil cooling)

Engine component current supply relay J757

Motronic current supply relay J271

Auxiliary signals:  
Engine speed  
Radiator fan control units J293 and J671

Ignition coils N324 – N328  
Cylinders 6 – 10

Inlet camshaft timing adjustment valve 2 N208  
Exhaust camshaft timing adjustment valve 2 N319

Injectors, cylinders 6 – 10  
N84 – N86, N299, N300

Lambda probe 2 heater, Z28  
Lambda probe 2 heater, after catalytic converter Z30

Fuel metering valve 2 N402

Electro/hydraulic engine mounting solenoid valve,  
left N144

Throttle valve drive 2, G296

Radiator fan 3 relay, J752  
Radiator fans, left and right V402, V35

## Engine management

The engine management system utilises a p/n control system without an air mass meter.

The intake manifold pressure sender G71 and the intake manifold temperature sender G72 are mounted on the intake manifold at the front and directly in contact with the intake air inside the intake manifold.

The engine control unit J623 (master) utilises the following variables to compute the engine load:

- Engine speed (n)
- Intake manifold pressure (p)
- Intake manifold temperature
- Throttle valve angle

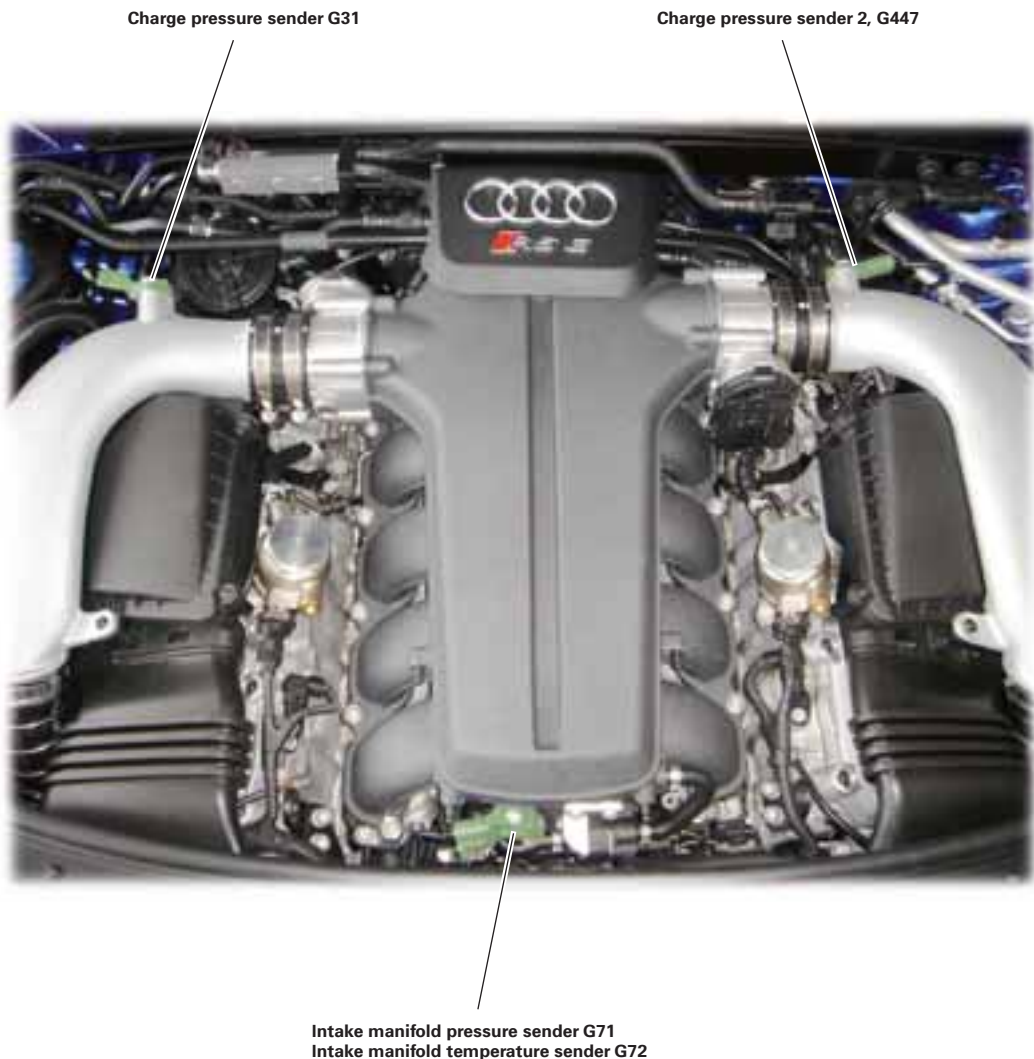
The control unit calculates the injection timing and duration, and takes into account the relevant correction factors.

Correction factors are:

- cylinder-selective knock control
- lambda control
- idle speed control
- activated charcoal filter control

### Substitute function

If no signals are received from the intake manifold pressure sender, the engine control unit utilises the signal from the throttle valve potentiometer and the engine speed signal to calculate the injection duration and timing. If no signal is received from the intake air temperature sender, a substitute value of 45 °C is used.



431\_090

## Charge pressure control

Each cylinder bank has its own turbocharger circuit and consists of the following components:

- Exhaust manifold turbocharger module
- Charge-air cooler (air/air)
- Charge pressure control solenoid valve/wastegate operation
- Charge pressure sensor
- Throttle valve part

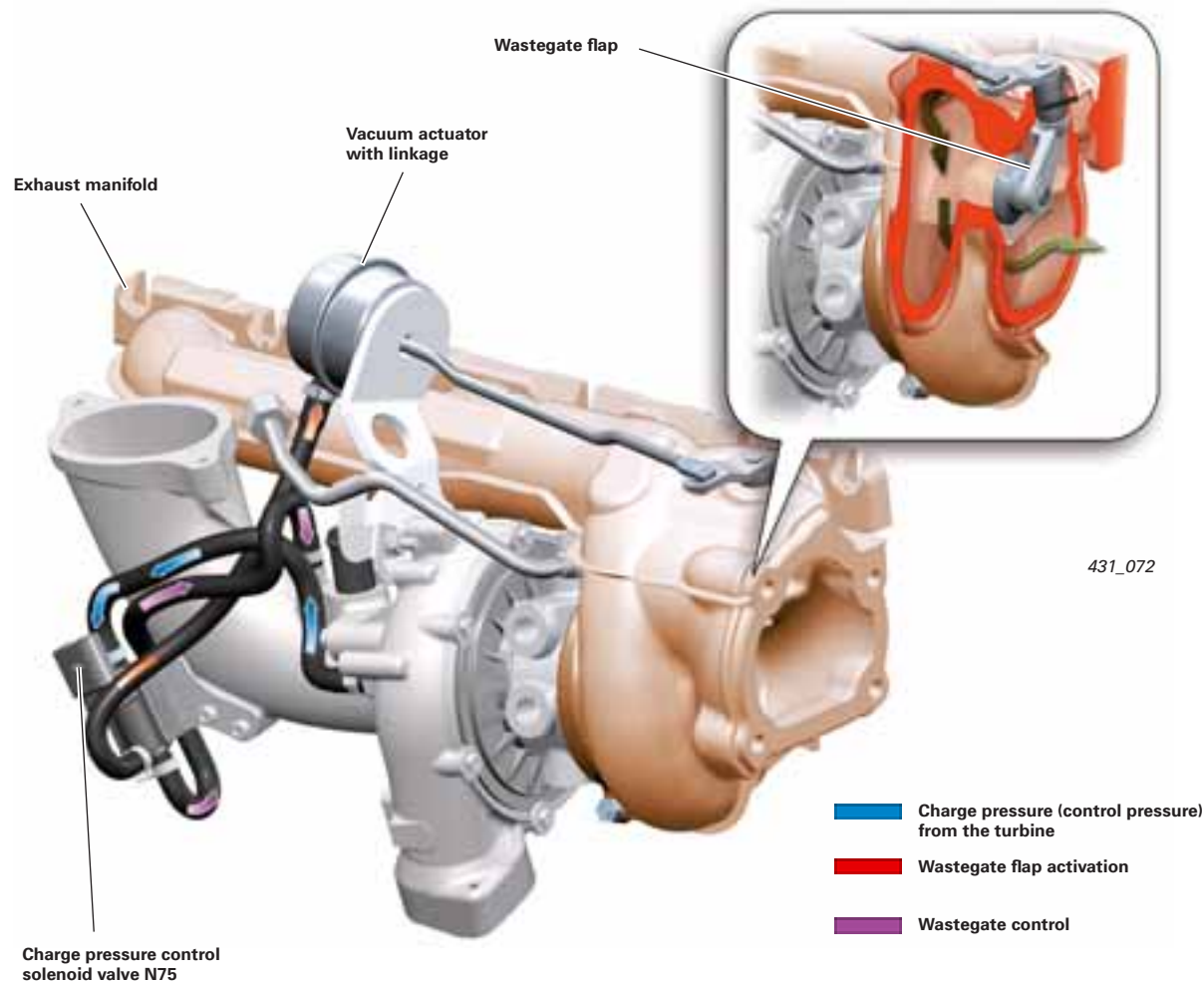
A charge pressure sensor is integrated in each charge air line leading from the charge-air cooler to the intake manifold.

The engine control unit compares the signal from the charge pressure sensors with the characteristic map, and sends the signal via the charge pressure control solenoid valves N75/N274 to the vacuum actuators of the turbochargers.

A control pressure is generated from the charge pressure and the intake pressure via the cyclically operated charge pressure control solenoid valves N75/N274.

The applied control pressure acts on the vacuum actuators, which in turn actuate the wastegate flaps via linkages. Each of the wastegate flaps opens a bypass allowing the exhaust gases to partially bypass the turbines and flow into the exhaust system. The charge pressure control system can be used to regulate the rotational speed of the turbines and thereby set the maximum charge pressure.

When the engine running in overrun mode, the charge pressure control solenoid valves N75/N274 open the bypass leading from the charge air turbines to the intake manifold upstream of the turbochargers and thereby control the wastegate.

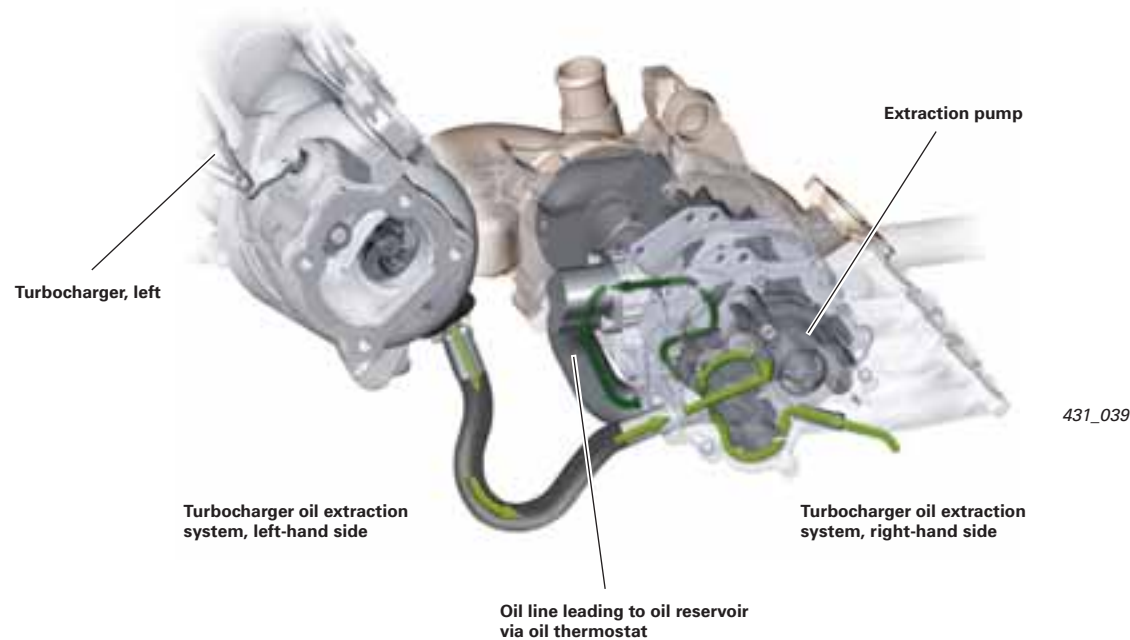


### Note



When the charge pressure control system is deenergised, the charge pressure acts directly upon the vacuum actuator and against the force of the vacuum actuator spring. The maximum possible charge pressure is thus limited to the basic boost pressure level.

## Turbocharger oil extraction system



The turbochargers are supplied with oil from the oil pressure ports on the cylinder heads. The return oil does not return to the engine block as before, but is drawn off by a separate extraction pump.

The suction pump is integrated directly in the oil pump module and pumps the extracted oil internally into the oil reservoir via the feed pump and the oil thermostat.

## Flow control

At high engine speeds, the high suction capacity of the extraction pump is reduced by means of the intake air.

The suction pump creates a so-called Venturi effect at the connection between the oil return pipe and the air pipe, whereby air is drawn out of the air filter and into the oil extraction flow. This air/oil mixture is fed internally into the oil reservoir by the feed pump, the elements again being separated inside the oil reservoir cyclone.

The extraction pump has a high suction capacity due to the high engine speeds. Without volumetric flow control, the oil could be drawn off before reaching the lubrication point in the turbocharger.





## Automatic gearbox 09E

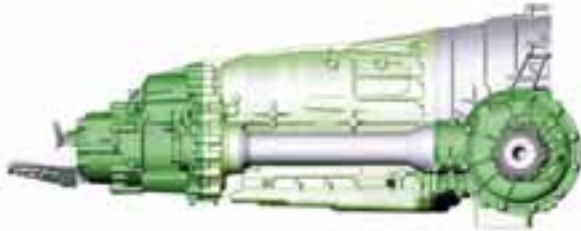
The six-speed automatic gearbox 09E known from the Audi A8 is used on the Audi RS 6.

In combination with the V10 biturbo engine, the following special features are worth mentioning in addition to the adjustments that have been made with regard to torque and engine speed:

- Gearbox oil cooling for transfer case and front axle cooling (common oil supply)
- Thermostat-controlled gearbox oil cooling with electric recirculation pump 2, V403
- Self-locking centre differential (40/60)
- Mechatronics with shorter operating times

The hydraulic control system (mechatronics and gearbox hardware) have been adopted from the 0B6 gearbox (Audi A4 2008).

### Independent oil supply





431\_091

### Common oil supply



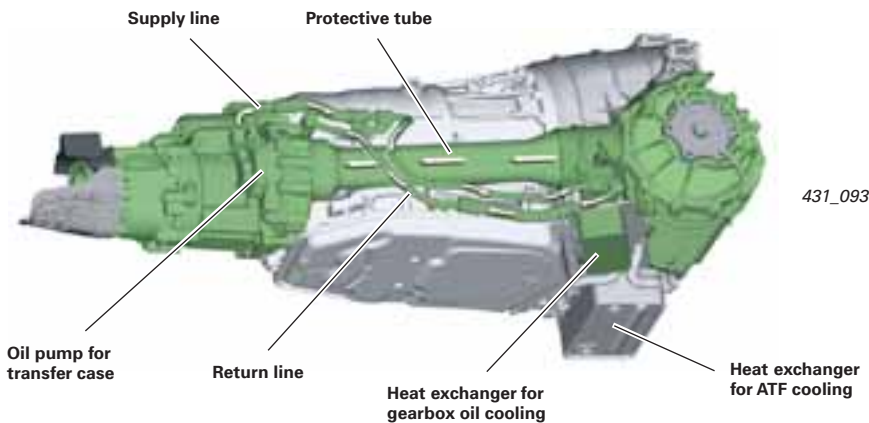
431\_092

-  ATF oil circulation system
-  Gearbox oil circulation system

### Reference



For more detailed information about the new mechatronics module, please refer to SSP 385 "Six-speed Automatic Gearbox".



431\_093

The oil pump for the transfer case pumps gearbox oil through the heat exchanger for gearbox oil cooling (oil/water) via the lines connected to the exterior of the gearbox.

Since the double oil seal ring is not installed in the protective tube on this version of the 09E gearbox, gear oil from the front axle drive can enter the transfer case through the protective tube. This ensures that the oil from the front axle drive is cooled. The 09E gearbox with common oil supply is already used in the twelve-cylinder Audi A8.

### Note



Please follow the instructions for checking the oil levels and for refilling the gearbox oil after repair work in the current service literature ("Transfer case and final drive with common oil supply").

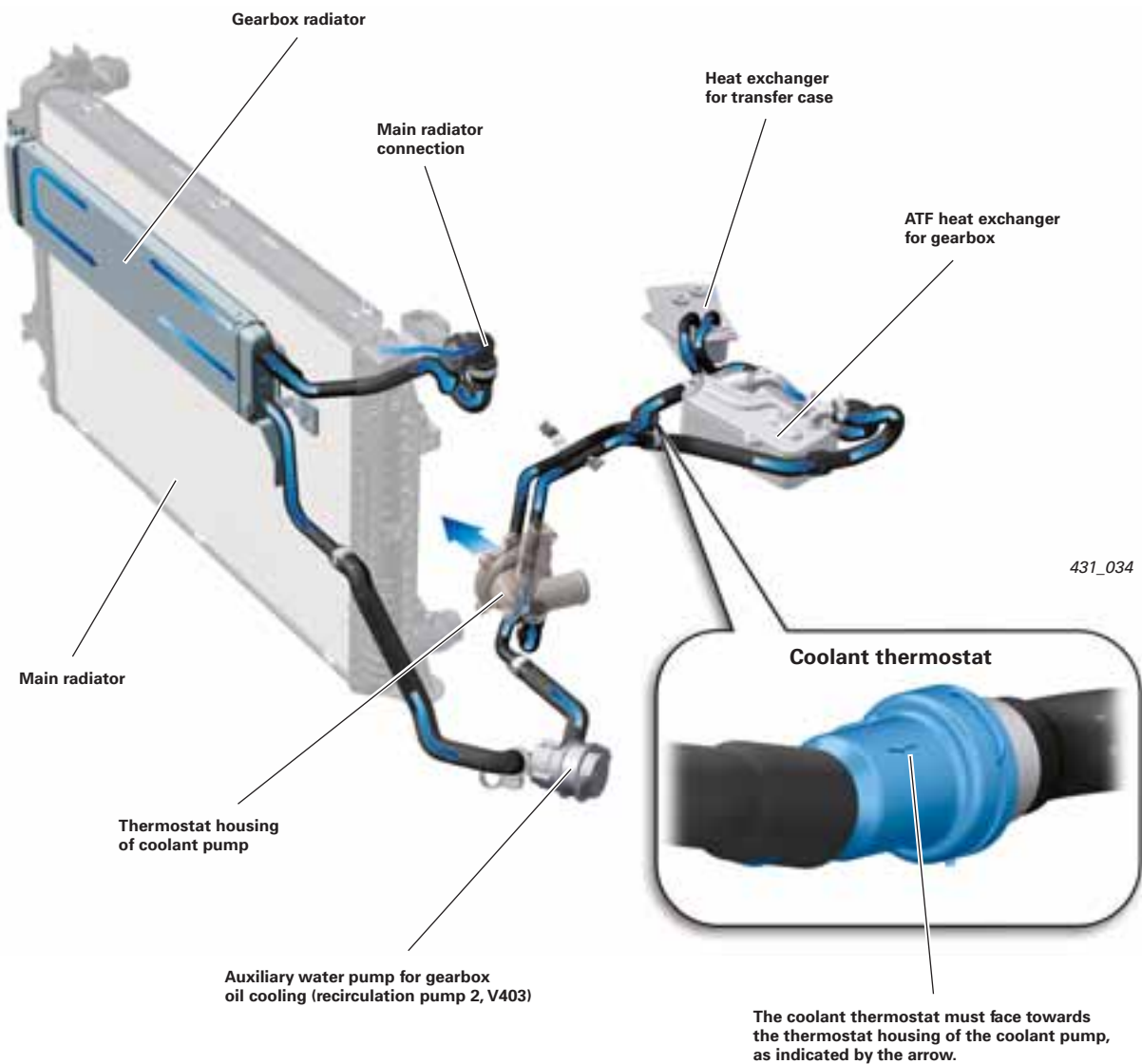


# Automatic gearbox 09E

## Gearbox oil cooling

Coolant for gearbox oil cooling is extracted from the main radiator at the top left and pumped into the gearbox oil cooling circuit by a separate auxiliary water pump.

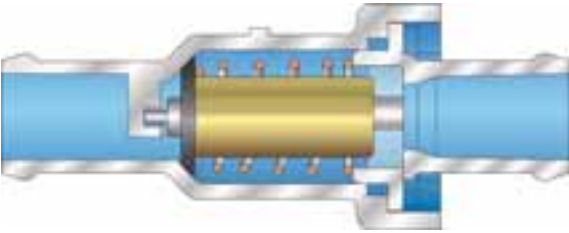
The automatic transmission fluid and the transfer case oil are cooled by separate heat exchangers (water/oil) using coolant.



### Thermostat control

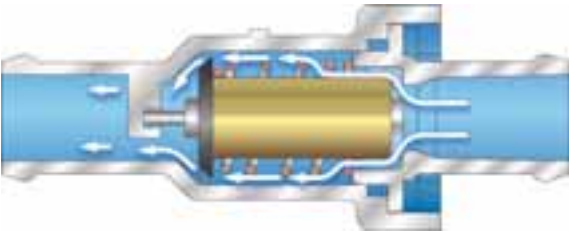
An additional "coolant thermostat" integrated in the gearbox oil cooling system opens only when the temperature of the coolant exceeds 87 °C, thereby enabling the automatic gearbox to reach its operating temperature quickly and ensuring that the gearbox is provided with sufficient cooling under load at temperatures of 87 °C and higher.

cold - closed



431\_068

warm - open



431\_069

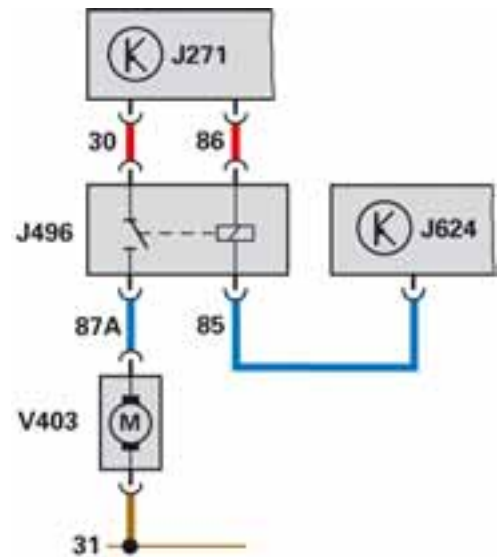
### Activation of recirculation pump 2, V403

The following components are involved in the activation of the gearbox oil cooling system:

- Motronic current supply relay J271
- Engine control unit 2, J624 (slave)
- Auxiliary coolant pump relay J496
- Recirculation pump 2, V403

Motronic current supply relay J271 supplies relay J496 with voltage at terminals "30" and "86". Engine control unit 2, J624 (Slave) applies an earth signal to terminal "85" of the auxiliary coolant pump relay J496 when a coolant temperature of 90 °C is reached.

When relay J496 closes, it supplies recirculation pump 2, V403 with voltage via terminal "87A". Once energised, the recirculation pump runs until the engine comes to a halt.



431\_096

# Suspension system

## Dynamic Ride Control – DRC

### DRC sports suspension systems

The Audi RS 6 is fitted as standard with a sports suspension featuring Dynamic Ride Control (DRC). The sports suspension plus package is optional.

The DRC system is a purely mechanical system, in which the shock absorbers are interconnected hydraulically by means of central valves in a diagonal configuration. To accomplish this, the front left shock absorber is connected to the rear right shock absorber and the front right shock absorber to the rear left shock absorber via a central valve with a pressure-equalising chamber.

The task of the system is to reduce body roll and pitch, which typically occur under acceleration/braking and when cornering.

The DRC system works on a two-phase principle: 1., a uniform phase and 2., a counter-phase.

#### Reference

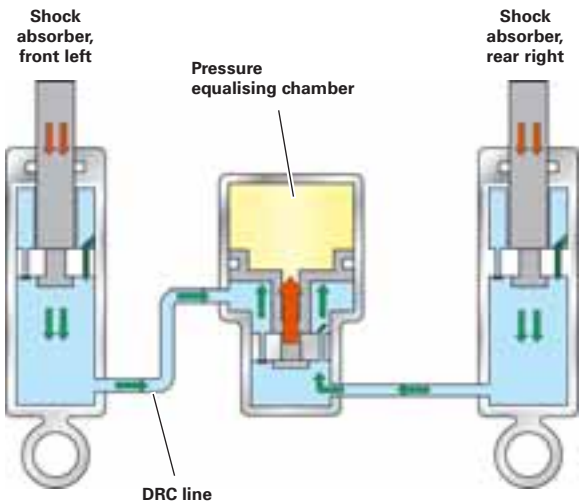


Please refer to the Computer Based Training (CBT) relating to the Audi RS 4.

### Uniform phase

The uniform phase occurs when the entire suspension system "bumps", for example when driving over an uneven section of motorway.

Both the shock absorbers on each axle compress simultaneously. The increase in pressure due to the piston rods moving downwards compresses the gas in the pressure equalising chamber of the central valve.

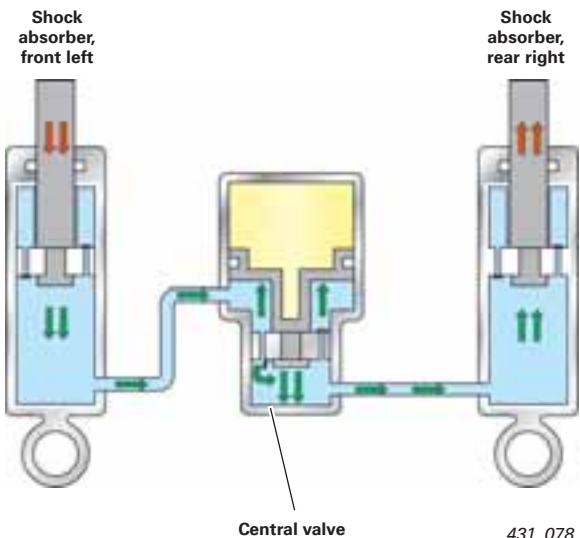


431\_077

### Counter-phase

The counter-phase takes place during roll and pitch movements of the vehicle, for example when cornering. When negotiating a right-hand curve, the front left shock absorber bumps and the rear right shock absorber rebounds. The DRC system counteracts this physical principle.

Different damper movements produce different pressure potentials in the central valve. Both pressure potentials present at the central valve are equal and act in precisely the opposite directions. The forces therefore cancel each other out, as a result of which no shock absorber movement takes place and body roll is suppressed.



431\_078

## Sports suspension plus with DRC

The optional sports suspension plus is based on the DRC suspension, but additionally features a three-stage adjustable shock absorber rate.

The three shock-absorber firmness settings – "comfort", "dynamic", "sport" – can be selected by the driver via the MMI.

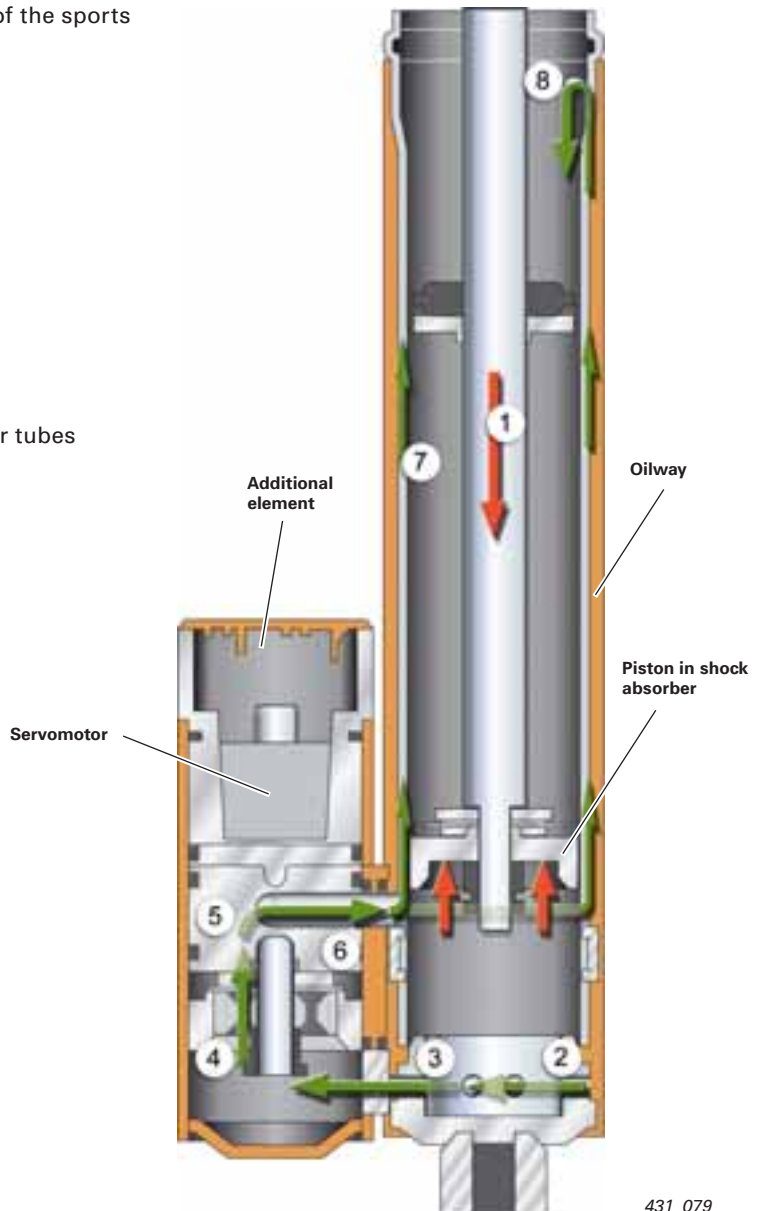
These adjustments are possible due to adjuster units with servomotors on the shock absorbers. The adjuster unit is fitted directly to the shock absorber. It consists of a DC motor, which actuates a roller-shaped rotation valve, and a Hall sensor, which signals the adjustment of the motor to the ECD control unit (electronically controlled damping) J250.

From a technical point of view, the adjuster units on the shock absorbers of the sports suspension plus represent bypasses with a variable through-flow cross-section.

In the shock absorber setting "sport", the rotation valve is activated in such a way that the upper channel (6) is closed. As a result, no damping fluid is able to flow through the adjusting element. The piston in the adjusting element is thereby disconnected from the hydraulic circuit. The entire damping fluid must pass only the piston in the shock absorber. The "sport" setting represents the firmest damper setting.

Hydraulic circuit of a shock absorber of the sports suspension plus:

- ① Direction of piston movement
- ② Lower port
- ③ Lower channel
- ④ Piston in the adjuster unit
- ⑤ Rotation valve
- ⑥ Upper channel
- ⑦ Channel between inner and outer tubes
- ⑧ Upper port



431\_079

# Suspension system

In the damper setting "dynamic", the rotation valve is activated in such a way that the bypass is "half-open".

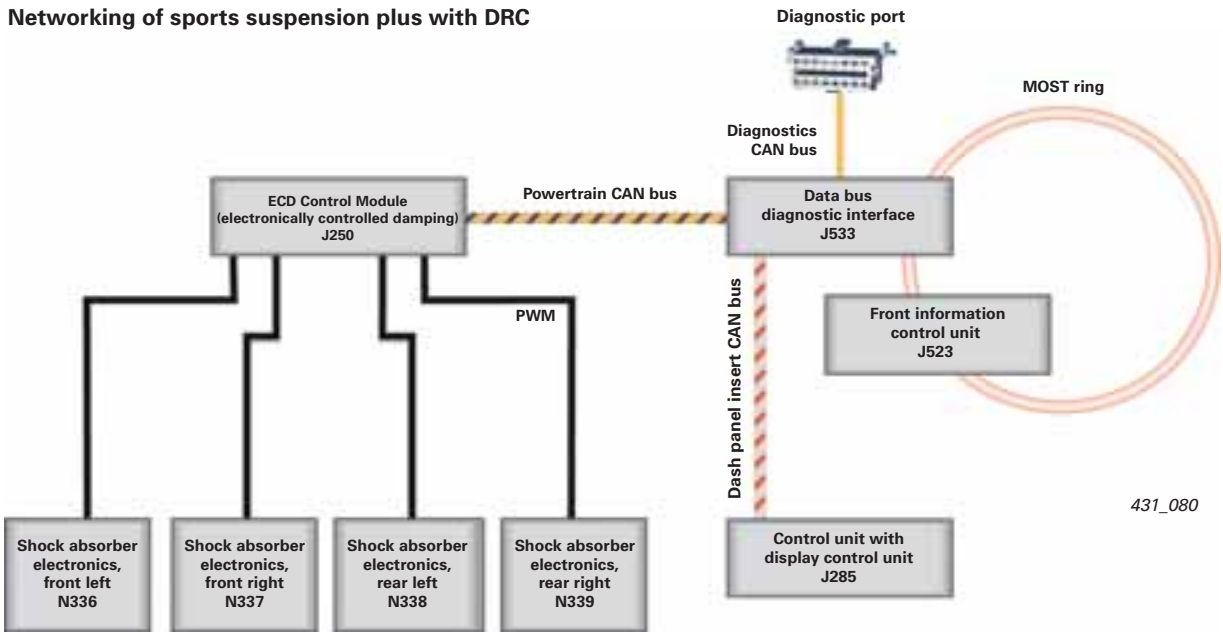
The damping fluid can now flow through the piston of the adjusting element and through the piston in the shock absorber. A softer shock absorber rate is thereby achieved.

The "dynamic" setting, the firmness of the shock absorbers roughly corresponds to the shock absorber rate of a standard DRC sports suspension.

In the "comfort" damper setting, the rotation valve is activated to the extent that the bypass is "fully open". Even more damping fluid can now flow through the piston of the adjusting element.

This allows the most comfortable shock absorber set-up to be realised.

## Networking of sports suspension plus with DRC



The shock absorber adjusting elements, wheel electronics N336 to N339, are activated by the ECD control unit (electronically controlled damping) J250.

The Hall sensors of the shock absorber damping electronics signal the position of the servomotors to control unit J250 by means of pulse width modulated signals.

The ECD control unit (electronically controlled damping) J250 on the Audi RS 6 is similar to the adaptive suspension control unit J197 on the Audi A6 allroad and is also installed in the same position - behind the glove box.

The ECD control unit (electronically controlled damping) J250 is connected to the data bus diagnostic interface J533 via the powertrain CAN data bus. The driver can set the desired shock absorber rate using the MMI.



### Warning lamp for sports suspension plus

When the ignition is turned on, the yellow warning lamp of sports suspension plus lights up briefly.

When an electrical malfunction occurs in sports suspension plus, the warning lamp lights up continuously.

On the MMI panel, all three shock absorber rates are greyed out so that the driver can no longer adjust the shock absorber rate.

Warning lamp for sports suspension plus in dash panel insert



431\_081

### Special tools and workshop equipment for the DRC system

The VAS 6209 filling system known from the Audi RS 4 can be used to fill and evacuate the DRC hydraulic system.

The procedure for filling and evacuating hydraulic lines between the central valve and the shock absorbers is, in principle, identical to the procedure for the Audi RS 4, model B7.

When repair work is needed, please follow closely the description given in the Workshop Manual of the RS 6.

A new item is the filling system for DRC central valves VAS 6209/3.

Pressureless, undamaged DRC central valves, for example valves which have become pressureless due to a leaking shock absorber, can be refilled using the filling system for DRC central valves VAS 6209/3.

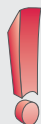
The hand pump integrated in the system allows pressures of over 20 bar to be built up, thereby enabling the pressure equalising chamber in the DRC central valve to be compressed again.

### Filling system for DRC central valves VAS 6209/3



431\_082

#### Note



DRC hydraulic lines on the sports suspension plus may only be evacuated and filled in the "comfort" shock absorber setting.

# Suspension system

## Wheels and tyres



Standard equipment	Optional equipment	Optional equipment
Cast aluminium wheel 10-spoke design 9J x 19 suitable for snow chains  Tyres: 255/40 R 19 also available as winter tyre	Cast aluminium wheel (silver or titanium finish) Five-segment spoke design 9.5J x 20 unsuitable for snow chains  Tyres: 275/35 R 20 also available as winter tyre  Cast aluminium wheel Five-segment spoke design 9J x 20 suitable for snow chains  Winter tyres: 265/35 R 20	Cast aluminium wheel Seven double spoke design 9.5J x 20 unsuitable for snow chains  Tyres: 275/35 R 20 also available as winter tyre

## Brake system

The Audi RS 6 is fitted standard with a 19" steel brake system and optionally with a 20" ceramic brake system. Unlike on the Audi RS 4, the optional ceramic brake system on the Audi RS 6 has ceramic brake discs at the front and rear.

### Steel brake

- PR number **1LM** (front wheel brake) and **1KJ** (rear axle brake)
- Front brake disc: 390 x 36 mm, drilled, ventilated
- Front brake caliper: Brembo 6-piston caliper (painted black with "RS" logo)
- Rear brake disc: 356 x 28 mm, drilled, ventilated
- Rear brake caliper: TRW single-piston caliper with electromechanical parking brake (painted black)

The steel brake discs on the Audi RS 6 are not uni-directional. When changing the front brake linings, particular attention must be paid to correct fitting of the centre guide bolt.

Fixed caliper of the steel brake (front axle)



431\_087

### Ceramic brake

- PR number **1LN** (front wheel brake) and **1KK** (rear wheel brake)
- Front brake disc: 420 x 40 mm, drilled, ventilated
- Front brake caliper: Alcon 8-piston caliper (painted anthracite with "Audi ceramic" logo)
- Rear brake disc: 356 x 28 mm, drilled, ventilated
- Rear brake caliper: TRW single-piston caliper with electromechanical parking brake (painted anthracite)

The brake discs of the ceramic brake are unidirectional, both on the front and rear axles.

The rear-axle brake calipers are identical in the steel brake and ceramic brake versions, except that the brake calipers are painted in different colours. Please note that the steel and ceramic rear-wheel brakes have different brake pads.

Fixed caliper of the ceramic brake (front axle)



431\_088

Designation of the ceramic brake disc on the brake disc bowl:

- 1 Direction of travel
- 2 Audi logo
- 3 Supplier
- 4 Serial production number
- 5 Audi part number
- 6 Audi rings
- 7 Production date
- 8 Permissible minimum thickness of the brake disc
- 9 Weight of the new brake disc including brake disc bowl

The ceramic brake discs are made of carbon reinforced silicon carbide (C/SiC). Although this material has little in common with household ceramics, special care is required when handling these brake discs.

Unlike steel brake discs, where wear is indicated by material abrasion only, ceramic brake discs are subject to both mechanical and thermo-chemical wear.

Thermo-chemical wear is where atomic carbon is emitted from the carbon reinforced silicon carbide. This can be determined either by visual inspection or by weighing the brake discs.

Ceramic brake discs of the rear axle



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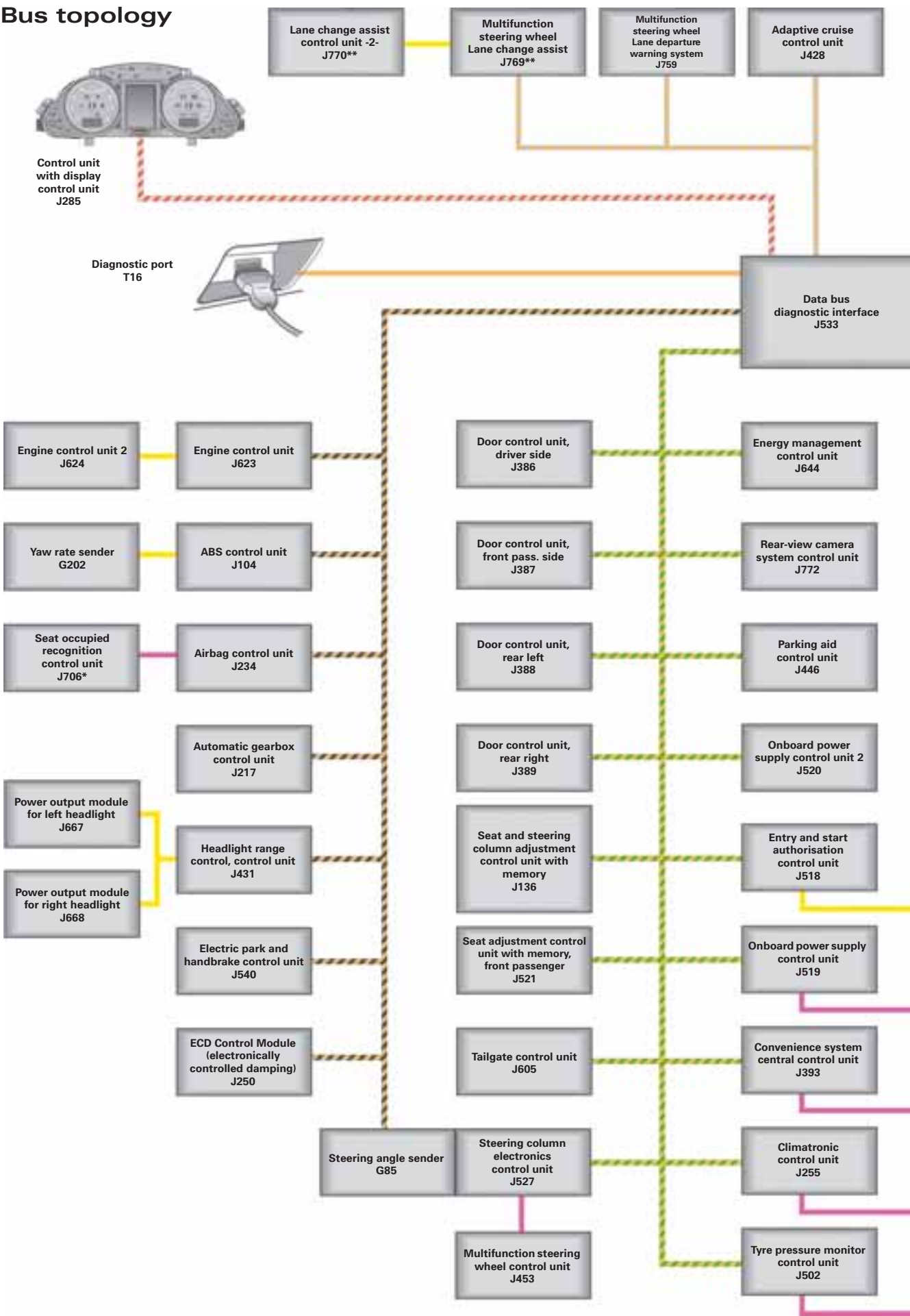
### Reference

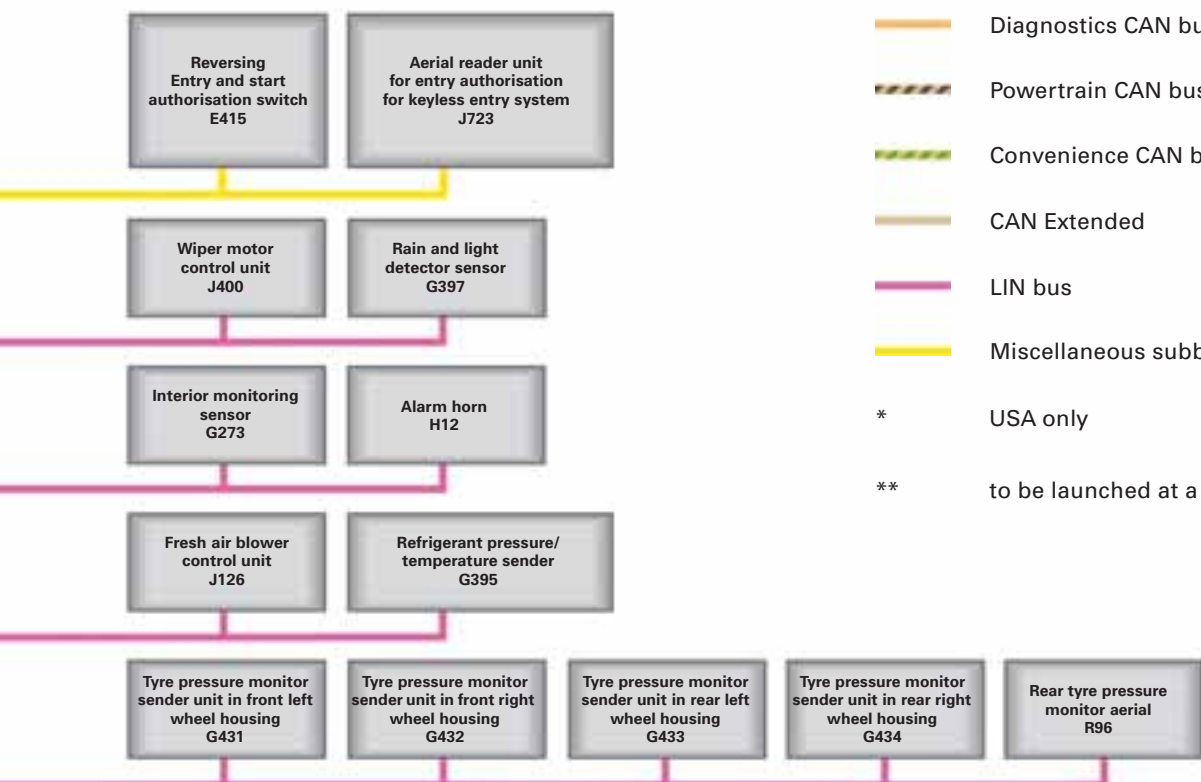
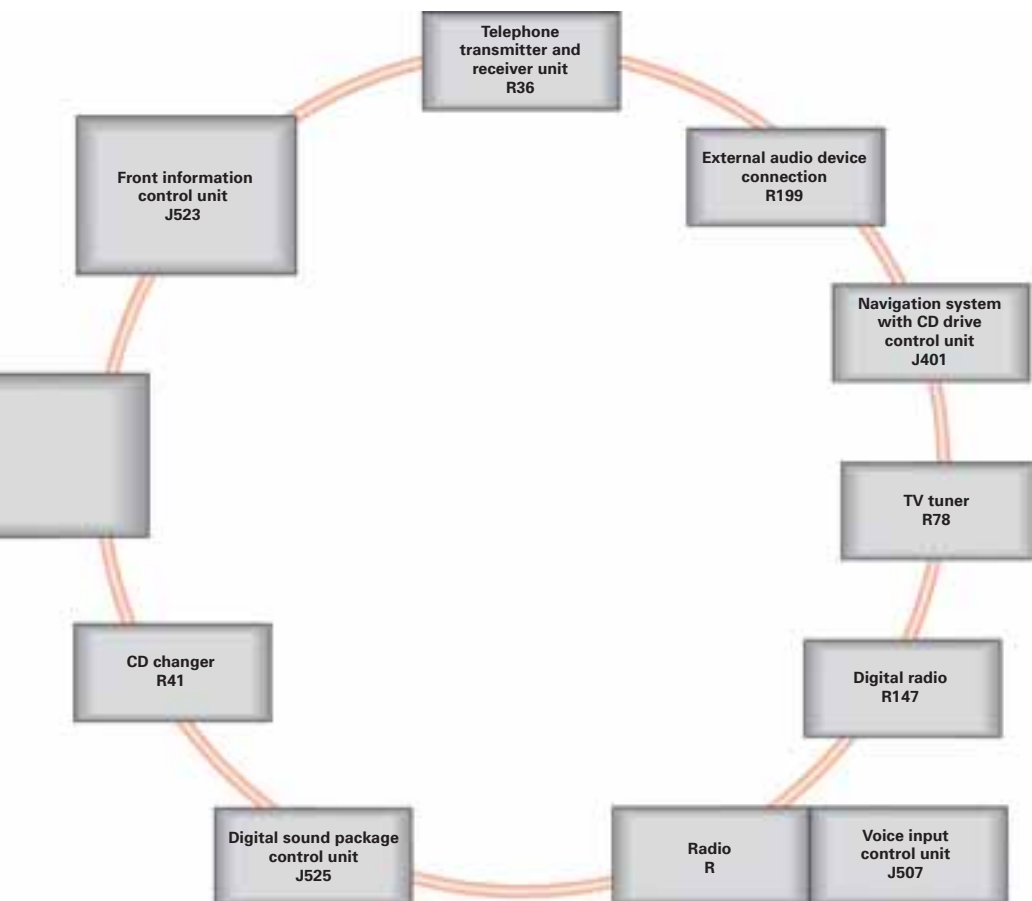
For information about the handling and assessment of wear and damage in ceramic brake discs, please refer to the current service literature.











# Electrical system

## Bus topology





-  MOST bus
-  Dash panel insert CAN bus
-  Diagnostics CAN bus
-  Powertrain CAN bus
-  Convenience CAN bus
-  CAN Extended
-  LIN bus
-  Miscellaneous subbus systems
- \* USA only
- \*\* to be launched at a later date

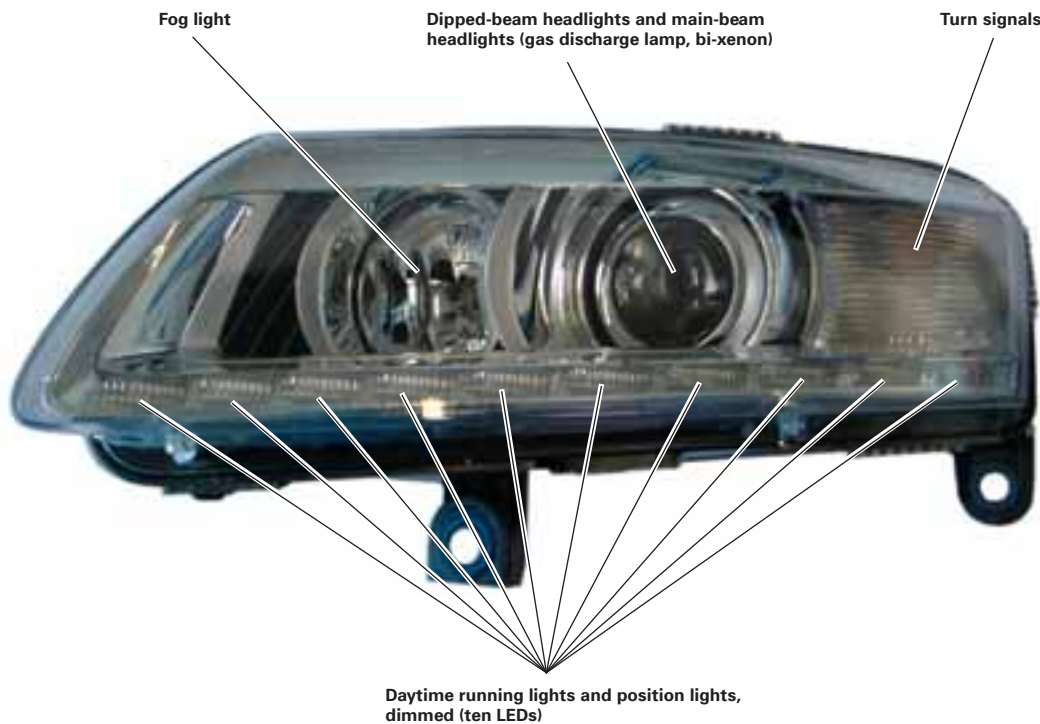
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Headlights

The Audi RS 6 is equipped with bi-xenon headlights and adaptive light. The fog lights are integrated in the headlights.

Unlike on the Audi S6, the ten LEDs for the daytime running lights and position lights are also integrated in the headlights.



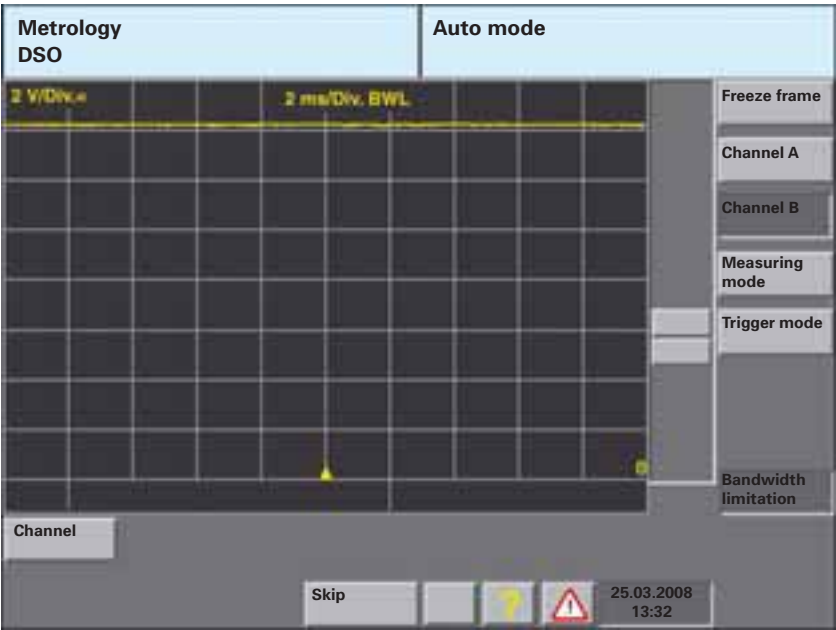
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Bulbs	Type	Power output
Daytime running lights and position lights	LED	10 watts
Dipped-beam headlights and main-beam headlights	Gas discharge lamp D2S	35 watts
Turn signals	PY21W (silver glass)	21 watts
Fog light	H7	55 watts

The rear lights of the Audi RS 6 are identical to those of the Audi A6 in the Highline trim version.

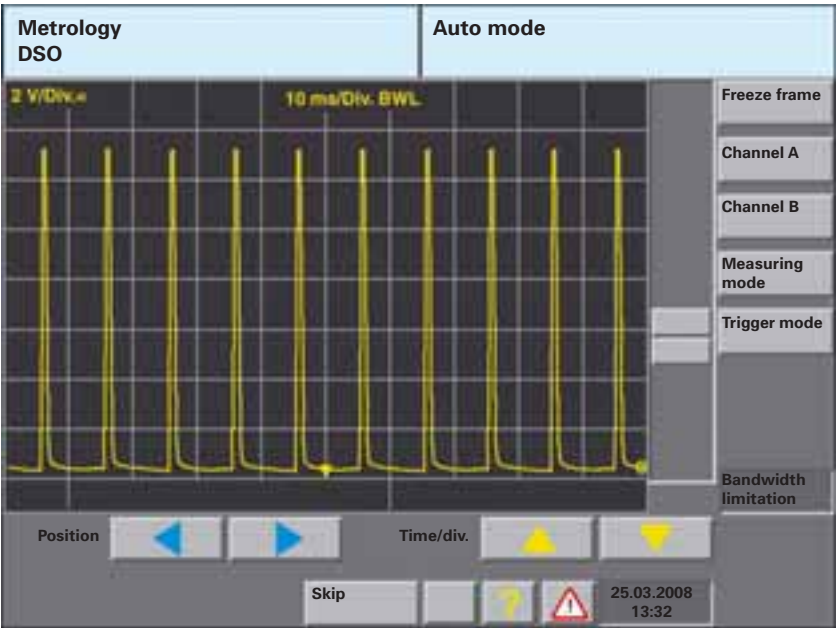
The 10 LEDs are operated as daytime driving lights or, in the dimmed version, as position lights.

The LED units are activated by the onboard power supply control unit J519. If the onboard power supply control unit sends a 12V signal to the LED units, the daytime running lights are switched on.



431\_097

If the onboard power supply control unit J519 sends a pulsed signal, the LEDs are operated at a reduced luminosity and deployed as position lights. The LED units are currently unsuitable for repair or replacement.



431\_098

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