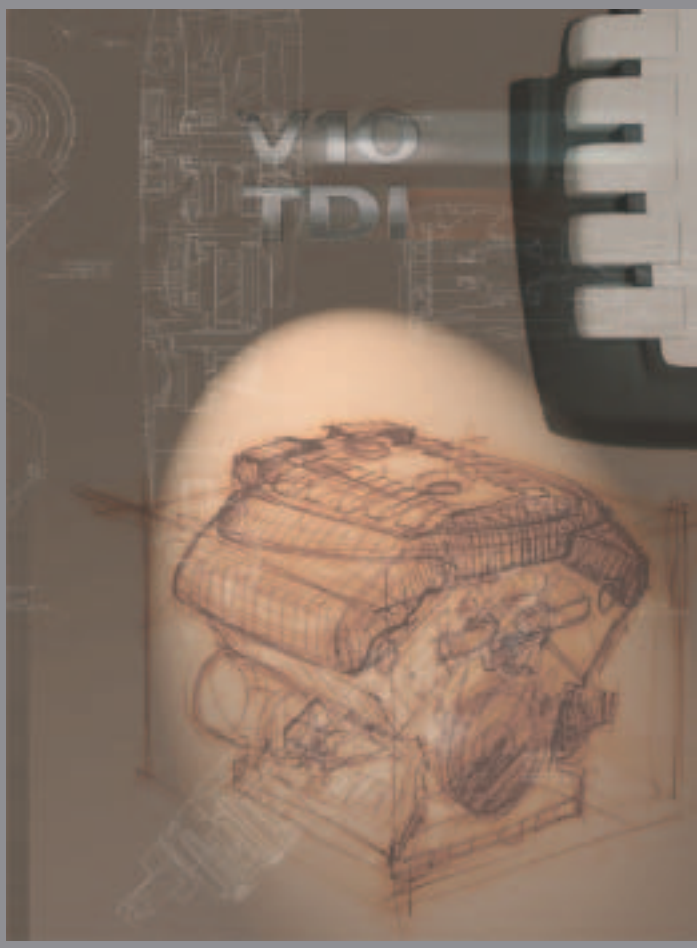
The Touareg V10-TDI Engine

Design and Function



Self-Study Program
Course Number 89N303

Volkswagen of America, Inc.
Service Training
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Always check Technical Bulletins and the Volkswagen Worldwide Repair Information System for information that may supersede any information included in this booklet.

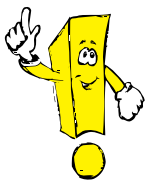
Contents

The Self-Study Program provides you with information regarding designs and functions.

The Self-Study Program is not a Repair Manual.

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

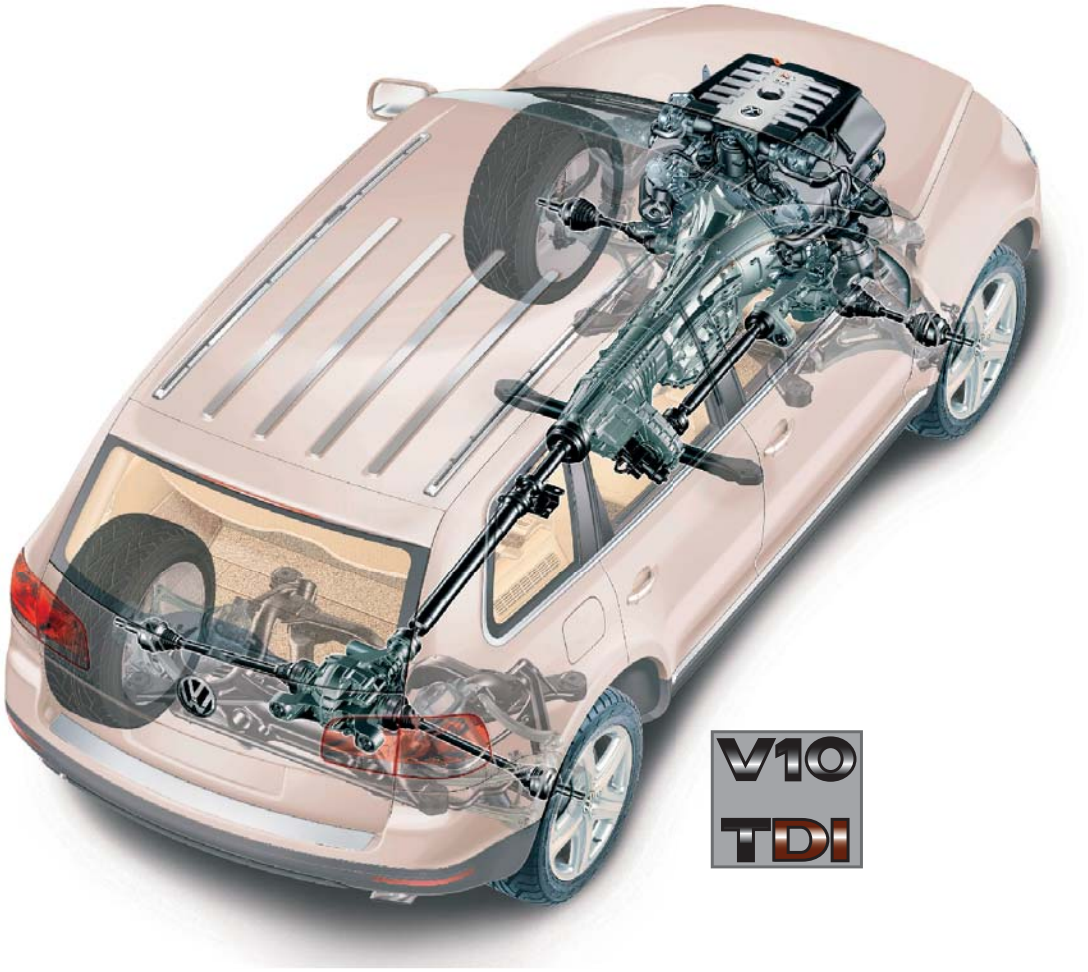
New!



Caution/Note

Introduction

"...Easy to recognize, the beauty of the classical lines,
the calm but predominantly powerful charisma
of intelligent and sensible engine activity, simple and elegant -
in short, ladies and gentlemen, the world's top performer!
A milestone..."



With the V10-TDI engine, Volkswagen once again sets new standards in diesel technology. Due to a multitude of innovative techniques, the highest demands in terms of performance, torque and emissions of a diesel engine are fulfilled for the luxury vehicle class.

The V10-TDI engine crowns 25 years of diesel engine development at Volkswagen. It is the most powerful series passenger-vehicle diesel engine in the world.

Introduction

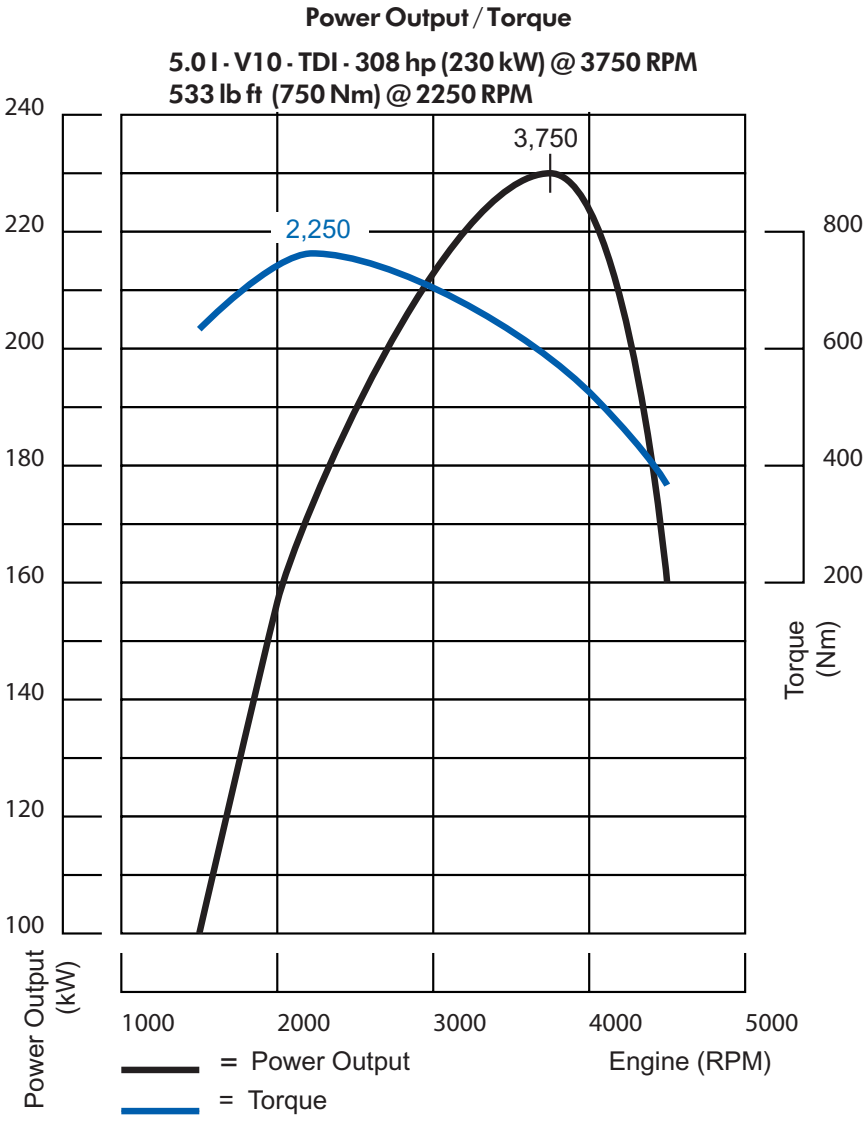
303_001

The V10-TDI Engine

The V10-TDI engine is a newly developed diesel engine in which innovative lightweight construction and enormous power are united within compact dimensions.

It has a 90^0 aluminum cylinder block with 5 cylinders in each bank of the block. The control and auxiliary drive are gear-driven. The fuel injection system uses solenoid controlled unit injectors to ensure a high performance yield at low exhaust emissions.

Engine Code	BKW
Construction	10 Cylinders, 90^0 V-Angle
Displacement	300 Cubic Inches (4921 cc)
Bore	3.19 In.(81 mm)
Stroke	3.76 In. (95.5 mm)
Valves-per-Cylinder	2
Compression Ratio	18:1
Horsepower	308 hp (230 kW) @ 3750 RPM
Torque	553 lb ft (750 Nm) @ 2250 RPM
Engine Management	Bosch EDC 16
Fuel Requirements	Diesel 49 CZ minimum
Exhaust Treatment	Exhaust gas recirculation and oxidation catalytic converter
Firing Order	1-6-5-10-2-7-3-8-4-9



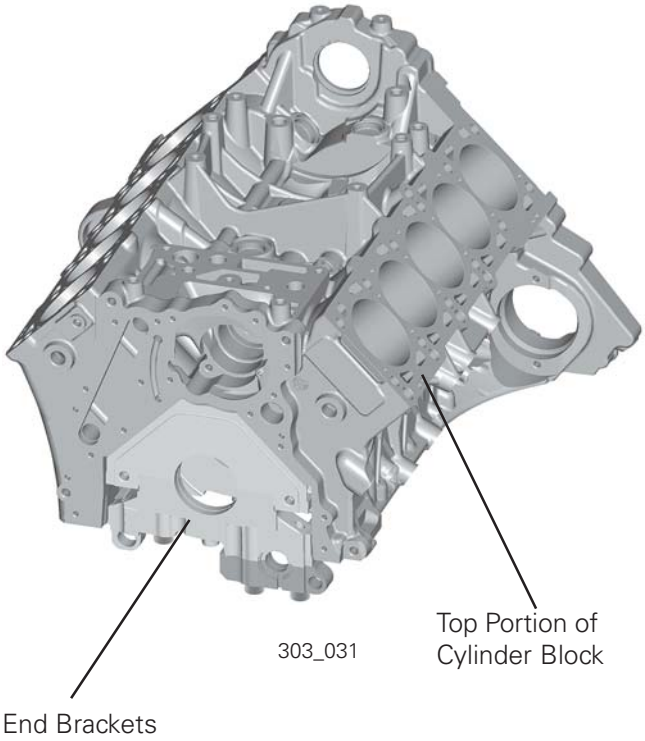
Engine Mechanics Technical Features

- Cylinder block made of aluminum with an end bracket made of cast-iron
- Joining of cylinder head and cylinder block with tie-rod bolt connection
- Control and auxiliary drive unit are gear-driven
- Balancer shaft to reduce vibrations

Engine Management Technical Features

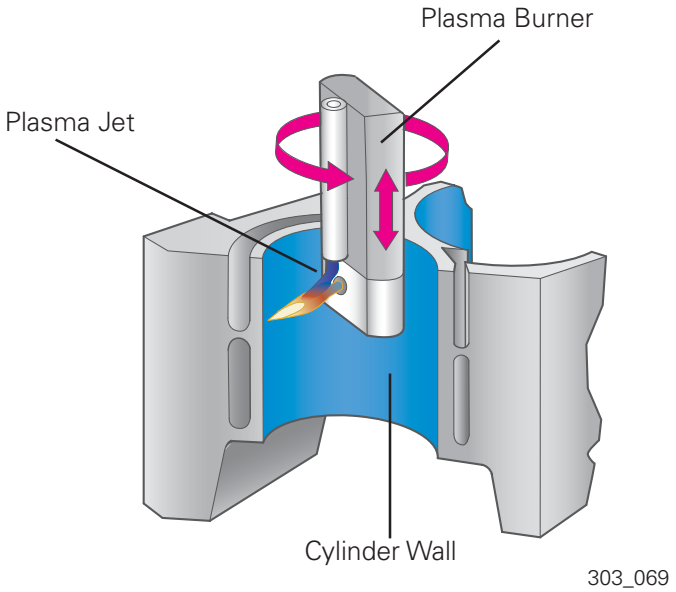
- EDC 16
- Two Engine Control Modules
- Pneumatic controlled exhaust gas recirculation with electric motor operated intake manifold flaps
- Oxygen sensors for controlling exhaust gas recirculation

A detailed description of the engine management system can be found in Self-Study Program No. 89P303 "Touareg Electronic Diesel Control EDC 16", design and function.



Cylinder Block

The cylinder block assembly consists of three components; an aluminum cylinder block, upper and a lower end brackets. The aluminum cylinder block provides a significant weight reduction for the 90° cylinder banks. The high tensile cast iron end brackets give the assembly a rigid platform.

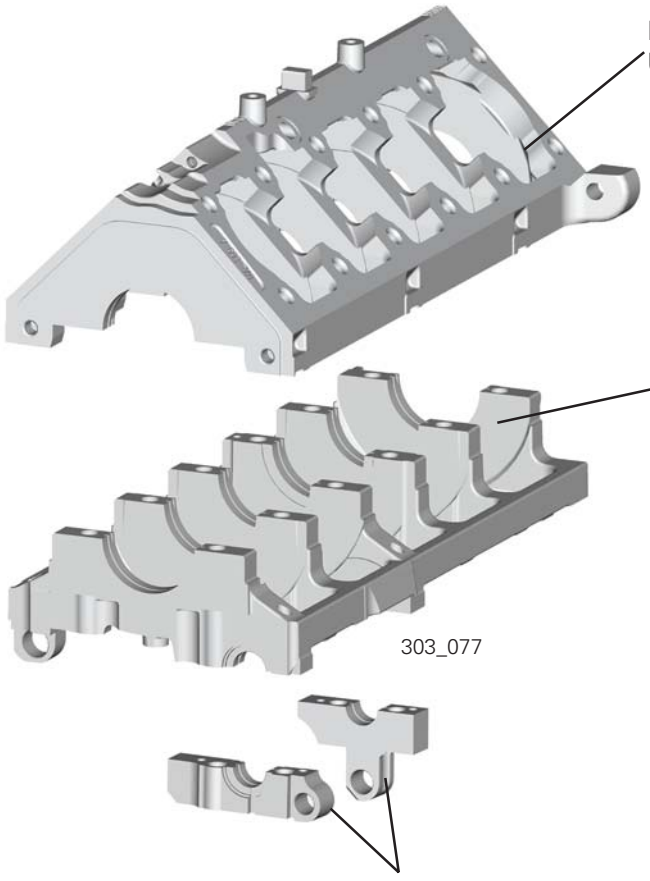


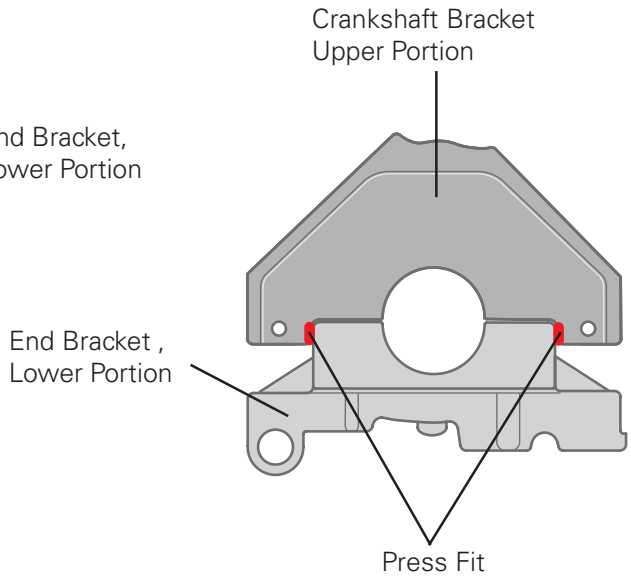
Plasma-Sprayed Cylinder Walls

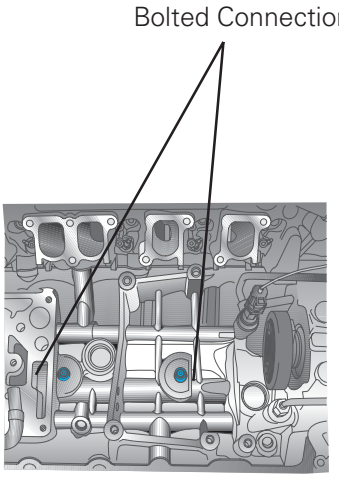
For the first time in diesel engines, a plasma-sprayed running film is applied to the cylinder walls. As a result, the use of cylinder liners in the aluminium cylinder block is no longer necessary. This reduces the weight of the engine and permits compact dimensions due to a short distance between the cylinder bores.

End Bracket

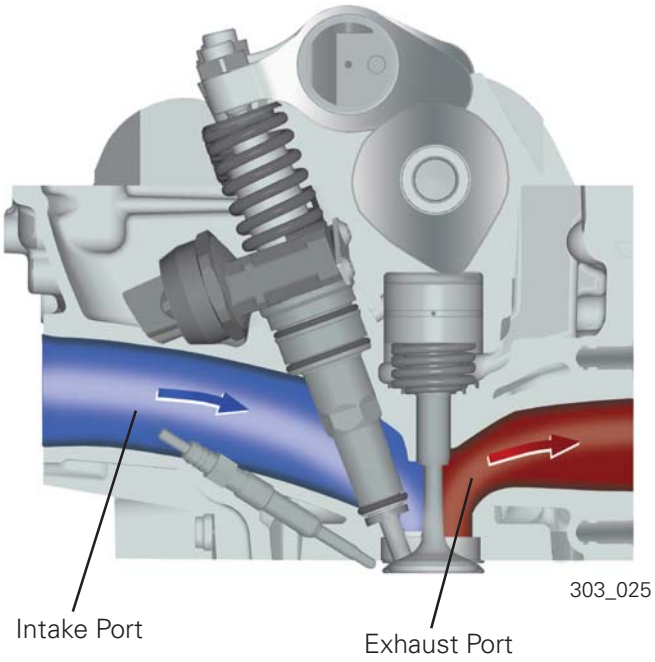
The upper and lower end brackets are manufactured from high tensile cast iron. The upper and lower portions of the end brackets use a press fit; and 4 bolts per main journal to provide the crankshaft with a strong and rigid structure to contain the high combustion forces of the diesel engine.







The cylinder block will be damaged or deformed by loosening the bolts connecting the cylinder block with the upper portion of the end bracket .

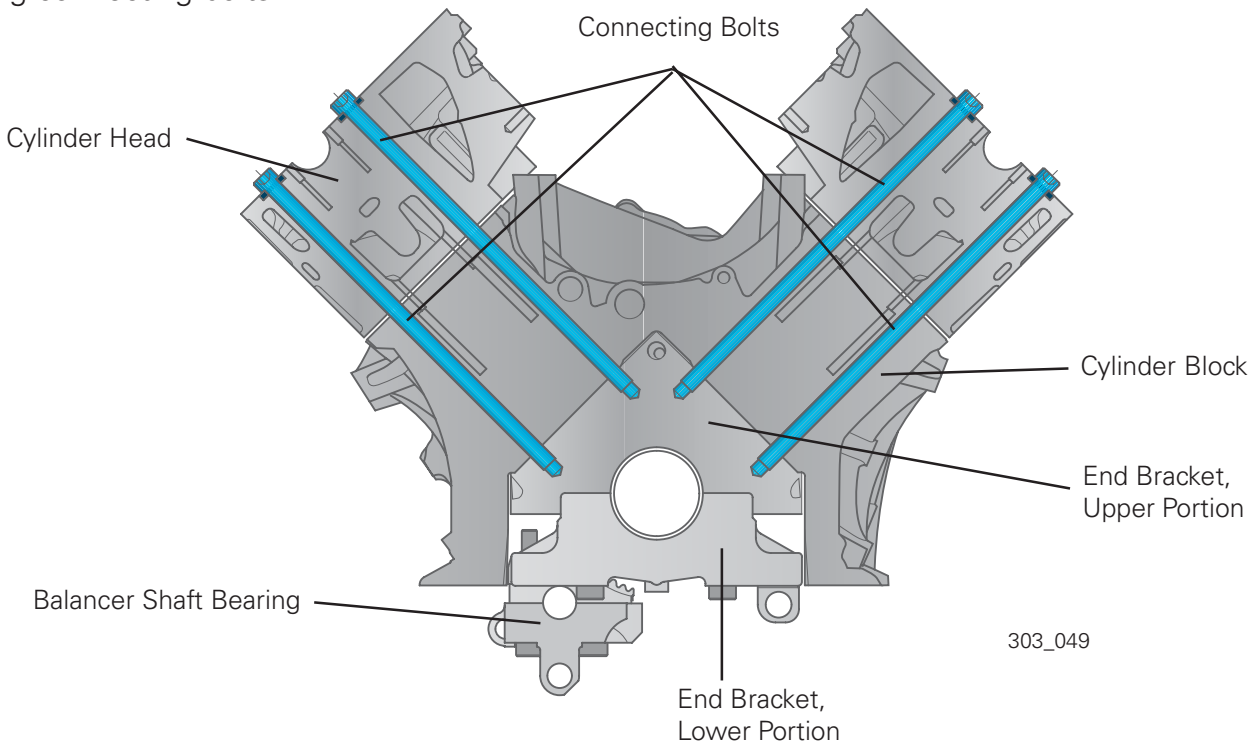


Cylinder Head

The V10-TDI engine has two aluminium-alloy cylinder heads. The intake and exhaust ports are arranged according to the crossflow principle; that is, the intake and exhaust ports are located on opposite sides of the cylinder head. This arrangement provides good gas exchange and thus good cylinder filling. The intake ports are located in the V space of the engine, while the exhaust ports are on the engine exterior.

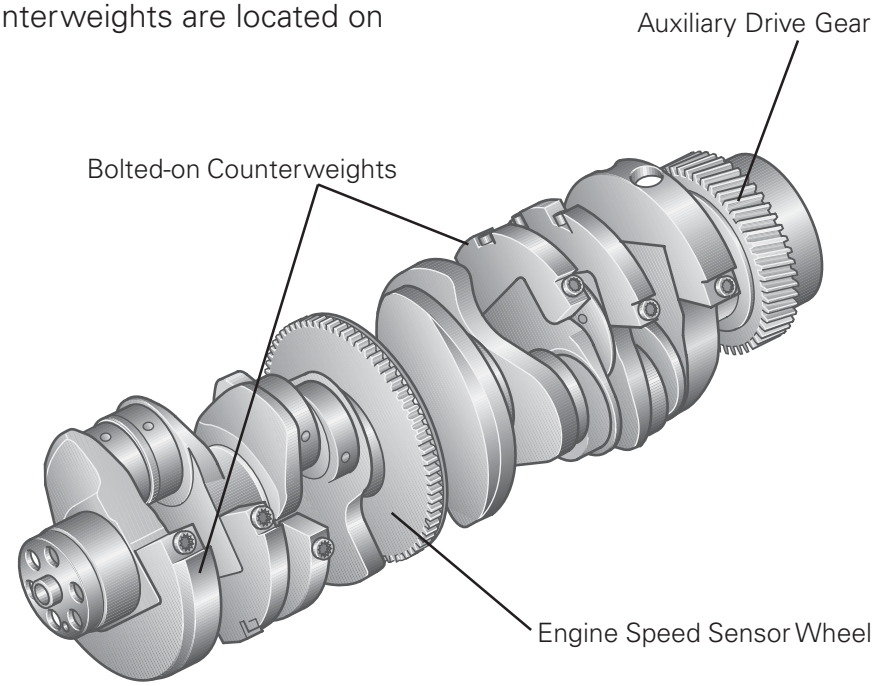
Connecting Bolt Principle

To prevent tension in the cylinder block, the cylinder heads, cylinder block, and upper portion of the end bracket are bolted to each other using connecting bolts.



Crankshaft

The crankshaft of the V10-TDI engine is made of tempered steel; forged from one piece. The auxiliary drive gear, engine speed sensor wheel, and bolted-on counterweights are located on the crankshaft.



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Crank Pin Offset

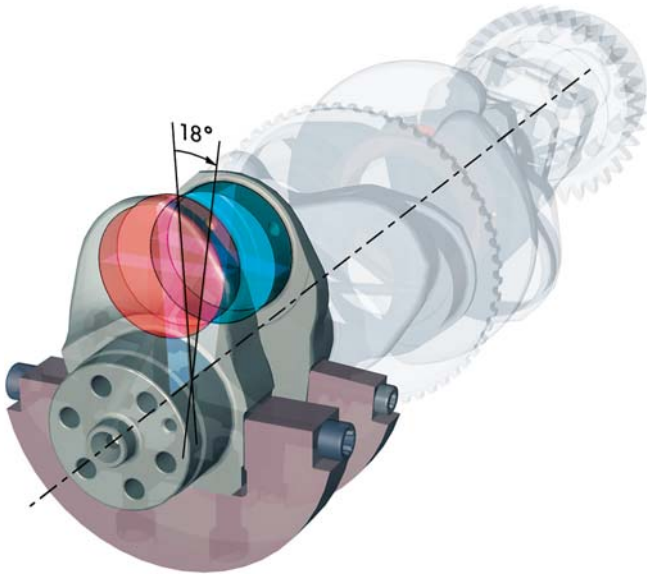
The cylinders of a 4-stroke engine fire within two complete revolutions of the crankshaft (720°). To attain uniform ignition, the ignition angle for a 10 cylinder engine must be 72°.

$$\frac{\textbf{720° crankshaft angle}}{\textbf{10 cylinders}} = \textbf{72° ignition angle}$$

A 10 cylinder V-engine must therefore have a V-angle of 72°:

Since the V10-TDI engine has a V-angle of 90°, the crank pin must be offset by 18° to attain uniform ignition:

90° V-angle – 72° ignition angle = 18° crank pin offset



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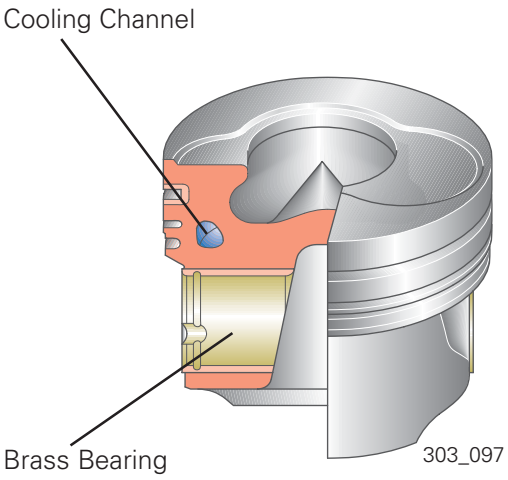
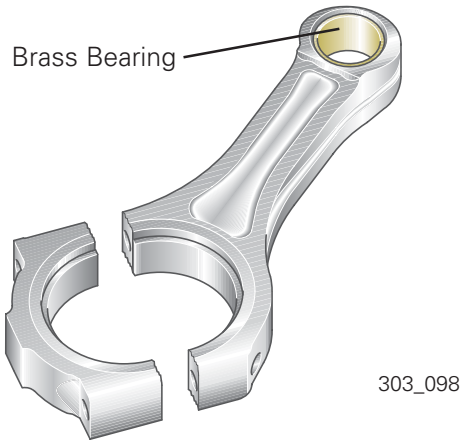


Pistons and Connecting Rods

To keep the demands on the piston and connecting rods low at high combustion pressures, the piston pin bosses and the connecting rod boss have a trapezoidal shape. This distributes the combustion forces over a broader area. The piston pin bosses are also strengthened by brass bearings.

A cooling channel is infused into the piston to cool the piston ring zone. Oil is injected into this cooling channel from the oil-spraying jets as soon as the piston is located at bottom dead center.



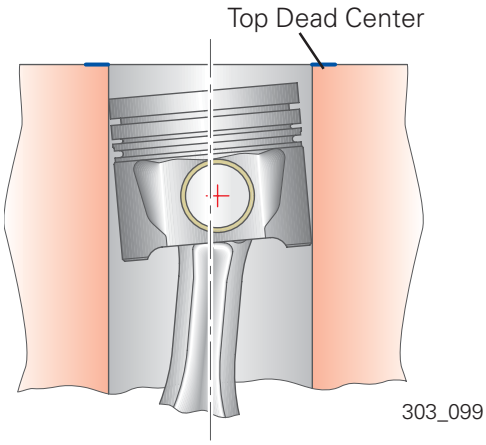
Connecting Rod

The connecting rod is forged from a high density sintered metal. To separate the cap from the rod a procedure called "Cracking" is required.

Piston Pin Axis Offset

The piston pin axis is offset to prevent noise from the tilting of the piston at top dead center.

Each time the connecting rod is in a sloping position, lateral piston forces occur which alternately press the piston against the cylinder walls.



The lateral piston force changes direction at top dead center. The piston is tilted to the opposite cylinder wall there, thus resulting in noise.

To prevent this, the piston pin axis is offset.

Due to the offset arrangement of the piston pin axis, the piston changes sides before it reaches top dead center and then supports itself on the opposite cylinder wall.

Balancing

To attain low vibration running of the engine, the moments of inertia must be balanced.

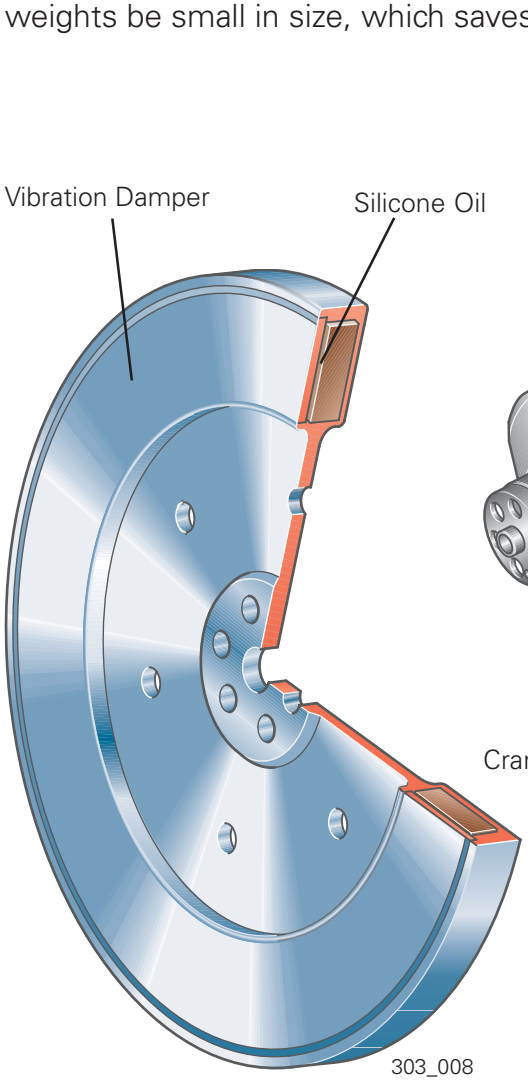
For this, 6 counterweights are attached to the crankshaft. In addition, a counter rotating balancing shaft and a weight located in the drive wheel of the balancing shaft eliminate the moments of inertia. The balancing shaft is driven by the crankshaft and serves as a driveshaft for the oil pump.

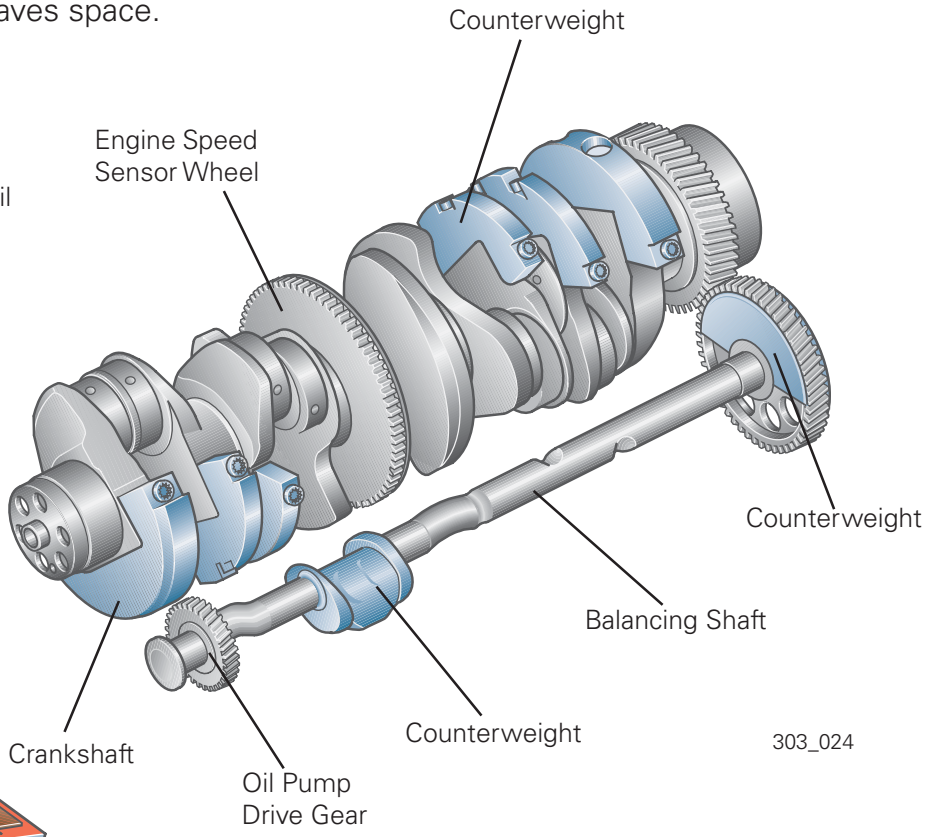
The counterweights are made of a tungsten alloy. As tungsten has a high density, the weights be small in size, which saves space.

Vibration Damper

The vibration damper reduces the rotational vibrations of the crankshaft. It is filled with a silicone oil.

The rotational vibrations of the crankshaft are eliminated by the shear force of the silicone oil.





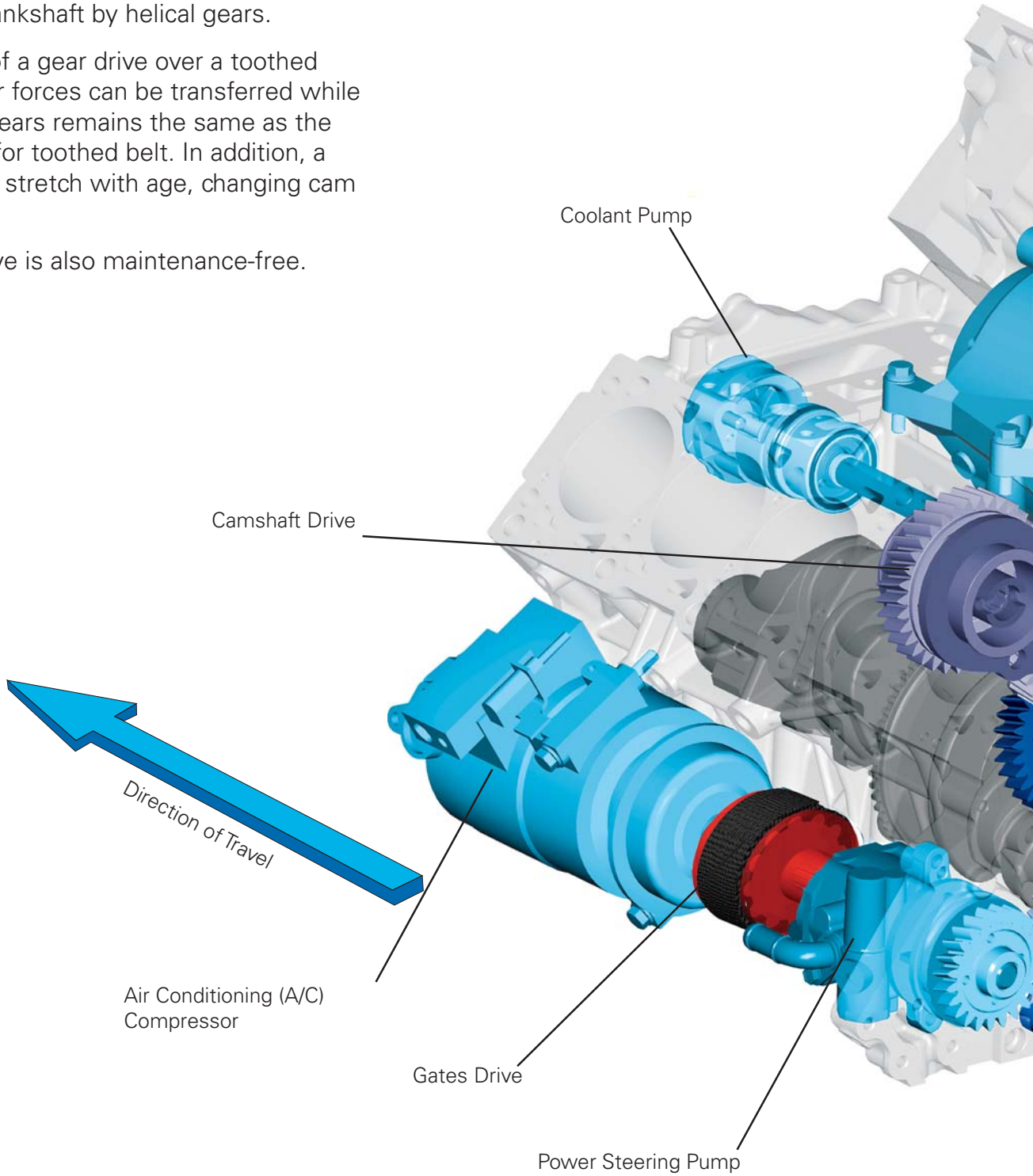
Auxiliary Drive and Components

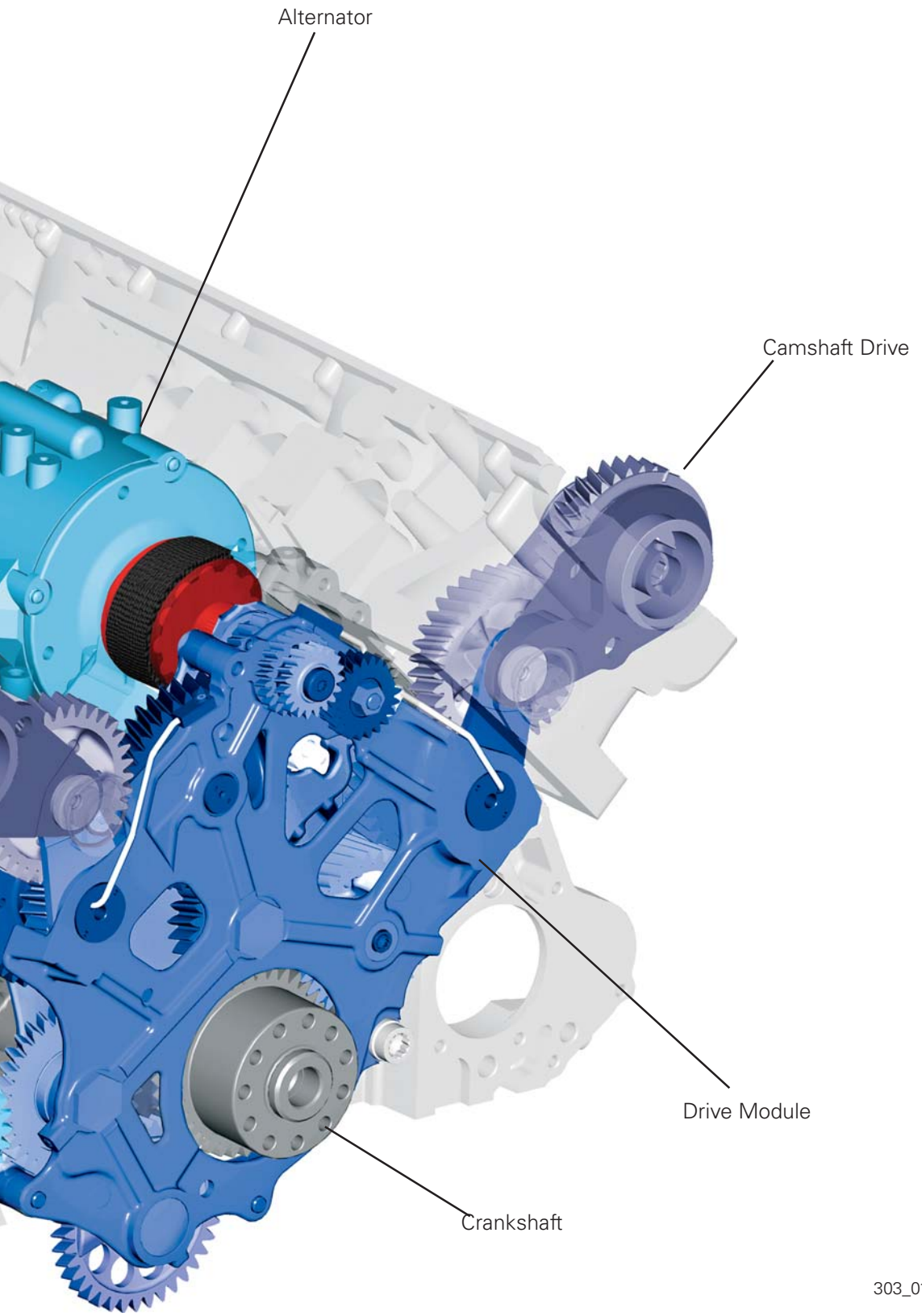
The auxiliary drive is located on the flywheel side.

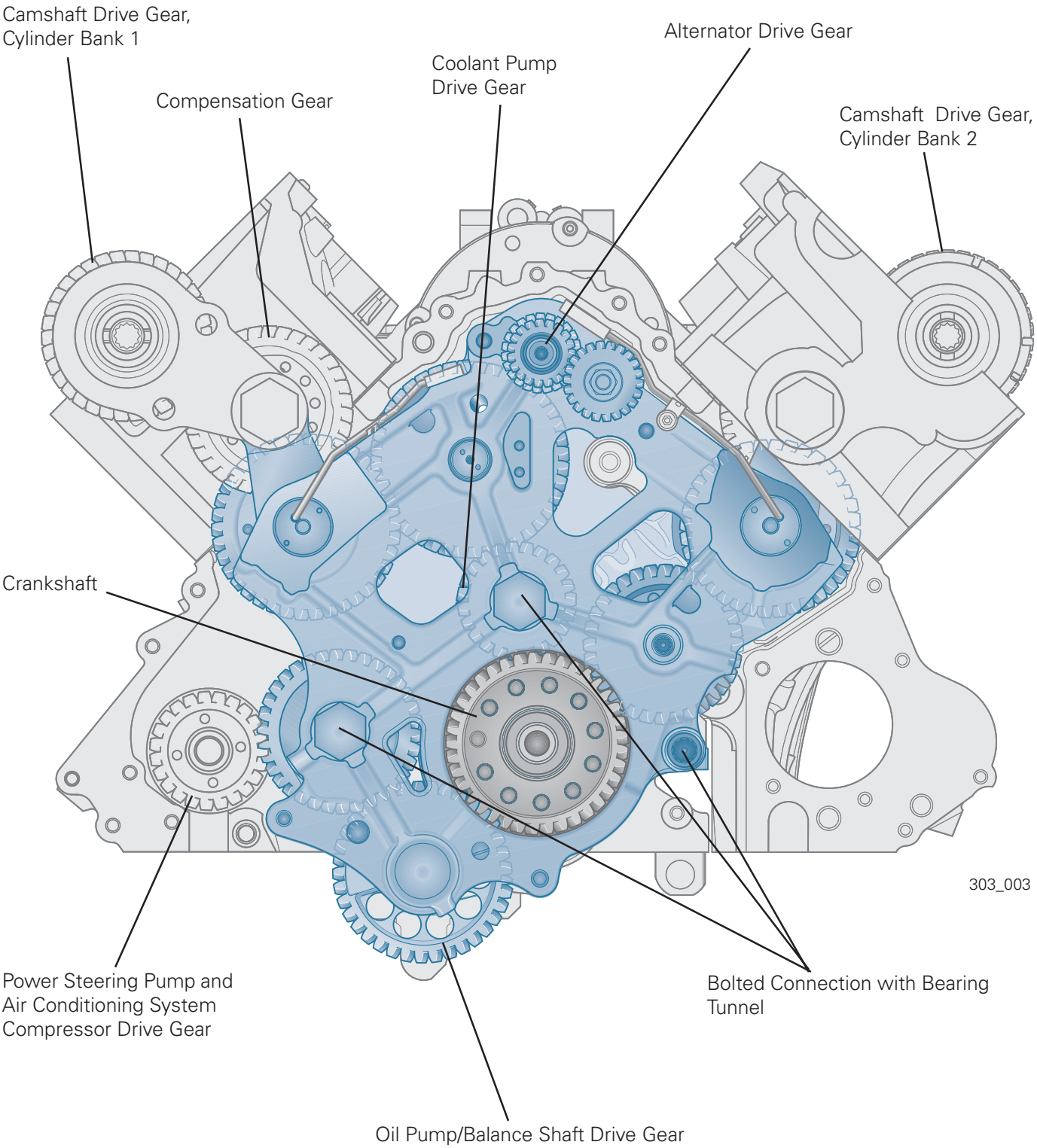
The camshafts and the auxiliary components are driven by the crankshaft by helical gears.

The advantage of a gear drive over a toothed belt is that larger forces can be transferred while the size of the gears remains the same as the sprockets used for toothed belt. In addition, a toothed belt will stretch with age, changing cam timing.

The auxiliary drive is also maintenance-free.




Alternator
Camshaft Drive
Drive Module
Crankshaft
303_016

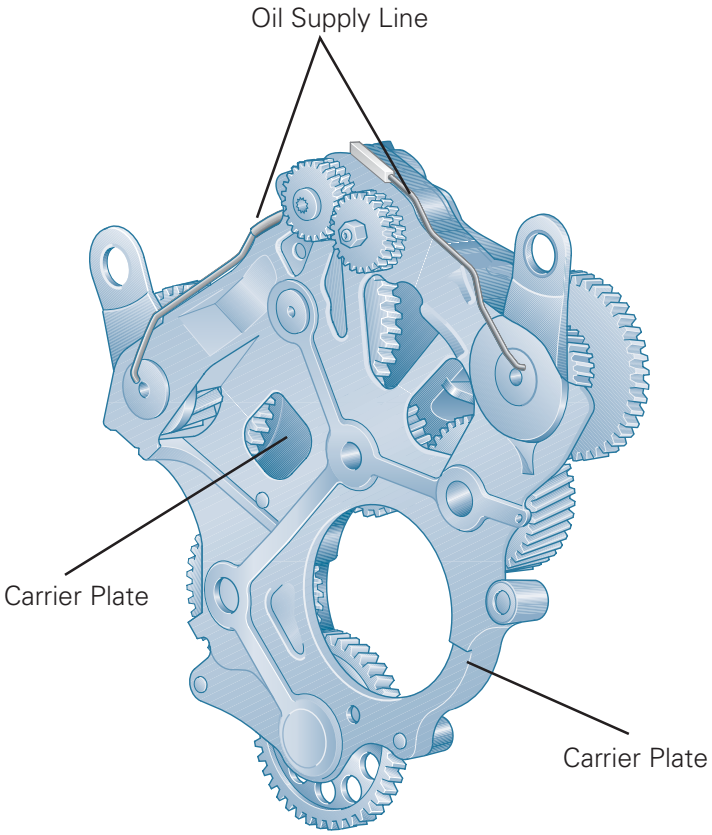

Camshaft Drive Gear,
Cylinder Bank 1
Compensation Gear
Coolant Pump
Drive Gear
Alternator Drive Gear
Camshaft Drive Gear,
Cylinder Bank 2
Crankshaft
303_003
Power Steering Pump and
Air Conditioning System
Compressor Drive Gear
Bolted Connection with Bearing
Tunnel
Oil Pump/Balance Shaft Drive Gear

Drive Module

The drive module uses helical gears to drive the camshafts, coolant pump, alternator, power steering pump and air conditioning compressor. The helical gears are mounted in two carrier plates made of cast iron to provide uniform expansion through the entire temperature operating range of the engine.

The drive module is connected by three bolts to the bearing tunnel formed by the upper and lower cast iron end brackets.

The gears have a helix angle of 15°; with two tooth mesh. The two tooth mesh provides a larger bearing surface that is stronger and quieter than a spur gear mesh.



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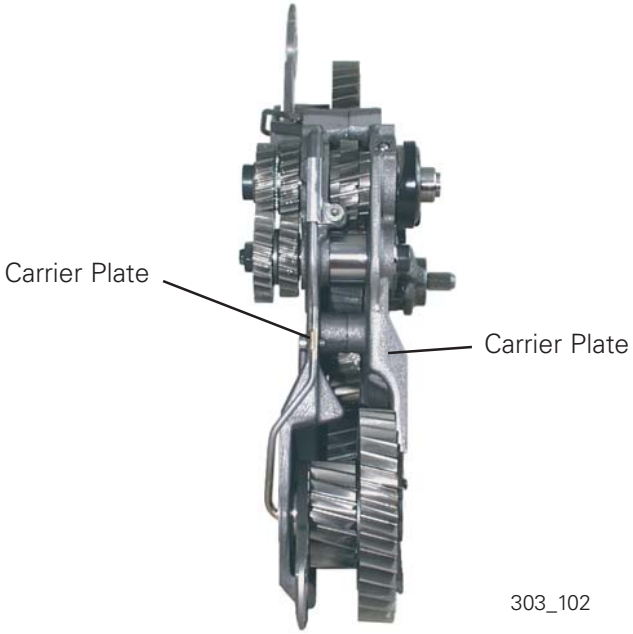

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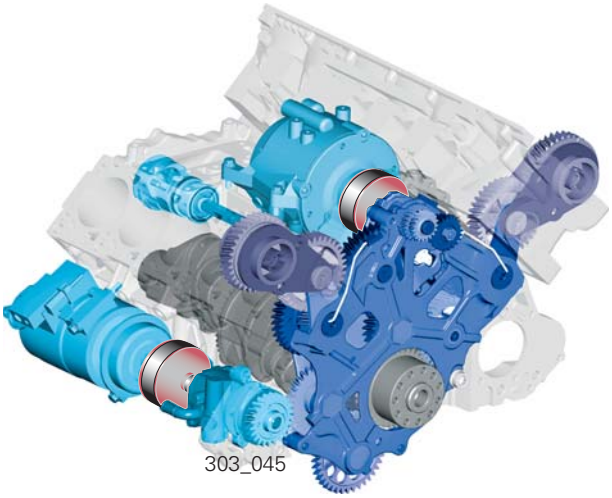

303_045

Shackle Joint

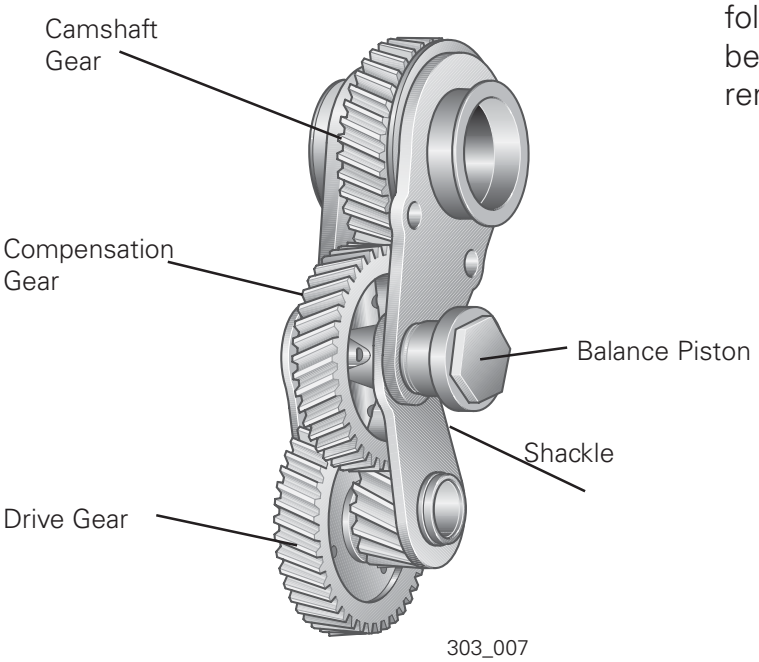
The camshafts located in the cylinder head are driven by gears located in brackets called a shackle joint.

The shackle joint is used to compensate for the end play of the gears and expansion of the aluminium cylinder heads and cylinder block throughout the entire operating temperature of the engine.

How it Works

When subjected to heat, the spacing between the camshaft to the drive module changes.

The compensation wheel in the shackle joint follows the joint movement; thus the play between the wheels within the shackle joint remains equal.



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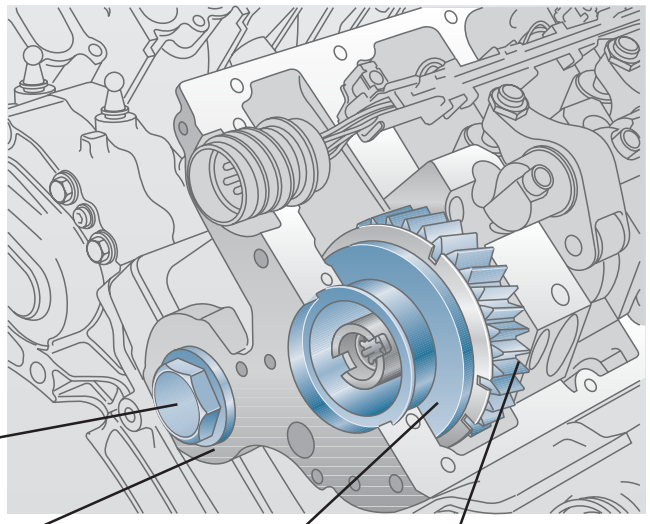
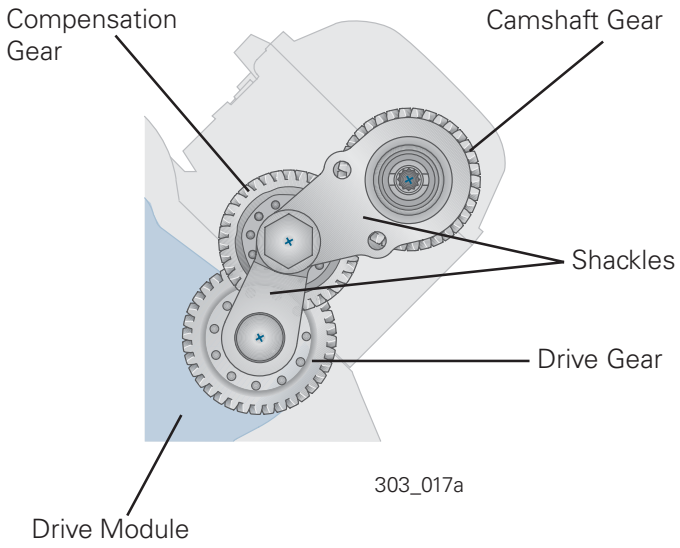


303_113

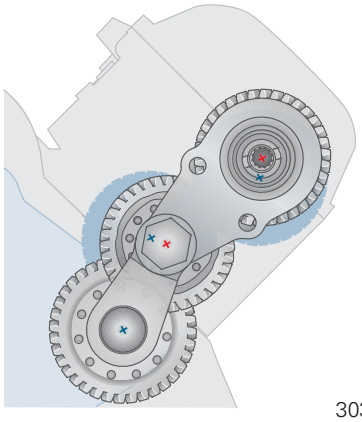
Balance Piston

Preload on the shackle joint is achieved by a balance piston. The piston consists of a sleeve in which several spring washers are arranged behind one another, axially tensioned.

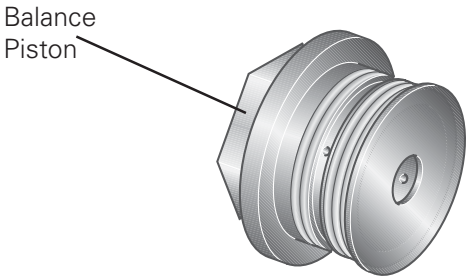


303_017a

Setting for "Warm Engine"



303_017b



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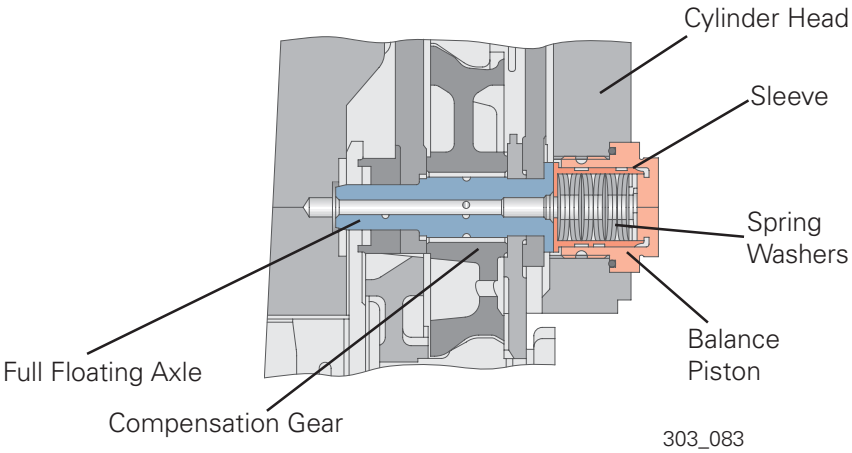
The balance piston is bolted into the cylinder head. Using a full floating axle, it tensions the two shackle joints; this prevents "dangling movements" of the shackle joint.



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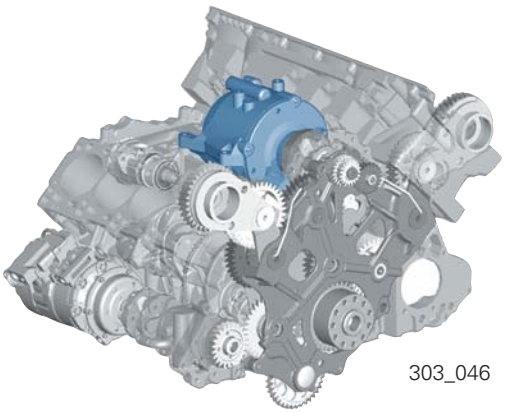


303_046

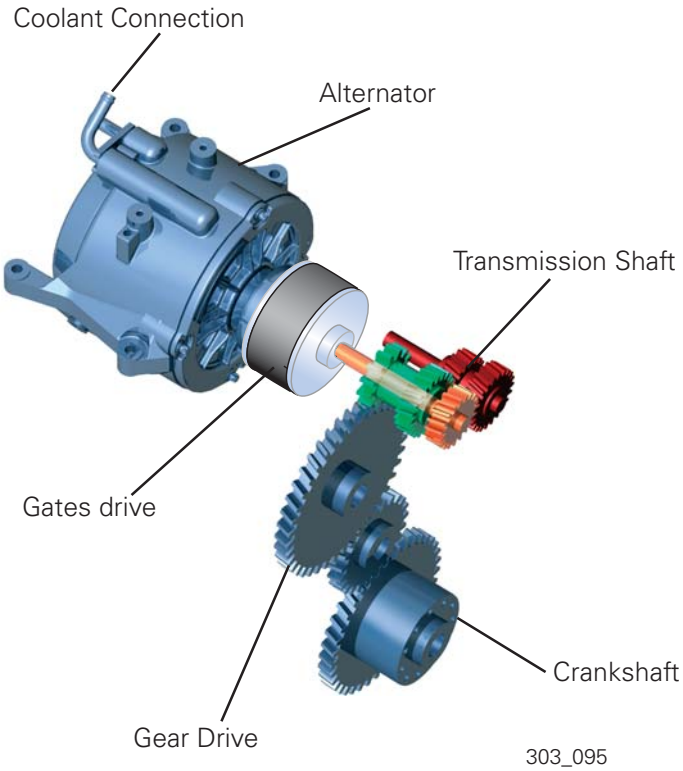
Alternator

The alternator is arranged in a space-saving manner in the V-space of the engine.

It is driven by a Gates® drive via a gear drive on the transmission shaft. Due to the transmission shaft, the alternator speed increases by a factor of 3.6 compared to the engine speed.

This provides an increased alternator performance that can cover high power demands of the vehicle electrical system even when idling.

The alternator is liquid-cooled.



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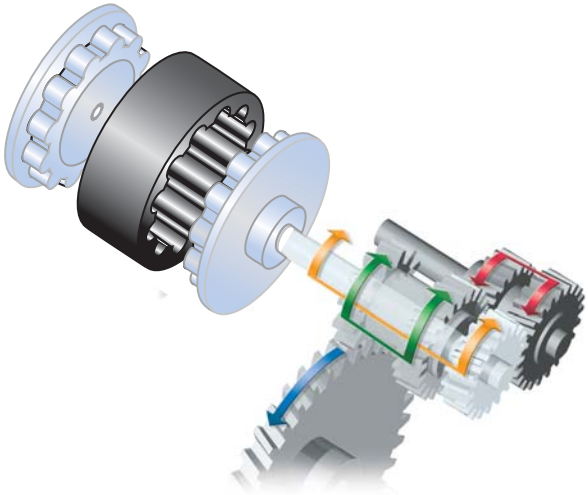
Powerflow



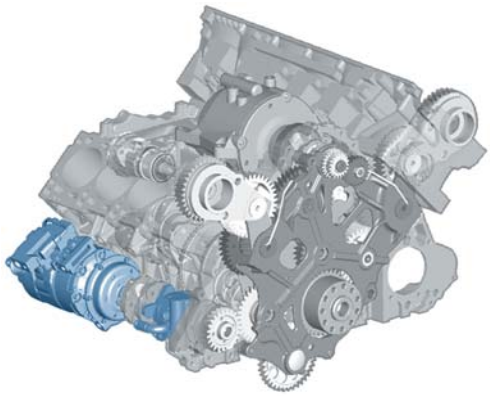
303_101

Power Steering Pump/Air Conditioning System Compressor

The power steering pump and the air conditioning system compressor are arranged in a row on the engine block. The power steering pump is driven directly by the gear drive. The air conditioning system compressor is driven by a Gates® drive connected to the power steering pump.

The overload protection of the air conditioning system compressor is implemented by a reinforced rubber element.

The Gates® drive consists of two metal drive couplings with lugs that fit into a fabric reinforced rubber sleeve. The elasticity of the sleeve compensates for small shaft bending angles and changes in length between the drive couplings. It also provides a vibration dampening effect for torque fluctuations.



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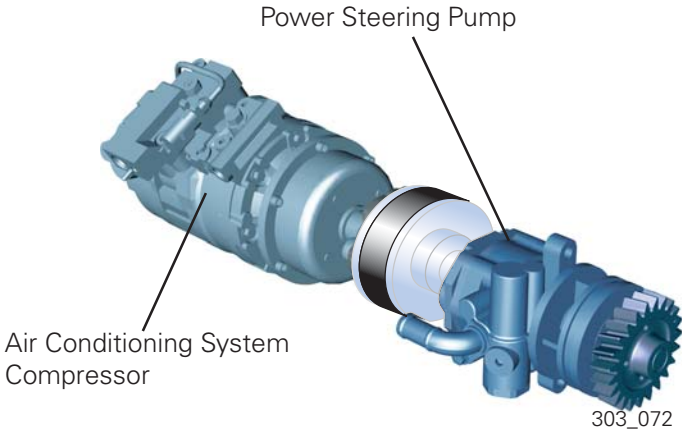

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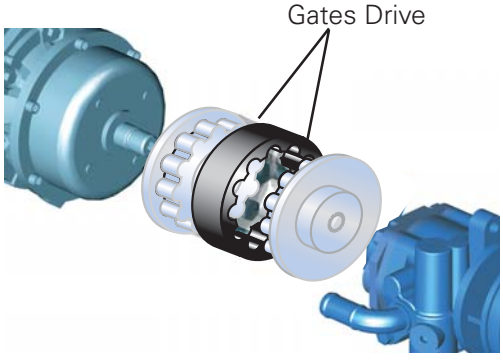

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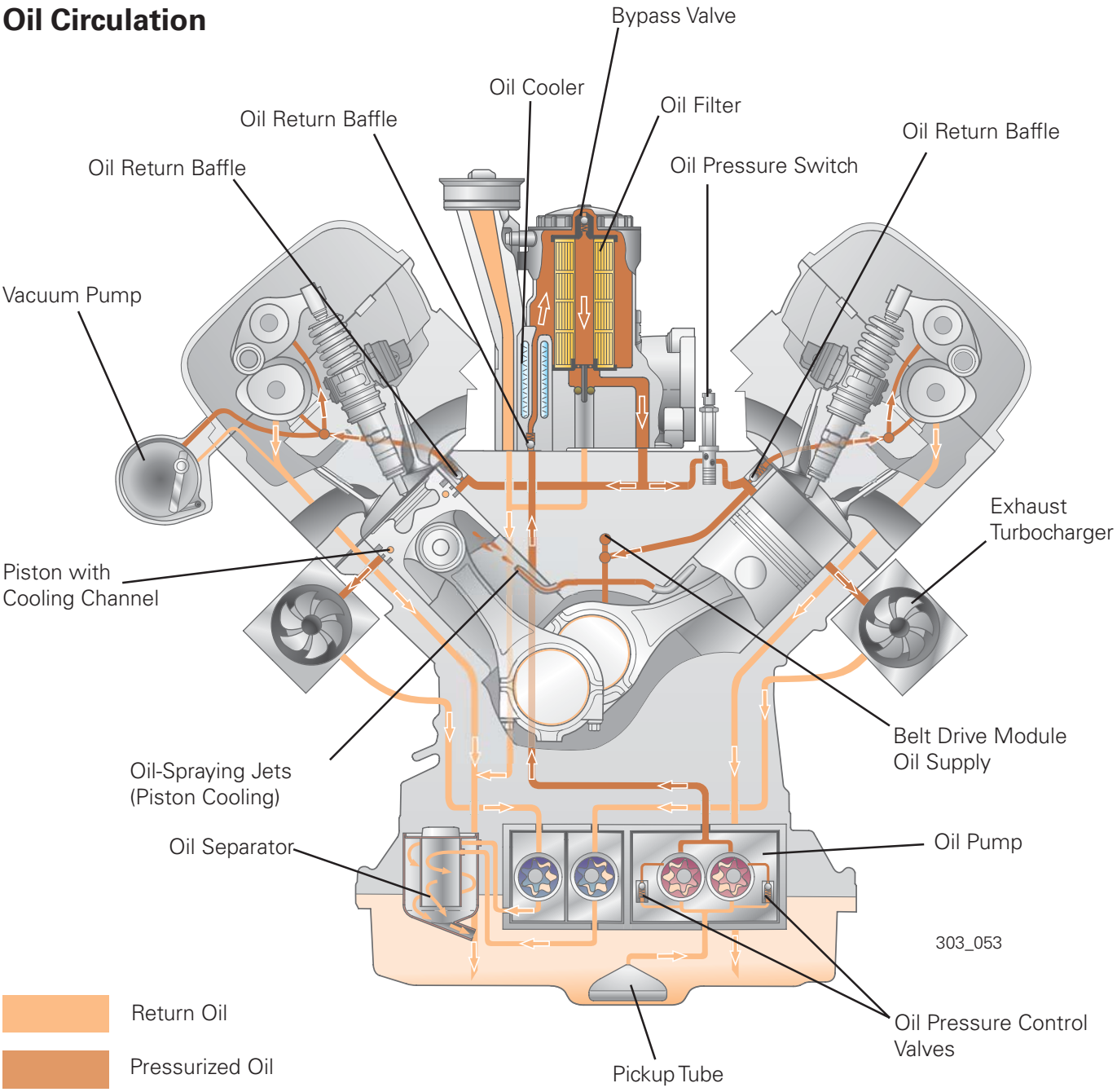
Oil Circulation

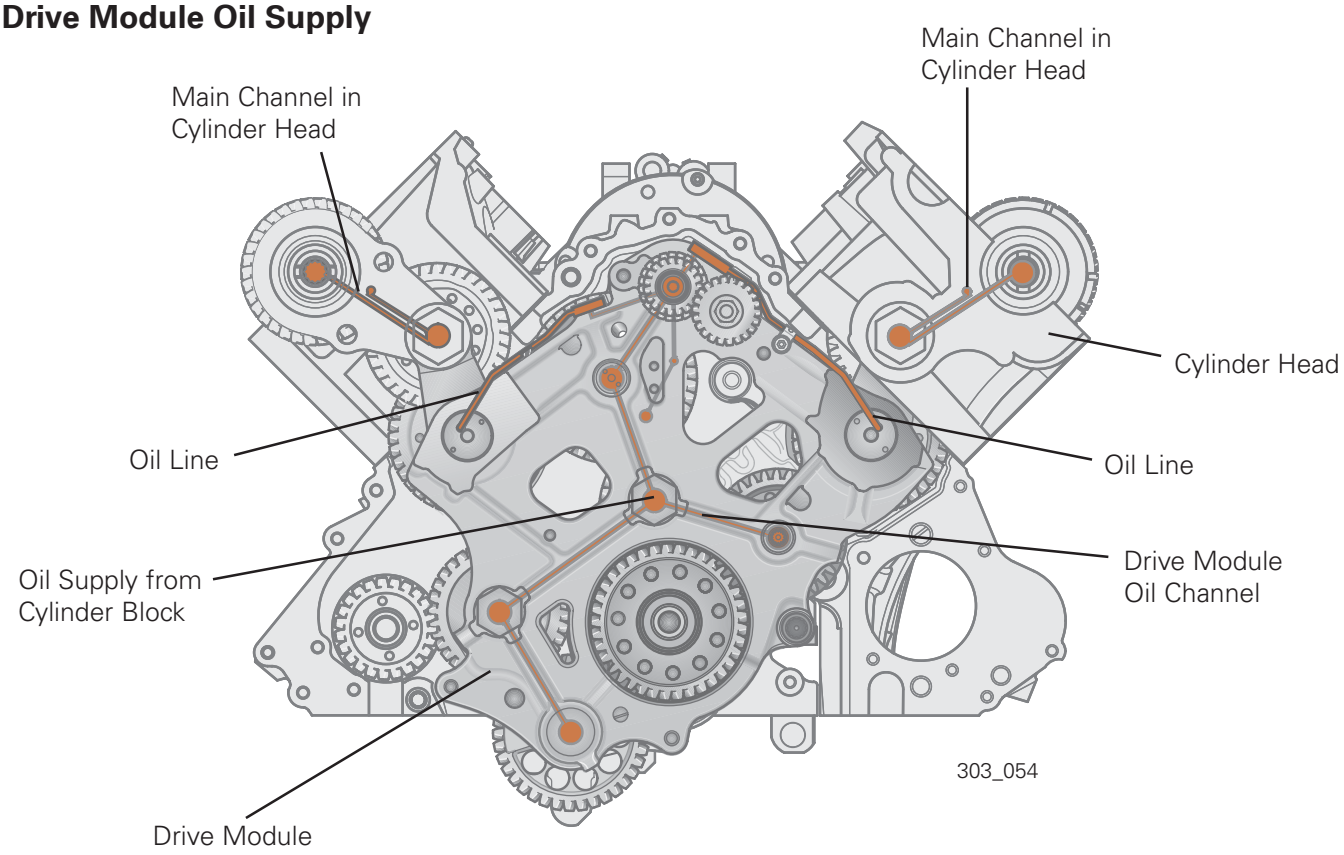


The **Oil Pressure Control Valves** control the oil pressure of the engine. They open as soon as the oil pressure reaches the maximum permitted value.

The **Oil Return Baffles** prevent oil from flowing back out of the cylinder head and the oil filter housing into the oil pan when the engine is at a standstill.

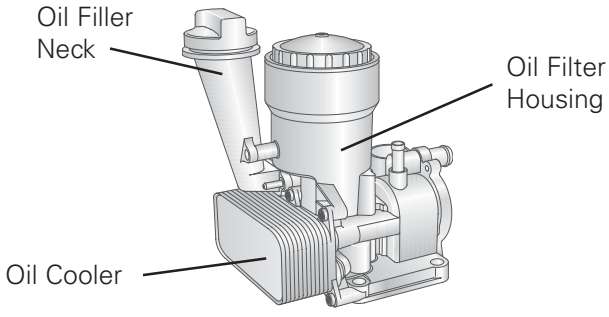
The **Bypass Valve** opens when the oil filter is restricted, thus ensuring the oil supply to the engine (the oil filter is bypassed; the oil supply is unfiltered when the bypass valve is open).

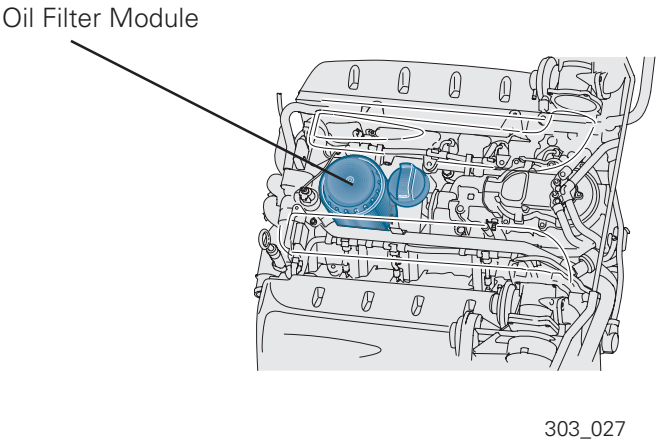
Drive Module Oil Supply



Oil Filter Module

The oil filter module is located in a space-saving manner in the V-space of the engine. The oil filters, the oil filler neck and the oil cooler are integrated in the oil filter module.



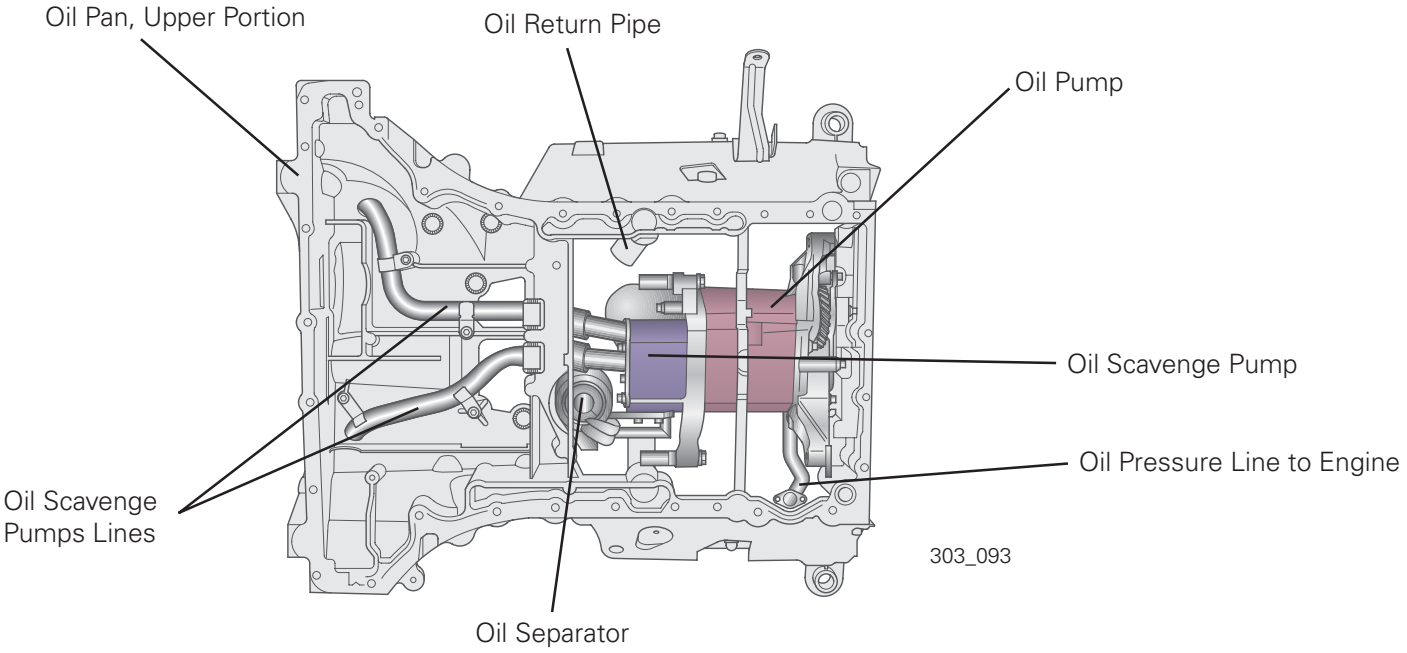


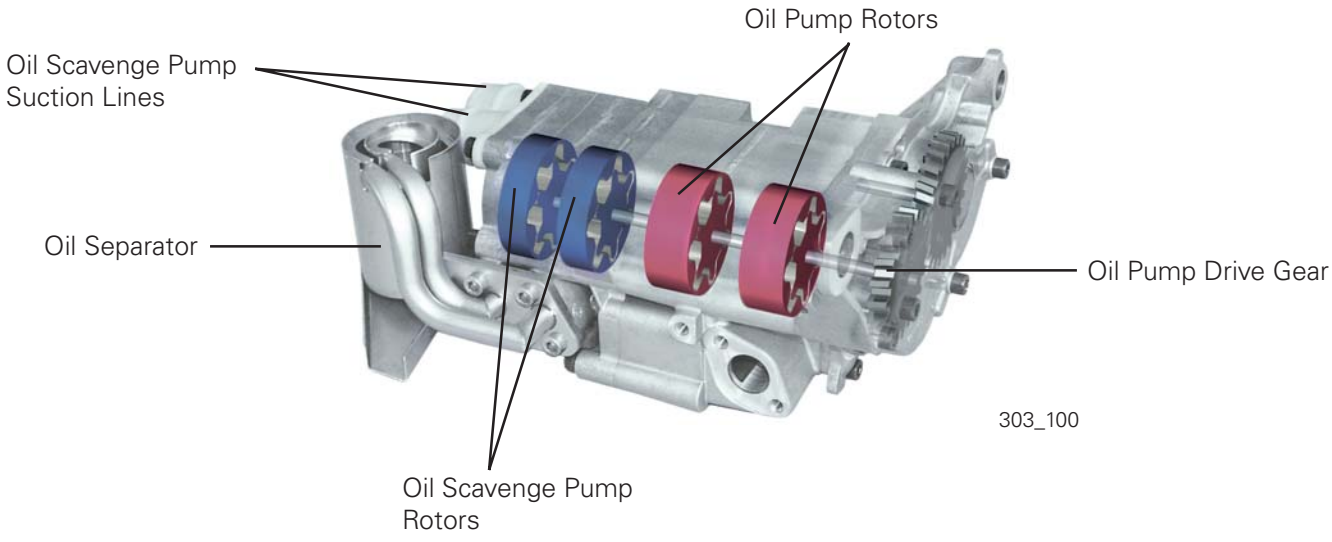
Oil Pump

The oil pump is located in the upper portion of the oil pan. It has oil pump rotors, that operate according to the duo-centric principle. Two of these are oil pressure pumps that generate the oil pressure required for the oil circulation.

The other two are oil scavenge pumps that return oil from the turbocharger oil returns to the oil sump, ensuring that there is a sufficient amount of oil in the sump in every operating state.

The oil pump is gear-driven by the balancer shaft.



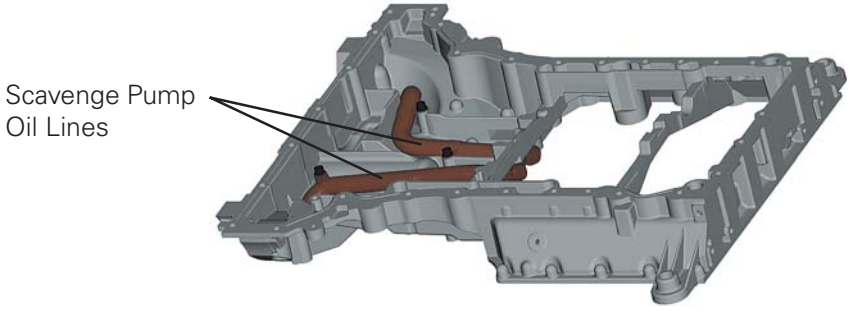


Oil Pan

The oil pan consists of two cast-aluminium parts.

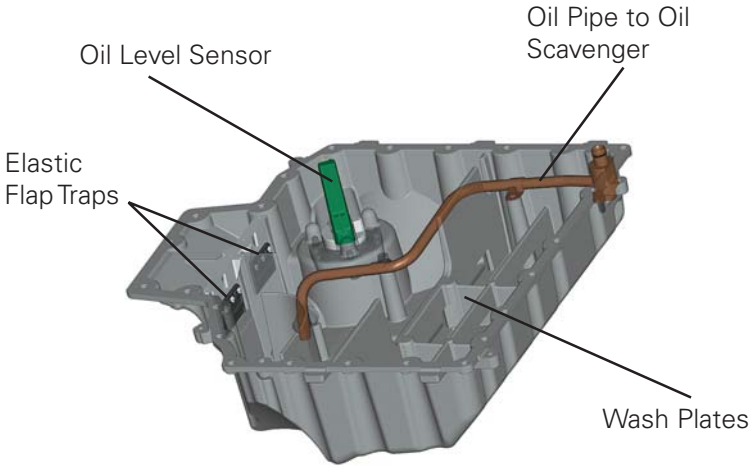
The lines for the oil scavenge pumps are located in the upper part of the oil pan. The lower part of the oil pan contains the oil level sensor and the wash plates that are used to calm the oil in the oil sump.

The Touareg has a deep, lower part of the oil pan, so it can hold a large amount of oil. In addition, the lower part of the oil pan of the Touareg has elastic flap traps. These prevent the oil sump from running dry when driving on inclines.



Oil Pan, Upper Portion

303_078



303_080

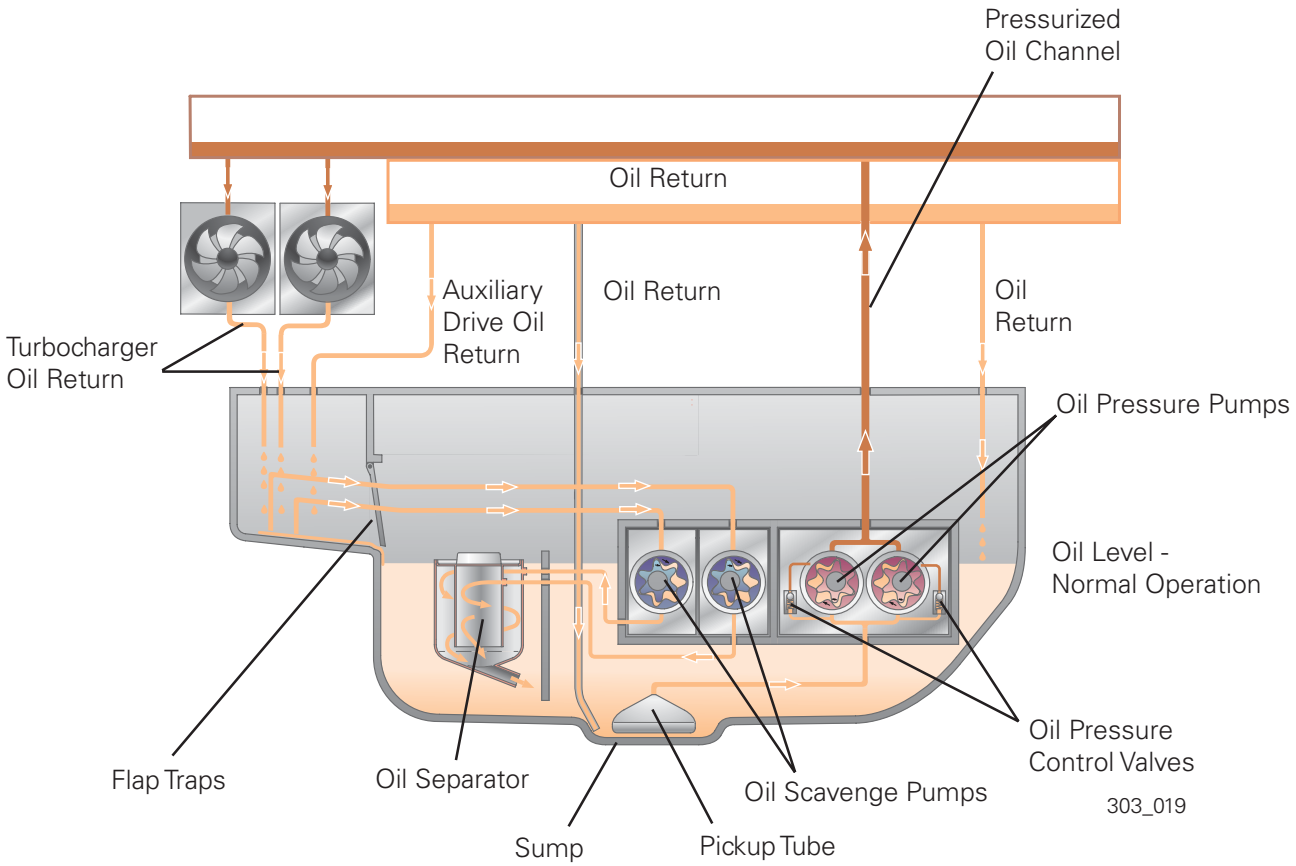
303_081

Oil Pan, Lower Portion

Oil Scavenge System

Two oil scavenge pumps are used to ensure an ample supply of oil in the sump in all driving conditions.

The following examples describe the oil scavenge system in three different driving states.

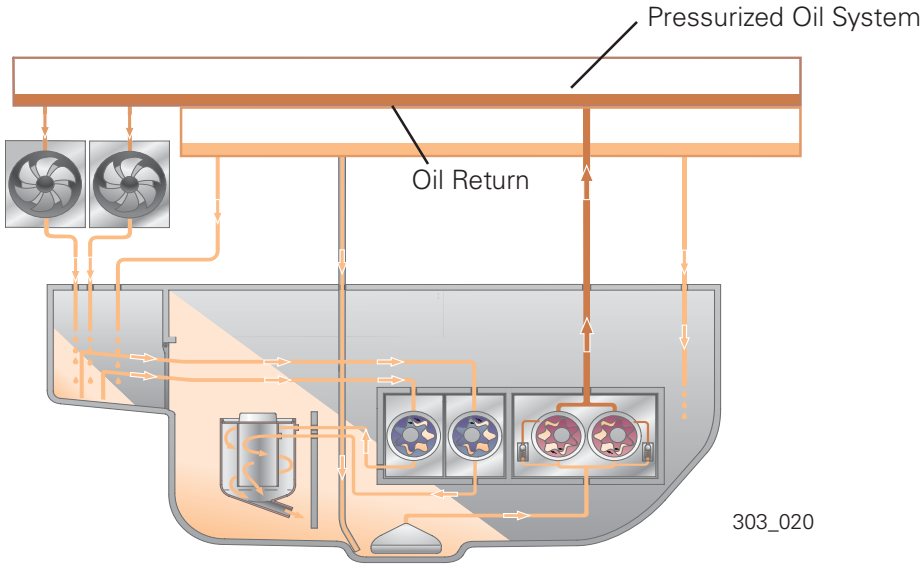


During uniform, level driving, the two oil pressure pumps suction the oil from the oil sump through the pickup tube and pump it into the pressurized oil system of the engine. Part of the returning oil flows directly into the oil sump of the oil pan while the rest flows from the returns of the turbocharger and auxiliary drive into the rear area of the oil pan.

There, the oil is suctioned off by oil scavenge pumps and returned to the oil sump by the oil separator.

The oil separator works according to the principle of a cyclone. It separates the oil from the scavenged oil-air mixture before the oil flows back to the oil sump.

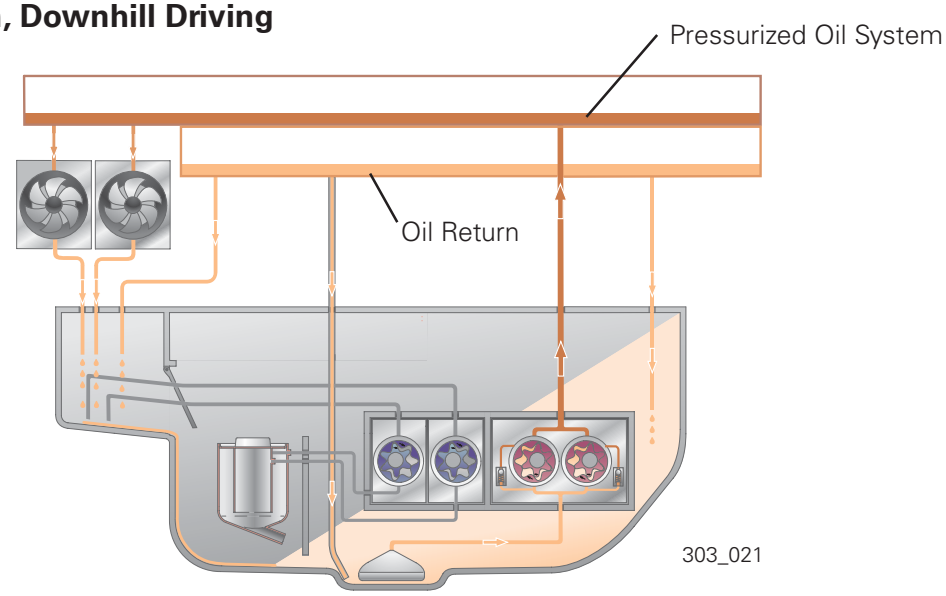
Oil Scavenge System, Uphill Driving



During uphill driving or when accelerating, the oil flows into the rear area of the oil pan. The flap traps close, preventing the oil from flowing into the rear area of the oil pan. The oil scavenge pumps suction the oil out of the rear area of the oil pan, eliminating backpressure from the turbocharger and the auxiliary drive oil return. This oil is then routed to the oil separator.

The oil separator removes air from the oil. The air-free oil drains into the sump, ensuring ample oil supply to the oil pressure pumps.

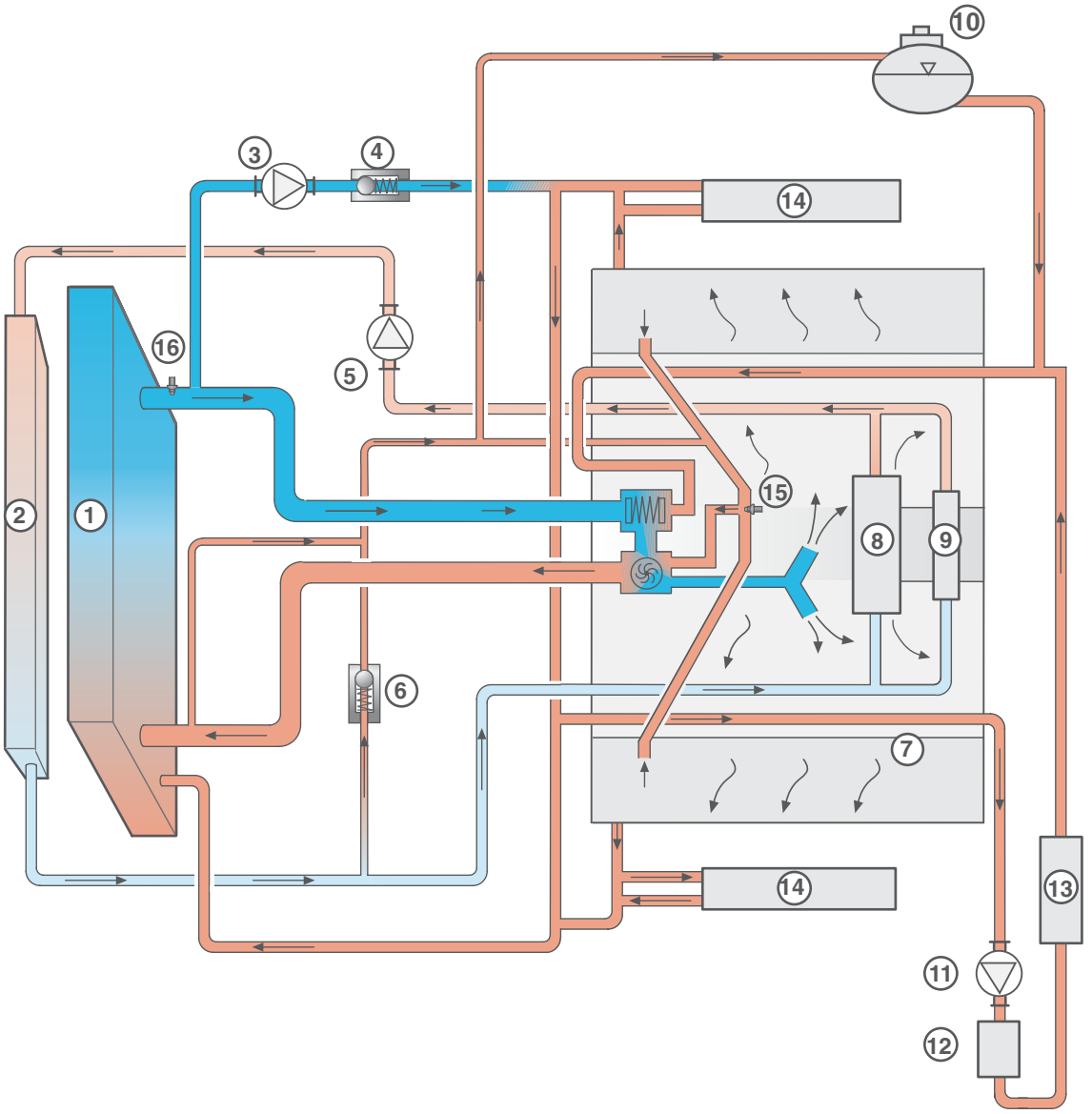
Oil Scavenge System, Downhill Driving



During downhill driving or braking, the oil collects in the front part of the oil pan. As a result, the oil level lies above the pickup tube, ensuring ample oil supply to the oil pressure pumps. The return oil from the turbocharger and auxiliary drive flows into the oil sump through the open flap traps.

Coolant Circulation System

System Overview



Engine Coolant Circulation

Warm

Cold

Coolant Circulation for Alternator and Fuel Cooling (Touareg Only)

Warm

Cold

303_039

1. Cooler for Engine Coolant Circulation
2. Cooler for Alternator/Fuel Cooling
3. Pump for Coolant After-run V51
4. Check Valve
5. Pump for Fuel Cooling V166
6. Valve Body
7. Cylinder Head/Cylinder Block
8. Generator (Alternator)
9. Fuel Cooler
10. Compensator Reservoir
11. Recirculation Pump V55
12. Heater Core for Heater
13. Auxiliary Water Heater (Auxiliary Heater)
14. Cooler for Exhaust Return (Phaeton only)
15. Engine Coolant Temperature (ECT) Sensor G62
16. Coolant Temperature Sensor - Radiator Outlet G83

Coolant Circulation for Alternator and Fuel Cooling

In the Touareg, the V10-TDI engine has a separate coolant circulation for the alternator and the fuel cooling. This is required because the temperature of the coolant is too high to cool the returning fuel when the motor is running.

Pump for Coolant After-run V51

The pump for coolant after-run is an electrically driven pump that is activated by the Engine Control Module (ECM).

It fulfills two duties:

1. At low engine speeds, the pump for coolant after-run supports the mechanically-driven coolant pump, thus providing for sufficient coolant circulation.
2. To carry out the coolant after-run function, the pump is activated by the ECM according to a characteristic map.

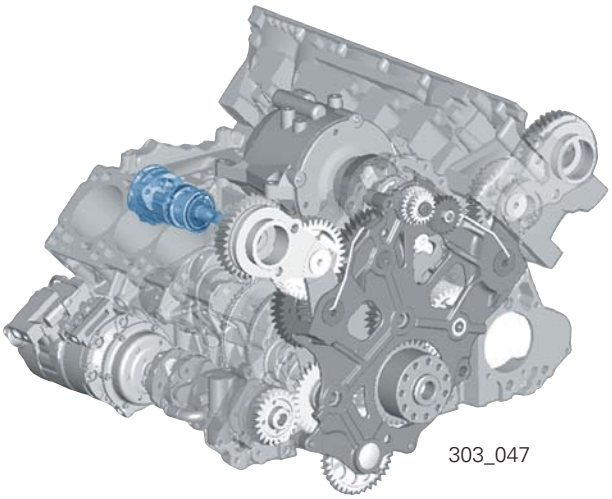
Recirculation Pump V55

The fuel cooling pump is an electrical circulation pump. If required, it is activated by the Climatronic control unit, providing coolant circulation for the alternator and the fuel cooling.

1. When the engine is running, the pump provides an increased flow of coolant through the heater core for the heater; it also supports the functioning of the auxiliary heater.
2. The pump fulfills the duties of the residual heat function up until 30 minutes after the engine is stopped. For this purpose, it is activated by the Climatronic control unit when the driver activates the residual heat function.

Pump for Fuel Cooling V166

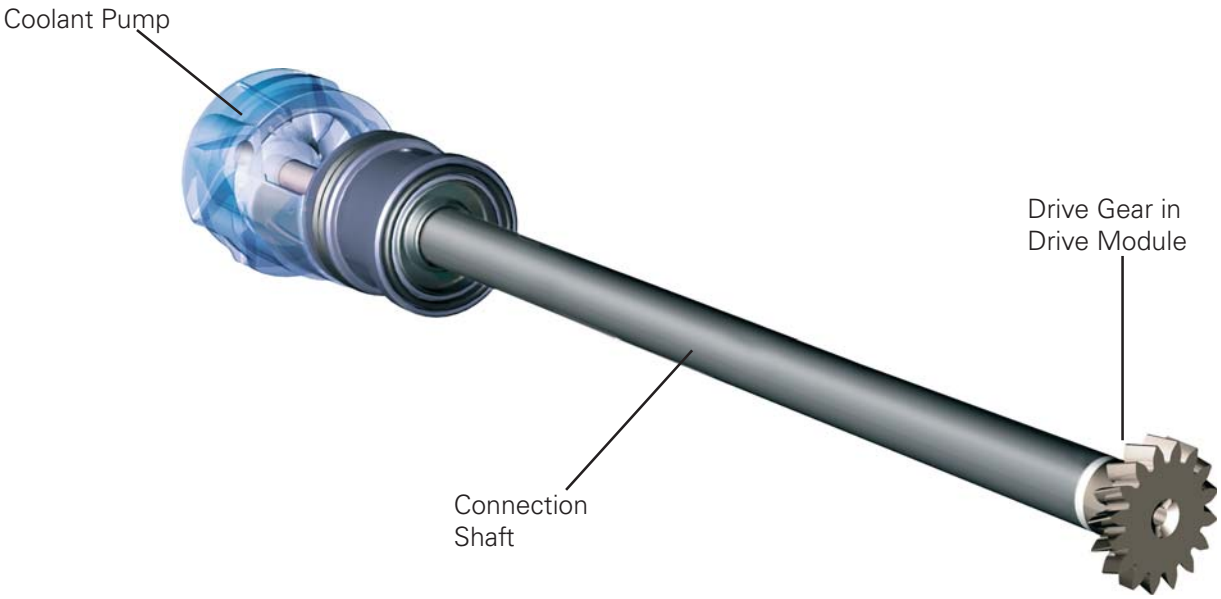
The fuel cooling pump is an electrical circulation pump. If required, it is activated by the ECM, providing coolant circulation for the alternator and the fuel cooling.



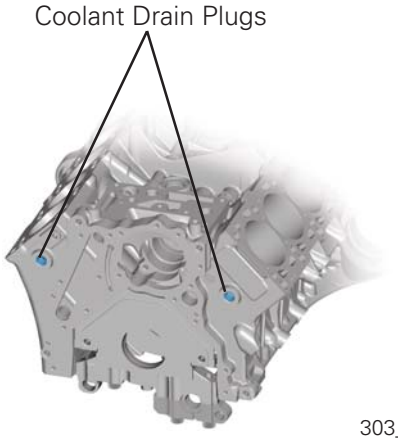
303_047

Coolant Pump

The coolant pump is located on the front of the engine block. It is driven by the belt drive module by a connection shaft.



303_075



303_076

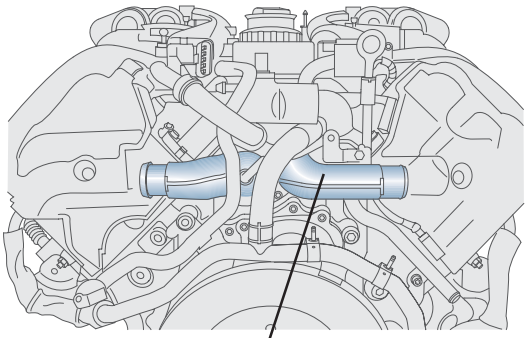
Coolant Drain Plugs

Two coolant drain plugs are located on the engine face in the cylinder block. When the cylinder heads or another component in the V-space of the engine is removed, the coolant drain plugs can be used to drain the coolant down to the level of the coolant pump.

Thermostat for Map-Controlled Engine Cooling

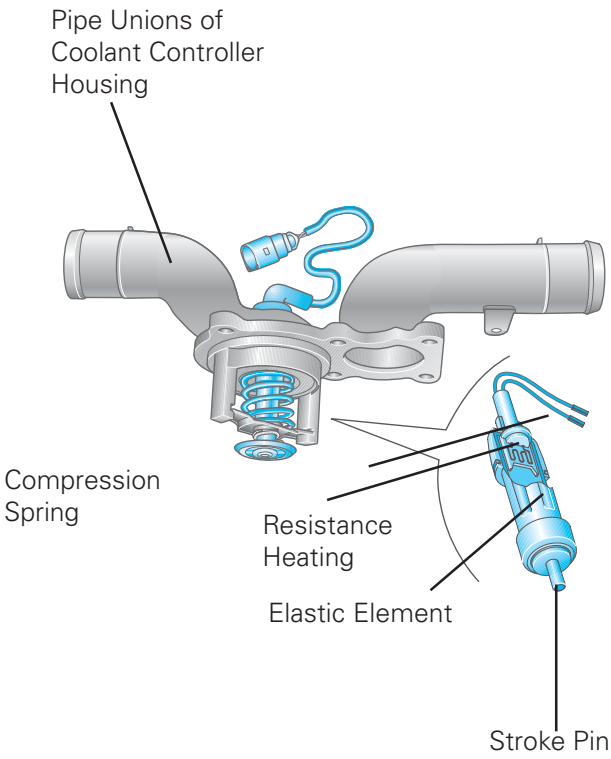
The thermostat for map-controlled engine cooling is located in the pipe union of the coolant controller housing. It switches between the large and the small coolant circulation systems. For this, it is activated by the ECM according to the requirements of the engine's operating state. Characteristic maps that contain the nominal value temperature, depending on the engine load, are stored in the ECM.

The advantage of characteristic map-controlled engine cooling is that the coolant temperature level can be adapted to the current operating state of the engine. This helps to reduce fuel consumption in the partial-load range and to reduce exhaust emissions.

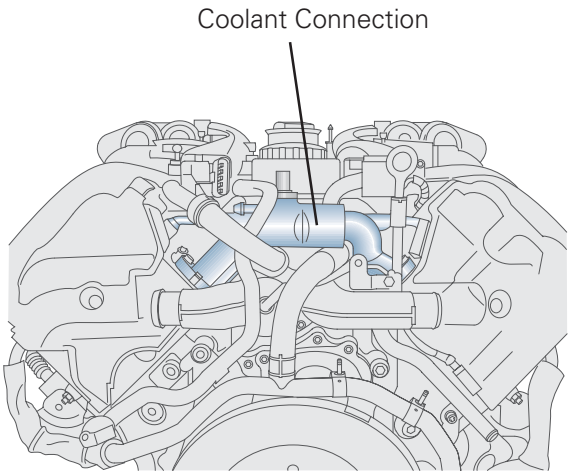


303_026

Pipe Unions of Coolant Controller Housing



303_015

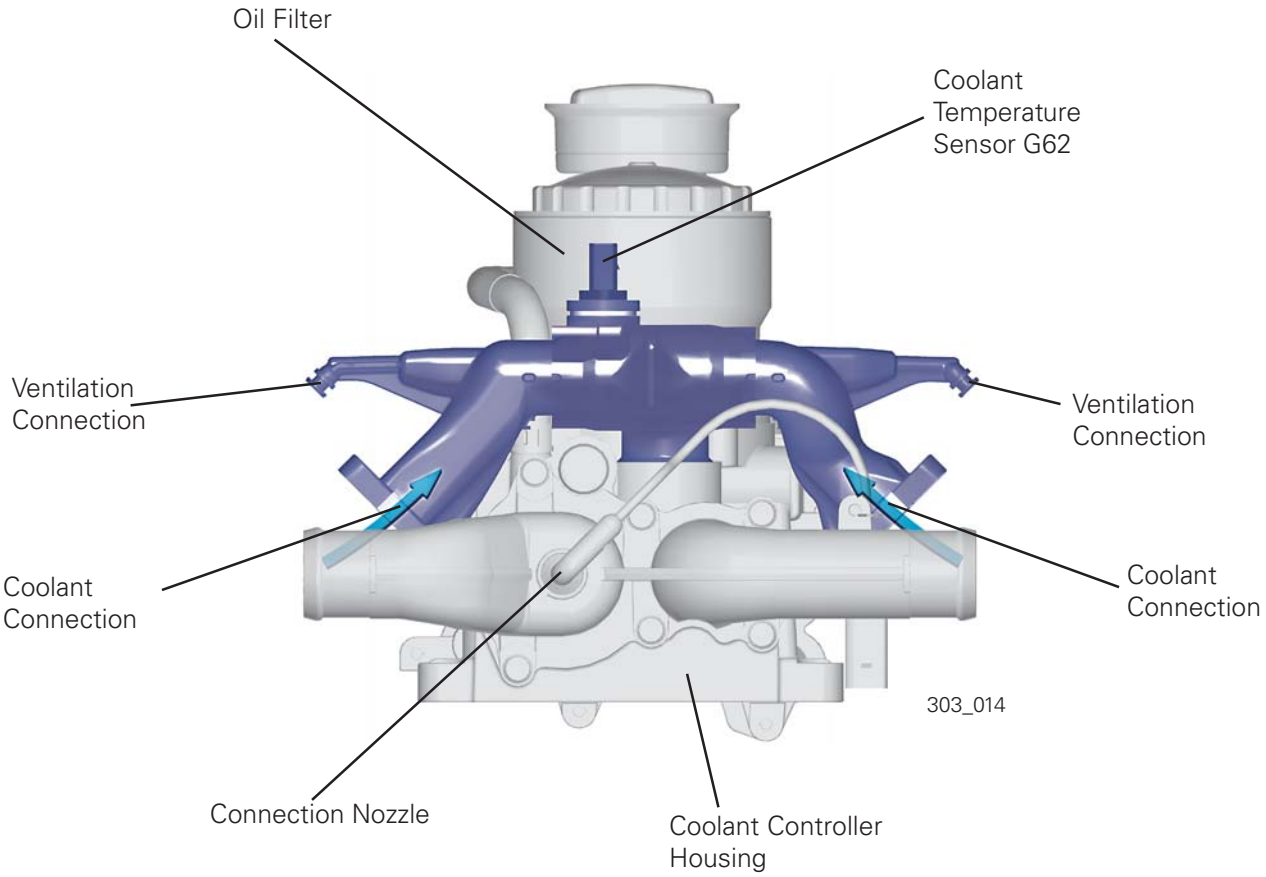


Water Connection

The water connection is located in the V-space of the engine, above the coolant controller housing.

It connects the coolant circulation of the two cylinder heads. The coolant is transported out of the cylinder heads through the two large connections to the coolant controller housing. The topmost small connections are used for ventilation.

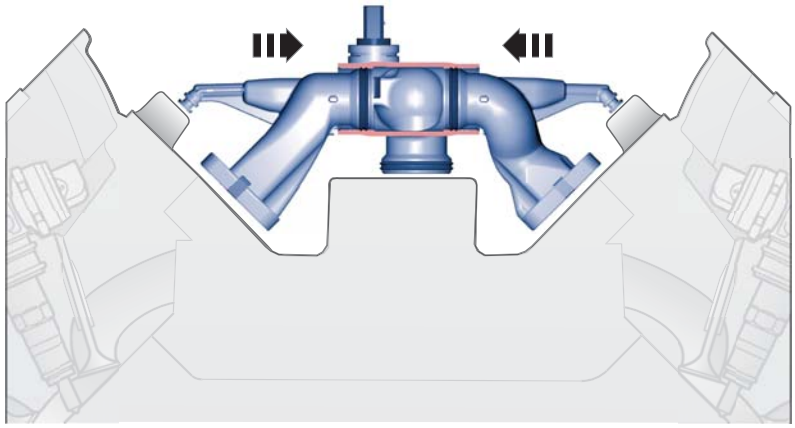
303_012



Removal and Installation

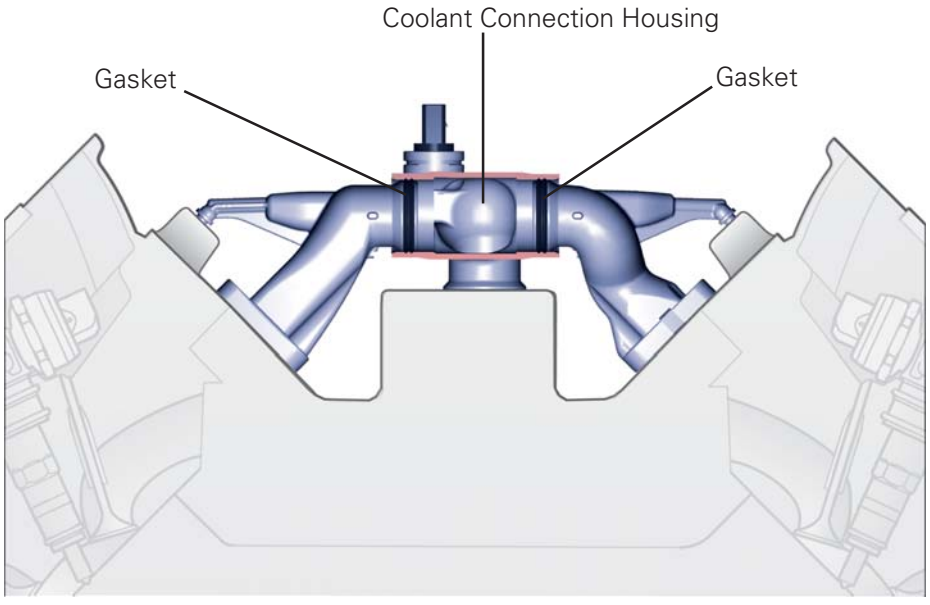
To permit the coolant connection in the V-space of the engine to be removed and installed, the two large connections in the coolant connection housing can be pushed in/pulled apart.

Coolant Connection - Assembly Position



303_105

Coolant Connection - Installed Position

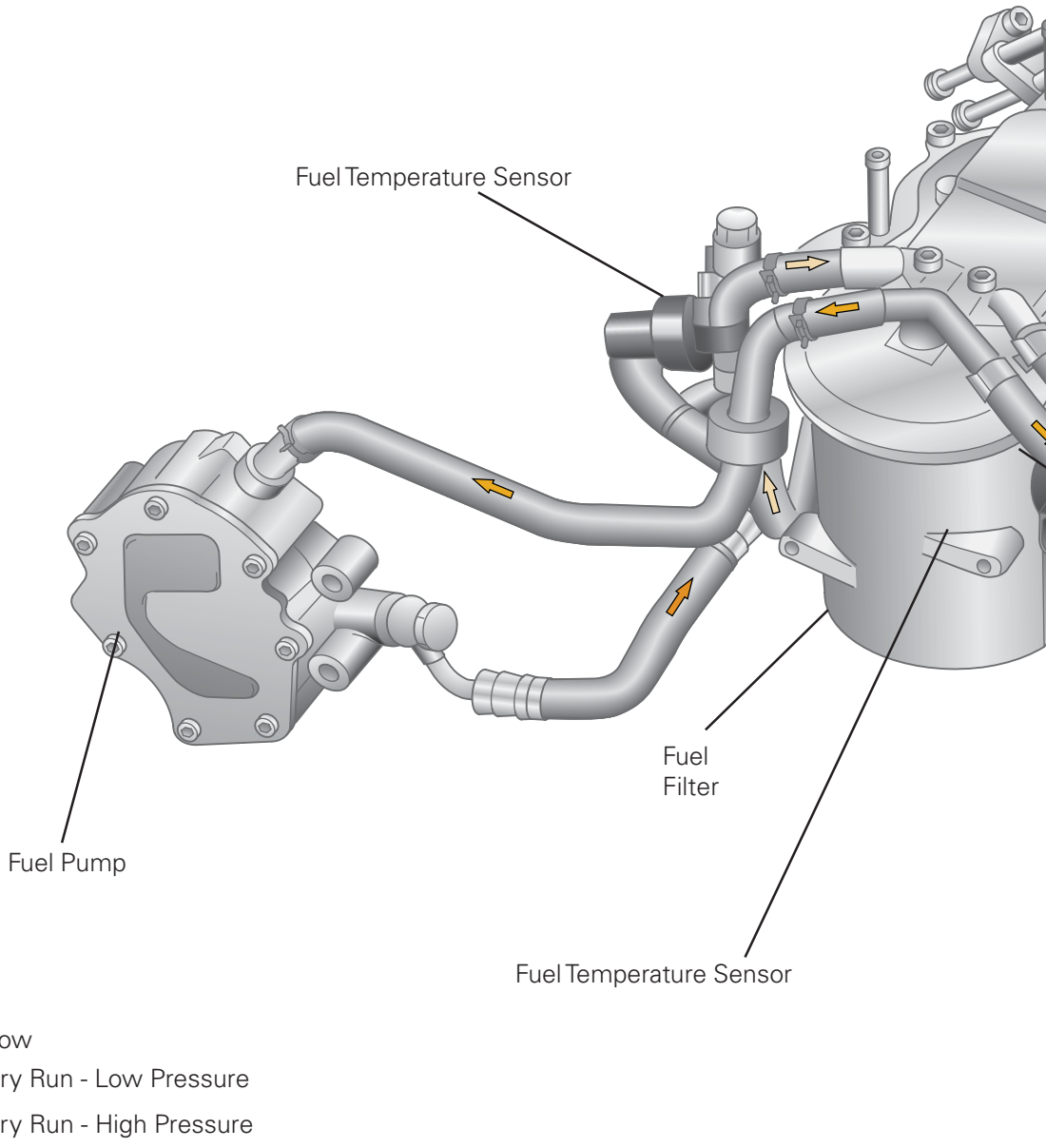


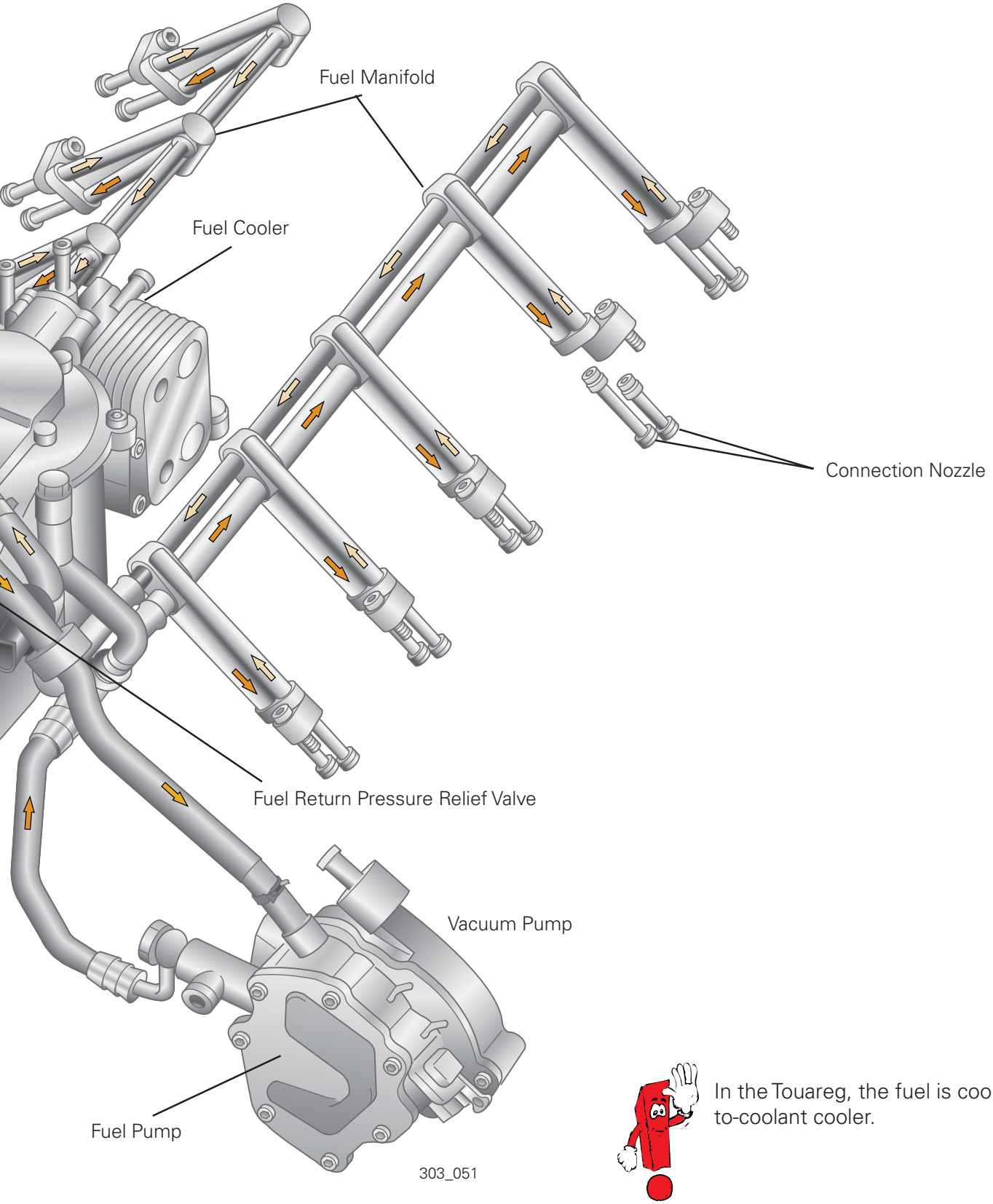
303_013

Fuel System

The fuel is transported out of the fuel tank to the fuel filter unit by electrical fuel pumps. The mechanical fuel pumps suck the fuel out of the fuel filter unit and transport it at high pressure into the preliminary run of the fuel rails.

The fuel not required for fuel injection is returned to the tank through the return fuel rails, fuel filter, and fuel cooler.





In the Touareg, the fuel is cooled by a fuel-to-coolant cooler.

Overall Schematic Diagram

The **Electrical Fuel Pumps** work as preliminary transport pumps, pumping fuel to the fuel filter unit.

The **Check Valves** prevent fuel in the fuel manifold and the preliminary run line from flowing back into the fuel tank when the engine is at a standstill.

The **Fuel Filter Unit** protects the injection system from excessive wear by removing dirt and water.

The **Fuel Pumps** transport the fuel out of the fuel filter unit and pump it at high pressure into the preliminary run of the fuel rails.

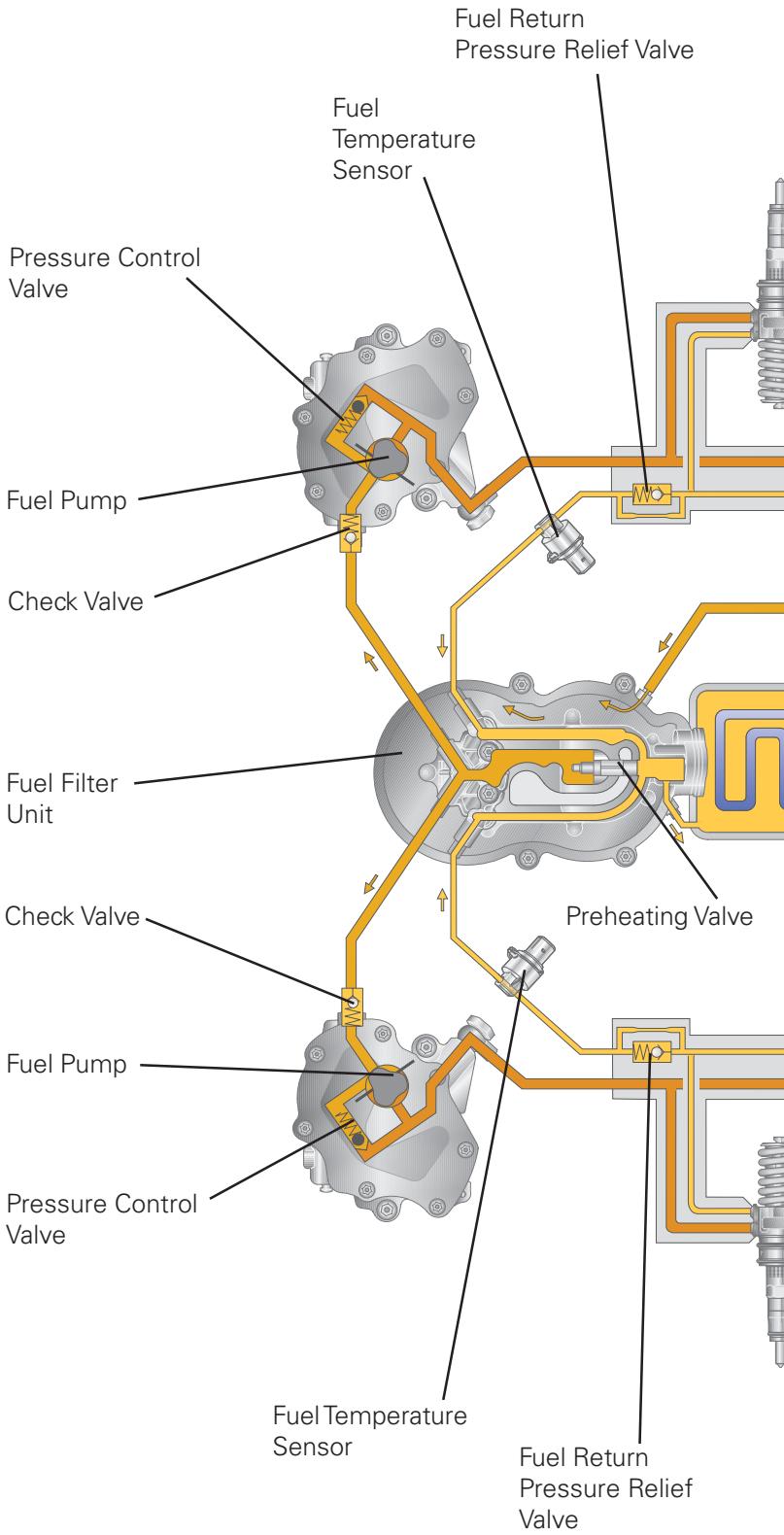
The **Pressure Control Valves** regulate the fuel pressure in the fuel preliminary run to approximately 8.5 bar.

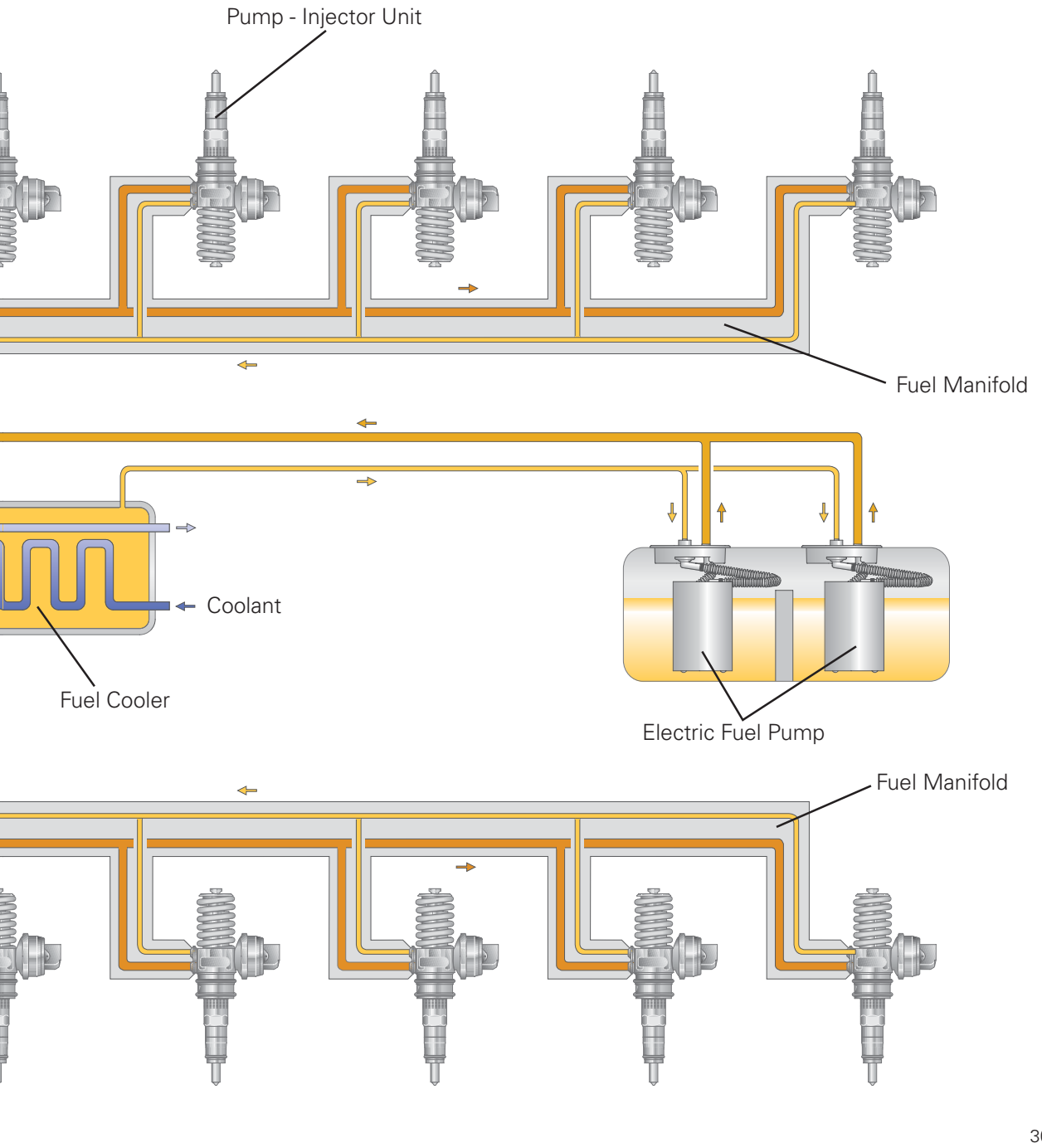
The **Pressure Relief Valves** limit the fuel pressure in the fuel return flow to approximately 1 bar. As a result, the pressure conditions in the fuel system are balanced.

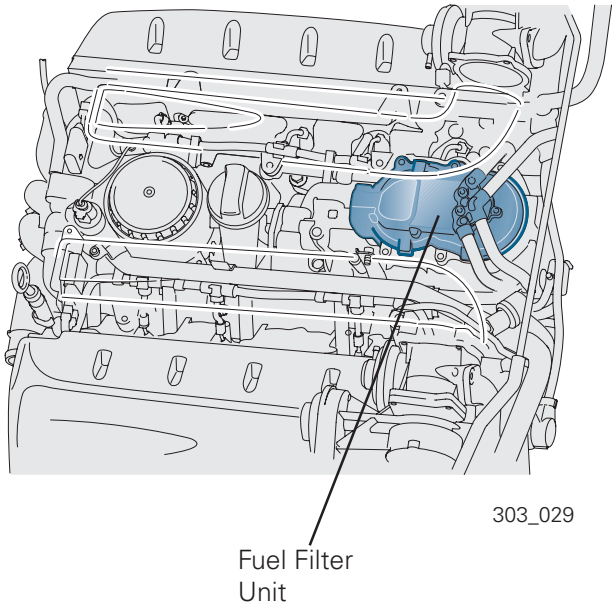
The **Fuel Temperature Sensors** are used to record the fuel temperature for the ECMs.

The **Preheating Valve** guides the fuel in the return flow into the fuel filter unit when the outside temperature is low, thus preventing clogging of the filter inserts.

The **Fuel Cooler** cools the fuel in the return flow to protect the fuel tank from fuel that is too hot.



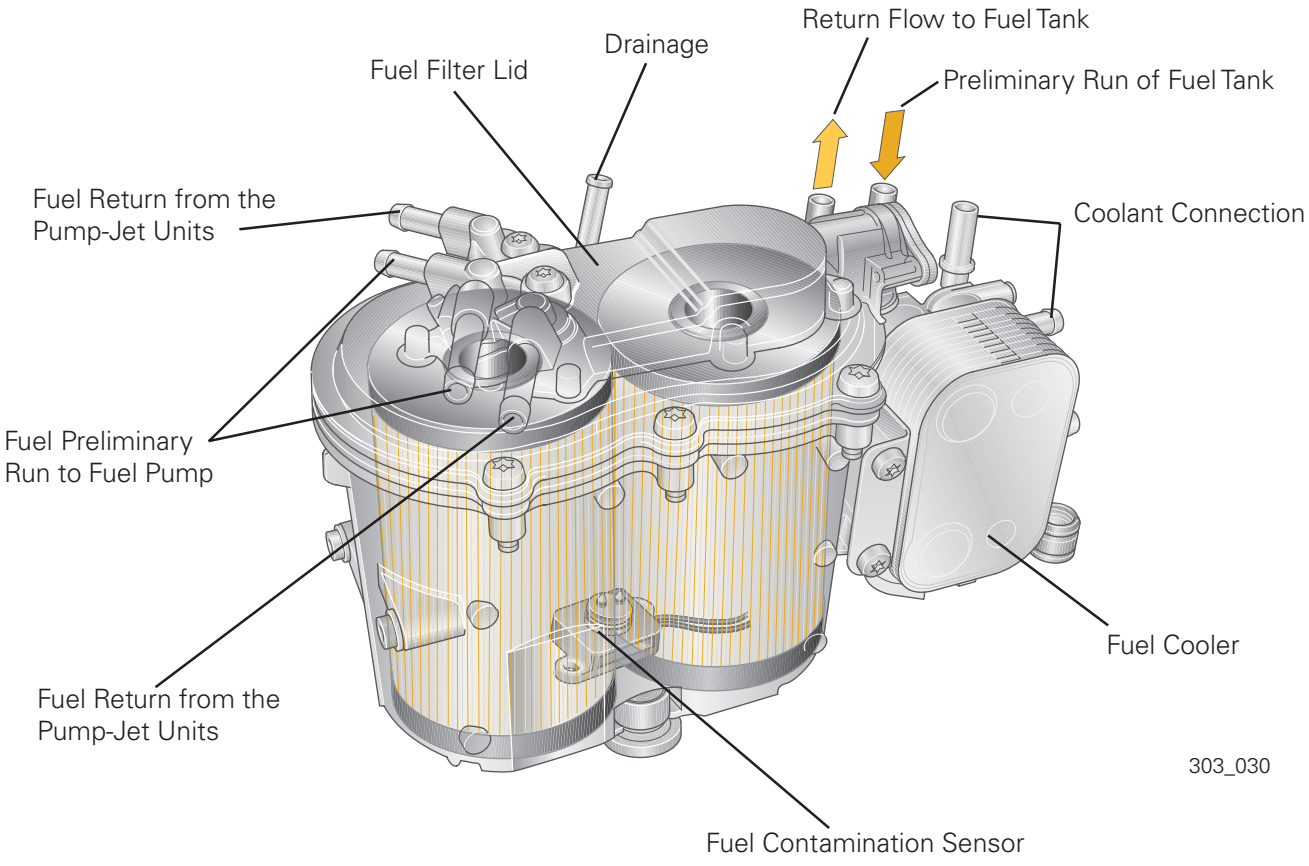

Pump - Injector Unit
Fuel Manifold
Coolant
Fuel Cooler
Electric Fuel Pump
Fuel Manifold
303_088
Return
Preliminary Run - Low pressure
Preliminary Run - High pressure



Fuel Filter Unit

The fuel filter unit is located in a crash-safe position in the V-space of the engine. It contains two filter inserts and a sensor for the fuel contamination. The sensor for the fuel contamination is used to inform the driver if the water level in the filter unit is too high, using an indicator light in the dash panel insert.

There is a preheating valve in the lid of the fuel filter unit; when the outside temperature is low, this guides the fuel in the return flow from the engine back into the filter. In the Touareg, a coolant-fuel cooler is integrated into the fuel filter unit. It cools the fuel flowing back into the fuel tank, thus preventing damage to the fuel tank by return flow fuel that is too hot.



Preheating Valve

At low outside temperatures, diesel fuel tends to thicken. This can clog the fuel filter; as a result, operating the engine may no longer be possible due to a lack of fuel.

Warm Fuel Temperature

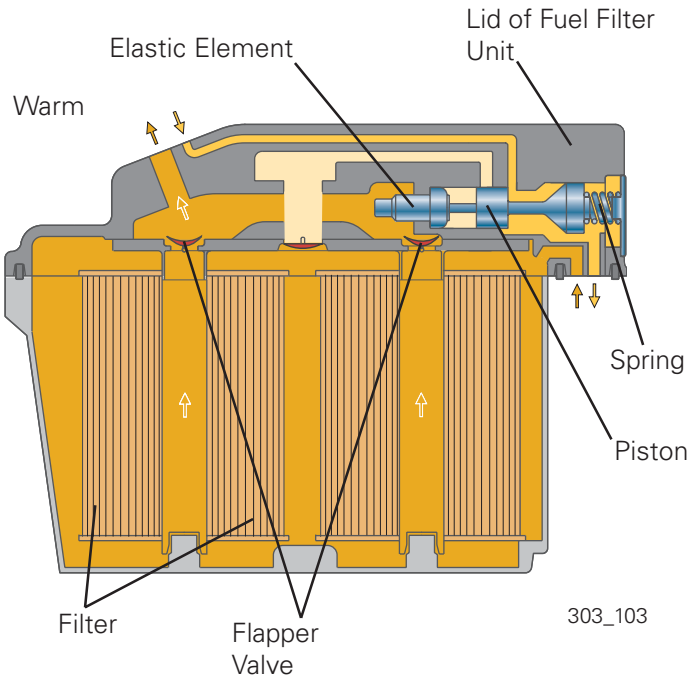
At a fuel temperature above 104°F (40°C) in the fuel preliminary run, the piston is pressed against the spring by the elastic element. The preheating valve completely opens the way into the fuel return flow. The fuel that is flowing back from the pump-jet units directly enters the return flow to the fuel tank.

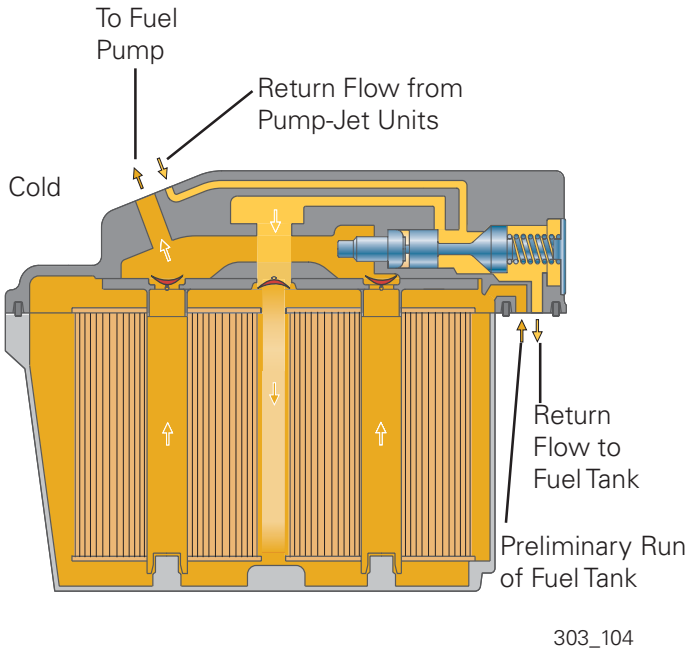
In the fuel preliminary run, the fuel is transported via filter inserts and the flapper valve to the fuel pumps.

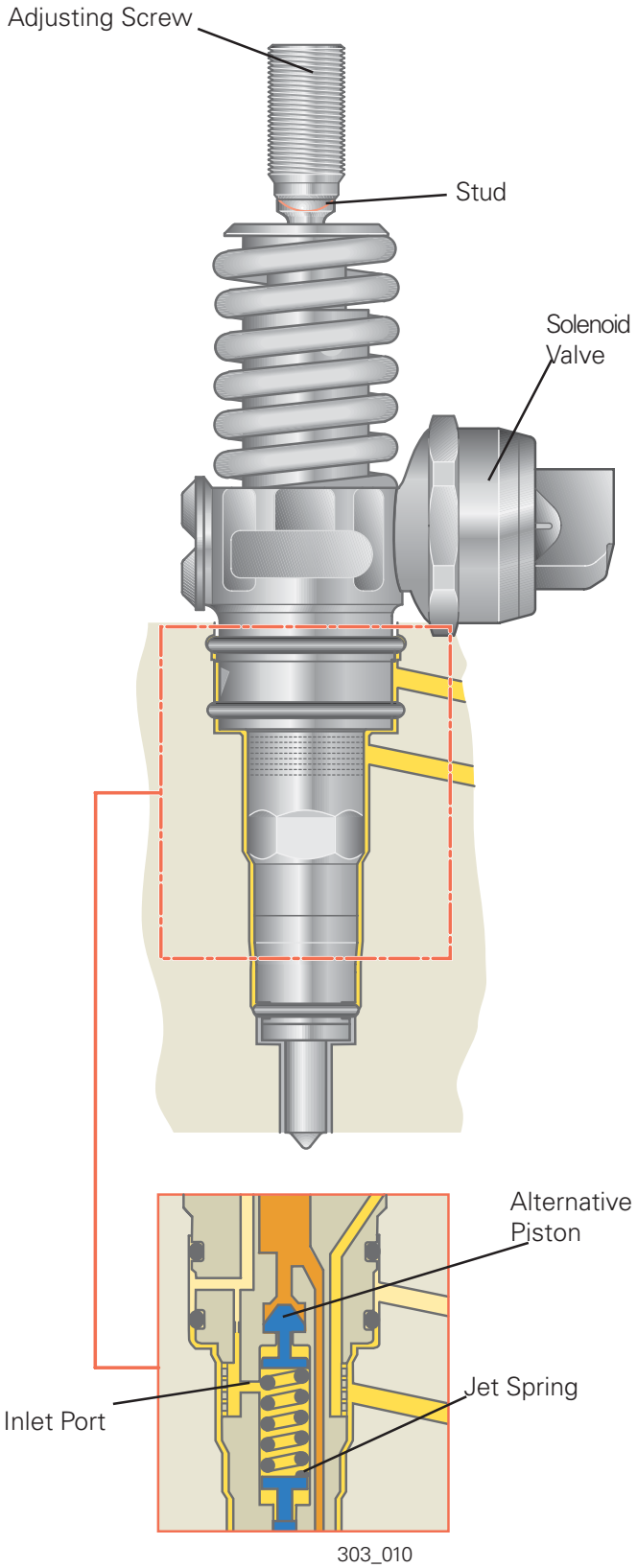
Cold Fuel Temperature

At a fuel temperature below 50°F (10°C), the elastic element contracts, so that the spring force of the piston closes the way to the fuel tank. As a result, the fuel that is flowing back from the pump-jet units is guided to the filters. The fuel in the filter unit is heated, thus preventing clogging of the filters.

Depending on the outside temperature, the preheating valve guides the fuel that is flowing back from the pump-jet units either to the fuel filters or to the fuel tank.







Pump-Injector Units

The same type pump-injector units used in the 1.9l/74 kW TDI engine are also used in the V10-TDI engine.

They are characterized by:

- A low-friction drive
- An increased injection pressure in the partial load range
- A compact solenoid valve

To provide a low-friction drive, the adjusting screw is equipped with a rounded end while the stud is provided with a ball socket. Due to the large radius, the surface pressure is low. In addition, the engine oil can collect in the ball socket, thus ensuring good lubrication between the adjusting screw and the stud.

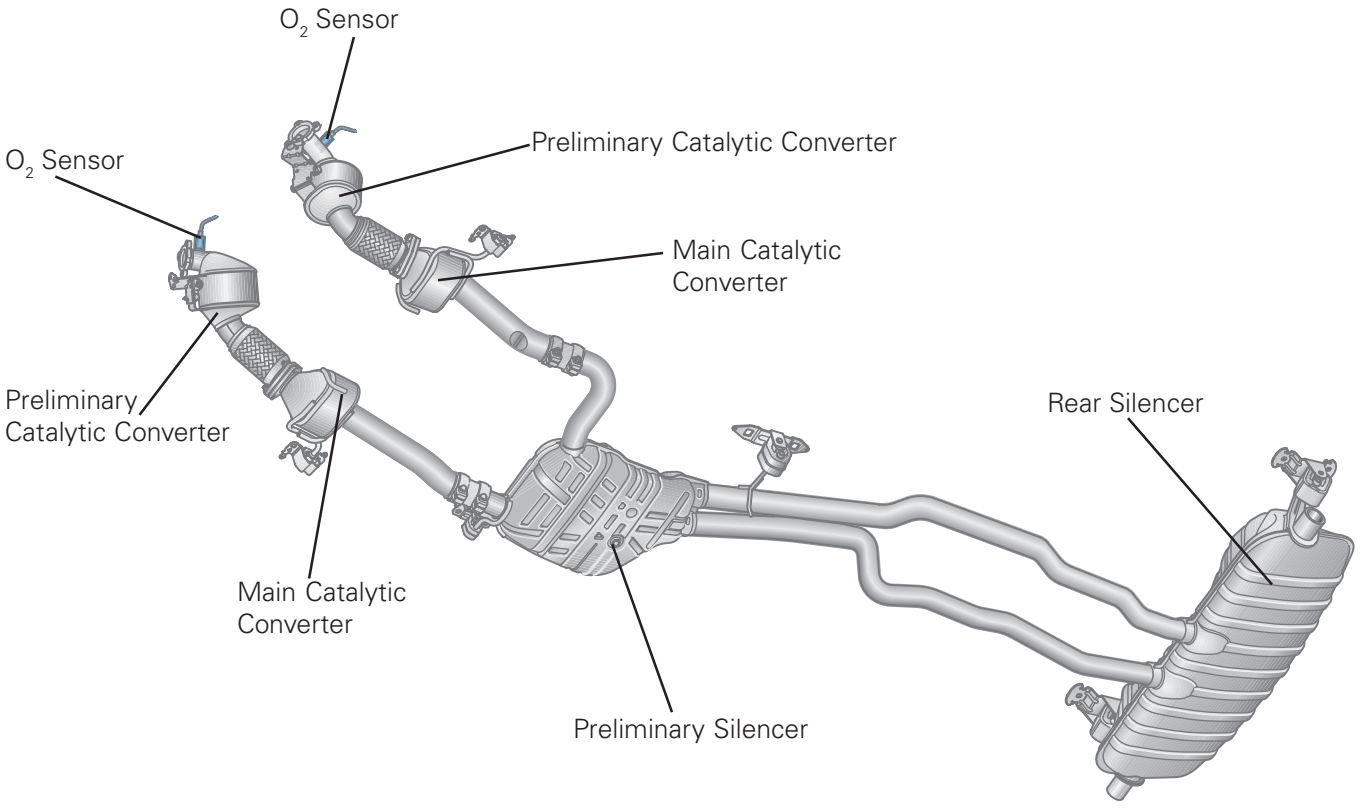
In the partial load range, the injection pressure is increased by an alternative piston with a large stroke. Due to the large stroke of the alternative piston and the throttling effect of the inlet port between the jet spring space and the fuel channel, the pressure in the jet spring space increases. The jet springs are further prestressed, thus increasing the injection pressure.

Exhaust System

The all-stainless steel exhaust system of the V10-TDI engine consists of one preliminary catalytic converter and one main catalytic converter per cylinder bank, as well as a preliminary silencer and a main silencer.

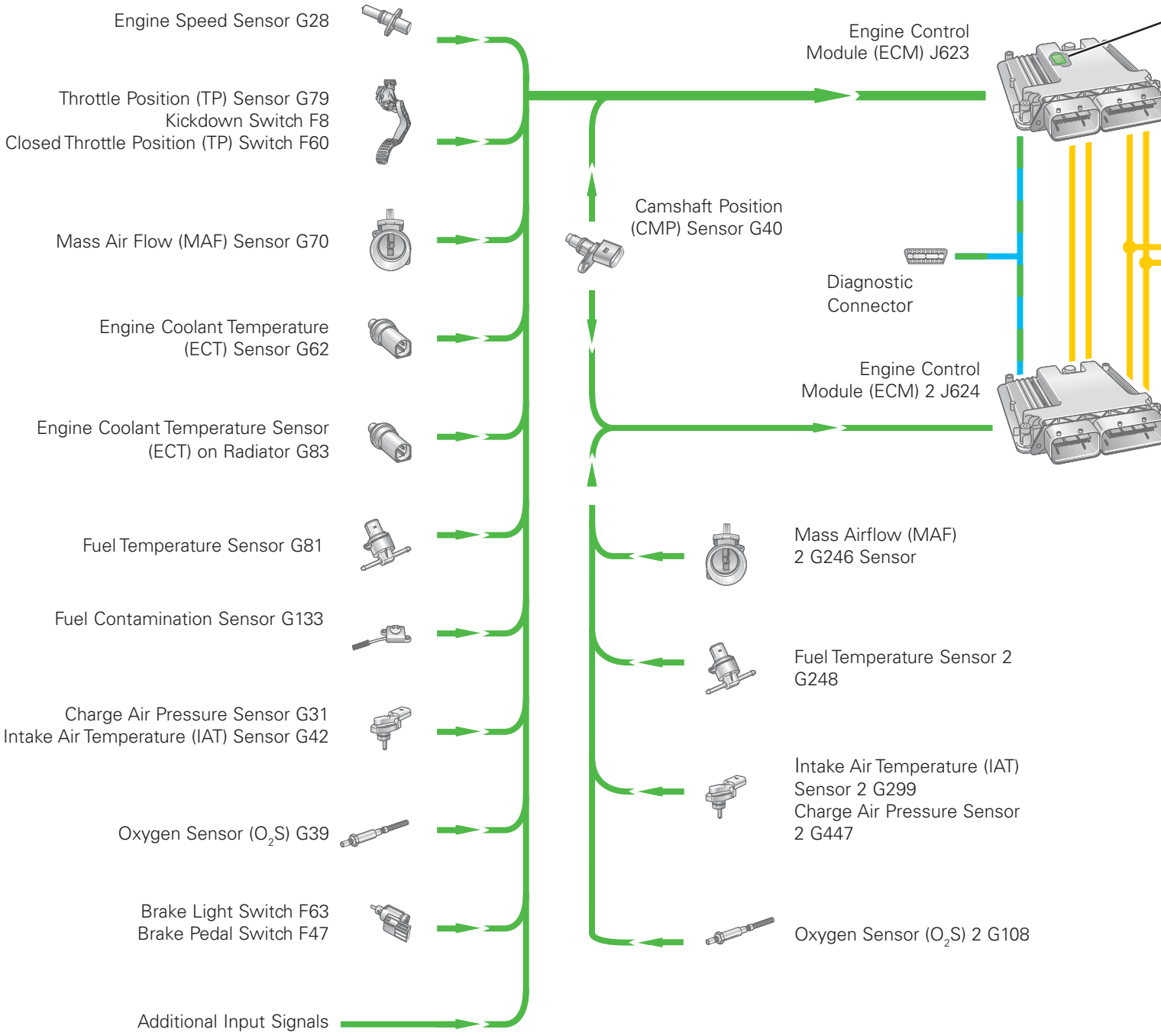
All catalytic converters are oxidation catalytic converters.

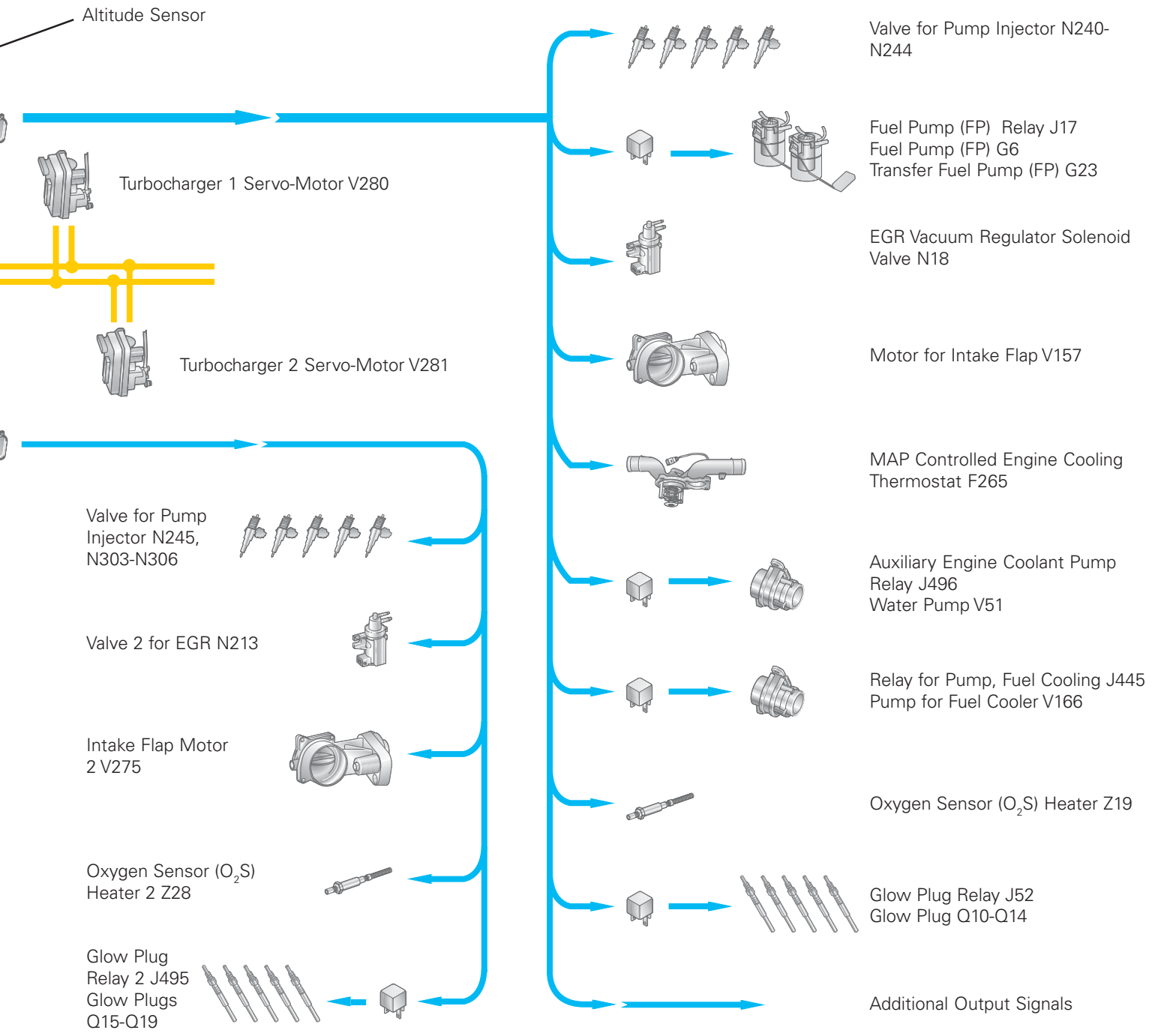
The preliminary catalytic converters are located near the engine so operating temperature can be quickly attained, ensuring a high degree of pollutant reduction. The oxygen sensors located in front of the preliminary catalytic converters are used to control exhaust gas recirculation.



Overview of Engine Management

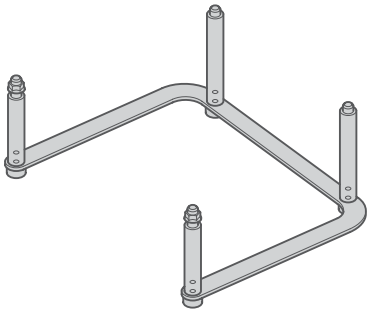
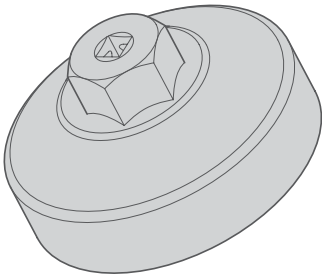
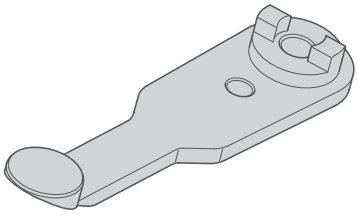
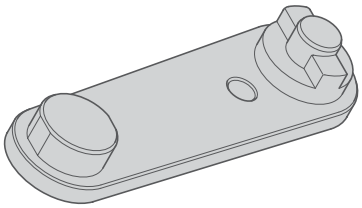
This section provides you with an overview of the V10-TDI engine management system. A detailed description of the sensors, actuators and functions of engine management can be found in Self-Study Program 89P303," Touareg Electronic Diesel Control EDC 16.



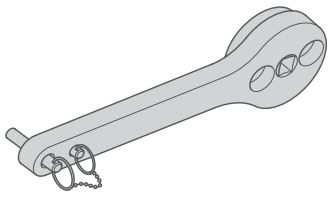
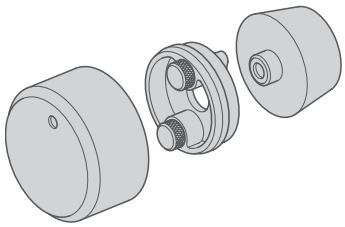
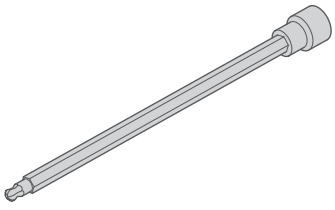
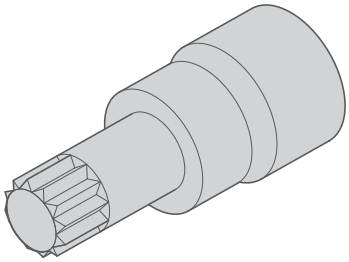

Altitude Sensor
Turbocharger 1 Servo-Motor V280
Turbocharger 2 Servo-Motor V281
Valve for Pump Injector N245, N303-N306
Valve 2 for EGR N213
Intake Flap Motor 2 V275
Oxygen Sensor (O_2S) Heater 2 Z28
Glow Plug Relay 2 J495
Glow Plugs Q15-Q19
Valve for Pump Injector N240-N244
Fuel Pump (FP) Relay J17
Fuel Pump (FP) G6
Transfer Fuel Pump (FP) G23
EGR Vacuum Regulator Solenoid Valve N18
Motor for Intake Flap V157
MAP Controlled Engine Cooling Thermostat F265
Auxiliary Engine Coolant Pump Relay J496
Water Pump V51
Relay for Pump, Fuel Cooling J445
Pump for Fuel Cooler V166
Oxygen Sensor (O_2S) Heater Z19
Glow Plug Relay J52
Glow Plug Q10-Q14
Additional Output Signals

303_036

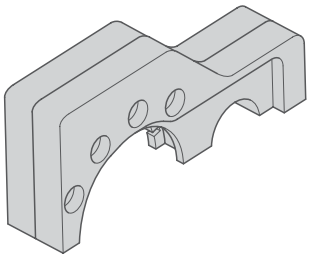
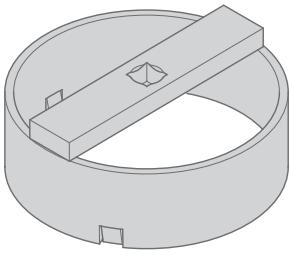
Service

Designation	Tool	Usage
T10191 Frame	 303_056	To switch off the V10-TDI engine
T10192 Oil Filter Key	 303_057	Removal and installation of the oil filter lid
T10193 Camshaft Clamp	 303_058	To fasten the camshaft cylinder bank 1 when setting the control times
T10194 Camshaft Clamp	 303_059	To fasten the camshaft cylinder bank 2 when setting the control times Removal and installation of the oil filter module

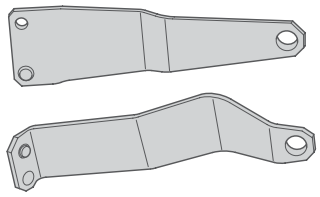
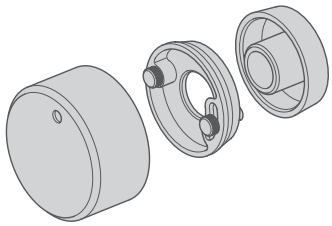
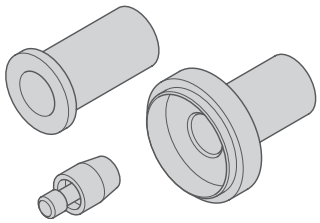
Service

Designation	Tool	Usage
T10195 Crankshaft Clamp	 303_061	To fasten the crankshaft when setting the control times
T10196 Key	 303_061	To install the PTFE crankshaft gasket on the flywheel side
T10197 Plug Cartridge SW6	 303_062	For removal and installation of various add-on pieces in the V-space of the engine
T10198 Plug Cartridge XZN16	 303_063	For removal and installation of the camshaft wheel

Service

Designation	Tool	Usage
T10199 Clamping Device	 303_064	Clamping the camshaft gears to remove and install the camshaft gears
T10200 Guide Pin	Figure not available at time of printing	For removal and installation of the belt drive module
T10201 Clamping Device	Figure not available at time of printing	For removal and installation of the bearing tunnel
T10202 Key	 303_067	For removal and installation of the fuel transport unit

Service

Designation	Tool	Usage
T10126 Transport Shackle	 303_108	To transport the V10-TDI engine with workshop crane VAS 6100
T10207 Assembly Equipment	 303_109	To install the PTFE crankshaft gasket on the gearbox side
T10208 Assembly Equipment	 303_110	To install the PTFE crankshaft gasket on the alternator shaft
T10210 Caliper	Figure not available at time of printing	To align the pump-injector units

Notes

Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment may or may not be required for Certification.

You can find this Knowledge Assessment at:

www.vwwebsource.com

From the vwwebsource.com Homepage, do the following:

- Click on the Certification tab
- Type the course number in the Search box
- Click "Go!" and wait until the screen refreshes
- Click "Start" to begin the Assessment

For Assistance, please call:

Certification Program Headquarters

1 - 877 - CU4 - CERT

(1 - 877 - 284 - 2378)

(8:00 a.m. to 8:00 p.m. EST)

Or, E-Mail:

Comments@ VWCertification.com

The Touareg
V10-TDI Engine

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