BMW Engine Table**

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Engine Code	Fuel	Cylinders	Engine size	hp	E Number	Models
N43 B16O0	Petrol	4	1599	122	E81, E87, E90	116i, 316i*
N43 B20U0	Petrol	4	1995	143	E81, E87, E88, E90, E91	118i, 318i
N47 D20U0	Diesel	4	1995	143	E81, E87, E90, E91	118d, 318d
N46 B20O0	Petrol	4	1995	150	E85	Z4 2.0i
N43 B20O0	Petrol	4	1995	170	E81, E87, E88, E90, E91, E92, E93	120i, 320i
N47 D20O0	Diesel	4	1995	177	E60, E61, E81, E82, E83, E87, E88, E90, E91, E92, E93	120d, 320d, 520d, X3 2.0d
N47 D20T0	Diesel	4	1995	204	E81, E82, E87	123d
N52 B25U1	Petrol	6	2497	177	E85	Z4 2.5i
N53 B25U0	Petrol	6	2497	190	E60, E61	523i
N52 B25O1	Petrol	6	2497	218	E83, E85	Z4 2.5Si, X3 2.5Si
N52 B30U1	Petrol	6	2996	218	E82, E88	125i
N54 B30O0	Petrol	6	2979	306	E71, E82, E88, E90, E91, E92, E93	135i, 335i, X6 xDrive35i
M57 D30U2	Diesel	6	2993	197	E60, E61, E90, E91, E92, E93	325d, 525d
M57 D30O2	Diesel	6	2993	218	E83	X3 3.0d
M57 D30O2	Diesel	6	2993	231	E90, E91, E92, E93	330d
M57 D30O2	Diesel	6	2993	231	E65, E66	730d, 730Ld
M57 D30O2	Diesel	6	2993	235	E60, E61, E70, E71	530d, X5 3.0d, X6 xDrive30d
M57 D30T2	Diesel	6	2993	286	E60, E61, E63, E64, E70, E71, E83, E90, E91, E92,	335d, 535d, 635d, X5 3.0sd, X3 3.0sd, X6 xDrive35d
N53 B30U0	Petrol	6	2996	218	E60, E61, E90, E91, E92, E93	325i, 525i
N52 B30O0	Petrol	6	2996	258	E65, E66	730i, 730Li
N52 B30O1	Petrol	6	2996	265	E81, E85, E86, E87	130i, Z4 3.0 Si
N52 B30O1	Petrol	6	2996	272	E70, E83	X5 3.0Si, X3 3.0Si
N53 B30O0	Petrol	6	2996	272	E60, E61, E63, E64, E90, E91, E92, E93	330i, 530i, 630i
S54 B32	Petrol	6	3246	343	E85, E86	M Roadster, M Coupé
S65 B40	Petrol	8	3999	420	E90, E92, E93	M3
N62 B40O1	Petrol	8	4000	306	E60, E65, E66	540i, 740i, 740Li
N62 B4801	Petrol	8	4799	355	E70	X5 4.8i
N62 B4801	Petrol	8	4799	367	E60, E61, E63, E64, E65, E66	550i, 650i, 750i, 750Li
S85 B50	Petrol	10	4999	507	E60, E61, E63, E64	M5, M6
N73 B60vD	Petrol	12	5972	445	E65, E66	760i, 760Li

* Ireland only ** Data correct at time of print

Features Glossary

The features section of Fast Facts provides a description of features common across the BMW range. Descriptions and key benefits are covered for each feature.

Engines

Catalytic converter

As an important part of a car's emissions control system, a catalytic converter works to reduce the level of toxins present in car emissions. By treating the exhaust before it has left the car, a substantial amount of pollution is reduced.

Benefits

By reducing the amount of pollution produced by a vehicle, a catalytic converter helps to reduce the level of harmful exhaust emissions without negatively affecting the engine performance of the car.

Common-rail injection system

BMW diesel engines are unique in terms of sound, performance and fuel economy. Common-rail injection system maintains a high fuel injection pressure throughout the entire fuel injection cycle. This high pressure in the fuel rail allows fuel to be injected several times during each combustion cycle, via electrically guided injectors. It is possible for small quantities of fuel to be injected before the main injection, improving efficiency and significantly reducing noise during the main combustion process.

Benefits

Having separate pre and main injection events improves engine acoustics, fuel economy and fuel emissions. Common-rail injection system also allows the engine to accelerate instantaneously and powerfully, even from low engine revs.

Configuration

Engine configuration describes the positioning of the cylinders within an engine. BMW is renowned for its in-line engines. In-line engines are those engines which have all cylinders aligned in one row, making them outstandingly well balanced. No other configuration matches the combination of performance and refinement provided by an in-line configuration.

Engines with eight or more cylinders cannot be constructed as an in-line configuration due to their overall length and therefore are aligned as V engines; the cylinders are aligned in a V shape, reducing the overall length of the engine compared to in-line engines.

Benefits

In-line engines benefit from smooth power delivery and are the most dynamically balanced engines, whilst V engines minimise the longitudinal dimensions of the engine and make it possible for cars to accommodate larger engines.

Diesel Particulate Filter (DPF)

Diesel Particulate Filters work by filtering out soot particles contained in the exhaust gas from a diesel engine.

By collecting these fine particles whilst still inside the exhaust system, the DPF prevents these particles from entering the atmosphere and causing further pollution.

Benefits

Diesel Particulate Filters have no adverse affect on the performance of a vehicle, whilst effectively reducing the emissions levels of the vehicle.

Digital Motor Electronics (DME)/Digital Diesel Electronics (DDE) engine management

The Digital Motor Electronics (DME)/Digital Diesel Electronics (DDE) microprocessor system continuously monitors a wide variety of engine functions, calculates the ideal fuel quantity and ignition timing, and adjusts them several hundred times per second.

Benefits

DME/DDE ensures optimum power with low fuel consumption and lower emissions.

DIVA and DISA: Fully variable and differentiated intake systems

DIVA and DISA systems work to ensure that the engine adjusts perfectly to the driver's power requirements. Both systems work on the basic principle that long air intake travel provides high torque at low engine speeds, whereas short intake travel develops high power at high engine speeds.

DIVA is a fully variable air intake system that adapts the length of the intake manifold, whereas DISA uses a valve that is closed at low engine speeds but open at high speeds therefore increasing engine performance.

Benefits

Both DIVA and DISA systems increase engine performance by providing high torque at low engine speeds and high power at high engine speeds.

Electronic throttle butterfly control

Replacing the mechanical cable connecting the accelerator pedal and throttle butterflies, electronic throttle butterfly control works by sending an electrical signal to the engine management system with every movement of the accelerator pedal. The system requires a mere 120 milliseconds to open the throttle butterflies in full, about the same time it will take a skilled driver to press down the accelerator.

Benefits

Electronic throttle butterfly control provides particularly smooth, vibration-free driving, especially at low engine revs. It also serves to optimise fuel consumption and emissions control. Finally, electronic throttle butterfly control enhances driving safety by automatically applying a programme in the event of a dangerous mechanical defect, such as the throttle butterflies inadvertently being placed in the full load setting.

High-precision direct injection (HPI)

High-precision direct injection (HPI) describes the process of injecting fuel under high pressure directly into the combustion chamber.

The fuel is then vapourised in the combustion chamber and the mixture is cooled. The density is increased (the cooler it is, the greater the density) and improves the efficiency of the engine by up to 10%.

Benefits

High-precision direct injection helps increase the power, whilst retaining low fuel consumption figures.

M high pressure Double- / Bi-VANOS

Bi-VANOS significantly improves the torque curve of the petrol engine. Valve timing both on the intake and outlet camshaft is adjusted to the power and torque required of the engine as a function of the accelerator pedal position (load-related) and engine revs, all of which is done with infinite precision. M Double- / Bi-VANOS requires very high oil pressure (approx. 80-120 bar) in order to adjust the camshafts as quickly and precisely as possible.

Benefits

M high pressure Double-/ Bi-VANOS ensures supreme torque at low engine revs and equally impressive output at high speeds. The engine's idling qualities are improved by the reduction of unburnt residual gases and special engine management maps for the warm-up period which enhance the efficiency of the catalytic converter.

Power

Power describes the amount of work produced by an engine within a certain period of time, measured in horsepower (hp). The more power an engine produces allows a higher ratio between the engine and rear wheels, which results in greater torque being applied to the rear wheels.

Benefits

The more power a car has available relates directly to the amount of acceleration it has. This results in higher performance and ultimately, faster cars.

Torque

Torque is a force that rotates objects. When using a wrench, force must be applied to the handle. This force creates torque on the wheel bolt, which turns it. The amount of torque applied to the bolt depends on the force exerted on the wrench and the length of the lever.

In a car engine, the combustion process creates a force which acts on the piston and connecting rod. This is converted into a rotary force (torque) by the crankshaft, which in turn, drives the gearbox and drivetrain.

It should be noted that an engine with a high level of torque may not develop high levels of horsepower.

Benefits

Torque provides everyday usability and allows increased flexibility for drivers. BMW diesel engines provide high levels of torque at low engine speeds; this

ensures high performance is available in any gear, therefore reducing the amount of gear shifting required.

Turbocharger

The term 'turbocharger' is used to describe the device in internal combustion engines used to improve performance through a process of forcing compressed air into the engine's combustion chambers. This allows a higher amount of fuel to be burned which in turn results in a higher power output.

Turbochargers work by obtaining their power from the engine's exhaust gas. This waste gas then travels through a turbine, which in turn spins the compressor. A Variable Nozzle Turbine (VNT) involves the use of a turbine housing that can change its internal configuration to adapt to variations in the engine's air boost requirements. VNT works by adjusting the gas flow cross section at the inlet of the turbine wheel in order to optimise turbine power with the required load. At low engine speeds and low gas flows, the vanes of the VNT close, thereby reducing the inlet area to the turbine. This results in an increase in turbine inlet pressure, which increases turbine power and creates higher engine boost pressure. At high engine speeds and loads, the vanes open, thereby increasing the turbine inlet area. This has a combined effect of preventing over-boost and reducing engine outlet pressure for improved fuel economy at high load operating conditions. VNT turbochargers also help to control exhaust emissions.

Benefits

By increasing the turbine inlet area, overboost is prevented and engine outlet pressure is reduced, for improved fuel economy at high load operating conditions. VNT turbochargers also help to control exhaust emissions.

Twin turbocharger

BMW uses two different configurations of twin turbos in their engines. In the diesel engines, an in-line variable twin turbocharging system is used, whilst in petrol engines, a bi-turbo arrangement is used, featuring two small turbo chargers of the same size, each serving a different set of cylinders.

For twin turbo engines, two turbochargers of different sizes are connected in series to guarantee unrivalled responsiveness and amazing power.

The two turbochargers work hand in hand: the smaller of the two at low engine loads, the larger one at higher engine loads, and both together in between. Therefore for the variable in-line twin turbo engines, there are three basic operating modes:

- At low engine loads, the intake air flows through the large turbocharger and is compressed in the small one. Because of its optimum efficiency for this range, it breathes power into the engine almost immediately from idling (avoiding turbo lag).
- As load increases, so does the importance of the second and larger turbocharger, which is used as a pre-compressor at first. In the small turbocharger, the intake air is then compressed even further. A turbine control valve distributes the exhaust flow variably to both turbochargers and therefore controls their interaction.
- At higher engine loads, only the larger turbocharger works.

Benefits

The two-stage turbocharger design resolves the conflict between good response at low speeds and plentiful top-end power. It also provides an unrivalled synthesis of dynamics and high eco-friendliness (EU4 classification). Finally, its very high efficiency ensures particularly low fuel consumption.

Variable turbine geometry provides high torque throughout the engine's range in addition to optimised fuel consumption and decreased emissions.

VALVETRONIC

VALVETRONIC determines by how much the inlet valves open. At any given time, the quantity of combustion air required in the engine's cylinder depends on load. The further the accelerator is depressed the more air the engine has to induct in order to achieve the optimum fuel-air mixture inside the cylinder. Conversely, the engine needs less air at low load, for example when idling. VALVETRONIC regulates the quantity of air that the engine inducts for combustion by varying the opening of the inlet valves. Pressing down the accelerator pedal activates an electric motor(s). This ensures the required valve lift by means of an eccentric shaft(s) and connecting lever, with VANOS controlling the valve opening times.

VALVETRONIC varies valve lift to a far greater degree than any other system. In certain operating ranges, it varies valve lift so much that it acts in place of the traditional engine throttle with the valves completely controlling the engine's breathing (air intake).

Benefits

By allowing the valves to control engine breathing, VALVETRONIC significantly reduces engine power loss at lower loads. Valve lift is tailored precisely to operating conditions – small valve opening for lower loads, larger valve opening for higher loads. In low speed and light-load driving, engine operation is especially smooth because of the small valve lift. VALVETRONIC provides increased torque, coupled with lower fuel consumption and a reduction of harmful emissions.

VANOS variable valve timing

VANOS is the acronym for 'VAriable NOckenwellen Steuerung', German for 'variable camshaft control' or 'variable valve timing'. Whereas VALVETRONIC determines how much valves open, VANOS determines when the valves

open. Variable valve timing means the valves can be opened or closed at various points in the combustion cycle.

- VANOS varies inlet valve timing according to engine operating conditions, enhancing low to medium-speed torque whilst reducing emissions and fuel consumption. In contrast to some competitor variable valve timing systems, VANOS varies valve timing infinitely (rather than having simply a low and high-speed setting). VANOS uses oil pressure to adjust the valve timing, dependent on engine revs, load and temperature.

- Double-VANOS varies the timing of both the inlet and outlet valves according to the specific needs of the engine (many competitor systems still vary inlet valve timing only). The cylinders are fed the optimum fuel/air mixture to deliver a seamless wave of power and torque.

- Bi-VANOS refers to two separate VANOS units that are installed on the two banks of a V-configuration engine. On a V8, there is one VANOS unit for cylinders one to four and one unit for cylinders five to eight. It is possible to have a Bi-VANOS system that incorporates two Double-VANOS units.

Benefits

VANOS optimises engine performance, economy and emissions control. Fewer unburned residual gases improve idling, and special engine control maps for the warm-up phase enhance the effectiveness of the catalytic converter. This ensures smoother idling, more progressive response in stop-and-go traffic and reduced fuel consumption.

Transmission

Adaptive Transmission Management (ATM)

Available on cars with automatic transmission, Adaptive Transmission Management constantly changes the driving characteristics of the vehicle, adapting to whoever is driving and to varying road conditions. ATM is able to determine if the vehicle is going up or down hill, how hard it is being driven, the type of road surface and if the 'Sport' programme has been selected. It then selects the most appropriate programme and gear to match the performance required. For example:

- Individual gears are shifted at higher engine revs if the driver favours a sportier driving style or at lower engine revs if the driver enjoys a more relaxed style.

- ATM also constantly monitors the position and operation of the accelerator pedal and compares wheel slip and drive forces. If wheel slip is detected, the system employs a special programme to adjust shifting behaviour to the specific road conditions.

Benefits

ATM constantly adapts the character of the vehicle to road conditions and to the driver's preferred driving style.

BMW automatic transmissions

All current BMW automatic transmissions provide full electronic control with Adaptive Transmission Management (ATM) and the Steptronic system.

The six-speed automatic transmission with Steptronic for manual gear shifting improves vehicle dynamics by adding a sixth gear. Thanks to the use of new technologies, the transmission has a compact, lightweight design. This is partly due to combining the electronic and hydraulic control functions in a single unit (sometimes referred to as 'Mechatronics').

BMW automatic transmissions also incorporate important safety features:

- Shiftlock makes sure that the gear lever can only be moved from Neutral or Park into a drive gear when the driver's foot is on the brake pedal

- Interlock allows the key to be pulled out of the ignition only when the driver has moved the gear lever to position Park.

Benefits

BMW automatic transmissions optimise gear change quality (faster and smoother shifting), performance (broader spread of transmission ratios) and fuel economy. Additionally, the reduced number of interfaces within the transmission increases reliability.

BMW manual transmissions

BMW manual transmissions come with a six speed gearbox and are available in many different variants; the gearbox is matched to the output of the engine and tailored to meet the exact requirements of the individual model.

The manual gearbox offers drivers total control over the gears they choose to drive in and when they wish to change up or down gear, dependent upon the driving situation.

Benefits

BMW manual transmissions are engineered to provide precise control and a high level of driving pleasure.

Sequential M Gearbox (SMG) with DRIVELOGIC

The Sequential M Gearbox with DRIVELOGIC enables the driver to adjust gearshift characteristics by means of 11 driving programmes (six sequential, five automatic) to their personal style of driving, ranging from reserved but dynamic all the way to ultra-sporting.

Paddle switches on the steering wheel reduce the time required for gear changing to between just 50 and 80 milliseconds (depending on model). The driver presses the paddle on the right to change up and the paddle on the left to change down.

An electro-hydraulic system performs the mechanical clutch engagement and gearshift process. Numerous special functions such as the uphill gradient and acceleration assistant or shift lights are also incorporated into the Sequential M Gearbox.

Benefits

The Sequential M Gearbox with DRIVELOGIC is a high performance drive concept combining the benefits of the impressive transmission technology used in Formula 1 with all the requirements of everyday driving.

Servotronic

Servotronic is a special form of variable power assisted steering and uses the vehicles road speed to determine the power assistance required. Some Servotronic systems include a Sport button, which enables the driver to manually select a steering curve which matches their driving style, by stiffening the steering when this button is pressed.

Benefits

Servotronic provides high levels of power assistance when parking and manoeuvring at low speeds, followed by a gradual reduction of power assistance as road speed increases, ensuring greater contact with the road at high speeds and, as a result, an even higher standard of steering precision.

Seven-speed M Double Clutch Transmission (M DCT) with DRIVELOGIC

M DCT is an innovative BMW M transmission that provides uninterrupted power delivery when shifting from one gear to another. This is achieved by combining the function of two gear boxes into one unit. While one gear is carrying torque to the drive shaft the gearing of the clutch pack not in use can be pre-selected based on information from the throttle position and rev counter. This makes it possible for one clutch pack to engage with the next gear at the same time as the other disengages the previous one resulting in seamless gear changes.

Benefits

M DCT results in faster acceleration compared to a manual transmission as well as achieving reductions in CO_2 emissions and increased fuel efficiency.

Sports Automatic Transmission

BMW have introduced the new Sports Automatic Transmission; this six-speed transmission incorporates a Sport button located behind the gear lever which, when pressed, allows gear shifts to be controlled using paddles mounted on the steering wheel. Simply push either paddle away from you to change down or pull towards you to change up, keeping your hands in full control of the steering at all times.

Benefits

Sports automatic transmission allows drivers to enjoy an even sportier drive, with minimum effort and maximum enjoyment. Using the paddles results in gear changes being even faster, resulting in an even more dynamic drive.

Steptronic system

Steptronic allows the driver to drive as if using a manual gearbox. The primary gear change gate provides the conventional Park, Reverse, Neutral and Drive gear change positions. Moving the gear lever to the left into the manual M/S slot enables Sport mode. In Sport mode 'S', gear changes occur at higher engine speeds for a livelier performance feel. The driver can make upshifts and downshifts at will by 'tipping' the gear lever forward for downshifts or backwards for upshifts. The operation requires no clutch and the current gear is displayed on the instrument panel.

Benefits

The Steptronic system allows drivers flexibility in their driving style. By giving them the option of driving with an automatic gearbox, yet having the option to change up or down gear when and if required, helps to customise the drive to individual preferences, dependant upon the type and length of journey and on the individual's preferred style of driving.

Variable M differential lock

An M differential lock works to ensure M cars handle with the best possible traction whatever driving situation they are faced with. Whilst conventional differential locks measure the difference in torque on the two drive wheels, the variable M differential lock operates an axial piston pump which reacts to the difference in speed between the wheels. The result is a significant increase in traction compared to conventional differential locks. If needed, 100% of the power can be apportioned to the wheel which has the most grip, offering excellent driving stability.