

Press Release

Jan 14, 2011 | ID: 36222

T3 and T4 GTDi PETROL ENGINES

- T3 and T4 - Volvo's two new four-cylinder 1.6 litre petrol engines with GTDi (Gasoline Turbocharged Direct Injection) technology
- Performance of a larger engine while offering fuel economy of a smaller engine
- T3 and T4 standard with Start/Stop fuel economy technology in the all-new S60 and V60
- T4 available with Volvo's automatic six-speed Powershift gearbox

In order to meet customers expectations of power and performance but increasing levels of fuel economy from a petrol engine, Volvo has developed a new 1.6-litre petrol engine with two variations of power and torque output.

Designated as the T3 and T4 engines, both feature the very latest in direct fuel injection technology and differ in engine output due to modified engine management software. The T3 with start/stop features 150 PS while the T4 offers 180 PS.

The T3 and T4, both with start/stop are available in the all-new S60 and V60. The V70 and S80 also benefit from the introduction of the T4 engine but without start/stop. Both the T3 and T4 engines are available with a six speed manual gearbox, whilst Volvo's six-speed twin-clutch Powershift transmission is an option on the T4.

The 180 PS T4 engine delivers maximum torque of 240 Nm from just 1600 rpm all the way up to 5000 rpm. An automatic on-demand overboost function provides 270 Nm of torque which results in excellent pulling power across the entire rev range. The torque curve is relatively gentle, providing a comfortable driving experience. The 150 PS T3 version offers 240 Nm of torque but does not require the overboost function.

"Small, high-performance GTDi engines are a part of our bid to get more energy out of smaller engines" says Paul Welander, acting Senior Vice President Product Development at Volvo Cars.

The engine itself is based upon the 1.6 normally aspirated petrol engine previously offered in a number of models with a number of important changes.

The previous engine used a conventional port injection while the new engine uses direct fuel injection. A turbocharger is now used to offer increased power and torque without having to increase the engine capacity and thus size and weight. Separate ignition coils instead of common ignition coils, along with need-dependent cooling all offer greater control of engine management and temperature to optimise performance.

On both engines, each injector has been positioned centrally above the piston, just beside the spark plug. The injectors have six holes each which deliver finely atomised fuel distribution.

The centrally located multi-hole injector makes it possible to control fuel dosage precisely. In cold starts, the fuel is sprayed into the middle of the combustion chamber just prior to ignition. The high fuel injection pressure for a petrol engine of 100 bar means that preparation is perfect and less fuel ends up on the cold combustion chamber walls. This helps cut emissions and considerably reduces the amount of fuel consumed. Another effect is a major reduction in the amount of soot particulates compared with a side-positioned injector.

In cold starts, this injection technology also contributes to quick heating of the catalytic converter, which in turn speeds up the exhaust cleaning process.

Direct injection gives a high fill rate in the combustion chamber. Apart from effective combustion and lower emissions, this also helps the turbo start up earlier and provides swift response even from low engine revs. This promotes fast acceleration and good driveability from low speeds.

"This is the most modern injection technology in existence and Volvo played a major role in its development," says Paul Welander. "Our cooperation with Bosch, which manufactures the system, has been ongoing for a number of years and is highly successful."

The new GTDi engines have a compact format and both the engine block and cylinder head are made entirely from die-cast aluminium. The cylinder block features an 'open deck' type which results in low weight and improved heat-dissipation capability. A plastic inlet manifold helps to minimise the weight.

In order to reduce petrol consumption and emissions, the fuel must also be used as efficiently as possible. The fuel injection system has therefore been refined so that combustion can be regulated with extreme precision.

Direct injection, in combination with a Borg Warner fixed vein turbocharger and variable valve timing, has made it possible to deliver performance properties on a par with far larger engines whilst reducing fuel consumption and environmental impact to considerably lower levels.

"We estimate reductions in fuel consumption and exhaust emissions in the region of twenty per cent compared with a conventional petrol engine with larger displacement and similar performance," says Welander.

The GTDi engines utilise variable valve timing for the inlet and exhaust camshafts. Both the inlet and exhaust valves' opening times can be varied to optimise overlap and ensure exactly the right fill in the combustion chamber, irrespective of engine revs. This optimises combustion throughout the rev range and contributes to swift acceleration in all operating conditions.

The six-speed twin-clutch Powershift transmission offered on the T4 combines the manual gearbox's efficiency and driving dynamics with the automatic transmission's smoothness and convenience. Clutch operation is coordinated so that no torque losses arise during gear-changes. The gearbox disengages the gear if the driver releases the accelerator when the car is rolling in order to create less rolling resistance and improve fuel consumption. The result is the same comfort and seamless drive as a conventional automatic transmission, combined with the performance of a manual gearbox.

Engine specifications 1.6 GTDi T3:

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|---------------------|-------------------------|
| Engine type | 4-cylinder petrol turbo |
| Displacement | 1595 cm ³ |
| Bore | 79.0 mm |
| Stroke | 81.4 mm |
| Compression ratio | 10.0:1 |
| Valves per cylinder | 4 |
| Camshafts | DOHC |
| Max power output | 150 PS |
| Max torque | 240 Nm |
| Emissions | Euro 5 |

Engine specifications 1.6 GTDi T4:

| | |
|---------------------|--|
| Engine type | 4-cylinder petrol turbo |
| Displacement | 1595 cm ³ |
| Bore | 79.0 mm |
| Stroke | 81.4 mm |
| Compression ratio | 10.0:1 |
| Valves per cylinder | 4 |
| Camshafts | DOHC |
| Max power output | 180 PS |
| Max torque | 240 Nm / 1600-5000 rpm, 270 Nm for brief overboost |
| Emissions | Euro 5 |

NB: Pricing, performance and economy data for each model can be found in the included price lists.

Keywords:

Old S60, Old V60, Press Releases, 2011, V70 (2008-2016), S80 (2008-2016)

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