WEBM001801

SHOP MANUAL

PW95R-2

HYDRAULIC EXCAVATOR

SERIAL NUMBER

PW95R-2 21D0200280 and up

KOMATSU

Utility

HOISTING INSTRUCTIONS

⚠ Heavy parts (25 kg or more) must be lifted with a hoist etc. In the **Disassembly and Assembly** section, every part weighing 25 kg or more is clearly indicated with the symbol kg.

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
   - Check for removal of all bolts fastening the part to the relative parts.
   - Check for any part causing interference with the part to be removed.

2. Wire ropes

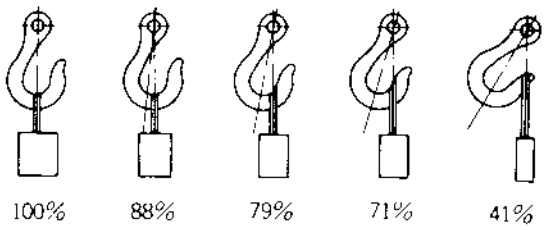
1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

WIRE ROPES
(Standard «S» or «Z» twist ropes without galvanizing)

Rope diameter (mm)	Allowable load (tons)
10	1.0
11.2	1.4
12.5	1.6
14	2.2
16	2.8
18	3.6
20	4.4
22.4	5.6
30	10.0
40	18.0
50	28.0
60	40.0

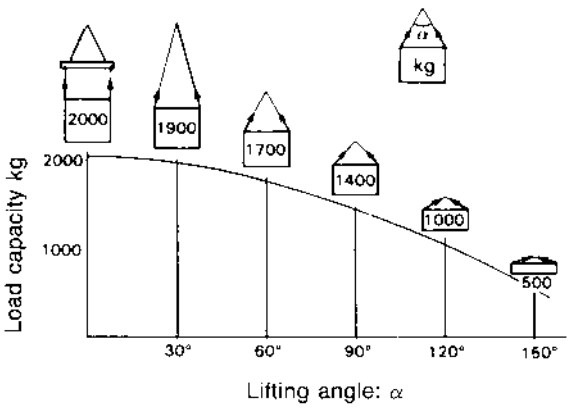
The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook. Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result.
Hooks have maximum strength at the middle portion.



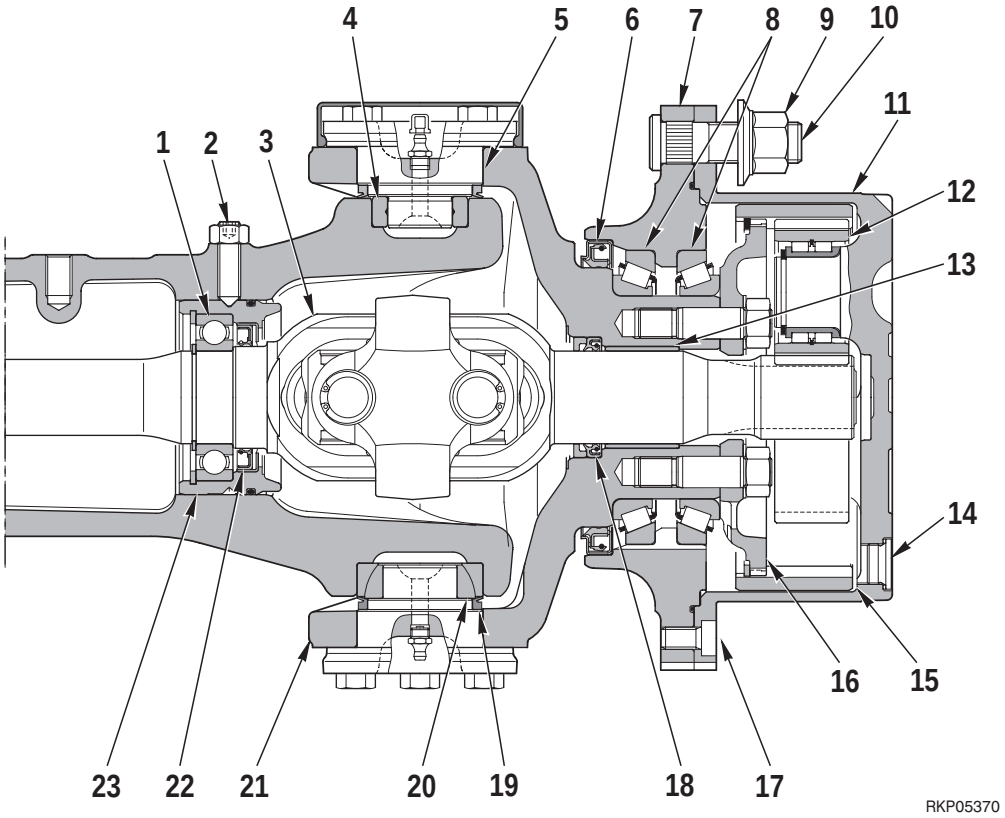
3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.
⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can cause dangerous accidents.

4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles.
The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various handing angles.
When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended.
This weight becomes 1000 kg when two ropes make a 120° hanging angle.
On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



10 STRUCTURE AND FUNCTION

FINAL REDUCTION



1. Bearing
2. Dowel
3. Cardan shaft (Z = 14)
4. Bushing
5. Joint
6. Seal
7. Wheel hub
8. Bearing
9. Nut
10. Stud bolt
11. Support
12. Bevel gear (Z = 27)
13. Bushing
14. Plug
15. Ring gear (Z = 70)
16. Ring gear carrier
17. Screw
18. Seal
19. Seal
20. Bushing
21. Housing
22. Seal
23. Bushing

SPECIFICATIONS

Amount of oil: 0.8 ℓ
Reduction ratio: 1:6

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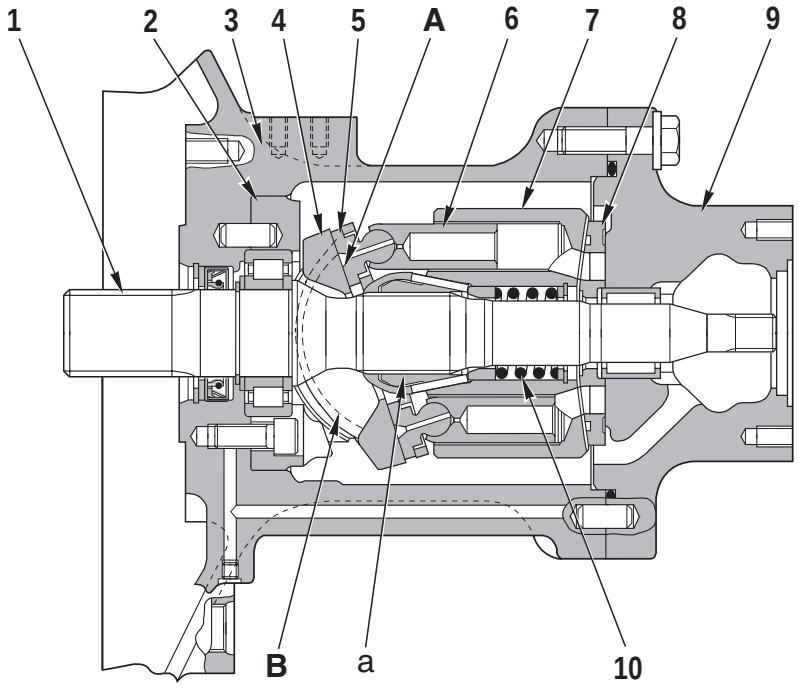
FUNCTION

- The engine rotation and torque transmitted to the pump shaft is converted into hydraulic energy, and pressurized oil is discharged according to the load.
- It is possible to change the delivery amount by changing the swash plate angle.



Section A – A

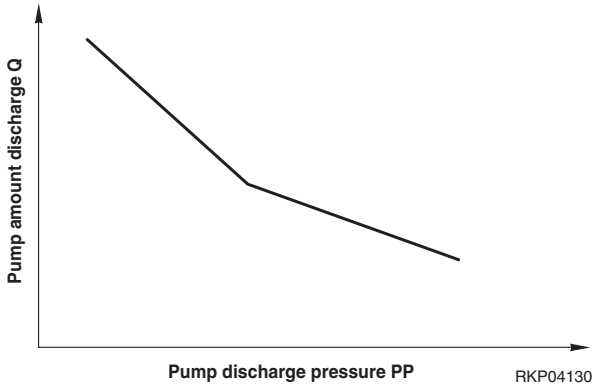
RKP03120

STRUCTURE

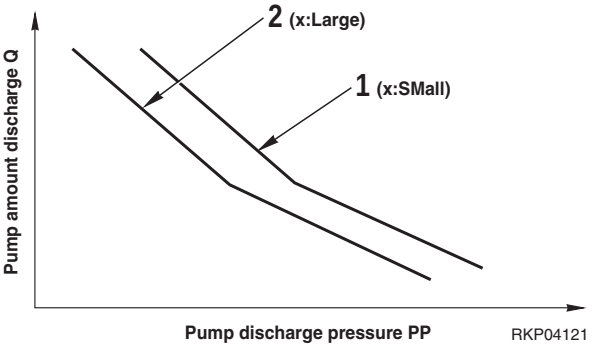
- The cylinder block (7) is supported to the shaft (1) by the spline **a**, and the shaft (1) is supported by the front and rear bearings.
- Tip of the piston (6) is a concave ball, and shoe (5) is caulked to it to form one unit. The piston (6) and the shoe (5) form a spherical bearing.
- The rocker cam (4) has a flat surface **A**, and the shoe (5) is always pressed against this surface while sliding in a circular movement.
- The rocker cam (4) brings high pressure oil at the cylindrical surface **B** with the cradle (2), which is secured to the case, and forms a static pressure bearing when it slides.
- The piston (6) carries out relative motion in the axial direction inside each cylinder chamber of the cylinder block (7).
- The cylinder block (7) seals the pressure oil to the valve plate (8), and carries out relative rotation. This surface is so designed that the oil pressure balance is maintained at a suitable level. And oil inside each cylinder of the cylinder block (7) is sucked in and discharged through the valve plate (8).

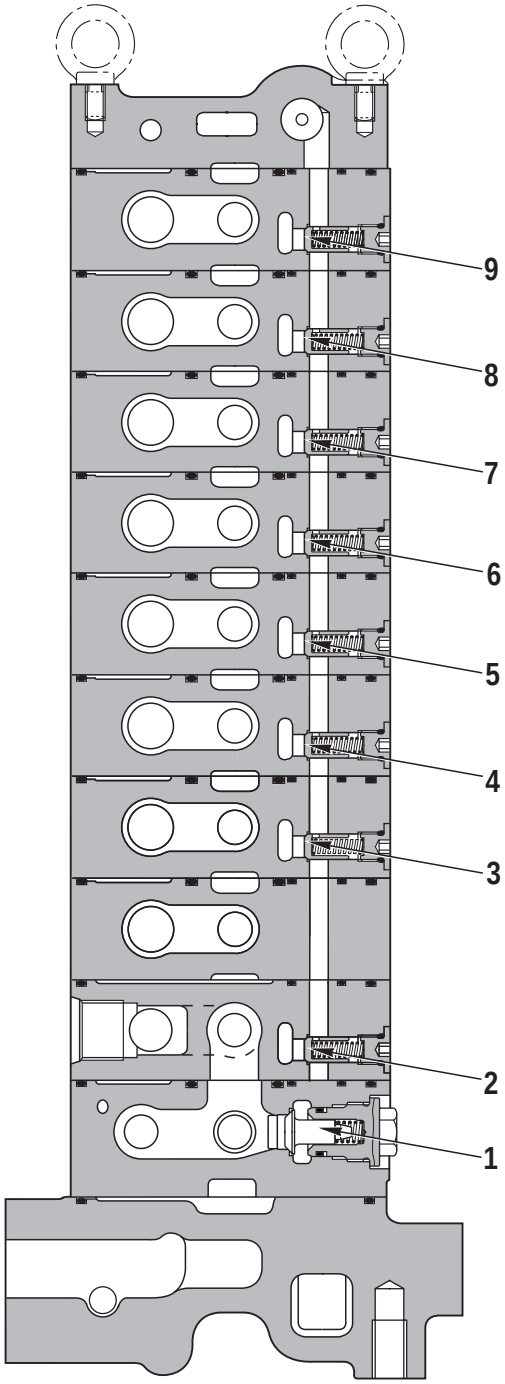
- When the control lever is moved to full-stroke, in other words, as the opening area of the control valve becomes large, the difference of the pump pressure **P_{PLS}** and the **LS** pressure **P_{LS}** (**LS** differential pressure **ΔP_{LS}**) becomes smaller.
- **LS** pressure **P_{LS}** introduced to the spring chamber **B** of the **LS** valve becomes more or less the same as the pump pressure **P_{PLS}** and the spool (6) is pushed to the left side (←) by the combined force of the **LS** pressure and the spring (4), closing the Port **C** and forming a path between the Ports **D** and **E**.
- Therefore, the pressure oil functioning to the chamber **X** at the large diameter side of the servo piston (1) flows to the Port **D** from the Port **E**, and then to the **PC** valve.
- At this time, since the Port **E** of the **PC** valve is open to the drain inside the pump case through the inside of the piston, pressure in the chamber **K** of the large diameter side of the servo piston also becomes to the drain pressure.
- By this, the servo piston (11) is moved to the max. swash plate angle side (←) by the pump pressure **PP** functioning to the chamber **J** at the small diameter side.

- When the load is large and pump discharge pressure **PP** is high, the force pushing spool (3) to the left becomes larger and spool (3) moves to the position shown in the diagram above.
  When this happens, as shown in the diagram above, part of the pressurized oil from port **X** passes through the **LS** valve, flows out from port **C** to port **D**, and the pressurized oil flowing from port **C** to the **LS** valve becomes approximately 3/5 of main pump pressure **PP**.
- When port **E** and port **G** of the **LS** valve are connected (see (1) **LS** valve), the pressure from port **J** enters the large diameter end of servo piston (9), and servo piston (9) stops.
- If main pump pressure **PP** increases further and spool (3) moves further to the right, main pump pressure **PP** flows to port **B** and port **C** and acts to make the discharge amount the minimum. When piston (9) moves to the left, piston (7) is moved to the left. For this reason, springs (4) an(6) are compressed and push back spool (3).
  When spool (3) moves to the left, the opening of port **C** and port **D** becomes larger. As a result, the pressure at port **C** (=**J**) drops, and piston (9) stops moving to the left. The position in which piston (9) stops when this happens is further to the left than the position when pump pressure **PP** is low.
- The relation of pump pressure **PP** and the position of servo piston (9) forms a bent line because of the double-spring effect of springs (6) and (4). The relationship between pump pressure **PP** and pump discharge amount **Q** is shown in the figure on the right.



- If command current **X** sent to solenoid (1) increases further, the relationship between pump pressure **PP** and pump discharge amount **Q** is proportional to the pushing force of the **PC-EPC** valve of output pressure. In other words, if the pushing force of output pressure is added to the force pushing to the left because of the pump pressure applied to the piston (2), the relationship between **PP** and **Q** moves from **1** to **2** in accordance with the increase.





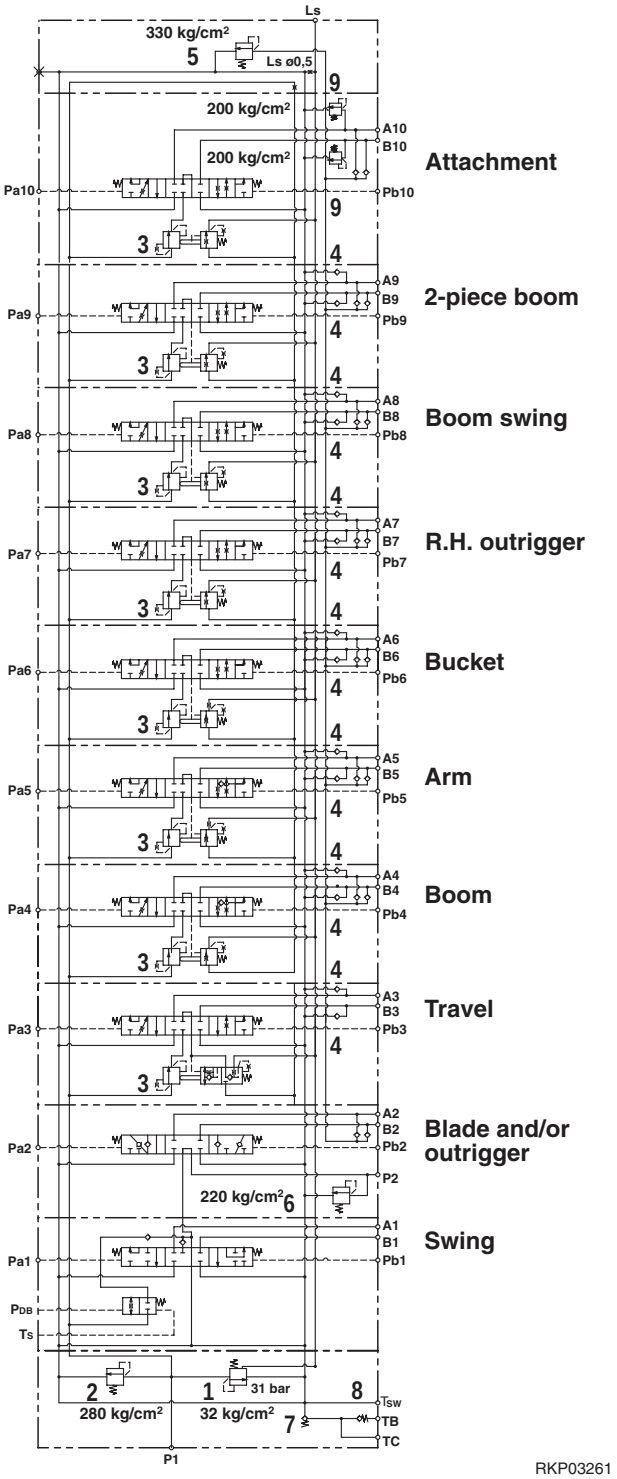
Section D – D

RKP03200

1. Swing check valve
2. Blade check valve
3. Boom check valve
4. Arm check valve
5. Bucket check valve
6. Outrigger check valve
7. Boom swing check valve
8. 2-piece boom check valve
9. Attachment check valve

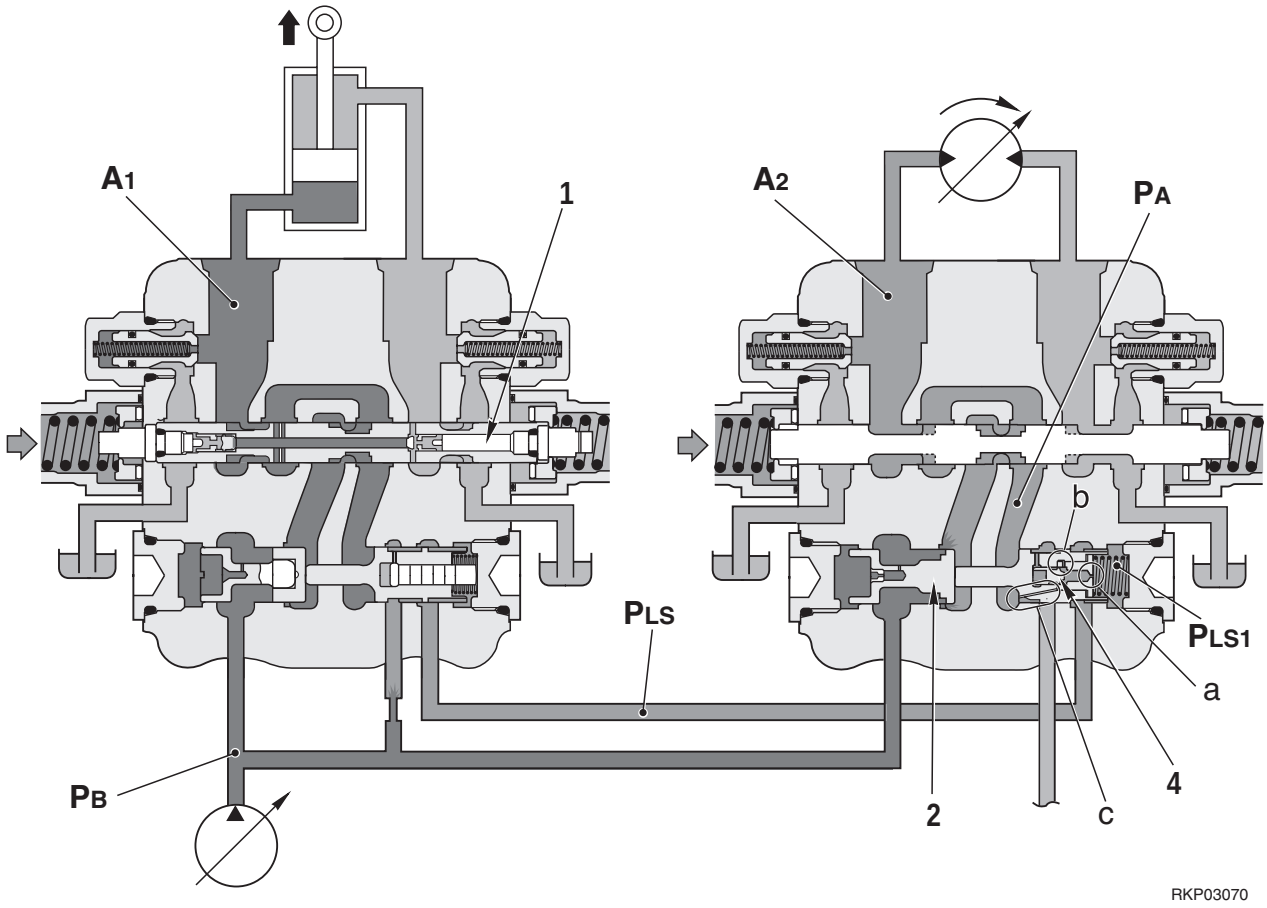
3. Operation for each function and valve

Hydraulic circuit diagram and names of valves



RKP03261

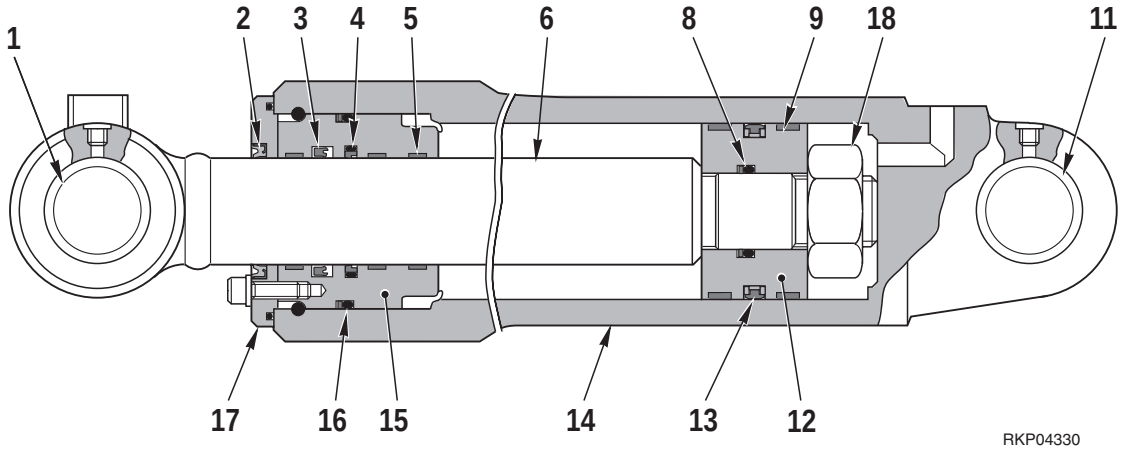
1. Unload valve
   LS pressure + 23 bar (25 kg/cm^2)
2. Main relief valve (P1 port)
   294 bar (300 kg/cm^2)
3. Pressure compensation valve
4. Suction valve
5. Safety valve
   324 bar (330 kg/cm^2)
6. Main relief valve (P2 port):
   216 bar (220 kg/cm^2)
7. Lift check valve
8. Cooler bypass valve
   opening pressure: 8.1 bar (8.3 kg/cm^2)
9. Safety valve: 196 bar (200 kg/cm^2)



When the travel and another actuator are operated together

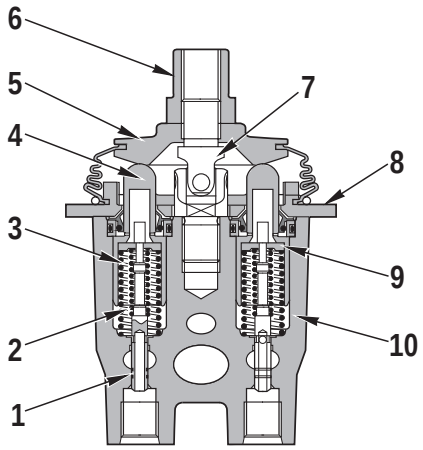
- When the boom spool (1) is operated, the pressure in the **LS** circuit P_{LS} becomes same as the boom circuit pressure A_1.
- Since the pressure in the boom RAISE actuator circuit is normally higher than that of the travel actuator ($A_1 > A_2$), the pressure in the spring chamber P_{LS1} in the reducing valve (2) at the travel side is higher than the travel circuit pressure (P_A).
- Therefore, the pressure reducing valve (2) moves to the left (←) side, and the **LS** pressure in the spring chamber P_{LS1} from the orifice **a** pushes and opens the check valve (4), and flows to the travel circuit P_A through the path **b** and the path **c**.
- Thus, the **LS** circuit pressure P_{LS}, which has been the same as the boom circuit pressure A_1, flows to the travel circuit A_2 and lowers.

2-PIECE BOOM

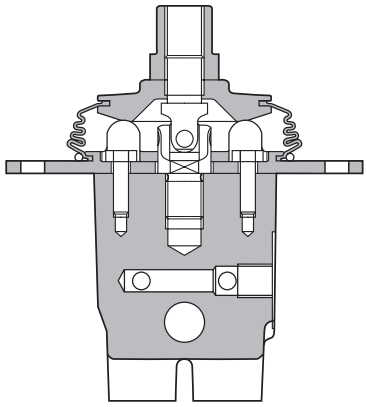


1. Head bushing
2. Snap ring
3. Gasket
4. Gasket
5. Guide ring
6. Piston rod
7. Head cushion plunger
8. Gasket
9. Guide ring
10. Half flange (No. 2)
11. Bottom bushing
12. Bottom bushing
13. Gasket
14. Cylinder
15. Cylinder head
16. Gasket
17. Clamping flange
18. Nut
19. Bottom cushion plunger
20. Ball (No. 12)

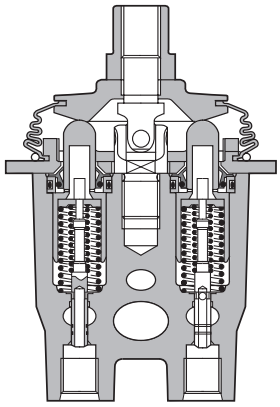
Cylinder	Boom	2-piece-boom	Arm	Bucket	Boom swing	Blade or outriggers
Piston rod size diameter	70	50	60	60	60	60
Cylinder inside diameter	120	90	100	90	100	120
Piston stroke	770	580	900	800	650	185
Max. cylinder length	1990	1510	2230	1970	1650	710
Min. cylinder length	1220	930	1330	1170	1000	525
Piston nut width across flat	—	60	70	—	—	—



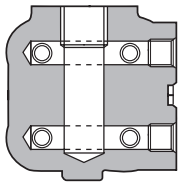
Section A – A



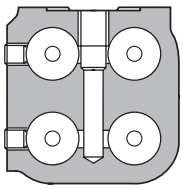
Section B – B



Section C – C



Section D – D

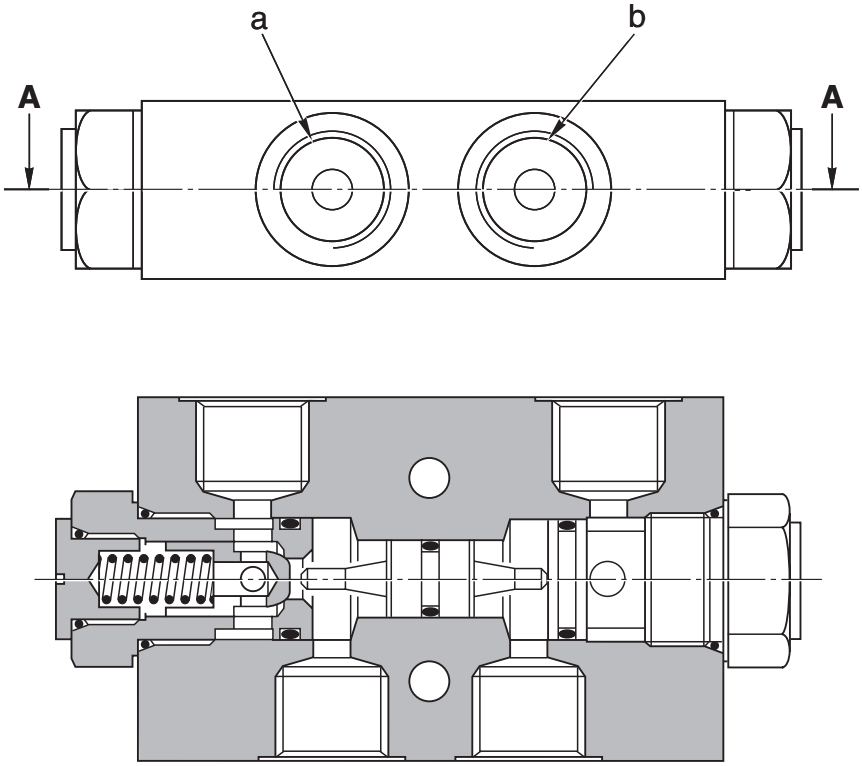


Section E – E

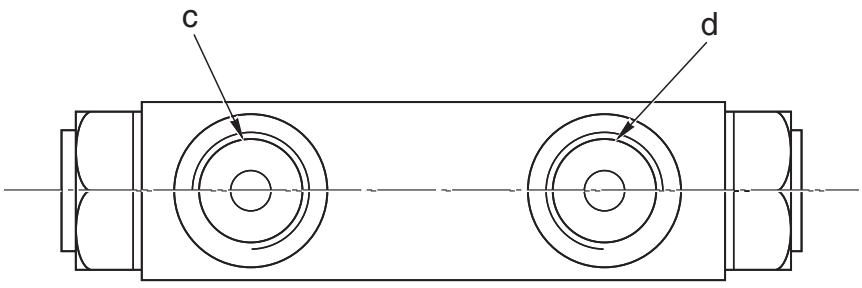
RKP01080

1. Spool
2. Adjusting spring (internal)
3. Return spring (external)
4. Plunger
5. Disc
6. Nut
7. Joint
8. Cover
9. Pin
10. Body

BLADE OR OUTRIGGER SAFETY VALVE



Section A – A

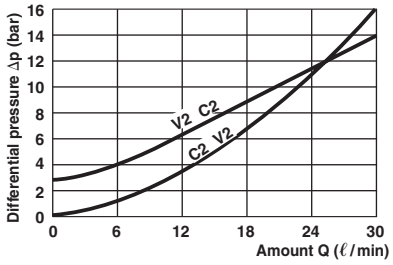


RKP03760

a. V2 Port - See hydraulic circuit
b. V1 Port - See hydraulic circuit
c. C2 Port - To blade or outrigger (Bottom side)
d. C1 Port - To blade or outrigger (Head side)

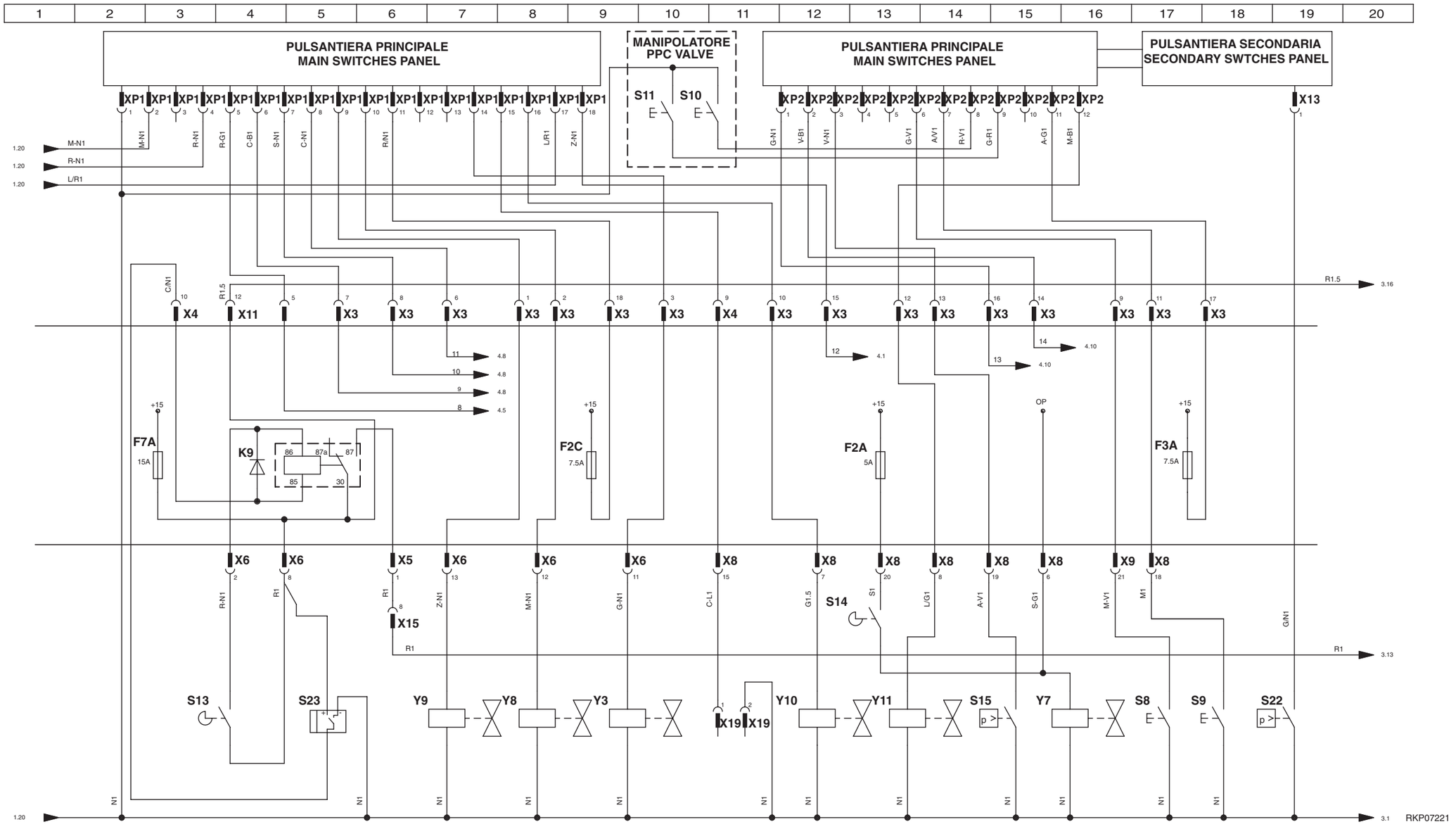
SPECIFICATIONS

Start opening: 7:1



RKP04541

ELECTRICAL DIAGRAM (2/4)



COMPONENTS

K9 - STOP LIGHT RELAY
S8 - HAMMER PEDAL BUTTON
S9 - PLIERS BUTTON
S10 - HAMMER BUTTON
S11 - JOYSTICK GRAB BUTTON
S13 - BRAKE LIGHT SWITCH
S14 - ARM MICRO SWITCH
S15 - ANTI OVERTURNING PRESSURE SWITCH
S22 - BRAKE PRESSURE SWITCH
S23 - WORKING BRAKE SWITCH
Y3 - WORKING BRAKE SOLENOID VALVE
Y7 - SERVOCONTROL SOLENOID VALVE
Y8 - HAMMER SOLENOID VALVE
Y9 - GRAB SOLENOID VALVE
Y10 - AXLE LOCK SOLENOID VALVE
Y11 - PARKING BRAKE SOLENOID VALVE

CONNECTORS

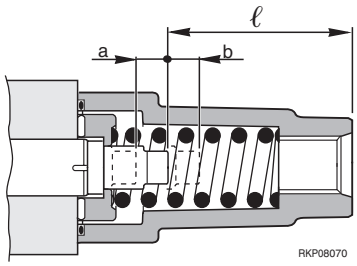
X3 - RIGHT LATERAL DASHBOARD LINE 18 WAY CONNECTOR
X4 - RIGHT LATERAL DASHBOARD LINE 12 WAY CONNECTOR
X5 - ENGINE LINE 11 WAY CONNECTOR
X6 - LIGHTS SWITCH-GEAR SHIFT LINE 13 WAY CONNECTOR
X7 - STEERING INTERFACE LINE 21 WAY CONNECTOR
X8 - LOOM LINE 21 WAY CONNECTOR
X9 - LIGHTS SWITCH-GEAR SHIFT LINE 21 WAY CONNECTOR
X11 - LATERAL DASHBOARD LINE 13 WAY CONNECTOR
X13 - PARKING BRAKE LIGHT 1 WAY CONNECTOR
X15 - ENGINE LINE 11 WAY CONNECTOR
X19 - OPTIONAL PLIERS SOLENOID VALVE 2 WAY CONNECTOR
XP1 - SWITCHES PANEL 18 WAY CONNECTOR
XP2 - SWITCHES PANEL 12 WAY CONNECTOR

FUSES

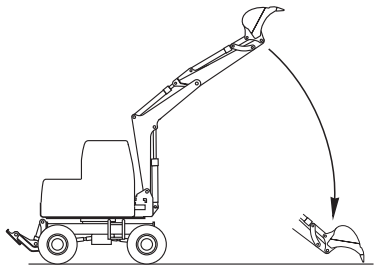
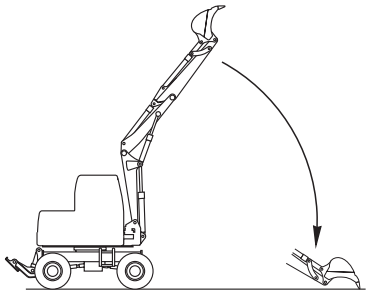
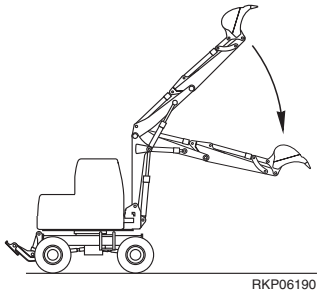
F2A - SERVOCONTROL VALVE FUSE 5A
F2C - BUTTONS RELAYS FUSE 7.5A
F3A - BUTTONS RELAYS FUSE 7.5A
F7A - STOP LIGHT AND HEATER 15A

• FOR MACHINE

All tests, if not otherwise specified, should be performed with WORKING MODE in position P

Machine model				PW95R-2					
Classification	Check item	Test conditions	Unit	Standard value			Permissible value		
Engine	Engine speed with pump P1 at max. pressure	• Hydraulic oil temp.: 45 – 55°C • Engine oil pressure: in correct range • Cooling water temp.: in correct range • Swing lock pin inserted • Max. pressure P1: with boom • Max. pressure P1-P2: with boom and swing boom • Max. pressure P2: with arm and swing boom	rpm	2200			2200±50		
	Engine speed with pump P1 and P2 at max. pressure			2175			2175±50		
	Engine speed with pump P2 at max. pressure			2300			2300±50		
	Engine speed when pumps P1-P2 are at max. pressure and the WORKING MODE selector is in pos. E			2310			2310±50		
Spool travel	Boom		mm	ℓ	a	b	ℓ	a	b
	Arm			45	6.5±0.3	6.5±0.3	45	6.5±0.3	6.5±0.3
	Bucket								
	Swing								
	Blade-outriggers								
	Boom swing								
	2nd boom								
	Travel								
	Attachment								
	Boom double speed								
Travel of levers and pedals	Boom control lever	• At centre of lever knob • Reading at end of travel • Engine stopped • Equipment on the ground	Neutral → Raise / Lower	80±8			70 – 90		
	Arm control lever		Neutral → Extended / Retracted	80±8			70 – 90		
	Bucket control lever		Neutral → Open / Curled	80±8			70 – 90		
	Swing control lever		Neutral → Swing right / Swing left	80±8			70 – 90		
	Blade outriggers control lever		Neutral → Raise / Lower	100±10			85 – 115		
	Fuel control lever		Min. → Max.	135±15			115 – 155		
	Boom swing pedal		Neutral → Swing right / Swing left	20±2			16 – 24		
	2nd boom pedal		Neutral → Open / Closed	30±3			25 – 35		
	Travel control pedal		Neutral → Max.	60±6			50 – 70		
	Brakes pedal		Zero → Max.	30±3			25 – 35		

• FOR MACHINE

Machine model					PW95R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Work equipment	Time lags	Boom (Standard)	Measuring posture  RKP06170 • Engine speed: low idling • Oil temperature: 45 – 55°C • Retract fully the cylinders of the arm and bucket. Lower bucket to ground and measure time taken for chassis to rise from ground.	sec	Max. 2	Max. 3
		Boom (2-piece boom)	Measuring posture  RKP06180 • Engine speed: low idling • Oil temperature: 45 – 55°C • Retract fully the cylinders of the arm and bucket. Extend the 2nd boom fully. Lower bucket to ground and measure time taken for chassis to rise from ground.		Max. 2	Max. 3
		2nd boom	Measuring posture  RKP06190 • Engine speed: low idling • Oil temperature: 45 – 55°C • Retract fully the cylinders of the arm and bucket. Extend the 2nd boom fully. Bring the boom into a vertical position. Close completely the 2nd boom and measure the time taken to increase the pressure.		Max. 2	Max. 3

MEASURING COMPRESSION PRESSURE

⚠ When measuring the compression pressure be careful not to get caught in cooling fan, in the alternator belt or in other rotating parts.
- Check all cylinders.

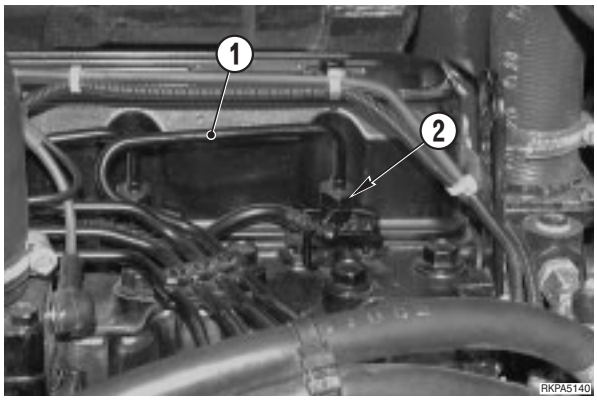
★ Test condition:
- Engine: at operating temperature
- Hydraulic oil: 55 – 60 °C
- Battery: at full charge
- Valve clearance:
  adjusted (see «ADJUSTING VALVE»)

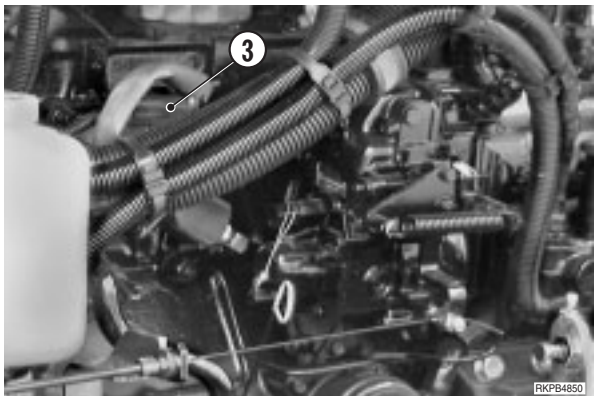
1 - Disconnect high pressure pipe (1).

2 - Remove nozzle holder assembly (2) of cylinder to be checked.

3 - Disconnect connector (3) of fuel cut-off solenoid valve.

4 - Crank engine with starting motor.





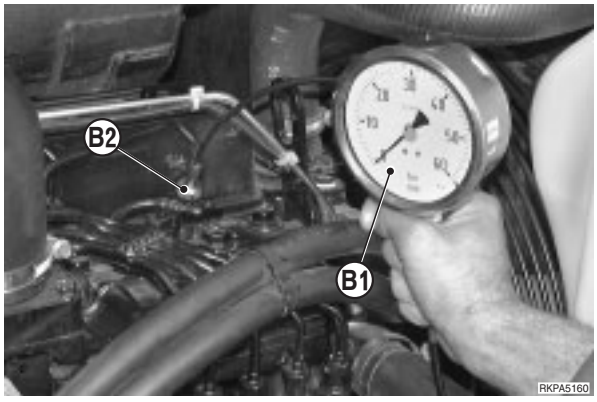
5 - Install **B2** adapter and connect **B1** pressure gauge.
- ★ Check that seal is installed in the adapter and that it is not damaged.

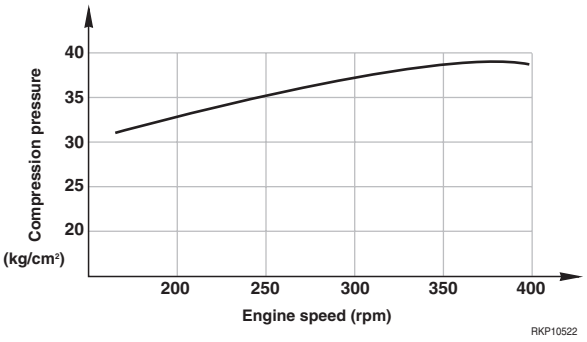
6 - Crank engine with starting motor and measure compression pressure.
- ★ Compression value:
  Normal: 35 – 1 kg/cm^2
  Minimum permissible: 28±1 kg/cm^2 at 250 rpm
- ★ Difference between cylinders: 2 – 3 kg/cm^2

7 - After measuring, install the nozzle holder assembly (2), connect high pressure pipe, feedback pipe and connector (3).

Nm Nozzle holder collar bolts: 6.9 – 8.8 Nm

Nm High pressure union: 19.6 – 24.5 Nm





5. Bleeding air from the Load Sensing circuit

★ When removing the priority valve or the steering unit on starting up the machine, air must be bled from the Load Sensing circuit. The procedure is as follows:

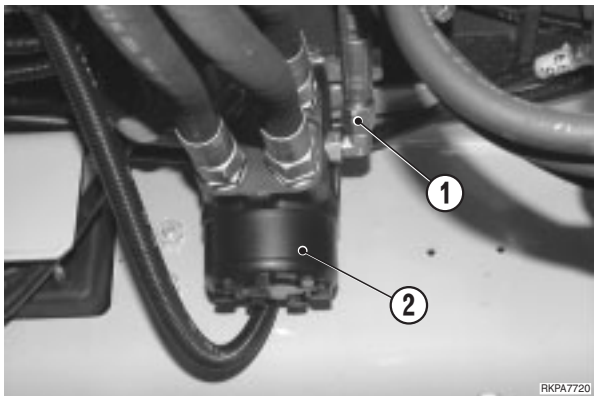
1 - Start the engine and leave it running at low idling speed.

2 - Loosen the outgoing union (1) of the steering unit (2).

3 - Start turning the steering wheel slowly, and continue until oil runs out of the union (1) without a trace of air.

4 - Stop turning the steering wheel and tighten the union (1).

★ After the bleeding operation and before starting to travel, execute a complete steering action with both axles.



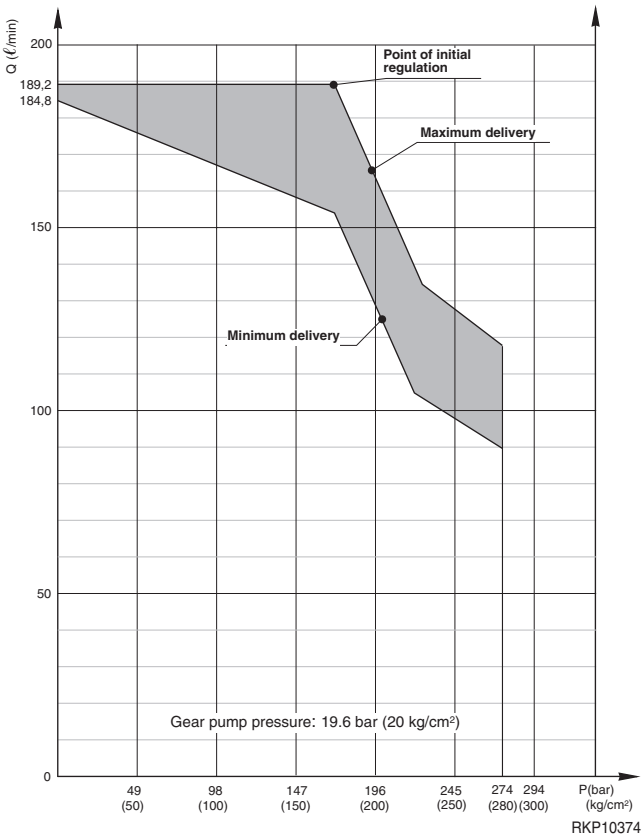
3 - Check the flow – pressure values against the values of «P MODE» diagram as shown on «TECHNICAL SPECIFICATION» making if necessary, the proportional calculating to obtain the flow values referred to 2200 rpm/min. necessary to make the control.

If the measured values are lower than those permissible, it is necessary to overhaul or to replace the pump.

NOTE: Making the flow readings each 9.8 bar (10 kg/cm^2), also the initial pump regulation is made, that, in the operating mode «P», corresponds to a pressure of 196 bar (200 kg/cm^2).

4 - Turn the WORKING MODE selector on position **E** and repeat the checks comparing the flow values with «E MODE» curve.

5 - Raise the working attachments, turn the WORKING MODE selector on position **P** and start the upper structure rotation; keeping the lever to the end of stroke, make the flow-pressure measurements and compare the values with the «P MODE» curve.



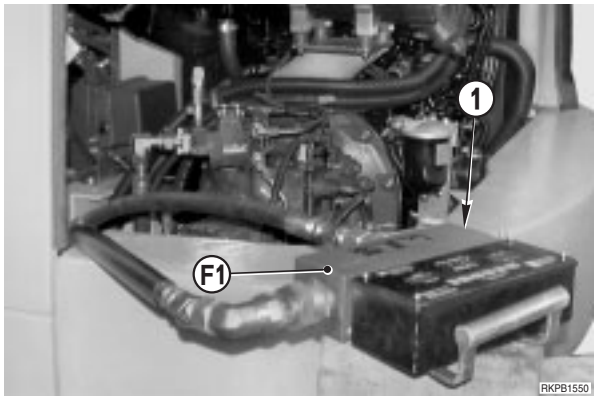
3. Measurement of pump P2

1 - Start the engine and bring it at idling of 2200 rpm/min.

2 - Adjust the delivery pressure with flowmeter knob (1) at 29.4 bar (30 kg/cm^2).

3 - Check the flow – pressure values against the values shown on «TECHNICAL SPECIFICATION» making if necessary, the proportional calculating to obtain the flow values referred to 2200 rpm/min necessary to make the control.

If the measured value is lower than that permissible, it is necessary to overhaul or to replace the pump.



BLEEDING AIR FROM THE BRAKE LINES

★ Bleed air from both axles.

1 - Start the engine and put it into low idling.

2 - Engage and release the working brakes several times, until the accumulators of the brake line are completely recharged.

3 - Stop the engine.

4 - Return the ignition key to position **«I»** and press the button that engages the working brakes.

5 - Attach a transparent flexible hose (1) to the bleeding screws (2) in order to collect the oil.

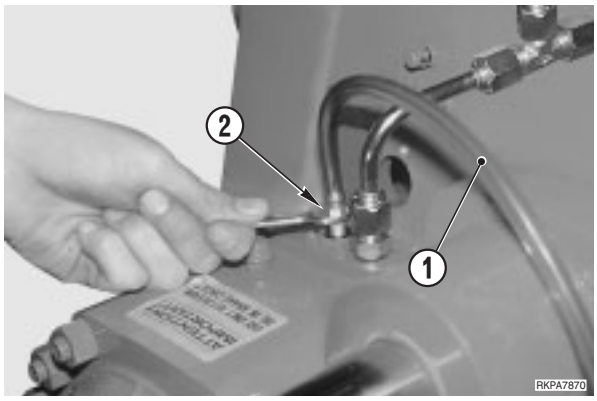
6 - Slowly loosen by a half turn the bleeding screw (2) of one brake group until oil runs out of the screw without any trace of air.

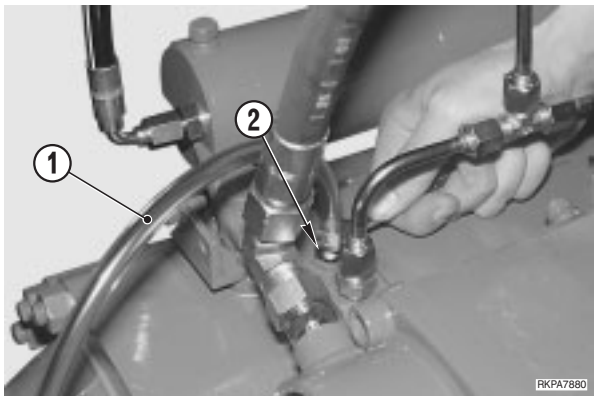
7 - Tighten the screw (2).

8 - Repeat the bleeding operation for the other brake group.

★ If the level in the accumulators drops during the bleeding operation, and the warning light for low brake oil pressure comes on, interrupt the bleeding operation and recharge the accumulators.

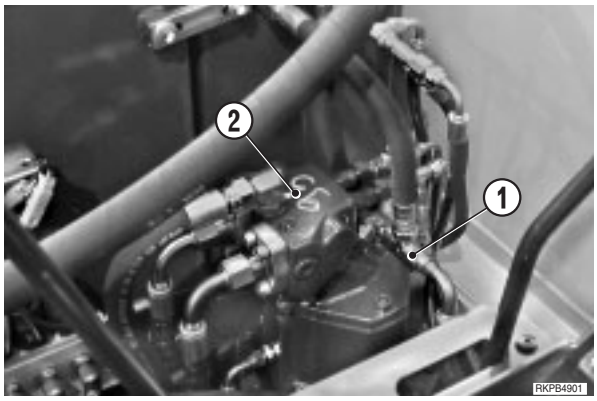
★ Once the bleeding operation is concluded, replace the protective caps over the screws (2).





MEASUREMENT OF INTERNAL OIL LEAKAGES IN THE SWING MOTOR

★ Test conditions:
- Engine: at working temperature
- Hydraulic oil: 45 – 55°C
- WORKING MODE selector: position P
- Revolving frame: secured by the rotation-blocking pin.



1 - Disconnect the drainage hose (1) of the motor (2).

2 - Attach a provisional hose to collect the drainage oil.

3 - Start the engine and bring it up to high idling speed.

4 - Push the swing control lever as far as it will go.

5 - Hold it in this position for 30 seconds and then measure the oil leakage for the next minute.

6 - Reduce motor speed to low idling, swing the revolving frame 180° and repeat the measurement.

7 - Check that the average between the two measurements falls within the normal range. (See «TECHNICAL DATA»).

8 - Re-assemble the hydraulic drainage circuit.

9. Blade test

1 - Position the machine with the arm vertical and resting on the ground, and with the bucket resting on its back.

2 - Bring the blade to roughly half its potential stroke and support it on a block, height 28 cm, placed in the centre.

3 - Stop the engine and release any residual hydraulic pressure.

4 - Disconnect from both safety valves (1) union (2) and pipe (3) that connect them to the cylinder (4). Plug the valves to prevent entry of any impurities.

5 - Plug the tube (3) on the head side of just one cylinder (4) and attach a provisional tube on the base side of the same cylinder to collect any leakages.

★ The second cylinder should be left completely free.

6 - Start the engine, push down with the boom to raise the machine in order to remove the block on which the blade is resting.

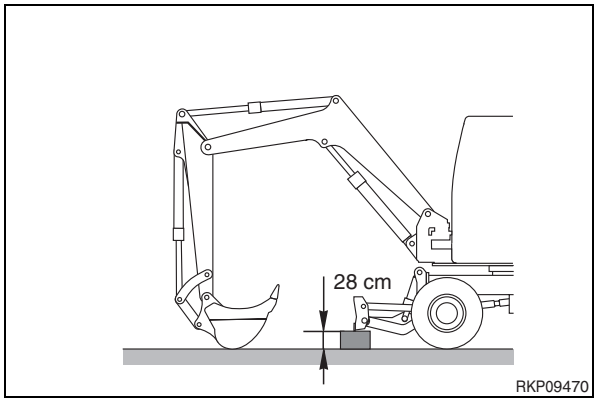
7 - Lower the machine and stop the engine.

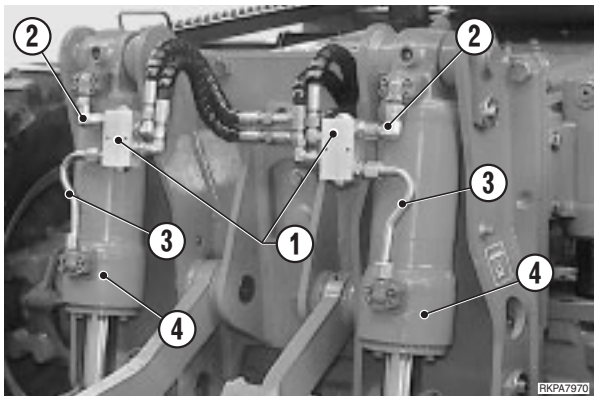
8 - Check the position of the blade for 5 minutes.

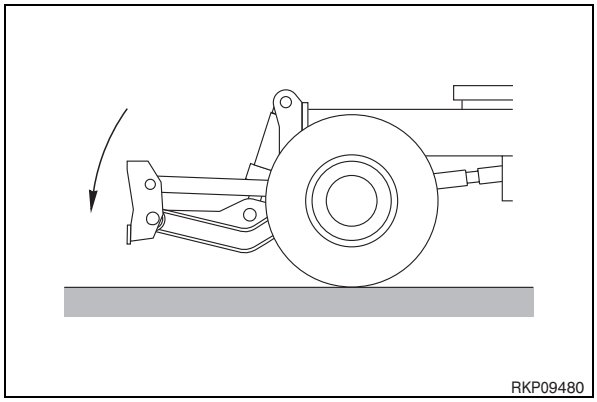
- If the blade tends to sink, the drift is due to the cylinder (4).
- If the blade does not tend to sink, the drift is due to the safety valve group (1).

★ To discover whether or not the drift is due to the swivel joint, see «CHECKING FOR LEAKAGES INSIDE THE SWIVEL JOINT - CIRCUITS FOR OUTRIGGERS AND BLADE».

9 - To test the other cylinder repeat these operations, starting from point 5.







SPECIAL TOOLS

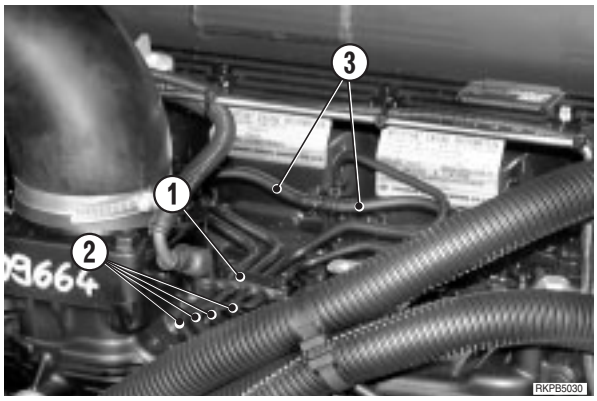
Nature of work	Symbol		Code	Description	Q.ty	Notes
Removal/Installation revolving frame Installation of swing machinery for revolving frame	A	1	ATR201320	Coupling for brake and swing release	1	—
		2	ATR200400	Rear raising equipment	1	—
		3	ATR200410	Front raising equipment	1	—
Removal/Installation of counterweight Removal of wheels Disassembly/Assembly of cylinder nut	B	1	ATR800230	Dynamometric wrench with multiplier	1	Max. 700 kgm (700 dNm)
Assembly travel motor	C	1	ATR501290	Tool	1	Rotating unit assembly
		2	ATR501300	Tool		For central pin clearance checking
		3	ATR501310	Tool		Gasket, spacer, circlip assembly
Removal/Installation of swing circle	D	1	ATR200420	Swing circle raising equipment	1	—
Removal of wheels	E	1	ATR200650	Raising support	1	—
Disassembly/Assembly the cylinders	F	1	ATR200470	Pliers for mounting gaskets	1	All cylinders
		2	ATR200480	ø 50 calibrator	1	To calibrate piston rod gaskets
			ATR200490	ø 60 calibrator	1	
			ATR200500	ø 70 calibrator	1	
		3	ATR200510	ø 90 plunger	1	To calibrate piston gaskets
			ATR200520	ø 100 plunger	1	
			ATR200530	ø 120 plunger	1	
		4	ATR200540	ø 90 calibrator ring	1	To calibrate piston gaskets
			ATR200550	ø 100 calibrator ring	1	
			ATR200560	ø 120 calibrator ring	1	
		5	ATR200570	ø 50 insertion bushing for piston rod	1	To mount flange and head
			ATR200580	ø 60 insertion bushing for piston rod	1	
			ATR200590	ø 70 insertion bushing for piston rod	1	
		6	ATR200600	Pliers for mounting snap-ring	1	All cylinders
		7	ATR800260	Socket wrench (6-point 60)	1	Bucket cylinder
			ATR800250	Socket wrench (6-point 70)	1	Boom and arm cylinder
		8	ATR200610	Tool for disassembly and assembly cylinders	1	All cylinders

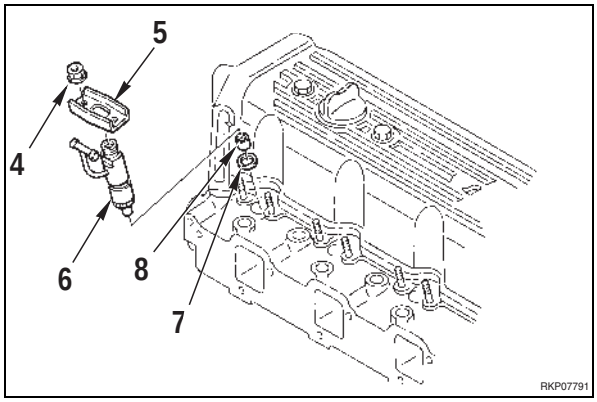
REMOVAL OF NOZZLE HOLDER

1 - Remove suction pipe (1) with union (2). ※1

2 - Remove collar (5) lock nut (4) and remove nozzle holder (6), seat (7) and guard (8).

※2





INSTALLATION OF NOZZLE HOLDER

- To install, reverse the removal procedure.

※1

- High pressure pipe fittings: 24.5 – 35.3 Nm (2.5 – 3.5 kgm)
- Collar screw: 9.8 – 11.8 Nm (1 – 1.2 kgm)

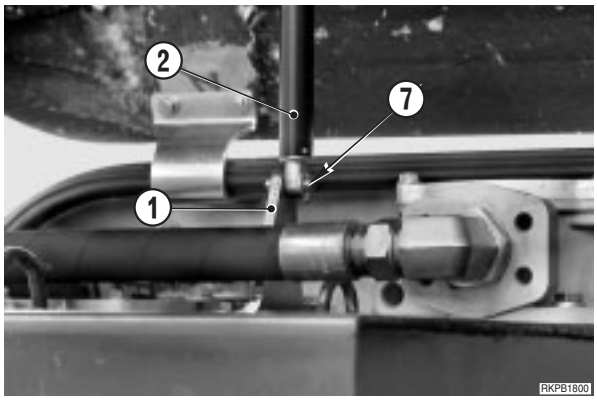
※2

- Collar lock nuts: 9.8 – 11.8 Nm (1 – 1.2 kgm)

REMOVAL OF FRONT HOOD

⚠ Lower the work equipment until it is resting on the ground and switch off the engine.

1 - Detach the gas cylinder (2) from the support (1).

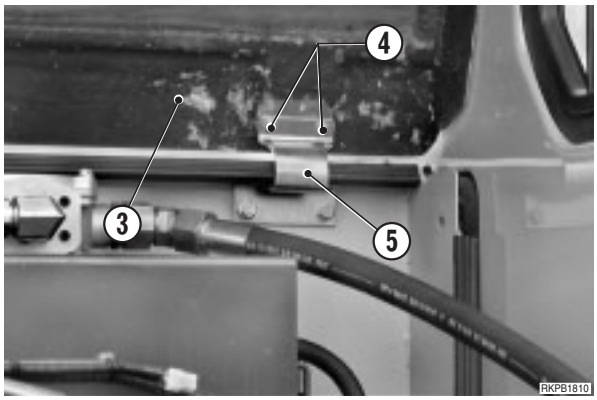


2 - While holding up the hood (3) remove the screws (4) that attach the hood (3) to the hinges (5).

※1

★ Mark the position of any shims.

kg Engine hood: 27 kg



INSTALLATION OF FRONT HOOD

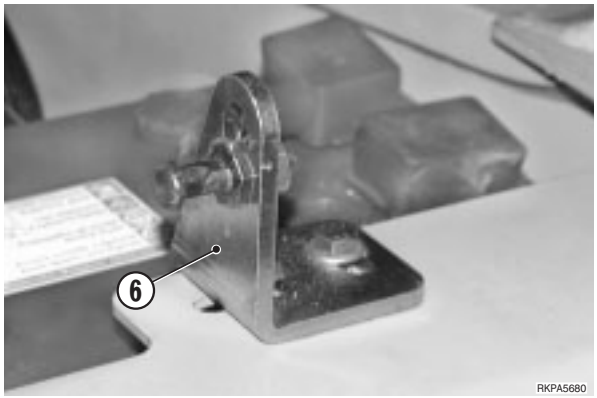
- To install, reverse the removal procedure.

※1

★ Check the centering and adjustment of the closing hook (6).

★ Position any shims.

⚠ Replace the cotter pins (7).



INSTALLATION OF ENGINE-PUMP GROUP

- To install, reverse the removal procedure.

1 - Fill the hydraulic oil tank to maximum level.

While filling, bleed air from the main pump piston. (For details, see «20. TESTING AND ADJUSTMENTS»).

Hydraulic oil needed: approx. 74 ℓ

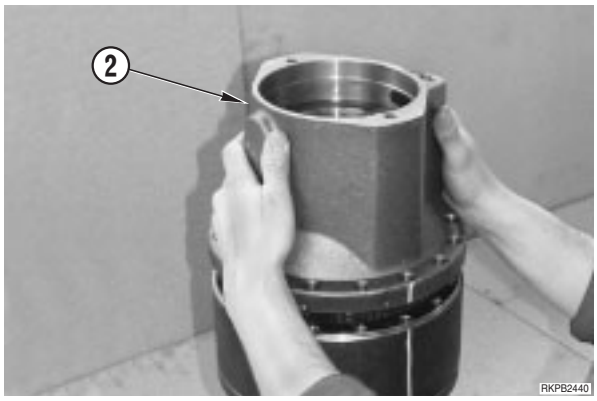
2 - Fill the cooling circuit.

Coolant liquid needed: approx. 18 ℓ

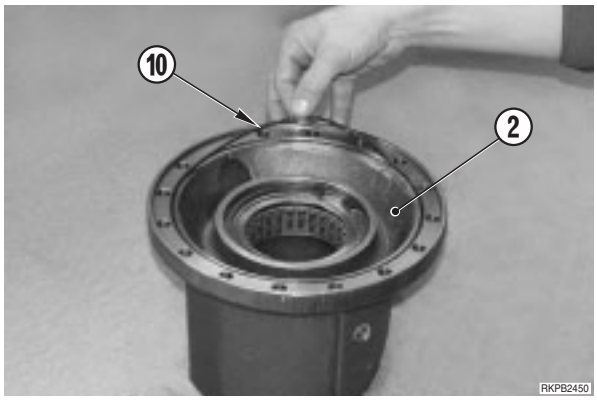
3 - Start the engine to circulate the oil and check that there are no leakages.

4 - Switch off the engine, check the level and, if necessary, top it up.

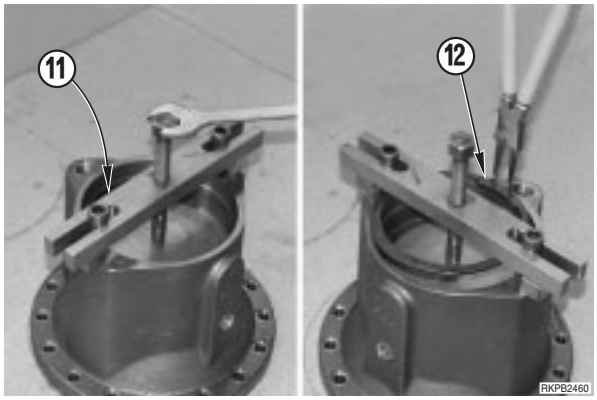
4 - Detach the brake-flange group (2).



5 - Detach the O-ring (10) from the brake unit (2).

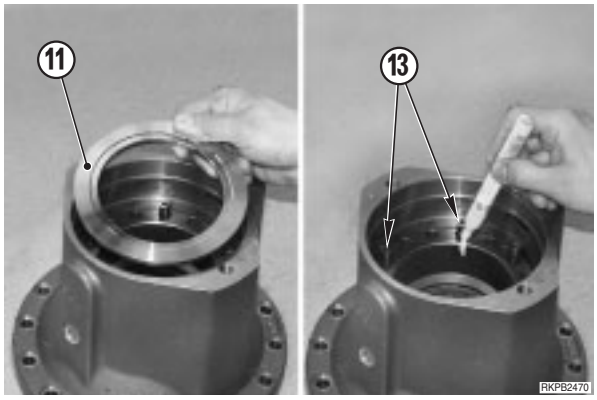


6 - Using a plunger and a pad, press on the spring retainer (11) and remove the snap-ring (12).



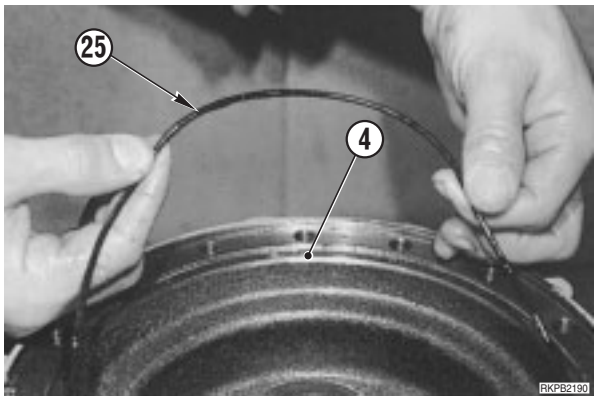
7 - Remove the spring retainer (11).

8 - Mark the position of the springs (13)

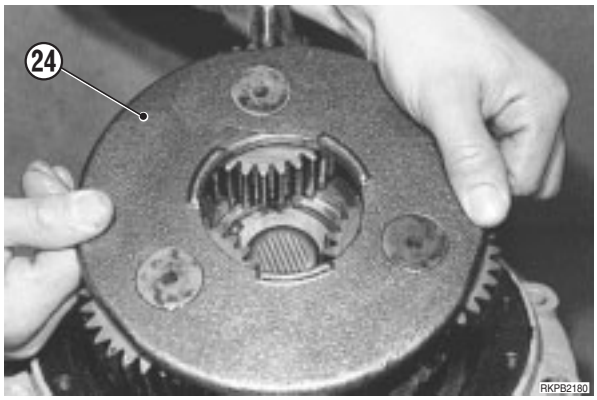


16 - Lubricate the O-ring seating of the gearbox housing (4) and mount the seal (25).

Seating: ASL800050

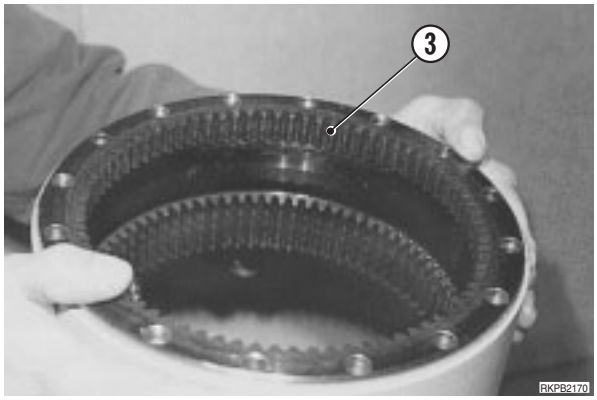


17 - Install the 2nd sun gear groups (24).

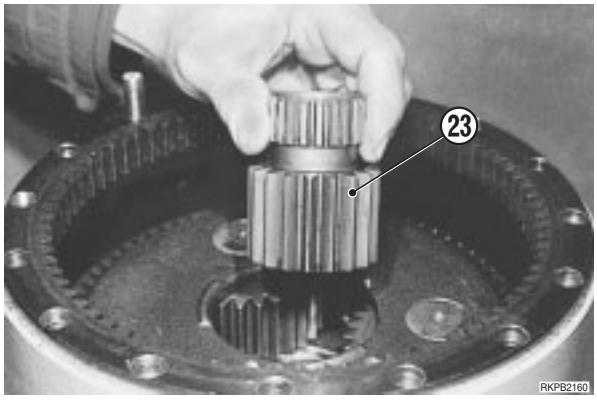


18 - Mount the toothed ring (3).

★ Check the position against the marks made before dismantling.



19 - Mount the pinion (23) of the 2nd sun gear.



REMOVAL OF SWING CIRCLE

1 - Remove the upper revolving frame. (For details, see «REMOVAL OF UPPER REVOLVING FRAME»).

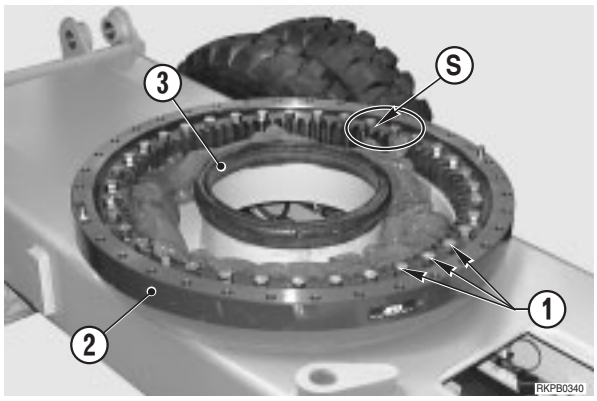
2 - Completely remove all contaminated grease.

3 - Remove the screws (1) that secure the swing circle (2).

4 - Remove the swing circle (2) using the tool **D1**.

※1

Swing circle: 124 kg



INSTALLATION OF SWING CIRCLE

★ Before installing the swing circle, check the condition of the central gasket (3).

⚠ For reasons of safety, when installing the swing circle, insert two screws into the front and back holes in the frame.

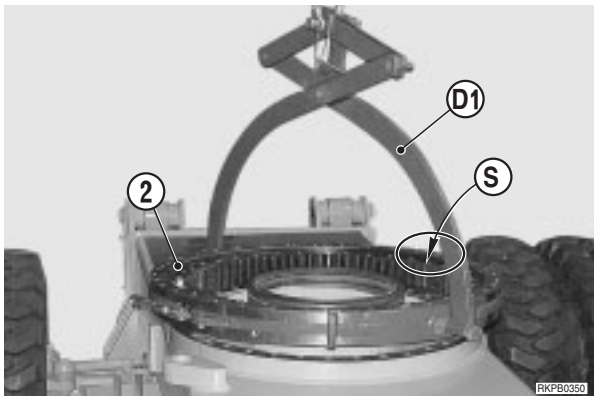
- To install, reverse the removal procedure.

※1

Before attaching the swing circle, check that the area marked with an «S» is positioned on the right-hand side of the chassis.

Attachment screws: Loctite 242

Lubricating grease: approx. 25 kg

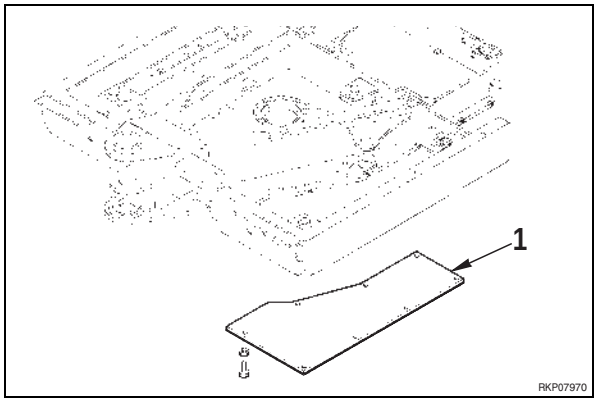


REMOVAL OF THE STEERING UNIT

Lower the work equipment until it is resting on the ground and stop the engine.

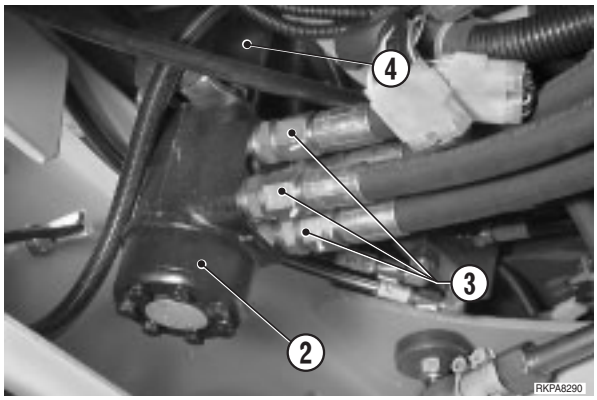
Release all residual pressures from all circuits (For details, see «20. TESTING AND ADJUSTMENTS»).

1 - Remove the LH guard (1) of the revolving frame.



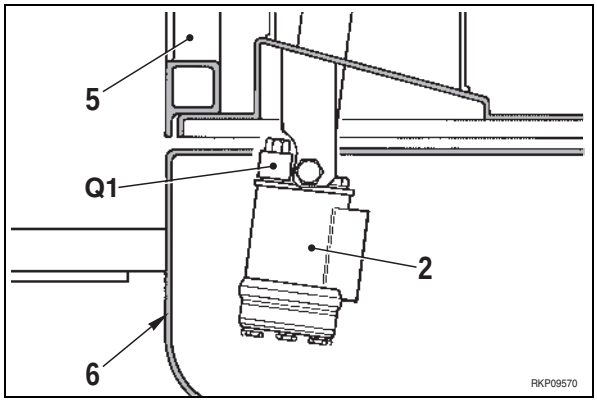
2 - Disconnect the tubes (3) from the steering unit (2).

★ Make some identifying marks on the tubes before disconnecting them, to avoid mixing up the positions when reconnecting.



3 - Using the special wrench **Q1**, remove the screws that fasten the steering unit group (2) to the steering column (4).

★ In order to remove the front screws, attach the special wrench **Q1** to the steering unit (2) and move it with a normal wrench inserted in the lower provided between the cabin (5) and the revolving frame (6).

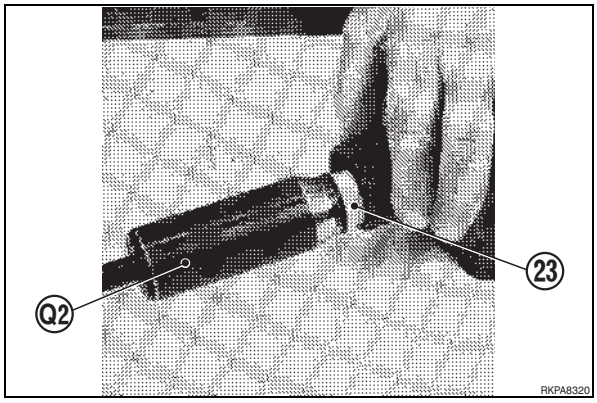


INSTALLATION OF THE STEERING UNIT

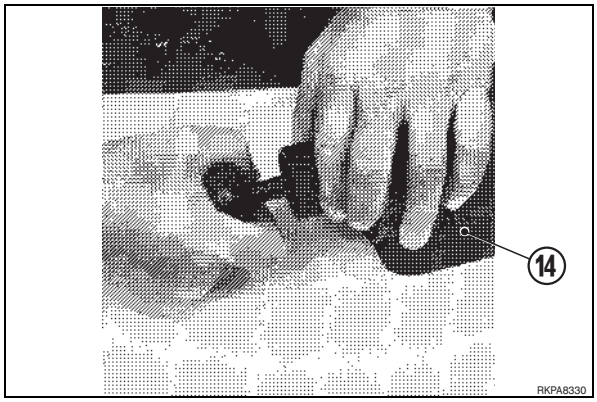
- To install, reverse the removal procedure.

1 - Start the engine and bleed air from the Load Sensing circuit (See «20. TESTING AND ADJUSTMENTS»).

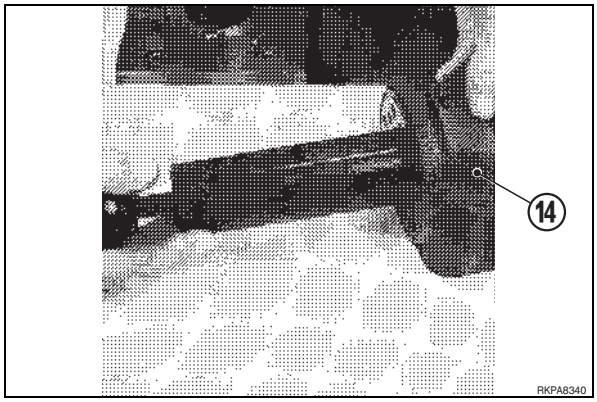
13 - Mount the tool **Q2** and insert it in the guide already inserted in the hole of the steering unit.



14 - Push the gasket (23) into the seating of the body of the steering unit (14), assisting the movement with slight rotatory movements.

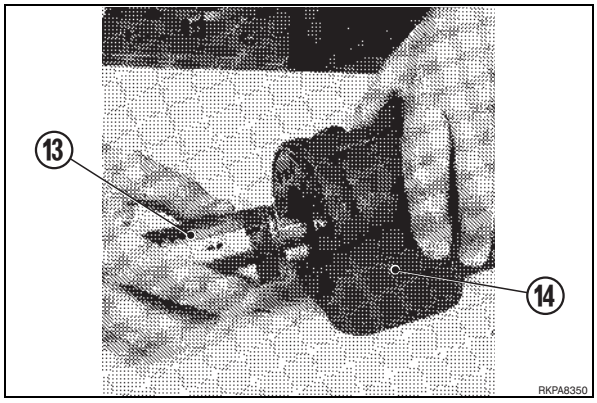


15 - Extract the guide from the body of the steering unit (14) using the tool **Q2**, and leaving in position the push-rod carrying the gaskets.



16 - Insert the bushing/spool group (13) into the hole of the steering unit (14).
Assist the insertion with slight rotatory movements.

★ Insert the group while keeping the cross pin horizontal.



INSTALLATION OF THE TRAVEL MOTOR

- To install, reverse the removal procedure.

※1

Screw: 34 – 41 Nm

※2

★ Before connecting the drainage tube (5), fill the motor casing with hydraulic oil.

※3

★ Carefully check the O-ring seal between motor and transmission. If there are any doubts as to its condition, change it.

Sealant: ASL800050

1 - Start the motor and travel both forwards and backwards at low speed to bleed the system and to check the leaktightness of the tubing.

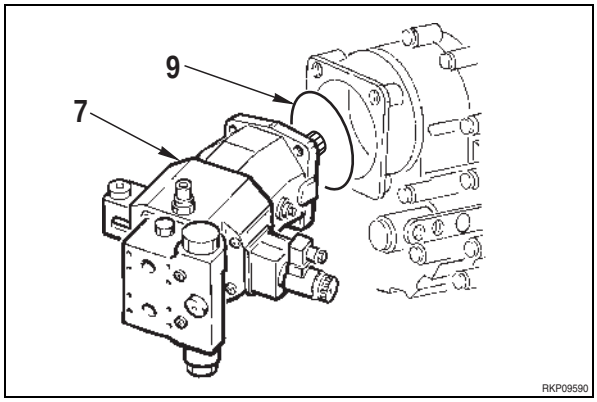
2 - Stop the motor and check the level of oil in the tank.

If the travel motor is to be dismantled for any form of inspection or overhaul, before using the machine again check:

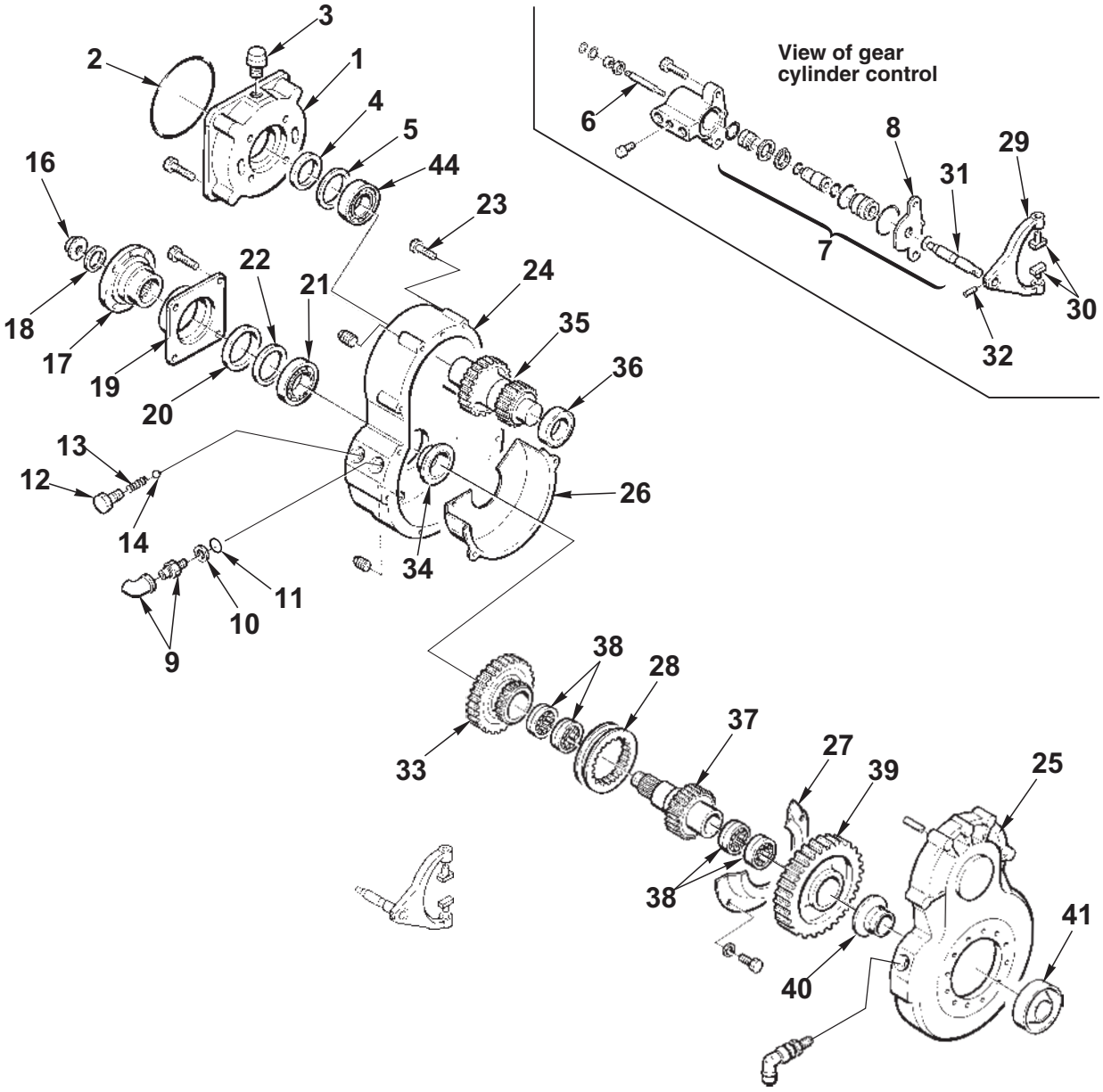
1 - The setting of the automatic displacement control system.

2 - The speed of the travel propeller shaft.

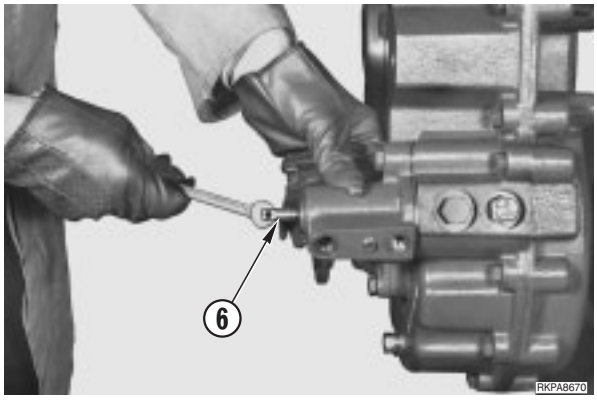
★ For test and adjustment procedures, see «20. TESTING AND ADJUSTMENTS».



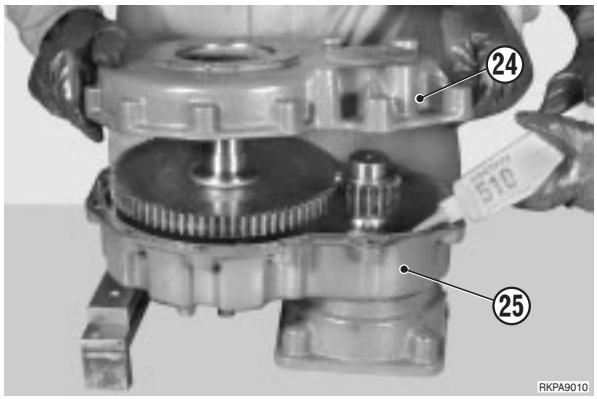
DISASSEMBLY OF THE TRANSMISSION



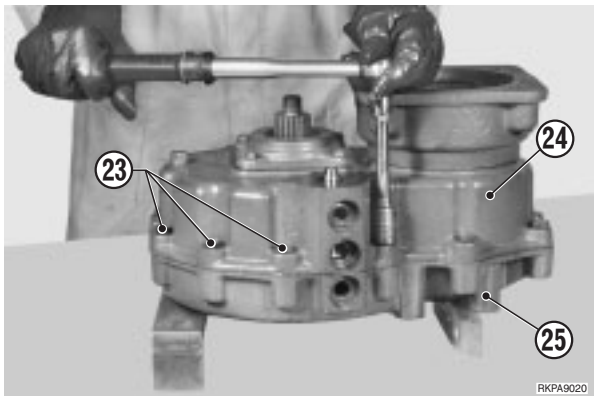
1 - Unscrew and take out the gear control shaft (6).



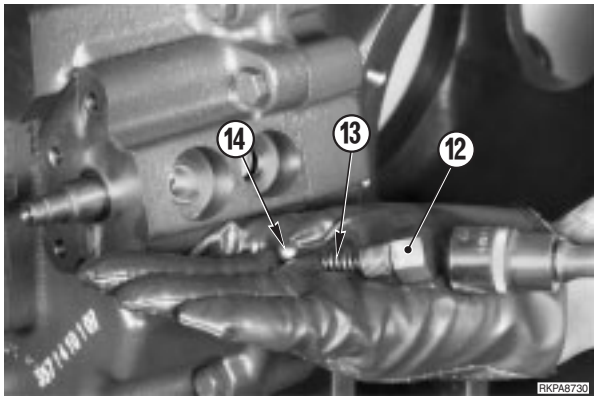
12 - Fit the housing (25) onto the casing (24) making sure to centre the pins.
★ Apply sealant to the surface of cover.
★ Use a plastic hammer to mate.
Cover: Loctite 510



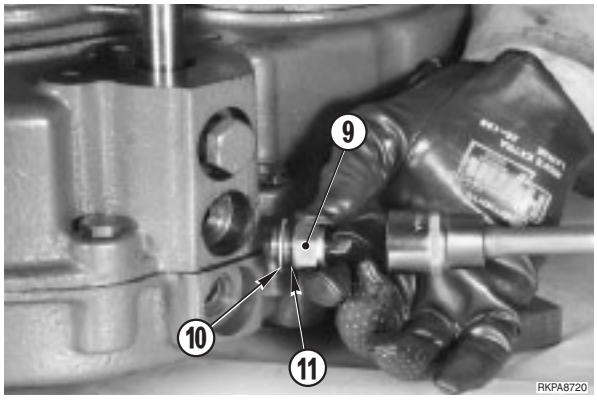
13 - Bolt casing (24) and housing (25) with screws (23).
Screws: 48 – 62 Nm



14 - Lubricate the ball (14), spring (13) and the screw (12) and install the neutral position assembly.
Ball and spring: ASL800050
Screw: 80 – 100 Nm



15 - Fit the in-gear-position microswitch (9), the O-ring (11) and washer (10).
Microswitch: Max. 54.2 Nm



INSTALLATION OF REAR AXLE

- To install, reverse the removal procedure.

1 - Refill the axle with lubricating oil and check tightness.

2 - Start the engine to circulate the oil, recharge the accumulators of the brake line, and check the leaktightness.

3 - Execute a few full steering manoeuvres.

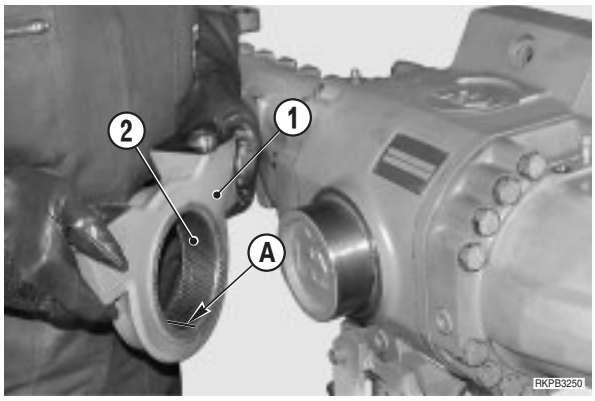
4 - Bleed air from the rear brake line.
(See «20. TESTING AND ADJUSTMENTS»).

5 - Stop the engine and check the level of the oil in the tank.

4. Brakes

1 - Remove the swinging support (1) on the side opposite the drive.

★ If the bushing (2) is worn and needs replacing, note down the assembly side of the connection notch "**A**".

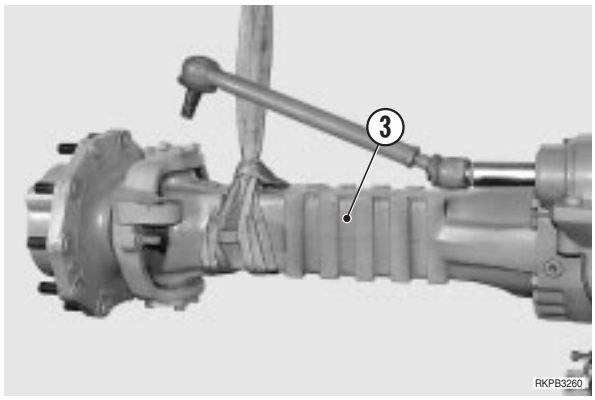


2 - Disconnect the pins of the steering bars from the steering case (See «5. Steering cylinder»).

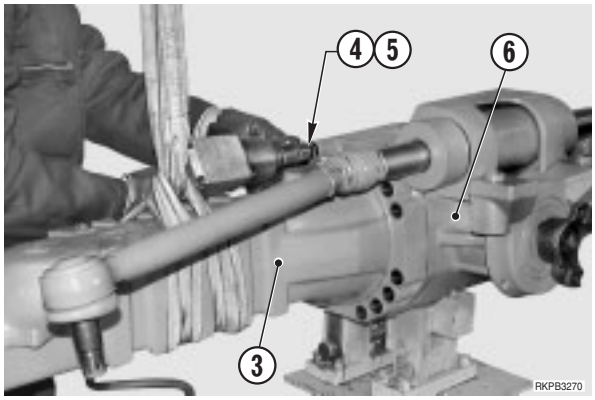
Only for rear axle

3 - Disconnect the negative brake cylinder.

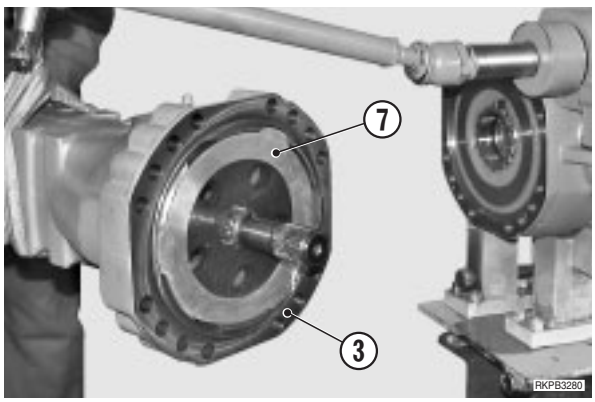
4 - Sling the arm (3) to be removed and put the rod under slight tension.



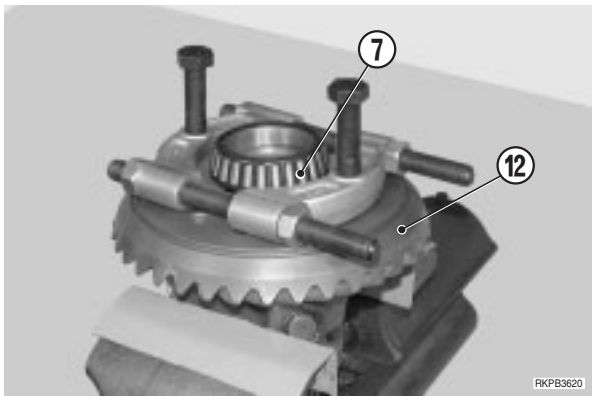
5 - Unloose and remove the screws (4) and the washers (5) that fix the arm (3) to the central body (6).



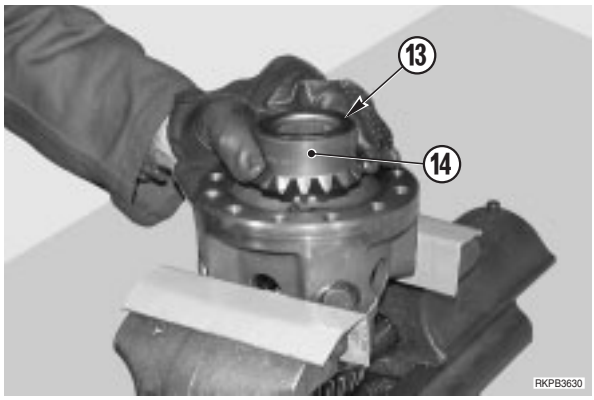
6 - Remove the arm (3) together with the pack of the braking disks (7).
Place the arm on a bench.



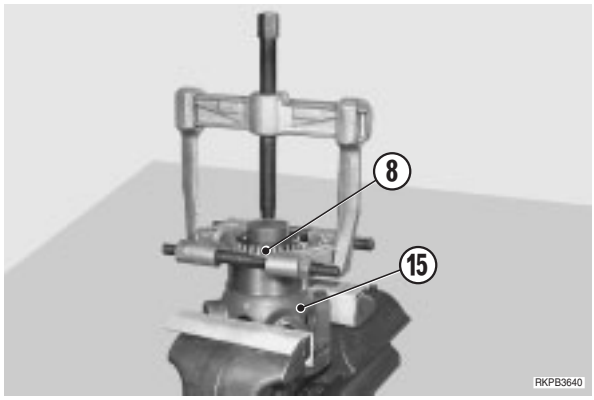
10 - If the bearing need replacing, extract the bearing (7) and remove the crown (12).



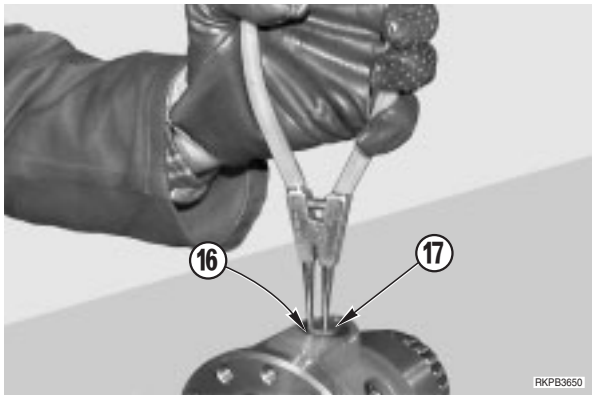
11 - Remove the shim washer (13) and the planetary gear (14).



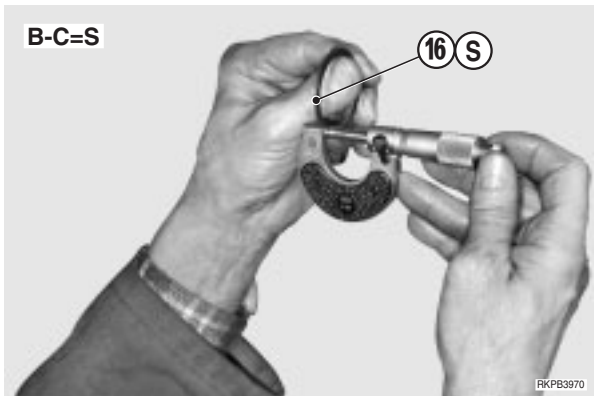
12 - If the bearing need replacing, extract the bearing (8) from the differential carrier (15).



13 - Remove the snap rings (16) from the two pins (17) of the planet wheel gears (18).

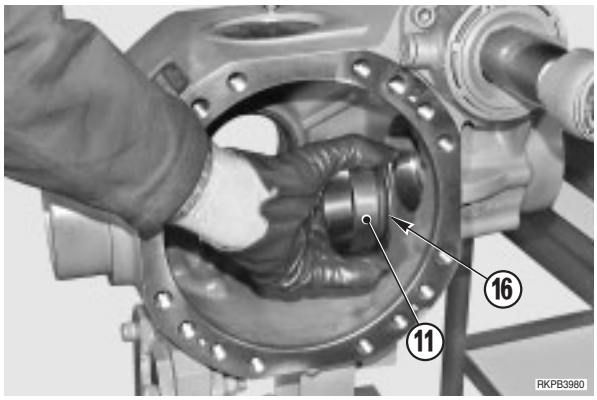


14 - Calculate the difference between sizes "**B**" and "**C**" so as to obtain the size "**S**" of the shim (16) that will go under the thrust block of the internal bearing (11).



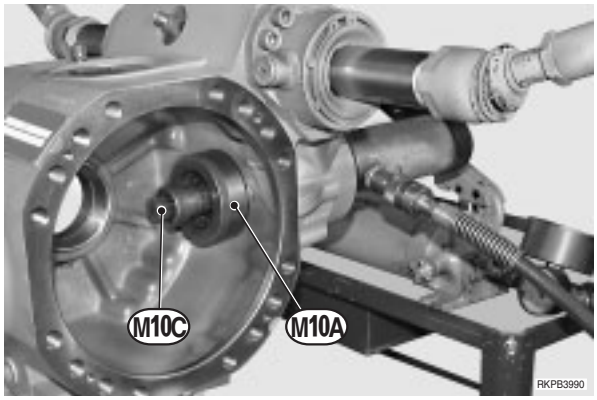
15 - Insert shim "**S**" (16) and the thrust block of the internal bearing (11) in the central body.

★ To hold shim "**S**" (16) in position, apply grease.

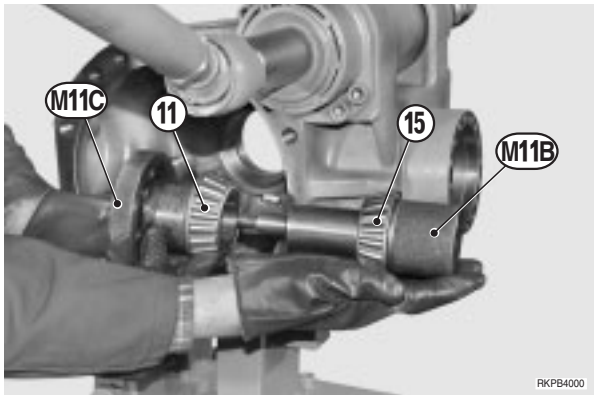


16 - Position tool **M10A** and tension rod **M10C**. Connect the tension rod to the press, fasten the thrust block and then remove the tools.

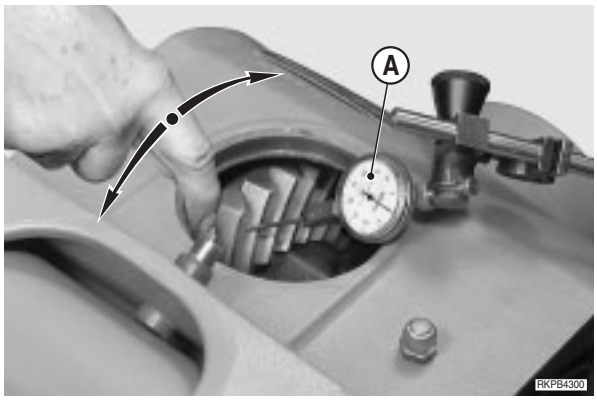
★ Before going on to the next stage, make sure that the thrust block has been completely inserted.



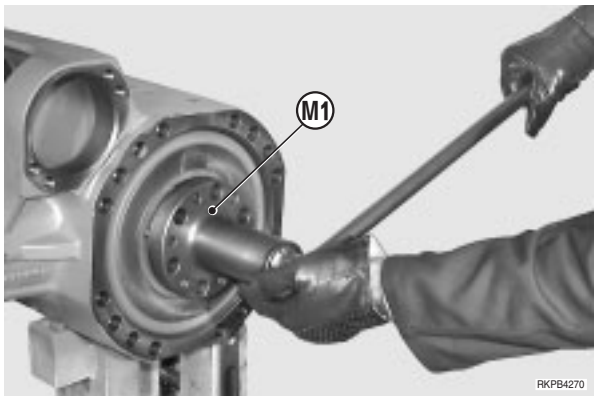
17 - Position tools **M11C** and **M11B** complete with tapered bearings (11) and (15); manually tighten until a rolling torque has been obtained.



21 - Manually move the crown (12) in both directions in order to check the existing backlash between the pinion and the crown.



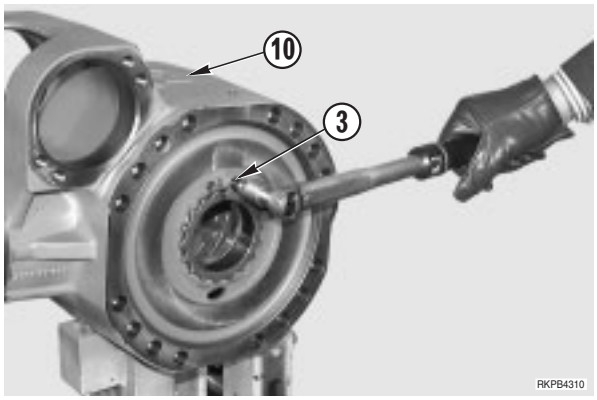
22 - Adjust the backlash between the pinion and the crown by unloosing one of the ring nuts (1) and tightening the opposite to compensate.
- ★ Normal backlash: 0.18 – 0.23
- ★ Difference between MIN. and Max. clearance for whole circumference should not exceed 0.09 mm.



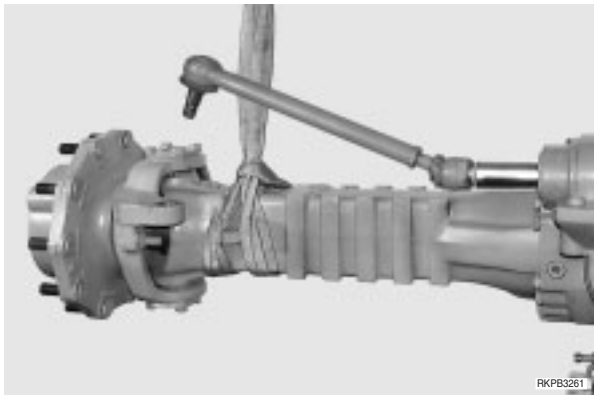
23 - Apply Loctite 242 to the screws (3), fit them into one of the two holes and tighten.

N•1 Torque wrench setting: 23.8–26.2 Nm

24 - Fit the top plug (10) after applying repositionable jointing compound for seals to the rims.

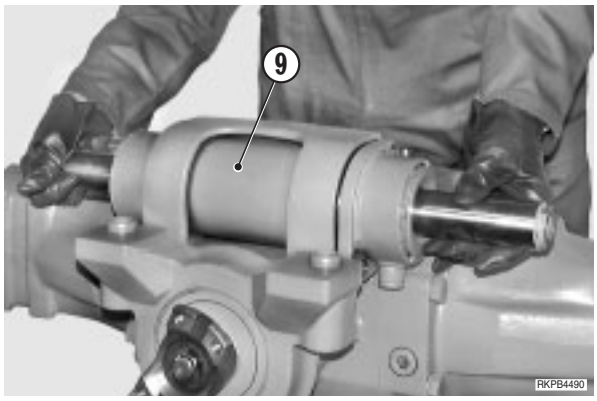


25 - Re-install the complete arms.
For details, see Assembly «3. Brake».



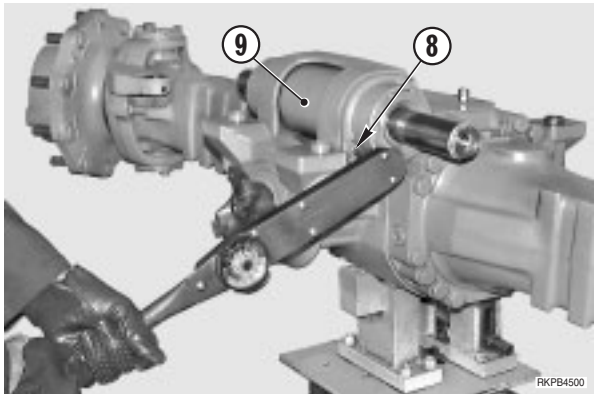
6. Install of steering cylinder

1 - Check that the O-rings (15) of the axle unit are in good condition; lubricate the seats of the seals (15) and fit the steering cylinder (9) into its seat.



2 - Lock the cylinder by cross- tightening the screws (8).

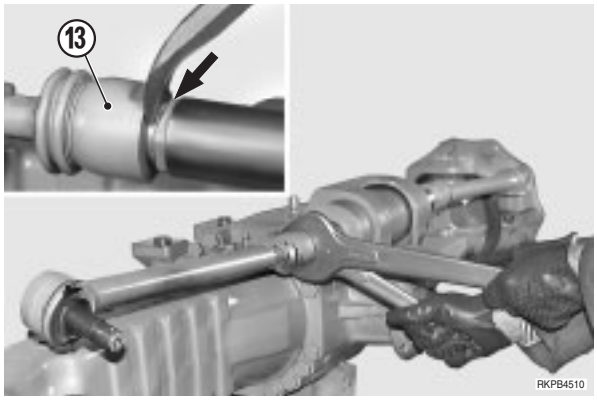
Torque wrench setting: 116–128 Nm



3 - Apply Loctite 242 to the thread and connect the steering bars by screwing the terminals onto the piston stem.

Torque wrench setting: 240–270 Nm

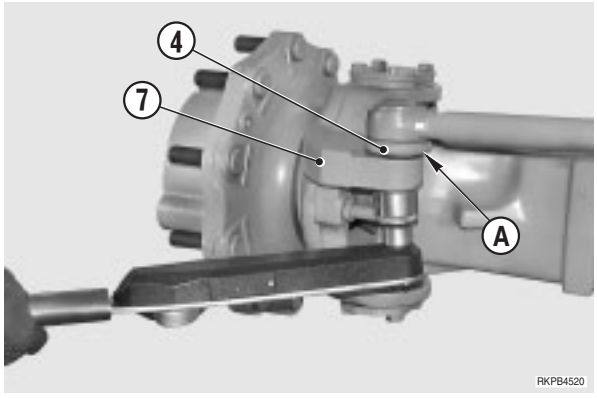
★ Versions with coupling require that the rim of the articulation (13) is riveted onto the surfaces of the piston stem.



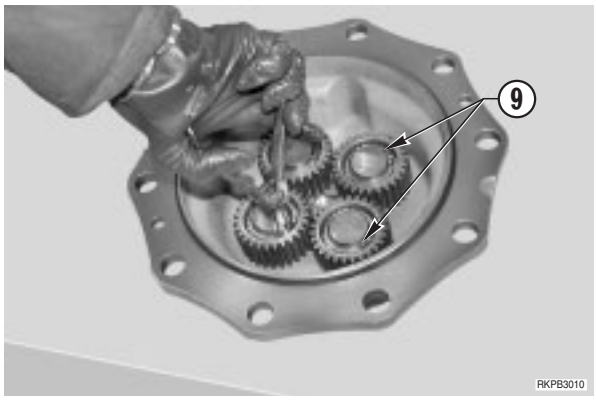
4 - Insert the pins (4) in the steering case (7) and lock into position using a torque wrench setting of 260–290 Nm.

Find the position of the notching in relation to the hole of the cotter pins and tighten the nut (6) further.

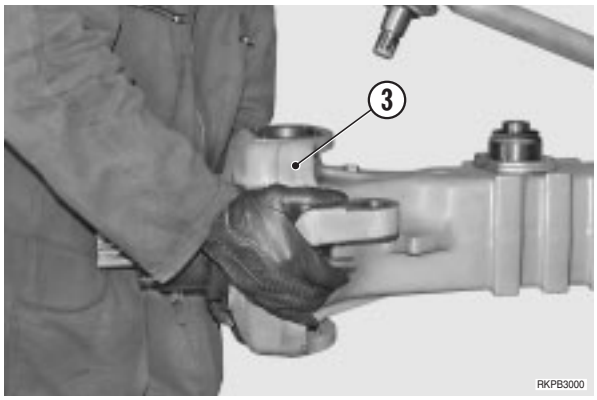
Check that rubber guards (**A**) are intact.



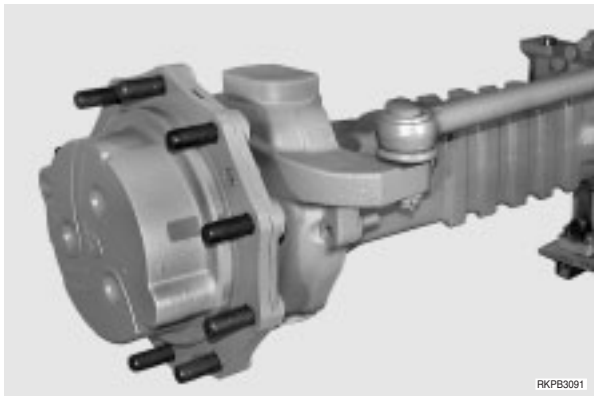
14 - Lock the gears (10) into position by fitting the snap rings (9).



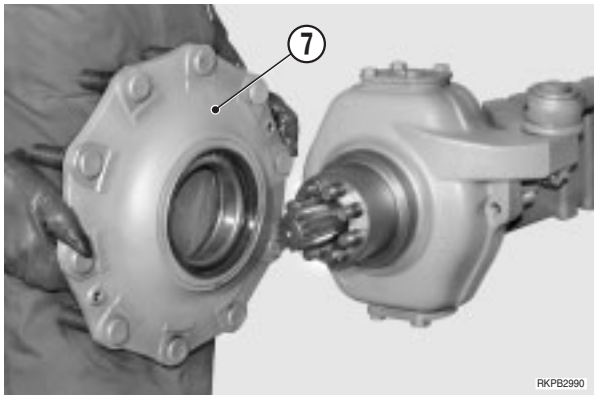
15 - Fit the steering case (3) onto the U-joint (19) and install the articulation pins. For pin assembly details, see Assembly «9. Steering case».



16 - Connect the steering bars.
(For details, see «6. Assembly of steering cylinder»).



17 - Install the hub (7).



REMOVAL OF BOOM SWING CYLINDER

1 - Swing the boom to the right to extend the cylinder fully.

2 - Swing the revolving frame 45° and rest the work equipment on the ground.

3 - Switch off the engine and move the PPC valve several times to release all residual pressures.

4 - Remove the RH front guard (1) from the revolving frame (2).

5 - Disconnect the tubes (3) from the cylinder and plug them. Also plug the flanges (4) of the cylinder (5).

6 - Disconnect the lubricator tube (6).

7 - Place a block beneath the cylinder head to prevent the edge of the frame making dents in the piston rod. Also place a support beneath the cylinder.

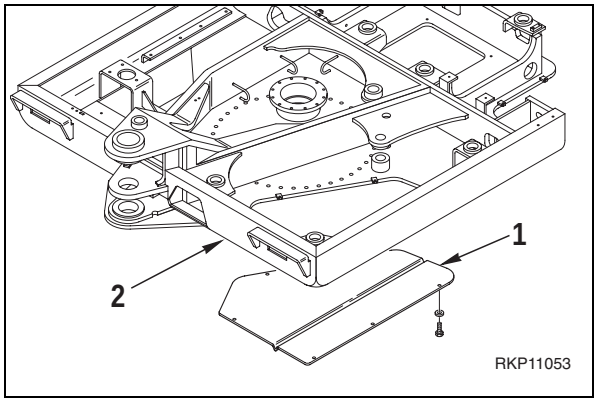
8 - Remove the screw (7), draw out the pin (8) and detach the piston rod from its support (9). ※1 ※2

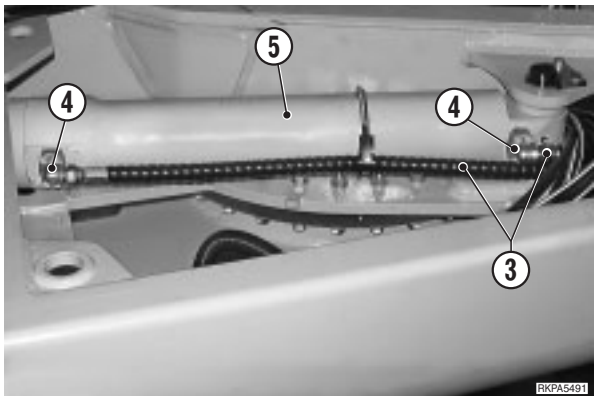
9 - Remove the screws (10) and draw out the stop (11) and the pin (12). ※2 ※3 ※4

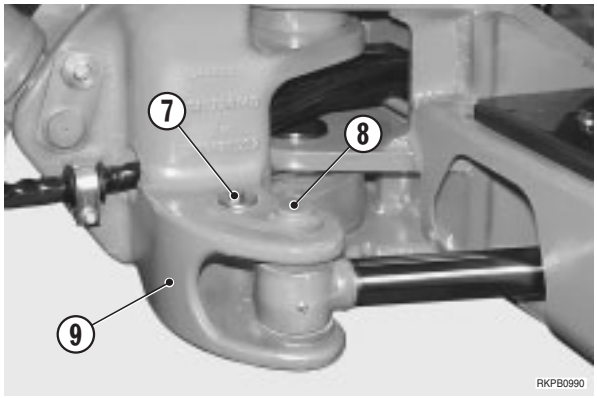
10 - Slide the cylinder out partially from the front and, as soon as possible, put it in a sling and lift it off.

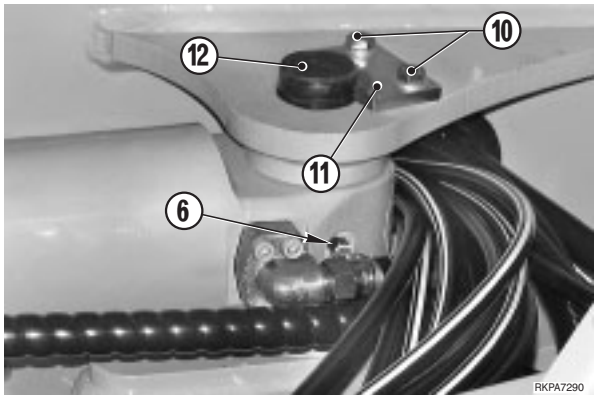
★ During this operation take great care not to dent the piston rod.

kg Cylinder: 90 kg









INSTALLATION OF BOOM SWING CYLINDER

- To install, reverse the removal procedure.

※1

★ Insert the adjustments to a given clearance (distributed on both sides of the piston) until a clearance of 1 – 2 mm is obtained.

※2

⚠ When aligning the positions between hole and pin, let the engine run at minimum idling.
Do not insert fingers into the hole to check the alignment.

※3

Inside bushings: ASL800050

※4

★ Insert the adjustments to a given clearance (distributed on both sides of the cylinder) until a clearance of 0.5 – 1 mm is obtained.

- Start the engine and bleed air from the cylinder. (For details, see «20. TESTING AND ADJUSTMENTS»).

★ After bleeding the air, check the oil level in the tank.

REMOVAL OF BUCKET

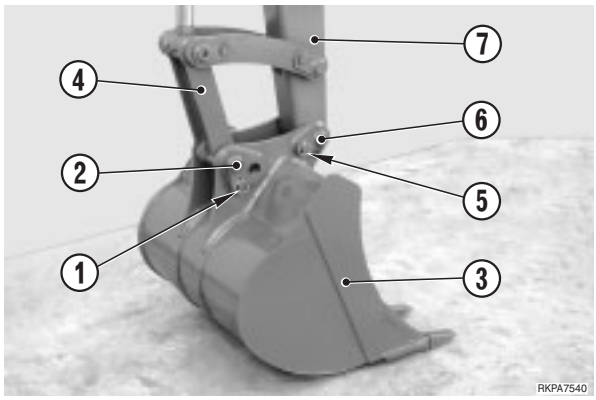
⚠ Lower the bucket to the ground, resting with its back on a flat surface.

1 - Take out the safety pin (1) and the connecting pin (2) between bucket (3) and tie-rod (4).

※1 ※2 ※3

2 - Take out the safety pin (5) and the pin (6) that connects the bucket to the arm (7).

※2 ※3 ※4



INSTALLATION OF BUCKET

- To install, reverse the removal procedure.

※1

★ Insert the adjustments to a given clearance between bucket (3) and tie-rod (4).

※2

⚠ When lining up the hole and the pin, let the engine turn at low idling speed.
Do not insert fingers into the holes to check alignment.

※3

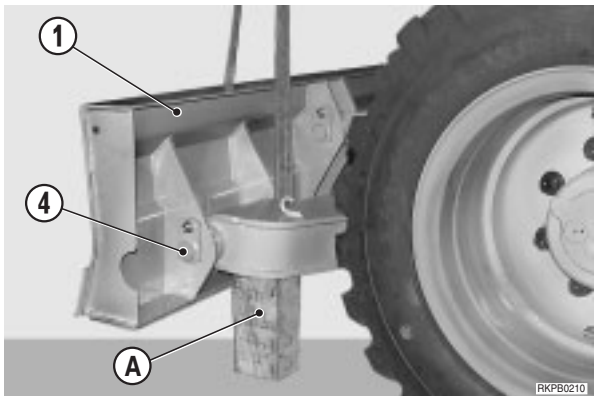
Inside bushings: ASL800050

※4

★ Insert the adjustments to a given clearance (on both sides) between the bucket (3) and the arm (7), until a play of 0.5 – 1 mm is obtained.

REMOVAL OF BLADE AND OUTRIGGERS

1 - Raise the blade (1) or the outriggers (2) and place blocks (A) under the arms (3); Lower the equipment until the arms rest lightly on the blocks.

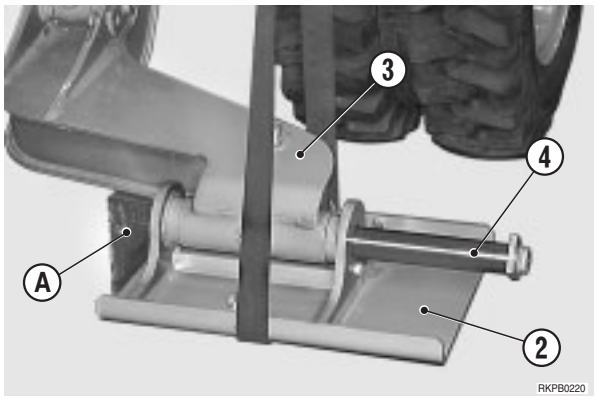


2 - Attach the blade (1) or the outriggers (2) to the lifting equipment and apply slight tension to the cables.

3 - Take out the screws and remove the pins (4).
※1 ※2 ※3

4 - Remove the blade (1) or the outriggers (2).

Blade: 210 kg
Outrigger: 29 kg



INSTALLATION OF BLADE AND OUTRIGGERS

- To install, reverse the removal procedure.

※1

Internal bushings: ASL800050

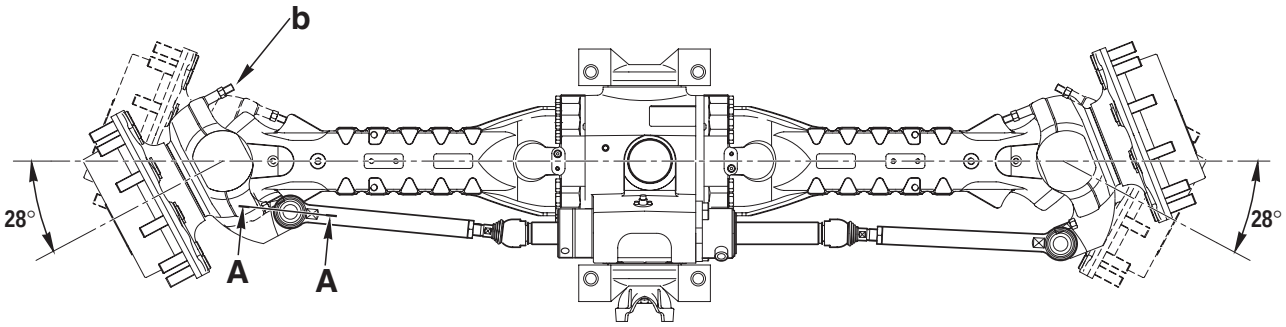
※2

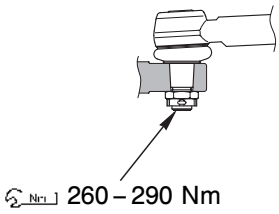
Do not insert fingers into the holes to check on alignment.

※3

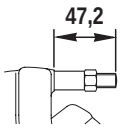
★ Insert the shims on both sides of the arm, in order to obtain a clearance of 0.5 – 1 mm.

Steering and convergency angle

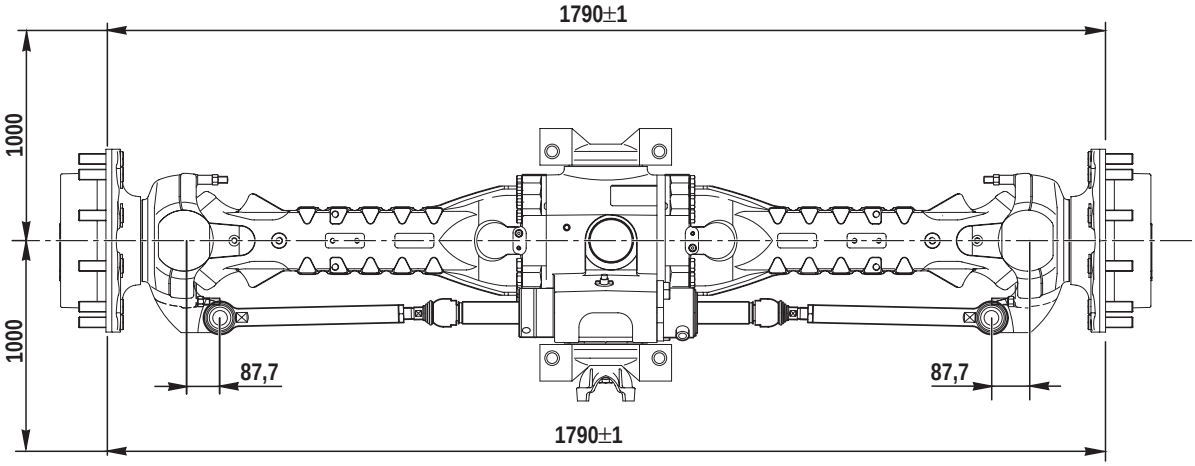




Section A – A



Detail B



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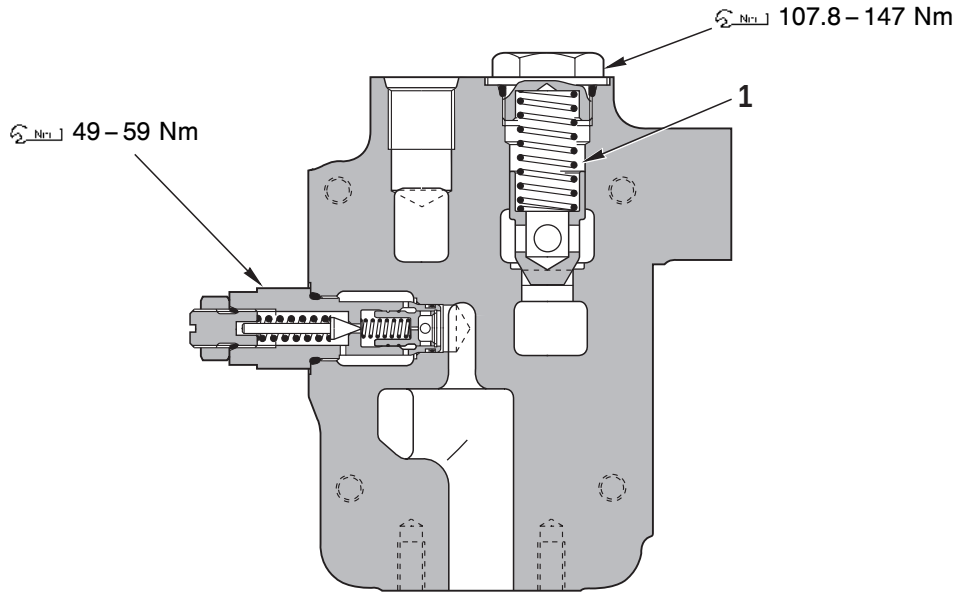
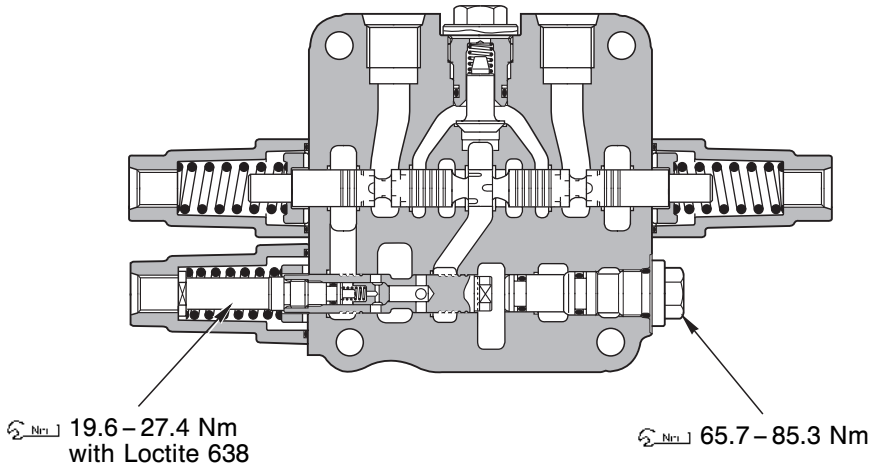


Section BB – BB RKP02821

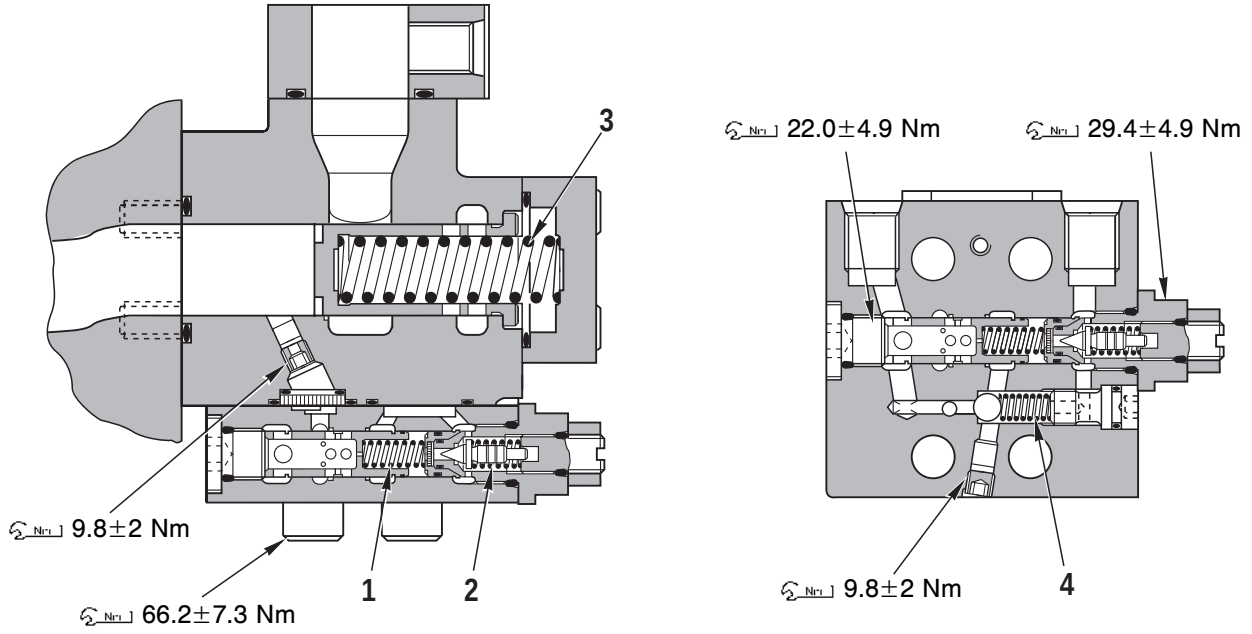


Section E – E RKP02811

Unit: mm

No.	Check item	Criteria					Remedy
1	Lift check valve spring	Free length x O.D.	Installed length	Installed load	Free length	Installed load	Replace
		—	46.4	138 N 14.1 kg	—	—	

SERVOCONTROL FEED UNIT



Section A – A

Section B – B

RKP04090

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Pilot valve spring	Free length	Installed length	Installed load	Free length	Installed load	Replace
		19.2x7.2	16.1	19.6 N (2 kg)	—	17.7 N (1.8 kg)	
2	Reduction box pilot valve spring	16.5x7.2	12.7	20.6 N (2.1 kg)	—	18.6 N (1.9 kg)	
3	Spring	71x18	59	199.8 N (20.4 kg)	—	186.2 N (19 kg)	
4	Relief valve spring	16.1x7.8	13.4	61.7 N (6.3 kg)	—	58.8 N (6 kg)	