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**Technical training.
Product information.**

N55 Engine.



BMW Service

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General information

Symbols used

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



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

Information status and national variants

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to left-hand drive vehicles with European specifications. Some controls or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as the result of the equipment variants used in specific markets or countries.

Additional sources of information

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

- Owner's Handbook
- Integrated Service Technical Application.

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The information contained in this document form an integral part of the technical training of the BMW Group and are intended for the trainer and participants of the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the Technical Data.

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VH-23/International Technical Training

N55 Engine.

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N55 Engine.

1. Introduction

1.1. Highlights

The N55 engine is the successor to the N54 engine. Re-engineering and modifications have made it possible to now use only one exhaust turbocharger. Against the backdrop of reduced costs and improved quality, the technical data have remained virtually the same.

1.1.1. Technical data

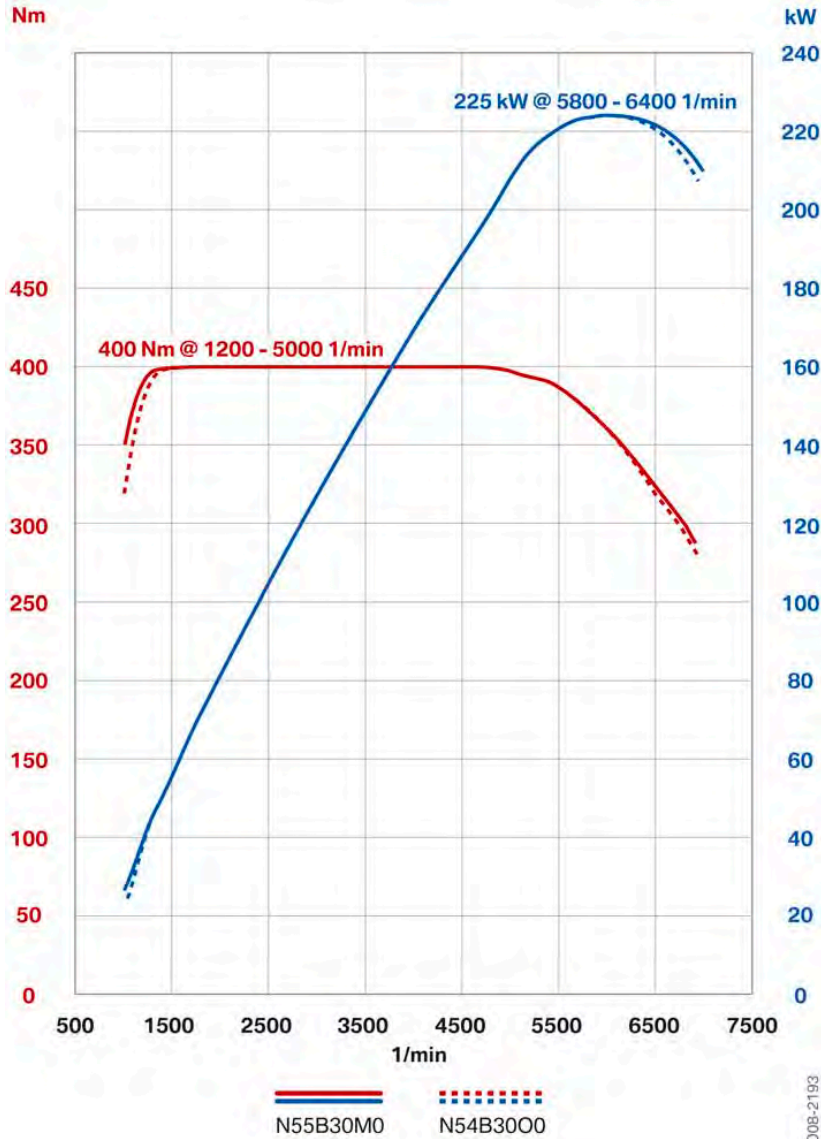
	Unit	N54B3000 (E71/ X6 xDrive35i)	N55B30M0 (F07/535i)
Configuration		6 inline	6 inline
Cylinder capacity	[cm ³]	2979	2979
Bore/stroke	[mm]	84.0/89.6	84.0/89.6
Power output at engine speed	[kW/bhp] [rpm]	225/306 5800 - 6250	225/306 5800 - 6400
Power output per litre	[kW/l]	75.53	75.53
Torque at engine speed	[Nm] [rpm]	400 1300 - 5000	400 1200 - 5000
Compression ratio	[ε]	10.2	10.2
Valves/cylinder		4	4
Fuel consumption, EU combined	[l/100 km]	10.9	8.9
CO₂ emission	g/km	262	209
Digital Motor Electronics		MSD81	MEVD17.2
Exhaust emission legislation EURO, US		EURO 4	EURO 5
Engine oil specification		BMW Longlife-01 BMW Longlife-01 FE BMW Longlife-04	
Top speed	[km/h]	240	250
Acceleration 0 - 100 km/h	[s]	6.7	6.3
Vehicle kerb weight DIN/EU	[kg]	2070/2145	1940/2015
* = Electronically governed			

1.1.2. Full load diagram

Compared to the predecessor, the N55 engine is characterised by lower fuel consumption with the same power output and torque data.

N55 Engine.

1. Introduction



Full load diagram E90 335i with N54B30O0 engine compared to the F07 535i with N55B30M0 engine

N55 Engine.

1. Introduction

1.2. New features/changes

1.2.1. Overview

Assembly	Component	New development	Same design	Remarks
Engine mechanical system	Crankcase		●	Adapted for monoturbo. Cylinder bore changes to 84 mm. Large longitudinal ventilation holes. Modified oil supply to vacuum pump.
	• Engine casing components	Cylinder head	●	Integrated water channel for injector cooling.
	• Crankshaft drive	Cylinder head cover	●	Integration of blow-by pipe. Crankcase ventilation.
	• Camshaft drive	Crankshaft	●	Asymmetric counterweight arrangement and reduced weight.
	Pistons and connecting rods	●	Formed hole in small connecting rod eye. Lead-free big-end bearing shells.	
Valve gear	VANOS		●	Solenoid valves with integrated non-return valve and 3 screen filters. Increased adjustment speed and reduced susceptibility to soiling.
	• Design • Valvetronic	Valvetronic	●	Updated and integrated in cylinder head. 3rd generation brushless servomotor. Position detection of eccentric shaft integrated in servomotor.
Belt drive and auxiliary equipment	Belt drive	●		Newly developed belt drive and vibration absorber.
Oil system	Oil supply		●	Intake pipe, oil deflector and oil collector integrated in one component. Oil pump with Duroplast slide valve and characteristic map control. Modified oil filter housing.
	• Oil circuit			
Air intake and exhaust system	Exhaust turbocharger	●		Twin scroll exhaust turbocharger with wastegate valve and electric diverter valve.
	• Air intake system	Catalytic converter	●	No underbody catalytic converter.
	• Exhaust system			

N55 Engine.

1. Introduction

Assembly	Component	New development	Same design	Remarks
Vacuum system <ul style="list-style-type: none"> Design 	Vacuum pump		●	Modified, similar to N63 engine.
Fuel conditioning system <ul style="list-style-type: none"> Overview 	Fuel injectors	●		Solenoid valve fuel injectors.
Cooling system <ul style="list-style-type: none"> Overview 	Coolant ducts		●	Adapted for one exhaust turbocharger.
Engine electrical system <ul style="list-style-type: none"> Connection to vehicle electrical system Functions Sensors Actuators 	Crankshaft sensor Digital Motor Electronics (DME) Hot-film air mass meter (HFM) Oxygen sensor Oil pressure sensor Oil temperature sensor Ignition coils Spark plugs Fuel injectors	● ● ● ● ● ● ● ●	● ● ● ● ● ● ● ●	Integrated for MSA. Mounted on the intake manifold and cooled by intake air. Improved signal quality and temperature resistance. Adopted from N63 engine (LSU ADV). New sensor for absolute pressure measurement. Mounted in main oil duct. With higher ignition voltage and improved EMC Spark plug, common part with N63 engine. Solenoid valve fuel injectors.

N55 Engine.

1. Introduction



N55 Engine

TO08-2150

N55 Engine.

2. Models.

2.1. N54B3000 engine variants

Model	Version	Series	Displacement in cm ³	Stroke/bore in mm	Power output in kW/bhp at rpm	Torque in Nm at rpm
135i	ECE	E82, E88	2979	89.6/84.0	225/306 5800 - 6250	400 1300 - 5000
135i	US	E82, E88	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
335i	ECE	E90, E91, E92, E93	2979	89.6/84.0	225/306 5800 - 6250	400 1300 - 5000
335i xDrive	ECE	E90, E91, E92	2979	89.6/84.0	225/306 5800 - 6250	400 1300 - 5000
335i	US	E90, E92, E93	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
335i xDrive	US	E90, E92	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
Z4 sDrive35i	ECE	E89	2979	89.6/84.0	225/306 5800 - 6250	400 1300 - 5000
Z4 sDrive35i	US	E89	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
535i	US	E60	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
535i xDrive	US	E60, E61	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
X6 xDrive35i	ECE	E71	2979	89.6/84.0	225/306 5800 - 6250	400 1300 - 5000

N55 Engine.

2. Models.

Model	Version	Series	Displacement in cm ³	Stroke/bore in mm	Power output in kW/bhp at rpm	Torque in Nm at rpm
X6 xDrive35i	US	E71	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft lbs) 1400 - 5000
740i	ECE	F01, F02	2979	89.6/84.0	240/326 5800 - 6250	450 1500 - 4500

ECE = Europe version, adapted to the respective markets with option code.
US = US version, adapted to the respective markets with option code.

2.2. History

6-cylinder petrol engine with exhaust turbocharger at BMW

	Unit	745i	745i
Engine		M30B32	M30B32
Series		E23	E23
Cylinder capacity	[cm ³]	3210	3430
Power output	[kW/bhp]	185/252	185/252
Torque	[Nm/(rpm)]	380/4000	388/2200
Engine management		DME	DME
Compression ratio	[ε]	7.0 : 1	8.0 : 1
V max	[km/h]	222	227
Acceleration 0 - 100 km/h	[s]	7.8	7.9
First used		1980	1983
Last used		1983	1986

N55 Engine.

3. Engine identification.

3.1. Engine designation and engine identification

3.1.1. Engine designation

This PI describes the following version of the N55 engine: N55B30M0.

In the technical documentation, the engine designation is used for unique identification of the engine.

In the technical documentation you will also find the abbreviated engine designation, i.e. N55, that only indicates the engine type.

Item	Description	Index/explanation
1	Engine developer	M, N = BMW Group P = BMW Motorsport S = BMW M GmbH W = Other-make engines
2	Engine type	1 = Straight 4 (e.g. N12) 4 = Straight 4 (e.g. N43) 5 = Straight 6 (e.g. N53) 6 = V8 (e.g. N63) 7 = V12 (e.g. N73) 8 = V10 (e.g. S85)
3	Change to basic engine concept	0 = Basic engine 1 to 9 = Changes, e.g. combustion process
4	Operating principle or fuel supply and installation position if applicable	B = Petrol, longitudinal installation D = Diesel, longitudinal installation H = Hydrogen
5	Displacement in litres	1 = 1 litre +
6	Displacement in 1/10 litre	8 = 0.8 litres = 1.8 litres
7	Performance class	K = Smallest U = Lower M = Medium O = Upper (standard) T = TOP S = Super
8	Re-engineering subject to approval	0 = New development 1 - 9 = Re-engineering

N55 Engine.

3. Engine identification.

Breakdown of N55 engine designation

Index	Description
N	BMW Group Development
5	Straight 6 engine
5	Engine with direct injection, Valvetronic and exhaust turbocharger
B	Petrol engine, longitudinal
30	3.0-litre capacity
M	Medium performance class
0	New development

3.1.2. Engine designation

The engines are marked on the crankcase with an engine identification code for unique identification. This engine identifier is also required for approval by the authorities.

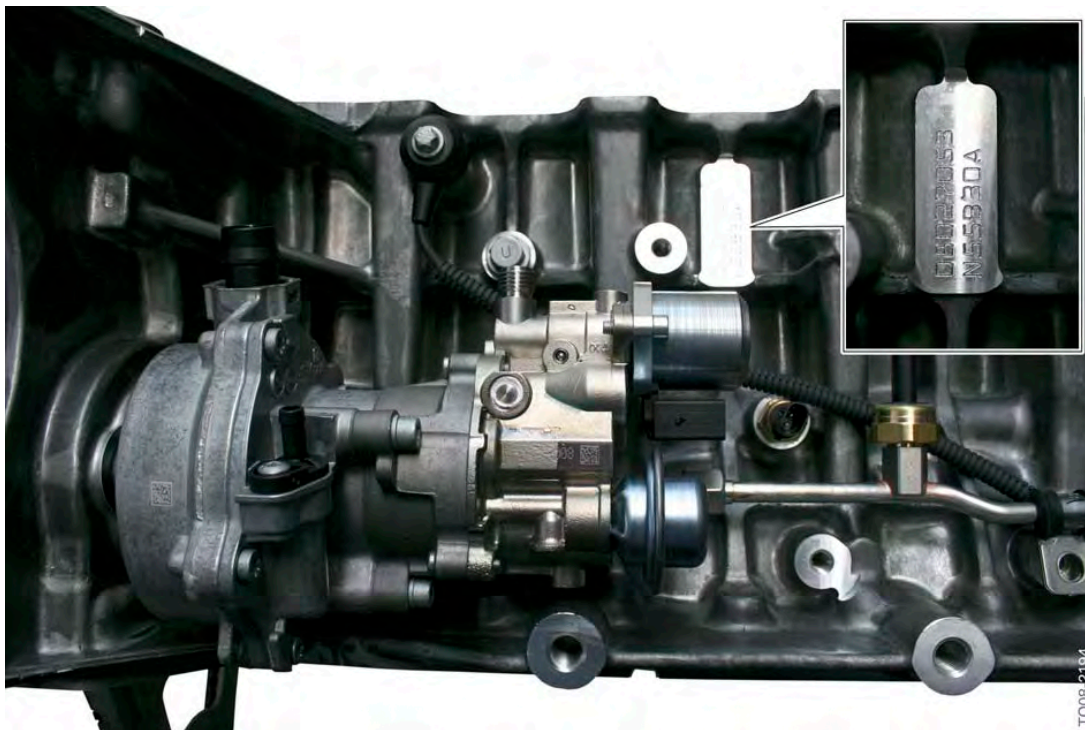
The N55 engine further develops this identification system and the code has been reduced from previously eight to seven characters. The engine serial number can be found under the engine identifier on the engine. Together with the engine identifier, this consecutive number enables unique identification of each individual engine.

Item	Description	Index/explanation
1	Engine developer	M, N = BMW Group P = BMW Motorsport S = BMW M GmbH W = Other-make engines
2	Engine type	1 = Straight 4 (e.g. N12) 4 = Straight 4 (e.g. N43) 5 = Straight 6 (e.g. N53) 6 = V8 (e.g. N63) 7 = V12 (e.g. N73) 8 = V10 (e.g. S85)
3	Change to basic engine concept	0 = Basic engine 1 to 9 = Changes, e.g. combustion process
4	Operating principle or fuel supply and installation position if applicable	B = Petrol, longitudinal installation D = Diesel, longitudinal installation H = Hydrogen

N55 Engine.

3. Engine identification.

Item	Description	Index/explanation
5	Displacement in litres	1 = 1 litre +
6	Displacement in 1/10 litre	8 = 0.8 litres = 1.8 litres
7	Type approval requirements (modifications that require renewed type approval testing)	A = Standard B - Z = as required, e. g. RON 87



N55 engine, engine identification and engine serial number

Index	Description
08027053	Individual consecutive engine serial number
N	Engine developer, BMW Group
5	Engine type, straight 6
5	Change to basic engine concept, turbocharging, Valvetronic, direct fuel injection
B	Operating principle or fuel supply and installation position, petrol engine longitudinal
30	Displacement in 1/10 litre, 3 litre
A	Type approval requirements, standard

N55 Engine.

4. Engine mechanical system.

4.1. Engine housing

The engine housing consists of the engine block (crankcase and bedplate), cylinder head, cylinder head cover, oil pan and gaskets.

4.1.1. Engine block

The engine block is made from an aluminium diecasting and consists of the crankcase with bedplate.

Crankcase and bedplate

The crankcase features cast cylinder liners (2) made from cast iron. A new feature is that the webs between two cylinders now have a groove (3). Coolant can flow along these grooves from one side of the crankcase to the other, thus cooling the webs.

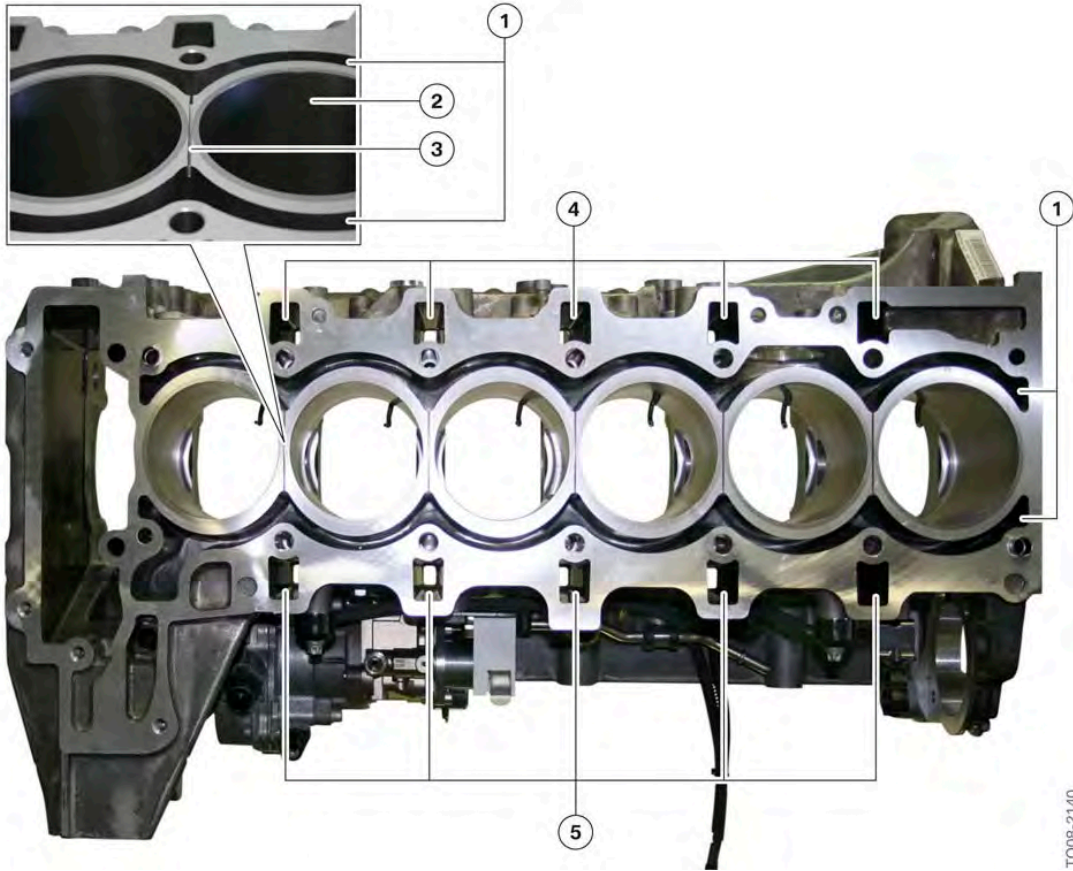
As opposed to the N54 engine, five oil return ducts on the exhaust side (4) now permit oil to return from the cylinder head into the oil pan. These oil return channels extend into the bedplate up to below the oil deflector. They help reduce churning losses as the returning engine oil can no longer reach the crank drive even at high transverse acceleration.

Five oil return channels on the intake side (5) also ensure that the blow-by gasses can flow unobstructed from the crankshaft area into the cylinder head and to the crankcase breather in the cylinder head cover.

The cooling duct (1) in the engine block is split and coolant flows directly through it.

N55 Engine.

4. Engine mechanical system.



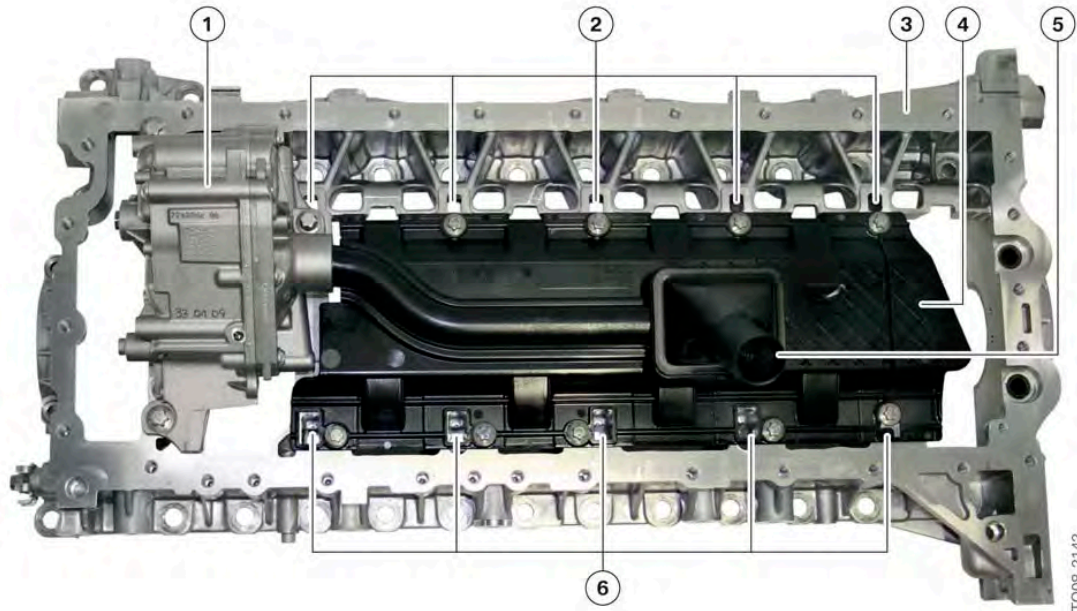
N55 engine, crankcase with web cooling

T008-2140

Index	Description
1	Cooling duct
2	Cylinder liner
3	Groove
4	Oil return ducts, exhaust side
5	Oil return ducts, intake side

N55 Engine.

4. Engine mechanical system.



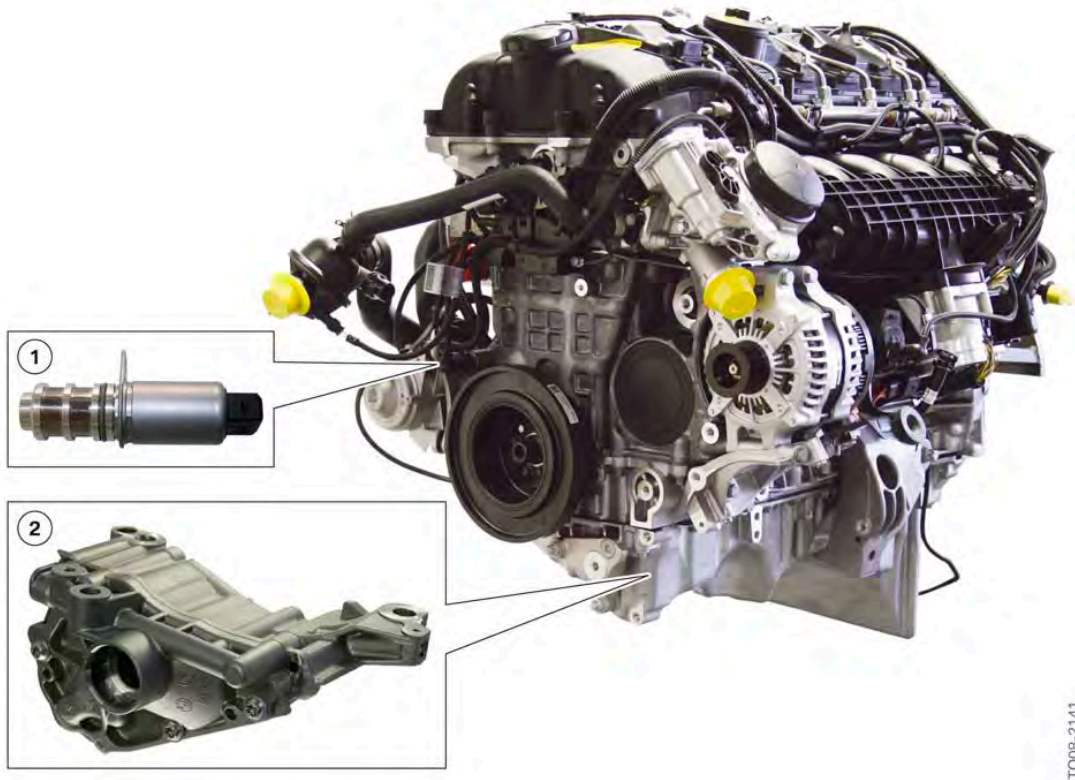
N55 engine, bedplate from below

Index	Description
1	Oil pump
2	Oil return ducts, intake side
3	Bedplate
4	Oil deflector
5	Intake manifold with oil screen filter
6	Oil return ducts, exhaust side

Ducts are provided for the oil supply to the vacuum pump as it is now lubricated by filtered oil and not by unfiltered oil as on the N54 engine. The oil pressure control valve has been integrated for the map-controlled oil pump.

N55 Engine.

4. Engine mechanical system.



N55 engine, oil pressure control

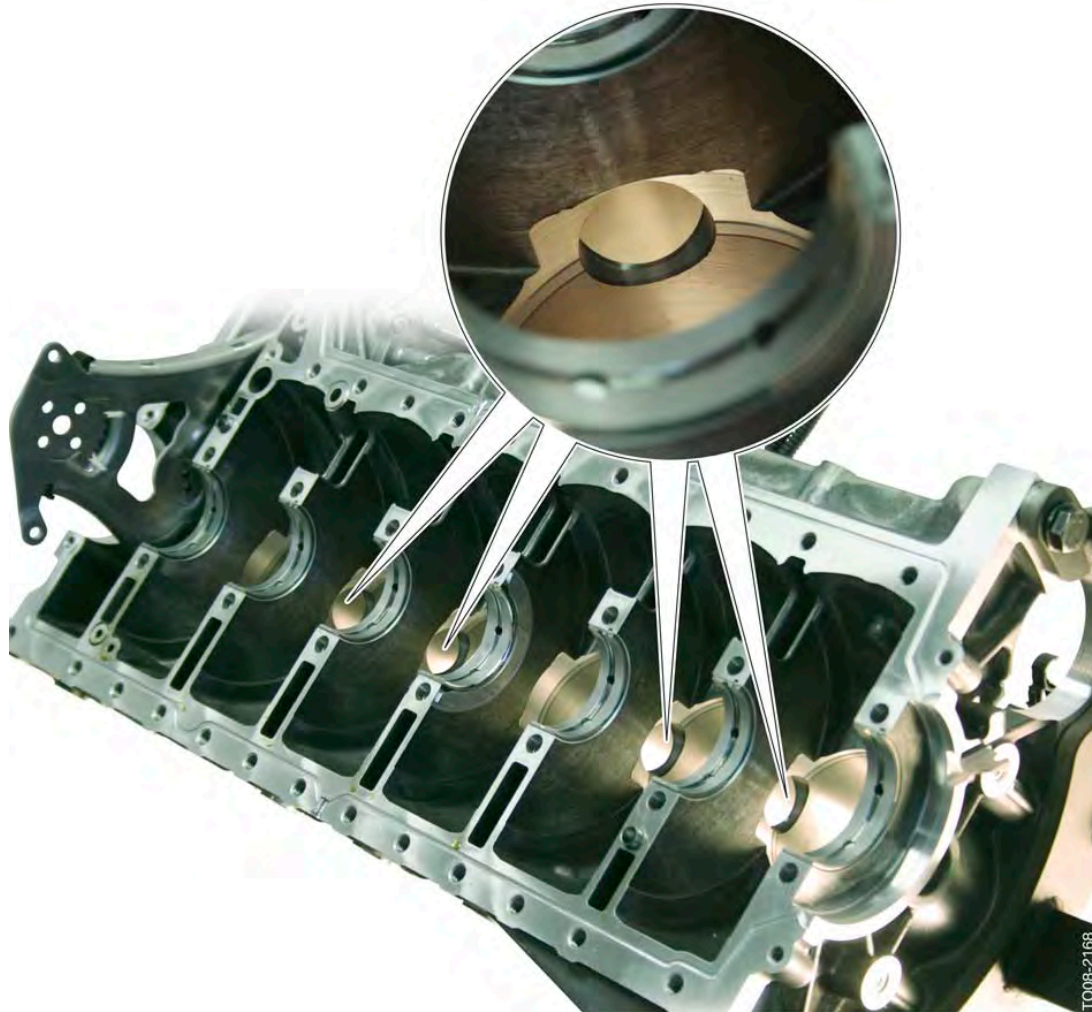
TO08-2141

Index	Description
1	Oil pressure control valve
2	Oil pump

The crankcase has larger bored longitudinal ventilation holes. The longitudinal ventilation holes improve the pressure equalisation of the oscillating air columns that are created by the up and down movement of the pistons.

N55 Engine.

4. Engine mechanical system.



N55 engine, ventilation holes in crankcase

In addition, the connections at the mono turbocharger have been adapted for the oil supply and coolant cooling.

4.1.2. Cylinder head

The cylinder head of the N55 engine is a new development. Direct fuel injection with exhaust turbocharging and Valvetronic are used for the first time on a BMW 6-cylinder engine. The cylinder head features a very compact design and is equipped with third generation Valvetronic.



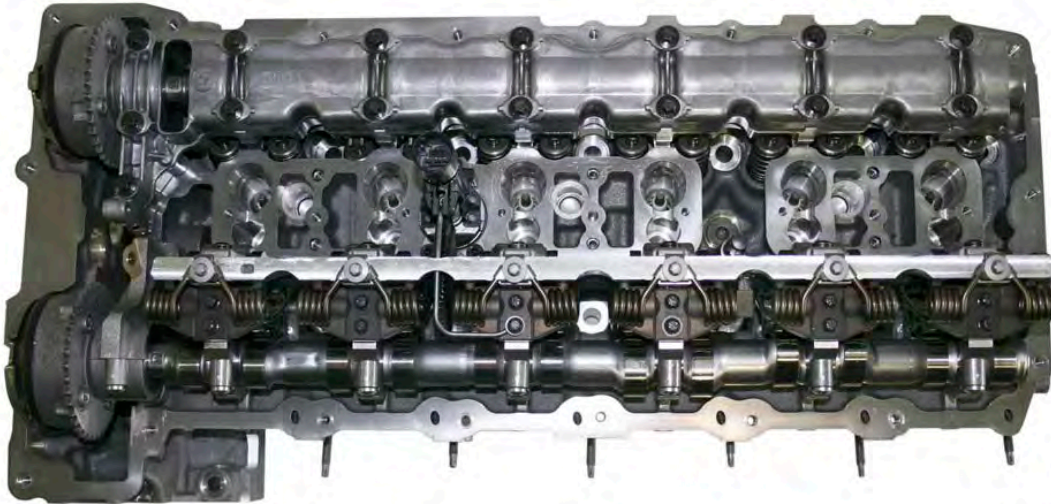
The combination of exhaust turbocharger, Valvetronic and direct fuel injections is referred to as **Turbo-Valvetronic-Direct-Injection (TVDI)**.

N55 Engine.

4. Engine mechanical system.

This system reduces CO₂ emission and fuel consumption by 3 - 6 %.

There are now no connections for the VANOS non-return valves as they have been integrated in the solenoid valves. The cylinder head further features cooling channels about the fuel injectors, providing indirect cooling.



N55 engine, cylinder head

TO08-2146

4.1.3. Cylinder head cover

Design

The cylinder head cover is a new development. The vacuum accumulator for the vacuum system is integrated in the cylinder head cover.

All components for crankcase ventilation and the blow-by channels are also integrated in the cylinder head cover. The integrated non-return valves ensure that the blow-by gasses are reliably added to the intake air.

The N55 engine is equipped with a vacuum-controlled crankcase ventilation system. A regulated negative pressure of approx. 38 mbar is maintained.

N55 Engine.

4. Engine mechanical system.



N55 engine, cylinder head cover with crankcase ventilation

Index	Description
1	Connection, blow-by gas to clean air pipe
2	Connection, vacuum line to vacuum pump
3	Reserve, vacuum connection
4	Vacuum connection to electropneumatic pressure converter EPDW for wastegate valve
5	Duct for blow-by gas feed into intake system with integrated non-return valve
6	Blow-by gas duct with settling chamber, impact plate, pressure control valve and non-return valves
7	Pressure regulating valve

The blow-by gasses flow through the opening in the area of the sixth cylinder into the settling chamber in the cylinder head cover. From the settling chamber, the blow-by gasses are directed through holes on to an impact plate, against which the oil impacts, due to the high flow rate, and flows off. The blow-by gasses cleaned of oil now flow via the pressure control valve and, depending on the operating mode, via the non-return valves into the intake area upstream of the exhaust turbocharger or via the cylinder head ahead of the intake valves. The separated oil is directed via a return flow duct to below the oil level into the oil pan.

Function

The standard function can only be used as long as a vacuum prevails in the intake air manifold, i.e. in naturally-aspirated engine mode.

N55 Engine.

4. Engine mechanical system.

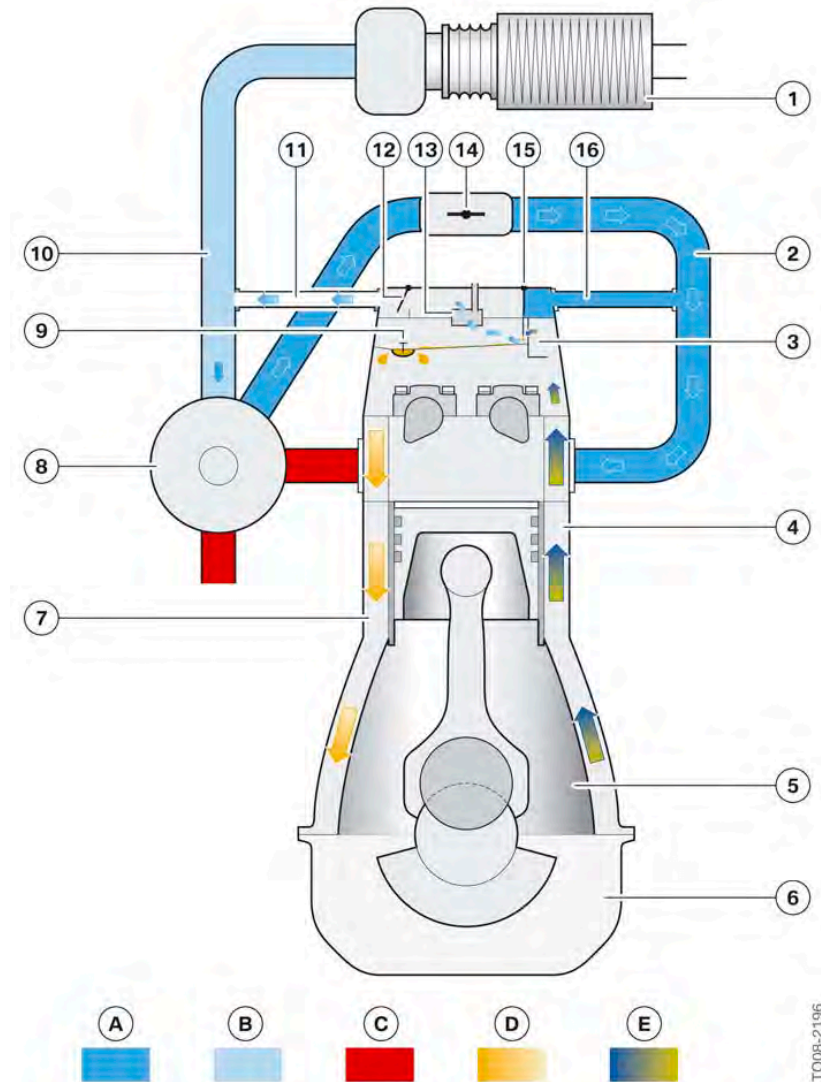
Index	Description
A	Ambient pressure
B	Vacuum
C	Exhaust gas
D	Oil
E	Blow-by gas
1	Air cleaner
2	Intake manifold
3	Perforated plates
4	Oil return channel
5	Crankcase
6	Oil sump
7	Oil return channel
8	Exhaust turbocharger
9	Oil drain valve
10	Charge air intake line
11	Hose to charge air intake line
12	Non-return valve
13	Pressure regulating valve
14	Throttle valve
15	Non-return valve
16	Channel in cylinder head and cylinder head cover

Blow-by gasses can no longer be introduced via this channel as soon as the pressure in the intake air manifold increases. There would otherwise be the danger that the boost pressure could enter the crankcase. A non-return valve in the blow-by channel in the cylinder head cover closes the channel to the intake air manifold, thus protecting the crankcase from excess pressure.

The now greater demand for fresh air creates a vacuum in the clean air pipe between the exhaust turbocharger and intake silencer. This vacuum is sufficient to open the non-return valve and to draw off the blow-by gasses via the pressure control valve.

N55 Engine.

4. Engine mechanical system.



N55 engine, crankcase ventilation, turbocharged engine mode

Index	Description
A	Excess pressure
B	Vacuum
C	Exhaust gas
D	Oil
E	Blow-by gas
1	Air cleaner
2	Intake manifold

N55 Engine.

4. Engine mechanical system.

Index	Description
3	Perforated plates
4	Oil return channel
5	Crankcase
6	Oil sump
7	Oil return channel
8	Exhaust turbocharger
9	Oil drain valve
10	Charge air intake line
11	Hose to charge air intake line
12	Non-return valve
13	Pressure regulating valve
14	Throttle valve
15	Non-return valve
16	Channel in cylinder head and cylinder head cover



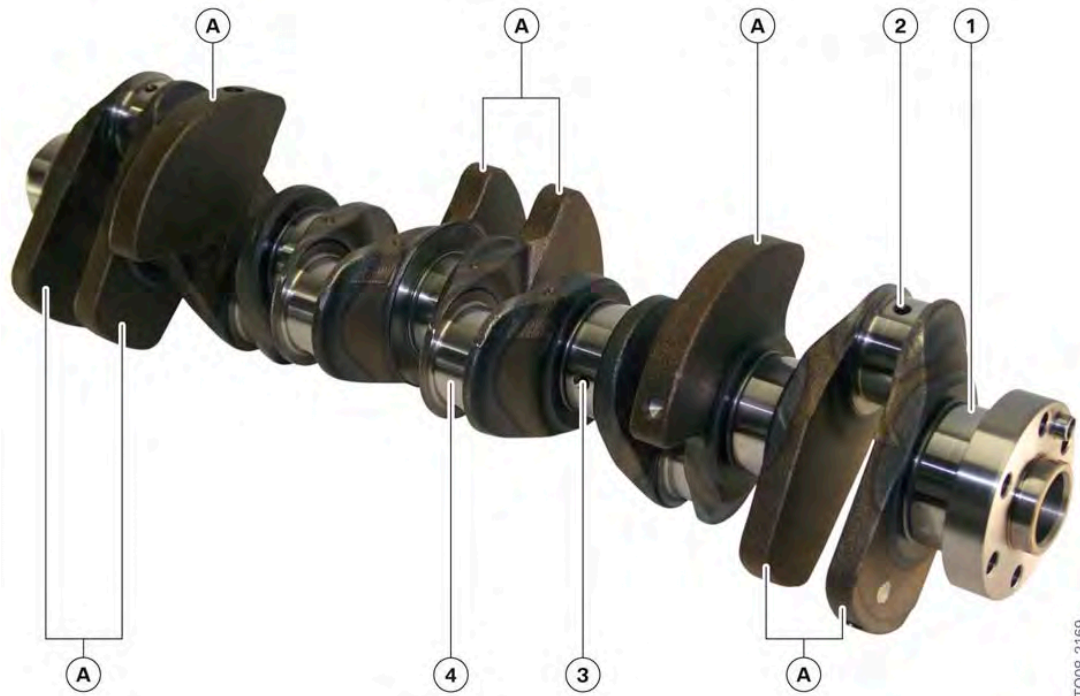
If a customer complains about high oil consumption and at the same time the exhaust turbocharger is found to be oiled up, it should not be immediately assumed that the exhaust turbocharger is defective. If the oiling already exists after the introduction of the blow-by gasses then the entire engine should be checked for leaks. Defective gaskets or defective crankshaft seals may be the cause of excessively high blow-by gas throughput. Leaking crankshaft seals can cause an oil consumption of up to 3 l/1000 km.

4.1.4. Oil pan

The oil pan is made from an aluminium casting. The oil deflector and the intake pipe to the oil pump are designed as one component. To facilitate attachment to the bedplate, the oil return ducts are designed such that they extend over the oil deflector. Consequently, the oil return ducts end in the oil sump.

N55 Engine.

4. Engine mechanical system.



N55 engine, crankshaft

TO08-2169

Index	Description
A	Counterweights
1	Main bearing journal 7
2	Oil hole from big-end bearing to main bearing
3	Oil hole from main bearing to big-end bearing
4	Big-end bearing journal, cylinder 4

Crankshaft main bearings

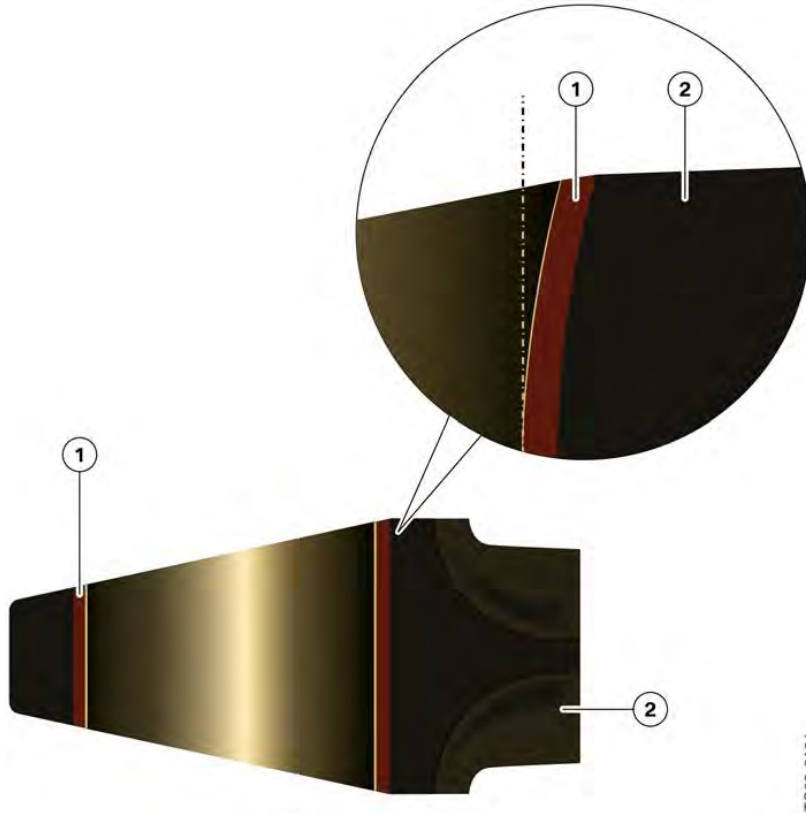
As on the N54 engine, the main bearings on the crankshaft are designed as two-component bearings free of lead. The thrust bearing is mounted at the fourth bearing position.

4.2.2. Connecting rod and bearing

The size of the connecting rod of the N55 engine is 144.35 mm. A special feature is the formed hole in the small connecting rod eye. This formed hole optimally distributes the force acting from the piston via the gudgeon pin over the surface of the bush and reduces the load at the edges.

N55 Engine.

4. Engine mechanical system.



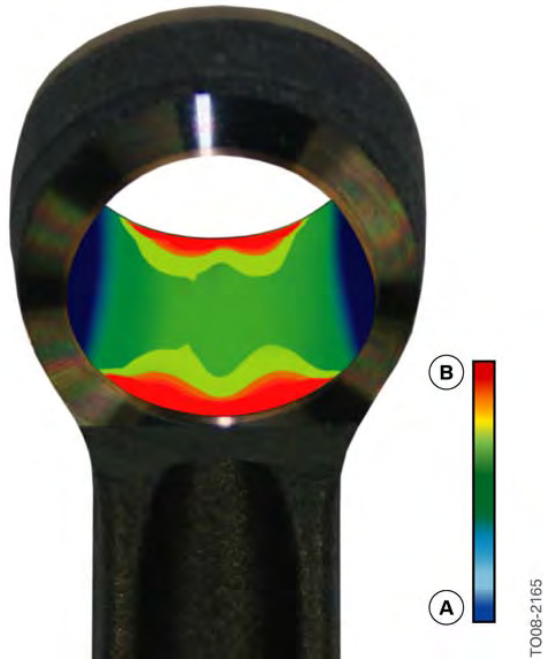
N55 engine, small connecting rod eye

Index	Description
1	Bush
2	Connecting rod

The following graphic shows the surface load on a standard connecting rod without the formed hole. Due to the piston pressure, the force exerted via the gudgeon pin is mainly transmitted to the edges of the bush in the small connecting rod eye.

N55 Engine.

4. Engine mechanical system.



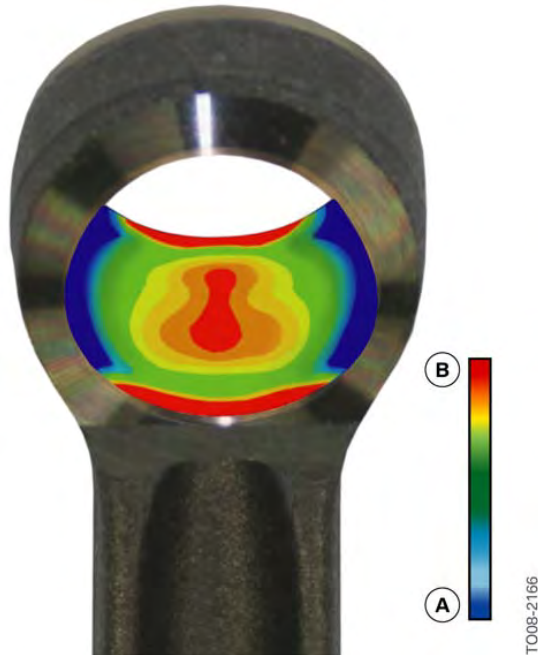
N54 engine, small connecting rod eye without formed hole

Index	Description
A	Low surface load
B	High surface load

When the small connecting rod eye has a formed hole, the force is distributed over a larger area and the load on the edges of the bush is reduced considerably. The force is now spread over a larger area.

N55 Engine.

4. Engine mechanical system.



N55 engine, small connecting rod eye with formed hole

Index	Description
A	Low surface load
B	High surface load

Lead-free big-end bearing shells are used on the large connecting rod eye. The material G-488 is used on the connecting rod side and the material G-444 on the bearing cap side.

The size M9 x 47 connecting rod bolts are the same on the N55 and N54 connecting rod.

4.2.3. Pistons with piston rings

A full slipper skirt piston supplied by the company KS is used. The piston diameter is 82.5 mm. The first piston ring is a plain rectangular compression ring with a chrome-ceramic coating on the contact surface. The second piston ring is a tape faced Napier ring. The oil scrape ring is designed as a steel band ring with spring that is also known as VF system.

N55 Engine.

4. Engine mechanical system.



TO08-2161

N55 engine, piston with gudgeon pin and piston rings

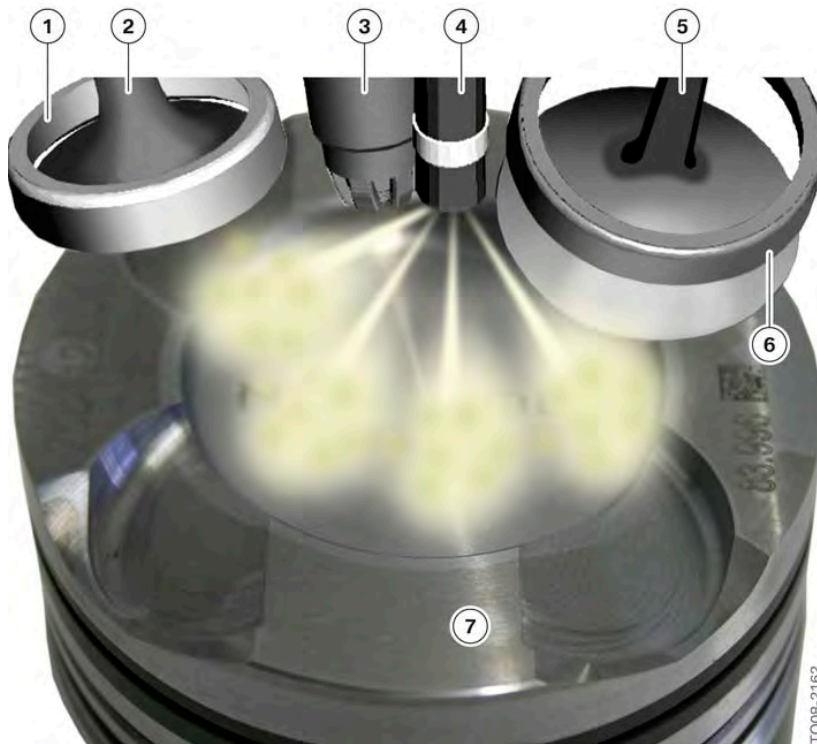
Index	Description
1	Plain rectangular compression ring
2	Taper faced Napier ring
3	VF system ring
4	Steel inlay for first piston ring
5	Groove for first piston ring
6	Groove for second piston ring
7	Groove for oil scraper ring
8	Hole for lubricating oil drain
9	Graphite coating

N55 Engine.

4. Engine mechanical system.

Combustion chamber geometry

The following graphic shows the arrangement of the individual components about the combustion chamber. It can be seen that the BMW (spray-guided) high precision injection (HPI) system is not used but rather a Bosch solenoid valve fuel injector with multi-hole nozzle. The fuel injector is combined with turbocharging and Valvetronic III. For better illustration, a valve with valve set has been removed in the graphic.



N55 engine, combustion chamber with components

Index	Description
1	Valve seat, exhaust valve
2	Exhaust valve
3	Spark plug
4	Fuel injector
5	Intake valve
6	Valve seat, intake valve

4.3. Camshaft drive

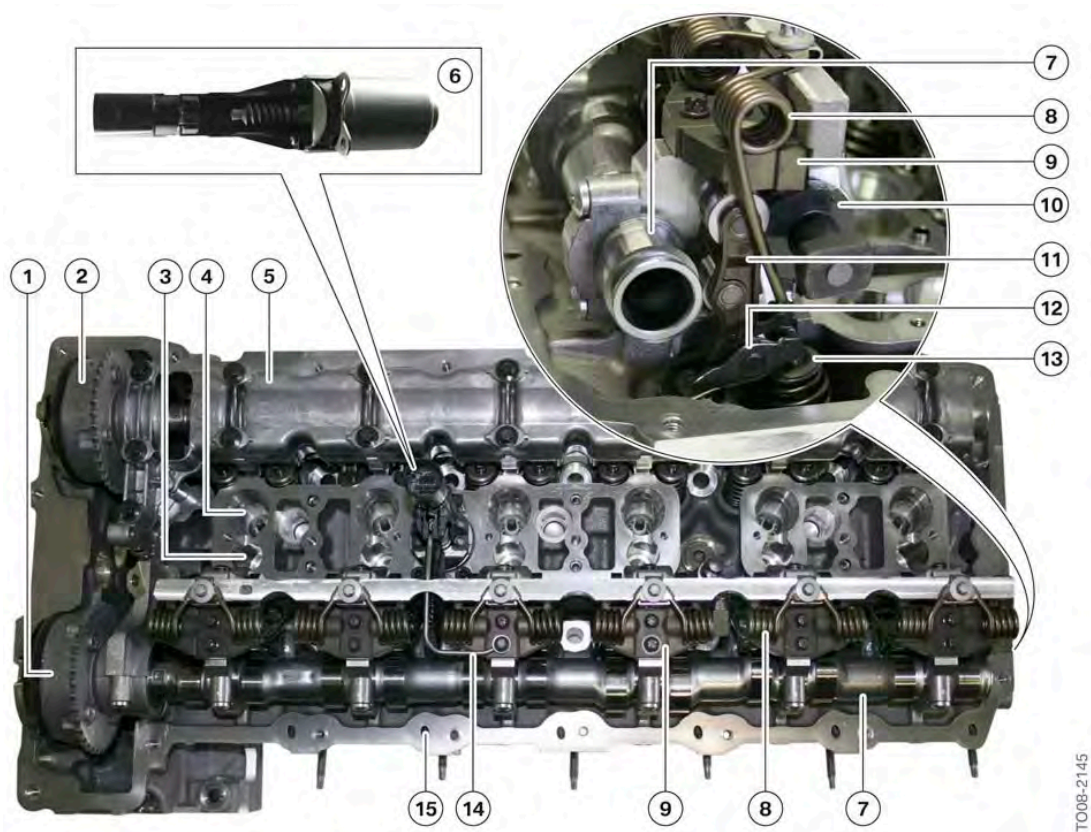
The camshaft drive corresponds to the camshaft drive on the N54 engine.

N55 Engine.

5. Valve gear.

5.1. Design

The following graphic shows the design of the cylinder head on the N55 engine with the Valvetronic III and direct fuel injection combination.



N55 engine, overview of valve gear

Index	Description
1	VANOS unit, intake camshaft
2	VANOS unit, exhaust camshaft
3	Injector well
4	Spark plug well
5	Camshaft housing
6	Valvetronic servomotor
7	Inlet camshaft
8	Torsion spring
9	Gate
10	Eccentric shaft

N55 Engine.

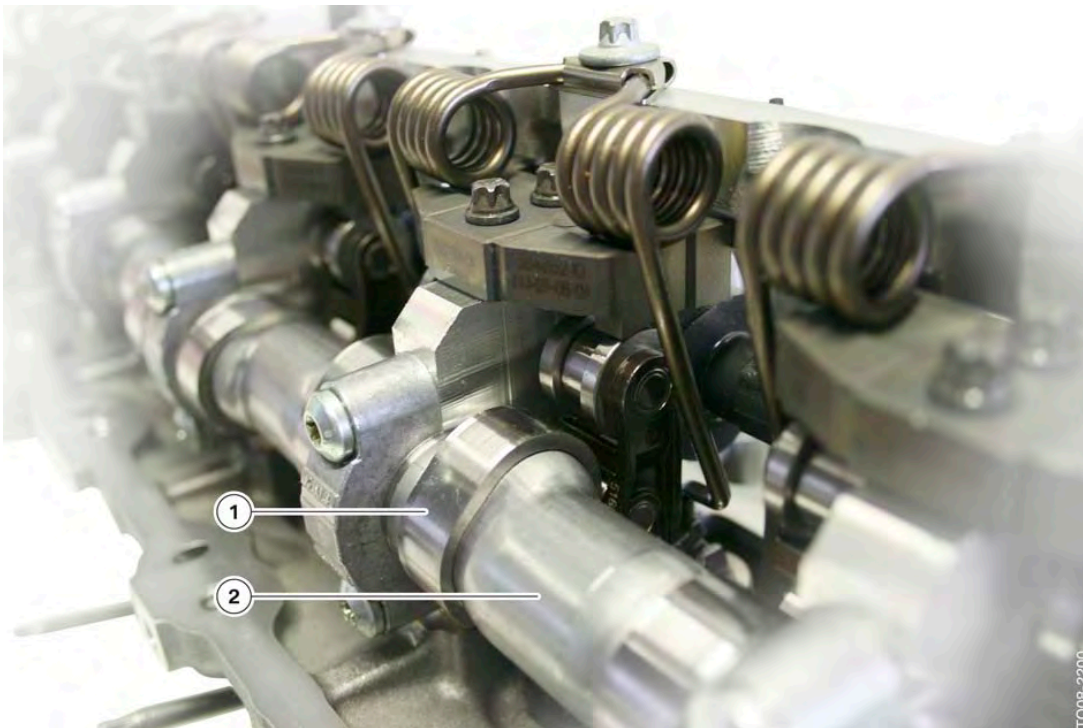
5. Valve gear.

Index	Description
11	Intermediate lever
12	Roller lever tappet
13	Valve head
14	Oil spray nozzle
15	Hole for introducing blow-by gas

5.1.1. Camshafts

Cast or lightweight camshafts were used simultaneously on the N54 engine. This made it possible to use lightweight camshafts as well as cast camshafts or a mixture of both in an N54 engine.

Only lightweight construction camshafts are used on the N55 engine. The lightweight camshafts for the N55 engine are manufactured in an internal high pressure forming process. The exhaust camshaft features bearing races and is encapsulated in a camshaft housing. The camshaft housing reduces oil foaming during operation.



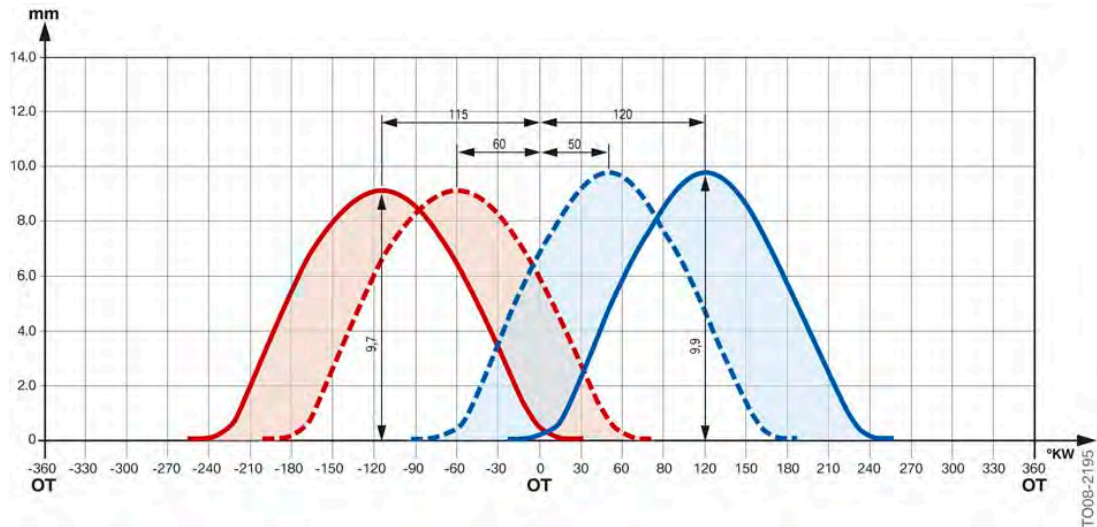
N55 engine, assembled camshaft made in an internal high pressure forming process

Index	Description
1	Shell-shaped cam
2	Corrugated tube

N55 Engine.

5. Valve gear.

5.1.2. Valve timing



N55 engine, valve timing diagram

		N54B3000	N55B30M0
Intake valve Ø	[mm]	31.4	32
Exhaust valve Ø	[mm]	28	28
Maximum valve lift, intake valve/exhaust valve	[mm]	9.7/9.7	9.9/9.7
Intake camshaft spread (VANOS adjustment range)	[°crankshaft]	55	70
Exhaust camshaft spread (VANOS adjustment range)	[°crankshaft]	45	55
Intake camshaft opening angle (max.-min. spread)	[°crankshaft]	125 - 70	120 - 50
Exhaust camshaft opening angle (max.-min. spread)	[°crankshaft]	130 - 85	115 - 60
Opening period Inlet camshaft	[°crankshaft]	245	255
Opening period Exhaust camshaft	[°crankshaft]	261	261

N55 Engine.

5. Valve gear.

5.1.3. Intake and exhaust valves

The valve stem has a diameter of 5 mm on the intake valve and 6 mm on the exhaust valve. The reason for the larger diameter is that the exhaust valve is hollow and is filled with sodium. In addition, the valve seat of the exhaust valve is armoured.

5.1.4. Valve springs

The valve springs are different for the intake side and exhaust side.

5.2. Valvetronic

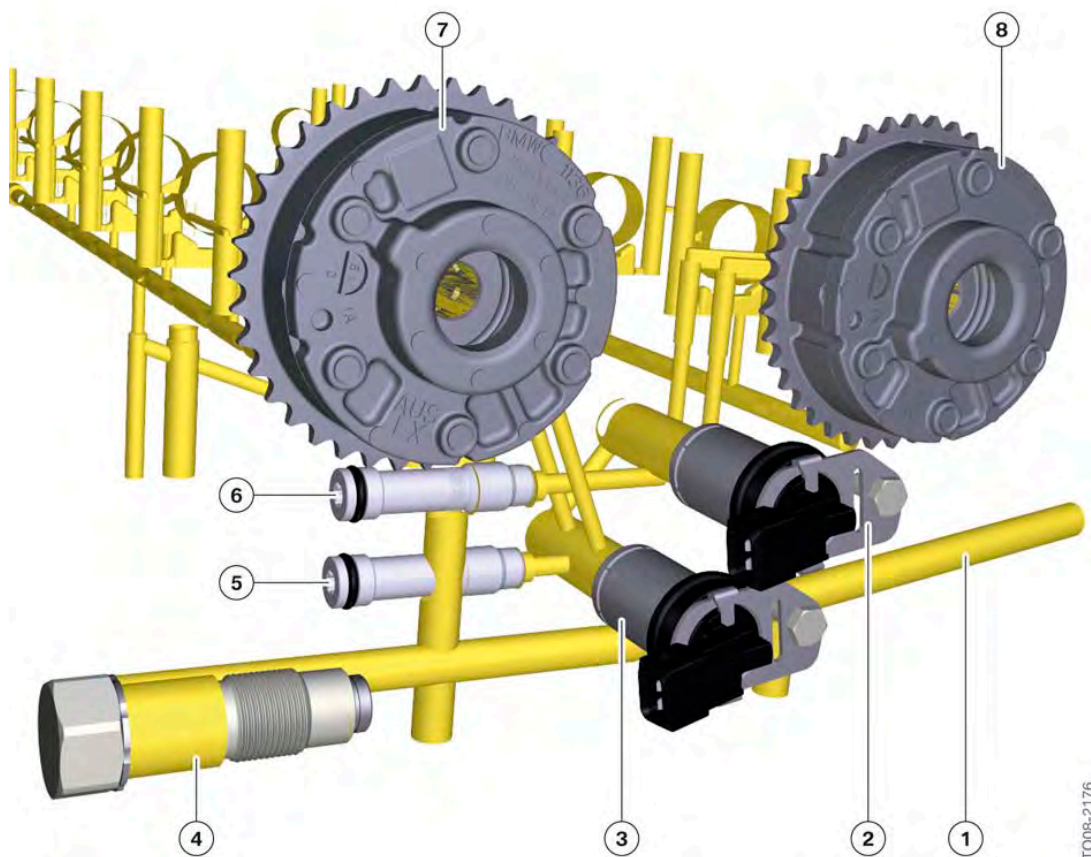
5.2.1. VANOS

Overview

The VANOS system has been optimised to provide even faster adjustment speeds of the VANOS units. The optimisation has also further reduced the susceptibility to soiling. It can be seen from the following comparison of the VANOS on the N54 engine and the VANOS on the N55 engine that fewer oil channels are required.

N55 Engine.

5. Valve gear.



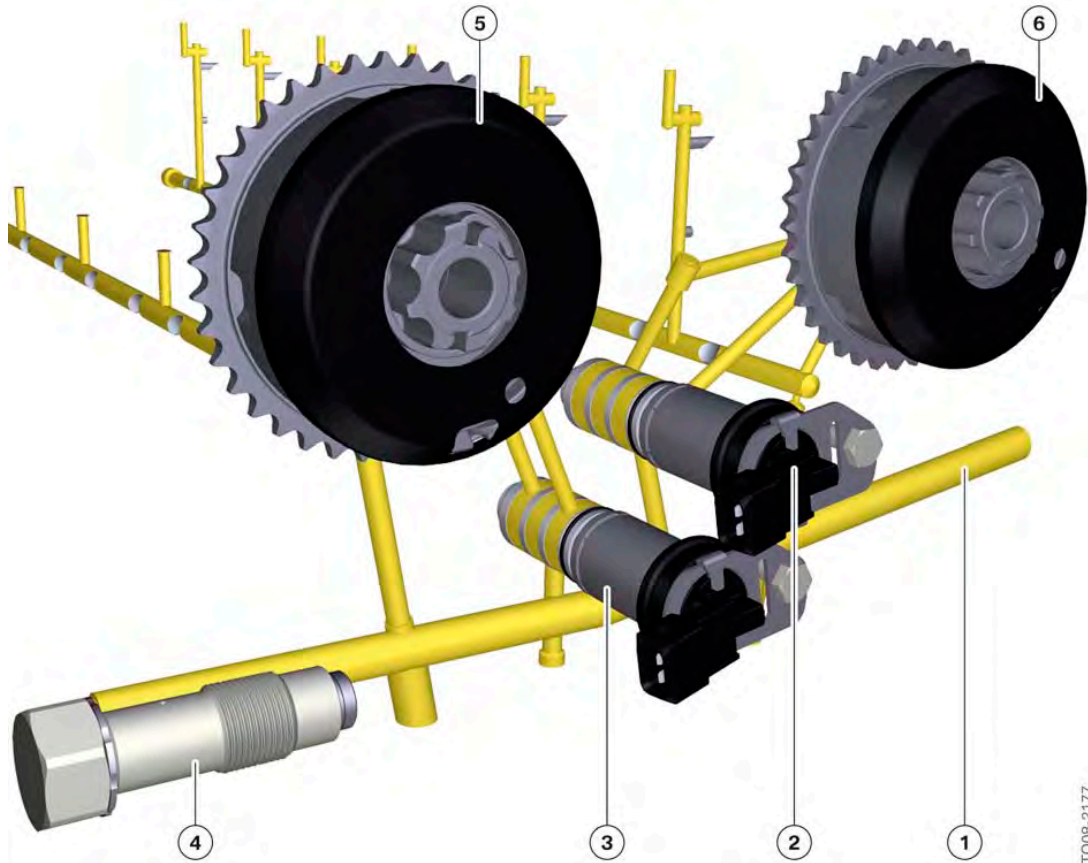
N54 engine, VANOS with oil supply

T008-2176

Index	Description
1	Main oil duct
2	VANOS solenoid valve, intake side
3	VANOS solenoid valve, exhaust side
4	Chain tensioner
5	Return shut-off valve, exhaust side
6	Return shut-off valve, intake side
7	VANOS adjustment unit, exhaust side
8	VANOS adjustment unit, intake side

N55 Engine.

5. Valve gear.



N55 engine, VANOS with oil supply

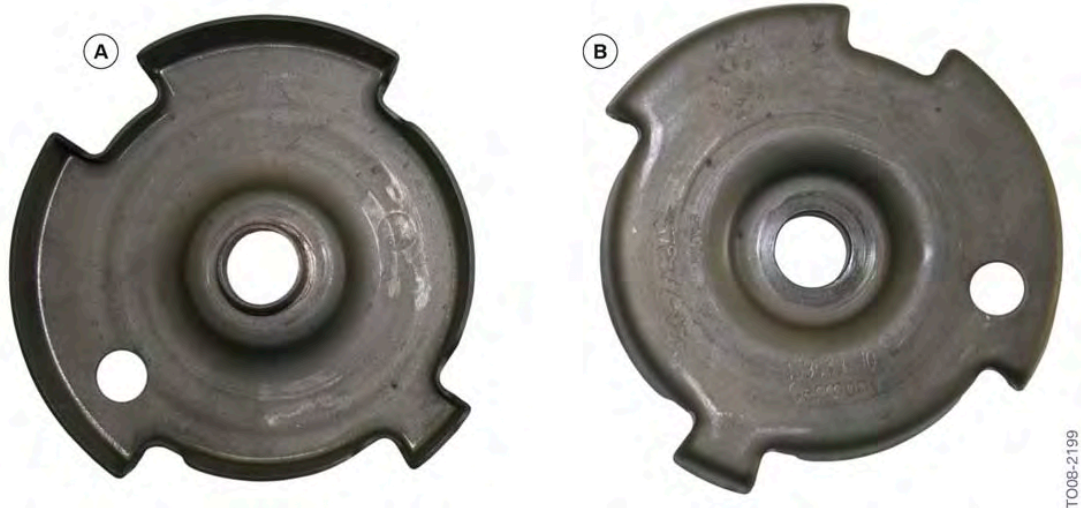
TO08-2177

Index	Description
1	Main oil duct
2	VANOS solenoid valve, intake side
3	VANOS solenoid valve, exhaust side
4	Chain tensioner
5	VANOS adjustment unit, exhaust side
6	VANOS adjustment unit, intake side

The sensor wheels are now pure deep-drawn sheet metal components and no longer made from two parts. This design increases production accuracy while reducing manufacturing costs.

N55 Engine.

5. Valve gear.



N55 engine, camshaft sensor wheel

Index	Description
A	Rear view
B	Front view

VANOS solenoid valves

The return shut-off valve with screen filter used on the N54 engine have now been integrated in the VANOS solenoid valves on the N55 engine. This measure has made it possible to reduce the number of oil ducts in the cylinder head. In addition, the non-return valves have been integrated in the VANOS solenoid valves. Screen filters on the VANOS solenoid valve ensure trouble-free operation and reliably prevent the VANOS solenoid valve from sticking as the result of dirt particles.

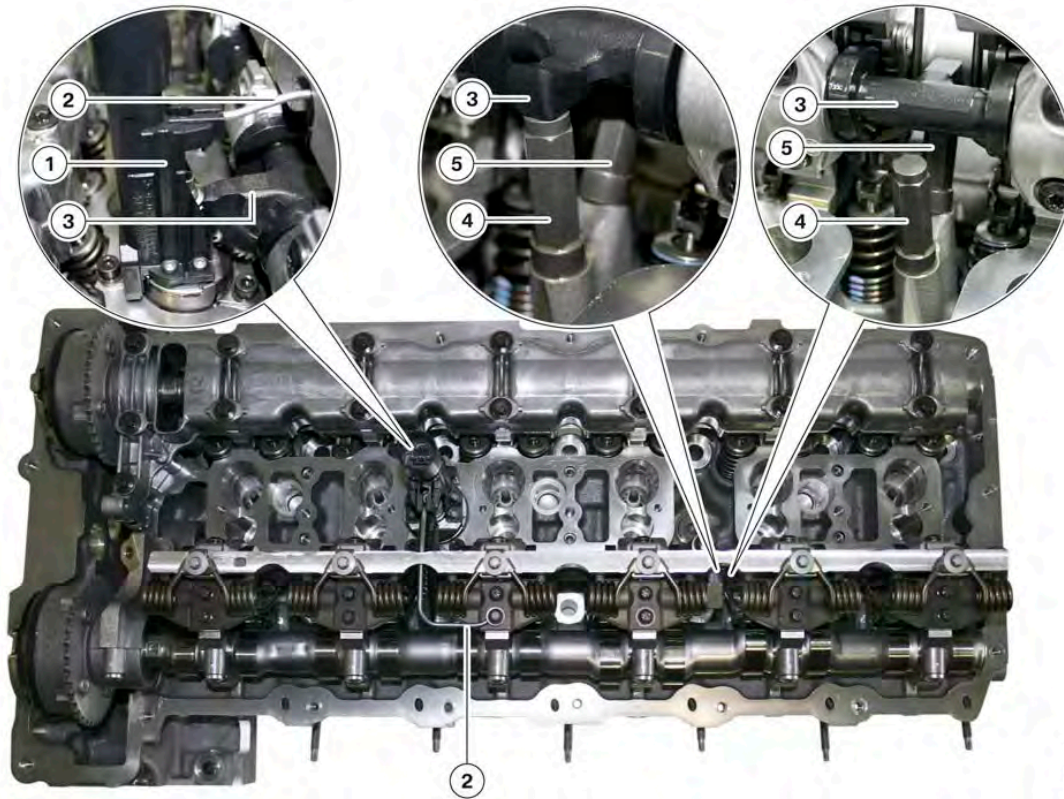
5.2.2. Valve list adjustment

Overview

As can be seen from the following graphic, the installation location of the servomotor has changed. A further feature is that the eccentric shaft sensor is no longer mounted on the eccentric shaft but has been integrated in the servomotor.

N55 Engine.

5. Valve gear.



N55 engine, valve lift adjustment

TO08-2175

Index	Description
1	Valvetronic servomotor
2	Oil spray nozzle
3	Eccentric shaft
4	Minimum stop
5	Maximum stop

The Valvetronic III system is used. The differences between Valvetronic III and Valvetronic II are in the arrangement of the Valvetronic servomotor and the Valvetronic sensor. As in Valvetronic II, the turbulence level is increased in Valvetronic III for the purpose of optimising the mixture formation with phasing and masking at the end of the compression cycle. This movement of the cylinder charge improves the combustion during partial load operation and in catalytic converter heating mode. The quench areas also contribute to mixture formation.

Phasing

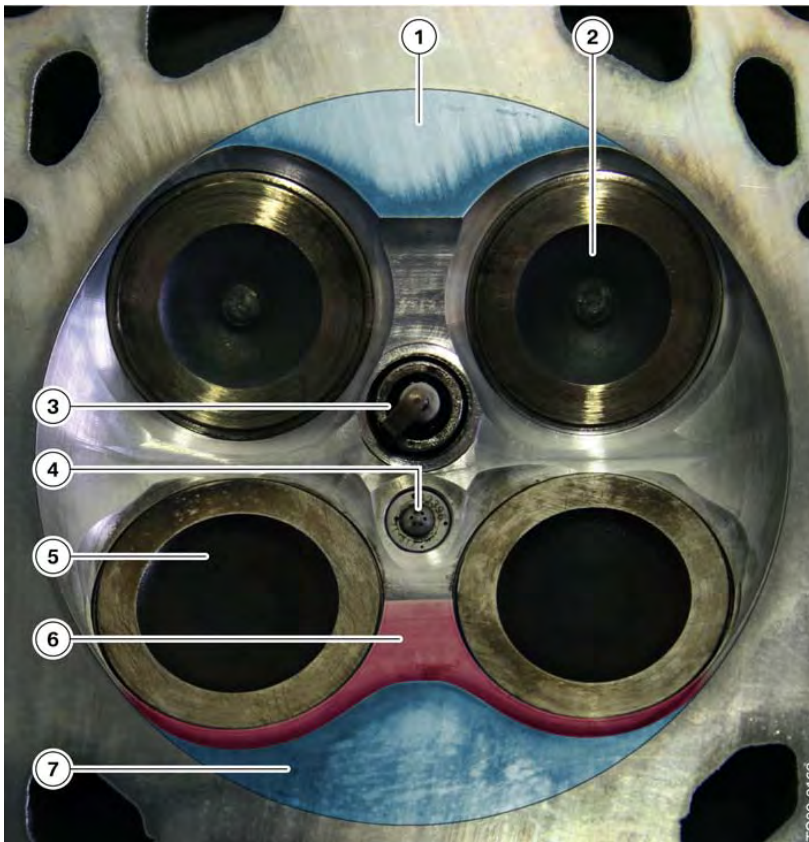
Phasing results in a lift difference between both intake valves of up to 1.8 mm in the lower partial load range. Consequently, the flow of fresh air is distributed asymmetrically.

N55 Engine.

5. Valve gear.

Masking

Masking refers to the design of the valve seats. This shaping ensures that the incoming fresh air is aligned in such a way as to give rise to the required cylinder charge movement. The advantage of this measure is that the combustion retardation is reduced by approx. 10 °crankshaft. The combustion process takes place faster and a larger valve overlap can be achieved, thus considerably reducing NO_x emissions.



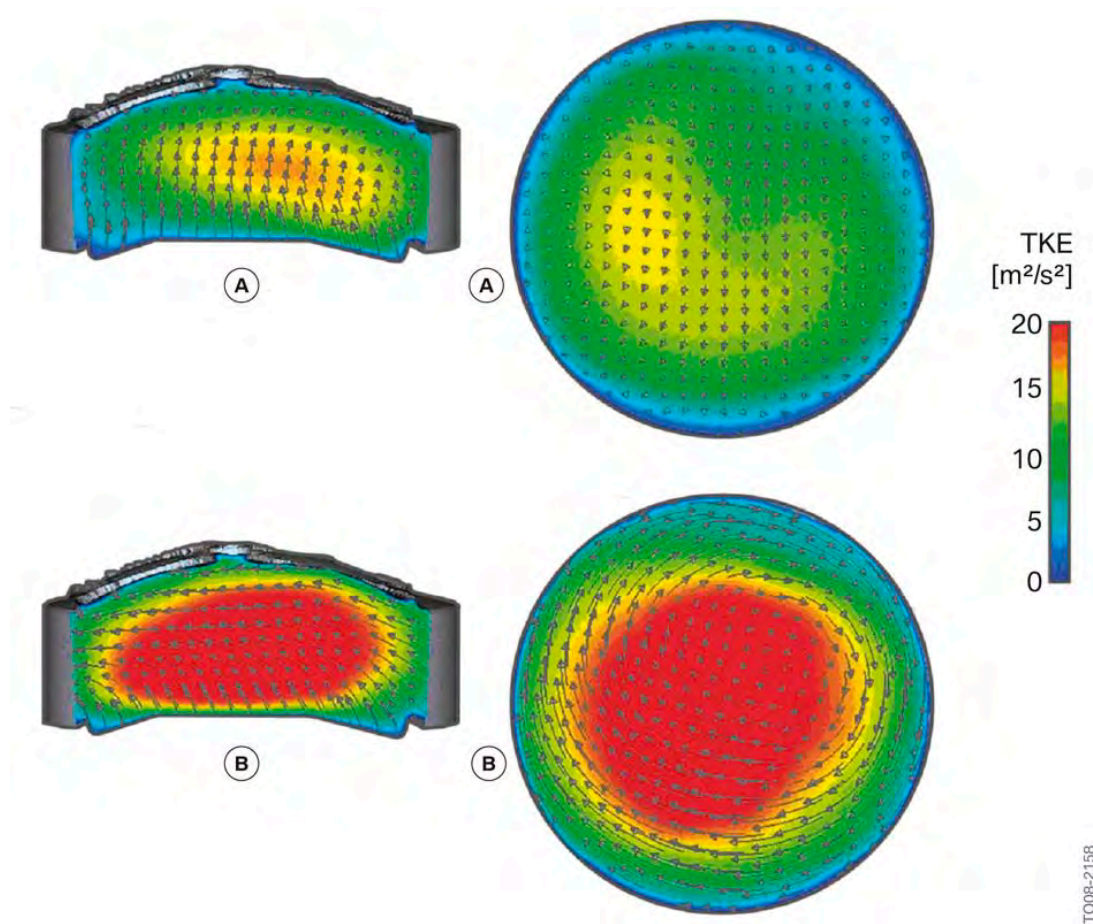
N55 engine, combustion chamber roof

Index	Description
1	Quench area
2	Exhaust valves
3	Spark plug
4	Fuel injector
5	Intake valve
6	Masking
7	Quench area

N55 Engine.

5. Valve gear.

The following graphic shows the effect of the previously described measures. These measures achieve improved and faster combustion in the red area. Technically, this is known as the turbulent kinetic energy.



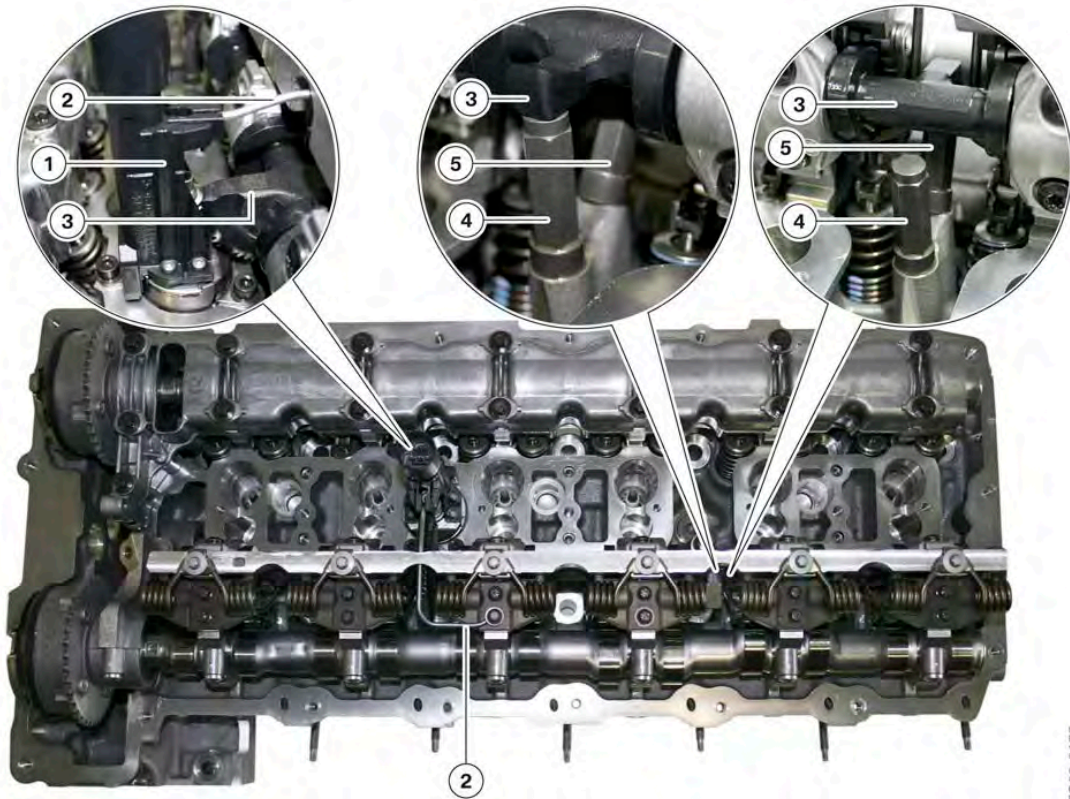
Influence of phasing and masking on flow in the combustion chamber

Index	Description
A	Valvetronic I
B	Valvetronic II + III with phasing and masking
TKE	Turbulent kinetic energy

Engine response is improved by the combination of Valvetronic III, direct injection and turbocharging. The response up to naturally aspirated full load is shortened on a naturally aspirated engine with Valvetronic as there is now no need wait for the intake air manifold to be filled. The subsequent torque build-up as the turbocharger starts up can be accelerated with the partial lift setting at low engine speed. This effectively flushes out residual gas, thus resulting in faster torque build-up.

N55 Engine.

5. Valve gear.



N55 engine, valve lift adjustment

TO08-2175

Index	Description
1	Valvetronic servomotor
2	Oil spray nozzle
3	Eccentric shaft
4	Minimum stop
5	Maximum stop

Valvetronic

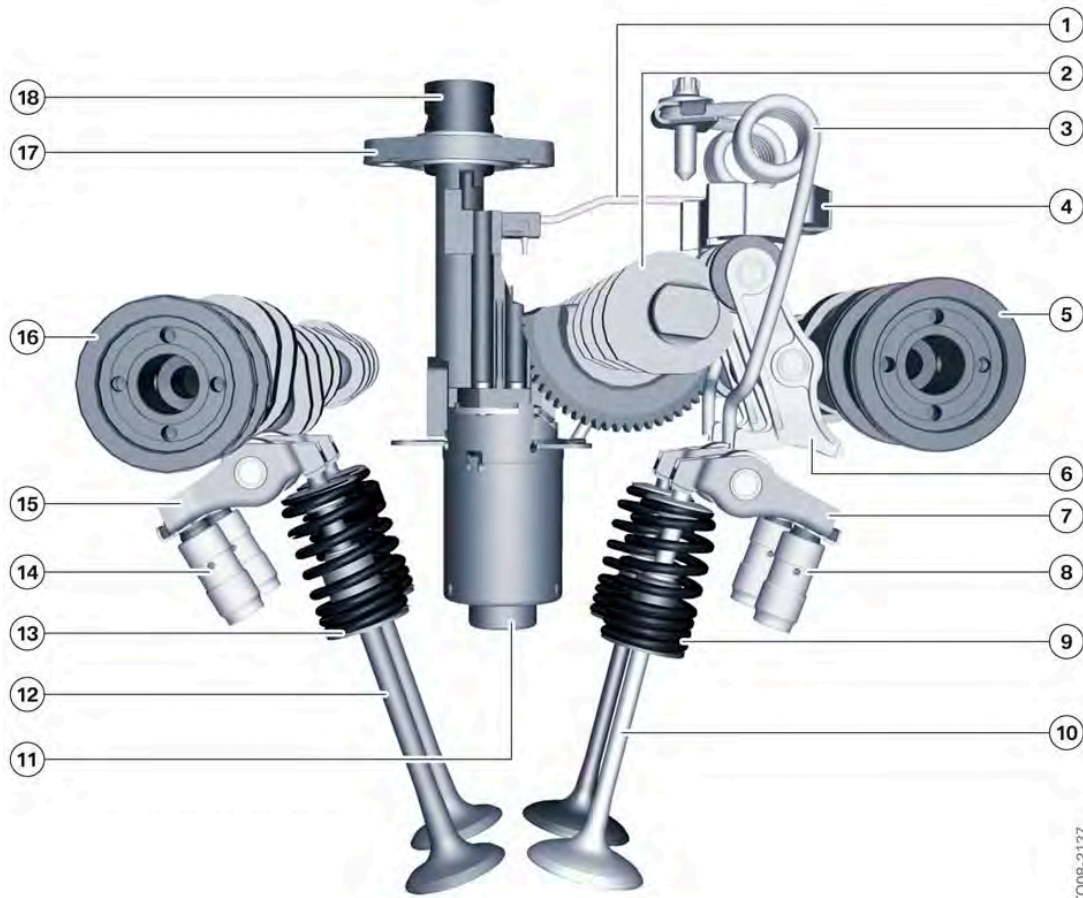
A new brushless DC motor is used. The Valvetronic servomotor exhibits the following special features:

- Open concept (oil through-flow)
- The eccentric shaft angle is determined by angle increments from the integrated sensor system
- Power intake reduced by approx. 50 %
- Higher actuating dynamics (e.g. cylinder-selective adjustment, idle speed control, etc.)
- Weight advantage (approx. 600 gramme)

N55 Engine.

5. Valve gear.

The third generation Valvetronic servomotor also contains the sensor for determining the position of the eccentric shaft. A further feature of the Valvetronic servomotor is that engine oil flows through and about it. An oil spray nozzle lubricates the worm drive for the eccentric shaft.



TO006-2137

N55 engine, design of valve lift adjustment

Index	Description
1	Oil spray nozzle
2	Eccentric shaft
3	Torsion spring
4	Gate
5	Inlet camshaft
6	Intermediate lever
7	Roller lever tappet
8	Hydraulic valve lash adjustment
9	Valve spring

N55 Engine.

5. Valve gear.

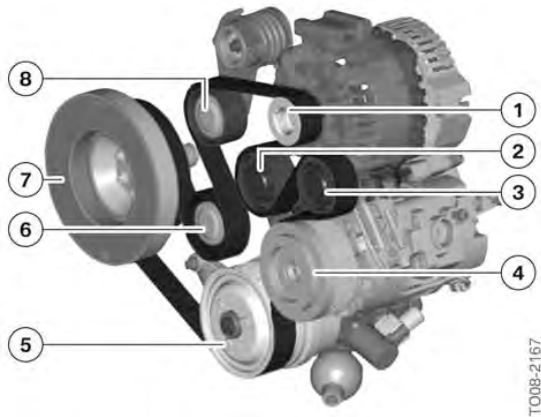
Index	Description
10	Intake valve
11	Valvetronic servomotor
12	Exhaust valve
13	Valve spring
14	Hydraulic valve lash adjustment
15	Roller lever tappet
16	Exhaust camshaft
17	Sealing sleeve
18	Socket

N55 Engine.

6. Belt drive and ancillary components.

6.1. Belt drive

Two versions of the belt drive are used. The version for the automatic engine start/stop function has three deflection pulleys and one double ribbed belt.



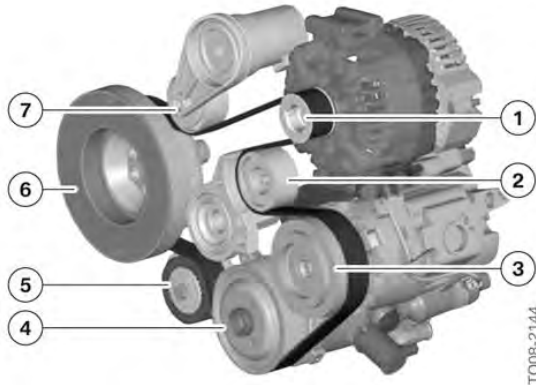
N55 engine, version without MSA

Index	Description
1	Belt pulley, alternator
2	Deflection pulley
3	Deflection pulley
4	Belt pulley, A/C compressor
5	Belt pulley, power steering pump
6	Deflection pulley
7	Vibration absorber with belt pulley
8	Belt tensioner

Thanks to the modified layout of the A/C compressor it is possible to use a one-sided poly-V-belt on vehicles with MSA. The modifications also include a new plain bearing in the belt tensioner.

N55 Engine.

6. Belt drive and ancillary components.



N55 engine, version with MSA

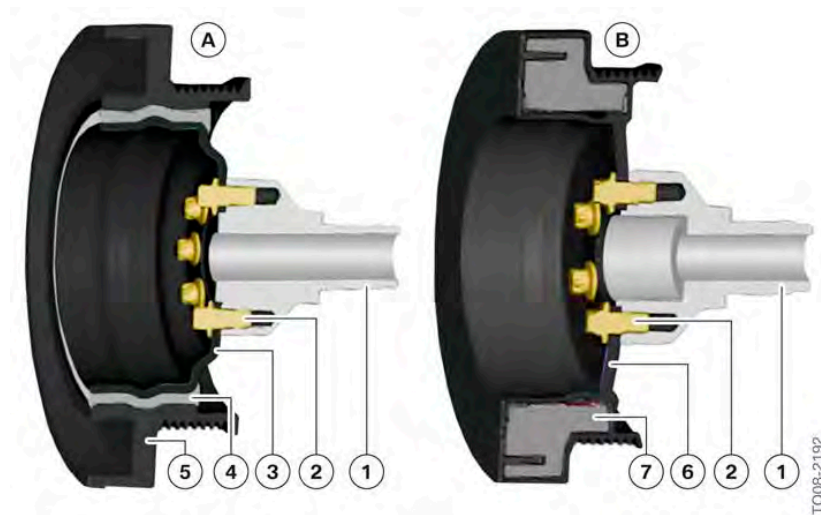
Index	Description
1	Belt pulley, alternator
2	Deflection pulley
3	Belt pulley, A/C compressor
4	Belt pulley, power steering pump
5	Deflection pulley
6	Vibration absorber with belt pulley
7	Belt tensioner

6.1.1. Vibration absorber

A single-mass vibration absorber is used on the N55 engine. The belt pulley is mounted on the secondary pulley. Compared to the N54 engine, this design layout additionally reduces the belt load as the vulcanisation decouples the belt pulley with flywheel mass from the crankshaft.

N55 Engine.

6. Belt drive and ancillary components.



N54 engine, vibration absorber

Index	Description
A	Vibration absorber, N55 engine
B	Vibration absorber, N54 engine
1	Crankshaft
2	Bolts
3	Primary pulley
4	Vulcanisation
5	Secondary belt pulley with flywheel mass
6	Primary belt pulley
7	Flywheel mass

N55 Engine.

6. Belt drive and ancillary components.



T008-2170

N55 engine, vibration absorber

Index	Description
1	Secondary belt pulley with flywheel mass
2	Flange
3	Vulcanisation

N55 Engine.

7. Oil supply

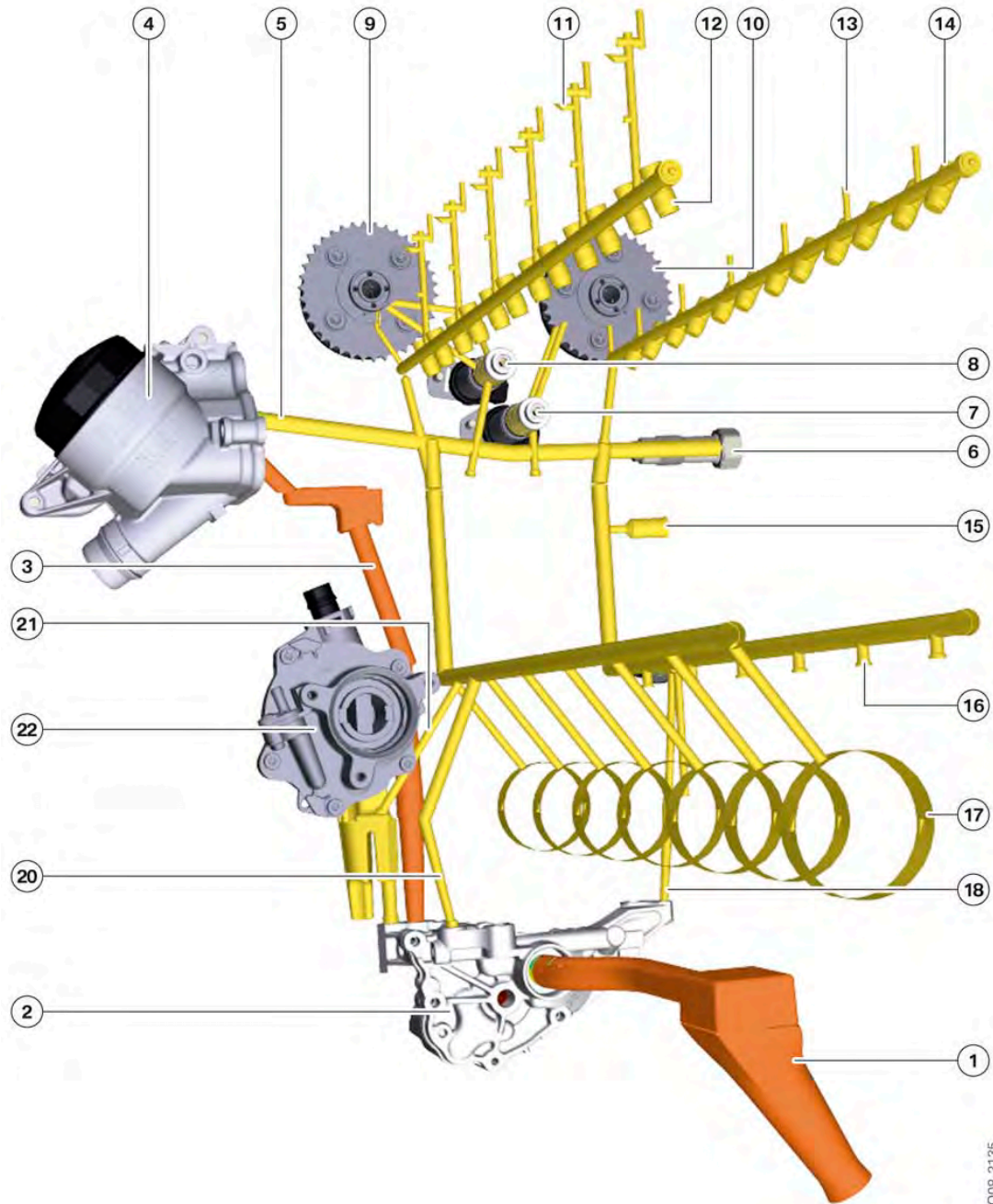
7.1. Oil circuit

7.1.1. Oil ducts

The following graphics show an overview of the oil circuit in the N55 engine. Compared to the N54 engine, there are considerably fewer oil ducts in the cylinder head. This is mainly due to the use of the new VANOS solenoid valves.

N55 Engine.

7. Oil supply



N55 engine, oil ducts

TO08-2135

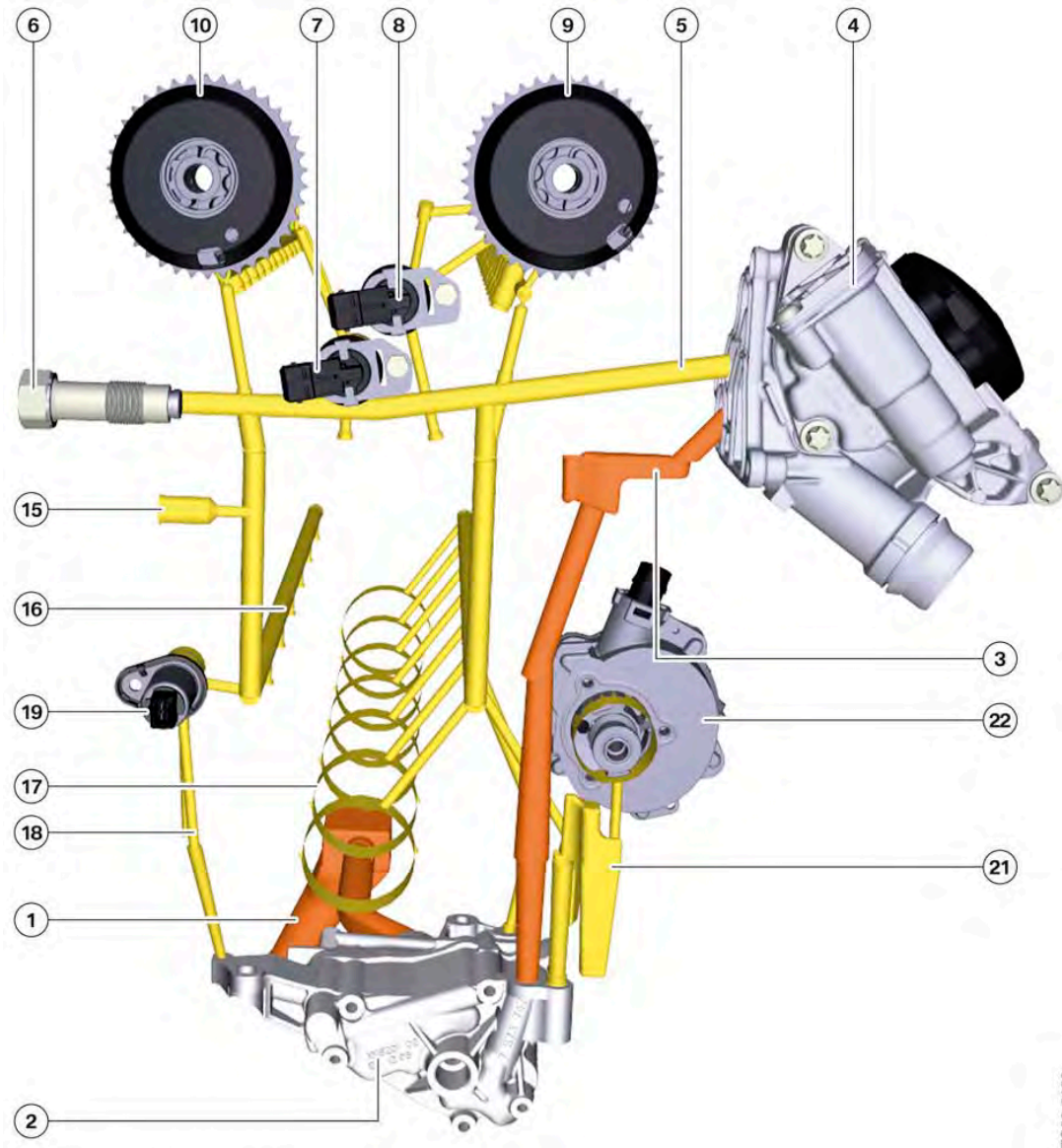
N55 Engine.

7. Oil supply

Index	Description
1	Intake pipe
2	Oil pump
3	Unfiltered oil duct
4	Oil filter
5	Main oil duct (filtered oil duct)
6	Chain tensioner
7	VANOS solenoid valve, exhaust side
8	VANOS solenoid valve, intake side
9	VANOS adjustment unit, intake side
10	VANOS adjustment unit, exhaust side
11	Oil duct for intake camshaft and eccentric shaft lubrication
12	Hydraulic valve lash adjustment
13	Oil duct for exhaust camshaft lubrication
14	Hydraulic valve lash adjustment
15	Connection to exhaust turbocharger lubrication
16	Connection for oil spray nozzles
17	Crankshaft bearing
18	Oil duct for oil pressure control
20	Oil duct for oil pressure control
21	Oil duct for vacuum pump lubrication
22	Vacuum pump

N55 Engine.

7. Oil supply



N55 engine, oil ducts

TO08-2136

Index	Description
1	Intake pipe
2	Oil pump
3	Unfiltered oil duct
4	Oil filter
5	Main oil duct (filtered oil duct)

N55 Engine.

7. Oil supply

Index	Description
6	Chain tensioner
7	VANOS solenoid valve, exhaust side
8	VANOS solenoid valve, intake side
9	VANOS adjustment unit, intake side
10	VANOS adjustment unit, exhaust side
15	Connection to exhaust turbocharger lubrication
16	Connection for oil spray nozzles
17	Crankshaft bearing
18	Oil duct for oil pressure control
19	Oil pressure control valve
21	Oil duct for vacuum pump lubrication
22	Vacuum pump

7.1.2. Oil return

The following graphics show the integrated oil deflector. It combines the following components:

- Oil deflector
- Intake snorkel

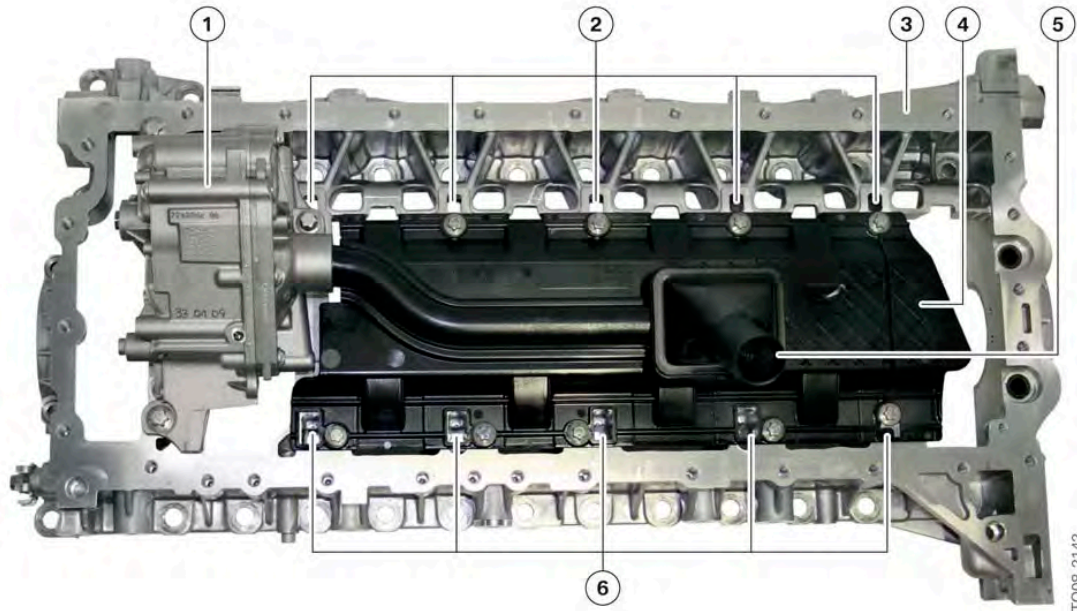
The greatest possible partitioning between the oil sump and crank drive is achieved by the integrated oil deflector. Oil scraper edges that specifically direct the spray oil from the crank drive are additionally provided on the bedplate.

The adaptation for the required type of oil pan can be simply made by changing the intake snorkel.

The oil flowing back from the cylinder head is directed under the oil deflector. In this way, no returning oil can reach the crankshaft and cause churning losses even under high transverse acceleration conditions.

N55 Engine.

7. Oil supply

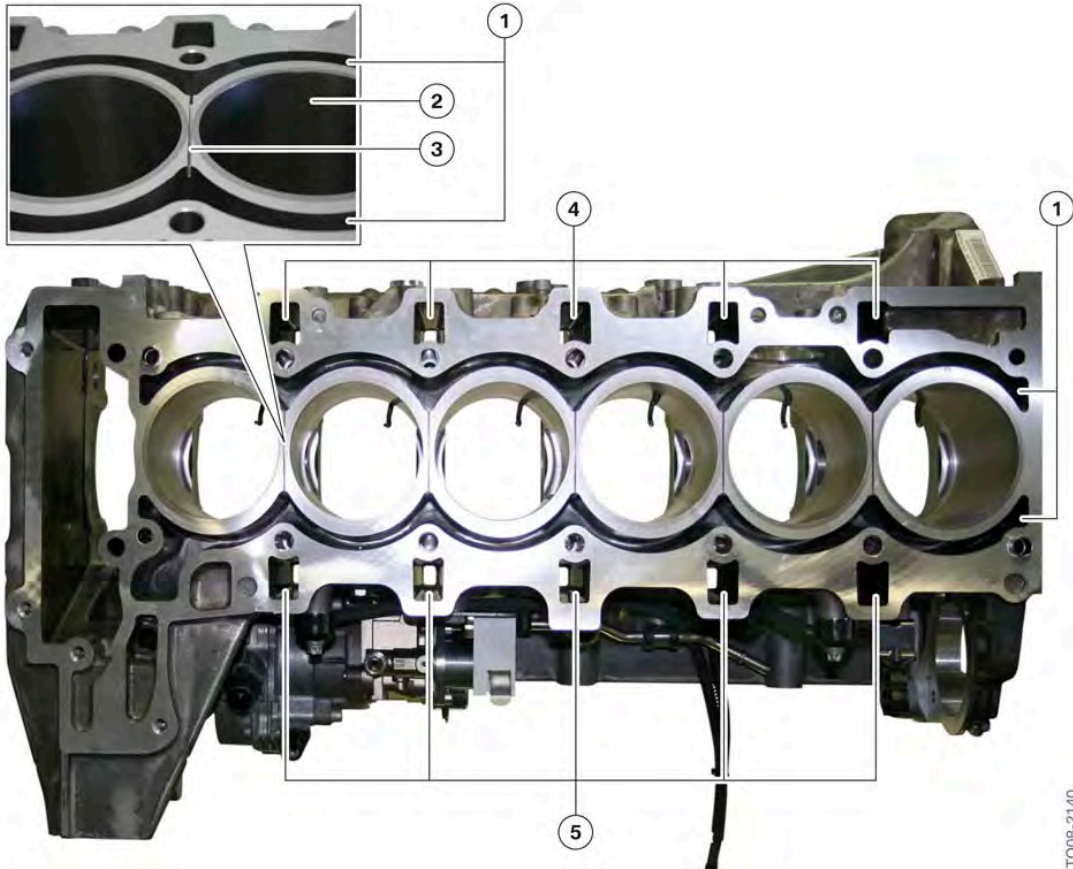


N55 engine, bedplate with oil pump and oil deflector

Index	Description
1	Oil pump
2	Oil return ducts, intake side
3	Bedplate
4	Oil deflector
5	Intake manifold with oil screen filter
6	Oil return ducts, exhaust side

N55 Engine.

7. Oil supply



N55 engine, return ducts

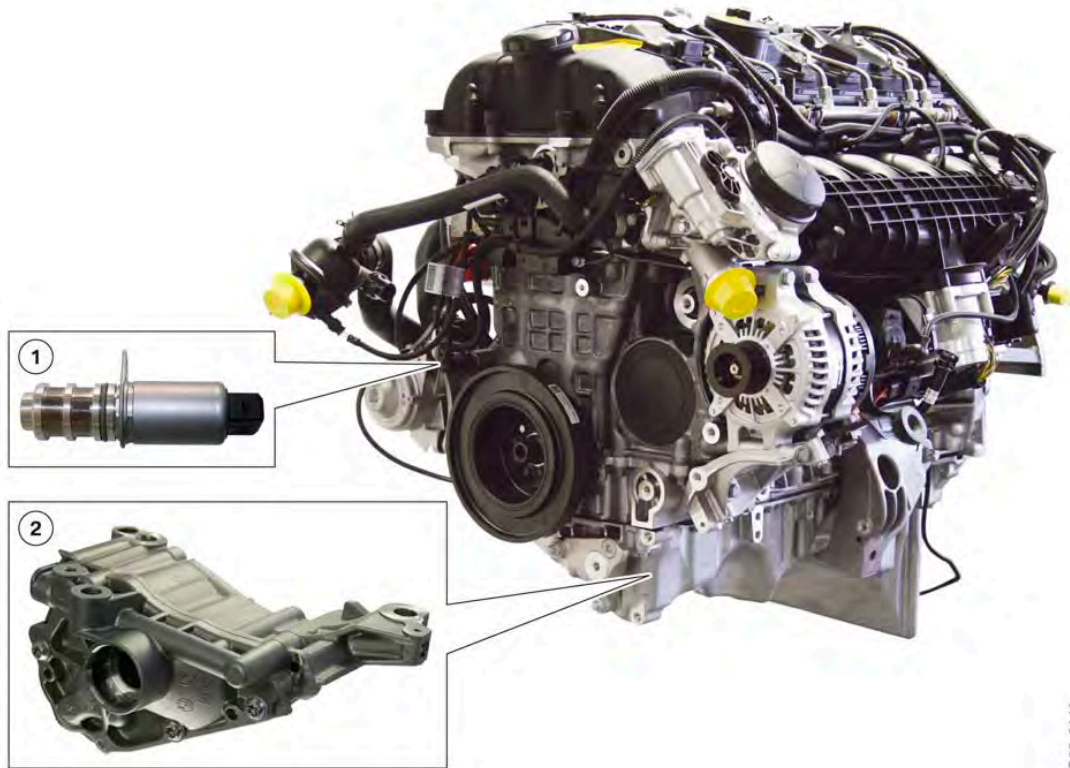
Index	Description
1	Cooling duct
2	Cylinder liner
3	Groove
4	Oil return ducts, exhaust side
5	Oil return ducts, intake side

7.1.3. Oil pump and pressure control

A modified version of the reciprocating slide oil pump known from the N54 engine is used. For the first time a Duroplast reciprocating slide valve is used. The volumetric flow control system known from the N53 engine is also used. The operating principle of the oil pump is described in the Product Information "N63 Engine". The operating principle of the pressure control system is described in the Product Information "N53 Engine".

N55 Engine.

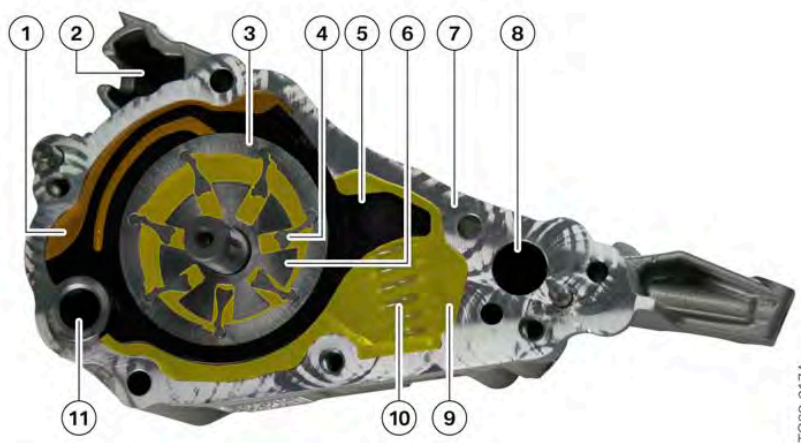
7. Oil supply



TO08-2141

N55 engine, oil pump and pressure control valve

Index	Description
1	Oil pressure control valve
2	Oil pump



TO08-2174

N55 engine, oil pump

N55 Engine.

7. Oil supply

Index	Description
1	Control oil chamber
2	Pressure limiting valve
3	Rotor
4	Vane
5	Reciprocating slide valve
6	Inner rotor
7	Housing
8	Hole for pressure control valve
9	Damping oil chamber
10	Compression spring (2x)
11	Axis of rotation

The oil pump has been redesigned to cater for the functionality and durability of the Duroplast reciprocating slide valve.

7.1.4. Oil filtration and oil cooling

The oil filter housing is made from Duroplast. A separate engine oil cooler is also used for cooling the engine oil. Depending on the oil temperature, a thermostat on the oil filter housing releases the oil flow to the oil cooler.

7.1.5. Oil spray nozzles

The N55 engine is equipped with oil spray nozzles for the purpose of cooling the piston crown. A special tool is required for positioning the oil spray nozzles.

7.1.6. Oil monitoring

Oil pressure

Since the N55 engine has an oil pump with volumetric flow control, it is necessary to exactly measure the oil pressure. For this reason, a new sensor supplied by the company Sensata is fitted. The N53/ N43 engine was equipped with a Honeywell sensor.

Advantages of the new sensor:

- Measurement of absolute pressure (previously relative pressure)
- Characteristic map control possible in all speed ranges.

Oil level

The known oil condition sensor is used for the purpose of measuring the oil level.

N55 Engine.

8. Air intake and exhaust system

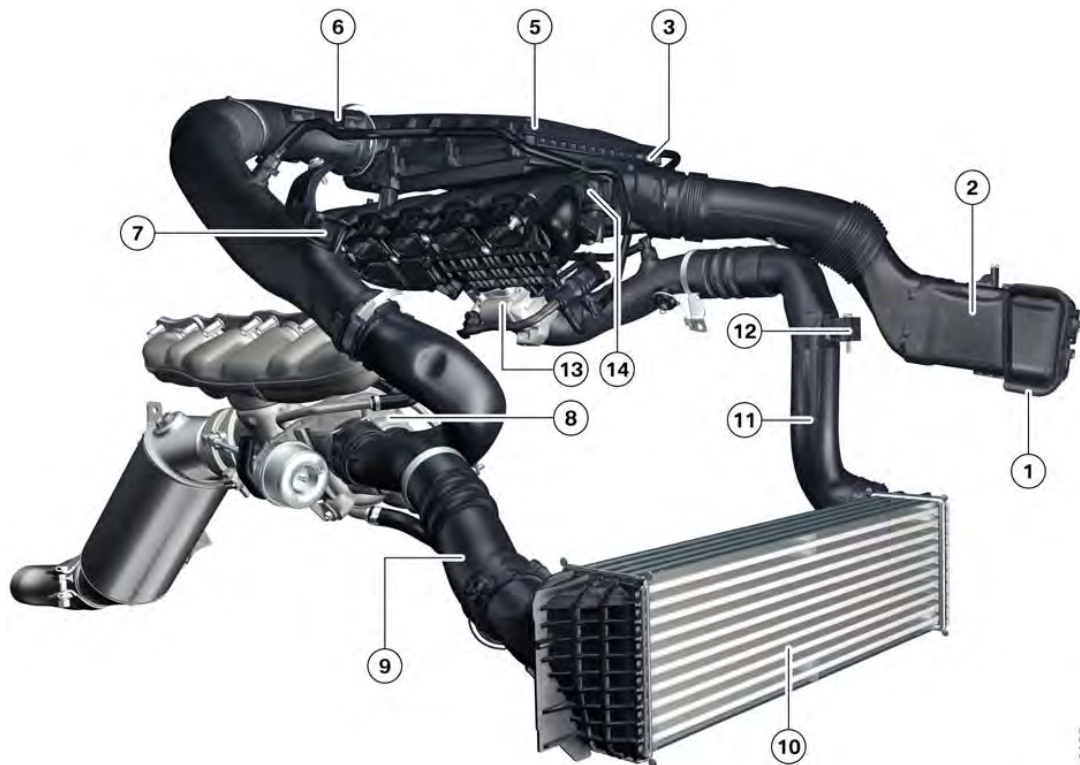
8.1. Air intake system

8.1.1. Overview

Several functions have been optimised for the N55 engine:

- Unfiltered air routed up to the intake silencer (adopted from the N54 engine)
- Filtered air duct completely new and simplified to accommodate the new exhaust turbocharger
- Crankcase ventilation
- Diverter valve system integrated in exhaust turbocharger
- Fuel tank ventilation correspondingly adapted.

As can be seen from the graphics, the design layout of the air intake system has been simplified as only one turbocharger is used.



N55 engine, air intake system

TO08-2188

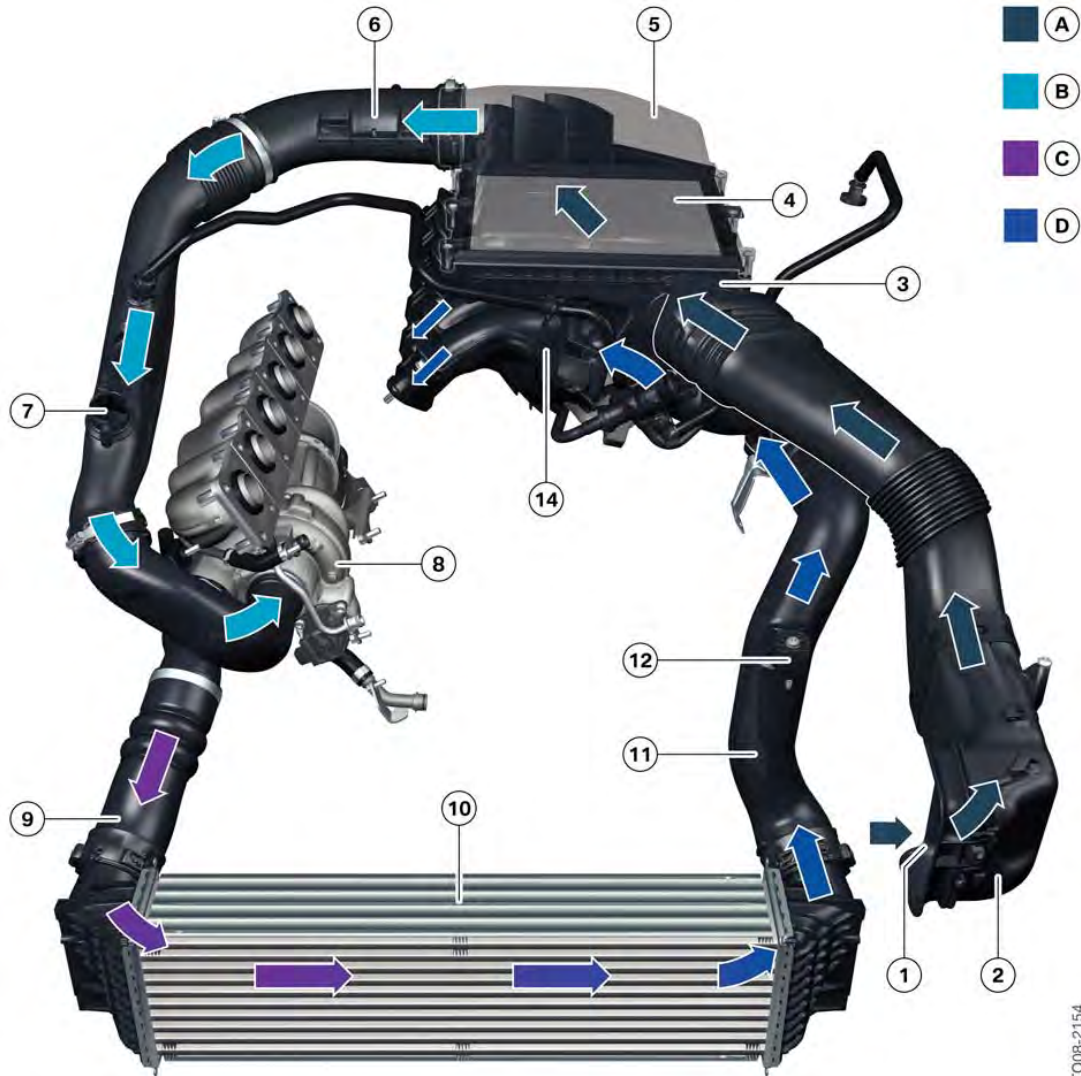
N55 Engine.

8. Air intake and exhaust system

Index	Description
1	Intake snorkel
2	Unfiltered air line
3	Intake silencer
5	Air intake silencer cover
6	Hot-film air mass meter
7	Crankcase ventilation connection
8	Exhaust turbocharger
9	Charge-air pipe
10	Intercooler
11	Charge-air pipe
12	Boost pressure-temperature sensor
13	Throttle valve
14	Intake manifold

N55 Engine.

8. Air intake and exhaust system



N55 engine, air intake system

TO08-2154

Index	Description
A	Unfiltered air
B	Purified air
C	Heated charge air
D	Cooled charge air
1	Intake snorkel
2	Unfiltered air line
3	Intake silencer

N55 Engine.

8. Air intake and exhaust system

Index	Description
4	Filter element
5	Air intake silencer cover
6	Hot-film air mass meter
7	Crankcase ventilation connection
8	Exhaust turbocharger
9	Charge-air pipe
10	Intercooler
11	Charge-air pipe
12	Boost pressure-temperature sensor
14	Intake air manifold

The basic function of the diverter valve remains the same. The difference compared to the N54 engine is that the diverter valve is not operated pneumatically. The diverter valve on the N55 engine is an electric actuator that is controlled directly by the DME. The number of components has been greatly reduced by positioning the diverter valve on the exhaust turbocharger. The diverter valve can connect the intake side to the pressure side.

As on the N54 engine, the undesirable peaks in the boost pressure that can occur when the throttle valve closes fast are reduced. This means the diverter valve plays an important role in terms of the engine acoustics while protecting the components of the exhaust turbocharger. The detailed operating principle is described in the Product Information "N54 Engine".

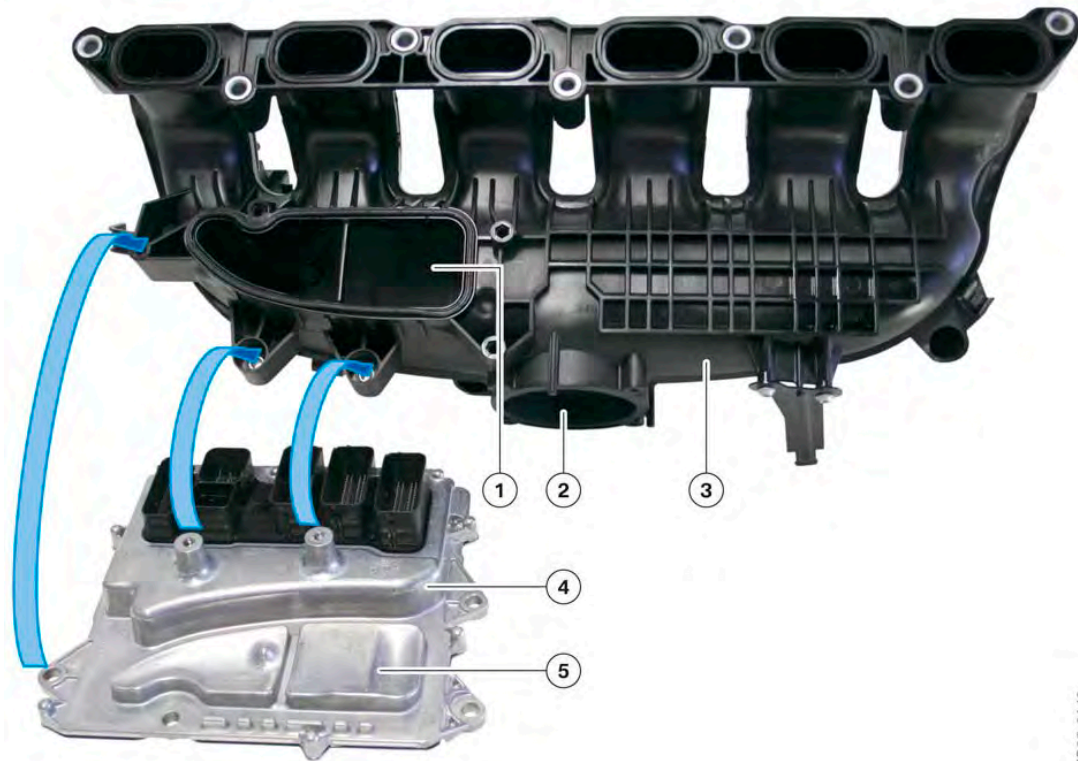
8.1.2. Air intake system

As can be seen in the following graphic, the engine control unit is mounted on the intake system. The intake air is also used to cool the engine control unit.

Thanks to this arrangement, the engine can already be assembled with the control unit and the sensors and actuators connected to the engine in production.

N55 Engine.

8. Air intake and exhaust system



TO08-2149

N55 engine, intake system with DME control unit

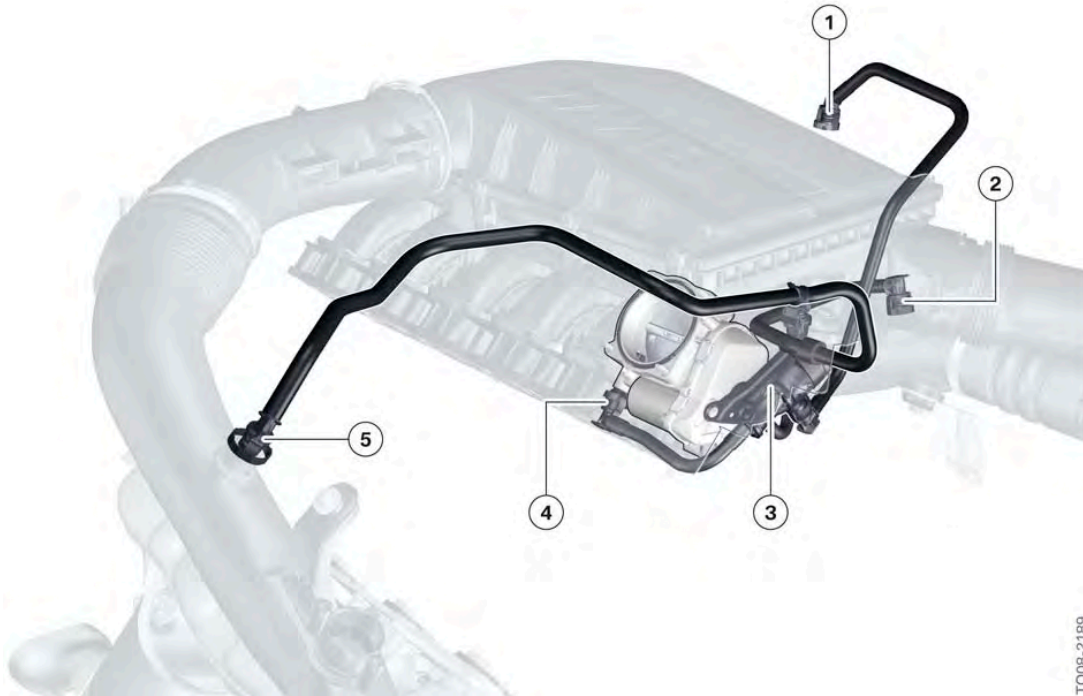
Index	Description
1	Connection flange for engine control unit cooling
2	Connection flange for throttle valve
3	Air intake system
4	Engine control unit
5	Cooling fins

8.1.3. Fuel tank ventilation system

The fuel vapours are buffered in a carbon canister and then fed via the fuel tank vent valve to the combustion process. The turbocharging system makes it necessary to also adapt this system to given conditions.

N55 Engine.

8. Air intake and exhaust system



T008-2189

N55 engine, fuel tank ventilation system

Index	Description
1	Connection to ventilation line from carbon canister
2	Connection upstream of throttle valve
3	Fuel tank vent valve
4	Connection downstream of throttle valve
5	Connection upstream of exhaust turbocharger

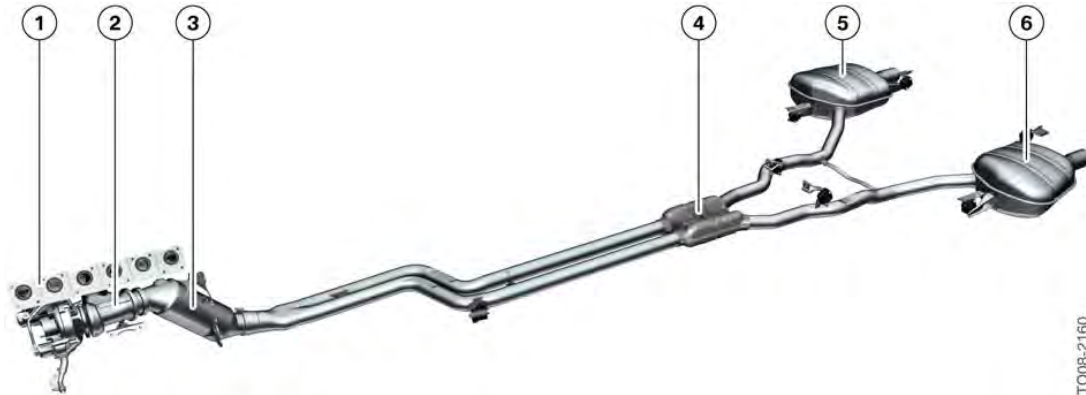
8.2. Exhaust system

8.2.1. Overview

With the twin scroll exhaust turbocharger, the design of the exhaust system is less complicated than that for the N54 engine with two exhaust turbochargers. In addition to a near-engine catalytic converter (3), the exhaust system also features a centre silencer (4) and two rear silencers (5 + 6).

N55 Engine.

8. Air intake and exhaust system



N55 engine, exhaust system F07

TO08-2160

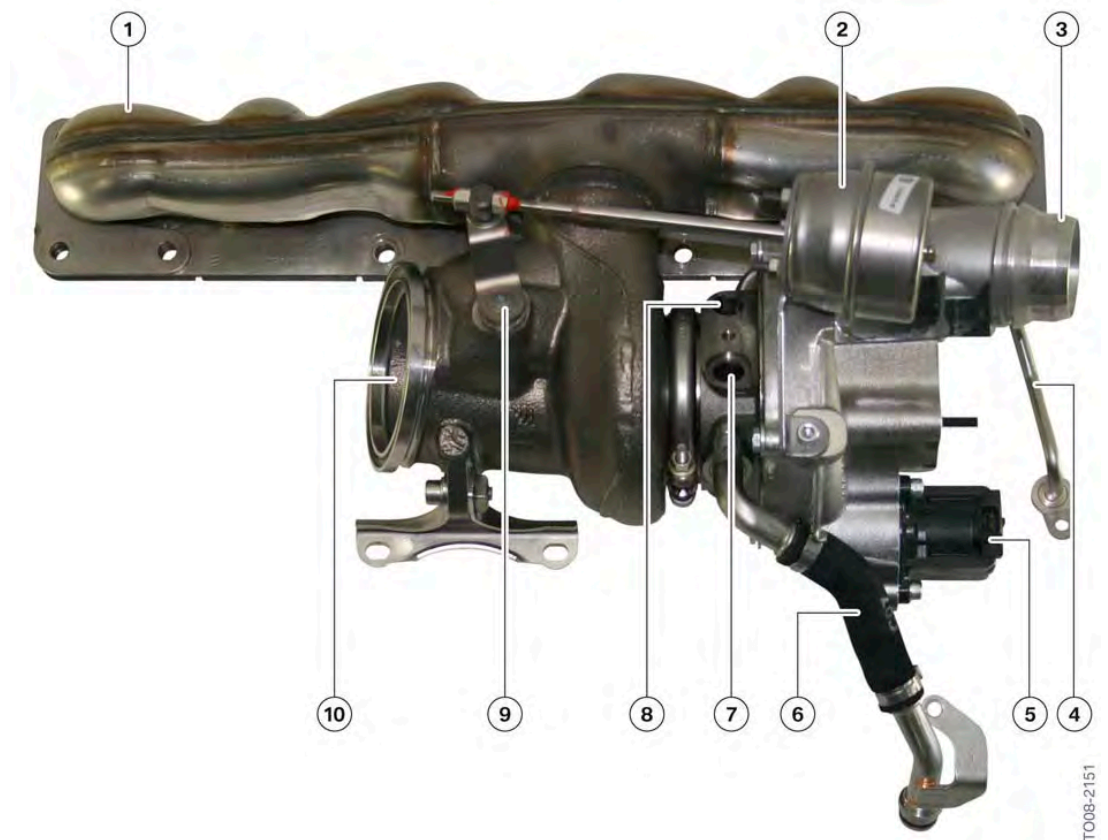
Index	Description
1	Exhaust manifold
2	Exhaust turbocharger
3	Catalytic converter
4	Centre silencer
5	Rear silencer, right
6	Rear silencer, left

8.2.2. Exhaust manifold

The exhaust manifold is air-gap insulated and designed as a six into two manifold. Combining three exhaust channels each into one exhaust channel is necessary in order to ensure optimum flow to the twin scroll exhaust turbocharger. The exhaust manifold and exhaust turbocharger are welded together to form one component.

N55 Engine.

8. Air intake and exhaust system



N55 engine, attachment of exhaust turbocharger to engine block

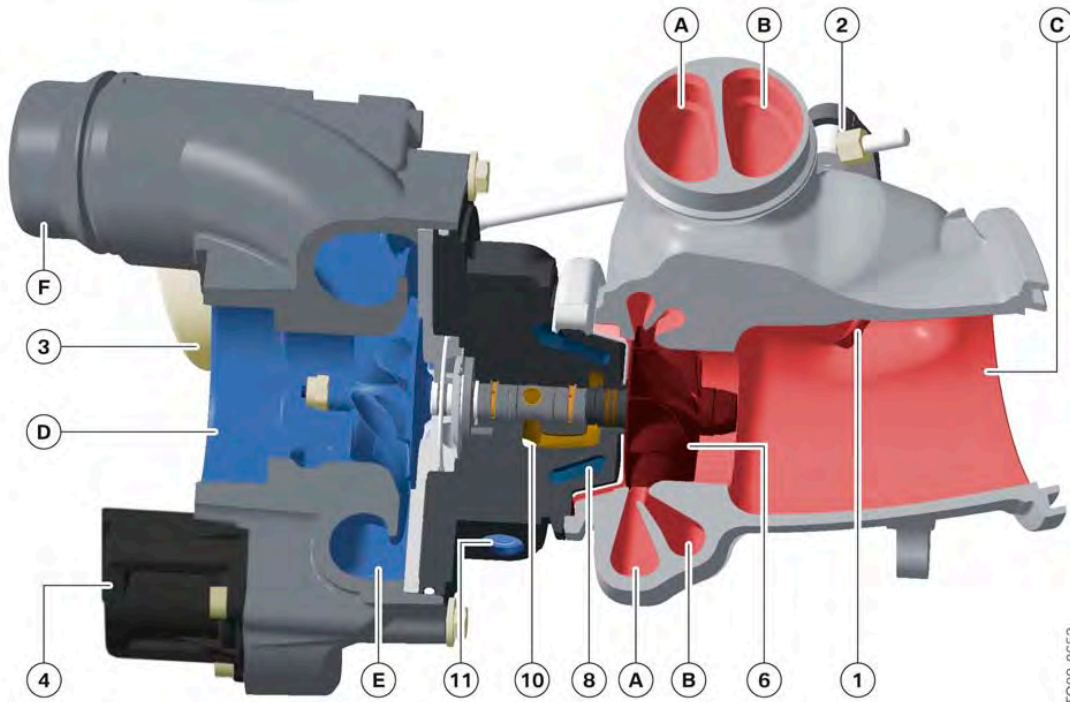
Index	Description
1	Exhaust manifold
2	Vacuum unit
3	Connection to intercooler
4	Oil feed line
5	Diverter valve
6	Oil return line
7	Coolant infeed
8	Coolant return
9	Shaft, wastegate valve
10	Connection to exhaust system

N55 Engine.

8. Air intake and exhaust system

8.2.3. Exhaust turbocharger

The N55 engine is equipped with a twin scroll exhaust turbocharger instead of two separate small turbochargers as used on the N54 engine. The following graphic shows the operating principle of the twin scroll exhaust turbocharger.



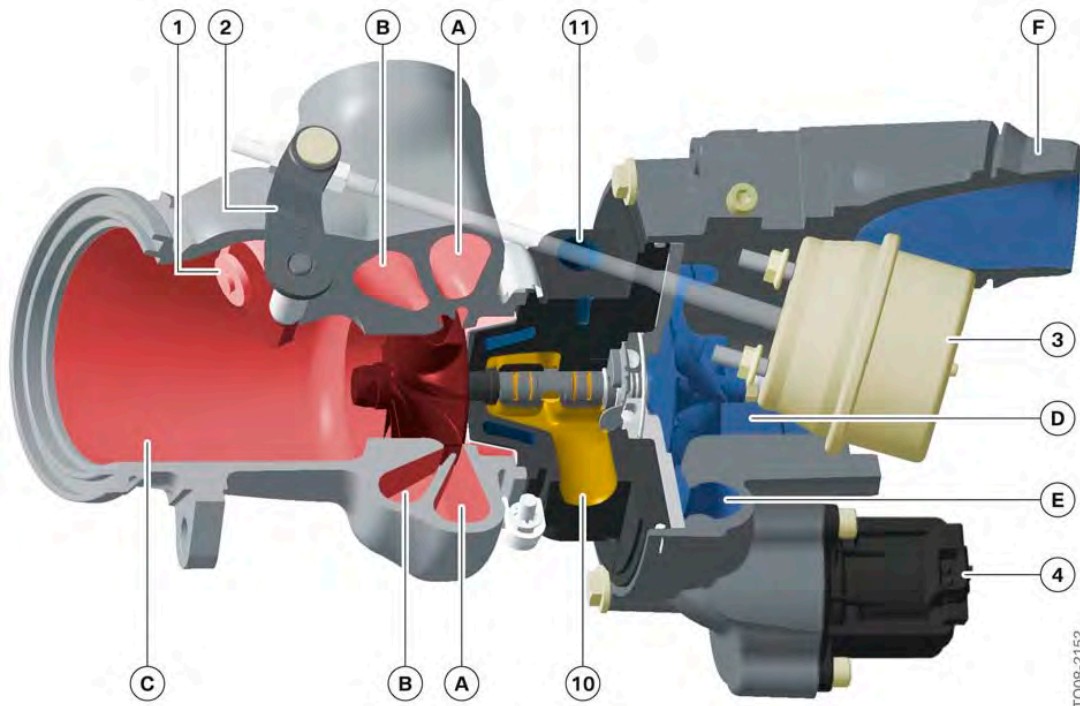
Twin scroll exhaust turbocharger

Index	Description
A	Exhaust duct 1 (cylinders 1 - 3)
B	Exhaust duct 2 (cylinders 4 - 6)
C	Connection to catalytic converter
D	Inlet from intake silencer
E	Ring channel
F	Outlet to intercooler
1	Wastegate valve
2	Lever arm, wastegate valve
3	Vacuum unit for wastegate valve
4	Diverter valve

N55 Engine.

8. Air intake and exhaust system

Index	Description
6	Turbine wheel
8	Cooling duct
10	Oil return
11	Coolant return



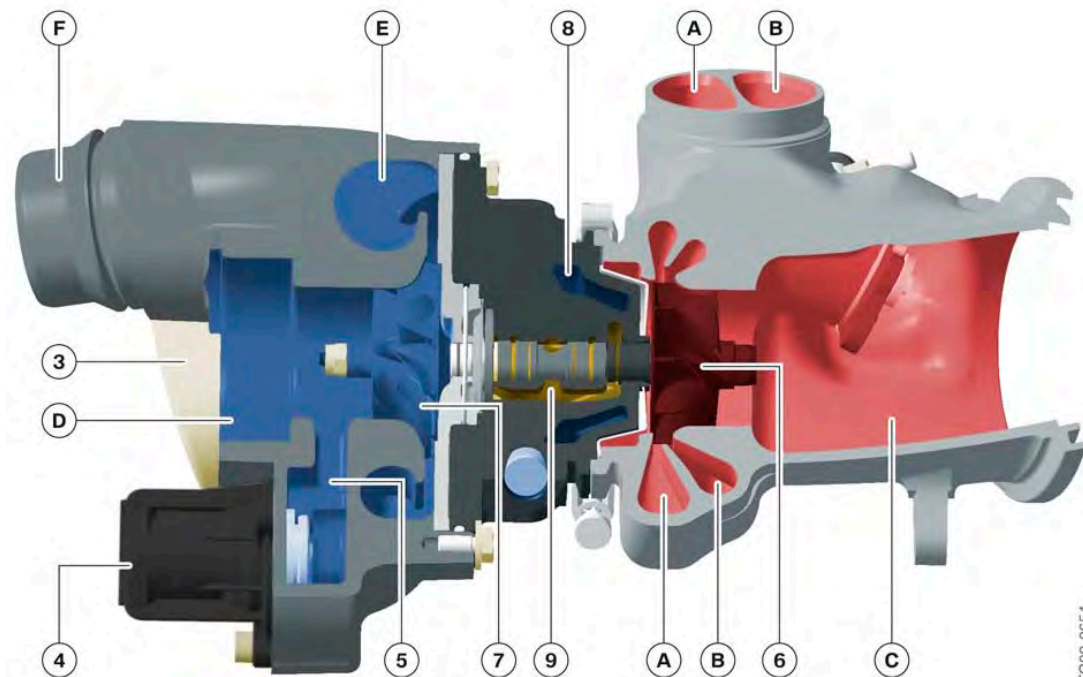
Twin scroll exhaust turbocharger

Index	Description
A	Exhaust duct 1 (cylinders 1 - 3)
B	Exhaust duct 2 (cylinders 4 - 6)
C	Connection to catalytic converter
D	Inlet from intake silencer
E	Ring channel
F	Outlet to intercooler
1	Wastegate valve
2	Lever arm, wastegate valve

N55 Engine.

8. Air intake and exhaust system

Index	Description
3	Vacuum unit for wastegate valve
4	Diverter valve
10	Oil return
11	Coolant return



Twin scroll exhaust turbocharger

Index	Description
A	Exhaust duct 1 (cylinders 1 - 3)
B	Exhaust duct 2 (cylinders 4 - 6)
C	Connection to catalytic converter
D	Inlet from intake silencer
E	Ring channel
F	Outlet to intercooler
1	Wastegate valve
2	Lever arm, wastegate valve
3	Vacuum unit for wastegate valve
4	Diverter valve
5	Bypass

N55 Engine.

8. Air intake and exhaust system

Index	Description
6	Turbine wheel
7	Compressor wheel
8	Cooling duct
9	Turbine shaft

Function of the twin scroll exhaust turbocharger

A constant exhaust gas pressure is applied to the exhaust turbocharger only rarely. At low engine speeds, the exhaust reaches the exhaust turbine in pulsating form. Due to this pulsation, a higher pressure ratio is temporarily reached in the exhaust turbine. Since the efficiency increases as the pressure rises, the pulsation also improves the boost pressure progression and thus the torque progression of the engine. This is the case particularly at low engine speeds.

To ensure the individual cylinders do not mutually influence each other during the cylinder charge change process, cylinders 1 - 3 (cylinder bank 1) and cylinders 4 - 6 (cylinder bank 2) are each combined to form one exhaust channel. The flow of exhaust gas in the turbocharger is directed in scrolls (spirals) to the exhaust turbine via the exhaust channels (1 + 2). This design layout makes it possible to optimally use the pulsations for generating boost pressure.

The known wastegate valve is used for the purpose of limiting the boost pressure.

8.2.4. Catalytic converter

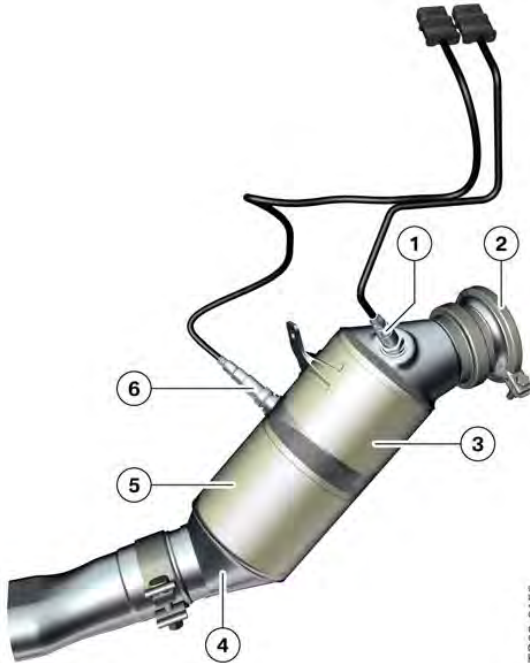
Two ceramic monoliths are contained in the catalytic converter housing. The catalytic converter has a volume of 2.7 litres. Depending on the type of vehicle the ceramic monoliths have different coatings.

Ceramic monolith 1 has a volume of 1.2 litres, a diameter of 125 mm and contains 600 cells.

Ceramic monolith 2 has a volume of 1.5 litres, a diameter of 125 mm and contains 400 cells.

N55 Engine.

8. Air intake and exhaust system



N55 engine, catalytic converter

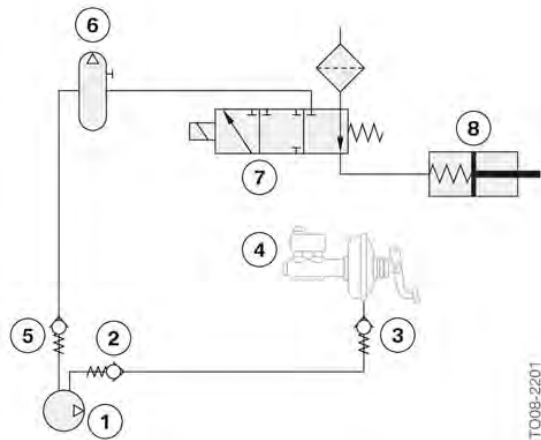
Index	Description
1	Oxygen sensor upstream of catalytic converter
2	Connection at exhaust turbocharger
3	Ceramic monolith 1
4	Catalytic converter outlet funnel
5	Ceramic monolith 2
6	Oxygen sensor after ceramic monolith 1

N55 Engine.

9. Vacuum system.

9.1. Design

The N55 engine is equipped with a vacuum pump for generating the vacuum required by the brake booster and the auxiliary load. This auxiliary load on the F07 is the wastegate valve. A vacuum accumulator is used to ensure there is sufficient vacuum for the wastegate valve at all times.



N55 engine, vacuum system

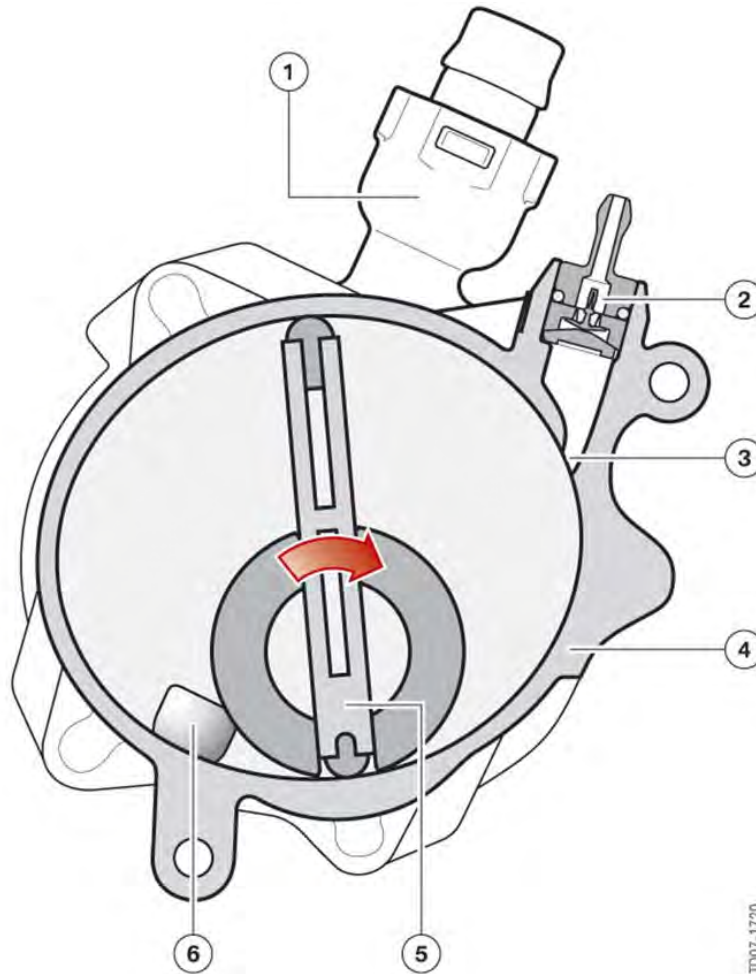
Index	Description
1	Vacuum pump
2	Non-return valve
3	Non-return valve
4	Brake servo unit
5	Non-return valve
6	Vacuum accumulator
7	Electropneumatic pressure converter
8	Vacuum unit, wastegate valve

9.1.1. Vacuum pump

The vacuum pump is similar to that used on the N63 engine. It is a two-stage pump and therefore has two connections. The first stage is for the brake booster and the second for the auxiliary load.

N55 Engine.

9. Vacuum system.



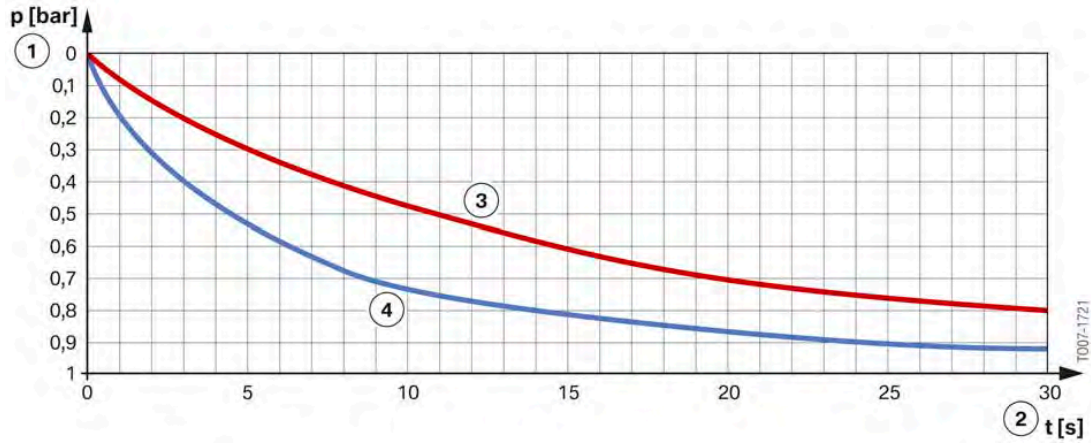
N55 engine, vacuum pump

Index	Description
1	Non-return valve for brake booster
2	Non-return valve for auxiliary load
3	Connection opening for auxiliary load
4	Vacuum pump housing
5	Vane
6	Connection opening for brake booster

The largest part of the space expansion (evacuation) is used for the first stage, ensuring vacuum is built up at a rapid rate for the brake booster. Only in the last section is the opening for the auxiliary load released, i.e. the second stage cuts in. It therefore takes longer to build up the vacuum here, as shown in the following diagram.

N55 Engine.

9. Vacuum system.



N55 engine, delivery rate of the two-stage vacuum pump

Index	Description
1	Vacuum
2	Time
3	Delivery rate for auxiliary load
4	Delivery rate for brake booster

This solution takes into account the different requirements for the brake booster and the auxiliary load.

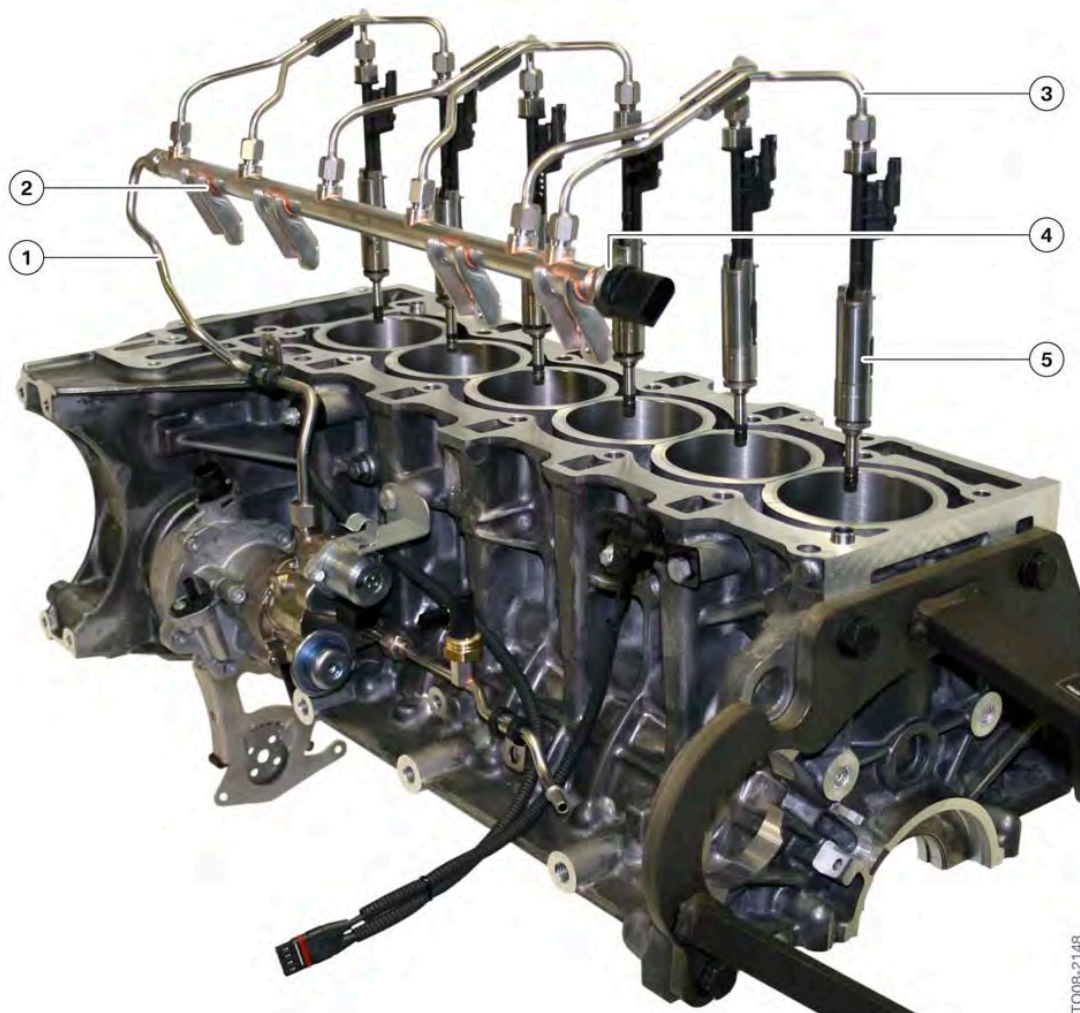
N55 Engine.

10. Fuel preparation.

10.1. Overview

The high pressure fuel injection system (HDE) is used on the N55 engine. In contrast to high precision injection (HPI) solenoid fuel injectors with multi-hole nozzles are used.

The following overview shows the complete fuel preparation system. The fuel preparation system used on the N55 engine is similar to the fuel preparation system of the N54 engine. For instance, the same high pressure pump is used. The high pressure fuel injection valves are new. Bosch high pressure fuel injection valves with the designation HDEV5.2 are used.



N55 engine, overview of high pressure fuel injection system

TO08-2148

N55 Engine.

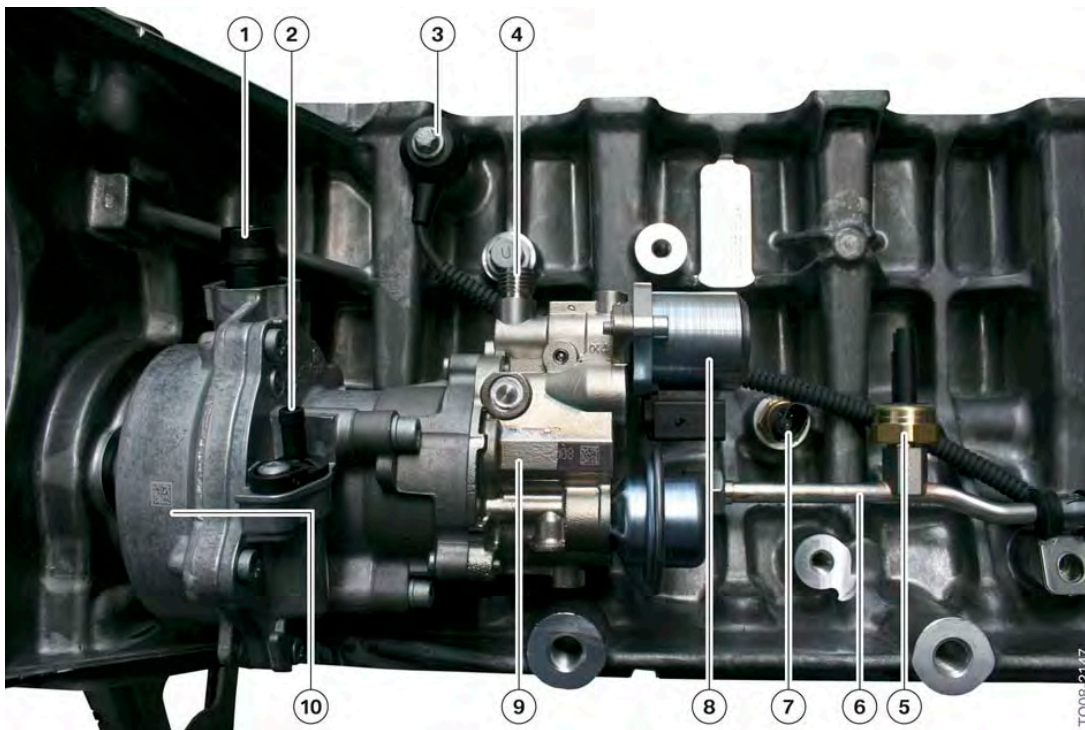
10. Fuel preparation.

Index	Description
1	High pressure line
2	Rail
3	High pressure line
4	Fuel rail pressure sensor
5	Solenoid valve fuel injector

10.1.1. Fuel pressure sensor

The fuel is conveyed at a primary pressure of 5 bar by the electric fuel pump from the fuel tank via the supply line to the high pressure pump. The primary pressure is monitored by the fuel pressure sensor. The fuel is delivered by the electric fuel pump corresponding to requirements. The fuel pressure sensor known from the N54, N53 and N63 engine is used.

In the event of the fuel pressure sensor failing, the electric fuel pump continues operation at 100 % delivery rate as from terminal 15 ON.



N55 Engine

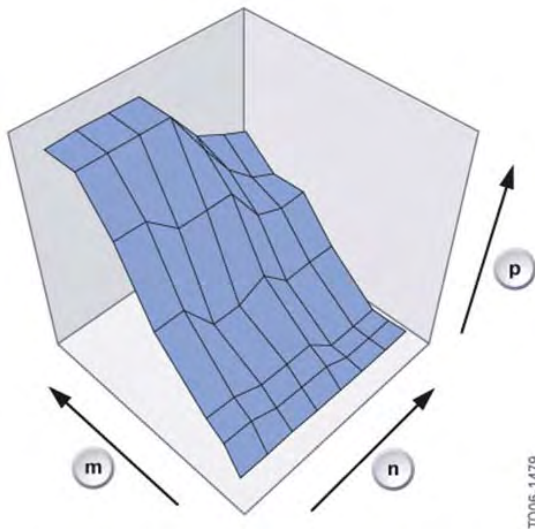
N55 Engine.

10. Fuel preparation.

Index	Description
1	Non-return valve for brake booster
2	Non-return valve for auxiliary load
3	Knock sensor
4	Connection, high pressure line to fuel rail
5	Fuel pressure sensor
6	Fuel supply line
7	Oil pressure sensor
8	Quantity control valve
9	High pressure pump
10	Vacuum pump

10.1.2. High pressure pump

The fuel is pressurised in the permanently driven three-piston high pressure pump and delivered to the fuel rail via the high pressure line. The fuel stored under pressure in the fuel rail is distributed via the high pressure lines to the high pressure fuel injection valves. The required fuel pressure is determined by the engine management as a function of the engine load and engine speed. The pressure level is registered by the rail pressure sensor and sent to the engine control unit. The fuel is regulated by the quantity control valve based on a target/actual value comparison of the rail pressure. The pressure level is configured such to achieve the best possible fuel consumption and smooth running properties of the N55 engine. A pressure of 200 bar is only required at high load and low engine speed. The high pressure pump is of the same design as the high pressure pump used on the N53 and N54 engines.



N55 engine, fuel pressure diagram

T006-1479

N55 Engine.

10. Fuel preparation.

Index	Description
m	Engine load
n	Engine speed
p	Pressure

ACHTUNG! Öffnen des Kraftstoffsystems bei Kühlmitteltemperatur über 40 °C nicht zulässig. Gefahr von Körperverletzung. Reparaturanleitung beachten.

CAUTION! Do not open the fuel system if the coolant temperature is above 40 °C/104 °F – risk of injury! Consult the repair manual.

ATTENTION ! Il est interdit d'ouvrir le système d'alimentation en carburant lorsque la température du liquide de refroidissement est supérieure à 40 °C. Risque de blessure. Respecter les instructions du Manuel de réparation.

¡ATENCIÓN! Prohibido abrir el sistema de combustible cuando la temperatura del líquido refrigerante supere los 40 °C. Peligro de lesiones. Consultar el manual de reparaciones.

注意! 冷却液温度高于40摄氏度时禁止打开燃油系统。存在身体伤害的危险。注意维修说明。

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Warning information for working on the high pressure system

10.1.3. Fuel injectors

The high pressure fuel injection valve HDEV5.2 from Bosch is a solenoid valve fuel injector. In contrast to the piezo-injector used on the current BMW engines, the solenoid valve fuel injector is designed as an inward-opening multi-hole valve with highly variable jet angle and jet form. The solenoid valve fuel injector is designed for a system pressure of up to 200 bar.



Work should only be carried out on the fuel system after the engine has cooled down. The coolant temperature must not be more than 40 °C. These requirements must be observed otherwise the residual pressure in the high pressure fuel system could cause fuel to spray out.

It is essential to observe the utmost cleanliness when working on the high pressure fuel system and follow the working procedures described in the repair instructions. Even minute soiling and damage at the screw connections of the high pressure lines could cause leaks.

Particular care must be taken when working on the fuel system of the N55 engine to ensure that the ignition coils are not soiled with fuel. The resistance of the silicone material is greatly reduced by contact with fuel. This could result in sparkover at the top of the spark plug and misfiring.

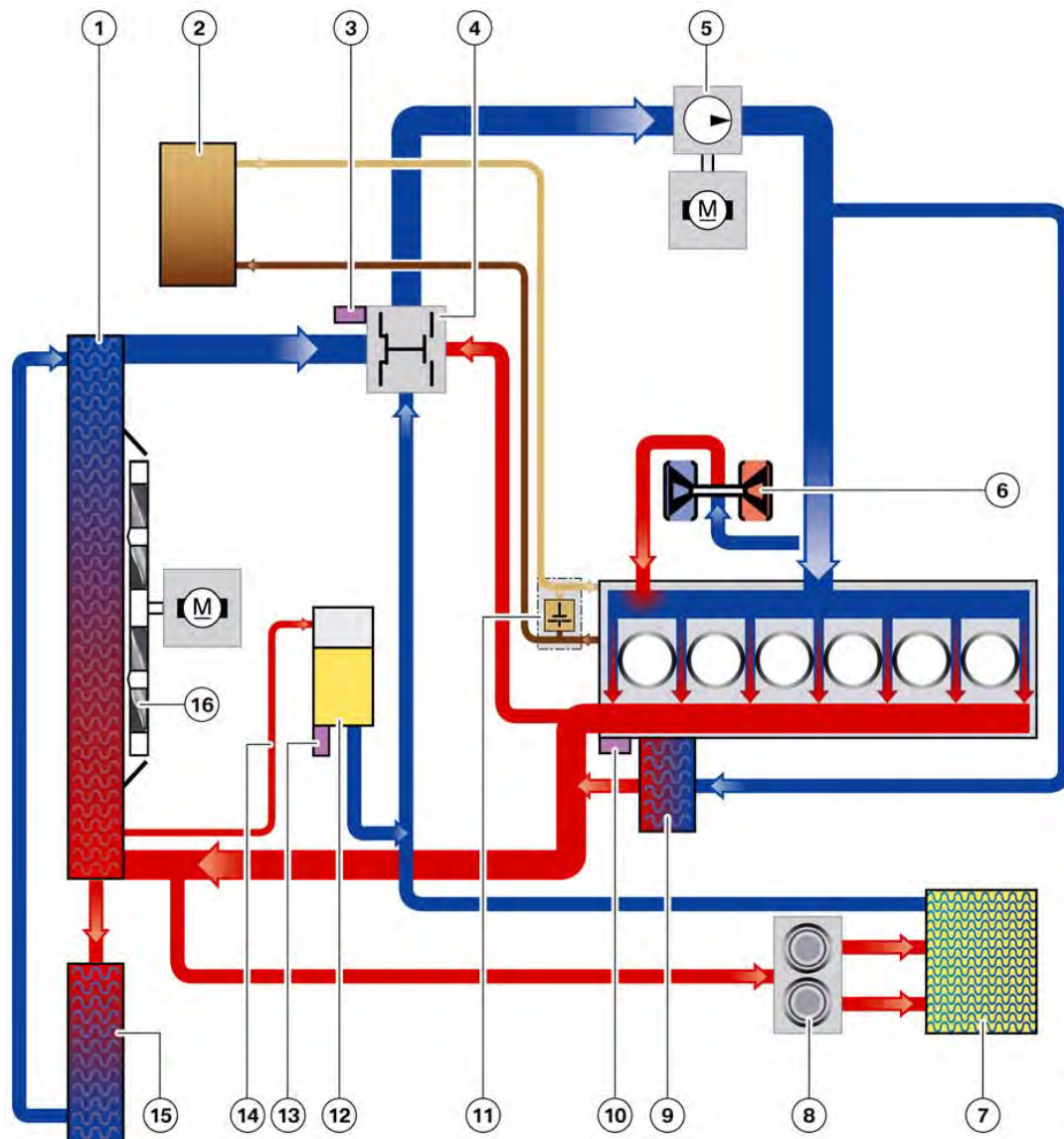
- Before working on the fuel system, remove the ignition coils and use a rag to prevent fuel entering the spark plug well.
- The ignition coils must be removed before installing new solenoid valve fuel injectors and utmost cleanliness must be observed.
- Ignition coils that have been heavily soiled with fuel must be replaced.

N55 Engine.

11. Cooling system.

11.1. Overview

The cooling system of the N55 engine consists of a coolant cooling system and an oil cooling system. Depending on the version, different types of oil cooling system are used. In the hot climate variant, heat transfer from the engine oil to the coolant area of the engine is avoided by decoupling the oil cooler from the coolant circuit.



N55 engine, cooling system

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N55 Engine.

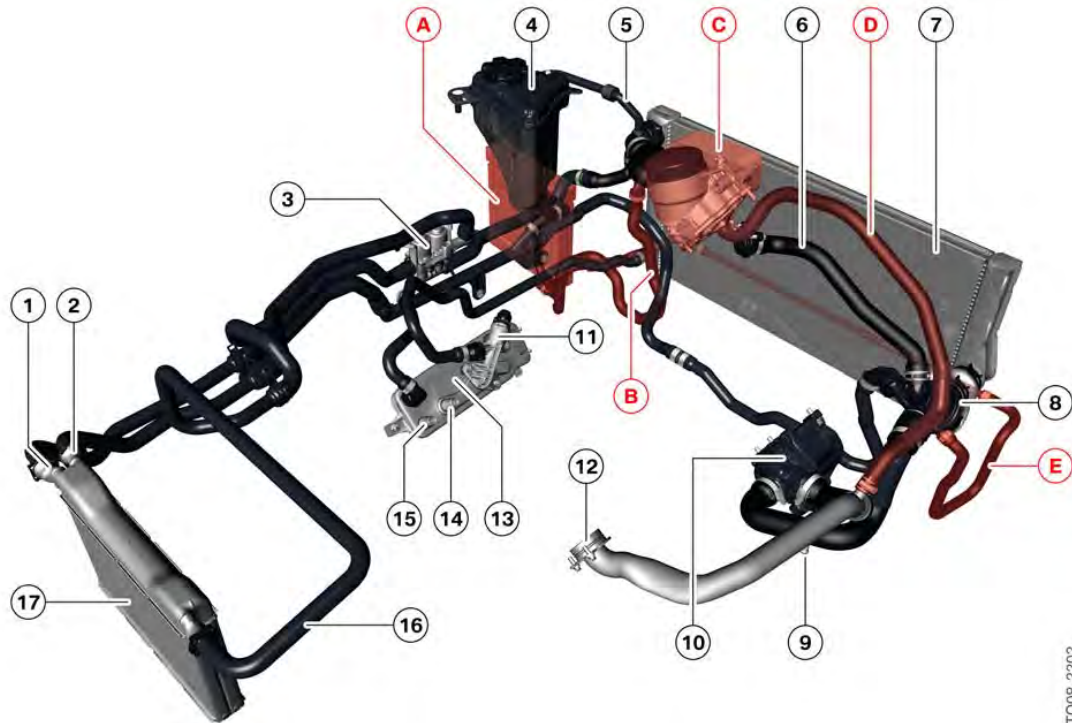
11. Cooling system.

Index	Description
1	Radiator
2	Engine oil cooler (hot climate version)
3	Heater coil
4	Characteristic map thermostat
5	Electric coolant pump
6	Exhaust turbocharger
7	Heating heat exchanger
8	Coolant valve
9	Oil-to-coolant heat exchanger (Europe version)
10	Coolant temperature sensor
11	Engine oil thermostat (hot climate version)
12	Expansion tank
13	Coolant level switch
14	Equalisation line
15	Auxiliary radiator (Europe version)
16	Electric fan

The components highlighted in red in the following graphic are only fitted in the Europe version. The Europe version has an auxiliary radiator (A) on the left-hand side of the vehicle. The engine oil is cooled by means of an oil-to-coolant heat exchanger (C).

N55 Engine.

11. Cooling system.



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N55 engine, cooling system

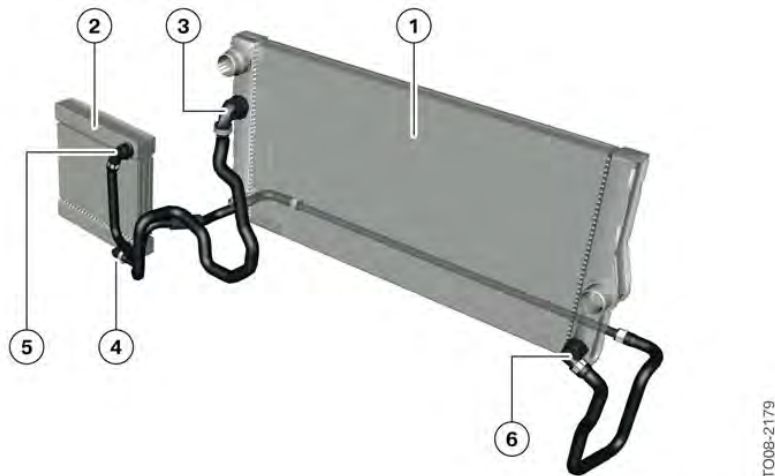
Index	Description
A	Auxiliary radiator
B	Coolant feed line to auxiliary radiator
C	Oil-to-coolant heat exchangers
D	Coolant feed line to oil-to-coolant heat exchanger
E	Coolant return line from auxiliary radiator
1	Zone 1 feed line, heating heat exchanger
2	Zone 2 feed line, heating heat exchanger
3	Coolant valve
4	Expansion tank
5	Equalisation line
6	Radiator
7	Bypass line for small cooling circuit
8	Thermostat
9	Electric coolant pump
10	Exhaust turbocharger supply line
11	Thermostat for transmission oil cooling

N55 Engine.

11. Cooling system.

Index	Description
12	Coolant feed line to engine block
13	Transmission oil-to-coolant heat exchanger
14	Connection, transmission oil line
15	Connection, transmission oil line
16	Return, heating heat exchanger
17	Heating heat exchanger

The following graphic shows the connection of the auxiliary radiator to the cooling system. The auxiliary radiator is connected to the radiator by means of parallel coolant lines, thus increasing the cooling surface area.



N55 engine, auxiliary radiator

Index	Description
1	Radiator
2	Auxiliary radiator
3	Feed connection to auxiliary radiator
4	Feed connection at auxiliary radiator
5	Return connection at auxiliary radiator
6	Return connection from auxiliary radiator

A separate engine oil heat exchanger is used for the hot climate variant.

N55 Engine.

11. Cooling system.



N55 engine, engine oil cooling, hot climate

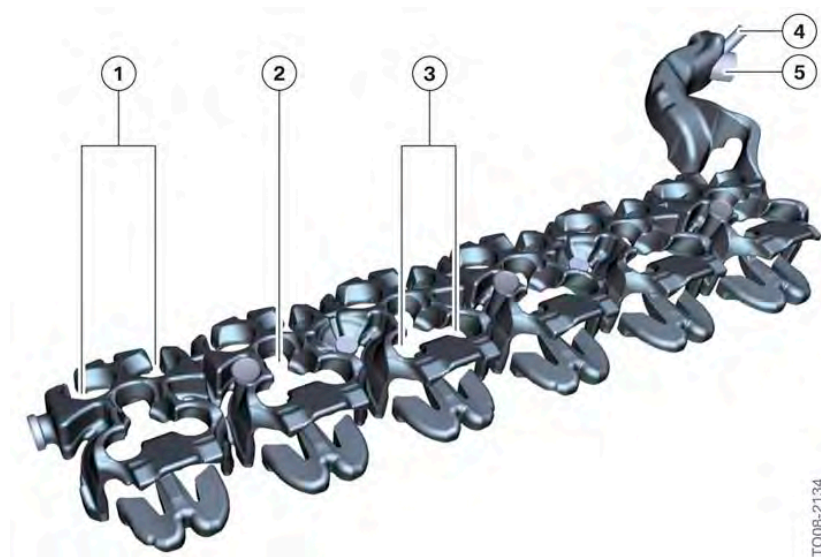
Index	Description
1	Oil filter module
2	Thermostat
3	Oil cooler lines
4	Engine oil cooler

11.1.1. Coolant ducts

The coolant ducts in the cylinder head are now also used for indirect cooling of the fuel injectors. The following graphic clearly shows that the coolant flows over the valves and the fuel injectors, thus reducing the heat transfer to the components to a minimum.

N55 Engine.

11. Cooling system.



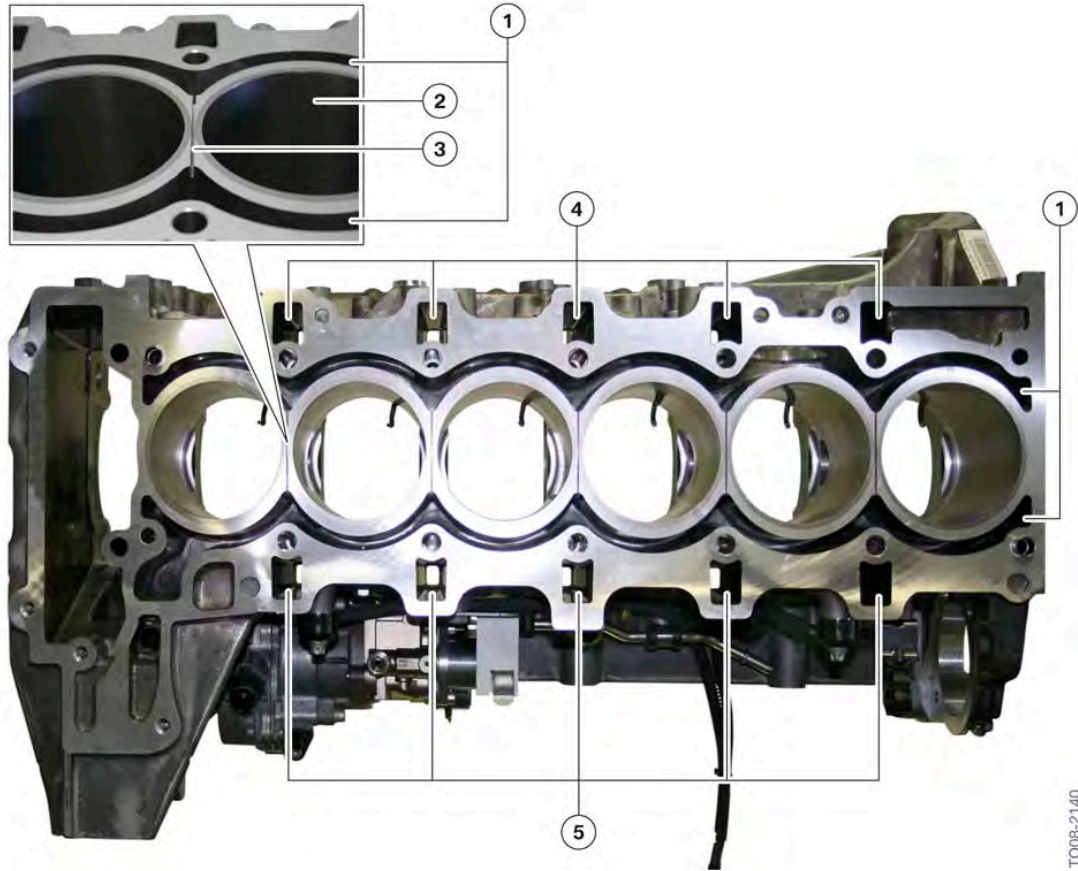
N55 engine, coolant ducts in cylinder head

Index	Description
1	Channel, intake valves
2	Channel, fuel injectors
3	Channel, exhaust valves
4	Connection, coolant hose to thermostat (small cooling circuit)
5	Connection, coolant hose to radiator (large cooling circuit)

The cast iron cylinder liners are cast in the aluminium diecasting. The webs between the cylinders have grooves to optimise cooling. Coolant can flow along these grooves from one side of the crankcase to the other, thus cooling the webs.

N55 Engine.

11. Cooling system.



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N55 engine, coolant ducts and web cooling in engine block

Index	Description
1	Cooling duct
2	Cylinder liner
3	Groove
4	Oil return ducts, exhaust side
5	Oil return ducts, intake side

N55 Engine.

12. Engine electrical system.

12.1. Connection to vehicle electrical system

12.1.1. Overview

For the first time, an engine-mounted Digital Motor Electronics (DME) module is used. The DME is flanged to the intake manifold and is cooled by the intake air. The near-engine DME has the following advantages:

- Engine wiring harness divided into six individual modules
- All electrical components on the engine supplied directly via the DME
- No E-box
- 211 pins are available, the plug-in connections are water-tight



N55 engine, wiring harness routing

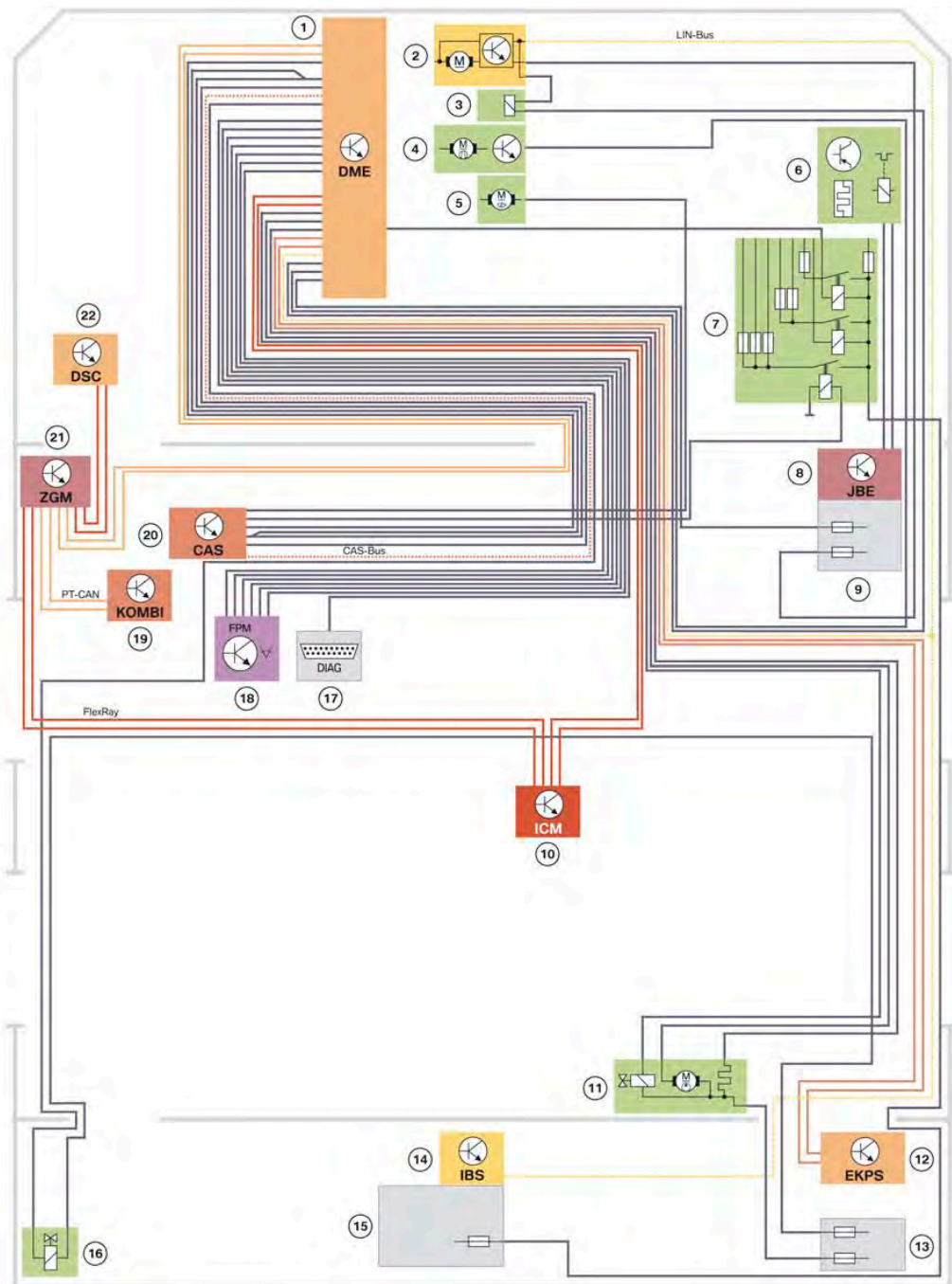
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N55 Engine.

12. Engine electrical system.

12.1.2. System circuit diagrams

Circuit diagram, connection to vehicle electrical system



N55 engine, circuit diagram, connection to vehicle electrical system

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N55 Engine.

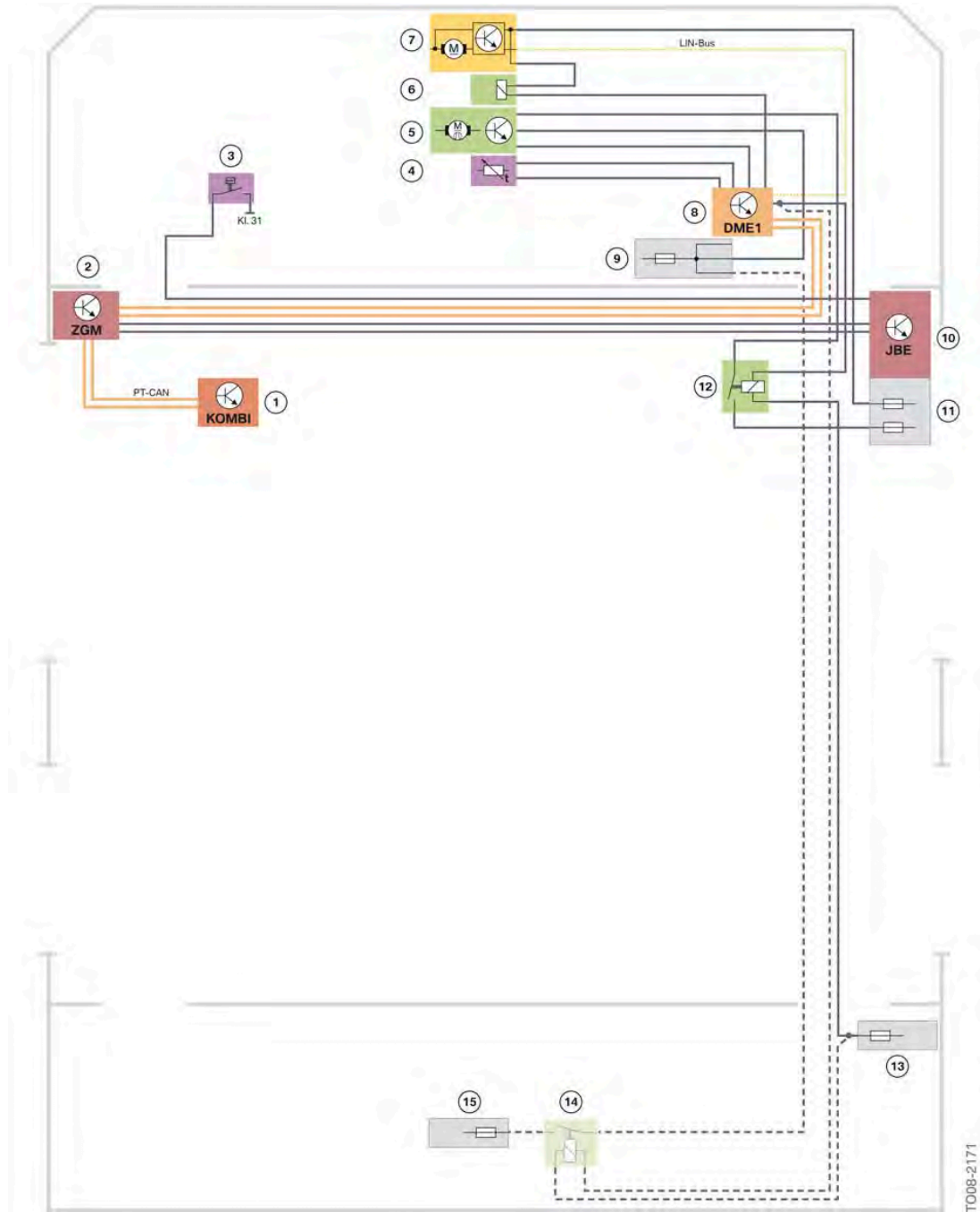
12. Engine electrical system.

Index	Description
1	Digital Motor Electronics
2	Electric air flap control
3	Mechanical air flap control
4	Electric fan
5	Starter
6	A/C compressor
7	Front power distribution box
8	Junction box electronics
9	Junction box
10	Integrated Chassis Management
11	Fuel tank leak diagnostic module (only US and South Korea)
12	Electronic fuel pump controller
13	Rear power distribution box
14	Intelligent battery sensor
15	Battery power distribution box
16	Exhaust flap changeover valve
17	Diagnosis socket (engine speed signal)
18	Accelerator pedal module
19	Instrument cluster
20	Car Access System
21	Central Gateway Module
22	Dynamic stability control

N55 Engine.

12. Engine electrical system.

System circuit diagram, engine cooling



N55 engine, circuit diagram, engine cooling

N55 Engine.

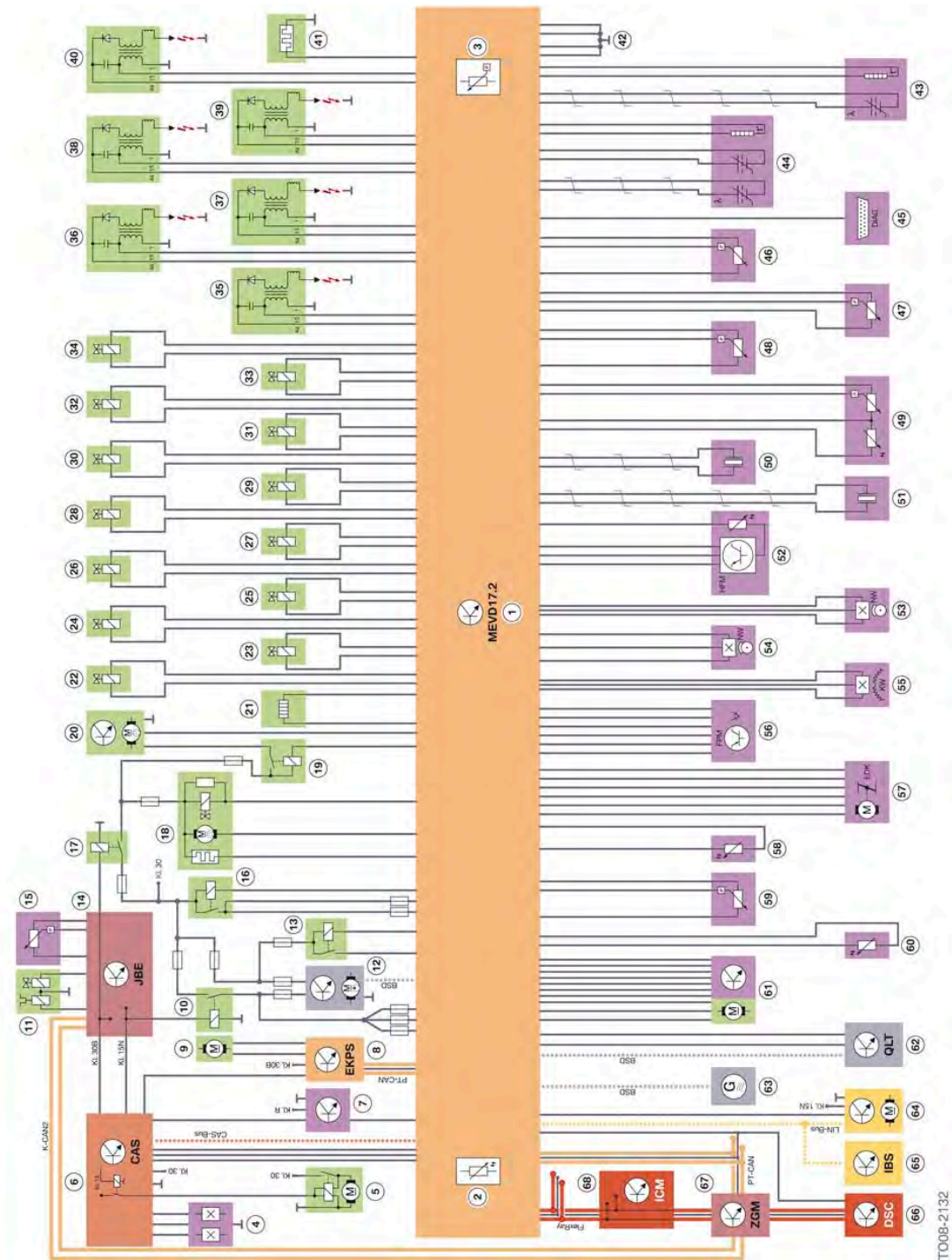
12. Engine electrical system.

Index	Description
1	Instrument cluster
2	Central Gateway Module
3	Coolant level switch
4	Coolant temperature sensor
5	Electric fan
6	Mechanical air flap control
7	Electric air flap control
8	Digital Motor Electronics
9	Front power distribution box
10	Junction box electronics
11	Junction box
12	Electric fan relay
13	Rear power distribution box
14	Electric fan relay (only for 850 Watt and 1000 Watt electric fan)
15	Battery power distribution box

N55 Engine.

12. Engine electrical system.

System circuit diagram MEVD17.2



N55 engine, circuit diagram MEVD17.2

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N55 Engine.

12. Engine electrical system.

Index	Description
1	Engine electronics Valvetronic, direct injection 17.2 MEVD17.2
2	Ambient pressure sensor
3	Temperature sensor
4	Brake light switch
5	Starter
6	Car Access System CAS
7	Clutch module
8	Electronic fuel pump control EKPS
9	Electric fuel pump
10	Terminal 15N relay
11	A/C compressor
12	Coolant pump
13	Valvetronic relay
14	Junction box electronics JBE
15	Refrigerant pressure sensor
16	Relay, ignition and injection
17	Terminal 30B relay
18	Fuel tank leak diagnosis module DMTL
19	Electric fan relay
20	Electric fan
21	Characteristic map thermostat
22	Diverter valve
23	Fuel tank vent valve
24	VANOS solenoid valve,intake camshaft
25	VANOS solenoid valve, exhaust camshaft
26	Oil pressure control valve
27	Electropneumatic pressure converter EPDW for wastegate valve
28	Quantity control valve
29 - 34	Fuel injectors
35 - 40	Ignition coils
41	Engine breather heater
42	Ground connections
43	Oxygen sensor after catalytic converter
44	Oxygen sensor before catalytic converter
45	Diagnostic socket

N55 Engine.

12. Engine electrical system.

Index	Description
46	Low-pressure fuel sensor
47	Intake manifold pressure sensor after throttle valve
48	Fuel rail pressure sensor
49	Charge air temperature and pressure sensor
50	Knock sensor, cylinders 1 - 3
51	Knock sensor, cylinders 4 - 6
52	Hot-film air mass meter (HFM)
53	Intake camshaft sensor
54	Exhaust camshaft sensor
55	Crankshaft sensor
56	Accelerator pedal module FPM
57	Throttle valve MDK
58	Coolant temperature sensor at engine outlet
59	Oil pressure sensor
60	Oil temperature sensor
61	Valvetronic servomotor
62	Oil condition sensor
63	Alternator
64	Active cooling air flap control
65	Intelligent battery sensor IBS
66	Dynamic stability control DSC
67	Central Gateway Module ZGM
68	Integrated Chassis Management ICM

12.1.3. Engine control unit

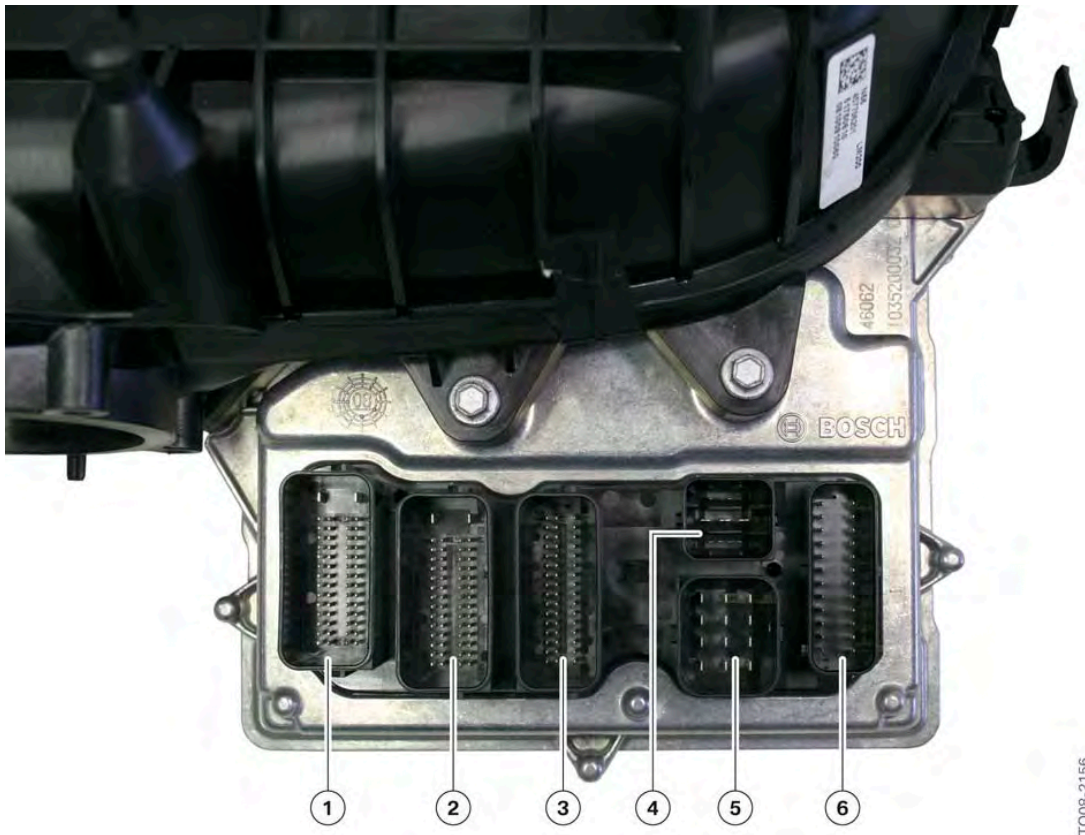
The N55 engine is equipped with the Bosch engine management MEVD17.2. The MEVD17.2 is integrated in the intake system and is cooled by the intake air. The MEVD17.2 is FlexRay-compatible and directly supplies voltage to the sensors and actuators.

The top side of the DME housing also serves as the bottom section of the intake system. The housing is contoured in the area of the intake manifold to ensure optimum flow through the intake system.

The plug connections between the wiring harness and DME are water-tight.

N55 Engine.

12. Engine electrical system.



N55 engine, engine management MEVD17.2

Index	Description
1	Module 100, sensors 2
2	Module 200, sensors 1
3	Module 300, vehicle wiring harness connection
4	Module 400, Valvetronic
5	Module 500, power supply module
6	Module 600, injection and ignition

12.2. Functions

12.2.1. Fuel supply system

The fuel pressure sensor sends a voltage signal, corresponding to the system pressure applied between the fuel pump and the high pressure pump, to the engine control unit (DME control unit). The system pressure (fuel pressure) is determined with the fuel pressure sensor upstream of the high pressure pump. The target pressure is constantly compared to the actual pressure in the DME control unit.

N55 Engine.

12. Engine electrical system.

If the target pressure deviates from the actual pressure, the engine control unit increases or decreases the voltage for the electric fuel pump. This voltage is sent in the form of a message via the PT-CAN to the EKP control unit.

The electric fuel pump (EKP) control unit converts the message into an output voltage for the electric fuel pump, thus regulating the required delivery pressure for the engine (or high pressure pump). The electric fuel pump is pilot-controlled in the event of signal failure (fuel pressure sensor). Should the CAN bus fail the EKP control unit operates the electric fuel pump with the applied system voltage. The high pressure pump increases the fuel pressure to 50 and 200 bar. The fuel flows via the high pressure line to the fuel rail. The fuel is buffered in the fuel rail and distributed to the fuel injectors.

Fuel quantity control

The rail pressure sensor measures the current fuel pressure in the rail. The excess fuel is returned to the inlet to the high pressure pump when the quantity control valve in the high pressure pump opens. Restricted vehicle operation is possible in the event of the high pressure pump failing.

The quantity control valve controls the fuel pressure in the rail. The engine management actuates the quantity control valve with a pulse width-modulated signal. Depending on the pulse width, a variable throttle cross section is released, thus providing the quantity of fuel required for the current load status of the engine. It is additionally possible to reduce the pressure in the rail.

12.2.2. Boost pressure control

The engine management controls the boost pressure with the wastegate valve at the exhaust turbocharger. An electropneumatic pressure converter which converts the signals from the engine management and defined vacuum is used to adjust the wastegate valve infinitely variable with vacuum.

A diverter valve is flanged to the exhaust turbocharger. This diverter valve can control the engine management directly, thus establishing a connection between the intake side and the pressure side. The diverter valve can eliminate undesirable peaks in the boost pressure that can occur when the throttle valve is closed quickly. The diverter valve therefore has a decisive influence on the engine acoustics while protecting the components of the exhaust turbocharger. A pressure wave is built up from the throttle valve to the exhaust turbocharger when the throttle valve is closed. This pressure wave comes up against the turbine blades in the exhaust turbocharger and presses them against the bearings. The diverter valve substantially reduces this pressure wave and thus the load on the exhaust turbocharger.

12.2.3. Engine cooling

The advantages of the conventional cooling system are utilised for the cooling system with electric coolant pump. The heat management determines the current cooling requirement and controls the cooling system accordingly. Under certain circumstances, the coolant pump can be completely switched off, e.g. to rapidly heat up the coolant during the warm-up phase. The coolant pump continues to operate when the hot engine is shut down. The coolant capacity can therefore be varied irrespective of the engine speed. In addition to the characteristic map thermostat, the heat management makes it possible to use various characteristic maps for controlling the coolant pump. In this way the engine control unit can adapt the engine temperature to the driving conditions.

The engine control unit regulates the following temperature ranges:

N55 Engine.

12. Engine electrical system.

- 108 °C = Economy mode
- 104 °C = Normal mode
- 95 °C = High mode
- 90 °C = High mode and control with characteristic map thermostat

The engine management sets a higher temperature (108 °C) when, based on vehicle operation, the engine control unit detects "Economy" mode. The engine is operated with relatively low fuel requirements in this temperature range. The internal engine friction is reduced at higher temperatures. The increase in temperature therefore realises low fuel consumption in the low load range. The driver wishes to utilise the optimum power developed by the engine in "High and control with characteristic map thermostat" mode. For this purpose, the temperature in the cylinder head is reduced to 90 °C. This temperature reduction promotes improved volumetric efficiency, thus resulting in an increased engine torque. Adapted to the relevant driving situation, the engine control unit can now regulate a defined operating range. In this way it is possible to influence the fuel consumption and power output through the cooling system.

12.2.4. System protection

If the coolant or engine oil overheat during engine operation, certain vehicle functions are influenced to the effect that more energy is available to the engine cooling system.

These measures are divided over two operating modes:

- Component protection
 - Coolant temperature between 117 °C and 124 °C
 - Engine oil temperature between 150 °C and 157 °C
 - Result: the output of the air conditioning system (up to 100 %) and of the engine is reduced
- Emergency
 - Coolant temperature between 125 °C and 129 °C
 - Engine oil temperature between 158 °C and 163 °C
 - Result: the power output of the engine is reduced (up to approx. 90 %).

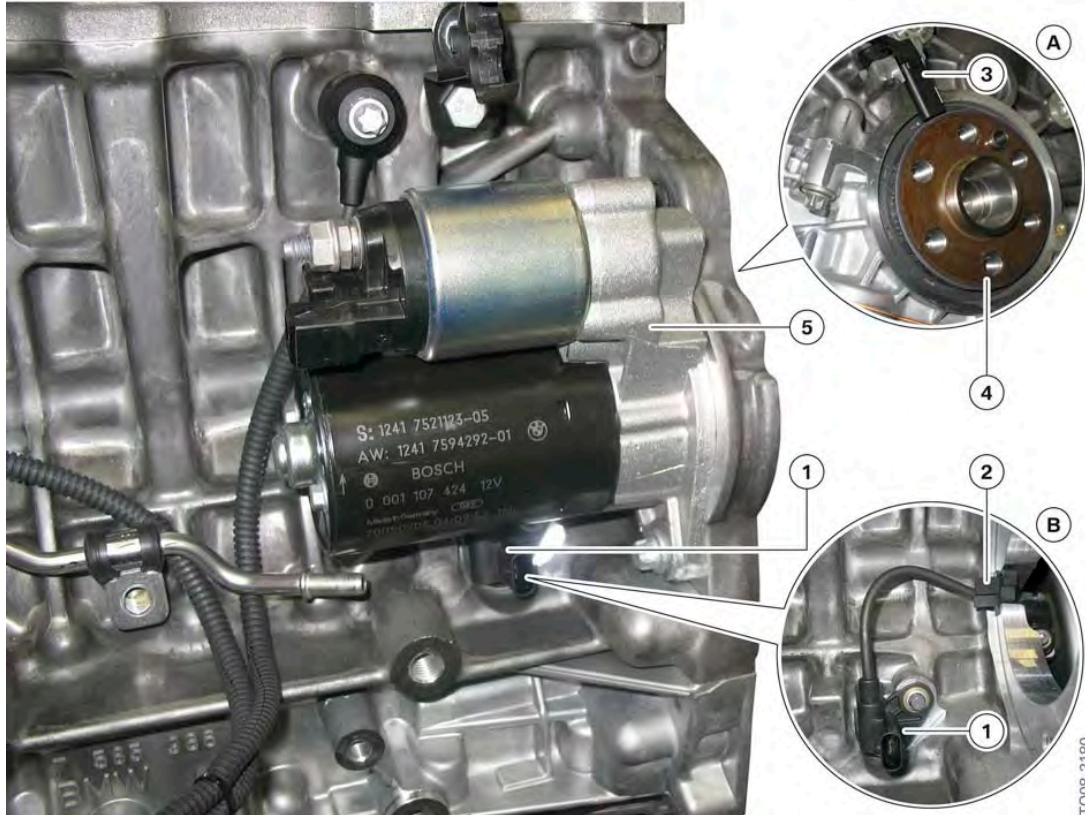
12.3. Sensors

12.3.1. Crankshaft sensor

The function of the new integrated crankshaft sensor is identical to that of the crankshaft sensors used for the automatic engine start-stop function (MSA). The engine reversal detection is required for the MSA function. The sensor and function are described in the Product Information "N47 Engine".

N55 Engine.

12. Engine electrical system.



N55 engine, location of crankshaft sensor

Index	Description
A	Direction of view towards crankshaft
B	Same view without starter
1	Connector
2	Dust seal
3	Sensor
4	Multipole wheel

N55 Engine.

12. Engine electrical system.



N55 engine, crankshaft sensor with multipole sensor wheel

Index	Description
1	Connector
2	Dust seal
3	Sensor

12.3.2. Ignition coil and spark plug

Ignition coil

A new ignition coil has been developed for the N55 engine. The ignition coil provides a higher ignition voltage, improved electromagnetic compatibility and is sturdier.



The ignition voltage of the secondary coil on the N43 and N53 engines is reversed. This is achieved by reverse actuation and a diode in the secondary circuit. The positive polarisation extends spark propagation, thus improving the flammability of the mixture. This feature is only required in stratified charge mode. Since the air/fuel mixture is homogeneous on the N55 engine, the "normal" ignition coil is used.

Spark plug

The N55 engine is equipped with the spark plug that is a common part with the N63 engine and N74 engine. The strength has been improved and the voltage strength increased by improved ceramics.

12.3.3. Oil pressure sensor

The new oil pressure sensor can now determine the absolute pressure. This is required for more accurate oil pressure control. The sensor design is identical to that of the fuel pressure sensor.

N55 Engine.

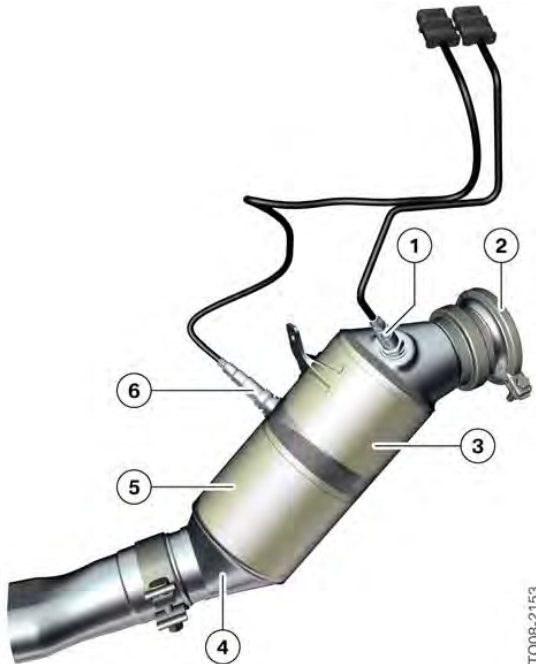
12. Engine electrical system.

The DME supplies a voltage of 5 Volt to the oil pressure sensor.



N55 engine, oil pressure sensor

12.3.4. Oxygen sensors



N55 engine, catalytic converter and particulate filter

Index	Description
1	Oxygen sensor upstream of catalytic converter
2	Connection at exhaust turbocharger
3	Ceramic monolith 1
4	Catalytic converter
5	Ceramic monolith 2
6	Oxygen sensor after catalytic converter

A new connector is used for the oxygen sensors. The new connector system provides greatly improved contacting properties and eliminates "background noise" caused by contacting problems. The vibration-free contact point represents a further improvement.

N55 Engine.

12. Engine electrical system.

Oxygen sensor before catalytic converter

The Bosch oxygen sensor LSU ADV is used as the control sensor before the catalytic converter. The function is comparable with that of the oxygen sensor LSU 4.9 and is therefore not described in detail here. This oxygen sensor is already used on the N63 engine. The abbreviation LSU stands for 'Lambdasonde Universal' and ADV for Advanced.

The oxygen sensor before catalytic converter (LSU ADV) offers the following advantages:

- High signal stability specially during turbocharged operation thanks to low dynamic pressure dependence
- Increased durability due to reduced pump voltage
- Increased accuracy (by a factor of 1.7 compared to LSU 4.9)
- Ready for operation faster < 5 seconds
- Greater temperature compatibility
- Improved system connector with more effective contacting properties

The LSU ADV has an extended measuring range, making it possible to measure precisely from lambda 0.65. The new oxygen sensor is ready for operation faster so that exact measured values are already available after 5 seconds.

The measuring dynamics of the sensor are higher, making it possible to determine and therefore also control the fuel-air ratio separately in each cylinder. Consequently, the flow of exhaust gas is homogeneous, the emission values can be reduced and the long-term emissions characteristics optimised.

Oxygen sensor after catalytic converter

The oxygen sensor after catalytic converter is also known as the monitoring sensor. The known Bosch LSF 4.2 monitoring sensor is used.

12.3.5. Hot-film air mass meter

The Siemens SIMAF GT2 hot-film air mass meter is used. The Siemens SIMAF GT2 air mass meter is equipped with planar metal resistors on glass. This technology has been used in the SIMAF GT1 for more than 15 years. Based on this tried and tested sensor technology, the SIMAF GT2 represents a consistent further-development and optimisation with higher vibration resistance, improved accuracy at all operating temperatures and lower sensitivity to water and pulsations.

N55 Engine.

12. Engine electrical system.



N55 engine, HFM

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12.4. Actuators

12.4.1. Valvetronic servomotor

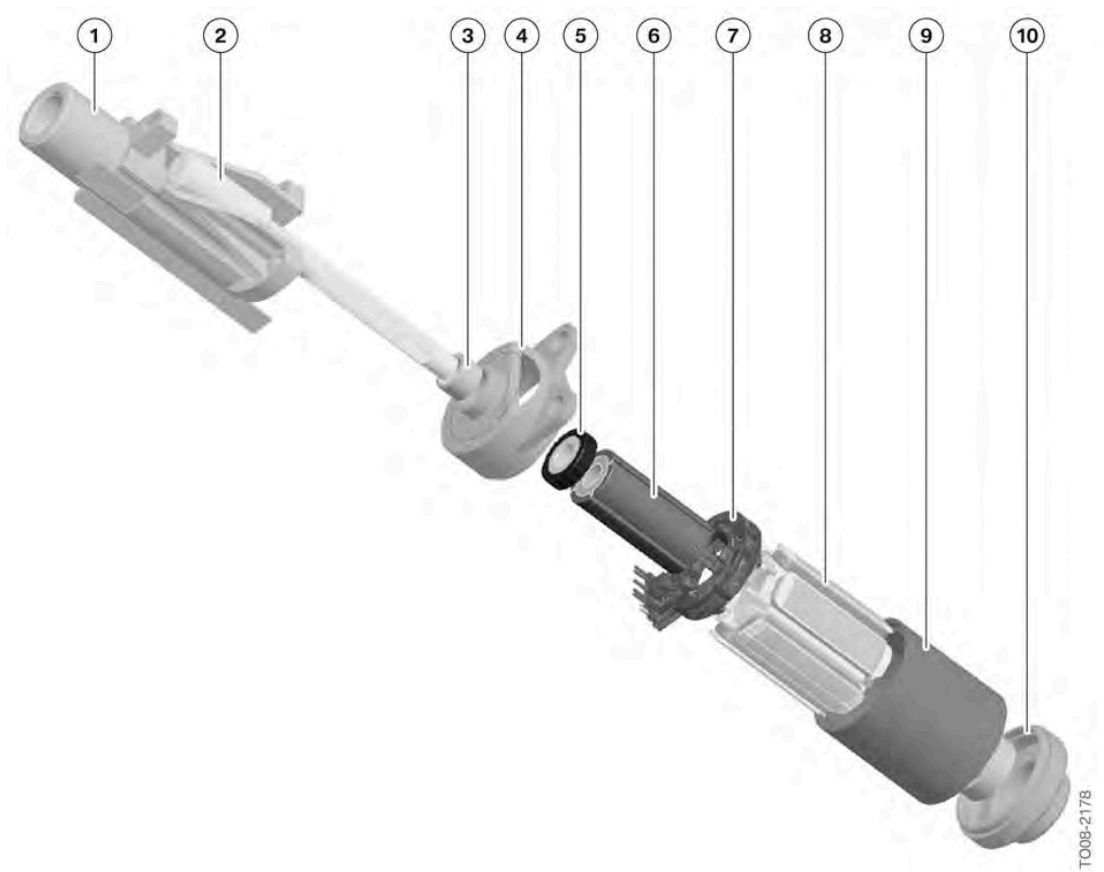
A brushless direct current motor (BLDC motor) is used as the Valvetronic servomotor. Thanks to the contactless energy transfer system, the BLCD motor is maintenance-free and very powerful. The use of integrated electronic modules ensures precision control.

Function

Actuation of the Valvetronic servomotor is limited to maximum 40 amps. A maximum of 20 amps is available over a period of > 200 milliseconds. The Valvetronic servomotor is actuated by a pulse width-modulated signal. The duty cycle is between 5 % and 98 %.

N55 Engine.

12. Engine electrical system.



N55 engine, Valvetronic servomotor

Index	Description
1	Socket
2	Worm shaft
3	Needle bearing
4	Bearing cover
5	Magnetic sensor wheel
6	Rotor with four magnets
7	Sensor
8	Stator
9	Housing
10	Bearing

N55 Engine.

12. Engine electrical system.

The DME supplies the sensor with a voltage of 5 Volt. The DME receives signals via five Hall elements and evaluates them. Three of the five Hall sensors are used for rough division and two for fine subdivision. In this way, the angle of rotation of the servomotor can be determined to $< 7.5^\circ$. Together with the step-up ratio of the worm drive, very accurate and fast lift adjustment of the valve can be achieved in this way.

12.4.2. High pressure fuel injection valve

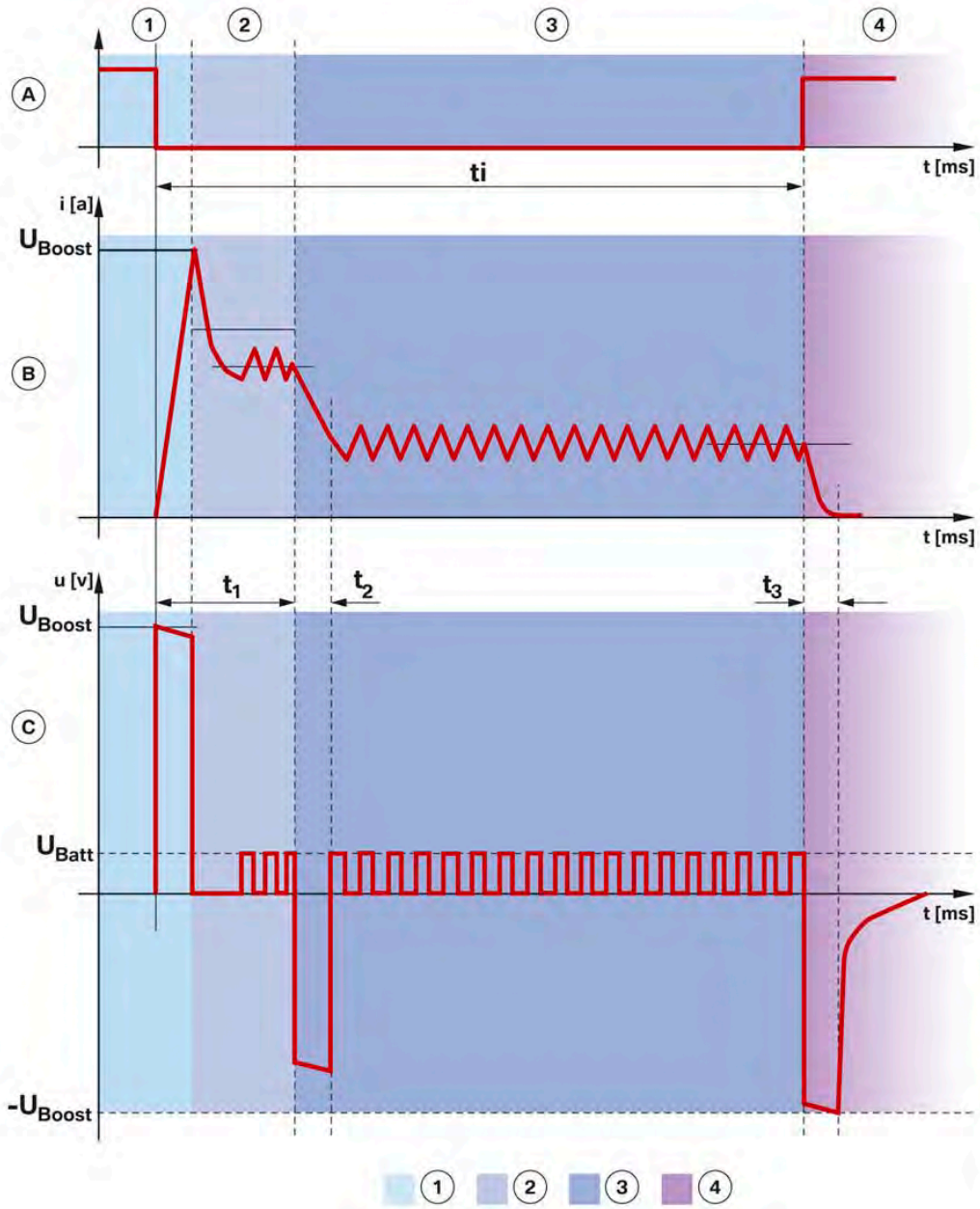
The HDEV5.2 used on the N55 engine is a new development based on the HDEV5.1 high pressure fuel injection valve used on the N14 engine. The function is the same.

Function

The HDEV5.2 is actuated in four phases as shown in the following graphic.

N55 Engine.

12. Engine electrical system.



N55 engine, actuation phases of the HDEV5.2

N55 Engine.

12. Engine electrical system.

Index	Description
A	DME actuation signal
B	Current flow HDEV5.2
C	Voltage at HDEV5.2
1	Booster phase
2	Energisation phase
3	Hold phase
4	Switch off phase

- 1 **Booster phase:** Opening of the HDEV5.2 is initiated in the booster phase by a high booster voltage from the DME. The booster phase ends on reaching approx. 10 amps. The high current is achieved by a voltage of up to approx. 65 Volt.
- 2 **Energisation phase:** In the energisation phase, the HDEV5.2 is completely opened by controlling the current to approx. 6.2 amps. At the end of the energisation phase, the current is reduced from the energisation to the holding current level of approx. 2.5 amps.
- 3 **Hold phase:** The energised HDEV5.2 is kept open by controlling the current at approx. 2.5 amps in the hold phase.
- 4 **Switch off phase:** The current is switched off at the end of the injection time in the switch off phase. At least 2 milliseconds elapse between two injection cycles.

N55 Engine.

13. Service information.

13.1. Engine mechanical system

13.1.1. Engine casing components

Cylinder head



The combination of exhaust turbocharger, Valvetronic and direct fuel injections is referred to as **Turbo-Valvetronic-Direct-Injection (TVDI)**.

Cylinder head cover



If a customer complains about high oil consumption and at the same time the exhaust turbocharger is found to be oiled up, it should not be immediately assumed that the exhaust turbocharger is defective. If the oiling already exists after the introduction of the blow-by gasses then the entire engine should be checked for leaks. Defective gaskets or defective crankshaft seals may be the cause of excessively high blow-by gas throughput. Leaking crankshaft seals can cause an oil consumption of up to 3 l/1000 km.

13.2. Fuel conditioning system

13.2.1. Overview

Fuel injectors



Work should only be carried out on the fuel system after the engine has cooled down. The coolant temperature must not be more than 40 °C. These requirements must be observed otherwise the residual pressure in the high pressure fuel system could cause fuel to spray out.

It is essential to observe the utmost cleanliness when working on the high pressure fuel system and follow the working procedures described in the repair instructions. Even minute soiling and damage at the screw connections of the high pressure lines could cause leaks.

Particular care must be taken when working on the fuel system of the N55 engine to ensure that the ignition coils are not soiled with fuel. The resistance of the silicone material is greatly reduced by contact with fuel. This could result in sparkover at the top of the spark plug and misfiring.

N55 Engine.

13. Service information.

- Before working on the fuel system, remove the ignition coils and use a rag to prevent fuel entering the spark plug well.
 - The ignition coils must be removed before installing new solenoid valve fuel injectors and utmost cleanliness must be observed.
 - Ignition coils that have been heavily soiled with fuel must be replaced.
-

13.3. Engine electrical system

13.3.1. Ignition coil and spark plug

Ignition coil



The ignition voltage of the secondary coil on the N43 and N53 engines is reversed. This is achieved by reverse actuation and a diode in the secondary circuit. The positive polarisation extends spark propagation, thus improving the flammability of the mixture. This feature is only required in stratified charge mode. Since the air/fuel mixture is homogeneous on the N55 engine, the "normal" ignition coil is used.



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