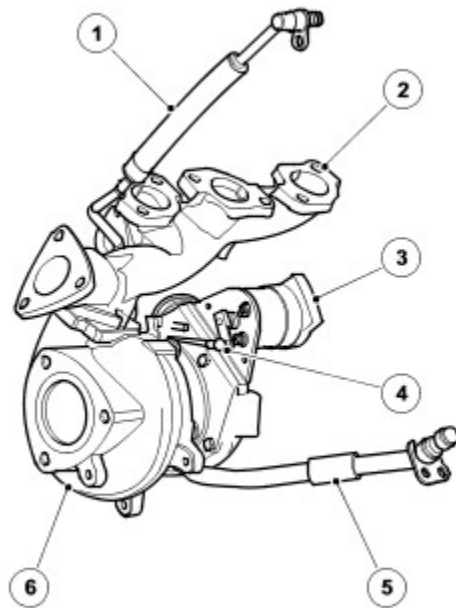




Turbocharger



E50590

Item	Part Number	Description
1	-	Oil feed pipe
2	-	LH exhaust manifold
3	-	Actuator motor
4	-	Actuator lever
5	-	Oil return pipe
6	-	Turbocharger

The variable vane turbocharger, fitted to the LH exhaust manifold of the TdV6 engine, makes it possible to vary the exhaust gas flow of the turbine, dependent on engine operation. This improves the power transfer to the turbine wheel and compressor, particularly at low engine speeds, thus increasing the boost pressure. The guide vanes are opened progressively as the engine speed increases so that the power transfer always remains in balance with the required charger speed and the required boost pressure level. Variable vanes facilitate better use of the exhaust gas energy so as to further improve the efficiency of the turbocharger and thus of the engine, compared to the more conventional 'wastegate control'.

Advantages:

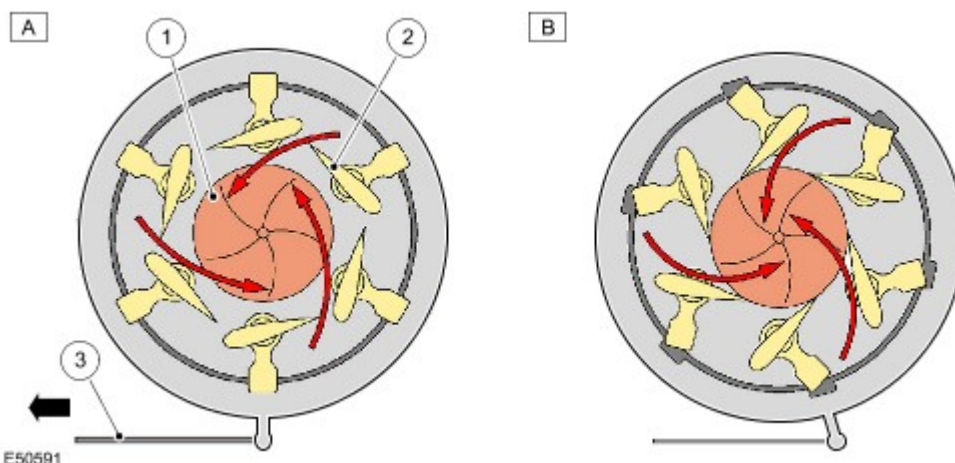
- High torque at both high and low engine speeds
- Continuous and optimum adjustment for all engine speeds
- No wastegate valve required, exhaust energy is better utilised, less back-pressure in conjunction with same compressor work
- Low thermal and mechanical load improves engine power output
- Low emissions
- Optimised fuel consumption over the entire engine speed range

The turbochargers construction is similar to the unit fitted to the Freelander Td4 engine. However, a stepper motor instead of a vacuum diaphragm electronically controls the variable vanes.

The DC rotary actuator motor operates a drive shaft. The drive shaft is connected to the vanes by an actuating lever. Adjustment of the vanes is achieved by moving the actuating lever. When the drive shaft is turned, a signal is created at

the end of the drive shaft; this feedback signal is used to determine the angular position of the vanes. This information is transmitted to the Engine Control Module (ECM).

There is a temperature sensor in the control unit, which drives the stepper motor to a safe position (vanes fully opened) if the maximum temperature is exceeded. The ECM detects any malfunctions in the stepper motor and generates Diagnostic Trouble Codes (DTC).



Item	Part Number	Description
A	-	Closed (fast)
B	-	Open (slow), default position
1	-	Turbine
2	-	Vanes
3		Actuator lever

At low engine speeds, because of the flat setting of the vanes, the relatively low flow of exhaust gases are accelerated and routed in such a way that they meet the vanes of the turbine wheel at the outermost edge. Consequently, a high torque is produced at the turbine wheel, and a high turbine speed is therefore achieved.

At high engine speeds the vanes are progressively opened, so that a large flow of exhaust gas is delayed and is directed more and more towards the centre of the turbine wheel.

The torque at the turbine wheel is artificially lowered. In this way the turbine speed, and therefore the air quantity required by the engine, are matched to engine speed. Consequently, the boost pressure is approximately constant over the whole engine speed range.

The operating parameters are controlled electronically by the ECM using powertrain sensors and driver inputs. For additional information, refer to [Electronic Engine Controls](#) (303-14C Electronic Engine Controls - 2.7L Diesel)

The turbocharger is designed for fail safe operation. If a fault occurs regarding the control of the unit, the vanes default to the fully open position so as to produce minimum boost.