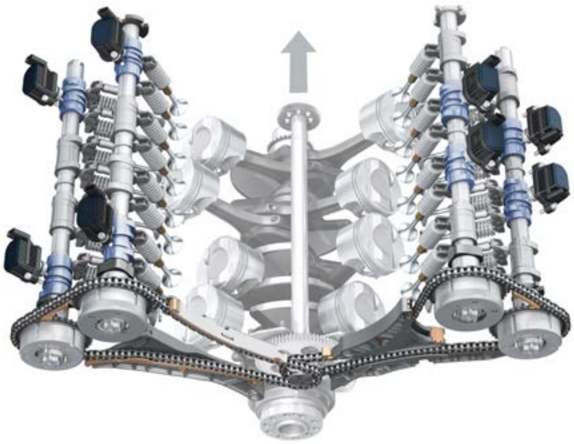


The Audi 4.0l V8 TFSI engine from the EA825 series

eSelf Study Program 920493

Audi Academy

Audi of America, LLC
Service Training
Created in the U.S.A.
Created 2/2020
Course Number 920493

Always check Technical Bulletins and the latest electronic service repair literature for information that may supersede any information included in this booklet.

The eSelf-Study Program (eSSP) teaches a basic understanding of the design and mode of operation of new models, new automotive components or new technologies.

It is not a repair manual! Figures are given for explanatory purposes only and refer to the data valid at the time of preparation of the SSP.

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

Release Date: February 2020

The new Audi V8 engine from the EA825 series is a joint development of Porsche and AUDI AG. The engine construction is based on the V6 engine from the EA839 series. This has advantages not only for the manufacturing process; the close relationship has benefits for after sales service as well. For example, many of the special tools can be used for both engines.

The new V8 engines were first introduced by two other Group brands: Bentley and Porsche. At Audi, the new V8 will be installed first in the A8.

The engines are manufactured in the new Porsche engine production facility in Zuffenhausen.

676_153

Learning objectives of this eSelf-Study Program:

This eSelf-Study Program describes the function of the 4.0l V8 TFSI engine of the EA825 engine series. Once you have completed this eSelf-Study Program, you will be able to answer the following:

- What are the technical characteristics of the engine?
- How do the oil supply and engine cooling systems work?
- What are the special features of the air supply system?
- What effect does the improved injection system have?
- What has changed for after-sales service and maintenance?

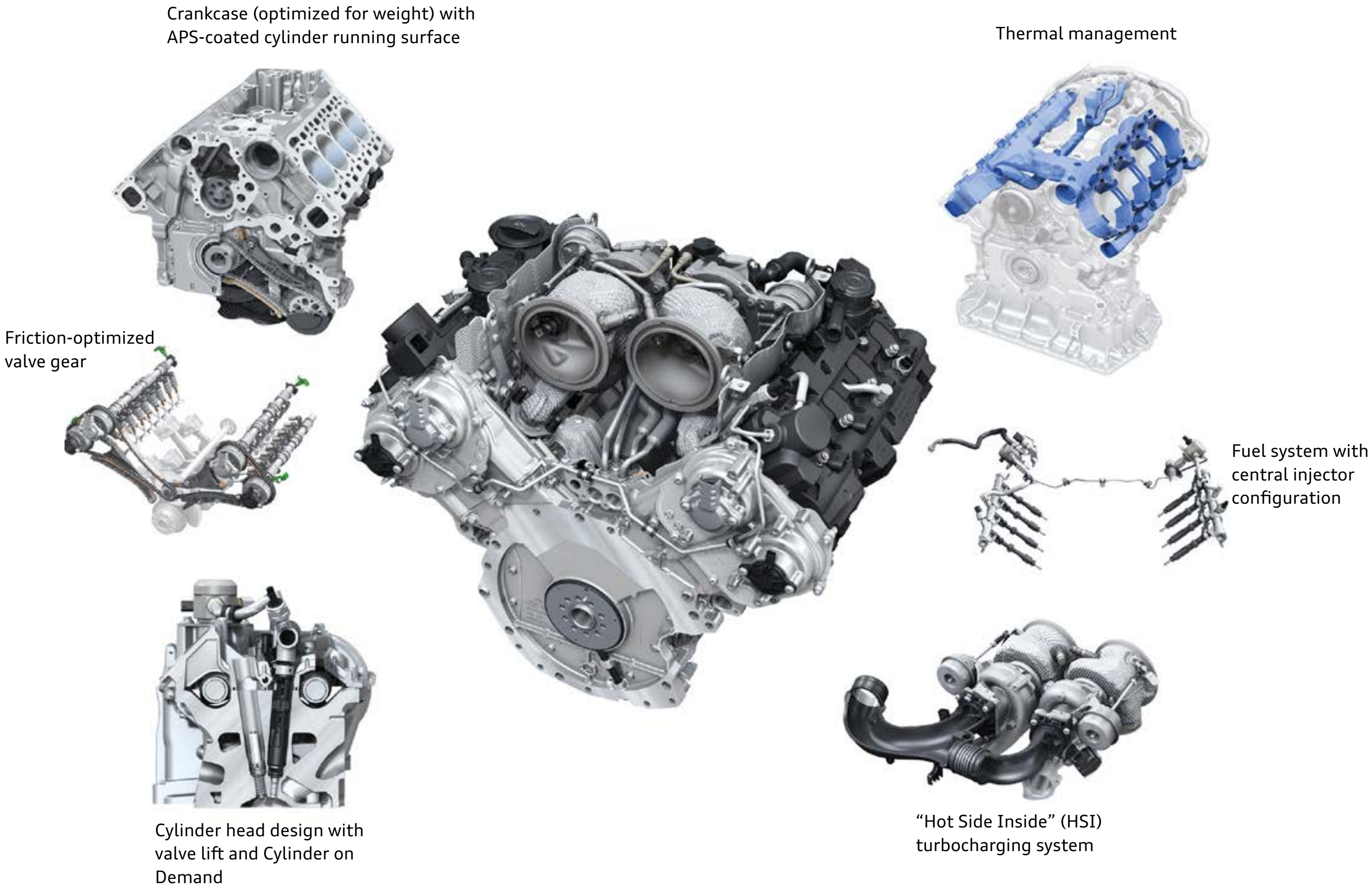
Engine description and special features

- Eight-cylinder V-engine with 90° bank angle
- Aluminum cylinder block
- Chain drive valve timing
- Four valves per cylinder, double overhead camshafts (DOHC), roller cam followers, variable valve timing
- Turbochargers with charge air cooling (maximum charge pressure: 31.9 psi [2.2 bar] absolute)
- Emission control system with pre and main catalytic converter system, Oxygen sensors
- High-pressure and low-pressure fuel systems (controlled according to demand)
- Cylinder on Demand (CoD)
- Indirect charge air cooling system
- Fully electronic direct injection with electric throttle
- Adaptive Oxygen sensor control
- Mapped ignition with single ignition coils
- Cylinder-selective adaptive knock control
- Thermal management system

Advantages over the previous version V8 from the EA824 family:

- High torque at low rpm
- Improved responsiveness
- Significant increase in efficiency
- Increased power output and torque
- Better fuel economy
- Meets the relevant country-specific emission standards
- Thermal management system (new cooling module)
- Reduced engine friction
- Improved injection system

Highlights of the new V8 engine



676_002

Technical data

Torque-power curve of 4.0l V8 FSI engine (engine code CXYA)

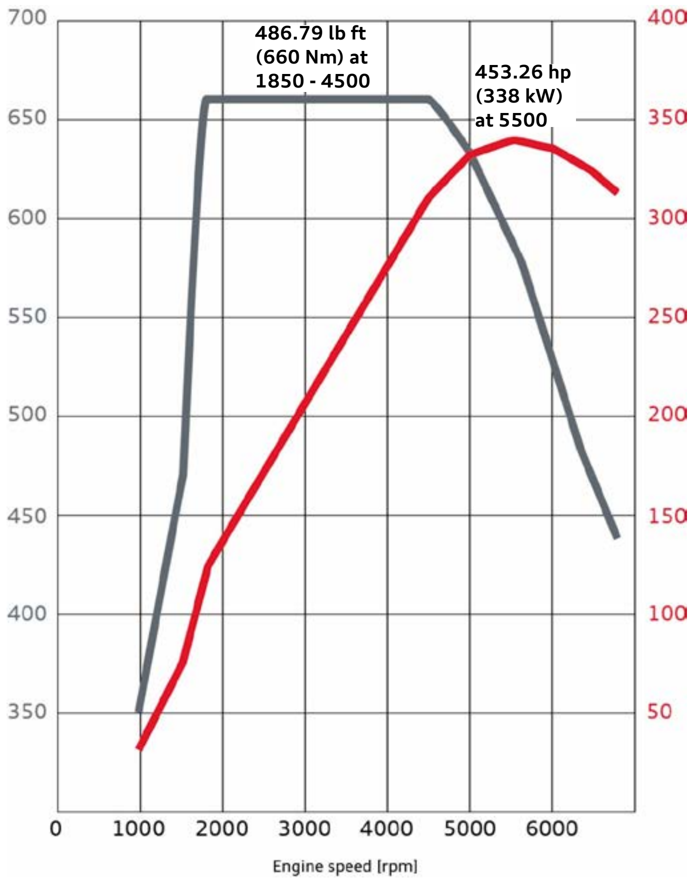


Diagram: engine at full load

Power output in kW

Torque in Nm

676_003

Features	Specifications
Engine code	CXYA
Design	8-cylinder engine with 90° V angle
Capacity	243.85 cu in (3996 cm)³
Stroke	3.38 in (86.0 mm)
Bore	3.38 in (86.0 mm)
Cylinder spacing	3.22 in (82.0 mm)
Number of valves per cylinder	4
Firing order	1-3-7-2-6-5-4-8
Compression ratio	11.0 : 1
Power output at rpm	453.26 hp (338 kW) at 5500
Torque at rpm	486.79 lb ft (660 Nm) at 1850 - 4500
Fuel	Premium unleaded
Turbocharging	"Hot Side Inside" (HSI) turbochargers with charge air cooling (maximum charge pressure: 31.9 psi [2.2 bar] absolute)
Engine management	Bosch MG1CS008
Engine weight	509.2 lb (231 kg)
Emission control	Dual exhaust system with pre-catalytic converter and 3-way catalytic converter
Emission standard	ULEV125, (Pr. number:7MU)
Firing order during changeover to 4 cylinder operation (cyl. 2, 3, 5, 8 shut off)	1-7-6-4

Engine mechanics

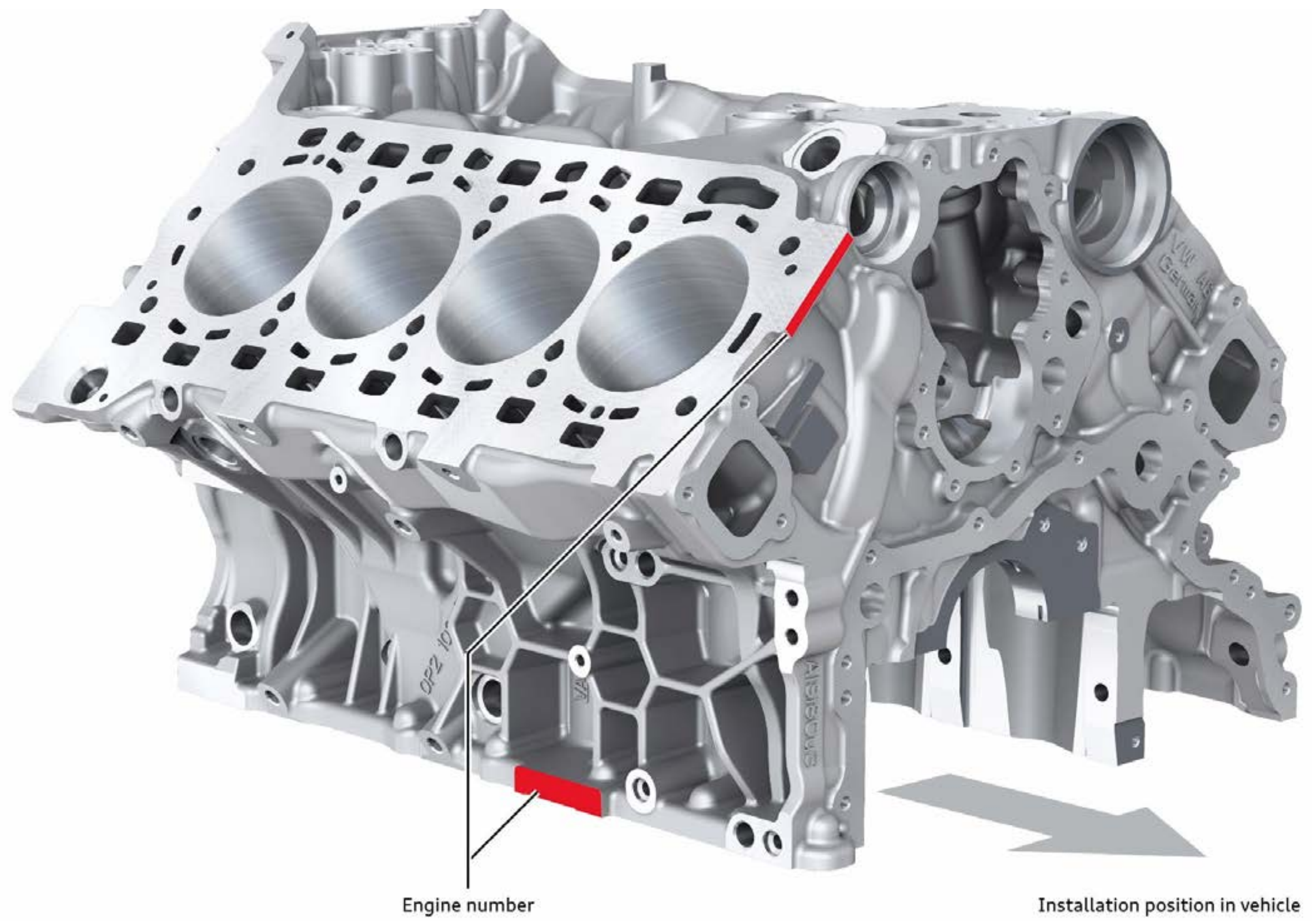
Cylinder block

The aluminum (ALSi9Cu3) cylinder block is single sand cast unit. It is a “deep skirt” design. This means the individual cylinder walls reach down as far as the upper oil sump providing a very high degree of rigidity. The entire cylinder block including the bearing covers and corresponding bolts weighs 86.2 lb (39.1 kg).

In addition to the oil and cooling passages, the following components and assemblies are integrated with or installed on the cylinder block:

- Oil spray jets
- Water pump intermediate shaft
- Oil pump
- Oil cooler
- Coolant pump
- Engine mounting
- Mounting points for ancillary components

The engine number is engraved on a plate on the front of the engine below cylinder bank 1. There is also a sticker with the engine code and serial number attached to the vacuum pump cover.



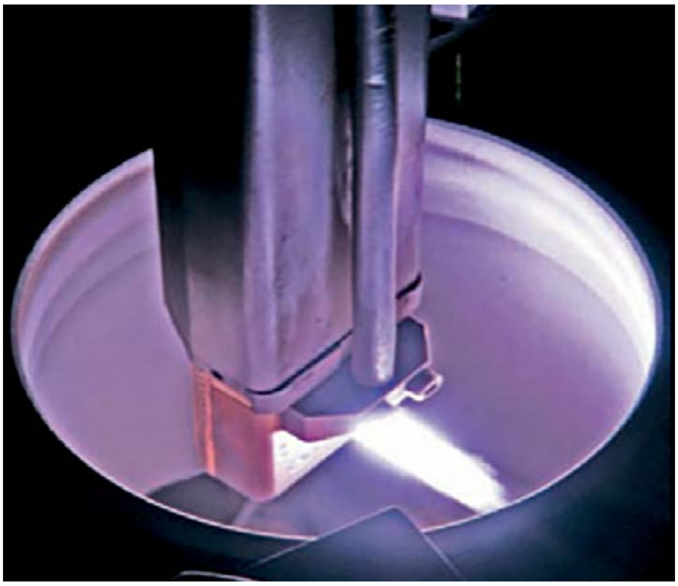
676_004

Atmospheric plasma spraying (APS)

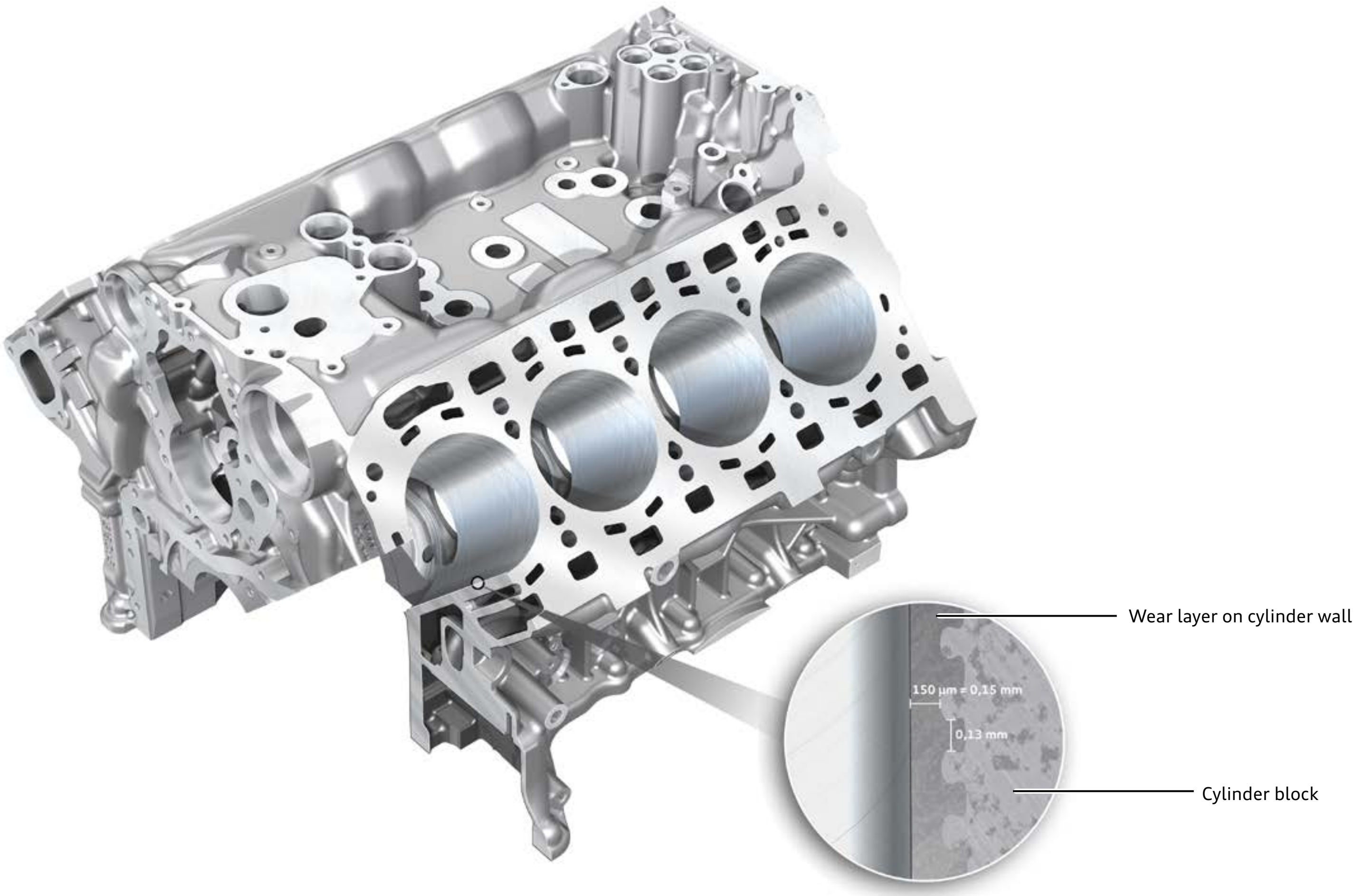
To create a sufficiently robust iron running surface, the cylinder walls are first roughened with a special milling tool which cuts a dovetailed pattern into the cylinder. The resulting undercuts ensure that the APS coating adheres properly.

A rotating plasma torch is then inserted into the cylinder. An arc discharge is used to create a plasma into which a powdered coating material is blown using compressed air. The powder melts and is sprayed onto the rough cylinder wall. There it solidifies and fills the undercuts thus creating a wear layer.

A layer of iron (roughly equivalent to 100Cr6 bearing steel) is applied in several layers in approximately 30 seconds. The final thickness is approximately 150 micrometers. (One micrometer equals one millionth of a meter.)



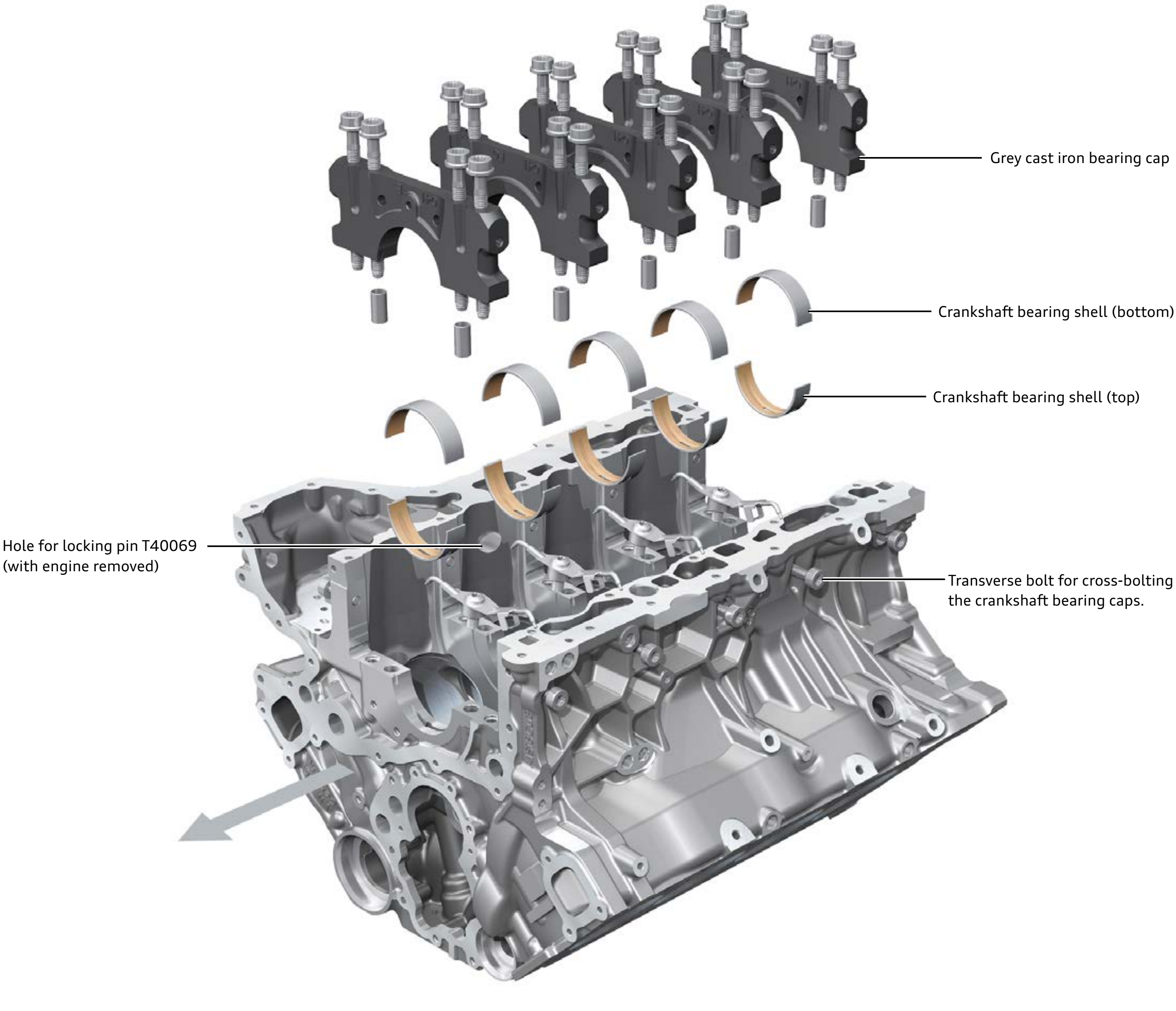
Application of plasma coating *676_005*



676_006

Crankshaft bearings

The upper crankshaft bearing bosses are integral with the cylinder block. The grey cast iron bearing caps are retained with longitudinal and transverse bolts.



676_007

Sump (top section)

The top section of the sump is made of an aluminum die cast alloy. Dowel pins are used to ensure exact positioning during assembly.

Sump (bottom section)

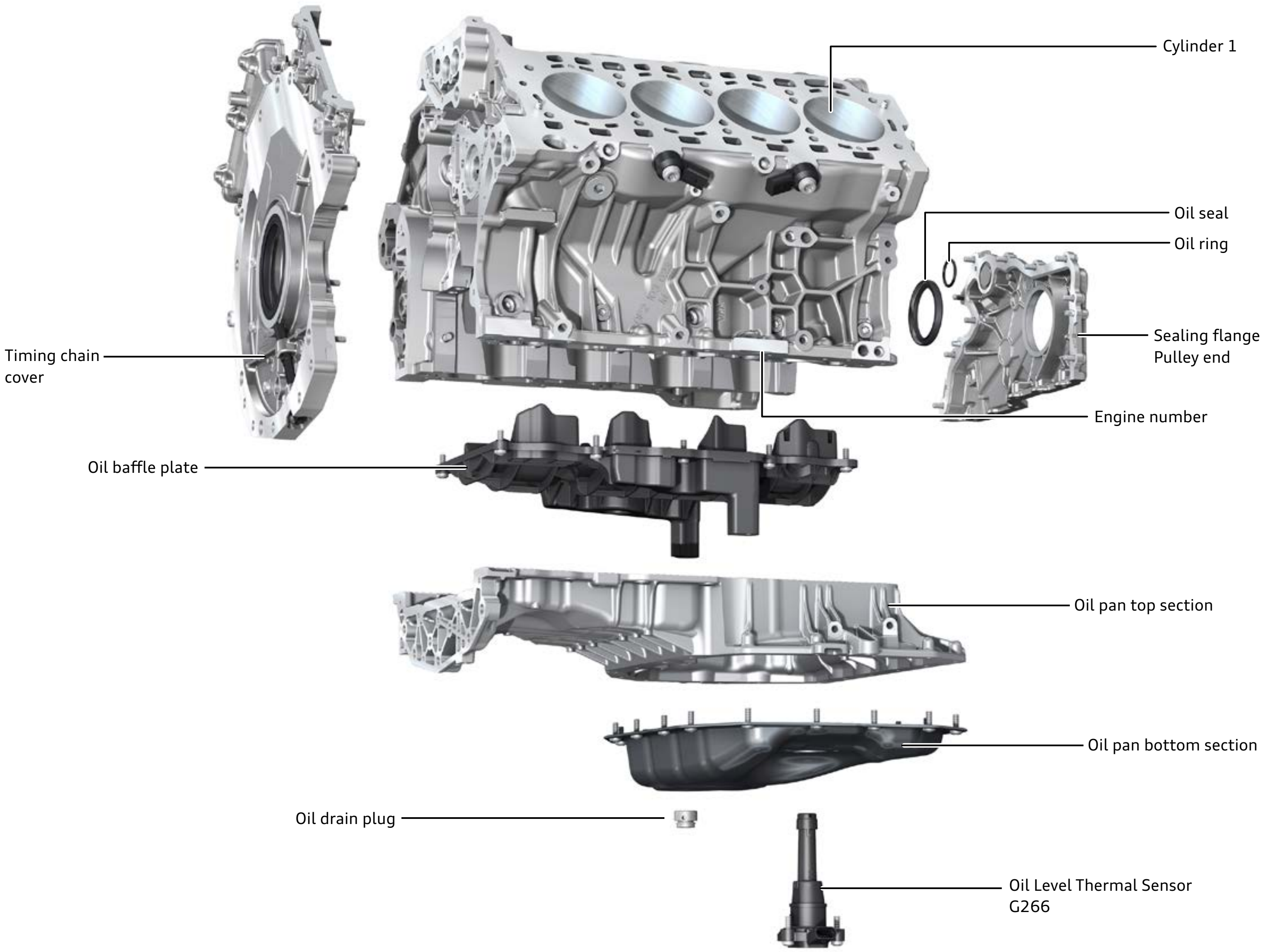
The bottom section of the sump is made of an aluminum sheet metal. The oil drain plug and the oil level/oil temperature sensor are integrated with it.

Timing chain cover

This die-cast component is made of an aluminum alloy; if it needs to be removed, it can be pressed off the cylinder block using auxiliary bolts. The engine speed sensor as well as the crankshaft oil seal are located in the cover.

Sealing flange (pully end)

This component is also made of an aluminum alloy. It provides the attachment point for the dipstick tube and the crankshaft oil seal.



676_008

Note
Housing cover and sumps are sealed by a liquid gasket (see ElsaPro for details).

Crankshaft

The forged steel crankshaft is supported by five main bearings to ensure a smooth running engine.

The cylinder banks are positioned at a 90 degree angle to one another with connecting rods of the cylinders opposite of each other sharing the same bearing journal.

676_009

Crankshaft bearings

The IROX bearings conform to the high demands of hybrid drive and start/stop operation.

Three-layer bearing construction:

- The steel backbone provides the required stability.
- The second layer is made of a soft metal carrier substrate to which the third layer is fixed.
- The third layer consists of a polymer base with a homogeneous distribution of filler materials which ensure the best possible running and wear characteristics.

676_010

Thrust washers

Four thrust washers (top and bottom) are installed on crankshaft bearing four to control longitudinal movement of the crankshaft. The oil grooves of the thrust washers face towards the crankshaft.

676_013

Piston

To minimize noise, the cast pistons are mounted at a 0.5 mm offset towards the pressure side (see illustration *676_016* below). Due to the compression and valve timing, intake valve recesses of different sizes are integrated in the piston crown (intake valve: large; exhaust valve: small). The chamber walls on the piston pressure side are narrower than on the counter-pressure side which is subject to less strain. The high rigidity of the pressure side makes it possible to achieve a defined piston wear pattern while optimizing the load. On the counter-pressure side, the piston is much softer and can adapt better to the shape of the cylinder. This combination results in different pistons for cylinder bank 1 (right bank) and cylinder bank 2 (left bank).

Piston rings

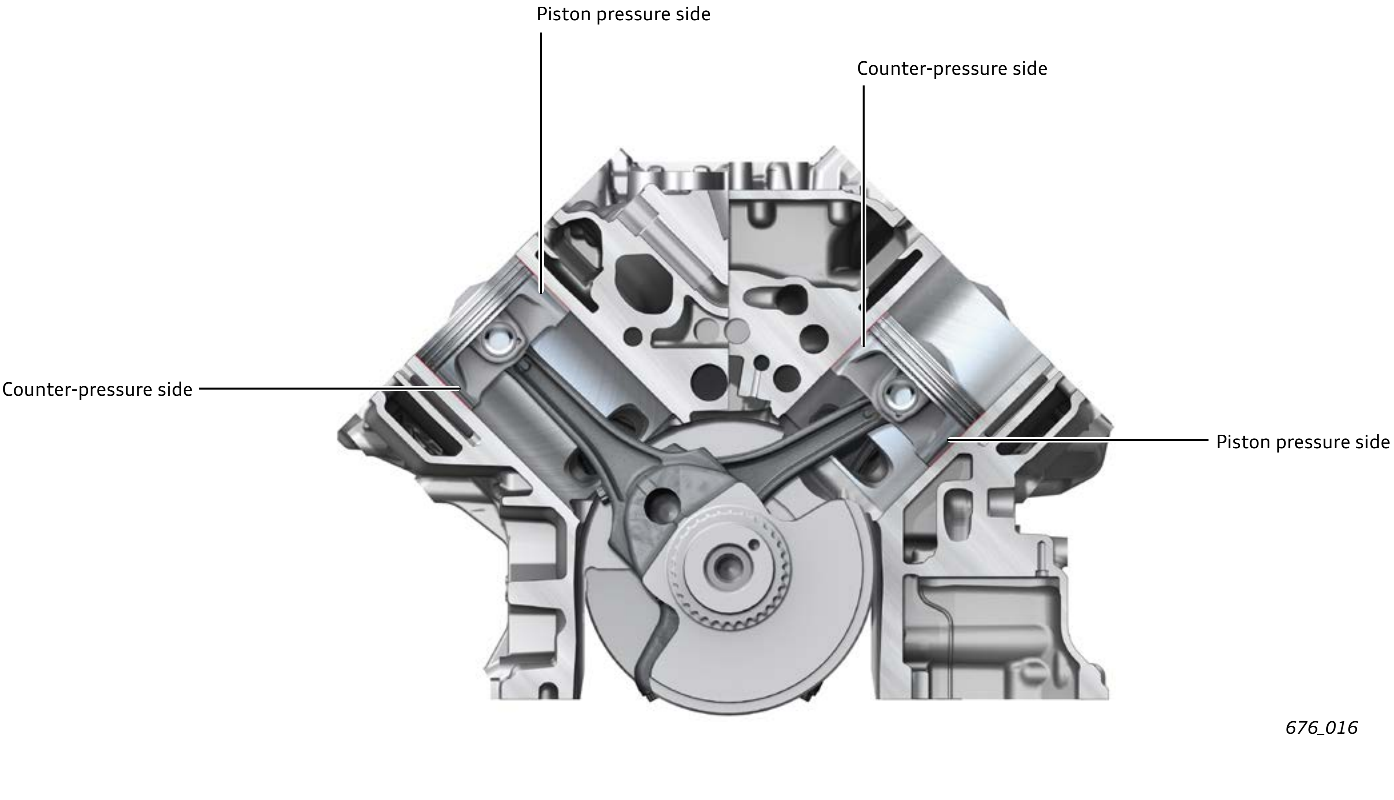
1. Top piston ring (compression ring) mounted in the ring carrier, rectangular section seal
2. Taper-faced ring
3. Oil scraper ring (3 parts)

Piston pins

The steel alloy piston pins are coated and hardened. Each piston pin measures 22 mm in diameter.

> **Note**
> The small valve recesses always face the inner V.

676_014



676_016

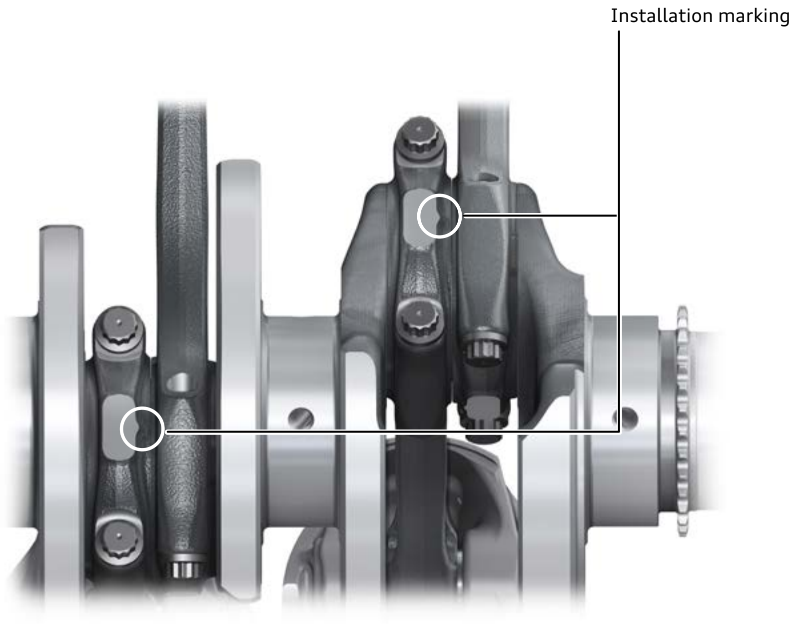
Connecting rods

The cracked trapezoidal connecting rods are made of high-strength steel. The bushing in the upper connecting rod small end is made from a copper alloy (CuNi9Sn6). The connecting rod bearings are 22.3 mm wide. Both bearing shells are identical. The bearings are made of three materials: a steel substrate, a bismuth-bronze alloy intermediate layer and a thin bismuth crystal lining. The connecting rods are installed at an offset to the engine's longitudinal axis.

676_017

Installing the connecting rods

It is important to install the connecting rods in the correct position. The points of the two installation markings must be in line with one another (see illustration *676_018*). Only connecting rods of the same weight class may be installed on a given engine.



View showing data matrix code
XX = weight class of large connecting rod eye
YY = weight class of small connecting rod eye

676_018

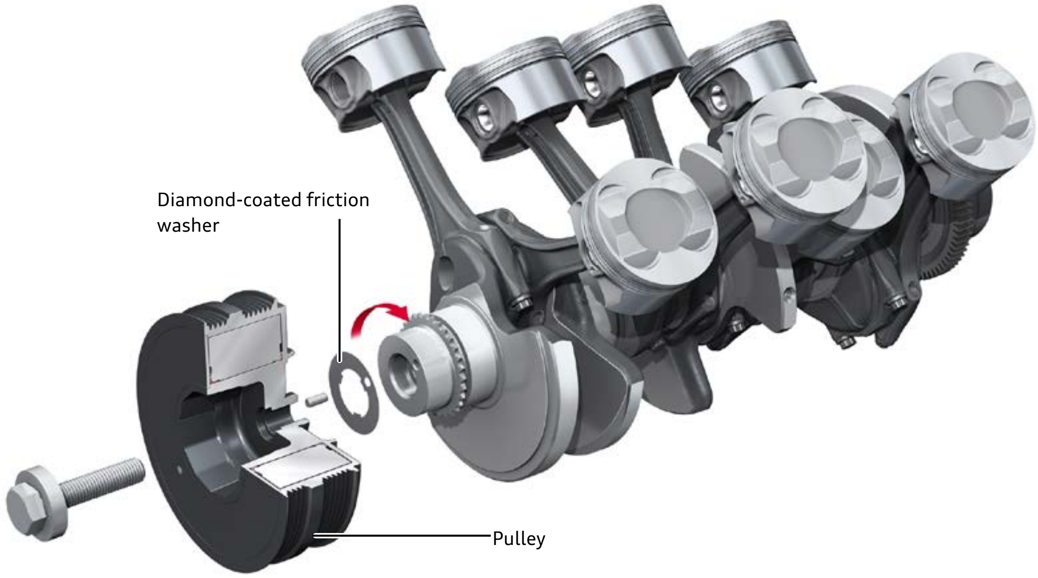
676_019

Note
Do not interchange bearing shells during installation; if new components are installed the specifications for clearance tolerances must be observed (see Elsa Pro for details).

Belt pulley / vibration damper

A single bolt secures the pulley/vibration damper to the crankshaft, and a dowel pin locates them in the correct position. A diamond-coated washer is installed between the vibration damper and the end of the crankshaft as a locating element.

The housing of the viscous vibration damper is made of forged steel, while the inertia ring is manufactured out of aluminum. This provides the greatest possible strength against deformation caused by centrifugal force.



676_020

Crankshaft speed detection

Engine Speed Sensor G28 is located in the timing chain cover. It detects signals from the magnetic ring on the drive plate.

676_021

Cylinder head

The cylinder heads have the following technical features:

- DOHC, 4 valves per cylinder.
- Roller cam followers.
- Integral exhaust manifold.
- “Hot Side Inside” (HSI).
- Direct injection combustion process with central injector position.
- Audi valvelift system (AVS). Enables Cylinder on Demand (CoD) operation.
- Intake valves: hardened and tempered.
- Exhaust valves: hardened and tempered, sodium-filled hollow stems.

676_023

Noise insulation

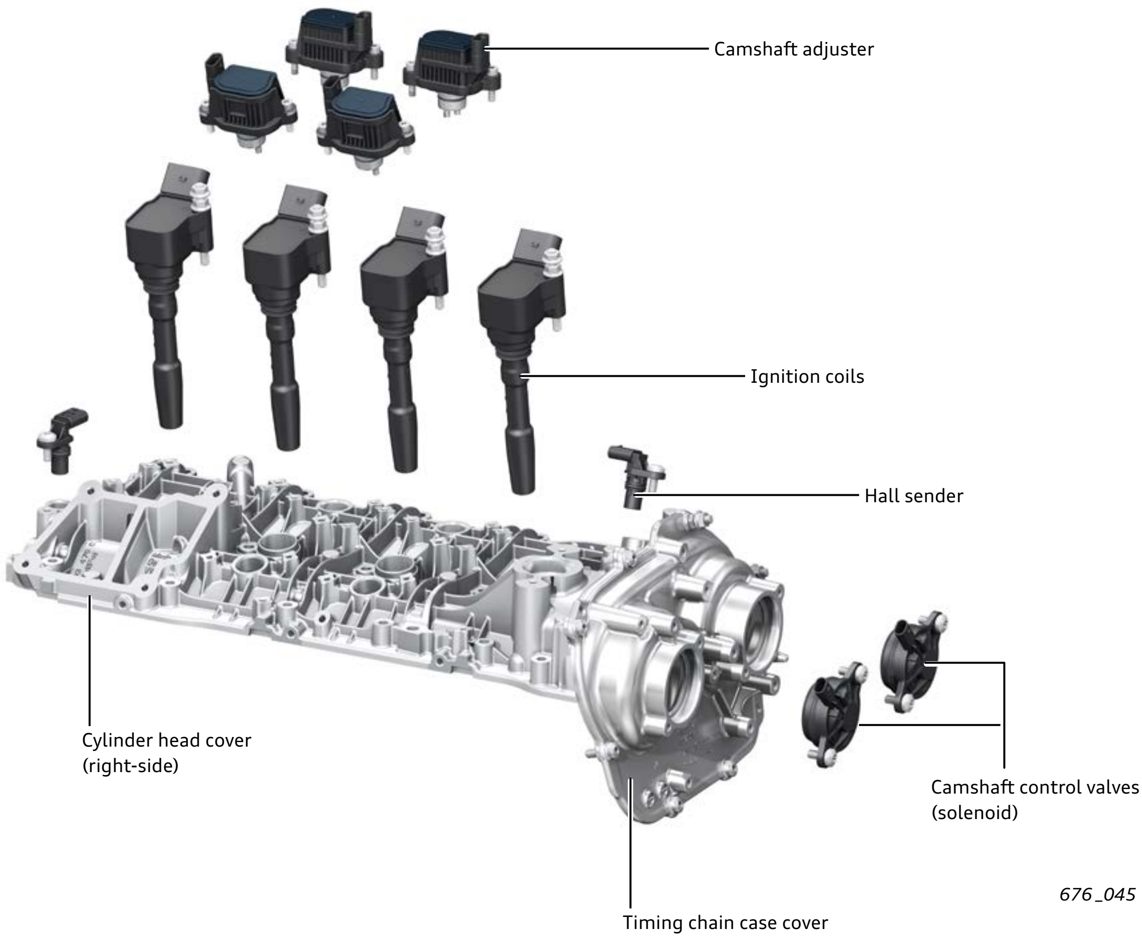
The two-part insulating mats over the cylinder head covers help reduce noise. This provides effective insulation against high-frequency ticking noises greater than 2500 Hz from the injectors and the high-pressure fuel pumps.

676_044

Note

Pay close attention to the installation order of components on the cylinder heads. Some components may be located under the insulating mats and can no longer be installed after the mats have been installed.

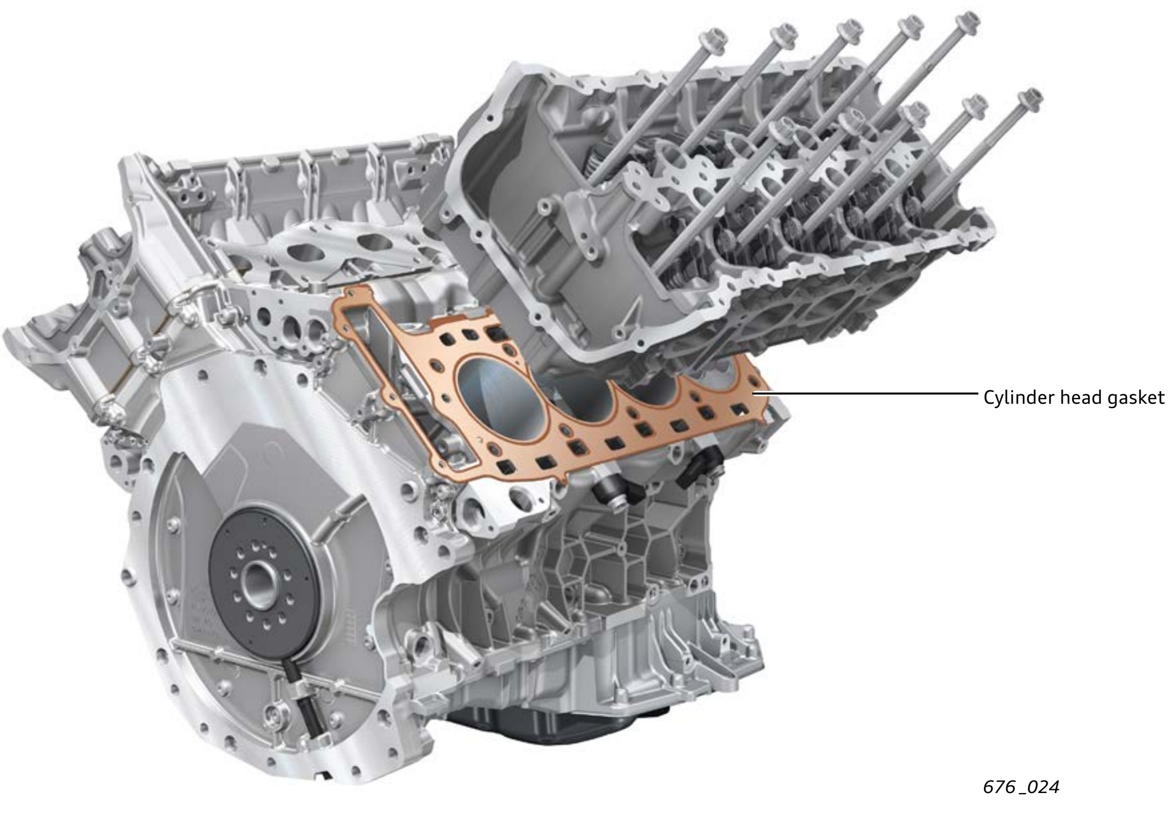
Cylinder head cover attachments



676_045

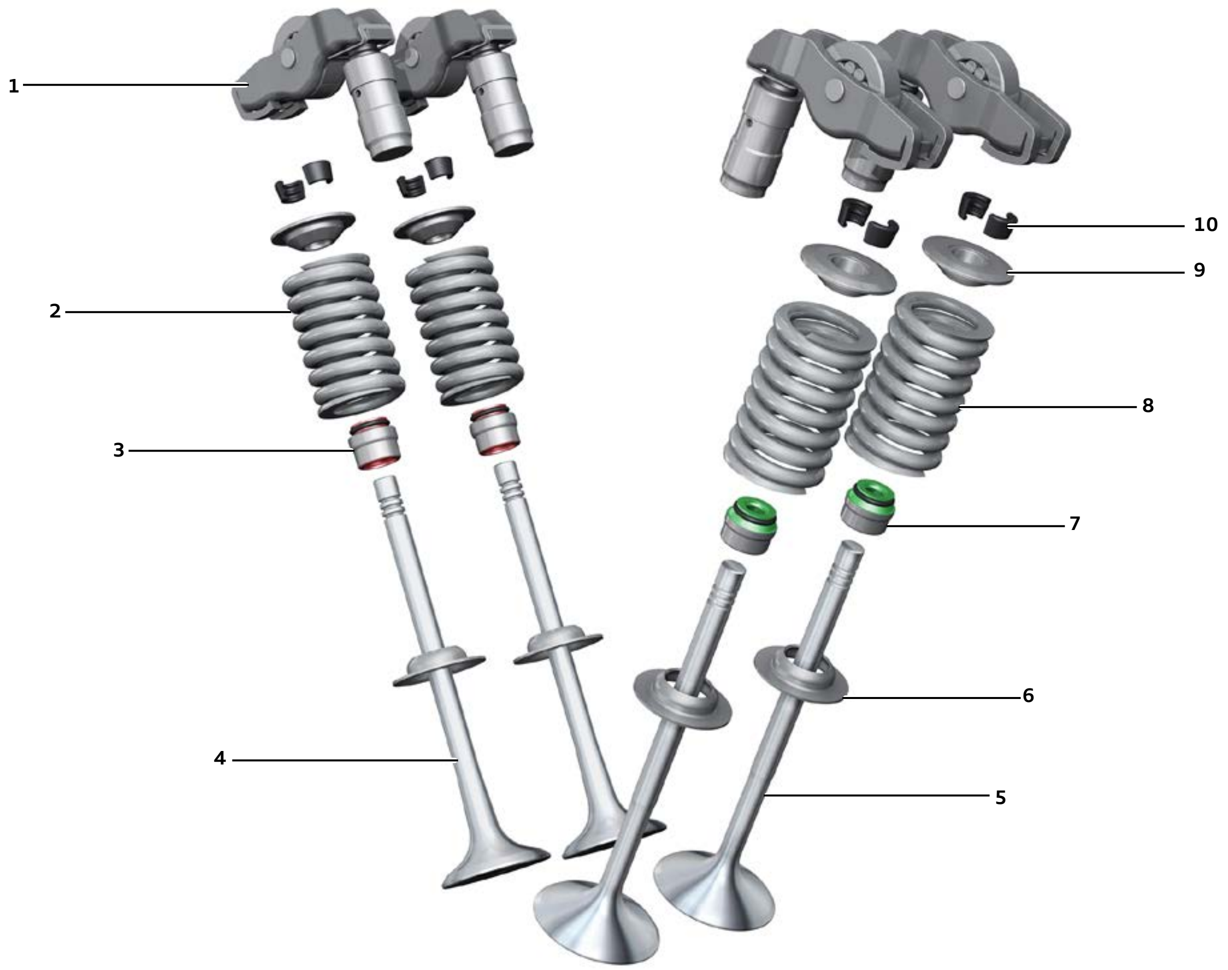
Cylinder head gasket

A three-layer metal gasket is used. It is only available in one thickness.



676_024

Valve gear



676_025

Legend

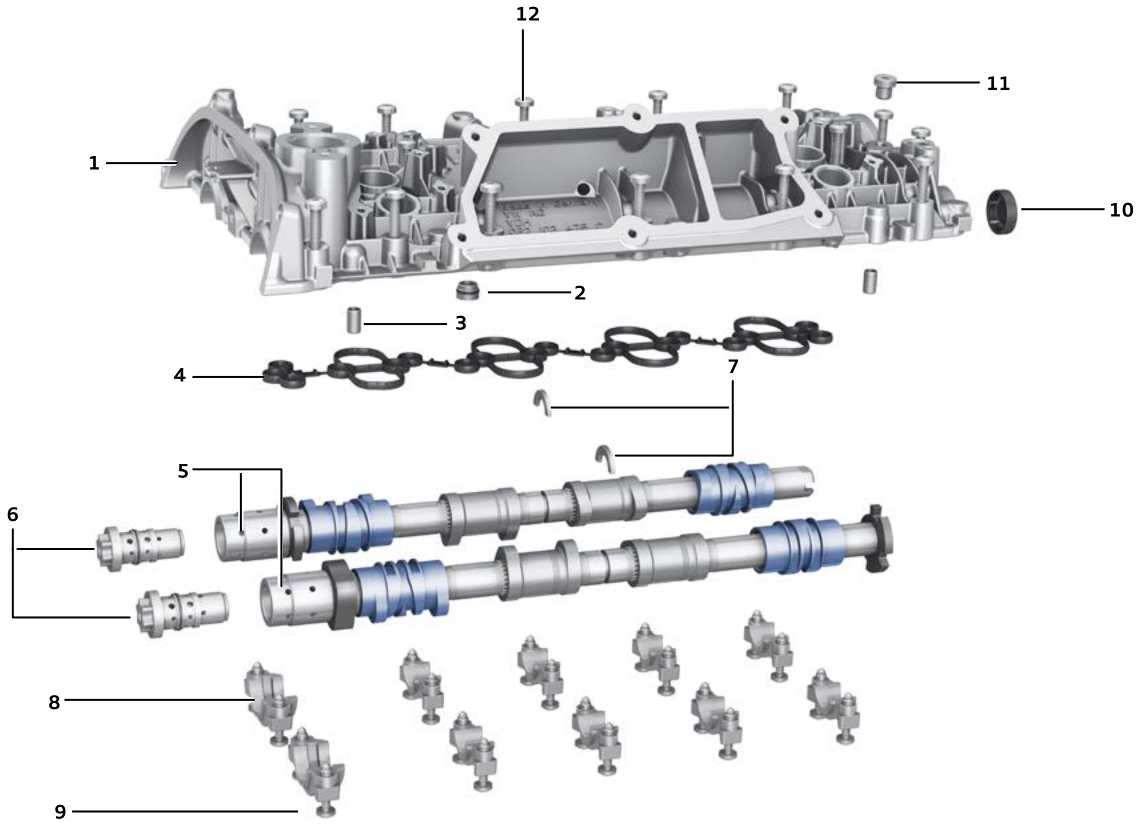
1. **Roller cam followers with supporting element**
2. **Exhaust valve spring**
3. **Twin-lip valve stem oil seal**
4. **Exhaust valve**
   Bi-metal valve with sodium filling and chromium-plated valve stem ends
5. **Inlet valve**
   Monometallic valves with inductive hardened valve seats
6. **Valve spring plate (bottom)**
7. **Single-lip valve stem oil seal**
8. **Inlet valve spring**
9. **Upper valve spring plate**
10. **Valve keepers**

The valve springs are a simple cylindrical shape.

Camshaft housings

The camshaft housings of both cylinder banks work in the same way; the only difference is the location of certain components. The camshaft housing for cylinder bank 2 is described here as an example. The cylinder head is sealed by a liquid gasket and a rubber molded gasket.

The camshafts are mounted in five sleeve bearings in the camshaft housing. The center bearing is constructed additionally as an axial bearing. The ignition coils, cam actuators for Cylinder on Demand, Hall sensors for camshaft position detection, high pressure fuel pump, injectors, fuel rail and oil separator for the crankcase breather system are also installed.

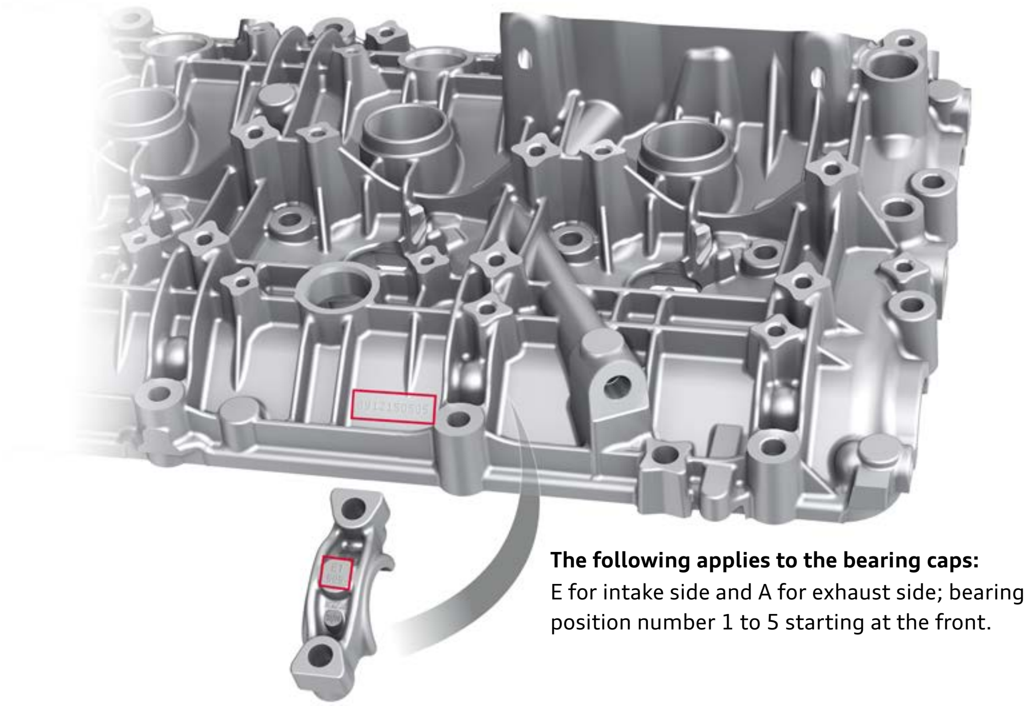


676_026

Legend

1. **Cylinder head cover**
2. **Retention valve**
3. **Dowel sleeves**
4. **Seal**
5. **Camshafts**
6. **Control valve for camshaft adjuster**
7. **Axial bearing**
8. **Bearing cap**
9. **Bolted connection for camshaft bearing**
10. **Sealing plug**
11. **Plug**
12. **Bolted connection for cylinder head cover**

Identification number of matched pair for camshaft housing and camshaft bearing



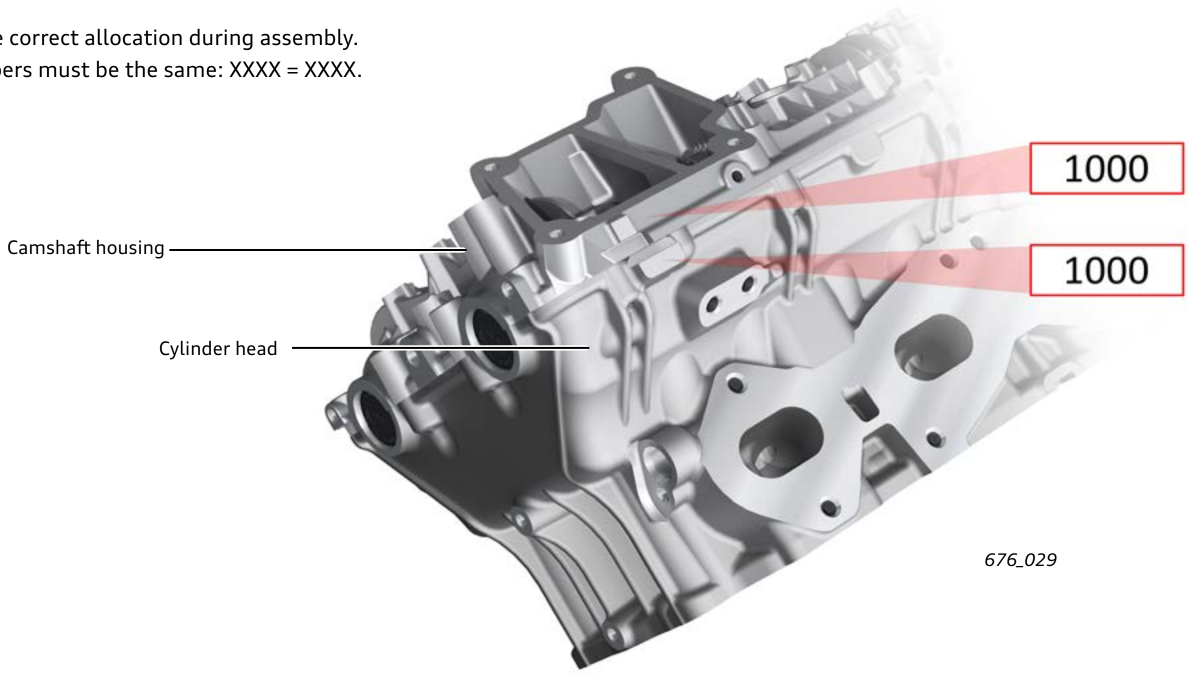
676_027

Identification number of matched pair for camshaft housing and cylinder head

The following applies to the camshaft bearing caps:

E for inlet side and A for exhaust side; bearing position number 1 to 5 starting at the front. The identification number for the matched pair is given underneath. The three-digit numbers on the bearing caps (see marking) must match the last three digits of the four-digit number on the camshaft housing.

- This identification number matches each bearing cap to a specific cylinder head.
- It is important to ensure correct allocation during assembly.
- The two four-digit numbers must be the same: XXXX = XXXX.



676_029

Camshafts

All four camshafts are composite camshafts comprising a basic shaft with pressed-on end pieces. The cam elements are installed onto the splines on the shaft. Two cam elements are fixed in position; the other two are moveable.

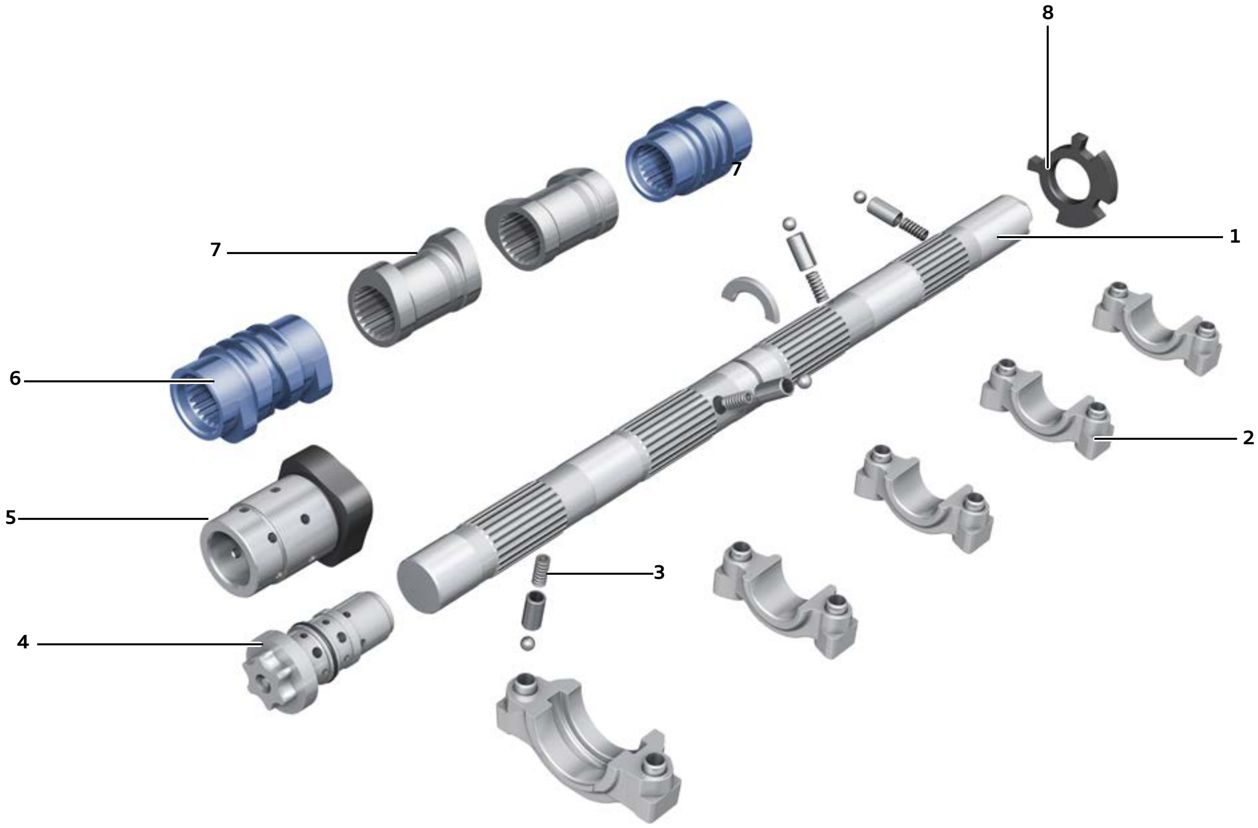
The moveable cam elements have two cam profiles for each valve. This provides the operational basis for the Cylinder on Demand (CoD) system.

The high-pressure fuel pumps are driven by the exhaust camshafts via four-lobe cams. In addition, each camshaft has a sender wheel used for detecting the camshaft position.

The bearings for the camshafts are located in the basic shaft. A groove for the axial bearing is located in the center of the camshaft.

676_030

Camshaft components



676_031

Legend

1. **Basic shaft**
2. **Bearing caps**
3. **Ball-and-spring locking mechanism**
4. **Control valve for camshaft adjuster**
5. **Shaft stub with four-lobe cams for driving the high-pressure fuel pump**
6. **Cam elements, moveable for the Cylinder on Demand system**
7. **Cam elements**
8. **Sender wheel**

Cylinder on Demand (CoD)

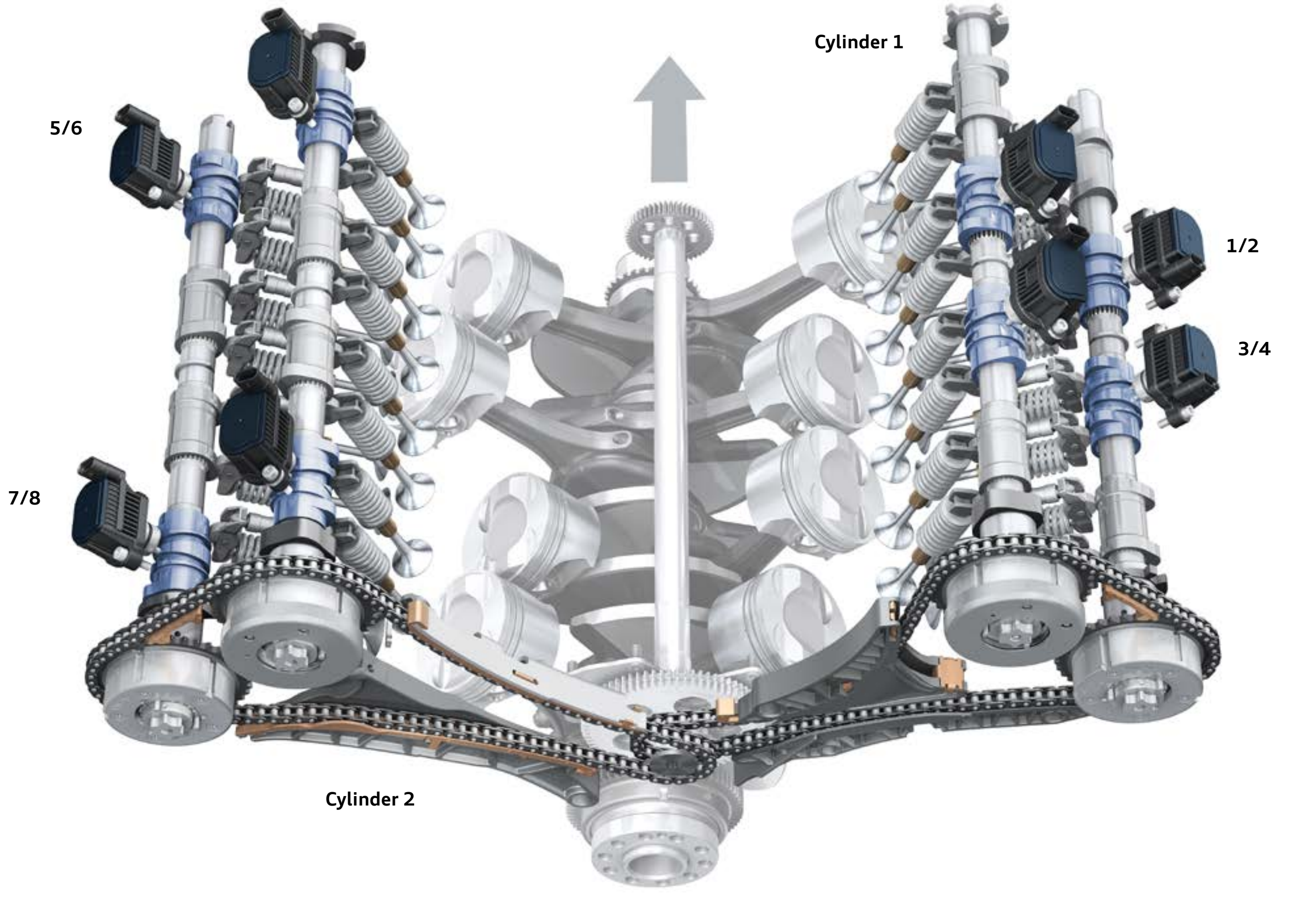
The EA825 engine is equipped with a cylinder management system. This system allows two cylinders on each cylinder bank to be shut off in certain circumstances, for example, under low engine load. When these cylinders are shut off, the other cylinders can work more effectively with reduced throttle loss. This saves fuel and reduces exhaust emissions.

The cylinders are shut off by keeping the corresponding inlet and exhaust valves closed, and by eliminating the fuel supply and ignition for these cylinders.

The inlet and exhaust valves are shut off via the Audi valvelift system. To make this happen, the system's actuators are activated in the same sequence as the firing order, which sets the moveable cam elements for cylinder 2, 3, 5 and 8 to zero stroke.

- Firing order with all cylinders activated: 1-3-7-2-6-5-4-8
- Firing order with half of cylinders activated: 1-7-6-4

For the vehicle occupants, it will be nearly imperceptible that only half of the cylinders are activated, as the active engine mountings eliminate nearly all potential vibrations. The function of the active engine mountings is described in SSP 920223 and SSP 990293



676_032

Legend

1. **Cylinder 2 Exhaust Cam Actuator 1 F454**
2. **Cylinder 2 Intake Cam Actuator 1 F452**
3. **Cylinder 3 Exhaust Cam Actuator 1 F458**
4. **Cylinder 3 Intake Cam Actuator 1 F456**
5. **Cylinder 5 Exhaust Cam Actuator 1 F466**
6. **Cylinder 5 Intake Cam Actuator 1 F464**
7. **Cylinder 8 Exhaust Cam Actuator 1 F478**
8. **Cylinder 8 Intake Cam Actuator 1 F476**

Cylinder on Demand strategy

Criteria for starting/ending CoD operation

Engine coolant temperature	95°F - 185°F (35°C - 85°C)
Engine torque	Between 62.69 - 162.26 lb ft (85 - 220 Nm) depending on the engine speed
Gear	D
Inactive in gears	1 ... 3
Battery voltage	Greater than 9,6 V
Catalytic converter heating	Inactive
Engine flaps	Inactive
Prevented during OBD diagnosis	› Oxygen sensor check › Catalytic converter check › Fuel tank breather check
EVAP system, high load greater than 12	Inactive
Maximum time in CoD cycle	300 s

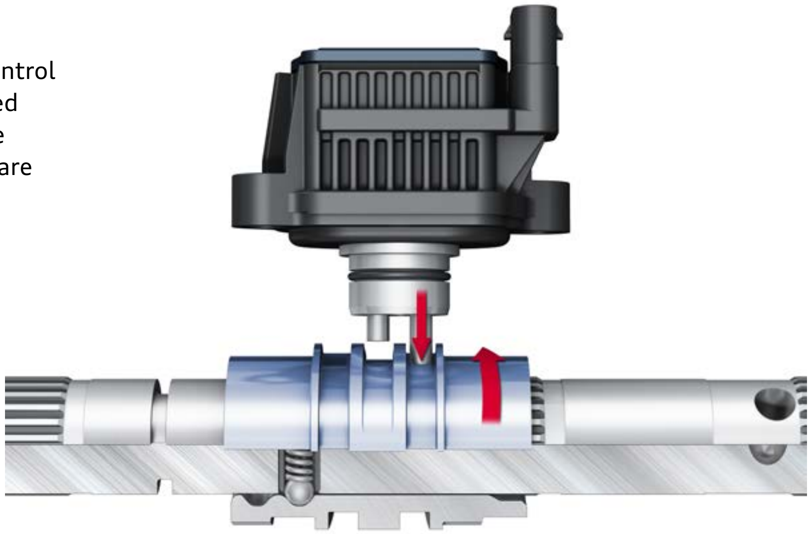
Exhaust gas is captured and sealed in when the cylinders are shut off.

How the CoD system works

This section describes the three phases in which the sliding cams move from zero to full lift.

Phase 1

When the cam actuator is activated by the engine control module, the actuator pin is inserted into the Y-shaped slotted gate. The ball locks the cam element in place through spring force. The intake and exhaust valves are closed.



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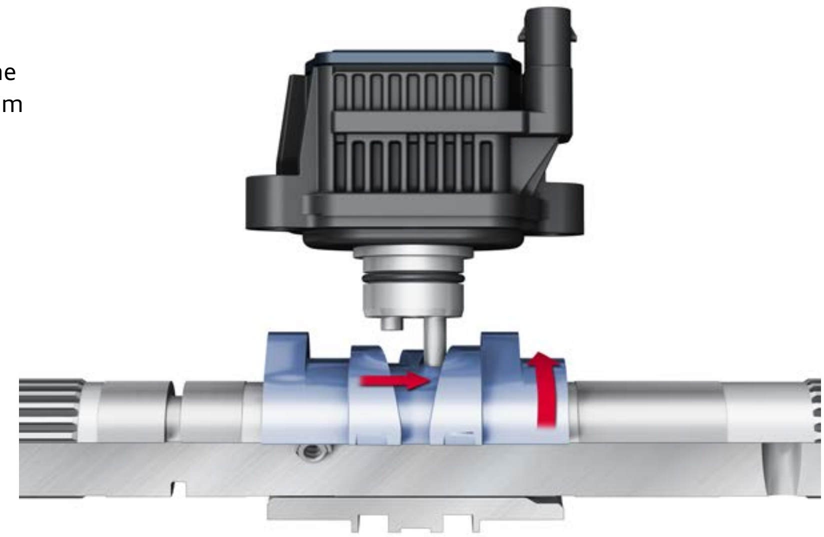
Phase 2

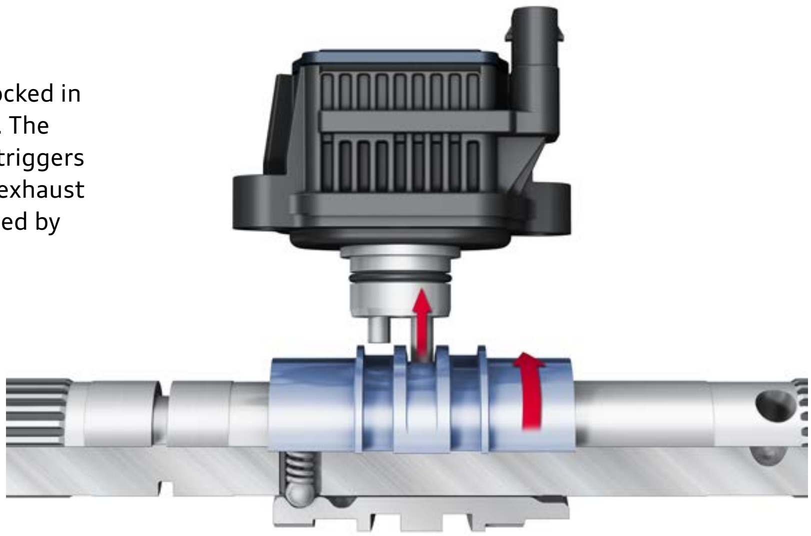
When the camshaft rotates further, the shape of the slotted gate causes the actuator pin to press the cam element out of the retainer.



676_034

Phase 3

Once it has changed positions, the cam element is locked in the second position by the ball through spring force. The retraction slot pushes the actuator pin back in. This triggers the retraction signal in the actuator. The intake and exhaust valves are still closed; they are just about to be opened by the contour of the full lift cam.



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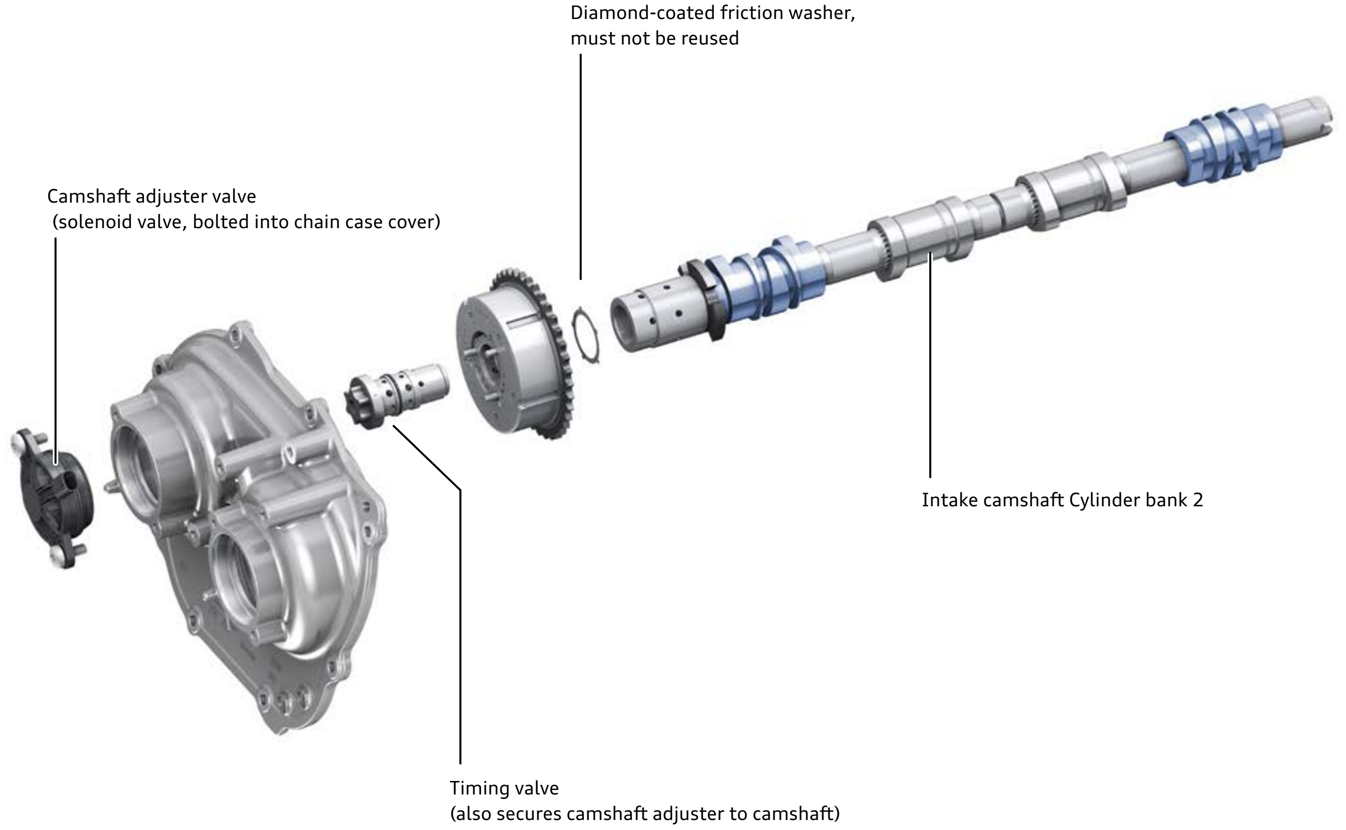
Camshaft adjusters

To optimize power output and torque as well as reducing emission levels and increasing fuel economy, camshaft adjusters are installed on all camshafts. The system also uses an internal exhaust gas recirculation strategy.

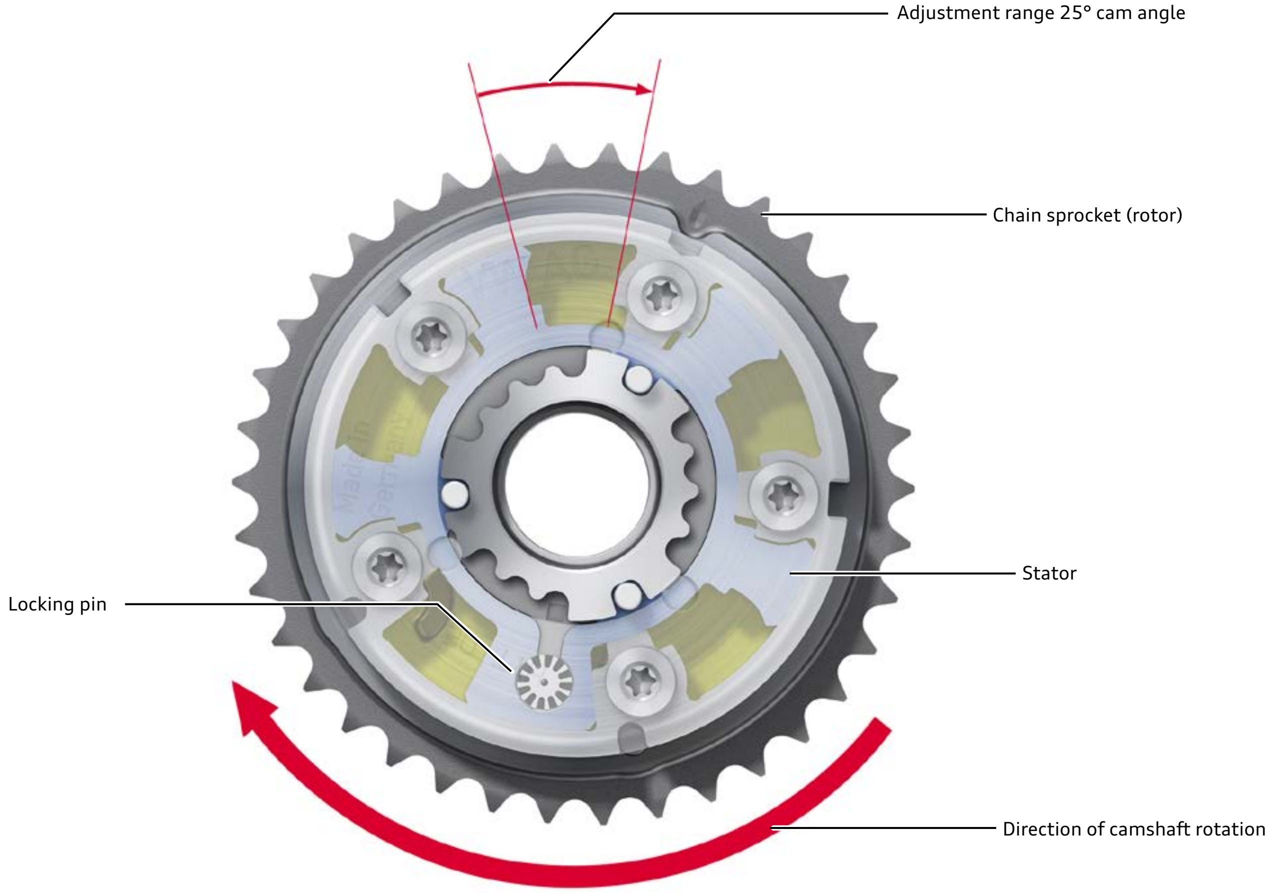
The hydraulic camshaft adjusters are in constant operation and have an adjustment range of 50° (crank angle).



Reference
For more information about the camshaft adjuster valve and the control valve, please refer to eSelf-Study Program 920173, The Audi 3.0L V6 TFSI EA839 Engine.

Intake camshaft adjusters

When the engine is switched off, locking pins use spring force to lock the intake camshaft adjusters in the “retard” position.



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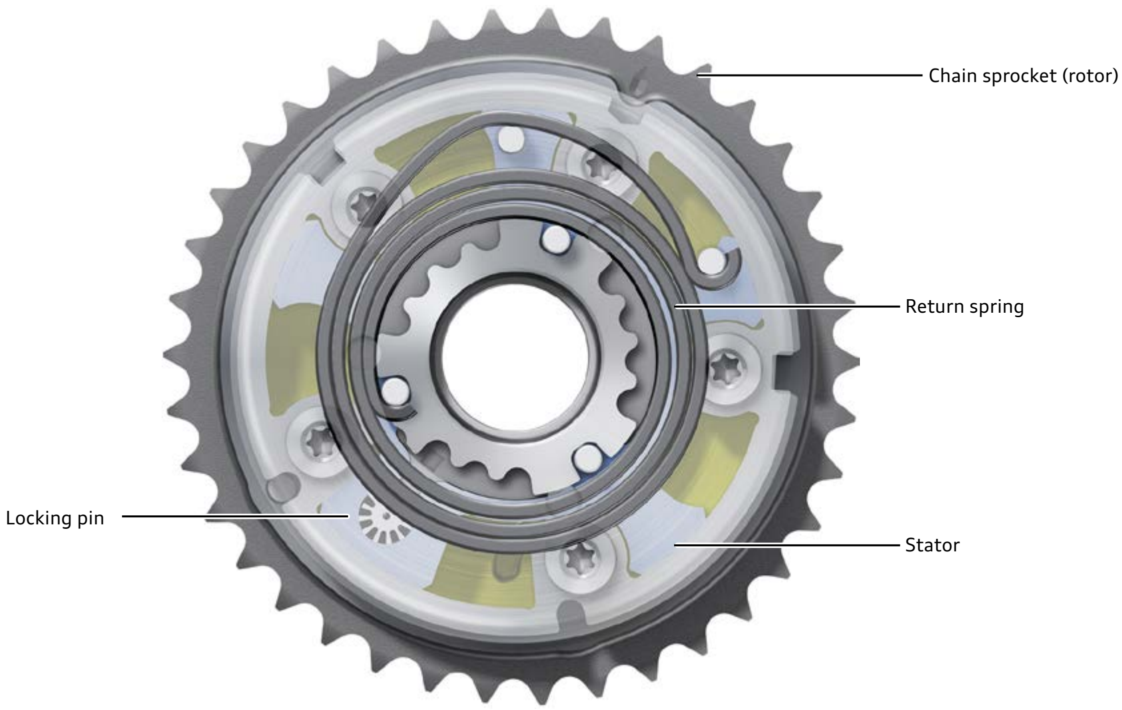
Exhaust camshaft adjusters

When the engine is switched off, spring force on the locking pins locks the exhaust camshaft adjusters in the “advanced” position. A return spring is necessary to achieve the “advanced” locking position when switching off the engine.

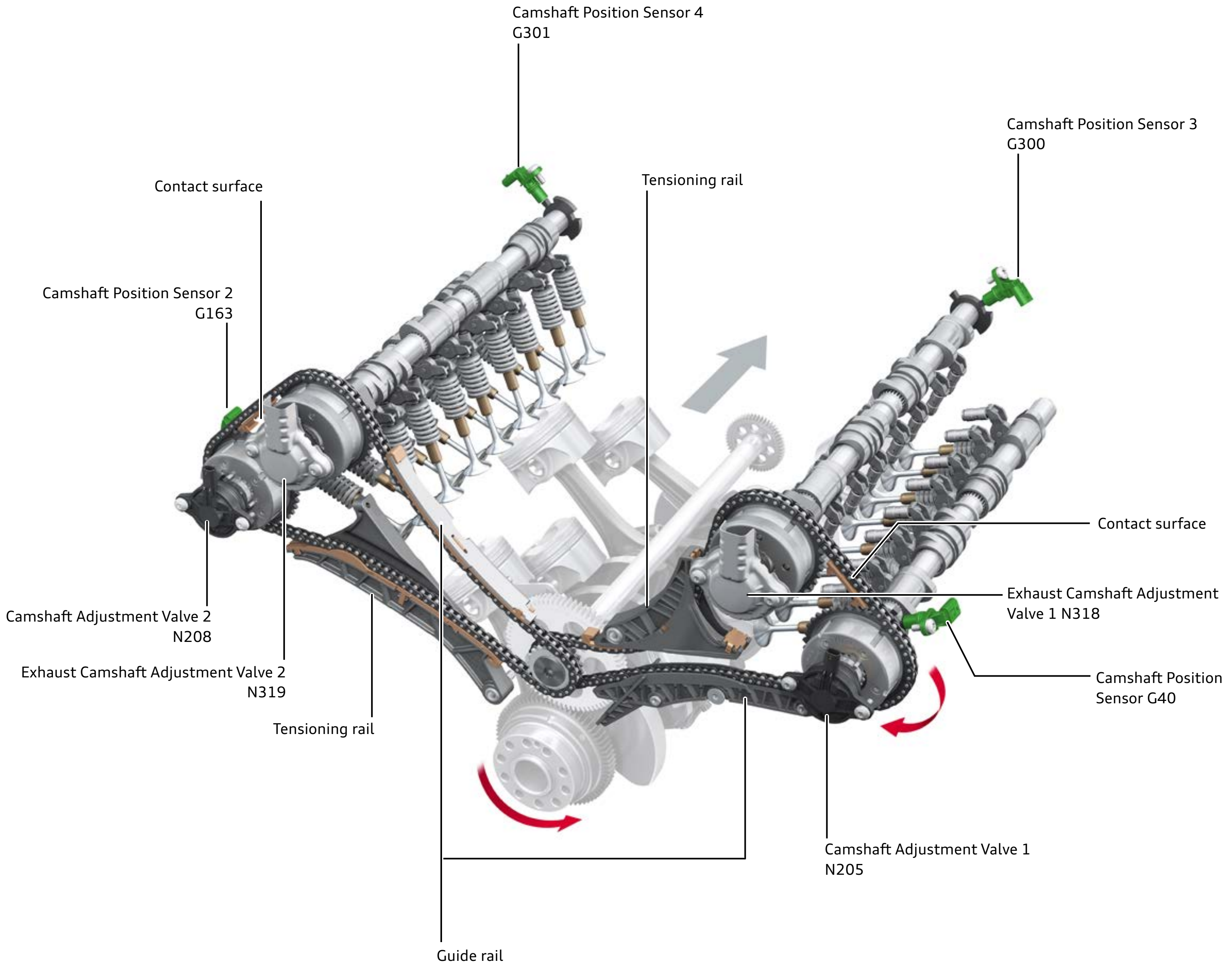


676_144

Camshaft drive configuration

The camshaft drive system of the new V8 engine is located on the transmission side of the engine. A gear on the crankshaft drives the intermediate gear which in turn drives the simplex chains for the camshafts.

The intermediate gear is configured as a tensioning gear. It is responsible for preventing noise.



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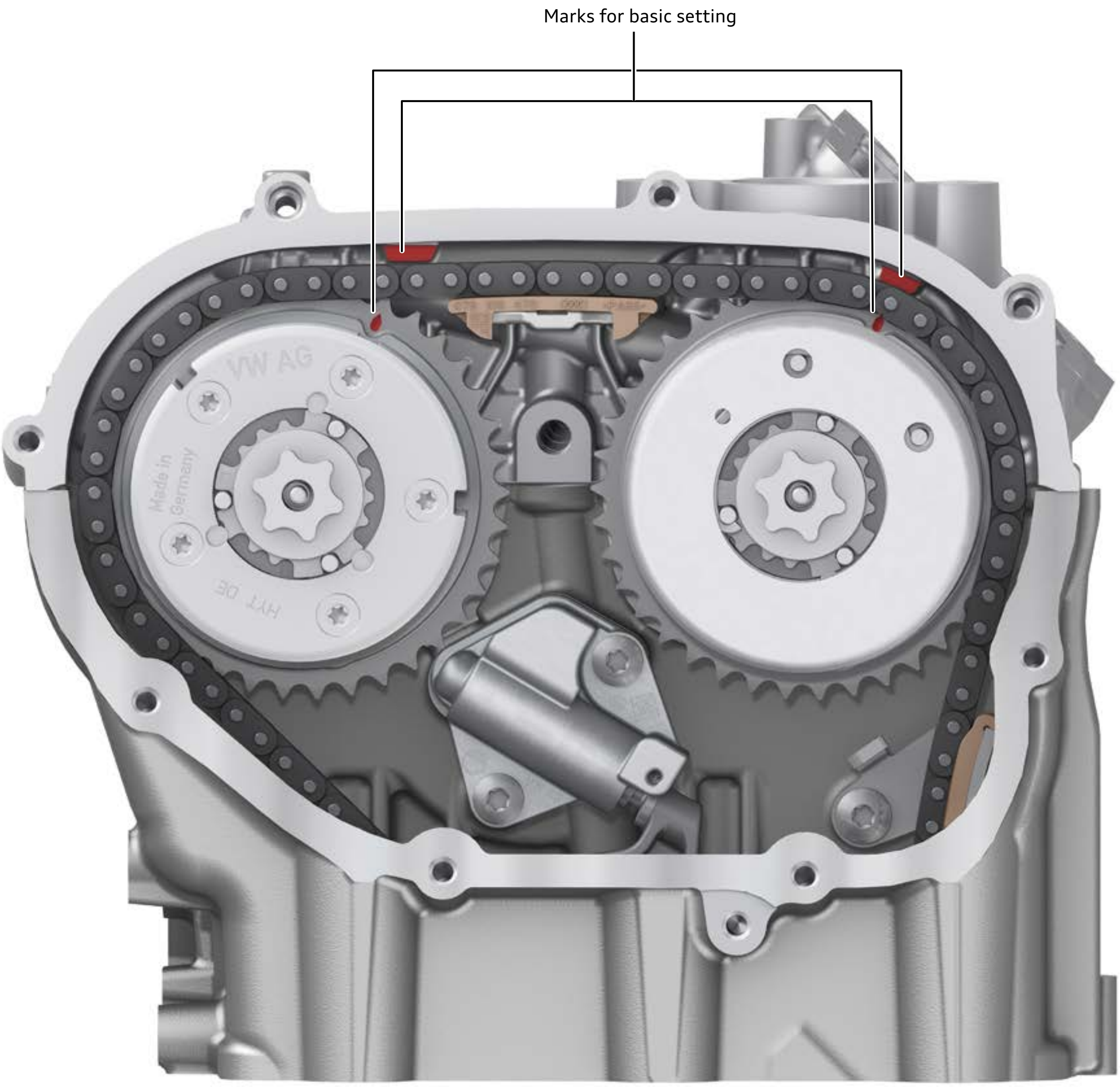
Basic positions for crankshaft/camshaft timing

The engine is in its basic position when cylinder 1 is at TDC position and the crankshaft can be locked in place. The markings on the camshaft adjusters must be opposite the corresponding projections on the camshaft housing. The camshaft adjusters must be positioned precisely, as the drive chain sprockets are tri-oval shaped. These tri-oval chain sprockets make it possible to minimize the dynamic forces from the valve gear and allow the engine to run more smoothly.



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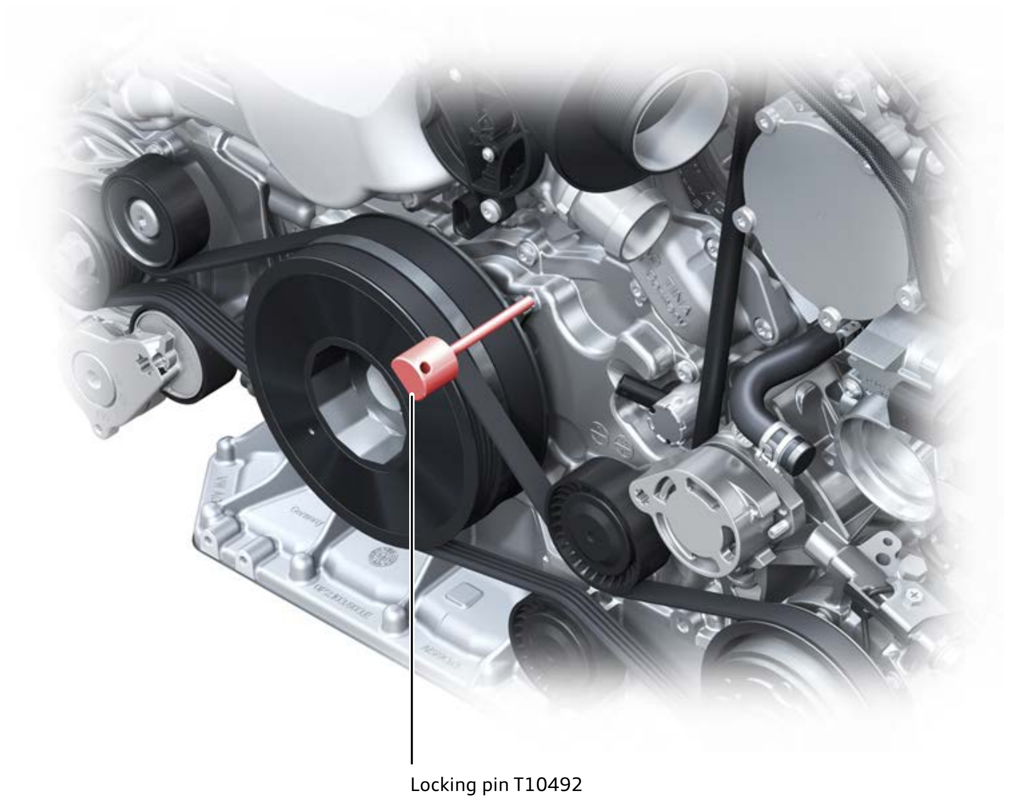
Locking the crankshaft

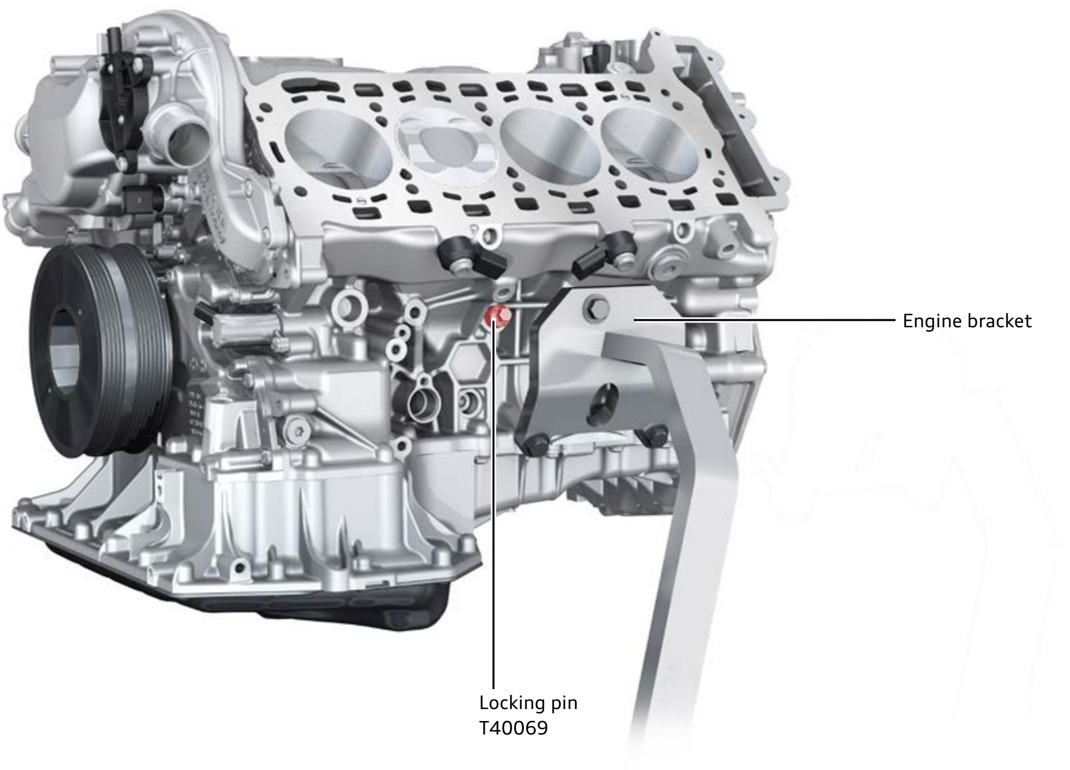
The crankshaft can be locked in two ways, as described below.

With the engine installed in the vehicle using lock in pin T10492



676_041

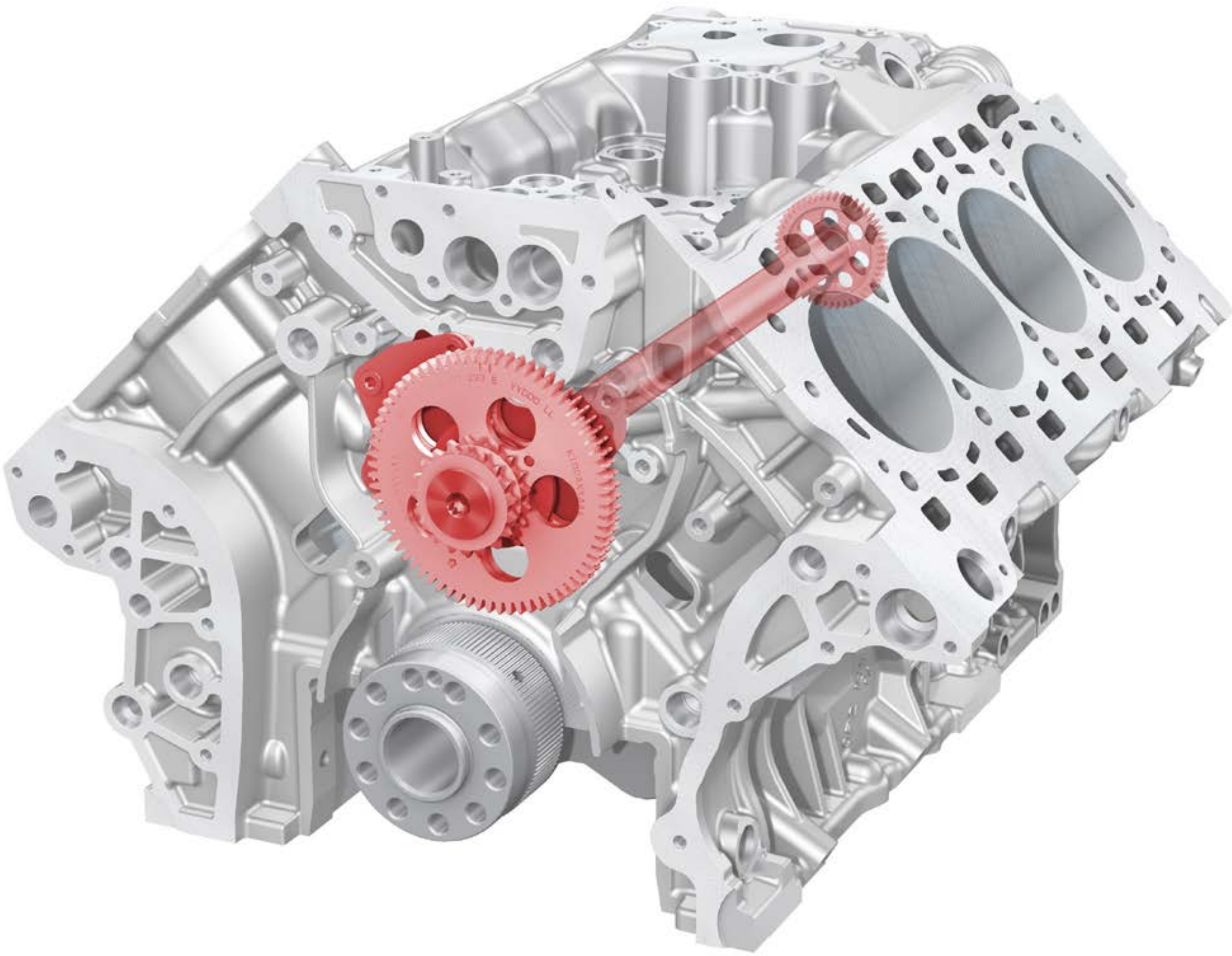
With the engine removed using lock in pin T40069



676_042

Water pump drive shaft

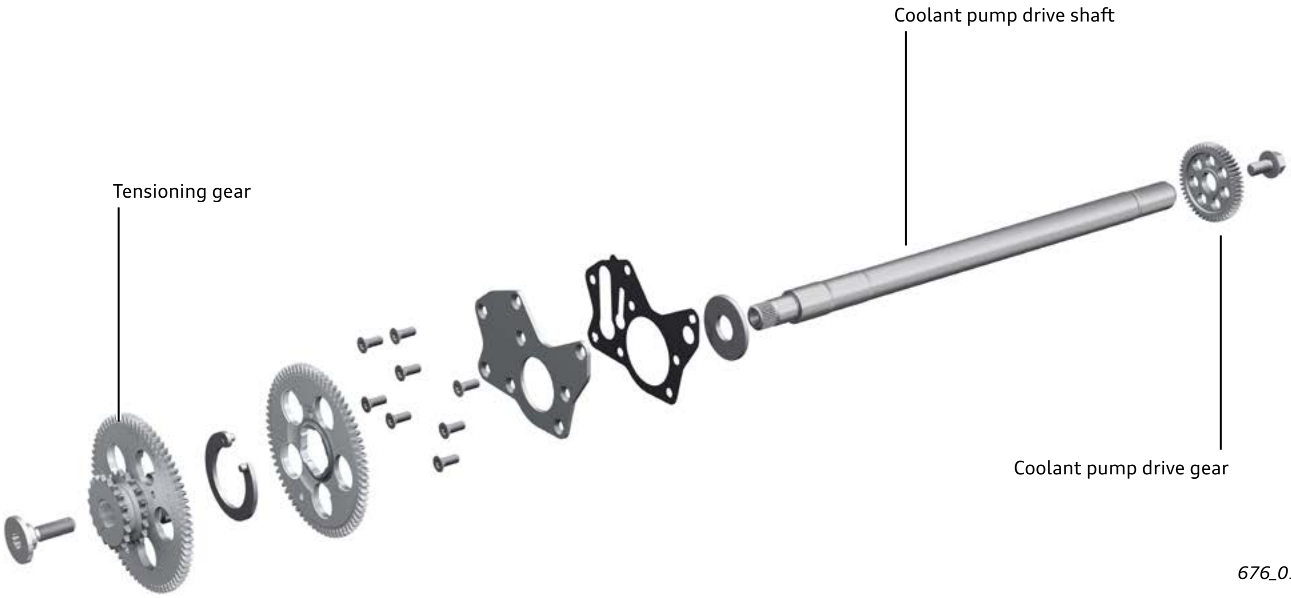
The water pump drive shaft is mounted in sleeve bearings and is driven by a tensioning gear via the crankshaft.



676_043

Tensioning gear

The tensioning gear must be pre-tensioned during installation using Locking Pin T40362.

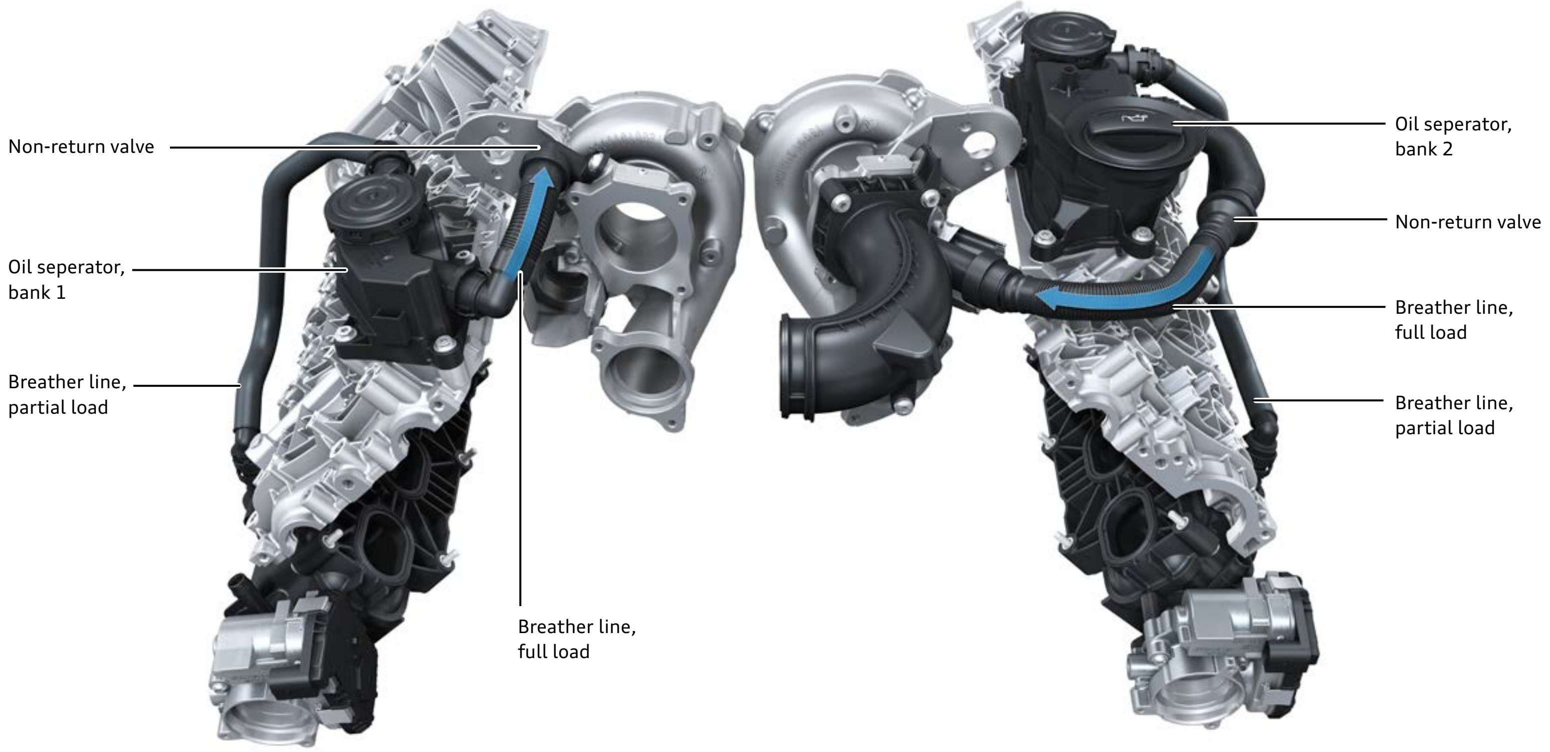


676_015

Crankcase ventilation system

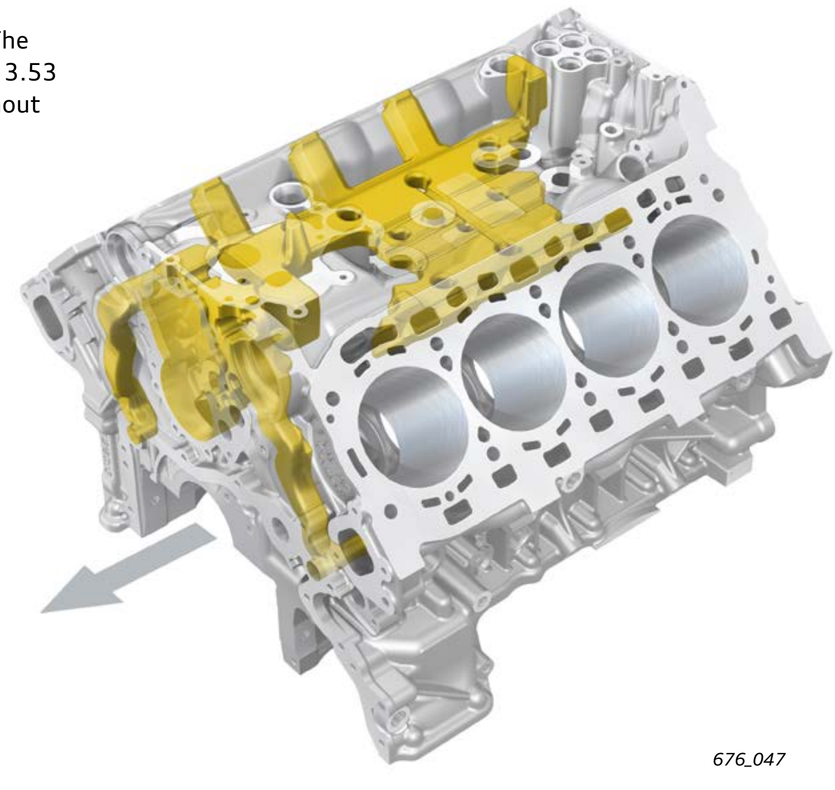
The crankcase is vented above the cylinder head covers. An oil separator module is bolted onto each cylinder head cover for this purpose. The filtered blow-by gases are also channeled separately for each cylinder bank. The inlet points are located upstream of the intake side of the turbocharger turbines (discharge at full load) as well as in the intake manifold of the cylinder heads (discharge at partial load).

Intake is regulated by non-return valves which open or close independently depending on the pressure level in the air supply. A non-return valve is installed in the breather line from the oil separator to the connection in front of the turbo-charger turbines. The second non-return valve is installed in the corresponding oil separator module.



676_046

The ECM regulates the crankcase ventilation system. The system must be capable of discharging approximately 3.53 cu ft (100 L) of blow-by gases from the crankcase without loosing oil in the process.



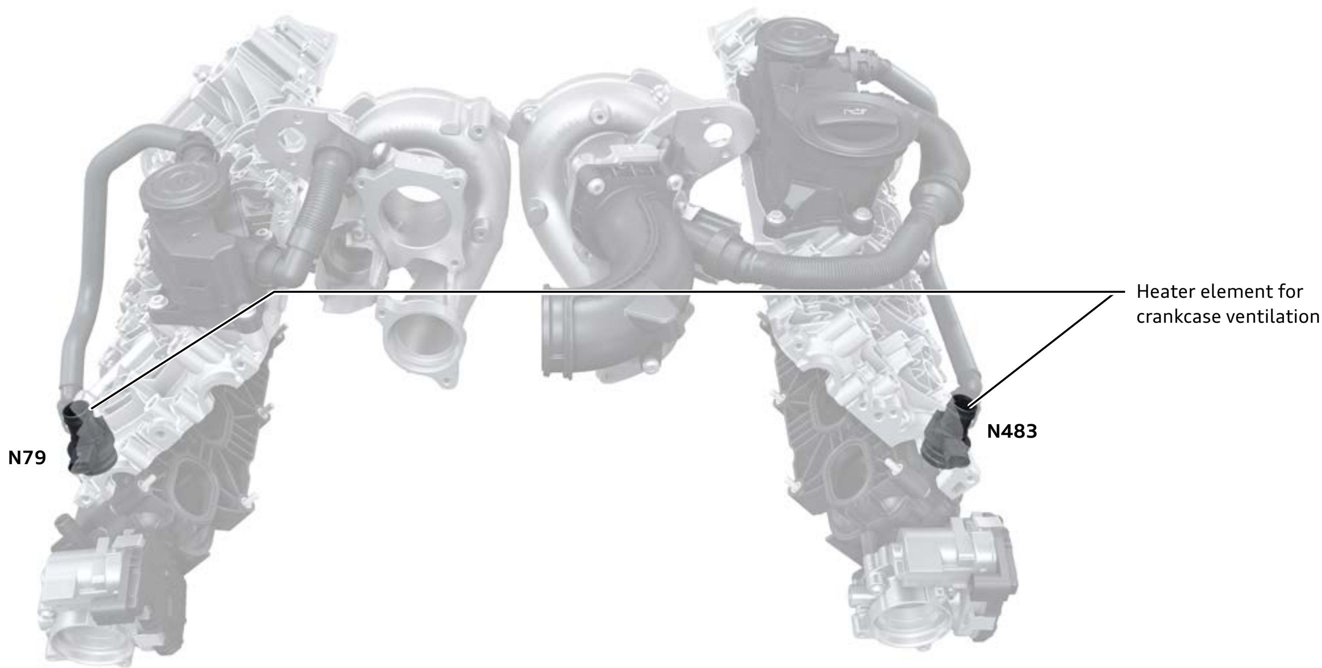
676_047

Blow-by discharge at partial load

On both cylinder banks, the filtered blow-by gases flow from the oil separator into the corresponding intake manifold. At low air temperatures and high flow speeds, the blow-by mass flow is heated in the intake manifold to prevent it from freezing under extreme conditions.

A PTC heater element is installed at the connection between the breather line and the intake manifold. It is controlled by the ECM via a PWM signal based on a calculated characteristic map.

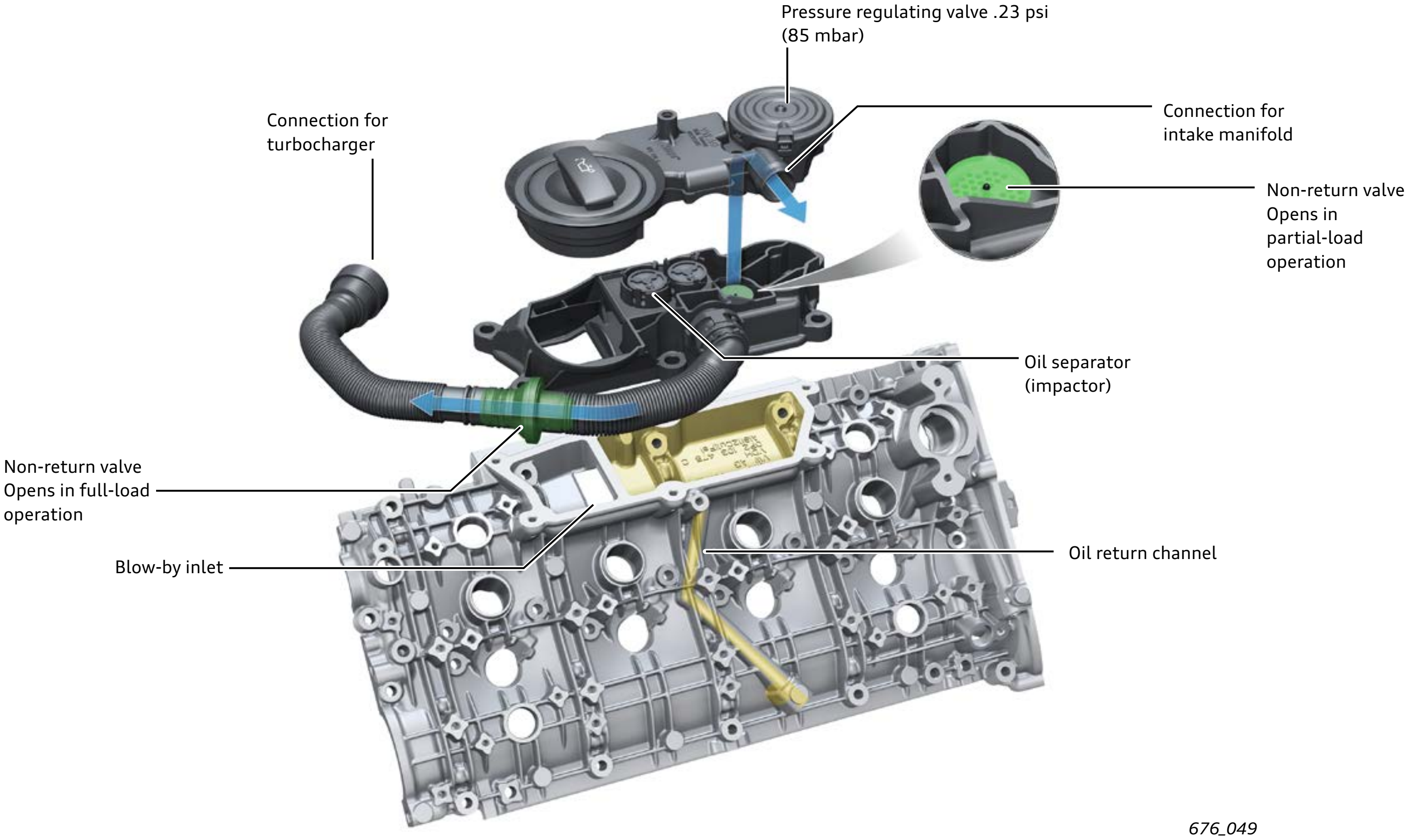
- Positive Crankcase Ventilation Heating Element N79 cylinder bank 1 (right-side)
- Crankcase Ventilation Thermal Resistor 2 cylinder bank 2 (left-side)



676_048

Oil separator

The blow-by gases flow out of the crankcase and into the cylinder head area via channels in the crankcase. From there, the blow-by enters an inlet plenum chamber in the cylinder head cover; this is where the oil separator is installed. When the engine is running, oil that has been separated collects in the collection chamber of the oil separator.



676_049

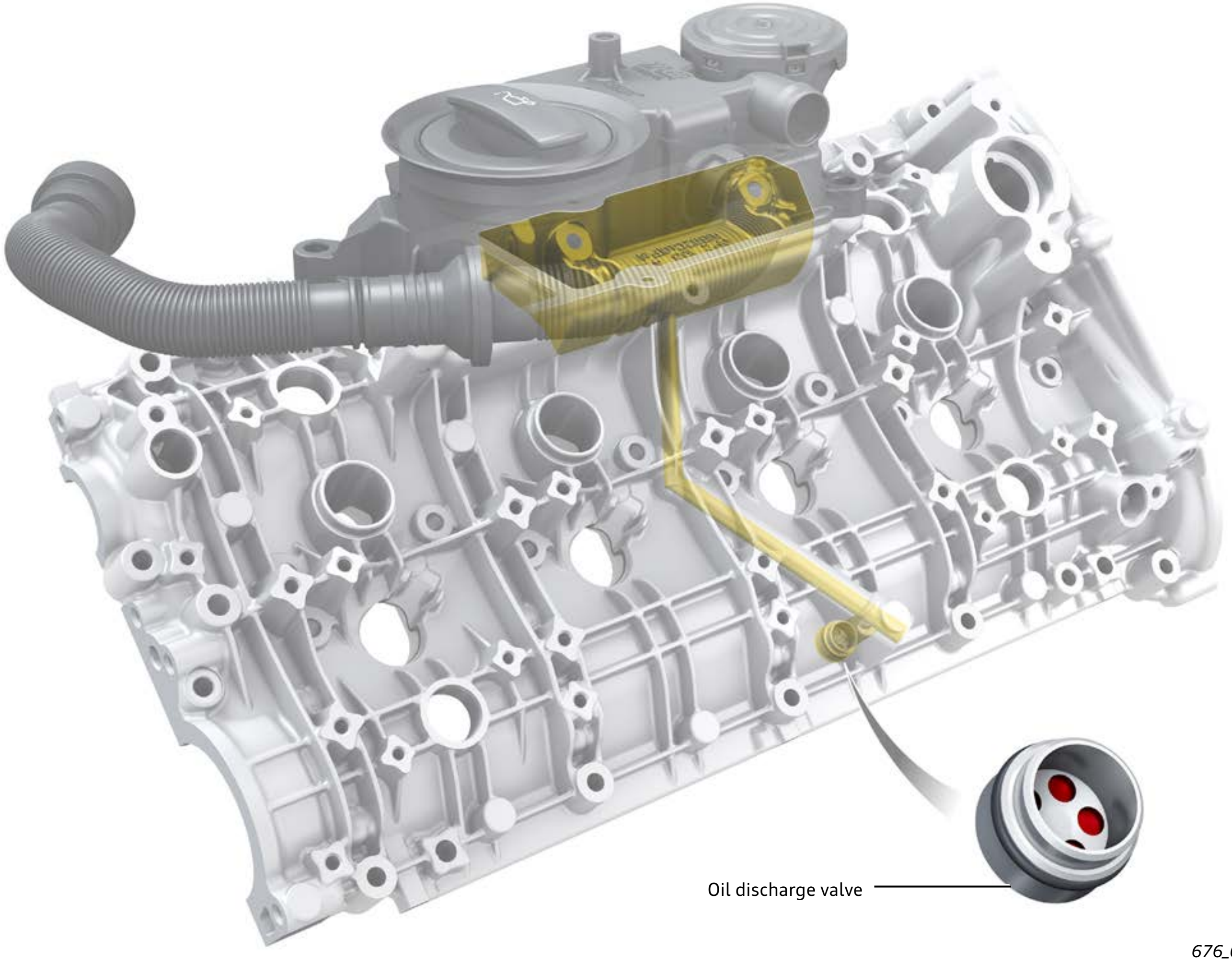
When the engine is not running or when a defined level in the oil separator is exceeded, the gravity valve opens and the oil drains into the crankcase. The gravity valve also prevents oil from the sump from entering the oil separator in the event of large fluctuations in pressure, for example due to sudden load change.

676_050

Reference
For more information about the oil separator, please refer to eSelf-Study Program [920173, The Audi 3.0L V6 TFSI EA839 Engine.]

Oil return

The separated oil in the oil separator collects in the cylinder head cover tray (located below the oil separator). It is directed through a drilled channel down to the inlet side and then enters the valve chamber of the cylinder head via the oil discharge valve.



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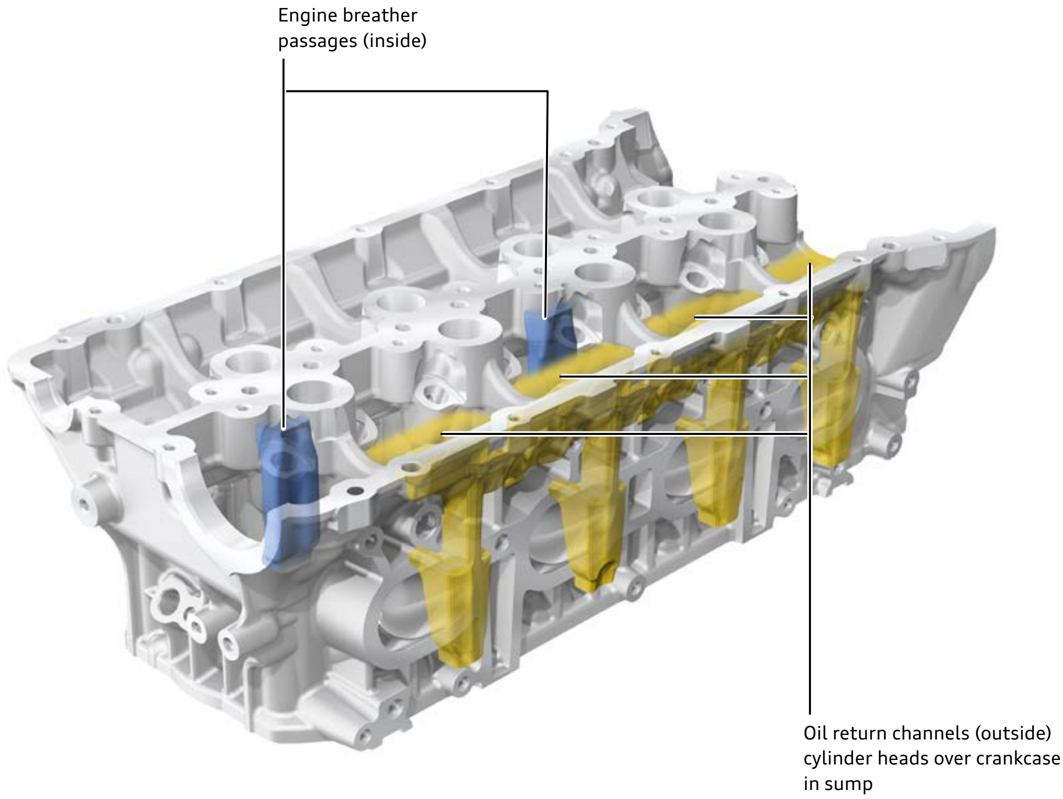
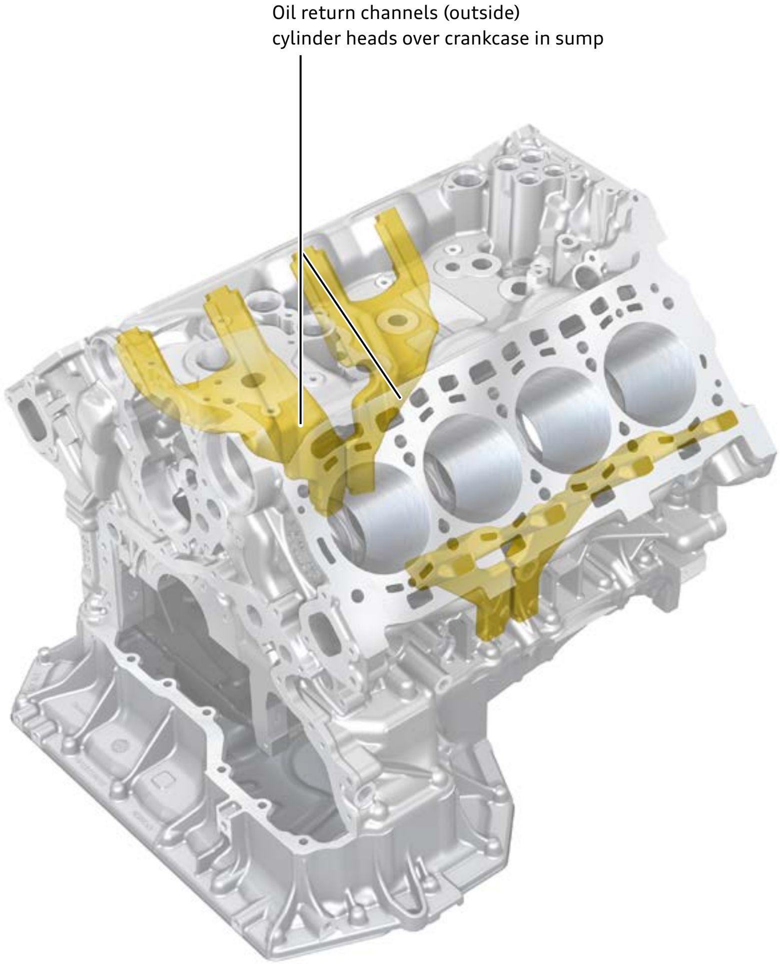


676_052

The oil flows into the sump via separate return channels. The inlet point is located below the oil surface level.



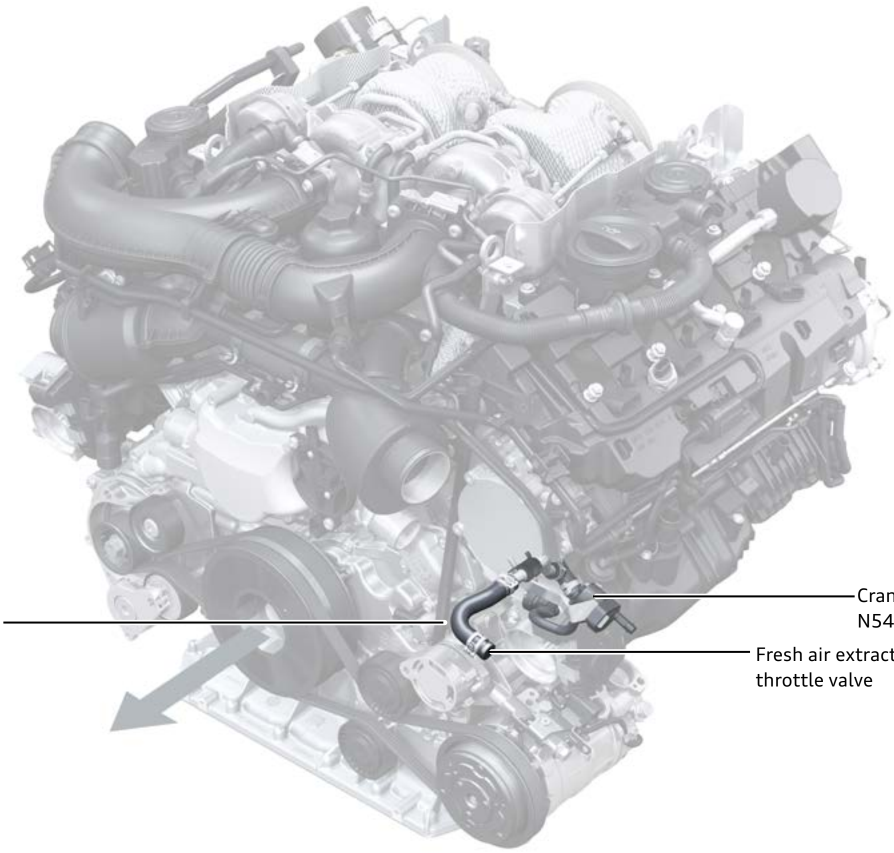
676_123

Positive Crankcase Ventilation (PCV)

Positive crankcase ventilation (PCV) takes place when charge pressure is present. The air flow which is channeled into the crankcase in this process is limited by defining the cross-section of the pipe in the crankcase connection. In certain operating modes, for example, to avoid blow-by gases when mixture adaption is active, Crankcase Ventilation Valve N546 is actuated, which regulates the flow of fresh air.

The fresh air intake point for the crankcase is located in front of the throttle valve for cylinder bank 2. Air is drawn into the crankcase at a connection just above the upper sump on the left side of the engine.

Two non-return valves are installed for security. They close when the difference in pressure between the air system and the crankcase becomes too great; otherwise the vacuum pressure inside the crankcase could become too high. The non-return valves are located in N546 and in the connection on the crankcase.



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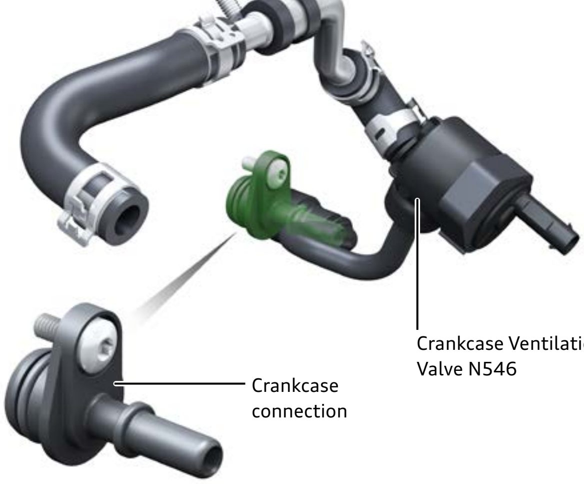

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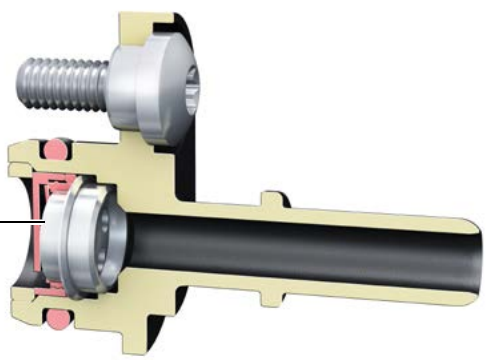


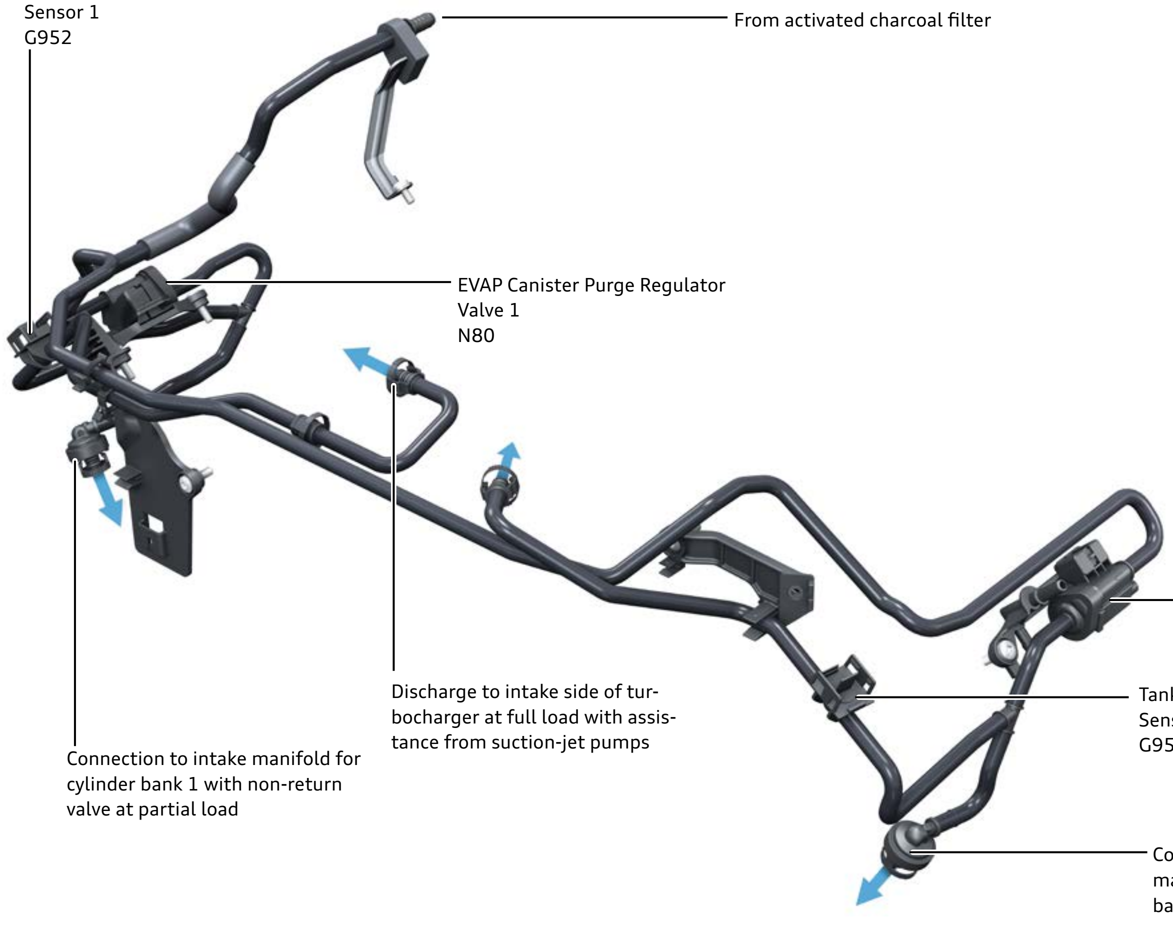
676_126

Fuel tank ventilation

Fuel tank ventilation is controlled by Engine Control Module J623. It is done by regulating the vapor flow from the charcoal canister via EVAP Canister Purge Regulator Valve 1 N80 and EVAP Canister Purge Regulator Valve 2 N115.

676_054

When there is a vacuum in the intake manifold, the activated charcoal filter is vented via the non-return valves in the intake manifold. When there is charge pressure, venting takes place on the intake side in front of the turbocharger.



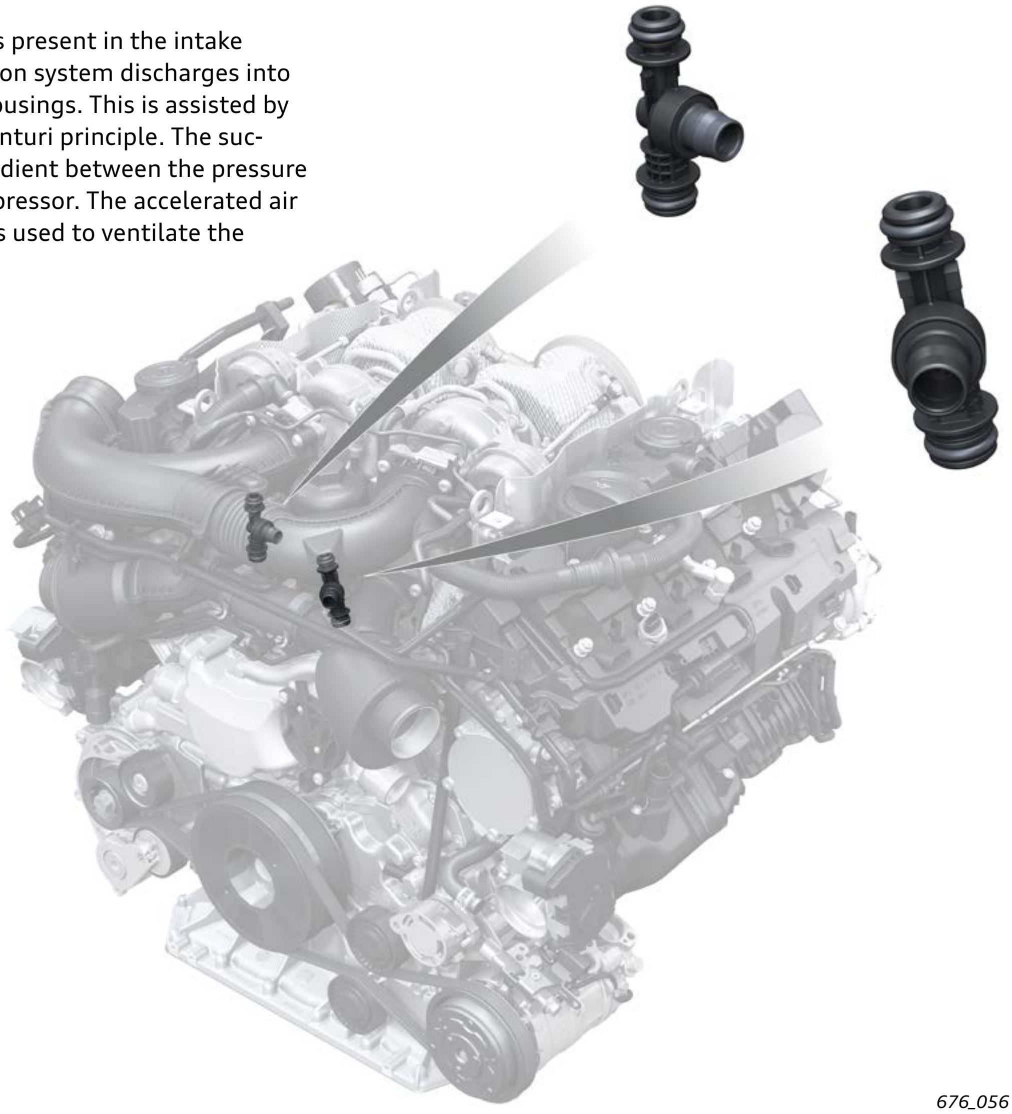
676_127

Tank Ventilation Pressure Sensors 1 and 2 are mounted upstream of the EVAP Purge Regulator Valves. They are used to check whether sufficient vacuum is present in the fuel tank ventilation lines.

If a ventilation line is disconnected or leaky, a pressure drop would not be measurable and the MIL would be switched on.

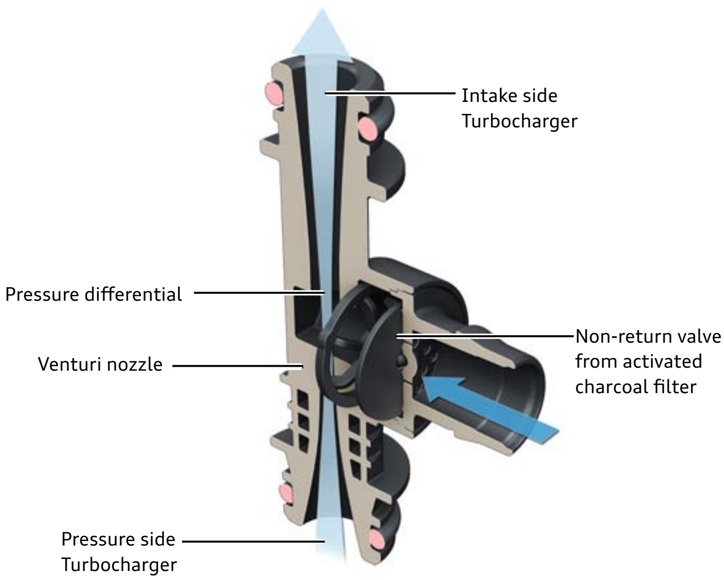
Suction-jet pumps for fuel tank breather system

During times when no vacuum is present in the intake manifold, the fuel tank ventilation system discharges into the turbocharger compressor housings. This is assisted by suction-jets operating on the Venturi principle. The suction-jets utilize the pressure gradient between the pressure and the intake sides of the compressor. The accelerated air flow produces a vacuum which is used to ventilate the charcoal canister.



676_056

Each suction-jet pump is connected to the intake side (vacuum) and the pressure side of the turbocharger. Once there is a sufficient difference in pressure between the intake side and the pressure side, for example, at full load, a "Venturi effect" is created. This extracts the fuel vapors from the activated charcoal filter and directs them into the intake side of the turbocharger.



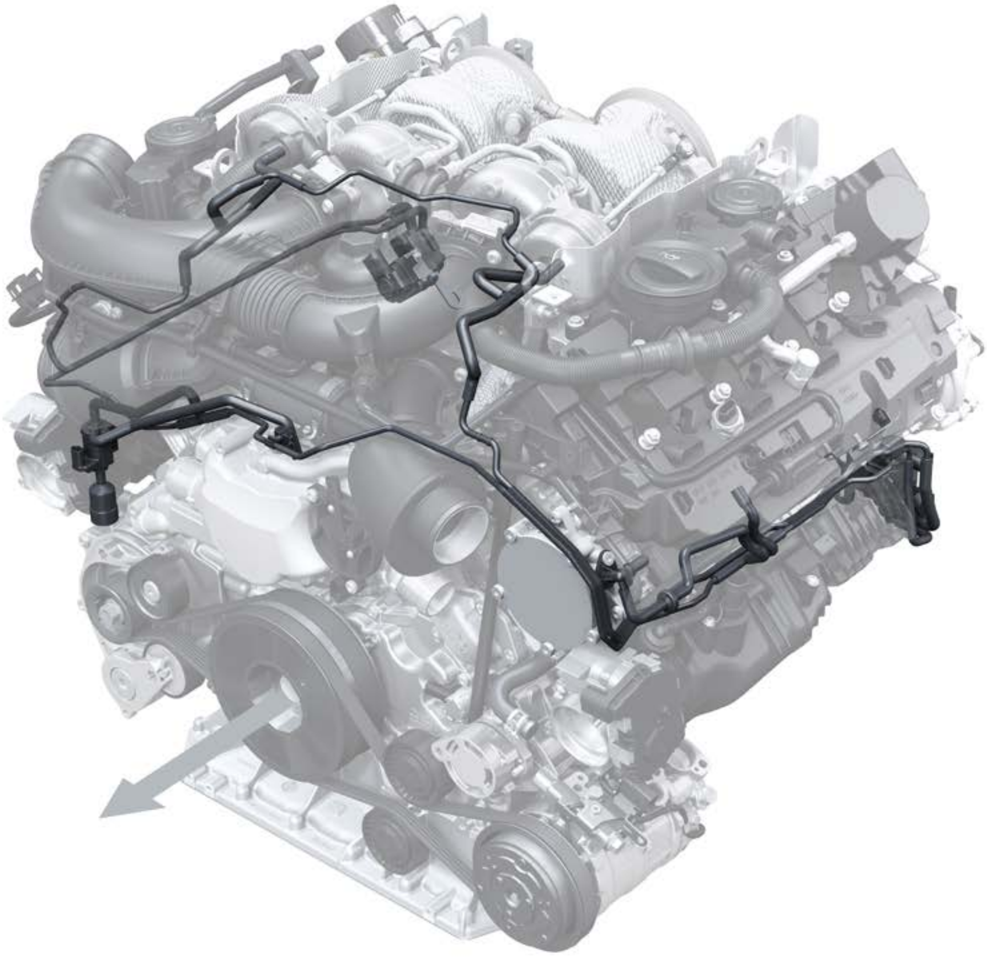
676_055

Vacuum system

Vacuum pressure is created by a single-vane pump driven by the inlet camshaft for cylinder bank 2.

The vacuum pump must supply the following components with vacuum pressure:

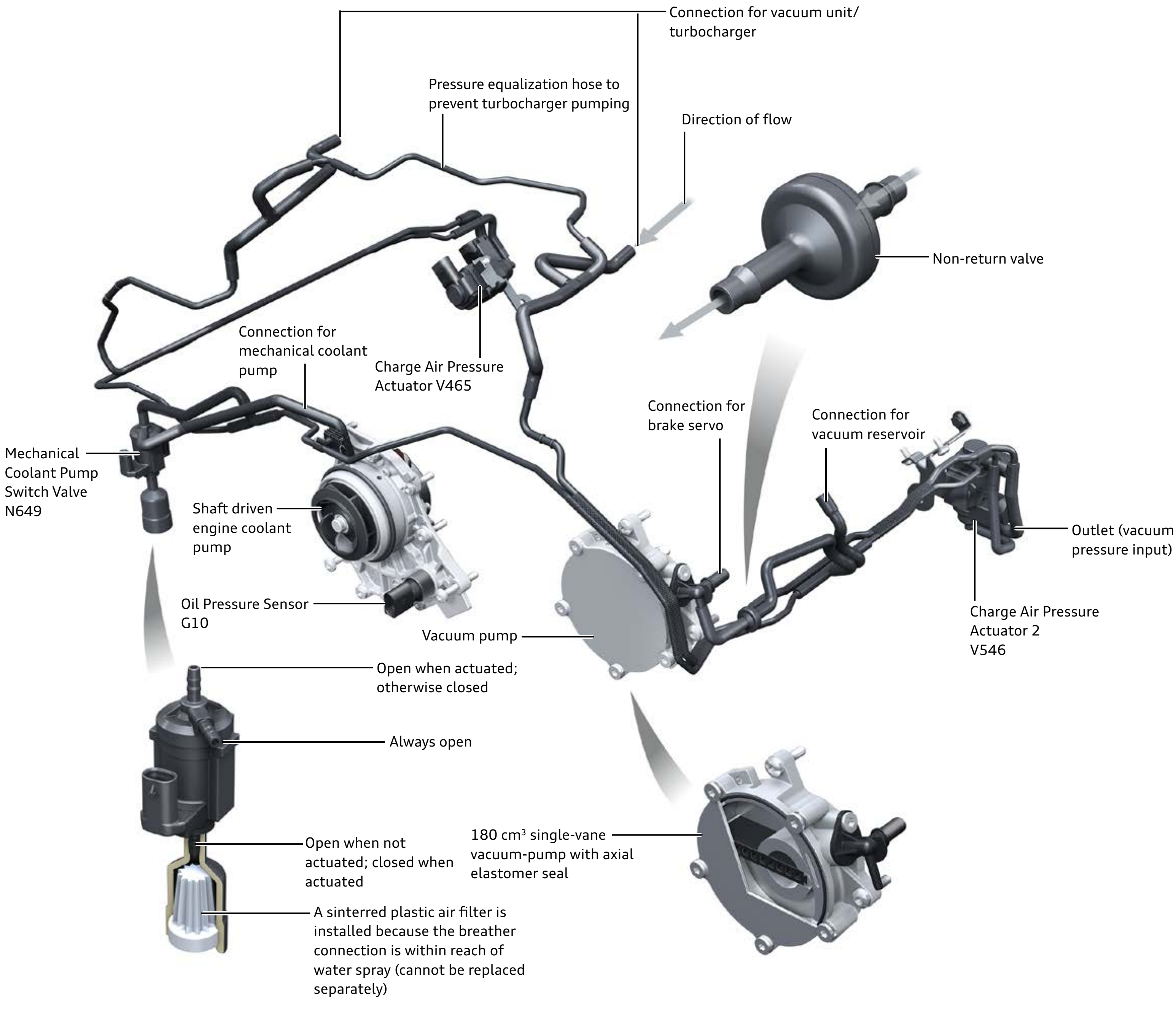
- The mechanical coolant pump: to ensure standing coolant in the cylinder block when the engine is warming up.
- The vacuum units of the turbocharger: to close the bypass flaps thus regulating the charge pressure.
- The brake servo.



676_057

Charge Air Pressure Actuators V465 and V546 are electro-pneumatic exhaust gas recirculation valves. They are able to initiate a calculated vacuum pressure (characteristic curve) according to the actuation (PWM) by the ECM. This determines the degree to which the bypass flaps are open; they are open when not actuated.

Mechanical Coolant Pump Switch Valve N649 is an electric changeover valve. It can only be switched to “on” and “off”.



676_058

Pressure equalization between the vacuum units of the bypass flaps

If there are differences between the characteristic curves of the two charge pressure positioners, this could cause the vacuum units to be actuated differently and create different pressure levels in the turbochargers, leading to undesired noises (turbocharger pumping). A connecting pipe equalizes the pressure between the vacuum connections of the vacuum units of both turbochargers.

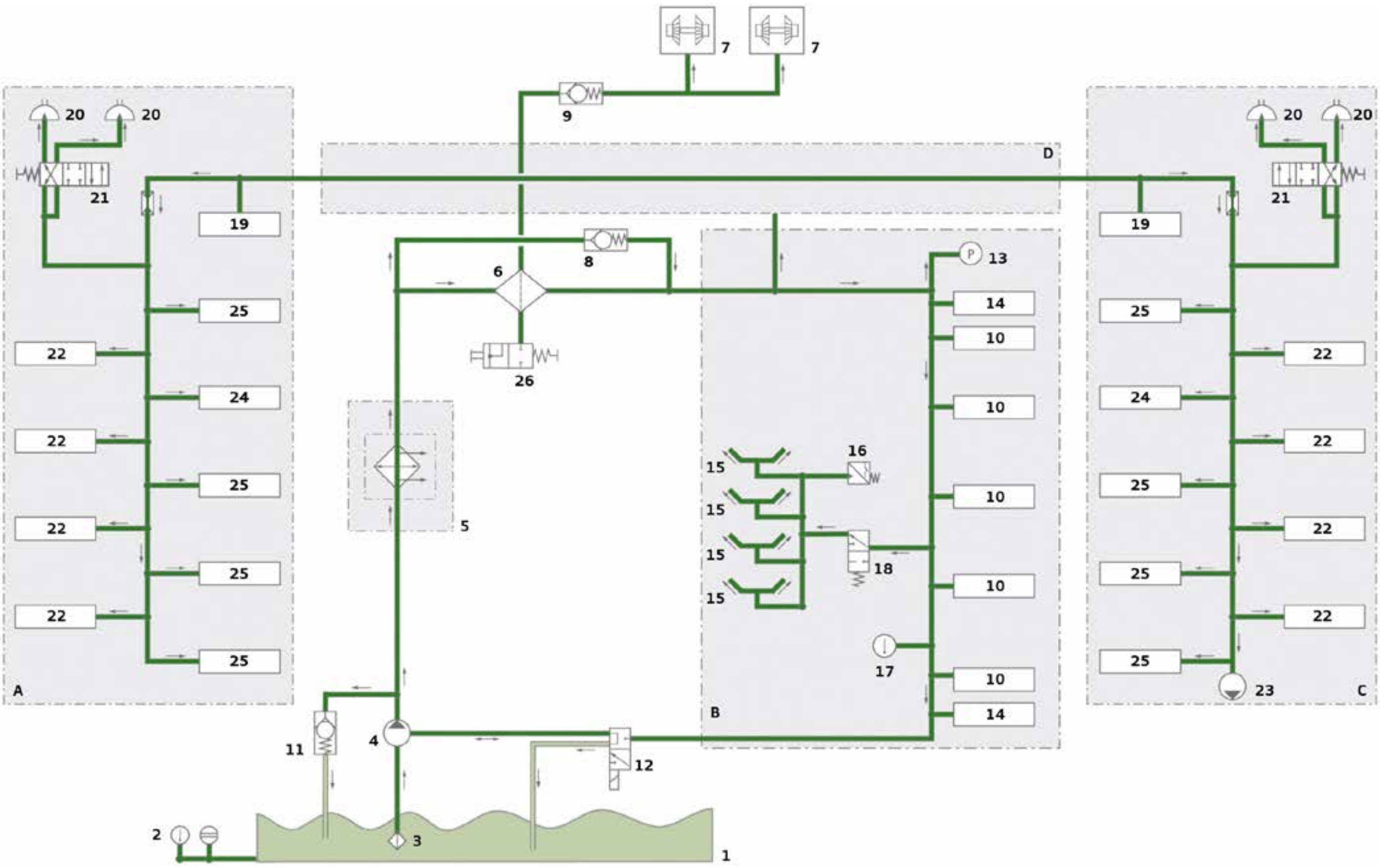
Oil supply

The key objectives for the oil circuit development are to keep pressure losses to a minimum and ensure optimal flow.

Key technical features of the oil circuit are:

- Fully variable map-controlled vane cell oil pump.
- Piston cooling jets which inject directly into the piston crown cooling ducts.
- Thermostat controlled engine oil cooler.

Oil circuit overview



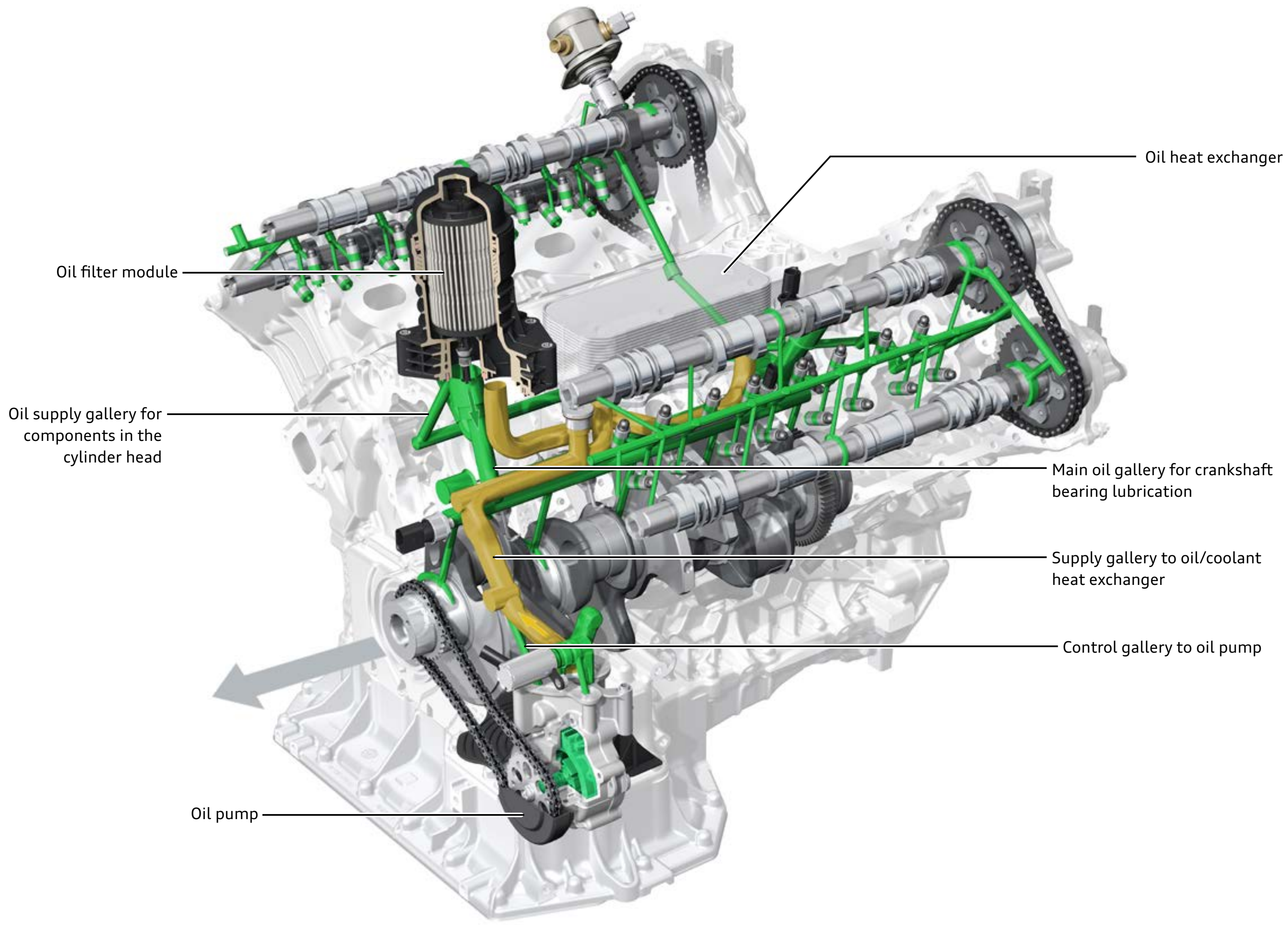
676_059

Key:

A Cylinder head 1
B Cylinder block
C Cylinder head 2
D Cylinder head gallery

1 Oil pan
2 Oil Level Thermal Sensor G266
3 Oil intake with strainer
4 Oil pump
5 Oil-coolant heat exchanger (engine oil cooler)
6 Oil filter
7 Turbocharger
8 Bypass valve
9 Turbocharger non-return valve
10 Connecting rod
11 Pressure relief valve (cold start valve)
12 Oil Pressure Regulation Valve N428
13 Oil Pressure Sensor G10
14 Intermediate shaft bearing
15 Oil gallery for piston cooling jets
16 Oil Pressure Switch F22
17 Oil Temperature Sensor G8
18 Piston Cooling Nozzle Control Valve N522
19 Chain tensioner
20 Camshaft adjuster
21 Camshaft control valves
22 Camshaft bearings
23 Vacuum pump
24 High-pressure fuel pump
25 Hydraulic valve clearance compensation element
26 Oil drain valve

Overview of engine components

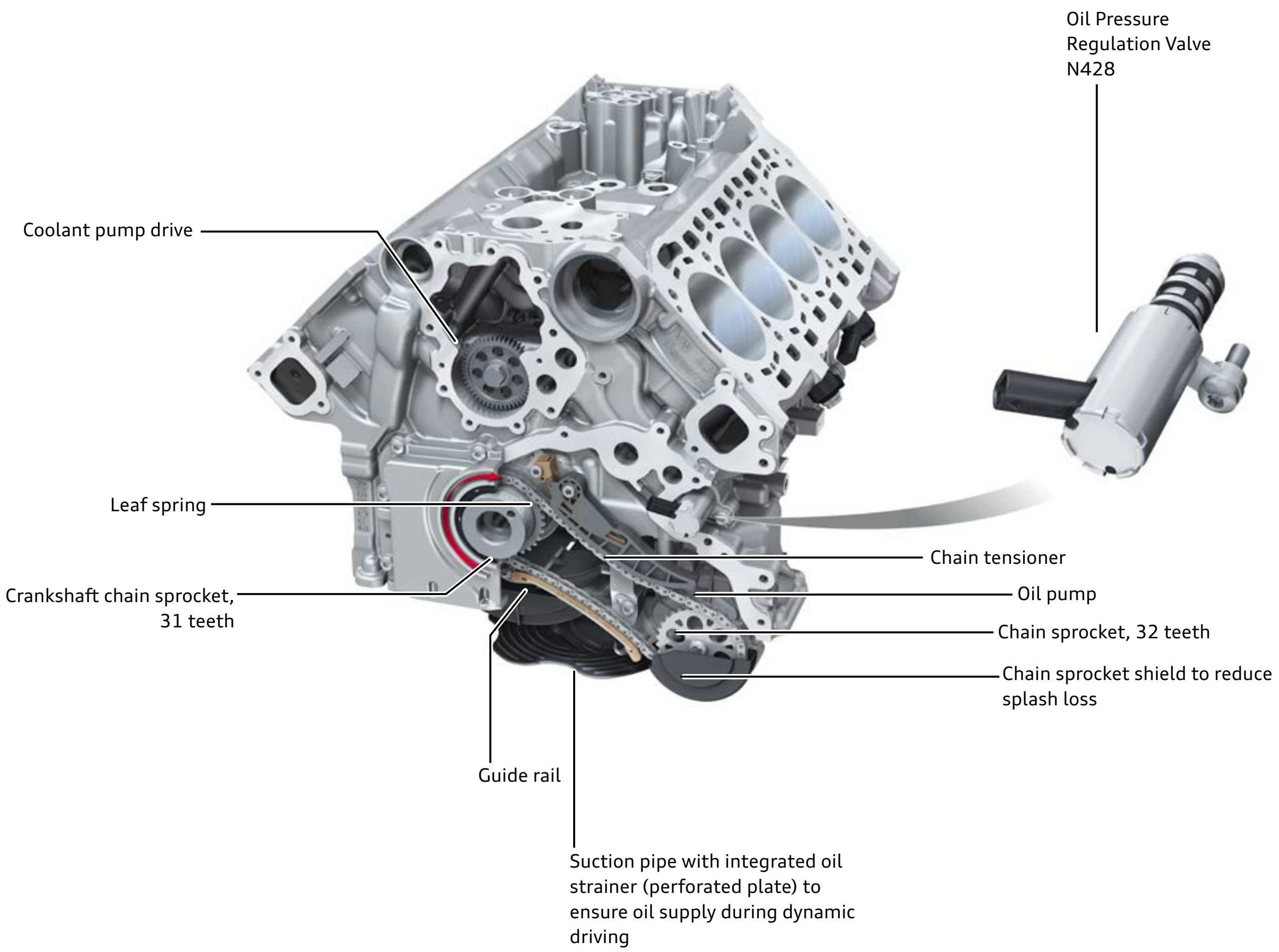


676_060

Oil pump

Drive

The vane cell oil pump is driven by the crankshaft via a chain drive on the front side of the engine. A 7mm chain and leaf-spring chain tensioner (no hydraulic damping) is used. A guide rail is installed on the driving side of the pump due to the distance between the shafts for the chain sprockets.

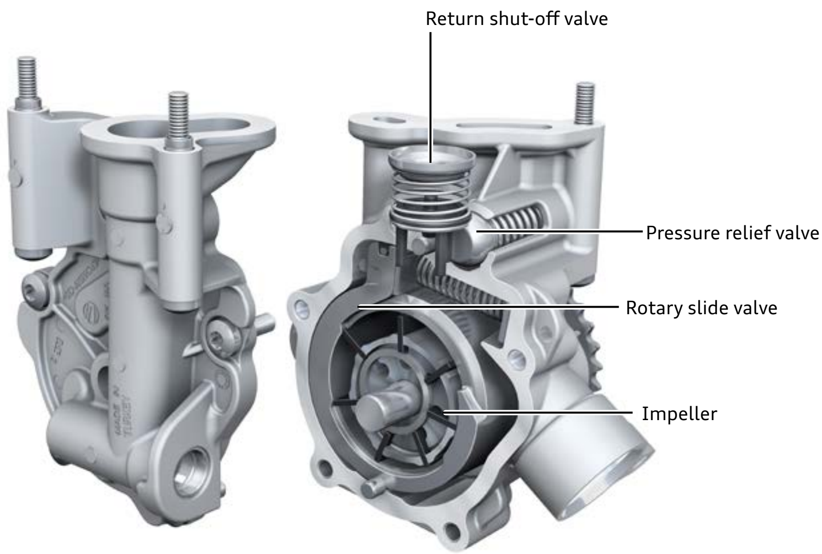


676_061

Oil pump

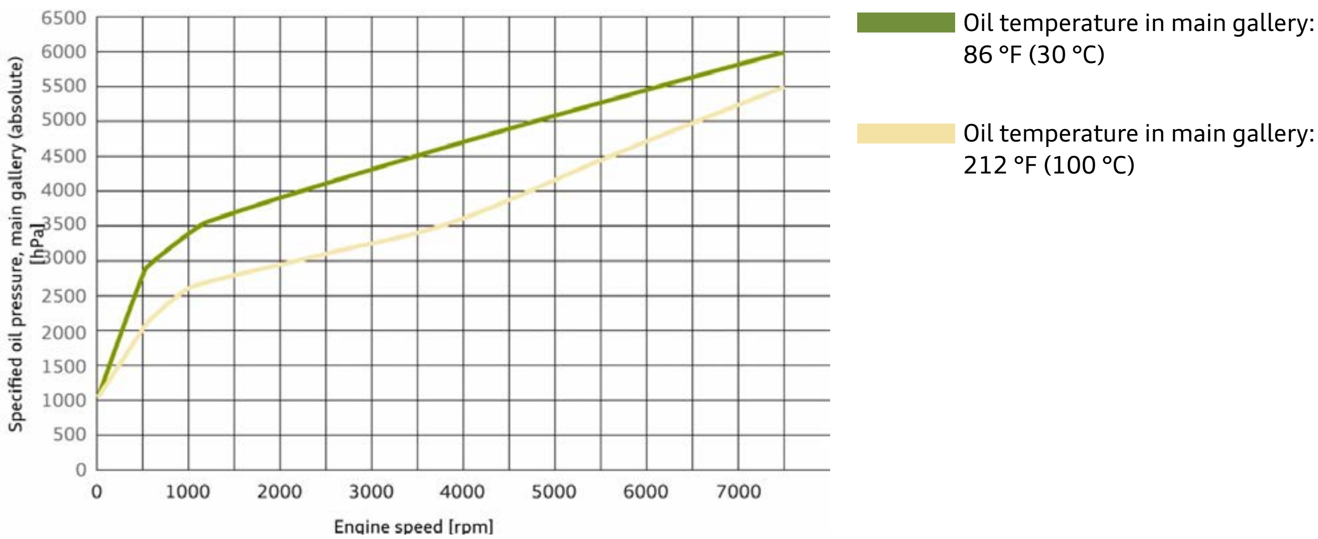
The fully variable vane pump has a very compact construction. It is bolted onto the crankcase. A metal gasket is necessary to seal the individual oil passages from one another at the point where the components mate.

676_062



676_065

Oil pump: range of operation



676_063

Note

For new vehicles, two-stage oil pressure regulation is only activated after the first 620 mi (1000 km). This compensates for the higher friction when breaking in new parts and is the best way of removing particles of residue worn off during the break-in process. After installing new components such as the engine/short block, cylinder head, camshaft housing or turbocharger, activate the “engine run-in” program in the Guided Fault Finding (GFF). This will ensure that only the high pressure stage is allowed for the next 620 mi (1000 km).

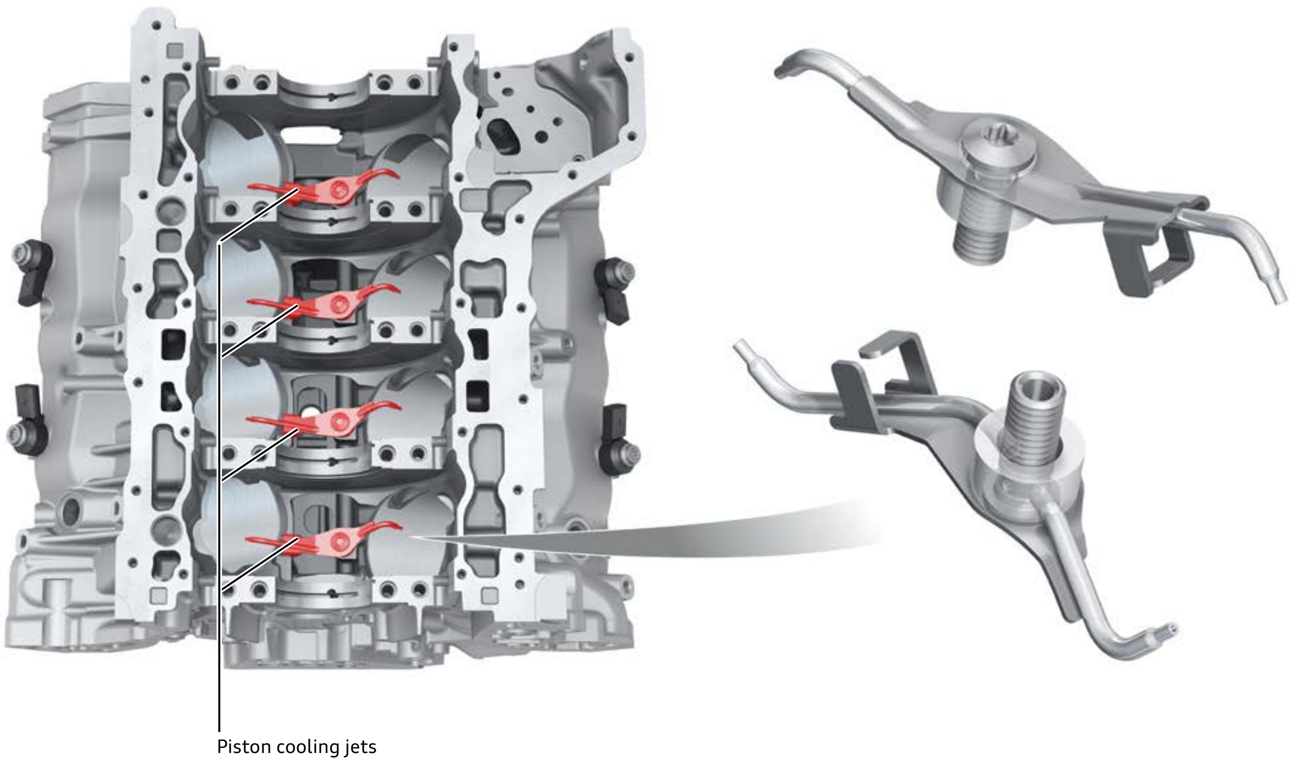
Reference

For further information regarding fully variable oil regulation, please refer to eSelf-Study Program 920173, The Audi 3.0L V6 TFSI EA839 Engine.

Piston cooling

It is not necessary to cool the pistons with oil spray during every phase of engine operation. When no cooling is required, Piston Cooling Nozzle Control Valve N522 is switched to ground by Engine Control Module J623. This closes off the channel from the main oil gallery to the oil gallery for the piston cooling jets.

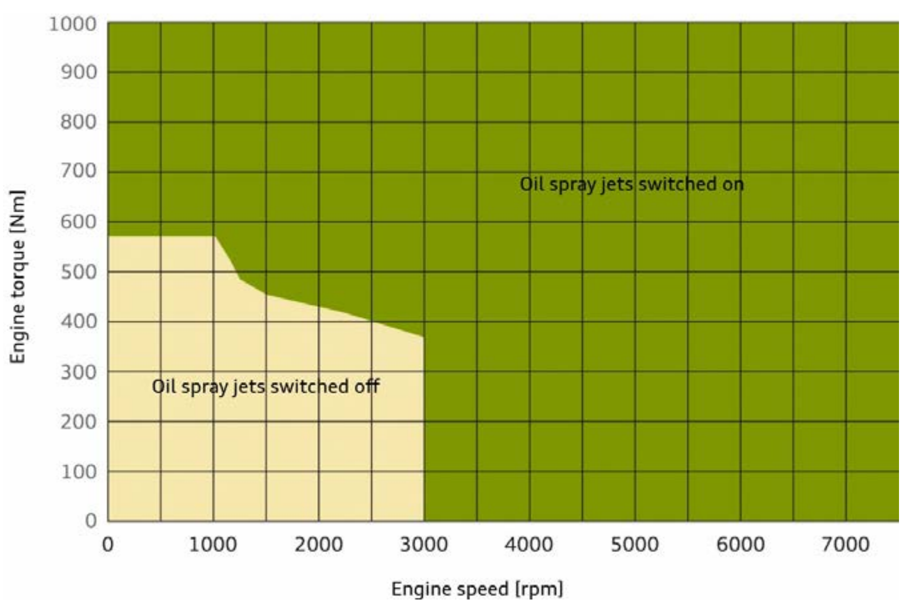
When the oil gallery is closed, the oil pressure dissipates via the piston cooling jets. Feedback to the ECM is provided by the signal from Oil Pressure Switch F22. F22 is located in the oil gallery and opens at pressures between 4.35 - 8.70 psi (0.3 - 0.6 bar).



676_066

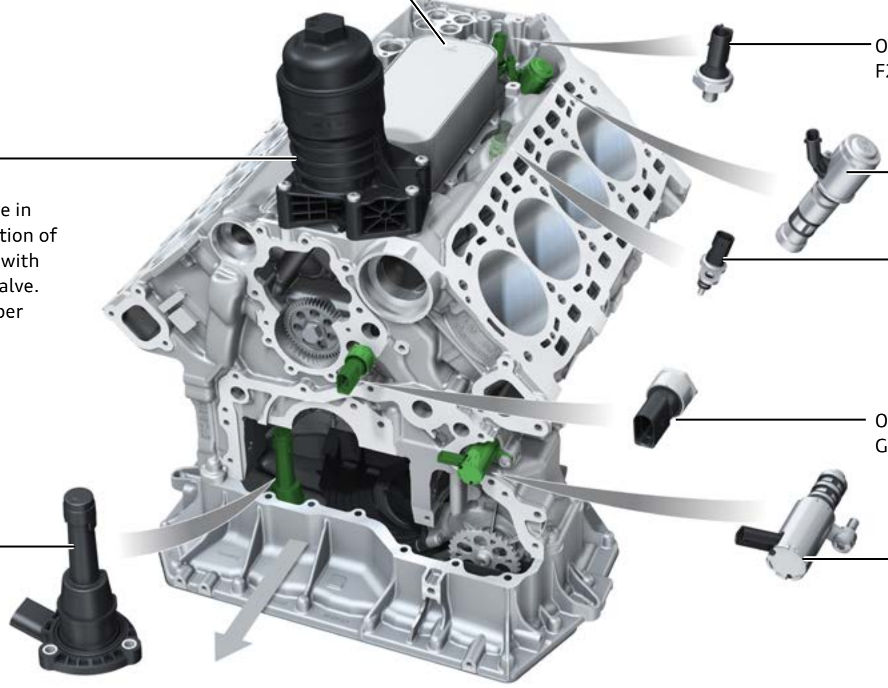
Piston cooling jets: range of operation

Piston cooling is activated based on a characteristic map that considers the variables of engine rpm, engine torque and oil temperature. For this purpose, Oil Temperature Sensor G8 provides the engine oil temperature value of the main oil gallery. Piston cooling is only activated at oil temperatures above 50 °F (10 °C).



676_067

Sensors and actuators



676_068

Note
Oil Temperature Sensor G8, Oil Pressure Switch F22 and Piston Cooling Nozzle Control Valve N522 are located under a heat shield.

Oil Temperature Sensor G8

G8 is also located in the inner V of the engine. This NTC thermistor measures the temperature of the engine oil in the main oil gallery. The ECM uses the signal primarily as the input variable for calculating the oil pressure regulation.

In addition, the oil temperature in the main oil gallery determines whether the piston cooling jets are activated. For example, at oil temperatures over 248 °F (120 °C), the piston cooling jets are activated even at low engine speeds.

676_154

Oil Level Thermal Sensor G266

The signal from G266 is evaluated by the ECM, which uses the temperature and oil level values to compute the oil change interval. The information regarding oil level and oil temperature is transmitted to the ECM via a PWM signal. The sensor has a 12 Volt power supply.

676_069

Piston Cooling Nozzle Control Valve N522

This solenoid valve operates on 12 Volt power. To activate the solenoid valve and close the oil passage for the piston cooling jets, the ECM switches it to ground. This means that the valve would be open in the event that it should fail (failsafe design).

676_070

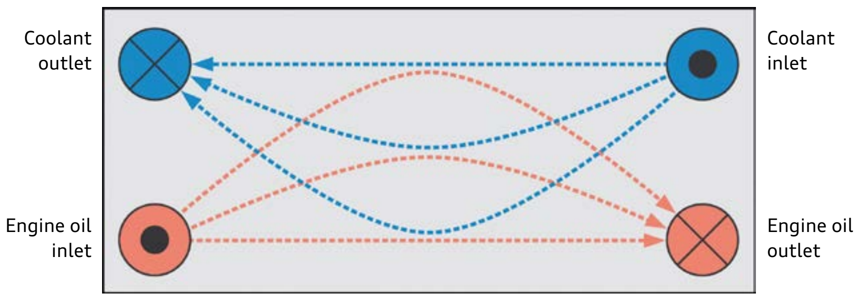
Oil filter and oil-coolant heat exchanger

The engine oil circulated by the oil pump flows first through the oil heat exchanger, which is installed in the inner V of the engine and connected to the coolant circuit on the coolant side.

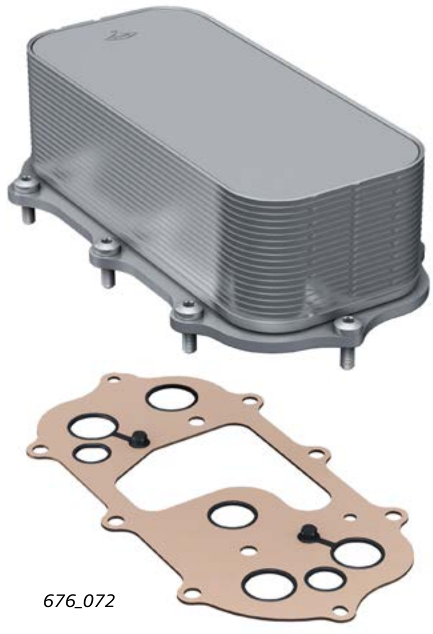
When the oil exits the oil-coolant heat exchanger, it flows through a passage in the cylinder block and into the oil filter module. Once it has been filtered, the oil flows into the main oil gallery of the engine; from there, it reaches the appropriate components via corresponding passages.

676_071

The oil-coolant heat exchanger is designed to provide a high degree of heat transfer. It comprises 19 stacked plates with plates for turbulent flow (10 oil/9 water), which provides a high degree of heat transfer. The coolant circulates via counterflow with a flow rate of up to 63.40 qt (60l) per minute.



Cross-flow of engine oil and coolant through exchanger 676_073

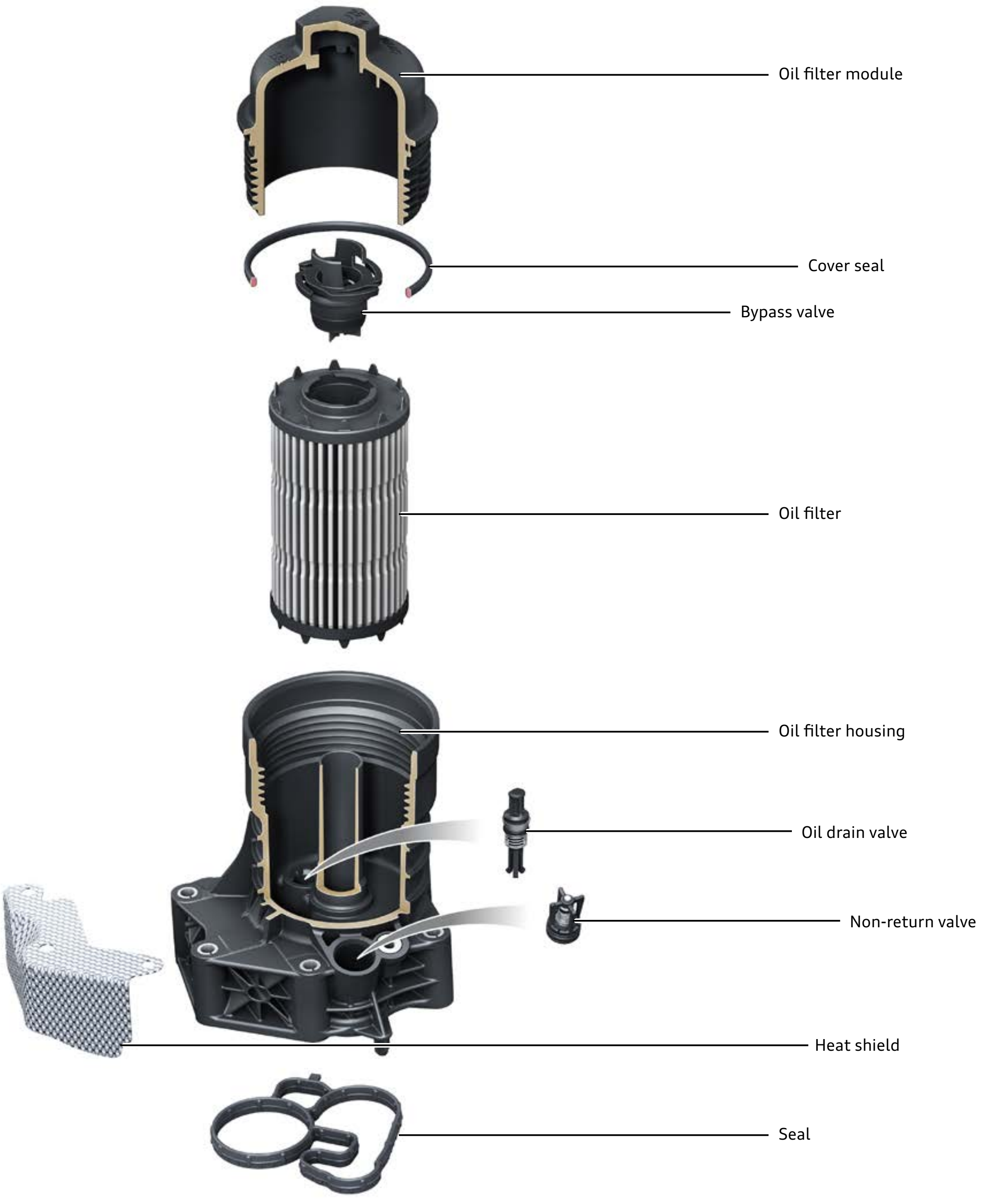


676_072

Oil filter module

The oil filter module is made of plastic and is installed in front of the oil-coolant heat exchanger in the inner V of the engine. This makes it very easy to replace the oil filter. A stainless steel heat shield protects the oil filter module by reflecting the heat that radiates from the turbocharger on cylinder bank 2.

A bypass valve is installed in the housing cover which directs the oil past the oil filter should it become clogged. Two additional valves are installed in the oil filter housing. The non-return valve prevents oil from flowing from the turbochargers back into the sump. The oil drain valve opens when the oil filter cover is unscrewed so that the oil drains into the sump when the oil filter is exchanged.

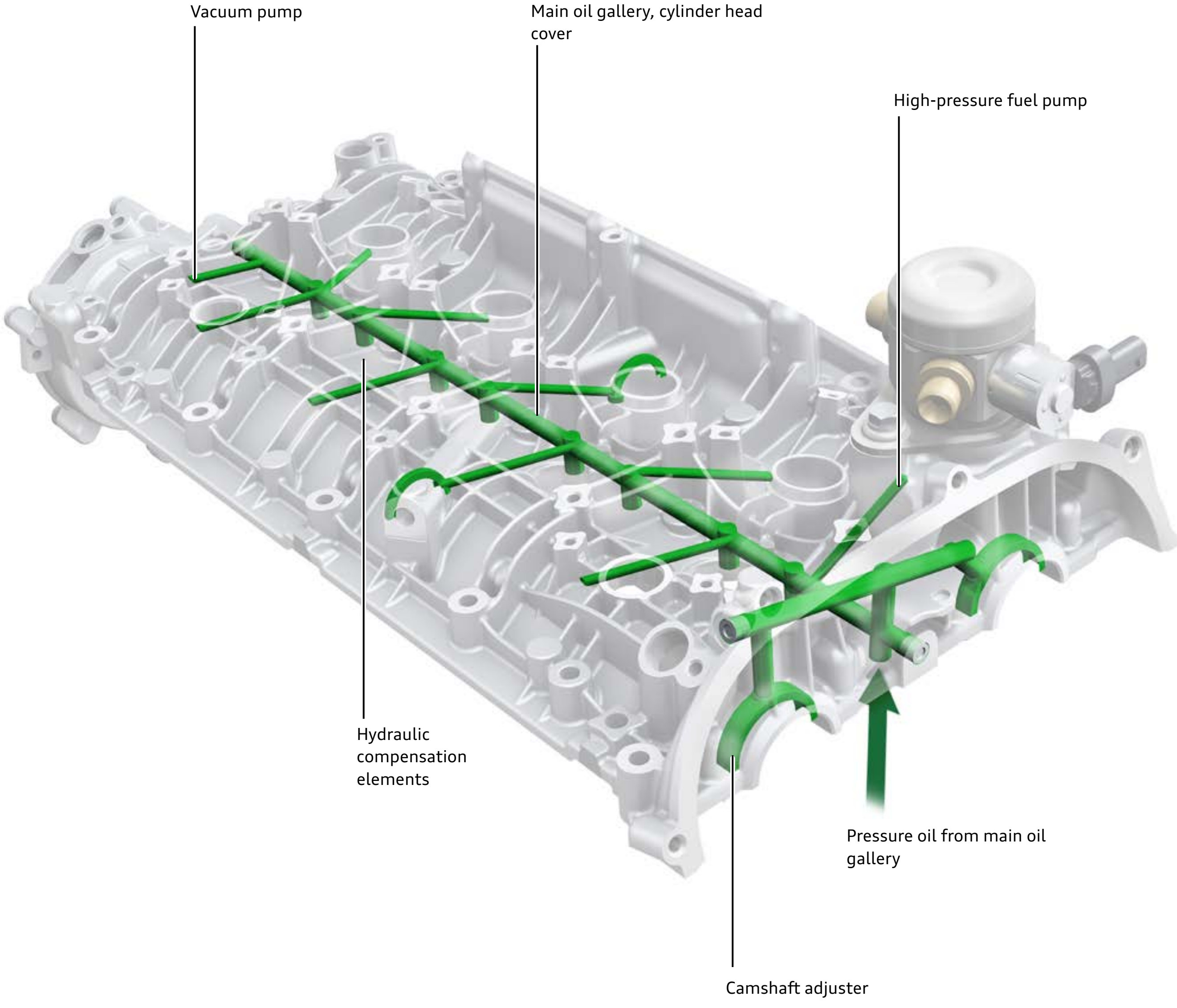


676_074

Oil supply in the cylinder head cover

The main oil gallery in the cylinder block supplies the oil pressure to the cylinder head cover.

From the main oil gallery, oil is supplied to the camshaft bearings, the hydraulic compensation elements, the high-pressure fuel pump and (on cylinder bank 2) the vacuum pump via branch ports. Oil is supplied to the large camshaft bearings and the camshaft adjusters via the main oil gallery of the cylinder head covers.

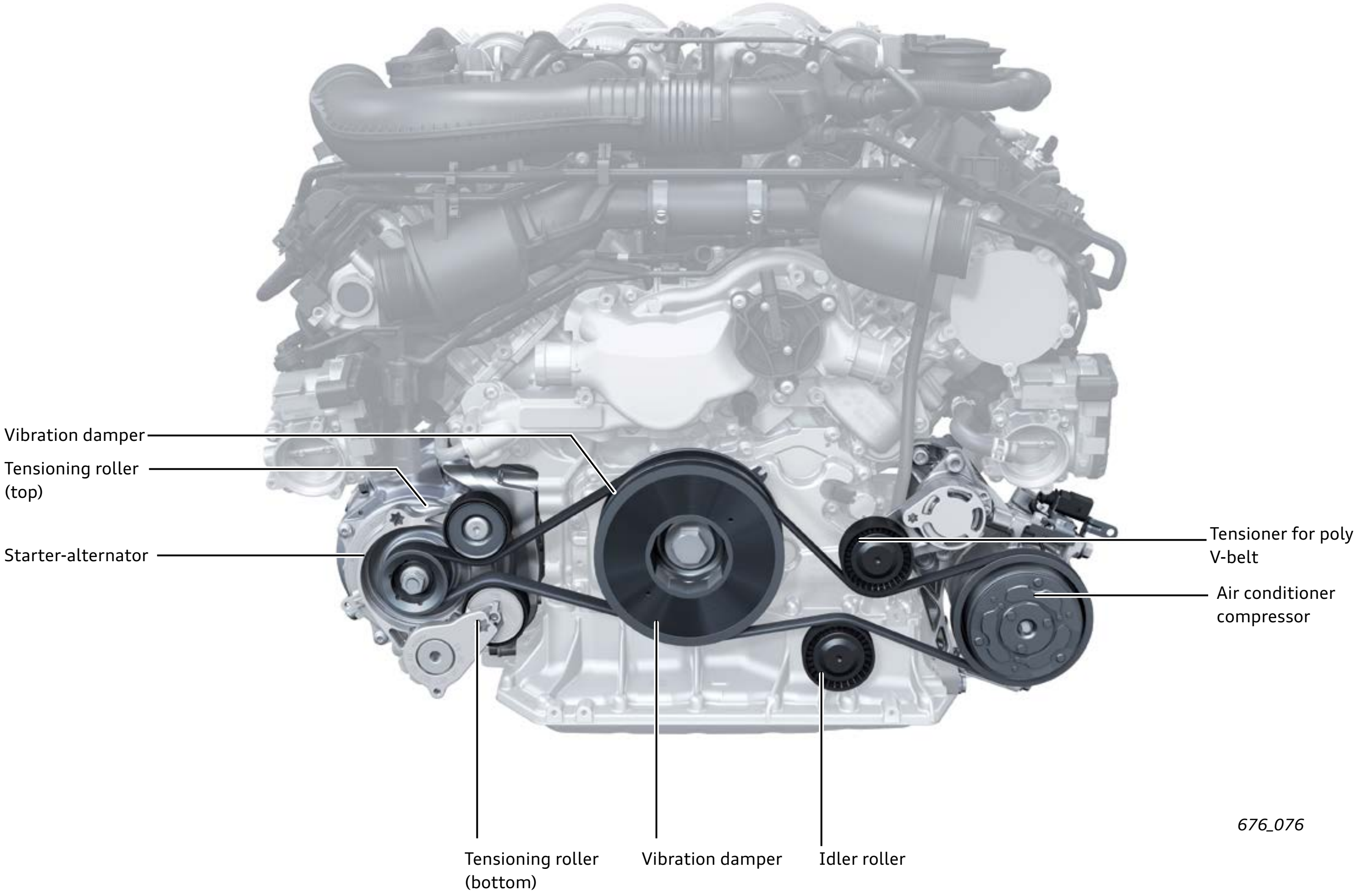


676_075

Drive for ancillaries

The alternator and air conditioner compressor are each driven by a separate drive belt. Both belt drives are driven by the vibration damper of the crankshaft.

The belt drives are tensioned by automatic tensioning devices and are maintenance-free.



676_076

Poly V-belt tensioner for starter-alternator (belt tensioner/damper)

676_077

Poly V-belt tensioner for air conditioner compressor (belt tensioner/damper)

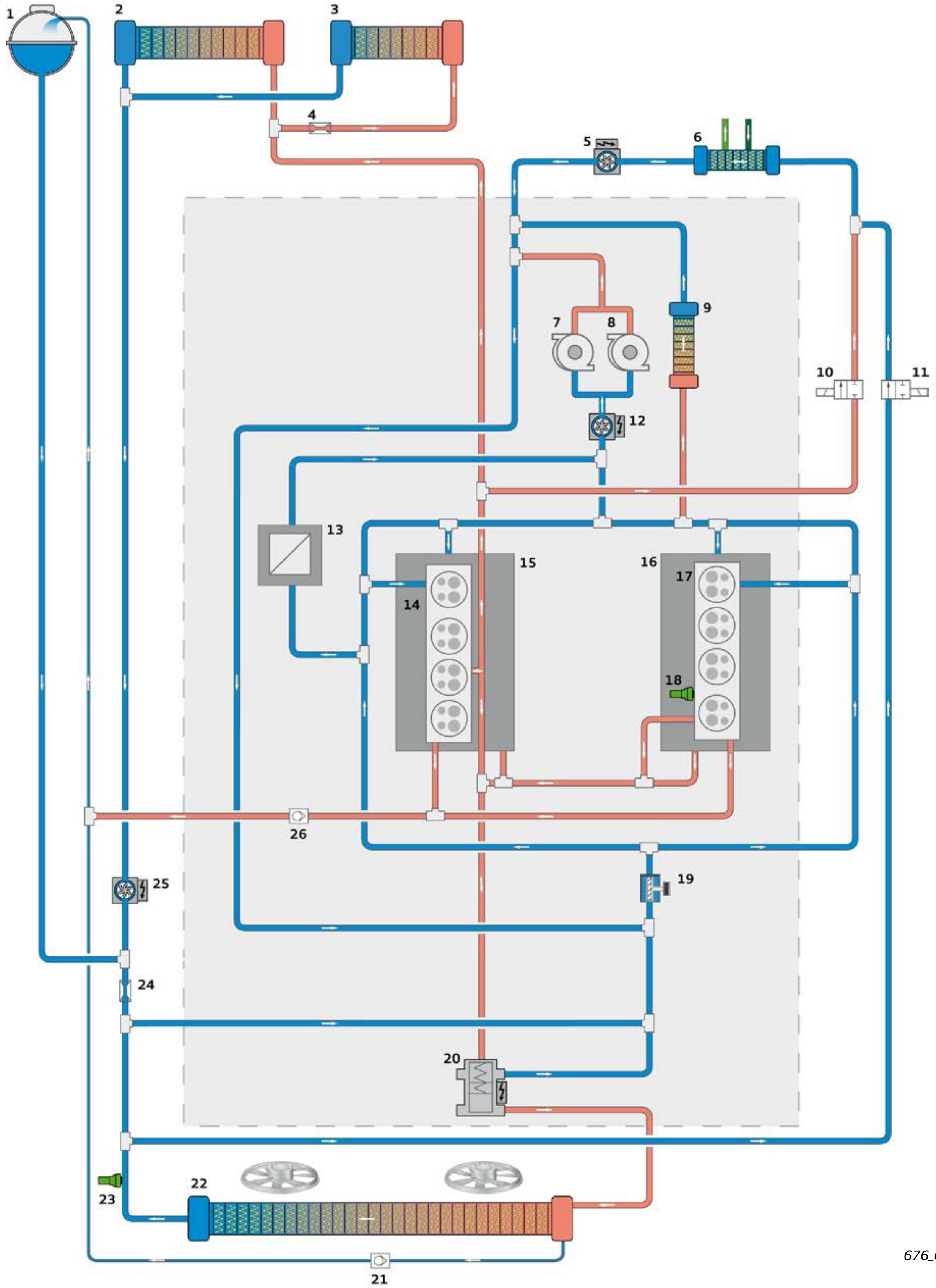
676_079

Cooling system

System overview

The new V8 engine has a thermal management system which activates various partial cooling circuits as required to help the engine, vehicle heating and transmission warm up quickly.

In addition to providing greater convenience, the main objective is to reduce fuel consumption and exhaust emissions.



676_080

Key:

1. Expansion tank
2. Heat exchanger for heater (front)
3. Heat exchanger for heater (rear)
4. Restrictor
5. High Temperature Circuit Coolant Pump V467
6. ATF cooler
7. Turbocharger, bank 1 (right-side)
8. Turbocharger, bank 2 (left-side)
9. Engine oil cooler
10. Transmission Fluid Cooling Valve N509
    (actuated by Transmission Control Module J217)
11. Transmission Coolant Valve N488
    (actuated by ECM J623)
12. After-Run Coolant Pump V51
13. Starter-alternator
14. Cylinder head (right-side)
15. Cylinder block (right-side)
16. Cylinder block (left-side)
17. Cylinder head (left-side)
18. Engine Temperature Sensor G407
19. Coolant pump (mechanical) With cover (standing coolant), actuated by Mechanical Coolant Pump Switch Valve N469
20. Map Controlled Engine Cooling Thermostat F265
21. Non-return valve
22. Radiator
23. Engine Coolant Temperature Sensor on Radiator Outlet G83
24. Restrictor
25. Coolant Recirculation Pump V50
26. Non-return valve

Cooled coolant

Warm coolant

Thermal management

The thermal management system is responsible for coordinating the optimal process of warming up the engine, transmission and passenger compartment. Reducing vehicle emissions is a primary concern in this process.

During the engine warm-up phase, the engine's mechanical coolant pump and Coolant Recirculation Pump V50, After-Run Coolant Pump V51 and High Temperature Circuit Coolant Pump V467 are switched off. Transmission Fluid Cooling Valve N509 and Transmission Coolant Valve N488 are closed. All the components listed are actuated as needed (as calculated by the characteristic map) so that the required coolant flow is achieved.

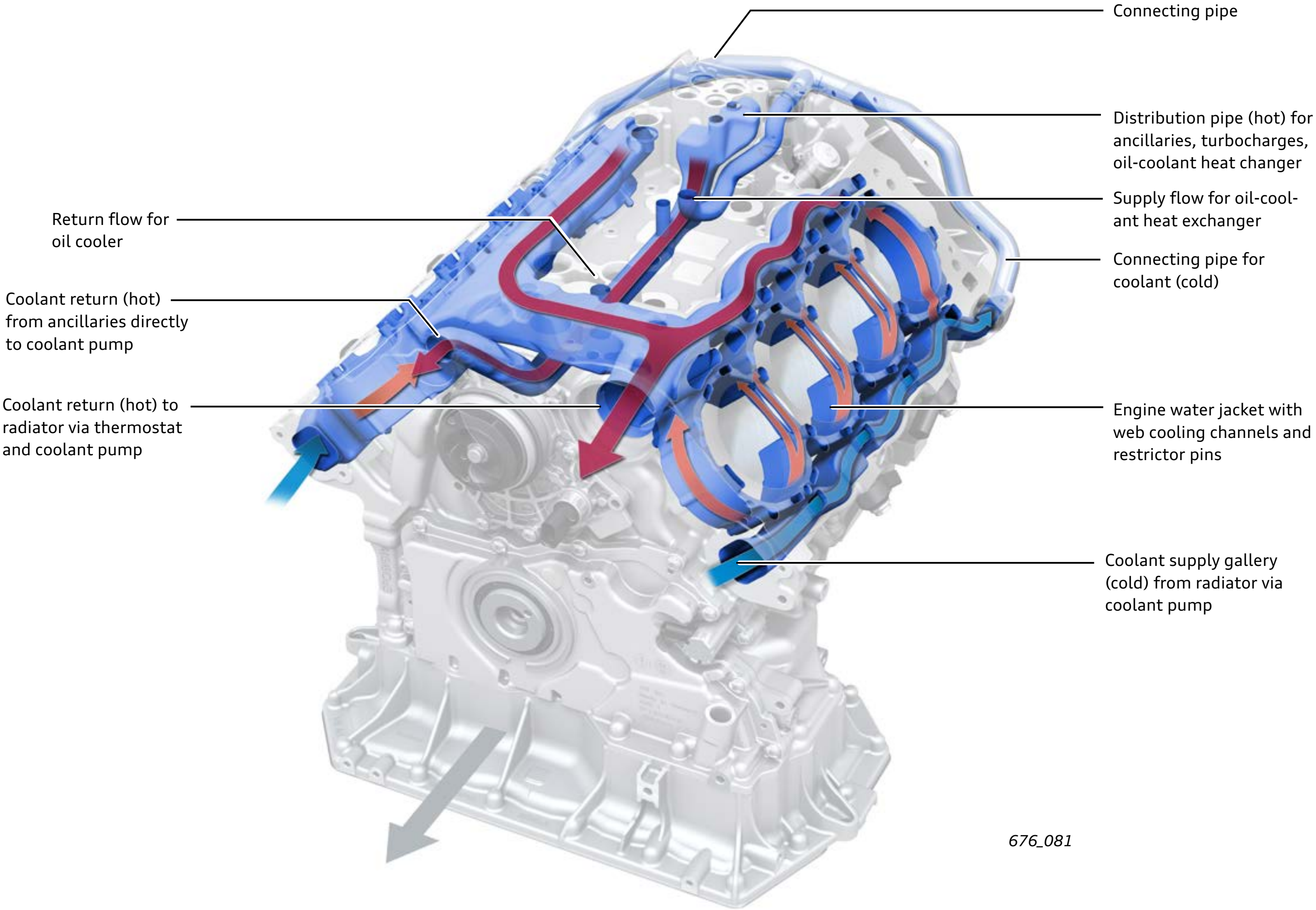
To provide a calculation, the characteristic map in the ECM requires numerous input parameters:

- Engine coolant temperature
- Ambient air temperature
- Engine speed, engine torque, engine power output
- Engine oil temperature
- Road speed
- Heating requirements
- Driving mode
- Radiator outlet temperature
- Transmission oil temperature

The following components can be activated in response:

- Mechanical Coolant Pump Switch Valve N649
- Map Controlled Engine Cooling Thermostat F265
- Coolant Recirculation Pump V50, After-Run Coolant Pump V51 and High Temperature Circuit Coolant Pump V467
- Transmission Fluid Cooling Valve N509 and Transmission Coolant Valve N488

Coolant circuit in cylinder block



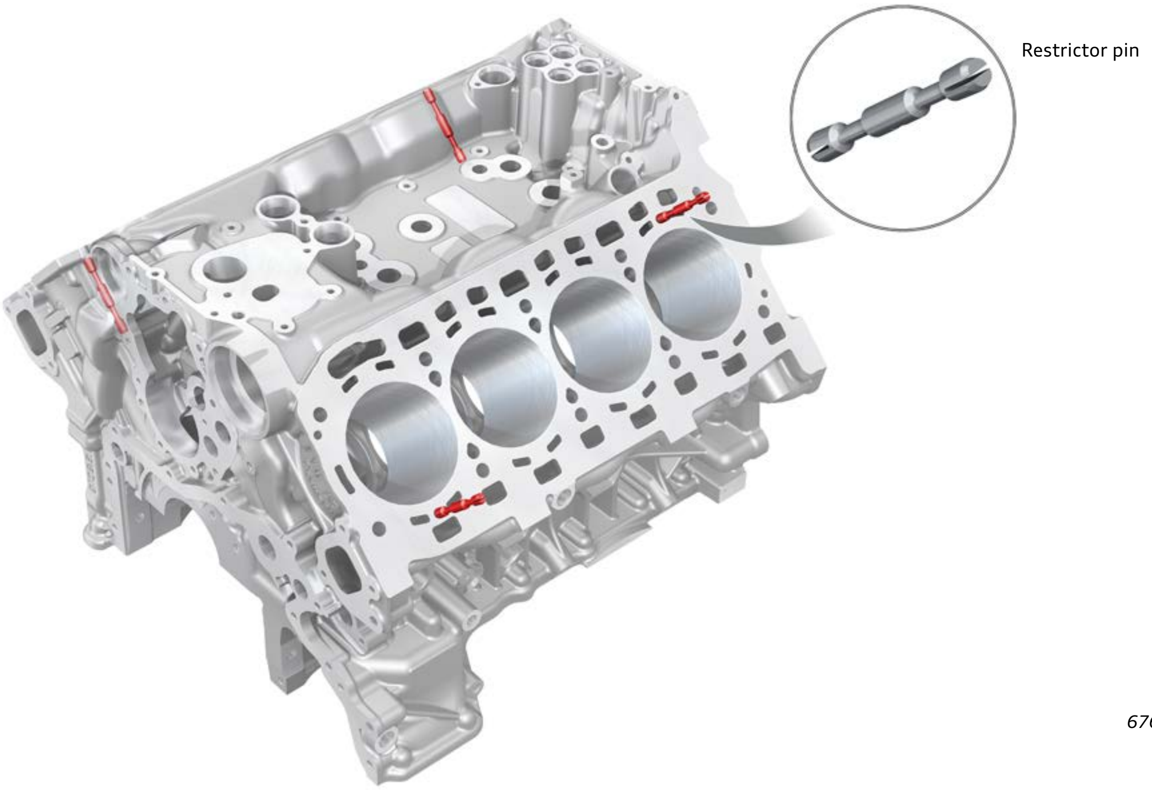
676_081

Restrictor pins

It is very important to provide cooling to the cylinder webs of the engine. Because they have a narrow cross-section, the coolant does not flow through them as easily. The coolant naturally always follows the path of least resistance.

To ensure that sufficient coolant can flow through the cylinder webs, constrictions must be created at other areas of the engine water jacket.

It is not possible to do this with the casting technique used to manufacture the cylinder block, so restrictor pins are installed at the appropriate positions. Two restrictor pins are installed in each cylinder bank.



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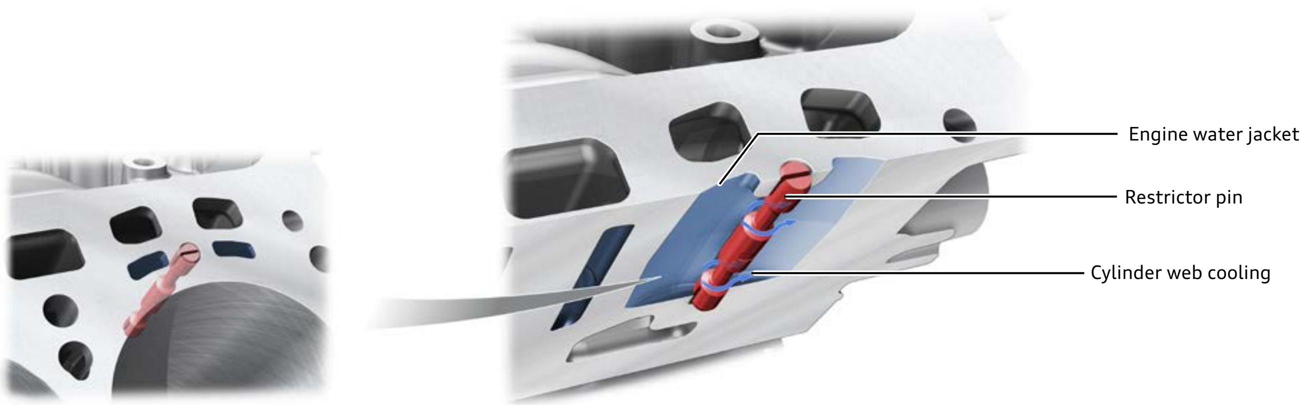


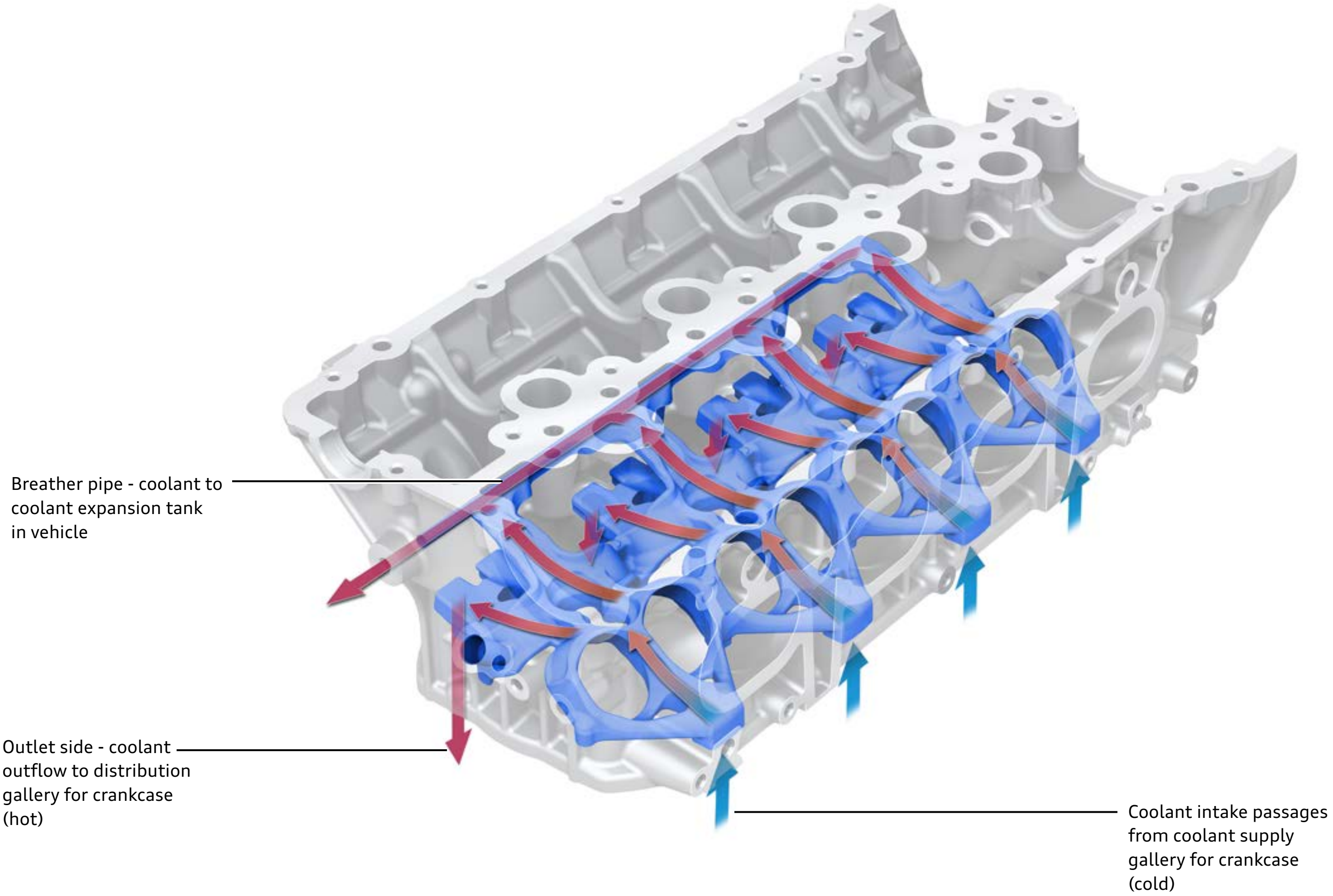
676_028

Note

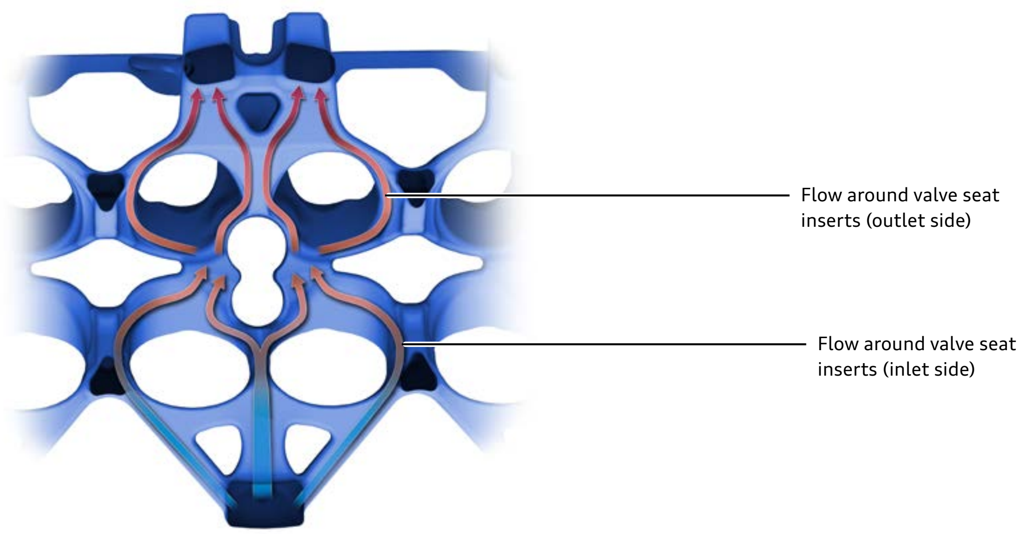
When making repairs in this area, it is important to ensure that the restrictor pins are installed. Without them, there would be no cylinder web cooling. This would cause the cylinder web areas to overheat, and certain components would become distorted. If a cylinder head were to warp causing a head gasket leak, coolant could leak into the combustion chamber.

Cooling concept for the cylinder head

The cylinder heads have the greatest cooling requirement compared to the other components in the cooling system. The flow to cylinder block and cylinder head is distributed at a ratio of 20:80, with up to 39.62 gal (159.0 L). of coolant per minute per cylinder head.



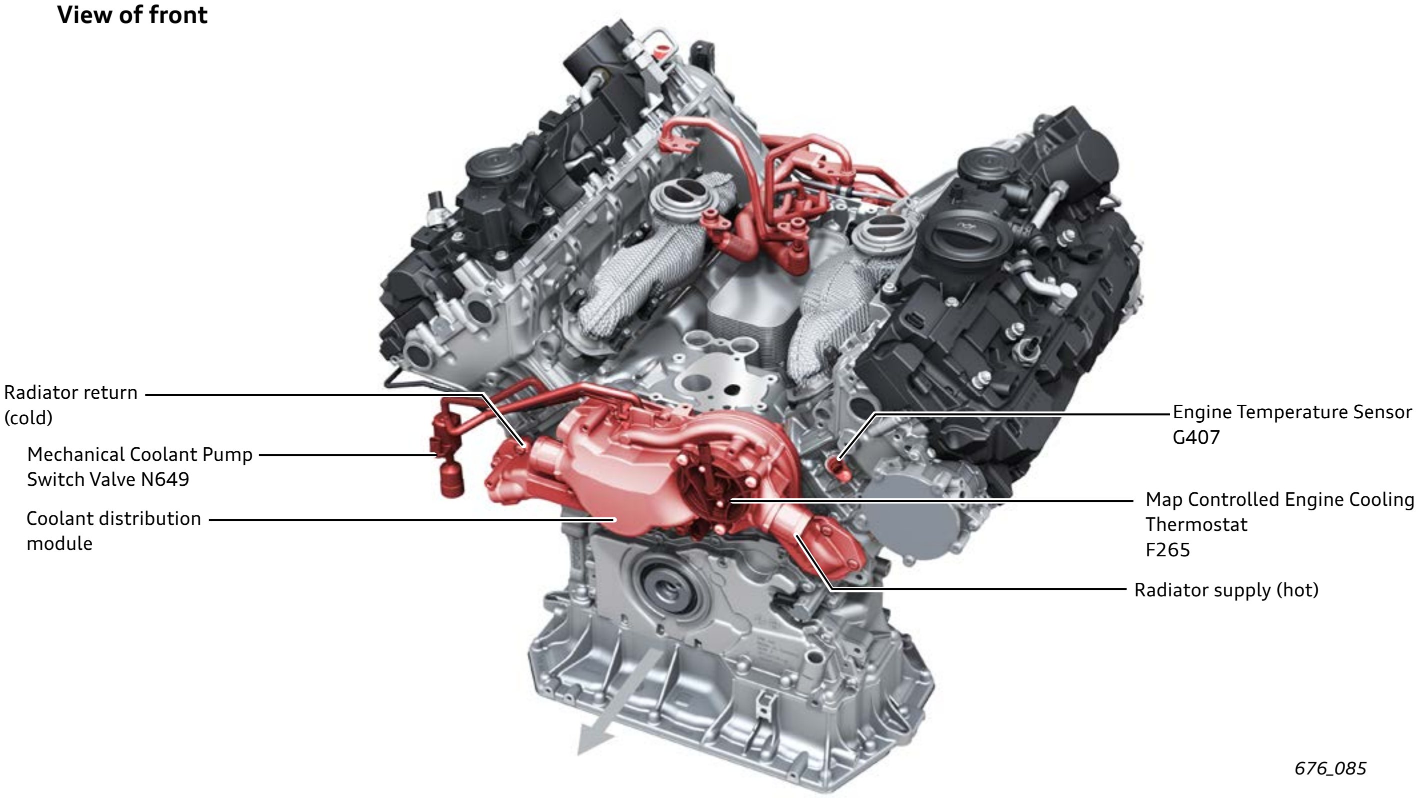
676_083



676_084

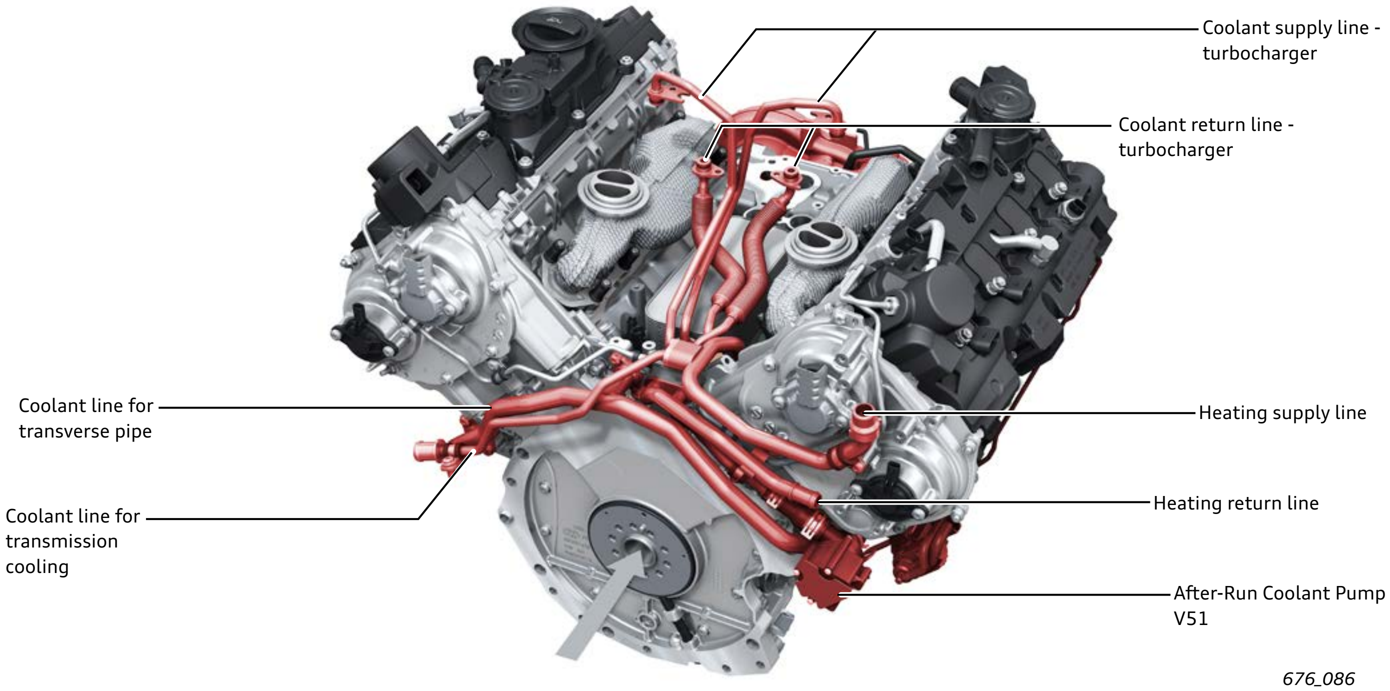
Components on the engine

View of front



676_085

View of transmission side



676_086

After-Run Coolant Pump V51

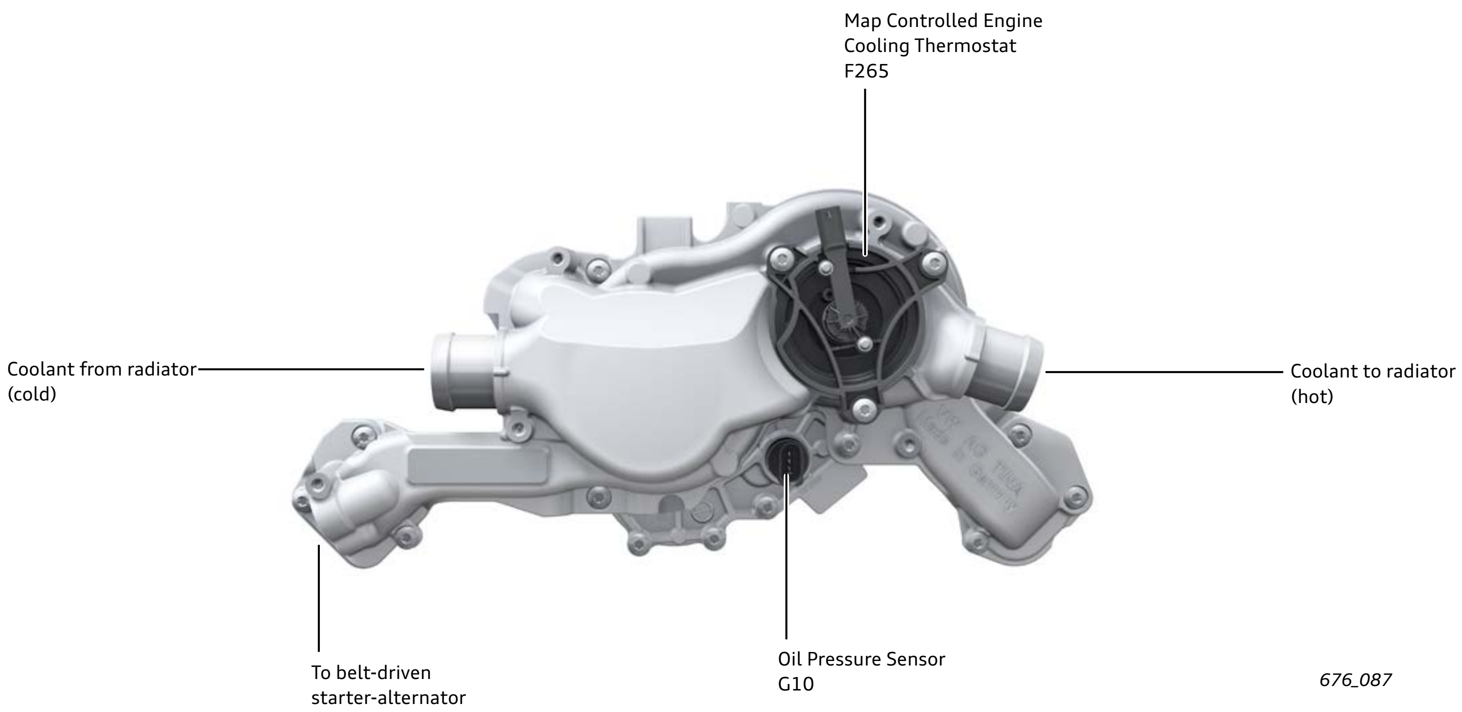
V51 is activated when greater cooling is required for the turbochargers at high engine loads. In addition, the pump operates for a defined period after the engine is switched off. This helps prevent heat-soak in the turbochargers. The electric radiator fan runs as well. To activate V51, the thermal management system performs calculations using the engine speed, engine torque, ambient temperature and coolant temperature.

- The after-run time lasts between 10 and 45 minutes (depending on the operating status of the engine).
- Delivery rate ~ 132.0 gal (500 L) per hour.

Coolant distribution module

The primary component of the thermal management system is installed on the front of the engine. In the coolant distributor housing, the flow of coolant is directed to the radiator, ancillaries and engine. The vacuum-controlled coolant pump and the map-controlled engine cooling system thermostat are located here as well. The coolant pump is driven by the intermediate shaft via a sprocket.

When the coolant pump opens the passage for the coolant, it flows through the entire engine, that is, through the cylinder heads as well. In other words, "split cooling" is not used on this engine. The flow to the cylinder block and cylinder head is distributed at a ratio of 20:80. For this reason, only one temperature sensor (G407) is installed for the entire engine; it is installed at an optimal location on the cylinder head of bank 2.



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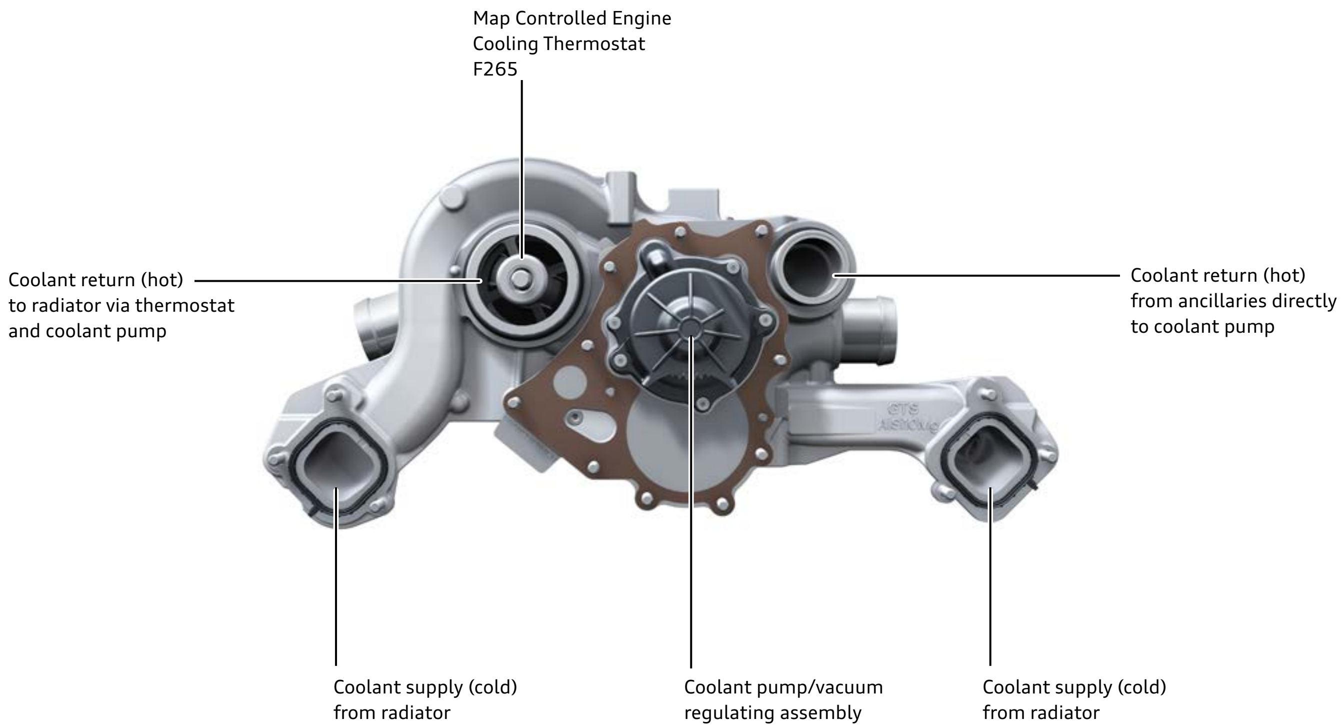


676_088

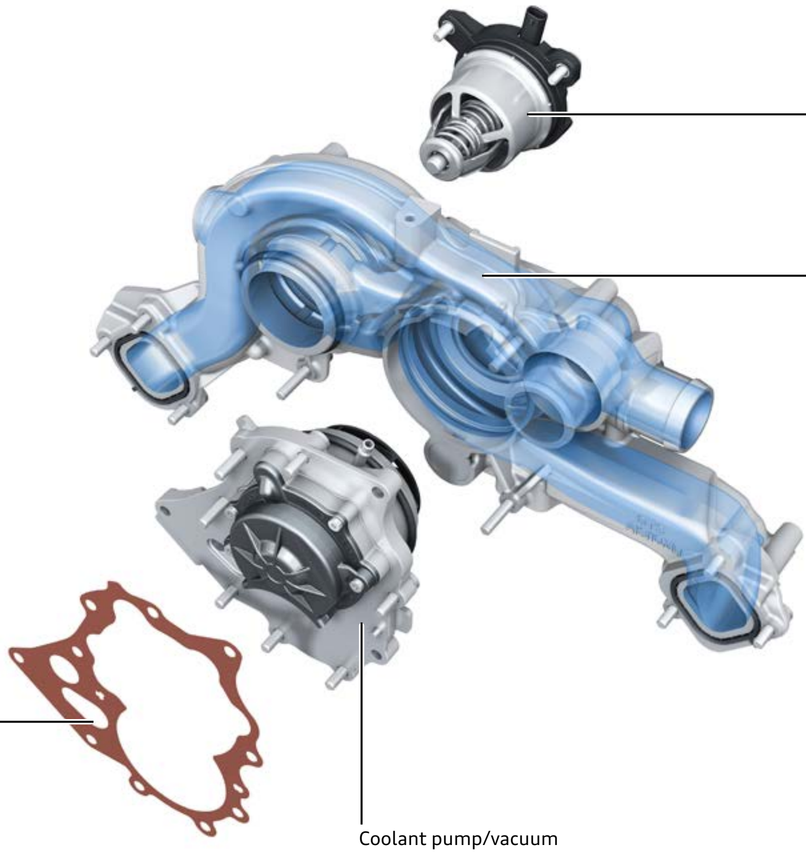
Map Controlled Engine Cooling Thermostat F265

The coolant temperature calculated in the characteristic map can be regulated between 201.2 °F - 222.8 °F (94 °C - 106 °C) as required. If the temperature is above 201.2 °F (94 °C), the ECM actuates the map-controlled engine cooling system thermostat via a PWM signal.

To protect the engine, the coolant temperature is lowered (F265 is not actuated) in the following situations:

- Driving mode Sport.
- Vehicle speed greater than 124.2 mph (200 km/h).
- Engine torque 438.8 lb ft (595 Nm).
- Engine temperature greater than 246.2 °F (110 °C).
- System DTCs.

676_089



676_022

Reference

For more information about the map-controlled engine cooling thermostat please refer to eSelf-Study Program 920173, The Audi 3.0L V6 TFSI EA839 Engine.

Regulating strategy of the mechanical coolant pump

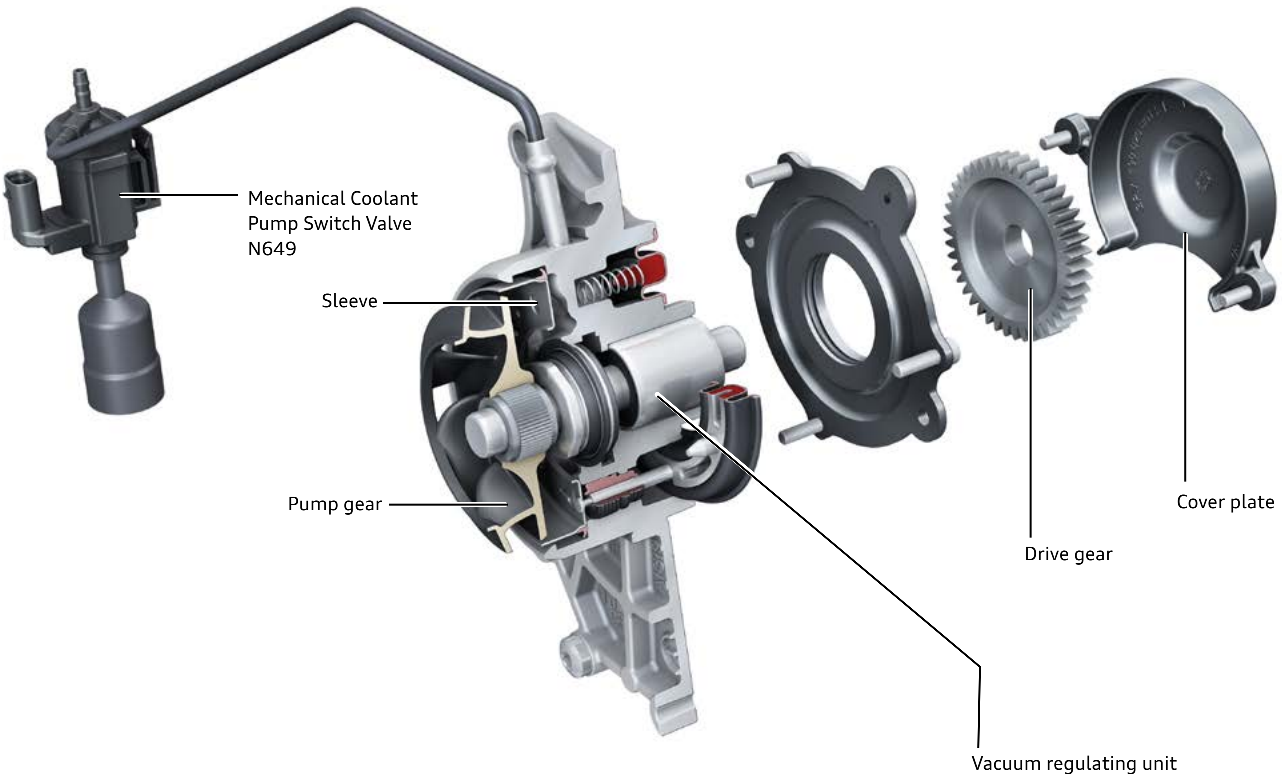
The on-demand mechanical coolant pump is activated when the following conditions are met:

- Coolant temperature between -14 °F - 176 °F (10 °C - 80 °C).
- Ambient temperature greater than 50 °F (10 °C).
- Engine torque greater than 368.7 lb ft (500 Nm) with all cylinders activated.
- Engine torque greater than 110.6 lb ft (150 Nm) with half of cylinders activated, depending on the coolant temperature and engine speed.
- Time since engine start greater than 600 seconds (10 minutes).

Conditions prohibiting activation:

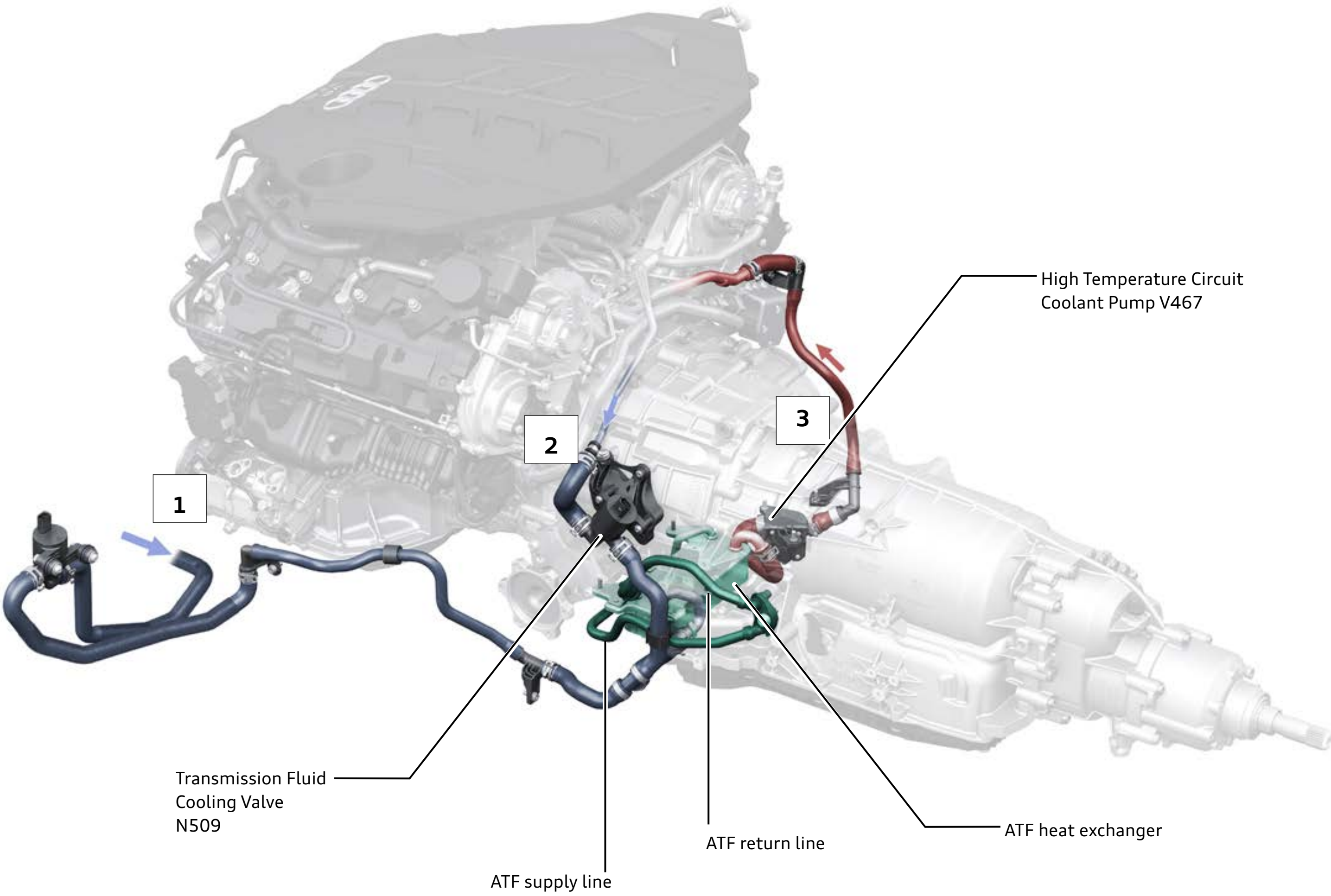
- Coolant temperature greater than 176 °F (80 °C).
- Engine speed greater than 3250 rpm.

If a signal is sent indicating the need to heat the passenger compartment during the engine warm-up phase, the impeller of the mechanical coolant pump is covered by the sleeve and Coolant Recirculation Pump V50 is switched on. In this way, pump V50 pumps coolant from the cylinder head into the heat exchanger.



676_090

Transmission coolant circuit



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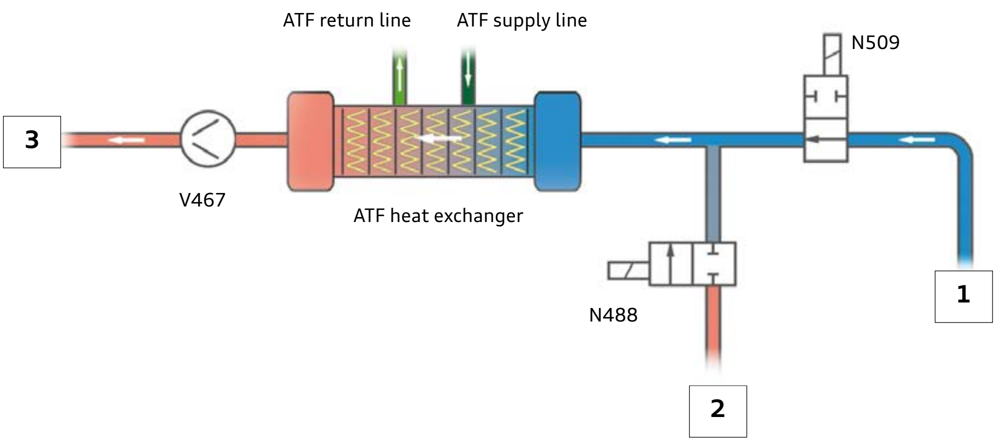


676_094

Supply flow

1. From radiator outlet
2. Warm coolant from engine

Return

3. To distribution pipe (hot), engine

N488 Transmission Coolant Valve
N509 Transmission Fluid Cooling Valve
V467 High Temperature Circuit Coolant Pump

The transmission coolant circuit can operate in three different system states:

Standing coolant

- N509 supplied with current (valve closed).
- V488 not supplied with current (valve closed).
- V467 not running.

ATF heating

- N509 supplied with current (valve closed).
- N488 supplied with current (valve open).
- V467 running.

ATF cooling

- N509 not supplied with current (valve open).
- N488 not supplied with current (valve closed).
- V467 running.

Transmission Fluid Cooling Valve N509 and Transmission Coolant Valve N488

These map-controlled solenoid valves control the inflow of warm coolant from the engine to the ATF cooler/cold coolant from the main radiator to the ATF cooler. Both valves are supplied with 12 Volt current. To activate them, the corresponding control module switches them to ground.

Valve N509 is activated by Transmission Control Module J217, which closes it. Activation is initiated by the thermal management system of the ECM. The valve is open when it is not supplied with current.

N488 is activated by the Engine Control Module J623. The valve is closed when it is not supplied with current.

High Temperature Circuit Coolant Pump V467

This pump is identical in form to pumps V50 and V51. It is responsible for pumping the coolant through the transmission coolant circuit.

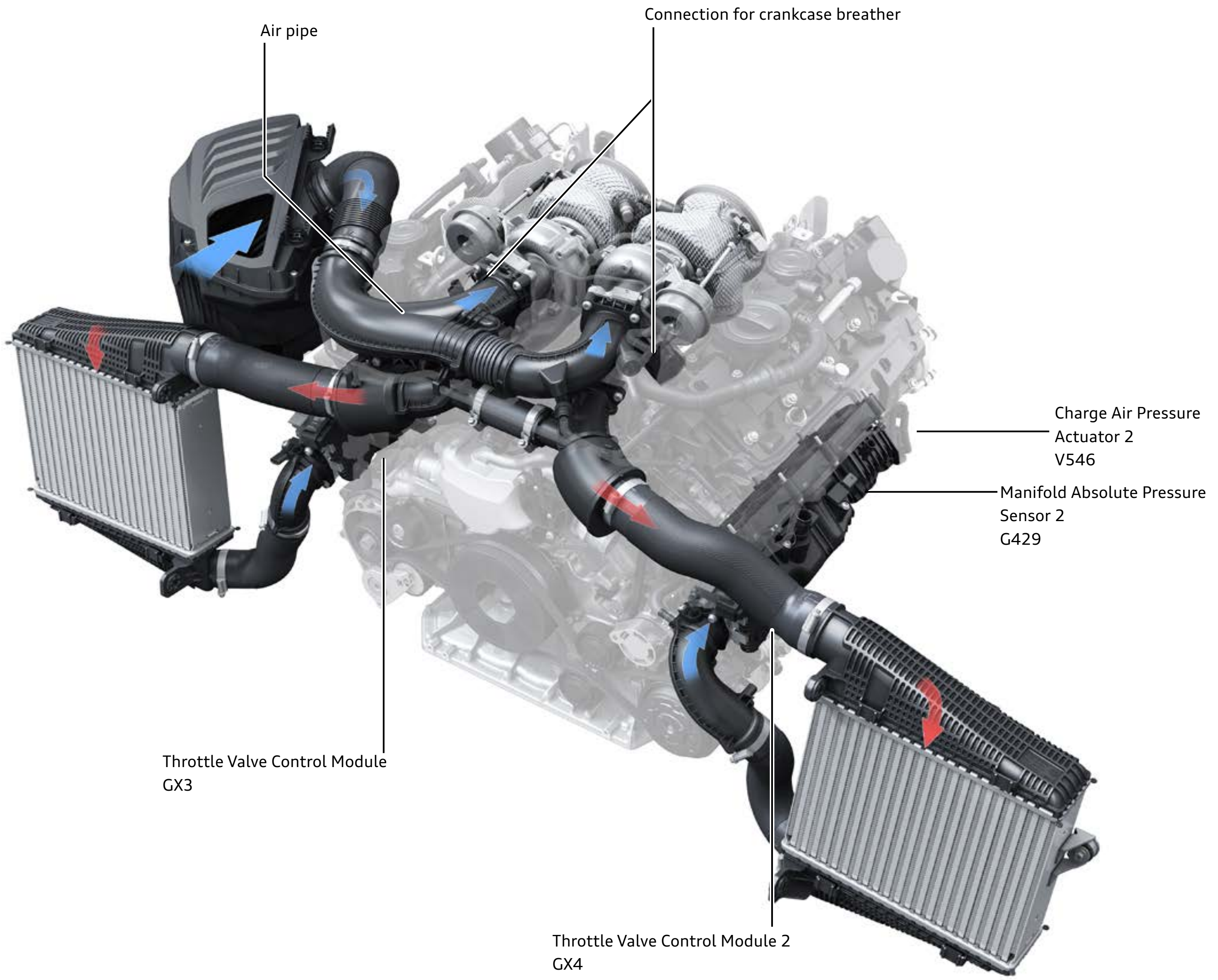
676_095

Note
Valves N488 and N509 look similar and are easily mistaken for one another; however, the part numbers are different.

Air supply

Overview of air ducts

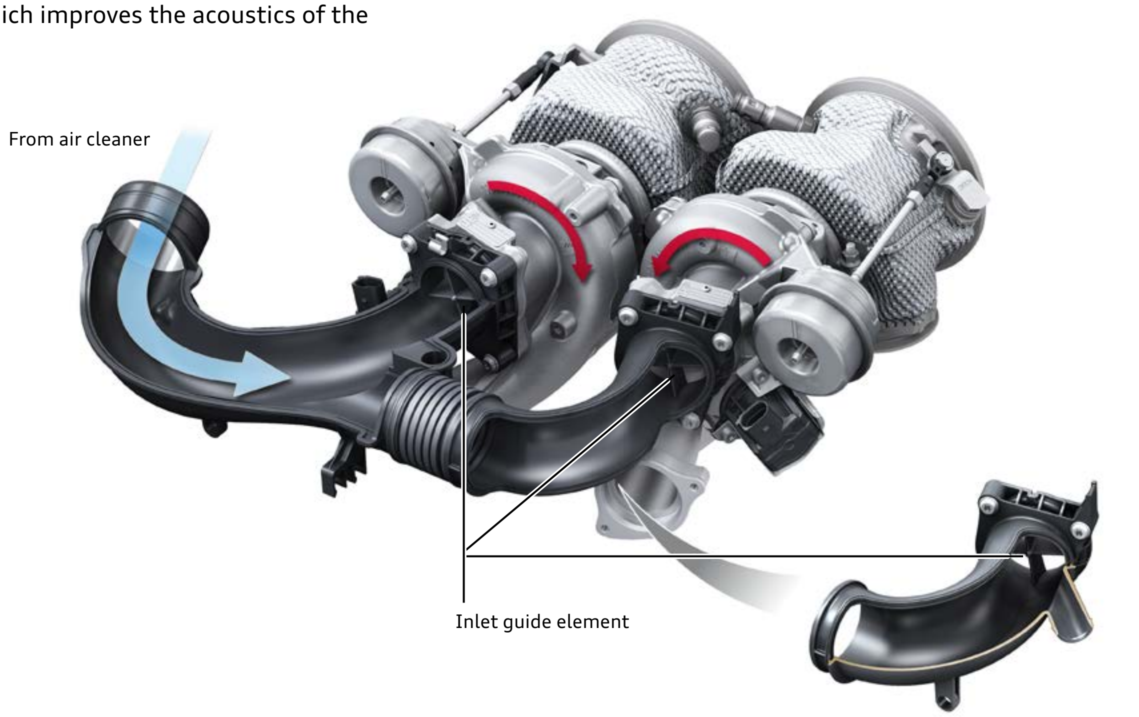
Different versions of the air supply system are used depending on the vehicle type and engine power output. The system shown here is for the 2020 Audi A8L. The air pipe connected to the air cleaner distributes intake air to both turbochargers.



676_096

Intake side

An inlet guide element is installed in the air pipe at the point where the air pipe connects to the turbocharger. This calms the flow of air before it enters the turbocharger. In addition, the air flow is given a slight “swirl” in the direction of the fan blades, which improves the acoustics of the air intake.



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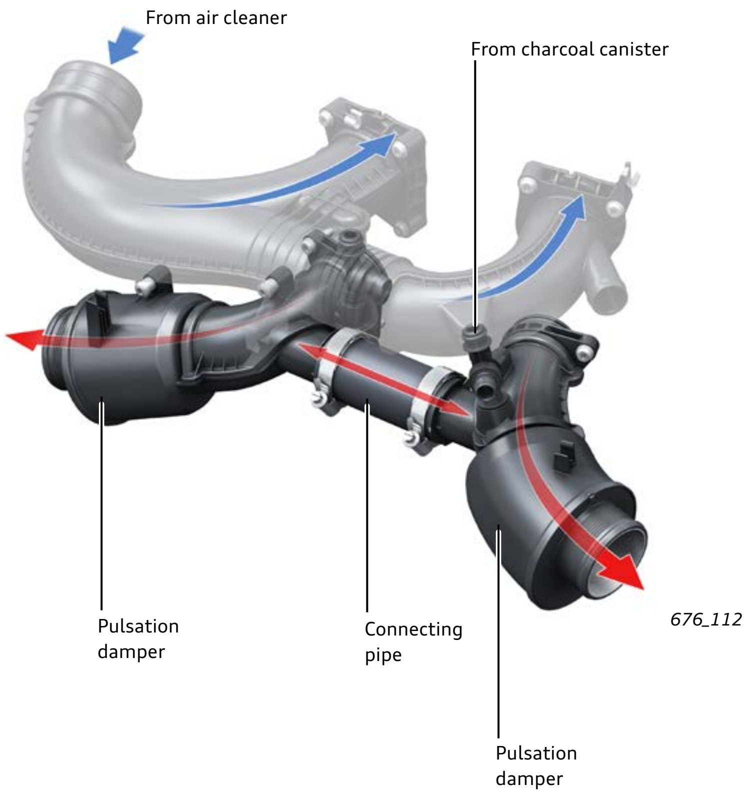
Pressure side

The air compressed in the turbochargers is channeled to the charge air coolers via pulsation dampers as an acoustic measure against air noise. The connecting pipe joins both outlets of the turbochargers with one another. This dampens out-of-phase pressure oscillations and helps prevent compressor surge.



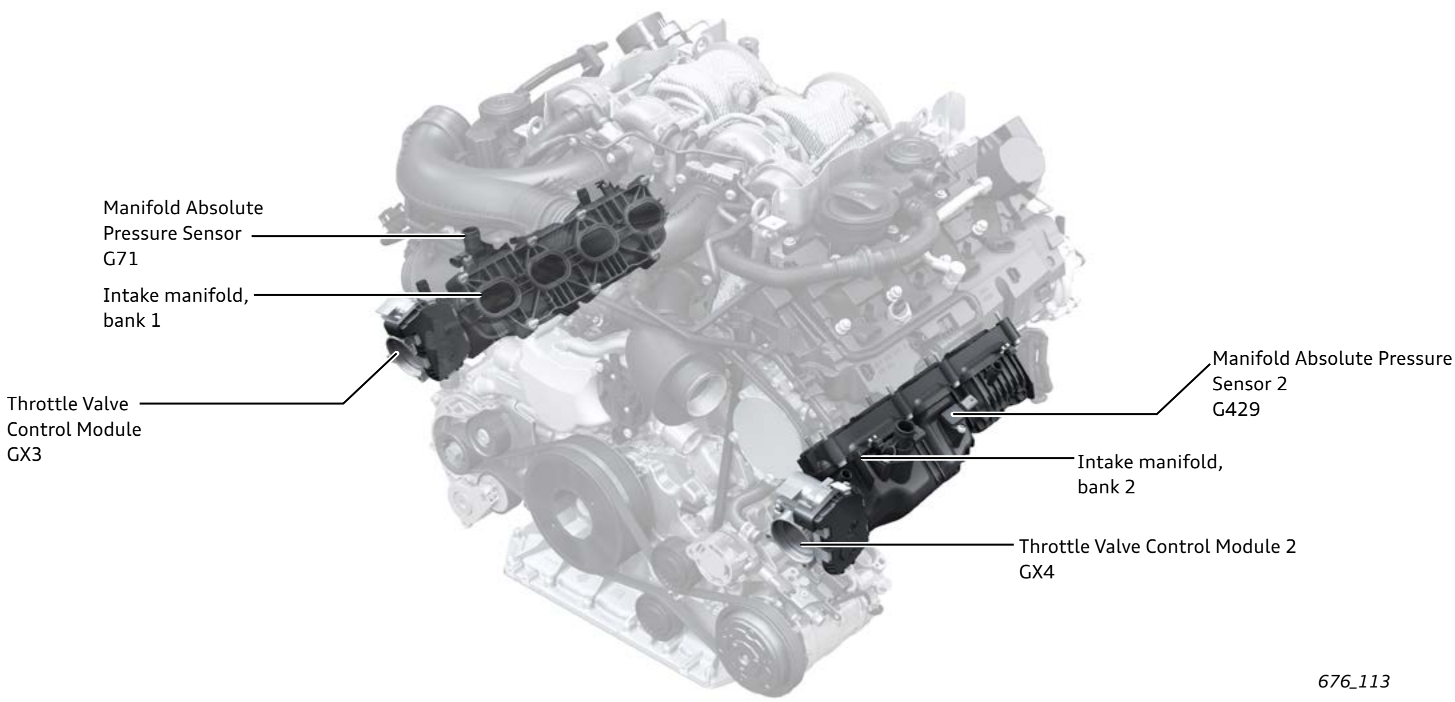
676_112

676_142

Intake manifolds

The intake manifolds are bolted to the cylinder heads. A throttle valve module is installed upstream of each intake manifold. EA825 engines do not require intake manifold flaps.

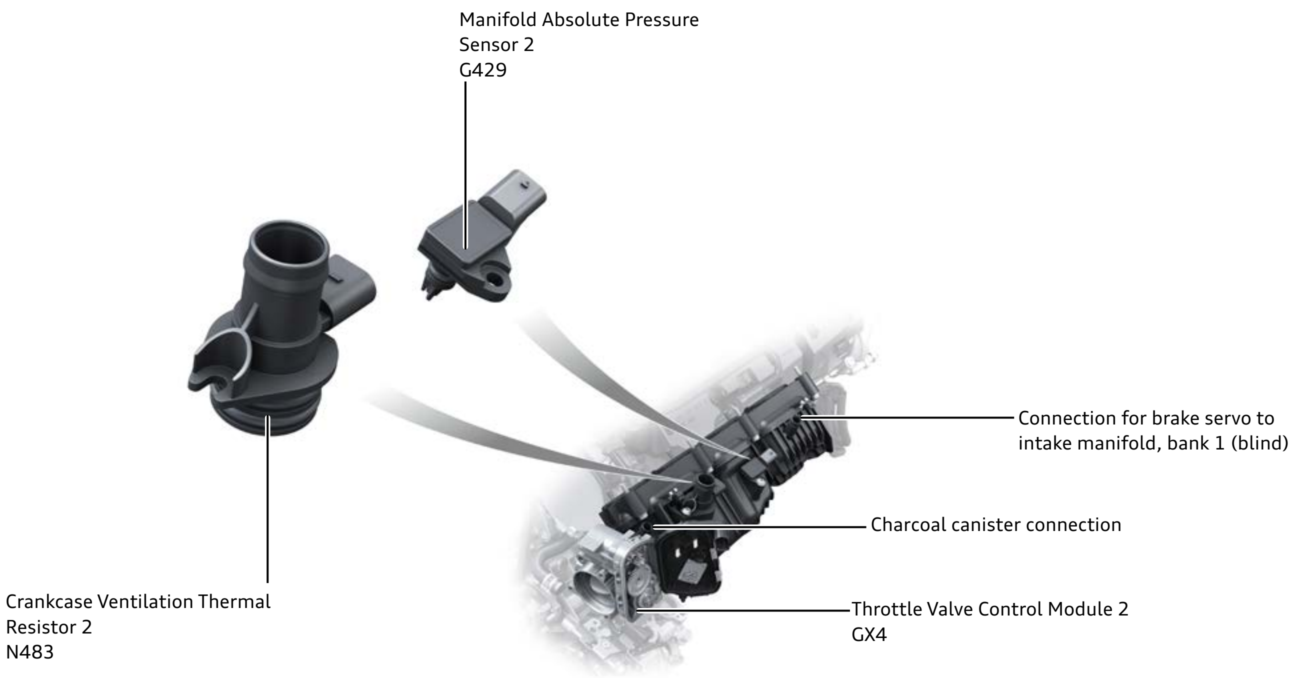
Both intake manifolds have connections for the activated charcoal canister and crankcase breather. Fuel vapors/ blow-by gases enter the intake manifold when there is vacuum pressure inside it. The third connection is for the brake servo (note: the connection on the intake manifold for bank 1 is non-functional).



676_113

The intake manifold pressure sensors measure the intake manifold pressure and the temperature of the intake air. The ECM uses the signals from the sensor downstream of the throttle valves to measure the air mass (volumetric efficiency measurement).

The signals from the sensors upstream of the throttle valves are used by the ECM to calculate and set the desired charge pressure. The signals are transmitted to the ECM by SENT protocol.

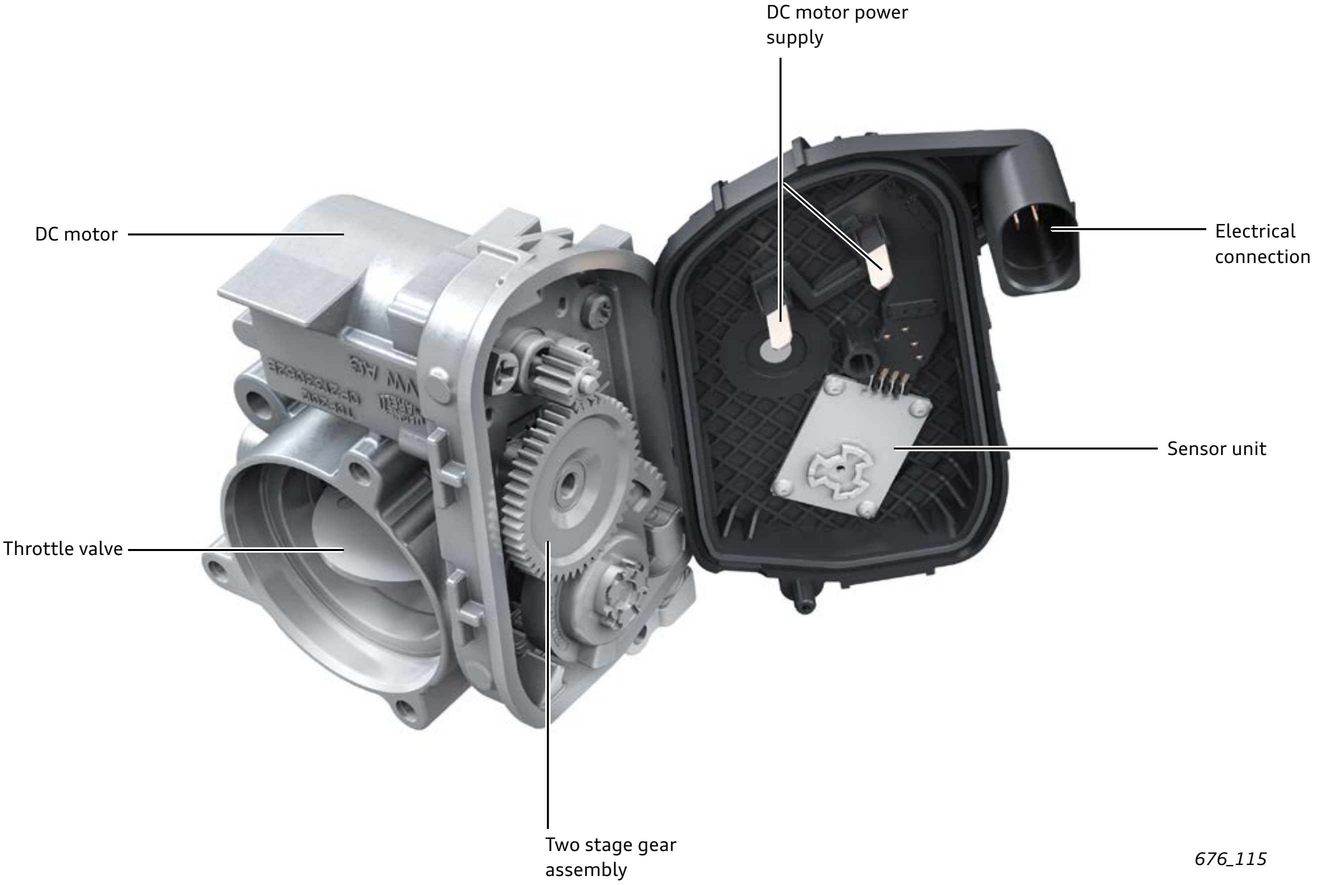


676_114

Throttle Valve Control Modules GX3 and GX4

A throttle valve module is installed upstream of each intake manifold. Non-contact throttle valve position sensors (Hall sensors) are used to determine the position of the throttle valves. They operate on the principle of redundancy, meaning that the feedback regarding the position of the throttle valve is delivered by two sensors working independently of and opposed to one another.

A DC motor with a two-stage gear assembly acts as an actuator for the throttle valve. This keeps the throttle valve positioned between the two mechanical limit stops. The position of the throttle valve is calculated based on the position of the accelerator pedal and the required engine torque.



676_115

Note
There are no master list terms for the throttle valve position sensors.

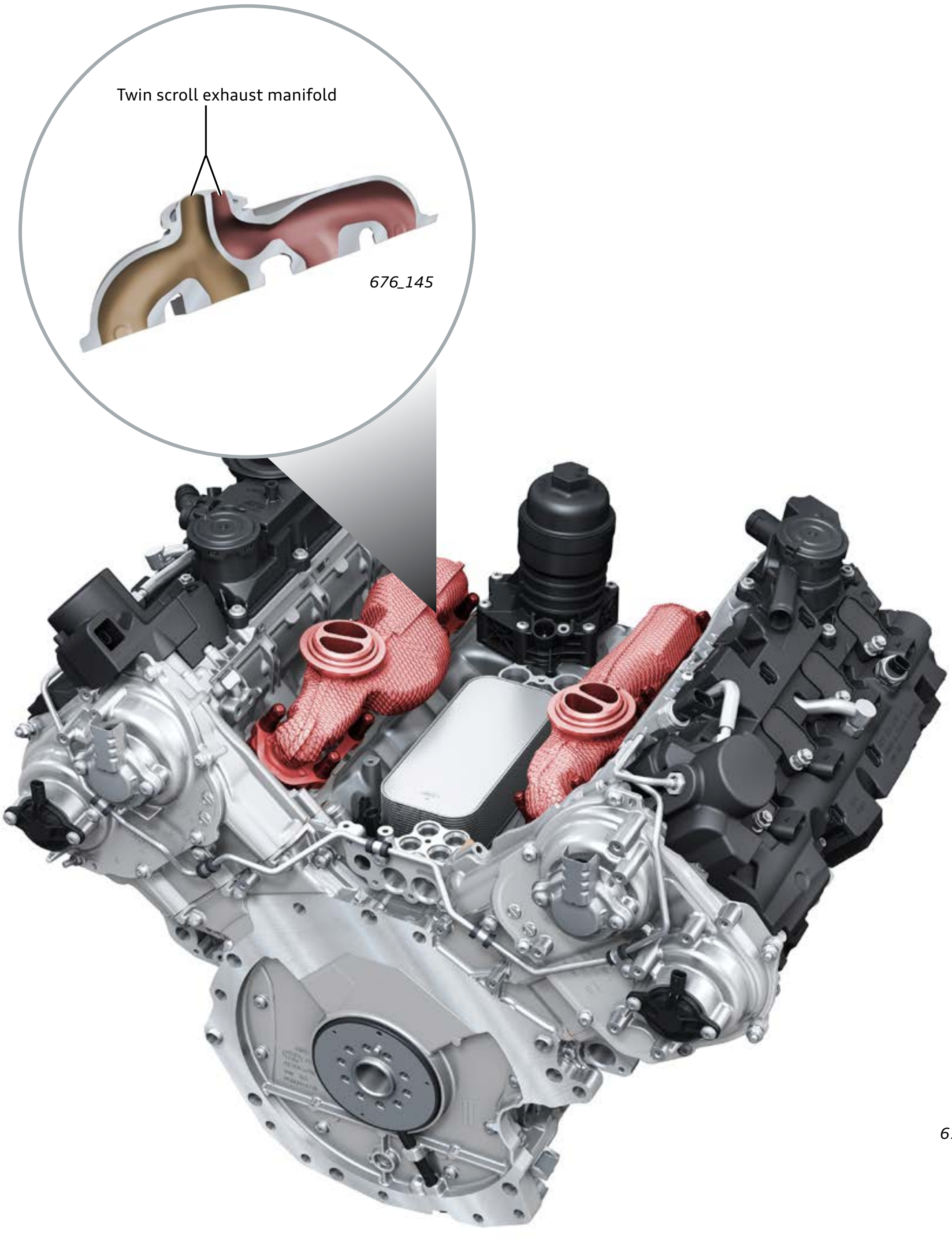
Turbocharging

Twin scroll exhaust manifold

The exhaust manifolds have a twin scroll design. With this separation, two cylinders create one stream of exhaust which is kept separate in its own channel inside the turbocharger until it reaches the turbine. Keeping the channels separate helps prevent the individual cylinders from affecting one other adversely during gas exchange.

Background:
The firing order on each cylinder bank creates a 180° firing interval for some cylinders. The exhaust compression waves (created when the valves open) from these cylinders would affect one another if they were able to interact via the exhaust manifold. This, in turn, directly affects the gas exchange, because the volume of fresh air would be reduced. The twin scroll design keeps the gases from those cylinders separate which correspond unfavorably with one another. This provides a significant torque advantage in the low engine RPM range.

Exhaust manifolds located in the inner V of the engine.

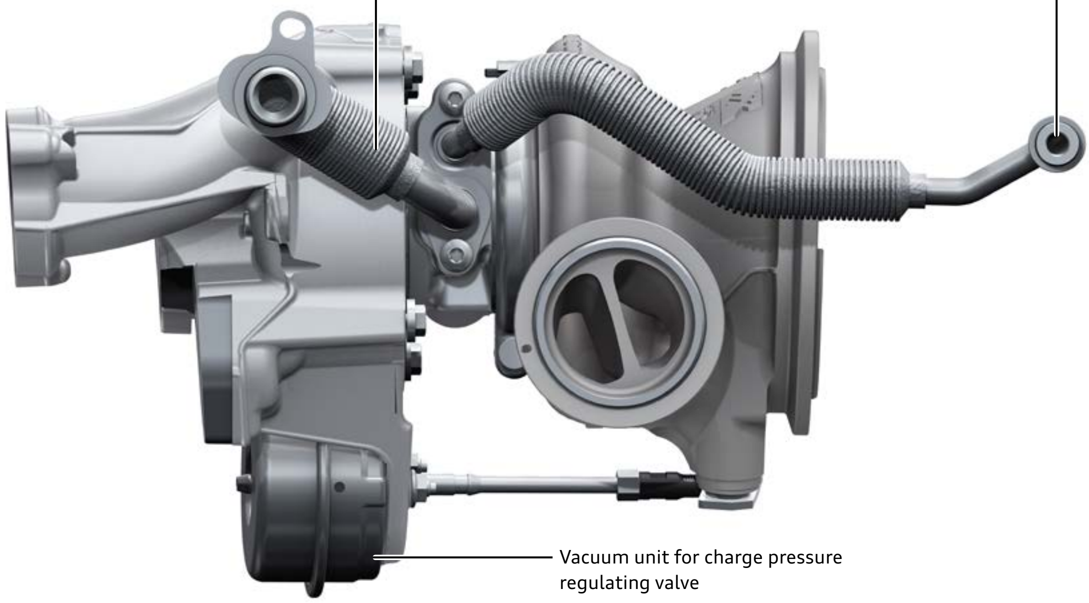


676_011

Twin scroll turbochargers

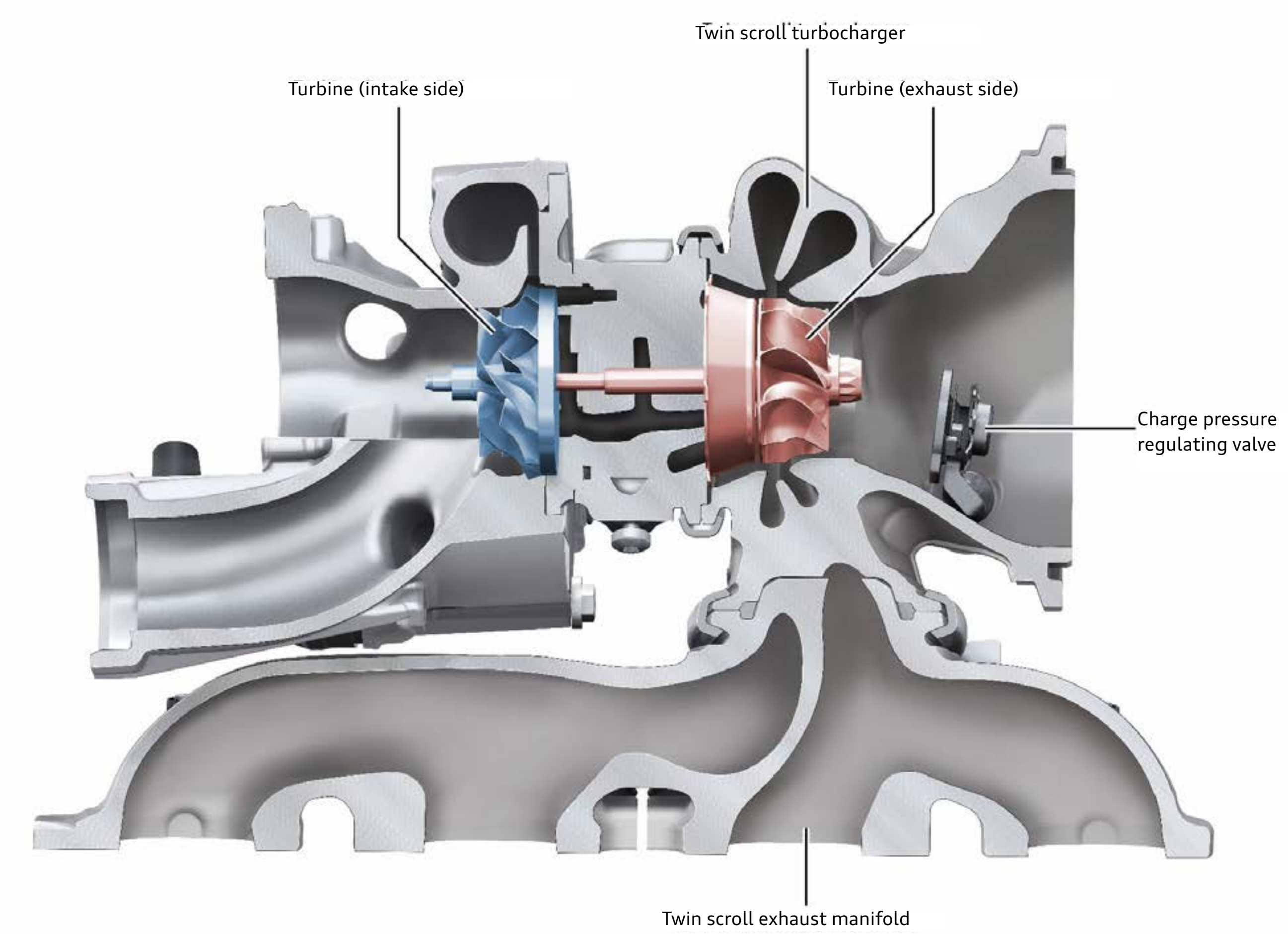
The gas flow paths are very short because the turbochargers are located centrally in the inner V of the engine. As a result, turbocharger response is very direct. The turbines rotate in opposite directions: The turbine on bank 1 rotates counter-clockwise; the one on bank 2 rotates clockwise. This design makes the best use of the space available.

676_118



676_139

Twin scroll turbochargers continued



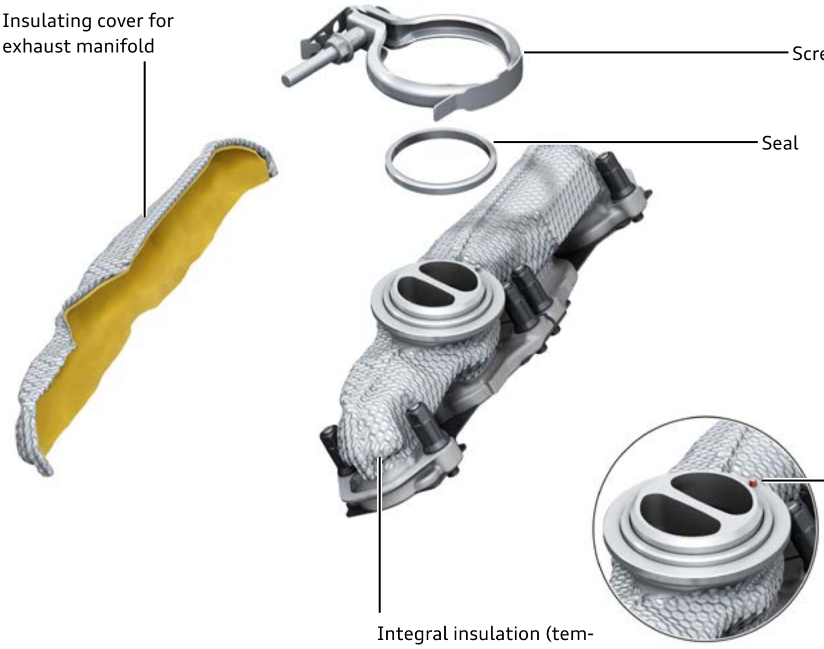
676_140

Turbocharger mounting

The turbochargers are secured to the exhaust manifolds with screw-type clips (V-band clamps). A gasket (made of mica-based material) seals off the connection between the two components.

The hot side of the turbocharger and the exhaust manifold are surrounded by insulating covers. This protects the adjacent components in the inner V and helps conserve a larger percentage of the exhaust energy.

676_138



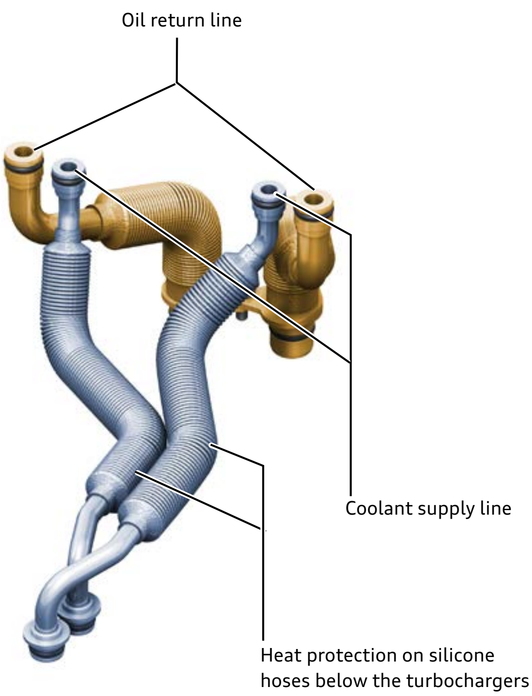
676_082

Turbocharger oil and coolant connections

The turbochargers are incorporated in the engine oil and coolant circuits to ensure that the turbine shafts and bearing are lubricated and cooled.

Coolant circulates through the turbochargers for a defined period of time after a hot engine has been switched off. This prevents heat soak and protects the components.

676_119



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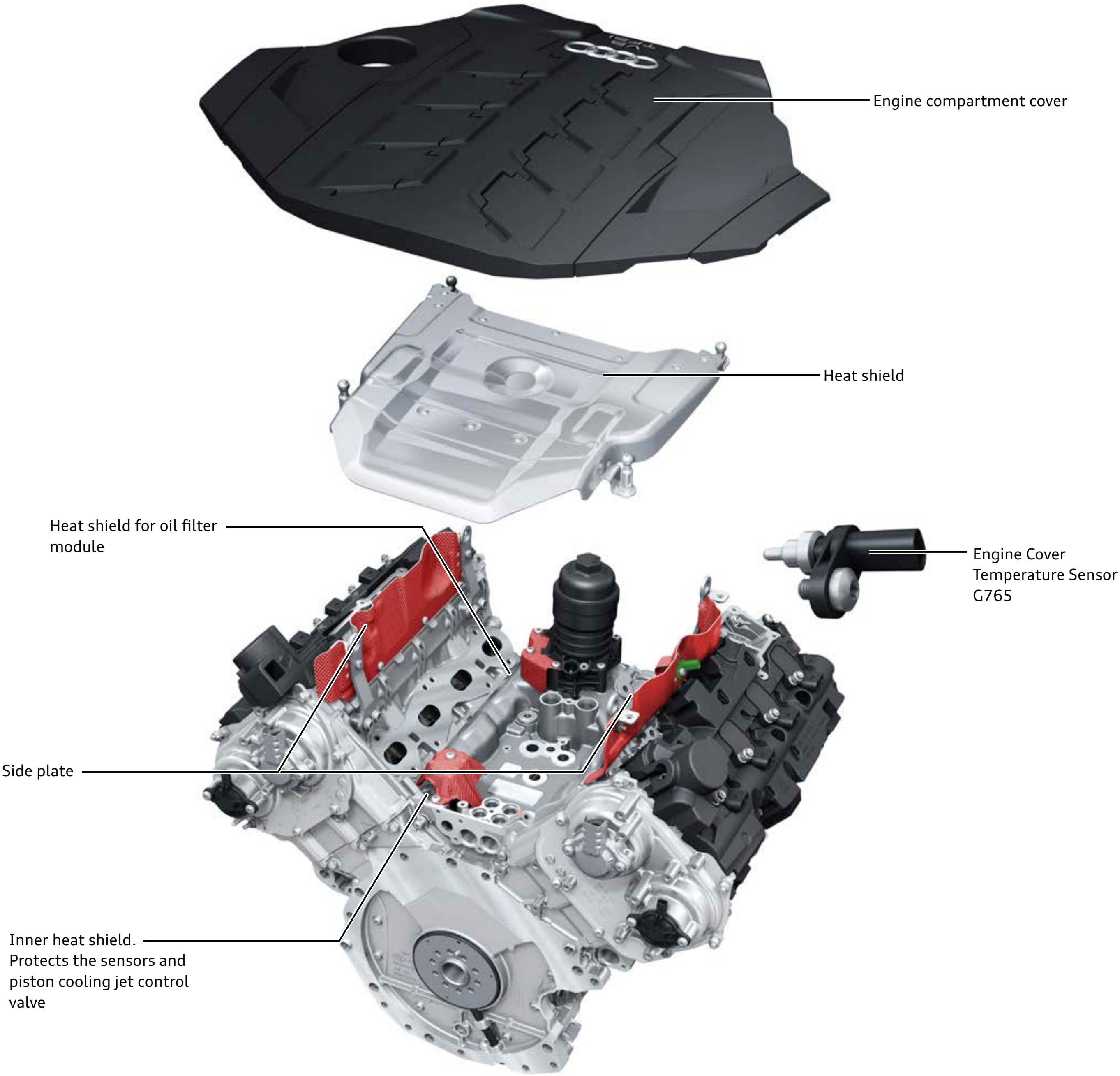
676_141

Heat shield in inner V of engine

The exhaust manifolds are located in the inner V of the engine (HSI). The adjacent components require protection to prevent them from becoming too hot. Additional heat shields are installed for this purpose in the inner V along with the heat shields on the exhaust manifolds and turbochargers. A heat shield is installed as additional protection under the engine compartment cover. This cover should always be in place when the engine is running. You can only ensure that cool air reaches the inner V of the engine unless all the components are properly installed.

All supply lines in the inner V are also made of heat-resistant materials (stainless steel, silicone) and in some cases are installed with additional heat shields. Engine Cover Temperature Sensor G765 monitors the temperature levels in the inner V of the engine. If the NTC thermistor registers temperatures that are too high, the ECM initiates cooling measures.

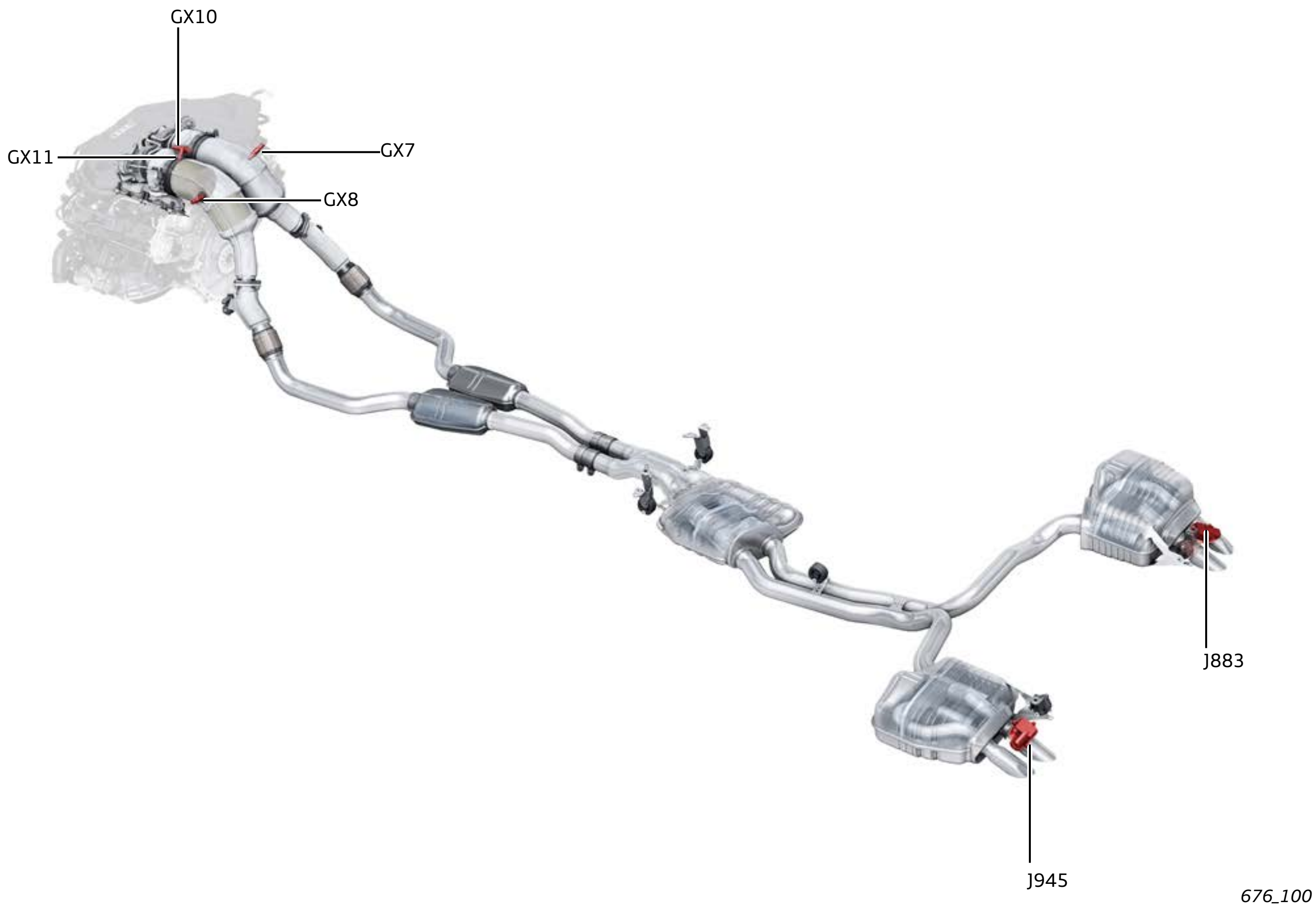


676_121

Exhaust system

The exhaust system shown is designed for versions with PR numbers EU6 AD/E/F (7CN), EU6 plus (7MM), ULEV125 (7MU) and EU4 (7GH).

Oxygen sensor control is done by a broad-band Oxygen Sensor before the pre-catalytic converter and a two-state sensor after it. Due to limited space, an additional catalytic converter is located in the area of the underbody.



676_100

Key:

GX7 Oxygen Sensor 1 After Catalytic Converter
G130 Oxygen Sensor After Catalytic Converter
Z29 Heater for Oxygen Sensor 1 After Catalytic Converter

GX8 Oxygen Sensor 2 After Catalytic Converter
G131 Oxygen Sensor 2 After Catalytic Converter
Z30 Heater for Oxygen Sensor 2 After Catalytic Converter

GX10 Oxygen Sensor 1 Before Catalytic Converter
G39 Heated Oxygen Sensor
Z19 Oxygen Sensor Heater

GX11 Oxygen Sensor 2 Before Catalytic Converter
G108 Heated Oxygen Sensor 2
Z28 Oxygen Sensor 2 Heater

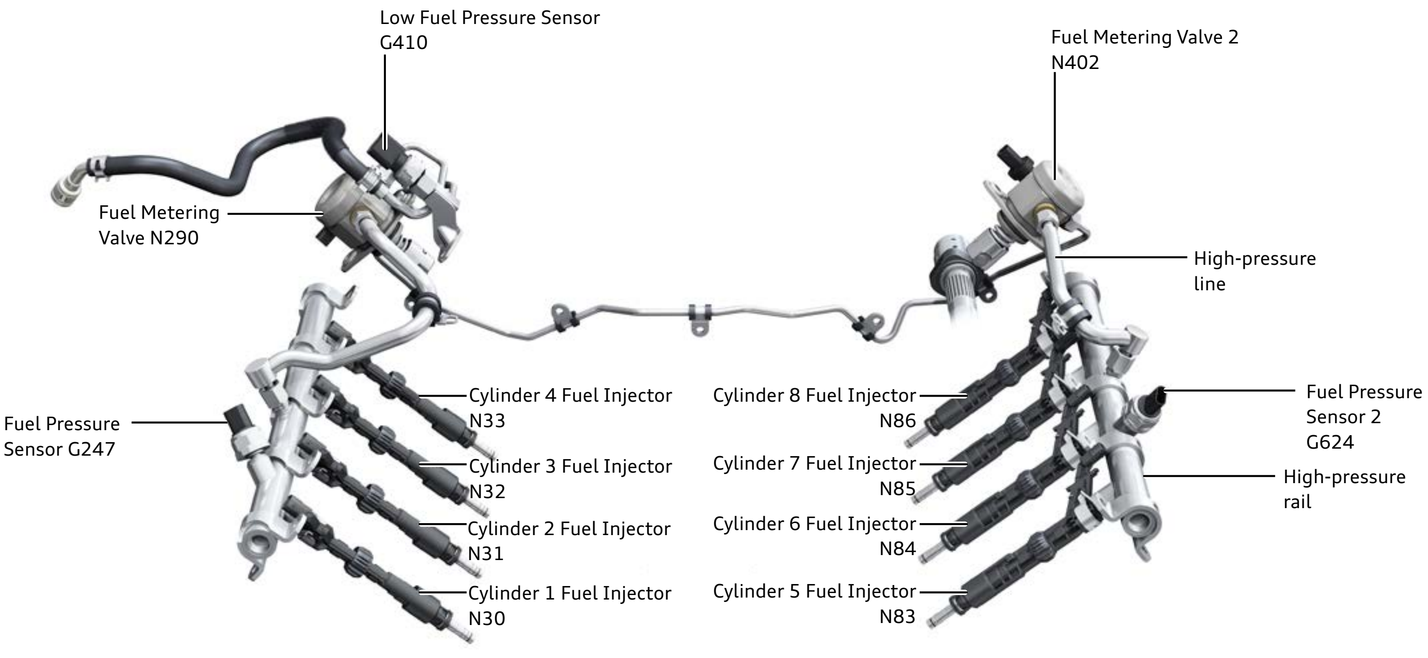
J883 Exhaust Door Control Unit
J945 Exhaust Door Control Unit 2

Fuel system

Fuel is supplied from the fuel tank to high pressure pumps on the engine by an electric pump. The pressure varies from 43.51 to 79.77 psi (3 to 5 bar). The system does not have a fuel return line. The amount of fuel required is calculated by the ECM; the amount supplied is always just enough to prevent bubbles from forming in the system.

Low Fuel Pressure Sensor G410 in the low-pressure pipe to monitor the low pressure in the system. Due to the greater fuel requirement for the V8 engine, each cylinder bank has its own high-pressure fuel pump. Each cylinder bank has its own high-pressure supply. The two systems are not connected to one another on the high-pressure side.

Overview of the high-pressure system

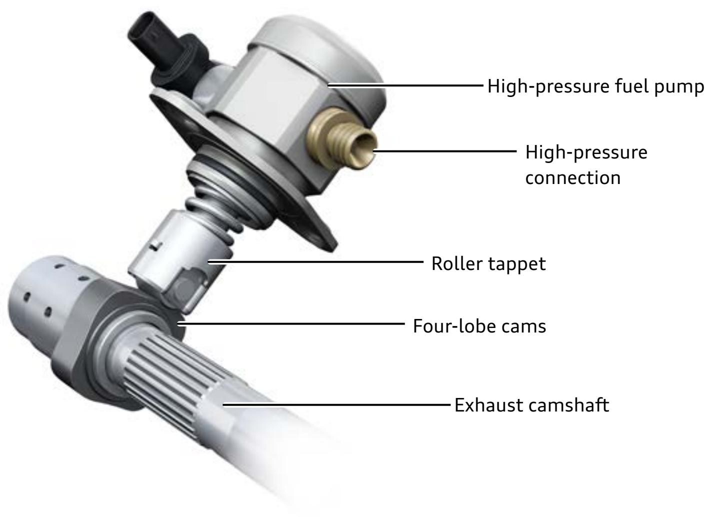


676_104

High pressure fuel pumps

The high-pressure fuel pumps are driven by roller tappets and four-lobe cams positioned on the exhaust camshafts. The maximum pressure generated is 3625.94 psi (250 bar). At approximately 4351.13 psi (300 bar), the pressure limiting valve in the pump opens.

The pump is open when no current is applied (fail-safe). This means that without electric actuation, the pump runs at the same pressure as the supply from the pump in the fuel tank.

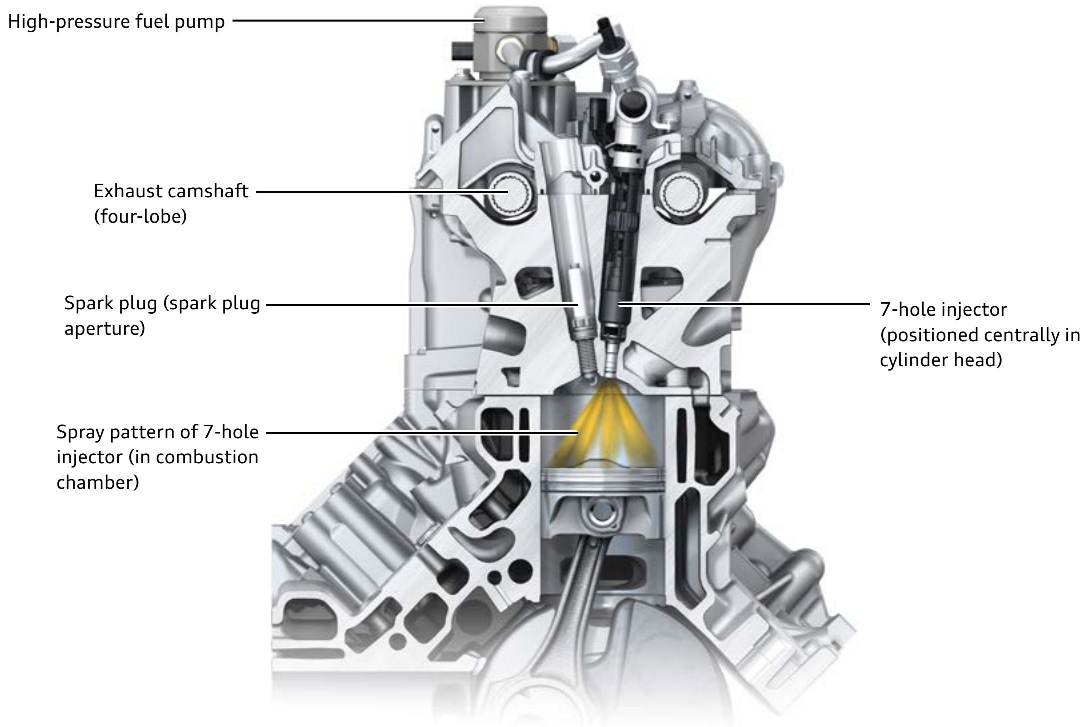


676_102

High-pressure injector

The injector is positioned directly next to the spark plug. This central position, together with adjustments to the injector hole diameter and the spray pattern suited to the conditions in the cylinder, helps provide the most homogeneous fuel distribution possible.

- 7-hole injector.
- Injector hole diameter: 0.007 in (0.19 mm).
- Needle lift: 0.0027 in (0.07 mm).
- Up to 65 V actuation.
- Injection period: 0.3 - 6 ms.
- Up to 3 injections possible (depending on engine speed).
- Injection pressure: approximately 1015.26 to 3625.94 psi (70 to 250 bar).



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Injector holes

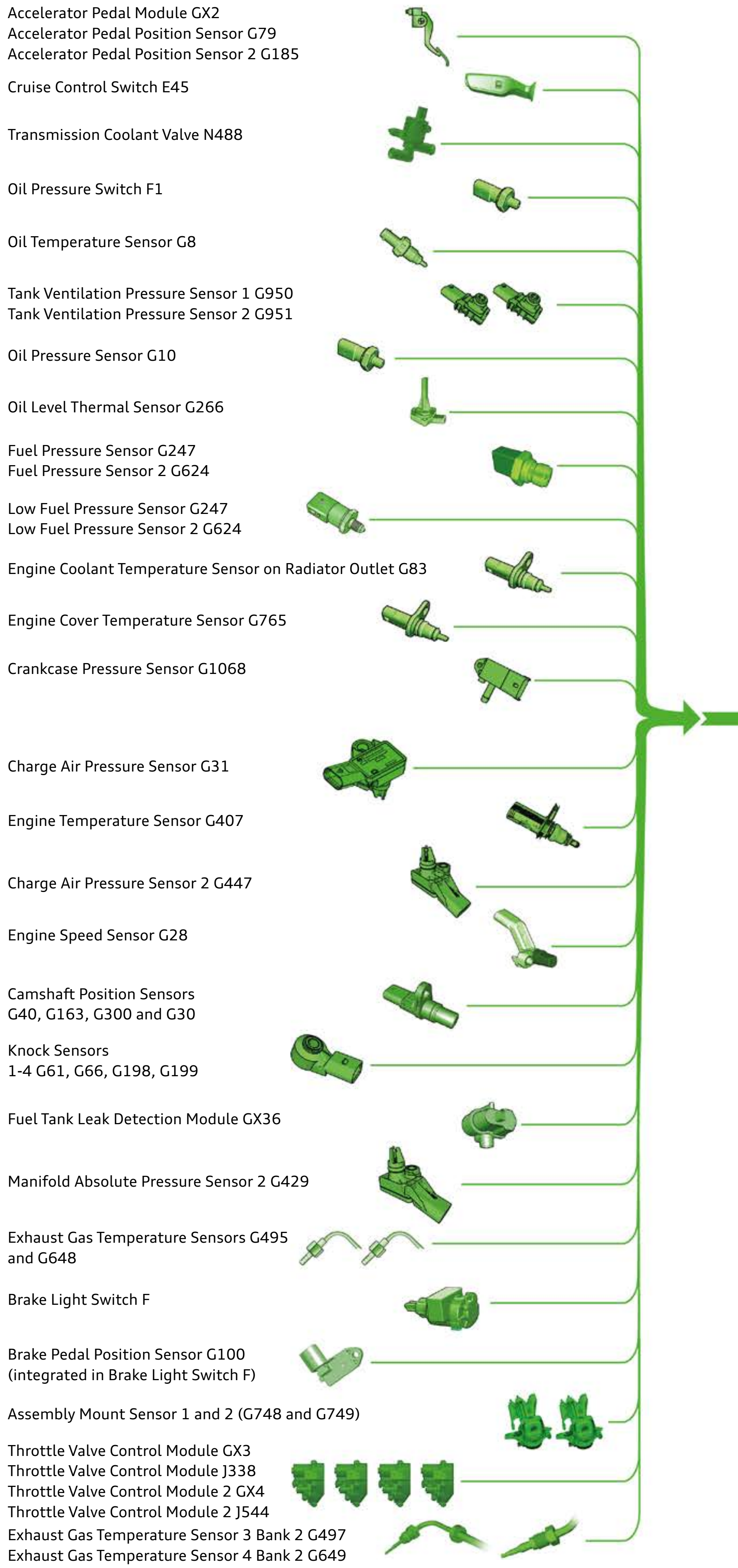
676_128

Cross-section of injector holes

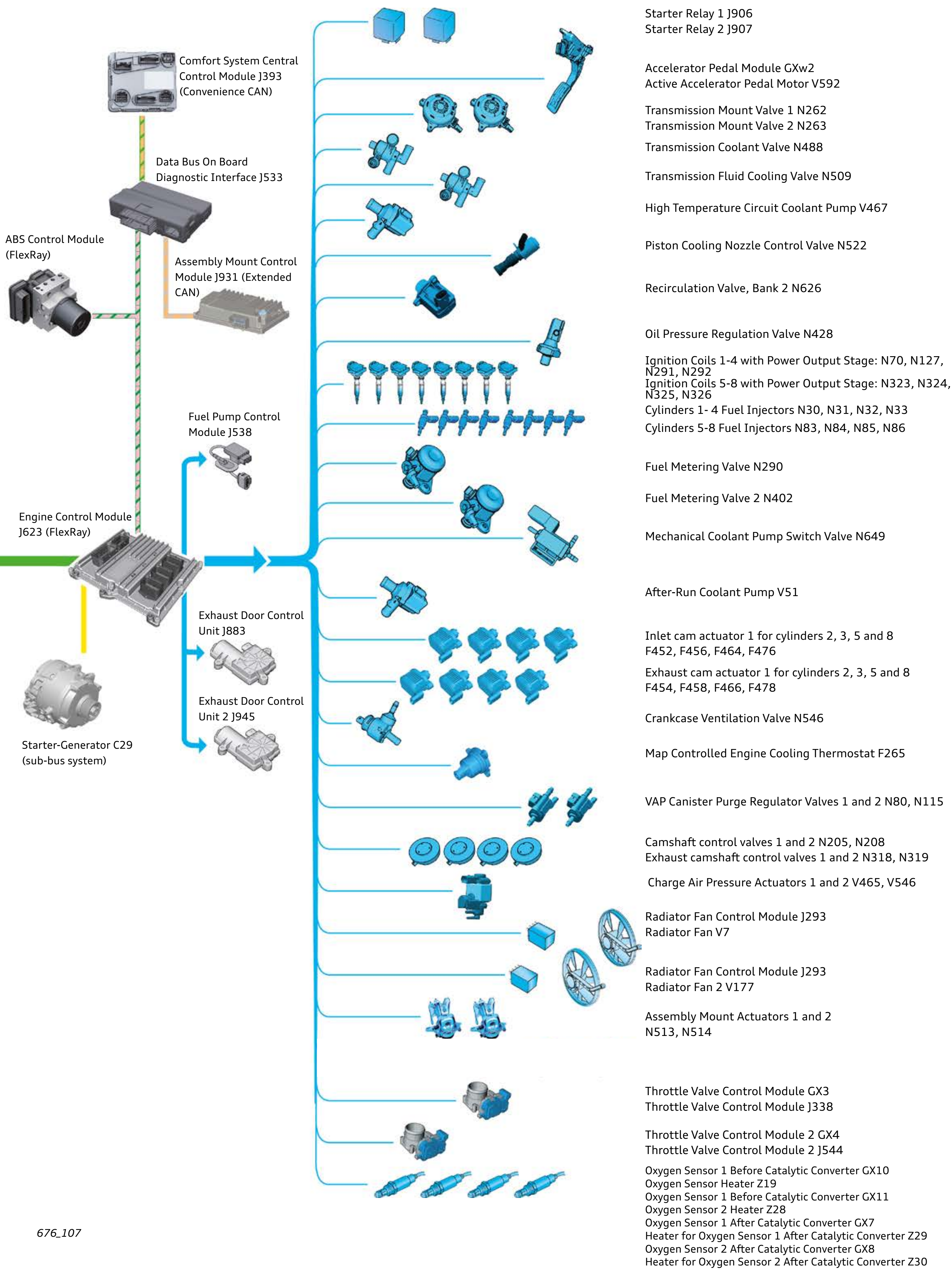
676_122

Engine management

System overview



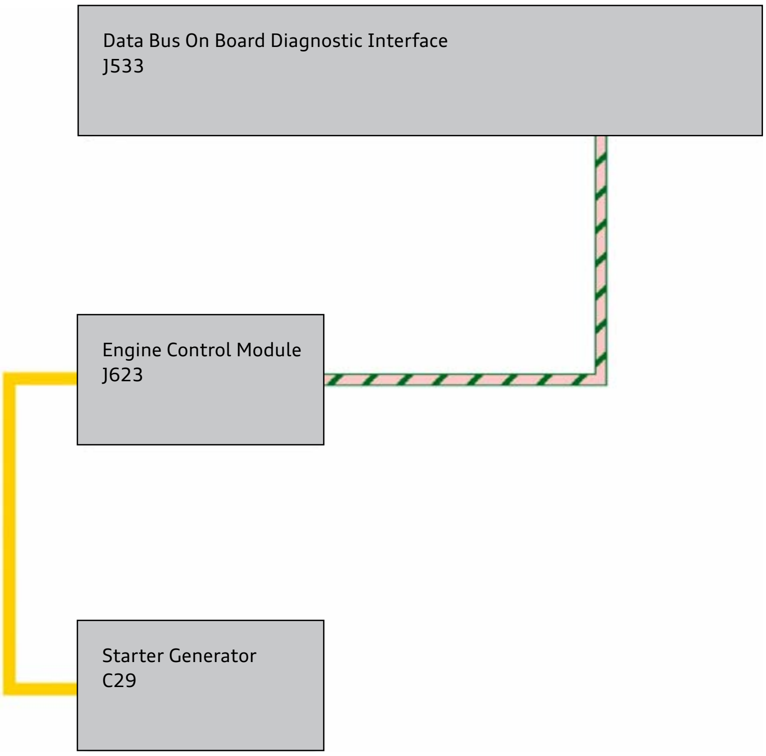
Actuators



676_107

Engine Control Module

The engine management system of the EA825 series engines is controlled via Engine Control Module J623 using BOSCH MG1 software. The ECM processes the incoming system information and controls the various functional groups. It is a node in the vehicle's data transfer network.



676_137

676_124

FlexRay
Sub-bus systems

Note
For further information about the engine management system of the EA825 series engines please refer to eSelf-Study Program 920173, The Audi 3.0L V6 TFSI EA839 Engine

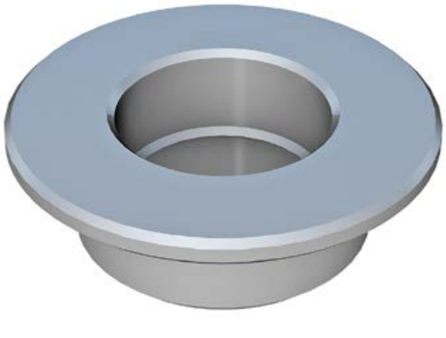
Inspection and maintenance

Service information and operations

Engine oil capacity (incl. filter) in liters (change capacity)	4.3
Service interval	According to service interval display, between 15,000 km/ 1 year and 30,000 km / 2 years depending on driving style and conditions of use.
Engine oil specification	VW 504 00
Engine oil extraction permitted	No (draining only)
Air filter change interval	60,000 miles
Spark plug change interval	40,000 miles (60,000 km) / every 6 years
Fuel filter change interval	–
Timing assembly	Chain (lifetime)

Special tools and workshop equipment

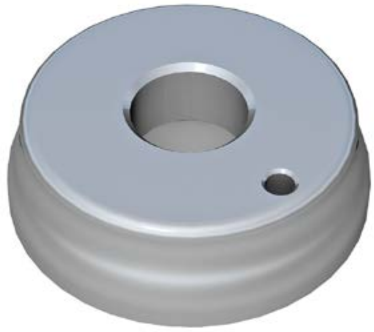
Thrust piece T40019/4



676_108

Accessories for oil seal extractor T40019, for pressing off from the crankshaft

Adapter T40320/4



676_109

Installing oil seal on crankshaft (pulley end).

Cleaning tool T90006

676_110

For cleaning the injector bores on V6 and V8 TFSI engines

Guide plate VAS 5161/43

676_146

For removing and installing the valve stem oil seals with the engine installed

Adapter T90005

676_111

The adapter is used in conjunction with T10055 and is used for removing the injector

Engine bracket V8 TFSI VAS 6095/1-17

676_147

The adapter together with engine and gearbox support VAS 6095A, ASE 456 004 01 000 and universal support VAS 6095/1, ASE 456 050 00 000 (depending on engine, support for 8-cylinder TFSI engines).

Engine bracket V8 TFSI VAS 6095/1-17A
The new product has some technical modifications, but the previous product can still be adapted for use. The application and adaptation are described in ElsaPro.

Engine bracket V8 TFSI VAS 6095/1-18

676_148

The adapter together with engine and gearbox support VAS 6095A, ASE 456 004 01 000 and universal support VAS 6095/1, ASE 456 050 00 000 (depending on engine, support for 8-cylinder TFSI engines).

Engine bracket V8 TFSI VAS 6095/1-18A
The new product has some technical modifications, but the previous product can still be adapted for use. The application and adaptation are described in ElsaPro.

Knowledge assessment

An On-Line Knowledge Assessment (exam) is Available for this eSelf-Study Program.

The Knowledge Assessment is required for Certification credit.

You can find this Knowledge Assessment at: **www.accessaudi.com**

From the accessaudi.com Homepage:

› Click on the “App Links”

› Click on the “Academy site CRC”

Click on the Course Catalog Search and select 920493 - “The Audi 4.0l V8 TFSI engine from the EA825 series”.

Please submit any questions or inquiries via the Academy CRC Online Support Form
which is located under the “Support” tab or the “Contact Us” tab of the Academy CRC.

Thank you for reading this eSelf-Study Program and taking the assessment.

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