Document Title:	Function Group:	Information Type:	Date:
Power transmission, description	**400**	**Service Information**	**2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Power transmission, description

The diesel engine powers the hydraulic system of the machine. The working pump for the working hydraulics, the servo pump, the fan pump and the brake and steering pump are all powered directly by the diesel engine.

The machine is driven forward by a hydraulic axial piston motor. This motor drives on both axles via a gearbox with two gears. The front axle is a pivoting axle. Both the front and rear axles are equipped with wet disc brakes. The parking brake is integrated in the gearbox.

The superstructure is slewed with a low-speed radial piston motor. There is a negative-action slew brake integrated in the radial piston motor. Between the motor and the slew ring, there is a slew pinion in mesh with a ring gear on the inside of the slew ring. The slew ring connects the superstructure with the undercarriage and is lubricated with grease.

A centre passage connects the superstructure and undercarriage hydraulically and electrically.

Document Title: **Travel gearbox, description**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel gearbox, description

General

The gearbox, with integrated differential **6**, is attached to the rear axle. The gearbox contains the planetary gear **3** with one planetary gear step and the gear wheel drive **5** (bevel gears). The speed gears are applied via the disc clutch **2** and the disc brake **1**. Both the clutch and the brake are negative, i.e. they are applied by the cup springs **7** and **8**. The clutch and the brake are released by hydraulic pressure which compresses the cup springs. The internal locking function **4** prevents engagement of the low gear when travelling at high speed until the rpm has dropped. This is controlled by the lubrication pump for the transmission **9**. The rear axle and the gearbox contain different types of oil and therefore a double seal **10** is installed.

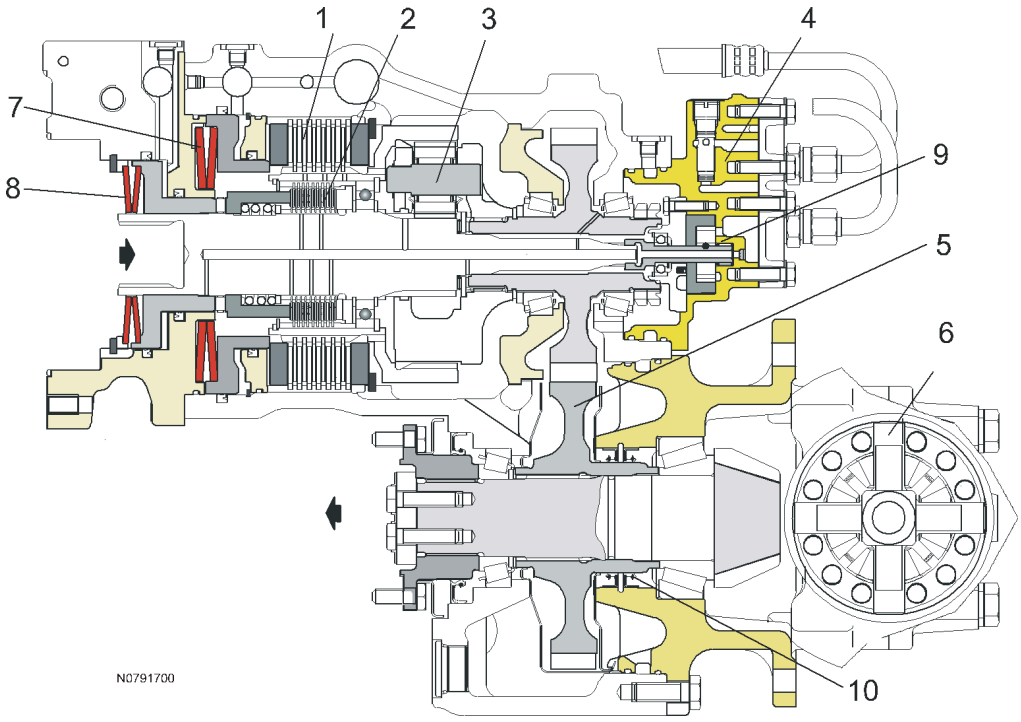

Figure 1
Gearbox 2 HL-70, cut-away view

1	Disc brake	5	Gear drive	9	Rotor pump for control pressure internal locking function and transmission lubrication
2	Disc clutch	6	Differential	10	Double seal
3	Planetary gear	7	Cup springs for disc brake		
4	Internal locking function	8	Cup springs for disc clutch		

Shifting, mechanical action

Off-road gear (turtle and snail)

The disc brake **1** (see fig. Gearbox 2 HL-70, cut-away view) is applied which means that the ring gear **1** is locked to the housing **2**. The sun gear **3** has the same rpm as the hydraulic motor. Thus, the sun gear drives the planetary gear **4** which in turn wanders on the locked ring gear **1**. Thus, the ring gear carrier **5** will rotate at a lower rpm than the input sun gear **B**.

On-road gear (rabbit)

The disc clutch **2** (see Fig. Gearbox 2 HL-70, cut-away view) is applied. The sun gear **3** is locked to the ring gear **1** (symbolised by the nail). This means that the whole planetary gear is locked as one unit. Thus the input speed of the sun gear **B** is the same as the output speed of shaft **A**.

Parking brake hydraulic system

Same as the on-road gear plus that the entire planetary gear assembly is locked to the housing with the brake **1**.

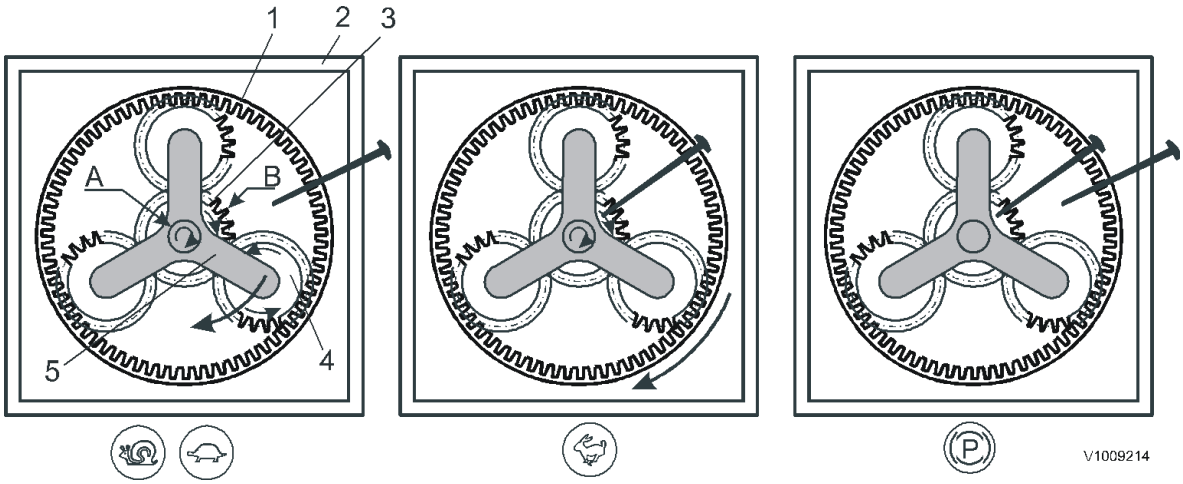

Figure 2
Shifting mechanical action

1. Ring gear
2. Housing
3. Sun gear
4. Planetary gear
5. Planetary gear carrier

A. Output shaft, connected to final step
B. Sun gear connected to hydraulic motor

Shifting, hydraulic and electrical action

Off-road gear (turtle and snail)

When the solenoid valve **MA5501** receives voltage, the valve shifts position so that the right symbol engages. The servo pressure from **P1** passes the valve and charges the accumulator **4**. The pressure continues through line **Z1** and through the centre passage and then in line **P2**. The pressure passes the spool **1**, but acts on the spring side of the spool at the same time to keep the left symbol in. The disc clutch **E** is released out through line **4** and via a non-return valve.

The pressure monitor **SE5501** is activated if the pressure drops below 2.6 MPa (e.g., loss of servo pressure) and a signal is sent to the computer. The computer cuts off the voltage to the solenoid valve **MA4202**, (see fig. Conditions for operating in different modes). This results in the control pressure from the pedal in the cab being drained to tank and the machine stops.

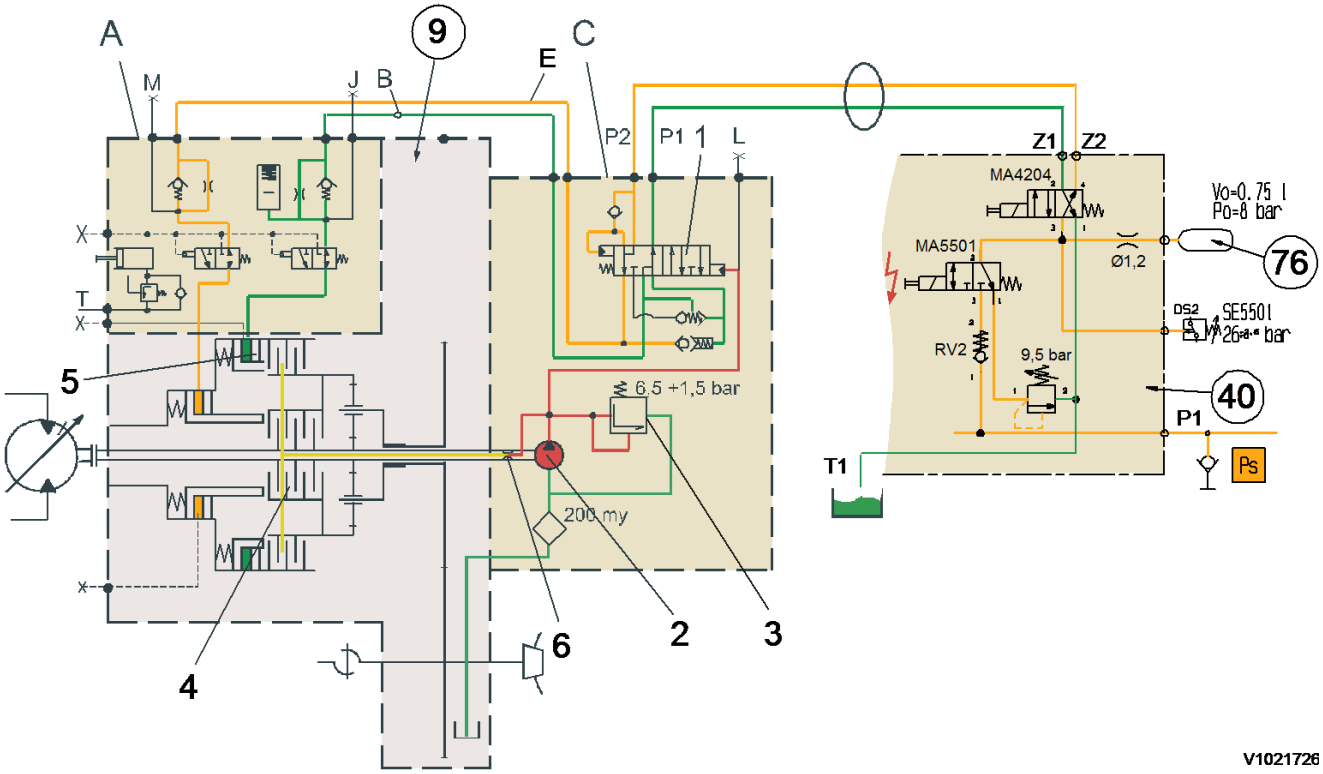

Figure 3
Off-road gear

1	Spool	6	Restriction	76	Accumulator tank for servo pressure, parking brake
2	Pump for control pressure of internal locking function and transmission lubrication	7	Shuttle valve	A	Connections + accumulator + disengagement for towing
3	Overflow valve	8	Leak-oil valve	B	Line, disc brake
4	Disc clutch	9	Gearbox	C	Internal locking function
5	Disc brake	40	Solenoid valve block	E	Line, disc clutch
				J L M	Plugged holes for pressure checks, if needed

On-road gear (rabbit)

Both the solenoid valve **MA5501** and **MA4203** have voltage (right symbol). The servo pressure goes via the line **Z2** to the connection **P1**. The pressure passes on through the spool **1** and out in the line **B** and in to the gearbox **9**, where the disc brake **5** is released. The disc clutch **4** is applied by spring force, as the piston is connected to tank. Since there is no pressure on the spring side of the spool **1**, the spool shifts to the right symbol when the transmission oil pressure increases to a certain value (see also sub-diagram in right corner). The restriction **6** gives increasing transmission oil pressure at increased rpm (speed). Max. transmission oil pressure is limited by the overflow valve **3** with 0.65 MPa opening pressure. The pressure in the line **P1** passes through the shuttle valve and results in the disc brake **5** still is released.

If the operator, when operating at high speed with the on-road gear engaged, activates the off-road gear, the line **P2** is connected to the servo pressure. The pressure passes through the spool **1**. The spool cannot change position since there is a non-return valve. The oil (pressure) goes through a shuttle valve **7** which changes position, but there is still pressure out in line **B**, which results in no gearshifting until the travel speed has been reduced to such an extent that the left symbol in the spool **1** is activated and downshifting to the off-road gear can take place.

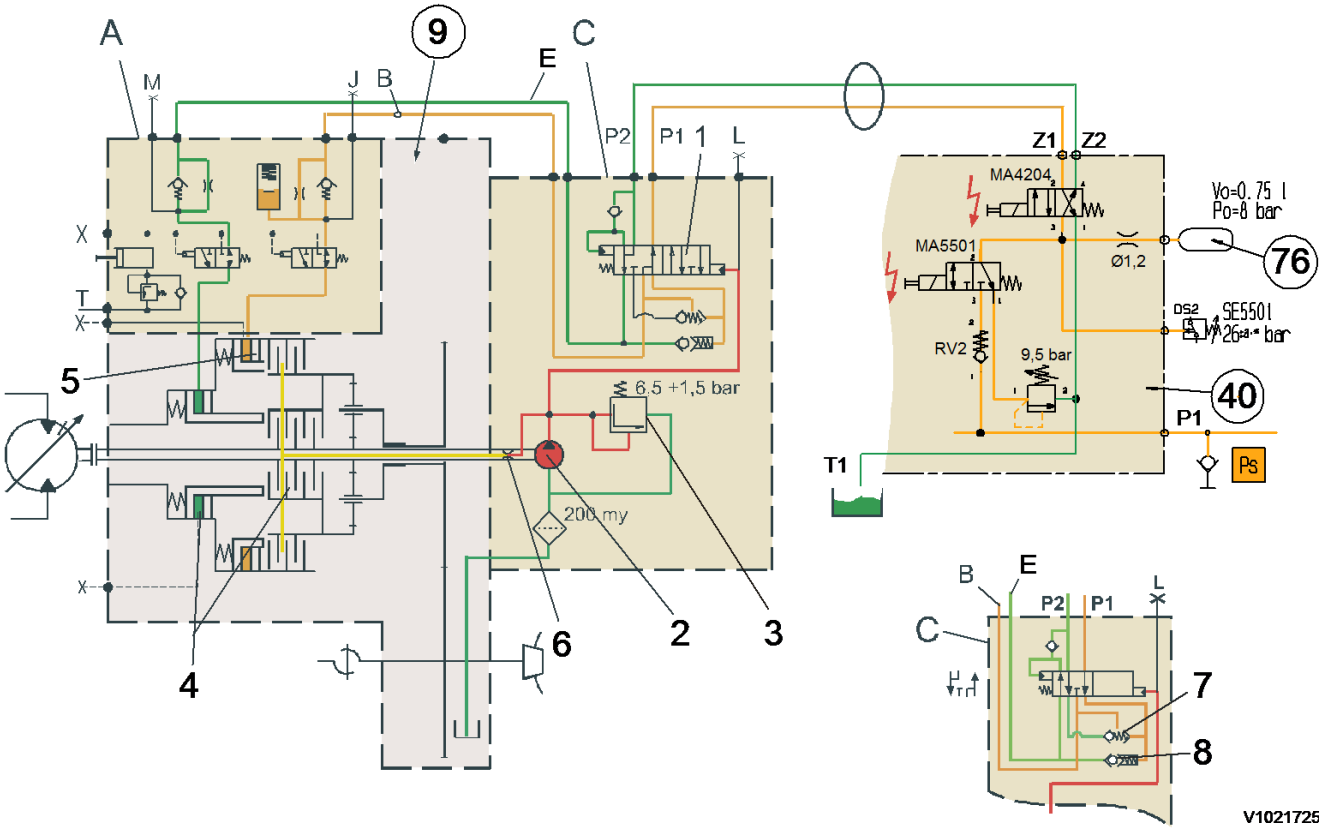

Figure 4
On-road gear

1	Spool	6	Restriction	76	Accumulator tank for servo pressure, parking brake
2	Pump for control pressure of internal locking function and transmission lubrication	7	Shuttle valve	A	Connections + accumulator + disengagement for towing
3	Overflow valve	8	Leak-oil valve	B	Line, disc brake
4	Disc clutch	9	Gearbox	C	Internal locking function
5	Disc brake	40	Solenoid valve block	E	Line, disc clutch
				J	Plugged holes for pressure checks,
				L	if needed
				M	

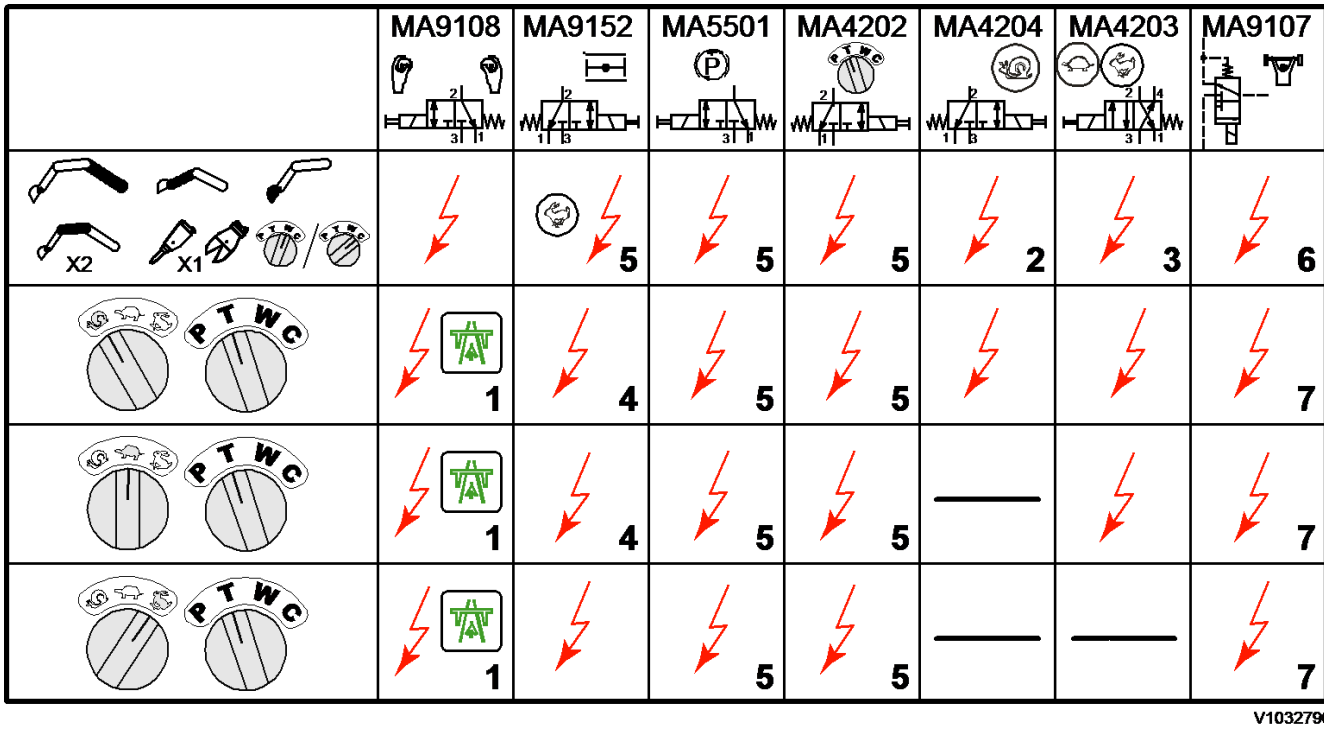

Figure 5
Conditions for operating in different modes

1. If the superstructure and undercarriage are aligned, the voltage is cut off
2. Low speed (turtle) and high speed (rabbit) cut off the voltage
3. High speed (rabbit) cuts off the voltage
4. Brake pressure 5 MPa (725 psi, 50 bar) cuts off the voltage
5. Position P cuts off the voltage
6. Power Boost activated 10 seconds
7. Control pressure transport min. 0.7 MPa (102 psi, 7 bar) SE4201

Document Title: **Travel gearbox, removal and installation**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel gearbox, removal and installation

The travel gearbox is integrated with the rear axle. When removing and installing the travel gearbox, refer to **Service manual gearboxes, excavators**.

Document Title: **Travel motor, description**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel motor, description

Forward travel

When the parking brake is released, see *Parking brake, description* in *Section 5*, solenoid valve **MA5501** is energised. The servo pressure passes via pressure monitor **SE4203**, and when the pressure reaches 26 bar, valve **MA4202** is energised via a signal from the **T-ECU**. The servo pressure then also passes directly via the solenoid valve block to pedal valve **29** via a restriction in port **P4**. When the operator depresses the pedal for operating forward, the servo pressure **Ps** is converted to control pressure, which passes on via line **2** and shuttle valve **A** to solenoid valve **MA4202**. In this valve it is the right symbol which is activated, which means that the control pressure passes to plugged position. The control pressure continues through the shuttle valve **B** in the solenoid valve block **40** and out through line **S** to Da valve **C**, see 910 Valve block B, description. Further, the pressure passes via line **2** through port **BB5** in to the valve block in the spool and the symbol changes to position **D**.

The stand-by pressure from the pump enters the block and leaves via a restriction into line **E** (LS) and moves on to the pump which increases its flow. The pressure increases and, when it is greater than in the travel motor (the load pressure), the non-return valve in symbol **D** opens and the flow moves via port **BB5** and port **12** in the centre passage to travel motor **10**. The return flow is through port **14** and in to the block via port **BA5** and on via a restriction to tank and the machine is set in motion.

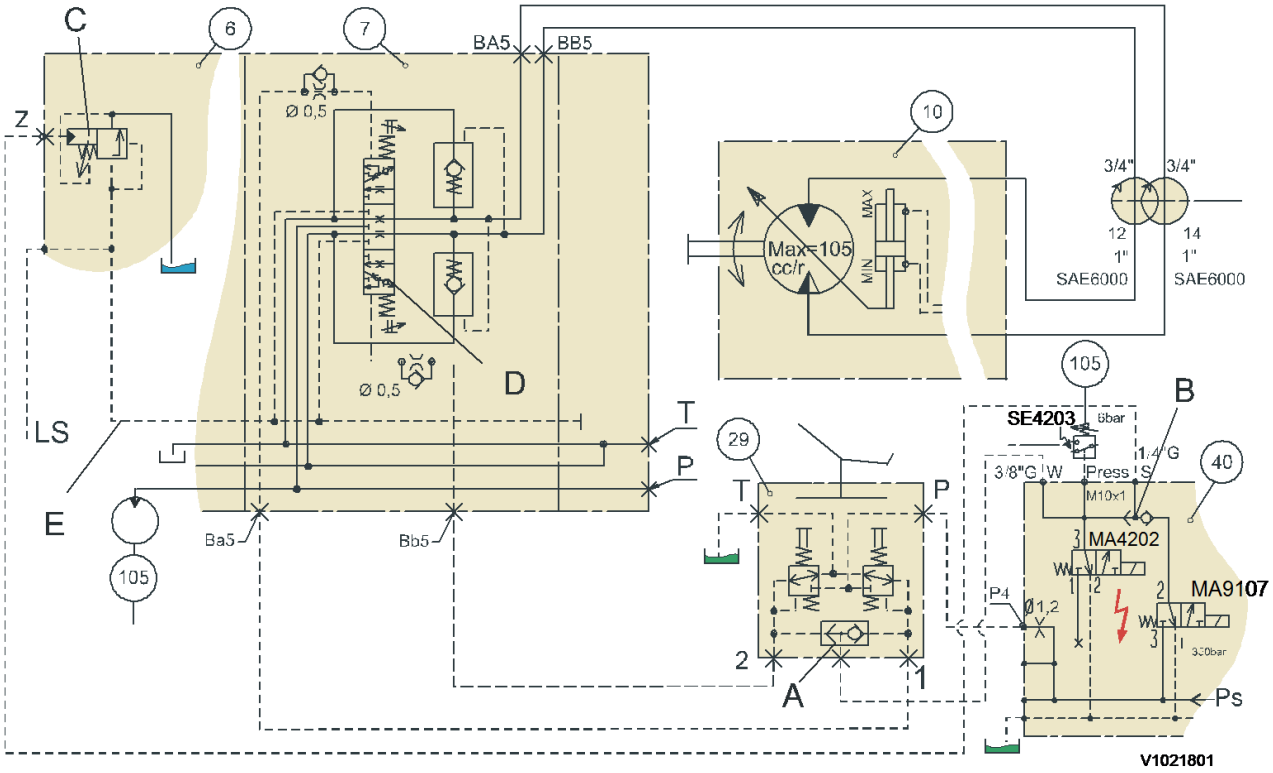

Figure 1
Hydraulic diagram for travel system

A	Shuttle valve	C	Da valve	E	Line (LS)
B	Shuttle valve	D	Position for symbol		

Travel motor with retardation valve

The travel motor is described in . There are references to detail drawing in , and .

When travelling, a flow enters port **A** and moves on to shuttle valve **9** which changes position and sends the flow to control spool **2**. The pressure in the flow is still so low that the control spool does not change its position. The flow continues via non-return valve **3a** and actuates retardation valve **2** (A) for the upper symbol. The movement is restricted to delay the return flow connection to tank. The oil continues via non-return valve **6a** to line **11** and to pressure-reducing valve **1**. In this valve, the pressure is reduced to 125 –160 bar (fixed setting). The reduced pressure continues and moves control piston **8** so that the motor is in minimum displacement position. If the machine is not standing on a downhill grade, the pressure will increase until the control spool **2** switches so that the cross symbol is activated. This results in the reduced pressure switching sides and changing the motor displacement to maximum with subsequent increased motor torque and the machine can start to accelerate. As the acceleration continues, the pressure in the system drops so that the motor displacement is reduced as the speed increases. The return oil from the motor now passes the open retardation valve. If the operator brakes by pressing the pedal in the opposite direction (countering), the oil returns through non-return valve **8a** to port **A** and passes via the main valve block to tank via a 10 bar pressure back-up valve. At countering, retardation is also increased with the variable restriction **7b**. Since the motor has started to work as a pump, braking is rapid. If the pedal is still depressed when the machine stops, the machine changes travel direction. Without countering, the retardation spool alone gives a slower retardation.

When operating with the snail symbol activated (inching), solenoid valve **MA4204** is supplied with voltage and the right symbol is active. The servo pressure passes out at port **Z3** and on to line **2** and to control spool **2** on the travel motor. Here, the servo pressure **Ps** acts on a circular area on the spool and the upper symbol becomes engaged. The motor is locked in max. displacement (low speed) regardless of how high the system pressure is. This may be practical, for example, when loading on a ramp so that uncontrolled speed increase does not result when the crest of the ramp has been passed.

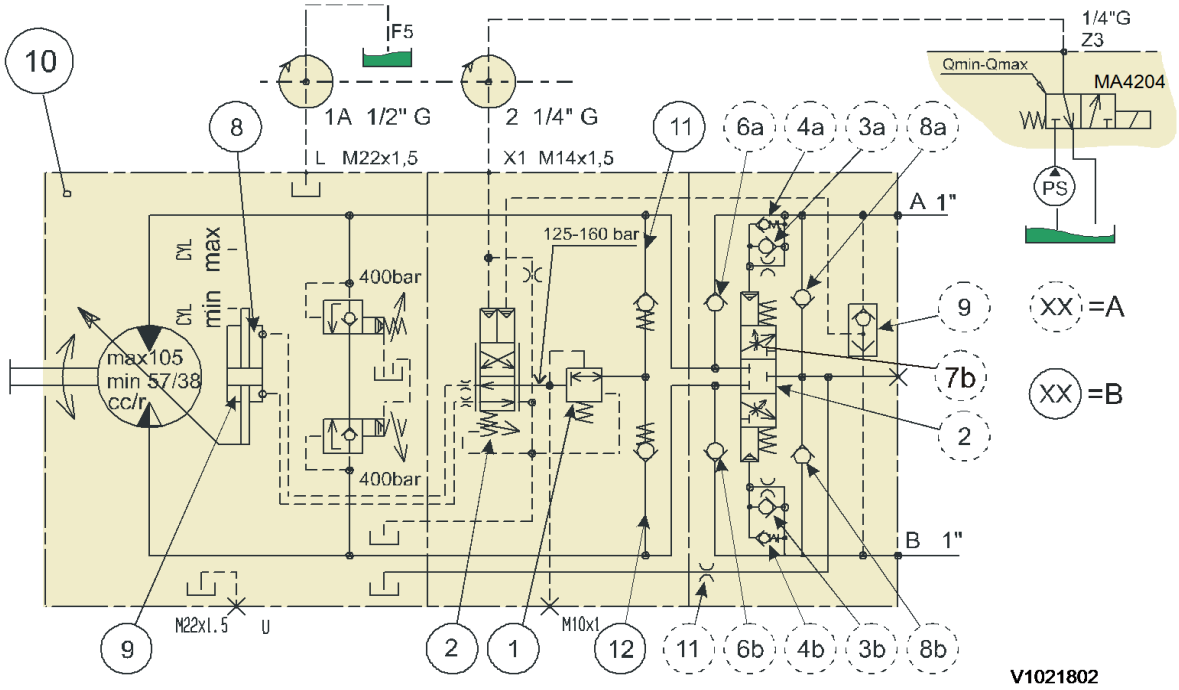

Figure 2
Hydraulic diagram for travel motor

A. Refers to and
B. Refers to

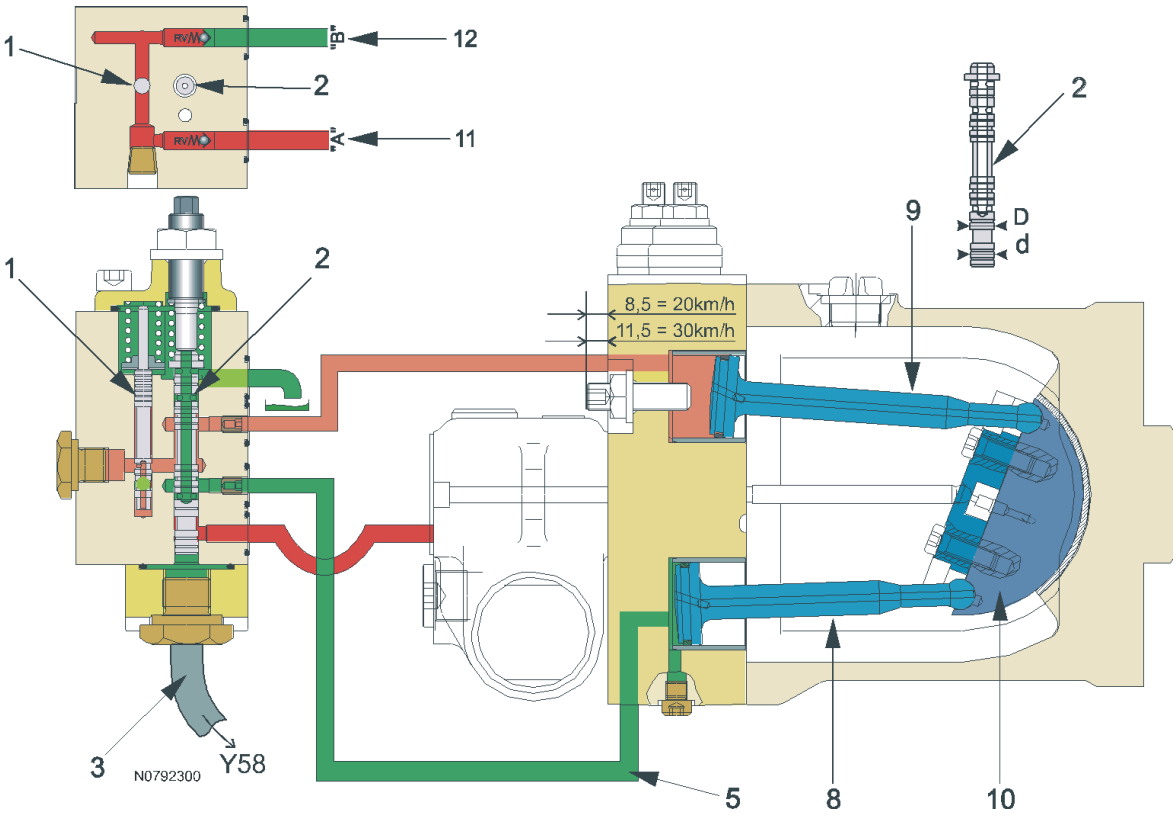

Figure 3
Travel motor

1	Pressure-reducing valve	9	Control piston
2	Control spool	10	Swivel disc for altering displacement
3	Servo pressure / tank	11	Line to pressure-reducing valve
8	Control piston	12	Line to pressure-reducing valve

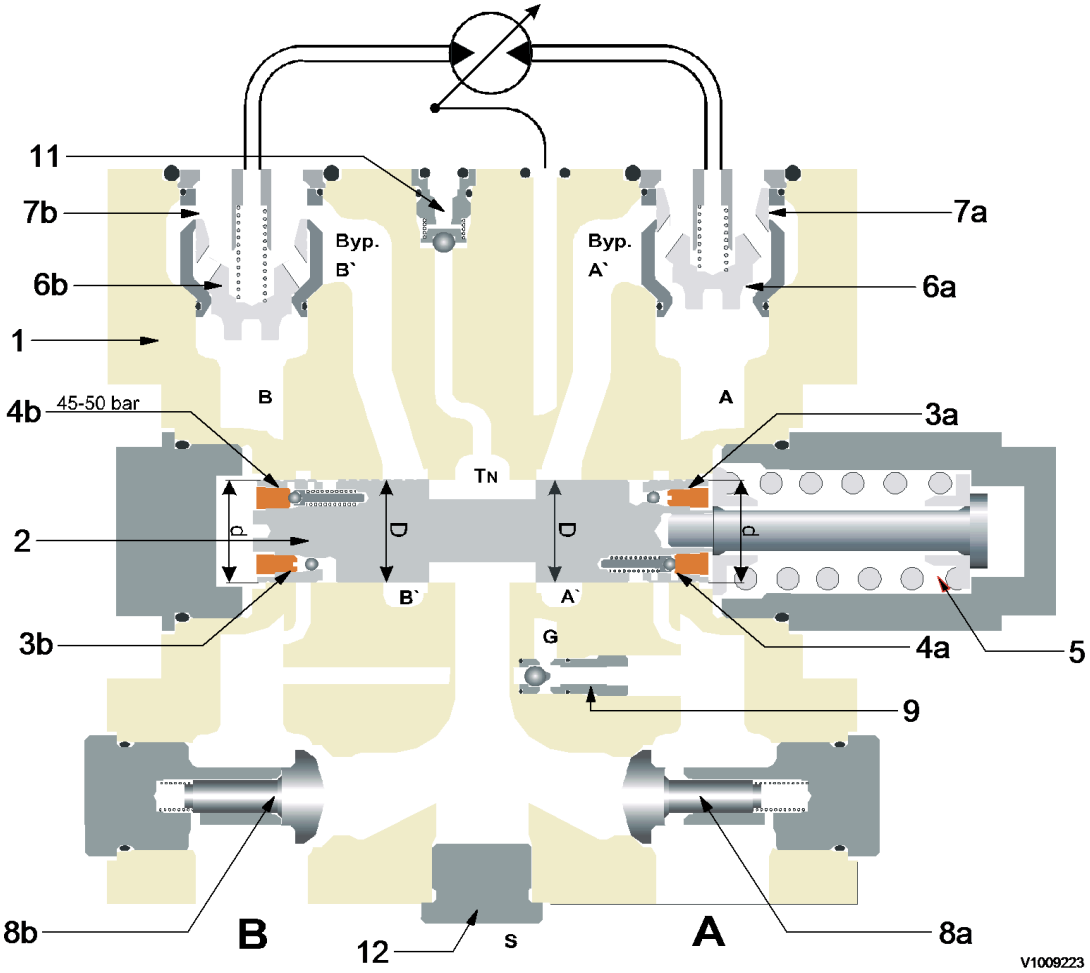

Figure 4
Retardation valve in neutral position

1	Housing, retardation valve	5	Spring for retardation spool	8b	Non-return valve
2	Retardation spool	6a	Non-return valve	9	Shuttle valve
3a	Non-return valve	6b	Non-return valve	11	Restriction in cooling line
3b	Non-return valve	7a	Variable restriction		
4a	Pressure-limiting valve	7b	Variable restriction	A	Port
4b	Pressure-limiting valve	8a	Non-return valve	B	Port

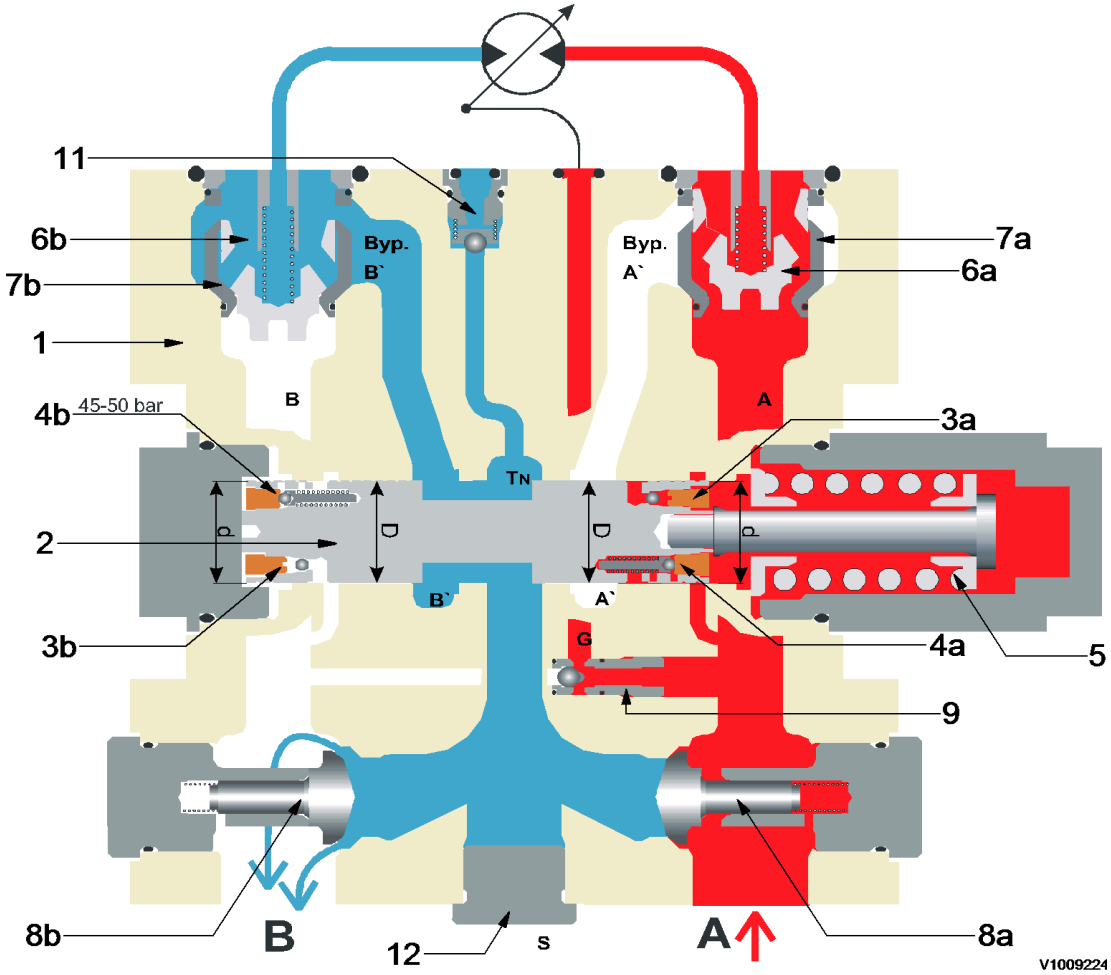

Figure 5
Retardation valve in travel position

1	Housing, retardation valve	5	Spring for retardation spool	8b	Non-return valve
2	Retardation spool	6a	Non-return valve	9	Shuttle valve
3a	Non-return valve	6b	Non-return valve	11	Restriction in cooling line
3b	Non-return valve	7a	Variable restriction		
4a	Pressure-limiting valve	7b	Variable restriction	A	Port
4b	Pressure-limiting valve	8a	Non-return valve	B	Port

Document Title: **Shock valve removed, checking**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Shock valve removed, checking

Op nbr 912-019

88830200 Check valve
88830175 Pump

Preferably use a glycerine cushioned pressure gauge 0–600 bar (0–8702 PSI).

NOTE!
This procedure is meant to check the shock valves of Wheeled Excavator's A- and B-series travel motor only.

It is also possible to check some of the shock valves of the main control valve (MCV), but be careful: it must be exactly the same valve size as shown on the picture and what fits in the special tool 88830200.

CAUTION

Maintain greatest possible cleanliness during all work on the hydraulic system.

NOTE!
When the shock valve is removed:

First check for visible contamination or damages.

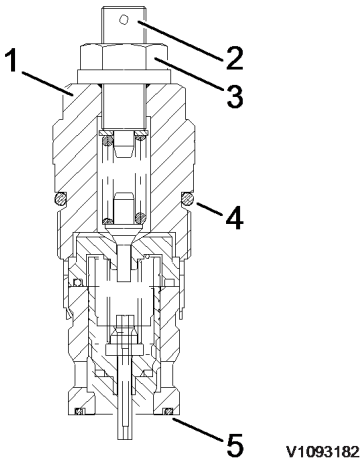

Figure 1
Shock and anti cavitation valve

1. Valve
2. Adjusting screw
3. Lock nut
4. O-ring
5. O-ring

NOTE!
It is important that o-ring (5) seals the shock valve to the special tool housing.

1. Fix the special tool preferably on a bench vise.

2. Remove the plug from the special tool and screw in the shock valve with low torque 15~20 Nm.

3. Connect the remaining tools according to the figure.
   Oil that drains from the special tool's overflow must be collected in a suitable container.

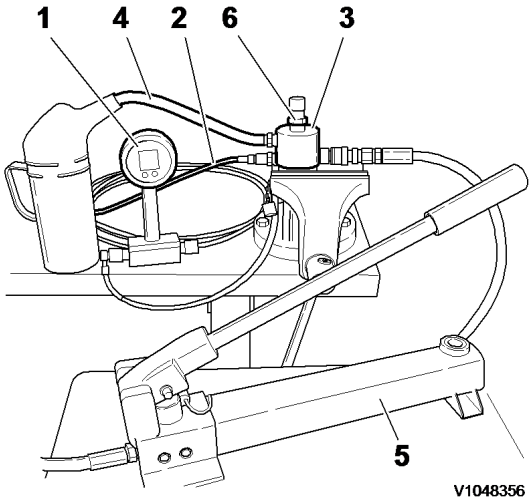

Figure 2
Tool connections

1. Pressure gauge
2. Minimess hose
3. Special tool
4. Drain hose
5. Hydraulic hand pump
6. Shock valve

4. Check the opening pressure of the shock valve by pumping until the pressure no longer rises.
   Read off the measured value and compare with pressure specification, see
   Adjust the shock valve according to specification if necessary.
   A ¼ turn corresponds to approximately 90–100 bar (1305–1450 PSI).

5. Check again the opening pressure of the shock valve.
   NOTE!
   If the shock valve is not adjustable, replace to a new one.

Document Title: **Travel motor, removing**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel motor, removing

Op nbr 4411-01

14 360 000 Vacuum pump

WARNING

Place the machine on a horizontal and solid surface and block the wheels securely so that there's no risk of the machine starting to roll.

WARNING

Hot hydraulic oil and hydraulic oil under pressure may result in severe personal injuries

WARNING

The work involves handling heavy components - failure to stay alert may result in severe crushing injuries.

NOTE!
Plug all hoses and connections when these have been disconnected or removed.

1. Support one of the tool boxes.
   Remove the bolts and the tool box.

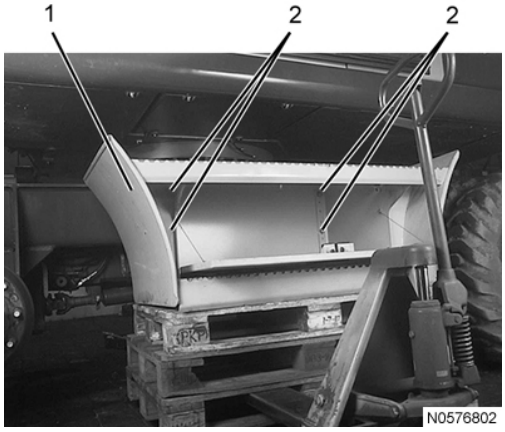

Figure 1
Undercarriage

1. Tool box
2. Bolts

2. Detach the propeller shaft from the travel gearbox.

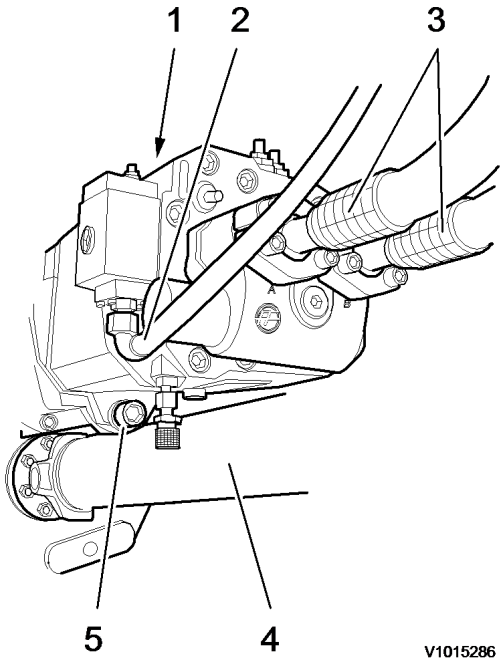

Figure 2
Travel motor

1. Leak-off oil hose (port 1A centre passage)
2. Control hose (port 2 centre passage)
3. Pressure hoses (port A and B retardation valve)
4. Propeller shaft
5. Bolt, lower

3. Connect the vacuum pump, see 900 Vacuum pump, connection.

4. Place a container under the travel motor to collect any oil spillage.

5. Disconnect the leak-off oil hose from the top of the travel motor, the control hose and the pressure hoses.

6. Remove the travel motor lower bolt and place a jack with a lowering height of 150 mm along the motor.
   Then place the container between the motor and travel gearbox.
   Remove the travel motor top bolt and carefully pull out the motor from the gearbox.
   Then carefully lower the motor.

Document Title: **Travel motor, installing**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel motor, installing

Op nbr 4411-02

14 360 000 Vacuum pump
14 024 293 Locking fluid

WARNING

The work involves handling heavy components - failure to stay alert may result in severe crushing injuries.

NOTE!
Transfer connection couplings when installing a new travel motor.

NOTICE

Seals in disconnected or removed hoses should be replaced before connecting according to markings made earlier. Grease the new seals before installing them.

1. Grease and install the O-ring on the travel motor.

2. Support the travel motor so that it is level with the mountings.
   Carefully move the motor into place.
   Install the lower and upper bolts.

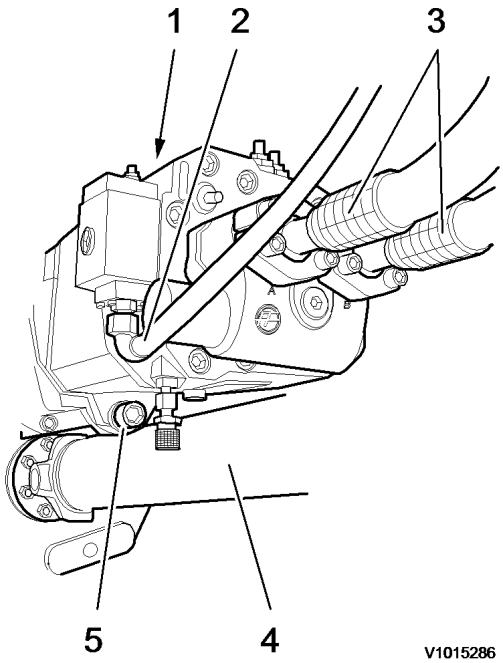

Figure 1
Travel motor

1. Leak-off oil hose (port 1A centre passage)
2. Control hose (port 2 centre passage)

3. Pressure hoses (port A and B retardation valve)
4. Cardan
5. Bolt, lower

3. Install the retardation valve, see 594 Retardation valve, installation.

4. Connect the control hose and pressure hoses.
   Fill the travel motor with hydraulic oil through the leak-off oil connection and then connect the leak-off oil hose.

5. Disconnect the vacuum pump, see 900 Vacuum pump, disconnection

6. Apply lock fluid on the bolts and install the propeller shaft on the travel gearbox.

7. Restore the machine.

8. Start the diesel engine. Check for leaks and repair if needed.

9. When starting, the travel motor should be run unloaded for five minutes in off-road gear (turtle or snail). This is to eliminate air pockets and refilling of oil.

Document Title: **Travel motor, replacement of shaft seal**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Travel motor, replacement of shaft seal

The method for replacing shaft seal in the travel motor is the same as for replacing shaft seal in the working pump, since the travel motor and working pump are almost identical. For replacing shaft seal, see 913 Working pump, changing shaft seal.

VOLVO
Construction Equipment

Service Information

Document Title: **Slew motor, description**	Function Group:	Information Type: **Service Information**	Date: **2014/7/4 0**
Profile: **EXC, EW140B [GB]**			

Slew motor, description

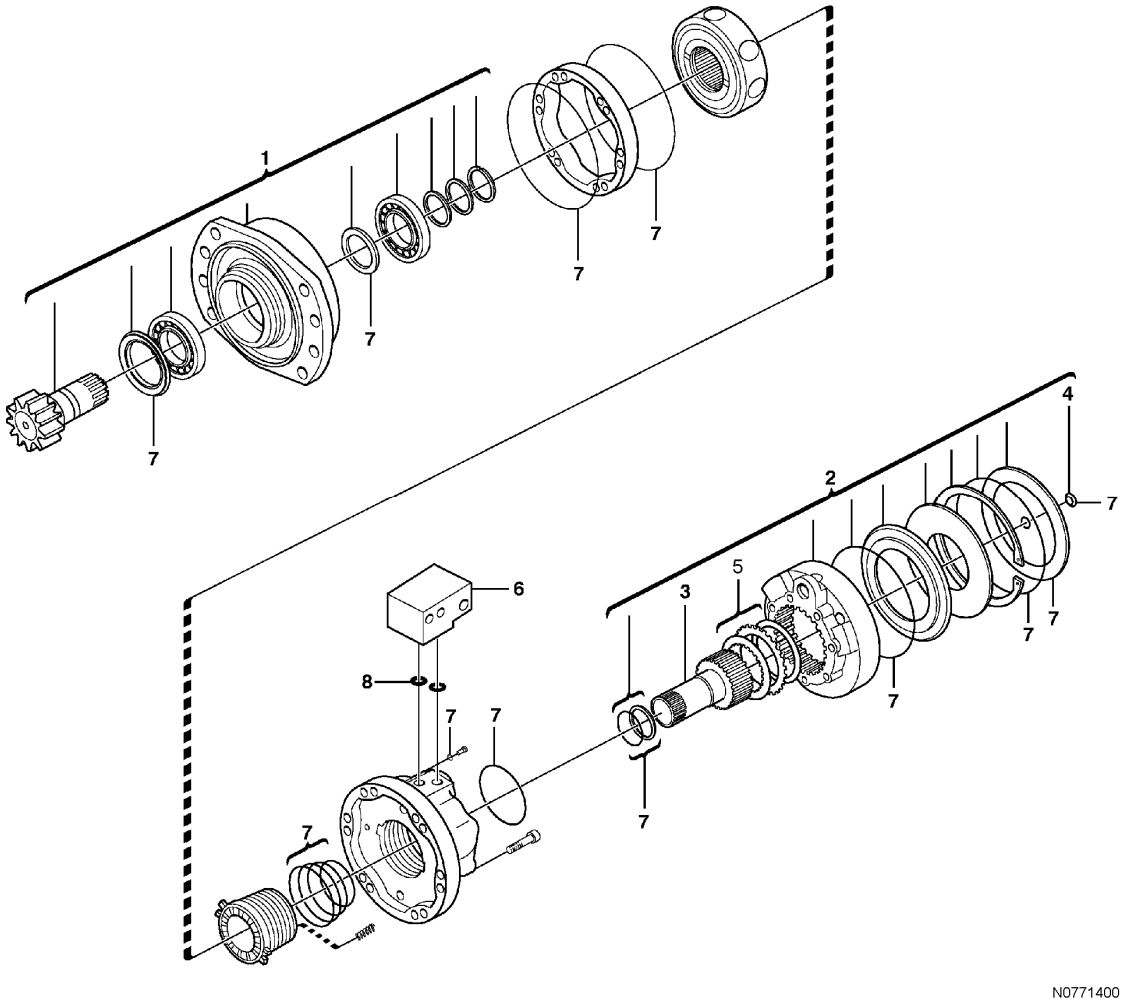

Figure 1
Slew motor, exploded view

1. Gear
2. Disc brake
3. Brake shaft
4. Plug
5. Brake kit
6. Block
7. Sealing kit
8. O-ring

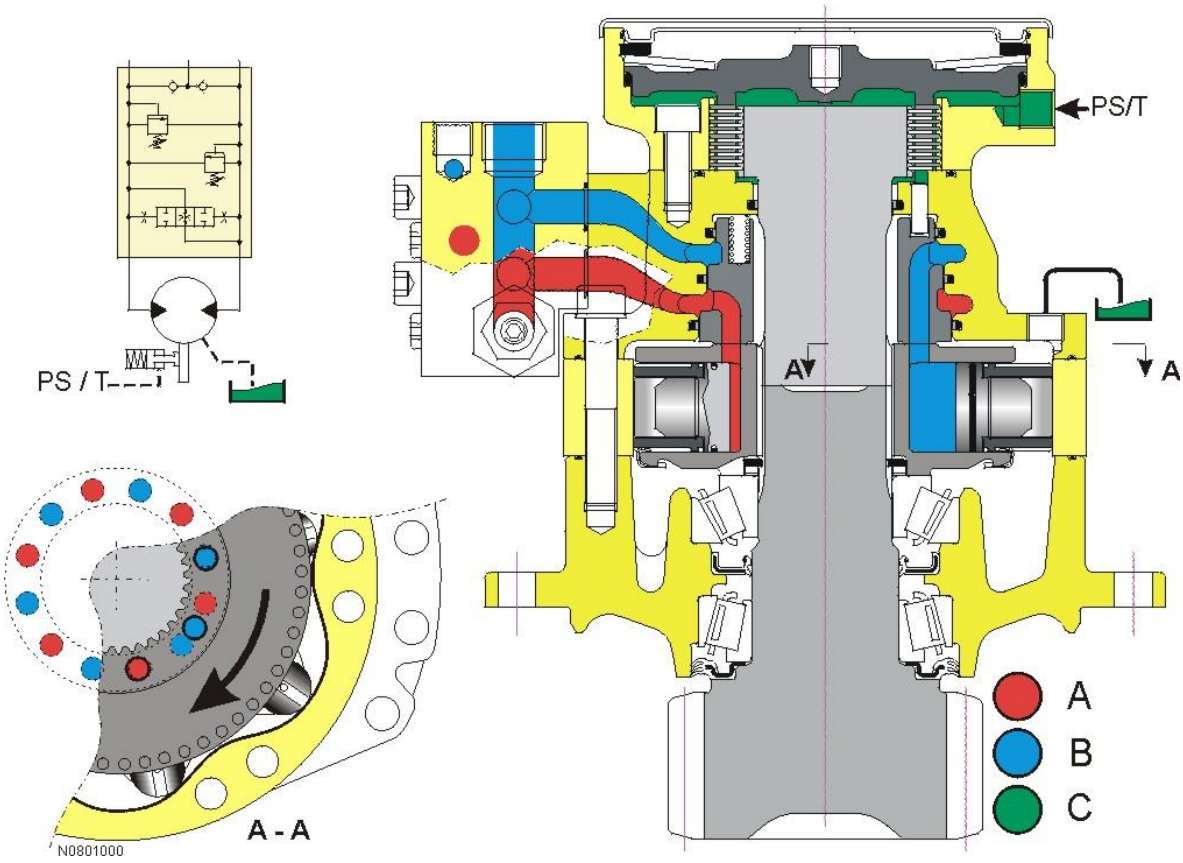

Figure 2
Slew motor

A. Pump pressure

B. Return pressure

C. Tank pressure

PS/T. Servo pressure / Tank

Slew system, hydraulic description

The slew system is a torque-controlled system, which means that the more the operator actuates the slew lever, the higher the slew torque will be, that is, the pressure to the slew motor increases. For adjusting the pressure-limiting valves **A** and **B**, see 910 Hydraulic pressure, adjusting.

When the operator actuates the control valve **30** to slew the superstructure on the machine to the left, the servo pressure **Ps** leaves port **1** as a control pressure. The pressure continues via shuttle valve **14** to relay valve **V1** (positioned in solenoid valve block 40), which changes position and opens for the servo pressure **Ps**. The servo pressure continues out through port **Z4** and via port **X** into the swing motor **13**, where the pressure releases slew brake **D**.

From control valve **30** the control pressure also branches out via line **Ba4** up to valve block **7** (part of the block is shown). The spool in the valve **O** moves upward and the basic pressure (stand-by) from the pump comes via valve **C** up to valve **O**. A duct has opened in the valve and the pressure can pass out into the LS-line and on through the restriction to the adjustable pressure-limiting valve **A**. The limited pressure continues via non-return valve **E** out into the LS-line and to the pump, which increases its flow.

From the branching point the LS-pressure also flows via a restriction to valve **C**. This valve opens and closes the flow from the pump depending on the pressure in signal line **F** and the pressure from pressure-limiting valve**A**. Valve **C** acts as a load-holding valve and a torque limiter.