

Engine cooling

Engine cooling

A turbocharged engine with direct fuel injection makes strong demands on the engine cooling. On the N14, e.g., an additional coolant pump is used for the exhaust turbocharger.

Brief description of components

The following Diagrams are described for engine cooling:

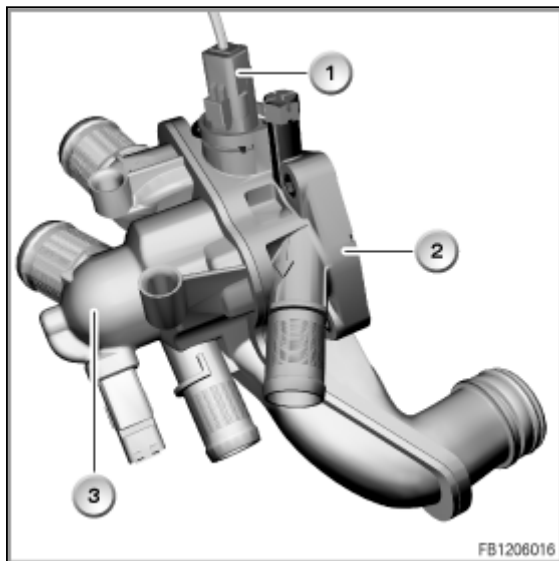
Electric Fan

The fan in the N14 is 2-stage.

There is a separate relay for each fan setting. The two relays are in the engine compartment distribution box.

Engine temperature sensor

The engine temperature sensor picks up the coolant temperature of the engine cooling circuit. The coolant temperature is one of the measured variables e.g. for the following calculations: fuel injection rate and nominal idle speed.



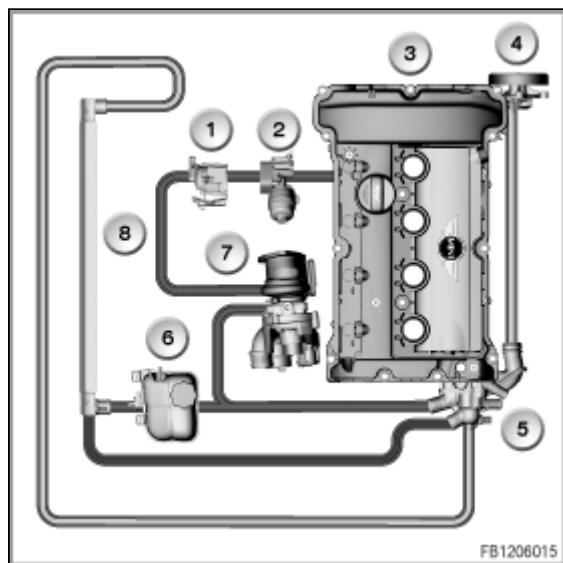
| <i>Index</i> | <i>Explanation</i> | <i>Index</i> | <i>Explanation</i> |
|--------------|-------------------------------|--------------|--------------------|
| 1 | Engine temperature sensor | 2 | Thermostat housing |
| 3 | Characteristic map thermostat | | |

The engine temperature sensor is on the thermostat housing.

Characteristic map thermostat

There is a heating element in the map thermostat.

The map thermostat opens and closes as regulated by a characteristic map. The opening temperature is 105 °C. The map thermostat sets a constant coolant temperature within its control range at the engine inlet.



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|--------------|-------------------------------|--------------|--------------------------|
| 1 | Turbocharger coolant pump | 2 | Oil-water heat exchanger |
| 3 | Engine | 4 | Coolant pump |
| 5 | Characteristic map thermostat | 6 | Expansion tank |
| 7 | Exhaust turbocharger | 8 | Radiator |

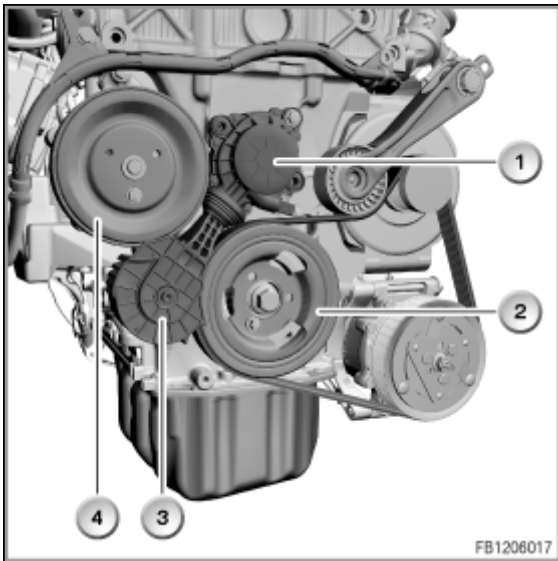
In driving states with low load, the map thermostat sets a high coolant temperature (favourable for consumption). At full load or high engine speed, the coolant temperature is lowered to approx. 85 °C to protect the components.

Wheel and disk actuating drive

On the N14 engine, the coolant pump is driven for the first time by a frictional wheel. The back of the belt on the belt pulley of the crankshaft drives the frictional wheel. The frictional wheel drives the coolant pump.

This means that no second belt drive is necessary.

On the N14, the coolant pump runs in parallel under all operation conditions (cannot be switched).



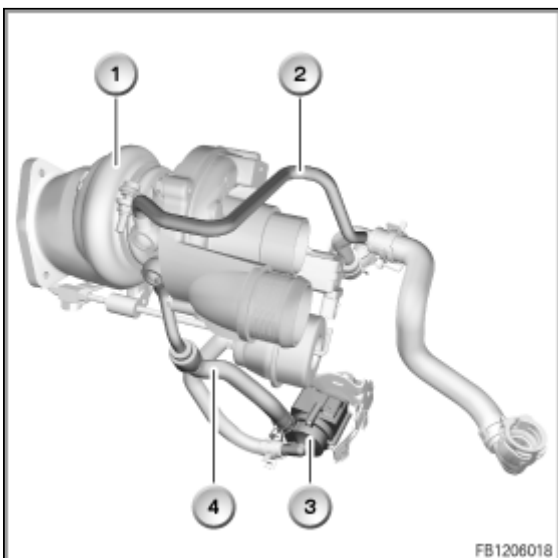
Engine with air-conditioning compressor shown

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|--------------|--------------------------------|--------------|-------------------------|
| 1 | Wheel and disk actuating drive | 2 | Crankshaft drive gear |
| 3 | Frictional wheel | 4 | Coolant pump drive gear |

The wheel and disk actuating drive means that the engine is very short and compact.

Turbocharger coolant pump

The engine has an additional coolant pump. The DME control module switches on the turbocharger coolant pump after stopping the engine. This prevents a thermal overload of the exhaust turbocharger. Even at high oil temperatures, the turbocharger coolant pump cools the exhaust turbocharger.



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|--------------|---------------------------|--------------|--------------------|
| 1 | Exhaust turbocharger | 2 | Return line |
| 3 | Turbocharger coolant pump | 4 | Delivery line |

System functions

The following system functions are described for the engine cooling:

Engine cooling

The map thermostat opens and closes, regulated by a characteristic map. This regulation can be divided into 3 operating ranges:

- Engine cold, map thermostat closed:
The coolant only flows in the engine (short circuit). The cooling circuit is closed. The thermostat is not activated.
- Engine hot, map thermostat open:
The entire volume of coolant flows via the radiator. This means that the maximum available cooling output is exploited.
The thermostat is not activated.
- Control range of the map thermostat:
Part of the coolant flows through the radiator. The map thermostat opens as of 105 °C and maintains a constant coolant temperature. In this operating range, the map thermostat can now be used to influence the coolant temperature specifically. This enables the setting of a higher coolant temperature in the part-load range of the engine. At higher operating temperatures in the part-load range, friction is reduced. This results in lower consumption and pollutant emissions. During full-load operation, higher operating temperatures involve disadvantages (retarding of the ignition due to knocking). For this reason, during full-load operation, the map thermostat is used to specifically set a coolant temperature of 85 °C.

Notes for Service department

General information

Note! Vehicles without air-conditioning compressor without belt tensioner.

On vehicles without an air-conditioning compressor, there is no belt tensioner.

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