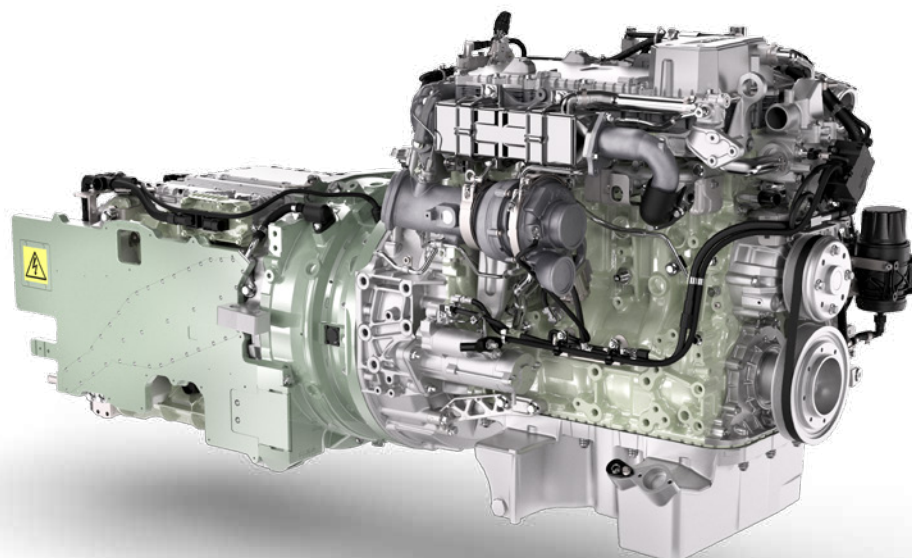




Volvo Buses. Driving quality of life

VOLVO ELECTRIC HYBRID DRIVELINE

Euro 6



GREEN EFFICIENCY – ONE STEP FURTHER

The Volvo Electric Hybrid Driveline represents a quantum leap in both fuel efficiency and environmental performance. Thanks to rapid charging and high battery capacity, up to 70% of a route can be operated in electric mode – silent and emission-free. The total energy saving can reach 60%, and emissions as well as diesel consumption can be reduced by up to 75%.

The Volvo Electric Hybrid Driveline is an extension of the well-proven driveline used in the Volvo 7900 Hybrid. The difference lies in a more powerful electric motor, increased energy storage and equipment for opportunity charging. This typically permits electric drive up to 7 km between chargings or 70% of a route.

Configuration

The Volvo Hybrid Driveline consists of five building blocks:

- The Volvo D5K Euro 6 diesel engine
- Electric motor/generator
- Energy Storage System (ESS)
- Rapid charging system
- Volvo I-Shift automated gearbox

The hybrid driveline makes it possible to downsize the diesel engine, thus delivering fuel savings compared with conventional vehicles. For further details on the D5K engine please refer to the separate fact sheet.

Energy Storage System (ESS)

The energy storage system features a Lithium-Ion battery. The battery's total energy capacity is 19 kWh. The battery is equipped with a heater/cooler system which operates both at the ramp and when driving.

Full electric drive

The bus will run primarily in electric mode. To enable full electric drive, the bus is equipped with electric power steering, an electrical air compressor and a DC/DC unit that converts 600 V power to 24 V power. The DC/DC unit replaces the conventional alternator. The vehicle switches between hybrid drive and full electric drive depending on the current conditions.

Hybrid drive

When additional power is required or when battery capacity reaches a pre-determined level, the bus goes into hybrid drive. The diesel engine and electric motor then propel the vehicle together. Torque is distributed between the two units depending on the ESS charge status, speed and other conditions.

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Rapid and automated charging

The bus is charged via a conductive charging interface located on the bus roof. All moving parts for the charging interface are located in the pylon in order to minimise the need for additional vehicle maintenance.

Typical charging time is 6 minutes and takes place at end bus stops, or at other suitable locations. Should charging not be done for some reason, the bus will continue to run in hybrid mode.

The charging sequence is activated automatically when the bus is in the right position, and is stopped either automatically when the battery is full or when the driver prepares to depart.

Brake energy regeneration

During braking or retardation, kinetic energy is generated and used to charge the ESS. This regenerated energy is later used for propulsion or for auxiliary consumers such as the air compressor, DC/DC unit or air conditioning system.

Volvo I-SAM electric motor	
Max. output	150 kW
Max. torque	1200 Nm

Volvo D5K240 EU6	
Max. output	240 hp (177 kW)
Max. power at	2200 rpm
Max. torque between 1200–1600 rpm	918 Nm
No. of cylinders	4
Bore	110 mm
Stroke	135 mm
Displacement	5.1 dm ³
Compression ratio	17.5:1
Oil-change volume, including oil filters	approx. 18.7 L

Euro 6-compliant through advanced after-treatment

The Volvo D5K is a low-emission engine, in terms of exhaust gases as well as noise. The low exhaust emissions are achieved by after-treatment of the exhaust gases using:

- SCR (Selective Catalytic Reduction)
- EGR (Exhaust Gas Recirculation)
- DPF (Diesel Particulate Filter)

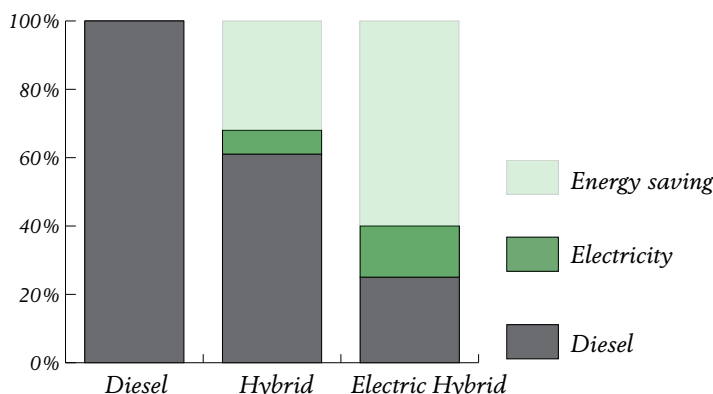
Thanks to the very high efficiency levels of the engine after-treatment system, emissions are below the legal requirements.

Volvo I-Shift

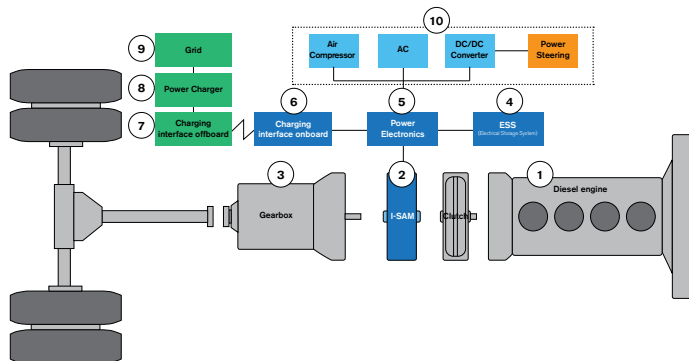
The Volvo I-Shift is a twelve-speed gearbox. Gear-changing is automatic and software-controlled. I-Shift is used for many different Volvo applications, but there is a special program for hybrid drivelines.

During gear-shifting the transmission program uses the electric motor to synchronise input and output shafts to speed up and optimise the comfort of the gear-shift. The electric motor and the ESS are also used to ensure that torque interruptions during gear-shifting are minimised.

Energy consumption and fuel savings



Results depend on duty cycle, route distance and climate.



The main components of the Volvo Electric Hybrid system

1. Diesel engine
2. Electric motor/generator (I-SAM)
3. Gearbox
4. ESS (Electrical Storage System)
5. Power electronics
6. Charging interface onboard
7. Charging interface offboard
8. Power charger
9. Grid
10. Electrified auxiliaries

VOLVO

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