

Document Title: Power transmission, description	Function Group: 400	Information Type: Service Information	Date: 2014/3/18
Profile: BHL, BL71 PLUS [GB]			

Power transmission, description

Gearbox

The gearbox is a four forward, four reverse power shuttle gearbox with torque converter, hydraulic shuttle control and column mounted electro-hydraulic direction control. The transmission has switchable four wheel drive. The torque converter is a fluid clutch.

Front axle

Drive is provided to the front axle by a propeller shaft direct from the transmission.

The front axle consists of a beam casing, housing the differential in the middle and a wheel hub unit at each end. The differential, of "open" type, is supported by two bearings.

The wheel hubs containing the epicyclic reduction gears are supported by two tapered roller bearings and are powered by a hydraulically-operated steering valve.

Rear axle

The rear axle features permanent drive, via a propeller shaft direct from the transmission. The axle features spiral crown and pinion driving through epicyclic hubs, differential lock and inboard oil-immersed brakes.

The rear axle consists of a beam casing, housing the differential in the middle and a wheel hub unit at each end. The differential, type "mechanical lock", is supported by two bearings.

The wheel hubs containing the epicyclic reduction gears are supported by two tapered roller bearings.

Furthermore, the rear axle has a braking system, that provides braking force to both the service brake and the parking brake.

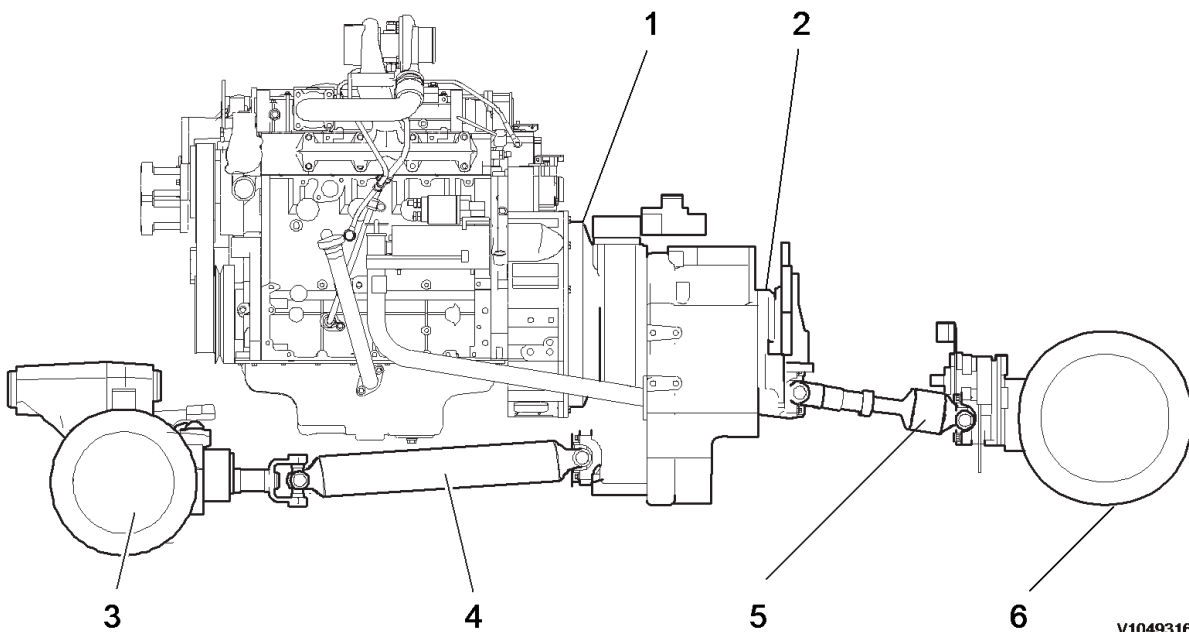


Figure 1
Power transmission

1. Torque converter
2. Gearbox
3. Front axle
4. Propeller shaft, front
5. Propeller shaft, rear
6. Rear axle

Document Title: Powershift transmission, description	Function Group: 400	Information Type: Service Information	Date: 2014/3/18
Profile: BHL, BL71 PLUS [GB]			

Powershift transmission, description

The Power Shift transmission is a fully automatic transmission with torque converter. The transmission has four forward gears and four reverse gears and operator controlled 4WD/2WD. Gear shifting is controlled by the position of the gear selector, SW4, and an electronic control unit, T-ECU. Engagement of gears is controlled by the electro-hydraulic control system. The engine output torque is transmitted and reinforced by the torque converter to the transmission. The transmission is supplied with hydraulic pressure from a pump driven by the input shaft from the engine. Gears are selected by using the gear selector, SW4, placed on the steering column. Engagement of gears is controlled by the transmission control unit after impulses from the speed sensor, SE5. Clutches in the transmission are activated by solenoid valves on the transmission control system. The four wheel drive, is operated by a spring applied clutch in the transmission. When supplied with hydraulic pressure from the control valve, the four wheel drive is disengaged.

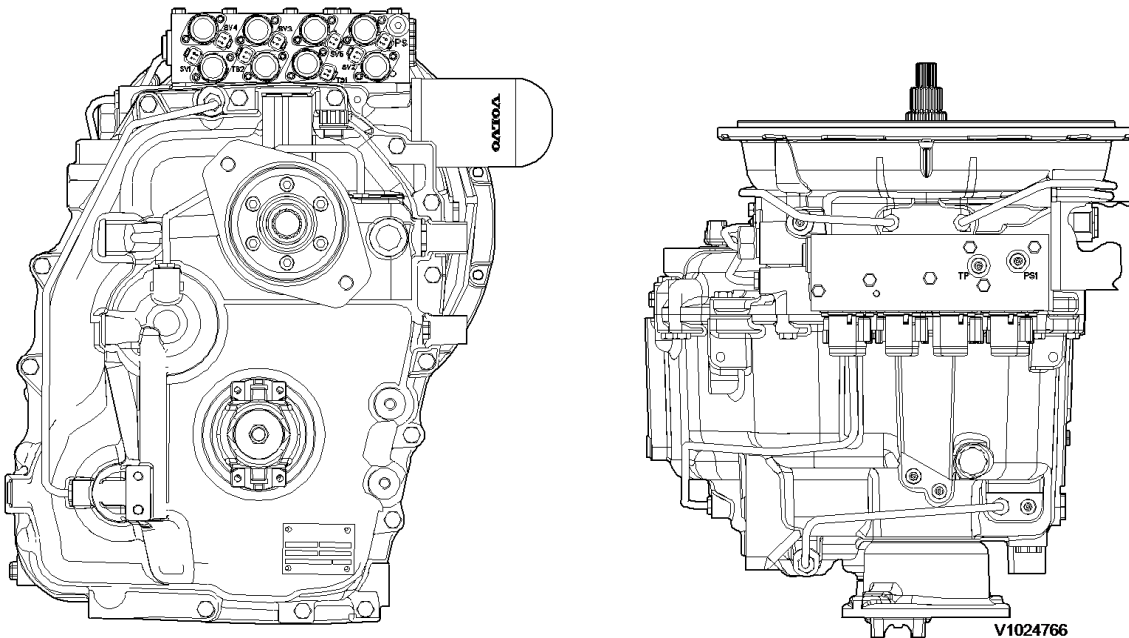
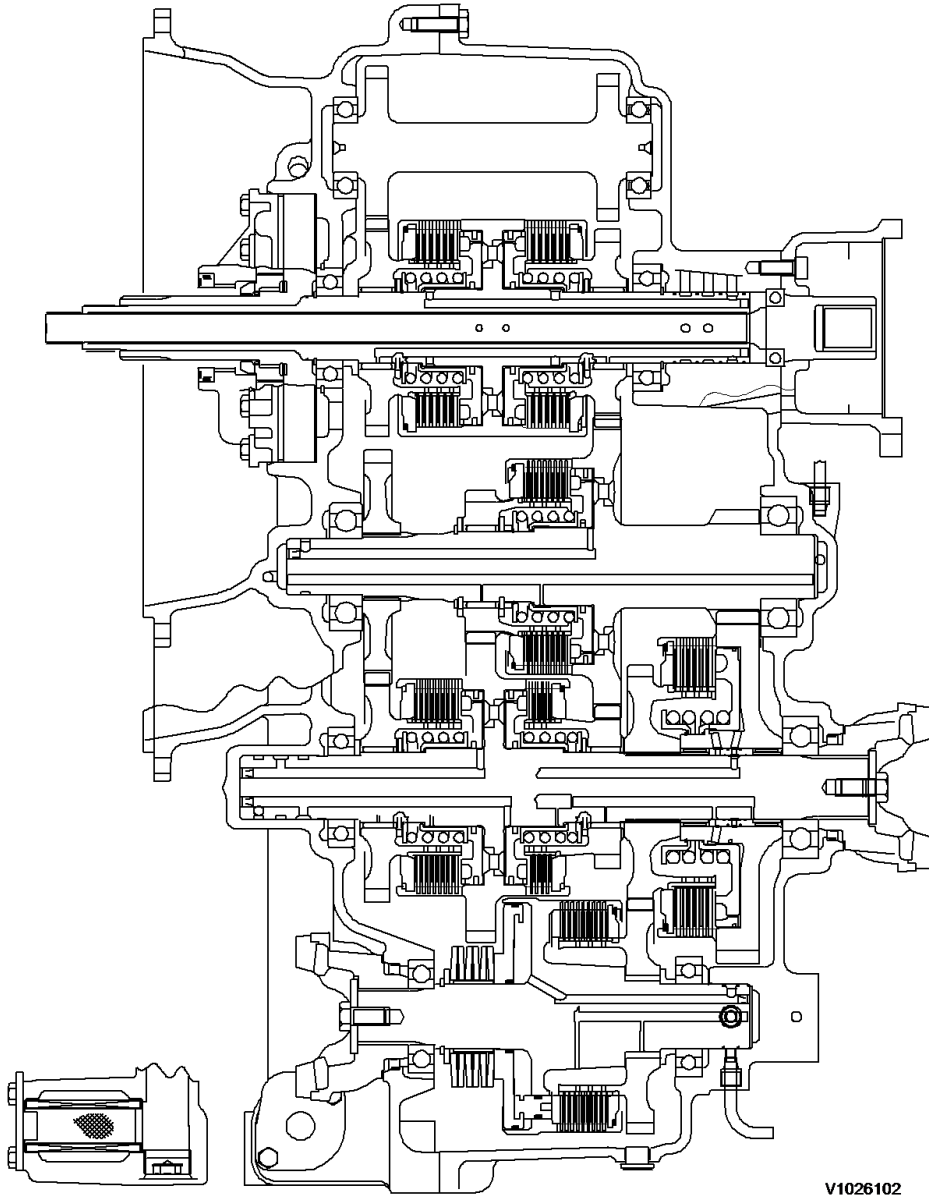


Figure 1
Power Shift transmission



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Figure 2
Power shift transmission, cut view

Document Title: Power transmission, troubleshooting	Function Group: 400	Information Type: Service Information	Date: 2014/3/18
Profile: BHL, BL71 PLUS [GB]			

Power transmission, troubleshooting

Problem	Cause	Action
Machine does not move	Faulty supply to solenoid valves	Check/Replace
	Damaged wiring connections between transmission and machine	Repair/Replace
	Oxidised contacts in electrical wiring	Clean
	Break in electric cable	Replace
	Damaged solenoids	Replace
	Damaged sensors	Replace
	Short circuits or false contacts	Check/Replace fuses
	Incorrect oil level	Top up
	Check for leaks	Repair/Top up
	Blocked intake filter	Clean
	Damaged oil pump	Replace
	Damaged oil pump relief valve	Replace oil pump
	Blocked/Damaged transmission filter	Replace
	Damaged/Jammed control valve	Replace
	Damaged converter	Replace
	Oil temperature below 0 °C (32 °F)	Carefully warm up the machine and all subsystems until the oil has reached working temperature
	Damaged rotary seals	Replace
	Damaged synchronisers	Replace
	Blocked reverser lever	Repair
Worn clutch unit	Replace/Repair clutch unit	
No drive transmission (broken gears, shafts, bearings, etc.)	Check/Repair/Replace	
Machine has reduced power transmission	Incorrect oil temperature	Wait for oil to reach working temperature (stall test)
	Transmission oil overheating	Restore acceptable temperature values
	Incorrect operating pressure	Check hydraulic circuit and replace (oil pump, filters, control valve)
	Damaged converter	Replace
	Incorrect oil level	Top up
	Worn clutch unit	Replace/Repair
	4WD clutch failure	Repair/Replace 4WD shaft group
	Overheating solenoids	Replace
	Damaged transmission and machine wiring connections	Repair/Replace
Damaged sensors	Replace	

Overheating	Damaged hydraulic cooling system	Repair
	Dirty heat exchanger	Clean
	Parking brake inadvertently activated	Release
	Excessive dirt on axle wheel hubs	Clean
	Seizing (broken gears, shafts, bearings, etc.)	Check/Repair/Replace
	Braking force outside transmission: irregular axle operation	Check/Repair axle
	Clutch plate drag	Repair/Replace
	Damaged converter	Replace
	Damaged oil thermostat	Replace
	Incorrect oil level	Top up
	Worn oil pump	Replace
Wheels rotate when machine is raised	Clutch plate drag	Repair/Replace
	Low oil temperature (high oil viscosity)	Wait for oil to reach working temperature (stall test)
	Incorrect oil specifications	Replace oil and filters
	Damaged control valve	Replace
	Faulty reverser locking	Repair/Replace
Noise	Damaged converter	Replace
	Damaged oil pump	Replace
	Aeration/Cavitation	Check oil level/Check oil specifications
	Seizing (broken gears, shafts, bearings, etc.)	Check/Repair/Replace
	Worn clutch plates	Replace
	Worn synchroniser actuation unit	Replace
	Worn 4WD clutch	Replace
Irregular actuation	Damaged control valve	Replace
	Electrical system fault	Repair/Replace
	Worn clutch plates	Replace
	Damaged converter	Replace
	Low oil temperature (high oil viscosity)	Wait for oil to reach working temperature (stall test)
	Overheating	See "Overheating"
	Damaged hydraulic system	Repair/Replace
Gear remains engaged	Damaged/Jammed shuttleshaft lever	Repair/Replace
	Electrical system fault	Repair/Replace
	Damaged control valve	Replace
	Damaged hydraulic system	Repair/Replace
	Damaged clutch unit	Repair/Replace
	Damaged gear lever rod	Replace
	Damaged synchronisers	Replace
No 4WD power transmission	Damaged 4WD clutch	Replace
	Hydraulic system fault	Repair/Replace
	Damaged control valve	Replace
	Faulty brake sensor	Check/Replace
	Electrical system fault	Repair/Replace
Gear shift won't engage	Damaged shifter	Replace
	Damaged synchronisers	Replace

Document Title: Torque converter, description	Function Group: 414	Information Type: Service Information	Date: 2014/3/18
Profile: BHL, BL61 PLUS, BL71 PLUS [GB]			

Torque converter, description

The engine output torque is transmitted and amplified by the torque converter.

The torque converter consists of an oil filled outer housing, an impeller, a turbine and a stator.

The oil pump inside a torque converter is a type of centrifugal pump. As oil is flung to the outside, a partial vacuum is created that draws more oil in at the center.

The impeller driving member produces oil movement inside the torque converter whenever the engine is running. The turbine, a driven fan splined to the input shaft of the gear box, is not fastened to the impeller, but is free to turn independently. Oil is the only connection between the two. The stator, designed to improve oil circulation inside the torque converter, increases efficiency and torque by causing the oil to swirl around the inside of the housing.

The primary action of the torque converter results from the action of the impeller passing oil at an angle into the blades of the turbine.

The oil pushes against the faces of the turbine vanes, causing the turbine to rotate in the same direction as the impeller.

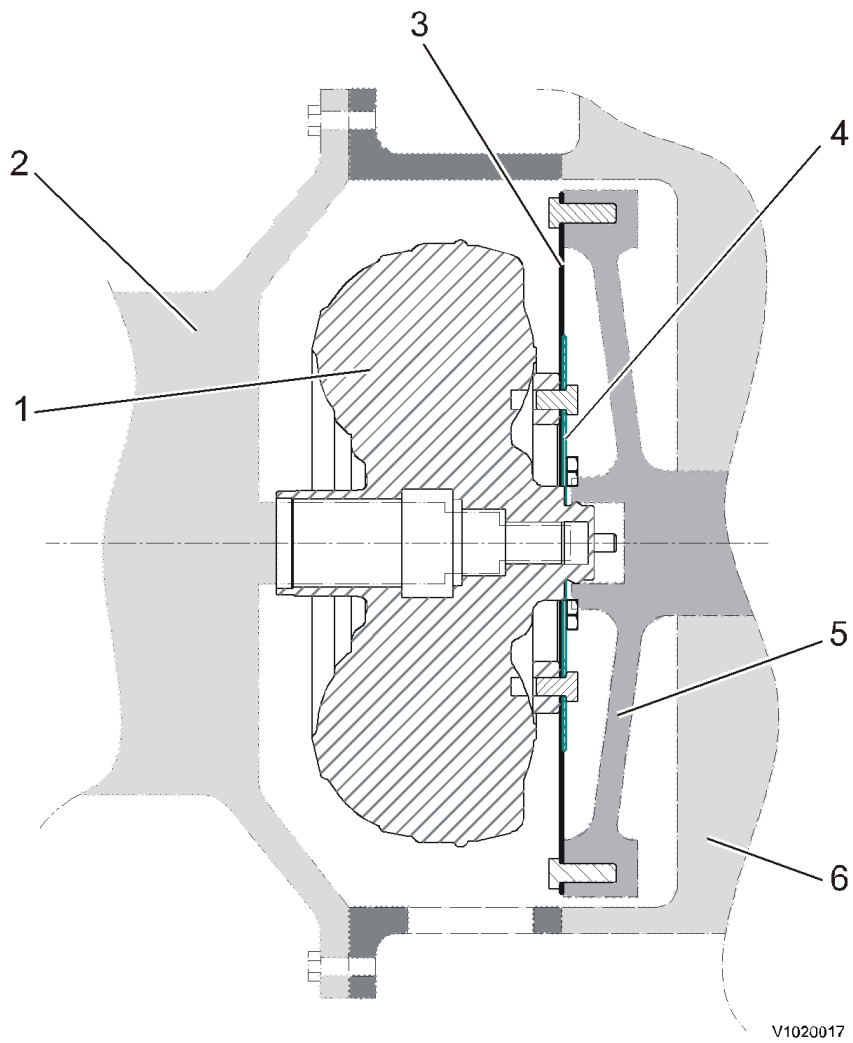
With the engine idling, the impeller rotates slowly. Only a small amount of oil is thrown into the stator and turbine. Not enough force is developed inside the torque converter to rotate the turbine. The machine remains stationary with the gearbox in gear.

During acceleration, the engine crankshaft, the converter housing, and the impeller begin to rotate faster. More oil is thrown out by centrifugal force, turning the turbine. As a result, the gearbox input shaft begins to rotate and the machine starts to move, but with some slippage. At speed, the impeller and turbine rotate at almost the same speed with very little slippage.

The stator is located in the very center of the torque converter, between the impeller and the turbine, and is mounted on a one way clutch that allows it to rotate clockwise, but not counter-clockwise. The purpose of the stator is to redirect the oil returning from the turbine and change its rotation back to that of the impeller, before it hits the pump (impeller) again.

Stator action is only needed when the impeller and turbine are turning at different speeds.

The one-way clutch locks the stator when the impeller is turning faster than the turbine. This causes the stator to route oil flow over the impeller vanes properly. Then, when turbine speed almost equals impeller speed, the stator can freewheel in its shaft so as not to obstruct flow.



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Figure 1
Torque converter, sectional view

1	Torque converter	3	Flexplate	5	Flywheel
2	Gear box	4	Flexplate	6	Engine

Document Title: Torque converter, removal	Function Group: 414	Information Type: Service Information	Date: 2014/3/18
Profile: BHL, BL71 PLUS [GB]			

Torque converter, removal

Op nbr 41404-1

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NOTE!

Oil that is being drained from the engine/transmission unit must be collected in a container.

1. Remove the engine/transmission unit, see [210 Engine, removal](#).
2. Block and support the engine/transmission unit in a safe and stable manner.

NOTE!

Make sure that it is possible to remove the transmission.

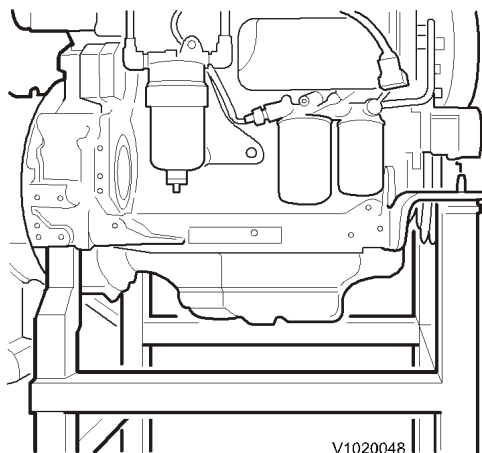


Figure 1
Supporting of engine/transmission unit

3. Remove the oil plug and drain the transmission oil (approx. 23 liters) into a clean container.

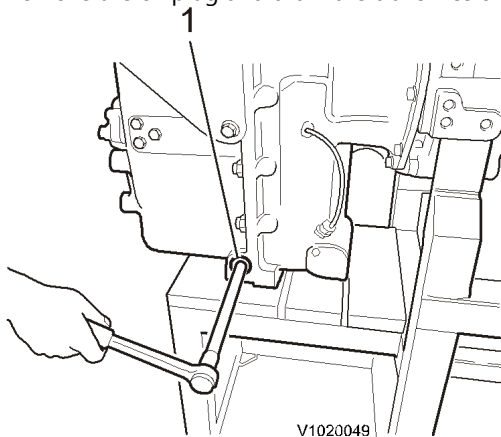


Figure 2
Draining transmission

1. Plug

4. Remove the filler pipe and the dipstick tube.

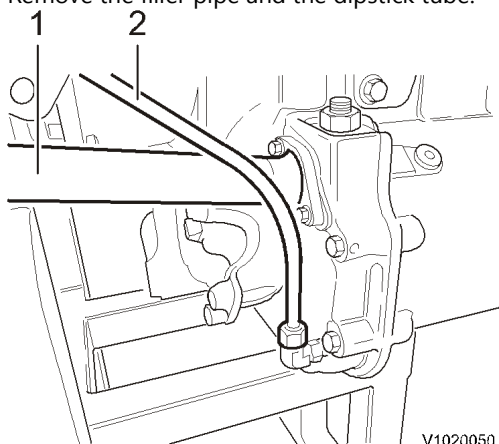


Figure 3
Transmission

- 1. Filler pipe
- 2. Dipstick tube

5. Remove the plate on the flywheel housing.

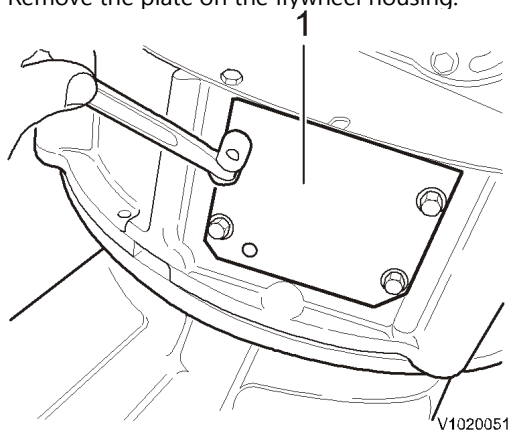


Figure 4
Underside of flywheel housing

1. Plate

6. Remove the bolt.

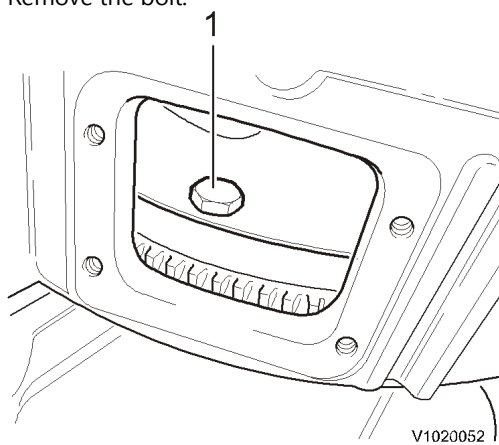
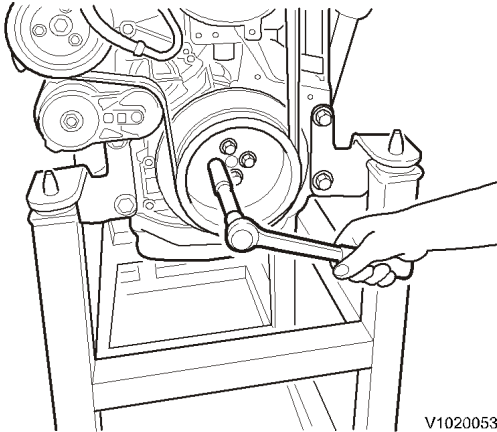


Figure 5
Underside of flywheel housing

1. Bolt

7. Rotate the engine by hand and remove the remaining bolts (3 pcs), through the plate opening under the flywheel housing.



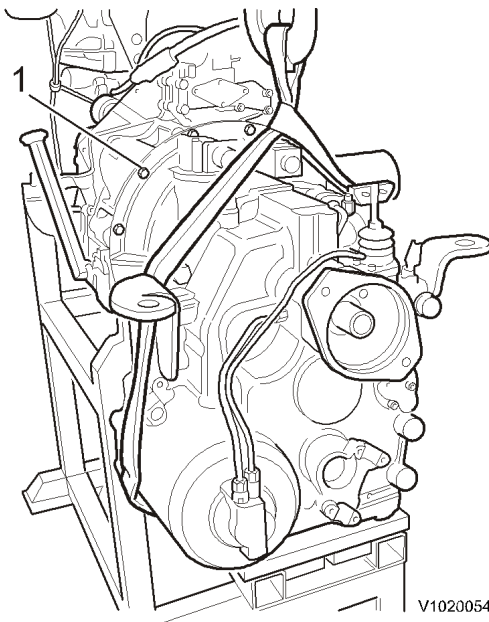
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Figure 6
Rotating the engine

8. Loop a sling around the transmission and tighten the sling using a lifting device. Remove the bolts (12 pcs).
9. Move the transmission backwards from the engine and lift it away carefully.

NOTE!

Make sure that the torque converter does not fall off the gear box shaft.



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Figure 7
Removing transmission

1. Bolt

10. Lift away the torque converter.

NOTE!

Ensure that the transmission oil seal is not damaged in the process.

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