ENGINE

N55 - Service Information

INTRODUCTION

The N55 engine is the successor to the N54, 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.

Fig. 1: Identifying BMW N55 Engine
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE SYSTEM OVERVIEW

The following provides an overview of the features of the N55 engine:

Crankcase:

- Large longitudinal ventilation holes inter-connect the crankcase lower chambers and relieve unwanted

crankcase pressure between cylinders.
- Modified oil galleries enhance the supply of oil to vacuum pump.

Crankshaft: Is light weight design and has an asymmetric counterweight arrangement.

Pistons and connecting rods:

- A specially formed bushing/bore in small end of the connecting rods evenly distributes the force of the pistons on the power stroke.
- Lead-free bearing shells are installed on the big-end of the connecting rods.

Cylinder head:

- Specially designed water passages intergraded into the cylinder head enhance injector cooling.
- The combustion chambers are machined to work in conjunction with the Valvetronic III system with regard to promoting air turbulence and mixture formation.

Crankcase ventilation:

- In contrast to the N54, the N55 crankcase ventilation does not use cyclone separators.
- The cylinder and head cover have integrated blow-by passages that connect the crankcase ventilation directly to the intake ports.

VANOS:

- The N55 VANOS oil passages are simplified compared to the N54 engine.
- The solenoid valves have integrated non-return valve and 3 screen filters.
- The VANOS units are of a lightweight design for increased adjustment speed and have a reduced susceptibility to soiling.

Valvetrain:

- The N55 is the first BMW turbo engine to incorporate Valvetronic.
- The valvetrain is a new designed that combines Valvetronic III with Double VANOS.
- With Valvetronic III the 3rd generation brushless servomotor is introduced.
- The position detection sensor of eccentric shaft is now integrated in the servomotor.

Oil supply:

- An enhanced and simplified oil circuit design is used.
- The inlet pipe, oil deflector, and oil collector are combined in one component.
- Oil pump uses a Duroplast slide valve and it is electronically controlled based on a characteristic map within the engine management.

Forced induction:

- The N55 uses a single twin scroll turbocharger with vacuum operated, electronically controlled wastegate valve.
- The electric diverter valve is intergraded into the turbocharger compressor housing.

Air intake and exhaust system:

- Air intake system is similar in configuration as the N54 with the exception of the intake manifold and the use of a single turbo.
- The intercooler is an air to air type mounted in the lower area of the front bumper cover.
- The exhaust system uses no underbody catalytic converter.

Vacuum system:

- The N55 engine has a two-stage vacuum pump as on the N54.
- The vacuum system has the vacuum reservoir built into the cylinder head cover.

Fuel injection:

- HDE (high pressure fuel injection) system is installed on the N55.
- The HDE system uses solenoid valve fuel injectors instead of the piezoelectric type used on HPI.
- The high pressure pump and pressure sensors are similar in design and function in both the HDE and HPI systems.

Digital Motor Electronics (DME):

- The DME is mounted on the intake manifold and cooled by intake air.
- The location of the DME facilitates the installation of the N55 engine in several current BMW platforms/models.

TECHNICAL DATA

TECHNICAL DATA

	Unit	N54B30O0 (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 liter	[kW/l]	75.53	75.53
Torque at engine speed	[Nm] [rpm]	400 1300 - 5000	400 1200 - 5000

Compression ratio	[ ]	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, US		ULEV	ULEV II
Engine oil specification		BMW Longlife-01 BMW Longlife-01 FE BMW Longlife-04	-
Top speed	[km/h]	240	250
Acceleration 0 - 100 km/h/62mph	[s]	6.7	6.3
Vehicle curb weight DIN/EU	[kg]	2070/2145	1940/2015
* = Electronically governed			

Full Load Diagram

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

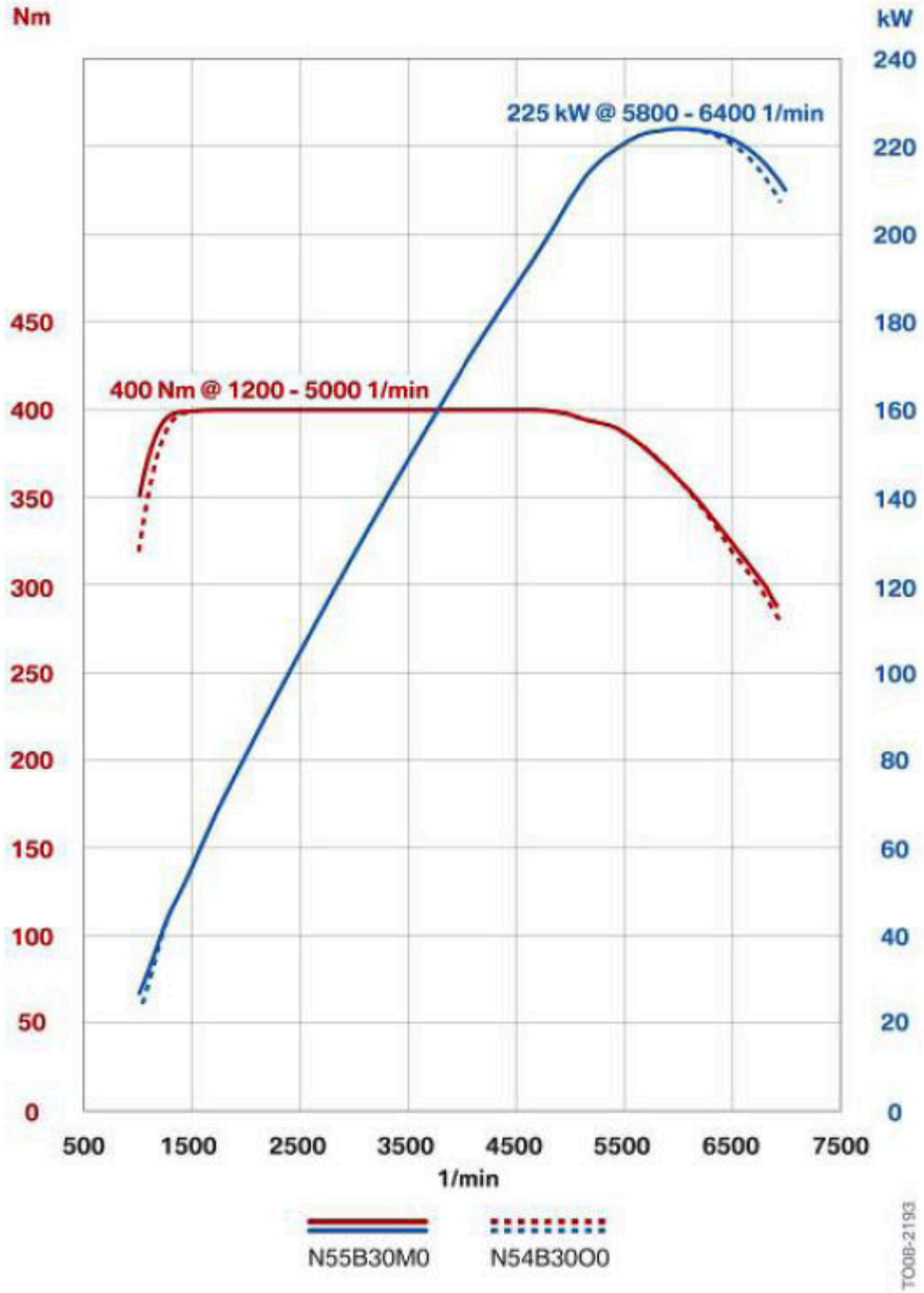

Fig. 2: Lower Fuel Consumption Characteristic Graph - E90 335I With N54B30O0 Engine To F07 535I With N55B30M0 Engine
Courtesy of BMW OF NORTH AMERICA, INC.

CURRENT MODELS

N54B30O0 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	US	E82, E88	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft-lbs) 1400 - 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
335 is	US	E92, E93	2979	89.6/84.0	320 SAE hp 5800 - 6250	450 (332 ft-lbs) 1400 - 5000
Z4 sDrive35i	US	E89	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft-lbs) 1400 - 5000
Z4 sDrive35is	US	E89	2979	89.6/84.0	335 SAE hp 5800 - 6250	450 (332/369 ft-lbs) (1)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	US	E71	2979	89.6/84.0	300 SAE hp 5800 - 6250	407 (300 ft-lbs) 1400 - 5000
740i	US	F01, F02	2979	89.6/84.0	315 SAE hp 5800 - 6250	450 (330 ft-lbs) 1600 - 4500

(1) The enhanced engine management system of the BMWZ4 sDrive35is and the 335is include an electronically controlled overboost function to briefly increase torque under full load by another 37 ft-lbs. This temporary torque peak of 369 ft-lbs gives the car a significant increase in acceleration for approximately 5 seconds.

ENGINE DESIGNATION AND ENGINE IDENTIFICATION

Engine Designation

This training material describes the N55B30M0 in detail.

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.

ENGINE DESIGNATION

Item	Meaning	Index/explanation
1	Engine developer	M, N = BMW Group P = BMW Motorsport S = BMW M mbH

		W = Non-BMW engines
2	Engine type	1 = R4 (e.g. N12) 4 = R4 (e.g. N43) 5 = R6 (e.g. N55) 6 = V8 (e.g. N63) 7 = V12 (e.g. N73) 8 = V10 (e.g. S85)
3	Change to the basic engine concept	0 = basic engine 1 - 9 = changes, e.g. combustion process
4	Working method or fuel type and possibly installation position	B = Gasoline, longitudinal installation D = Diesel, longitudinal installation H = Hydrogen
5	Displacement in liters	1 = 1 liter (whole number of liters)
6	Displacement in 1/10 liter	8 = 0.8 liter (tenth of liter)
7	Performance class	K = Smallest U = Lower M = Middle O = Upper (standard) T = Top S = Super
8	Revision relevant to approval	0 = New development 1 - 9 = Revision

Breakdown of N55 Engine Designation

ENGINE DESIGNATION

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

Engine Identification

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.

INDEX EXPLANATION

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1	Engine developer	M, N = BMW Group P = BMW Motorsport S = BMW M GmbH W = Non-BMW engines
2	Engine type	1 = R4 (e.g. N12) 4 = R4 (e.g. N43) 5 = R6 (e.g. N55) 6 = V8 (e.g. N63) 7 = V12 (e.g. N73) 8 = V10 (e.g. S85)
3	Change to the basic engine concept	0 = basic engine 1 - 9 = changes, e.g. combustion process
4	Working method or fuel type and possibly installation position	B = Gasoline, longitudinal installation D = diesel, longitudinal installation H = hydrogen
5	Displacement in liters	1 = 1 liter (whole number of liters)
6	Displacement in 1/10 liter	8 = 0.8 liter (tenth of liter)
7	Type test concerns (changes that require a new type test)	A. A = Standard B. B - Z = Depending on requirement, e.g. RON 87

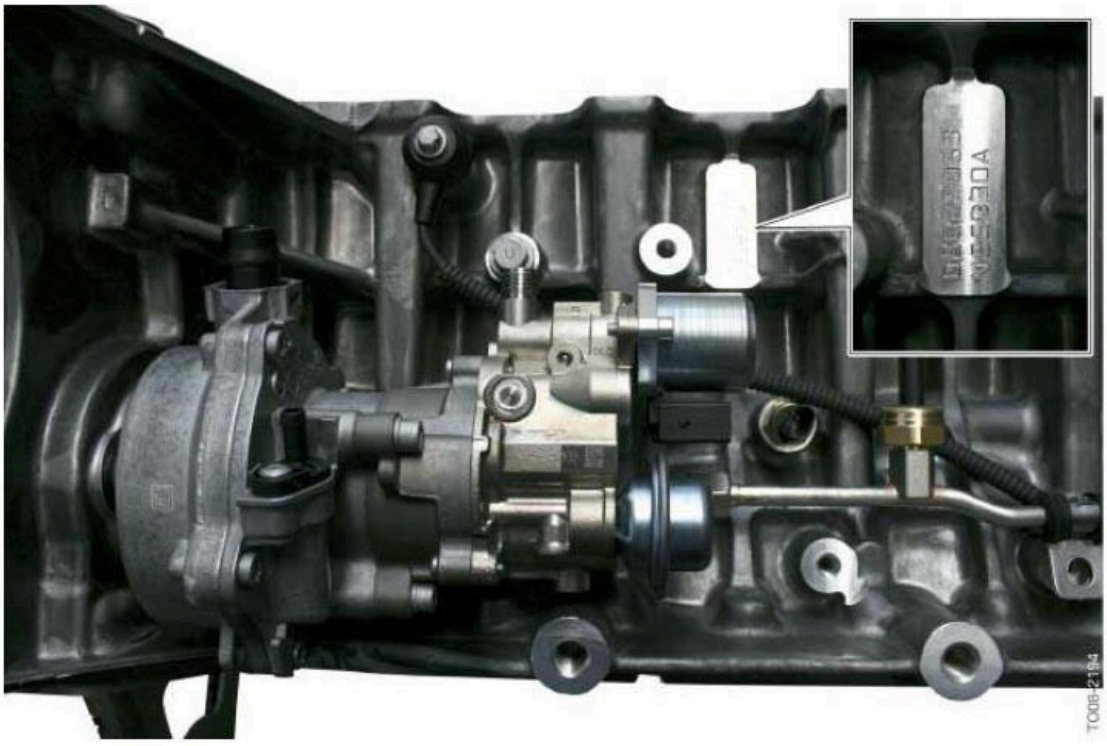

Fig. 3: Locating Engine Identification And Engine Serial Number - N55 Engine
Courtesy of BMW OF NORTH AMERICA, INC.

INDEX EXPLANATION CHART

Index	Explanation
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 liter, 3 liter
A	Type approval requirements, standard

ENGINE COMPONENTS

ENGINE HOUSING

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

Engine Block

The engine block is made from an aluminum die-casting and consists of the crankcase with bedplate.

Crankcase and Bedplate

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

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 crankshaft 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.

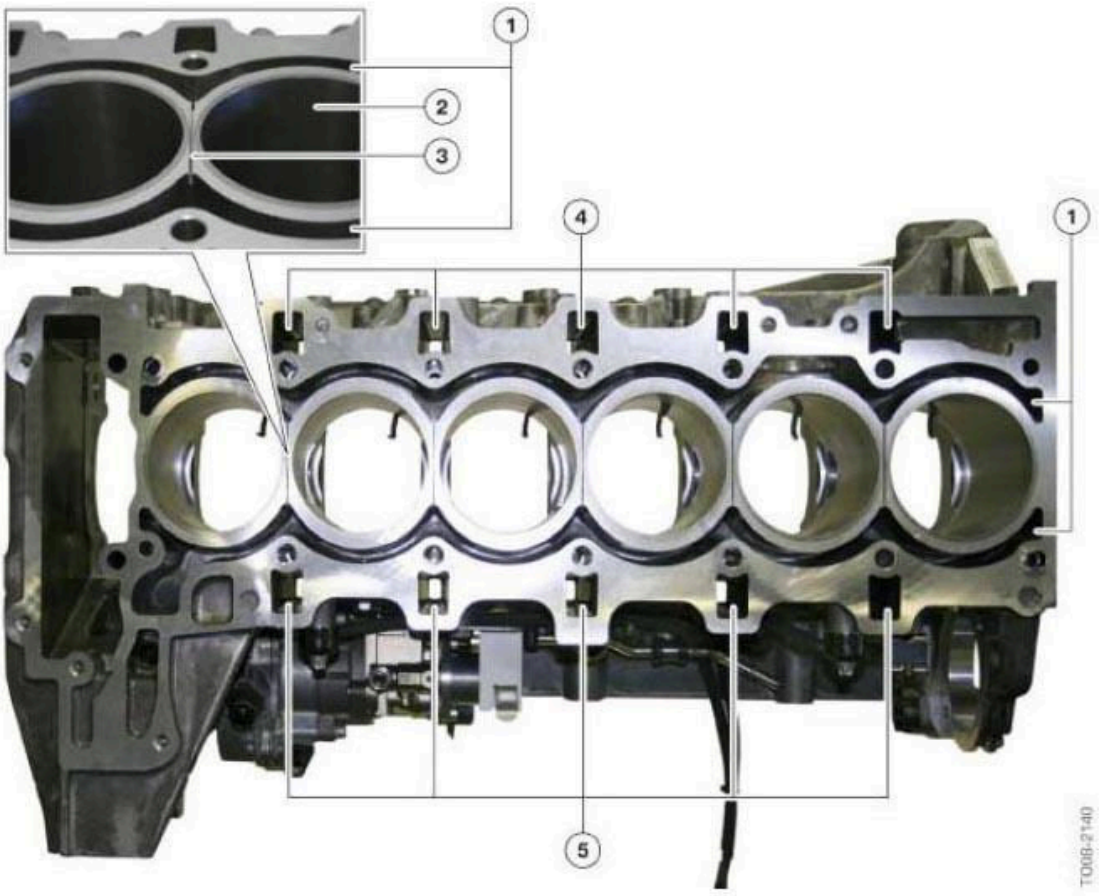

Fig. 4: Identifying Crankcase With Web Cooling Components - N55
Courtesy of BMW OF NORTH AMERICA, INC.

INDEX EXPLANATION CHART

Index	Explanation
1	Cooling duct
2	Cylinder liner
3	Grooved cooling passage
4	Oil return ducts, exhaust side
5	Oil return ducts, intake side

The crankcase has large longitudinal ventilation holes bored between the lower chambers of the cylinders. The longitudinal ventilation holes improve the pressure equalization, between the oscillating air columns that are created in the crankcase, by the up and down movement of the pistons.

This enhances power by relieving the unwanted pressure that acts against the downward movement of the pistons. It also enhances crankcase ventilation and adds to oil service life by promoting the movement of blow-by gasses within the engine.

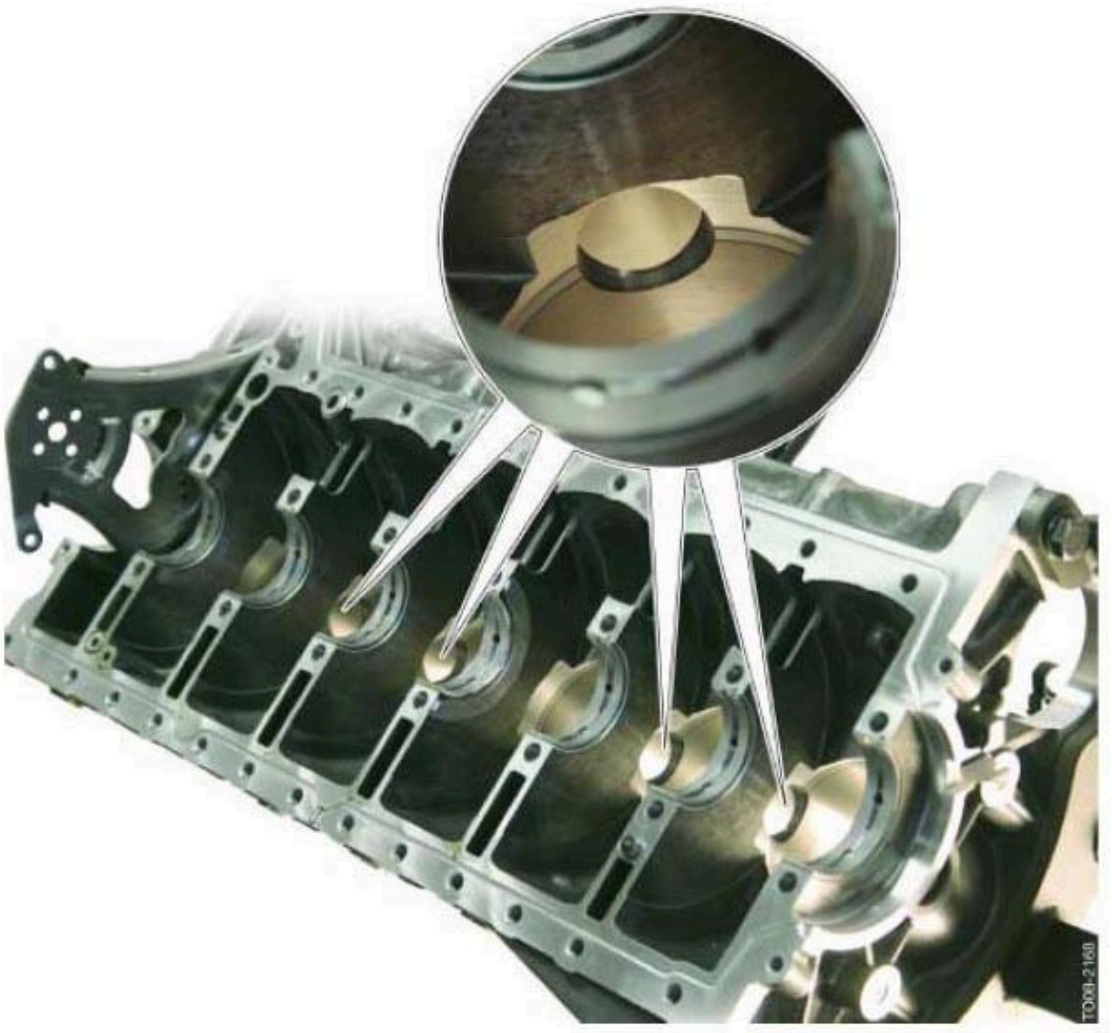

Fig. 5: Identifying Ventilation Holes In Crankcase - N55
Courtesy of BMW OF NORTH AMERICA, INC.

CRANKSHAFT

The crankshaft of the N55 is of lightweight design, at 20.3 kg it's approximately 3 kg lighter than the crankshaft in the N54 engine.

The crankshaft is made from cast iron (GGG70). The counterweights are arranged asymmetrically. There is no incremental wheel installed on the crankshaft. The timing chains are mounted by means of an M18 central bolt.