WEBM001001

SHOP MANUAL

WB97R-2

BACKHOE-LOADER

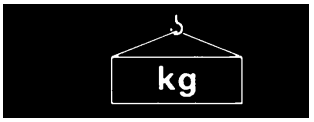
SERIAL NUMBER

WB97R-2 97F20743 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 

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:

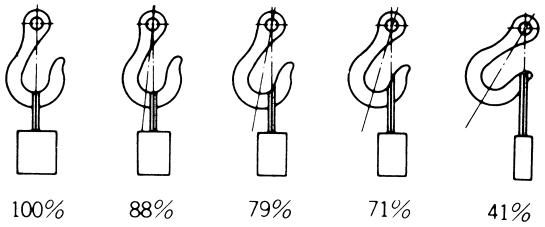
WIRE ROPES
(Standard «S» or «Z» twist ropes without galvanizing)

Rope diameter (mm)	Allowable load (tons)
10.0	1.0
11.2	1.4
12.5	1.6
14.0	2.2
16.0	2.8
18.0	3.6
20.0	4.4
22.4	5.6
30.0	10.0
40.0	18.0
50.0	28.0
60.0	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.

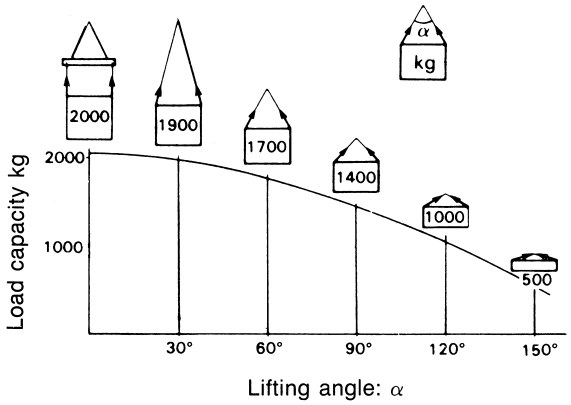
Hooks have maximum strength at the middle portion.



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°.



From liter to U.S. Gall.

1 ℓ = 0.2642 U.S. Gall.

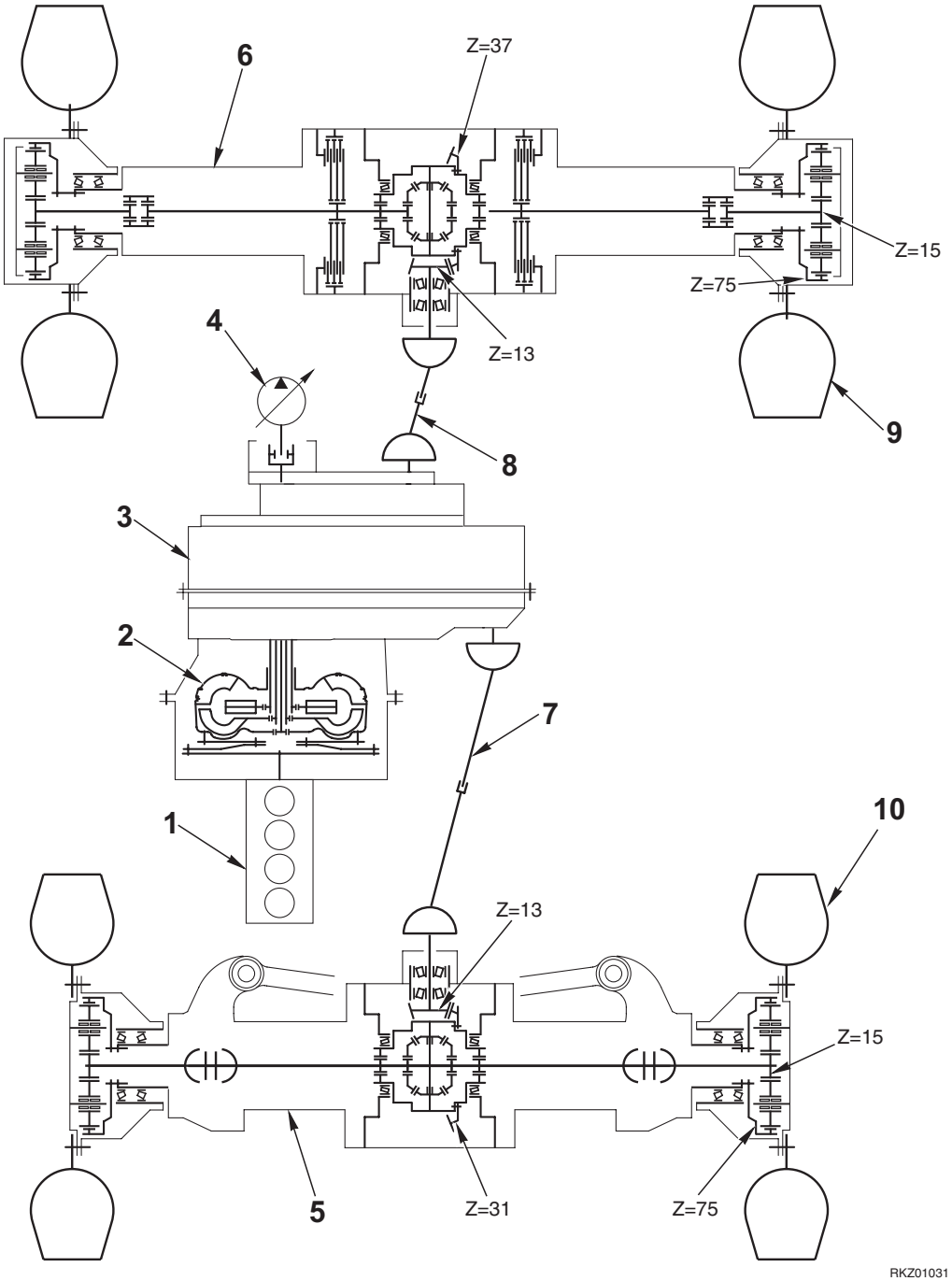
	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

From liter to U.K. Gall.

1 ℓ = 0.21997 U.K. Gall.

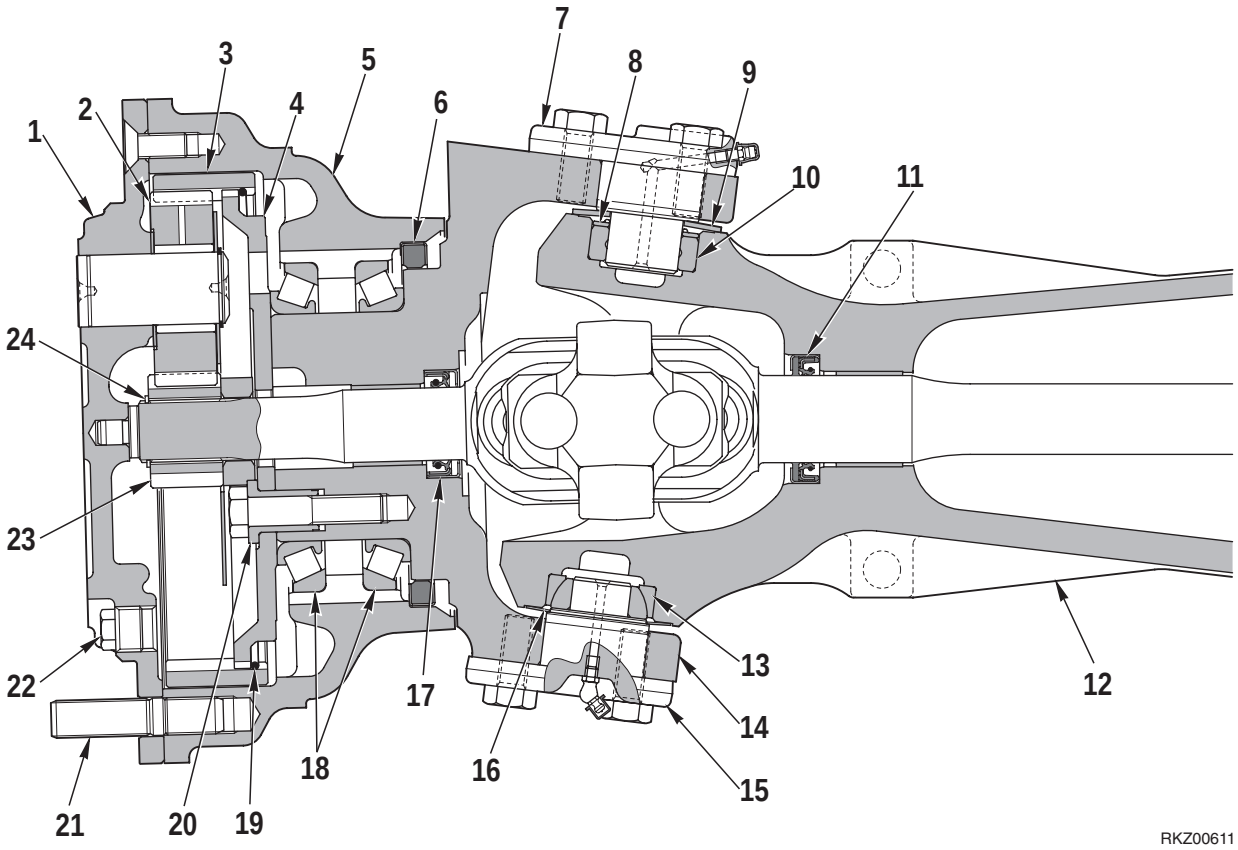
	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.969	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	12.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

Gears	Front axle				Rear axle			
	Transmission	Differential	Planetary	Total	Transmission	Differential	Planetary	Total
1st gear	4.374	2.436	6.000	62.592	5.440	2.846	6.000	92.893
2nd gear	2.436			34.859	3.030			51.740
3rd gear	1.232			17.630	1.532			26.160
4th gear	0.651			9.316	0.810			13.832



1. Diesel engine
2. Convertor
3. Transmission
4. Hydraulic pump
5. Front axle
6. Rear axle
7. Front Cardan drive shaft
8. Rear Cardan drive shaft
9. Rear wheels
10. Front wheels

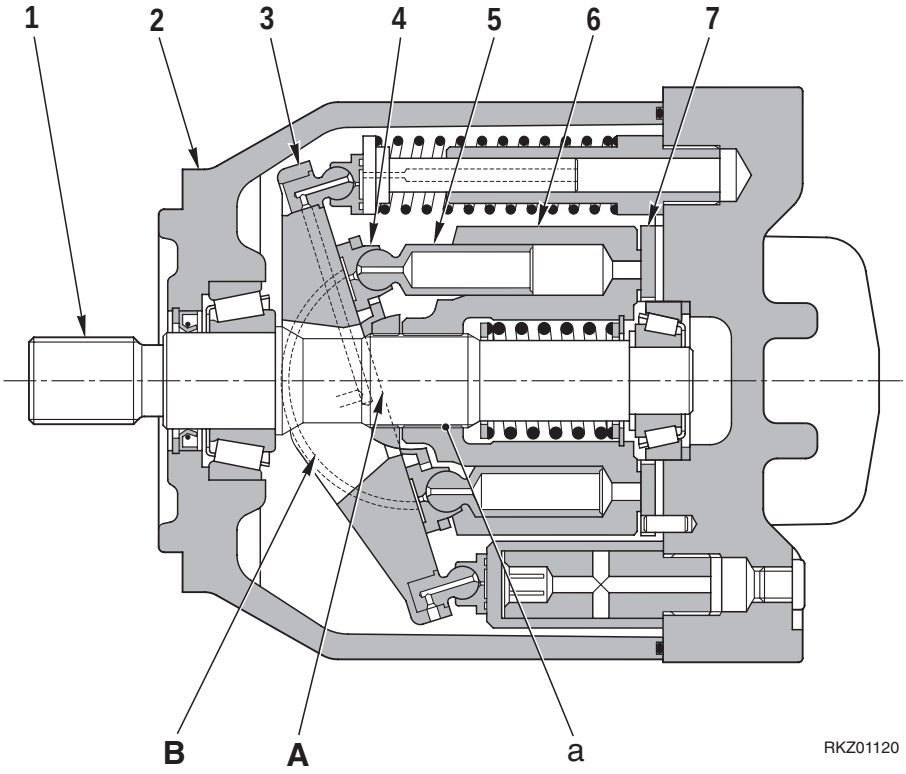
Final reduction - joint



1. Planetary carrier
2. Planetary (Z =29)
3. Ring gear (Z=75)
4. Ring gear carrier
5. Wheel hub
6. Seal
7. Pin
8. Shim
9. Protection
10. Bushing
11. Seal
12. Axle body
13. Bearing
14. Joint
15. Pin
16. Protection
17. Seal
18. Bearing
19. Snap ring
20. Steady pin
21. Stud bolt
22. Plug
23. Sun gear (Z=15)
24. Snap ring

FUNCTION

- The rotation and torque transmitted to the pump shaft is converted into hydraulic energy and pressurized oil is delivered according to the load requirements.
- The amount of oil delivered can be modified by changing the angle of the swash plate.



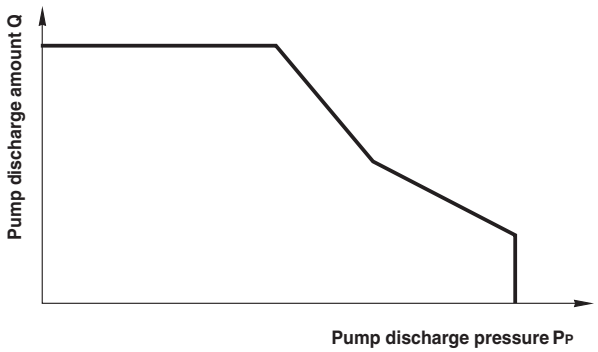
STRUCTURE

- The cylinder block (6) is supported and connected to the shaft (1) by the spline **a** and the shaft (1) is supported by the front and rear bearings.
- The tip of the piston (6) is ball-shaped. The shoe (4) is caulked to it to form one unit in such a way that the piston (5) and the shoe (4) together form a spherical bearing.
- The swash plate (3) has a flat surface **A** and the shoe (4) remains pressed against this surface while sliding in a circular movement.
  The swash plate brings highly pressurized oil onto the cylindrical surface **B** fashioned in the pump body (2), which means that the swash plate (3) slides on a hydrostatically-supported bearing.
- The pistons (5) perform their relative movements in an axial direction, inside cylindrical chambers fashioned in the cylinder block (6).
- The oil is brought up to pressure in the chambers of the cylinder block (6) by the rotatory movement of the block itself. The areas of pressure and suction are determined by the swash plate (7).
  The surface of the swash plate is so designed that the oil pressure always remains within acceptable limits.
  The oil in each chamber is drawn in and discharged through holes in the valve plate (7).

PC VALVE

FUNCTION

- The **PC** valve performs an approximate power check, and ensures that the hydraulic horse-power absorbed by the pump does not exceed the horse-power delivered by the endothermal engine.
  This is achieved by limiting the pump delivery **Q** in function of the delivery pressure **PP**, even if the **LS** valve requests an increase in delivery **Q** due to the larger section freed by the control valve spool, in the presence of high pressure pump delivery.
- In other words, when during operation the delivery **Q** increases and the delivery pressure **PP** also increases simultaneously, the **PC** valve reduces the pump delivery **Q**. When the delivery pressure **PP** decreases, the **PC** valve increases the pump flow.
- The relationships between the pump delivery pressure **PP** and the delivery **Q** are shown in the diagram.



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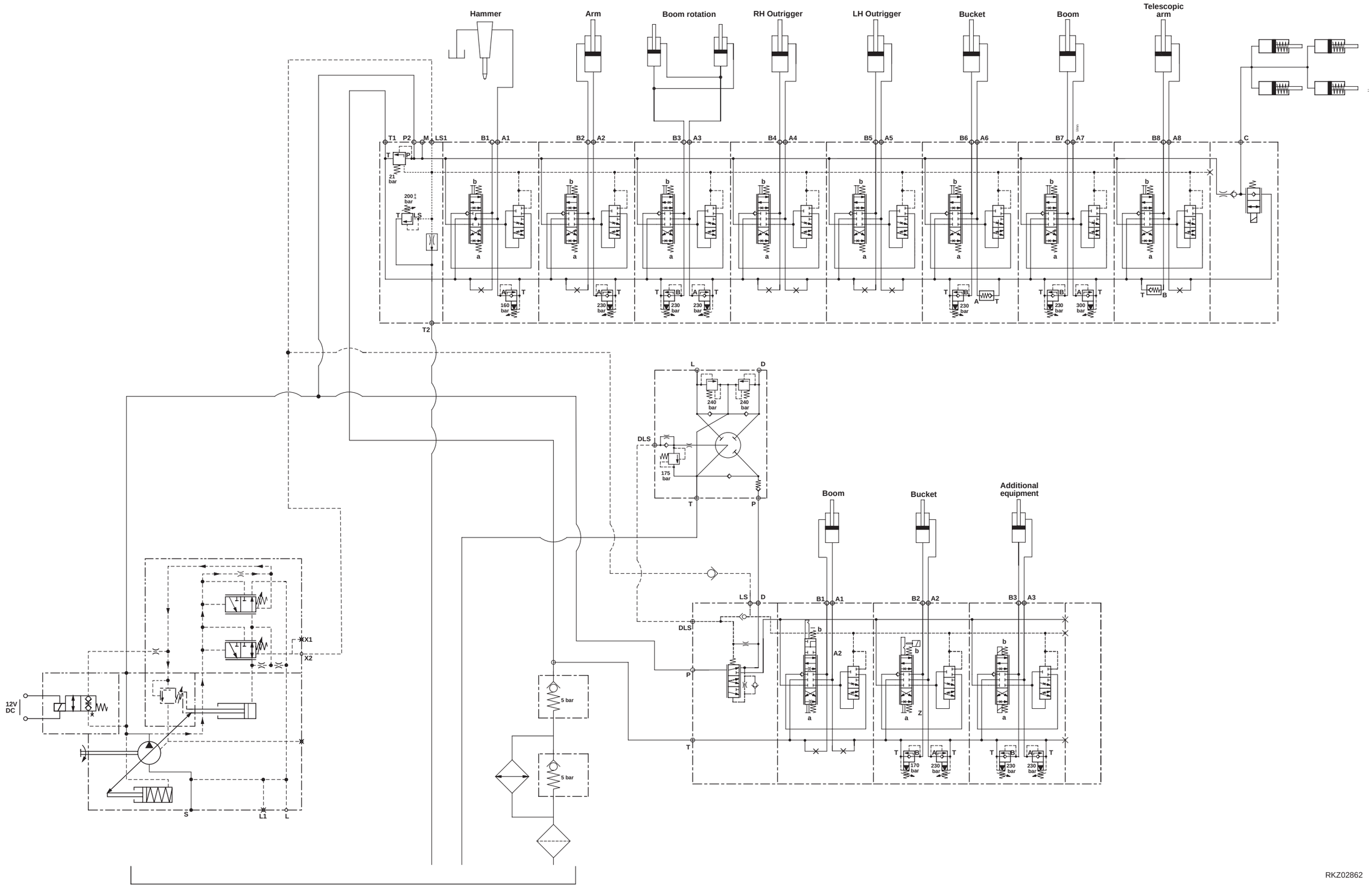
HYDRAULIC CIRCUIT



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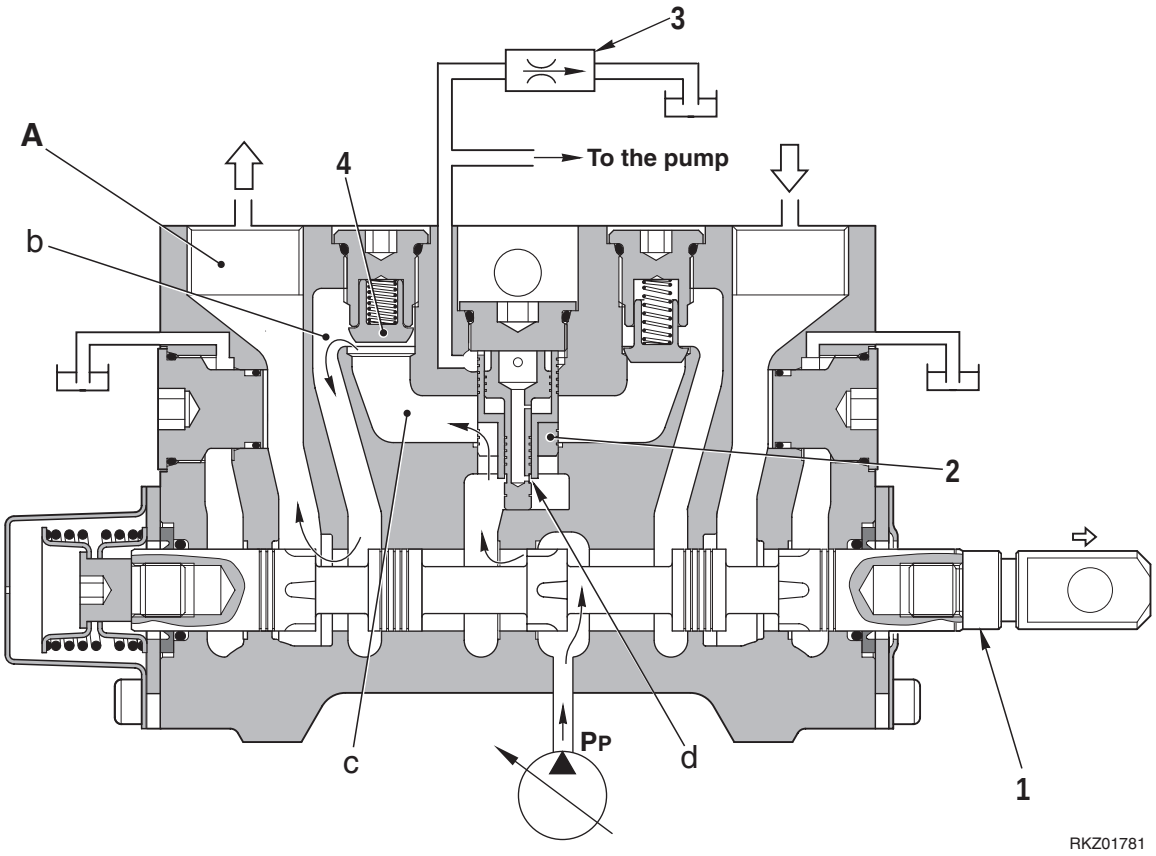
4. INTRODUCTION OF THE LS PRESSURE

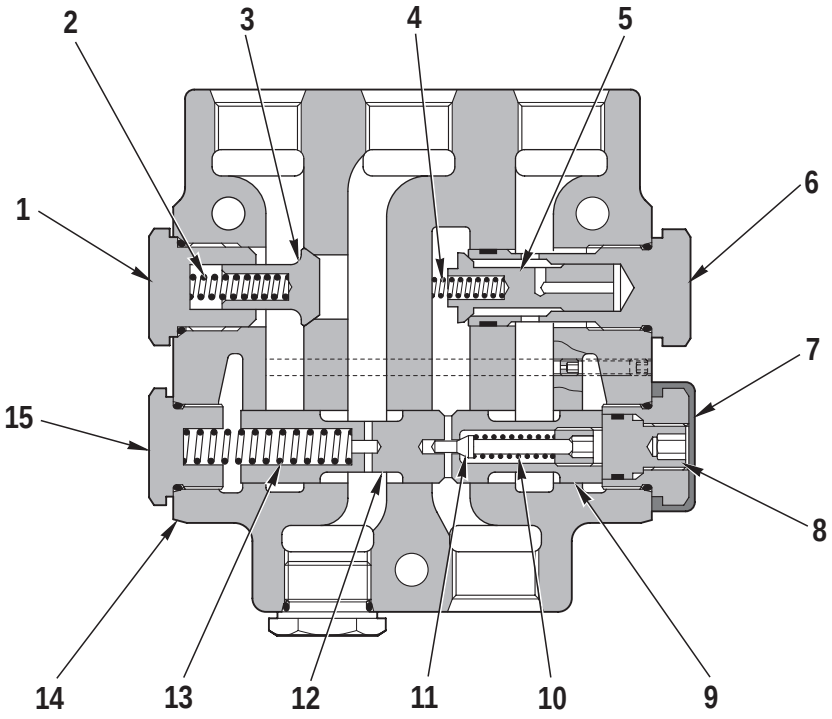
- The **LS** pressure is the pressure generated by external forces acting on the actuators at the outlet of the control valve.



OPERATION

- When the shuttle (1) is activated, the pump pressure PP starts to flow into the actuator circuit **A** through the duct **b**.
- At the same time the compensator (2) moves upwards (↑) so that the flow controlled by spool (1) can flow towards the actuator **A**.
  (Check valve (4) do not allow any flow up to when pressure in chamber **c** is higher than pressure in chamber **b**).
  Pressure downstream spool (1) flows in the **PLS** circuit downstream the compensator valve throught the orifice **d**.
- The **PLS** circuit of the **LS** is thus in communication with the tank circuit **T** by means of the **LS** decompression valve (3).
  (See the description of the **LS** decompression valve).
- The system stabilizes when a pressure difference of 18 bar is generated across the shuttle (1) between pump pressure **PP** and **PLS** pressure.

★ **The drawing shows boom safety valve**

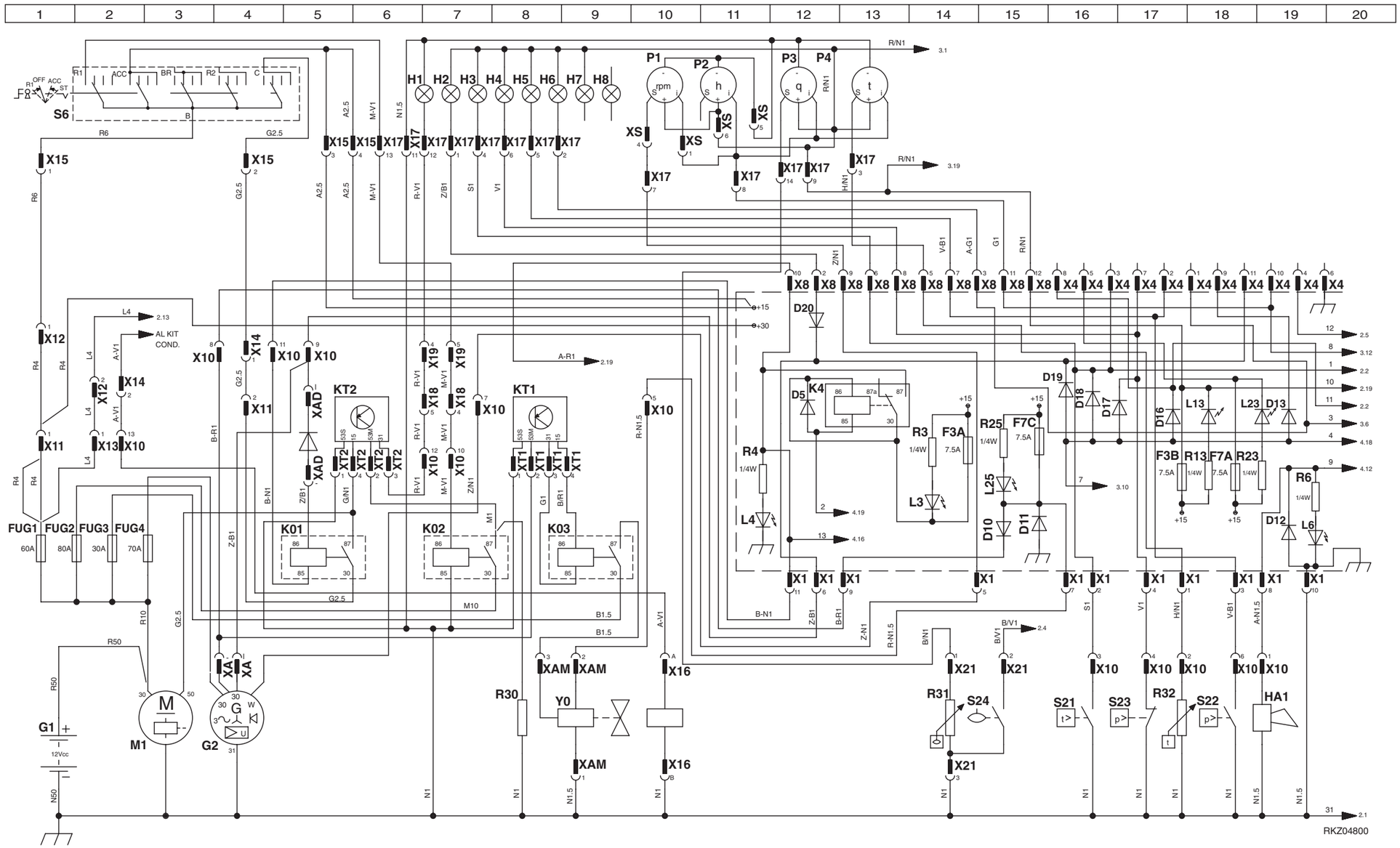


Section A - A

RKZ01050

1. Plug
2. Check valve spring
3. Check valve
4. Check valve spring
5. Check valve
6. Plug
7. Protection
8. Over-ride screw (Safety)
9. Spool
10. Safety valve spring
11. Safety valve
12. Spool
13. Spring
14. Housing
15. Plug

ELECTRICAL DIAGRAM (1/6)



COMPONENTS

G1 - Battery
G2 - Generator
H1 - Preheating warning light
H2 - Generator warning light
H3 - Engine water high temperature warning light
H4 - Air filter warning lamp
H5 - Hydraulic oil filter warning lamp
H6 - Optional warning lamp
H7 - Optional warning lamp
H8 - Optional warning lamp
HA1 - Horn
K01 - Starter relay
K02 - Preheating relay
K03 - Fuel shut off relay
K4 - Safety start relay
KT1 - Fuel shut off timer
KT2 - Preheating timer
M1 - Starter motor
P1 - Rpm instrument
P2 - Hour counter
P3 - Fuel level indicator
P4 - Water temperature instrument
R30 - Heating start
R31 - Fuel level sender
R32 - Water temperature sender
S6 - Starting switch
S21 - Engine water high temperature switch
S22 - Air filter blocked switch
S23 - Engine oil low pressure switch
S24 - Fuel gauge
Y0 - Fuel shut off solenoid valve

CONNECTORS

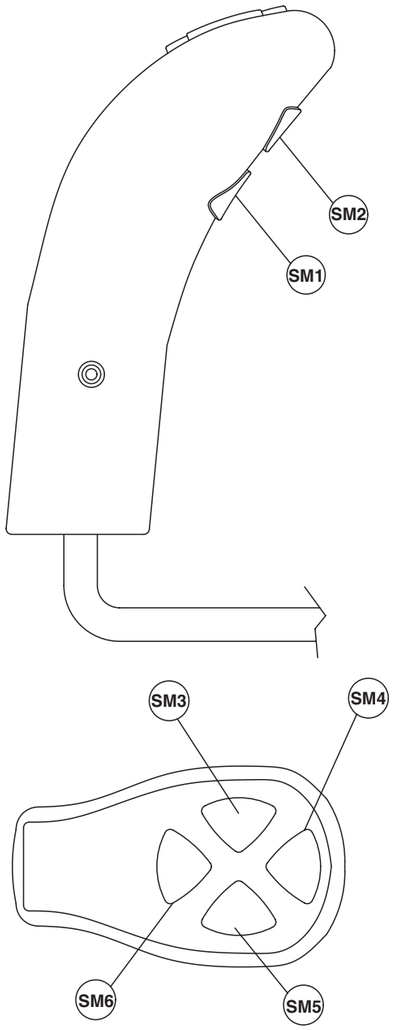
X1 - Front line (engine) 11 way connector
X10 - Front line-engine line 13 way connector
X11 - Power 3 way connector
X12 - Front line-cross line 3 way connector
X13 - Front line-engine line 2 way connector
X14 - Front line-cross line 4 way connector
X15 - Start key 4 way connector
X16 - Conditioner clutch 2 way connector
X17 - Lateral dashboard 21 way connector
X18 - Power box 5 way connector
X19 - Front dashboard 9 way connector
X21 - Fuel level indicator 3 way connector
XA - Generator 2 way connector
XAD - Diode 2 way connector
XAM - Fuel shut off valve 3 way connector
XS - Multifunction instrument 16 way connector
XT1 - Fuel shut off timer 4 way connector
XT2 - Preheating timer 4 way connector

FUSES

F3A - Safety start fuse 7.5A
F3B - Switch+warning light+ return to dig fuse 7.5A
F7A - Monitor fuse 7.5A
F7C - Fuel shut off fuse 7.5A
FUG1 - General fuse 60A
FUG2 - Preheating fuse 80A
FUG3 - Fuel shut off power fuse 30A
FUG4 - Generator fuse 70A

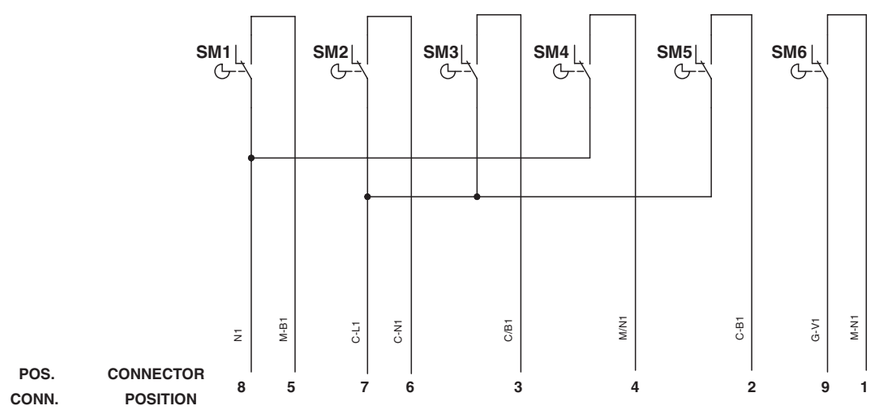
ELECTRICAL DIAGRAM (6/6)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20



MANIPOLATORE/JOYSTICK

POS	DESCRIZIONE/DESCRIPTION	FILO COMUNE COM. WIRE	FILO CONT. N.A. N.O. CONTACT WIRE	FILO CONT. N.C. N.C. CONTACT WIRE
SM1	KICK DOWN	N1	M-B1	
SM2	CONTROL-SQUARE	C-L1	C-N1	
SM3	BENNA CHIUDE/CLOSED GRAB	C-L1	C/B1	
SM4	STACCO CONVERTITORE/CONVERTER DETACHMENT	N1	M/N1	
SM5	BENNA APRE/OPENED GRAB	C-L1	C-B1	
SM6	BLOCCAGGIO DIFFERENZIALE/DIFFERENTIAL LOCK	M-V1	M-N1	



RKZ04840

FOR MACHINE

Machine model				WB97R-2	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Main valve pressure	2-3-Spool control valve	• Engine speed: max. • Oil temperature: 45 – 55 °C • Without steering	bar	200	200±7
	6-7-8-Spool control valve			200	200±7
	Steering unit	• Engine speed: 1500±50 rpm		175	175±7
Pressures of secondary valves circuits	Front bucket (curled)	• Engine speed: min. • Oil temperature: 45 – 55 °C • Check one circuit at the time ✻Check on test bench	bar	235	235±7
	Front bucket (dump)			175	175±7
	Attachment (3rd spool)			235	235±7
	Boom (raising) ✻			305	305±7
	Boom (lowering)			235	235±7
	Arm (Closing)			235	235±7
	Boom swing			245	245±7
	Bucket (curled)			235	235±7
	Side digging boom (right-left)			275	275±7
	Hammer (delivery)			165	165±7
	Steering unit (safety) ✻			240	240±7

MEASURING ENGINE SPEED

⚠ When checking engine speed, be careful not to touch high temperature parts and not to get caught in rotating parts.

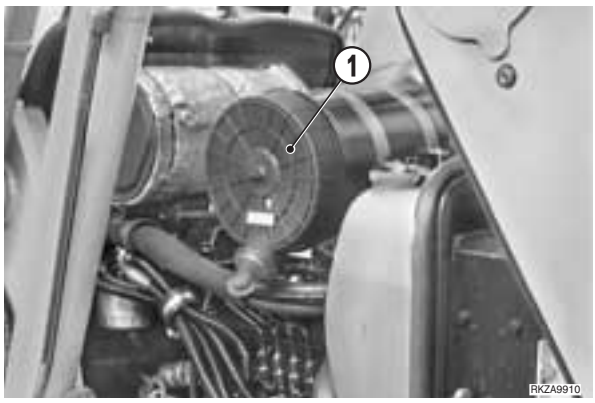
★ Check speed when following condition are reached:
- Engine water cooling temperature: 68 – 80 °C.
- Hydraulic oil temperature: 45 – 55 °C.

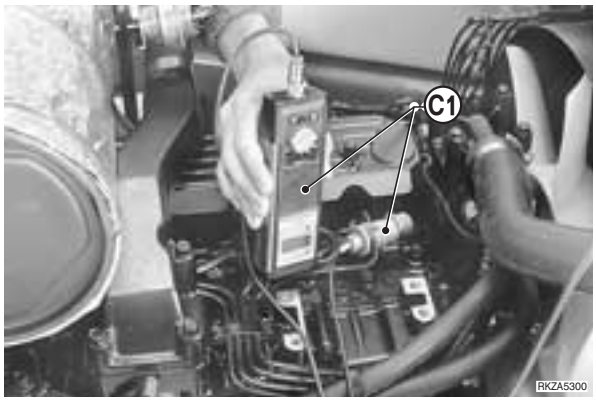
1 - Remove the air filter (1).

2 - Install and connect **C1** tachometer.
★ If using **C2** stroboscopic tachometer, mark a light notch on, engine pulley for an easier reading.

3 - Start engine and check:
- Low idling speed without load (accelerator pedal and hand accelerator released in «minimum» position).
- High idling speed without load (accelerator pedal at the travel end).
  ★ Low idling speed: 1050±50 rpm
  ★ High idling speed: 2375±50 rpm

★ If low and high idling speed with engine without load are not within permissible value, before going on with other operations, check accelerator pedal stoppers and wiring sheathings. (See «ACCELERATOR LEVER ADJUSTING»).





AIR BLEEDING - RELEASING RESIDUAL PRESSURE

1. Air bleeding from pump

★ Air bleeding from pump (that means the filling of pump body) is necessary:
- 1 - When removing pump.
- 2 - When removing or replacing connection hoses between pump and hydraulic tank.
- 3 - When replacing hydraulic oil and hydraulic tank overhaul.

The air bleeding is obtained as follows:

1 - Carry out tank oil filling and close hydraulic tank with plug **G1**.

2 - Remove plug (1) of breather pipe (2).

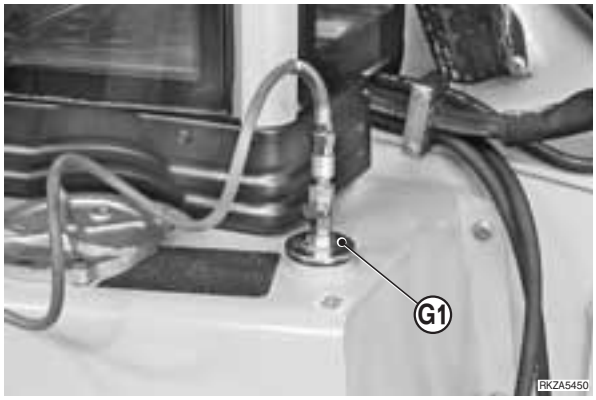
3 - Connect plug **G1** to low pressure air compressed connection.

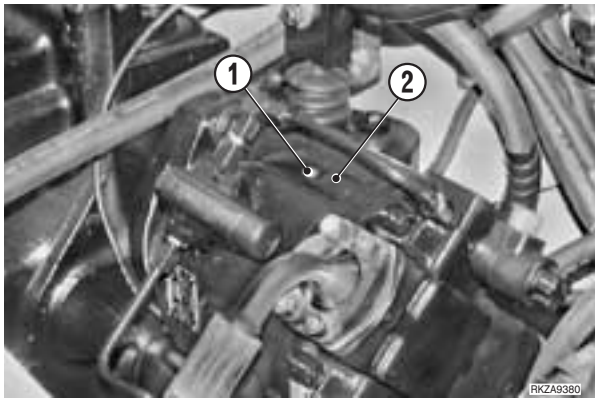
4 - Introduce slowly and intermittently air compressed in the hydraulic tank until when flows out oil without air bubbles.
- ★ Max. pressure in tank: 0.5 bar

5 - Mount plug (1) and lock it.

6 - Depressurize slowly hydraulic tank, check level and, if necessary, refill tank oil at correct level.

7 - Start engine and run it for few minutes before bleeding air from the whole system.





2. Air bleeding from cylinders

★ When hydraulic cylinders or pipe fitting have been removed, it is necessary to bleed air before to use again the machine.

★ Operate on a movement at a time starting from main cylinders (lifting).

1 - Start engine and run it at high idling speed for about 5 min. to worm up oil and to pressurise hydraulic system.

2 - Return engine at low idling speed, extend and retract the interested piston 4-5 times.
- ★ Extend, lower and retract pistons until about 100 mm from their end of stroke.

3 - Bring again the engine at high idling speed and repeat operation of point 2; return the engine at low idling speed and make a complete travel of piston until the hydraulic pump reaches its maximum pressure.

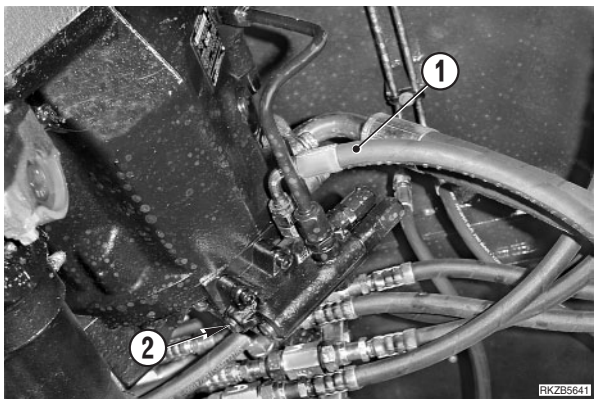
4 - Repeat above operation (starting from point 2) for all cylinders.

TESTING AND ADJUSTING OF UNLOADING VALVE

★ Testing conditions:
- Engine: stopped but at working temperature.
- Hydraulic oil: 45 – 55 °C.
- Machine: front equipment on the ground, parking brake applied and boom and arm fully extended.
- Working mode: Power

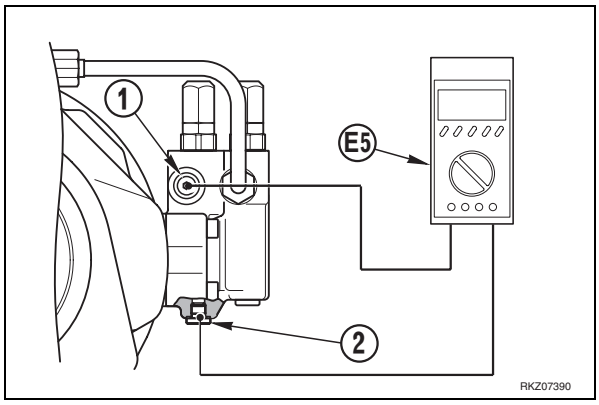
1 - Disconnect hose (1) from the Load Sensing line. Install an tee and reconnect hose (1).

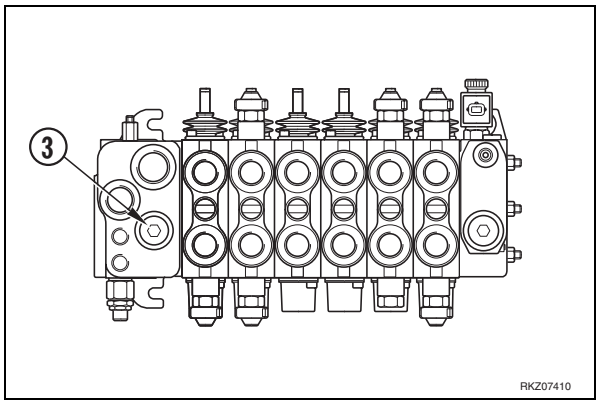
2 - Remove plug (2) and install a pressure adapter (M8x1).



3 - Connect the pressure gauge **E5** to adapter.

4 - Start the engine and bring it to 1050±50 rpm and, without any movement (lever in neutral position), read the ΔP pressure.
Normal value: 21±1 bar
★ If the ΔP value is not inside the limits, adjusting the Unloading valve (3).



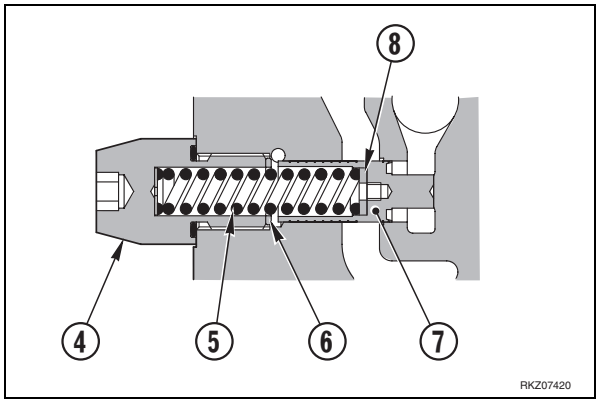


1. Adjusting the unloading valve

1 - Remove plug (4), spring (5), washers (6) and body valve (7).

2 - Place a shim (8) under the spring (5) and mount the valve.
- One shim of 1 mm increase pressure ΔP of 3 bar.

Nm Plug: 100 Nm



TESTING THE CORRECT FUNCTIONING OF THE POWER TRAIN CLUTCHES

★ Test conditions:
- Engine: stopped.
- Brake pedals: connected by a cotter pin.
- Machine: on solid and level ground with the equipment raised and safety devices engaged.

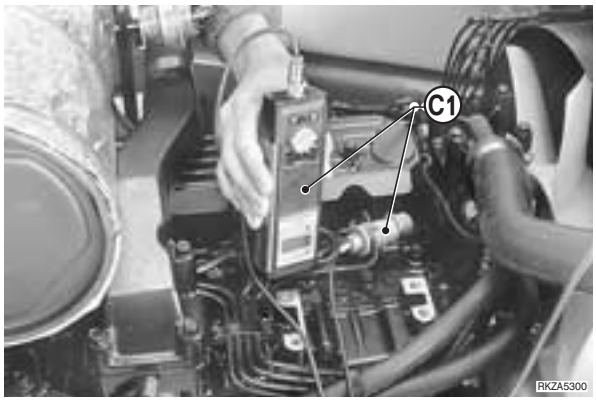
★ This test must be performed after having checked the pressures of the power train group.

1. Preparation of the machine

1 - Prepare a rev. counter **C1** to measure the engine rpm.

★ If mounting an electronic pressure transducer rev. counter on a diesel delivery line to the injection nozzles, make sure that it is placed far away from the line-clamp.

★ If using a stroboscopic tachometer **C2,** make a clearly visible notch on the engine pulley to facilitate the reading.

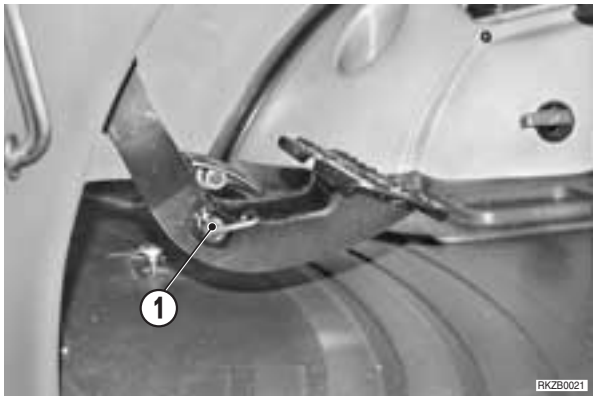


⚠ Make sure that the brake pedals are fastened together by the cotter pin (1).

⚠ During the following tests, during the engine acceleration phase with the gear engaged, the condition of the brake disks can also be checked
If, while force is being exerted on the brake pedals, the machine starts to travel (even slowly):

a - Release the accelerator immediately and stop the engine.

b - Check the wear on the brake disks and change them before completing the tests.
(See: «30. DISMANTLING AND ASSEMBLY - REAR AXLE»).



2. Testing

1 - Start the engine and heat the engine and all the fluids up to working temperature. In particular make sure that the power train oil reaches a temperature of 80±5 °C.

2 - With the engine in idling condition, accelerate to MAX. and check that in this condition the revs remain within permissible limits. (See «TESTING ENGINE SPEED»).

3 - Brake hard and bring the engine up to MAX.

4 - Maintaining the braking action and the acceleration, engage the FORWARD gear and check that the engine speed decreases until it is once again within permissible limits (See «TESTING THE ENGINE SPEED UNDER STRESS»).

5 - Repeat this test in REVERSE gear.

★ If the revs are high than the permissible limits, the clutches are worn, and must be replaced.

TROUBLESHOOTING

Oil leakage form gaskets and seals	
CAUSES	**REMEDY**
Prolonged functioning at high temperature of the oil	Replace the gasket or seal and matching surface if damaged Use correct lubrication and replace at recommended intervals
Oil gasket assembled incorrectly	
Seal lip damaged	
Contaminated oil	

Excessive wearing out of input flange spline	
CAUSES	**REMEDY**
Exhaustive use	Replace the flange Check that the pinion spline is not excessively worn out Replace bevel gear set if required
Pinion nut loosened	
Pinion axle backlash	

Fatigue failure of pinion teeth	
CAUSES	**REMEDY**
Exhaustive use	Replace bevel gear set
Continuous overload	

Pinion and ring teeth breakage	
CAUSES	**REMEDY**
Crash load of differential components	Check and/or replace other differential components

Side gear spline worn out	
CAUSES	**REMEDY**
Excessive use	Replace differential gear group. Replace halfshaft if required

Thrust washer surface worn out or scratched	
CAUSES	**REMEDY**
Insufficient lubrication; contaminated oil; incorrect lubrication	Use correct lubrication and fill up to right level. Replace at intervals recommended. Replace all scratched washers and those with 0,1mm thickness lower than the new ones

Inner diameter of tapered roller bearing worn out	
CAUSES	**REMEDY**
Excessive use axial pinion	Replace bearing. Check pinion axial backlash. Use proper lubrication, fill up to right level and replace at recommended intervals.
Excessive pinion axial backlash	
Insufficient lubrication; contaminated oil	

Bent or broken halfshaft or halfshaft broken at wheel side	
CAUSES	**REMEDY**
Vehicle intensively operated or overloaded	Replace. Check that wheel support is not worn out or wrongly adjusted.
Wheel support loosened	
Beam body bent	

HOW TO READ THE MANUAL

1. Removal and Installation of the groups

(1) The procedures and information needed to carry out the work of removing or Installing units or groups are given in the removal procedure. The sequence of operations is not repeated in the installation procedure.

(2) Information needed for installation is marked with the symbol ※1 ; The same symbol is repeated at the end of each removal procedure for the same item, to indicate to which installation item it refers.

(Example)
REMOVAL GROUP ●●● : ..... Title of operation

⚠: ..... Safety precautions to be followed when carrying out the operation.

1 - Remove XXXX (1): ..... Step in removal procedure.
★:..... Technique or important point to remember when removing XXXX (1)

2 - ▲ ▲ ▲ (2): ..... ※1 This sign means that information is given for the installation procedure

3 - Remove ■■■ (3):
..... ℓ: ..... Recovery of oil or water, and the quantity to be recovered.

INSTALLATION GROUP ●●● : ..... Title of operation

- To install, reverse removal procedure.

※1 : ..... Technique to be used for installation
★:..... Technique or important point to remember when removing ▲ ▲ ▲ (2)

- Addition of water or oil: ..... Step in removal procedure
★:..... Point to remember when adding water or oil.

2. To the precautions to be taken during the removal or installation of the groups, must be added the specific «PRECAUTIONS TO BE TAKEN DURING THE OPERATIONS».
Always make sure that these precautions are taken.

3. List of special tools

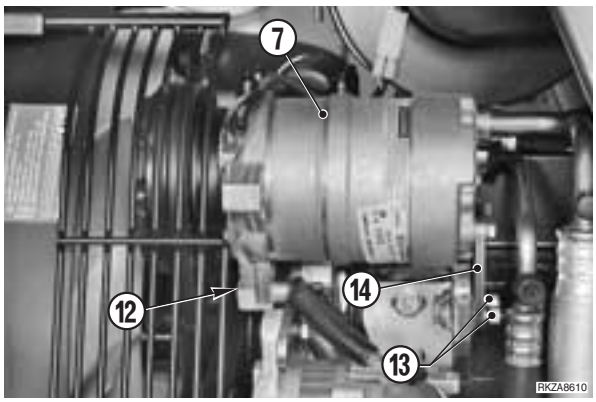
(1) For details of the descriptions, codes and quantities of each tool (**A1**; **A2** etc.) mentioned in the operational procedures, see the list «SPECIAL TOOLS» supplied in this section.

4. List of the tightening torques and weights, and the quantities oil, liquids or grease needed to fill tanks and containers

(1) In the operating procedures, you will find the symbols Nm, kg, , ; In the following order, these represent the values of «TIGHTENING TORQUES», «WEIGHT OF PARTS OR GROUPS», «QUANTITIES OF OIL OR LIQUIDS TO BE INTRODUCED», «SCREW LOCKING MATERIAL, SEALANTS AND LUBRICATION», «LUBRICATING GREASE».

NOTE
If no symbol is indicated, the values to be used are those given in the introductory sections of this manual.

6 - Remove the front screws (12), the rear nuts (13) and lift out the compressor (7) complete with its support (14).
※ 3



INSTALLATION OF THE AIR-CONDITIONING UNIT COMPRESSOR

- To install, reverse the removal procedure.

※ 1

Nm Belt-tightening screw: 123 Nm

★ Apply tension to the compressor belt.
(For details, see «TESTING AND APPLYING TENSION TO THE COMPRESSOR BELT»).

※ 2

★ Tighten until the flanges rest on the compressor.

※ 3

Nm Compressor retaining screws: 32 Nm

1 - Connect the unit to the maintenance station **B1** and refill it.

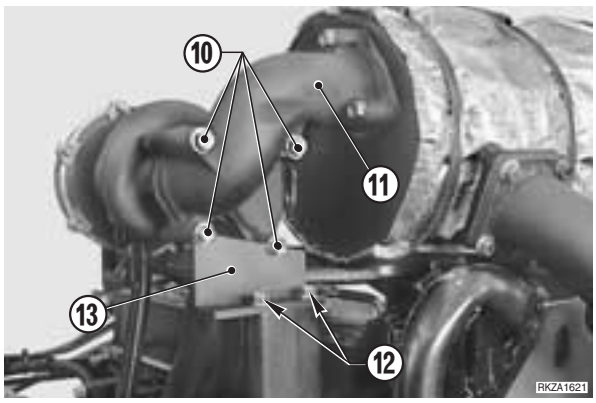
Quantity of fluid: 970±15 g

6 - Take out the screws (10) that join the turbocompressor tothecouplingsleeve,andremovethecouplingsleeve(11).

※ 2

7 - Take out the screws (12) and remove the bracket (13).

※ 3



8 - Take out the nuts (14), and the washers (15) and lift off the turbocompressor (16).

★ Carefully check the state of all the sealing gaskets. Replace them if there is any sign of damage.

INSTALLATION OF THE TURBOCOMPRESSOR

- To install, reverse the removal procedure.

※ 1

Nm Tube retaining screws: 22.5–28.4 Nm

Nm Flange screws: 8–9 Nm

※ 2

Nm Coupling joint screws: 22.5–28.4 Nm

※ 3

Nm Bracket screws: 22.5–28.4 Nm

1 - Start the engine and check that there are no leaks in the turbocompressor lubrication tubes.

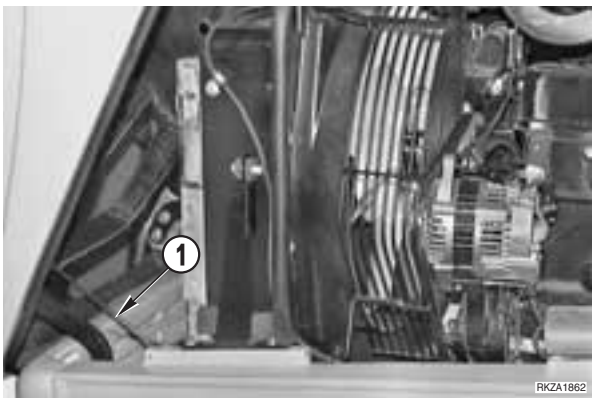
REMOVAL OF HYDRAULIC OIL COOLER

Fully raise the front working equipment and engage the safety stop.
Also make the backhoe safe.

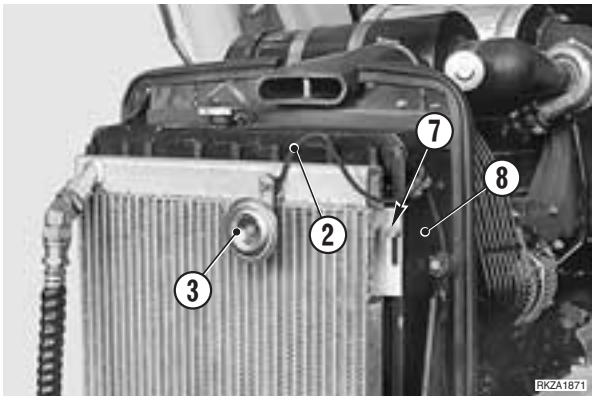
Disconnect the cable from battery negative terminal (–).

1 - Disconnect the safety gas cylinders (1) from the engine hood. Accompany the hood until it is completely open.
★ Place some soft material between the engine hood and the front closing mechanism.

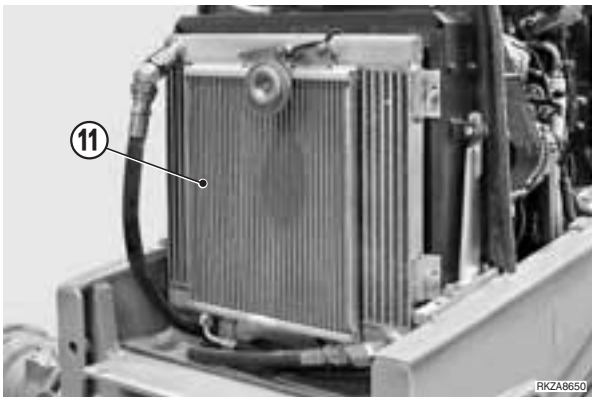
Completely release residual pressures from all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).



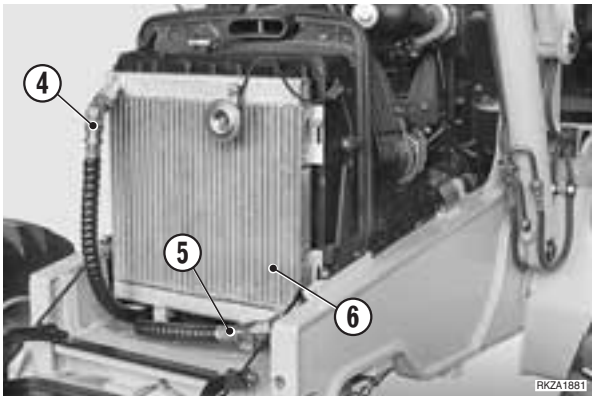
2 - Disconnect the cable (2) and remove the acoustic alarm (3).



3 - **Only for machines equipped with an air-conditioning unit**
Remove the condenser (11) without detaching the tubes, and put it to one side.



4 - Slowly loosen the hoses (4) and (5) to drain the hydraulic oil from the cooler (6). When all the oil has been drained, disconnect the hoses completely and plug them to prevent entry of impurities. ⁘ 1



19 - Remove the grips (35) of the outrigger control levers and lift off the cover (36) of the control levers.

20 - Remove the self-locking nuts (37) and the four screws that secure the cab. ⁘ 6

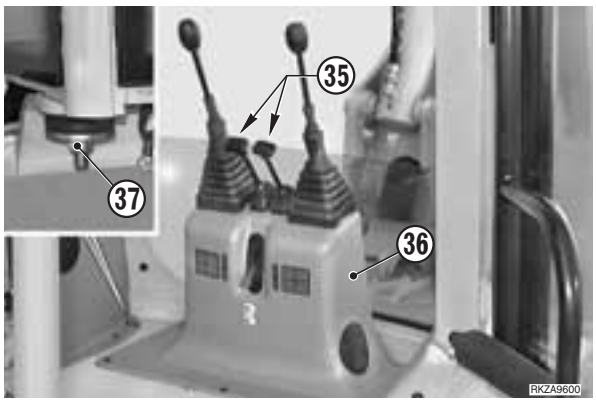
21 - Disconnect the hoses (38) and (39) from control valve (40).

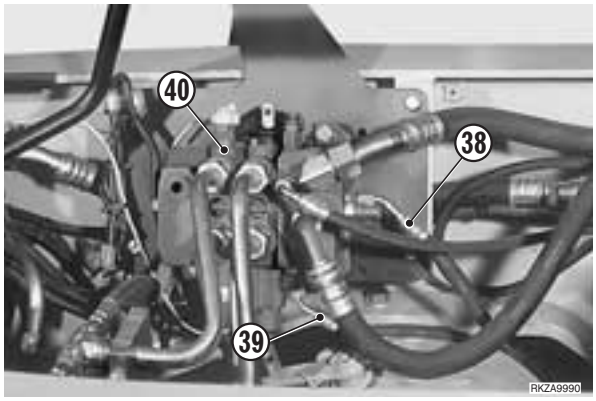
22 - Remove the protective plugs and screw two eyebolts "**A**" into the holes supplied for hoisting purposes. Attach the cab (41) to the hoisting tackle and apply a slight tension.

23 - Slowly raise the cab, directing its movement in such way that the gear lever slides out.

★ Make sure that all the electrical leads and the accelerator cables are free.

kg Cab: circa 630 kg





INSTALLATION OF THE CAB

• To install, reverse the removal procedure.

⁘ 1

★ Drain and refill the air-conditioning unit

Quantity of fluid (R134a): 970±15 g
Quantity of oil: see the amount recovered.

⁘ 2

★ Check and adjust the stroke of the hand and pedal accelerators. (For details, see «20. TESTING AND ADJUSTMENTS»).

⁘ 3

★ Adjust the stroke of the parking brake lever. (For details, see «20. TESTING AND ADJUSTMENTS»).

⁘ 4

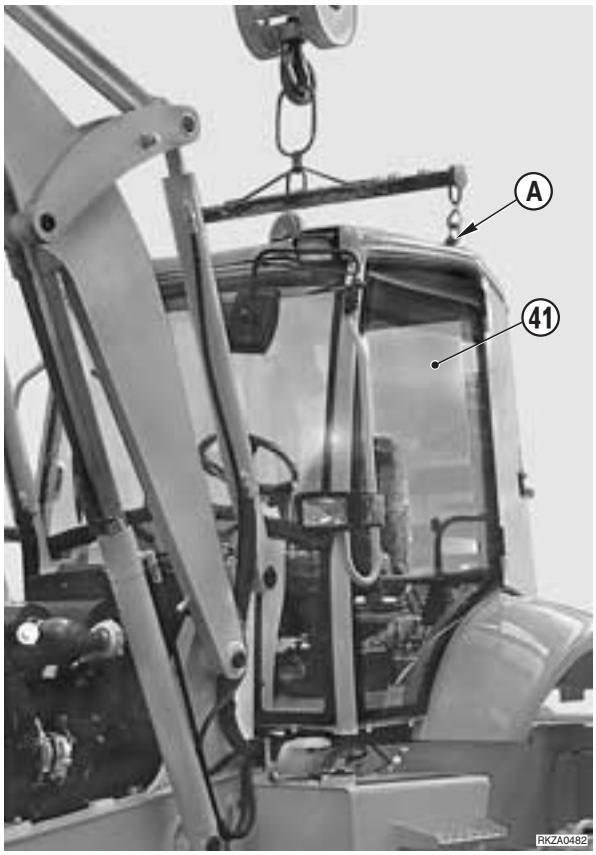
★ Bleed the air from the braking circuit. (For details, see «20. TESTING AND ADJUSTMENTS»).

⁘ 5

★ Bleed the air from the steering circuit. (For details, see «20. TESTING AND ADJUSTMENTS»).

⁘ 6

Nm Cab retaining screws: 169±9.8 Nm



INSTALLATION OF THE ENGINE GEARBOX-PUMP GROUP

- To install, reverse the removal procedure.

1 - Fill the hydraulic oil tank up to its maximum level.

Hydraulic oil: 92 ℓ

2 - Fill the gearbox up to its maximum level.

Gearbox oil: 16 ℓ

3 - Refill the coolant liquid.

Coolant liquid: 18 ℓ

4 - Drain and refill the air-conditioning unit.

Quantity of fluid (R134a): 970±15 g
Quantity of oil: see the amount recovered.

1

Screws for front counterweight: 300±30 Nm

2

Screws on gearbox side: 70 Nm

Screws on gearbox side: Loctite 262

3

Nut on axle side: 70 Nm

4

★ Fill up the pump casing and the pump, to bring the tank up to pressure.
For the method see «20. TESTING AND ADJUSTMENTS».

5

★ Bleed the air from the fuel lines.

6

Nuts from the anti-vibration supports: 196±19.6 Nm

4 - Start the engine to circulate the oil and coolant liquid. Check that there are no leaks.

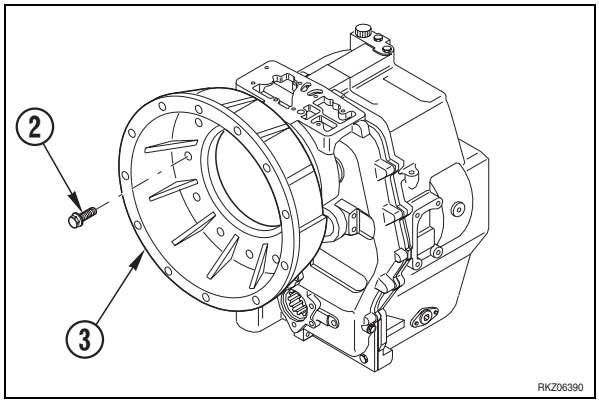
5 - Use a leak detector to check the leaktightness of the delivery and return pipes of the air-conditioning unit compressor.

6 - Bleed the air from the working equipment circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

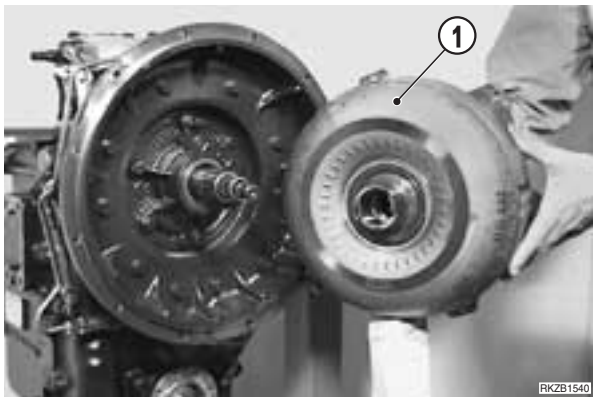
7 - Stop the engine, check the levels and, if necessary, top them up.

3 -Insert bellhousing (3) fastening screws (2).

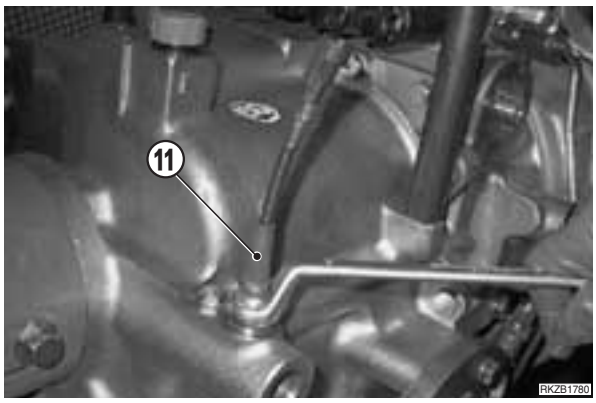
Nm Screw: 170 Nm



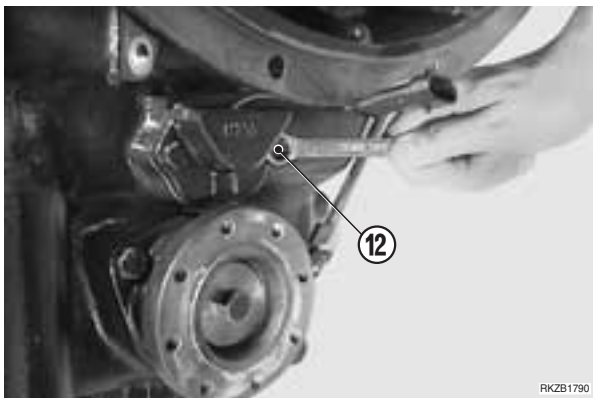
4 - Fit converter (1).
Turn the torque converter until engaging the relative splined shafts.



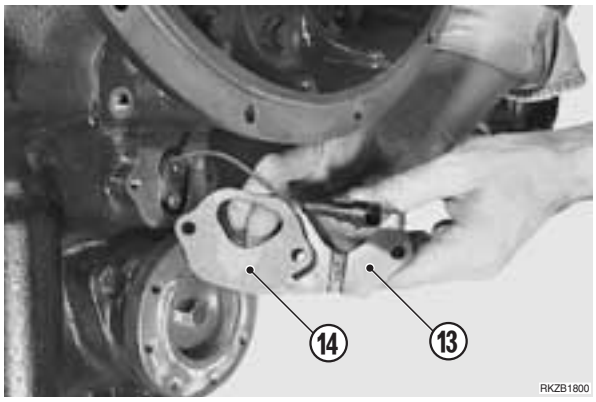
10 - Remove oil temperature sensor (11).



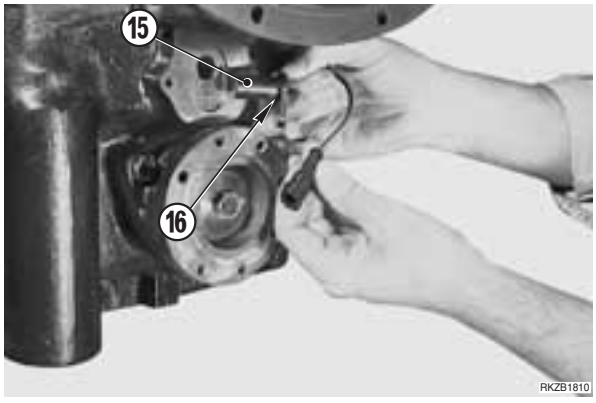
11 - Remove screws (12) of sensor cover.



12 - Remove sensor cover (13) and relative seal (14).

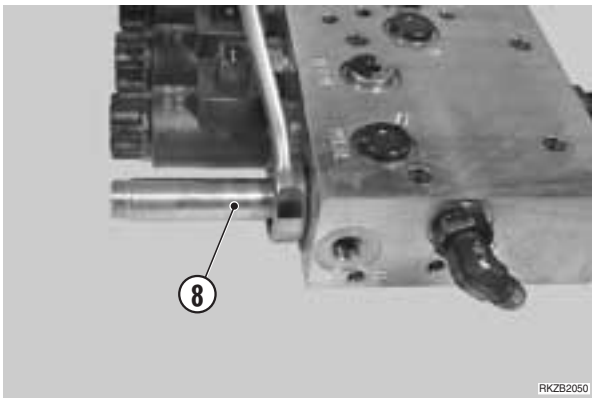


13 - Remove sensor/inductor (15) and O-ring (16).

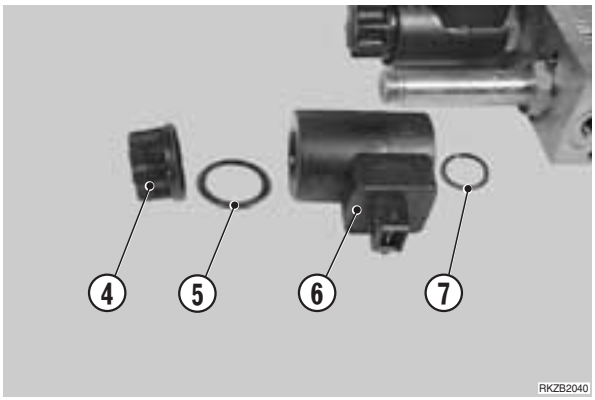


10. Assembly hydraulic control valve

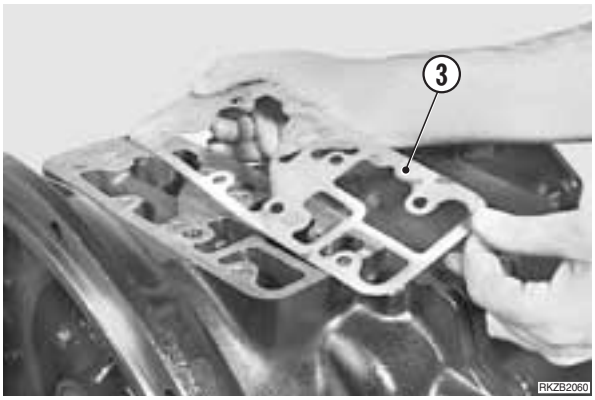
1 - Assemble solenoid valve inductor (8).



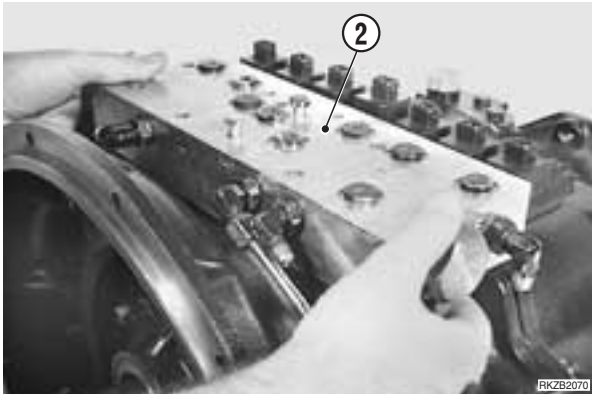
2 - Assemble O-ring (7), solenoid valve (6), O-ring (5) and then tighten nut (4) by hand.



3 - Assemble seal (3) on transmission.

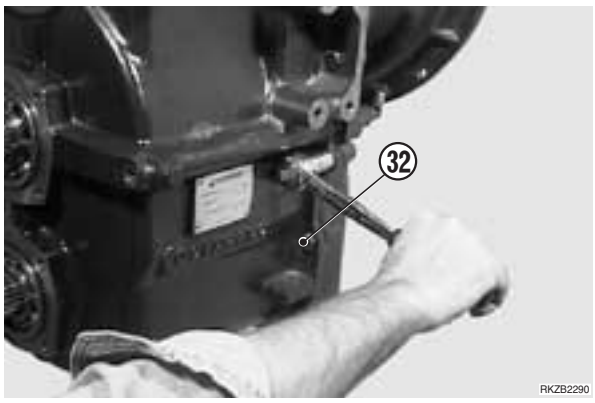


4 - Assemble control valve (2).



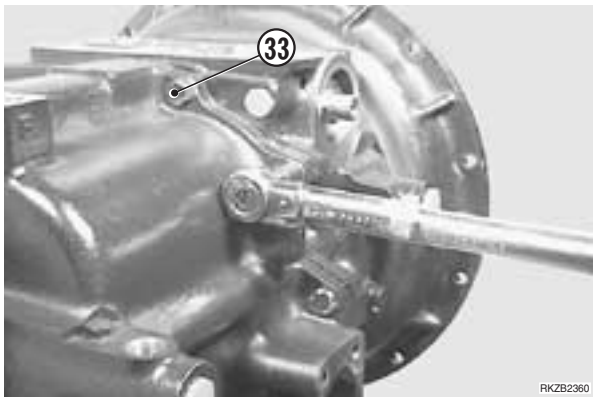
4 - Assemble screws (32).

Nm Screw: 50 Nm



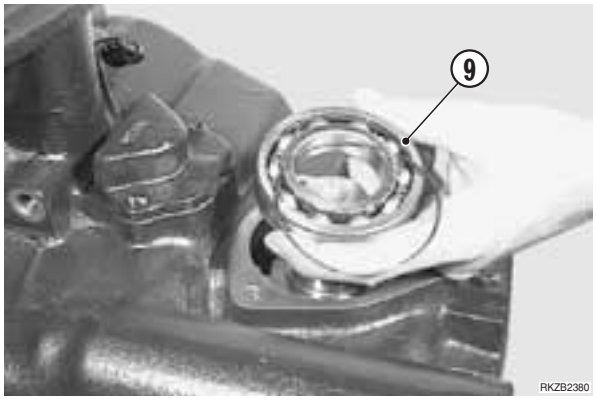
5 - Assemble screws (33).

Nm Screw: 50 Nm

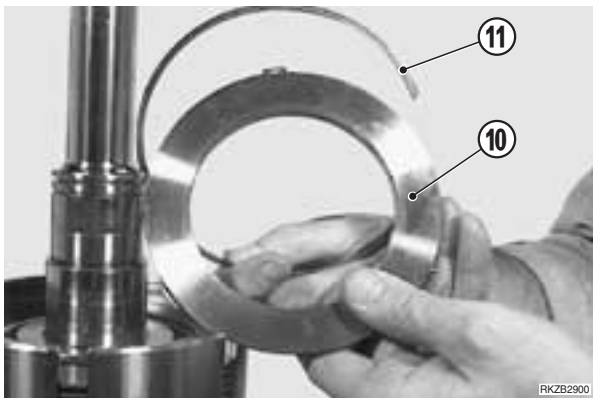


6 - Assemble bearing retaining ring (1).

7 - Assemble bearing (9). Use tool **C7**.

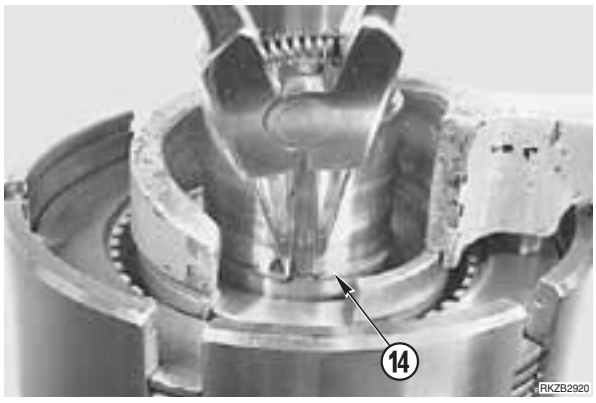


10 - Remove retaining ring (10) and stop washer (11).

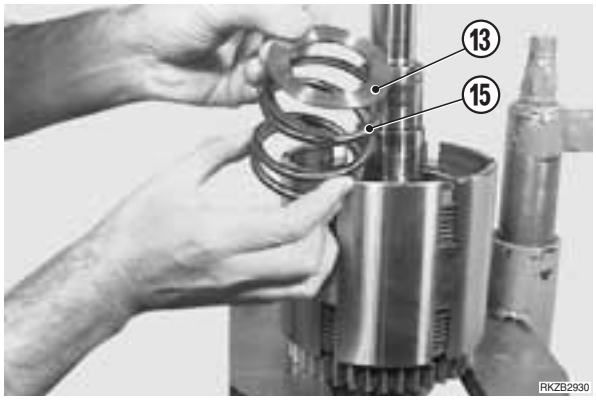


11 - Lower spring retaining cover (15). Remove spring pin (12). Use tool **C9** and a hydraulic press.

12 - Remove retaining ring (14).



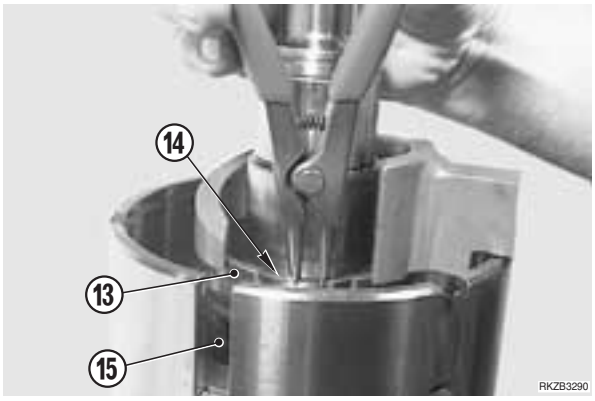
13 - Remove spring retaining cover (13) and spring (15).



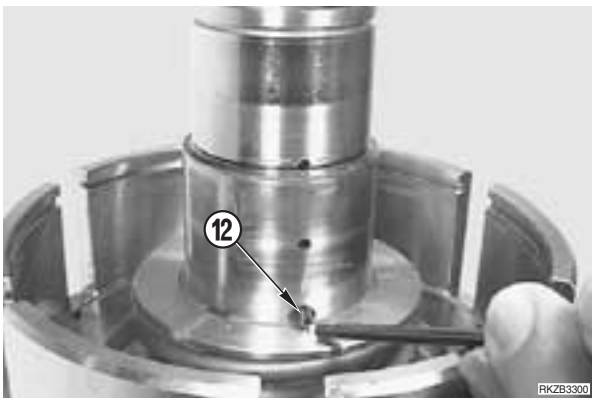
16 - Apply a thin film of grease on the outer edge and in the inner part of clutch piston (18) and insert.

17 - Insert spring (15) and spring retaining cover (13) and lover the spring retaining cover.

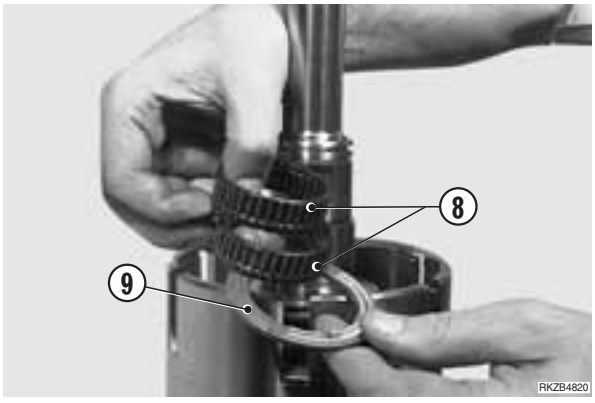
18 - Insert retaining ring (14). Use tool **C9** and a hydraulic press.



19 - Assemble spring pin (12).

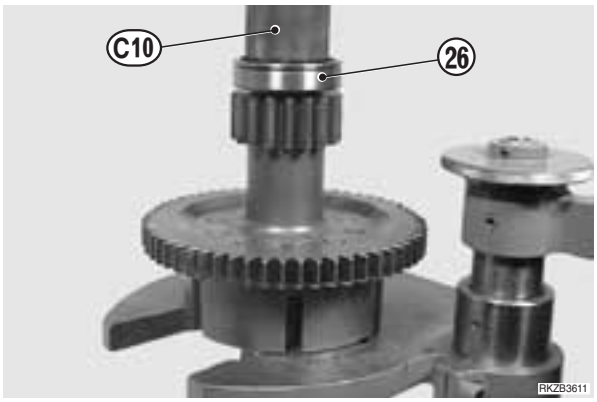


20 - Insert washer (9) and roller retainers (8).



16. Assembly shaft B

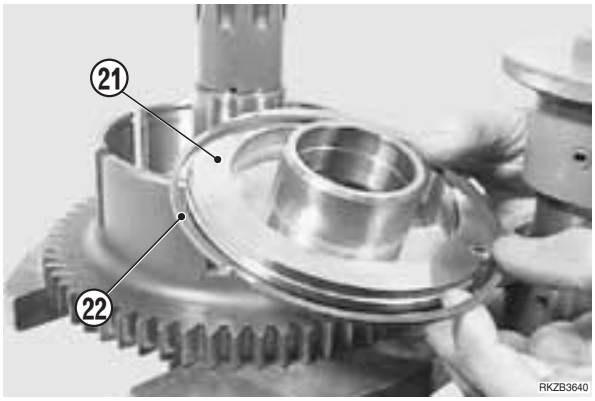
1 - Assemble bearing (26). Use tool **C10**.



2 - Insert washer (25) and assemble retaining ring (24).

3 - Insert and close rotary seal (23).

4 - Insert rotary seal (22) on clutch piston (21).

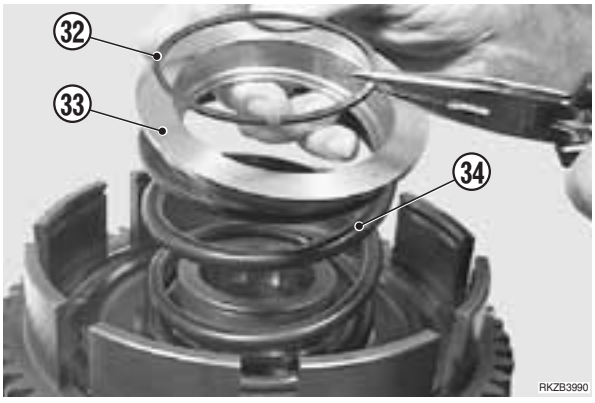


19 - Remove disc pack (29) and counterdiscs (30).

20 - Remove Belleville washer (31).

21 - Lower spring retaining cover (34) to allow retaining ring removal (32). Use tool **C9** and a hydraulic press.

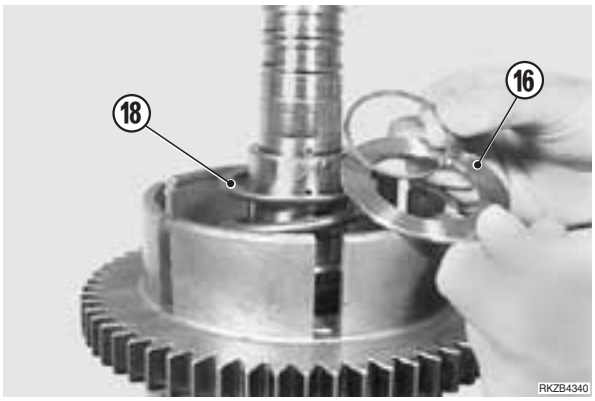
23 - Remove retaining ring (32), spring retaining cover (33) and spring (34).



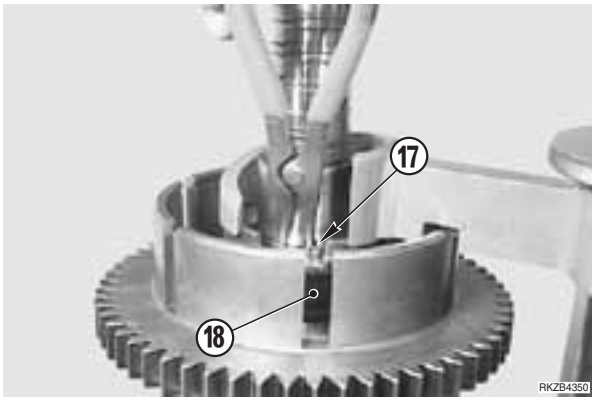
24 - Insert and close rotary seal (20) on clutch piston (19).

25 - Apply a thin film of grease on the outer edge and in the inner part of clutch piston (19).

26 - Insert clutch piston, spring (18) and spring retaining cover (16).



27 - Lower spring retaining cover (18) and insert retaining ring (17). Use tool **C9** and a hydraulic press.

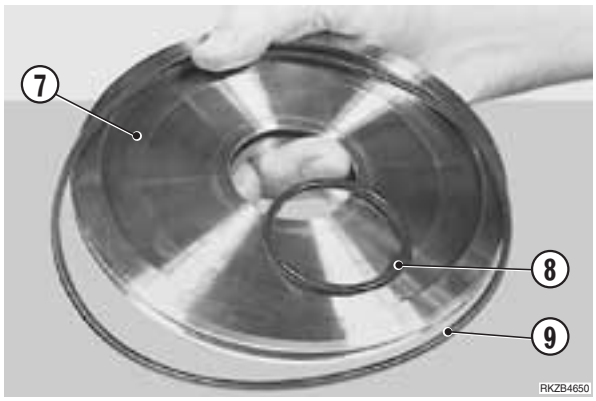


18 - Remove all bearing (23) parts.

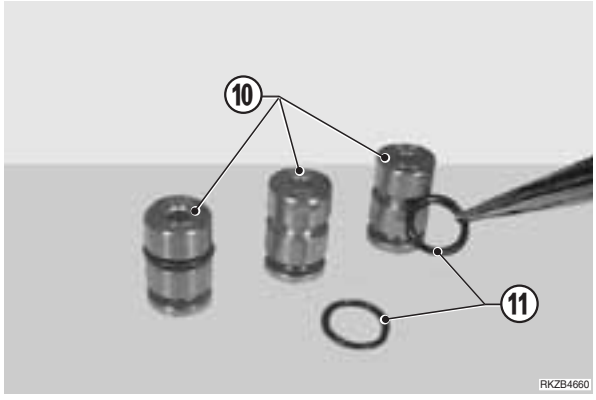
20. Assembly shaft E

1 - Assemble bearing (14) and the relative retaining ring (12). Use tool **C12**.

2 - Insert inner (8) and outer (9) O-rings on clutch piston (7).



3 - Insert O-rings (11) on the relative pins (10).

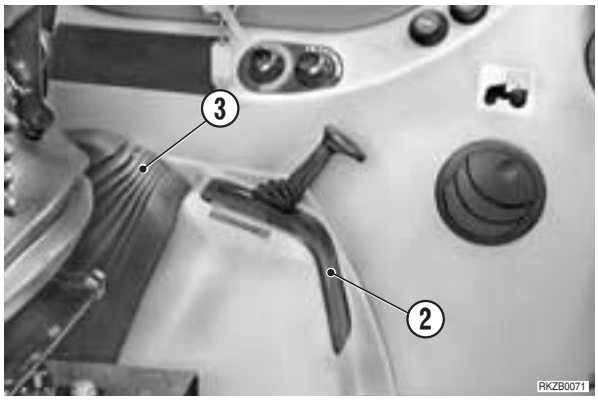


REMOVAL OF THE FRONT WORKING EQUIPMENT CONTROL VALVE

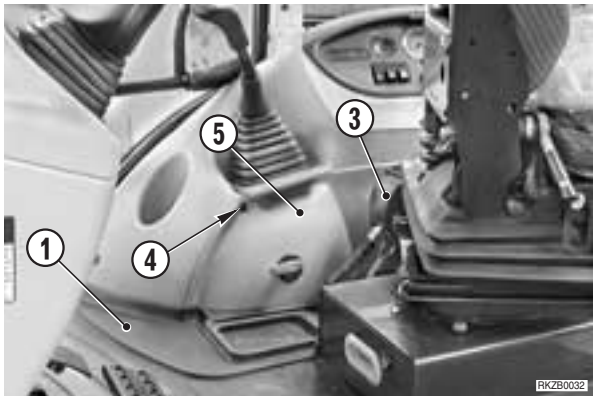
Lower the working equipment completely until it rests on the ground and stop the engine and remove the ignition wrench.

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

1 - Remove the mat (1) and disengage the protective sleeves (2), (3).



2 - Take out the screws (4) and remove the guard (5).



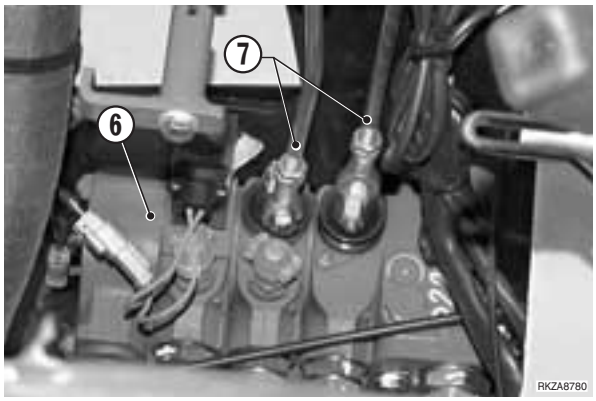
3 - Disconnect the spool control tie-rods (7) from the control valve (6).

4 - Disconnect from the control valve all pipes and lines for the actuators (8), pump delivery (9), drainage (10), Load Sensing (11) and steering unit delivery (13), and plug them.

★ Mark the pipes to avoid exchanging positions during reconnection.

5 - Take out the four control valve retaining screws.

6 - Remove the control valve (6).



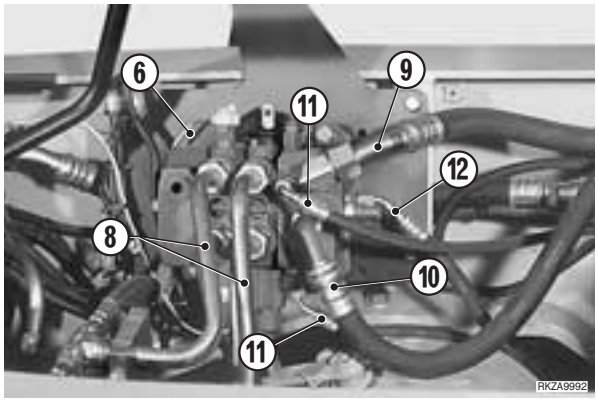
INSTALLATION OF THE FRONT WORKING EQUIPMENT CONTROL VALVE

- To install, reverse removal procedure.

1 - Start the engine to circulate the oil, and check that there are no leaks.

2 - Bleed the air from all circuits.
(For details, see «20. TESTING AND ADJUSTMENTS»).

3 - Stop the engine and check the oil level in the tank.

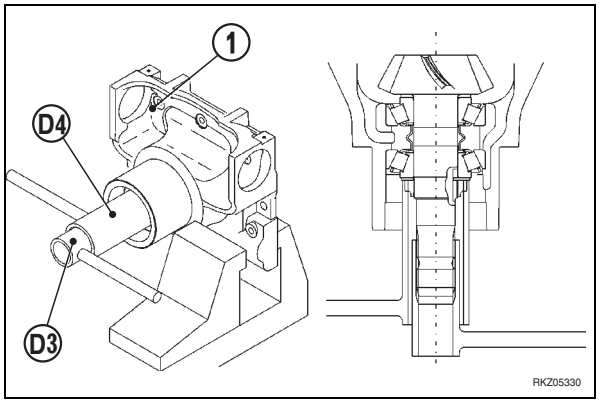


6. Pinion group disassembly

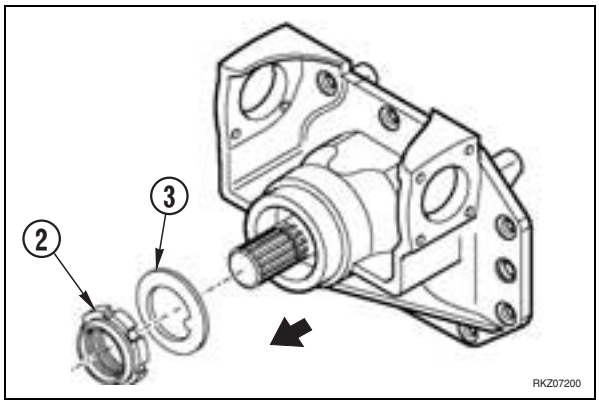
1 - Fit the differential carrier (1) in a vise.

2 - Unscrew the lock nut using special tools **D3** and **D4**.

★ This operation will irretrievably damage the ring nut.



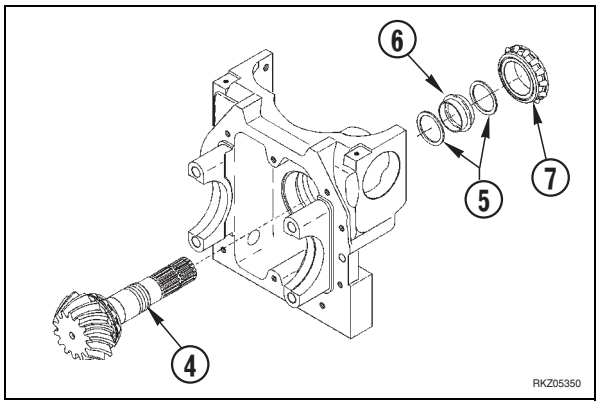
3 - Remove the ring nut (2) and collect its retaining washer (3).



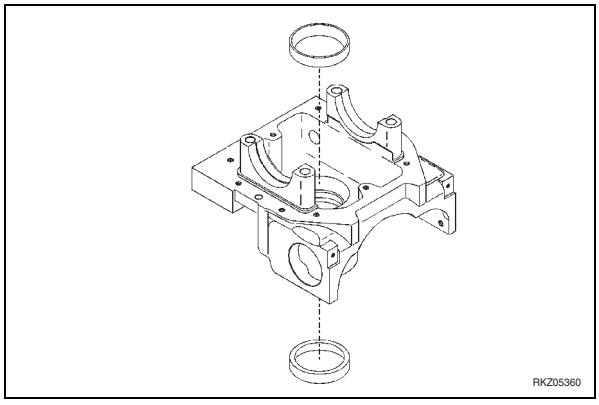
4 - Tap the shaft with a soft hammer to remove the bevel pinion (4).

★ Take care not to drop the pinion.

5 - Collect the washers (5), the collapsible spacer (6) and the inner cone of the tapered roller bearing (7).

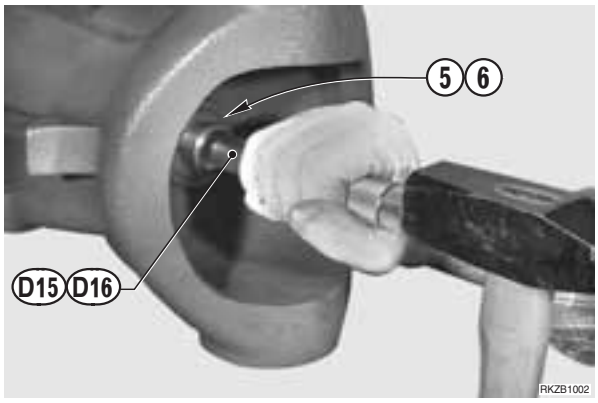


6 - Place the differential carrier on a flat surface as shown in the figure and remove the outer cups of the taper roller bearing (7) using a driver and a hammer.

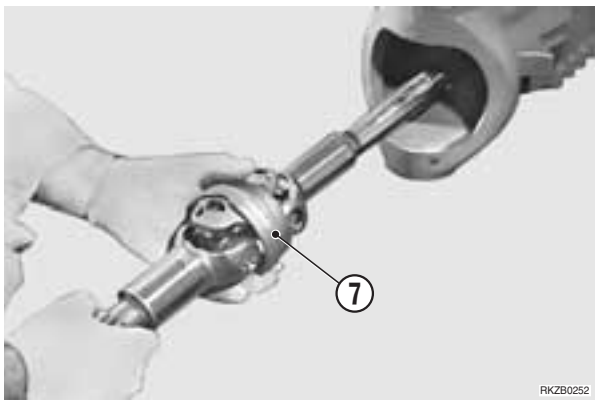


3 - Assemble the bush (5) on the axle beam with the special tool **D15** and a hammer.

4 - Assemble the seal ring (6) on the beam with the special tool **D16** and a hammer.
Fill ¾ of the seal ring cavity with grease.



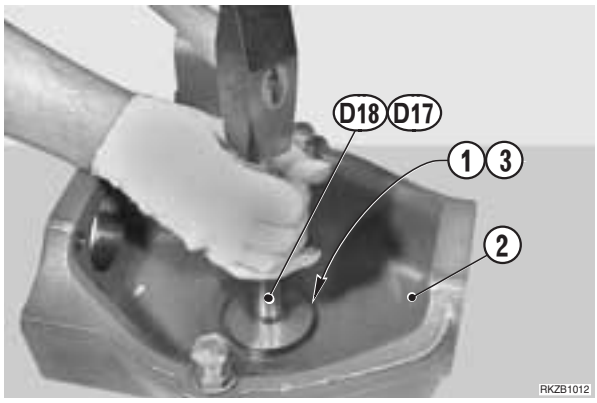
5 - Lubricate the bush (5) and the seal ring lip (6).
Insert the U-Joint (7) inside the axle beam.
★ Be careful not to damage the seal.



5. Wheel hub group assembly

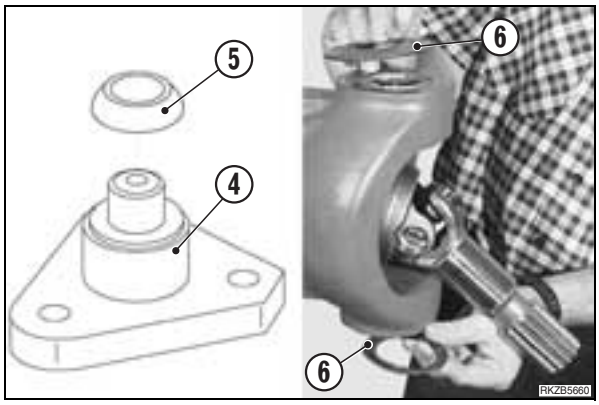
1 - Force the bush (1) into the swivel housing (2) with the special tool **D17** and a hammer or a press.

2 - Assemble the seal ring (3) on the swivel housing (2) with the special tool **D18** and a hammer.
Fill ¾ of the seal ring cavity with grease.



3 - Position the lower king pin (4) on a workbench and assemble the cone of the spherical joint (5) with the special tool **D19** under a press. Put the shim under the Belleville washer on the upper part.
Grease well the king pin housings with specific grease.

4 - Position the Belleville washers (6) on the king pin housings.

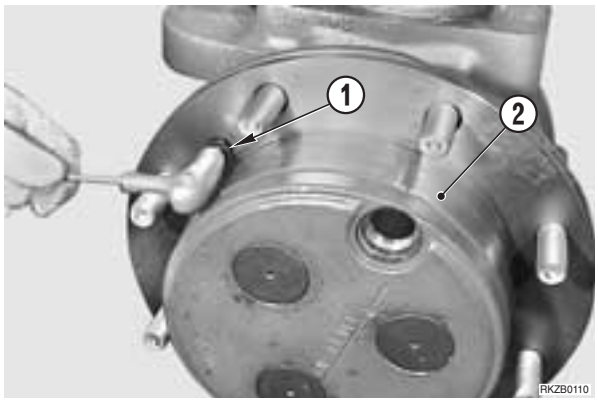


DISASSEMBLY OF REAR AXLE

1. Epicyclic reduction gear disassembly

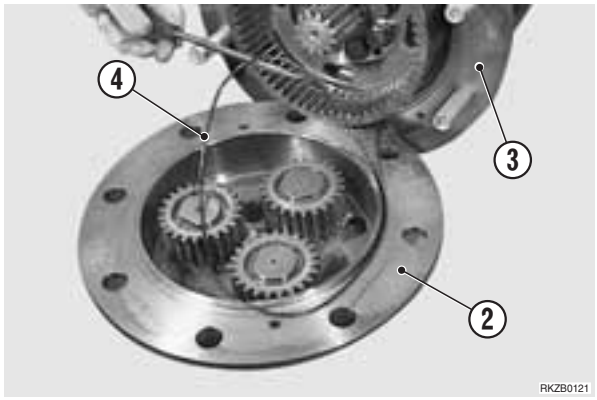
⚠ Before draining the oil, position the hub with the plug on the upper part and loosen it of some turns in order to eliminate any possible inner pressure, and then remove it completely.
Turn the hub upside-down till the hole is in the lowest point.
Drain the oil completely.

1 - Unscrew and remove the two fastening screws (1) of the planetary carrier (2) with a wrench.

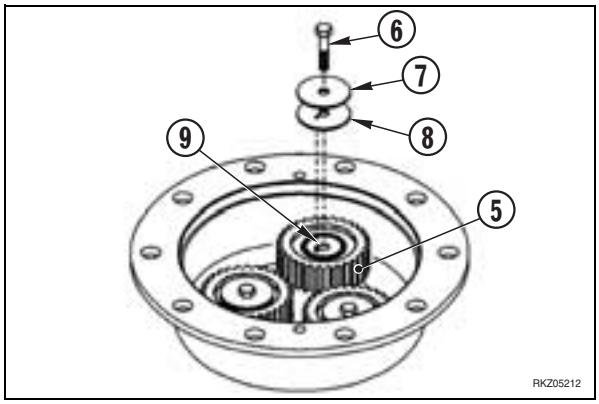


2 - Remove the planetary carrier (2) from the wheel hub (3). Position the planetary carrier on a table and check its wear conditions.

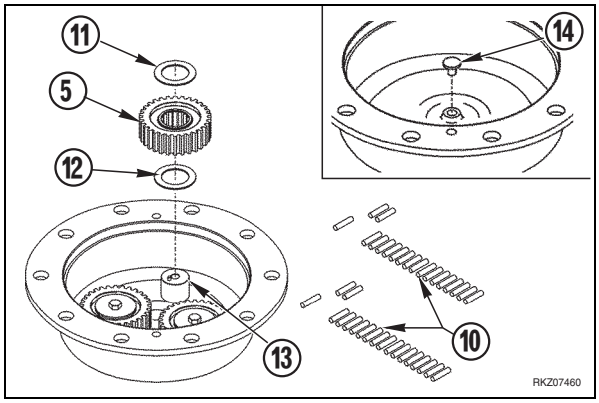
3 - Remove the O-ring (4) and check its conditions.



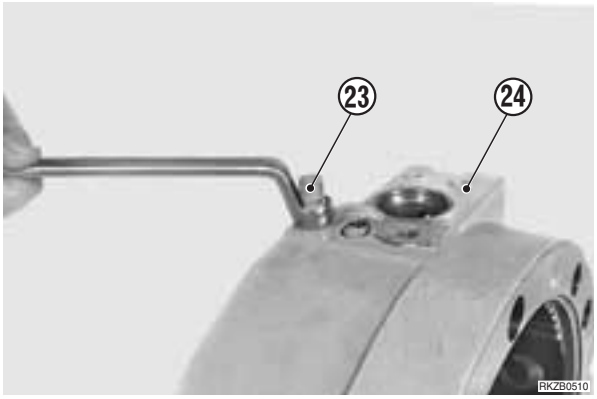
4 - To replace the epicyclic gears (5), if necessary, remove the screw (6) and relevant washers (7) and (8).
★ Treat the pin (9) with care.



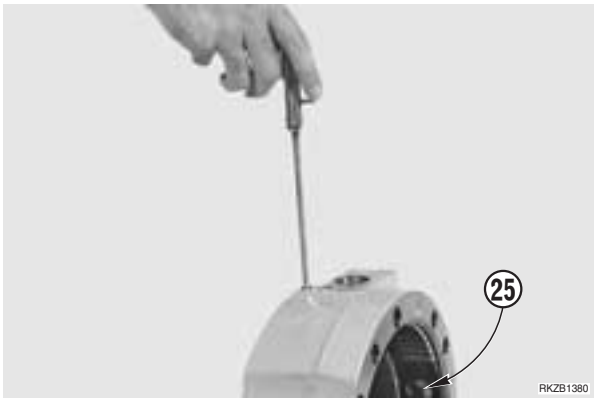
5 - Remove the epicyclic gear (5) from its seat, taking care not to lose the two units of rollers (10) and thrust washer (11) and (12) inside it.
★ If the pins (13) of the pinion gears are in poor condition, replace the entire planetary train with pre-fitted pins.
★ If the halfshaft stop (14) is worn, replace the entire planetary carrier.



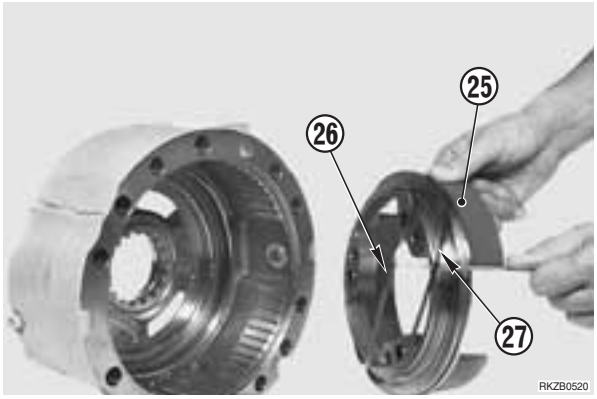
20 - Unloose the brake flange (24) bleed (23).



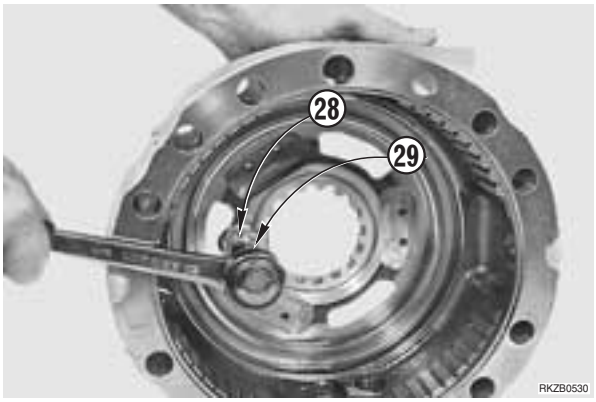
21 - Take the piston out (25).
If necessary, blow in air through the brake bleeder vent to eject the piston, using the minimum pressure.
★ Possible swift ejection of the piston.



22 - Remove the O-Rings (26) and (27) from the piston (25) and check their conditions.



23 - Unscrew the fastening screw (28) of the ring nut retainer (29).

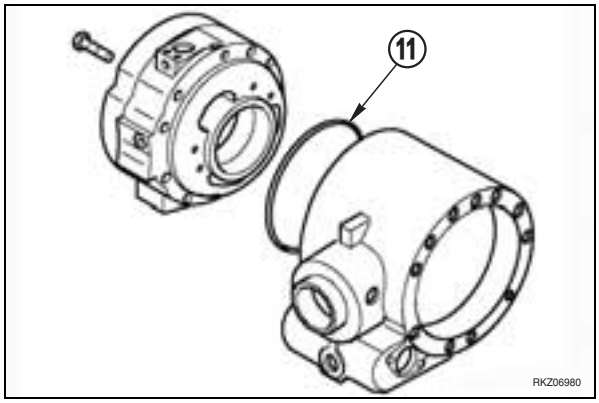


7 - Insert a new O-ring (11) on the flange. Lubricate the O-ring. Assemble the left flange on the central body.

8 - Tighten the securing screw of the brake cylinder with a torque-wrench.

Nm Screw: 79 Nm

★ Check that the reference marks made in the disassembly between flange and central body coincide.

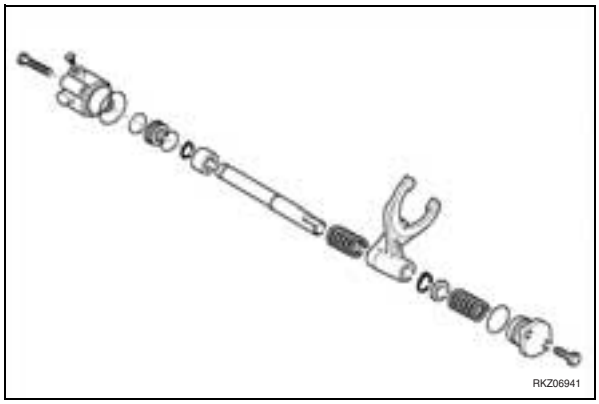


9 - Before the adjustment of the ring bevel gear bearings preloading, prefasten the brake cylinders with two additive screws M14X120.
Tighten at 79 Nm.
Once adjustment is made, remove them.

★ Respect the correct assemble side of the differential box with its relative components.

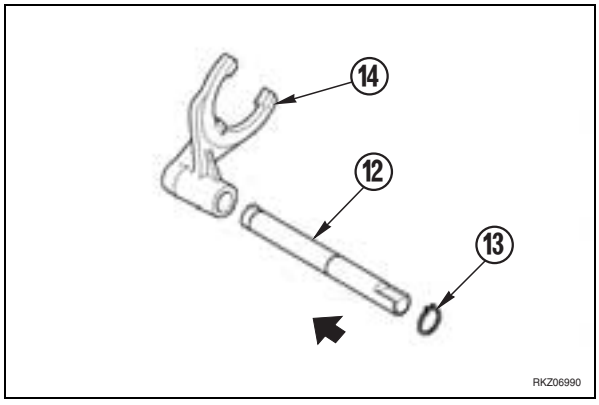
10 - Overturn and position the flange central body on a flat surface.
Insert the differential box.

★ The differential locking device elements have to be assembled by respecting the relative position pointed out in the figure.

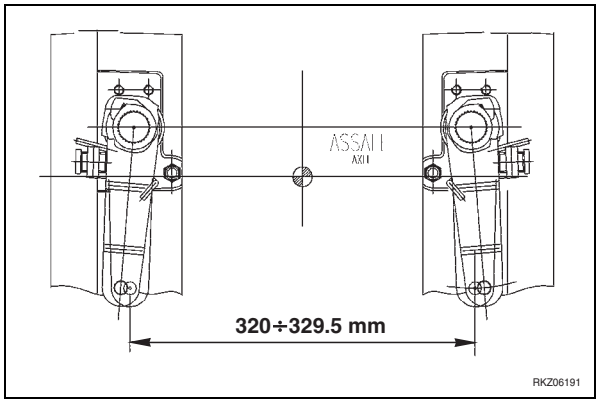


11 - Once the snap ring (13) has been introduced into the shaft (12) till about 20 mm from the flatted end, introduce the shaft into its housing in the central body, on the gear side, slipping it into the fork (14).

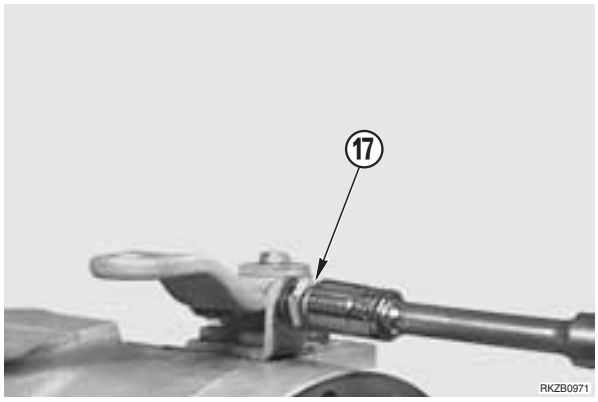
★ Do not put the snap ring in the housing.



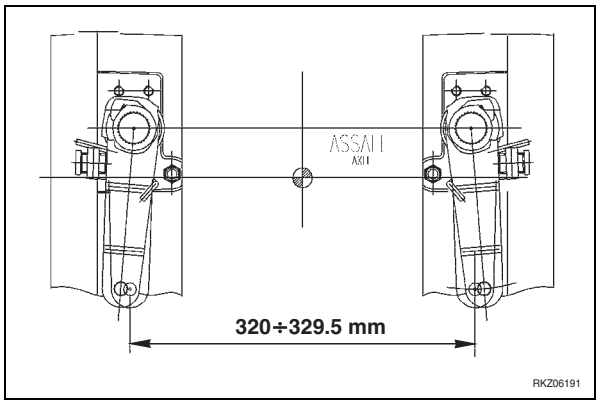
17 - Check that, in rest position, the measure between the middle of the connection holes at the lever ends is higher than the minimum value 320 mm.



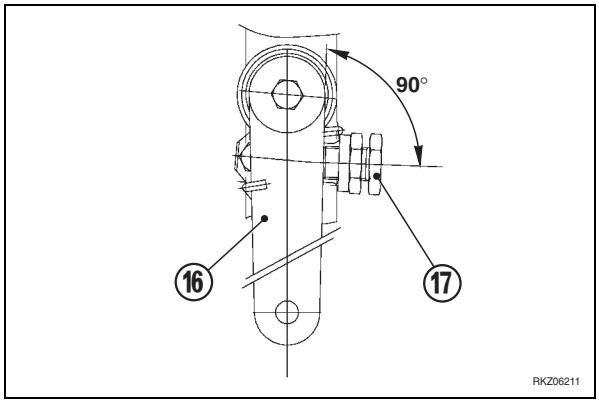
18 - Assemble the adjusting screws (17) on the brackets and screw in them, till they are in contact with the levers.



19 - Screw in the two screws of the same measure to be within the foreseen range for the levers in rest position: 320–329.5 mm (about 3 mm between lever and bracket will remain).



20 - If the screw (17) is not perpendicular to the side surface of the lever (16), adjust its position by moving the supporting bracket.



7 - Disconnect the connector (10) of the solenoid (11) of the control valve (12).

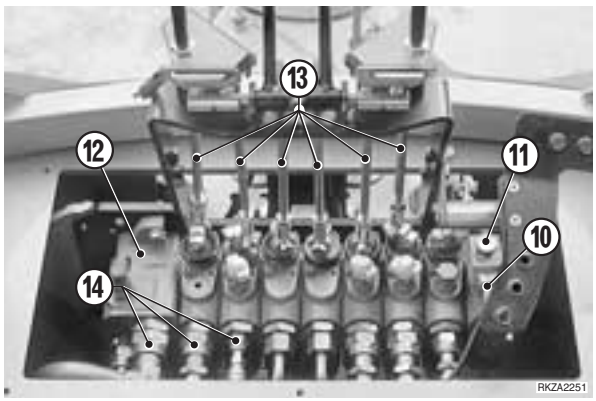
8 - Disconnect the lever command tie-rods (13) from the control valve.

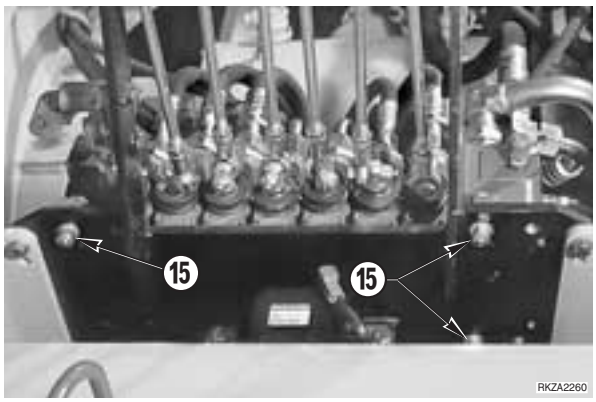
9 - Disconnect from the control valve the pipes (14) (delivery, return, Load Sensing and actuators). Plug them to prevent entry of impurities.
★ Mark the pipes to prevent exchanging positions during re-connection.

10 - Attach the control valve (12) to some hoisting tackle and apply a slight tension to the cables.

11 - Remove the four screws (15) and then the entire control valve.

kg Control valve: 6-spool 47 kg
7-spool 53 kg
8-spool 59 kg





INSTALLATION OF THE BACKHOE CONTROL VALVE

- To install, reverse the removal procedure.

★ Bleed the air from Load Sensing circuits and from the hydraulic circuits of all the actuators.
(For details, see «20. TESTING AND ADJUSTMENTS).

5 - Secure the piston-rod group (6) on the tool **A1**.

6 - **For the side digging boom cylinder**: remove the snap-spin (10).

7 - **For the piston rod of the boom cylinder**: remove the screw (7).

8 - Use the appropriate socket wrench **A7** on the piston hexagon (11) and unscrew the piston.

★ Measurement of the socket wrench:

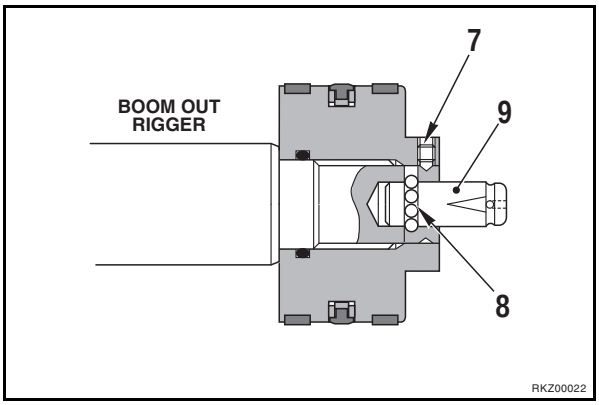
For raising the front bucket.:	55 mm
For tilting the front bucket.:	55 mm
Boom:	65 mm
Arm:	55 mm
Bucket:	55 mm
Outriggers:	46 mm
Jig arm:	46 mm
Side digging boom:	46 mm

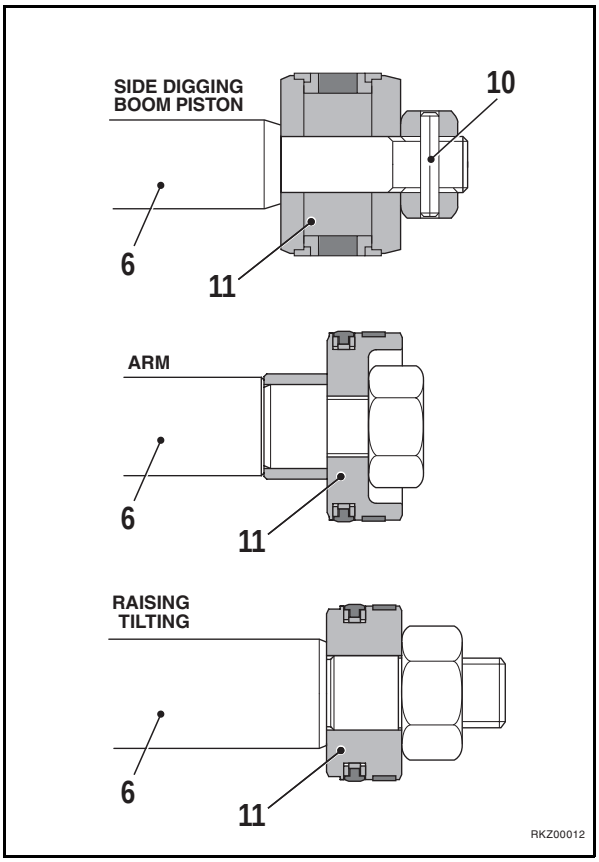
9 - **For the piston rod of the boom cylinder:** Take out the ball bearings (8) and the cushion plunger (9).

10 - Dismantle all the groups by removing all the seals, the dust-seals, the guide rings, and the fulcrum bushings.

⚠ The seals, the dust seals and the guide rings cannot be used again.

⚠ Carefully check the pistons (11). If both safety-caulked areas show wear, the pistons must be replaced.





REMOVAL OF THE BACKHOE WORKING EQUIPMENT

⚠ Fully extend the arm and open the bucket completely. Lower the equipment until it is resting on the ground.

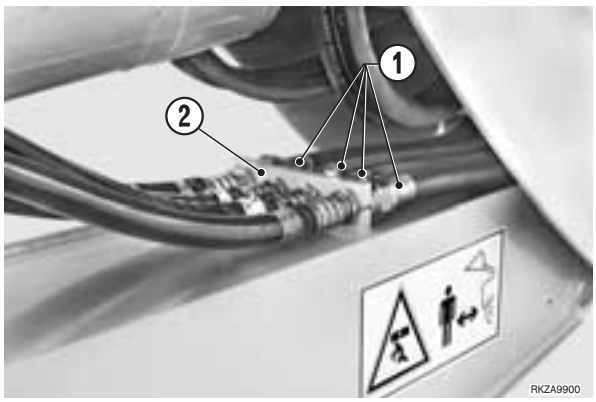
1 - Stop the engine and release the residual hydraulic pressures. (For details, see «20. TESTING AND ADJUSTMENTS»).

2 - Remove the boom cylinder. (For details, see «REMOVAL OF BOOM CYLINDER»).

3 - Take out the bracket (2) mounted inside the boom. Disconnect the tubes (1) from the arm cylinders.

★ Plug all tubes to prevent entry of impurities.

★ Mark the tubes to prevent exchanging positions during re-connection.



4 - Remove bracket (3).

★ Mark the tubes to prevent exchanging positions during re-connection.

5 - Put a sling round the equipment (4) and apply slight tension to the cables.

6 - Take out the snap-rings and remove the pin (5).

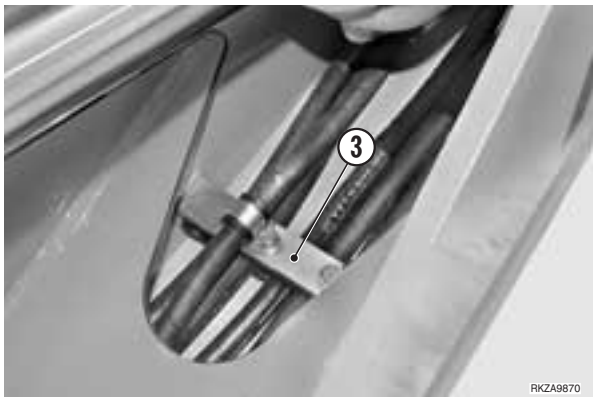
※1 ※2

7 - Remove the working equipment (4).

※3

kg Standard work equipment: 850 kg

★ While remove the equipment, extract the control hoses and take care to not stress them.

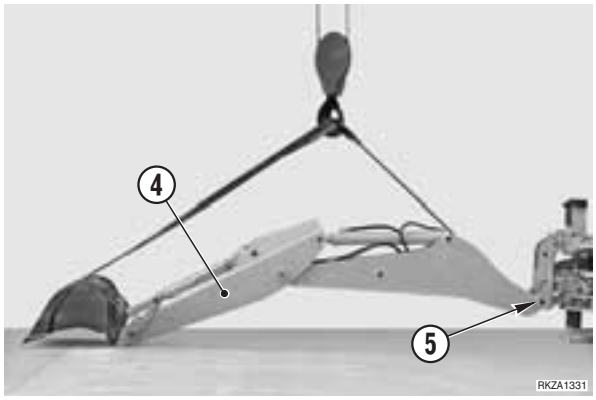


INSTALLATION OF THE BACKHOE WORKING EQUIPMENT

• To install, reverse the removal procedure.

※1

⚠ When aligning the positions between the hole and the pin, turn the engine over at low idling speed.
Do not insert fingers into the holes to check alignment.



※2

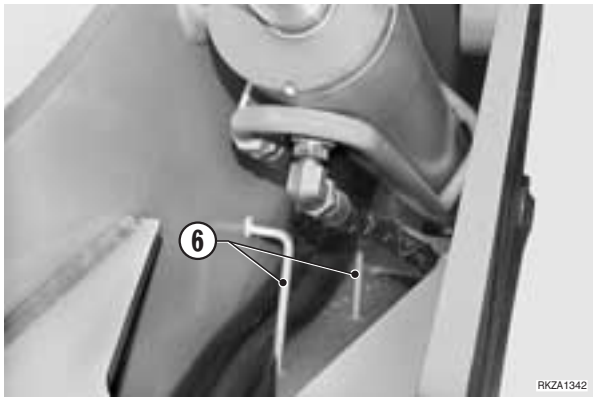
Internal bushing: ASL800050

※3

★ Pass the tubes of the cylinders inside the brackets (6).

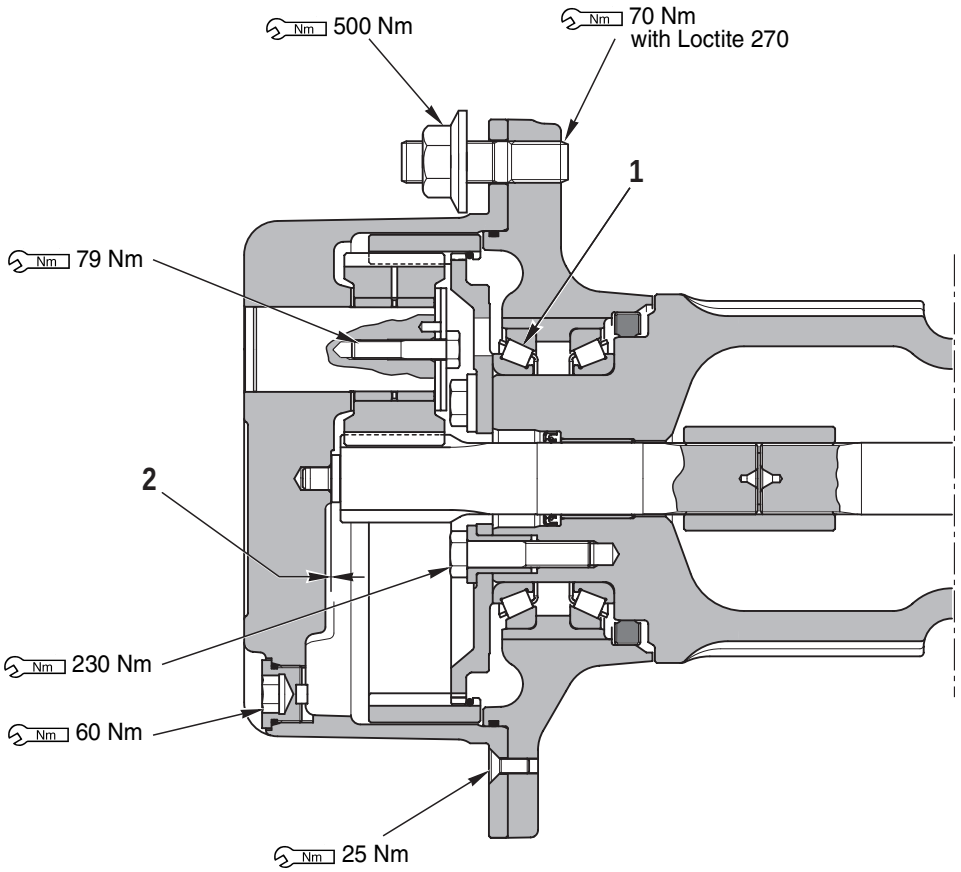
1 - Start the engine and bleed the air from the cylinders. (For details, see «20. TESTING AND ADJUSTMENTS»).

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



GROUP 40

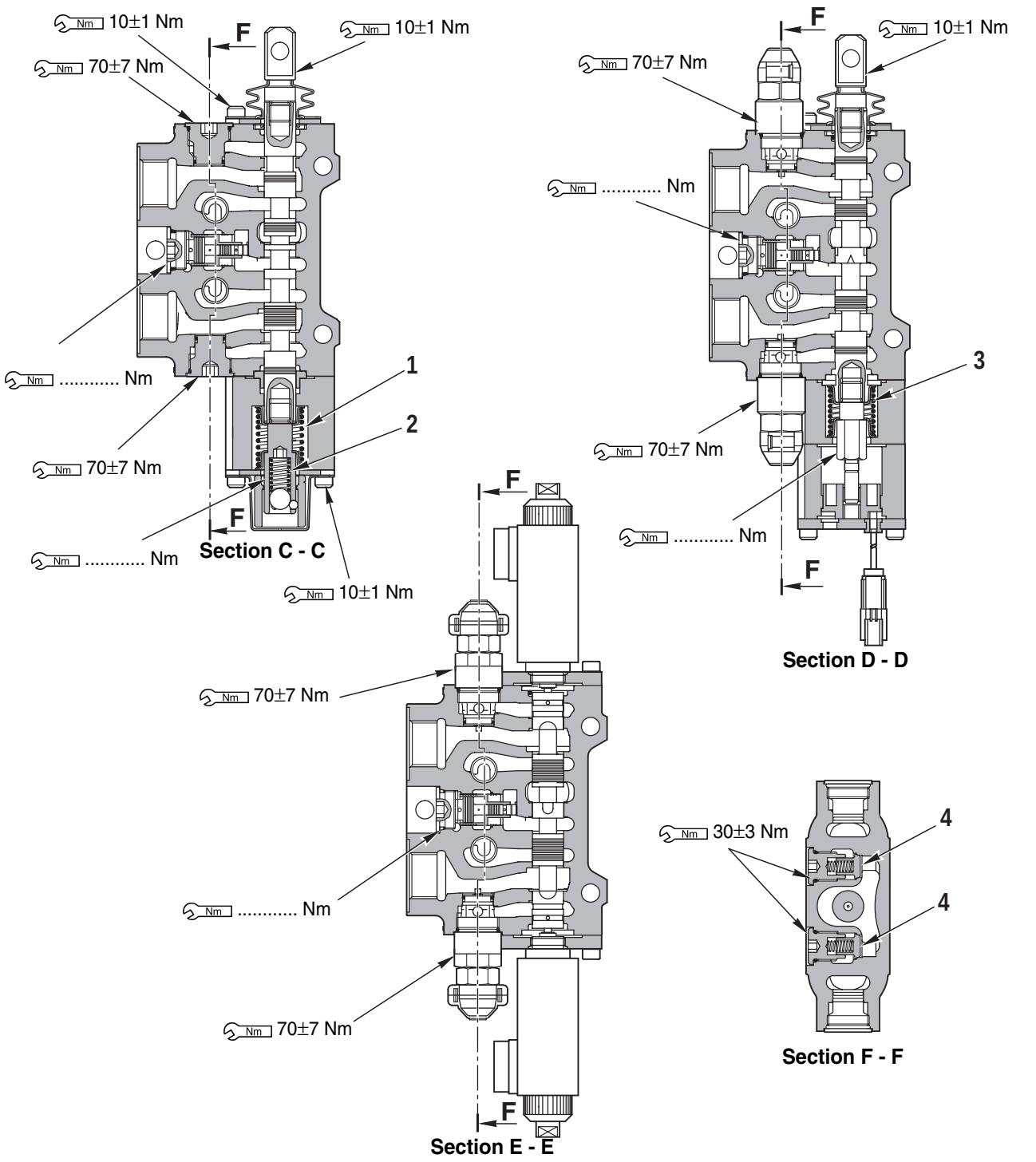
Planetary



RKZ04981

Unit: mm

N°	Check item	Criteria	Remedy
1	Hub rotation torque	—	Adjust
2	Drive shaft axle clearance	—	Replace



Unit: mm

N°	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Spool locking spring						
3	Spool return spring						
4	Check valve spring						

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