

Document Title: Power transmission, description	Function Group: 400	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Power transmission, description

The diesel engine drives the excavator's hydraulic system. The working pump for the working hydraulics, servo pump, fan pump as well as the brake and steering pump are driven directly by the diesel engine. The working pump and hydraulic transmission are controlled electronically by the T-ECU (Transmission electronic control unit).

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 an oscillating 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 engaged 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.

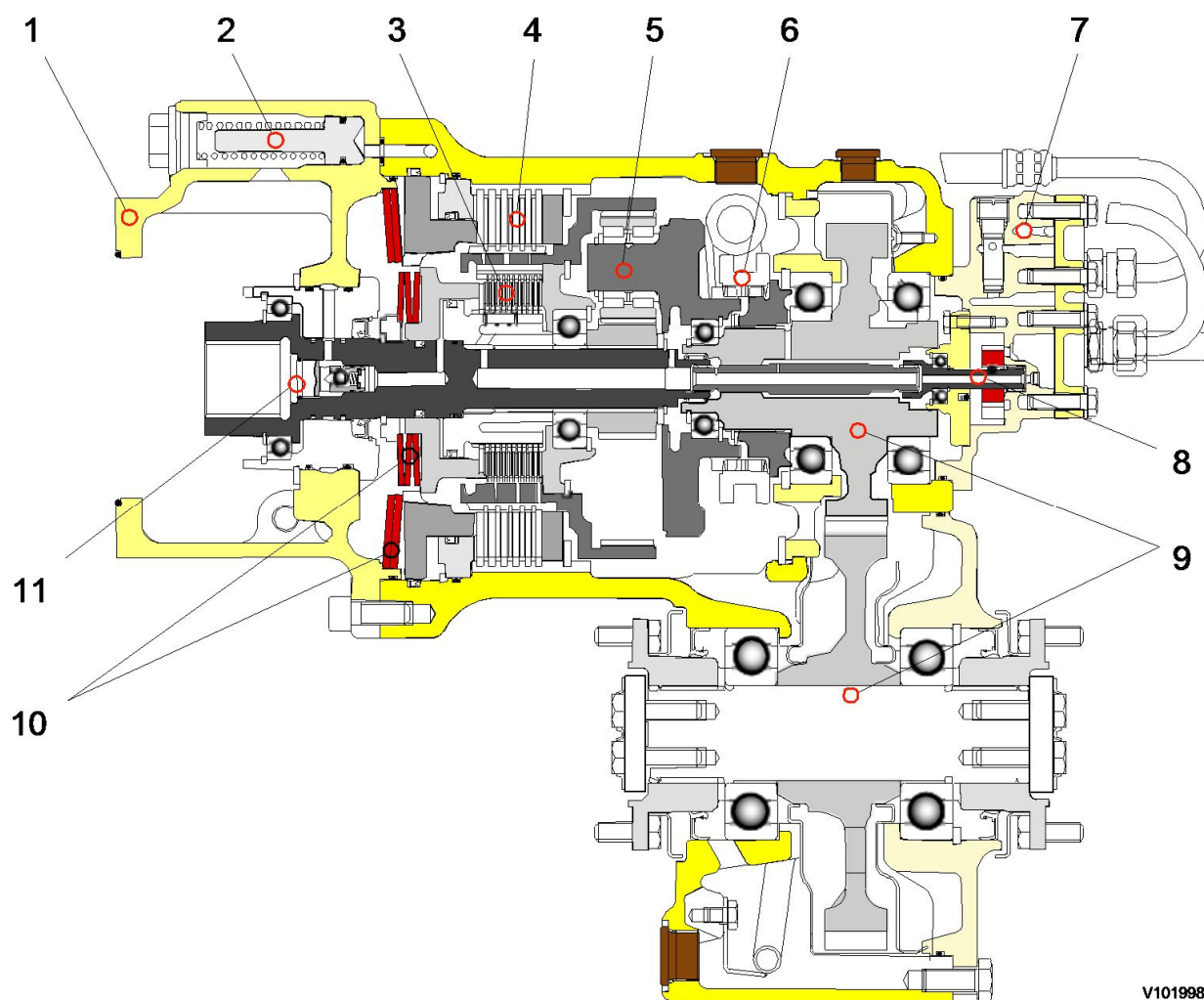
A centre passage connects the superstructure and undercarriage hydraulically and electrically.

Document Title: Travel gearbox, description	Function Group:	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Travel gearbox, description

General

In the gearbox there is a planetary gear **5** with a planetary gear stage and gear drive **9**. The gears engage (mesh) via the disc clutch **3** and disc brake **5**. Both clutch and brake are negative, which means that they are compressed by the cup springs **10**. The clutch and brake are released with hydraulic pressure which compresses the springs. The internal locking function **7** prevents low gear from engaging at high speed before the rpm has dropped, this is controlled by the transmission lubrication pump **8**.



V1019981

Figure 1
Gearbox 2 HL-100, cut-away view

- | | | |
|--|---|---|
| 1 Connection for hydraulic motor | 5 Planetary gear | 9 Gear drive |
| 2 Reservoir for control pressure of disc brake | 6 Release device | 10 Cup springs for disc clutch and disc brake |
| 3 Disc clutch | 7 Internal locking function | 11 Restriction valve |
| 4 Disc brake | 8 Rotor pump for control pressure internal locking function and | |

Shifting, mechanical action

Off-road gear (turtle and snail)

The disc brake **4** (see fig. Gearbox 2 HL-100, 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 **3**, see , is applied. The sun gear **3** is locked to the ring gear **1** (symbolized by the nail). This means that the entire planetary gear assembly is locked as a unit. Thus, the input rpm for the sun gear **B** is the same as the output rpm for the 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**.

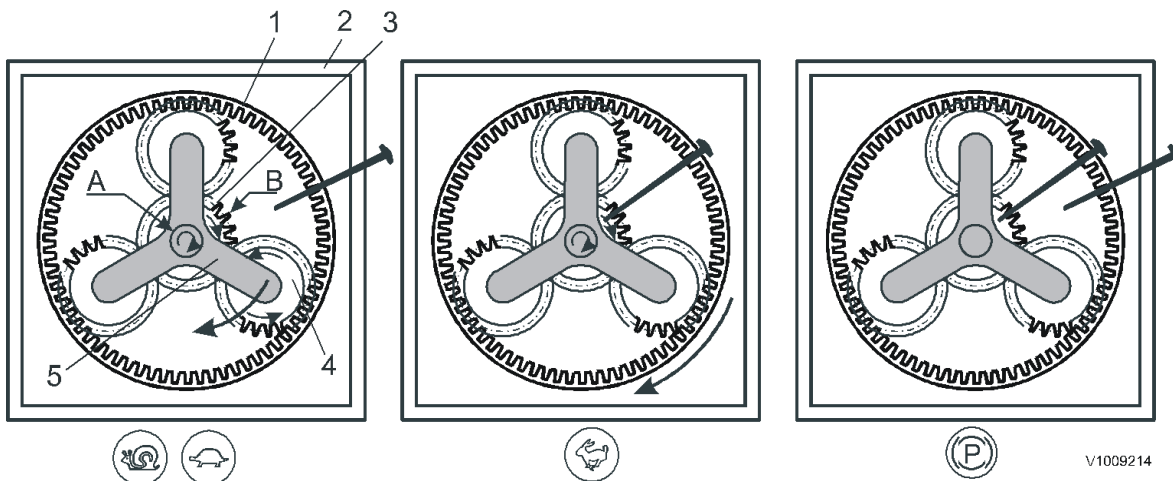


Figure 2

Shifting mechanical action

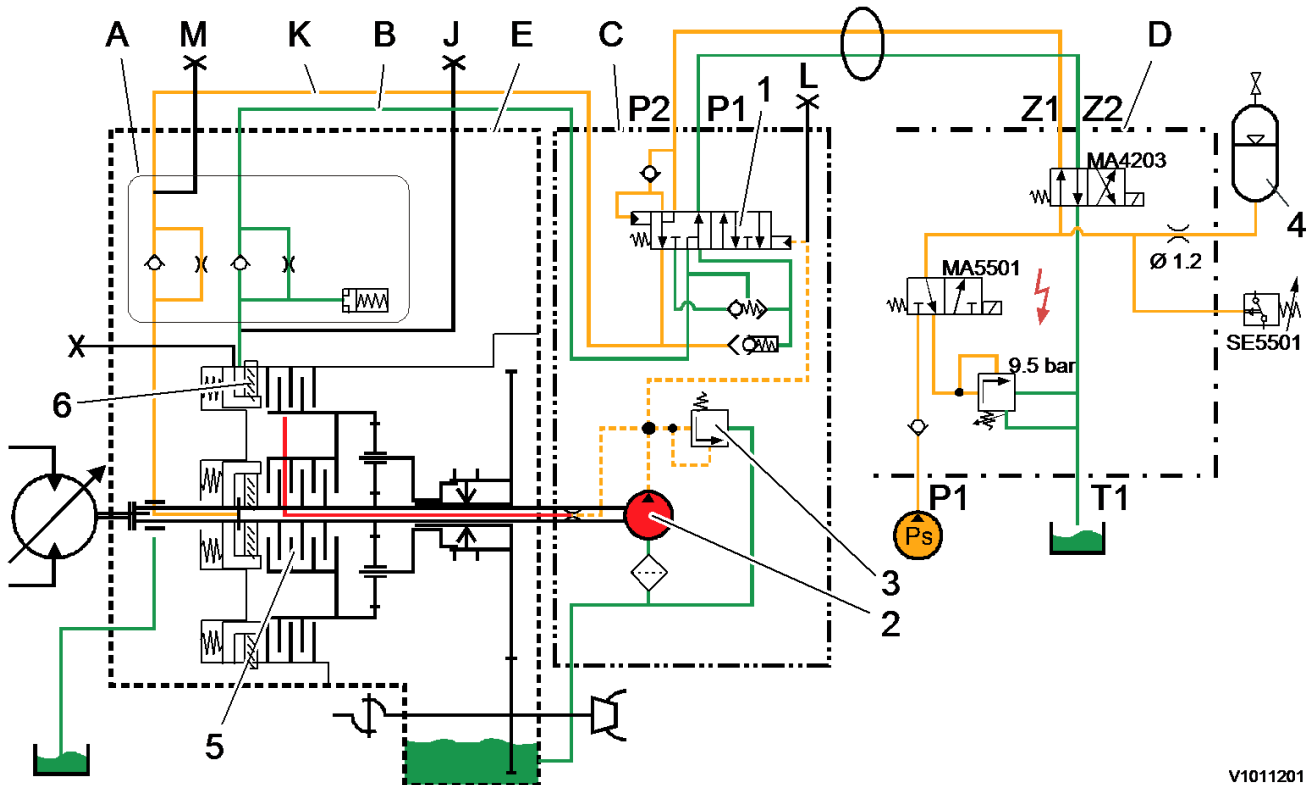
1. Ring gear
 2. Housing
 3. Sun gear
 4. Planetary gear
 5. Planetary gear carrier
-
- A. Output shaft, connected to final stage
 - B. Sun gear connected to hydraulic motor

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 **5** is released out through line **K** and via a non-return valve.

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



V1011201

Figure 3
Off-road gear

- | | | |
|----------------------------------|-----------------------------|-----------------------------|
| 1 Spool | 5 Disc clutch | C Internal locking function |
| 2 Lubrication oil pump | 6 Disc brake | D Solenoid valve block |
| 3 Pressure limiting valve | A Connections + accumulator | E Gearbox |
| 4 Accumulator | B Brake line | K Clutch line |
| J Are plugged holes for eventual | | |
| L pressure measurement | | |
| M | | |

On-road gear (rabbit)

Both the solenoid valve **MA5501** and **MA4203** have voltage (right symbol). The servo pressure passes via line **Z2** to the connection **P1**. Further, the pressure passes through the spool **1** and out in the line **B** and in to the gearbox **E**, where the disc brake **6** is released. The disc clutch **5** 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 lubrication oil pressure has increased to a certain value (see also sub-diagram in right corner). The restriction **7** gives increasing lubrication oil pressure at increased rpm (speed). Max. lubrication oil pressure is limited by 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 **6** still being released.

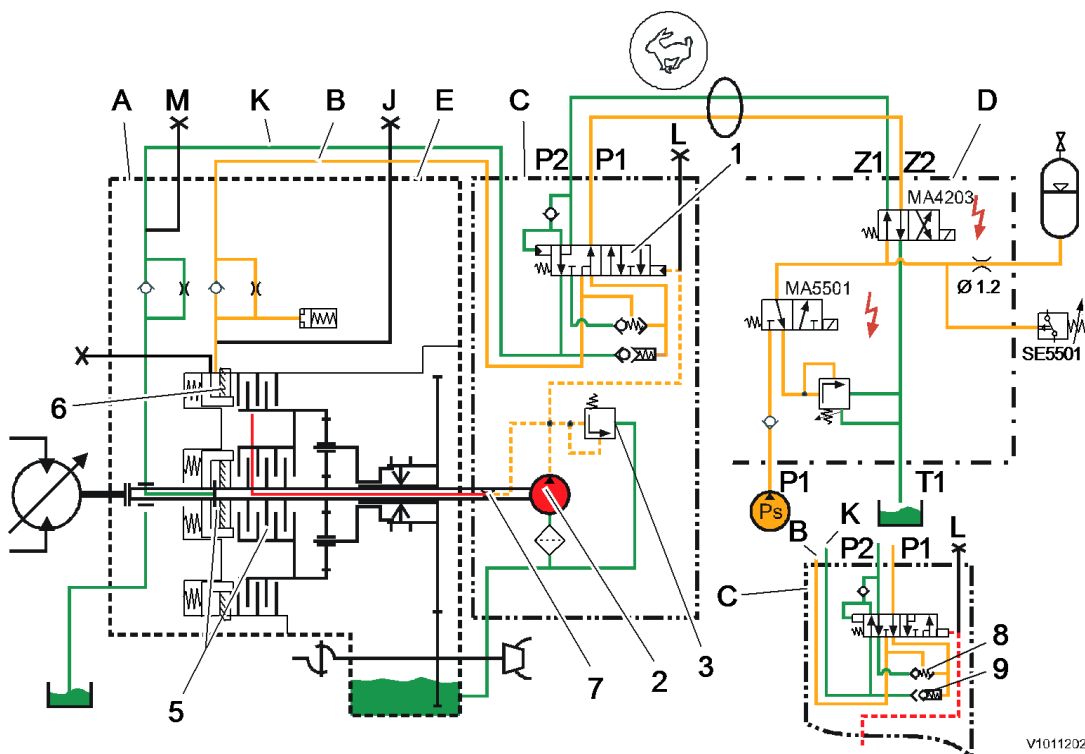
If the operator, when operating at high speed with the on-road gear engaged, activates the off-road gear, the line **P2** is connected to the servo pressure. The pressure passes through the spool **1**. The spool cannot change position since there is a non-return valve. The oil (pressure) goes through a shuttle valve **8** 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 pressure from the transmission lubrication pump is so low that the left symbol in the spool **1** is activated and downshifting to the off-road gear can take place.

	MA9108	MA9152	MA5501	MA4202	MA4204	MA4203	MA9107

V101975

Figure 4
Conditions for operating in different modes

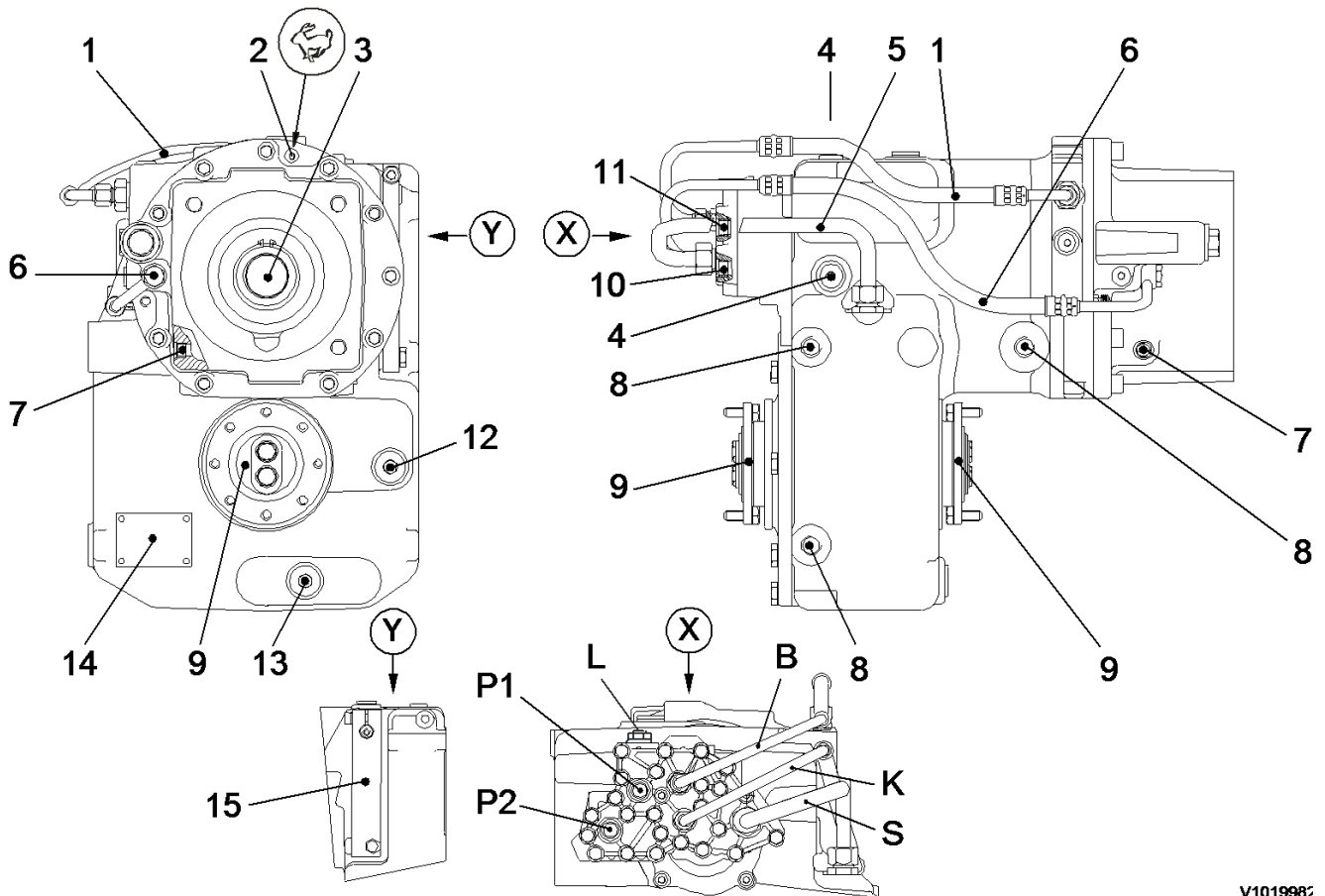
1. If superstructure and undercarriage are lined up cuts off voltage
2. Low speed (turtle) and high speed (rabbit) cuts off voltage
3. Creep speed (snail) and low speed (turtle) cuts off voltage
4. Brake pressure 5 MPa cuts off voltage
5. Mode P cuts off voltage
6. Power Boost activated 10 seconds
7. Control pressure transport min. 0.7 MPa (SE4201)



V1011202

Figure 5
On-road gear

- | | | |
|------------------------|-------------------|------------------------|
| 1 Spool | 7 Restriction | C Internal locking |
| 2 Lubrication oil pump | 8 Shuttle valve | D Solenoid valve block |
| 3 Overflow valve | 9 Leak-oil filter | E Gearbox |
| 5 Disc clutch | A Connections | K Line |
| 6 Disc brake | B Line | |



V1019982

Figure 6
Installation view

- | | | |
|--|---|--------------------------------------|
| 1 Pressure line from internal locking function to disc brake | 6 Pressure line from internal locking function to disc clutch | 11 Pressure port P1, on-road gear |
| 2 Breather, disc brake | 7 Connection for leak-oil | 12 Plug, oil filler/ oil level check |
| 3 Connection hydraulic motor | 8 Gearbox mounting | 13 Plug, oil drain |
| 4 Connection for inductive sensor | 9 Drive flange output shaft | 14 Identification plate |
| 5 Suction line, rotor pump (control pressure internal locking function and transmission lubrication) | 10 Pressure port P2, off-road gear | 15 Release lever |

Document Title: Travel gearbox, removal	Function Group:	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Travel gearbox, removal

Op nbr

14 360 000 Vacuum pump

NOTICE

Before starting any work, park the machine on a level surface and prepare it for service by putting it into service position according to Safety rules for service.

! WARNING

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

! WARNING

Risk of crushing injuries

NOTE!

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

1. Remove the step/tool box from the undercarriage.
2. Disconnect both propeller shafts from the travel gearbox.

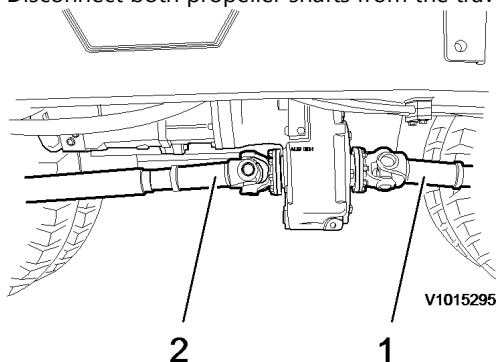
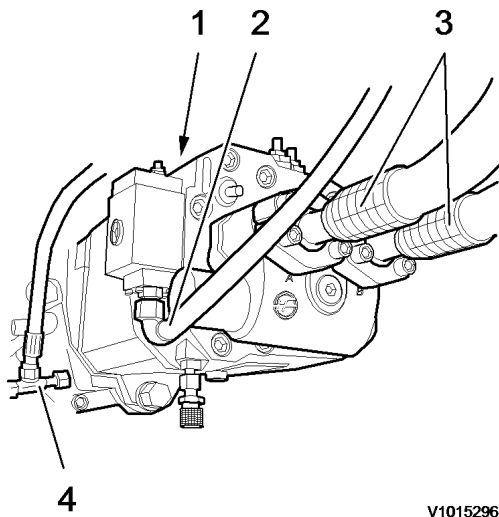


Figure 1
Travel gearbox

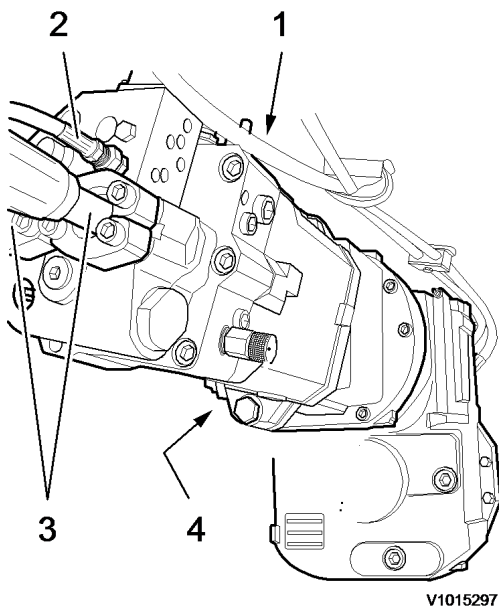
1. Front propeller shaft
2. Rear propeller shaft
3. Connect the vacuum pump, see [900 Vacuum pump connection](#).
4. Disconnect the leak-oil hose located on the travel motor's top side, the control hose, the pressure hoses and leak-oil hose for the gearbox.



V1015296

Figure 2
Travel motor 20 km/h

1. Leak-oil hose, travel motor (port 1A centre passage)
2. Control hose (port 2 centre passage)
3. Pressure hoses (port A and B retardation valve)
4. Leak-oil hose, gearbox (port 1B centre passage)



V1015297

Figure 3
Travel motor 30 km/h

1. Leak-oil hose, travel motor (port 1A centre passage)
2. Control hose (port 2 centre passage)
3. Pressure hoses (port A and B retardation valve)
4. Leak-oil hose, gearbox (port 1B centre passage)

5. Place a jack with a lowering height of >200 mm between the travel motor and the gearbox.

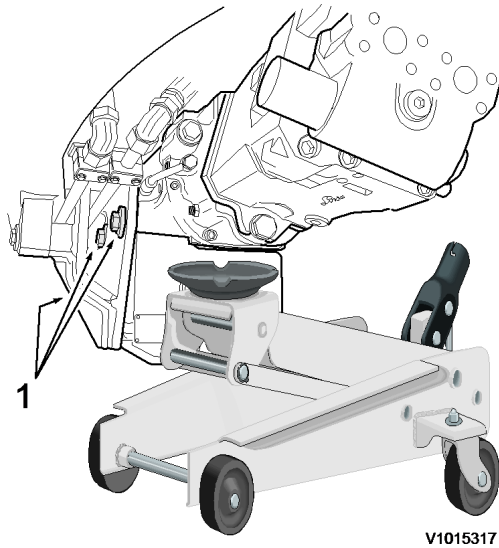


Figure 4
Gearbox mount

1. Bolts (3 pcs.)
6. Remove the bolts from the gearbox mount.
7. Carefully lower the gearbox so that control hoses P1 and P2 on the front end of the gearbox can be accessed for disconnection.
Then disconnect the hoses and carefully lower the gearbox.

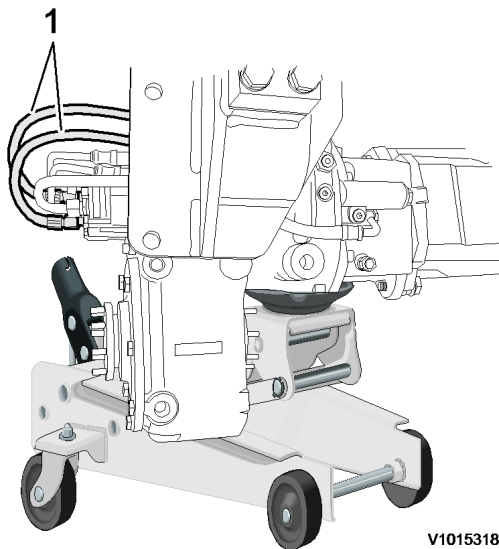


Figure 5
Gearbox lowered

1. Control hoses P1 and P2 on gearbox (port 3A and 5 on centre passage)

Document Title: Travel gearbox, installation	Function Group:	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Travel gearbox, installation

Op nbr

14 024 293 Locking compound

14 360 000 Vacuum pump

**WARNING****Risk of crushing injuries**

1. Remove the plug and fill the travel gearbox with transmission oil up to the plug connection.

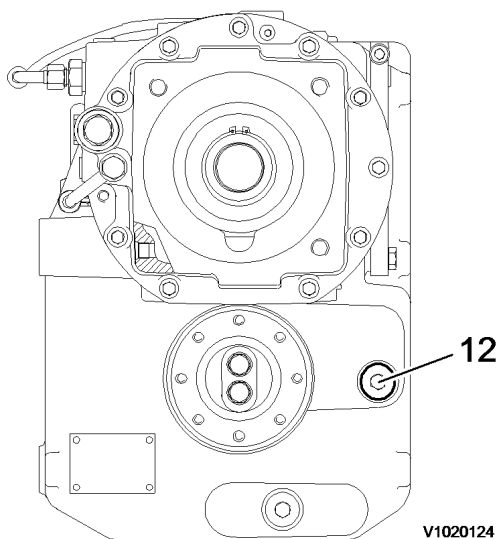
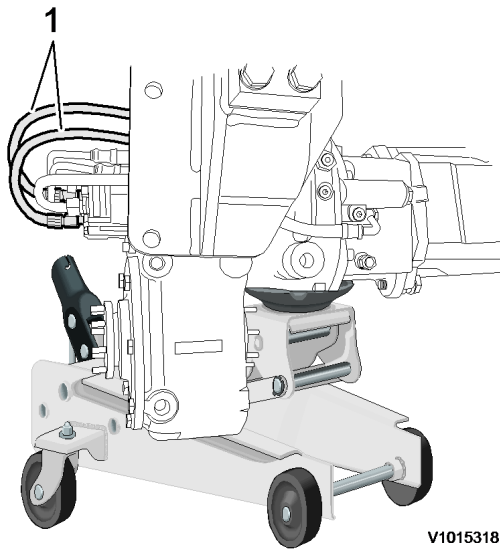


Figure 1

Oil filler travel gearbox

12. Plug, oil filler/ oil level check

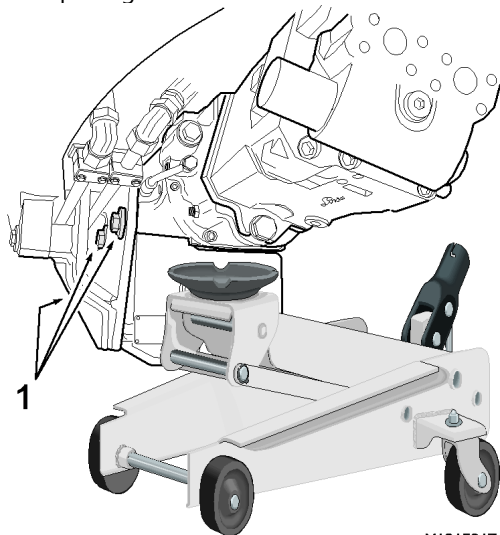
2. Transfer the travel motor and connections to the new gearbox.
3. Lift up the gearbox with a jack so that it's possible to connect control hoses P1 and P2.
Connect the control hoses.



V1015318

Figure 2
Installing control hoses

1. Control hoses P1 and P2 on gearbox (port 3A and 5 centre passage)
4. Lift up the gearbox and fit the bolts



V1015317

Figure 3
Gearbox mount

1. Bolts (3 pcs)
5. Connect the leak-oil hose on the gearbox and the control hose and pressure hoses.
Fill the travel motor with hydraulic oil through the leak-oil connection on the motor's top side.
Then connect the leak-oil hose.

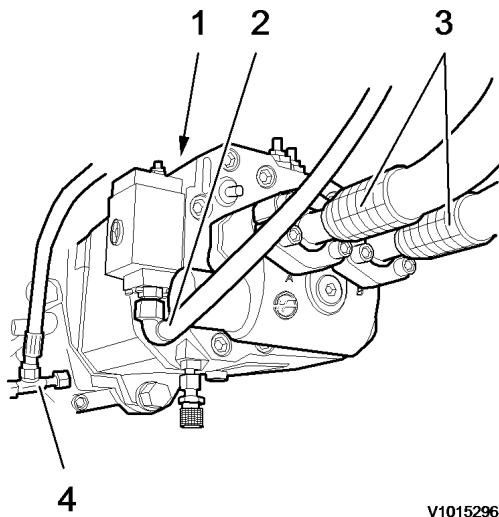


Figure 4
Travel motor 20 km/h

1. Leak-oil hose travel motor (port 1A centre passage)
2. Control hose (port 2 centre passage)
3. Pressure hoses (port A and B retardation valve)
4. Leak-oil hose gearbox (port 1B centre passage)

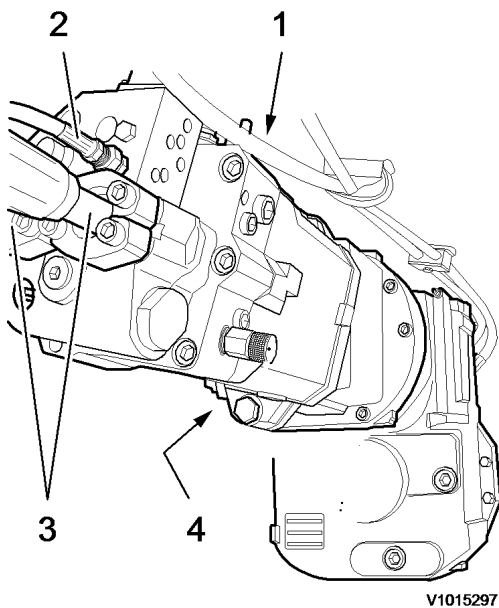


Figure 5
Travel motor 30 km/h

1. Leak-oil hose travel motor (port 1A centre passage)
 2. Control hose (port 2 centre passage)
 3. Pressure hoses (port A and B retardation valve)
 4. Leak-oil hose gearbox (port 1B centre passage)
6. Disconnect the vacuum pump, see [900 Vacuum pump, disconnection](#).
 7. Apply lock fluid on the bolts and fit the propeller shafts on the gearbox.

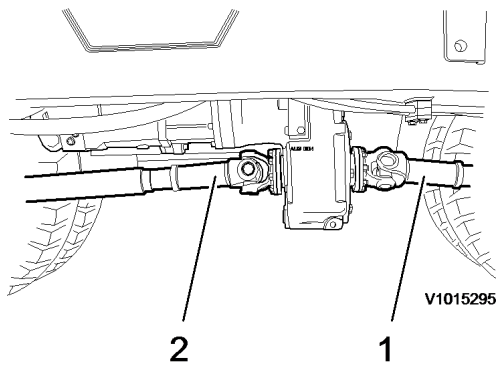


Figure 6
Travel gearbox

1. Front propeller shaft
 2. Rear propeller shaft
8. Restore the machine.
 9. Start the diesel engine. Check for leaks and repair if needed.
 10. When starting, the travel motor and gearbox 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, description	Function Group: 441	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Travel motor, description

Forward travel

When the parking brake is inactivated, see [550 Parking brake description](#), the solenoid valve for the parking brake **MA5501** receives voltage. The servo pressure passes via the pressure monitor **SE5501**, and when the pressure is 26 bar, the solenoid valve **MA4202** receives voltage via a signal from the computer (**T-ECU**). The servo pressure also passes directly via the port **W** on the solenoid valve block **40** to the pedal valve **29**. When the operator presses on the pedal **04** for forward travel, the servo pressure **Ps** is converted to control pressure, that passes via the line **1** on the pedal valve. The control pressure continues into the main valve block's port **a3** via the restriction **03** and controls the spool.

The pump pressure (stand-by) passes into the block and out via the restriction **01** to the line **02** (LS) and on to the pump which increases its flow. The pressure increases and when the pressure is greater than in the travel motor (load pressure), the non-return valve **05** opens and the flow passes via the port **A3** and port **13** in the centre passage as well as port B to the travel motor **10**. The return flow passes through port **14** and into the block through port **B3** and on via restriction **06** to tank and the machine starts to move.

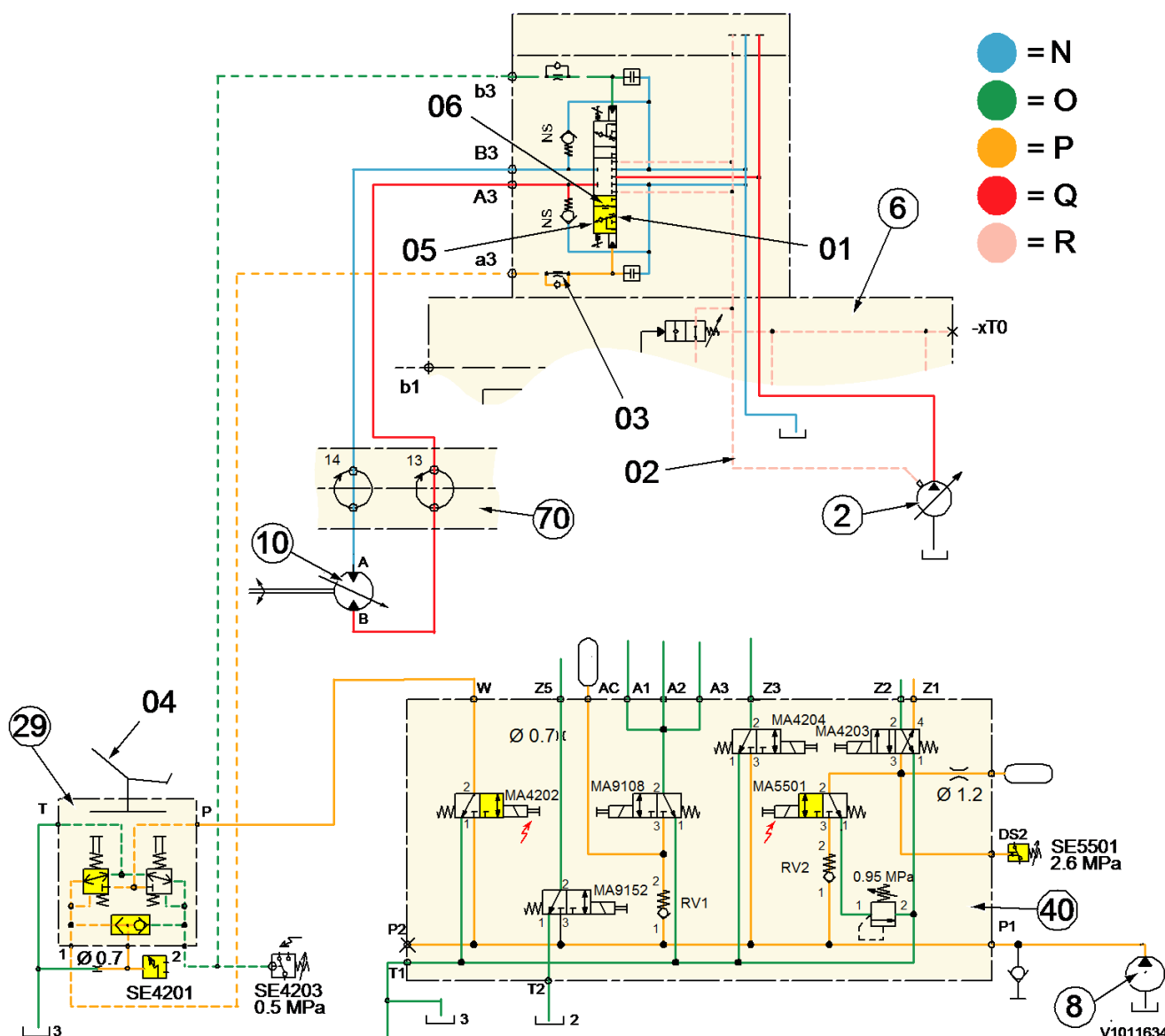


Figure 1
Sub-diagram travel system

Travel motor with retardation valve

When travelling, a flow comes into the **A**-port and on to shuttle valve **9** which changes position and sends the flow to the 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 affects the retardation valve **2** (A) for the upper symbol. The movement is restricted to delay the return flow's connection to tank. The oil continues via the non-return valve **6a** to line **11** and to the pressure reducing valve **1**. In it, the pressure is reduced to 125 - 160 bar (fixed setting). The reduced pressure continues and moves the control piston **8** so that the motor is in min. displacement. 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's displacement to max. with subsequent increased motor torque and the machine can start to accelerate. As the acceleration continues, the pressure drops in the system so that the motor's 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 the non-return valve **8a** to the 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 is stopped, the machine changes travel direction. Without countering, the retardation spool alone gives a slower retardation.

When operating with the snail symbol activated (inching), the solenoid valve **M4204** is supplied with voltage and the right symbol is active. The servo pressure passes out in 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.

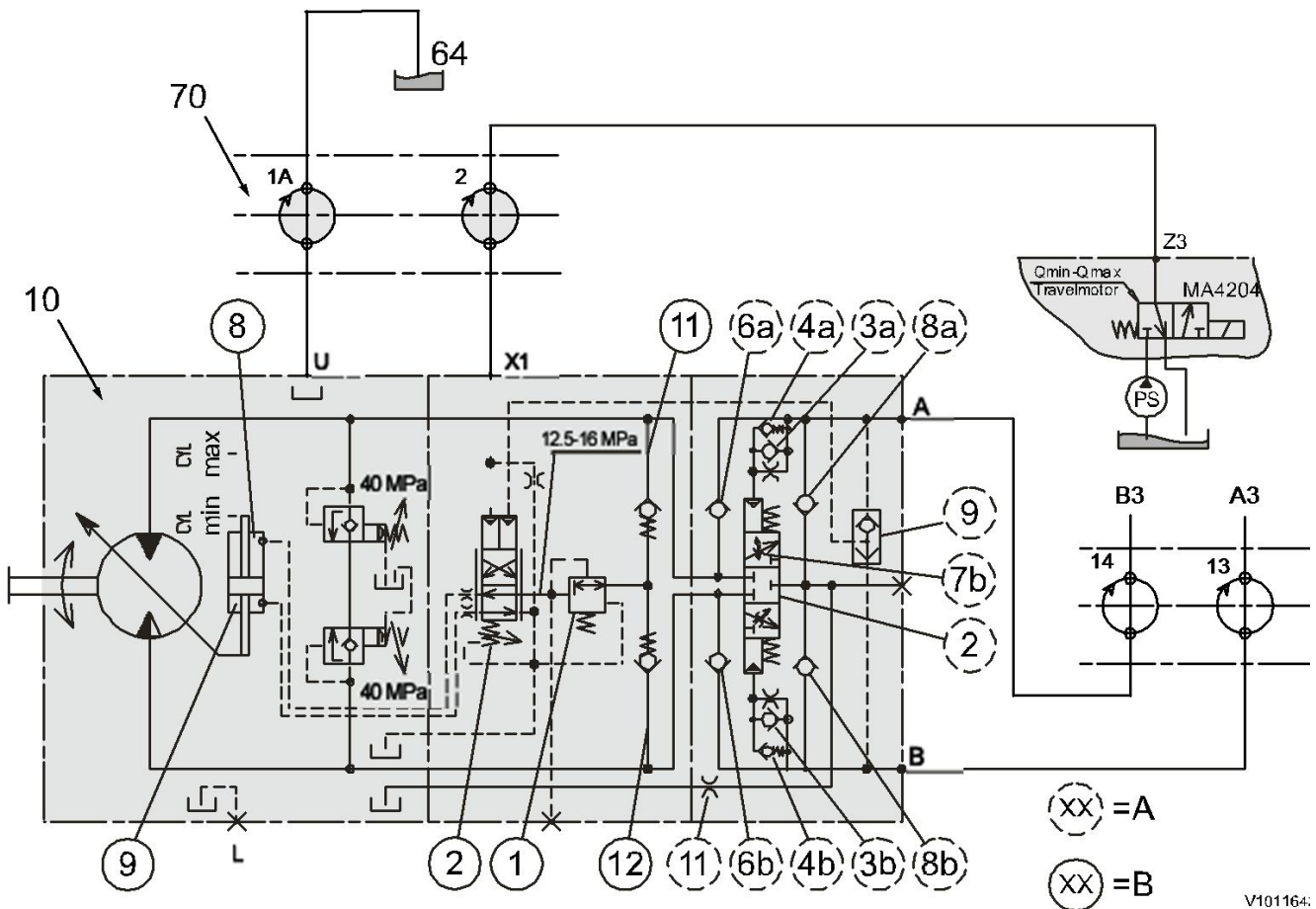
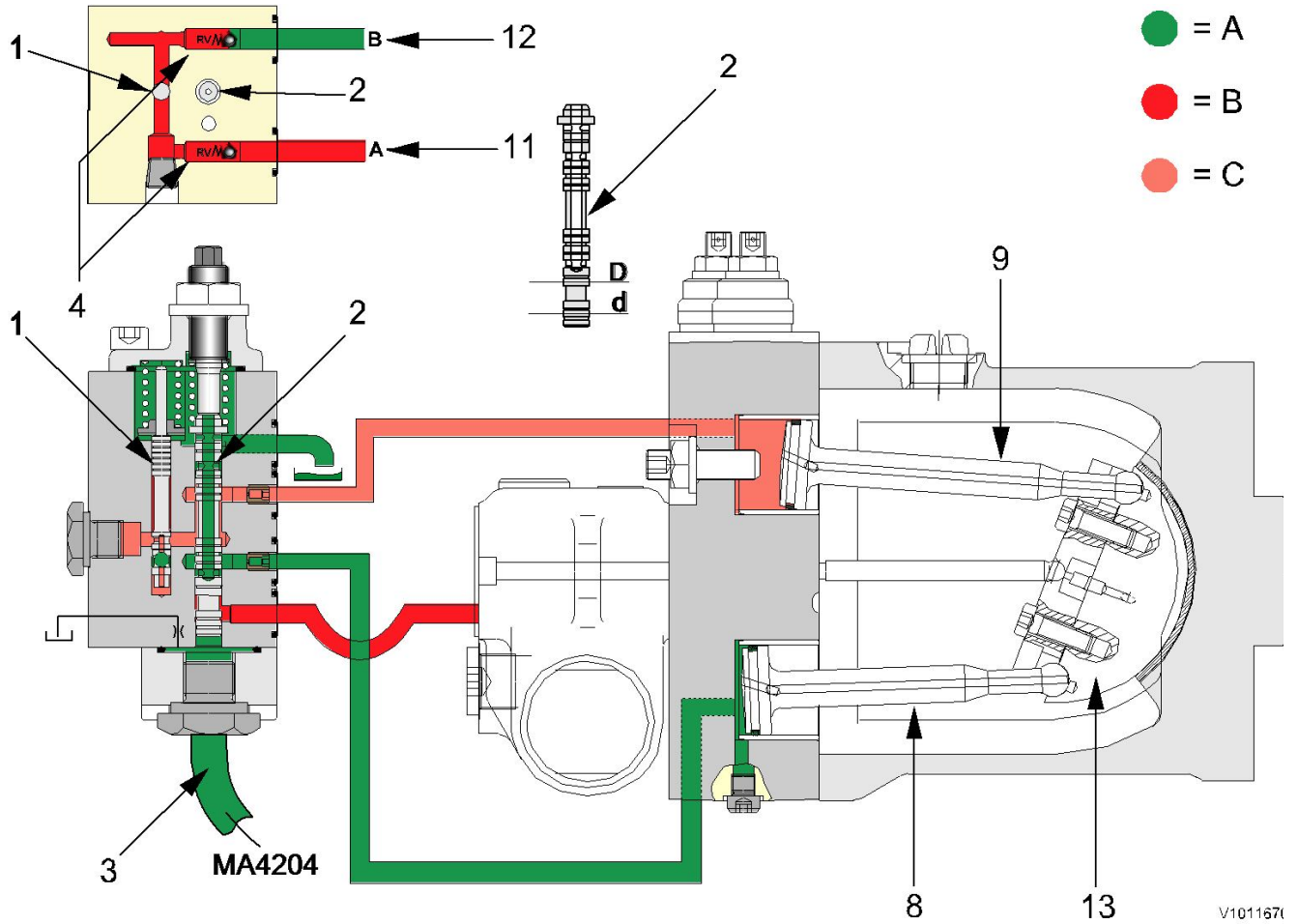


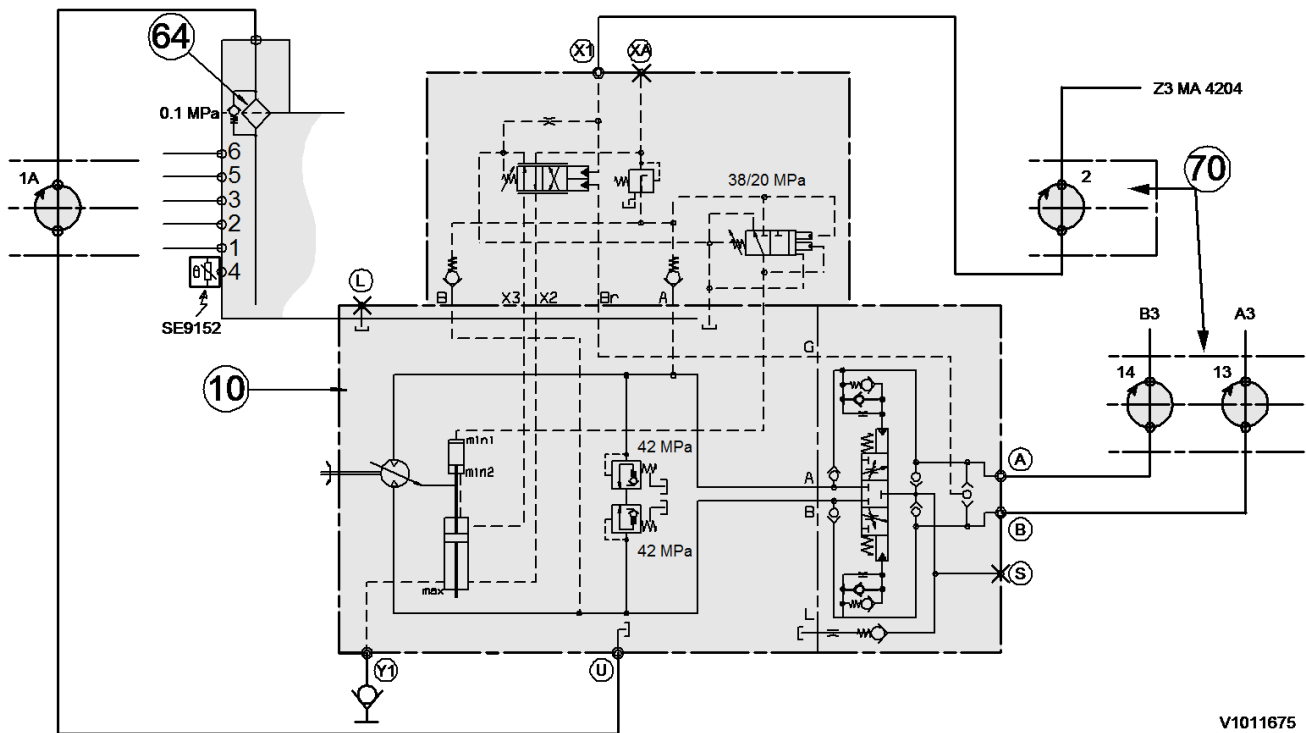
Figure 2
Hydraulic diagram for travel motor 20 km/h

A. Refers to fig. Retardation valve in neutral position and fig. Retardation valve in travel position

70. Centre passage



- | | | |
|----------------------------|---------------------------------------|--------------------------|
| 1. Pressure reducing valve | 9. Control piston | A. Return pressure |
| 2. Control spool | 11. Line A to pressure reducing valve | B. Pump pressure |
| 3. Tank/servo line | 12. Line B to pressure reducing valve | C. Reduced pump pressure |
| 4. Pressure limiting valve | 13. Torsion plate | |
| 8. Control piston | | |



V1011675

Figure 4
Hydraulic diagram for travel motor 30 km/h

- 10. Travel motor
- 64. Drain filter
- 70. Centre passage

Control for travel motor 30 km/h with Vmin1-min2

When the transport pedal is activated, the spool opens in the main valve block MCV and pump flow (dark red colour acc. to fig.) passes to **B** port (motor symbol) and into line Br. The pressure increase due to the start resistance. This pressure is designated system pressure in this description.

At low system pressure, the spool **2** is held in the lower position by spring force. The system pressure reaches the pressure reducing valve **5** via non-return valve **3**. The reduced pressure 12.5- 16.0 MPa (125-160 bar) acts in the chamber **G** via the line X3. The chambers **D** and **F** are connected to tank. The piston **E** is pressed against the min. screw **C** and the motor stands in min. 1 displacement.

Min. displacement gives low torque, the machine remains stationary but the system pressure increases. When the system pressure in line Br reaches the control point, approx. 29.0 MPa (290 bar), the spool **2** lifts and the chamber **G** becomes connected to tank and reduced system pressure acts in the chamber **F**. The motor switches to max. displacement, torque increases and the machine accelerates.

During acceleration, the system pressure drops and the variable motor is controlled toward min. displacement. When the chambers **F** and **D** have tank pressure, max. speed is determined by the min. screw **C**.

During operation with pump flow to the transport motor the system pressure may reach max. 36.0 MPa (360 bar), which is limited by the DA-valve. The control valve **11** has a switch point at 38.0 MPa (380 bar).

If the operator lifts the foot off the pedal at max. speed, or if the machine is operated downhill, the transport motor begins to work as a pump. The pressure increases in port **A** (motor symbol) when the retardation spool **10** moves toward centre position by the action of a centering spring. The pressure passes the non-return valve **4** and acts on a ring area on the spool in the valve **11**. At 38.0 MPa, the valve **11** shifts and the pressure passes to chamber D, displaces the piston E to the right (min. 2) and increases the displacement. This displacement increase causes a slight braking force, making the operator aware that it is time to use the brake pedal.

There is a small piston in the bottom end of the spool in valve **11**. This piston forces the pressure to drop to 20.0 MPa (200 bar) so that the spring can push the spool against the bottom position and chamber **D** becomes connected to tank. When chamber **D** is connected to tank, the motor reverts to min.1 displacement and it is possible to reach max. speed once again.

There is a port X1 on the control spool which is used when inching (snail). When the operator selects snail, the solenoid valve MA4202 shifts and the servo pressure 3.5 MPa (35 bar) is connected to port X1. 3.5 MPa acts on the bottom end of the

spool **2** and lifts it so that the chamber **F** is pressurized and chamber **G** becomes connected to tank. The motor is now locked in max. displacement and inching speed is guaranteed regardless of what the system pressure is. In inching (snail) mode, the off-road gear is also activated.

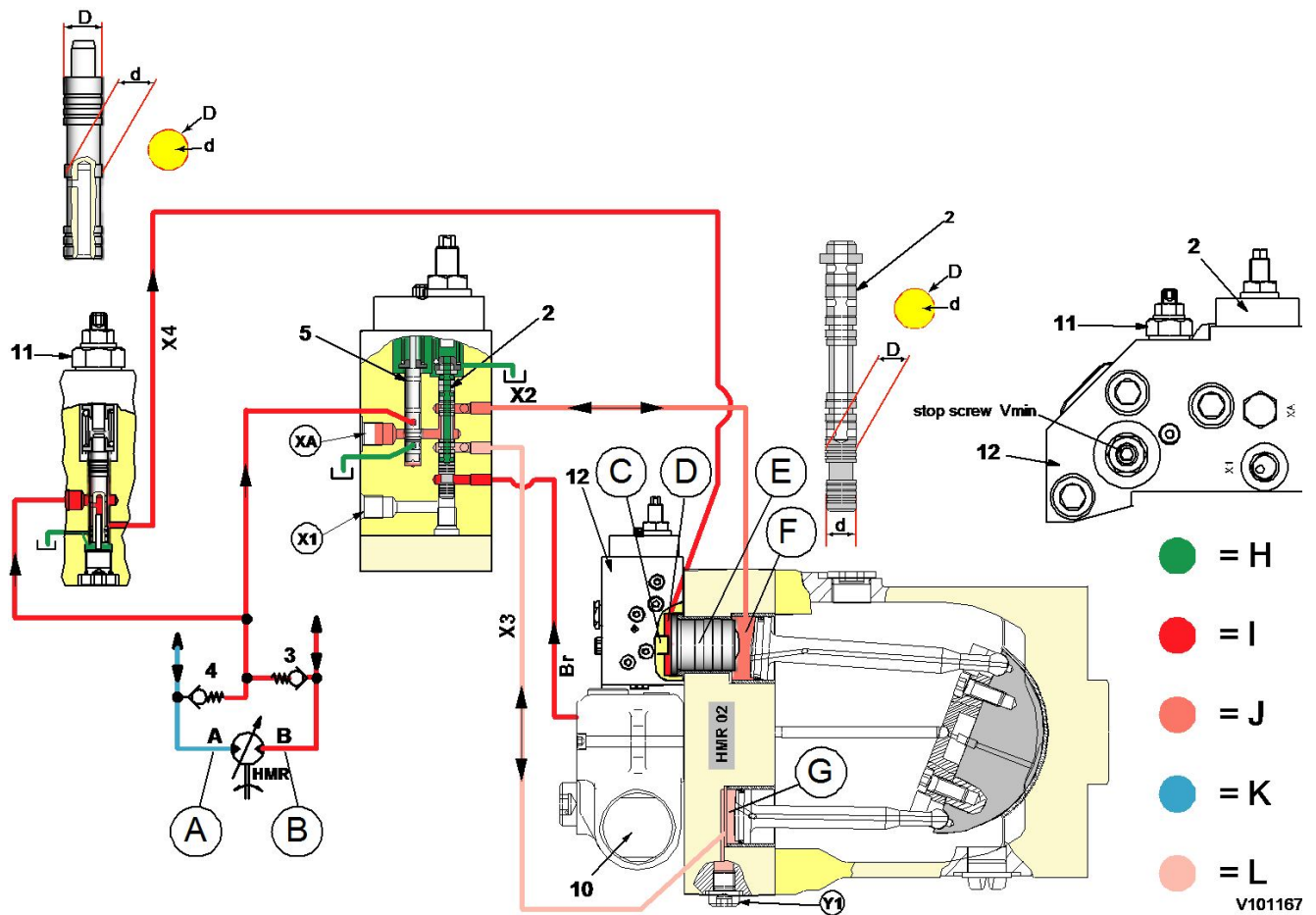
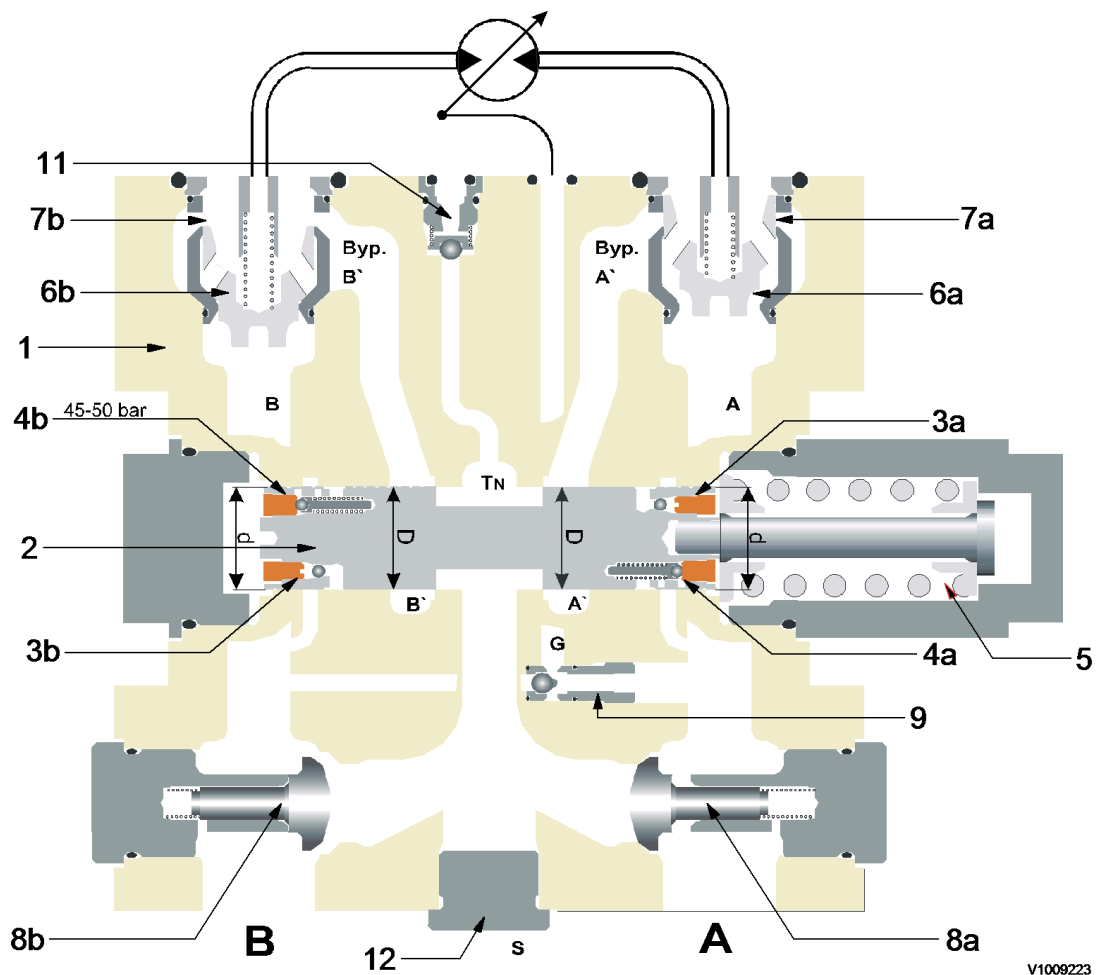


Figure 5
Control for travel motor 30 km/h

- | | | |
|----------------------------|------------------------------|------------------------------|
| 2. Spool | Y1 Pressure check connection | G. Chamber |
| 3. Non-return valve | A. Port | H. Return pressure |
| 4. Non-return valve | B. Port | I. Pump pressure |
| 5. Pressure reducing valve | C. Min. screw | L. Y1-pressure |
| 10. Retardation spool | D. Chamber | J. Reduced pump pressure |
| 11. Control valve | E. Piston | K. Increased return pressure |
| 12. Control block | F. Chamber | |



V1009223

Figure 6
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 |

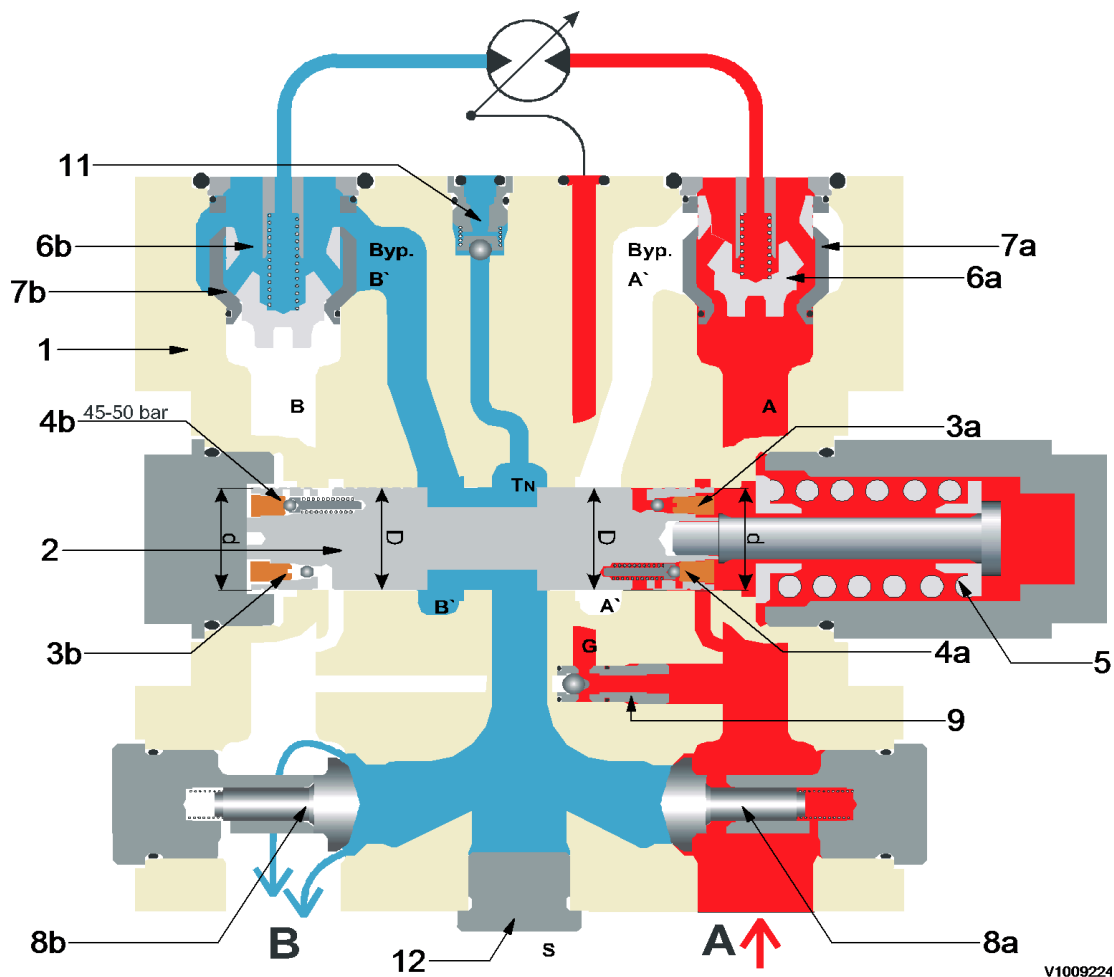


Figure 7
Retardation valve in travel position

- | | | |
|-------------------------------|---------------------------------|---------------------------------|
| 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: 2014/5/7 0
Profile: EXC, EW180B [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.



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.

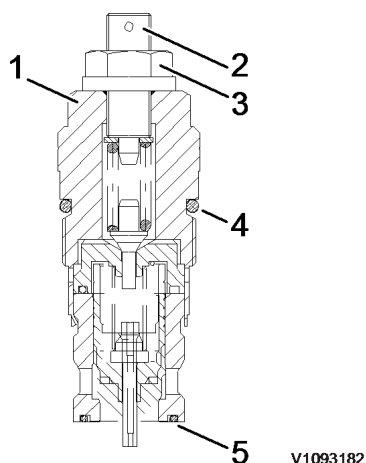


Figure 1
Shock and anti cavitation valve

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.

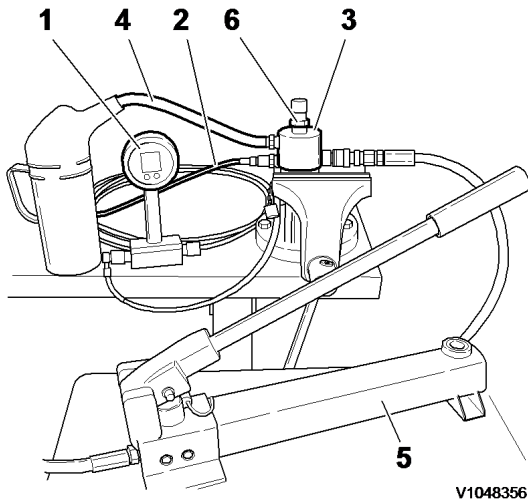


Figure 2
Tool connections

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 $\frac{1}{4}$ 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, removal	Function Group:	Information Type: Service Information	Date: 2014/5/7 0
Profile: EXC, EW180B [GB]			

Travel motor, removal

Op nbr 4411-01

14 360 000 Vacuum pump



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.



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



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.

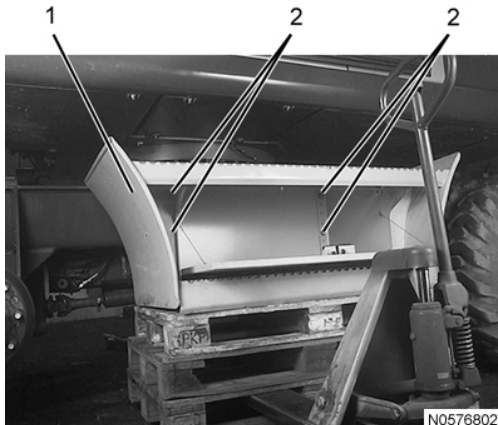
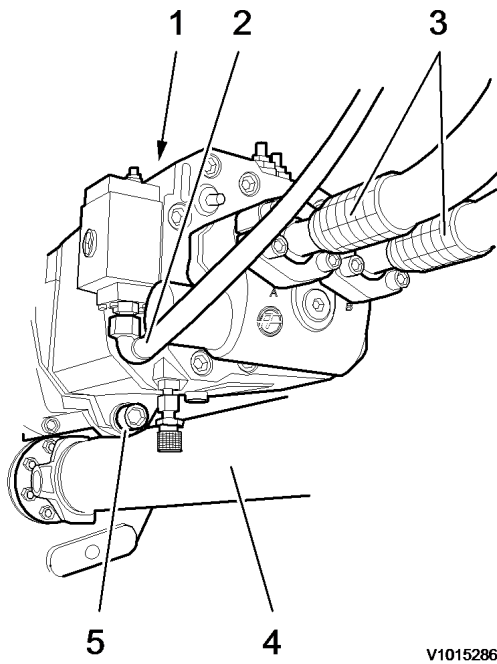


Figure 1
Undercarriage

1. Tool box
 2. Bolts
-
2. Disconnect the rear propeller shaft from the travel gearbox.

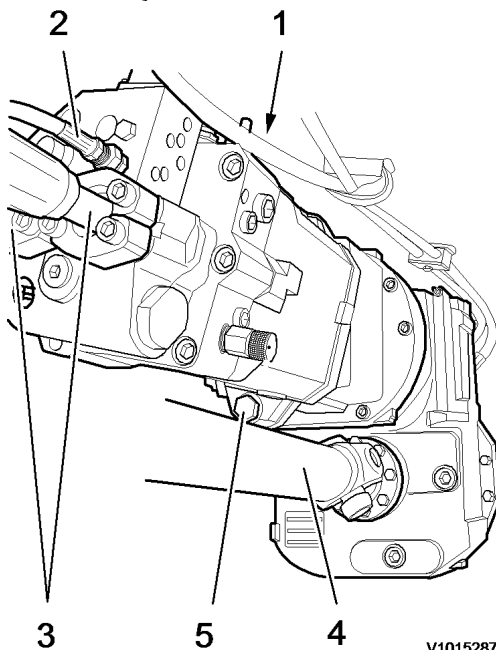


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Figure 2
Travel motor 20 km/h

1. Leak-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, rear
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 spills.
5. Disconnect the leak-oil hose located on the travel motor's top side, the control hose and the pressure hoses.
6. Remove the travel motor's 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's top bolt and carefully pull out the motor from the gearbox. Then carefully lower the motor.



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