

Reference Manual



B46TU/B48TU ENGINES



Technical Training

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Technical training.
Product information.

B46TU / B48TU Engines



BMW Service

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Technical Training

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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:



Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status: April 2017

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For changes/additions to the technical data, repair procedures, please refer to the current information issued by BMW of North America, LLC, Technical Service Department.

This information is available by accessing TIS at www.bmwcenternet.com.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application
- Aftersales Information Research (AIR)

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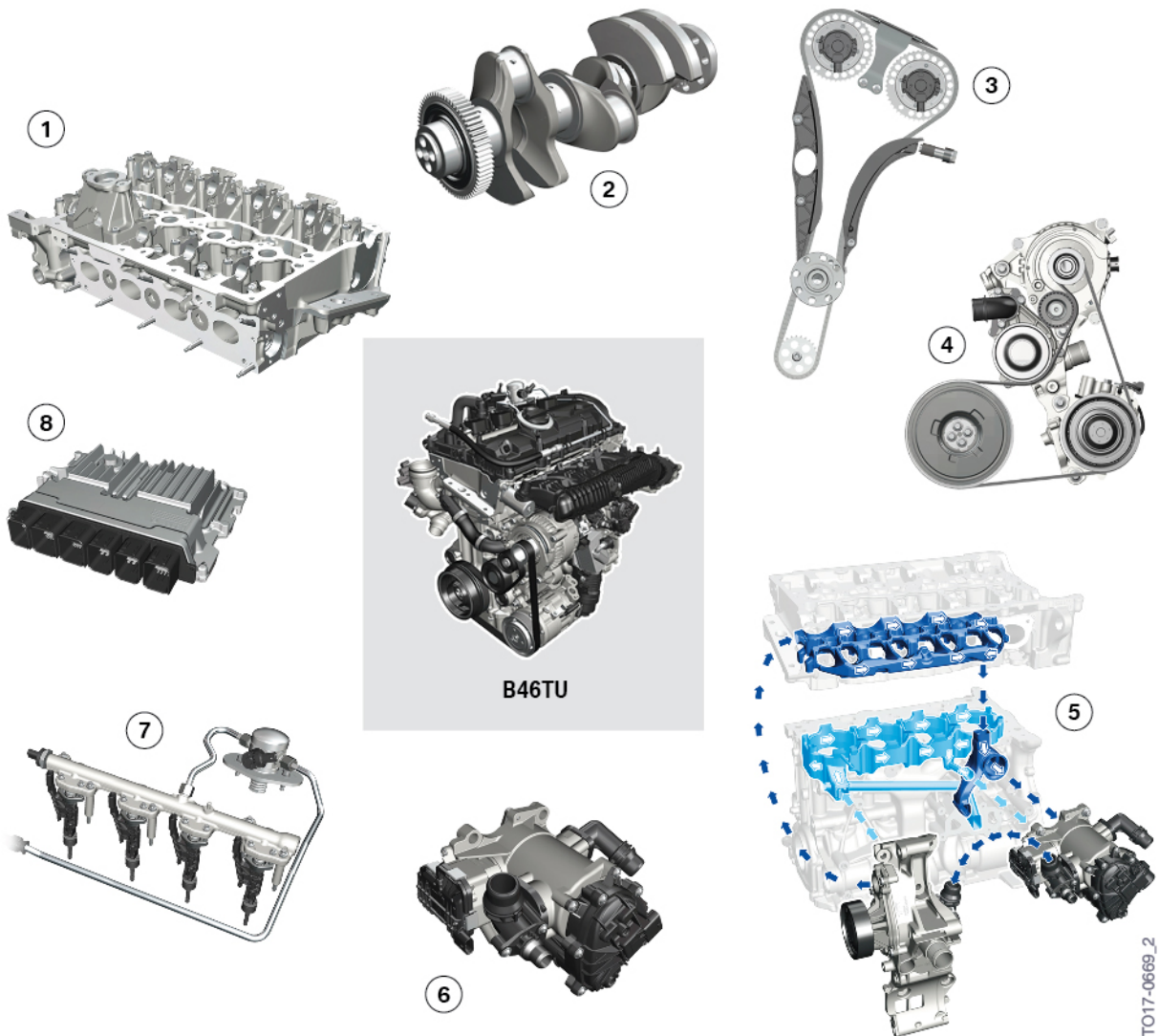
B46TU / B48TU Engines

1. Introduction

This document exclusively describes the changes to the B46 and B48 engine. The B46TU engine will be available in the new G20 3 Series and G29 Z4 Roadster in early 2019. The B48TU engine will be available starting in November 2018 exclusively in the F39 X2 M35i.

1.1. Innovations B46TU

To meet the legal requirements for emissions, a number of technical improvements have been implemented. The technical updates for the B46TU engine include the following new features:



New features

B46TU / B48TU Engines

1. Introduction

| Index | Explanation |
|-------|--|
| 1 | Modified cylinder head |
| 2 | Crankshaft weight reductions |
| 3 | Single-part timing chain drive |
| 4 | Modified belt guide |
| 5 | Split cooling |
| 6 | Heat management module with electrical Split Cooling Valve (SCV) |
| 7 | Fuel preparation with 350 bar (5076 psi) injection pressure |
| 8 | DME 8 |

Weight savings in the crankshaft drive area, injection pressure boosting in the fuel preparation area, and function changes in the engine cooling area have made it possible to reduce the CO₂ emissions by 2.5 - 5%, while increasing engine performance by 5 kW/20 Nm (8 hp/15 lb-ft).

1.2. Innovations B48TU

The technical improvements made to the B48TU engine are highlighted below:

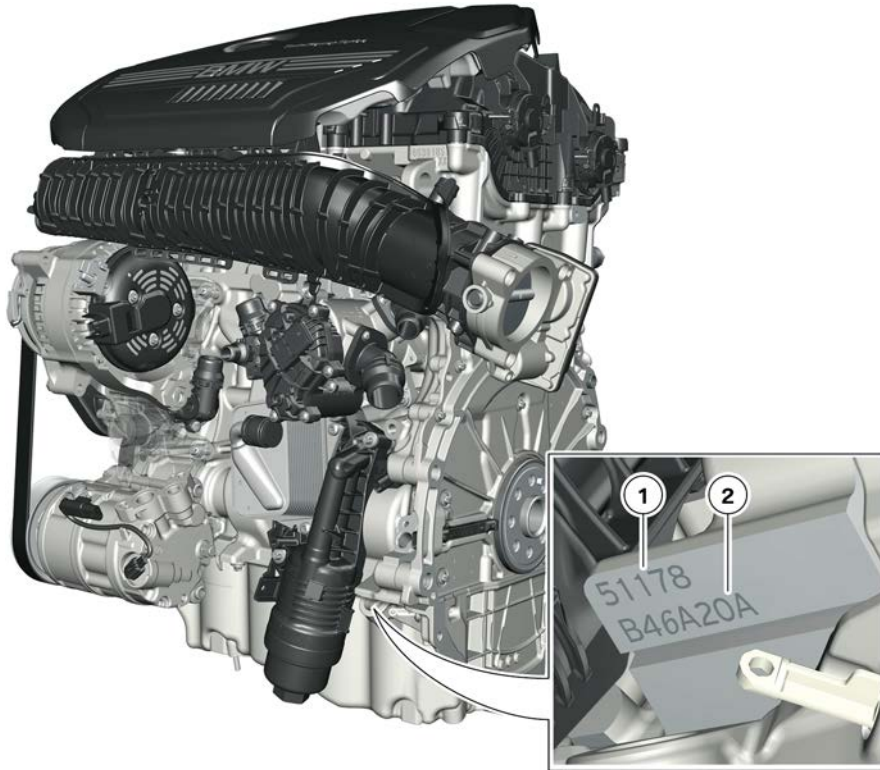
- 302 hp (225 kW)
- 332 lb-ft (450 Nm)
- Reinforced crankshaft with larger main bearing diameter.
- New piston with modified compression.
- New connecting rods without a bearing on small end.
- Newly developed larger exhaust turbocharger with integrated air-diverter valve.
- Modified fuel injectors with increased flow rate and 350 bar pressure.
- Newly developed intake air pipes for higher power and torque.
- Modified exhaust system to minimize back pressure.
- Engine cover with M Performance logo.

B46TU / B48TU Engines

1. Introduction

1.3. Engine identification

1.3.1. B46TU engine

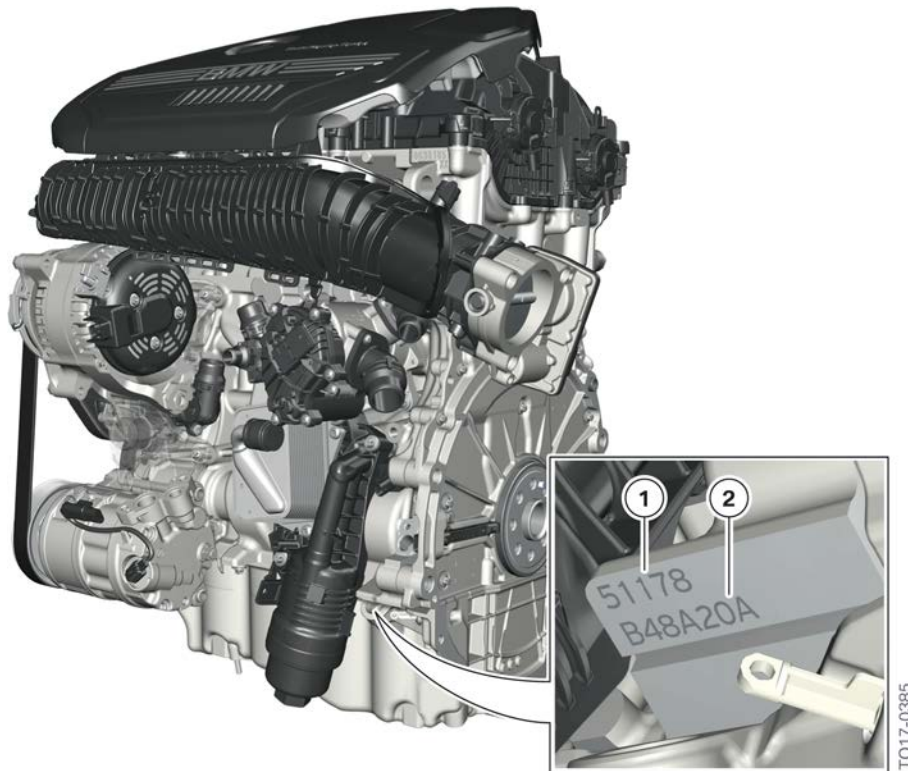


Engine identification—transverse mounted shown

B46TU / B48TU Engines

1. Introduction

B48TU engine



Engine identification—transverse mounted shown

| Index | Explanation |
|-------|-----------------------|
| 1 | Engine number |
| 2 | Engine identification |

The 7-digit engine identification is located on the crankcase in the area of the mounting for the crankshaft alignment pin. The first 6 digits of the engine **identification code**. Only the seventh digit is different. The seventh digit of the engine identification code is the test number of the type approval certification.

The 4th digit in the engine identification shown above is an **A**, this represents its a transverse mounted engine that will be installed in the F39 M35i. The G20 and G29 will have a **B** in the 4th position that represents the engine is longitudinal mounted.

The consecutive engine number is embossed above the engine identification. Using these two numbers the engine can be clearly identified by the manufacturer.

B46TU / B48TU Engines

1. Introduction

1.4. Technical data

The B46B2001 and B46B20T1 engine is described:

| | B46B2001 | B48B20T1 |
|---------------------------------------|--------------------------|--------------------------|
| Power output in [kW (hp)] at [rpm] | 190 (255) 5000–6500 | 225 (302) 5000–6250 |
| Torque in [Nm (lb-ft)] at [rpm] | 400 (295) 1550 – 4400 | 450 (332) 1750 – 4500 |
| Number of cylinders | 4 | 4 |
| Displacement in [cm ³] | 1998 | 1998 |
| Bore / stroke in [mm] | 82/94.6 | 82/94.6 |
| Compression ratio | 10.2 : 1 | 9.5 : 1 |
| Valves per cylinder | 4 | 4 |
| Start of Production (SOP) | 11/2018 | 11/2018 |

1.4.1. Model overview

The table below provides an overview of the models in which the new B46TU and B48TU engine is used.

| Models | Engine |
|---------------|---------------|
| G20 330i | B46B2001 |
| G29 Z4 | B46B2001 |
| F39 X2 M35i | B48A20T1 |

B46TU / B48TU Engines

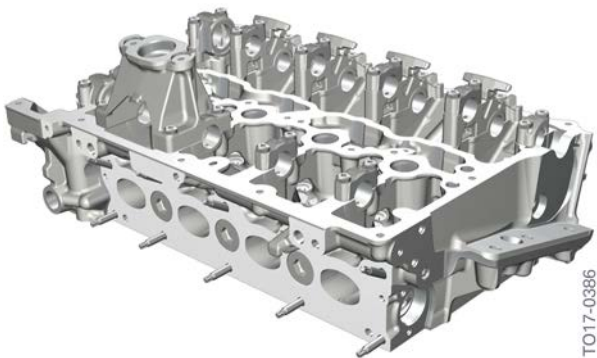
2. Engine Mechanical

2.1. Engine housing

2.1.1. Cylinder head

The cylinder head is made of aluminum.

Only slight modifications have been made to the B46TU head compared to the B46.



Cylinder head

B46TU / B48TU Engines

2. Engine Mechanical

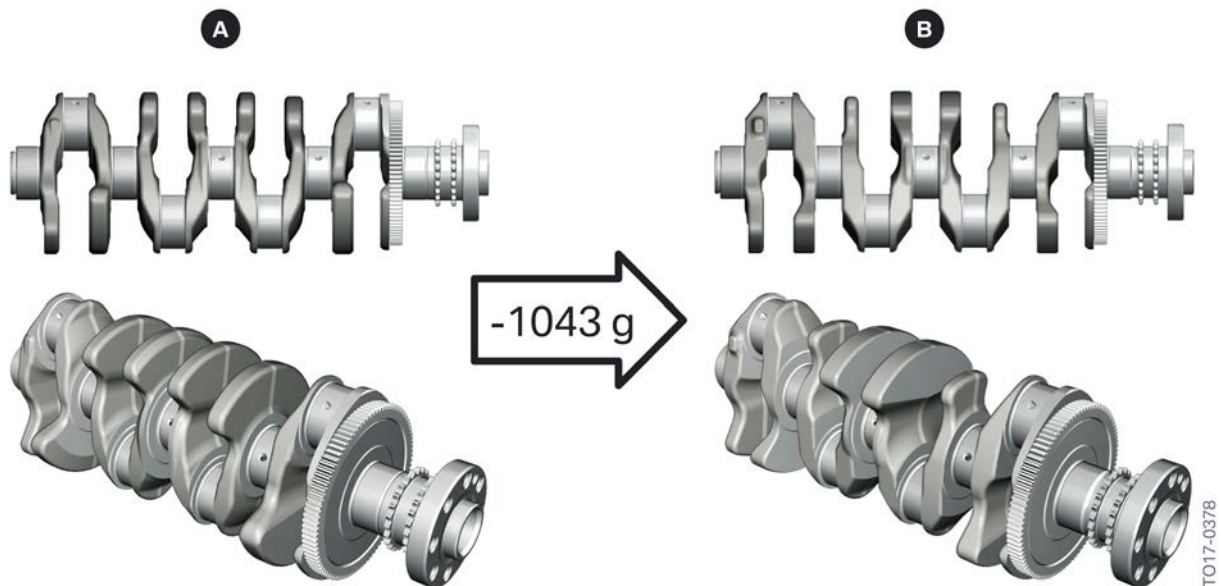
2.2. Crankshaft drive

2.2.1. Crankshaft

Comparison B46 crankshaft with B46TU crankshaft

The crankshaft of the B46TU engine have been revised. Material adaptations have to both the counterweights and the connecting rod bearing journals have made it possible to achieve weight savings of up to 1043 g (2.3 lbs).

A reinforced crankshaft with larger main bearing diameter is used in the B48A20T1 engine.



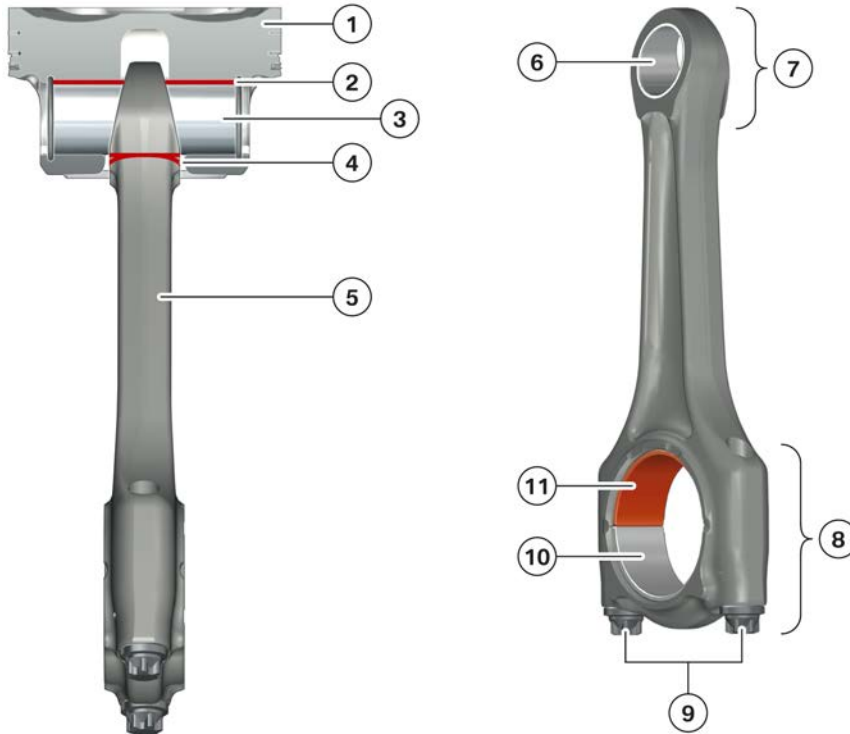
Comparison of crankshaft B46 engine with B46TU engine

| Index | Explanation |
|-------|--------------------------|
| A | Crankshaft of B46 engine |
| B | Crankshaft B46TU engine |

B46TU / B48TU Engines

2. Engine Mechanical

2.2.2. Connecting rod



Connecting rod

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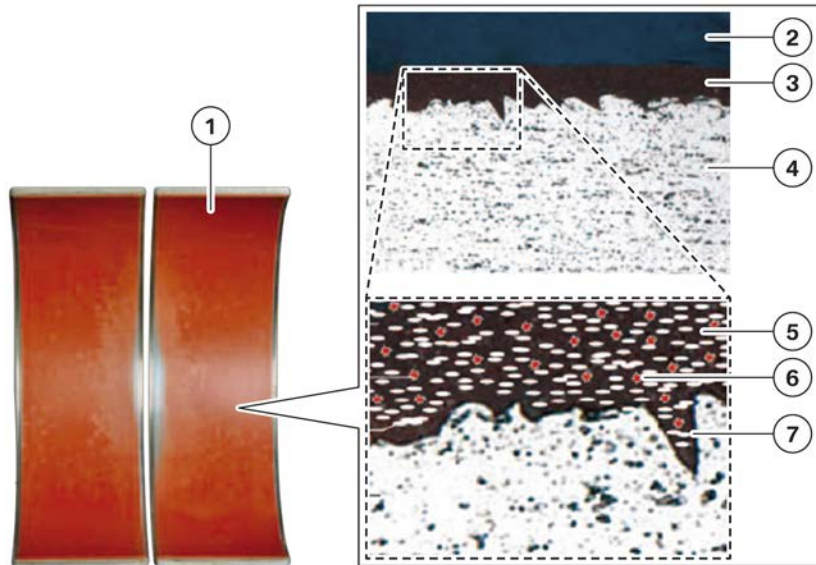
| Index | Explanation |
|-------|--|
| 1 | Piston |
| 2 | Area transferring the force |
| 3 | Wrist pin |
| 4 | Connecting rod bearing with shaped bore hole |
| 5 | Connecting rod |
| 6 | Connecting rod bearing (B46TU only) |
| 7 | Small connecting rod eye (trapezoidal shape) |
| 8 | Large connecting rod eye (cracked) |
| 9 | Connecting rod bolts of the connecting rod bearing cap |
| 10 | Connecting rod bearing shell of the connecting rod bearing cap |
| 11 | Connecting rod bearing shell of the connecting rod (IROX-coated) |

The drop-forged cracked connecting rods with IROX coating are known from the B38/B46 engines.

B46TU / B48TU Engines

2. Engine Mechanical

IROX coating



TO14-0130

Detailed magnification of the IROX coating

| Index | Explanation |
|-------|---------------------------|
| 1 | IROX-coated bearing shell |
| 2 | Oil film |
| 3 | IROX coating |
| 4 | Bearing shell |
| 5 | Binding resin |
| 6 | Hard particle |
| 7 | Solid lubricant |

The IROX coating is applied to a conventional bearing shell. It consists of a binding resin matrix made of polyamide-imide with embedded hard particles and solid lubricants. The polyamide-imide ensures, in combination with the hard particles, that the bearing shell surface is so hard that material abrasion is no longer possible. The solid lubricants reduce surface friction and replace the oil film which briefly no longer exists between the bearing shell and the connecting rod bearing journal during the starting phase. The IROX bearings are red due to their special coating.

The IROX-coated bearing shells are only located on the connecting rod side as here the load acts mainly on the bearing shells. The bearing shell caps are equipped with a bearing shell without IROX coating.



If a connecting rod bearing cap is mounted the wrong way round or on another connecting rod, the fracture structure of both parts is destroyed and the connecting rod bearing cap is not centered. In this event the entire set of connecting rods must be replaced with new parts. In Service please observe the specified jointing torques and angle of rotation specifications in the repair instructions.

B46TU / B48TU Engines

2. Engine Mechanical

Bearing shell classification of connecting rod bearing

The connecting rod bearing shells are available in one standard size. It is therefore not necessary to follow a procedure similar to that used with the main bearing shells of the crankshaft.

2.2.3. Chain drive

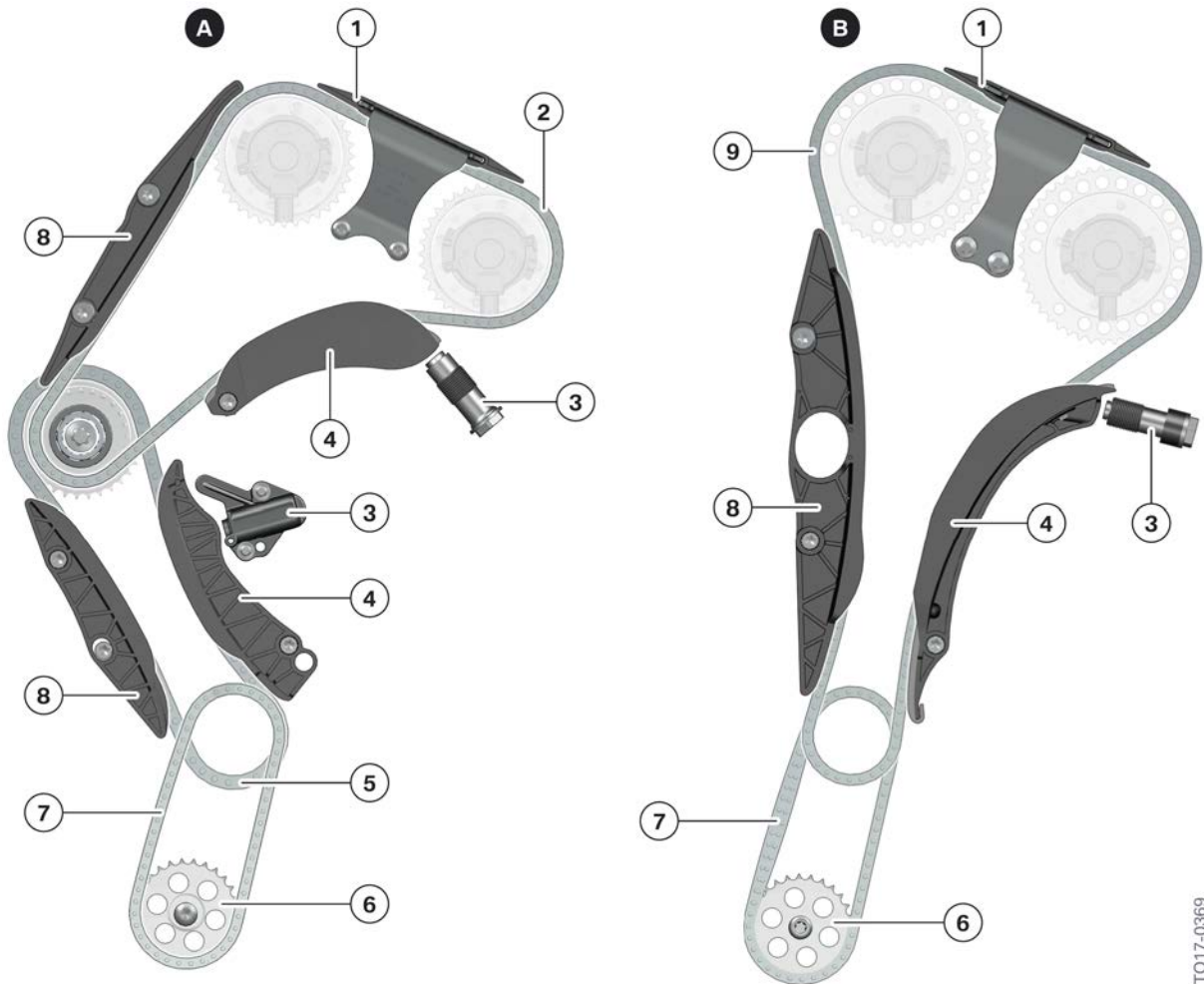
Features:

- Chain drive at the side of the engine emitting the forces.
- Single-part chain drive for driving the camshafts.
- Single sleeve-type chain 8 mm.
- Electric motor of the combined oil-vacuum pump via a separate chain.
- Plastic tensioning and guide rail.
- Hydraulic chain tensioner with spring preload and sealing sleeve.

The following comparison shows the differences between the timing chain drive of the B46 engine and that of the B46TU and B48TU engine:

B46TU / B48TU Engines

2. Engine Mechanical



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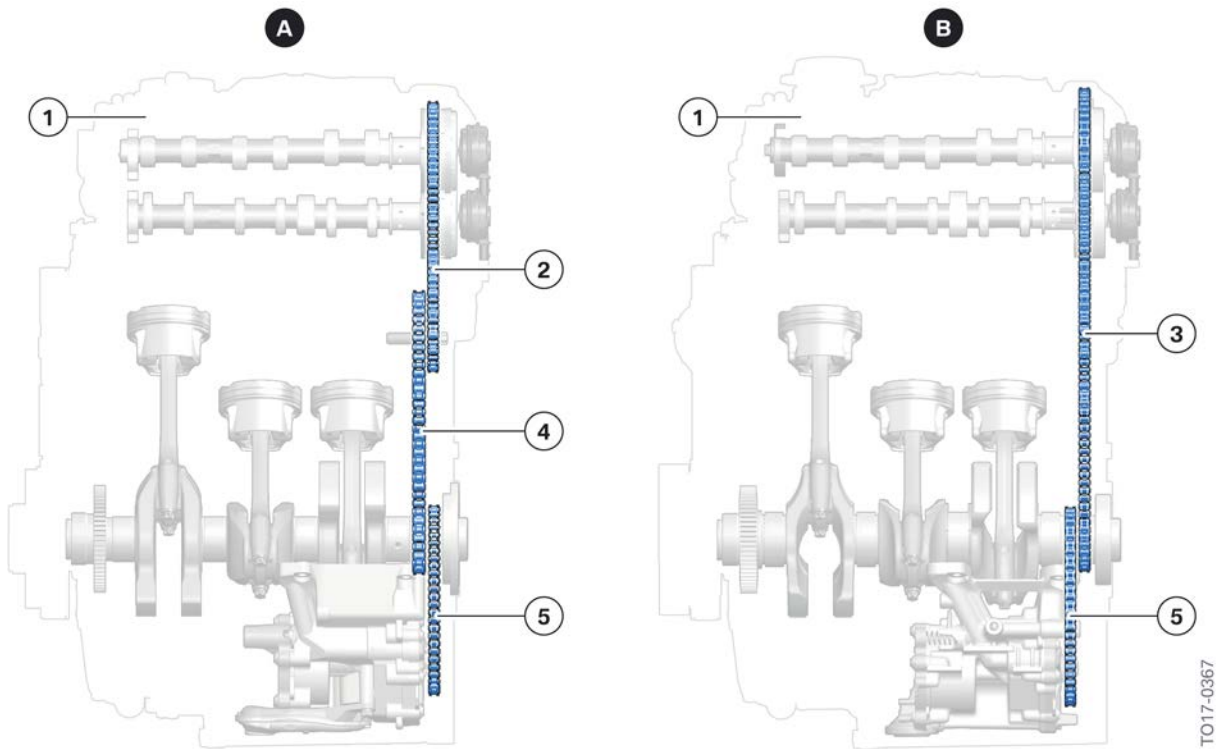
Comparison chain drive B46 engine with B46TU

| Index | Explanation |
|-------|--|
| A | Two-part chain drive B46 engine |
| B | Single-part chain drive B46TU and B48TU engine |
| 1 | Slide rail |
| 2 | Top timing chain |
| 3 | Chain tensioner |
| 4 | Tensioning rail |
| 5 | Bottom timing chain |
| 6 | Camshaft sprocket, oil/vacuum pump |
| 7 | Drive chain oil/vacuum pump |
| 8 | Guide rail |
| 9 | Timing chain |

B46TU / B48TU Engines

2. Engine Mechanical

The main difference between the chain drive compared with the B46 engine is the move from a two-part timing chain drive to a single-part timing chain drive. The timing chain directly drives the camshaft sprockets on the camshafts. Deflection via the intermediate shaft on the top timing chain and the second timing chain is no longer needed. The chains used here are 8 mm sleeve-type chains. Because the intermediate gearing is no longer needed, the number of teeth on the crankshaft (23 teeth) and the VANOS unit (46 teeth) has also changed.



Comparison chain track, B38 and B38TU engines shown

| Index | Explanation |
|-------|--|
| A | Chain track two-part timing chain drive (B38 engine shown, B46 is identical) |
| B | Chain track single-part timing chain drive (B38TU engine shown, B46TU and B48TU are identical) |
| 1 | B38 & B38TU engines shown |
| 2 | Upper timing chain |
| 3 | Timing chain |
| 4 | Lower timing chain |
| 5 | Drive chain oil/vacuum pump |

The way the combined oil/vacuum pump is driven by a separate drive chain from the crankshaft has not changed. Only the renewal of the chain tracks has changed; the drive chain for the oil/vacuum pump is now located in front of the timing chain.

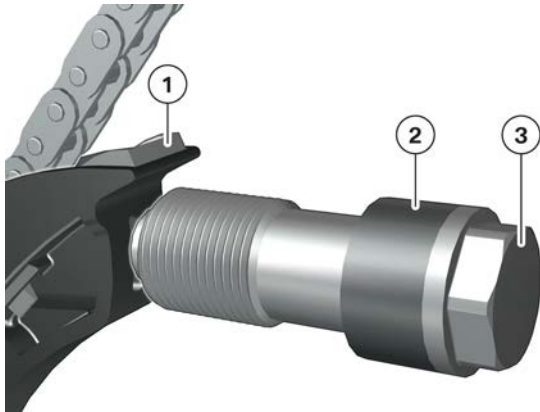
B46TU / B48TU Engines

2. Engine Mechanical

Eliminating the second timing chain offers the following benefits:

- Improved acoustics
- Lower space requirement
- Reduced weight

Chain tensioner



Chain tensioner

| Index | Explanation |
|-------|-----------------------------------|
| 1 | Tensioning rail |
| 2 | Sealing sleeve |
| 3 | Chain tensioner with screw thread |

Due to the cylinder head manufacturing process, the chain tensioner now has a sealing sleeve with a height of 12.5 mm instead of a sealing ring.

B46TU / B48TU Engines

2. Engine Mechanical

2.3. Valve gear

2.3.1. VANOS



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VANOS unit B46 engine and B46TU/B48TU engines

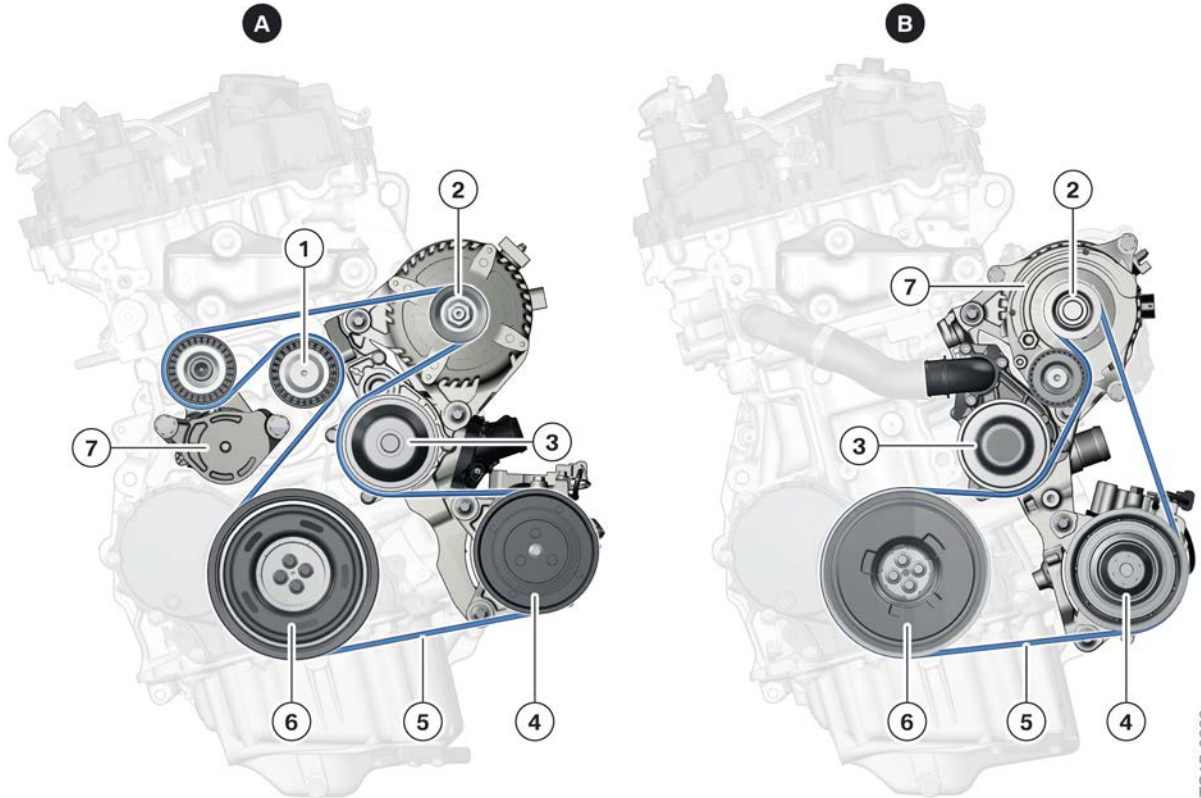
| Index | Explanation |
|-------|------------------------------|
| A | VANOS B46 engine |
| B | VANOS B46TU and B48TU engine |

Following the changeover from a two-part chain drive to a single-part chain drive, the camshaft sprockets on the VANOS now have 46 teeth instead of the previous 36 teeth. To compensate for the additional weight of the larger camshaft sprockets, the adjuster was designed to be shorter and more compact. Additionally, the chain track was displaced by 1.5 mm.

B46TU / B48TU Engines

2. Engine Mechanical

2.4. Belt drive



Comparison belt drive B46 engine and B46TU/B48TU engines

| Index | Explanation |
|-------|---|
| A | B46 Engine (transverse installation shown) |
| B | B46TU/B48TU engines (transverse installation shown) |
| 1 | Deflecting element |
| 2 | Alternator |
| 3 | Coolant pump |
| 4 | Air conditioning compressor |
| 5 | Ribbed belt |
| 6 | Torsional vibration damper |
| 7 | Belt tensioner |

The belt layout is a single-belt drive where all ancillary components are driven by one belt. Changing the belt guiding has help to save both material and space.

The length of the drive belt changes due to thermal expansion and ageing. So the drive belt can transmit the required torque, it must be continuously in contact with the belt pulley at a defined pressure. To allow this to happen, the belt tension is exerted by an automatic tensioning pulley mounted on the alternator; the pulley compensates for belt elongation over the full service life.

TO17-0363

B46TU / B48TU Engines

2. Engine Mechanical



In case of incorrect assembly of the drive belt, the coolant flow through the coolant pump is either insufficient or non-existent; there is thus a lack of cooling. There is a risk of damage to engine components and engine damage!

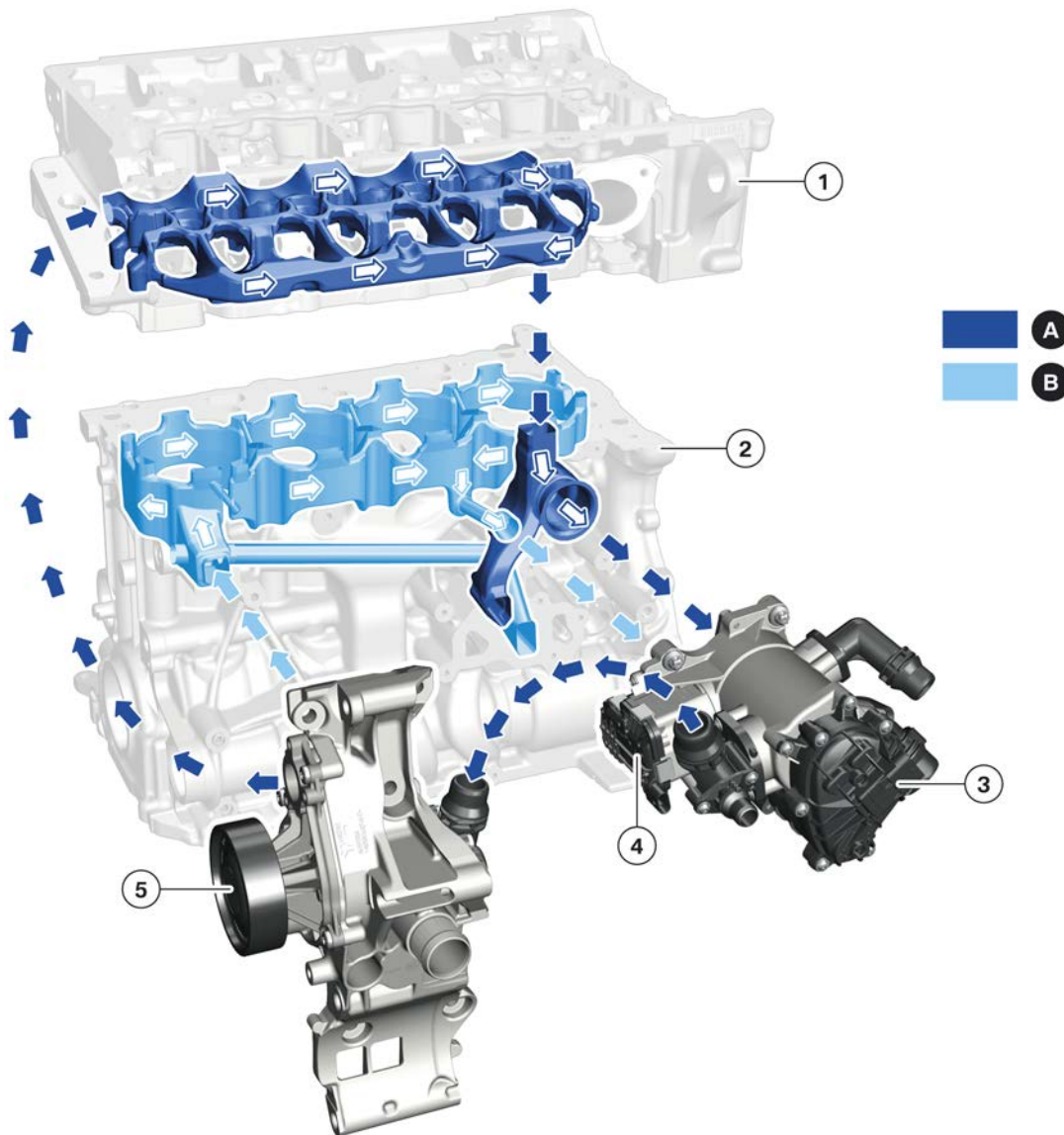
B46TU / B48TU Engines

3. Cooling System

3.1. Split cooling

Split cooling is a new development for the B46TU engine. This cooling concept is a modified version of which is already used in the N63TU2.

The Split Cooling function uses the electrical Split Cooling Valve (SCV), to enable on-demand decoupling of the crankcase from the coolant flow both in the warm-up phase and in partial load operation. In this situation, the coolant is exclusively routed through the cylinder head. The engine reaches its operating temperature more quickly in the warm-up phase, and can be operated with reduced emissions in partial load operation.



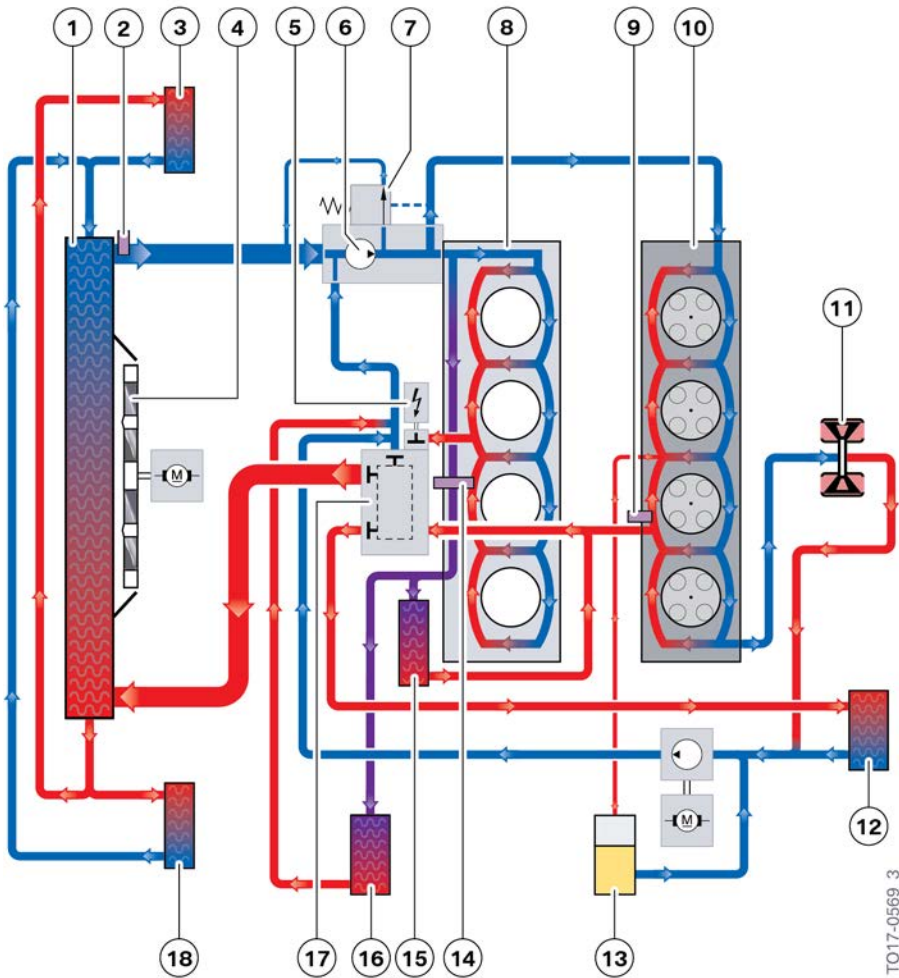
Coolant circuit

TO17-0389

B46TU / B48TU Engines

3. Cooling System

| Index | Explanation |
|-------|---|
| A | High cooling requirement, Split Cooling cylinder head |
| B | Low cooling requirement, Split Cooling crankcase |
| 1 | Cylinder head |
| 2 | Crankcase |
| 3 | Heat management module |
| 4 | Split Cooling Valve (SCV) |
| 5 | Coolant pump |



Cooling system overview

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B46TU / B48TU Engines

3. Cooling System

| Index | Explanation |
|-------|--|
| 1 | Radiator |
| 2 | Coolant temperature sensor radiator outlet |
| 3 | Additional coolant radiator |
| 4 | Electric fan |
| 5 | Split Cooling Valve (SCV) |
| 6 | Coolant pump |
| 7 | Bypass valve |
| 8 | Engine block (crankcase) |
| 9 | Coolant temperature sensor engine outlet |
| 10 | Cylinder head |
| 11 | Exhaust turbocharger |
| 12 | Heater core |
| 13 | Expansion tank |
| 14 | Component temperature sensor |
| 15 | Engine oil/coolant heat exchanger |
| 16 | Transmission oil/coolant heat exchanger |
| 17 | Heat management module |
| 18 | Additional coolant radiator |

In Split Cooling, the cooling requirements for the crankcase and the cylinder head are managed by the electrical Split Cooling Valve (SCV). The fact that the engine reaches operating temperature more quickly again translates to substantial consumption and emission reductions.

To guarantee optimal heat distribution during the cylinder head and crankcase warm-up, the coolant supply for the cylinder head and crankcase is controlled individually. Controlled by the Digital Motor Electronics (DME), the coolant is distributed by the electrical Split Cooling Valve (SCV) on the heat management module in the warm-up phase such that substantially more coolant is available to the cylinder head than to the crankcase. Depending on the engine's operating condition, the Digital Motor Electronics (DME) controls the distribution of the coolant quantity to the cylinder head and crankcase as required.



A bleeding procedure must be carried out in accordance with the repair instructions and is required following a part exchange in the cooling system or refilling of the cooling system.

A video demonstrating the bleeding procedure can be found in the B46TU Engine on-line course (OL1837).

Filling **without** a vacuum filler device (watering can filling) is **not approved!** There is a risk of engine damage in case of failure to comply! The filling procedure **must** be observed!

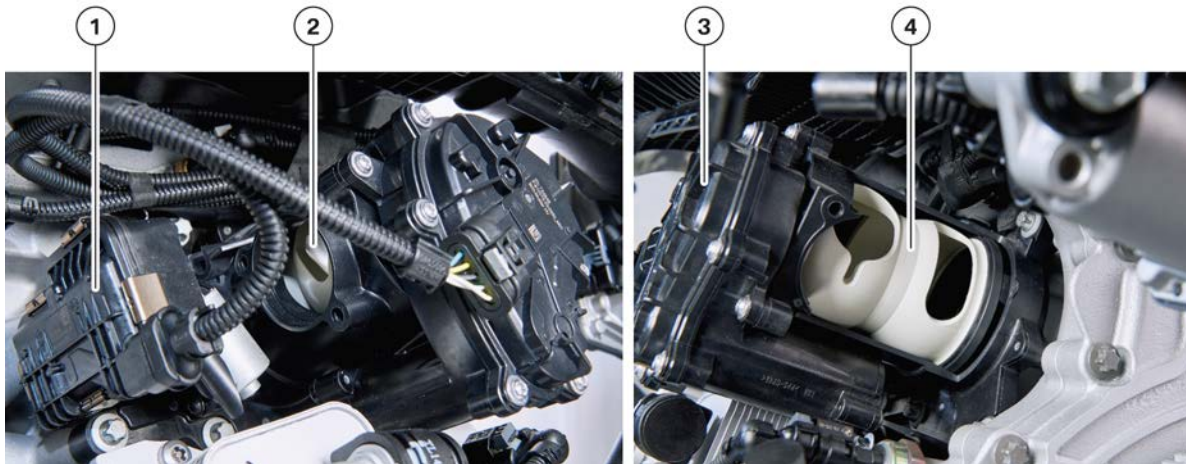
Operation of the vehicle is not permitted without completing the entire filling procedure sequence. There is a risk of functional limitations or overheating.

B46TU / B48TU Engines

3. Cooling System

3.2. Heat management module

The heat management module replaces the characteristic map thermostat.



Heat management module

| Index | Explanation |
|-------|---|
| 1 | Electrical Split Cooling Valve (SCV) |
| 2 | Coolant output towards the coolant pump |
| 3 | Electrical actuator |
| 4 | Rotary valve |

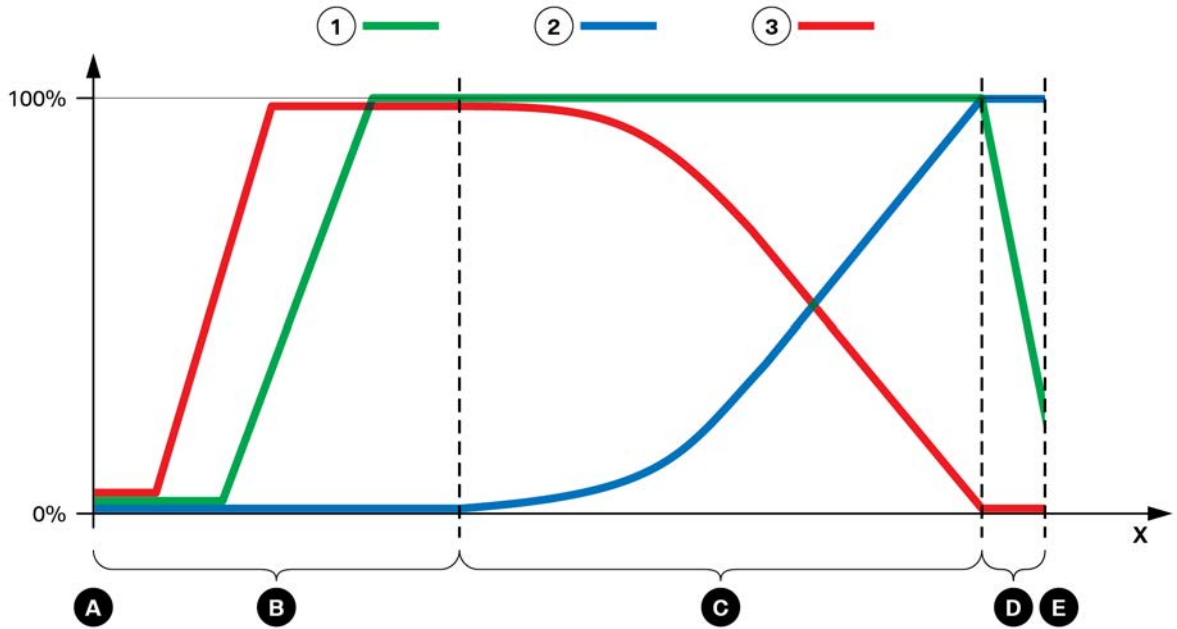
A rotary valve inside the heat management module ensures needs-driven cooling of the various engine components. The opening cross-sections of the various coolant ducts can be opened or closed variably. A position sensor in the electrical actuator of the heat management module forwards the current position of the rotary valve to the Digital Motor Electronics (DME). The exact position of the rotary valve can thus be determined so that it opens or closes a precisely defined cross-section with respect to the various coolant ducts. Adjusting the cross-sections ideally adapts the flow rates of the coolant ducts connected to the heat management module to the engine operating points. To correctly position the rotary valve, the Digital Motor Electronics (DME) require information including the coolant temperature from the coolant temperature sensor, and the material temperature of the cylinder head from the component temperature sensor. Warm-up and cooling of the engine and the supply to ancillary components can be implemented as driven by requirements, thus optimizing consumption.

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3. Cooling System

3.3. Operating strategy

The following graphic shows the positions of the rotary valve as the coolant temperature increases:



Switching diagram heat management module

| Index | Explanation |
|-------|---|
| 0% | Rotary valve closed |
| 100% | Rotary valve open |
| A | Cold start |
| B | Warm-up phase |
| C | Operating temperature |
| D | Transition from normal operation to maximum cooling requirement |
| E | Maximum cooling requirement |
| X | Rotational angle in angular degrees |
| 1 | Heater circuit |
| 2 | Main coolant circuit |
| 3 | Minor coolant circuit |

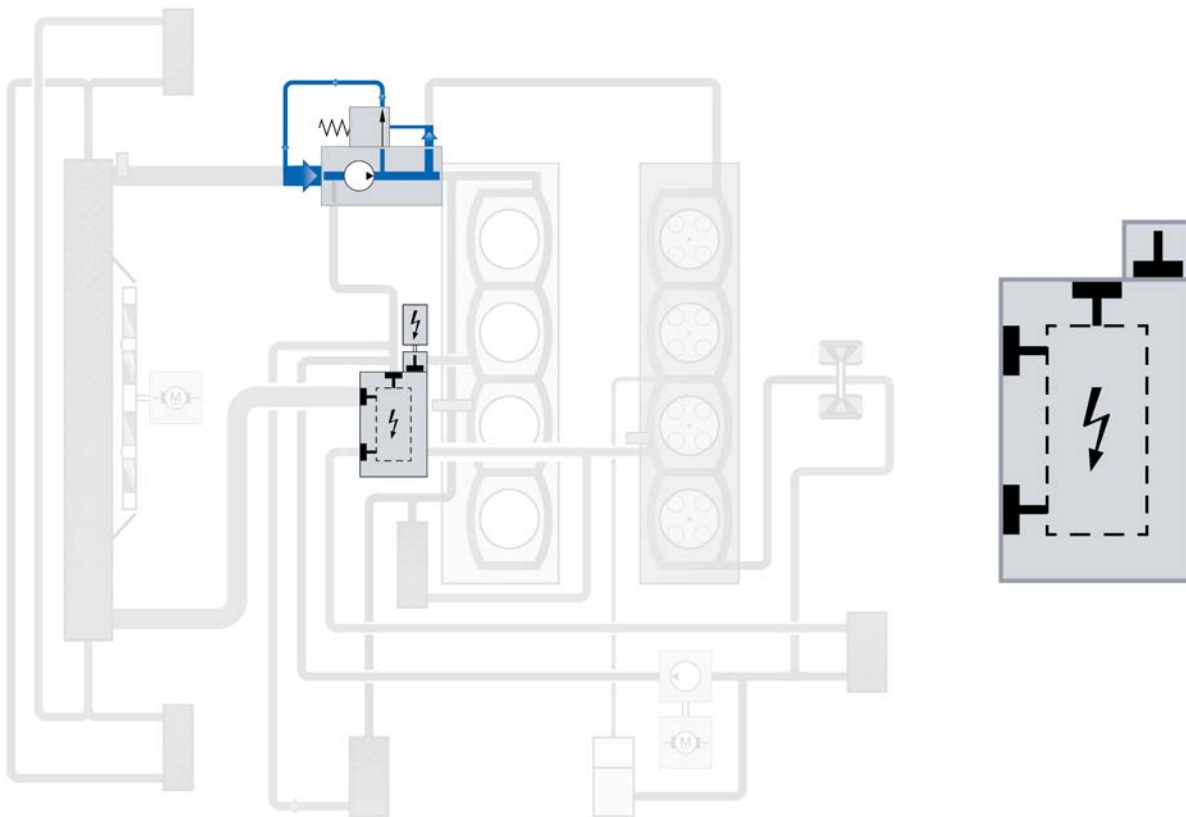
The openings on the rotary valve vary the cross-sections of the different coolant ducts as a function of the rotational angle of the rotary valve. The following graphics schematically represent the various engine operation phases, from cold start to maximum cooling requirement.

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3. Cooling System

3.3.1. Cold-start phase

Point A in the heat management module circuit diagram designates the cold start with an engine that has completely cooled down.



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Cold-start phase

In the cold-start phase, the coolant circulates exclusively via a bypass in the coolant pump. The rotary valve in the heat management module closes the coolant lines so that the excess pressure that builds up opens the pressure relief valve in the coolant pump (opening pressure 2.2 bar) and the coolant is recirculated in the coolant pump.

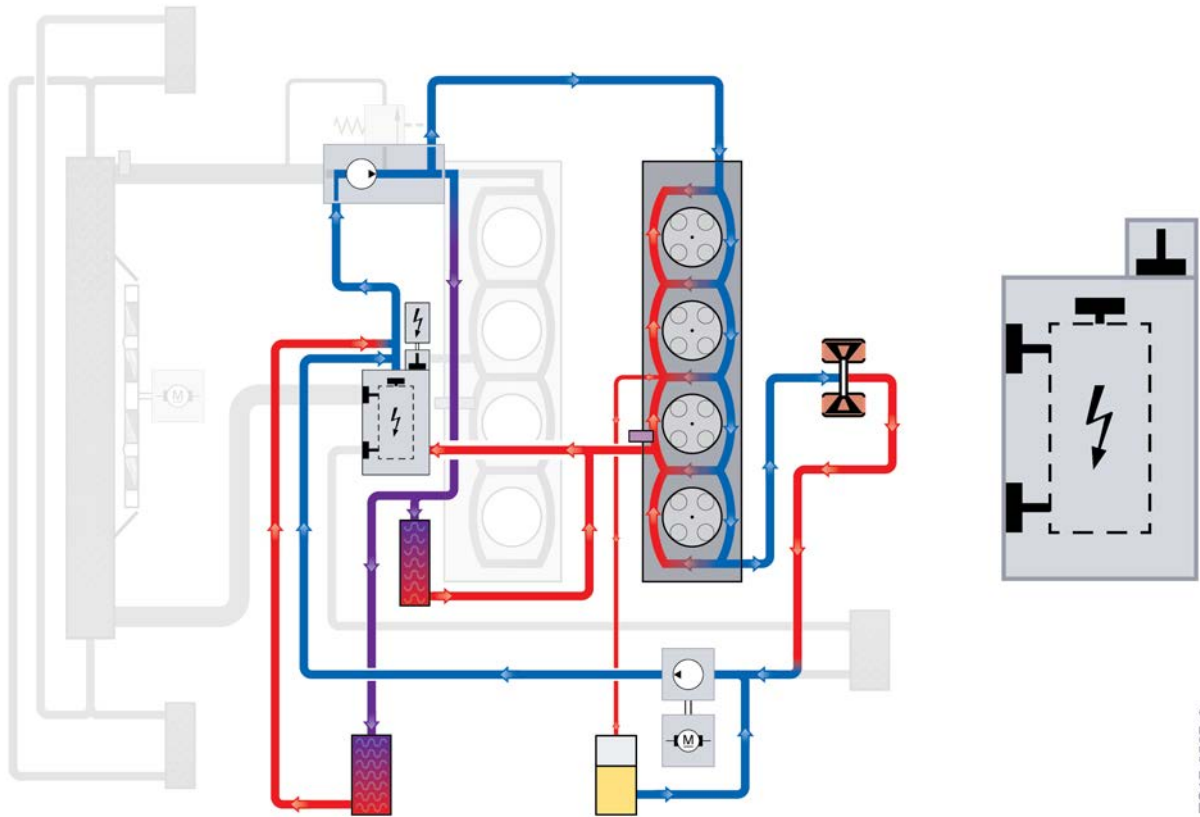
Because the coolant circuits through the exhaust turbocharger and the ventilation line of the cylinder head cannot be closed, a low volumetric flow is returned to the coolant pump here.

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3. Cooling System

3.3.2. Warm-up phase

Area A in the circuit diagram for the heat management module shows the opening angle of the rotary valve in the warm-up phase.



Warm-up phase

In the warm-up phase, the heat management module additionally opens the connection to the heating in addition to opening the bypass line. The coolant flows through the cylinder head, the exhaust turbocharger and the engine oil/coolant heat exchanger. The electrical Split Cooling Valve is closed; no coolant flow through the engine block (Split Cooling).

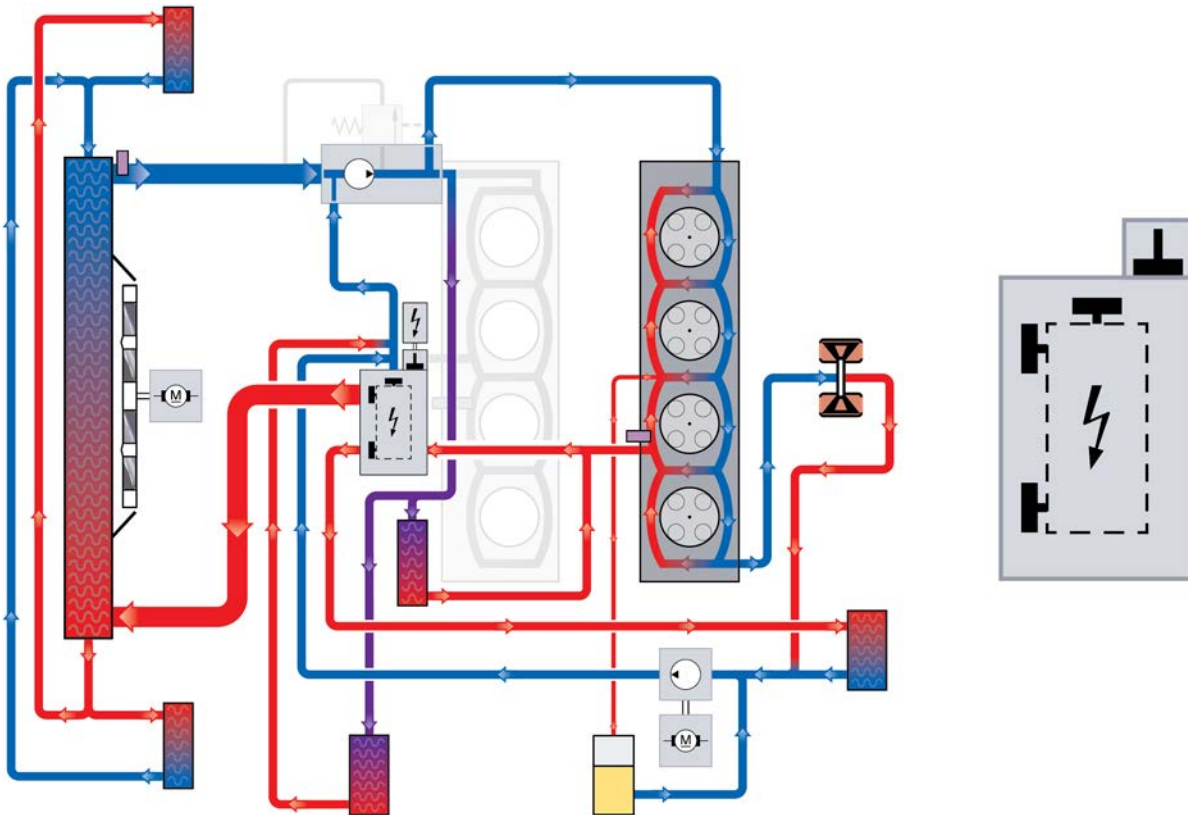
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B46TU / B48TU Engines

3. Cooling System

3.3.3. Operating temperature

The positions of the rotary valve at engine operating temperature are shown by area C of the heat management module circuit diagram.



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Operating temperature

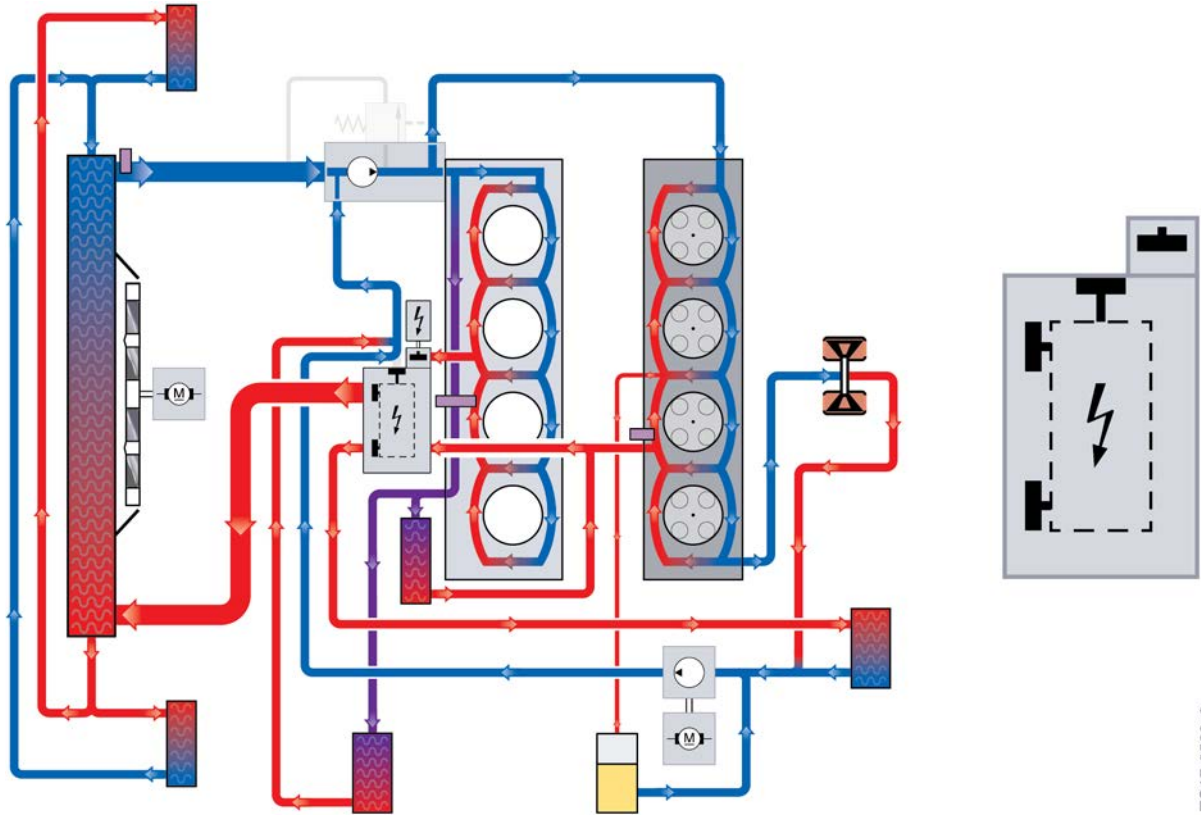
The graphic shows control with the engine at operating temperature. The position of the rotary valve means that the cross-sections of the respective coolant lines are open to a greater or lesser extent depending on the coolant temperature. The coolant flows with a varying volumetric flow through the small coolant circuit, the large coolant circuit and the heater circuit. Depending on the load request, the crankcase's coolant connection is opened by the electrical Split Cooling valve, thus cooling the crankcase. Large engine operation ranges are covered with the crankcase coolant circuit closed.

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3. Cooling System

3.3.4. Maximum cooling requirement

The maximum cooling requirement is shown at point E of the heat management module circuit diagram.



Maximum cooling requirement

To provide maximum cooling at high dynamic loads and/or high ambient temperatures, the radiator connection is fully opened (100%) and the bypass line is completely closed. Additionally, the heater circuit is 90% closed to achieve the maximum cooling thanks to the maximum coolant volumetric flow through the large coolant circuit.

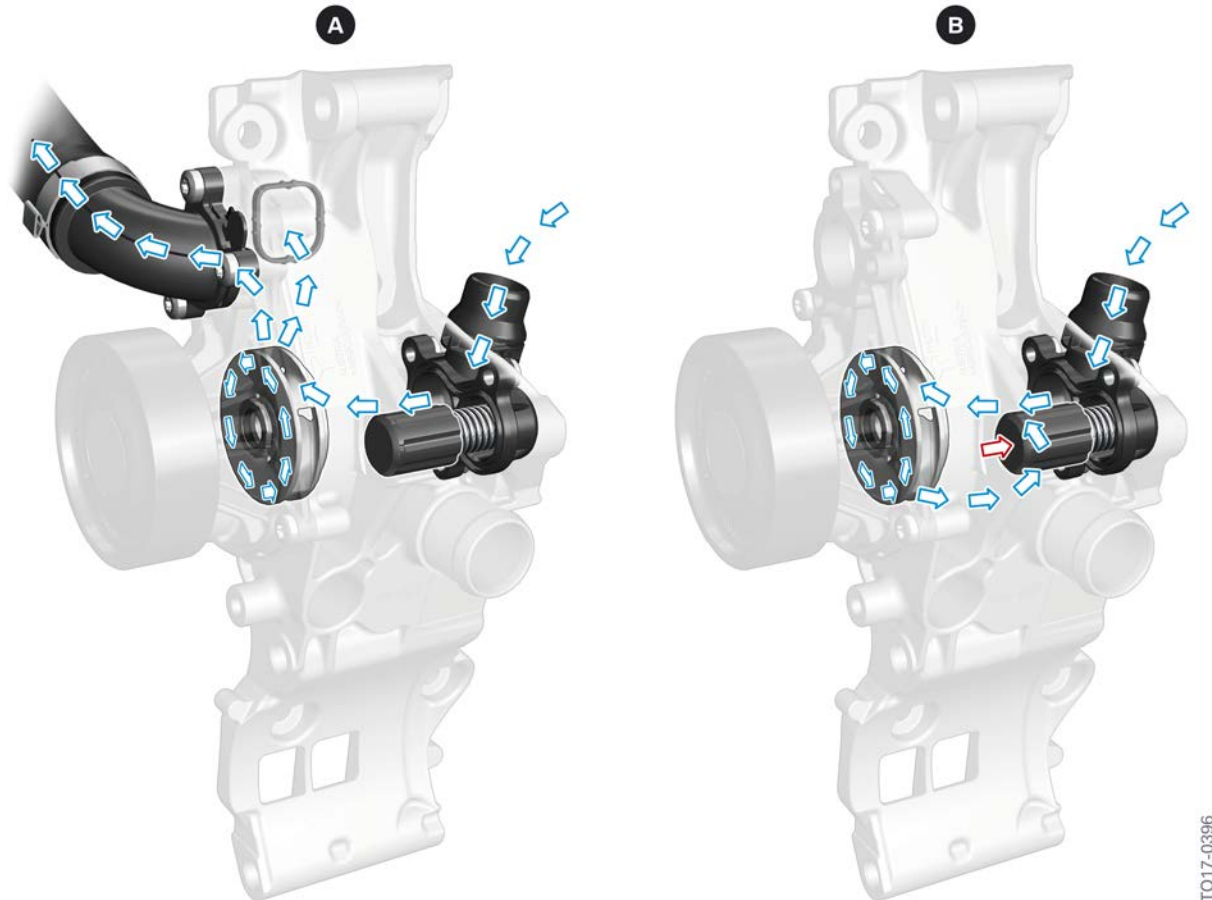
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B46TU / B48TU Engines

3. Cooling System

3.4. Coolant pump

The layout and function of the coolant pump have been revised and adapted to match the cooling concept of the B46TU/B48TU engines.



TO17-0396

Coolant pump

| Index | Explanation |
|-------|--|
| A | Pressure relief valve closed (pressure < 2.2 bar / 32 psi) |
| B | Pressure relief valve opened (pressure > 2.2 bar / 32 psi) |

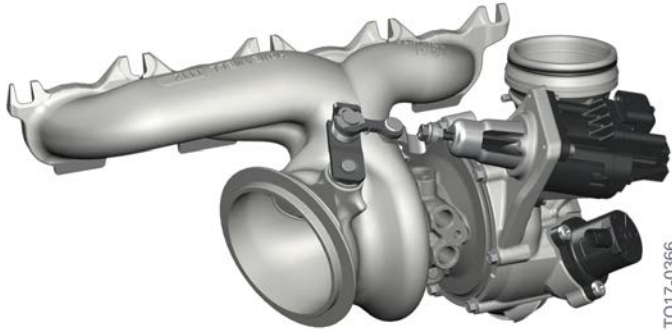
A pressure relief valve is installed in the mechanical coolant pump housing. In combination with the heat management module, the pressure relief valve on the one hand ensures that the engine operating temperature is reached more quickly, while at the same time reducing leaks and component damage due to high pressure in the cooling system.

If an excess pressure of more than 2.2 bar (32 psi) builds up in the coolant circuit, the pressure relief valve opens and releases a bypass channel. The coolant is now exclusively circulated in the pump body. Once the pressure drops below 2.2 bar (32 psi), the pressure relief valve closes and the coolant is again routed through the coolant ducts.

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4. Exhaust System

4.1. Exhaust turbocharger



Exhaust turbocharger

The exhaust turbocharger can be replaced individually and is exclusively made of steel. The boost charge pressure is still controlled by an electrical wastegate valve.

The Turbo on the B46TU and B48TU are different in design.

B46TU / B48TU Engines

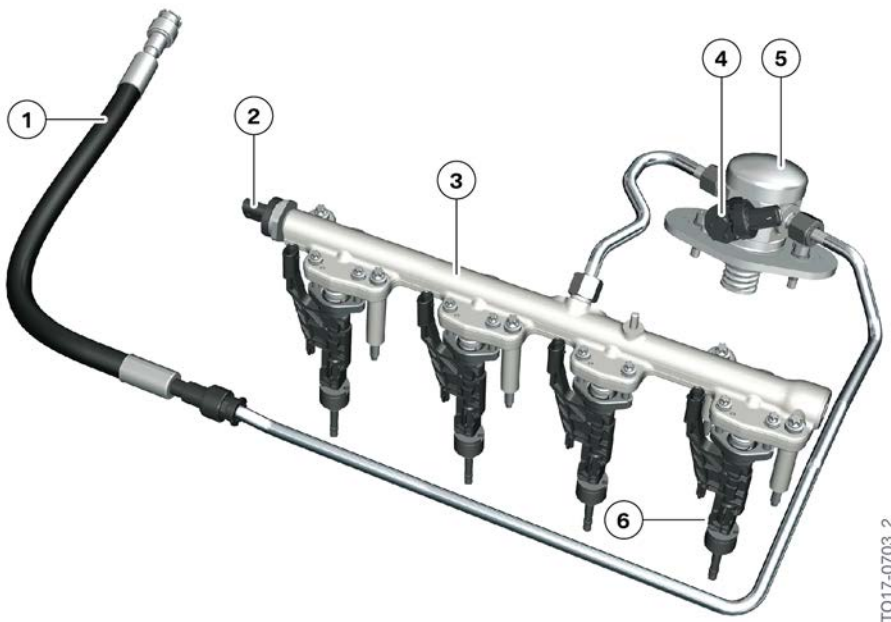
5. Fuel System

The fuel system is made up of the fuel supply and fuel preparation systems. The fuel supply includes the fuel tank with all mounted parts and the fuel lines up to the engine compartment.

The fuel preparation system consists of the fuel filter lines in the engine compartment and all the fuel system parts on the engine.

5.1. Fuel preparation

The fuel preparation has again been adapted to meet the emission legislation requirements. The high pressure pump and the injectors have been revised and designed for an fuel injection pressure of 350 bar (5076 psi).



Overview of fuel preparation

| Index | Explanation |
|-------|-------------------------|
| 1 | Fuel delivery line |
| 2 | Rail pressure sensor |
| 3 | Direct rail |
| 4 | Quantity control valve |
| 5 | High pressure pump |
| 6 | Solenoid valve injector |



Strict cleanliness must be observed when carrying out any work on the fuel system!

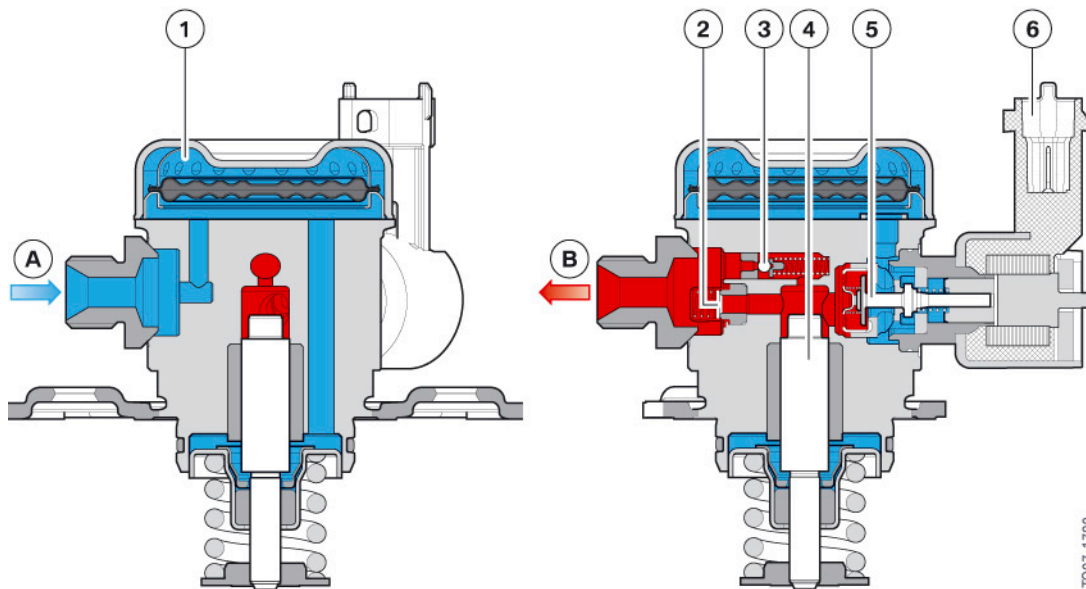
B46TU / B48TU Engines

5. Fuel System

5.1.1. Fuel high-pressure pump

The single-piston high pressure pump by Bosch, well-known from the B46 engine, is used. The high pressure pump HDP6 is driven by a triple cam which is attached to the exhaust camshaft. To be able to accommodate a fuel system pressure of 350 bar (5076 psi), the pump piston and tappet have been modified.

Low pressure fuel is supplied to the high pressure pump via the in tank electric fuel pump.



Bosch high-pressure pump HDP6

| Index | Explanation |
|-------|--|
| A | Low-pressure connection |
| B | High-pressure connection |
| 1 | Balancing chamber |
| 2 | High-pressure non-return valve |
| 3 | Pressure-limiting valve |
| 4 | Pump piston |
| 5 | Fuel fuel quantity control valve |
| 6 | Electrical connection of fuel quantity control valve |

The fuel quantity control valve at the high pressure pump adjusts the fuel pressure in the rail. The maximum pressure in the rail is 350 bar (5076 psi); it is kept throughout the engine's entire operating range. The fuel pressure is only reduced to 150 bar (2175 psi) during idling. The high pressure pump contains a pressure limiting valve which opens at a pressure of 400 bar (5801 psi). The fuel quantity control valve is activated via a Pulse-Width-Modulated (PWM) signal and assumes the open position in the de-energized state. This means the pump piston of the high pressure pump cannot compress the fuel.

B46TU / B48TU Engines

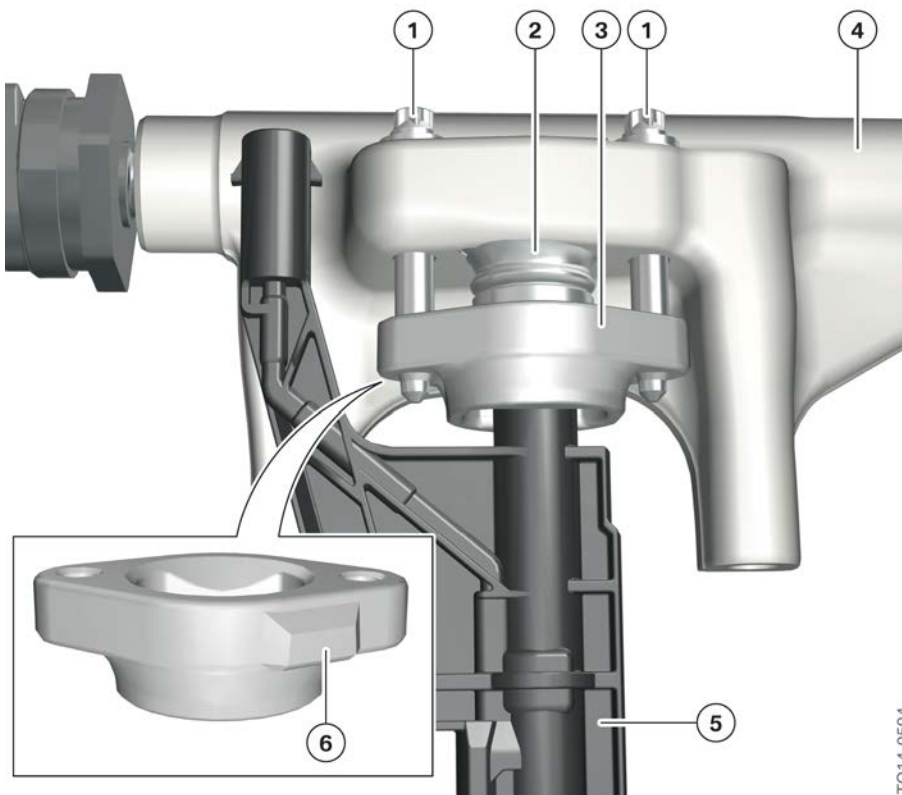
5. Fuel System

The high pressure pump in the high-pressure fuel system cannot build up pressure if the fuel quantity control valve is pulled off. In this situation, the maximum low fuel pressure of 5.8 bar (84 psi) would be present in the rail during an engine start. The system would be in emergency operation. To ensure the engine remains capable of running in this state, the opening period of the solenoid valve injectors has been extended and the idle speed increased. Although the vehicle remains drivable, the maximum engine performance is not available.



Due to the high fuel pressures, the fuel lines must never be detached when the engine is in operation. When removing the high pressure pump, follow the specifications in the current repair instructions. Excessive tilting of the pump can damage the pump piston!

5.1.2. Direct rail



TO14-0504

Injector mounting

B46TU / B48TU Engines

5. Fuel System

| Index | Explanation |
|-------|---|
| 1 | Mounting bolts |
| 2 | Plastic sleeve (not required to be reinstalled after taken apart for service) |
| 3 | Holding clamp with bayonet fitting |
| 4 | Rail |
| 5 | Solenoid valve injector |
| 6 | Casting lug |

The solenoid valve injectors are fastened to the holding clamp with a bayonet fitting. There is a plastic sleeve between the holding clamp and direct rail. This is not designed to collect escaping fuel. This is only used to support a helium leakage test during pre-assembly at the factory in order to check the tightness. After the initial assembly, this plastic sleeve is of no relevance to the engine operation. When the solenoid valve injectors are replaced, the plastic sleeves are no longer required and do not need to be reinserted.

The mounting bolts of the holding clamp must be replaced each time they are released.



The housing on the solenoid valve injectors is sensitive to excessive tensile forces and excessive rotational angles. When removing and installing the solenoid valve injectors, the procedure in the current repair instructions must be followed! If the solenoid valve injectors are damaged, fuel may be discharged.

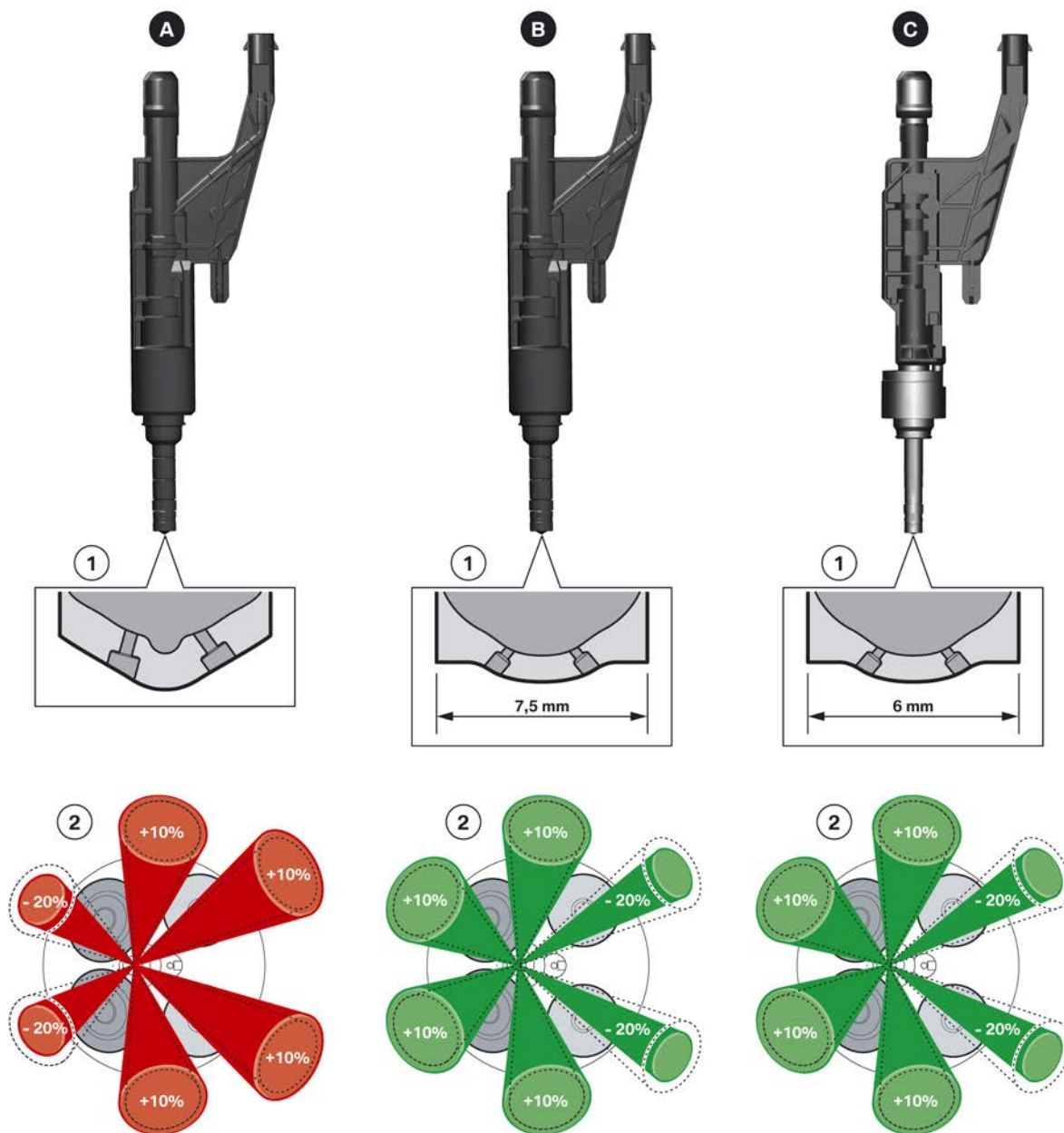
B46TU / B48TU Engines

5. Fuel System

5.1.3. Solenoid valve injector

Measures at the solenoid valve injector

The following graphic illustrates the differences between the HDVE5 and HDEV6 fuel injectors:



Solenoid valve injectors

TO17-0397

B46TU / B48TU Engines

5. Fuel System

| Index | Explanation |
|-------|---|
| A | Solenoid valve injector HDEV5 |
| B | Solenoid valve injector HDEV5 EVO |
| C | Solenoid valve injector HDEV6 (B46TU engine) |
| 1 | Injector seat |
| 2 | Injection pattern and volumetric distribution |

The new B46TU engine uses a solenoid valve injector HDEV6 by Bosch. Due to the more stringent exhaust gas emission regulations required to meet the exhaust emission standards, technical changes were again made to the solenoid valve injectors. Sorted fuel injectors are used. This means that they are hand selected at the factory and tested for the least amount of fuel leakage.

The solenoid valve injectors HDEV5 and HDEV5 EVO are used in the B46 engine. While keeping the fuel system pressure of 200 bar (2900 psi) (HDEV5 to HDEV5 EVO), a reduction in pollutant emission was achieved by changing the injection pattern and volumetric distribution.

Due to the fuel system pressure increase from 200 bar (2900 psi) to 350 bar (5076 psi), the solenoid valve injectors HEDV6 were optimized using suitable materials and coatings. The injection pattern and volumetric distribution have not changed compared with the HDEV5 EVO.

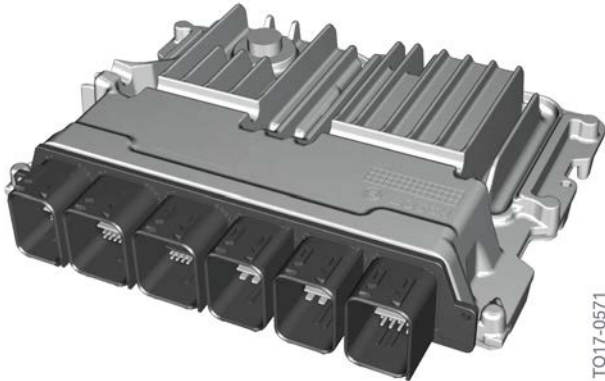


The repair instructions that are currently valid must be carefully followed when removing and installing the injectors in Service. An excessive rotational angle at the injector shank, and excessive tensile and compression forces during removal and installation can lead to damage and therefore leaks in the fuel system.

B46TU / B48TU Engines

6. Engine Electrical System

6.1. Digital Motor Electronics (DME)



DME 8 control unit

The Digital Motor Electronics (DME) is the computing and switching center. Sensors on the engine and the vehicle deliver the input signals and actuators implement the commands. The Digital Motor Electronics (DME) calculates the corresponding activation signals for the actuators from the input signals, and also the computing models and characteristic maps stored.

The operating voltage range of the Digital Engine Electronics (DME) is between 6 and 16 volts.

An ambient pressure sensor and a temperature sensor are integrated in the Digital Motor Electronics (DME).

The ambient pressure sensor permits precise determination of the density of the ambient air. This information is required for various diagnostic functions. In addition, in the event of a failure of the hot film air mass meter, a precise substitute value can be calculated for the cylinder filling with the help of additional input variables.

The temperature sensor measures the temperature inside the control unit. If the temperature there rises too sharply, multiple fuel injection is reduced for example, in order to cool the output stages slightly and to keep the temperature inside the control unit in a non-critical range.

The B46TU engine will have the DME 8 engine electronics generation. Depending on the engine version, the Digital Motor Electronics (DME) will be given a specific designation.

DME 8.x.y.z (x = number of cylinders, y = vehicle electric system architecture, z = H (hybrid)) can be decoded as follows:

- DME 8.4.0 = B46TU
- DME 8.6.0 = B58
- DME 8.8.0 = N63TU2



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