

SHOP MANUAL



WB150AWS-2

BACKHOE-LOADER

SERIAL NUMBER

WB150AWS-2 150F80001 and up

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September 2002

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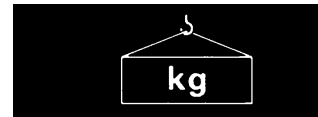
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HOISTING INSTRUCTIONS



! 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

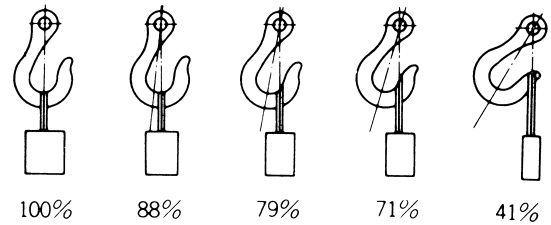
- 1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

WIRE ROPES (Standard «S» or «Z» twist ropes without galvanizing)	
Rope diameter (mm)	Allowable load (tons)
10.0	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. Slings 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.

! Slings 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.

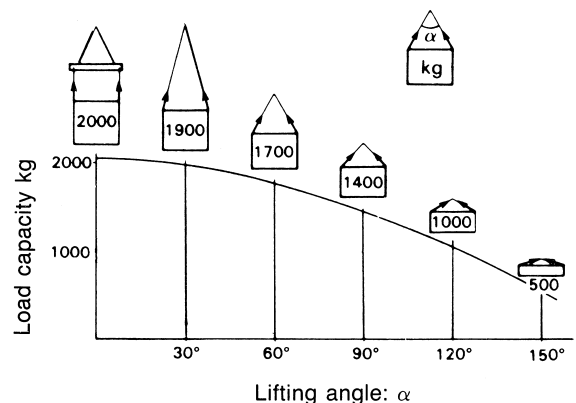
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles.

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 hanging 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.

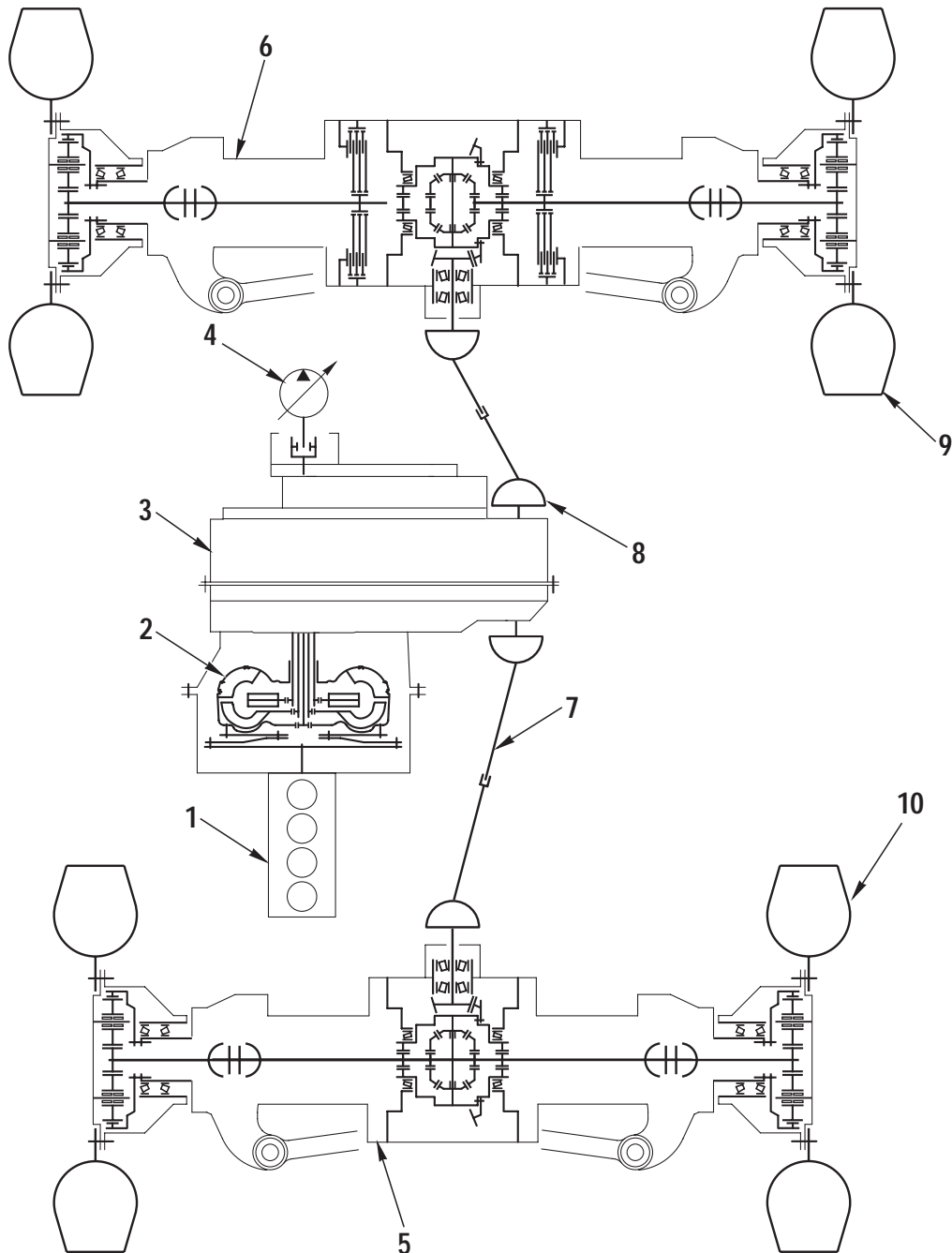
	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	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	7.699	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

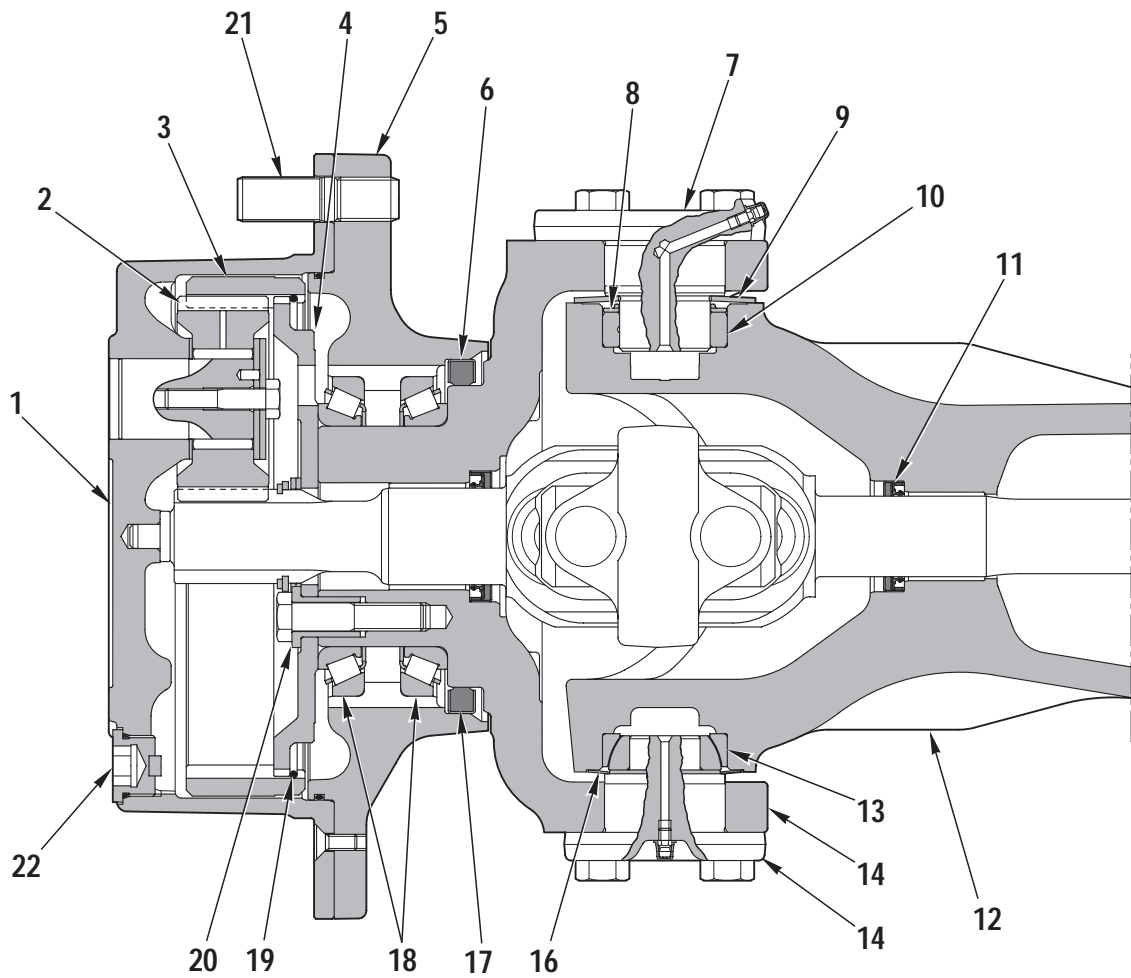
Gears	Transmission	Differential	Planetary	Total
1st gear	4.374	2.75	6.923	83.273
2nd gear	2.436			46.377
3rd gear	1.232			23.455
4th gear	0.651			12.394



RKZ04460

- 1. Diesel engine
- 2. Converter
- 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 - join

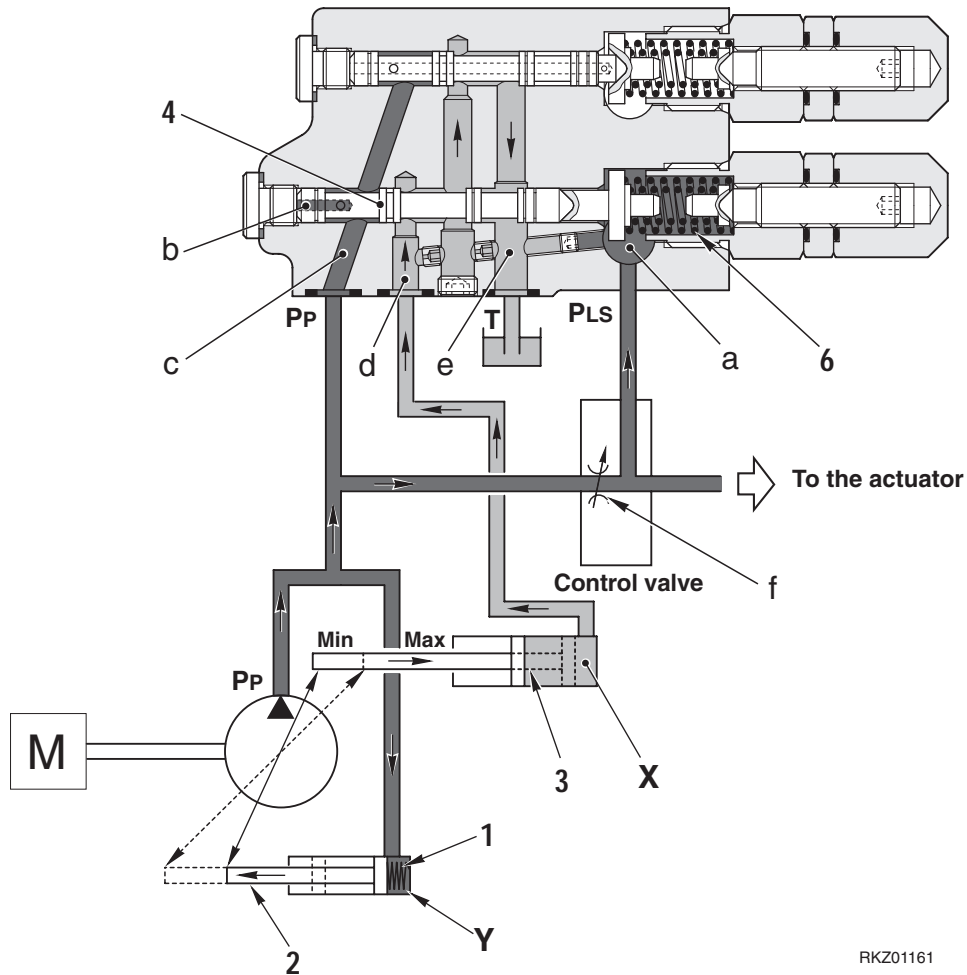


RKZ04300

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

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2. When a control valve lever is activated



RKZ01161

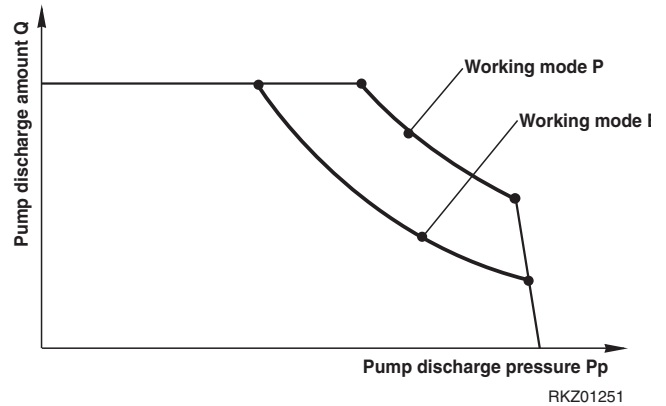
- When the control valve lever is moved out of its NEUTRAL position, the opening **f** is determined, allowing an **LS** signal to be generated.
- Until the ΔPLS generates a force less than the force exerted by the spring (6) on the spool (4), the system will remain stable.
When the opening **f** is such as to provoke a reduction in ΔPLS , the spool (4) moves to the left (←) to form a passage between delivery lines **d** and **e**. The chamber **X** loses pressure and the servo-piston causes the swash plate to move towards maximum displacement.

Equilibrium is re-established in the system when the pressure ΔPLS generates on the spool (4) the difference in force exerted by the spring (6), and the passage between delivery lines **c** and **d** is re-opened.

WORKING MODE SOLENOID VALVE

FUNCTION

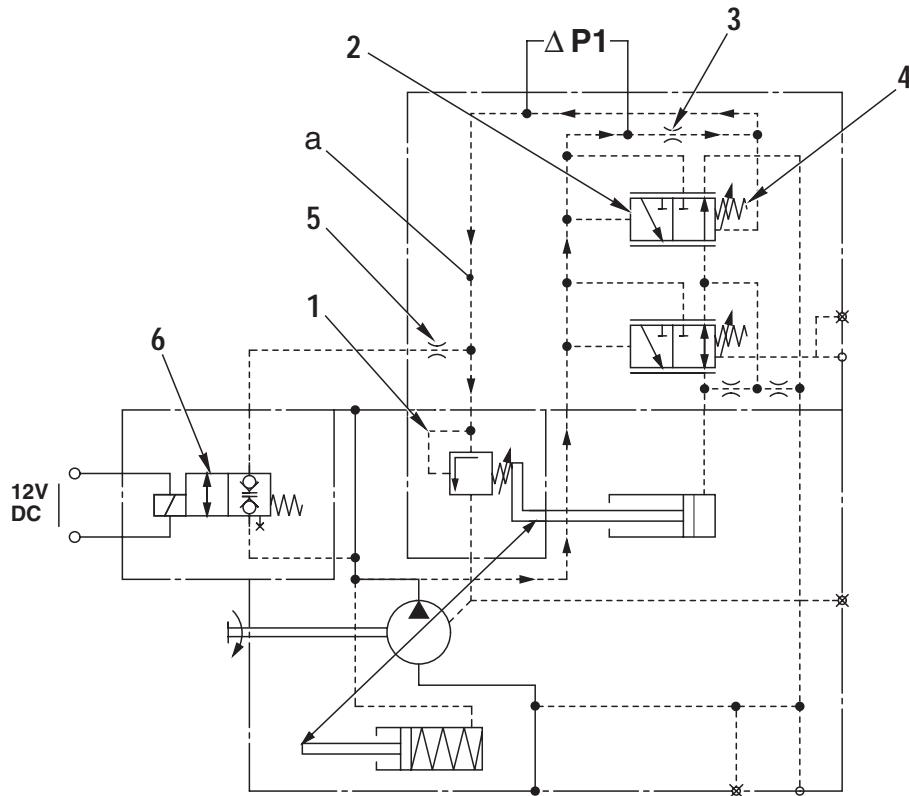
- Calibration of the pump absorption torque is normally performed for the working mode **E**. When the solenoid valve of the working mode is commutated the absorbed power of the pump is increased, as indicated by the working mode curve.



RKZ01251

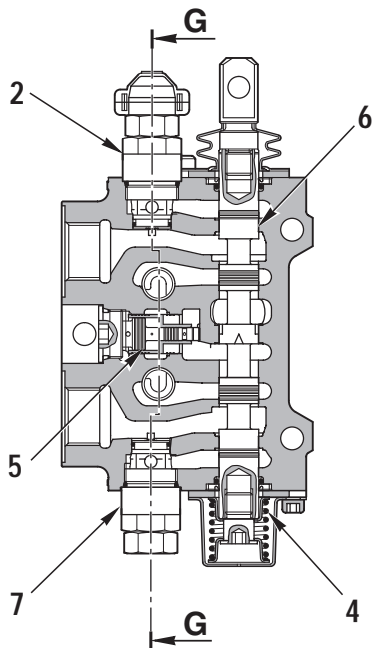
OPERATION

1. WORKING MODE E

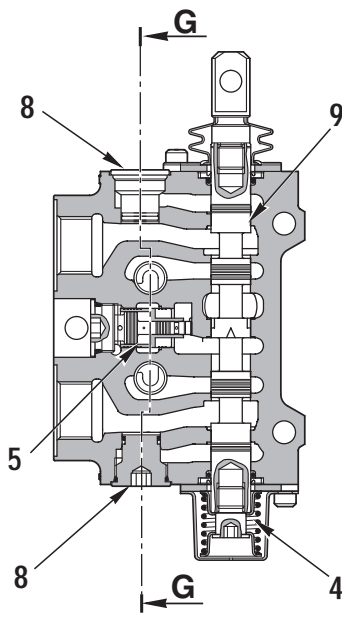


RKZ04940

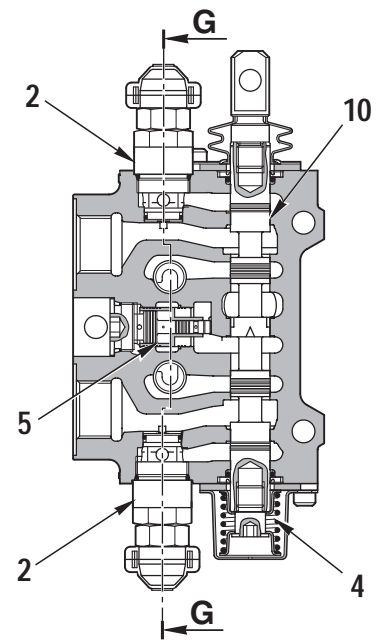
- During normal operation (Working mode **E**), the **PC** valve intervenes when a $\Delta P1$ is generated equal to the loading on the spring (4).
- The $\Delta P1$ is generated by the calibrated hole (3) in the spool of the **PC** valve (2) when, at a determined pump delivery pressure **P1**, the valve (1) puts the delivery line a into discharge, thus generating a flow **F1** in the delivery line a.



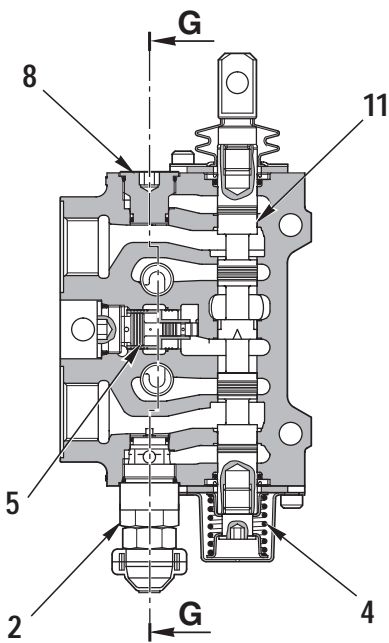
Section C - C



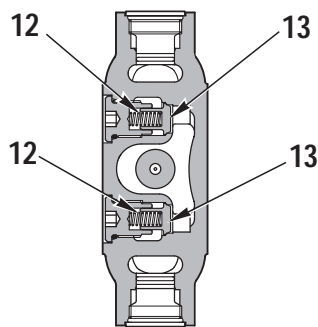
Section D - D



Section E - E



Section F - F



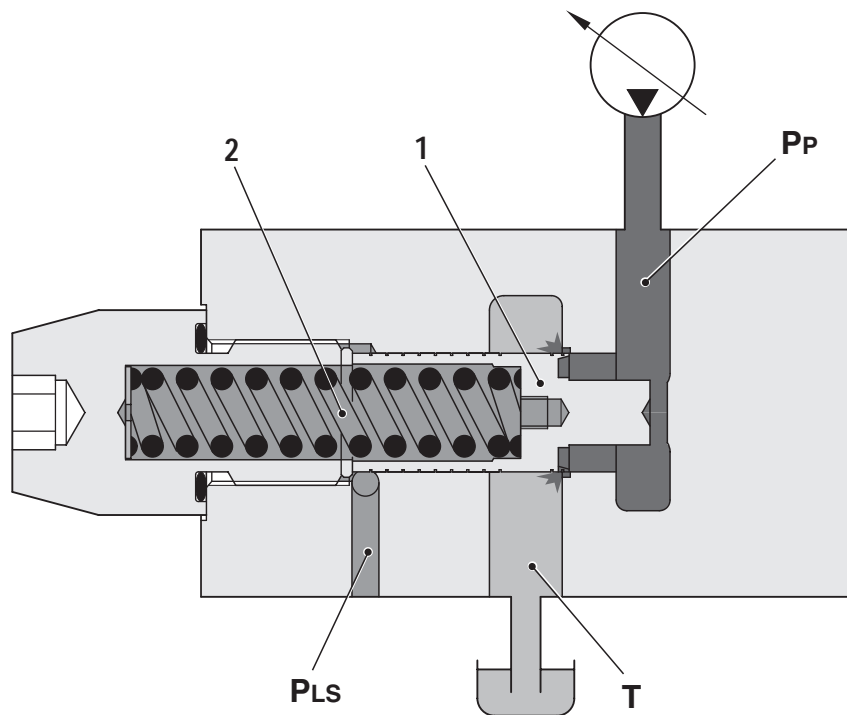
Section G - G

- | | |
|-----------------------------------|------------------------------|
| 1. Ball | 8. Plug |
| 2. Antishock/anticavitation valve | 9. Outrigger command spool |
| 3. Boom command spool | 10. Boom swing command spool |
| 4. Spool return spring | 11. Arm command spool |
| 5. Compensator | 12. Spring |
| 6. Bucket command spool | 13. Check valve |
| 7. Anticavitation valve | |

RKZ01380

2. If, during the precision regulations of the control valve, the request for oil flow to the actuators is equal or less than the delivery values given by the minimum angle of the swash plate, the pump delivery pressure **PP** is regulated by the pressure **PLS**+24 bar.

Because the unloading valve opens when the differential pressure between the pump delivery pressure **PP** and the **PLS** pressure becomes equivalent to the loading of the spring (2) (24 bar), the differential **LS** pressure ΔPLS becomes 24 bar



RKZ01750

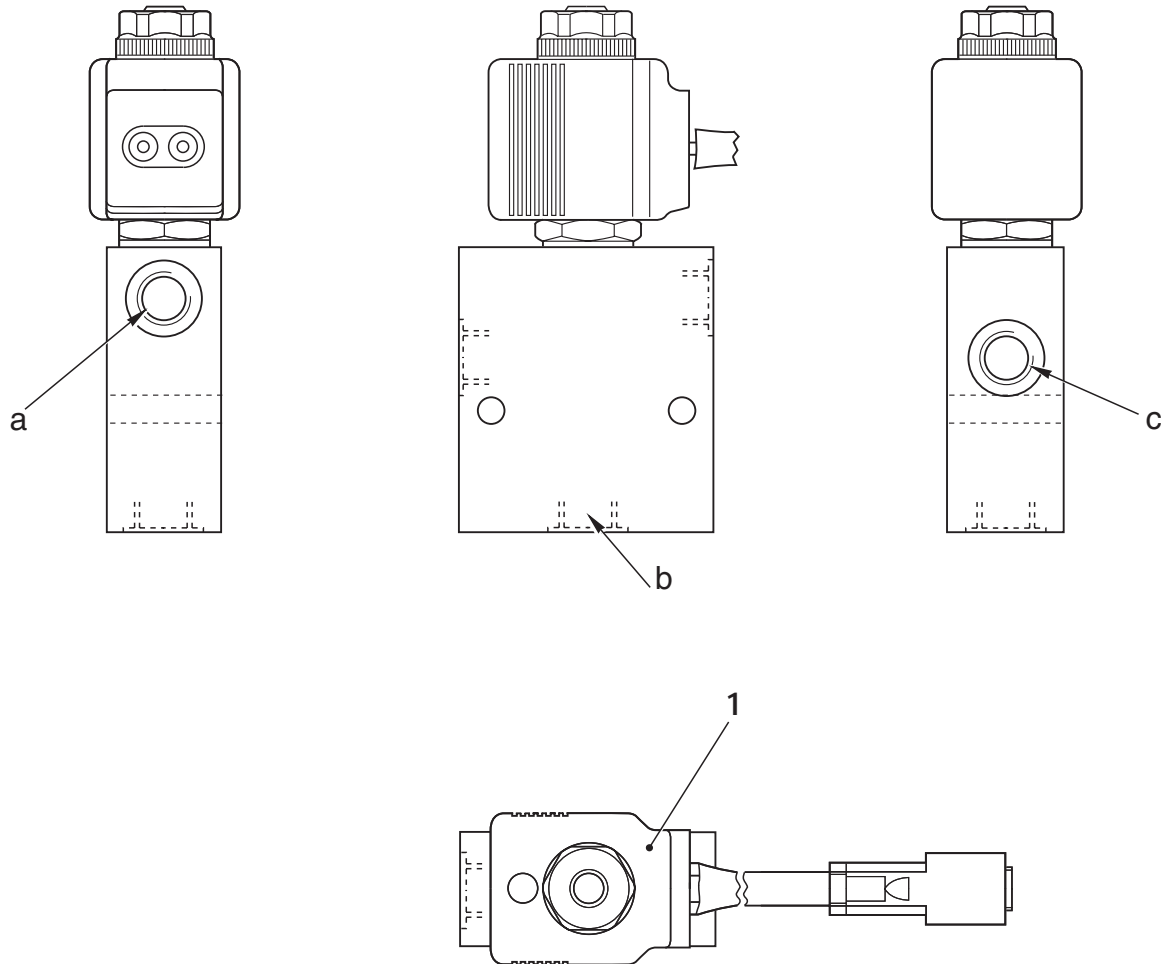
OPERATION

Final control of control valve

- When final control are performed with the control valve, a pressure **PLS** is generated that pressurizing the spring chamber, acts on the left-hand extremity of the valve (1). The actuator pressure is introduced into the **LS** circuit and then into the spring chamber. As a result, the pump pressure **PP** tends to increase.
 - When the differential pressure between the pump delivery pressure **PP** and the **LS** pressure **PLS** has the same value as the loading on the spring (2) (24 bar), the shuttle (1) moves to the left (←) and the pump circuit **PP** puts itself into communication with the tank circuit **T**.
- Consequently the exceeding pump delivery **Q**, relative to the actuator request, is sent to the tank circuit.
- The pump delivery pressure **PP** is regulated by the combination of the pressure provided by the spring (24 bar) and by the **LS** pressure **PLS**, i.e. when the pressure differential ΔPLS reaches the value of 24 bar.

SOLENOID VALVE

Solenoid valve group ST1 - Backhoe boom locking.



RKZ04640

1. EV4 - Backhoe boom locking
- a. Port 3 - To the transmission
- b. Port 2 - From the transmission
- c. Port 1 - Boom-locking cylinder

HOW THE AIR-CONDITIONING UNIT FUNCTIONS

The compressor (1) is driven directly by the engine shaft by means of a belt, and made to rotate by a pulley fitted with an electromagnetically-engaged clutch (1a).

A thermostatic sensor (7) controls the engagement and disengagement of the clutch. It disengages the clutch when the evaporator reaches the lower temperature limit and engages the clutch when the evaporator reaches the upper temperature limit.

The coolant fluid (in gaseous phase) is drawn into the compressor where it is subjected to compression and an intense heating process. In these conditions the fluid is then sent into the condenser (2) where, due to the heat extracted by ambient temperature air flowing over fins, it reaches condensation temperature, and passes into a high-pressure liquid state.

Subsequently the coolant passes into the drying-filter group (3) which performs three functions: it filters out impurities, absorbs any moisture present in the circuit and, finally, also functions as a reserve tank.

The coolant in its liquid state is then transferred to the evaporator (6), first passing through an expansion valve (5). The task of this valve is the constant metering of the quantity of fluid in order to maintain optimum evaporation.

In the evaporator the coolant fluid is subjected to expansion, bringing it up to the critical evaporation point at a temperature of approximately -8°C .

The flow of air generated by centrifugal fan (8) which passes through the evaporator (6) at ambient temperature is considerably warmer than -8°C . For this reason it yields heat to the coolant fluid, bringing it up to boiling point and complete evaporation.

On leaving the evaporator (6) the coolant is drawn once more into the compressor (1) and a new cycle commences.

The yielding of heat from the atmosphere in which the evaporator is positioned leads to the condensation of the water suspended in the air, and hence to dehumidification. The condensate is deposited on the evaporator fins where, if a temperature higher than 0°C is not maintained, it freezes and inhibits the functioning of the evaporator.

The task of keeping the temperature of the evaporator above 0°C (and thus within the optimum limits for heat exchange) is entrusted to a thermostatic sensor (7).

The condensate that forms on the evaporator fins (6) also contains dust, pollens and particles suspended in the air. Continual condensation therefore effectively purifies the air, and the droplets of condensate are discharged to the exterior.

A fixed quantity of anti-freeze oil is also introduced into the circuit, with the function of lubricating all the mechanical parts of the unit. A percentage of this oil circulates constantly throughout the unit in nebulized form, lubricating the compressor (pistons and bearings) and the expansion valve.

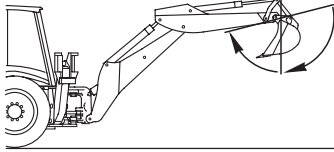
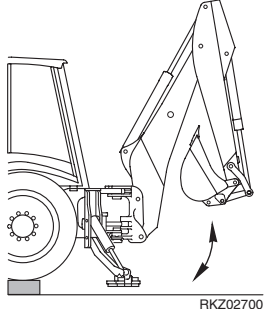
A pressure switch (4) has been inserted in the electrical control circuit to protect the unit in the case of a lack of coolant fluid or if the quantity becomes insufficient due to leakages. This switch will inhibit the engagement of the electromagnetic clutch and hence the functioning of the air-conditioning unit.

FOR MACHINE

Machine model				WB150AWS-2							
Classifi- cation	Check item	Test condition	Unit	Standard value				Permissible value			
Engine speed	Accelerator pedal	• Hydraulic oil temperature: 45–55 °C	Max.	2375±50				2325–2425			
		• Converter oil temperature: 80 °C	Min.	1050±50				1000–1100			
	Accelerator lever	• Engine oil temperature cooling circuit: in the limits	Max.	1950±50				1900–2000			
		• Hydraulic oil temperature: 45–55 °C	Min.	1050±50				1000–1100			
Control valve	All controls (front bucket and backhoe)	<p>RKZ02580</p>	mm	ℓ	a	b	c	ℓ	a	b	c
	For front shovel arm command only (with floating arm)			41.5	8	8	–	–	–	–	–
Travel of levers and pedals	Front bucket tilt lever control	<ul style="list-style-type: none"> • Engine stopped • At the centre of knob lever • Valve reading at the end of working stroke • Attachments on the ground 	Neutral → Raise Lower	50				60–110			
	Front bucket control lever		Neutral → Dump Curled	115				90–140			
	Boom backhoe control lever		Neutral → Raise Lower	100				80–120			
	Arm backhoe control lever		Neutral → Opening Closing	100				80–120			
	Bucket backhoe control lever		Neutral → Opening Closing	100				80–120			
	Boom swing backhoe control lever		Neutral → Right Left	100				80–120			
	Outriggers control lever		Neutral → Up Down	50				30–65			
	Fuel control lever		Min. → Max.	70				50–90			
	Telescopic arm control pedal		Neutral → Out In	15 30				10–20 20–40			
	Breaker control pedal		Neutral → Right Left	15 30				10–20 20–40			

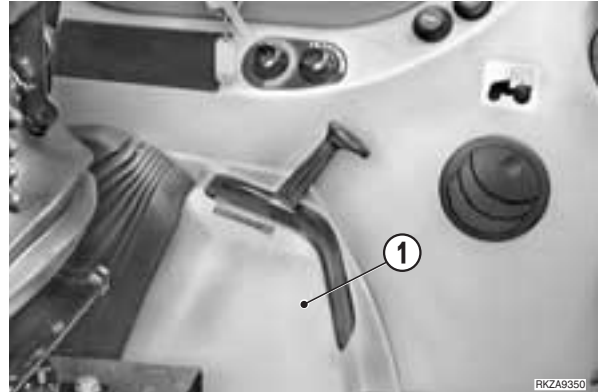
★ The technical data of follow table are referred to a machine with max 500 kg shovel bucket, 600 mm (max. 160 kg) backhoe bucket and standard arm (or telescopic arm) closed.

FOR MACHINE

Machine model				WB150AWS-2	
Classifi- cation	Check item	Test condition	Unit	Standard value	Permissible value
Work equipment	Time lags	<p>Measuring posture</p>  <ul style="list-style-type: none"> • Engine speed: Min. • Oil temperature: 45 – 55°C • Put arm in horizontal position. Tilt back bucket cylinder an then extend it. Check the time passing between bucket stop at dead centre and the restart movement. 	sec.	0	Max. 2
		<p>Measuring posture</p>  <ul style="list-style-type: none"> • Engine speed: Min. • Oil temperature: 45 – 55°C • Boom, arm and bucket fully retracted and putted in machine centre position. • Check the time necessary for outriggers to raise the machine from when they lean on level ground. • Check each outrigger at a time. 		0	Max. 2

2. Accelerator lever travel adjusting

1 - Remove mat and lateral cover (1).



2 - Loosen nut (2) and tight the end lever travel bolt (3) of some turns.

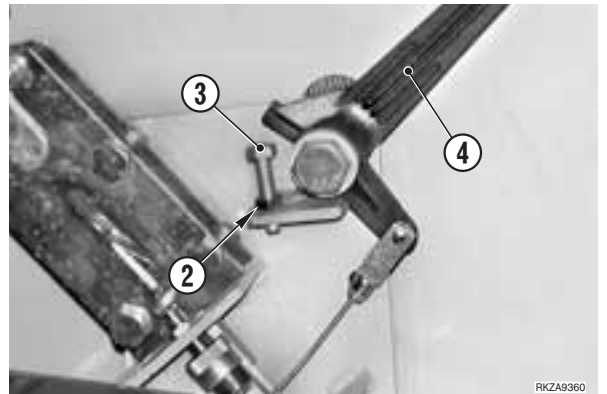
3 - Start engine and, with lever (4), bring it to the defined idling speed for hand accelerator.

★ Check using the stroboscopic tachometer **C2**.

★ Engine idling speed: 2000 ± 50 rpm

4 - Loosen end lever travel bolt (3) up to it is in contact with lever (4) and locked with nut (2).

5 - Bring engine at low idling and check accelerator lever idling speed again pushing lever at end stroke.



• **Secondary valves**

⚠ For setting, prepare machine as per pressure testing.


- ★ This setting is valid for all the secondary valve and has to be carried forcing the movement to be checked at its end of stroke.

1 - Loosen lock nut (1).

2 - Adjust pressure with adjusting screw (2).

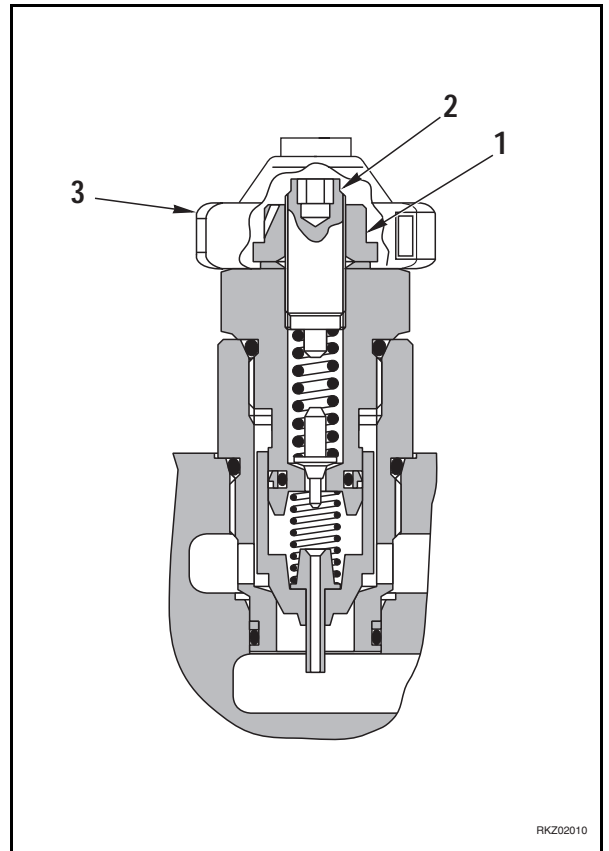
- To INCREASE pressure, rotate in CLOCKWISE direction.
- To DECREASE pressure, rotate in COUNTER-CLOCKWISE direction.

3 - Lock position with nut (1).

 Lock nut: 10±1 Nm

⚠ When terminated the setting, Apply safety plug (3) to avoid not authorised tamperings.

4 - Set the general valve pressure to the standard value.



RKZ02010

TESTING PRESSURES IN THE POWER TRAIN GROUP

The power train group can be used to perform pressure tests on the internal hydraulic circuit. These are useful for identifying malfunctions.

Specifically, the tests involve:

- 1 - Converter oil pressure.
- 2 - Clutch engagement pressures for both directions of travel.

★ 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.

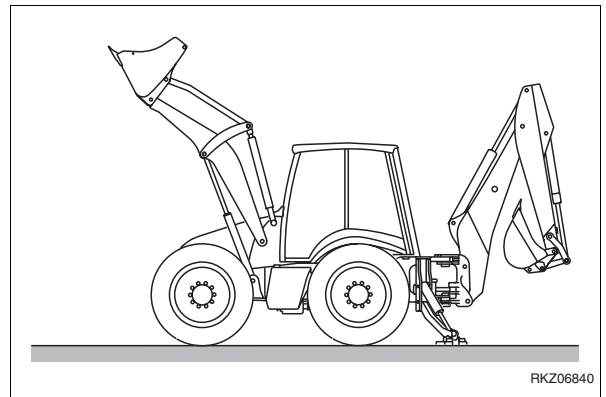
1. Preparing the machine

- 1 - Prepare the 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.

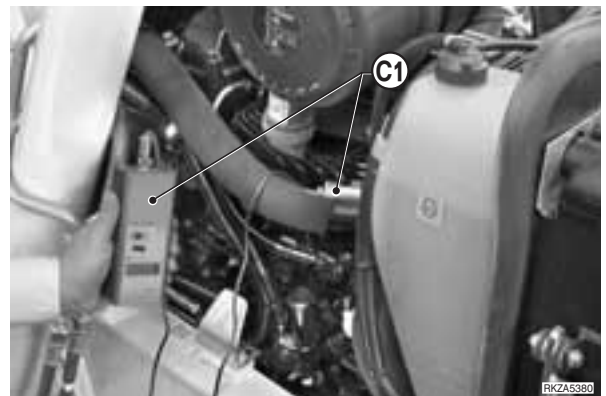
⚠ Make sure that the brake pedals are fastened together by the cotter pin (1).

2. Converter oil pressure

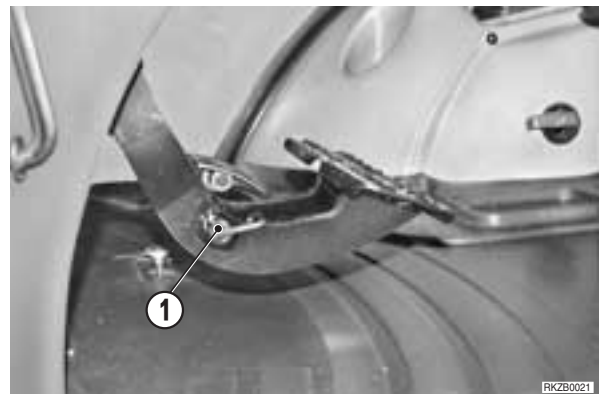
- 1 - Remove the plug (P28) and connect the pressure gauge **E6**.
- 2 - Start the engine and heat the engine and all the fluids up to working temperature. In particular make sure that the power train oil reaches a temperature of 80 ± 5 °C.
- 3 - With the engine at MIN, check the pressure on the pressure gauge **E6**.
 - ★ Normal pressure: Min. 1 bar - Max 4.5 bar
- 4 - Gradually increase the rev speed to 2200 rpm. Take a new reading from the pressure gauge **E6**.
 - ★ Normal pressure: Min. 6 bar - Max 11 bar
- 5 - Bring the engine back to MIN and compare the pressure with the normal value.
 - ★ Normal pressure: Min. 1 bar - Max 4.5 bar
 - ★ If the maximum pressure value drops to below the permissible lower limit, the power train pump needs an overhaul.



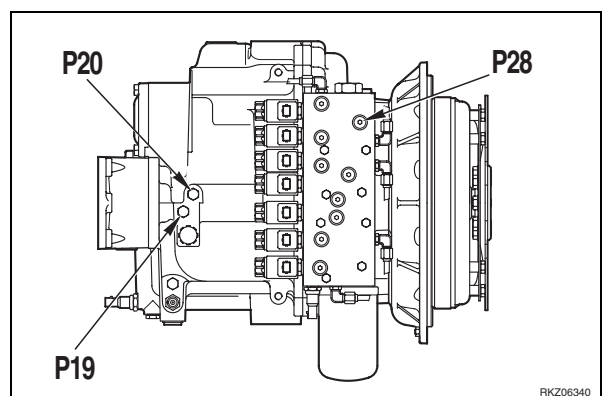
RKZ06840



RKZA5380



RKZB0021



RKZ06340

2. Checking the unit

Check the unit after the point 1., 2., 3., 4. and 6. of the precedent paragraph.

A diagnosis of faults in the unit is based on the working pressures.

When the pressures do not fall within the values given in the following table, the causes must be sought by checking the high-pressure (H.P.) and low pressure (L.P.) pressure gauges.

Outside Temperature (°C)	Unit with R134a.			
	L.P. (kg/cm ²)		H.P. (kg/cm ²)	
	Min.	Max	Min.	Max
20	1.2	2.5	6.0	9.0
25	1.0	2.5	7.5	10.5
30	1.1	2.4	9.5	13.0
35	1.3	2.4	12.0	15.5
40	1.5	1.8	18.0	18.8
45	1.8	1.9	21.5	22.0

The following conditions may be found:

Conditions	Causes - Faults
L.P. high - H.P. normal or low	<ul style="list-style-type: none"> • Electromagnetic pulley that slips or does not engage correctly • Expansion valve blocked in open position • Compressor damaged
L.P. low - A.P. high or normal	<ul style="list-style-type: none"> • Expansion valve blocked in closed position or obstructed • Filter saturated with moisture • Obstruction in the L.P. line or in the H.P. line between the filter and the evaporatorL.P.
L.P.normal - H.P. normal	<ul style="list-style-type: none"> • Infiltration of hot air into the evaporator group, the pipes or the cab • Hot air circulating in the heating group • Formation of ice on the evaporator
L.P. high - H.P. high	<ul style="list-style-type: none"> • Normal condition with very high ambient temperature (higher than 43°C) • Excess coolant(30 – 35% more) • Overheating of condenser • Air present in the unit • Obstruction in the H.P. line between the compressor and the condenser-filter tube, behind the measurement point of the H.P
L.P. normal or low - H.P. low	<ul style="list-style-type: none"> • Normal condition with very low temperature (lower than 5°C) • Lack of coolant (70 - 75% less) (probable leakages) • Obstruction in the H.P. line between the compressor and the condenser-filter tube, before the measurement point of the H.P. • Compressor damaged
L.P. roughly equal to H.P.	<ul style="list-style-type: none"> • Compressor belt missing • Electromagnetic pulley that slips or does not engage • Compressor damaged

Noise while driving	
CAUSES	REMEDY
Excessive backlash between pinion and ring gear	Adjust
Worn out pinion and gear ring	Replace
Worn out pinion bearings	Replace
Pinion bearings loosened	Adjust
Excessive axial pinion backlash	Adjust
Worn out differential bearings	Replace
Differential bearings loosened	Adjust
Ring gear out of roundness	Replace
Low lubricant level	Oil level
Poor or wrong lubricant	Replace
Bent halfshaft	Replace

Noise while driving in neutral	
CAUSES	REMEDY
Noise coming from axle are usually heard when vehicle moves in neutral gear but are not loud.	Replace or adjust (see above)
Incorrect backlash between pinion and ring (sound heard while decelerating disappears while increasing the speed)	Replace
Pinion or input flange worn out	Adjust

Intermittent noise	
CAUSES	REMEDY
Ring gear damaged	Replace bevel gear set
Differential box bolts loosened	Tighten to torque

Constant noise	
CAUSES	REMEDY
Ring gear teeth or pinion damaged	Replace bevel gear set
Worn out bearings	Replace
Pinion spline worn out	Replace
Bent halfshaft	Replace

Noise while steering	
CAUSES	REMEDY
Worn out differential gears	Replace
Worn out differential box or spider	Replace
Differential thrust washers worn out	Replace
Half shaft spline worn out	Replace

30 REMOVAL AND INSTALLATION

HOW TO READ THE MANUAL.....	3	CAB	
PRECAUTIONS TO BE TAKEN WHILE WORKING .	4	Removal	37
SPECIAL TOOLS	5	Installation	40
STARTING MOTOR		HEAT AND AIR-CONDITIONING GROUP	
Removal and installation	9	Removal	41
ALTERNATOR		Installation	42
Removal	10	FUEL TANK	
Installation	11	Removal and installation	43
AIR-CONDITIONING UNIT COMPRESSOR		HYDRAULIC OIL TANK	
Removal	12	Removal and installation	44
Installation	13	ENGINE-GEARBOX-PUMP GROUP	
INJECTION PUMP		Removal	45
Removal	14	Installation	50
Installation	17	PISTON PUMP	
INJECTION NOZZLES		Removal	51
Removal and installation	18	Installation	52
THERMOSTAT		TRANSMISSION	
Removal and installation	19	Removal	53
COOLING LIQUID PUMP		Installation	56
Removal	20	Disassembly and assembly.....	57
Installation	21	CONVERTOR	
TURBOCOMPRESSOR		Removal and installation	155
Removal	22	TRANSMISSION-REVERSE, DIRECTION	
Installation	23	INDICATOR AND HEADLIGHT DIPPER BEAM	
CYLINDER HEAD		CONTROL GROUP	
Removal	24	Removal and installation	156
Installation	26	STEERING UNIT	
FRONT COUNTERWEIGHT		Removal and installation	157
Removal and installation	28	WORKING BRAKE PUMP GROUP	
RADIATOR – OIL COOLER GROUP		Removal and installation	158
Removal	29	FRONT WORKING EQUIPMENT CONTROL VALVE	
Installation	31	Removal and installation	159
CONDENSER		FRONT AND BACKOHE CONTROL VALVE	
Removal and installation	32	Disassembly and assembly.....	159-1
MUFFLER		FRONT AXLE	
Removal and installation	33	Removal	160
EXHAUST PIPE		Installation	161
Removal and installation	34	Disassembly	162
ENGINE HOOD		Assembly.....	174
Removal	35		
Installation	36		

INSTALLATION OF THE ALTERNATOR

- To install, reverse the removal procedure.




- ★ Adjust the fan-belt tension.
(For details, see «20. TESTING AND ADJUSTMENTS - Fan-belt tension»).

- 6 - Disconnect the cab heating pipes (7).
- 7 - Disconnect the temperature sensor cables (8) and (9).
- 8 - Remove the radiator/oil-cooler group.
(For details, see «REMOVAL OF THE RADIATOR - OIL COOLERS»).
- 9 - Remove the fan (10), the spacer (11) and the pulley (12).

✳ 2

- 10 - Remove the four screws (13) and then the complete pump (14).


✳ 3

 Replace all seals with new ones.

INSTALLATION OF THE COOLANT LIQUID PUMP


- To install, reverse the removal procedure.

✳ 1

 Nm Locking screws for alternator support:
22.5–28.4 Nm

- ★ Apply tension to the alternator belt.
(For details, see «20. TESTING AND ADJUSTMENTS»).


✳ 2

 Nm Locking screws for pulley and fan:
44.1–53.9 Nm

✳ 3

 Nm Pump screws: 22.5–28.4 Nm

✳ 4

 Nm Locking screw for compressor: 64 Nm

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

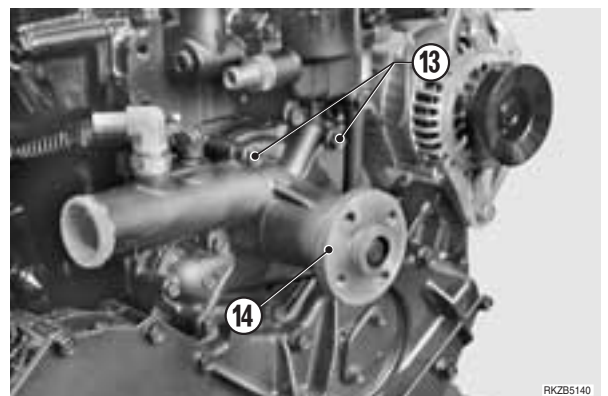
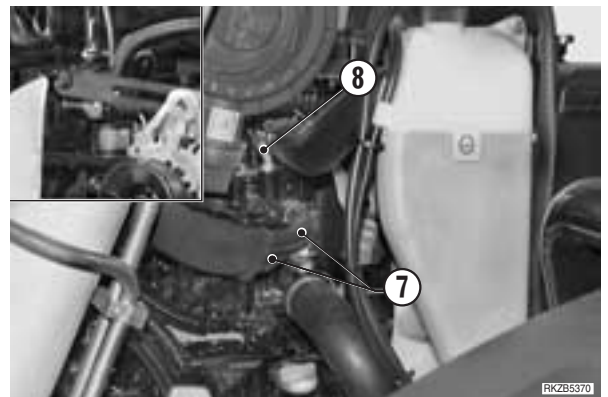
- 1 - Refill the coolant liquid circuit.



Coolant liquid: 18 ℓ

- 2 - Start the engine at low idling to circulate the coolant liquid through all circuits.
- 3 - Accelerate gradually up to 1700 rpm. After about one minute, stop the engine and check or top up the level in the container.

- ★ Check that there are no leaks.



INSTALLATION OF THE RADIATOR GROUP

- To install, reverse the removal procedure.

※ 1

- ★ Refill the coolant liquid circuit.



Coolant liquid: 18 ℓ

※ 2

- ★ Refill the air-conditioning unit.



Quantity of fluid (R134a): 970±15 g

Quantity of oil: See the amount recovered.

※ 3

- ★ Align the radiator with the fan and make sure that the fan is inserted in the inner of conveyor for 2/3 of the blade width.

※ 4

- ★ Ensure that the level of hydraulic oil in the tank is at maximum.

※ 5

- ★ Ensure that the level of transmission oil is at maximum.

1 - Start the engine at low idling to circulate all the fluids and to fill up the systems.

2 - Accelerate gradually up to 1700 rpm. After about one minute, stop the engine and top up all levels.

- ★ Check carefully that there are no leaks.

REMOVAL OF THE HEAT AND AIR-CONDITIONING GROUP

NOTE If no air-conditioning unit is included, perform only those operations relating to the heating unit.

⚠ Lower the working equipment completely until it rests on the ground, and stop the engine.

⚠ Cut off the supply of electricity by turning the accumulator-disconnecting switch in a counter-clockwise direction and remove the handle.

★ Drain the engine cooling liquid.



Coolant liquid: 18 ℓ

1 - Drain the air-conditioning unit.
(For details, see «20. TESTING AND ADJUSTMENTS»).

2 - Disconnect the flexible hose (1) of the heating water cock.

3 - Disconnect the connector of the power-supply cabling (2) and the clamp (3).

4 - Disconnect the connector (5) from the pressure switch (4).

5 - Disconnect the delivery pipe (7) and the return pipe (8) from the expansion valve (6).

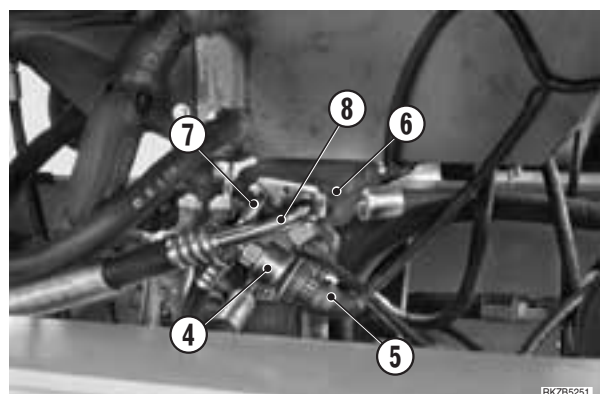
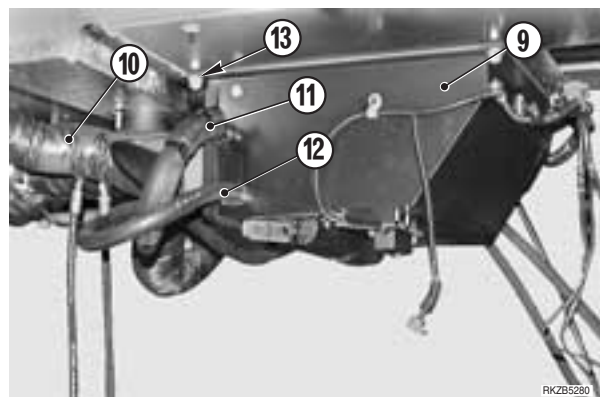
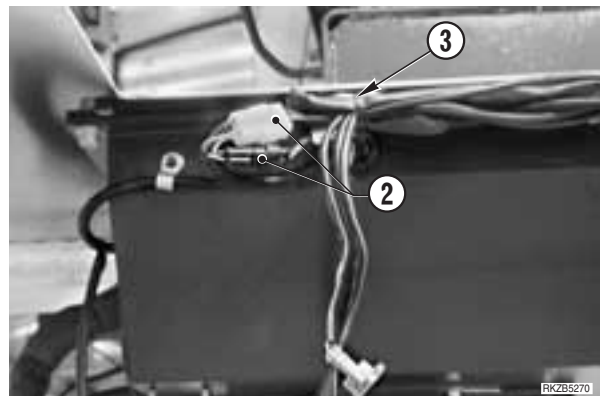
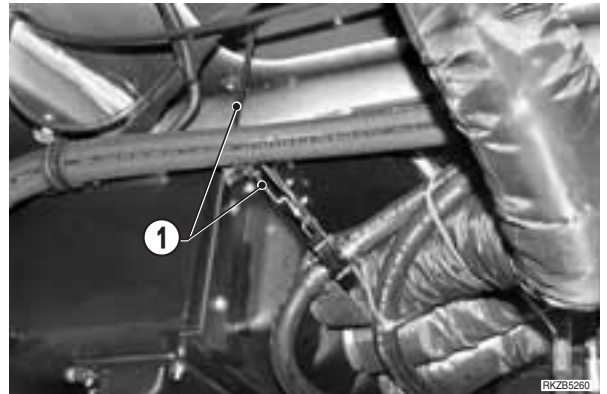
★ Immediately plug the tubes and the orifices tightly to prevent moisture from entering into the air-conditioning circuit.

★ Re-use the O-ring.

6 - Disconnect the pipes (10) from the fan-cooler (9).

7 - Disconnect the tubes (11) and (12) that connect with the engine.

8 - Remove the four nuts (13) and remove the group (9).



REMOVAL OF THE PISTON PUMP

! Lower the working equipment completely until it rests on the ground, and stop the engine.

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

! Cut off the supply of electricity by turning the accumulator-disconnecting switch in a counter-clockwise direction and remove the handle.

★ Drain the hydraulic oil.



Quantity of oil: 92 ℓ

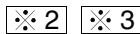
1 - Disconnect the suction hose (2) and the drainage pipe (3) from piston pump (1). ✖ 1

2 - Disconnect the delivery pipe (4) and the Load Sensing signal line (5).

★ Plug the pipes to prevent entry of impurities.

3 - Disconnect the solenoid connector (6).

4 - Take out the rear cardan shaft (7).

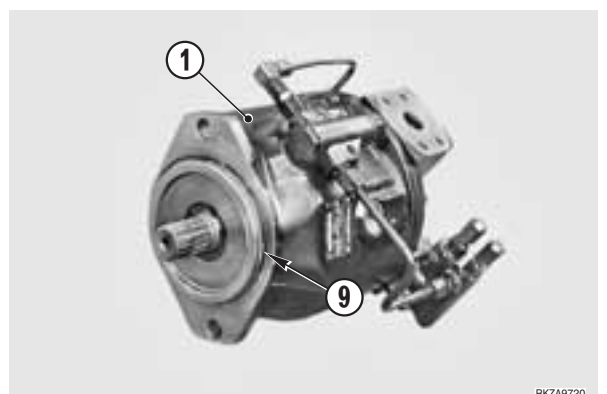
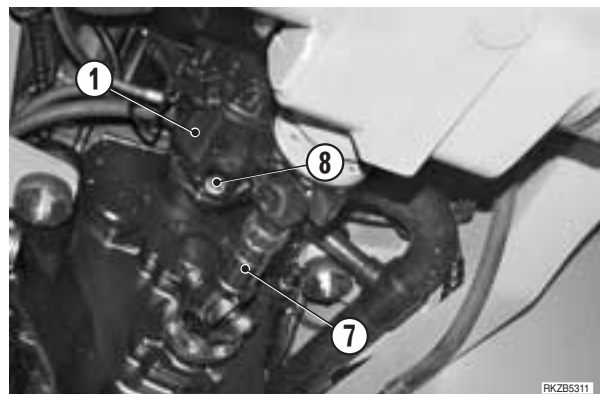
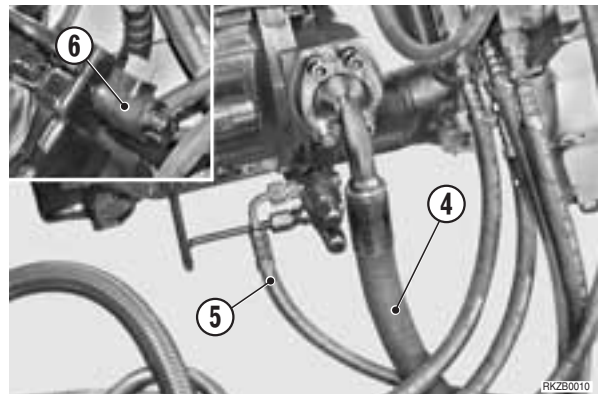
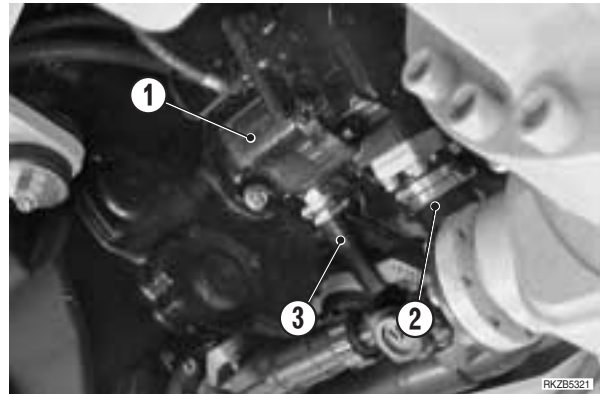


5 - Attach under pump (1) a pit jack and a suitable support.

6 - Take out the two screws (8) and remove the pump (1) complete with its O-ring (9). ✖ 3



Pump: 40 kg



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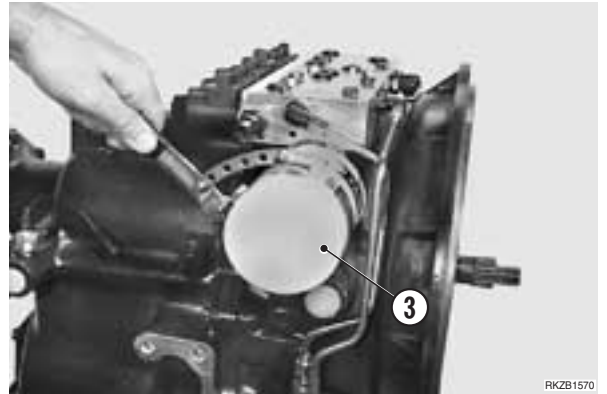
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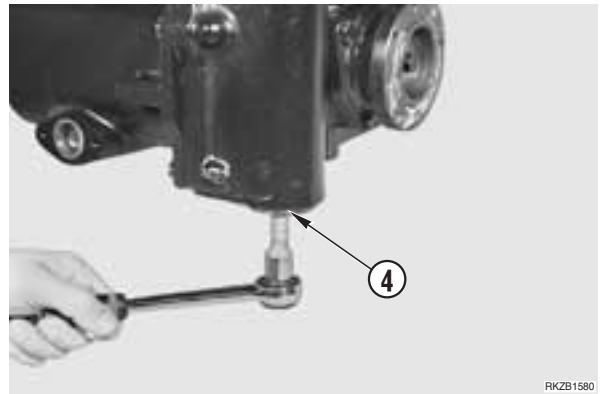
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3 - With a filter wrench remove filter (3).

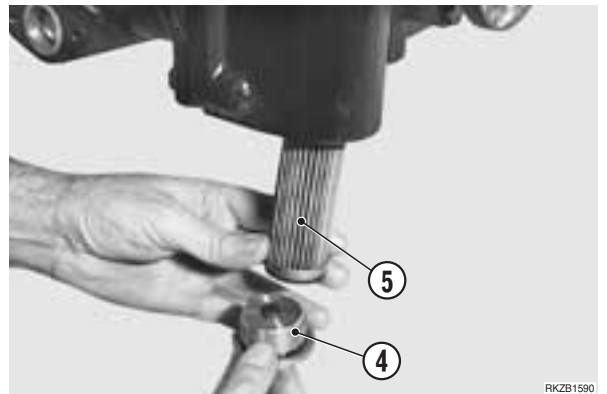


4 - Remove plug (4) and clean the magnet.



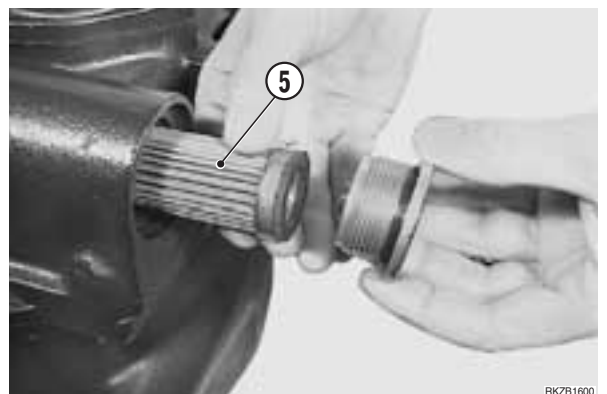
5 - Remove filter (5).

- ★ Filter must be replaced every disassembly.

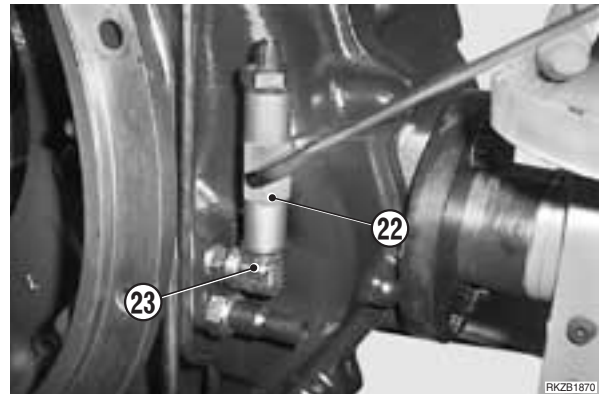


4. Assembly plugs and filters

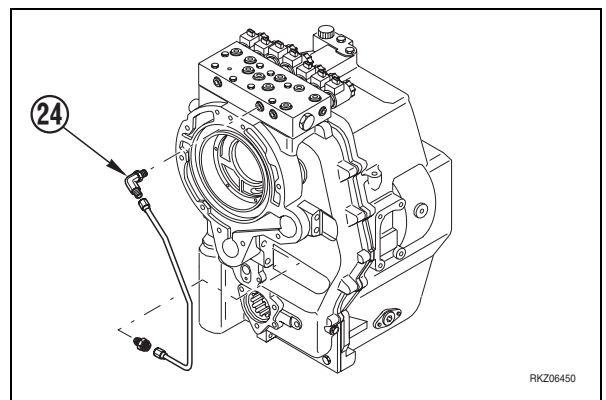
1 - Assemble filter (5).



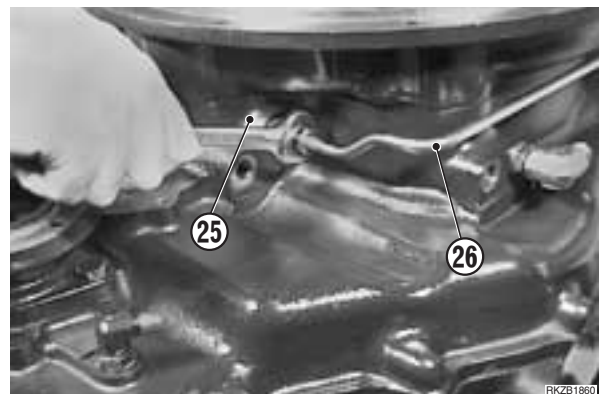
19 - Remove 2nd speed antishock valve (22) and lower fitting (23).



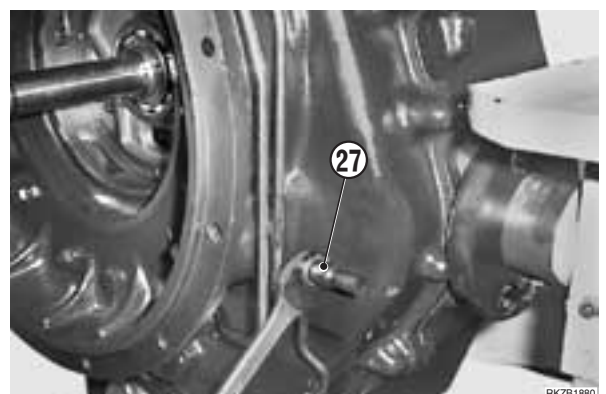
20 - Untighten 4th speed pipe upper fitting (24).



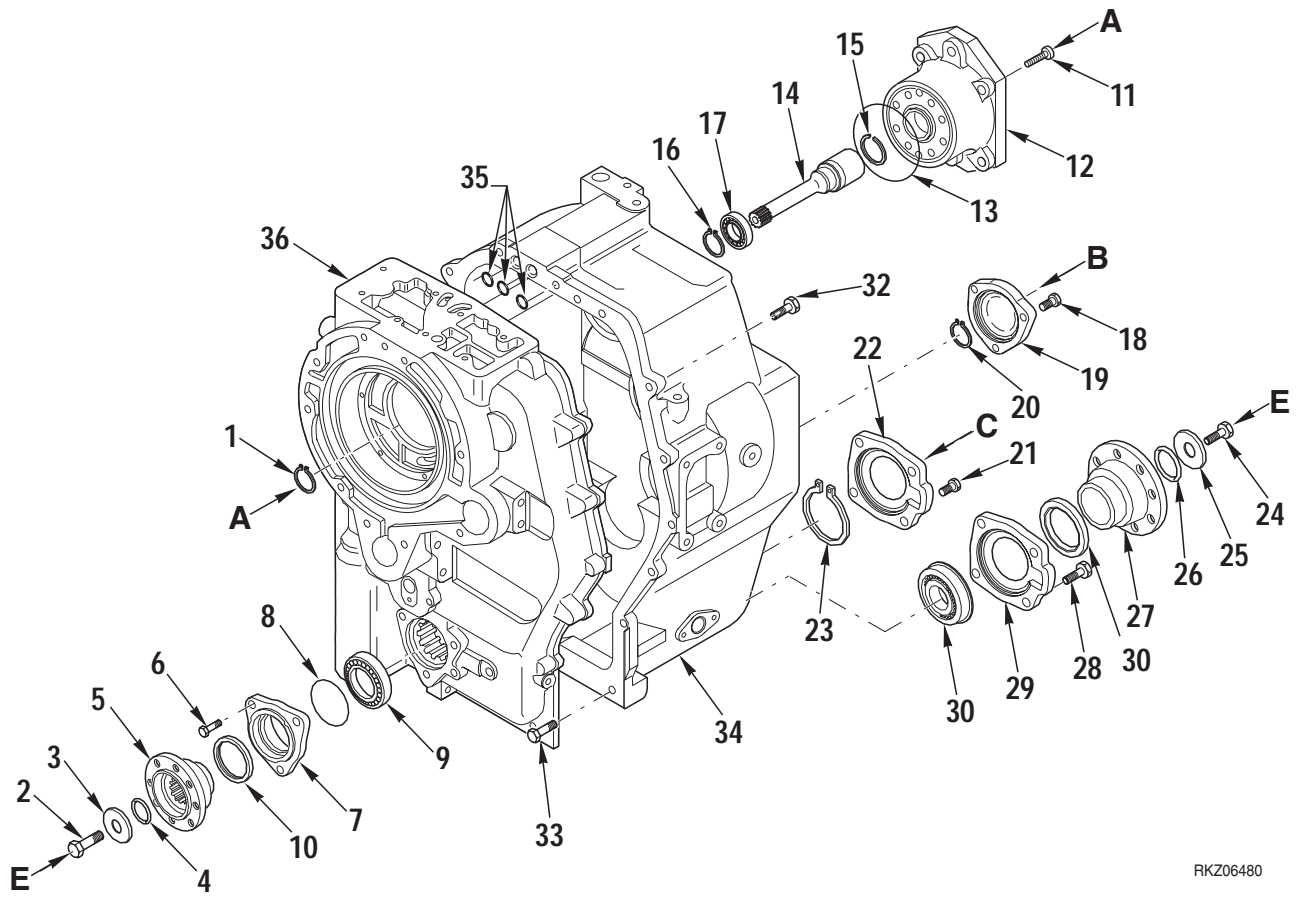
21 - Untighten 4th speed pipe (26) lower fitting (25) and remove pipe.



22 - Remove 2nd speed pressure sensor 2 bar (27).

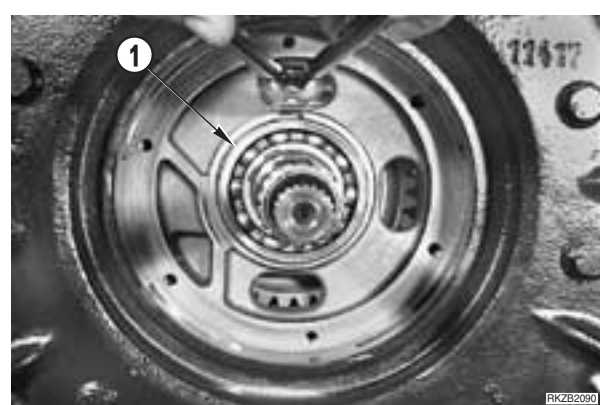


11. Disassembly transmission housing

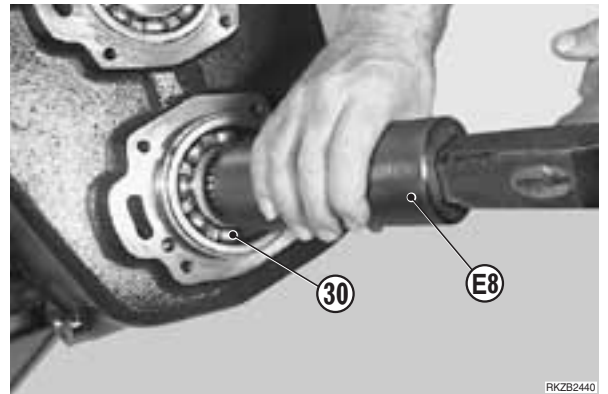


RKZ06480

- 1 - Drain oil from transmission hydraulic circuit.
- 2 - Remove bearing retaining ring (1).



13 - Assemble bearing (30). Use tool E8.




14 - Apply a thin film of Loctite 510.

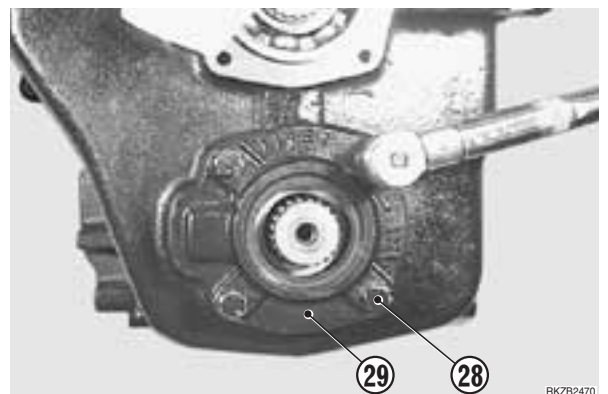


15 - Assemble seal ring (31) on cover (29). Use tool E4.



16 - Assemble cover (29) and tighten with screw (28).

 Screw: 139 Nm



18 - Widen and remove rotary seals (38).



19 - Remove retaining ring (21).



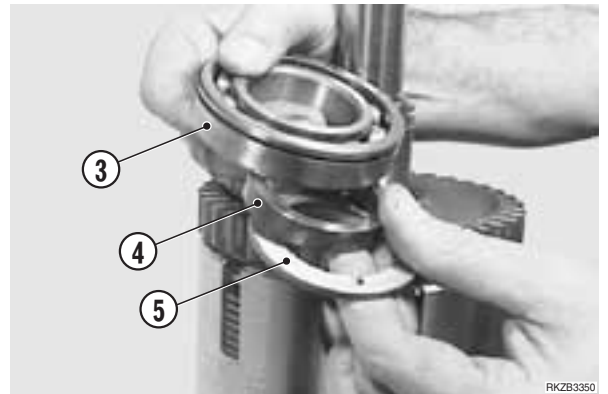
20 - Remove bearing (22) by means of an extractor.



21 - Remove bearing (23)



25 - Assemble washer (5), spacer (4) and bearing (3). Use tool **E8**.



26 - Insert retaining ring (2). Insert and close rotary seal (1).



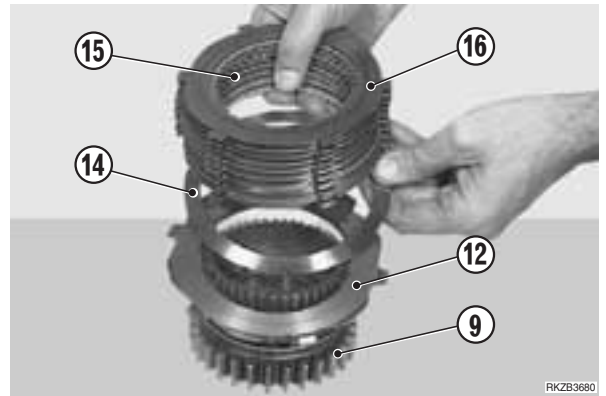
27 - Check for proper operation by blowing in compressed air into the special hole, about 6 bar.



28 - Assemble **D** shaft bearing (41). Use tool **E10**.



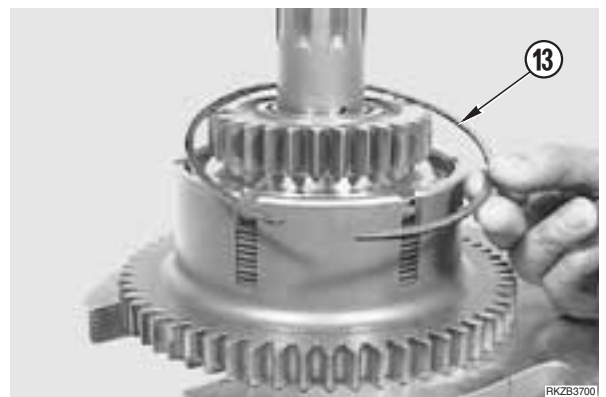
10 - Assemble disc pack (15), counterdiscs (16), Belleville washer (14) and stop washer (12) on gear (9).



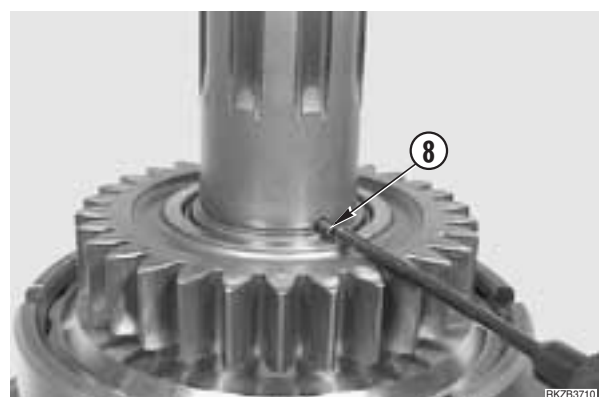
11 - Insert the assembly by means of two screwdrivers.



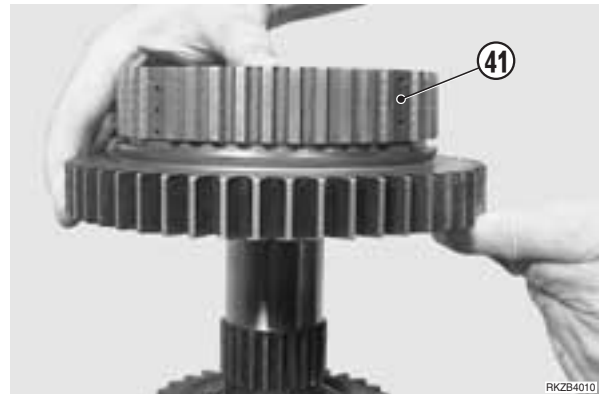
12 - Assemble retaining ring (13).



13 - Assemble spring pin (8).



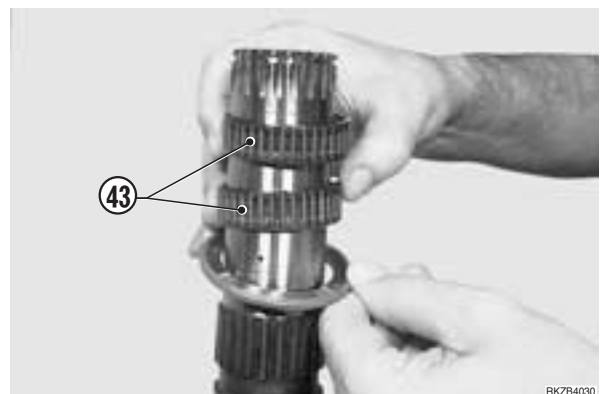
28 - Remove gear (41).



29 - Remove gear (42).



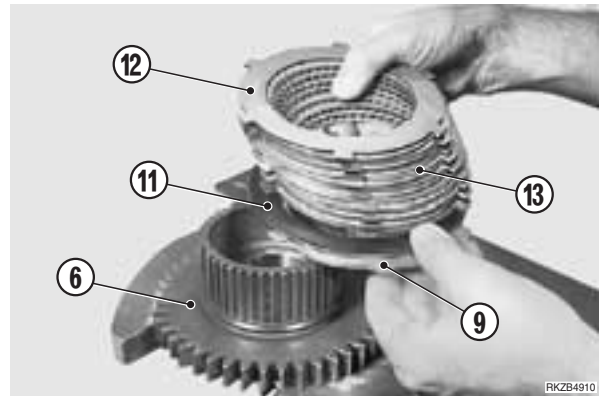
30 - Remove roller retainers (43).



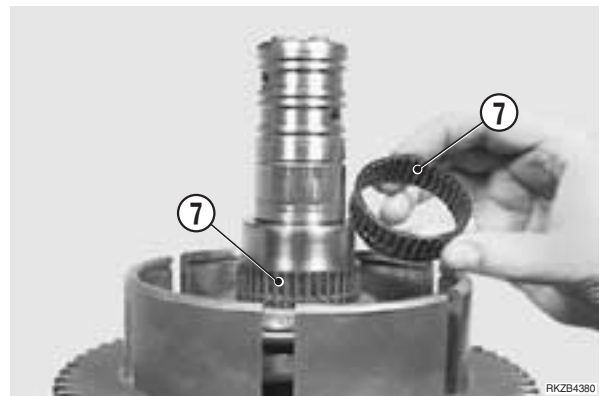
31 - Slightly lower stop washer (44).



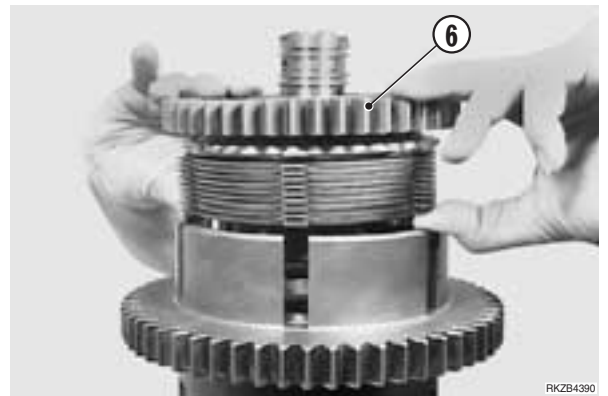
31 - Insert stop washer, Belleville washer, discs (12) and counterdiscs (13) on gear (6).



32 - Insert roller retainers (7).



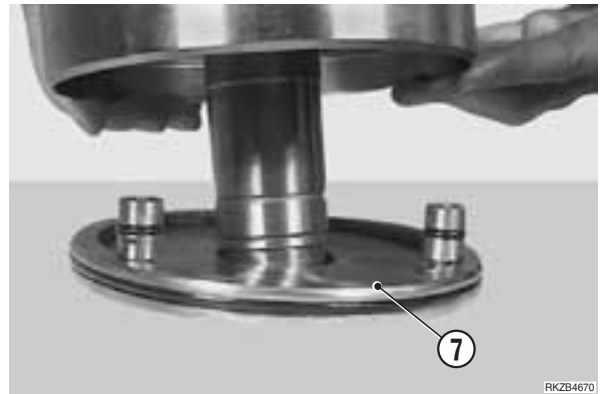
33 - Insert gear (6) with the disc pack on the main shaft.



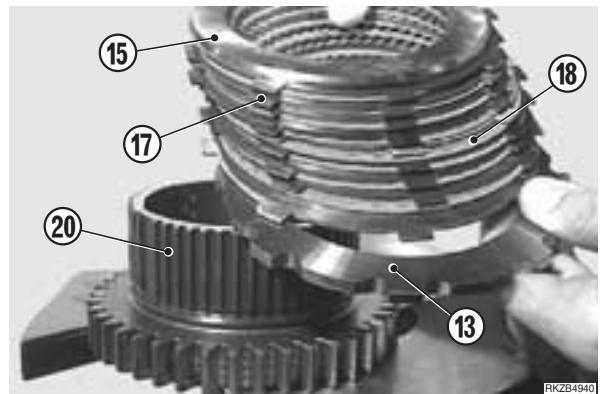
34 - Locate the pack assembly by means of two screwdrivers.



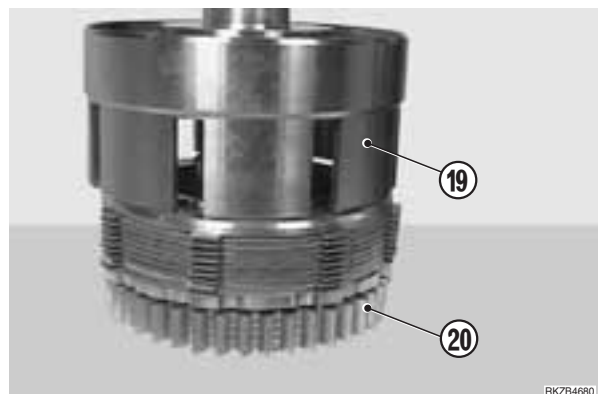
- 4 - Position the pins (10) on clutch piston (7) in correspondence with the holes on output shaft and insert clutch piston.



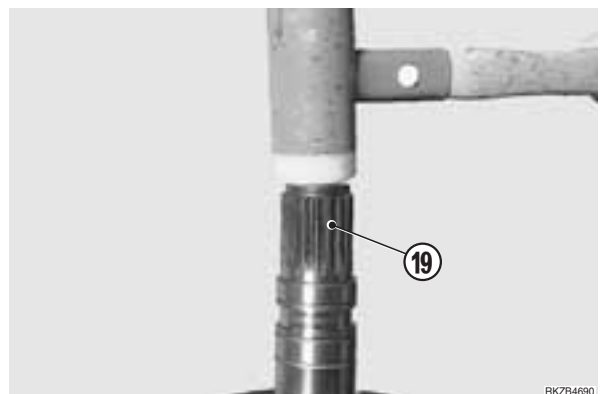
- 5 - Insert stop ring (15), disc pack (17), counterdiscs (18) and brake actuator (13) on gear (20).



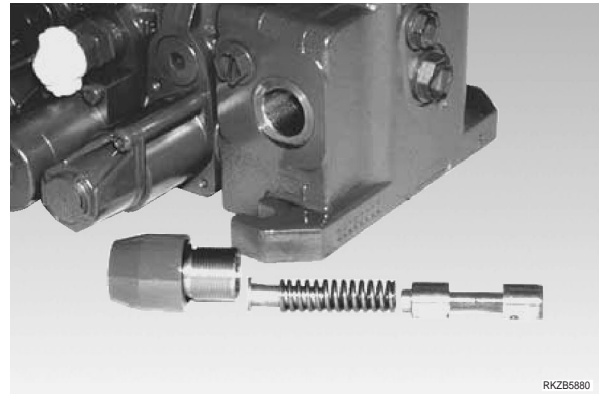
- 6 - Assemble shaft (19) on gear (20).



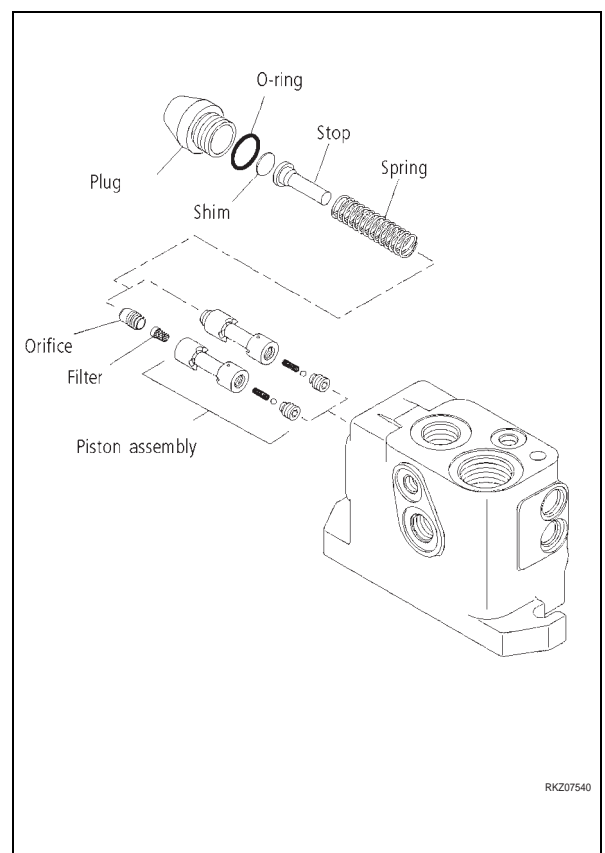
- 7 - Insert shaft (19) by using a rubber hammer.



- Remove the shim, the stop, the spring and the piston assembly.

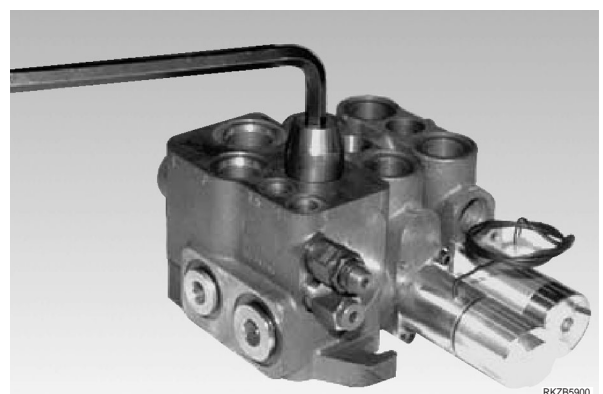


- ★ Replace defective parts.
- ★ Reassemble parts in reverse order.



4. Removal of the flushing valve for “closed center”

- On the inlet element, unscrew the flushing valve plug (12 mm socket wrench).
 - ★ Reassembly:
 - replace the plug O-ring.
 - torque: 100 ± 10 Nm



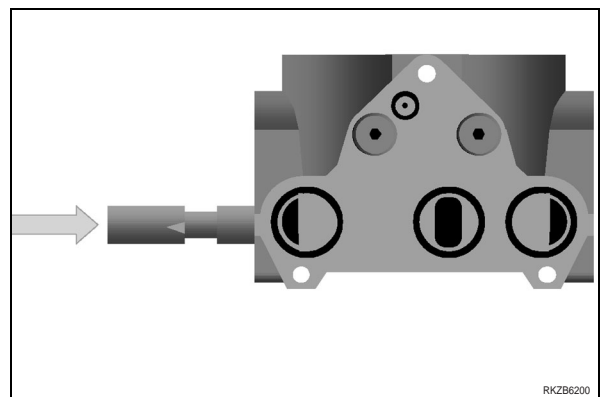
- ★ Reassembly:
 - replace the plug O-ring.
 - torque: 30 ± 3 Nm



8. Precaution when replacing the spool lip seal

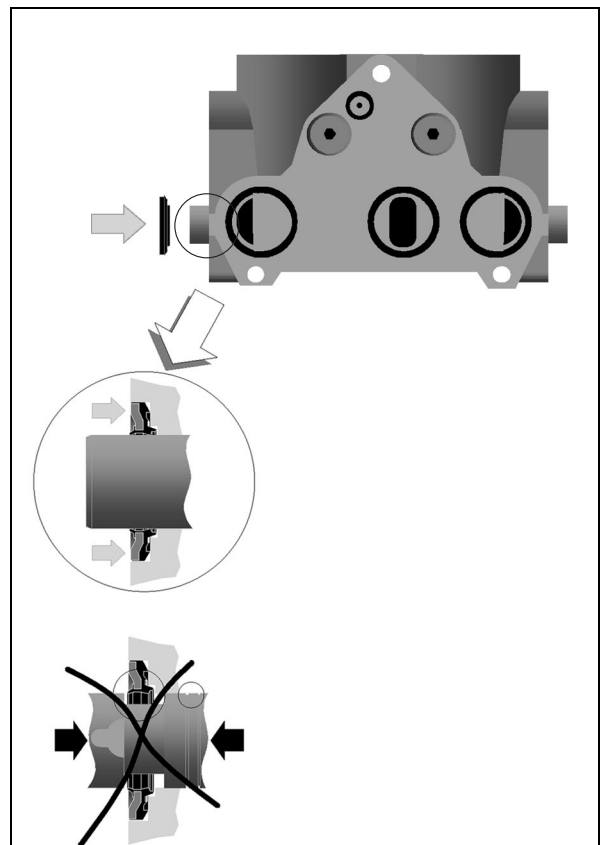
⚠ The lip seals are not interchangeable with the other spool seals (O-ring + wiper ring).

- Place the spool in the working section.



- Slide the lip seal perpendicularly onto the spool, positioning the metallic part of the lip seal on the outside.

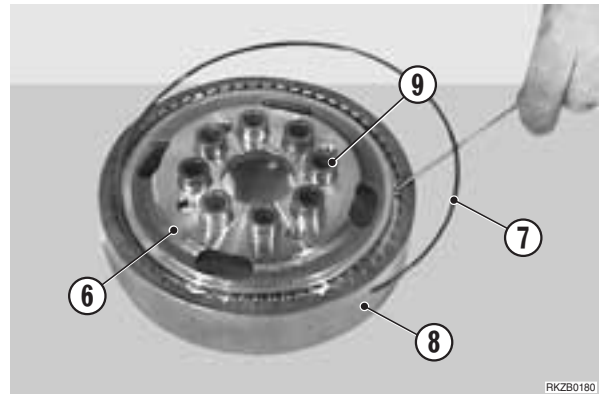
NOTE: the lip seal must be fitted on the end of the spool so that it is not damaged on the spool grooves and its tightness property does not deteriorate.



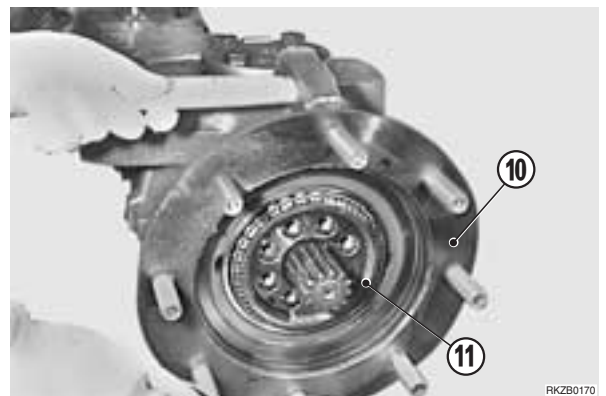
5 - Remove the steel stop ring (7) and disjoint the hub-lock ring gear (6) from the epicyclic ring gear (8).

★ Check the wear conditions of the components.

6 - **Only if necessary**, remove the centering bushes (9) of the hub lock ring gear with a hammer and the special tool **C1**.



7 - Remove the hub (10) with inner ring (11), using levers and a hammer to facilitate the operation.

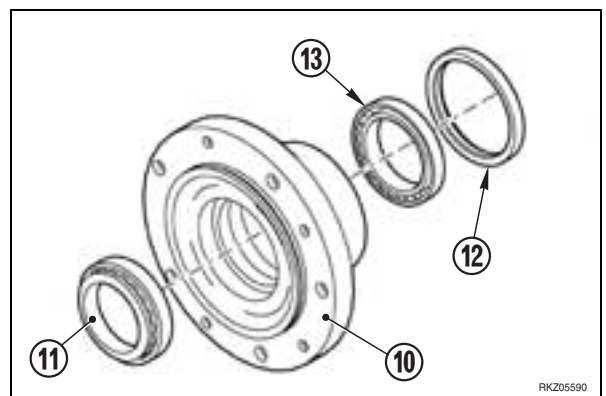


8 - Position on a flat surface the hub and take the seal ring (12) out with a lever.

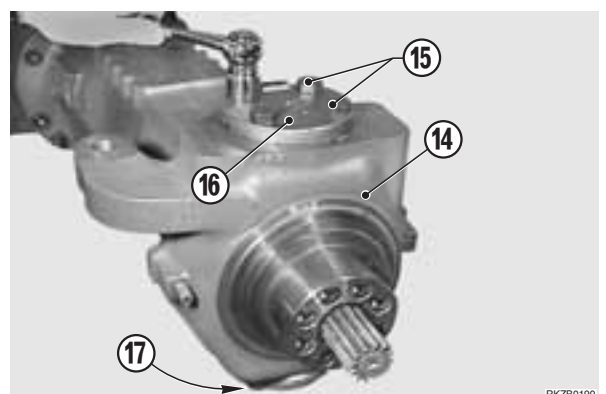
★ Seal ring must be replaced every disassembly.

9- Using a extractor and soft hammer, remove external washer (11) and (13) on both sides of the hub (10).

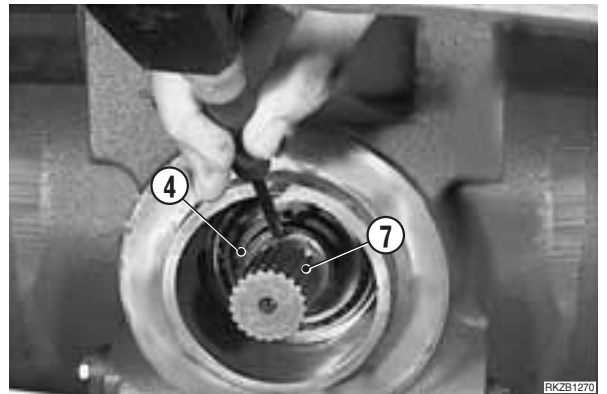
10 - Using a extractor, remove inner washer (13) from the swivel housing.



11 - Unscrew and remove the fastening screws (15) from the upper (16) and lower (17) king pin.

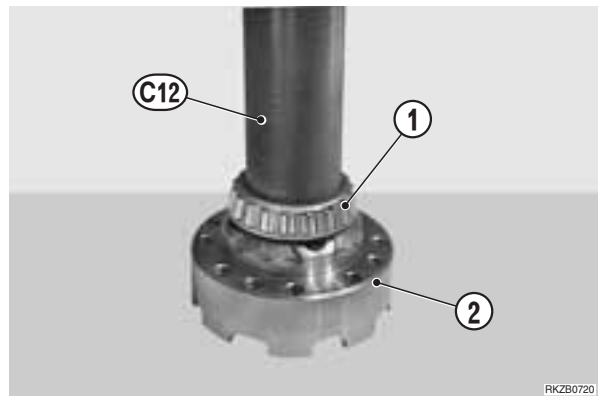


- 14 - Once the correct pre-loading has been achieved, caulk the lip of the lock nut (4) to correspond to the well of the pinion (7).

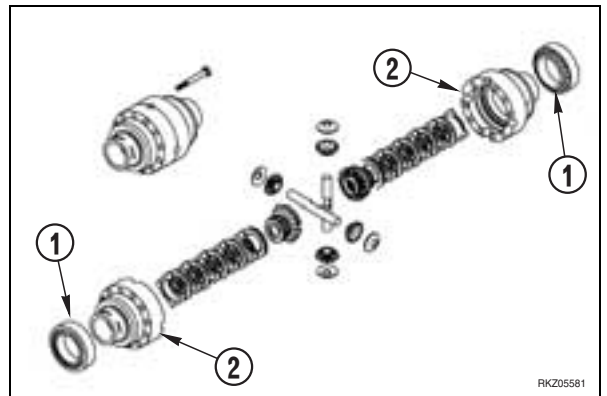


2. Differential group assembly



- 1 - Assemble the cones of the new taper roller bearing (1) on the half boxes (2), using the special tool C12 and a hammer.



- 2 - Position a half box on a workbench and assemble all its inner components (sun gears, planetary gears, thrust rings, pins and counterdiscs). Join the two half boxes, aligning the reference marks made upon them.

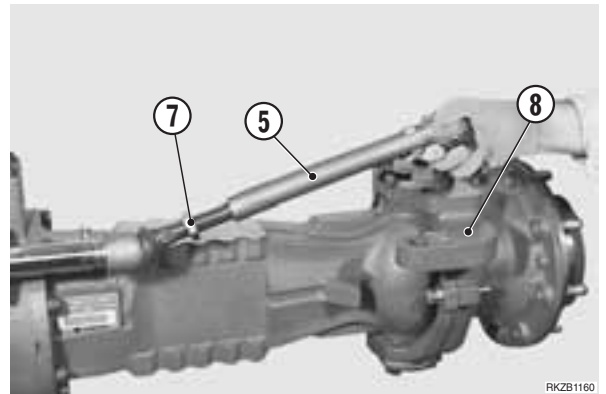


- 3 - Joint the two half boxes (2), aligning the reference marks.
- 4 - Position the ring bevel gear (3) and then fix the whole by tightening the screws.

-  Screw: 155 Nm
-  Screw: Loctite 270

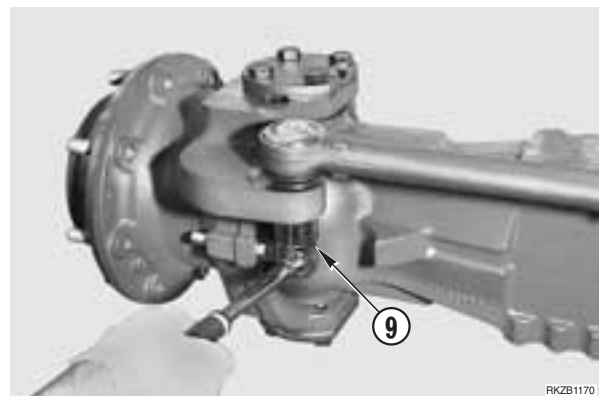


- 5 - Unloose nut (7) and screw in or out the guide rod (5) so that the ball joint call be inserted into the swivel housing (8).



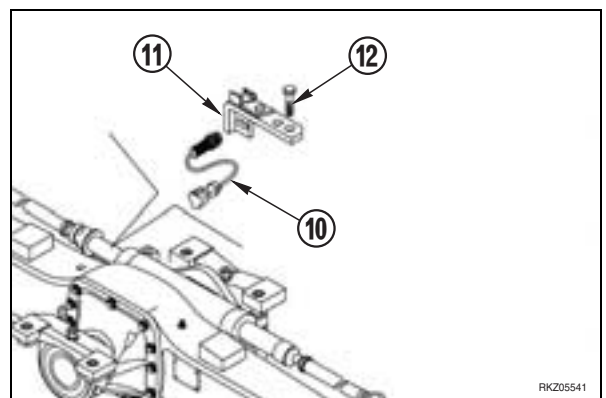
- 6 - Tighten nut (8).

 Nut: 260 Nm



- 7 - Assemble the sensor (10) and the relative support (11) to the axle and fix the fastening (12) screws with a dynamometric wrench

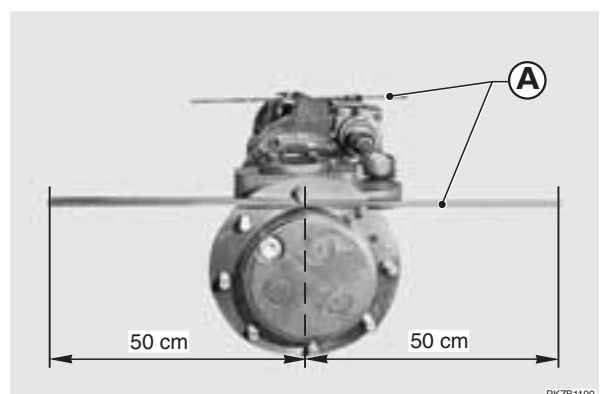
 Screw: 460 Nm



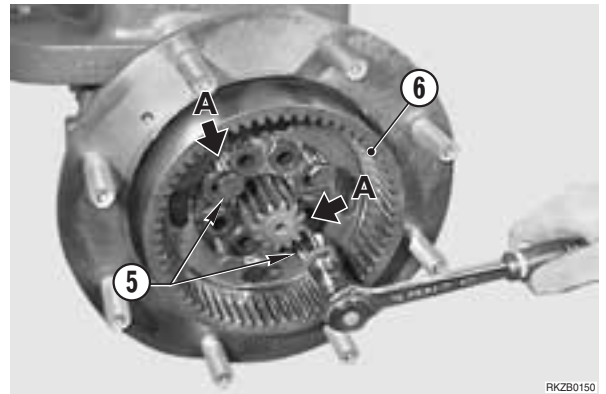
8. Toe-in adjustment

- 1 - Put two equal one-meter-long linear bars “A” on the wheel sides and lock them with two nuts on the wheel hub stud bolt.

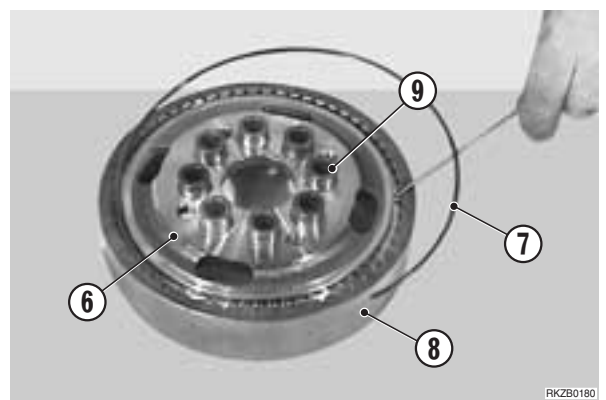
- ★ The two bars should be fixed on their middle so that they are perpendicular to the supporting surface and parallel to the pinion shaft axis. Align the two bars.



4 - To remove the hub-lock ring gear (6) from its housing, screw at least two of the just removed screws (5) in the threaded extraction holes "A".

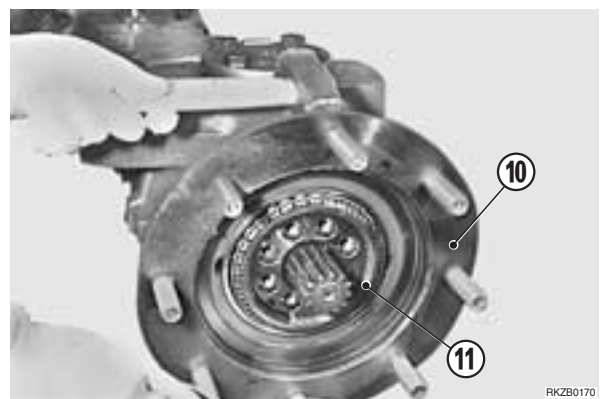


5 - Remove the steel stop ring (7) and disjoint the hub-lock ring gear (6) from the epicyclic ring gear (8).
 ★ Check the wear conditions of the components.



6 - **Only if necessary**, remove the centering bushes (9) of the hub lock ring gear with a hammer and the special tool D1.

7 - Remove the hub (10) with inner ring (11), using levers and a hammer to facilitate the operation.

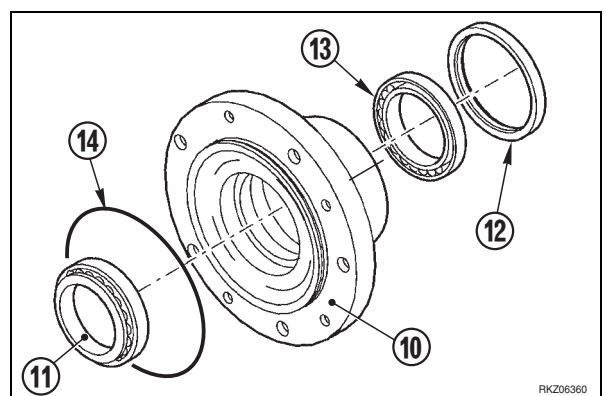


8 - Position on a flat surface the hub and take the seal ring (12) out with a lever.
 ★ Seal ring must be replaced every disassembly.

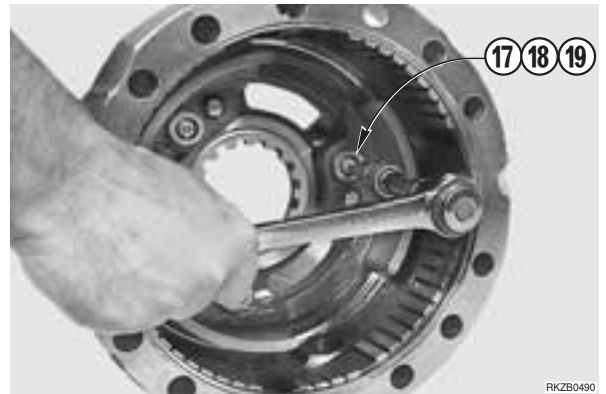
9- Using a extractor and soft hammer, remove external washer (11) and (13) on both sides of the hub (10).

10 - Using a extractor, remove inner washer (13) from the swivel housing.

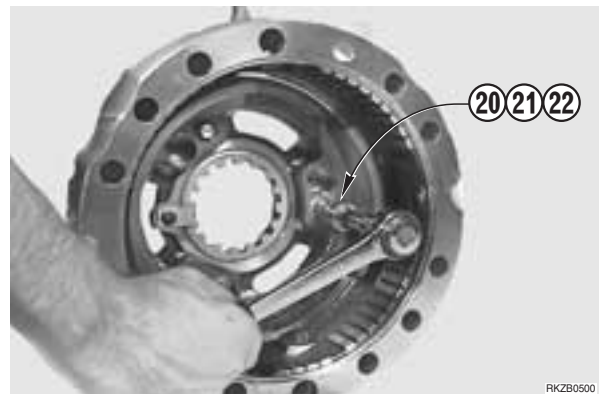
11 - Remove O-ring (14).



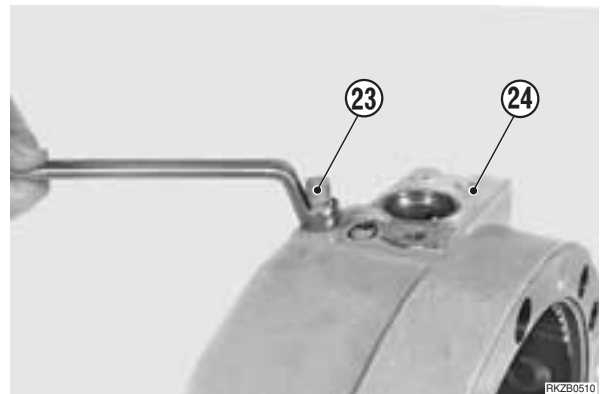
14 - Unscrew the upper self-adjust screws (17) and take the springs (18) and the bushes (19) out.



15 - Unscrew the lower self-adjust screws (20) and take the bushes (21) and the spacers (22) out.



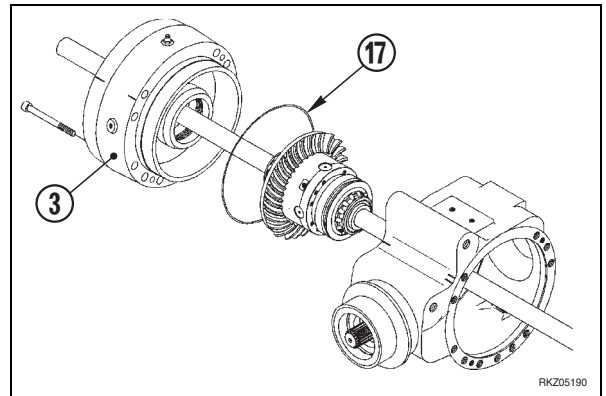
16 - Remove the valve (23) from brake flange (24).




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



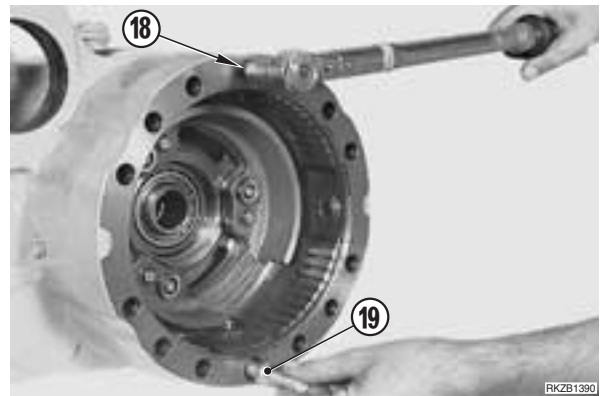
- 6 - Insert a new O-ring (17) on the brake flange (3).
- ★ Sustain the differential box with a bar, positioning first the brake flange on the side of the ring bevel gear.
 - ★ Respect the correct position of the ring bevel gear, that could be assembled inverted.



- 7 - Assemble and tighten the upper fastening screw (18) and the lower fastening stud bolt (19) of the brake flange (3) with dynamometric wrench to the requested torque.

 Nm Screw: 80 Nm

 Stud: 120 Nm



- 8 - Assemble the second brake flange (3) on the opposite bevel gear side. Insert and screw the adjusting ring nuts (20) of the pinion-ring, using the wrench with code **D2** till the bearing backlash is eliminated.

Then measure the pinion-ring gear backlash.

- ★ Tighten the ring nuts step by step without exceeding.

- 9 - Assemble the special tool **D14** on the pinion end. Move the pinion end alternatively and note the pinion gear backlash, measured with a comparator "A", so that the feeler is in contact and at 90° with the bracket surface on the special tool in correspondence with the reference mark. Check if the measured backlash value is within the request range.

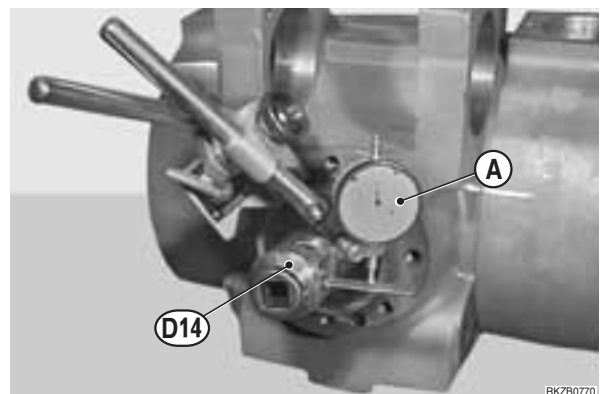
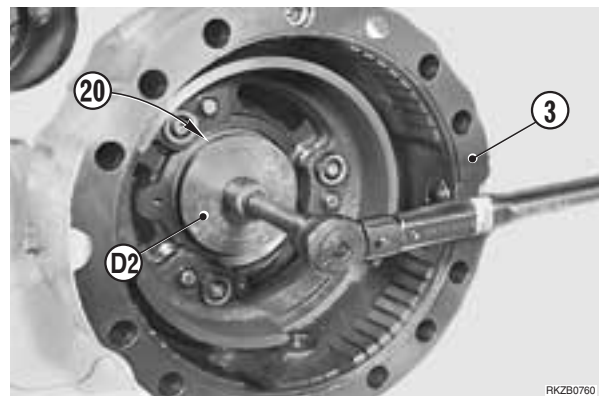
- ★ Backlash: **0.20 – 0.30 mm**

Carry out the adjustment by operating on the two ring nuts with the tool **D2**.

Adjust the ring nuts remembering that:

- If **the measured backlash is less** than the given tolerance range, screw the ring nut from the side opposite to the ring gear and unscrew the opposite one of the same measure;

- If **the measured backlash is higher** than the given tolerance range, screw the ring nut from the side of the ring gear and unscrew the opposite one of the same measure.

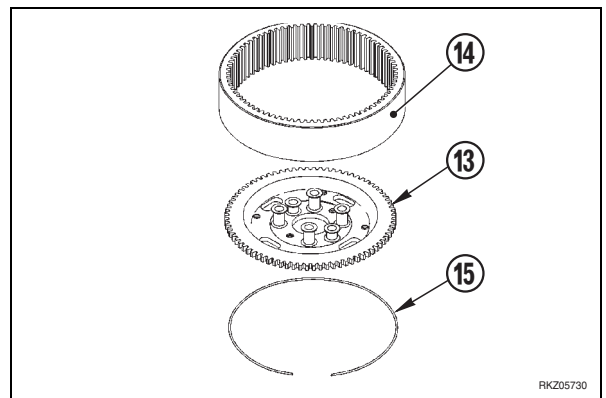


11 - Position the wheel carrier (11) on a workbench and force the bushes (12) to the carrier surface level with the special tool **D1**.

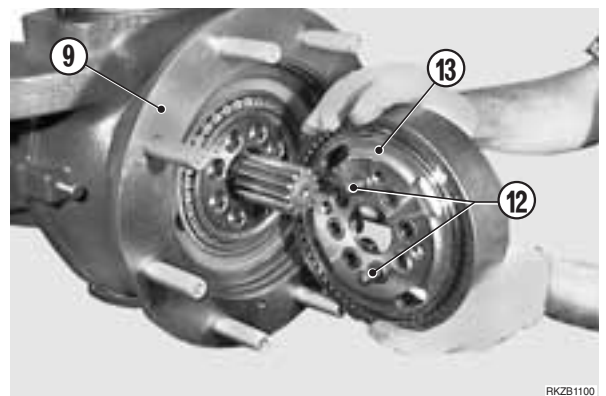
NOTE. At least two bushes (diametrically-opposed) should be set slightly higher than the carrier surface level to be used as dowel pins.



12 - Preassemble the wheel carrier group (13), epicyclic ring gear (14), with the special lock ring (15).

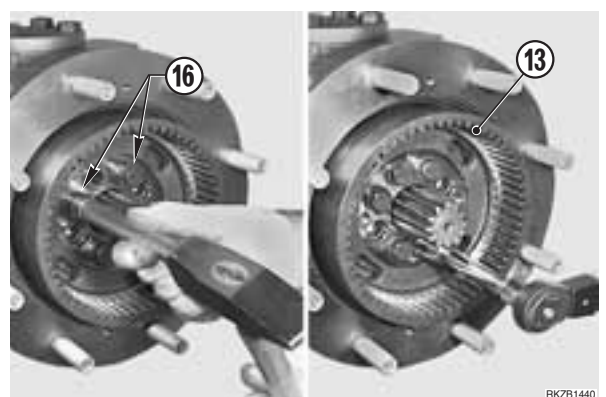


13 - Assemble the wheel carrier group (13) on the wheel hub (9) using the two projecting bushes (12) as dowel pins.



14 - Force all the hub dowel bushes completely with the special tool **D1** and a hammer. Assemble the wheel carrier fastening screws (16) and tighten to the requested torque.

 Screw: 230 Nm



REMOVAL OF THE FRONT BUCKET TILT CYLINDERS

! Lower the working equipment completely until it rests on the ground and stop the engine.

1 - Loosen the clips (1) and remove the tube protection (2).

★ **For the right-hand cylinder only**

Disconnect the sensor (3) and remove the bucket position indicator (4).

2 - Place a sling round the cylinder (5) and insert a block "A" between the spacer (6) of the piston fulcrum lever (7) and the link (8).

3 - Take off the snap-ring and the internal retaining spacer for the piston attachment pin (9).

4 - Take out the pin (9).

5 - Start the engine to retract the piston (10).

※ 1 ※ 2

★ Bind the piston head with wire to secure the fully retracted position and stop the engine.

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

! Cut off the supply of electricity by turning the battery-disconnecting switch in a counter-clockwise direction, and remove the handle.

6 - Take out the screw (11) and remove the clamp (12).

7 - Disconnect the tubes (13) and (14) and plug them to prevent entry of impurities.

8 - Remove the snap-ring (15) and the spacer (16).

9 - Remove the cylinder (5).



Cylinder: 45 kg

INSTALLATION OF THE FRONT BUCKET TILT CYLINDERS

• 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.

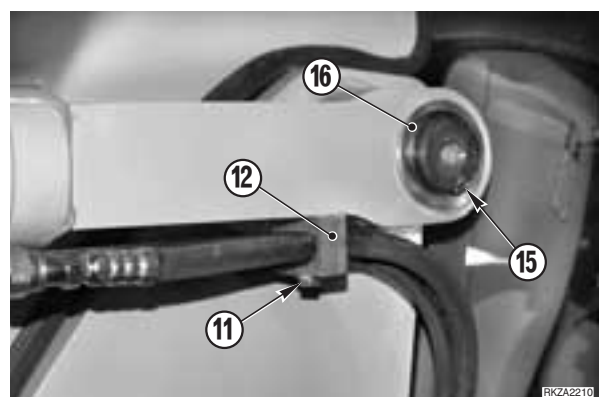
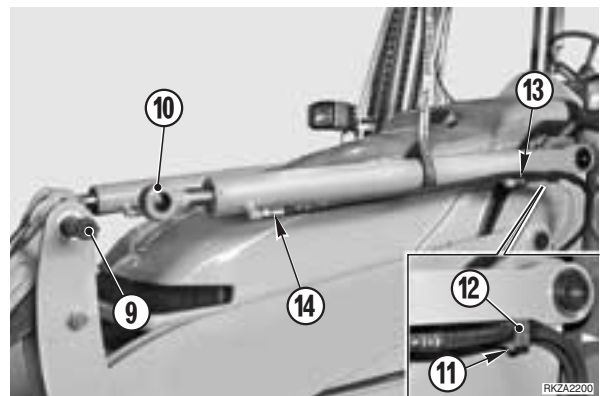
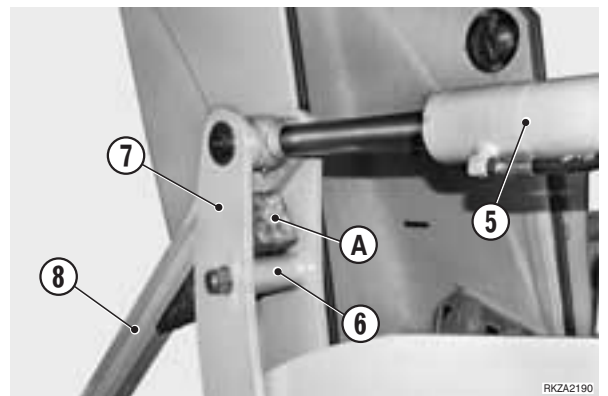
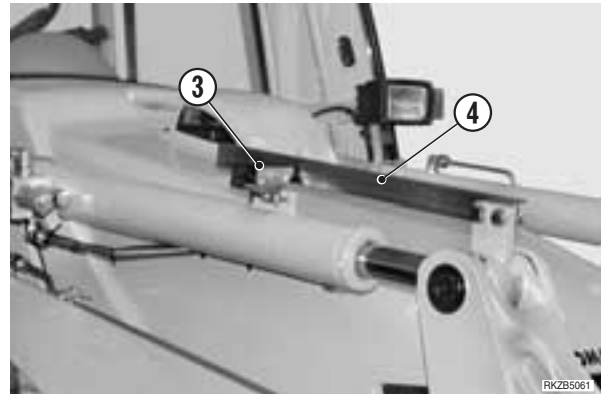
※ 2



Internal bushing: ASL800050

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

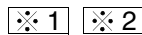
★ After bleeding the air, check the oil level in the tank.



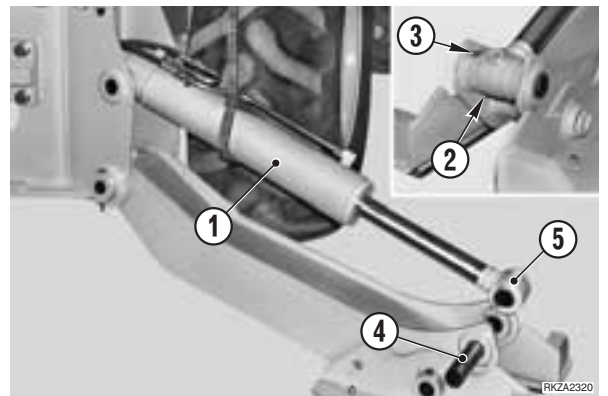
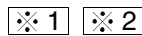
REMOVAL OF THE OUTRIGGER CYLINDERS

! Rest the back of the bucket on the ground, keeping the arm vertical.

- 1 - Lower the outriggers to the ground and stop the engine.
- 2 - Put a sling round the cylinder (1) and apply a slight tension to the cables.
 - ★ Leave the pipes free.
- 3 - Loosen and remove the nut (2) and the screw (3). Draw out the pin (4) until the piston head is disengaged.



- 4 - Start the engine and retract the piston (5).
 - ★ Secure the position of total retraction of the piston by binding the piston head rod with wire.
- 5 - Stop the engine and release the residual hydraulic pressures. (For details, see «20. TESTING AND ADJUSTMENTS»).
- 6 - Disconnect the pipes (6) and (7) and plug them to prevent entry of impurities.
- 7 - Take out the nut (8) and the screw (9) and remove the pin (10).
- 8 - Remove the cylinder (1).



Cylinder: 56 kg

INSTALLATION OF THE OUTRIGGER CYLINDERS

- To install, reverse removal procedure.

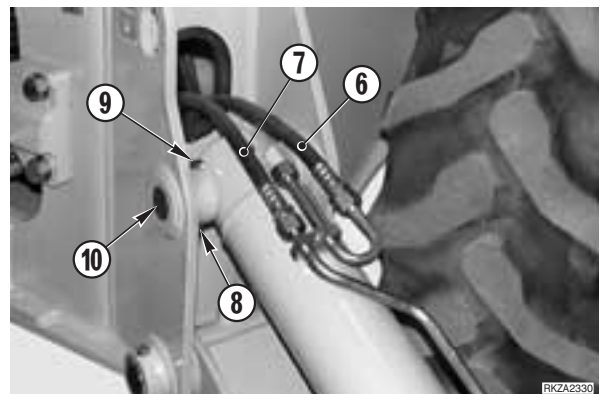


! When aligning the positions between the hole and the pin, turn the engine over at low idling speed. Do not insert fingers into the holes to check alignment.



Internal bushing: ASL800050

- 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.



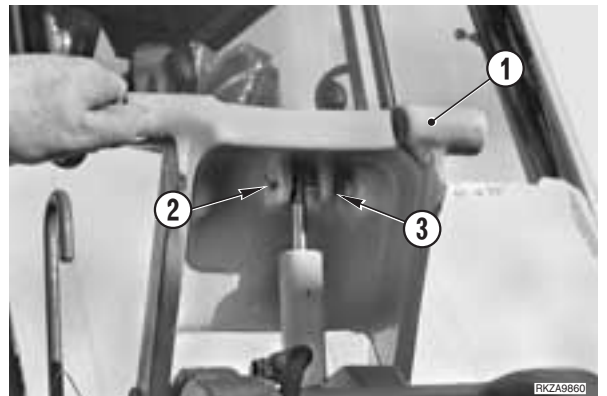
REMOVAL OF THE BOOM SAFETY CYLINDER

! Center the backhoe with the arm vertical and the back of the bucket on the ground.



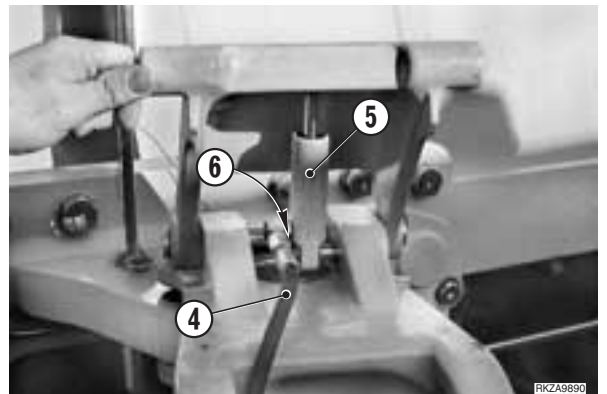
- 1 - Make sure that the safety stop (1) is raised.
- 2 - Stop the engine and release the residual hydraulic pressures.
- 3 - Take out the cotter pins (2) and remove the pin (3).

✖ 1 ✖ 2



- 4 - Disconnect the tube (4) that feeds the cylinder (5). Plug the tube to prevent entry of impurities.
- 5 - Take out the snap ring (6) and remove the cylinder (5).

✖ 1



INSTALLATION OF THE BOOM SAFETY CYLINDER

- To install, reverse the removal procedure.

✖ 1

 Pin seatings: ASL800050

✖ 2

- ★ Install new cotter pins.

- 1 - Start the engine and perform several lock and release manoeuvres to fill up and bleed air from the unit.

8 - Raise the support (5) until it is in a horizontal position. Loosen and take out the nut (9) and the screw (10). Slide out the pin (11) and take off the support (5).


※ 1 ※ 2

9 - Repeat the same operations on the other side.


INSTALLATION OF THE BACKHOE OUTRIGGERS

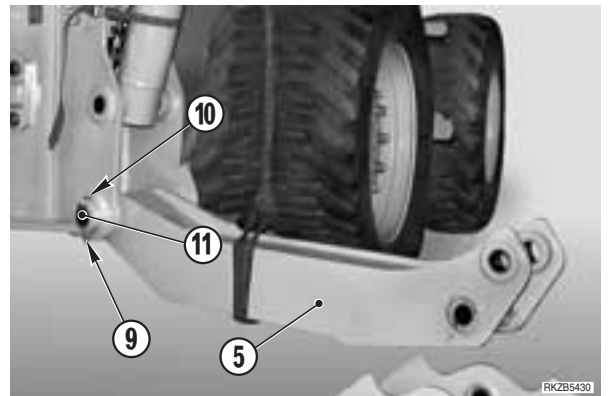
- To install, reverse the removal procedure.

※ 1

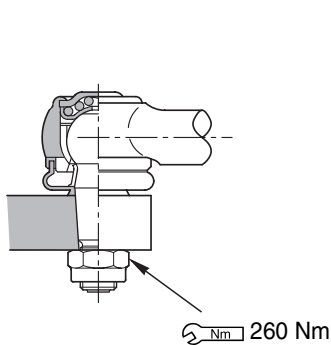
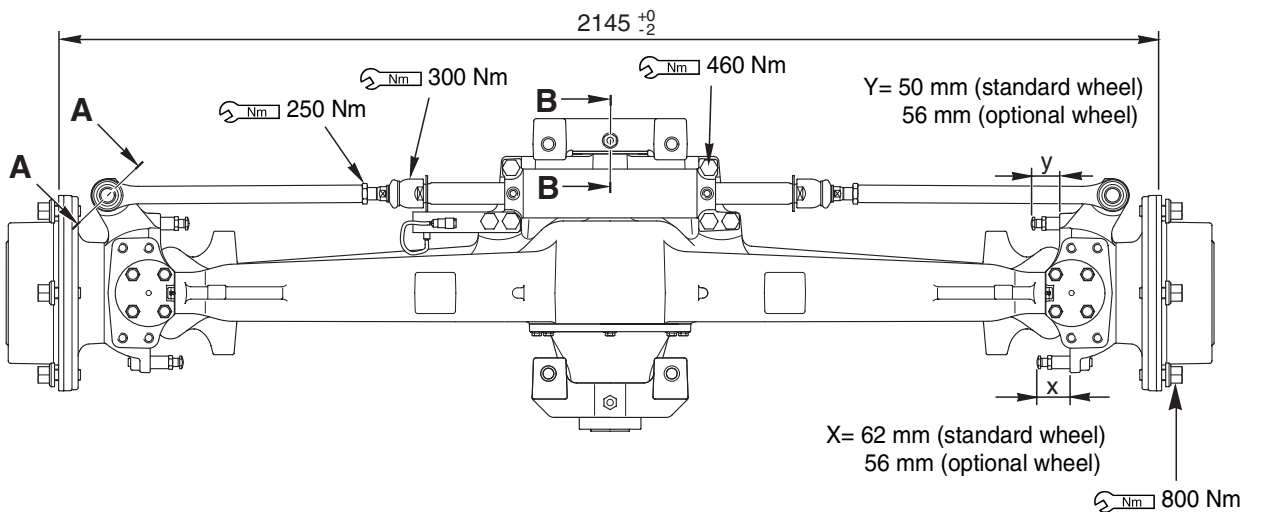
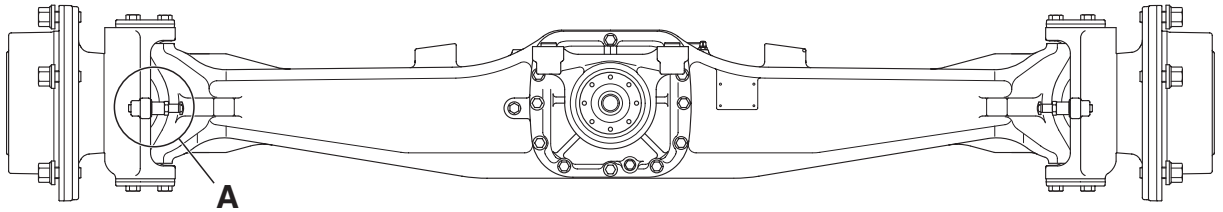
 When aligning the positions between the hole and the pin, turn the engine over at low idling speed. Do not insert fingers into the holes to check alignment.

※ 2

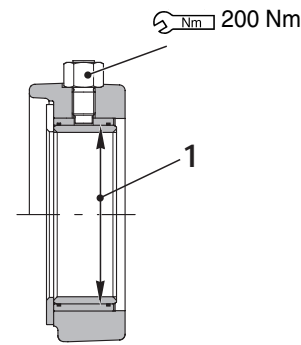
 Internal bushing: ASL800050



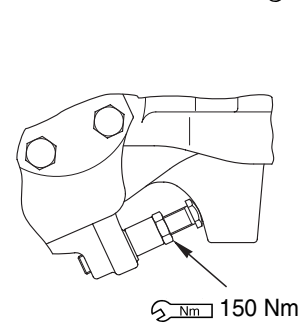
Steering unit cylinder



Section A - A



Section B - B

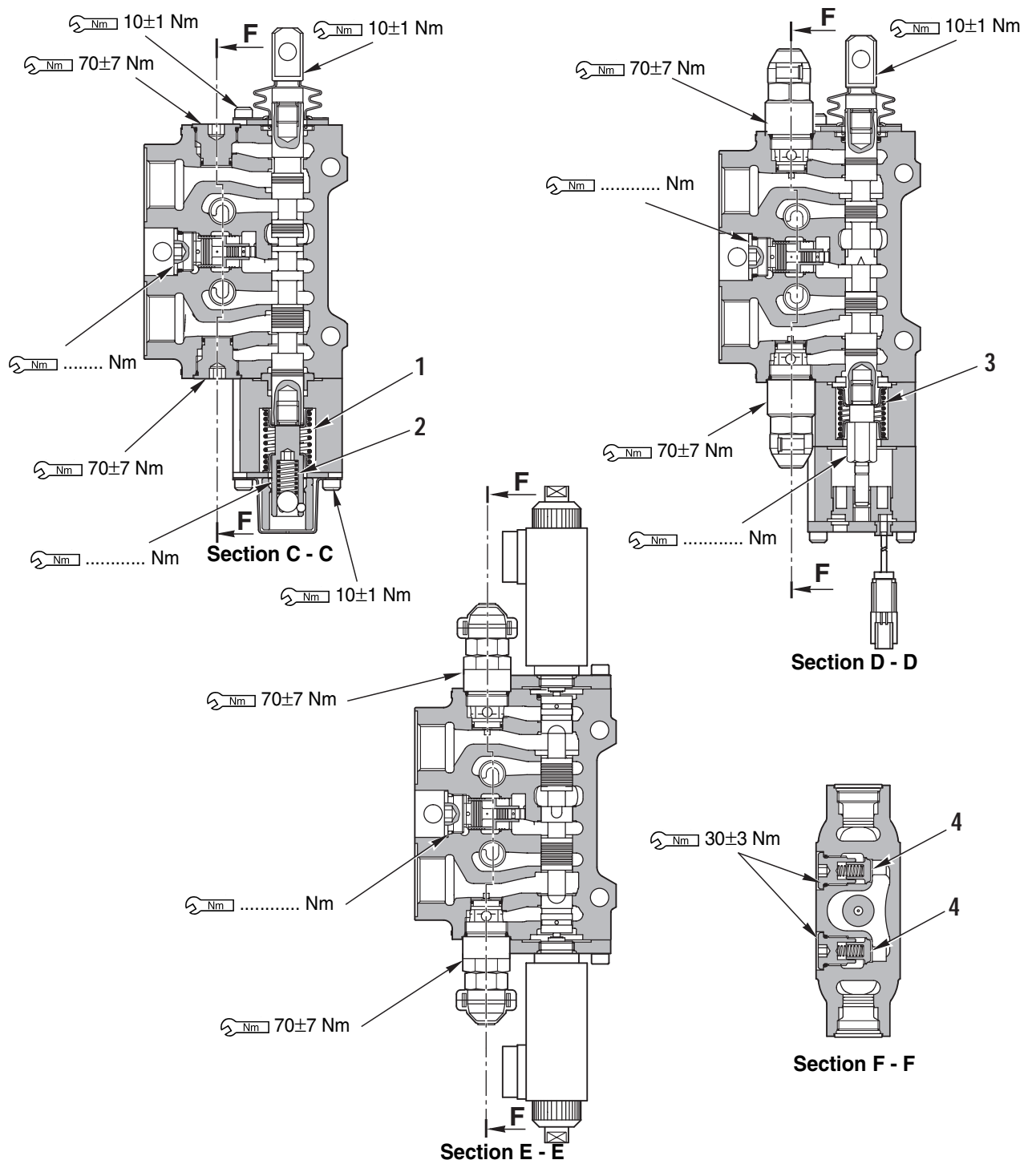


Detail A

FKZ04381

Unit: mm

N°	Check item	Criteria				Remedy
		Standard size	Tolerance		Standard clearance	
	Shaft		Hole			
1	Clearance between bushing and pin	-	-	-	-	Replace bushing and pin



RKZ00941
Unit: mm

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

Unit: mm

N°	Check item	Cylinder	Criteria					Remedy
			Standard size	Tolerance		Minimum clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston head and cylinder head	Boom	60	-0.030 -0.060	+ 0.076 + 0.030	0.06	0.136	Replace
		Arm	60	-0.030 -0.060	+ 0.076 + 0.030	0.06	0.136	
		Arm with telescopic arm	60	-0.030 -0.060	+ 0.076 + 0.030	0.06	0.136	
		Bucket	60	-0.030 -0.060	+ 0.076 + 0.030	0.06	0.136	
		Boom swing	50	+ 0.025 + 0.050	+ 0.064 + 0.025	0.05	0.114	
2	Tolerance between bushing and piston head mounting pin	Boom	50	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	Replace pin and bushing
		Arm	45	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	
		Bucket	45	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	
		Boom swing	50	-0.050 -0.089	+ 0.119 + 0.080	0.13	0.208	
3	Tolerance between bushing and cylinder mounting pin	Boom	50	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	Replace pin and bushing
		Arm	45	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	
		Bucket	45	-0.050 -0.089	+ 0.24 + 0.08	0.13	0.329	

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