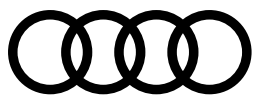




The Audi 2.5l TFSI Engine EA855 EVO Series

Self Study Program 920273



Audi of America, LLC
Service Training
Created in the U.S.A.
Created 07/2017

Course Number 920273

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

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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.



Note



Reference

Introduction

Audi launched its first five-cylinder engine for the North American market in 1977 with the Audi 5000. These engines have been the staple of the Audi product range ever since and have been used successfully in both production and racing cars. They have achieved cult status, not least because of their distinctive sound. Even today they offer an emotional driving experience. The five-cylinder era continued until 1998 when a new V6 TFSI engine was introduced.

However, the five-cylinder made a comeback with the introduction of the Audi TT RS. Since 2010, the 2.5 TFSI engine has been voted “International Engine of the Year” in its class for seven consecutive years by an international jury of motorists.

The new 2.5 liter R5 TFSI engine of the EA855 EVO series replaces the previous 2.5 liter R5 TFSI engine and makes its North American debut in the Audi TT RS. There are also plans to use this engine in other models including the Audi RS3.



Learning objectives of this Self-Study Program:

This Self-Study Program describes the design and function of the fourth-generation 2.5l R5 TFSI engine of the EA855 EVO series in the Audi TT RS.

After completing this Self-Study Program you will be able to answer the following questions:

- › What are the differences between the new engine and its predecessor?
- › Which structural design measures are used to achieve light-weight design?
- › How do the oil supply and engine cooling systems work?
- › What are the special features of the air supply system?
- › How do the new injection process and the engine management system work?

Engine description and special features

- › 5-cylinder in-line gasoline engine.
- › Aluminum cylinder block.
- › 4 valves per cylinder, double overhead camshafts (DOHC).
- › Exhaust turbocharger with charge air cooling (maximum charge pressure: 19.6 psi [1.35 bar]).
- › Twin path exhaust system with one close-coupled pre-catalytic converter, one broadband oxygen sensor (six-wire) upstream of the main catalytic converter, one heated oxygen sensor (four-wire) just after the main catalytic converter.
- › Variable valve lift adjustment with Audi valvelift system (AVS) on the exhaust side.
- › Direct charge air cooling (air to air intercooler).
- › Fully electronic engine management system with EPC.
- › Dual system with fuel straight injection (3626 psi [250 bar]) and cylinder-selective multipoint injection.
- › Adaptive lambda control.
- › Mapped ignition with single ignition coils.
- › Cylinder-selective adaptive knock control.
- › Intelligent thermal management.

The key differences to the previous model:

- › 57.32lb (26 kg) less weight.
- › Reduced friction.
- › The installed length of the engine has been reduced by creating a more compact installation space in the area of the rear chain drive and by switching to a single-track accessory belt drive.
- › Increased engine power and torque.
- › Better fuel economy.
- › MPI / FSI injection system.
- › Thermal management (active coolant pump).
- › Intelligent thermal management.

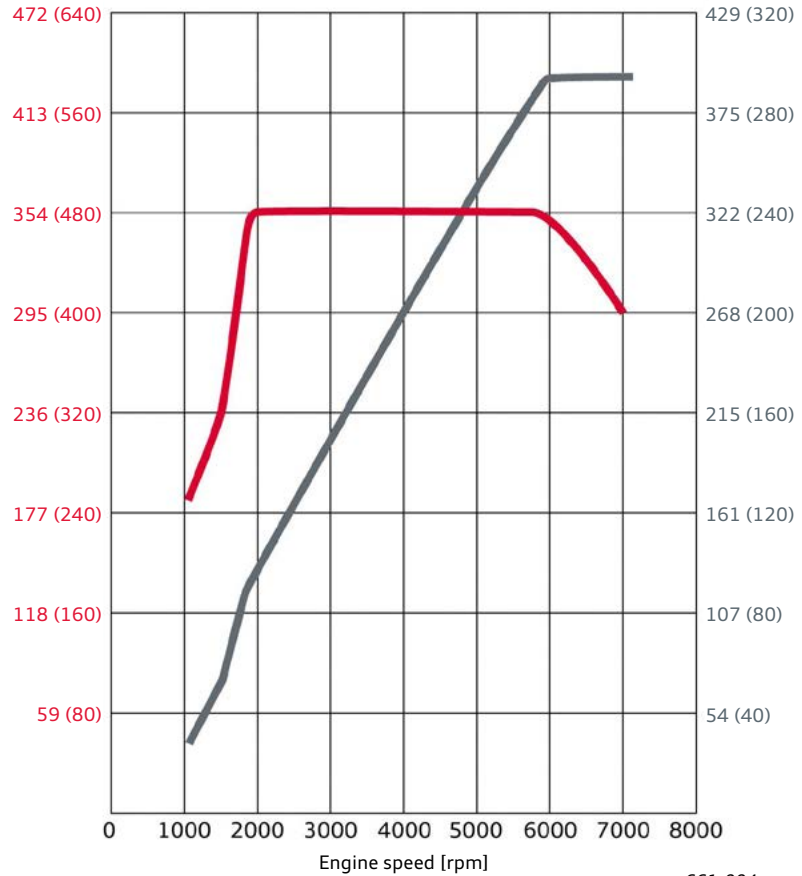
Key factors contributing to this reduction in weight are the aluminum cylinder block, a magnesium oil pan top section, an aluminum hydraulic vibration damper, a lighter crankshaft and the extensive use of aluminum bolts.



Specifications

Torque-power curve of 2.5l R5 FSI engine (Engine code DAZA)

- Power output in hp (kW)
- Torque in lb ft (Nm)



661_004a

Features	Specifications
Engine code	DAZA
Type	5-cylinder inline engine
Displacement	151 cu in (2480 cc)
Stroke	3.65 in (92.8 mm)
Bore	3.25 in (82.5 mm)
Cylinder spacing	3.46 in (88.0 mm)
Number of valves per cylinder	4
Firing order	1-2-4-5-3
Compression ratio	10.0 : 1
Power output at rpm	400 hp (298 kW) at 5850 - 7000
Torque at rpm	354 lb ft (480 Nm) at 1700 - 5850
Fuel type	Premium unleaded
Turbocharging	Exhaust turbocharger with charge air cooling (maximum boost pressure: 19.6 psi [1.35 bar])
Engine management	Bosch MED 17.01.62
Engine weight acc. to <i>DIN GZ 1</i>	352.7 lb (160 kg)
Exhaust gas treatment	Close-coupled pre-catalytic converter, broadband oxygen sensor upstream of pre-catalytic converter, heated oxygen sensor downstream of pre-catalytic converter
Emission standard	LEV3 / Tier 3

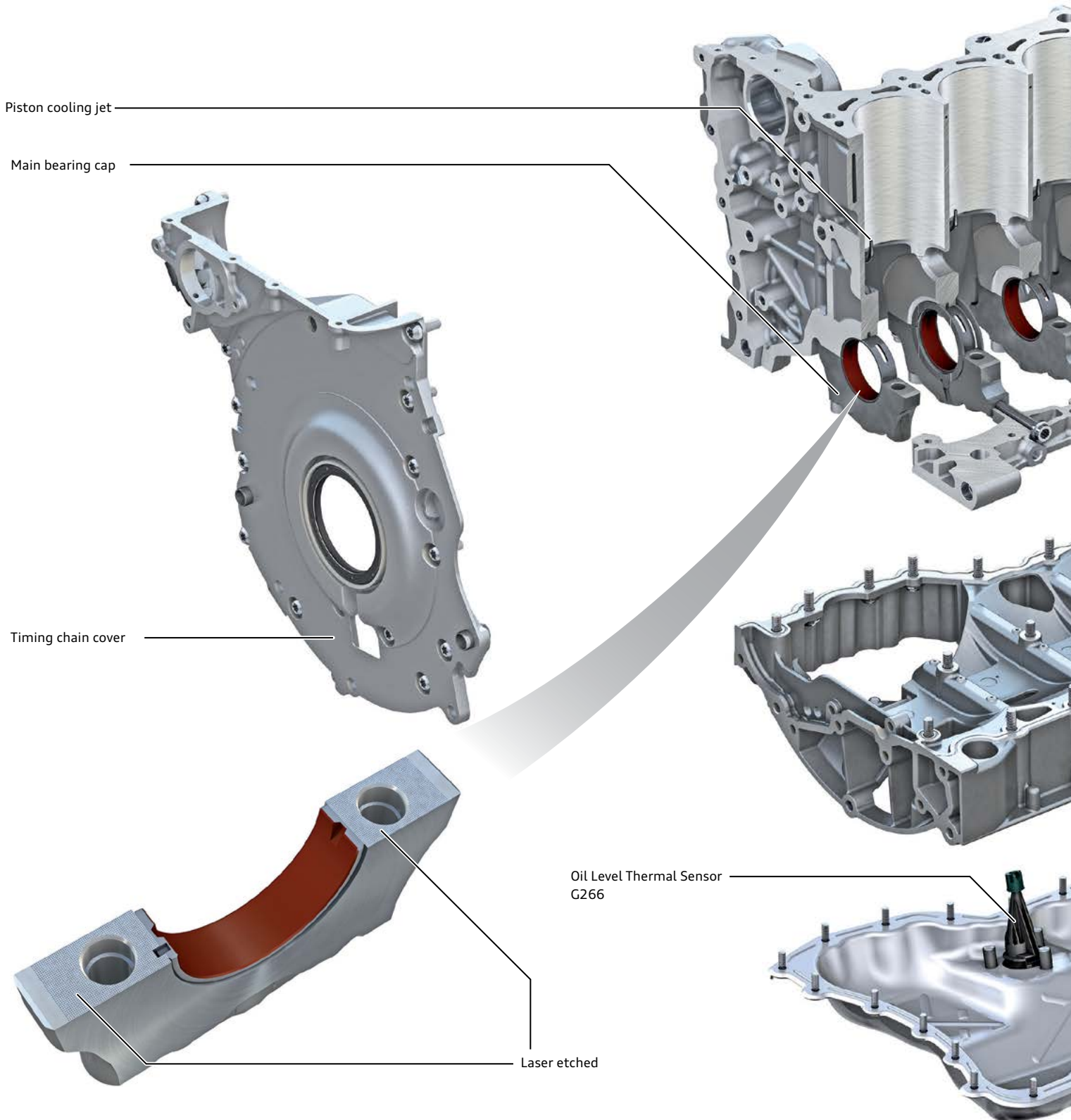
Engine mechanicals

Cylinder block

The cylinder block is aluminum alloy (ALSi7Mg0.3). The “deep skirt” design is manufactured in a “Rotacast” process ↗.

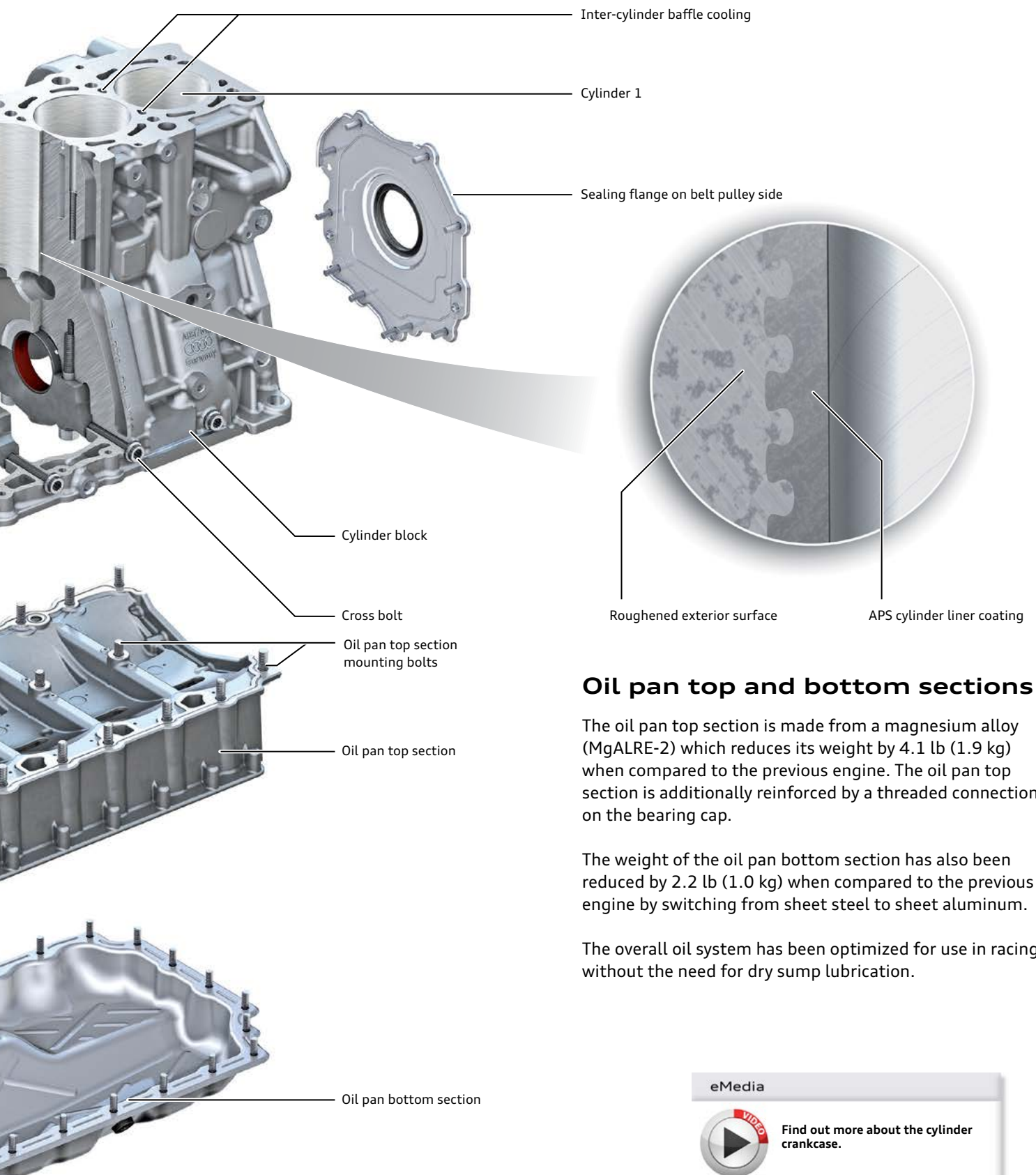
To increase strength, the main bearing caps are laser-etched and cross-bolted. In addition, the coolant passages and high pressure fuel pump mount are integrated in the cylinder block.

The cylinder liners are manufactured in an APS (*Atmospheric Plasma Spraying*) process ↗. While cooling is provided by coolant jackets located between the cylinders.



Timing case (cover for timing chains)

- > 21.1 oz (600 g) less weight.
- > More flexible attachment to cylinder head.
- > Reduced overall height.
- > Attachment for Intermediate Shaft Speed Sensor G265.



Oil pan top and bottom sections

The oil pan top section is made from a magnesium alloy (MgALRE-2) which reduces its weight by 4.1 lb (1.9 kg) when compared to the previous engine. The oil pan top section is additionally reinforced by a threaded connection on the bearing cap.

The weight of the oil pan bottom section has also been reduced by 2.2 lb (1.0 kg) when compared to the previous engine by switching from sheet steel to sheet aluminum.

The overall oil system has been optimized for use in racing without the need for dry sump lubrication.

eMedia



Find out more about the cylinder crankcase.

Crankshaft drive

Crankshaft

Despite higher power output compared to the predecessor engine, the weight of the crankshaft has been reduced by 3.3 lb (1.5 kg).

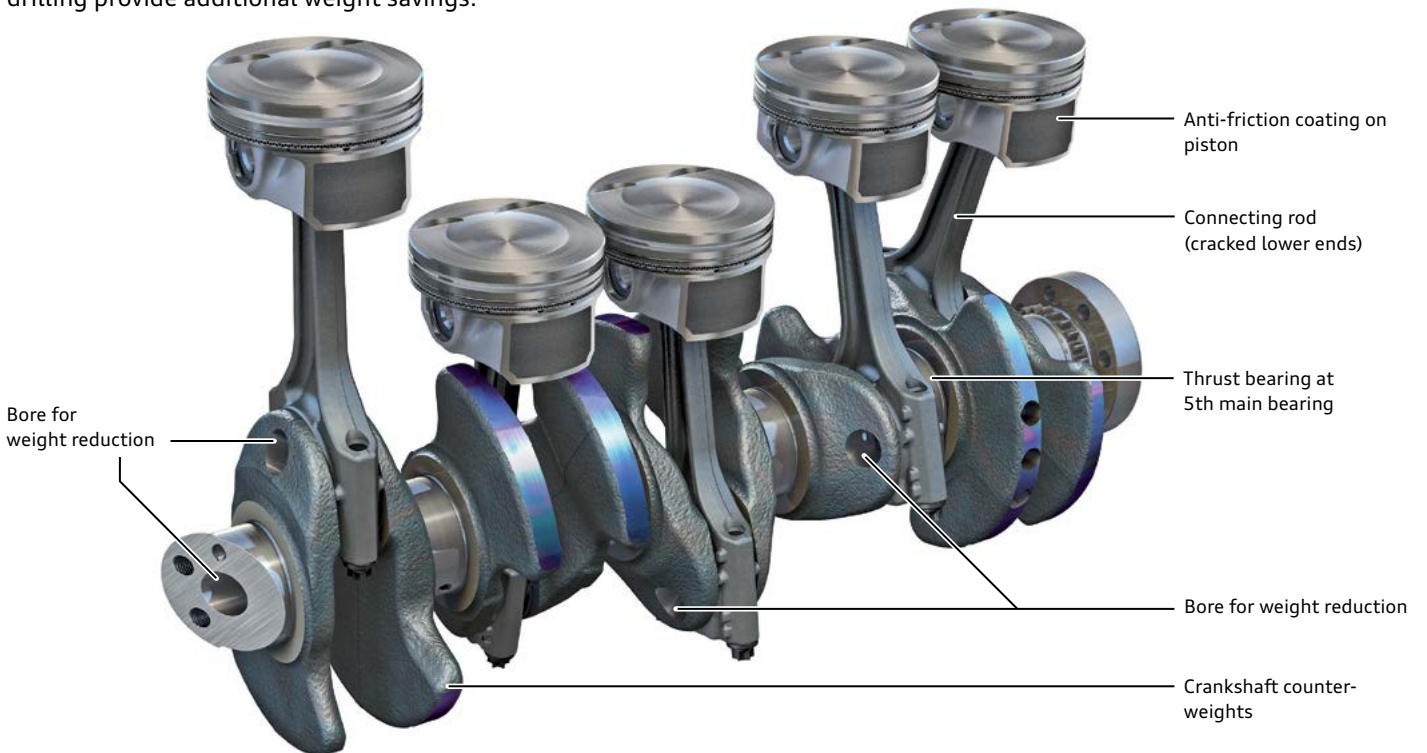
The forged and tempered crankshaft is made from steel (42CrMoS4).

The diameter of the crankshaft main bearings has been reduced to 2.04 in (52 mm) from 2.28 in (58 mm) which reduces friction. Drillings in the webs and a longitudinal drilling provide additional weight savings.

eMedia



Find out more about the crankshaft drive.



661_006

Main bearing shells

Due to the stresses exerted on the bearings, an “Irox* coating” is used on the crankshaft bearing shells.

The higher stresses are the result of:

- > Higher ignition pressures.
- > Higher temperatures.
- > Smaller bearing size.
- > Increased crankshaft flexure.
- > Start-stop system.

Main bearing, top/bottom

The main bearing shells consist of:

- > A steel back (approximately 0.09 in [2.25 mm]).
- > A very thin pure aluminum layer acting as a bonding layer (approximately 1 – 3 μm).
- > A polymer coating (approximately 70 % PAI + boron nitride (hard particles) + ferrous oxide Fe_2O_3 as a wear-resistant run-in and dry-run coating).
- > The thrust bearing is located at bearing five.

Connecting rod bearing, top/bottom

The small-end bearing shells consist of:

- > A steel back (approximately 0.043 in [1.1 mm]).
- > A very thin pure aluminum layer acting as a bonding layer (approximately 1 – 3 μm).
- > A polymer coating (approximately 70% PAI + MoS2 as run-in and dry-run coating).

* Federal mogul polymer coated bearings.

Pistons and connecting rods

Pistons

The pistons have a flat crown which allows higher power per unit of displacement.

- > A circumferential cooling duct reduces crown temperature by 80 °F (30 °C).
- > Asymmetric shape.
- > The compression ring is located by the integrated ring land.
- > The piston skirt has a wear-resistant anti-friction coating.
- > Enlarged valve recesses.
- > The wrist pin axis is offset 0.01 in (0.5 mm) relative to the center of the piston.
- > The piston and wrist pin are paired.

Piston rings

- > **Piston ring 1:** Rectangular ring (upper ring in ring land (compression ring))
- > **Piston ring 2:** Tapered piston ring
- > **Piston ring 3:** Three-piece oil control ring

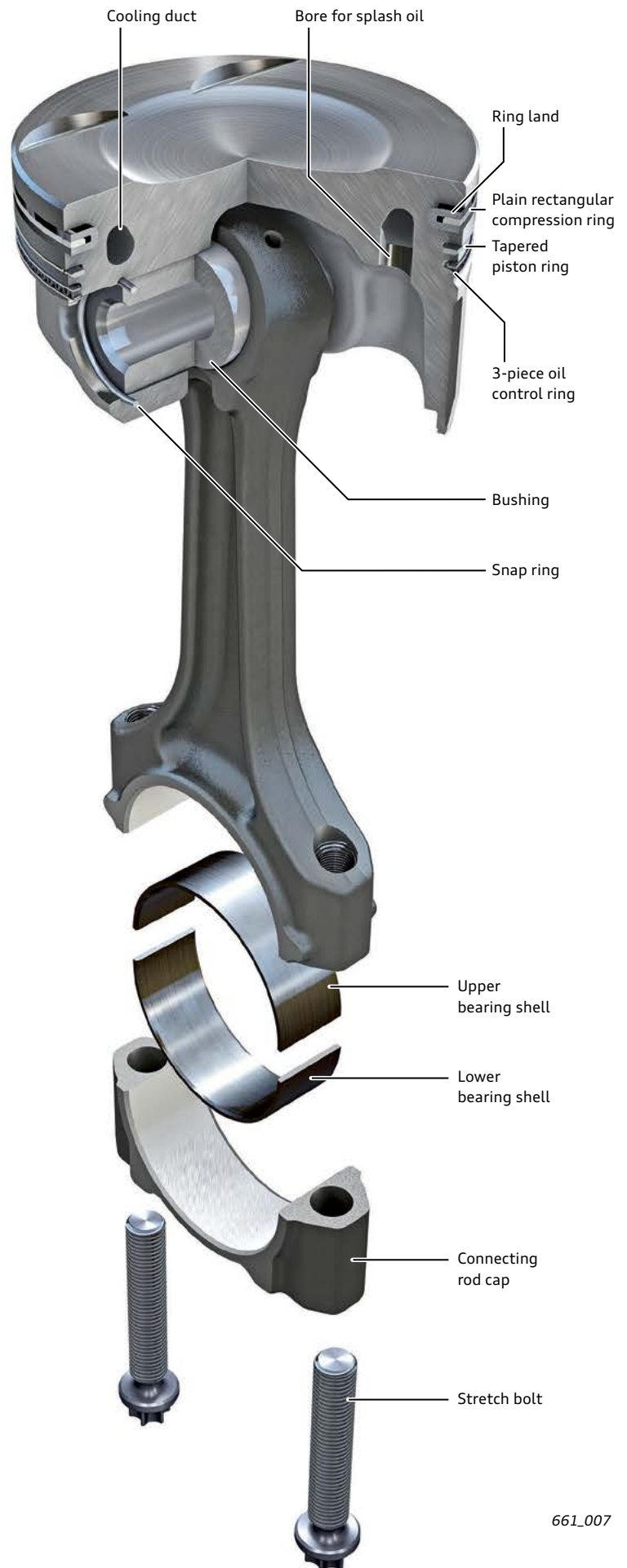
Wrist pin

The wrist pins are machined from slug material and coated.

They are manufactured to a high level of precision and protected by a special silver-colored coating of molybdenum nitride (MoN). This coating is able to withstand higher stresses.

Connecting rod

The forged cracked connecting rod is made of high strength steel in an I-beam shape. The small end is sleeveless. The surface is finely honed and roller burnished.



661_007



Reference

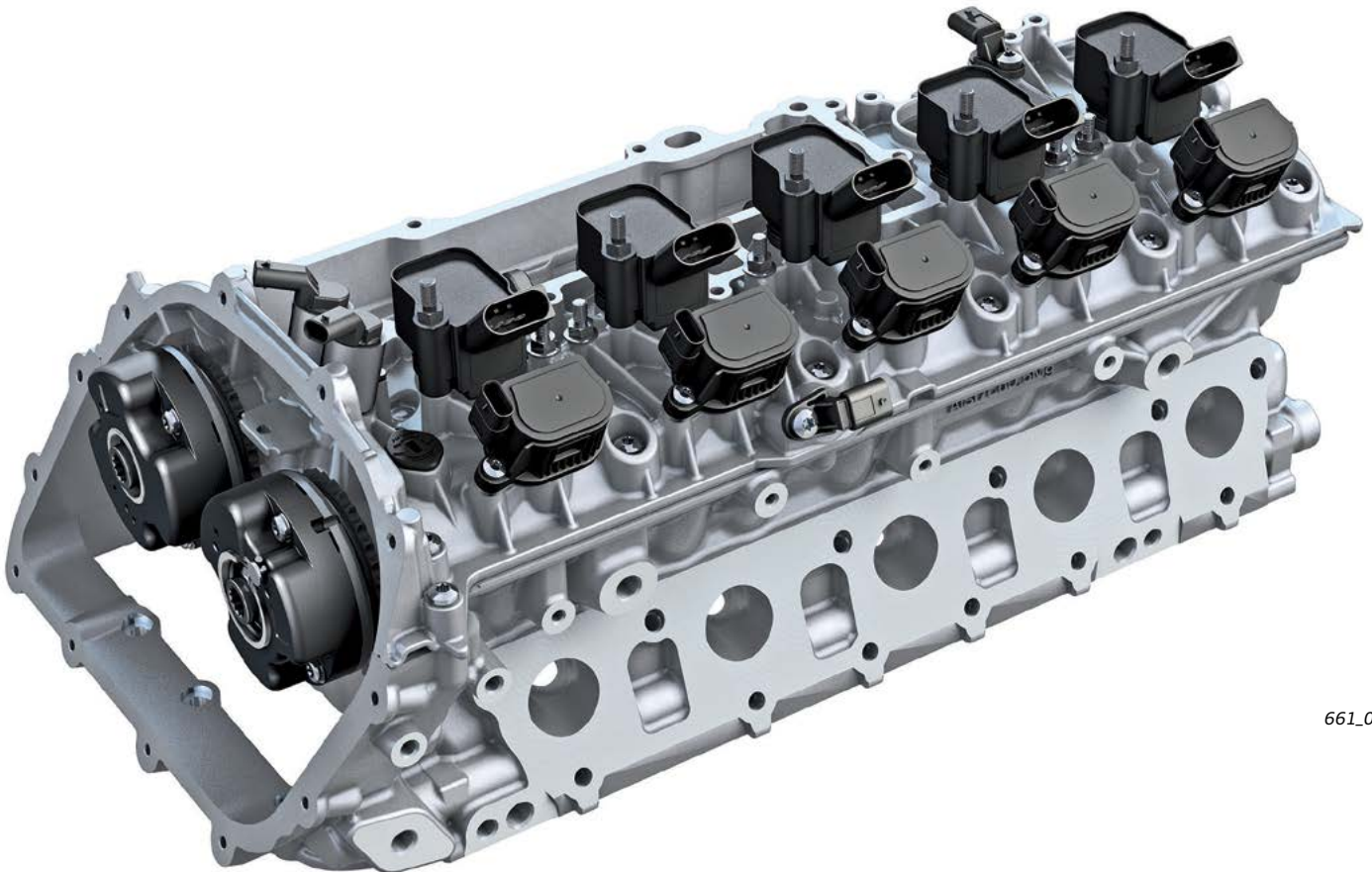
For further information about the 3-piece oil control rings, refer to [Self-Study Program 920163, Audi Third Generation 2.0l Engines.](#)

Cylinder head

The cylinder head has been revised in many areas compared with the predecessor engine. As a result of the higher peak compressive load, a new, five-ply cylinder head gasket is used in addition to ultra-high-strength cylinder head bolts. Due to high exhaust gas flow rates, a new exhaust valve stem seal is used.

Another key feature is the camshaft bearings, which have been modified to reduce friction.

The Audi valvelift system is used on the exhaust camshaft of a five-cylinder engine for the first time. A further modification is the relocation of the high pressure fuel pump to the cylinder block. This results in less vibration being transmitted to the camshaft drive and quicker camshaft adjustment times.

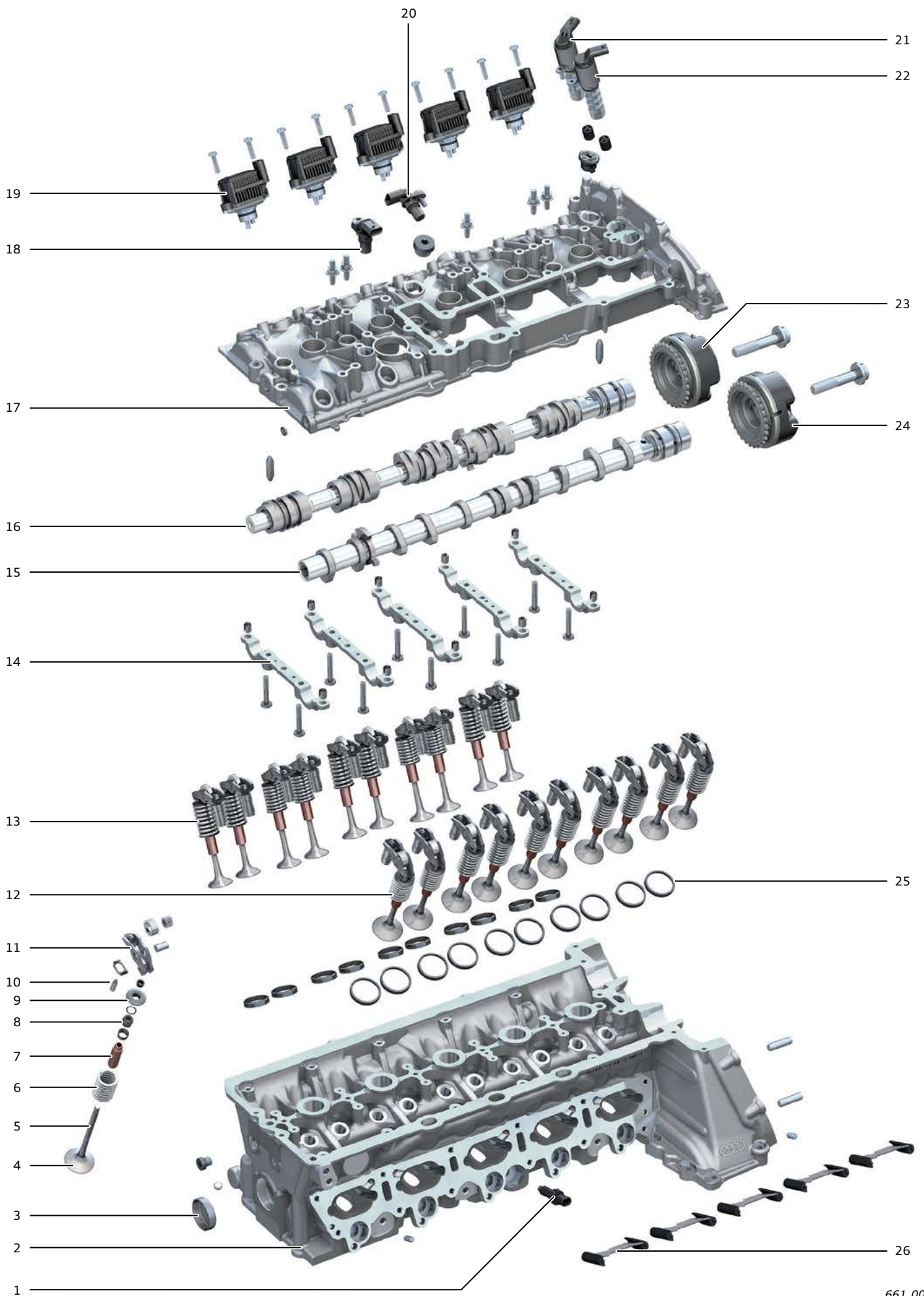


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Key to illustration on page 9

- | | | | |
|----|--|----|--|
| 1 | Engine Temperature Control Sensor G694 | 17 | Cylinder head cover |
| 2 | Cylinder head | 18 | Camshaft Position Sensor G40 |
| 3 | Freeze plug | 19 | Exhaust camshaft adjuster |
| 4 | Valve plate | 20 | Camshaft Position Sensor 3 G300 |
| 5 | Valve stem | 21 | Exhaust Camshaft Adjustment Valve 1 N318 |
| 6 | Valve spring | 22 | Camshaft Adjustment Valve 1 N205 |
| 7 | Valve guide | 23 | Exhaust camshaft adjuster |
| 8 | Valve stem oil seal | 24 | Intake camshaft adjuster |
| 9 | Upper spring disc | 25 | Valve seat rings |
| 10 | Support element | 26 | Port divider |
| 11 | Roller-type cam follower | | |
| 12 | Intake valve | | |
| 13 | Exhaust valve | | |
| 14 | Camshaft bearing bracket | | |
| 15 | Inlet camshaft | | |
| 16 | Exhaust camshaft | | |

Design

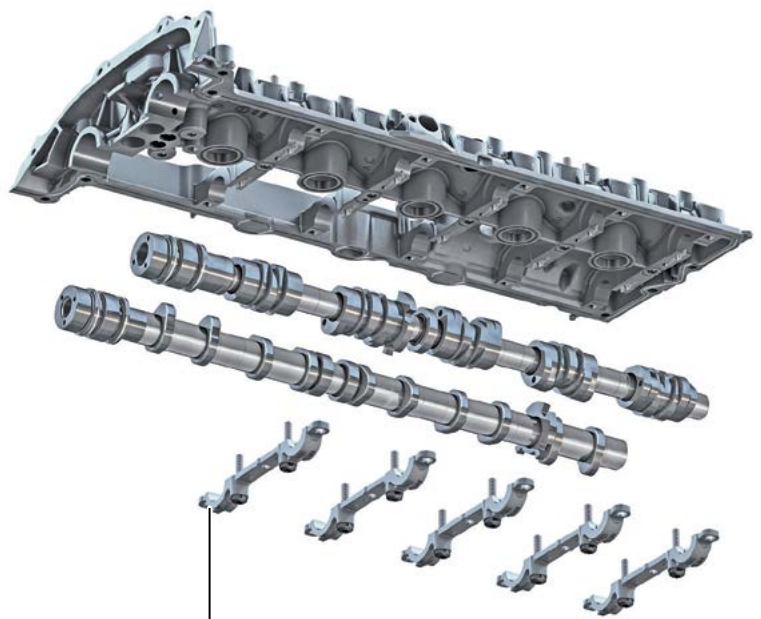


Camshafts

Both camshafts are bolted to the cylinder head cover using bearing brackets. The advantage of this concept is that of stress-free installation.

The camshaft mounting forms an integral part of a highly rigid assembly which makes the engine less susceptible to vibration at high speeds.

The first bearing behind the chain drive is larger. The cylinder head itself forms the lower bearing surfaces. In the event of damage, the complete cylinder head must be replaced.



Camshaft bearing brackets 1 - 5

661_010

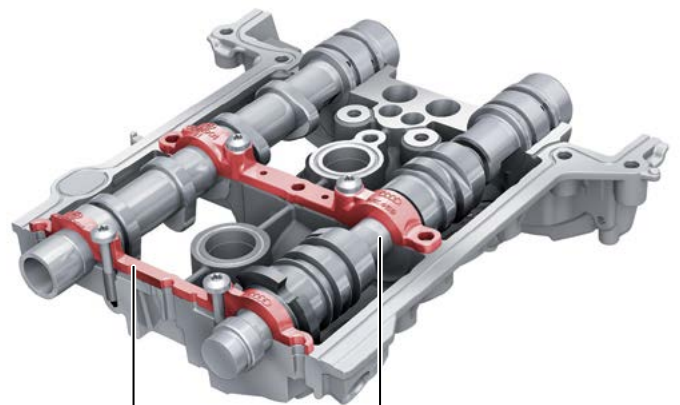
AVS camshaft bearing

On the EA855 EVO engine, the camshaft bearing journals are now directly on the camshaft instead of being on the sliding cam element.



661_011

EA888 Generation 3
Camshaft bearing journal on the AVS cam element



661_012

Bearing bracket

EA855 EVO
Exhaust camshaft journal surface on the basic camshaft



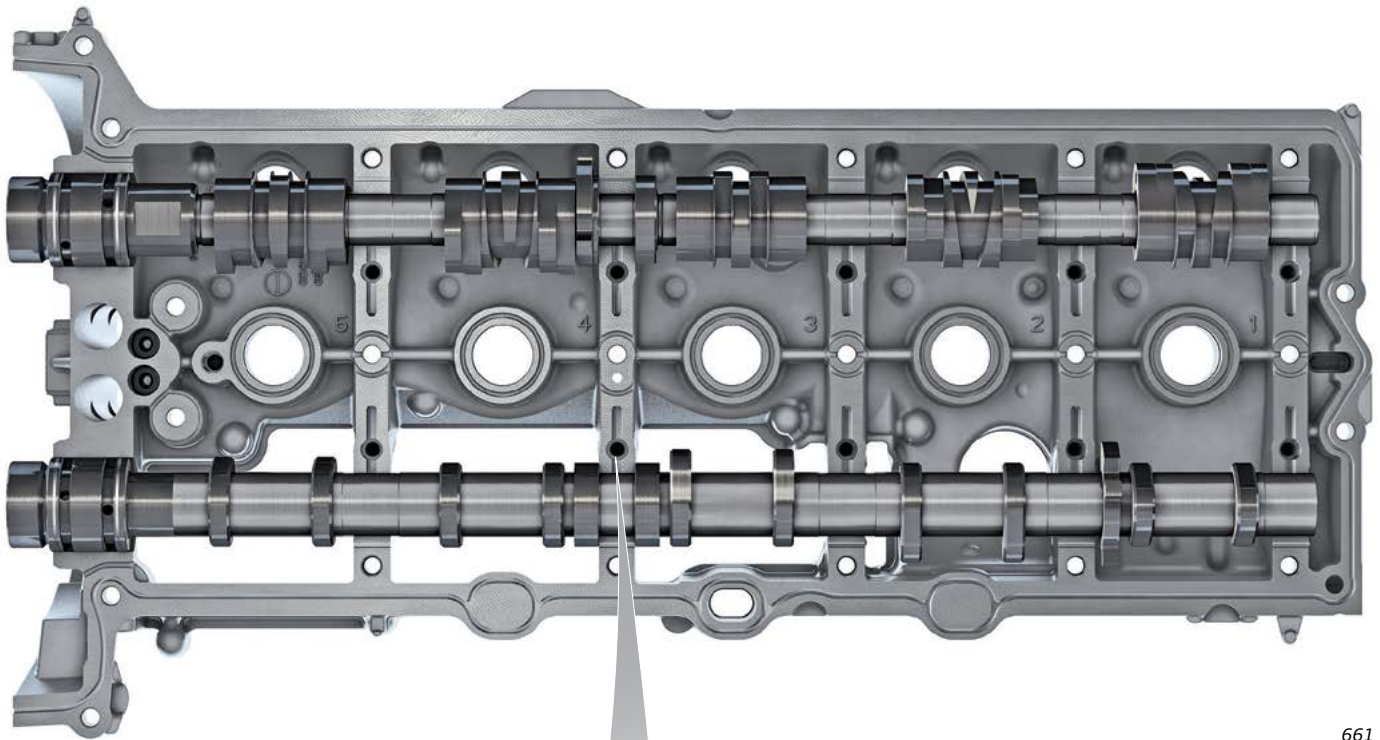
Note

1. To remove the cylinder head cover, the camshaft timing chain must first be removed.
2. If the camshaft bearings are damaged, the complete cylinder head must be replaced.

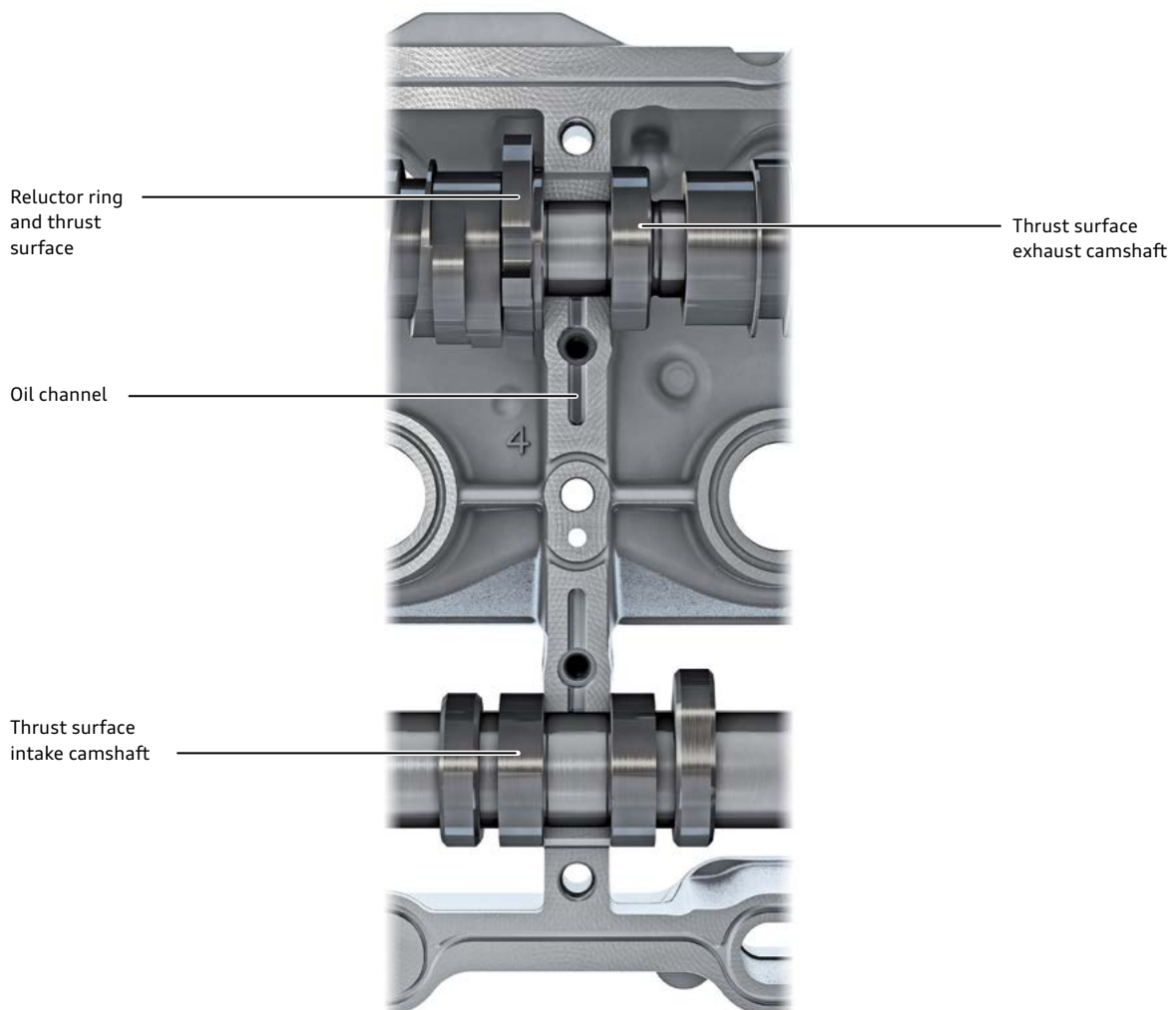
Axial camshaft bearing

The camshafts are supported laterally at the bearing bracket between cylinders three and four.

For this purpose, thrust surfaces are attached to the camshafts.



661_013



661_014

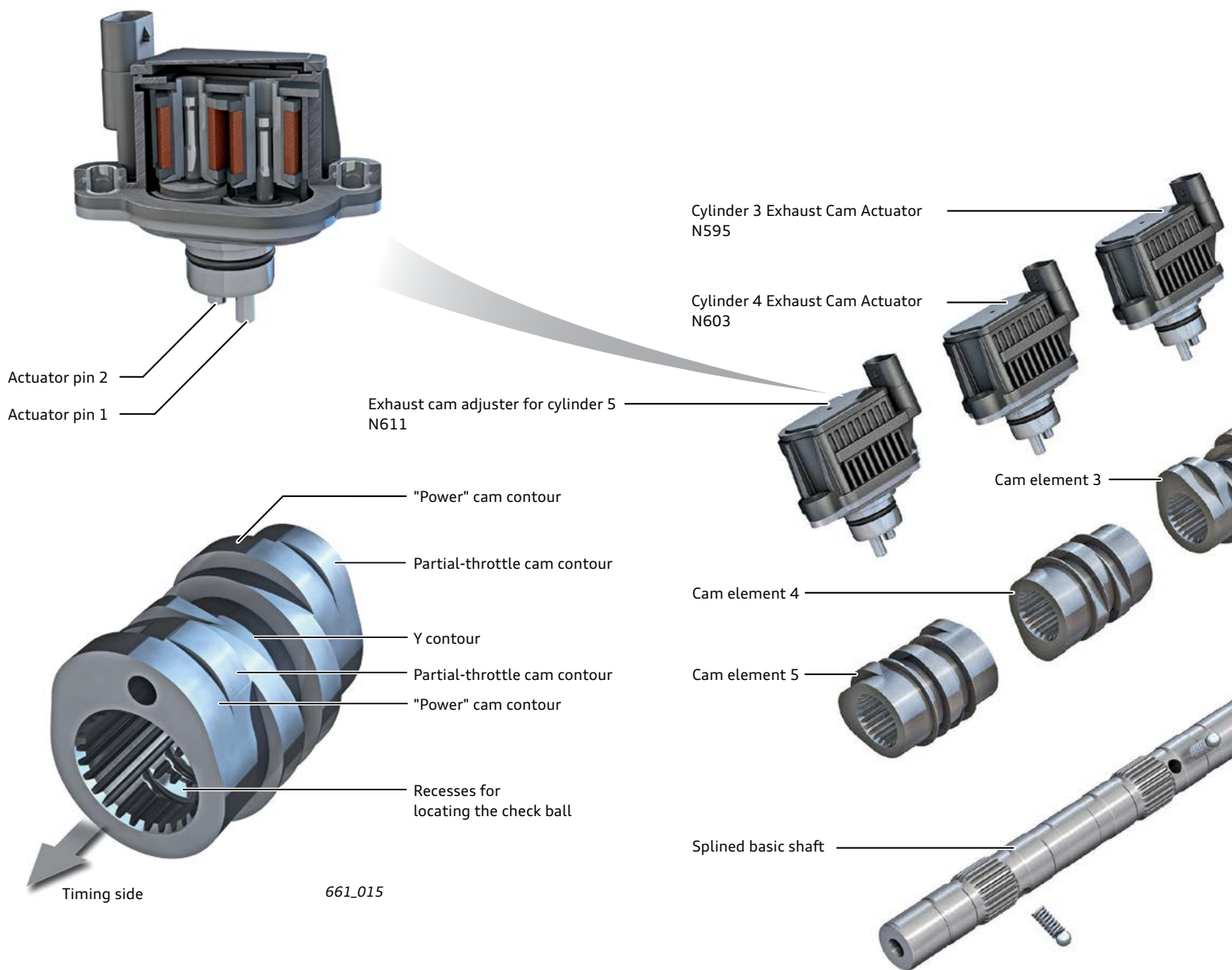
Audi valvelift system (AVS)

A significant improvement in fuel economy over the previous engine has been achieved by positioning the AVS on the exhaust side. This also improves the engine torque characteristic. Unlike previous systems, the lift of the exhaust valves is not adjusted. The two different cam contours only change event duration, that is the opening time of the valves.

Operation

The system works in conjunction with the variable valve timing system. Residual gas is significantly reduced through phase adjustment of the intake and exhaust camshafts by up to 50° crank angle (phasing angle) on the intake side and 42° crank angle (phasing angle) on the exhaust side, as well as by the adaptation of valve opening duration by the AVS on the exhaust side.

AVS makes it possible to shift between a valve opening duration of 200° crank angle for medium fuel economy at low and partial engine loads and a valve opening duration of 270° crank angle for rapid response and high performance at full throttle.



Note

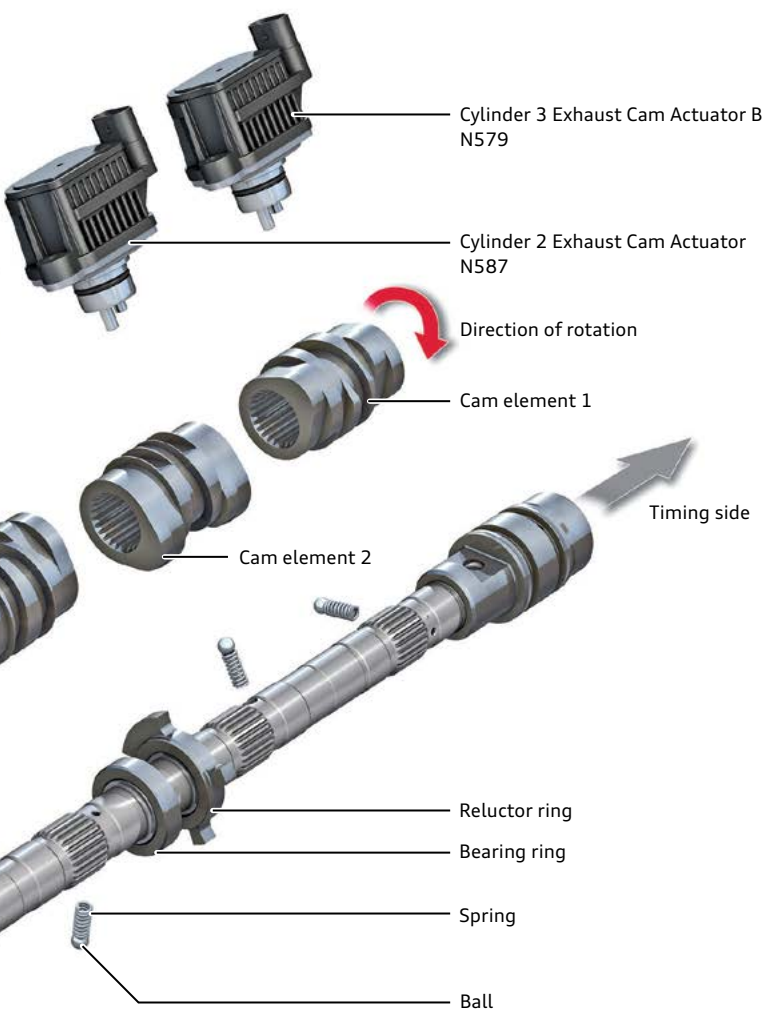
If a check ball or a spring is lost due to a cam element being moved too far during repair work, it can be ordered separately. If the cam element has been forced off the spline, the complete camshaft must be replaced (cam elements fit in any position). In the condition as supplied, the cam elements on a new camshaft are set to the "power" cam contour.

Exhaust camshaft design

The cam elements slide on to the splined basic shaft and are located by a ball and spring. Each cam element is adjusted by dual actuators, which can move the cam elements in both directions. The cam elements have a Y-shaped contour at the center.

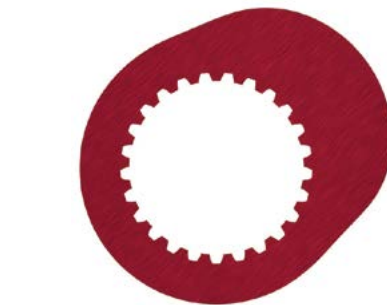
Configuration of the exhaust cam adjusters

Connection	Potential and function
A1	Ground coil 1 = actuator pin 1 = adjustment of cam element to "power" cam profile
A2	Ground coil 2 = actuator pin 2
in the A3	Terminal 87 voltage supply = adjustment of cam element to partial-throttle cam profile



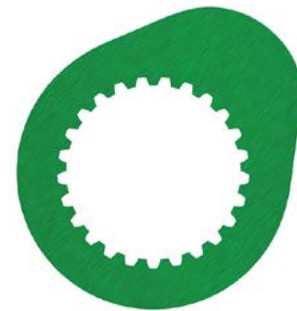
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Each cam actuator now has 2 actuator pins. Pin 1 moves the cam element to the power cam profile. Pin 2 moves the cam element to the part throttle profile.



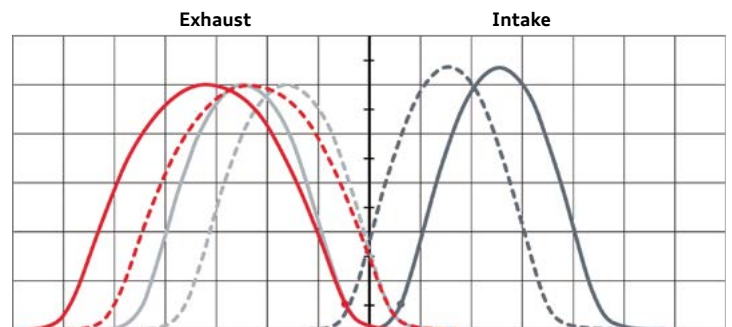
"power" cam profile 270° crank angle

661_017



Partial-throttle cam profile 200° crank angle

661_018



661_093

- Exhaust stroke 200°/10 mm
- - - Exhaust stroke 200°/10 mm (+42°)
- Exhaust stroke 270°/10 mm
- - - Exhaust stroke 270°/10 mm (+42°)
- Intake stroke 195°/10.7 mm
- - - Intake stroke 195°/10.7 mm (-50°)



Reference

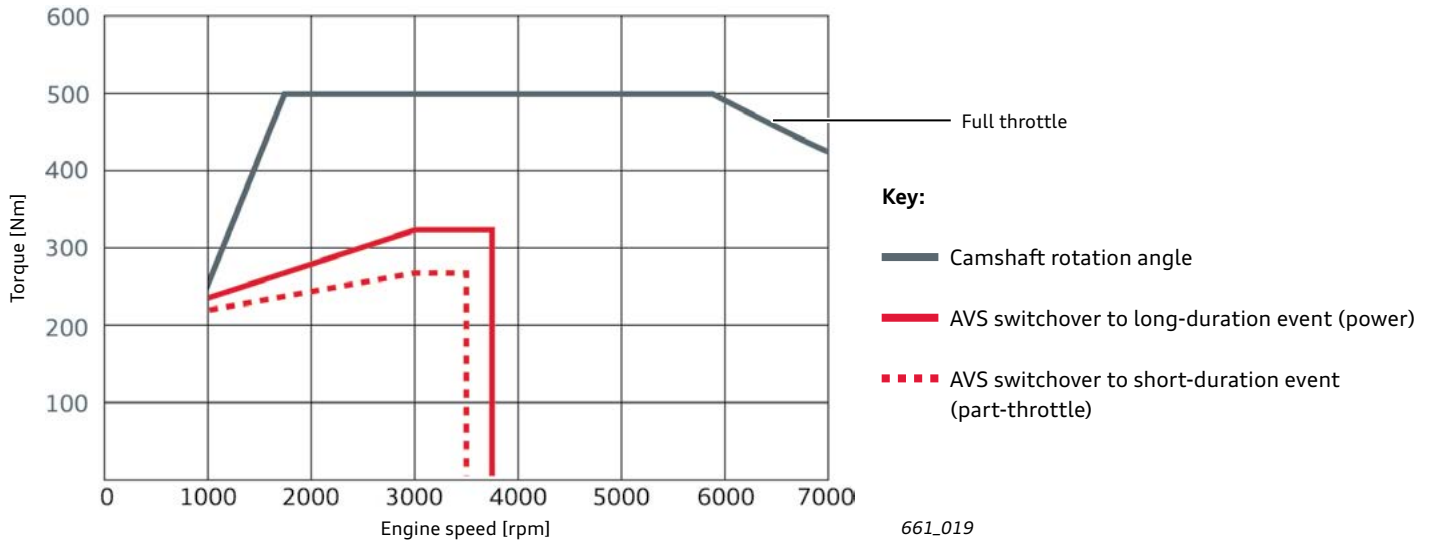
For further information about the working principle of the Audi valvelift system (AVS), please refer to [Self-Study Program 922903, The 2.0L 4V TFSI Engine with AVS](#).

AVS operating range

After the engine is shut off, all cam elements return to the partial-throttle cam contour.

The system switches over to the "power" cam contour at mapped operating points at about 3800 rpm and at a median combustion chamber 159.54 psi (11 bar). The diagram illustrates this process using an example.

The cam element is not switched over if the oil temperature drops below 14 °F (-10 °C) and if an engine speed of 4000 rpm is exceeded. It cannot be switched over until the engine speed drops below 4000 rpm and the oil temperature is above 159.5 °F (-10 °C).



AVS switchover to long-duration event

Power cam profile – long-duration event

- › Advantages across full throttle range and in terms of responsiveness.
- › Higher torque is achieved at low speeds because this valve timing configuration allows high scavenging rates at low engine speeds.

AVS switchover to short-duration event

Partial throttle cam profile - short duration event.

- › Advantages in terms of fuel efficiency at partial throttle, starting response, raw emissions and running refinement.

System response to faults

In case of faults, the system tries to set all cylinders equally to an event. If this is the short-duration event, the

cylinder charging rate is also reduced moderately (this is not normally noticeable during normal vehicle operation).

System/sensor	Event memory entry		Emergency operation/ power reduction		Engine speed reduction			Can problem be remedied? DCY ↗		Lamps	
	Yes	No	Yes	No	Yes	No	Engine speed	Yes	No	MIL	EPC
Long cam	X			X		X		X		X	X
Short cam	X			X		X		X			X
Combined operation	X			X		X		X		X	X

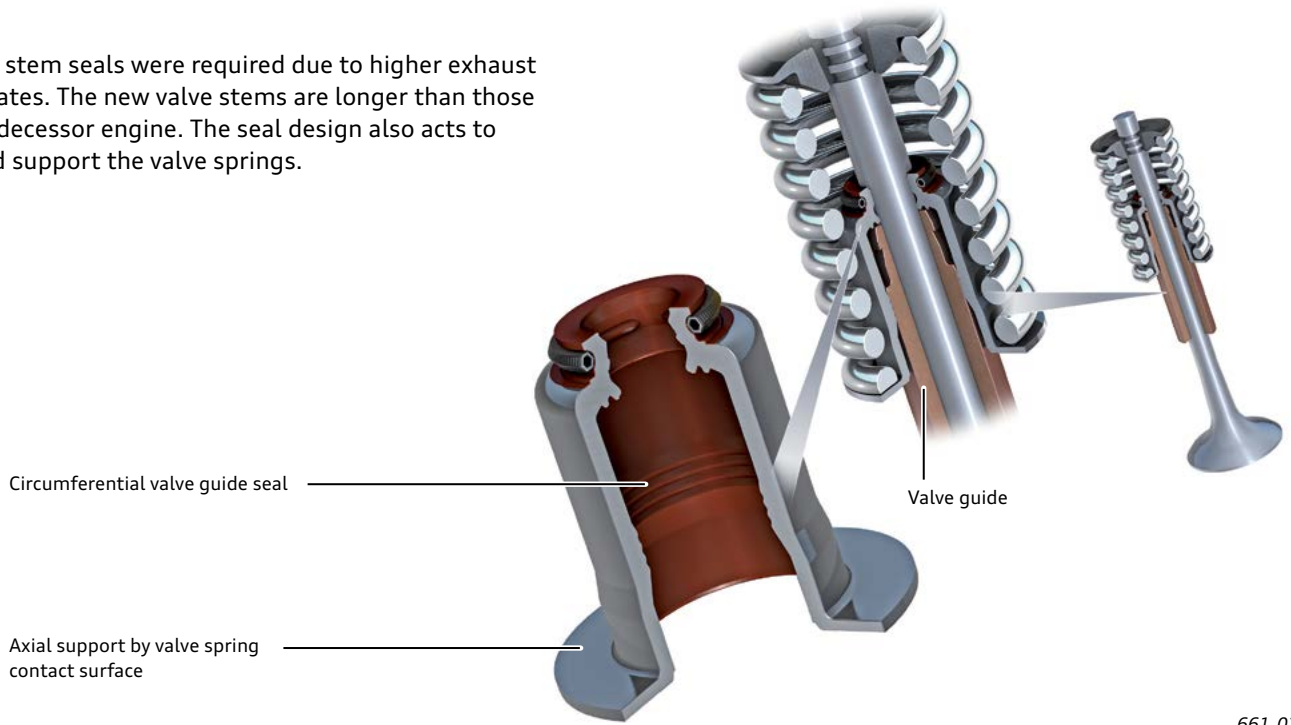


Note

Even if the cam elements are not all set to the short-duration profile after engine repairs, the engine can still be started. The engine may not run smoothly during the subsequent idling phase, because the control cycles are configured for the short-duration profile. If engine speed is increased to between 1200 and 1800 rpm, the system switches back and forth twice and reconfigures to the short-duration profile. When installing the exhaust camshaft, therefore, it is important to ensure that all cam elements are set to the short-duration profile.

Exhaust valve stem seal

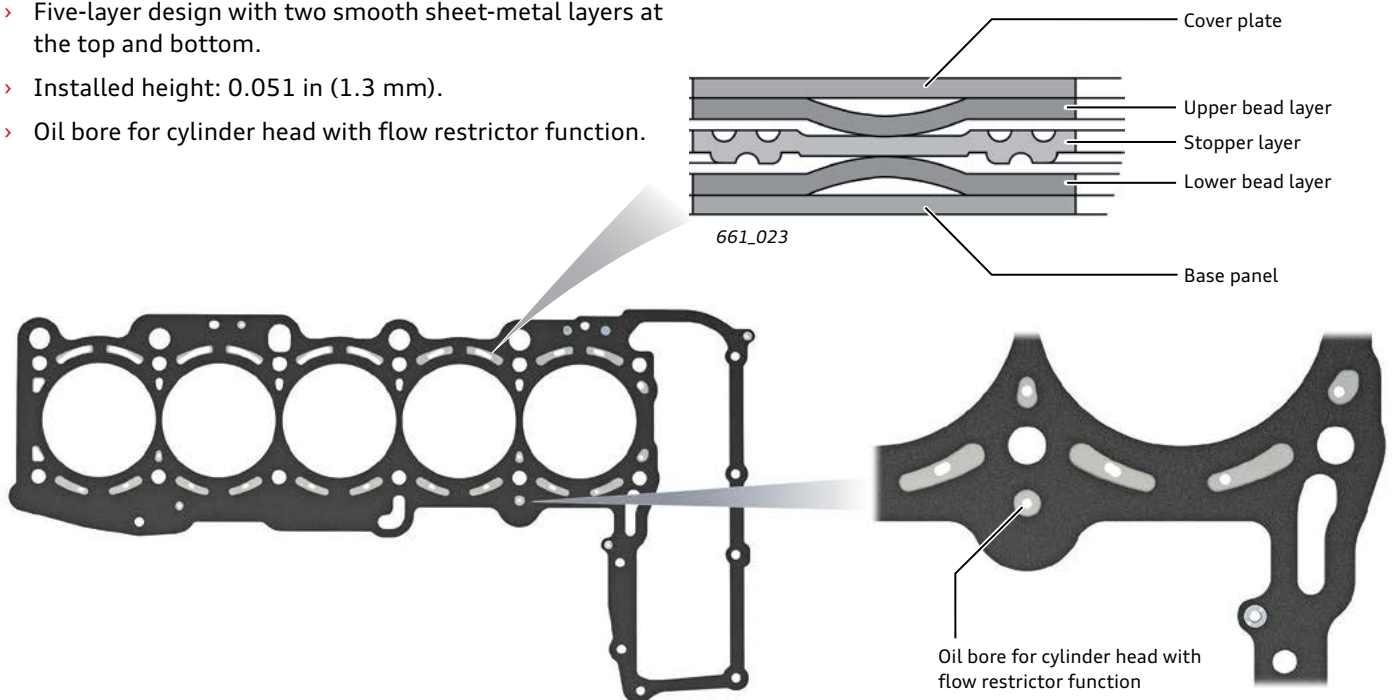
New valve stem seals were required due to higher exhaust gas flow rates. The new valve stems are longer than those of the predecessor engine. The seal design also acts to center and support the valve springs.



661_020

Cylinder head gasket

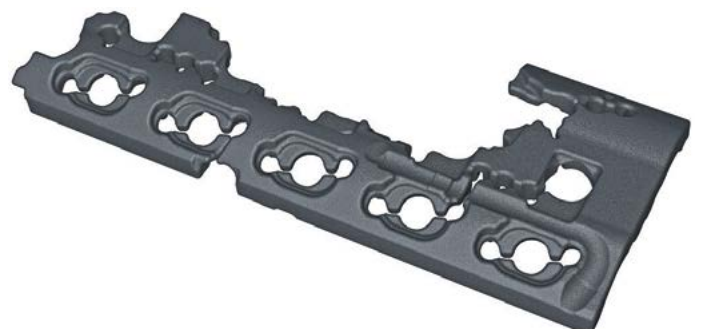
- > Five-layer design with two smooth sheet-metal layers at the top and bottom.
- > Installed height: 0.051 in (1.3 mm).
- > Oil bore for cylinder head with flow restrictor function.



661_022

Acoustic insulation for cylinder head

To reduce engine noise levels, a polyether polyurethane foam insulating panel is located directly above the cylinder head cover.



661_023

Timing assembly

The two stage timing assembly is located on the transmission side of the engine. The engine oil pump and the intermediate shaft are driven by primary chain A. It is an 8 mm toothed chain. The intermediate shaft is an assembly.

The camshafts are driven by chain B via the intermediate shaft gear. It is an 8 mm roller chain. The overall chain drive has been optimized for friction reduction.

Changes to the radii of the chain drive have created a more compact installation area. This and the switch to a single-track accessory drive have enabled a 0.07 in (2 mm) reduction to the overall length of the engine.

The high-pressure fuel pump drive has been relocated from the cylinder head to the engine block.

Advantages:

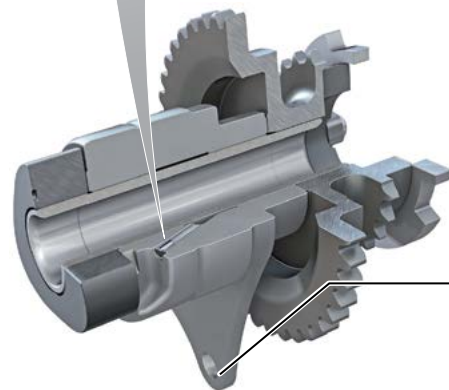
- > Improved vibration characteristics of the camshafts and reduced forces in the chain drive.
- > Shorter fuel lines due to positioning on the cylinder head.
- > Improved package in terms to pedestrian impact mitigation (clearance to hood).
- > System adaptable to increasing fuel pressures as needed in future applications.



661_026

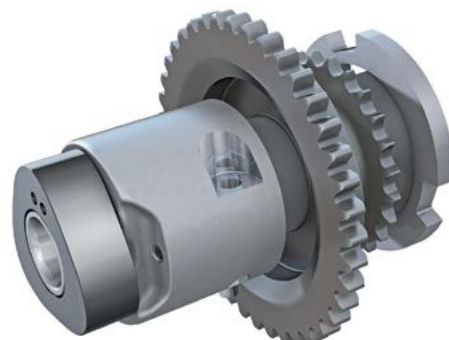
Lubricating oil supply for:

- > Anti-friction bearing of intermediate shaft assembly
- > High-pressure pump



661_024

Intermediate shaft with threaded connection on the face. Non-removable in older engines (pre 2017). This is the first generation design.



661_025

Intermediate shaft without threaded connection on the face. Removable, can be bolted together from above, cylinder head must be removed. This is the second generation design.



Find out more about the chain drive.

- Intake camshaft adjuster
- > 30 teeth
 - > Adjustment range 50° crank angle
 - > After the engine is shut off, the adjuster is locked in the retard position by a locking pin

- Exhaust camshaft adjuster
- > 30 teeth
 - > Adjustment range 42° crank angle
 - > After the engine is shut off, the adjuster is locked in the advance position by an auxiliary spring loaded locking pin

- Intermediate shaft assembly
- > Drive for camshafts, high-pressure pump and vacuum pump
 - > Three-lobe cam for high-pressure pump
 - > Press-fitted into cylinder block and bolted into place
 - > Anti-friction bearing
 - > Non-removable (first generation only)
 - > 24 and 40 teeth

- Fuel Metering Valve N290
- High-pressure fuel pump

Sliding rail

Direction of rotation

Chain tensioner, hydraulically damped

Tensioning rail

Chain drive B (8 mm roller chain)

Intermediate Shaft Speed Sensor G265

Intermediate shaft bolt coupling

Chain tensioner, hydraulically damped

Chain guide

Chain drive A (8 mm toothed chain)

Crankshaft chain wheel, 25 teeth

Flow-controlled vane cell oil pump

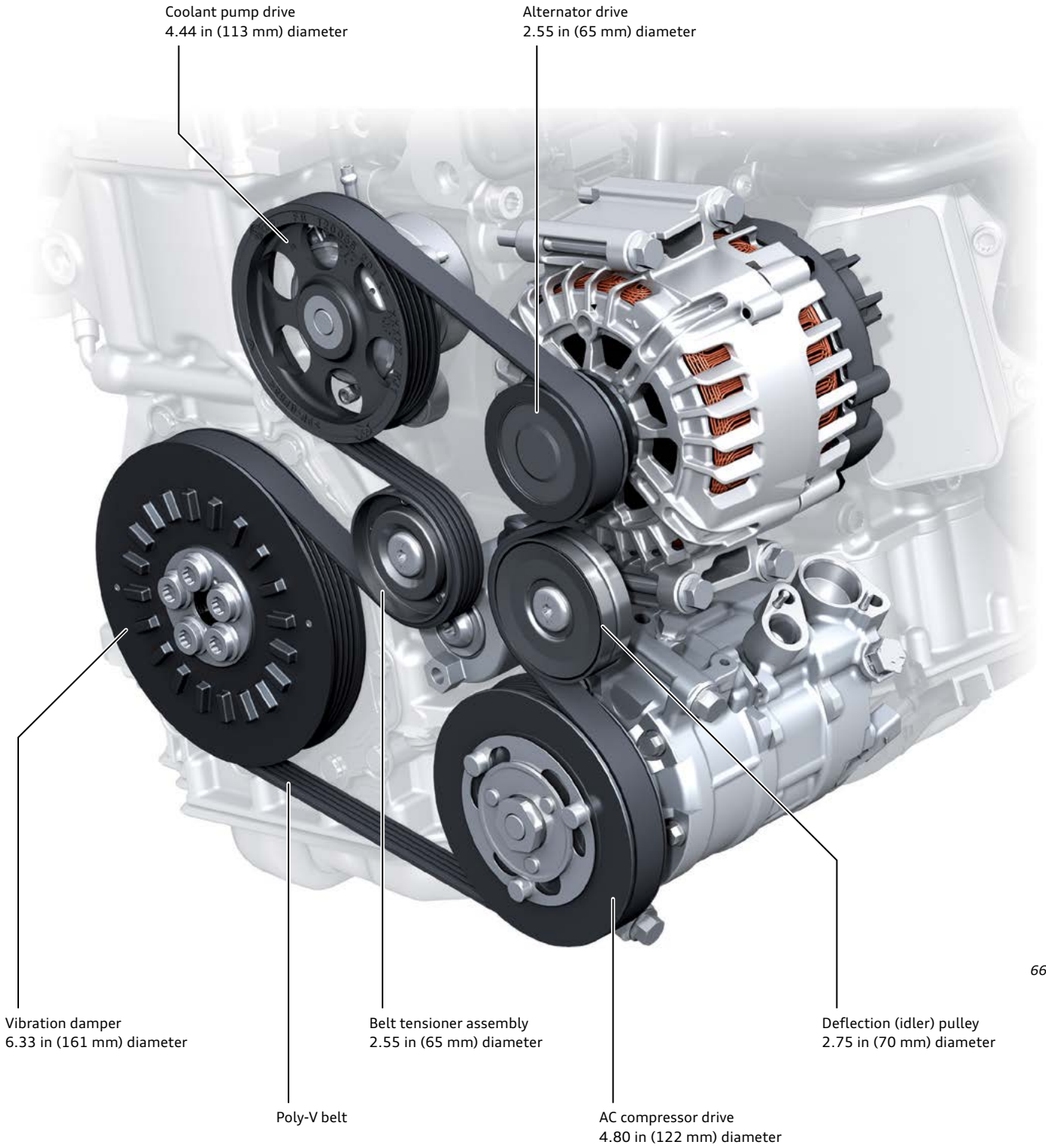
Chain guide

Oil pump chain wheel, 24 teeth

Accessory belt drive

Unlike its predecessor, a serpentine belt is used for the accessory units. The purpose of these modifications was to shorten the overall length of the engine.

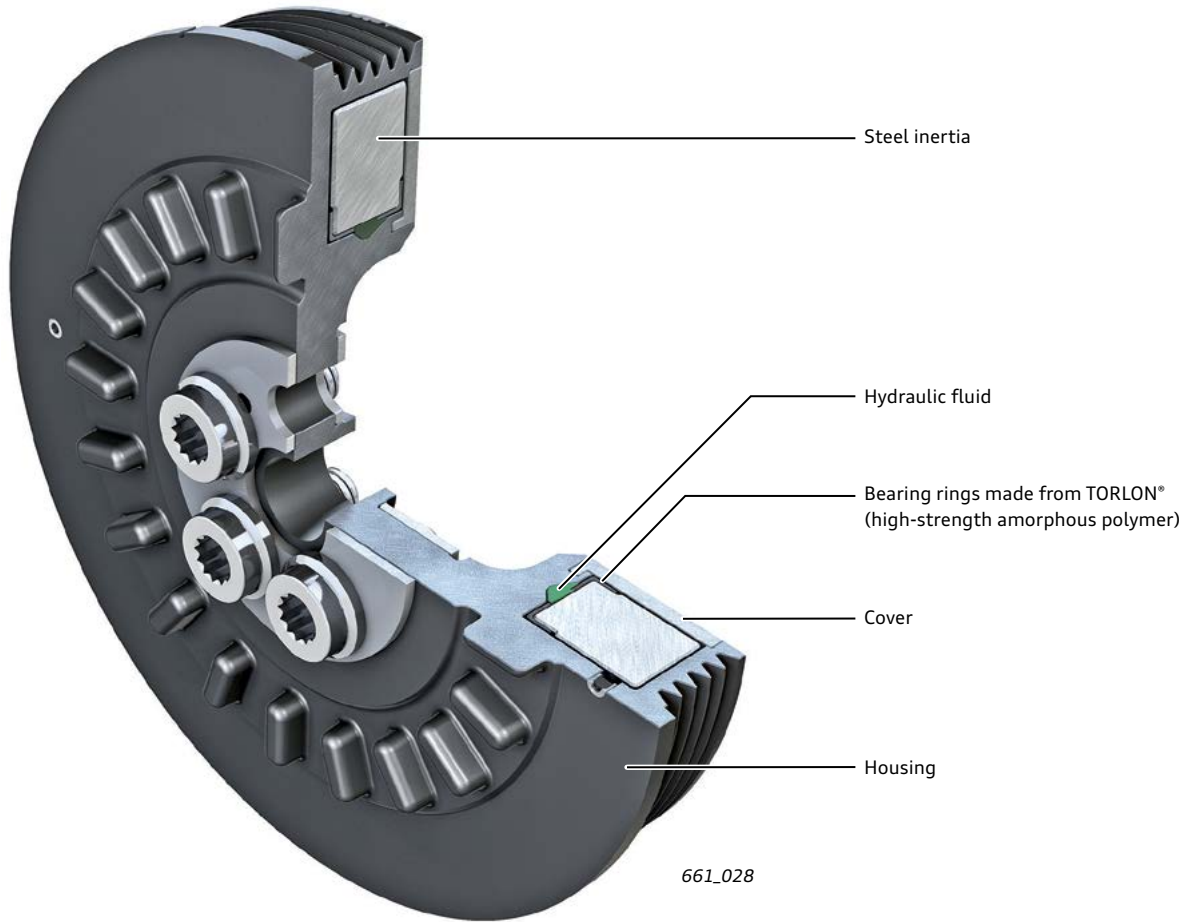
This allows the engine to be integrated into the Modular Transverse Matrix without the need for substantial modification of the front body structure.



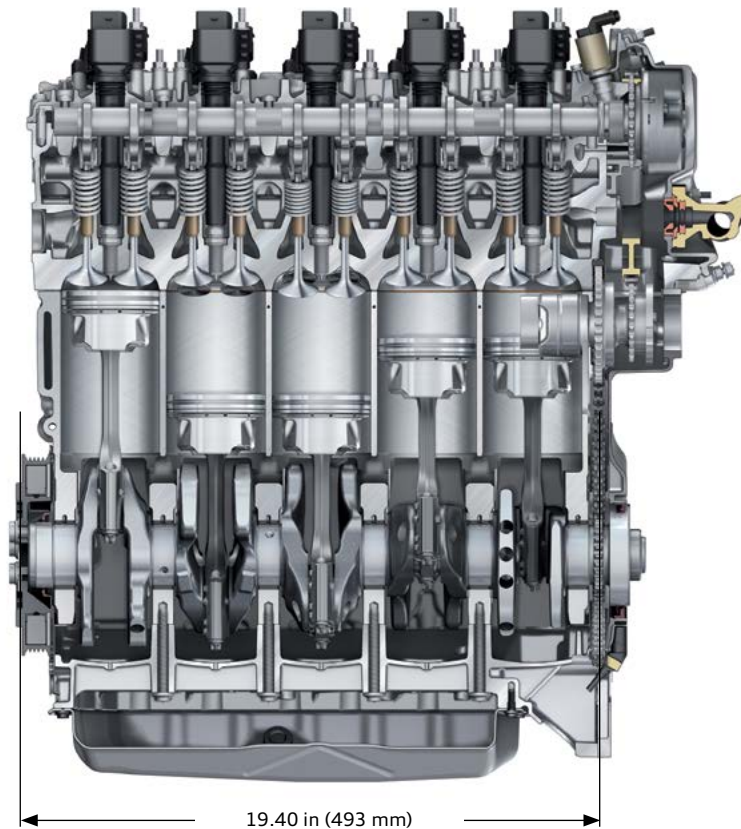
661_029

Vibration damper

The vibration damper is made from aluminum. Damping is done by a steel ring floating in hydraulic fluid.



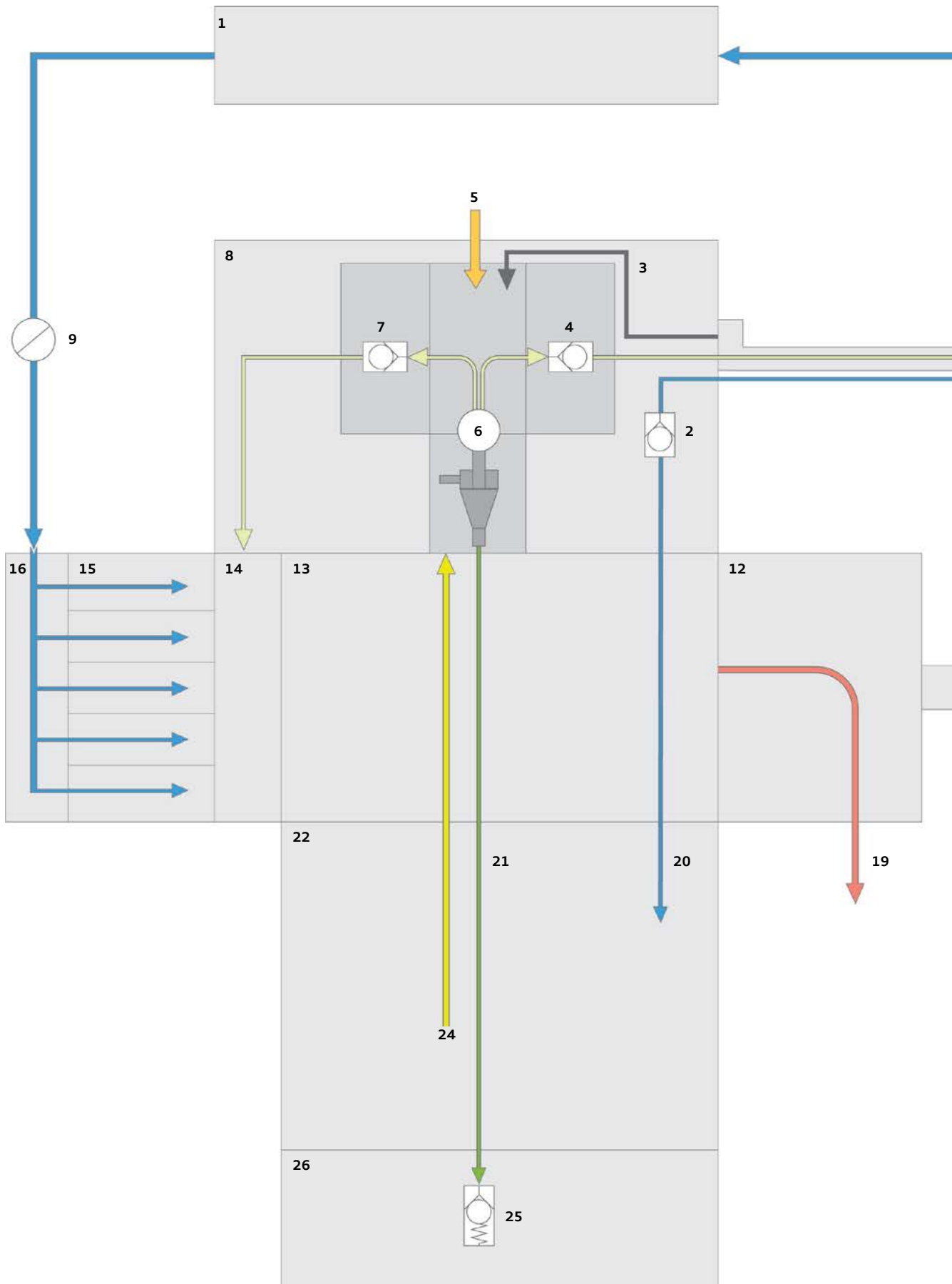
Overall length of engine

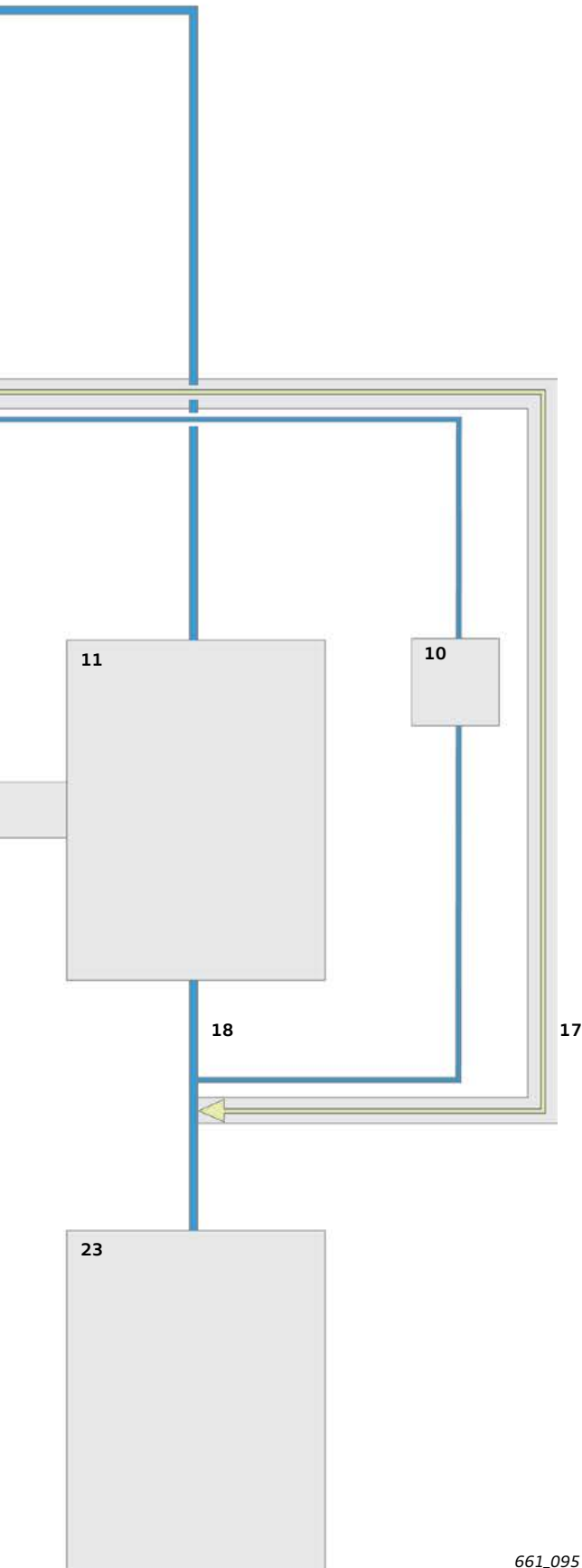


661_030

Positive crankcase ventilation

System overview





Key:

- Oil return
- Blow-by gas
- Cleaned blow-by gas
- Diagnostic channel
- Intake air
- Exhaust
- Tank ventilation

- 1** Charge air cooler
- 2** Non-return valve
- 3** Diagnostic channel
- 4** Non-return valve
- 5** Fuel tank vent
- 6** Pressure control valve
- 7** Non-return valve
- 8** Oil separator module
- 9** Throttle flap
- 10** Crankcase Ventilation Valve N546
- 11** Compressor
- 12** Turbine
- 13** Cylinder head
- 14** Intake ports
- 15** Intake manifold bottom section
- 16** Intake manifold top section
- 17** Vent line for charging mode
- 18** Intake line
- 19** Exhaust gas side
- 20** PCV line
- 21** Oil return channel
- 22** Crankcase
- 23** Air filter housing
- 24** Blow-by gas
- 25** Gravitational valve
- 26** Oil pan

661_095

Vent

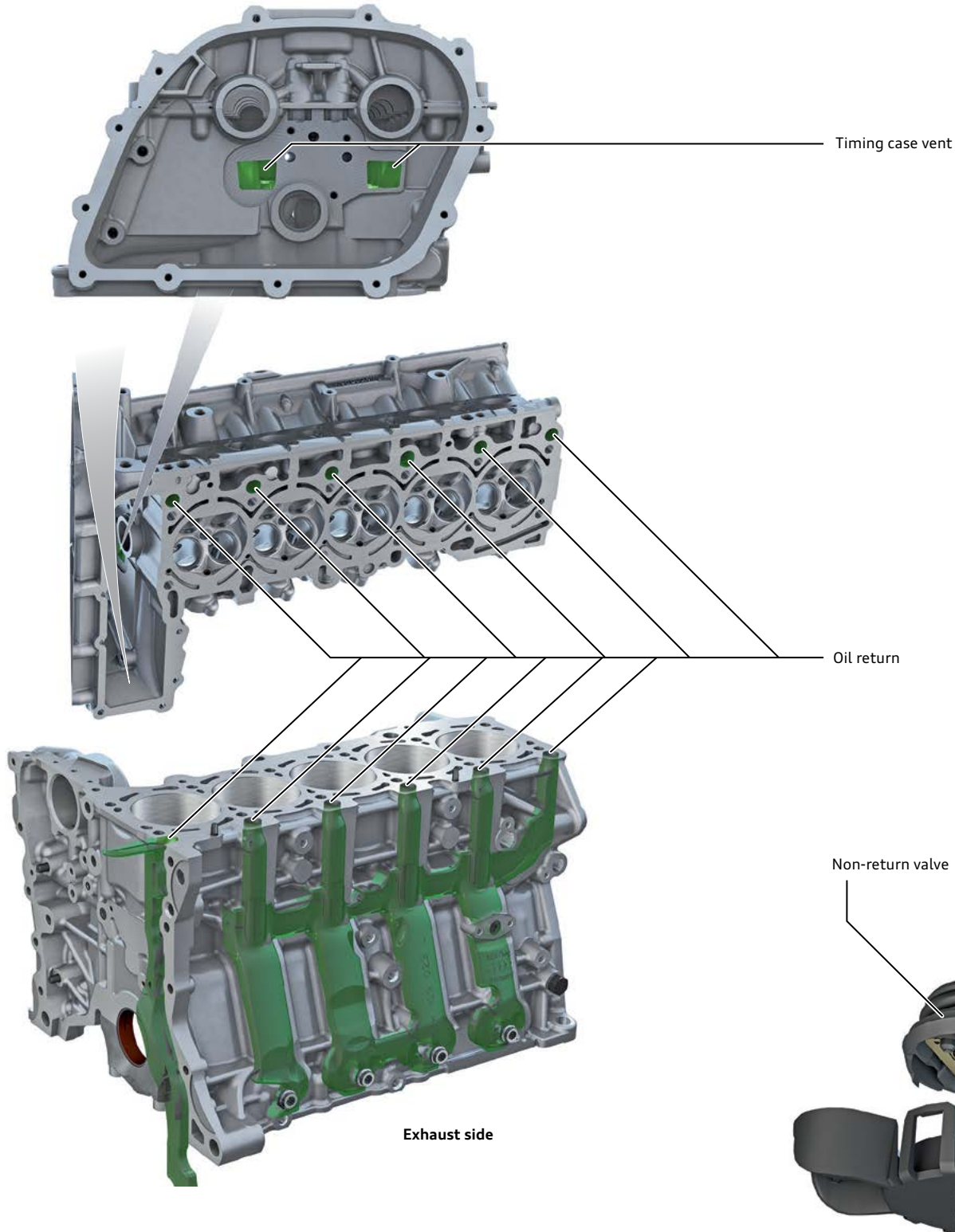
The blow-by gas flows into the cylinder head via the timing case. Here, oil is separated coarsely from the blow-by gas by reversing the direction of flow.

The oil separator module is flange-mounted to the top of the cylinder head cover. At this point, engine oil separated from the blow-by gas before the gas is recycled back into the combustion air stream.

Oil separator module

The oil separator module serves the following functions:

- > Coarse oil separation.
- > Fine oil separation.
- > Cylinder block pressure control.
- > Blow-by volume flow distribution.
 - > By means of non-return valves.
 - > To intake side of exhaust turbocharger.
 - > To intake manifold.
- > PCV.
- > Activated charcoal filter (ACF) inlet.



Oil return

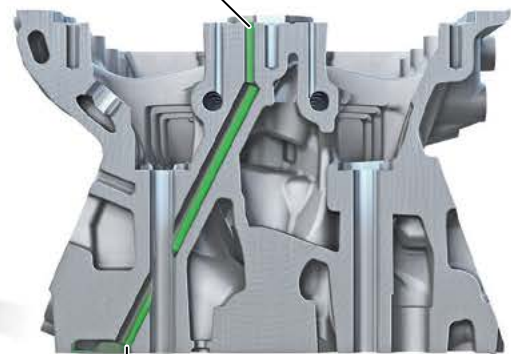
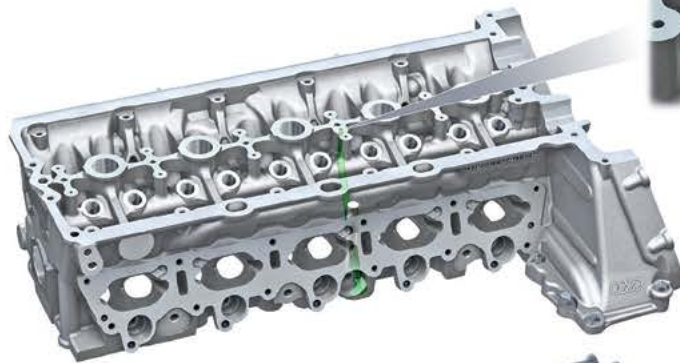
The oil separated by the coarse oil separator flows into the cylinder head via ports at the base of the four chambers in the coarse oil separator and is then recirculated back into the oil pan.

The oil separated by the fine oil separator is recycled back into the engine's fine oil return channel via a separate port in the module. This port passes through the cylinder head as well as the engine block and terminates at a gravitational valve in the oil pan top section. It opens when a sufficient amount of oil has collected in the return channel after the engine is shut off.

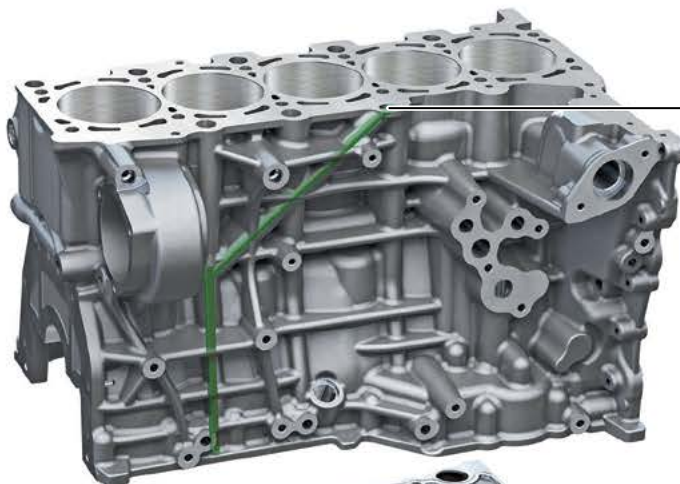
Camshaft bearing 4



Oil drain channel from fine oil separator



Fine oil return channel



Suction side

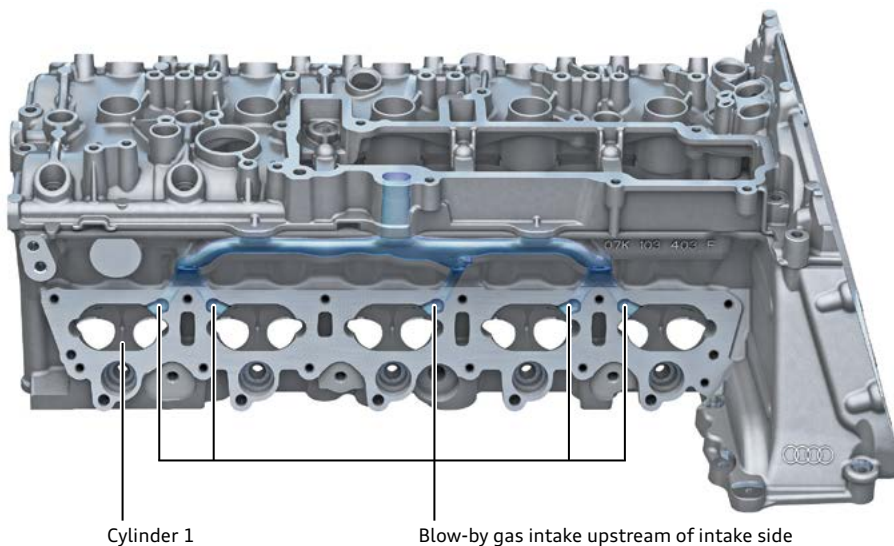
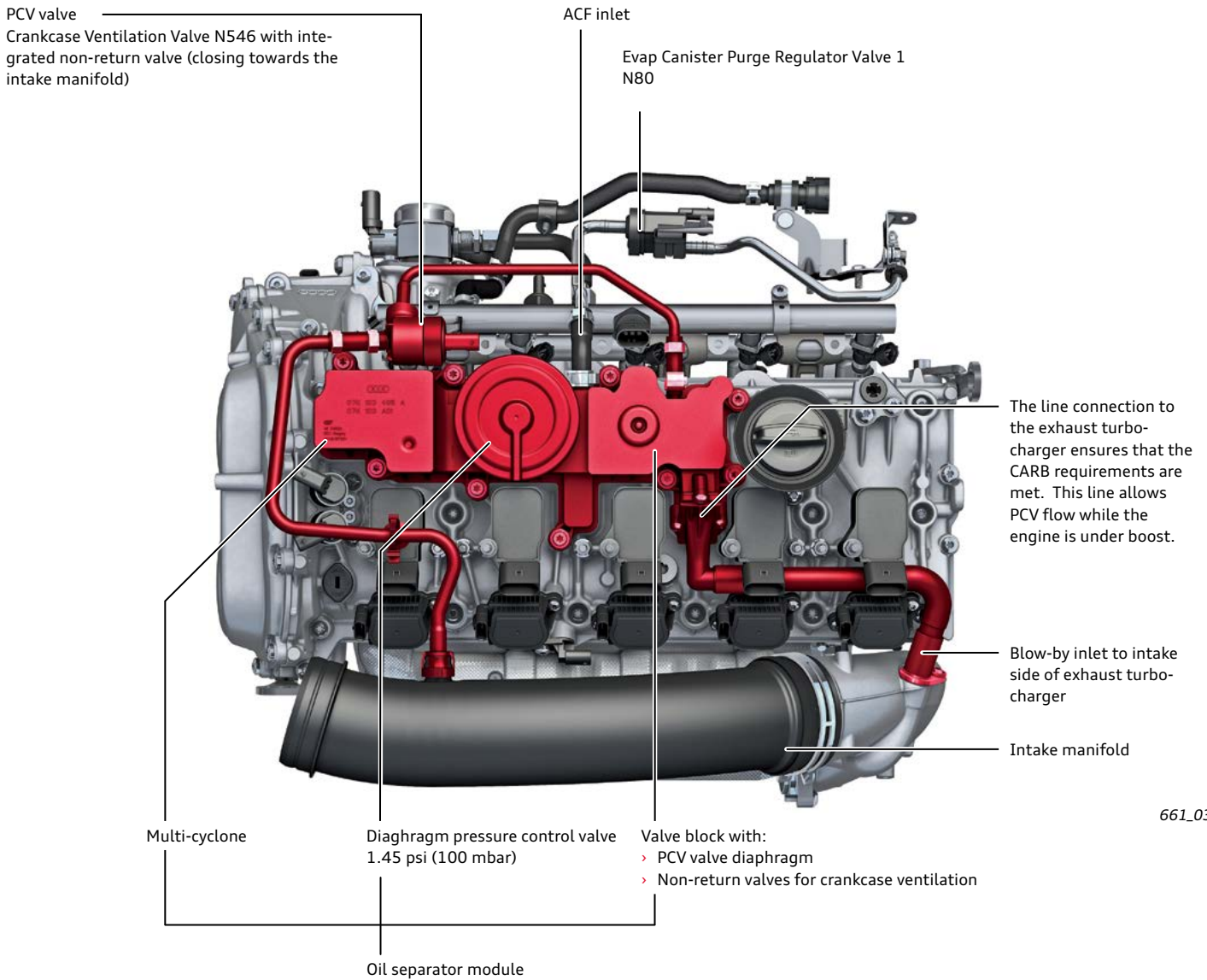


Oil pan top section

Discharge of treated blow-by gases

The volume flow of the blow-by gases is distributed by the oil separator module – either to the intake side of the turbo-charger turbine or directly into the cylinder head intake

ports, depending on the pressure conditions in the air supply system.



Positive crankcase ventilation (PCV)

To vent the crankcase, fresh air is extracted from the intake system and introduced into the oil separator module via the Crankcase Ventilation Valve N546. Here, the fresh air flows through a diaphragm valve (non-return valve) and into the crank chamber via a separate channel in the cylinder head cover, in the cylinder head and in the engine block. N546 is a solenoid valve which is open when de-energized.

N546 closes under the following conditions:

- > Overrun cut-off.
- > Active mixture adaption.
- > Engine idle.
- > Partial throttle.

For this purpose, the control signal for N546 is calculated from engine speed, air mass and intake manifold pressure by the ECM.

Activated Charcoal Filter (ACF) inlet

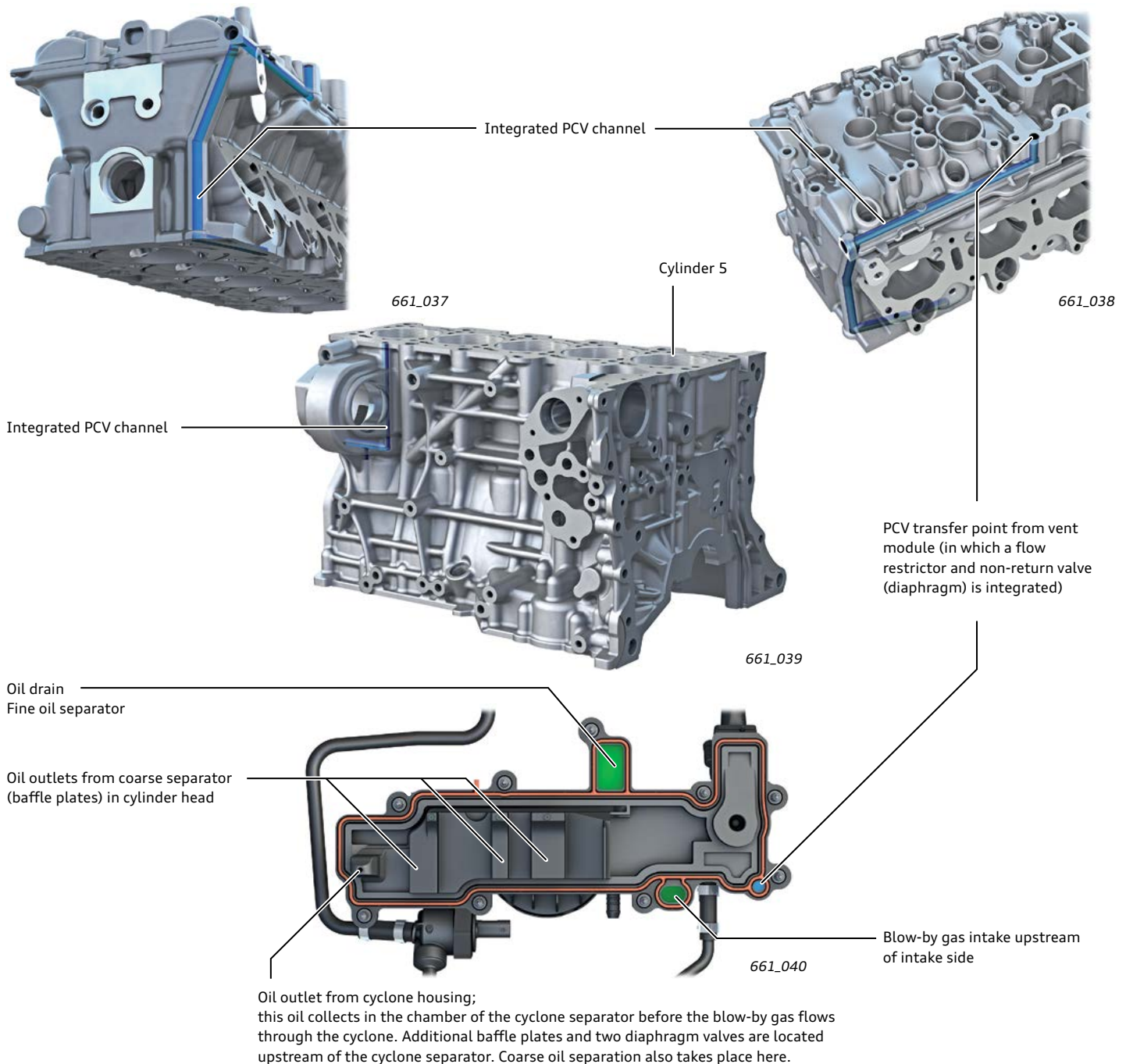
Evap Canister Purge Regulator Valve 1 N80 is closed when de-energized. Refer to diagram 661_035 on page 24. The mass flow from the activated charcoal canister is controlled by the ECM based on the duty cycle of N80.

The following input variables are evaluated:

- > Intake manifold pressure.
- > Ambient pressure (sensor in ECM).
- > Engine load.
- > Battery voltage.
- > Loading of the ACF canister (evaluation by lambda control).

During engine operation, N80 is closed under the following conditions:

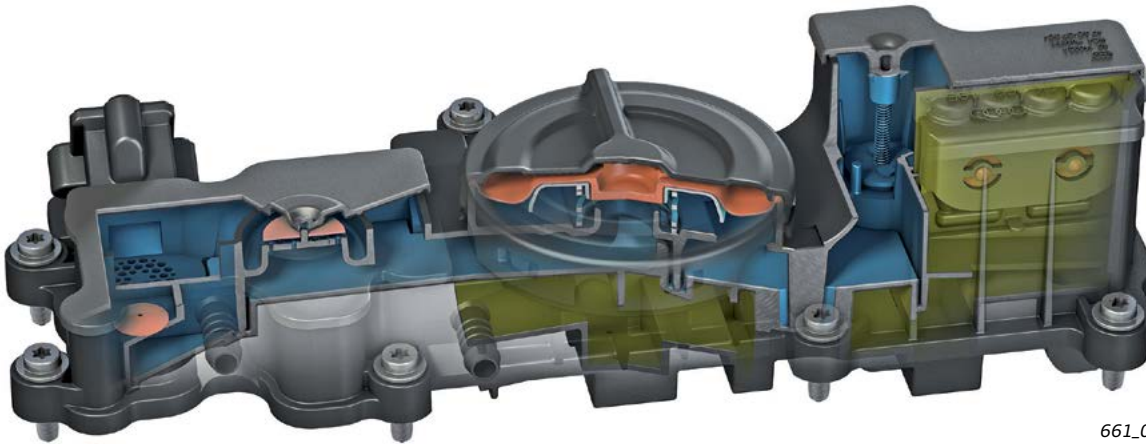
- > Over-run cut-off.
- > Stop phases in start-stop mode.
- > Terminal 15 off.
- > Various diagnoses.



Oil separator module

The module together with the coarse separator on its base protrudes into the cylinder head, where the blow-by gas is admitted into the system. After oil is separated (coarse separation) from the blow-by gas at the baffle plates, the blow-by gas flows through the cyclone separator where it is

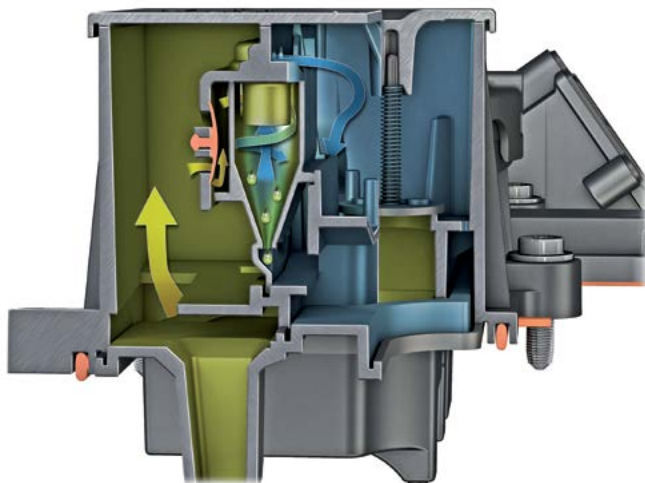
finely cleaned. The treated blow-by gas now flows through the pressure control valve into the section of the ventilation module where it is discharged in a controlled fashion via diaphragm valves, either to the turbocharger or to the intake ports.



661_041

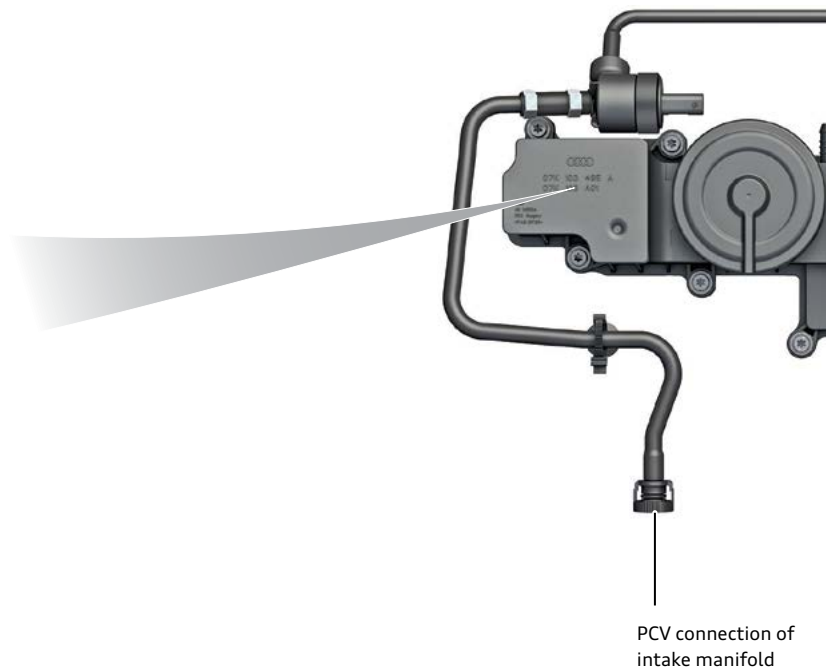
4-stage cyclone separator with :

- > Bypass valve (opens if flow rate is too high)
- > 2 non-return valves (close in the event of excess pressure in the cylinder block)



The blow-by gas flows into the chambers of the cyclone separator. If the flow rate is very high during dynamic engine operation, the bypass valve opens. This allows a portion of the blow-by gas to flow past the cyclone separator. This is necessary to ensure that no pressure builds up inside the crankcase.

Before the blow-by gas can flow into the cyclone separator, it first has to flow through a coarse separator upstream, where it passes through two diaphragm valves. The oil which collects here then flows into the separate oil return line of the cyclone separator. Refer to diagram on page 24.



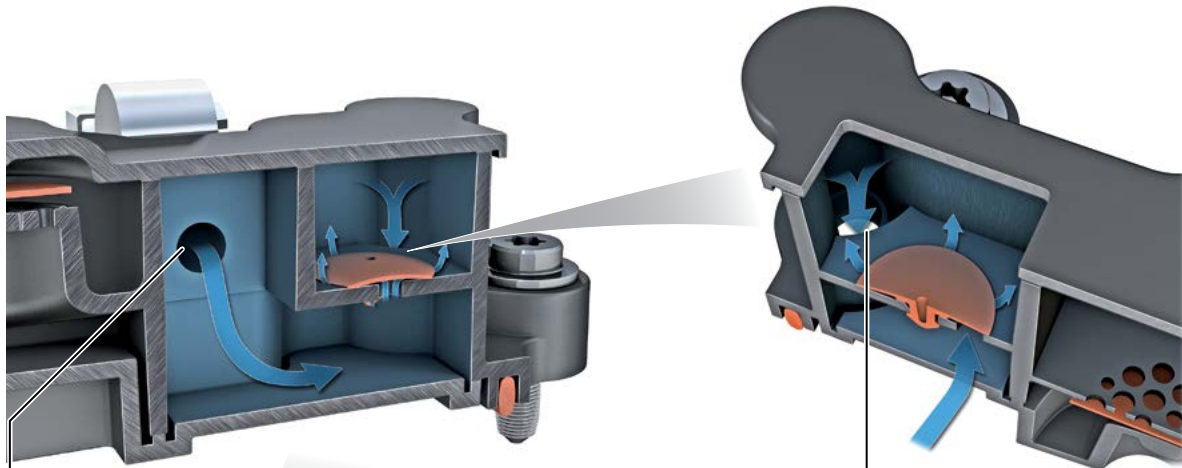
PCV connection of intake manifold



Note

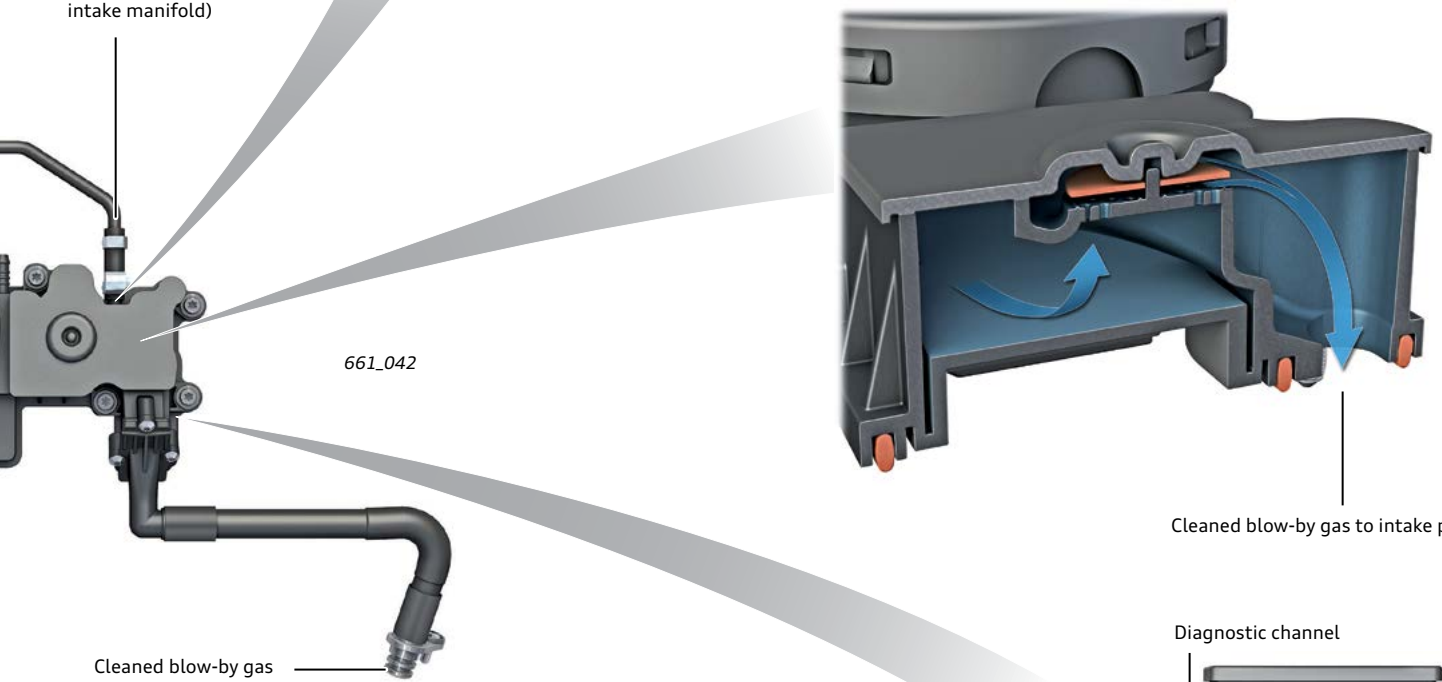
Functional faults in the system can cause high oil consumption due to a lack of oil separation or rough engine operation. Depending on how the PCV is configured, the system can be checked by measuring the pressure at the dip stick. If the system is intact, a pressure of between -1.23 to 1.74 psi (-85 to 120 mbar) should be realized when the engine is idling.

You can use the turbocharger test V.A.G. 1397A to measure the pressure.



PCV inlet (fresh air from intake manifold)

PCV transfer point, cylinder head cover

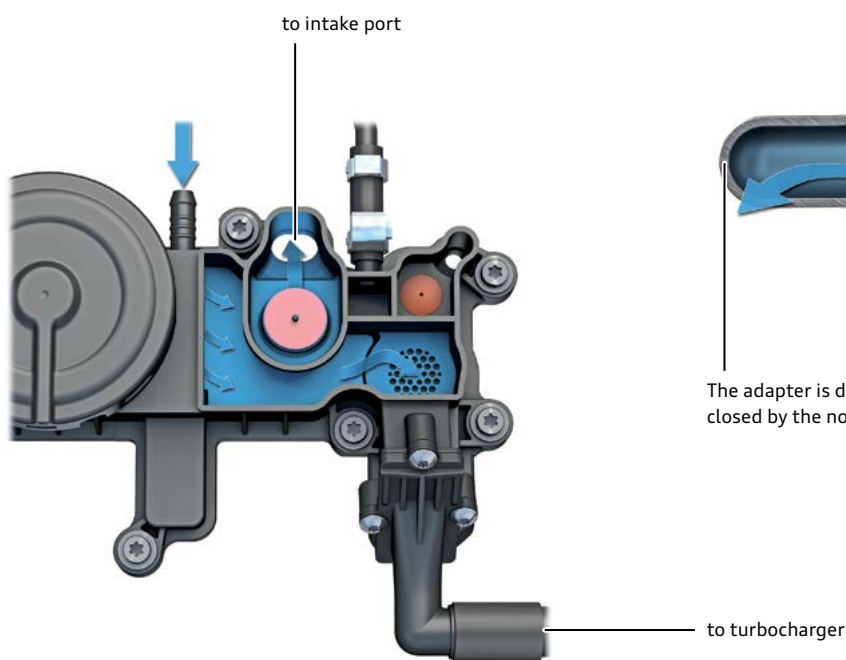


661_042

Cleaned blow-by gas to intake port

Cleaned blow-by gas to turbocharger

Diagnostic channel



to intake port

The adapter is designed in such a way that the diagnostic channel is also closed by the non-return valve.

to turbocharger

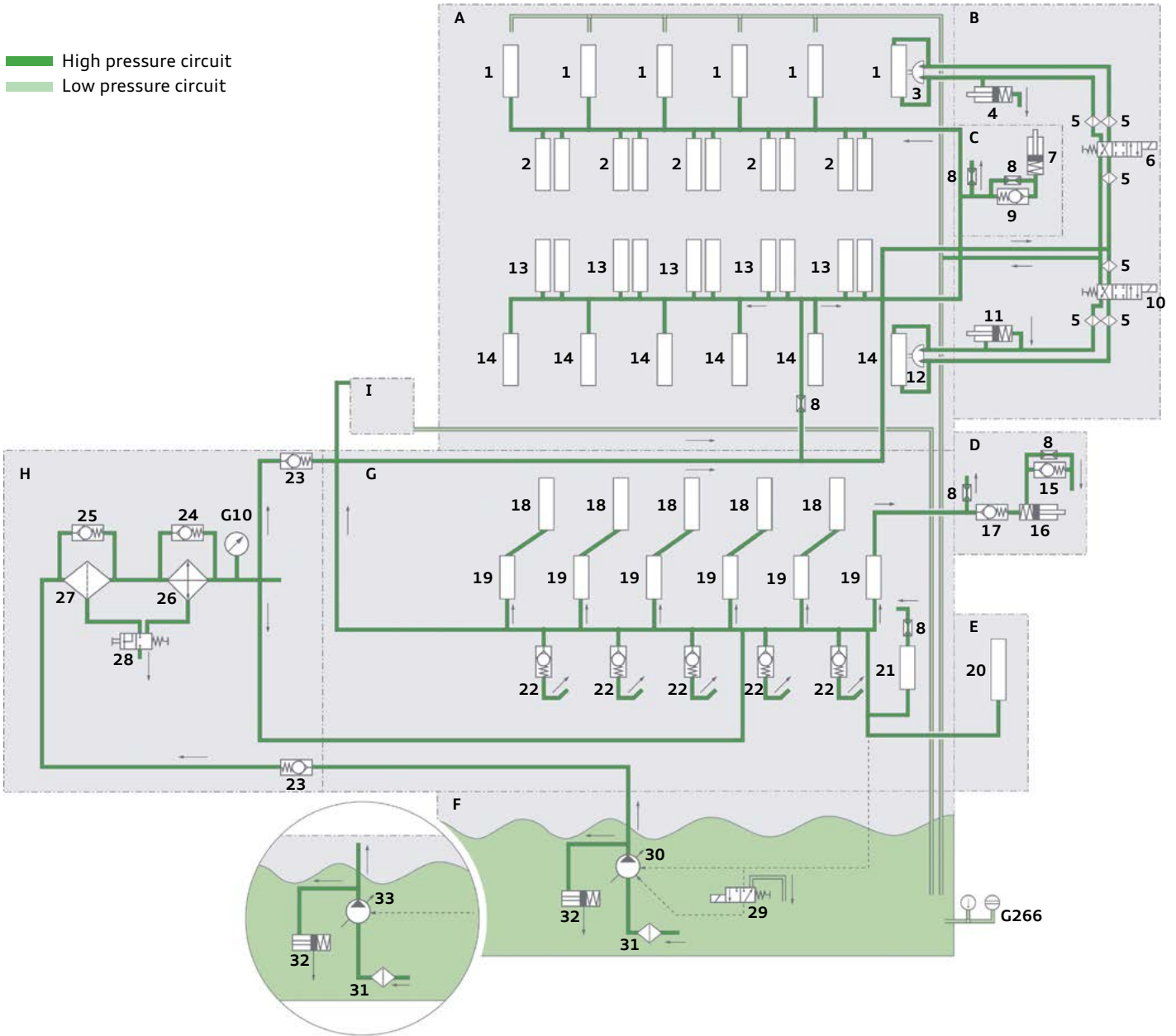
661_043

Oil supply

The engine oil circuit is designed for high oil flow rates to achieve effective cooling. The oil pump has a higher delivery rate than that of the predecessor engine.

The pistons are cooled by cooling jets which are directed at the piston crown cooling ducts.

Overview



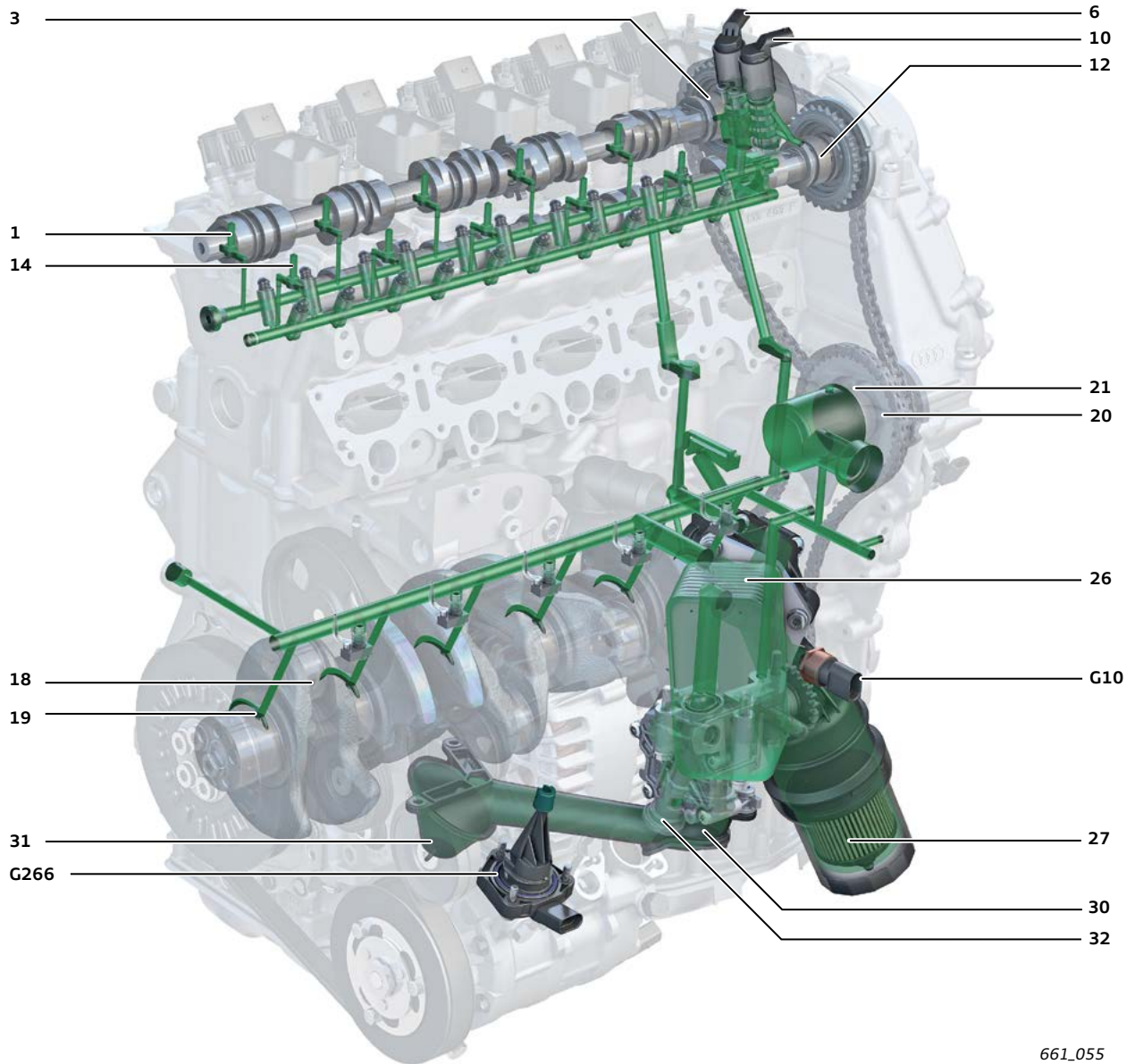
661_054



Note

The two-stage oil pressure control system will be introduced during 2018.

Identification of the engine components



Key to figures page 28 and page 29:

A	Cylinder head	14	Intake camshaft bearing
B	Cylinder head cover	15	Pressure relief valve, chain tensioner
C	Chain tensioner	16	Primary drive chain tensioner
D	Primary drive chain tensioner	17	Non-return valve in chain tensioner
E	Vacuum pump	18	Connecting rod bearing
F	Oil pan	19	Crankshaft main bearing
G	Cylinder crankcase	20	Vacuum pump bearing
H	Oil module	21	Intermediate shaft bearing
I	Turbocharger	22	Piston cooling jet (opening pressure 21.75 psi to 21.6 psi (1.5 to 1.8 bar), min. closing pressure 20.3 psi (1.4 bar))
1	Exhaust camshaft bearing	23	Non-return valve in oil module
2	Support element (exhaust)	24	Oil cooler bypass valve
3	Exhaust camshaft adjuster	25	Oil filter bypass valve
4	Exhaust camshaft adjuster lock	26	Oil/coolant heat exchanger (engine oil cooler)
5	Oil screen	27	Oil filter
6	Exhaust camshaft timing control valve	28	Oil drain valve in oil filter module
7	Secondary drive chain tensioner	29	Control valve for low pressure stage
8	Flow restrictor	30	Oil pump with two-stage pressure control system (2018 introduction)
9	Non-return valve in chain tensioner	31	Oil pump intake sieve
10	Intake camshaft timing control valve	32	Cold start valve
11	Intake camshaft adjuster lock	33	Oil pump with single-stage pressure control system
12	Intake camshaft adjuster	G10	Oil Pressure Sensor
13	Support element (intake)	G266	Oil Level Thermal Sensor

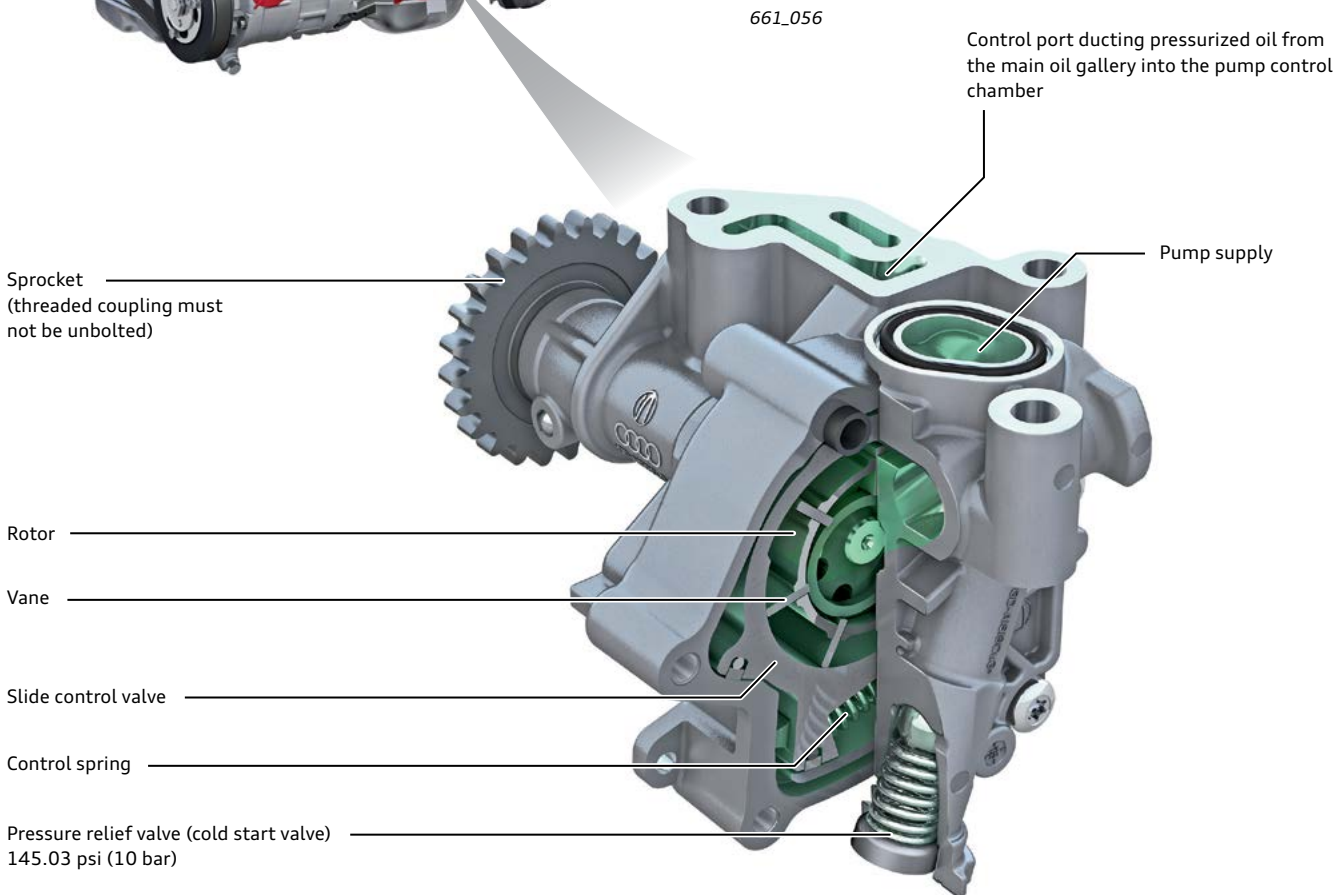
Oil pump

The oil pump is bolted to the cylinder block above the oil pan top section and is driven by the crankshaft via chain by the crankshaft. A high speed ratio allows the pump to achieve a maximum speed of 7200 rpm. The pump has a higher delivery rate than in the previous engine.

The oil pump is a vane cell pump with swivelling slide valve (control valve), which can be rotated against the force of the control spring by oil pressure, thus altering the volume

of the pump chamber and the delivery rate of the pump. The oil pressure required for this purpose is diverted from the main oil gallery and applied to the control surface of the rotary valve in the pump control chamber.

This pump control system ensures that sufficient engine oil is always distributed throughout the engine, without an unacceptable increase in oil pressure.



661_096



Reference

For a more detailed explanation of the design and function of the vane cell pump as well as the control function, refer to [Self-Study Program 920173, The Audi 3.0L TFSI EA839 Engine](#)

Sensors in the oil circuit

The 2.5l TFSI engine EA855 EVO does not currently use a variable oil pressure control system. However, the engine has all the components needed to provide fully variable oil

pressure control on demand including the necessary castings in the cylinder block. Only one oil pump control valve needed to be installed in the engine block.

Oil Pressure Sensor G10

G10 is bolted into the oil filter housing and measures both the oil pressure and the oil temperature in the main oil gallery downstream of the oil filter (refer to Fig. page 33).

The oil pressure sensor has been installed for its reliability and functionality. The electronic module integrated in the sensor sends the data to the ECM by SENT protocol and has a supply voltage of 5V.



661_057

Oil Level Thermal Sensor G266

Oil Level Thermal Sensor G266 has a 12V supply. It sends a PWM signal to the ECM.

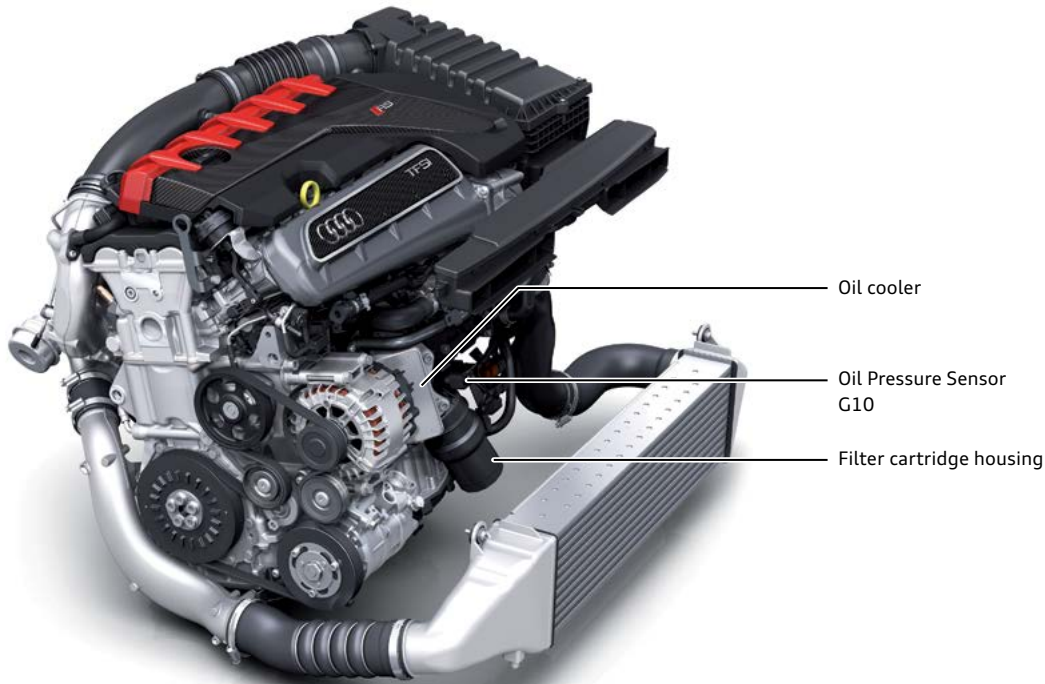


661_058

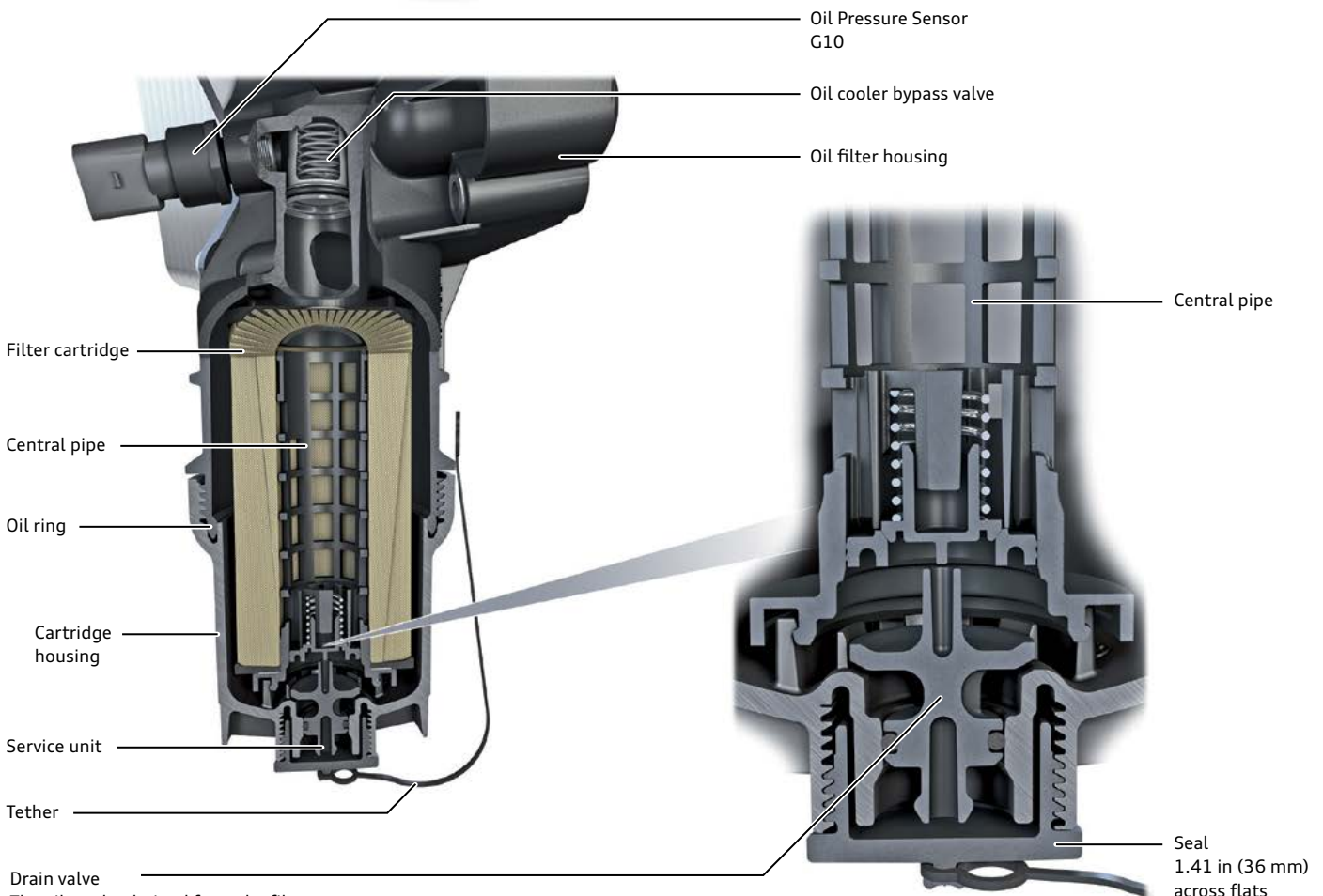
Oil filter housing / oil cooler

The oil filter housing is attached to the cylinder block and distributes the engine oil from the oil pump. A portion of the engine coolant also flows through the housing. Sealing is done by rubber gaskets. The oil filter cartridge housing is

bolted to the bottom of the oil filter housing. The oil cooler is also flange-mounted to the oil filter housing. To measure the engine oil pressure, G10 is integrated in the oil filter housing.



661_059



Drain valve
The oil can be drained from the filter housing before removing the filter using oil drain adapter T40057.

661_060

Oil flow

The oil delivered by the oil pump flows into the oil filter housing through a gallery in the cylinder block. The oil initially flows through the non-return valve, which prevents the engine galleries from running empty. This allows oil pressure to build up quickly after the engine starts.

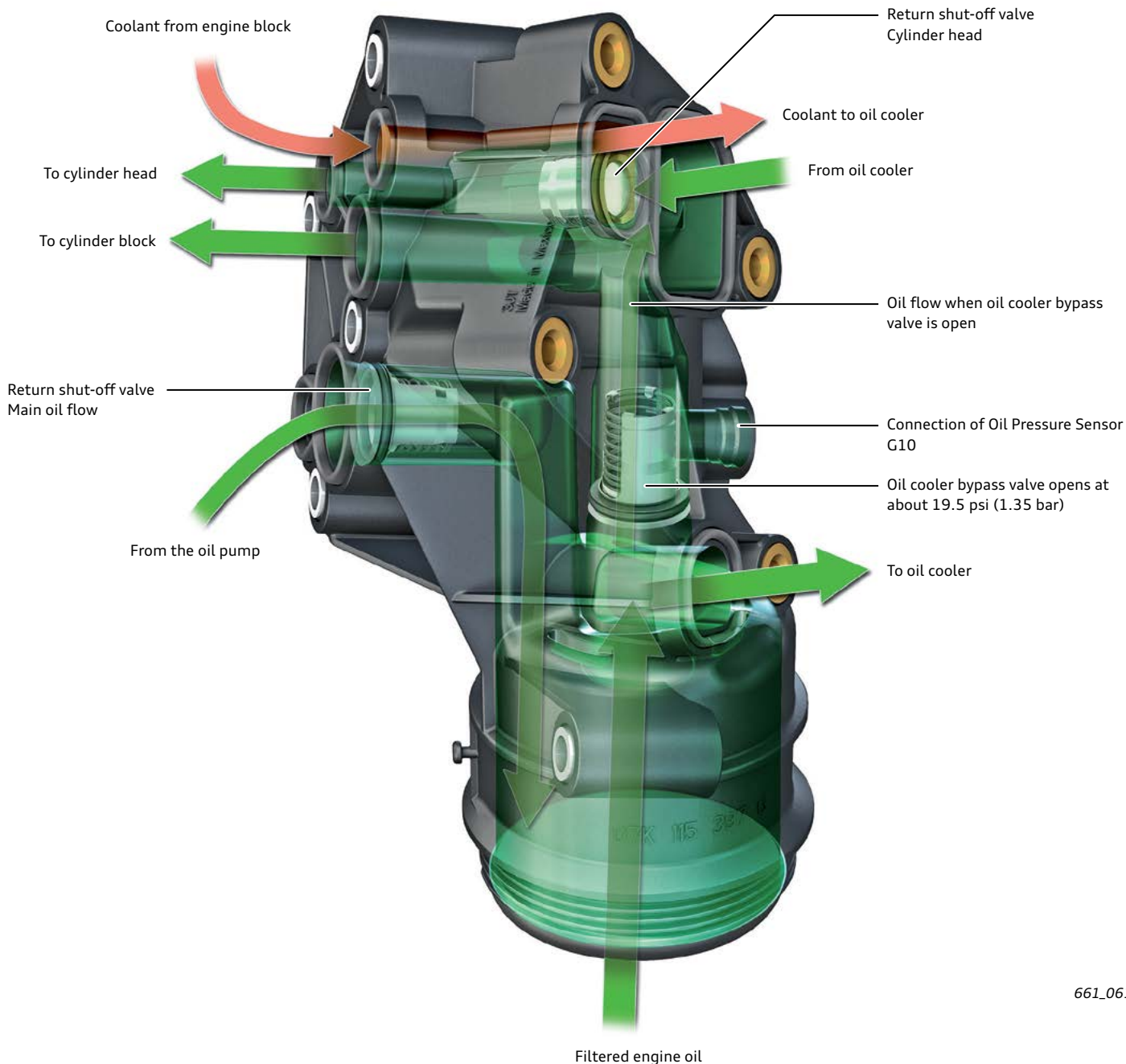
The engine oil flows through the oil filter cartridge from the outside in. The filtered oil then flows into the oil cooler before returning to the oil filter housing. From there, the oil is distributed to the cylinder block and cylinder head.

To ensure the cylinder head always has an adequate engine oil supply, an additional non-return valve is integrated in the oil filter housing.

A cooler bypass valve is also mounted to the oil filter holder. When the cooler bypass valve opens, a portion of the oil from the oil filter flows to the engine, bypassing the oil cooler.

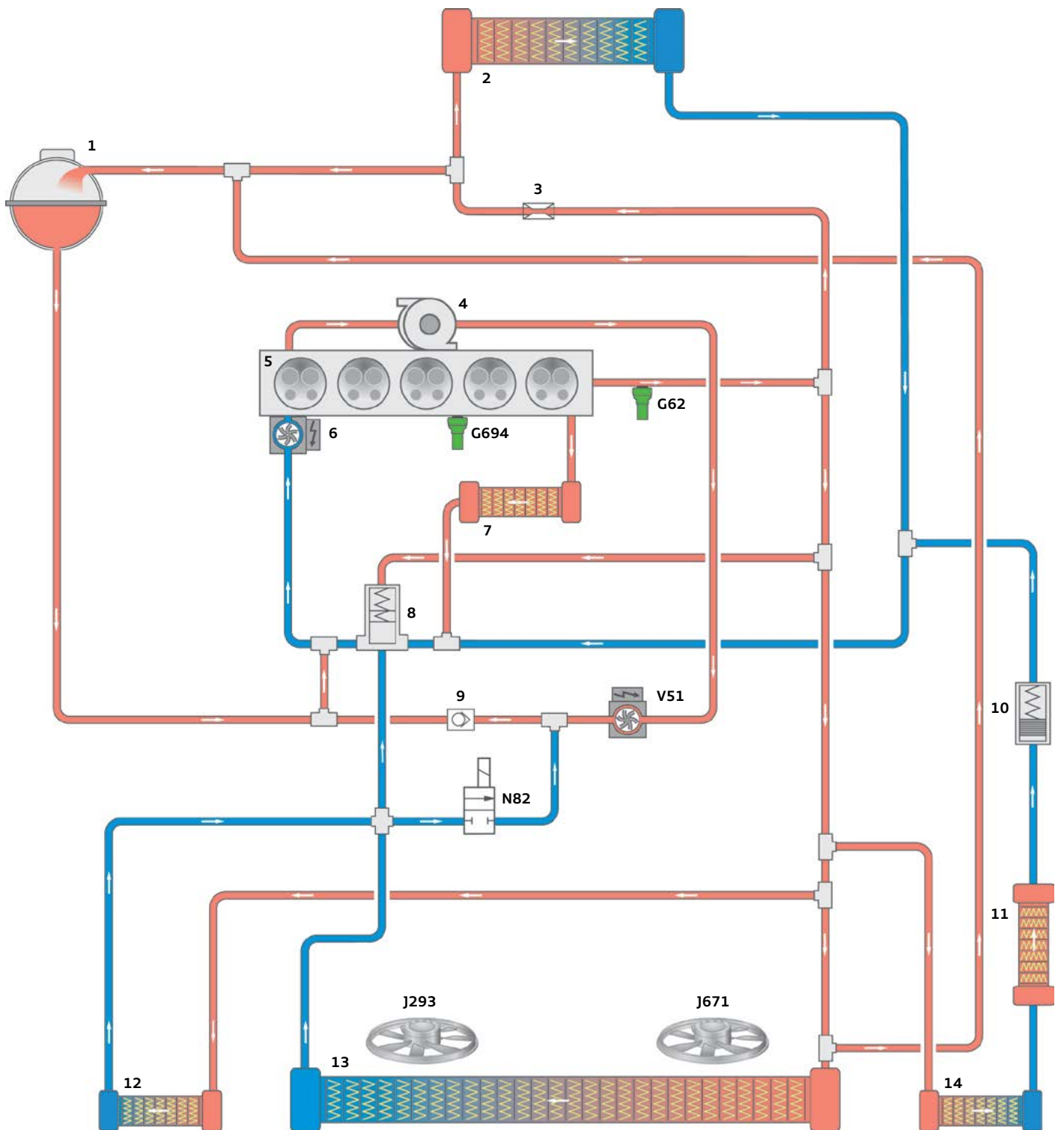
Coolant flow

The coolant for the oil cooler enters the connection on the engine and flows through a duct in the oil filter mount to the flange mounted oil cooler. The coolant outlet on the oil cooler is connected to the thermostat housing by a pipe.



Cooling system

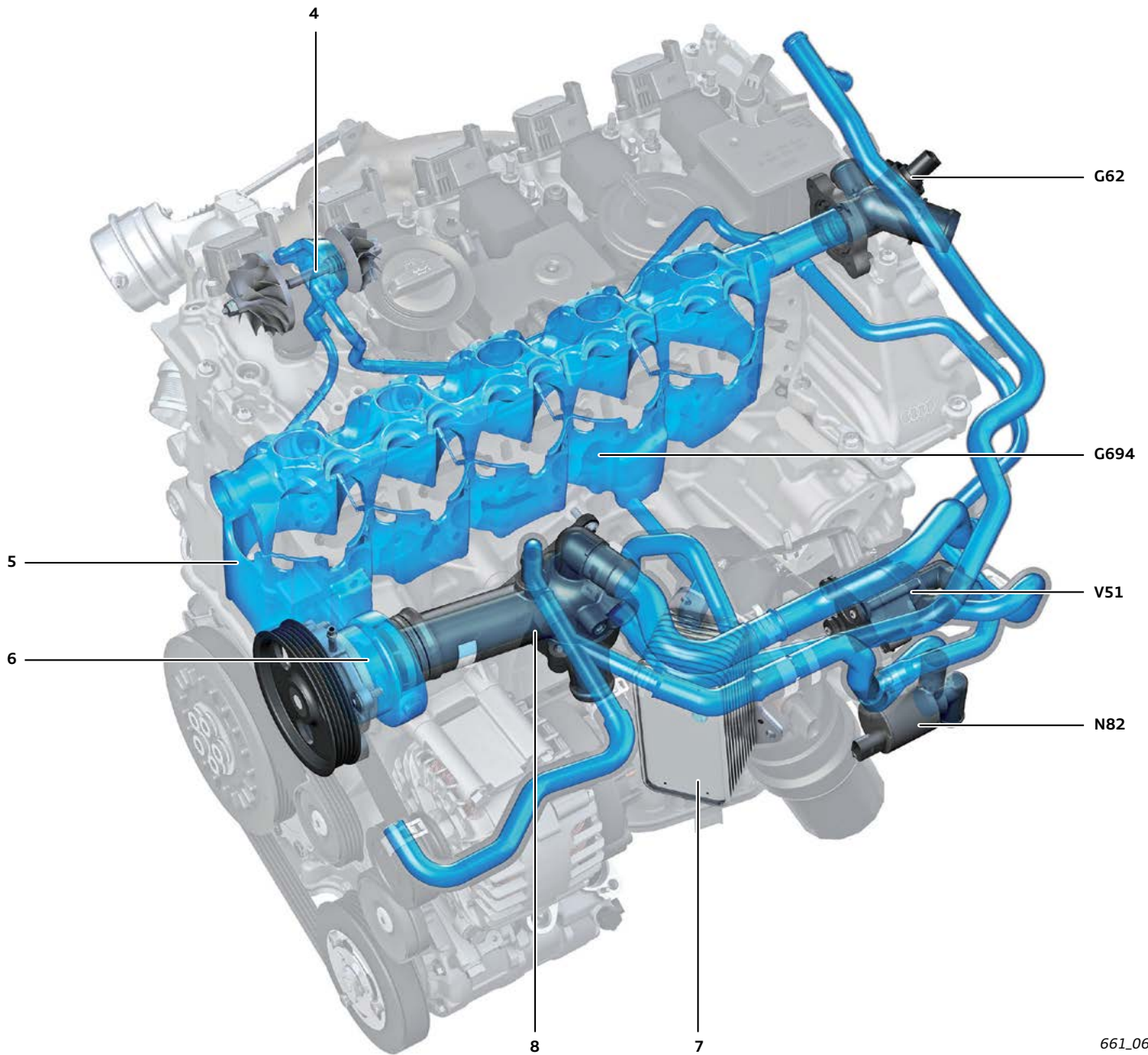
Overview



661_062

When the engine is not running and after-run cooling is active, the After-Run Coolant Pump works in combination with Coolant Shut-Off Valve N82 to reverse the direction of coolant flow.

Identification of the engine components



Key to figure on page 34:

- | | | | |
|-----------|--|-------------|-----------------------------------|
| 1 | Coolant expansion tank | G62 | Engine Coolant Temperature Sensor |
| 2 | Heater heat exchanger | G694 | Engine Temperature Control Sensor |
| 3 | Flow restrictor | J293 | Radiator Fan Control Module |
| 4 | Exhaust turbocharger | J671 | Radiator Fan Control Module 2 |
| 5 | Cylinder head/engine block | N82 | Coolant Shut-Off Valve |
| 6 | Coolant pump, activated by Mechanical Coolant Pump Switch Valve N649 | V51 | After-Run Coolant Pump |
| 7 | Engine oil cooler | | |
| 8 | Thermostat | | |
| 9 | Non-return valve | | |
| 10 | Thermostat for ATF cooler | | |
| 11 | ATF cooler | | |
| 12 | Auxiliary radiator | | |
| 13 | Radiator | | |
| 14 | Left auxiliary radiator | | |
- Cooled coolant
— Warm coolant

661_063

Innovative Thermal Management (ITM)

The purpose of the ITM system is to heat up the engine as quickly as possible. An active coolant pump is used to control the flow of heat in the engine during the warm-up phase.

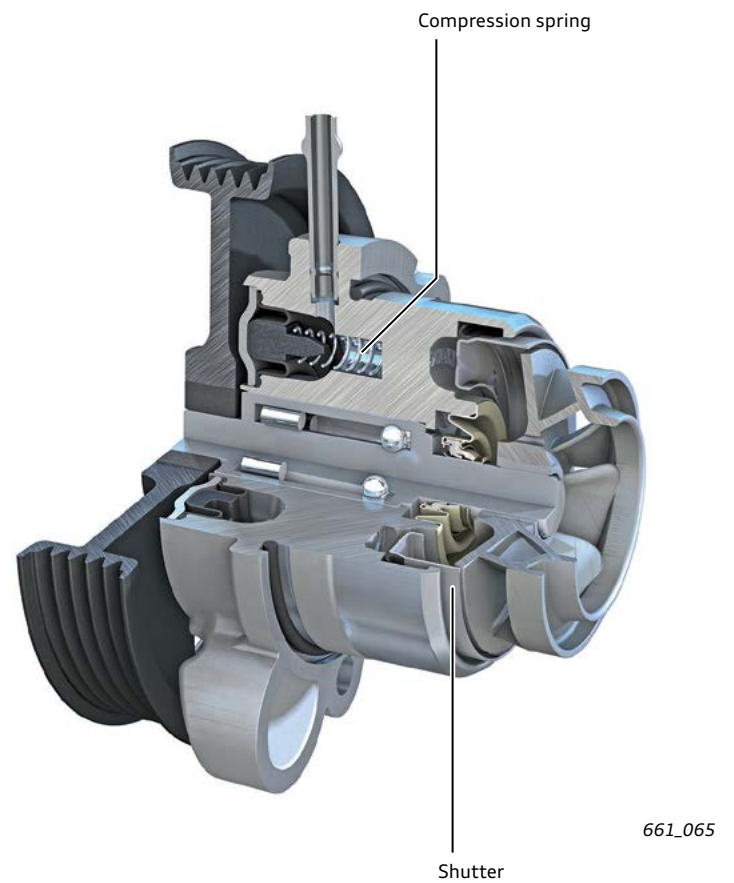
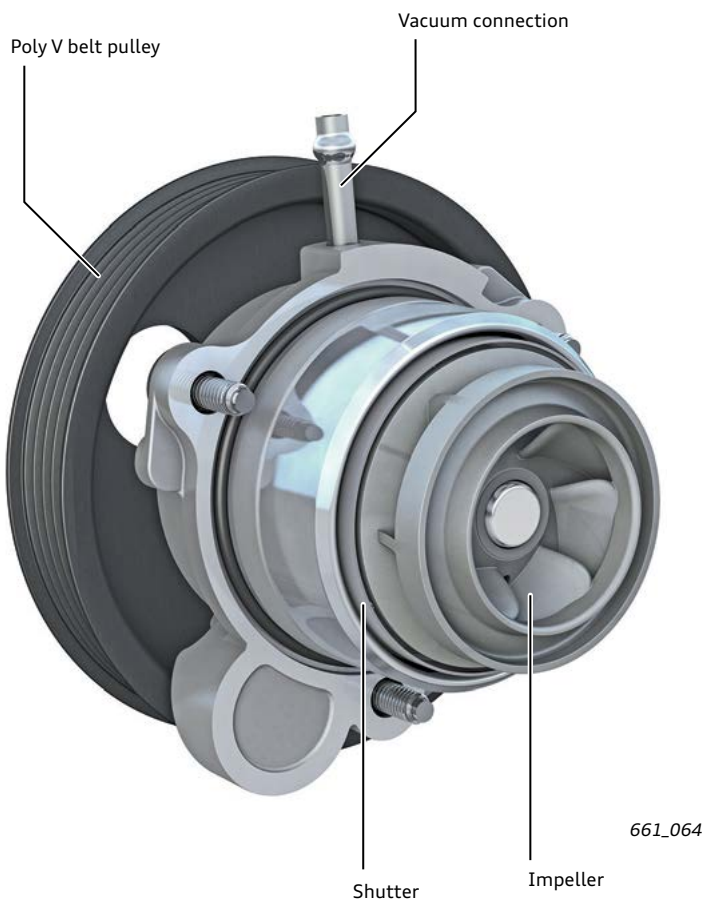
Coolant pump

The coolant pump is driven continuously by the crankshaft by means of a poly V belt.

During the cold start and engine warm-up phases the ITM system prevents the coolant from circulating within the cylinder block. A shutter is pulled (by vacuum over) the pump impeller against the force of compression springs. This prevents the water pump impeller from circulating coolant.

Two temperature sensors are used to monitor the temperatures in the engine. To ensure that no components are damaged after the engine is shut off, heat build-up is prevented by an electrical auxiliary pump. The ITM system is controlled by the ECM.

The vacuum required to activate the coolant pump is controlled by the Mechanical Coolant Pump Switch Valve N649. The coolant pump impeller is blocked at engine start-up when the ambient temperature measured at the cylinder head is between 3.2 °F to 140 °F (-16 °C to 60 °C).



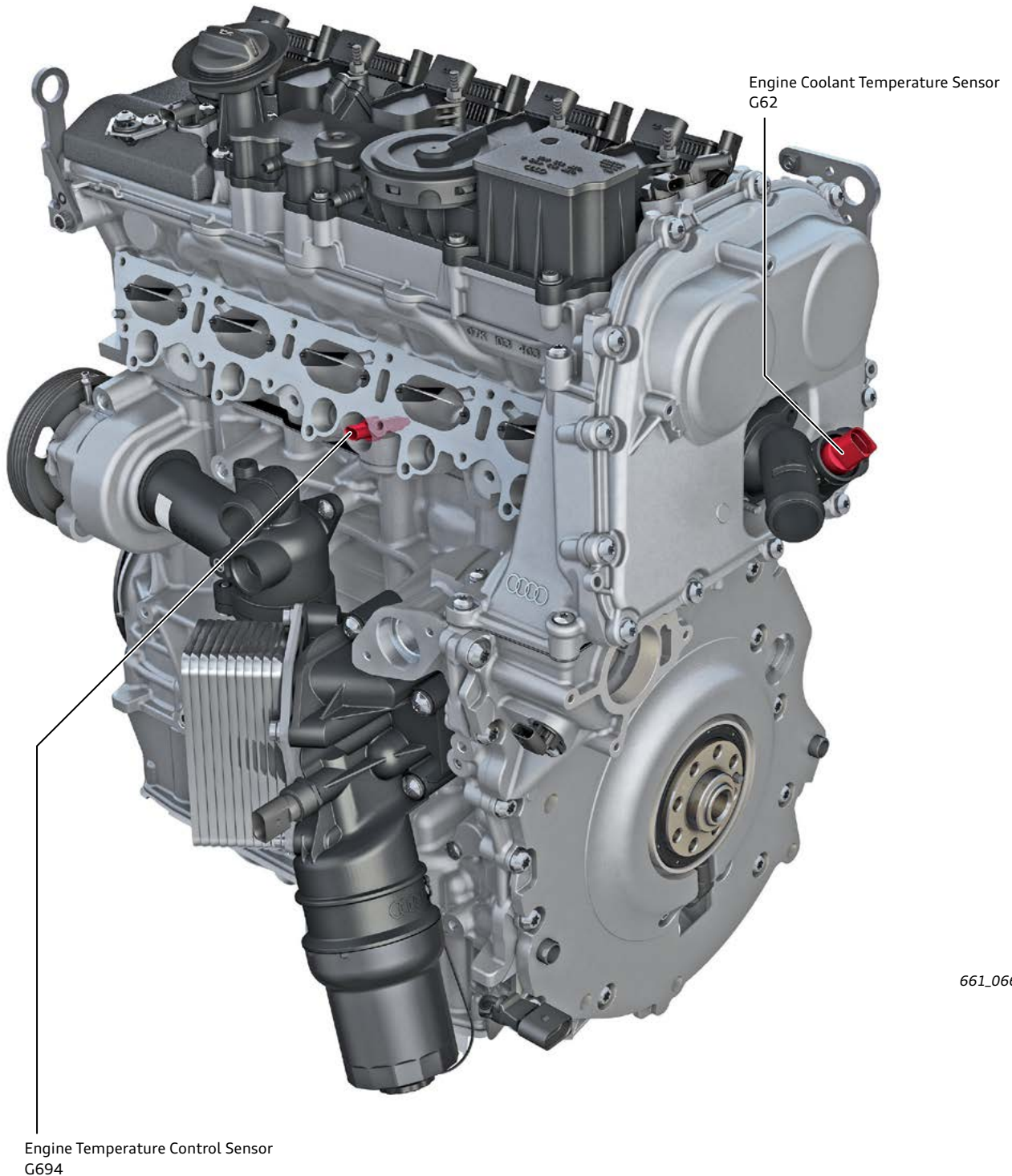
Sensors in the coolant circulation system

Engine Temperature Control Sensor G694

An NTC sensor is used to define the component temperature in close proximity to the combustion chamber of cylinder three in the cylinder head. However, the sensor is not immersed in coolant. Temperature measurement range: -40 °F to 365 °F (-40 °C to 180 °C). The ECM requires the signals generated by the sensor to calculate the after-run time of After-Run Coolant Pump V51.

Engine Coolant Temperature Sensor G62

G62 measures the coolant temperature in the cylinder block. It is positioned at the cylinder head outlet. The ECM requires the signals generated by the sensor to stop the circulation of coolant during the engine warm-up phase. The signal is also utilized to calculate various engine maps and for diagnostics.



661_066

Actuators in the coolant circuit

Coolant Shut-Off Valve N82

N82 is a solenoid valve integrated in the coolant system and is closed when de-energized. The ECM opens N82 whenever required by switching to ground. At this time, After-Run Coolant Pump V51 is activated and engine coolant is circulated to cool the turbocharger. N82 closes after V51 shuts down.

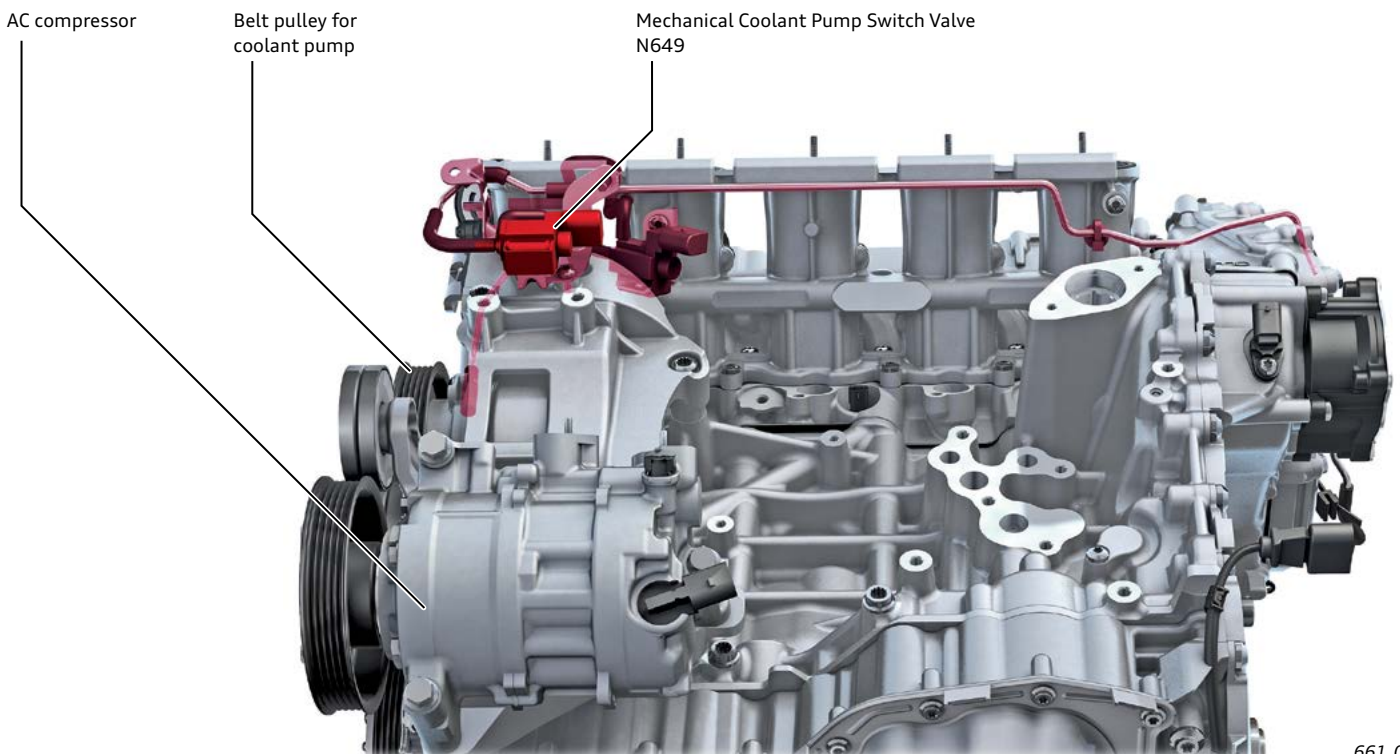


Coolant Shut-Off Valve
N82

661_067

Mechanical Coolant Pump Switch Valve N649

N649 is an electrical valve powered by the electrical system and switched to ground by the ECM on demand.



AC compressor

Belt pulley for
coolant pump

Mechanical Coolant Pump Switch Valve
N649

661_068

After-Run Coolant Pump V51

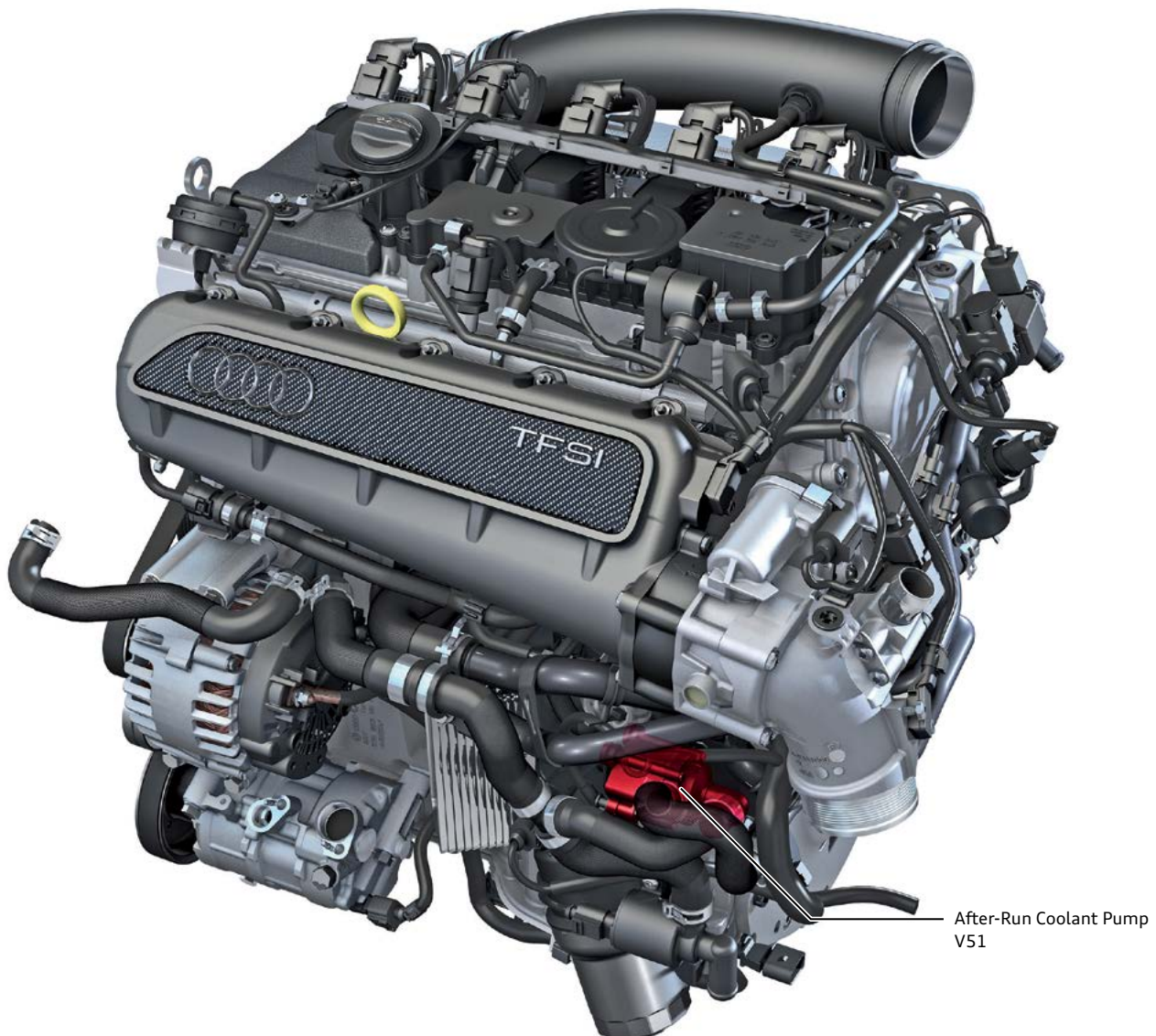
This electric auxiliary water pump is activated in order to protect the exhaust turbocharger against overheating.

It starts to run after a warm engine is shut off.

Run-on function

Depending on the calculation made by the ECM, the pump runs for the computed amount of time after the engine is shut off – but not for longer than 600 seconds. In addition, the radiator fans run at 45%, but not necessarily in combination with V51.

N82 also opens together with V51. If V51 is activated by the ECM (by PWM signal), it always runs at maximum speed.



661_069

Reference



For more information about the V51, refer to [Self-Study Programs 920173, The Audi 3.0L V6 TFSI Engine](#) and [920243, The Audi 1.8L and 2.0L Third Generation EA888 Engines](#).



Note

To safely fill and vent the cooling system, it is possible to activate the service position in the Basic setting using the VAS Scan Tool. The valves in the cooling system are opened at the same time. If VAS 6096/2 is used for evacuating the cooling system, it is possible to produce more vacuum within the system than before. Due to system design, it is important to warm up the vehicle and to re-check the coolant level after a test drive because the thermostat only allows flow through the transmission circuit while driving the vehicle.

Air supply and turbocharging

Overview

The air supply system is designed for maximum air flow rates, low throttle losses and short, direct air flow paths. The charge air cooler is located low in the vehicle front end and is able to take full advantage of available ram pressure. The advantage of this layout provides higher cooling capacity.

Two pressure and temperature sensors are used for measuring air mass: one upstream of the throttle valve, working in conjunction with Charge Air Pressure Sensor G31; and one downstream of the throttle valve, working in conjunction with Intake Air Temperature Sensor G42 and Manifold Absolute Pressure Sensor G71. Both sensors transfer their signals by SENT protocol.

Intake manifold

The two-part intake manifold is made from a sand-cast aluminum alloy. A pneumatic flap system is integrated in the bottom part of the intake manifold. In conjunction with the tumble inlet duct, it provides the charge motion required for optimal mixture. The fuel injectors of the MPI system are also installed here.

The intake manifold top section is configured as a header, to which the throttle valve control unit is attached by bolts.

Activating the intake manifold flaps

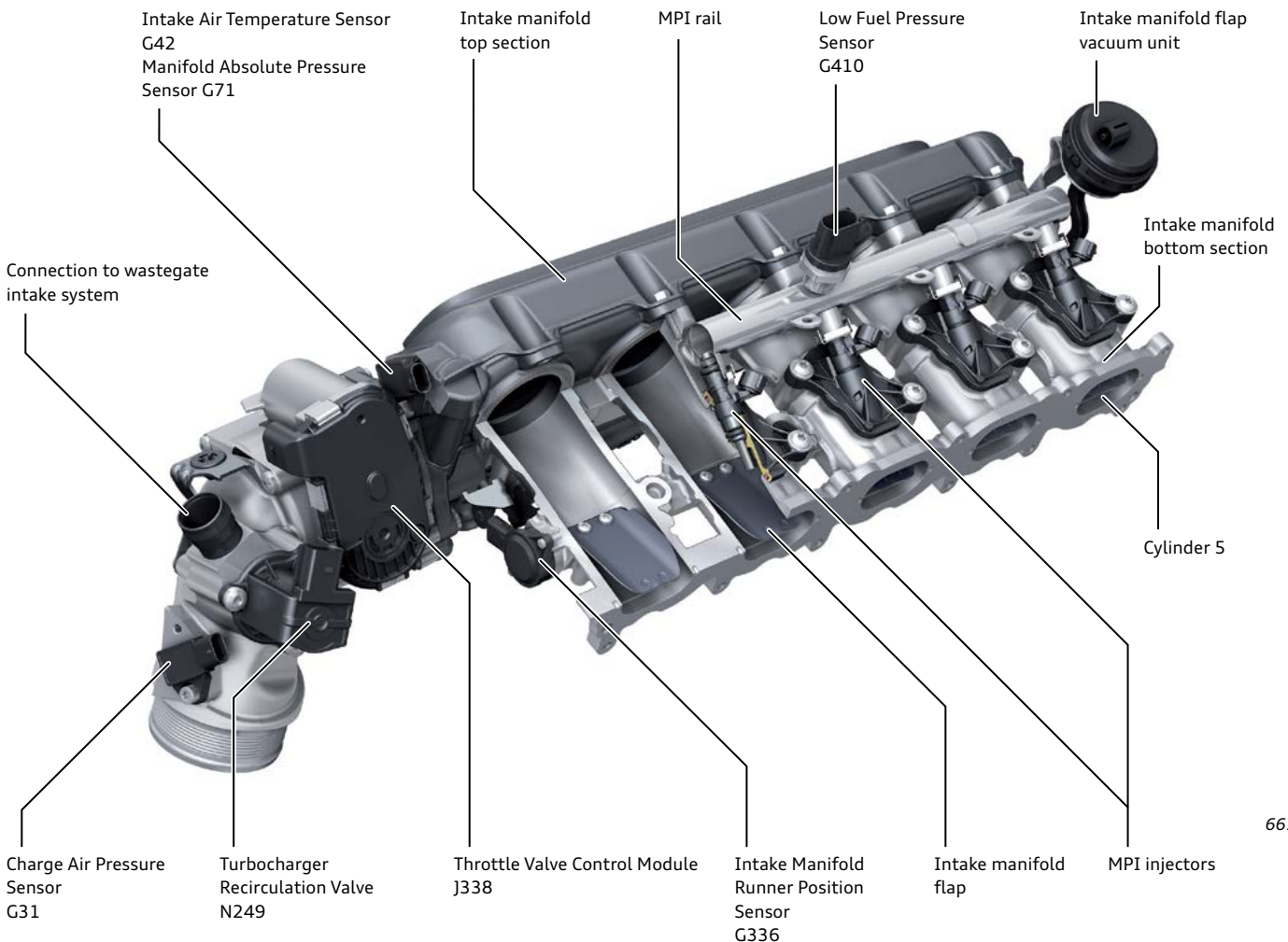
The intake manifold flap vacuum unit is switched by Intake Manifold Runner Control Valve N316.

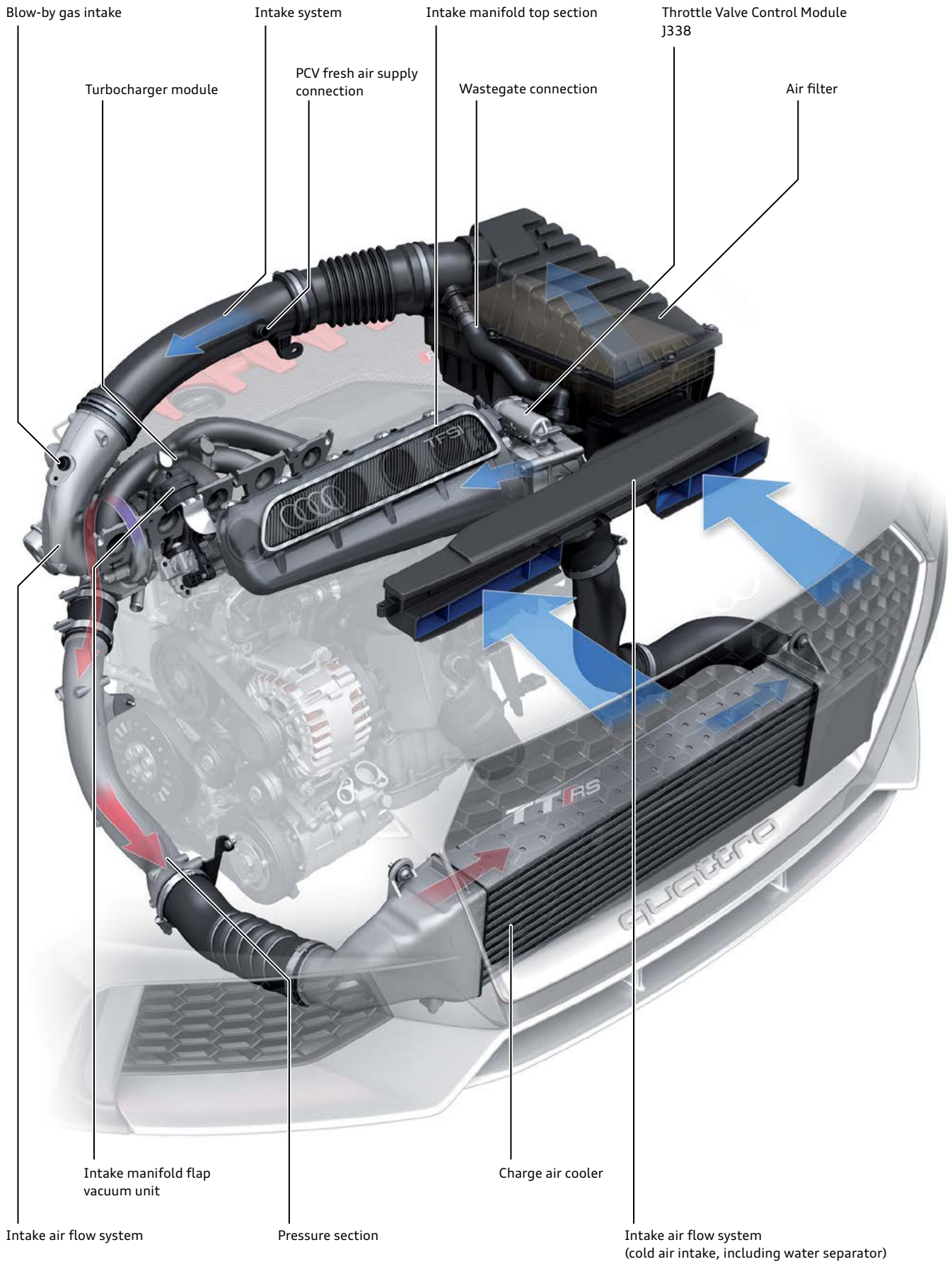
At idle and low partial throttle (during normal driving conditions) the intake manifold flap is closed.

If N316 is not activated by the ECM, and therefore is de-energized, the intake manifold flaps are closed by the force of the spring in the vacuum unit. The fresh air then flows into the combustion chambers (halved intake manifold) via the tumble intake ports in the cylinder head.

During the catalytic converter heating mode, the intake manifold flaps are closed up to medium engine speed.


In both cases, the air mass is factored in as a lesser factor when calculating the position of the intake manifold flaps. The position of the intake manifold flaps is monitored by Intake Manifold Runner Position Sensor G336.





661_045

eMedia

 Find out more about the air intake system.

Turbocharging

Turbocharger module

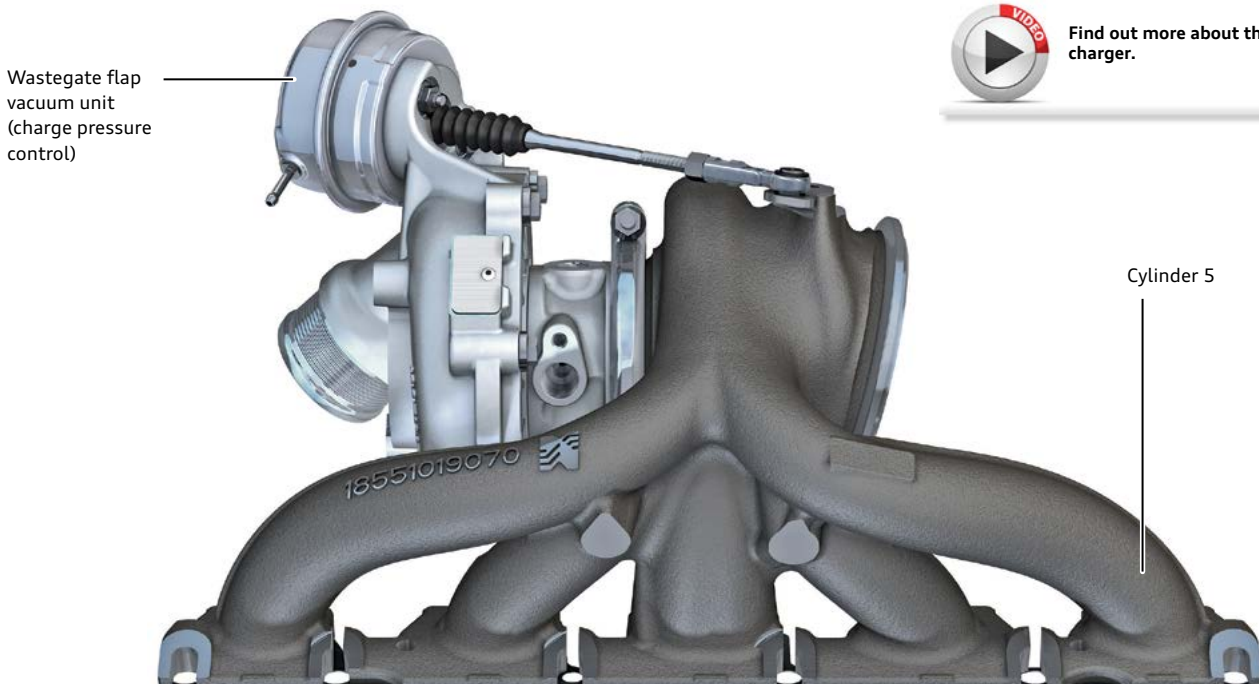
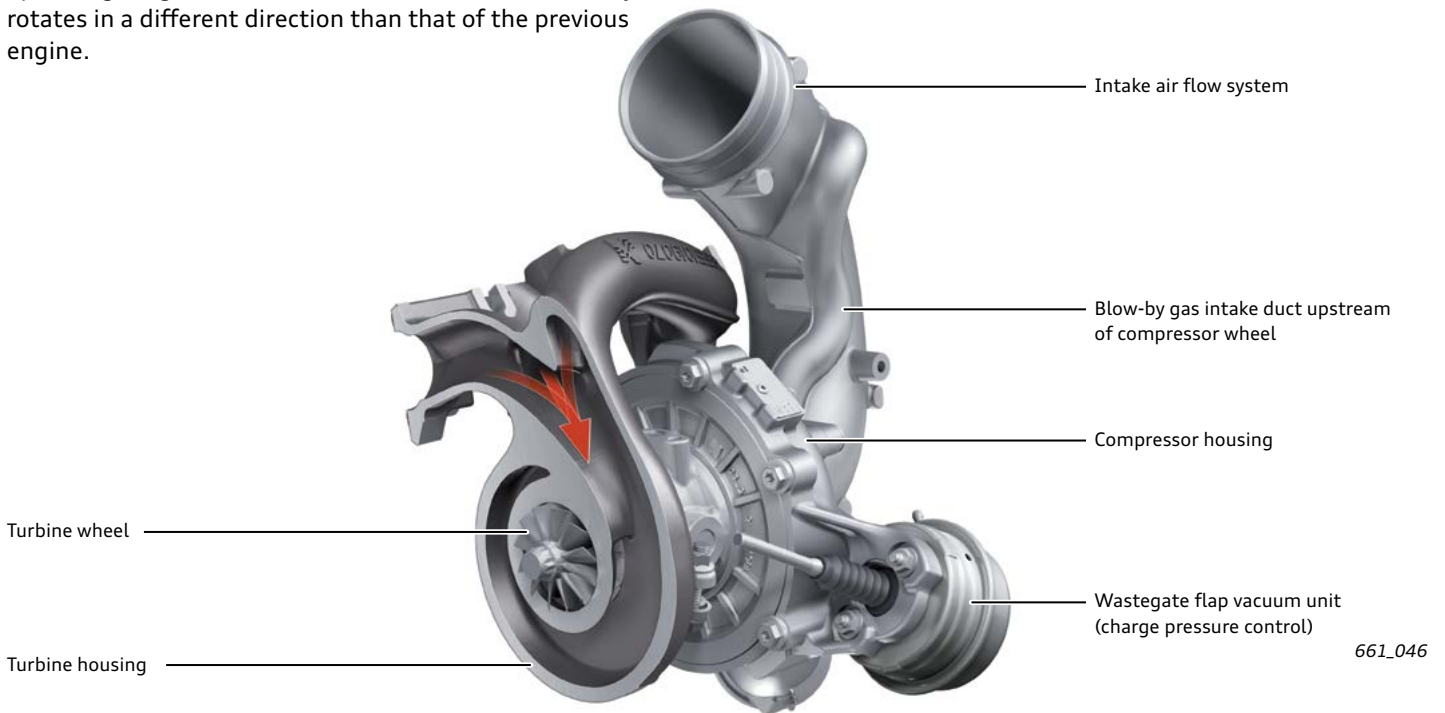
The turbocharger module is made of cast steel and is rated for exhaust gas temperatures of up to 1832 °F (1000 °C). A model-based exhaust gas temperature control system is used to ensure that this limit is not exceeded. This made it possible to eliminate an exhaust gas temperature sensor used in the previous model.

The turbocharger module is attached to the cylinder head by a clamping flange system, which is an effective way to compensate for thermal expansion.


The turbocharger assembly, the compressor and the turbine have been designed for high efficiency across a wide operating range, with the result that the rotor assembly rotates in a different direction than that of the previous engine.

The optimal conditions of turbocharger inflow and the low mass inertia of the turbocharger ensure very high average pressures and spontaneous throttle response at low engine speeds.

The conditions of catalytic converter in-flow have also been improved. To reliably meet emission standards, the catalytic converter is positioned as close as possible to the turbine housing.



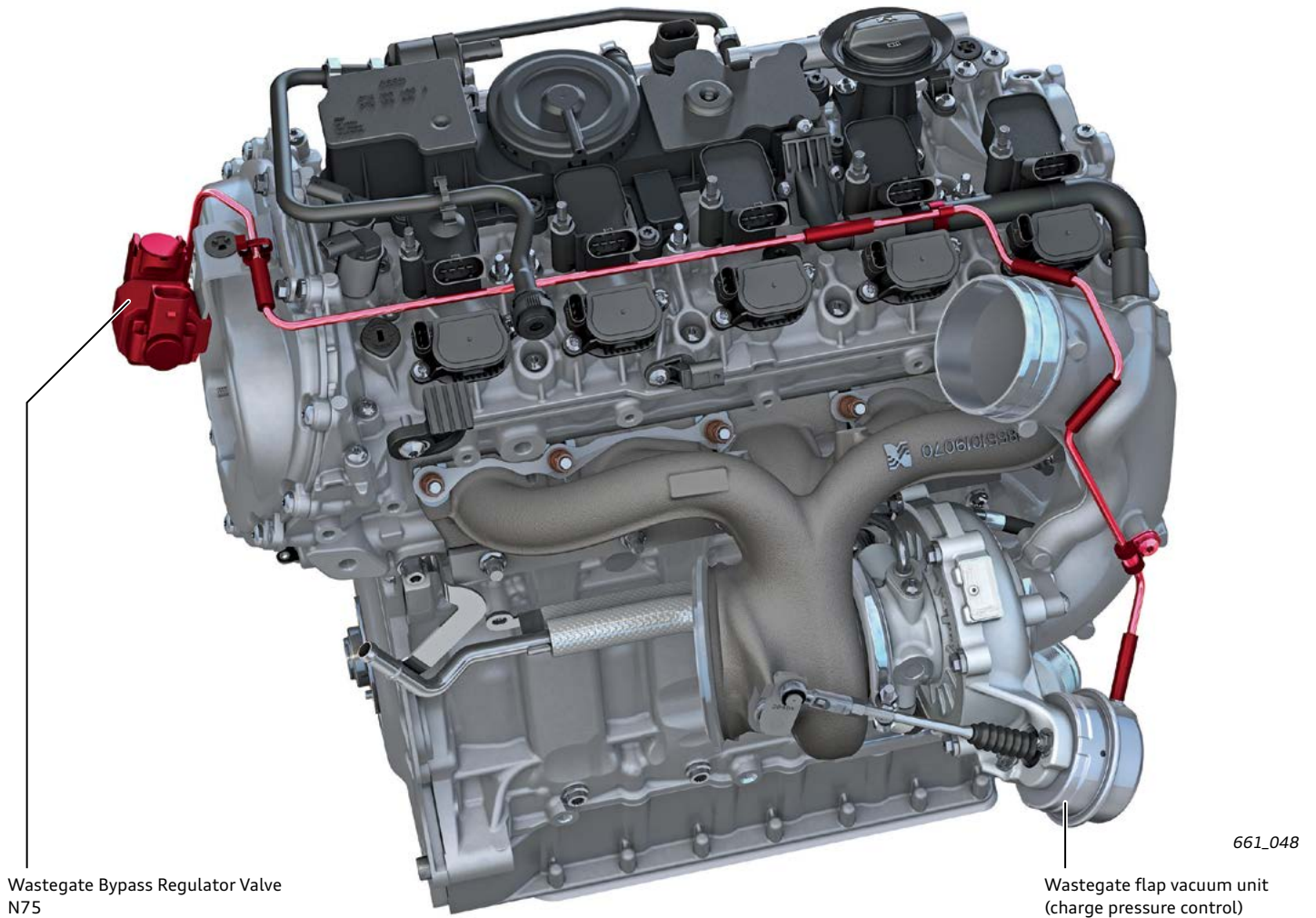
eMedia

 Find out more about the turbo-charger.

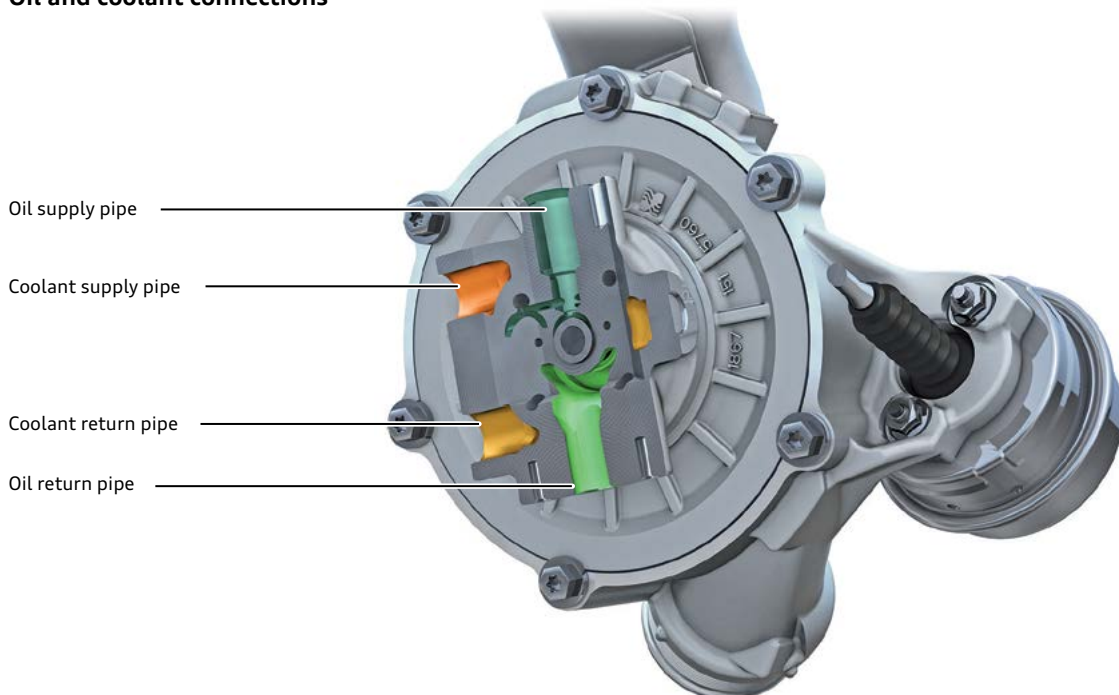
Charge air pressure control

The charge pressure is regulated up to a maximum boost of 19.6 psi (1.35 bar). This is done by vacuum controlled wastegate flap. The vacuum unit is activated by Wastegate Bypass Regulator Valve N75. The wastegate flap is opened when the vacuum unit is not activated.

Turbocharger Recirculation Valve N249 is installed upstream of the throttle valve module. (see figure on page 40).



Oil and coolant connections



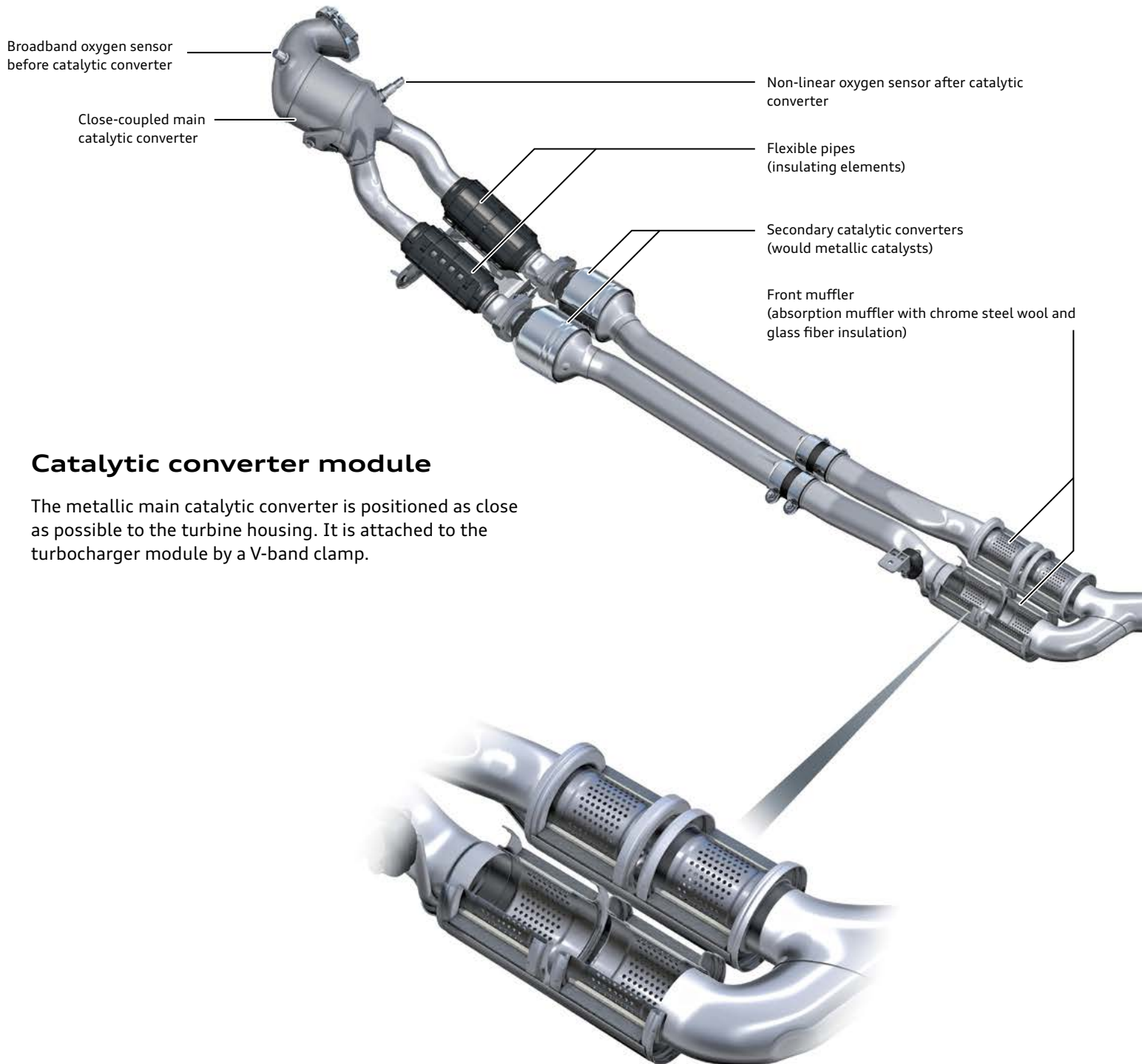
661_049

Exhaust system

Overview

The twin-path exhaust system extends from the main catalytic converter to downstream of the front muffler.

Two secondary catalytic converters are installed downstream of the catalytic converter module.



Reference

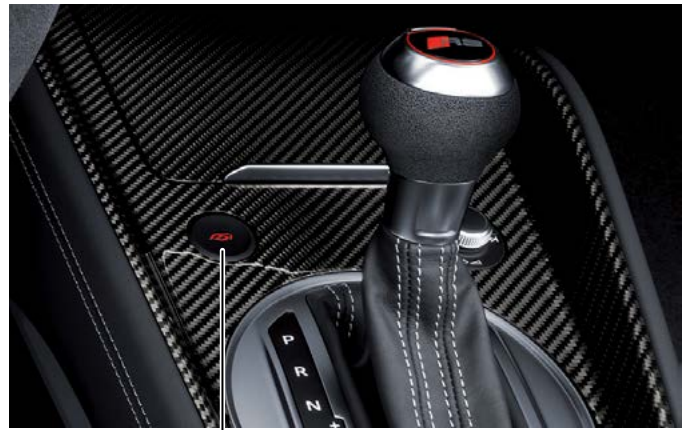
For more information about the working principle of the exhaust flaps, refer to Self-Study Program [920223, The Audi 4.0L V8 TFSI Engine with Twin Turbochargers.](#)

Switchable exhaust valves

In the comfort mode of Audi drive select, the flaps are closed at idling speed. The right flap is opened with increasing engine speed. If engine speed is increased still further, the left flap also opens subsequently.

At higher engine loads both flaps open earlier in order to achieve a more full-bodied sound in the exhaust system. In **Sport** mode the operating points are at lower engine speeds, that is the flaps open earlier.

The driver can adjust the exhaust gas flaps using the engine sound button on the center console.



Engine sound button

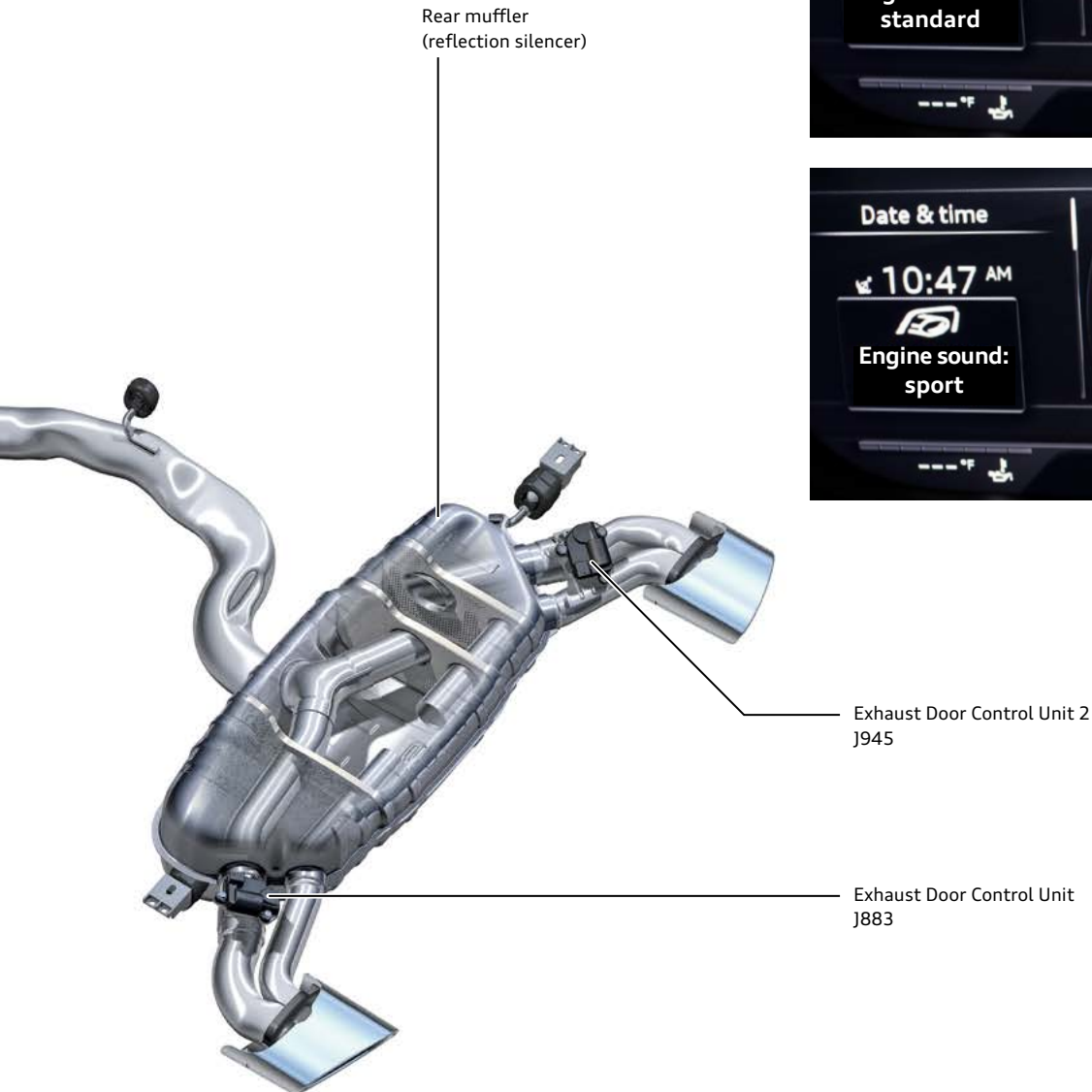
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661_051



661_052



Rear muffler
(reflection silencer)

Exhaust Door Control Unit 2
J945

Exhaust Door Control Unit
J883

661_053

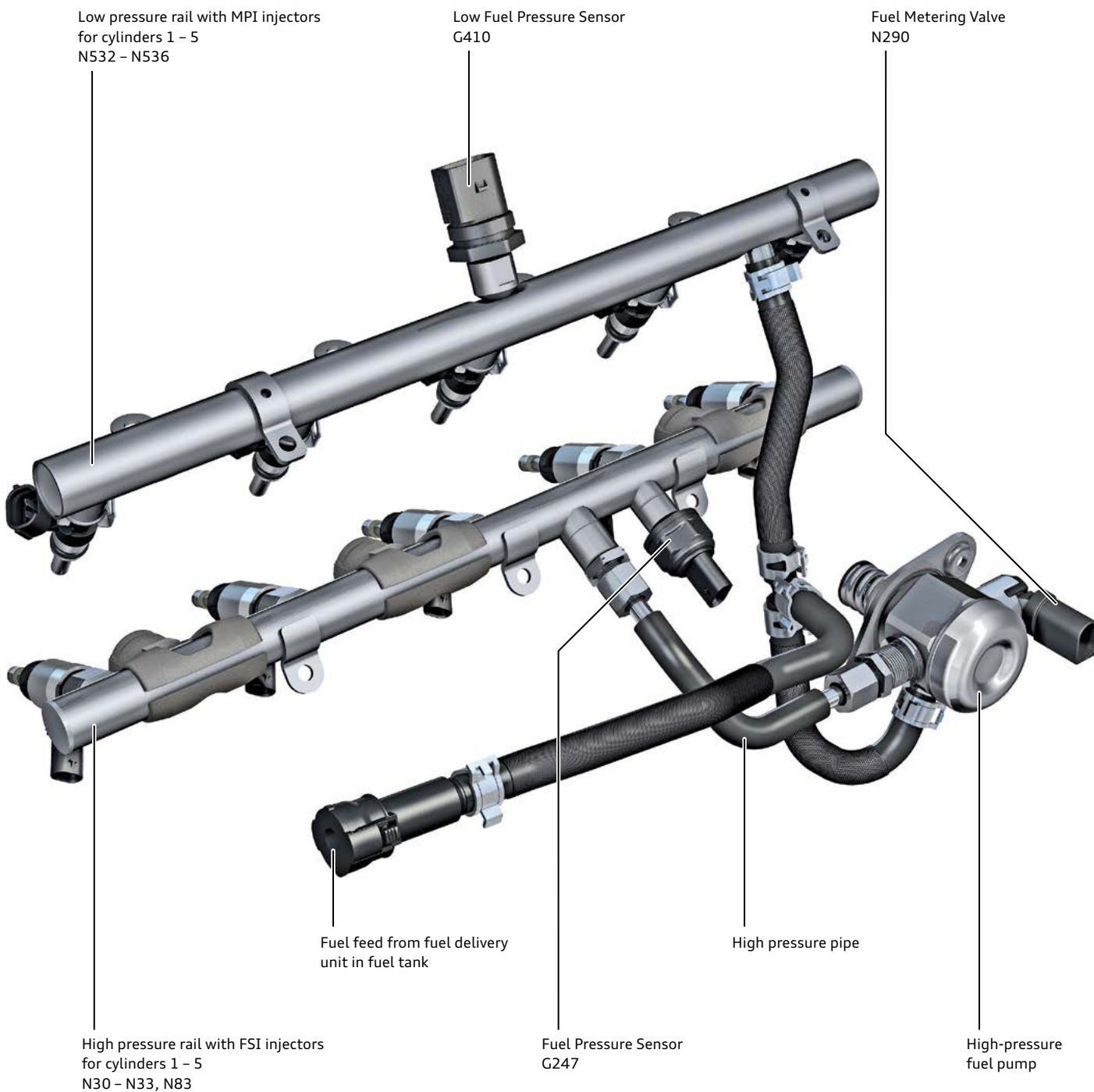
Fuel system

Overview

The 2.5l R5 TFSI engine of the EA855 EVO series is equipped with a combined, on-demand FSI/MPI fuel injection system based on the 2.0l TFSI engines of the EA888 series. The required exhaust emission limits were achieved by using a dual fuel injection system.

The FSI injection system is designed for system pressures of up to 3625.94 psi (250 bar), while the MPI injection system is rated for 101.52 psi (7 bar).

The single-piston high-pressure pump is driven by a three-lobe cam acting on the intermediate shaft of the chain drive.



Fuel injectors

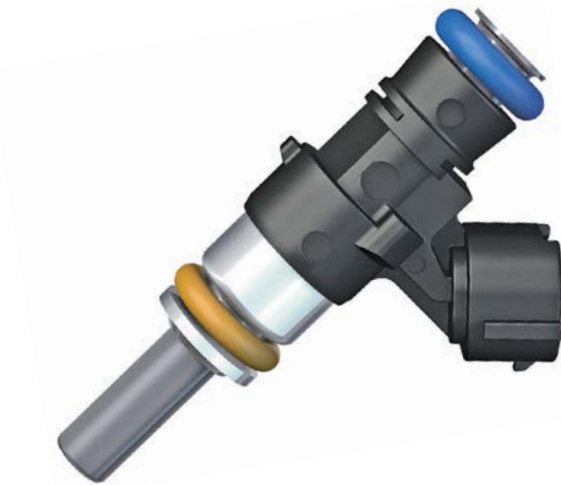
FSI injector



661_071

The electromagnetic FSI fuel injectors are designed for pressures of up to 3625.94 psi (250 bar). They are installed in the cylinder head and inject fuel directly into the combustion chamber. The injectors are activated by the ECM, which applies up to 65 volts. This means it is possible to have multi-injection pulses and/or to inject extremely small amounts of fuel.

MPI injector



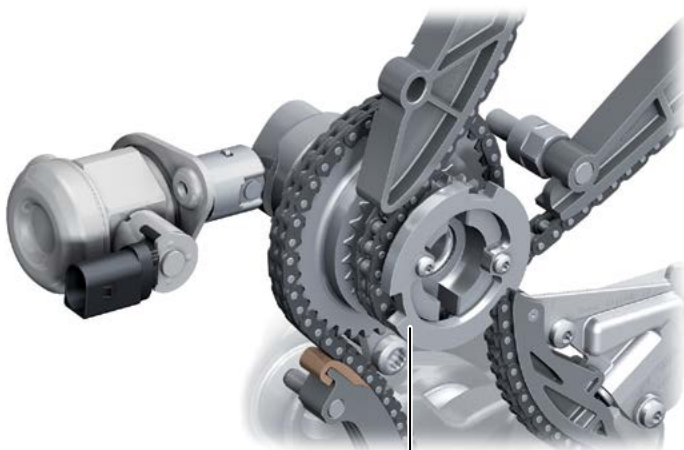
661_094

The MPI injectors are integrated in the intake manifold upstream of the intake manifold flaps. When the injectors are activated (the 12V supply is switched to ground), by the ECM, fuel is injected continuously into the air flow upstream of the intake valves.

Intermediate Shaft Speed Sensor G265

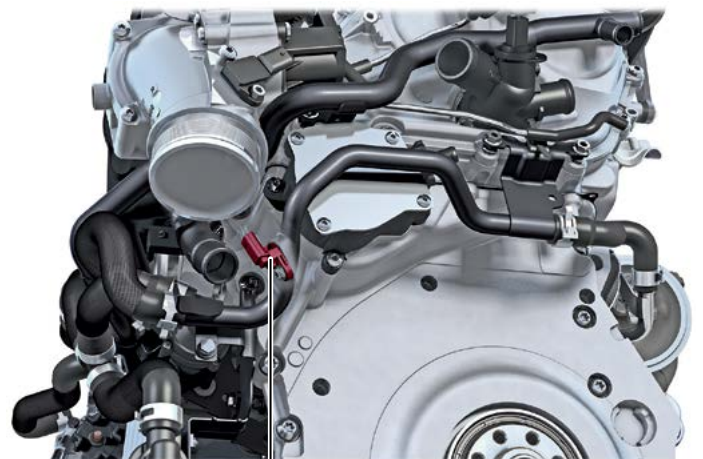
To calculate the injection time for each cylinder, the ECM requires information about the position and speed of the high-pressure fuel pump.

The speed and position of the intermediate shaft, and therefore the three lobed cam, are monitored by a Hall-effect sensor. This function was previously done by a cam-shaft sensor.



661_072

Intermediate shaft encoder disc



661_073

Intermediate Shaft Speed Sensor G265

Combustion process

The development targets for this new engine were:

- › Increased engine power.
- › Better fuel efficiency.
- › Compliance with applicable emission standards.

This has been achieved by using the combined FSI/MPI injection system.

The broad latitude for selecting injection parameters, in combination with the intake manifold flaps, makes it possible to bring particulate emissions into compliance with future emission limits.

Other modifications:

- › Turbocharger output has been increased by:
 - › Making optimal use of the exhaust pulsation acting on the turbine wheel.
 - › Revising the exhaust manifold design to minimize pressure loss.
 - › Reversing the direction of rotation of the rotor assembly.
- › Reducing the residual gas ratio.
- › Good fuel/air mixture homogenization.
- › Faster engine warm-up through the use of ITM.
- › Improving heat dissipation from the combustion chamber to reduce knock tendency.
- › High compression.

At low engine speeds, FSI fuel injection allows the separation of charge cycles and mixture preparation. This, in combination with phase adjustment of the intake and exhaust camshafts as well as exhaust-side event duration adjustment by the AVS system, greatly reduces the amount of gas left in the cylinders after gas exchange.

The extension of the intake camshaft phase adjustment range from 42° crank angle to 50° crank angle represents a significant improvement.

The increased output of the exhaust turbocharger helps the engine achieve high volumetric efficiency at low RPM. The new exhaust turbocharger provides high efficiency at medium engine speeds.

The intake, pressure and exhaust systems have been carefully coordinated and optimized for pressure loss at high engine speeds. The MPI injection system ensures that the required amount of fuel is made available.

Ignition coils

Exhaust cam adjuster

Exhaust camshaft

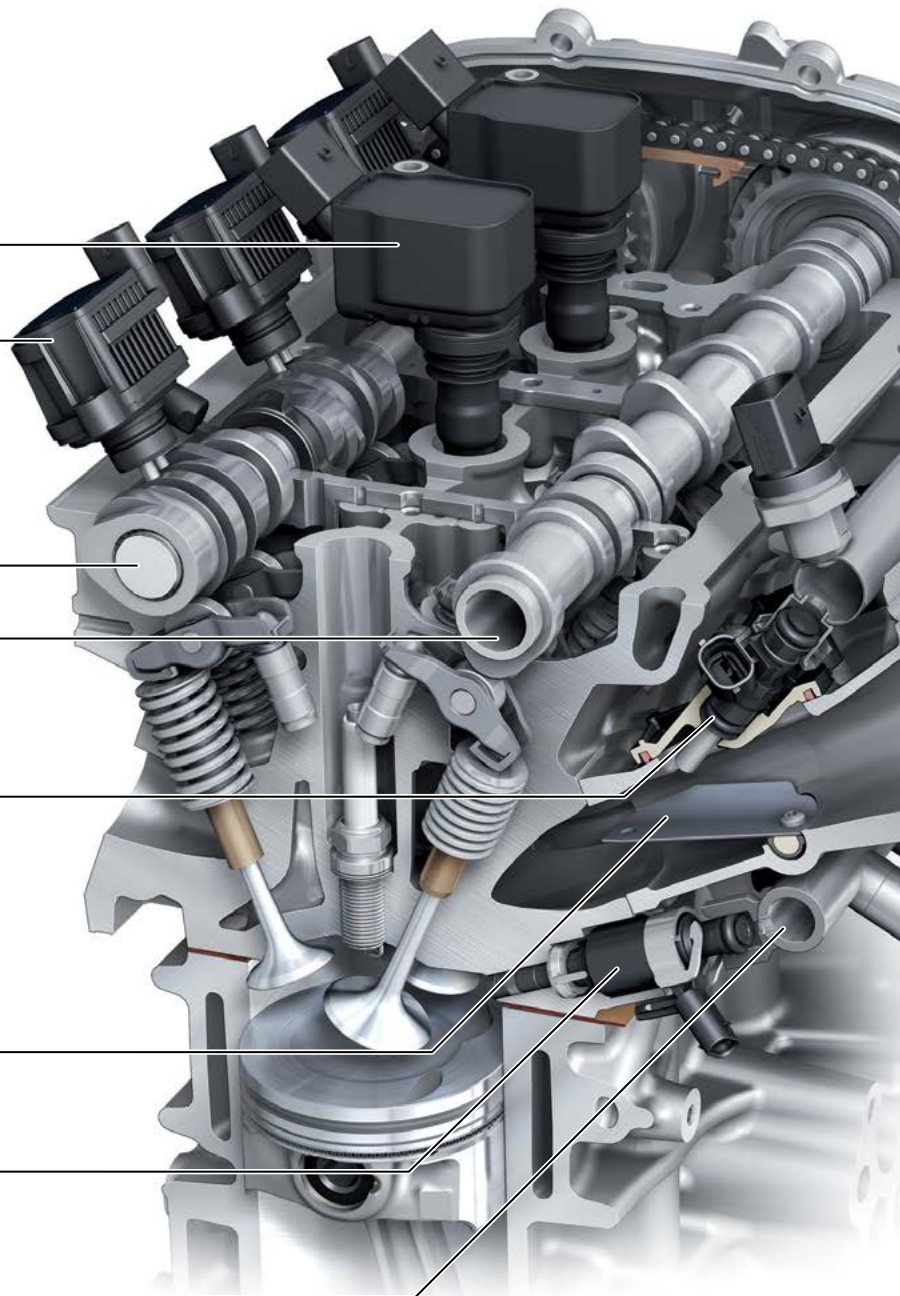
Intake camshaft

MPI fuel injectors,
cylinders 1 - 5
N532 - N536

Intake manifold flap

FSI fuel injectors,
cylinders 1 - 5
N30 - N33, N83

High-pressure fuel rail



Operating modes

- > High-pressure single phase injection.
- > High-pressure dual phase injection.
- > Dual injection (MPI and FSI).

Engine start

- > Coolant temperature below 113 °F (45 °C) high-pressure dual phased FSI during the compression stroke.
- > Coolant temperature over 113 °F (45 °C): single phased FSI during the compression stroke.

Warm-up and catalytic converter heating

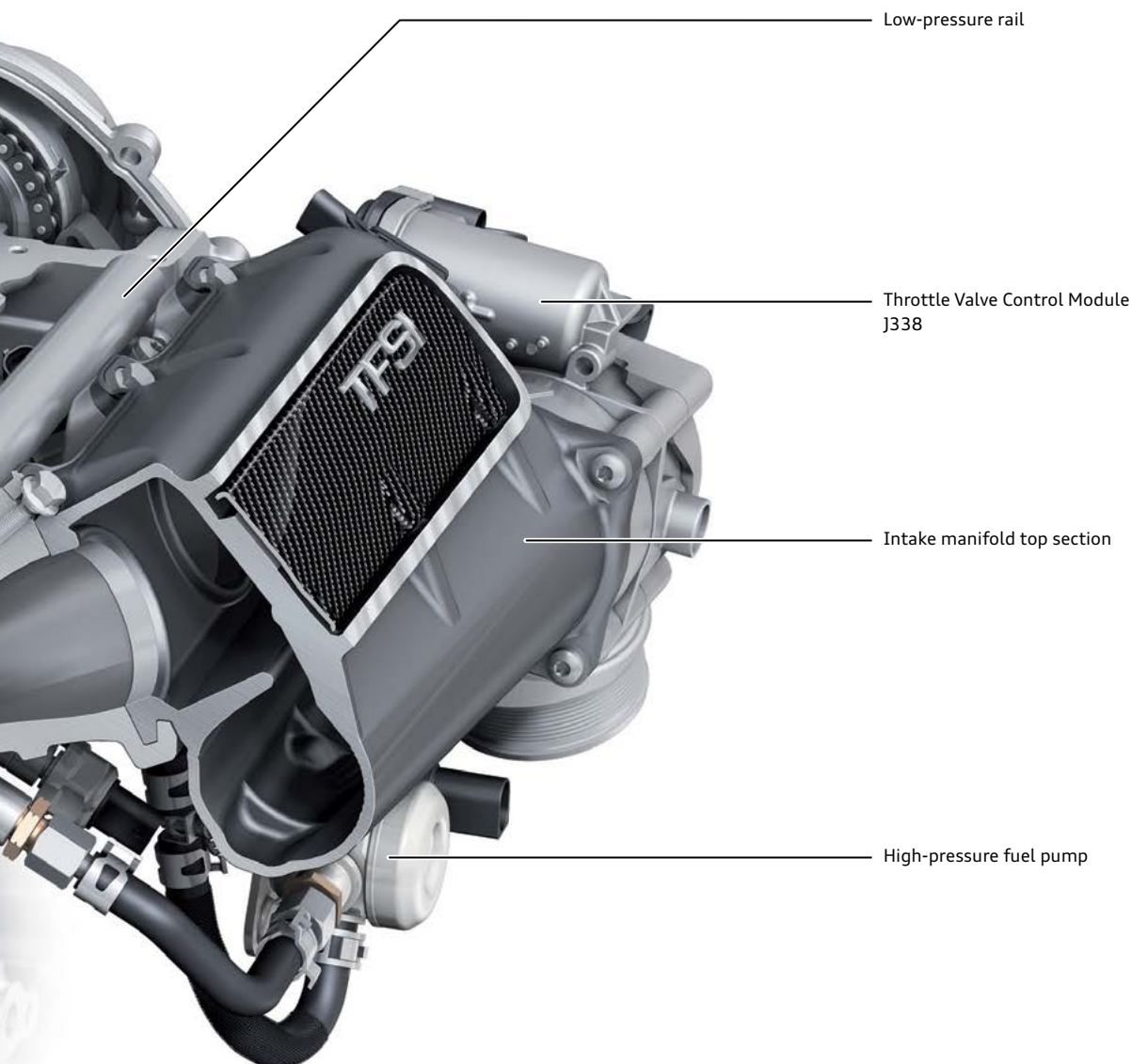
Example - engine running at heavy load:

- > 5% MPI and 95% FSI.

Limp-home function

Example - engine running at light load:

- > Coolant temperature over 86 °F (30 °C): 50% MPI and 50% FSI.
- > Intake manifold flaps stay closed at near-idle engine speeds.



Engine management

System overview

Sensors

Intake Manifold Sensor GX9 with
Intake Air Temperature Sensor G42 and
Manifold Absolute Pressure Sensor G71

Charge Air Pressure Sensor GX26 with
Charge Air Pressure Sensor G31 and
Intake Air Temperature Sensor 2 G299

Engine Speed Sensor G28

Throttle Valve Control Module GX3

Camshaft Position Sensor G40
Camshaft Position Sensor 3 G300

Accelerator Pedal Module GX2

Brake Light Switch F

Fuel Pressure Sensor G247

Low Fuel Pressure Sensor G410

Intermediate Shaft Speed Sensor G265

Knock Sensor 1 G61
Knock Sensor 2 G66

Engine Temperature Control Sensor G694

Oil Pressure Sensor G10

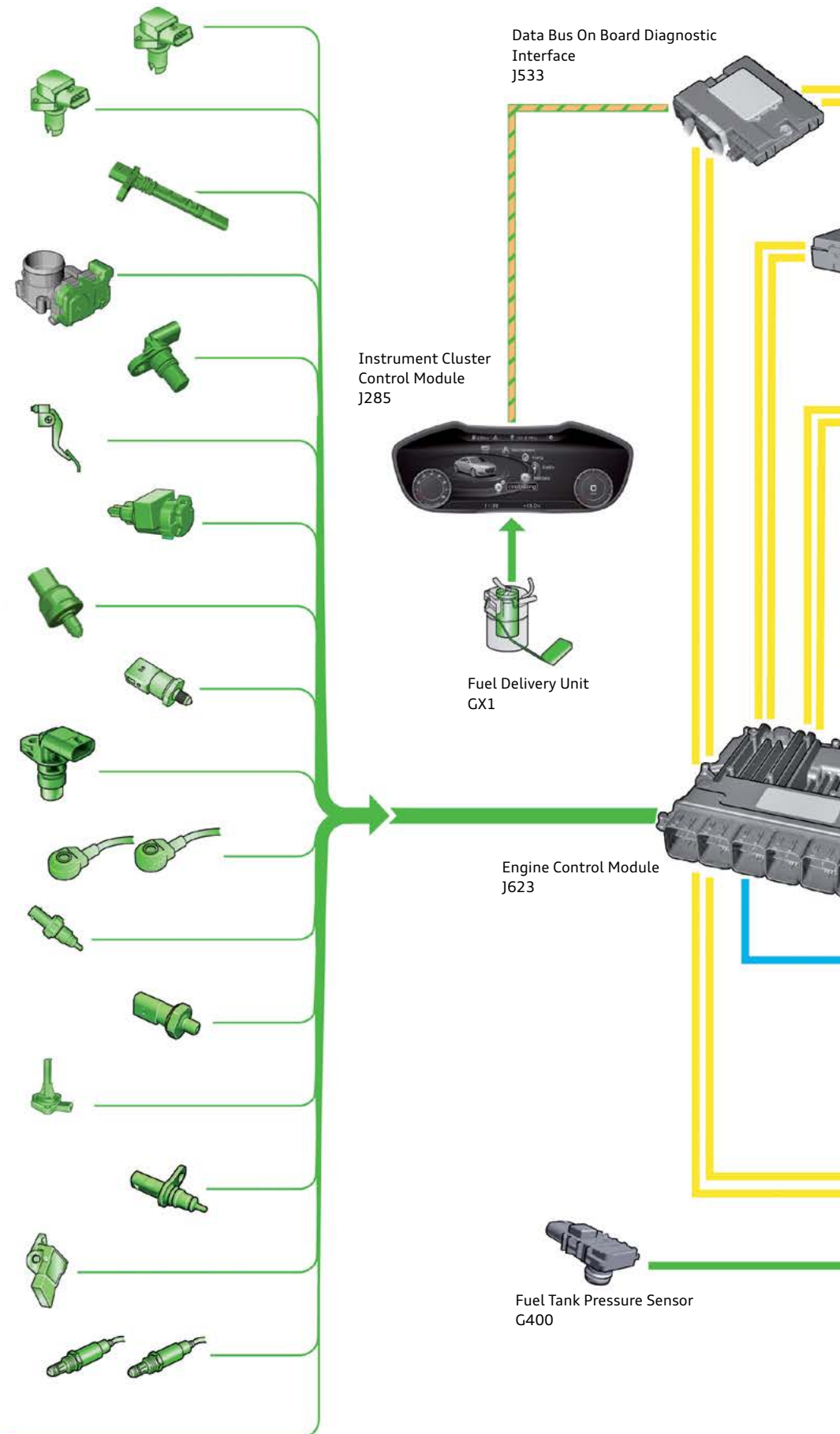
Oil Level Thermal Sensor G266

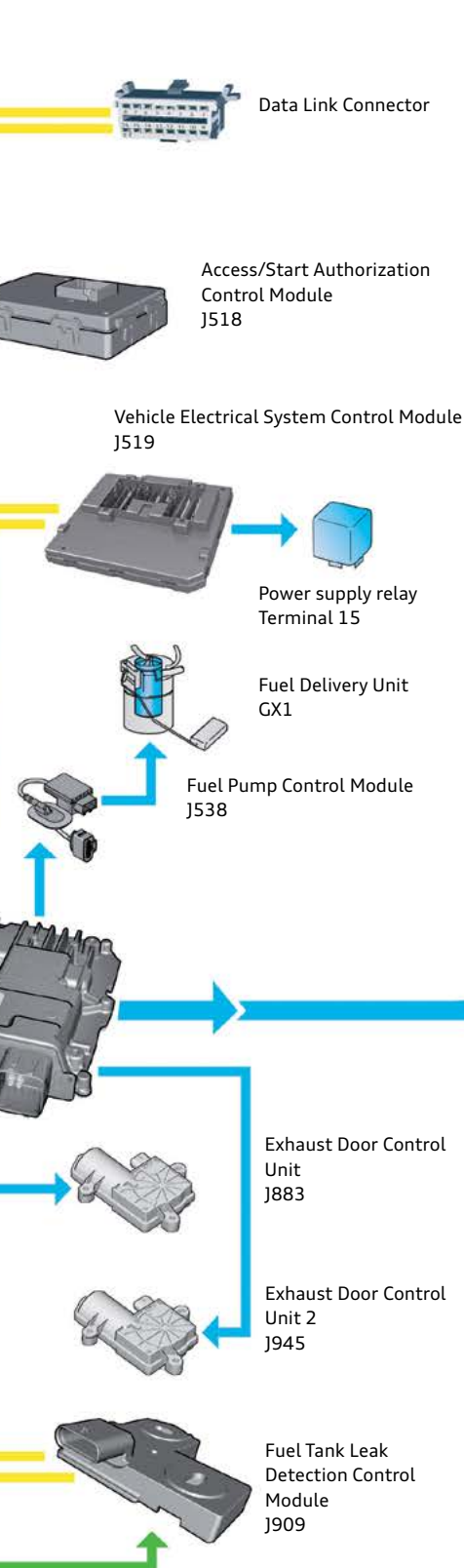
Engine Coolant Temperature Sensor G62

Intake Manifold Runner Position Sensor G336

Oxygen Sensor 1 Before Catalytic Converter GX10
Oxygen Sensor 1 After Catalytic Converter GX7

Additional signal for cruise control system





Actuators

- Injector, cylinders 1 – 4 N30 – N33
Injector, cylinder 5 N83
- Injector 2, cylinders 1 – 5
N532 – N536
- Ignition coils 1 – 5 with power output stage
N70, N127, N291, N292, N323
- Motronic Engine Control Module Power Supply
Relay J271
- Engine Component Power Supply Relay 2
J976
- Throttle Valve Control Module GX3
- Intake Manifold Runner Control Valve N316
- Wastegate Bypass Regulator Valve N75
- EVAP Canister Purge Regulator Valve 1 N80
- Turbocharger Recirculation Valve N249
- Crankcase Ventilation Valve N546
- Fuel Metering Valve N290
- Camshaft Adjustment Valve 1 N205
Exhaust Camshaft Adjustment Valve 1 N318
- Exhaust Camshaft Actuators for cylinders 1 – 5
N579, N587, N595, N603, N611
- Coolant Shut-Off Valve N82
- After-Run Coolant Pump V51
- Mechanical Coolant Pump Switch Valve N649
- Radiator Fan Control Module J293
Radiator Fan V7
Radiator Fan 2 V177
- Oxygen Sensor 1 Before Catalytic Converter GX10
Oxygen Sensor 1 After Catalytic Converter GX7
- Starter Relay 1 J906
Starter Relay 2 J907

Inspection and maintenance

Service information and operations

Engine oil specification	SAE 5W-30
Quantity of motor oil including filter in litres (change quantity)	7.5 quarts
Motor oil standard	> Fixed 10,000 mile service interval VW 502 00 or VW 504 00
Motor oil extraction permitted	Yes
Changing the oil	10,000 miles / 1 year
Inspection	20,000 miles (30,000 km) / 2 years
Air filter change interval	60,000 miles (90,000 km)
Fuel filter change interval	-
Spark plug change interval	60,000 miles (90,000 km) / 6 years
Ribbed V belt replacement interval	Lifetime
Timing assembly	Chain (lifetime)

Special tools and workshop equipment

VAS 5161A/39 Guide plate



For removal and installation of the valve keepers in combination with removal / installing device VAS 5161A.

T03000A Engine support¹⁾



661_076

661_077

For removal and installation of the engine in combination with engine and transmission jack V.A.G 1383 A.

T03000/3 Adapter



661_097

Used in combination with engine support T03000A for mounting the engine and transmission unit in the installed position during engine removal and installation.

T10122/6A Guide piece¹⁾



Ring seal for replacing the crankshaft on the transmission side.

T40264/2A Camshaft lock¹⁾



661_078

For locking the camshafts to set the valve timing.

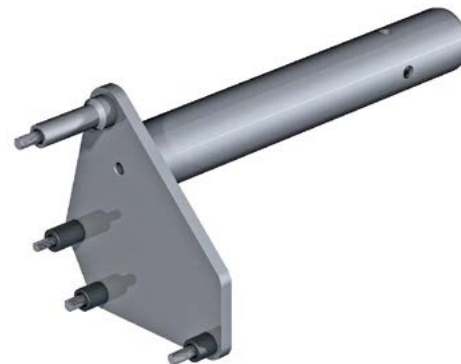
661_079

T40347 Funnel



For reliable installation of the piston in the cylinder.
The high quality of the funnel inner surface protects the sensitive three-part oil control rings of the piston against damage during installation.

T40371 Engine support



661_080

For clamping the engine onto the engine and transmission bracket VAS 6095.

661_081

T40376/1 Valve stem seal fitting tool



For installation of the new intake valve stem seals.

T40376/2 Valve stem seal fitting tool



661_082

For installation of the new exhaust valve stem seals.

661_083

¹⁾ As an alternative to these tools, it is possible to adapt older tools already available.
Detailed tool adaptation instructions are given in the workshop manual.

Appendix

Glossary

This glossary explains to you all terms which are shown in italics and indicated by an arrow ↗ in this self study program.

↗ APS – Atmospheric Plasma Spraying

In atmospheric plasma spraying (APS), spray additives in the form of particles are applied by means of a plasma jet to the surface of a substrate to be coated. A plasma is a hot gas in which neutral particles dissociate and ionize due to high temperature. Thus, compared to gas, charged particles such as electrons and ions are also present in a plasma. To produce a plasma, an electric arc is generated between a cathode and an anode by means of high-frequency ignition in a plasma burner. At an appropriately selected gas feed, a concentrated plasma jet with a high heat content is formed that flows from the nozzle of the plasma burner at high velocity. The temperatures in the hottest part of the plasma cone reach about 30,000 K.

The spray powder is introduced into the plasma jet by an injector. Depending on the process, argon or nitrogen is used as a carrier gas to deliver the spray powder to the burner with the necessary kinetic energy. After the powder is introduced into the plasma jet, the powder particles are melted and accelerated by the transfer of heat and momentum. Depending on the parameters selected, the powder particles impinge on the substrate at a certain temperature and temperature.

APS process at Audi

The APS spray coating is applied at Audi's in-house production facility by applying a fine-grained spray powder. To ensure better layer adhesion, the cylinder bore is mechanically roughened by a toothed profile before the spray powder is applied. This, in combination with an optimized honing process, produces small lubrication pockets in the cylinder liner which allow the piston rings to glide with a minimum of friction and wear. Further advantages of this solution are higher heat dissipation compared to cast iron, resulting in increased knock resistance during the combustion process and improved corrosion resistance to low-quality fuels in the international market.

↗ DCY – Driving Cycle

Faults and substitute reactions can be set and cancelled during vehicle operation (terminal 15 ON ...driving... OFF = 1 Driving Cycle) when fault status debounces "ok" again.

↗ DIN GZ – Excerpt from DIN 70020-GZ

This document contains information which is used to determine the engine mass of passenger cars driven exclusively by internal combustion engines. To make engine masses comparable, this document specifies which components are to be considered and disregarded.

Engine mass

An engine with classification G attachment parts is designated as the base engine.

An engine with classification G and Z (GZ) attachment parts is designated as the complete engine. Classification Z denotes additional parts.

↗ Rotacast method

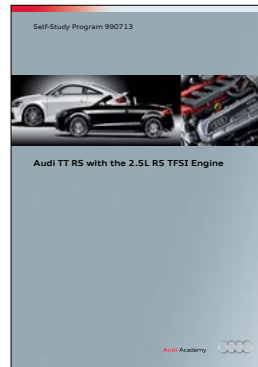
The Rotacast method is a tilt casting process variation on gravity die casting. After being filled with liquid aluminum, the entire die is swivelled through 180°. The uniform microstructure distribution ensures that optimal strength is achieved in both the bearing block and top deck areas. The aluminum alloy AlSi7Mg0.3 is used. The cylinder block of the 2.5l R5 TFSI engine is the world's first engine block to be manufactured using this method.

Self-Study programs

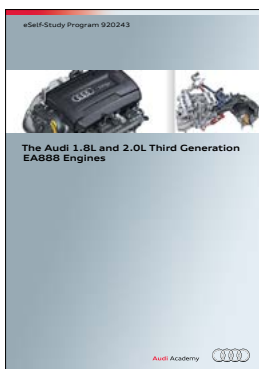
For further information about the 2.5L R5 TFSI engine of the EA855 EVO series, refer to the Self-Study programs listed below.



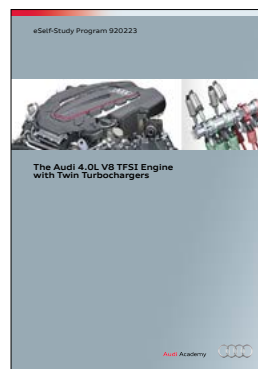
[SSP 922903](#)
The 2.0L 4V Engine with AVS



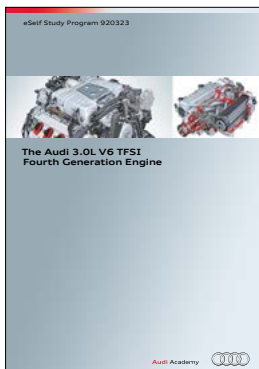
[SSP 990713](#)
Audi TT RS with the 2.5L R5 TFSI Engine



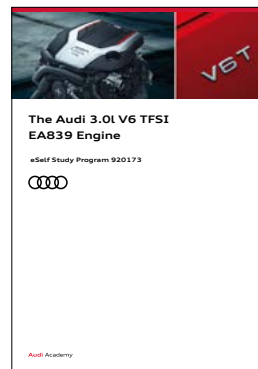
[SSP 920243](#)
The Audi 1.8L and 2.0L Third Generation EA888 Engines



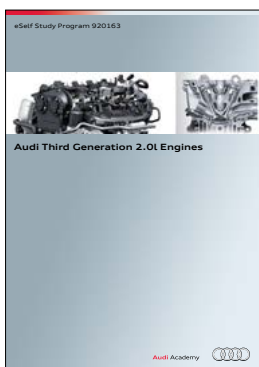
[SSP 920223](#)
The Audi 4.0L V8 TFSI Engine with Twin Turbochargers



[SSP 920323](#)
The Audi 3.0L V6 TFSI Fourth Generation Engine



[SSP 920173](#)
The Audi 3.0L V6 TFSI EA839 Engine



[SSP 920163](#)
Audi Third Generation 2.0L Engines

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 “920273 - The Audi 2.5l TFSI Engine EA855 EVO 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.

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