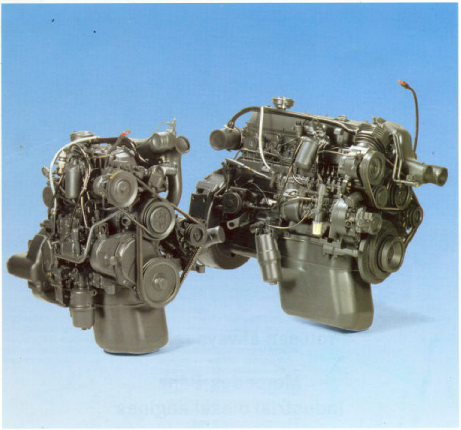
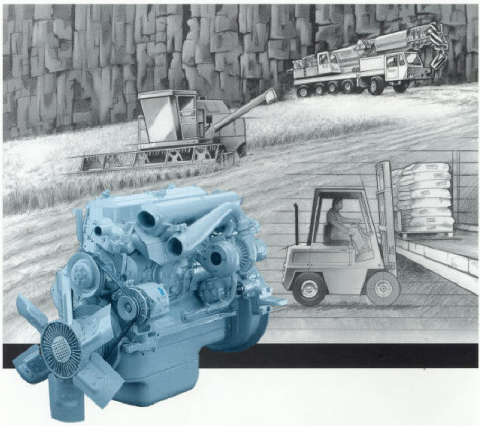
Mercedes-Benz
Industrial engines

Technical concept
300 series

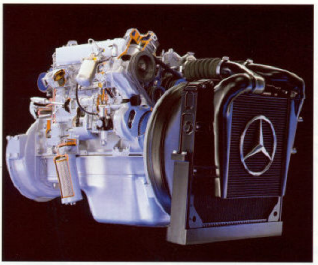




You can always rely on:

Mercedes-Benz
industrial diesel engines

The 300 engine series from Mercedes-Benz

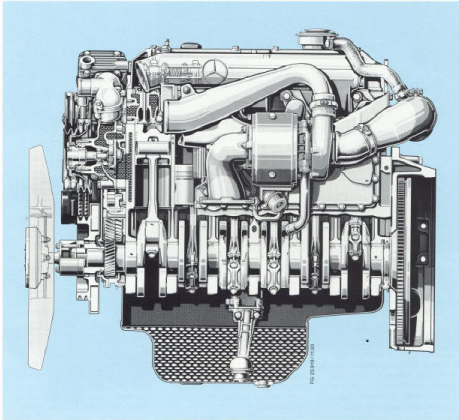


Engine development at Mercedes-Benz has always been pursued along the lines of advanced design, modern technology and precision in manufacture. The Mercedes-Benz engineers have succeeded in developing diesel engines of a special type – the 300 series. These engines achieve very high standards in every respect and are used for a large variety of purposes: to drive commercial vehicles, purpose-built vehicles, implements and machines for a wide range of different tasks. Mercedes-Benz industrial diesel engines have been developed from the large-scale production range of commercial vehicle engines already tested over millions of miles of operation around the globe.

As a result service life, weight, space requirements, fuel consumption, exhaust emissions and reliability have been optimised and ideally matched to one another.
The 300 series of industrial diesel engines comprises 4- and 6-cylinder in-line engines with direct injection. It includes naturally-aspirated engines and exhaust-gas turbocharged engines with and without intercooler. Depending on the type of operation, the charge air is either liquid-cooled or air-cooled.
The output of the Mercedes-Benz 300 series industrial diesel engines ranges from 25 kW (34 hp) to 177 kW (240 hp). The high degree of parts commonality between the individual engines, and the worldwide Mercedes-Benz service network, have decisive advantages for vehicle and implement manufacturers and users in that parts storage is simplified, maintenance is facilitated and downtime is reduced. Large-scale manufacture ensures consistently high quality and maximum precision.

It is in this field that the experience of a leading manufacturer of commercial vehicles and diesel engines bears fruit: as early as the planning stage in the design of new engines, the most up-to-date production methods are considered. The 300 series is a comprehensive range of engines that are matched to the most varied vehicles and implements. However, Mercedes-Benz offer more than just engines. Experienced experts, who are always up to date with practical requirements, are available to give our customers competent advice and assistance.

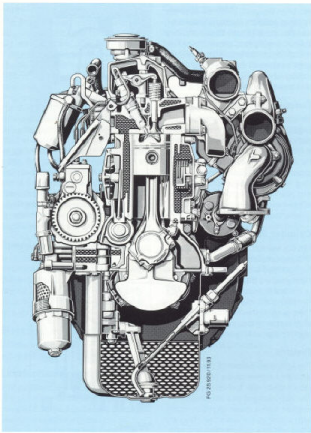
Powerful
Economical
Environmentally Compatible



There is a wide choice of engine outputs so customers never have to compromise. There is the right engine for every application, which can be adapted to the relevant operating conditions.

The wide range of engine models meets many different requirements as regards output and operation. No other range includes as many easily assembled versions as the 300 series from Mercedes-Benz. The high degree of parts commonality not only has advantages in terms of logistics, it also facilitates the work of the designers of vehicle and implement manufacturers.

The 4 and 6-cylinder engines are available in the following versions: naturally aspirated, turbocharged and turbocharged with intercooler.



They are designed so that torque increases considerably when engine speed decreases. Maximum torque is already available at low engine speeds in the range of low specific fuel consumption.
The high torque rise and the ratio of maximum torque to torque at rated engine speed ensure a high degree of flexibility in all practical applications.

Matching engine displacement and engine speed is one of the essential preconditions for long service life and operational reliability, low fuel consumption and environmentally compatible operation.
The further developed engines achieve the emission values specified under the general heading of EURO 2 which will apply as of October 1996 for vehicles to be newly introduced onto the market.

The EURO 2 requirements can only be achieved with turbocharged engines with intercooler. The optimised combustion in the engine once again considerably reduces gaseous pollutants and particulate emissions.

Advanced technology down to the smallest detail

The 300 series engines can be used for a very wide range of purposes. They are characterised by a multitude of special design features, some of which are described below as examples of the overall design concept.

Crankcase

The crankcase, made of grey cast iron, is especially rigidly designed and ribbed. Its small dimensions are a result of the smaller gaps between the cylinders. Cylinders are cast together in pairs with cooling ducts in the upper area.

Timing case

The timing case on the front of the engine accommodates the gear drive and the timing device and also the injection pump.

Cylinder head

The one-piece cylinder head is made of cast iron and is of a particularly sturdy design. It is fastened by stretch bolts which need not be retightened. Together with a steel-reinforced soft gasket these bolts ensure a reliable bond and optimum sealing between the cylinder head and the crankcase. The precisely working metering system in the one-piece cylinder head evenly distributes the coolant between all cylinders. To be protected, the injection nozzles are arranged in the light-alloy cylinder head cover. Intake and exhaust ducts are on the same side of the cylinder head.

Crankshaft and bearings

Counterweights are forged onto the crankshaft. In the 4 and 6-cylinder engines with crankshafts running in 5 and 7 bearings respectively, Mercedes-Benz use three-layer steel-backed shell bearings with a thin bearing surface. The copper content has been substantially increased to achieve a very hard surface which is highly resistant to wear. This ensures a very long bearing life. The front end of the crankshaft has been designed so as to enable the fitting of additional assemblies which can then be driven via cardan shafts or pulleys. A vibration damper on the front end of the crankshaft of the 6-cylinder engines reduces the vibration amplitudes and stresses both in the engine and the drive train.

Connecting rods

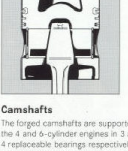
The connecting rods are precision-forged and split obliquely with serrated parting surfaces. They are supported in three-layer main bearings with steel-backed shells. The piston pins are supported in the connecting rods in long-life bronze bearings. The small-end bearings of the connecting rods of the intercooled engines have been given a trapezoidal shape.

Cylinder liners

The dry cylinder liners of the turbo-charged 6-cylinder engines are centrifugally cast from a special alloy. In the other engines the pistons run directly in the crankcase. In all cases there remain honing marks to ensure that there is always an even oil film even after long service, and this affords high resistance to wear.

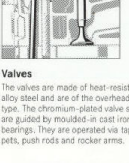
Pistons

The light-alloy pistons of the naturally aspirated engine have a conical piston crown cavity with fuel-trapping edge. The turbocharged and intercooled engines have a drawn-in piston recess with a strongly curved crown. They are fitted with one compression ring, one combined compression and oil scraper ring, and one oil scraper ring. The cast-in ring carrier of the uppermost piston ring ensures accurate, minimum-wear fit of the ring. The pistons of the turbo-charged and intercooled engines are sprayed with oil from below for cooling, and the piston pin is supplied with oil through a bore in the small end and by oil chambers on both sides.
The pistons and connecting rods are removable from above.



Camshafts

The forged camshafts are supported in the 4 and 6-cylinder engines in 3 and 4 replaceable bearings respectively in the crankcase. The engine's characteristics are to a great extent determined by the special shape of the cams. The camshafts are driven by gearwheels at the front end of the crankshaft in the timing case. A camshaft air compressor is driven by a crank pin.



Valves

The valves are made of heat-resistant alloy steel and are of the overhead type. The chromium-plated valve stems are guided by moulded-in cast iron bearings. They are operated via tappets, push rods and rocker arms.

Injection system

The Bosch in-line injection pump with automatic breathing is fitted to the timing case by means of an intermediate flange and connected to the lubrication circuit. The boost pressure compensator of the turbocharged engines suppresses smoke development at low engine speeds. The injection pumps of the EURO 2 engines generate an injection pressure of 1100 bar. Specially designed pump elements allow early start of injection in the partial-load range to avoid white smoke. The feed pump and prefilter with replaceable inserts are attached to the injection pump. The fuel filter with felt insert is fitted at the highest point. The engines are fitted with Bosch 4-orifice or 5-orifice nozzles, depending on the engine variant.

Speed and load control

A centrifugal governor is flange-mounted to the in-line injection pump. Depending on the use to which the engine is put, it is a minimum speed governor, a maximum speed governor or a variable speed governor.

Electrical equipment

Different types of starter and alternator are available.

Lubrication system

Forced-feed lubrication is by means of a gear-type oil pump driven by the camshaft. In the 6-cylinder naturally aspirated engines a plate-type oil cooler is fitted to the left-hand side of the crankcase. The turbocharged engines have disk-type oil coolers. The 4-cylinder naturally aspirated engine does not need an oil cooler; the turbocharged version is fitted with an oil cooler in front of the oil filter. All points which have to be lubricated and cooled are supplied with pressure oil. The injection pump and the governor are connected to this circuit, and so are the exhaust-gas turbocharger and the air compressor if included in the equipment.

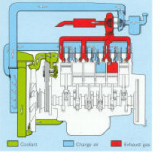
Cooling system

The cooling system is a closed, pressurised circuit, with cooling ducts cast into the crankcase and designed for operation with finned radiators. The coolant pump is fitted above the timing case. In the engine version with intercooler a simple housing with thermostats is fitted to the water pump. For different applications there are suction and pusher-type fans available which can be fitted on the crankshaft or in a raised position on the coolant pump.
Cooling air flows through the intercooler or alternatively, the intercooler is connected to the inner coolant circuit.

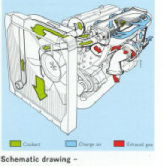
Charger system

Only turbocharged engines with intercooler are used for EURO 2 versions. A relatively high boost pressure is available in the lower and medium speed ranges. The higher-output engine models will be fitted with a wastegate to limit the boost pressure at higher engine speed and output. To avoid excessive boost pressure in the upper engine speed range, a diverter valve in the exhaust flow guides part of the exhaust gas past the turbine.

New features for EURO 2 engines



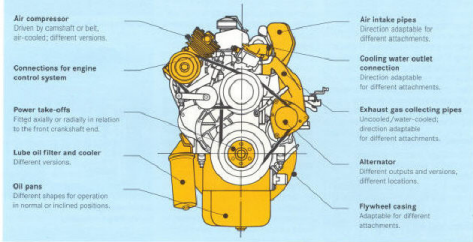
Schematic drawing – air/air charge-air cooling

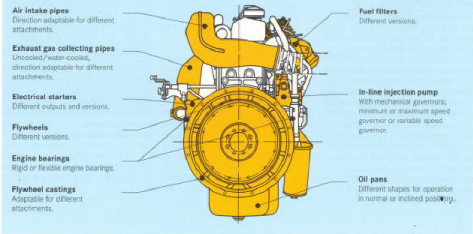


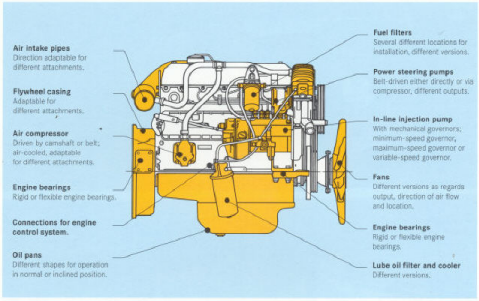
Schematic drawing – air/coolant charge-air cooling

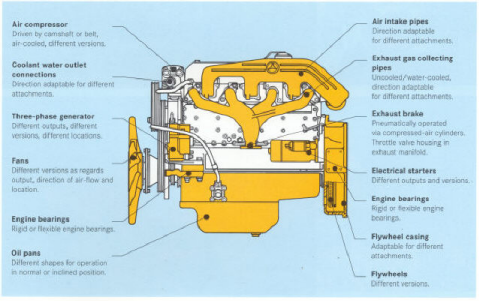
The 300 series – basic engines with a large variety of versions

Wherever a reliable and economical industrial engine is needed, special-vehicle and original-equipment manufacturers can safely rely on Mercedes-Benz. The modular system of the 300 series comprises basic engines which can be complemented by a large variety of practical components and assemblies, so as to solve every problem. Economy is improved by the high degree of parts commonality; this not only facilitates maintenance but also simplifies replacement parts stocking and thus reduces downtime. From the large variety of versions, we can only give you a few examples to illustrate that the 300 series engines can be adapted to every type of operation and to the most varied installation requirements.






Air intake pipes
Direction adaptable for different attachments.
Flywheel casing
Adaptable for different attachments.
Air compressor
Driven by camshaft or belt; air-cooled, adaptable for different attachments.
Engine bearings
Rigid or flexible engine bearings.
Connections for engine control system.
Oil pans
Different shapes for operation in normal or inclined position.
Fuel filters
Several different locations for installation, different versions.
Power steering pumps
Belt-driven either directly or via compressor, different outputs.
In-line injection pump
With mechanical governors; minimum-speed governor, maximum-speed governor or variable-speed governor.
Fans
Different versions as regards output, direction of air flow and location.
Engine bearings
Rigid or flexible engine bearings.
Lube oil filter and cooler
Different versions.


Air compressor
Driven by camshaft or belt, air-cooled, different versions.
Coolant water outlet connections
Direction adaptable for different attachments.
Three-phase generator
Different outputs, different versions, different locations.
Fans
Different versions as regards output, direction of air-flow and location.
Engine bearings
Rigid or flexible engine bearings.
Oil pans
Different shapes for operation in normal or inclined position.
Air intake pipes
Direction adaptable for different attachments.
Exhaust gas collecting pipes
Uncooled/water-cooled, direction adaptable for different attachments.
Exhaust brake
Pneumatically operated via compressed-air cylinders. Throttle valve housing in exhaust manifold.
Electrical starters
Different outputs and versions.
Engine bearings
Rigid or flexible engine bearings.
Flywheel casing
Adaptable for different attachments.
Flywheels
Different versions.

Mercedes-Benz industrial diesel engines – fields of application

In the design of the diesel engines from the 300 series, the engineers were able to draw on the experience gained in decades of research and development. These engines have proved themselves worldwide, under all conceivable operating conditions.

Purpose-built vehicles

Mobile cranes, tractors, road sweepers, special fire-fighting vehicles, snow-cutters, ski run levellers, concrete mixers, refuse-collecting vehicles.

Farming machinery

Combine harvesters, heavy-duty harvesting machinery, farm tractors, forage harvesters.

Building machinery

Hydraulic and cable-controlled excavators, wheeled loaders, crawler loaders, bulldozers, road-building machinery, trench-cutting machines, concrete pumps, concrete mixers, compressors.

Lifting and hauling machinery

Stationary and mobile cranes, fork-lift trucks, container handling equipment, industrial tractors.

Should you require further material for your information, please do not hesitate to contact our division for industrial engines and automotive components at the following address:

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Mercedes-Benz offer not only a high-quality product with a high standard of technology, but a comprehensive range of services as well. Some examples:

Project consulting.

Mercedes-Benz not only offer a series of engines with a wide range of power outputs to ensure functional suitability. Their experienced specialists also assist in selecting the right drive unit from a wide variety of possibilities. It is a cooperation based on a sense of partnership which has been practised for many years with the many users of Mercedes-Benz industrial engines.

The choice of engine is therefore determined by the requirements made on the power train. For this reason, comprehensive project consulting is indispensable if one is to arrive at the best possible solutions to one's requirements.

Application engineering consulting.

An engine may well be as long-lived and powerful as they make them – but it will never be able to offer the optimum solution if the particular application envisaged is not considered at the time of installation. The experts and facilities of Mercedes-Benz ensure a practice-oriented installation solution even in the most difficult of situations.

An economical solution is ensured only if the right engine with matching components and accessories has been found and correctly installed.

Parts support.

Mercedes-Benz make sure that parts are available for many years to come. Quality and delivery times are up to the high standards which Mercedes-Benz have set with their industrial engines all over the world.

Long-term parts availability and fast deliveries ensure continued year-long reliability of operation for Mercedes-Benz industrial engines.

Service network.

Mercedes-Benz have service facilities all over the world. These include well-equipped workshops as well as qualified personnel who are always up to date on the current state of technology.

Efficient service also decides whether high product quality can be converted into equally high application value.

Service training.

Mercedes-Benz Service Training provides the specialist knowledge required for proper maintenance, service and repair work on industrial engines. Special training courses with information tailored to specific needs, as well as flexible arrangements at home and abroad, ensure the training courses' success.

Since even the best product can only be as efficient as the experts that put it to work, service and maintain it, service training is a clear profit for the buyers of Mercedes-Benz industrial engines.

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