Document Title:	Function Group:	Information Type:	Date:
General description	**400**	**Service Information**	**2014/4/28**
Profile: **WLO, L90E [GB]**			

General description

Power from the engine is transferred hydraulically and mechanically to the wheels through the transmission (1), via a torque converter that adapts the output torque to the required torque and on to the drive axles (2, 3).
The hydraulic transmission is of type HTE202.
HTE202 is a hydromechanical four-speed transmission (Power Shift) with torque converter, spur gears and hydraulically operated disc clutches.
It has four forward and four reverse gears.
The designation E signifies that the transmission has a gear selector valve with shift solenoids of PWM-controlled proportional valves, (Pulse Width Modulated). This means that V-ECU emits a pulsating direct voltage at a constant frequency, but variable length sps-pulses.
The drive axles have floating axle shafts and planetary gear hub reductions with integrated oil-cooled disc brakes. Each axle has a space shared by the hub reductions, brakes and final drive.
The front axle has the designation AWB25 and the rear AWB20.

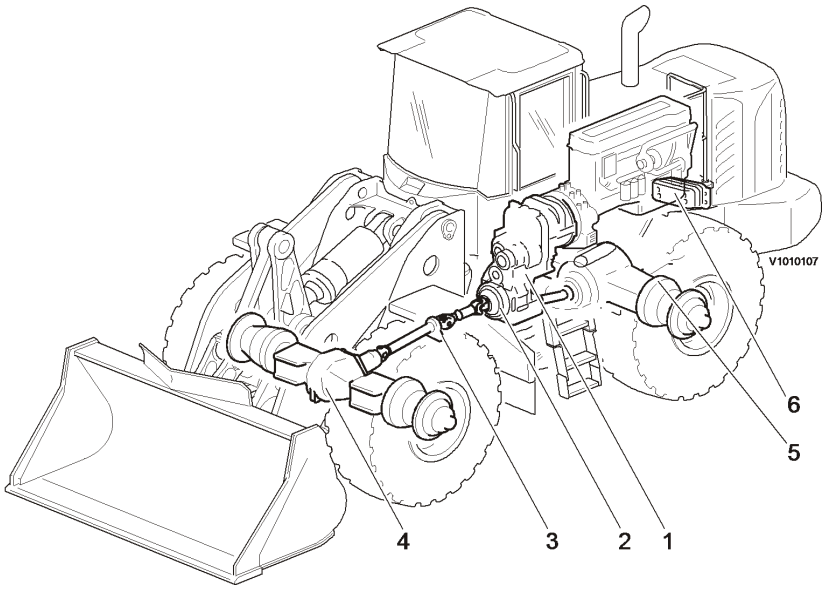

Figure 1
Power transmission

1. HTE202
2. Parking brake
3. Support bearing
4. AWB25
5. AWB20
6. Transmission oil cooler

Document Title: **Description**	Function Group: **414**	Information Type: **Service Information**	Date: **2014/4/28**
Profile: **WLO, L90E [GB]**			

Description

Torque converter

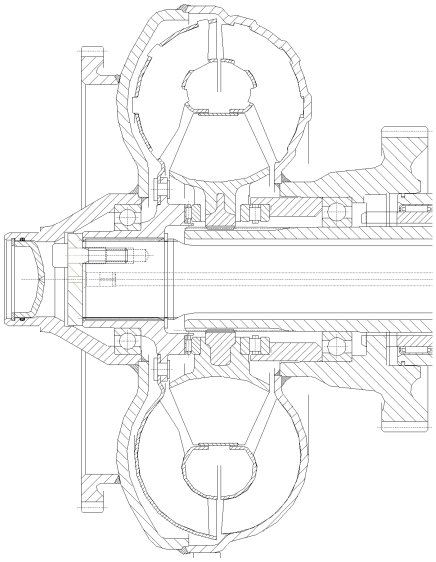

Figure 1

Torque converter

The torque converter consists of an engine-driven impeller and a turbine rotor that drives the transmission's mechanical part, the gearbox. A fixed stator is located between the impeller and the rotor.

Function

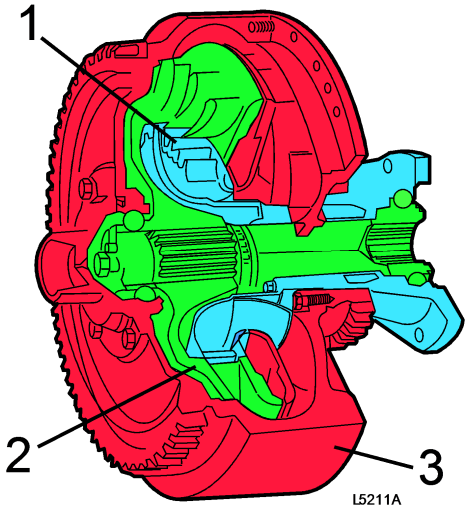

Figure 2
Principle diagram

1. Stator
2. Turbine rotor
3. Pump rotor

The red guide rails designate the pump rotor, which is run by the engine. The red arrow shows the direction of rotation.
The green guide rails designate the turbine rotor, which is connected to the transmission.
The blue guide rails designate stators, while the black arrows indicate oil flow.
The pump and turbine rotors can rotate freely and individually. If we imagine that the torque converter is filled with oil and the pump rotor is rotating, oil will flow as indicated by the thicker arrows.
Suppose the turbine rotor is stationary. Almost all of the kinetic energy the oil receives from the pump, after leaving the pump, remains. When the oil returns to the pump rotor, it receives an additional boost of kinetic energy.
At maximum oil speed, the turbine rotor torque will be three times greater than the torque supplied by the pump rotor. When the turbine rotor speed equals that of the pump rotor, torque increase is almost nil (smaller arrows).

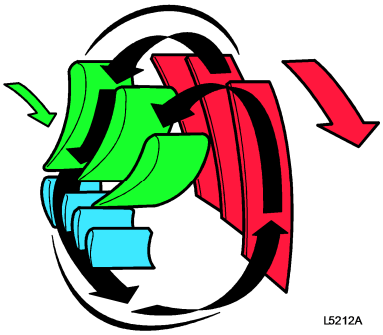

Figure 3
Principle diagram

The pump rotor speed is high; the turbine is stationary or rotates slowly. The eddy current, and thereby the torque increase, is greatest.

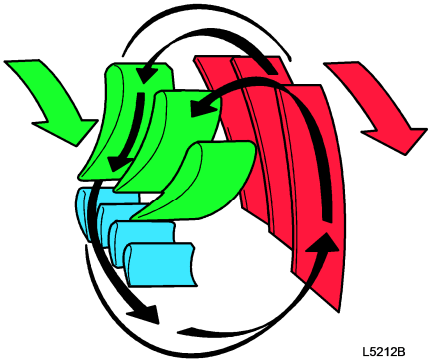

Figure 4
Principle diagram

The pump rotor and turbine speeds are almost identical.
The eddy current and subsequent torque increase is least.

Document Title: **Torque converter, removing, installing**	Function Group: **414**	Information Type: **Service Information**	Date: **2014/4/28**
Profile: **WLO, L90E [GB]**			

Torque converter, removing, installing

Op nbr 41403

6999003 Drift handle
6999050 Drift plate
9993354 Counterhold

Sling 3 m (10 ft)

NOTE!
The engine is removed (Section 2), hydraulic transmission is still in the machine. Make sure that the transmission is adequately secured.

Removing

1. Remove the lock ring and the cap.

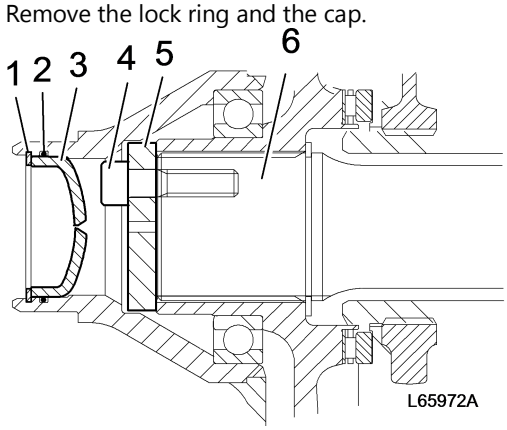

Figure 1
Torque converter – turbine shaft (cut-away view)

1. Lock ring
2. O-ring
3. Cap
4. Bolts (3 pcs.)
5. Washer
6. Turbine shaft

2. Remove the bolts. Use 9993354 to prevent rotation (rotation lock).

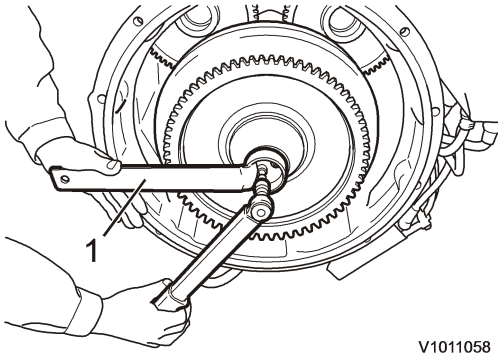

Figure 2

1. 9993354

3. Route a 3 m sling around the rear of the torque converter. Cross the sling and make sure that it locks on the rear (sling is tight).

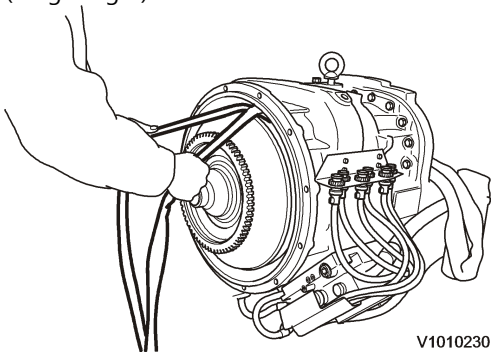

Figure 3

4. Route the other part of the sling around the ring gear on the outside and connect a lifting device.

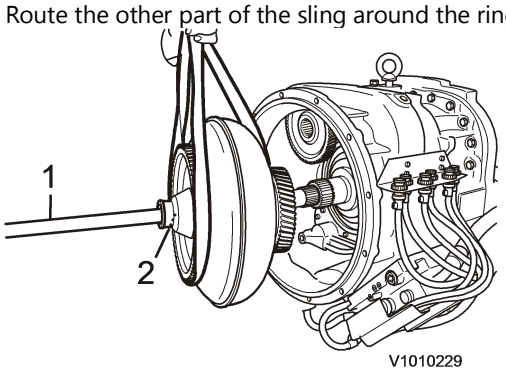

Figure 4

1. 6999003
2. 6999050

5. Remove the torque converter.
   Torque converter weight: **approx. 40 kg (88 lbs)**

Installing

6. Place the pump drive in position as shown in the figure.

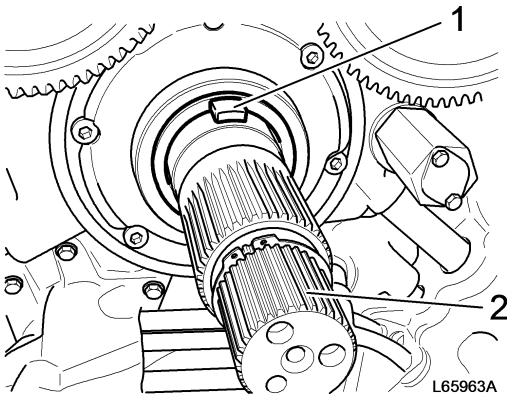

Figure 5

1. Pump drive
2. Turbine shaft

7. Make a mark on the torque converter directly in line with the pump drive's connection.

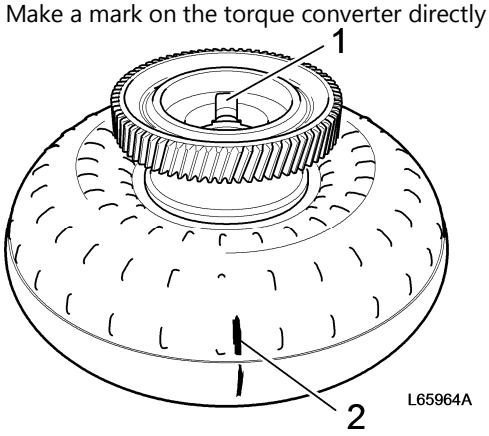

Figure 6

1. Connection for pump drive
2. Marking

8. Use 6999003 and 6999050, or corresponding pipe Ø50 mm, to make it easier to hold the torque converter horizontal and to be able to guide it in on the splines.
   Torque converter weight: **approx. 40 kg (88 lbs)**

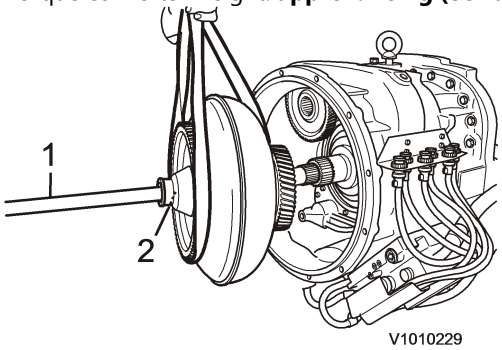

Figure 7

1. 6999003
2. 6999050

9. Fit the torque converter, fit it against the pump drive using the mark on the torque converter.

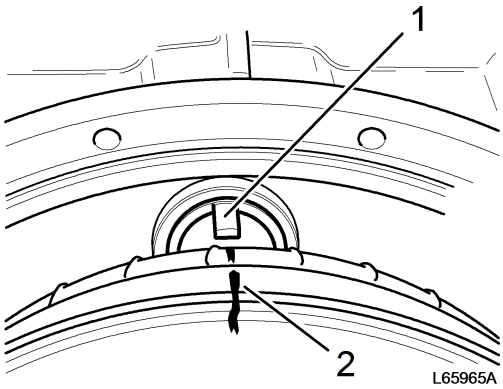

Figure 8

1. Pump drive
2. Marking

10. The torque converter is in the correct position when the washer rests against the turbine shaft.

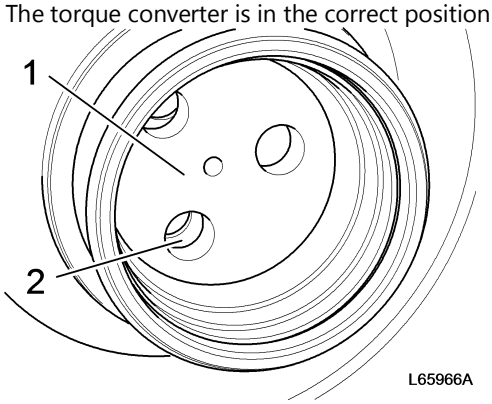

Figure 9

1. Washer
2. Turbine shaft

11. Clean and apply lock fluid on the bolts. Fit the bolts. Use 9993354 to prevent rotation (rotation lock).
Tightening torque: **40 Nm (29.5 lbf ft)**

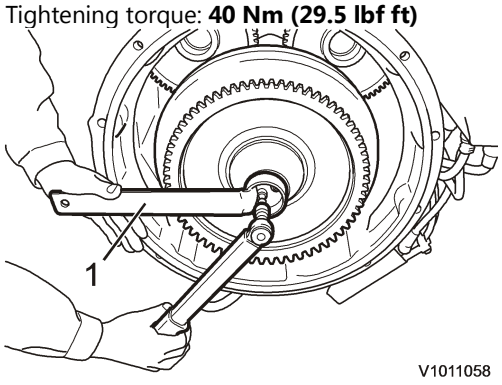

Figure 10

1. 9993354

12. Fit the O-ring, cap and lock ring.
NOTE!
Make sure that the hole in the cap is not clogged.

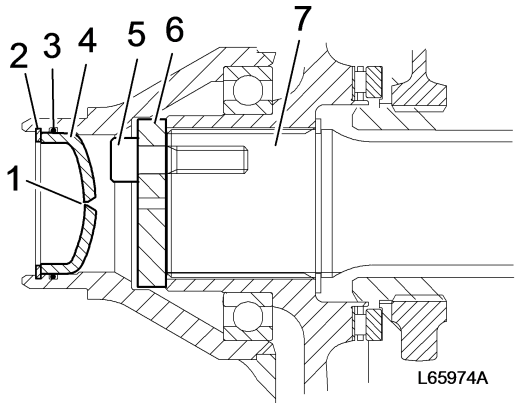

Figure 11
Torque converter – turbine shaft (cut-away view)

1. Hole
2. Lock ring
3. O-ring
4. Cap
5. Bolts (3 pcs.)
6. Washer
7. Turbine shaft

Document Title:	Function Group:	Information Type:	Date:
Gearshifting, description	**421**	**Service Information**	**2014/4/28**
Profile: **WLO, L90E [GB]**			

Gearshifting, description

The gear-shift mode programme can be adjusted to suit different operating and working conditions. To this end there is a mode selector (SW412), positioned on the front instrument panel. In combination with the gear selector the operator can choose between manual gear shifting or various automatic gear-shift mode programmes.
The gear-shift mode programme is available as an earlier or later version.
The versions differ in among other ways in the design of the mode selector, see figure.

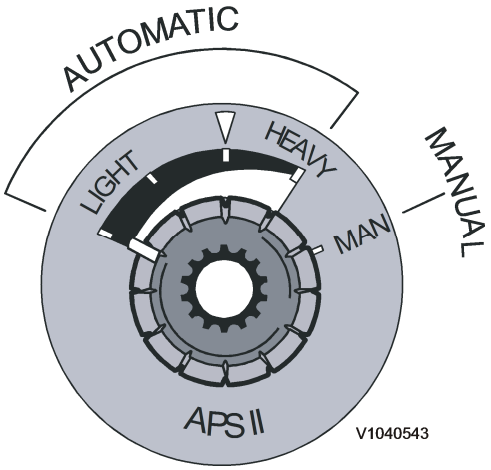

Figure 1
Mode selector (SW412), earlier version

Gear-shifting programme, positions (earlier version)

LIGHT (I)	The machine shifts already at low engine speed.
LIGHT (II)	The machine shifts at a slightly higher engine speed than in the first position.
NORMAL (∇)	Is used for "normal handling" and operation.
HEAVY:	The machine only shifts at a higher engine speed.
MAN	Shifting is done manually.

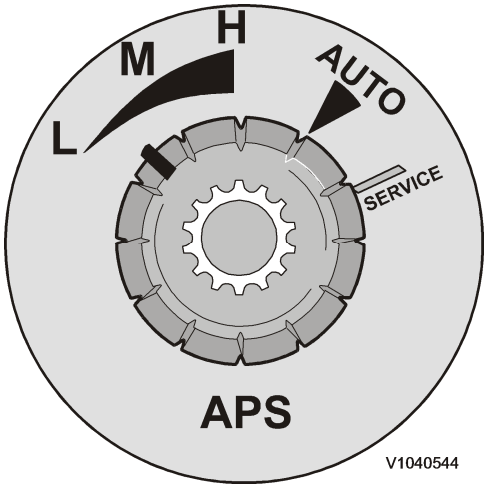

Figure 2
Mode selector (SW412), later version

Gear-shifting programme, positions (later version)

L	The machine shifts already at low engine speed.
M	The machine shifts at a slightly higher engine speed than in the first position.
H	The machine shifts at a higher engine speed than when in position M.
AUTO	The machine shifts fully automatically and selects gear-shifting programme for best comfort and economy.
SERVICE	Shifting is done manually.

Manual shifting

The mode selector (SW412) set to position "MAN" or “SERVICE” depending on version.

Changing travelling direction

Changing travelling direction at low travelling speed takes place in 2nd gear and at higher speed in 3rd gear and downshifting to 2nd gear does not take place until the machine has stopped and before it begins to move in the opposite direction.

The change is done with the gear selector (SW402) or switch on the control lever carrier (SW416), or, if the machine is equipped with lever steering, SW409. As a safety measure upshifting to a higher gear takes place if certain critical engine or travelling speeds are exceeded.

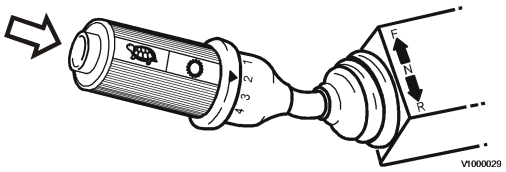

Figure 3
Gear selector control with SW401B for gear shifting 1–4, SW402 for shifting Forward/Reverse and SW401C for Kick-down

Kick-down function

Kick-down means that the operator requests gear shifting to 1st gear by actuating the kick-down button, for example SW401C. This choice is always available, regardless of machine version.

The moment of downshifting to 1st gear depends on the mode selector position, the engine speed and the travelling speed of the machine.

1st gear will be engaged if the machine is travelling at a sufficiently low speed or if the speed within 8 seconds of activating kick-down, is less than 8 km/h (5 mph).

1st gear remains engaged for at least 5 seconds, if the engine speed and the travelling speed of the machine so require, thereafter upshifting takes place according to the gear-shifting mode programme.

When changing travelling direction the kick-down function is cancelled immediately and upshifting to 2nd gear takes place.

Overspeed protection

When downshifting, V—ECU always checks that the travelling speed is not too high for the selected gear. Should this be the case, the current gear is retained until the speed has dropped to within the permitted range.

Automatic gear shifting

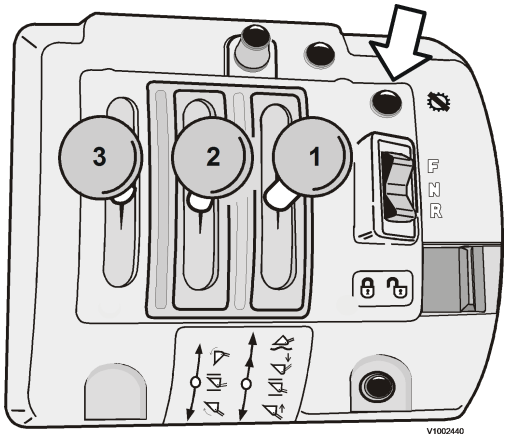

Figure 4
Switch downshifting / engine breaking

If SW412 is in position “Light—HEAVY” or “L—AUTO”, depending on machine version, gear shifting takes place automatically. The conditions for gear shifting are a combination of travelling speed and engine revolutions.
2nd gear is the basic gear and the gear in which the machine normally starts.

To achieve engine retarding, release the accelerator control fully and press the downshift / engine retarding button (SW406) once for each downshift. Downshifting takes place at the correct moment in order to achieve the greatest possible engine retarding effect from 4th gear via 3rd gear down to 2nd gear.
Further downshifting to 1st gear takes place, on earlier version, after that kick-down has been activated. On later version, this may also take place automaitcally, if SW412 is in position “AUTO” and if fully automatic function has been activated (SW417 in ON position).
Upshifting from 2nd gear to 3rd gear reverse takes place at a fairly high engine speed.
If the downshift / engine breaking button is kept pressed in while the accelerator is actuated, upshifting is prevented.
The gear-shifting points vary depending on whether the engine is pulling or breaking.

Transmission declutch

When the transmission declutch function is activated the transmission will be disengaged (to neutral) when braking. On earlier machines the function is activated with SW411, positioned on the front right instrument panel. On later machines the function is activated via the keypad.
For further description, see 301 Transmission disengagement.

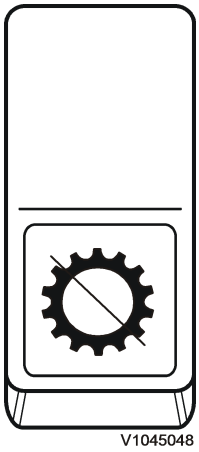

Figure 5
SW411

Fully automatic function

Later version machines are provided with the "Fully Automatic Function". When this function is activated, downshifting takes place automatically also to 1st gear. The function is activated with SW417, positioned on the front right instrument panel.