WEBM005700

SHOP MANUAL

WH609-1 WH613-1 WH713-1 WH714-1 WH714H-1 WH716-1

TELESCOPIC HANDLER

MODEL	SERIAL NUMBER
WH609-1	395F60001 and up
WH613-1	395F60003 and up
WH713-1	395F70001 and up
WH714-1	395F70002 and up
WH714H-1	395F70003 and up
WH716-1	395F70004 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

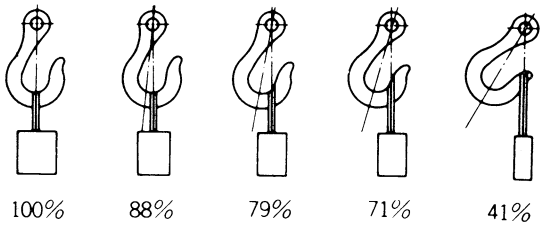
1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

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.

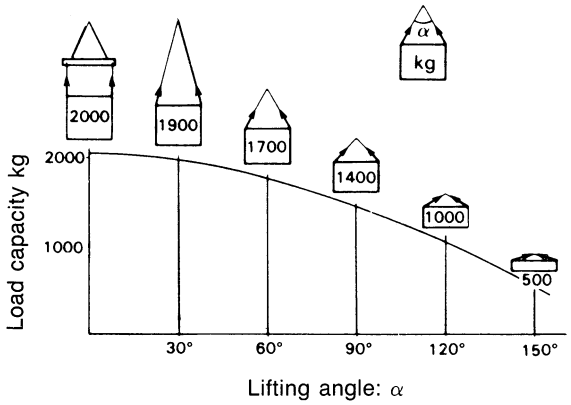
Hooks have maximum strength at the middle portion.



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

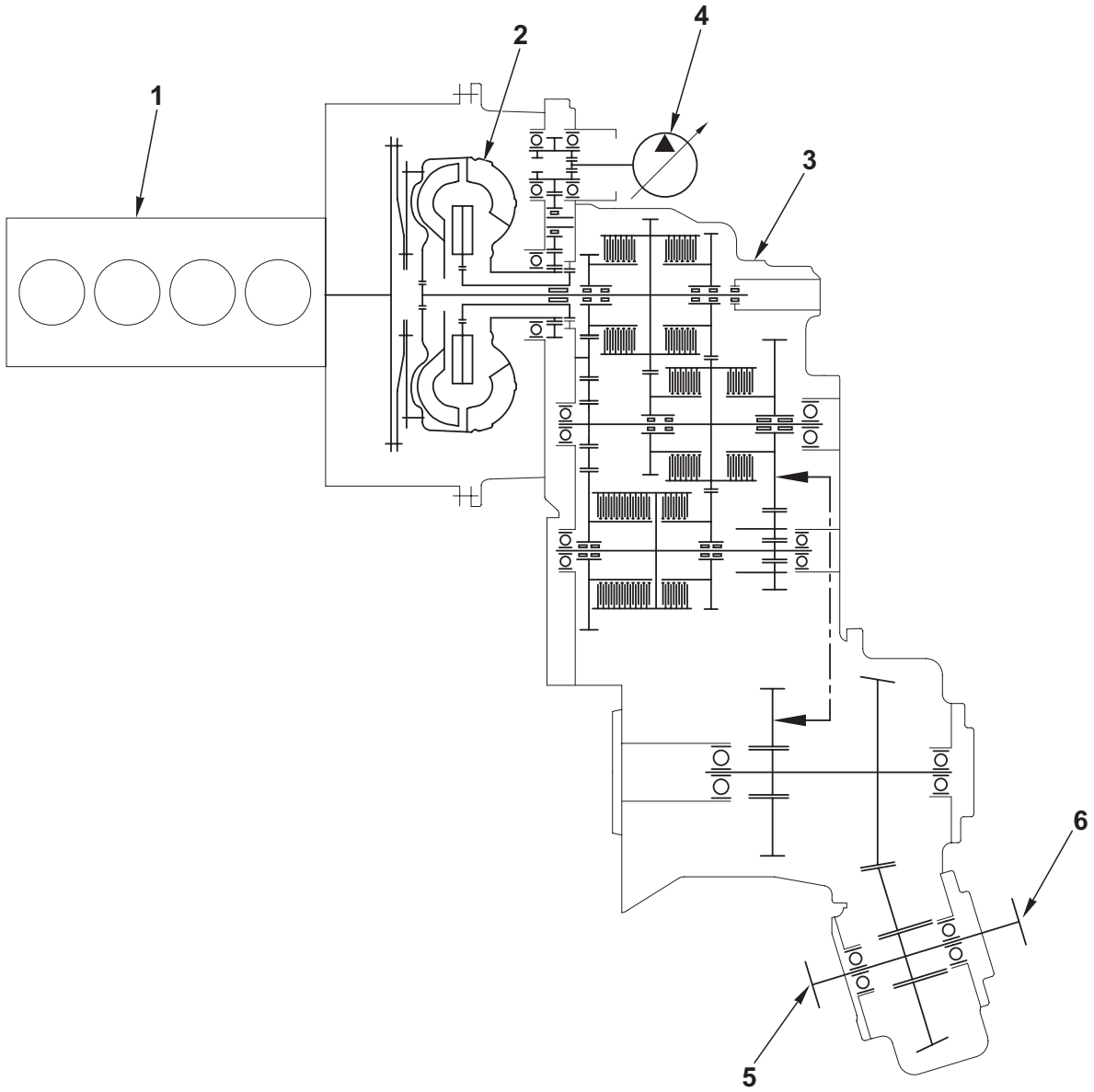
From liter to U.K. Gall.

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

TRANSMISSION

DIAGRAM OF THE POWER TRAIN



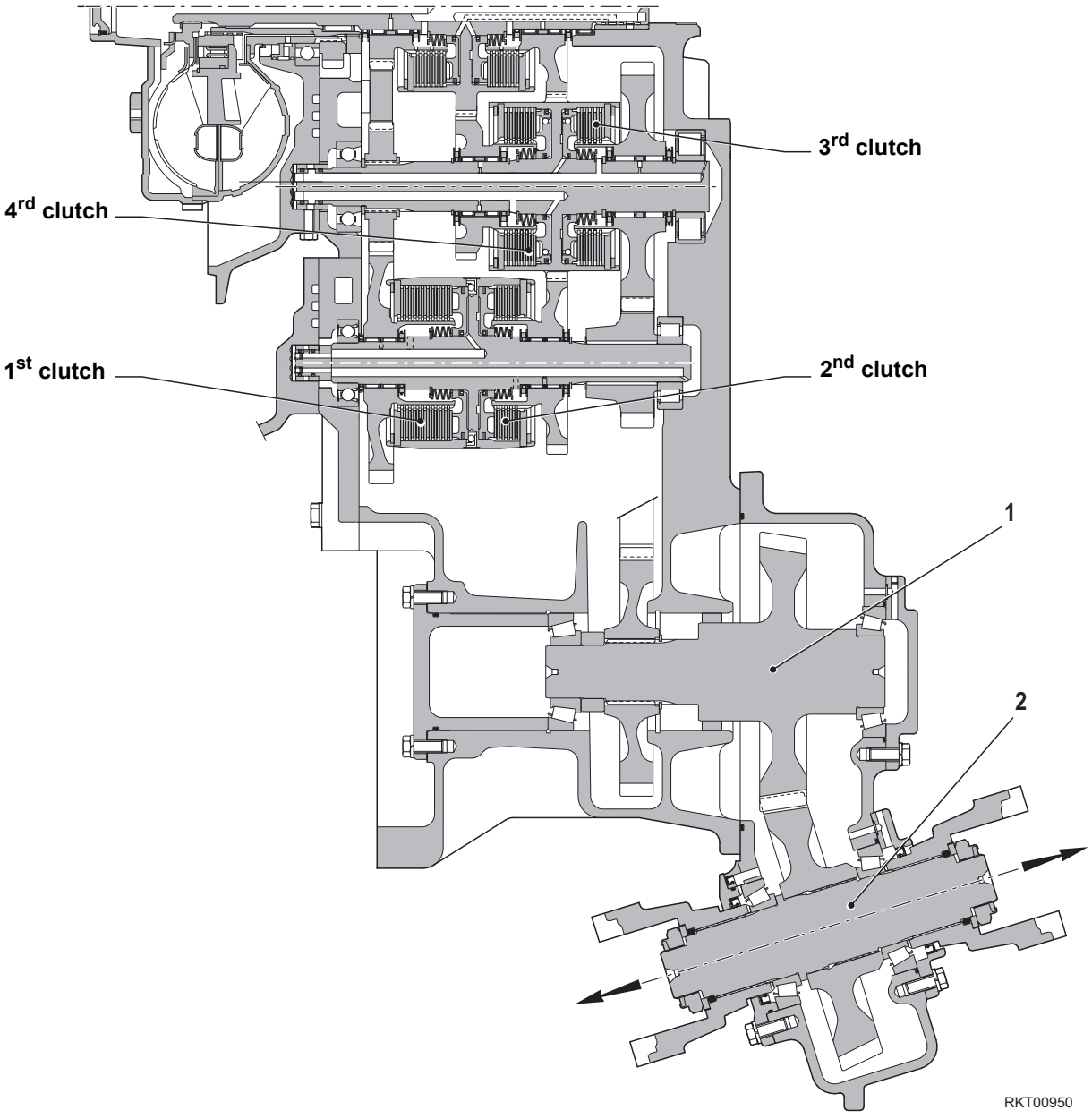
RKT00040

1. Engine
2. Converter
3. Transmission
4. Hydraulic pump
5. Rear flange
6. Front flange

1.3 Clutches

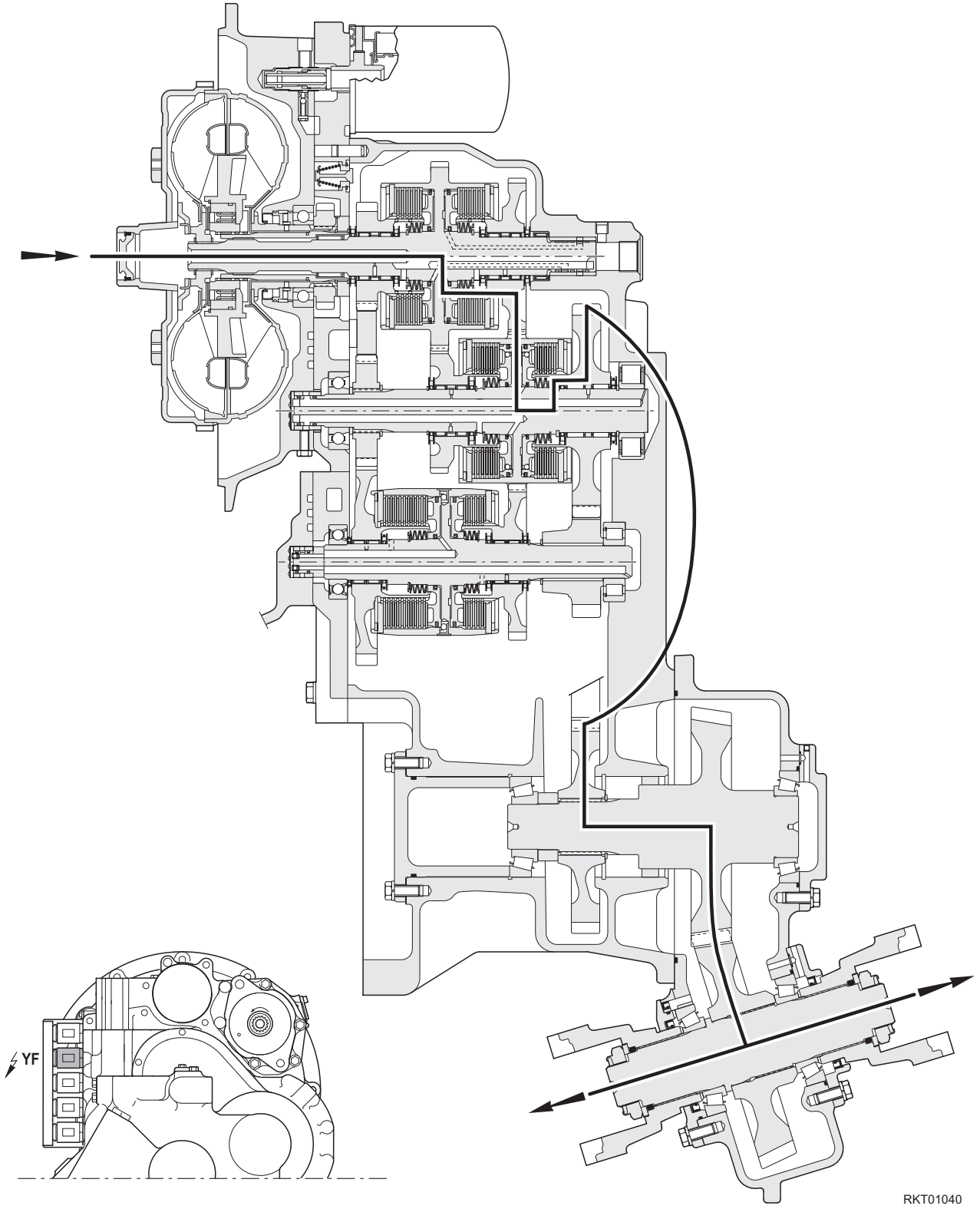
- Once a directional clutch is engaged, power is transmitted to the range clutches (1st,2nd, 3rd or 4th High).
- Operation and actuation of the range clutches is similar to the directional clutches.
- The engagement of the range clutches is not modulated.

1.4 Output section



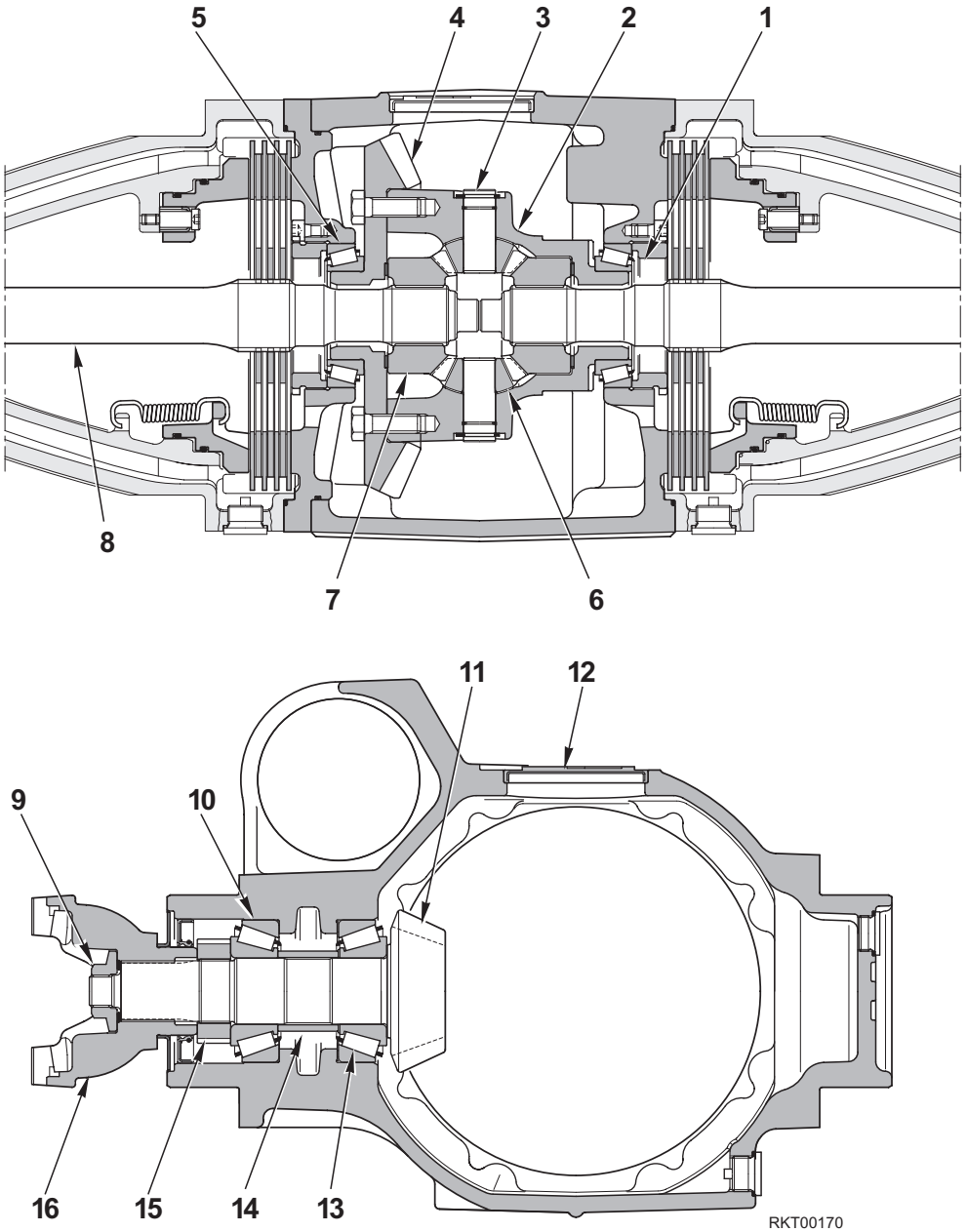
- Once a range clutch is engaged, power is transmitted to the output shaft.
  Output rotation is the same as engine rotation.
- The output shaft transmits motion to the drop box gears (1) and (2) which in turn transmit motion to the transmission shafts connected to the axles.

- **FORWARD 4th SPEED**



REAR AXLE

CENTRE BODY

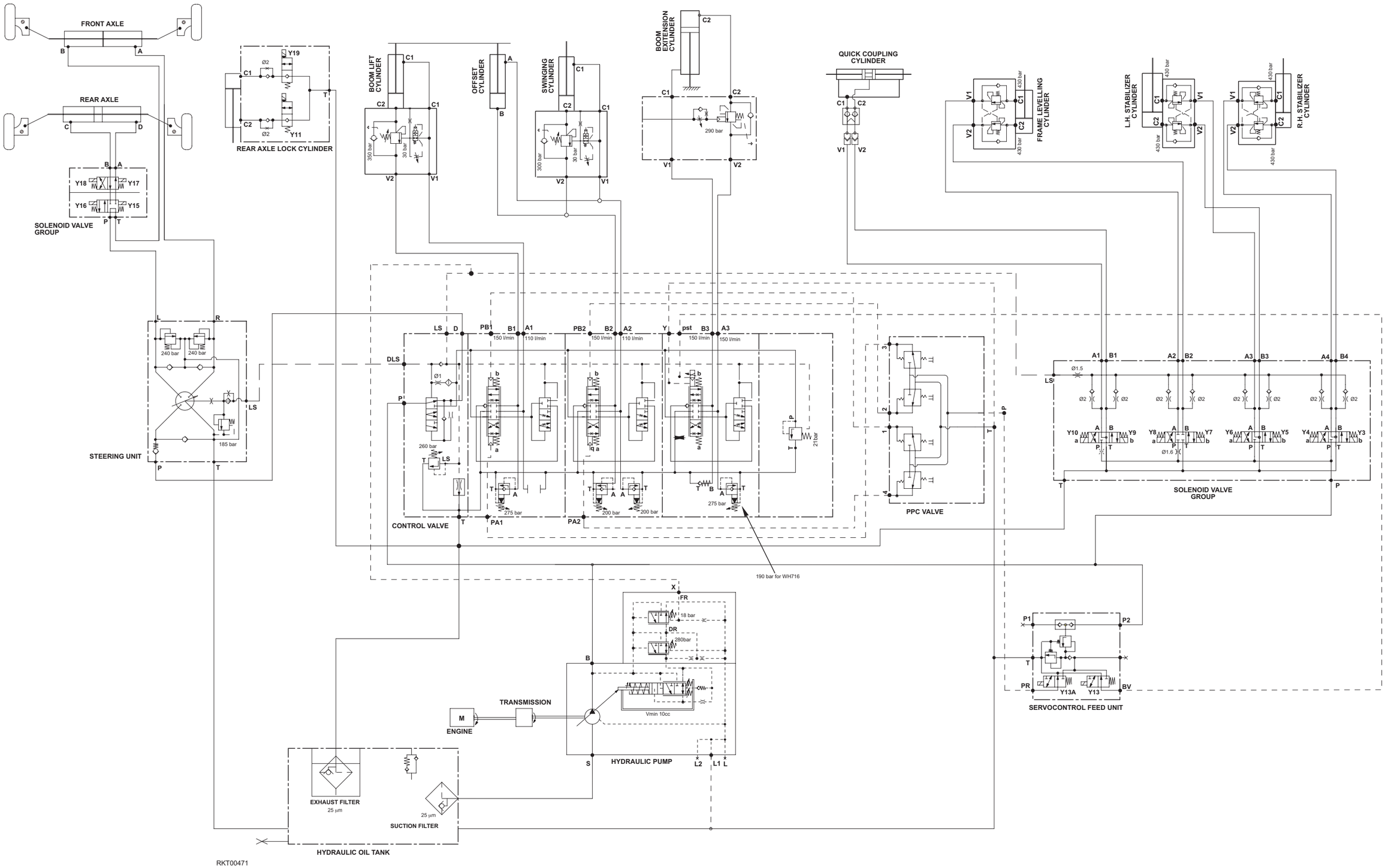


1. Ring nut
2. Differential housing
3. Pin
4. Ring gear
5. Bearing
6. Planetary gear
7. Side gear
8. Drive shaft
9. Nut
10. Bearing
11. Pinion
12. Plug
13. Bearing
14. Spacer
15. Ring nut
16. Flange

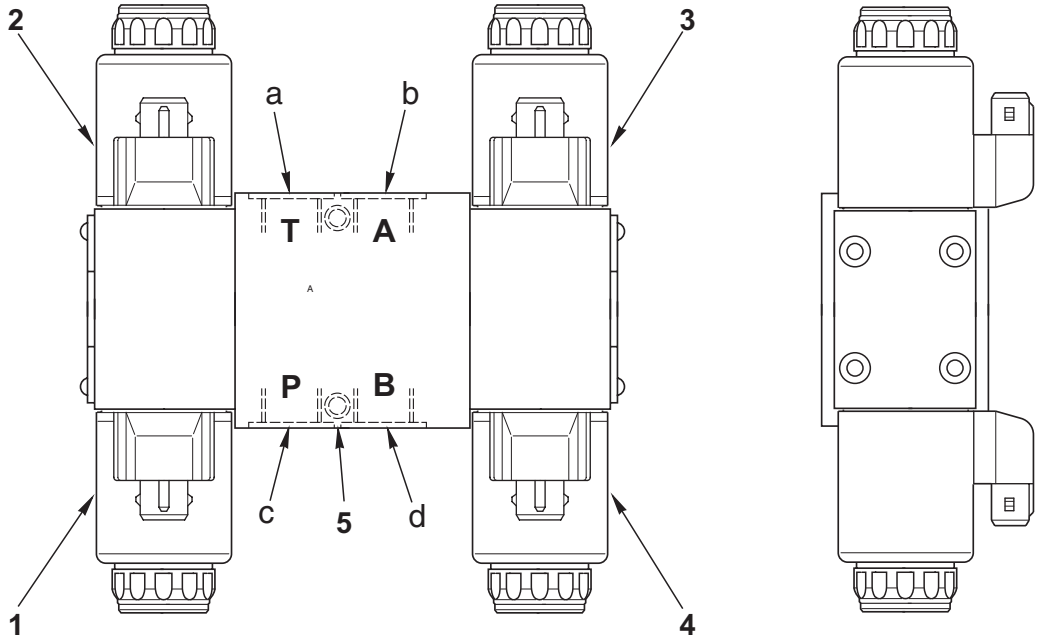
CHARACTERISTICS:

- **Version with aspirated engine**
  Amount of oil: 7.0 ℓ
  Reduction ratio: 8:31
- **Version with turbo engine**
  Amount of oil: 7.1 ℓ
  Reduction ratio: 9:31

HYDRAULIC DIAGRAM



ST1 STEERING SOLENOID VALVE GROUP (Y15 - Y16 - Y17 - Y18)

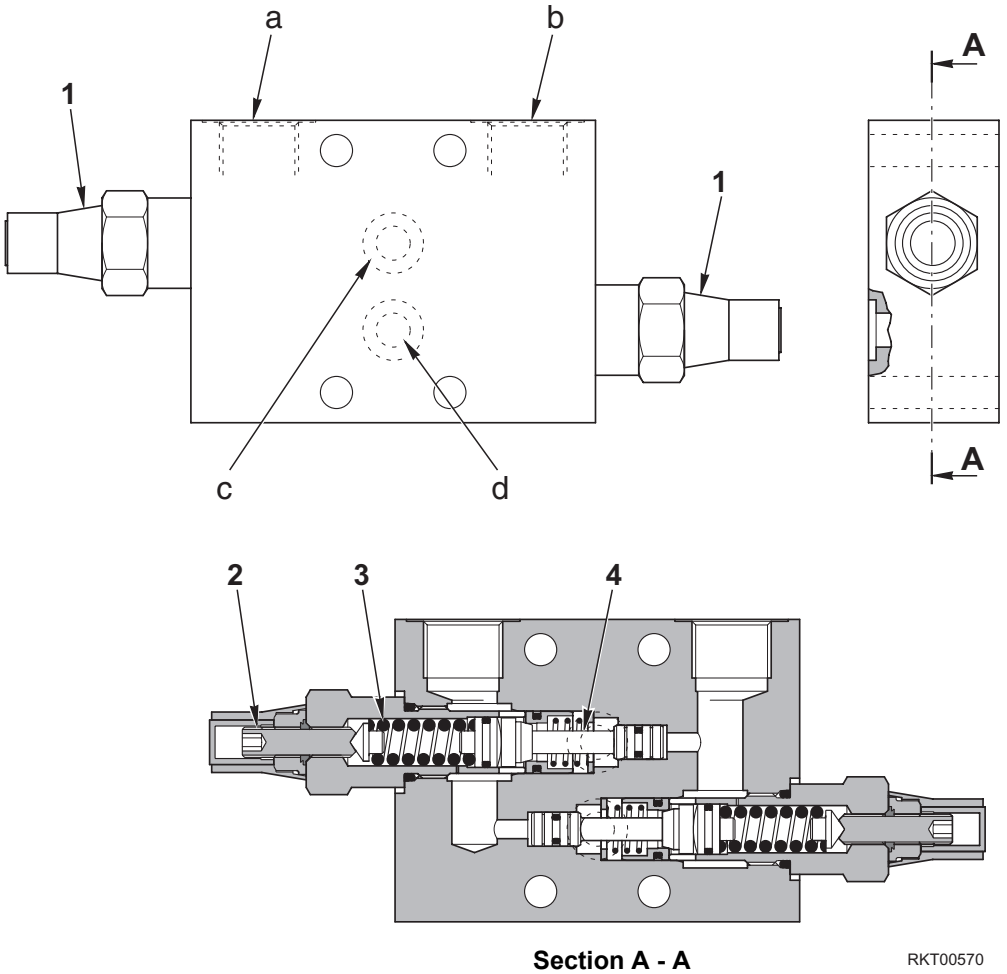


RKT00480

1. Y15 - Rear steering cut out
2. Y16 - Front/rear steering
3. Y17 - Phase coincidence steering
4. Y18 - Crab steering
5. Port block

a. T Port - To front axle steering cylinder (B Port)
b. A Port - To rear axle steering cylinder (D Port)
c. P Port - From steering unit (L Port)
d. B Port - To rear axle steering cylinder (C Port)

STABILIZERSI



Section A - A RKT00570

1. Safety valve
2. Adjusting screw
3. Spring
4. Valve

a. Port V2 - V2 Port-From OP3 solenoid valve group (B2 Port) (B3 Port)
From OP4 solenoid valve group (B3 Port) (B4 Port)

b. V1 Port - From OP3 solenoid valve group (A2 Port) (A3 Port)
From OP4 solenoid valve group (A3 Port) (A4 Port)

c. C2 Port - To stabilizer cylinder (base side)

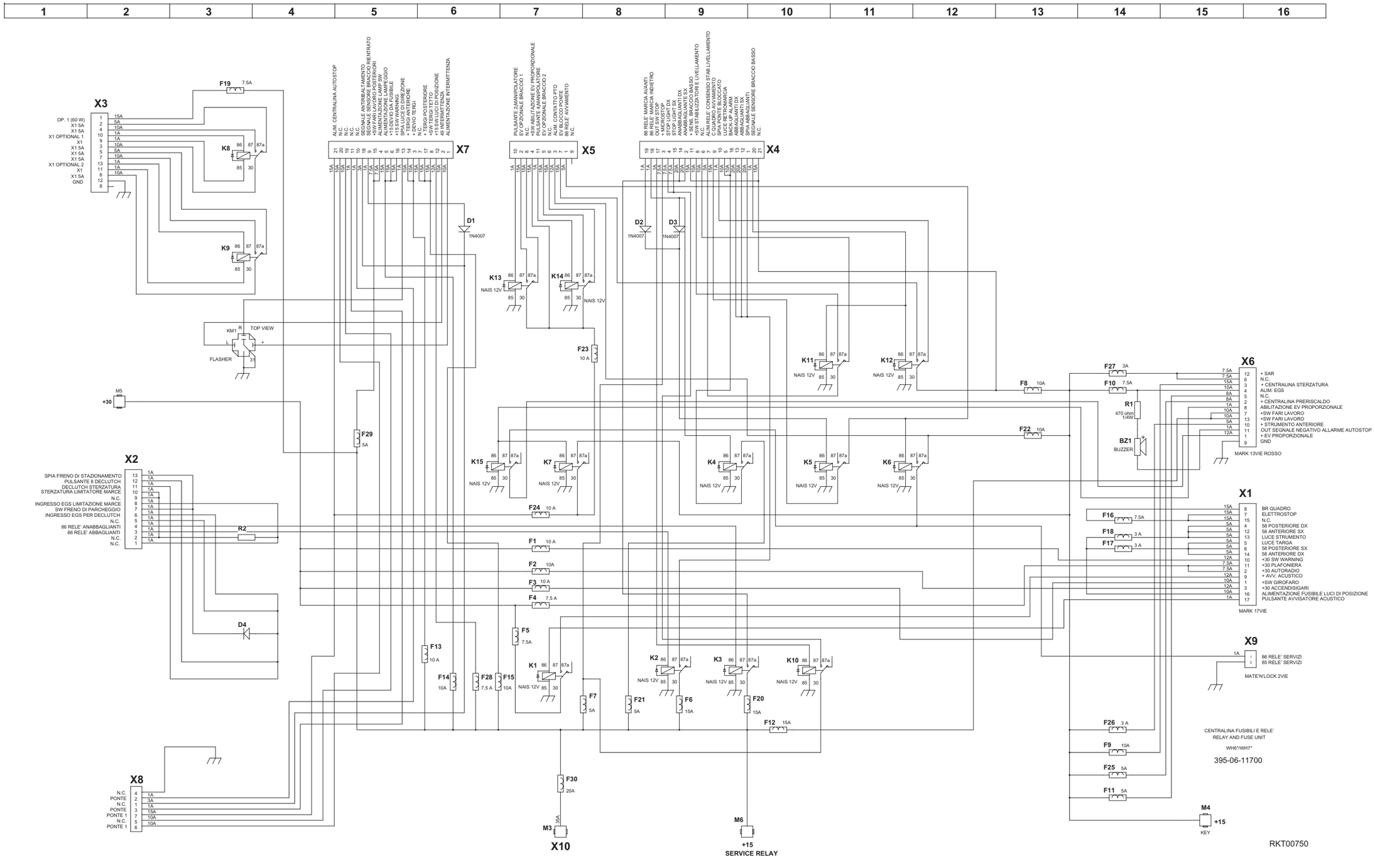
d. C1 Port - To stabilizer cylinder (head side)

CHARACTERISTICS

Safety valve calibration: 430 bar

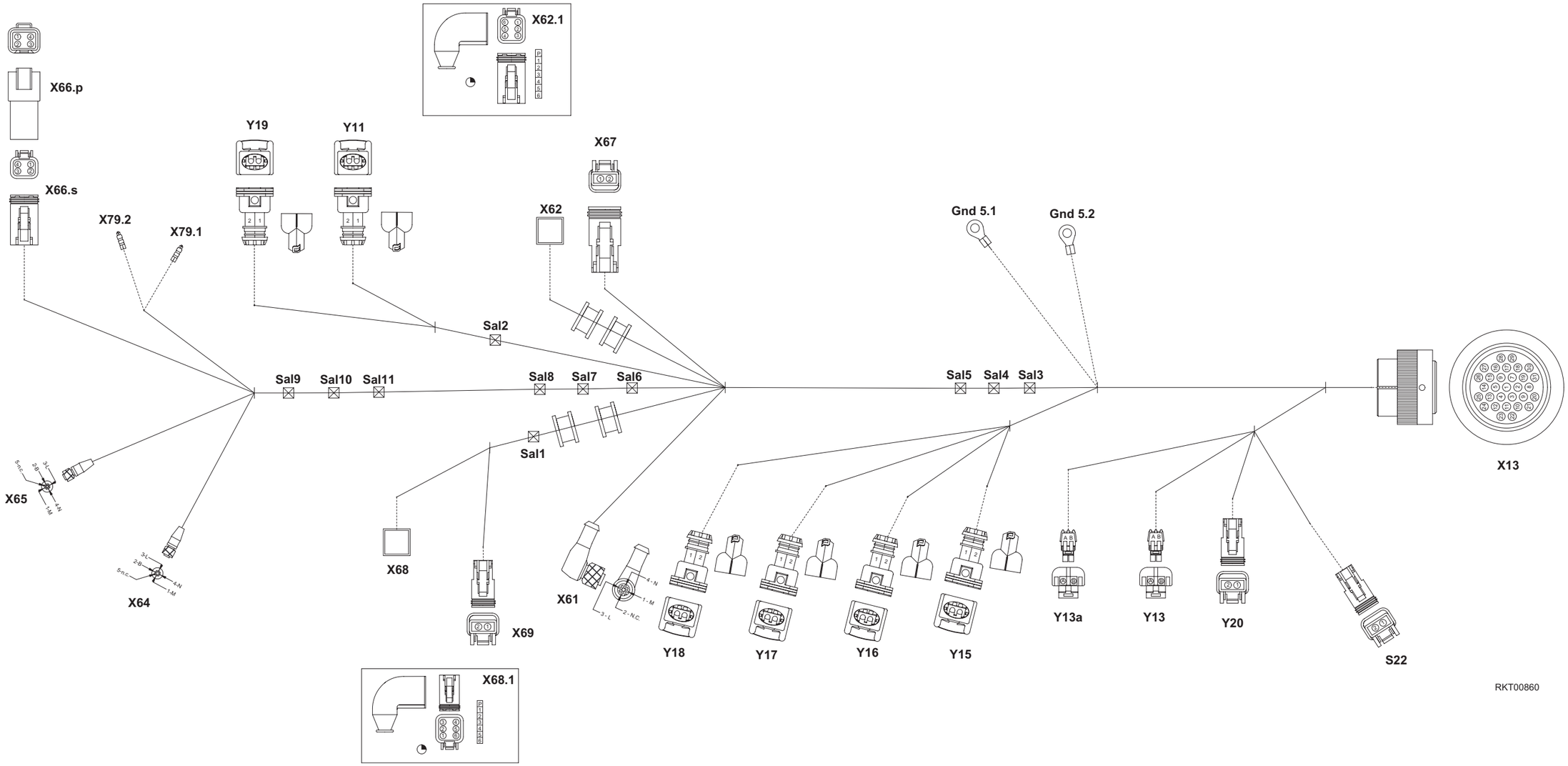
ELECTRICAL DIAGRAMS

FUSE CENTRE



REAR FRAME WIRING

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



• MACHINE MODELS WH713 - WH714 - WH714H - WH716

Machine model				WH713 - WH714 - WH714H - WH716	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed (load condition)	With stalled converter	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Machine in 2nd gear • Service brakes: applied	rpm	2015	2015–2100
	With stalled converter and hydraulic system in load condition	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Machine in 2nd gear • Service brakes: applied • Equipment crate curl at end of travel and steering at end of travel		1610	1610–2200
	With hydraulic system in load condition	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Parking brakes: applied • Equipment crate curl at end of travel and steering at end of travel		2450	2450–2550

• MACHINE MODEL WH613-1

Machine model					WH613-1	
Classification	Check item	Test conditions		Unit	Standard value	Permissible value
Hydraulic drift	Boom angle	• Machine control position: see Figures G and H in this chapter. • Machine levelled • Load P on forks: 3500 kg • Stabilizers: fully lowered. • Boom extension: letter **E** • Boom inclination: 60° in relation to the ground. • Forks: parallel to the ground. ★ Carry out two tests: a. with oil temperature at 40 °C b. a. with oil temperature at 80 °C ★ Measure any variations 10 minutes after engine stop ★ Measure inclination using a magnetic bubble placed on the boom ★ Measurement **A** at the tips of the forks ★ Measurement **B** at the mark between cylinder head and rod attachment	Inclination variation	a°	1.1°	0–2.5°
	Fork tip height		Tips down	mm	37.5	10–75
	Stabilizer cylinder (retraction)		RH		Max. 2	0
			LH		Max. 2	0

• MACHINE MODEL WH714-1

<table>
<tr><td colspan="4">Machine model</td><td colspan="2">WH714-1</td></tr>
<tr><td>Classification</td><td>Check item</td><td colspan="2">Test conditions</td><td>Unit</td><td>Standard value</td><td>Permissible value</td></tr>
<tr><td rowspan="4">Hydraulic drift</td><td>Boom angle</td><td rowspan="4">• Machine control position:
see Figures G and H in this chapter.
• Machine levelled
• Load P on forks: 3500 kg
• Stabilizers: fully lowered.
• Boom extension: letter E
• Boom inclination: 60° in relation to the ground.
• Forks: parallel to the ground.
★ Carry out two tests:
a. with oil temperature at 40 °C
b. a. with oil temperature at 80 °C
★ Measure any variations 10 minutes after engine stop
★ Measure inclination using a magnetic bubble placed on the boom
★ Measurement A at the tips of the forks
★ Measurement B at the mark between cylinder head and rod attachment</td><td>Inclination variation</td><td>a°</td><td>1.1°</td><td>0–2.5°</td></tr>
<tr><td>Fork tip height</td><td>Tips down</td><td rowspan="3">mm</td><td>37.5</td><td>10–75</td></tr>
<tr><td rowspan="2">Stabilizer cylinder (retraction)</td><td>RH</td><td>Max. 2</td><td>0</td></tr>
<tr><td>LH</td><td>Max. 2</td><td>0</td></tr>
</table>

• MACHINE MODEL WH716-1

Machine model					WH716-1	
Classification	Check item	Test conditions		Unit	Standard value	Permissible value
Hydraulic drift	Boom angle	• Machine control position: see Figures G and H in this chapter. • Machine levelled • Load P on forks: 3500 kg • Stabilizers: fully lowered. • Boom extension: letter **E** • Boom inclination: 60° in relation to the ground. • Forks: parallel to the ground. ★ Carry out two tests: a. with oil temperature at 40 °C b. a. with oil temperature at 80 °C ★ Measure any variations 10 minutes after engine stop ★ Measure inclination using a magnetic bubble placed on the boom ★ Measurement **A** at the tips of the forks ★ Measurement **B** at the mark between cylinder head and rod attachment	Inclination variation	a°	1.1°	0–2.5°
	Fork tip height		Tips down	mm	37.5	10–75
	Stabilizer cylinder (retraction)		RH		Max. 2	0
			LH		Max. 2	0

ADJUSTING BRAKE PEDAL TRAVEL AND POSITIONING THE STOP LAMP MICROSWITCHES

1 - Position the machine on firm level ground with the boom fully retracted and lowered; stop the engine and remove the ignition key.

2 - Install wedges under the wheels.

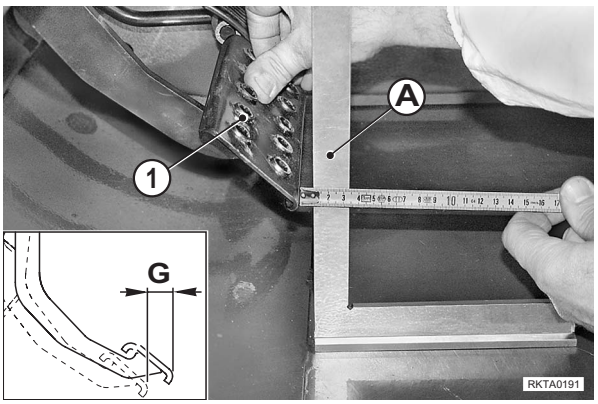
- **Checking procedure**

1 - Remove the mat.

2 - Place a square (**A**) to the cab floor and move the square close to the edge of the brake pedal (1).

3 - Press the brake pedal by hand and check pre-travel.

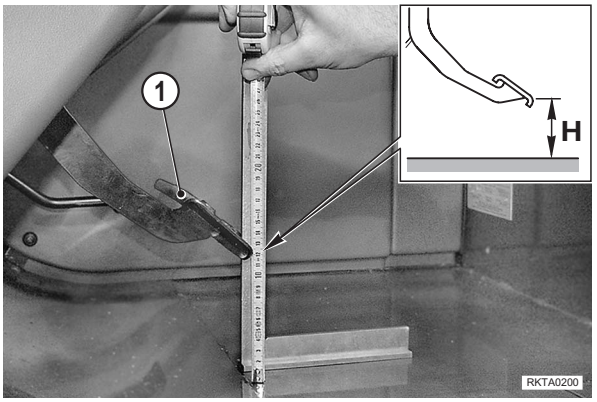
★ Normal pre-travel "**G**": 7 +1 -1 mm



4 - Release the pedal (1) and check the position height wise.

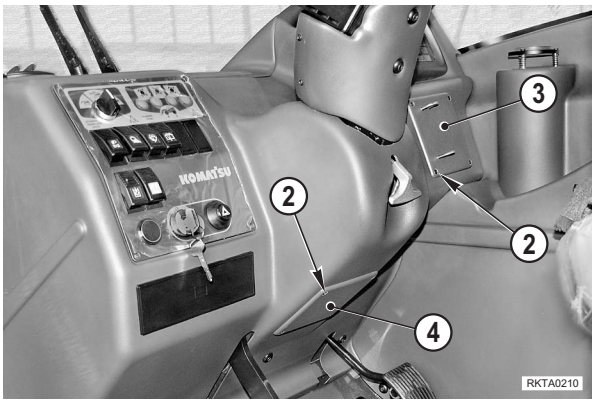
★ Normal height "**H**": 110 +2 -2 mm

5 - If either value is not within specifications, adjust as needed.



- **Pedal height adjustment**

1 - Loosen the screws (2) and remove the covers (3 and 4).



3. GENERAL AND SECONDARY VALVE CALIBRATION

- **General cut-off valve (1)**

⚠ Prepare the machine for calibration as described for the pressure checking procedure.

1 -Remove the tamper seal (2) (yellow colour)

2 -Loosen the retaining nut (3).

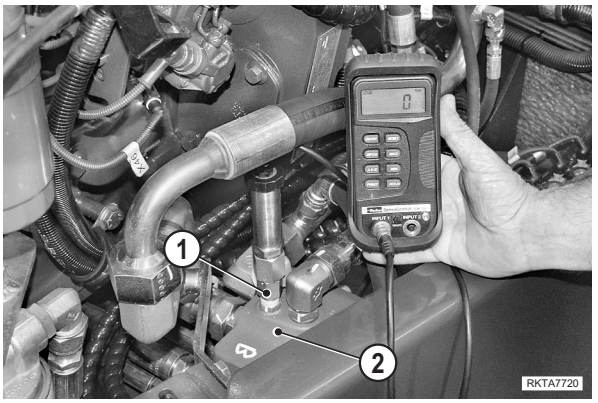
3 -With the engine at IDLE, lower the boom to the end of its travel.

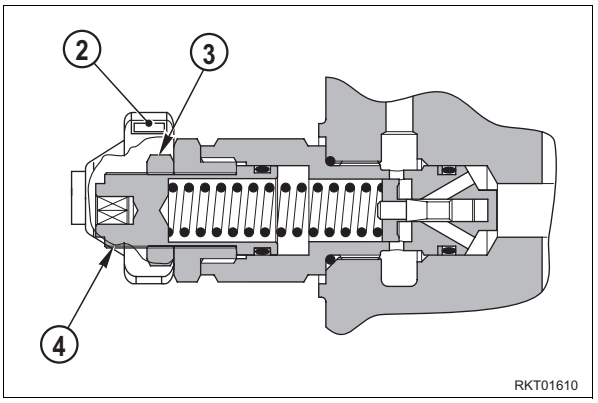
4 -Adjust maximum pressure using the screw (4) provided.
- Turn the screw CLOCKWISE to INCREASE pressure.
- Turn the screw COUNTER-CLOCKWISE to DECREASE pressure.

5 -Tighten the nut (3) to retain the position.

Retaining nut: 20 Nm

6 -Install a new tamper seal (2) (orange colour).





- **Secondary valves**

⚠ Prepare the machine for calibration as described for the pressure checking procedure.

★ This calibration applies to all secondary valves and can be inspected by forcing the movement to the end of its travel when checking.

1 -Loosen the retaining nut (1).

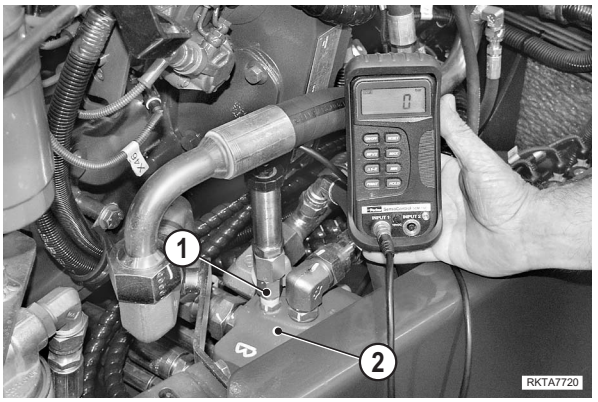
2 -Adjust pressure using the adjusting screw (3).
- Turn the screw CLOCKWISE to INCREASE pressure.
- Turn the screw COUNTER-CLOCKWISE to DECREASE pressure.

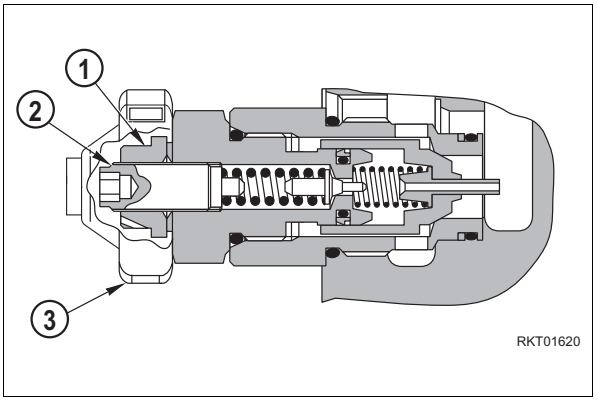
3 -Tighten the nut (2) to retain the position.

Retaining nut: 10±1 Nm

⚠ At the end of adjustment, apply a protection (1) (orange colour) against unauthorized tampering.

4 -Restore the general valve pressure.





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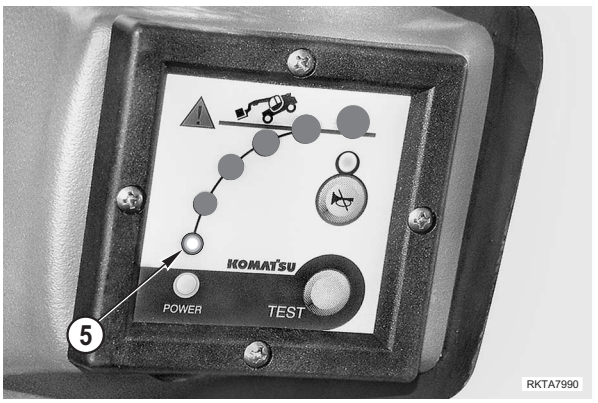
2 - Introduce a test jumper wire (4) into the female connector (X30).

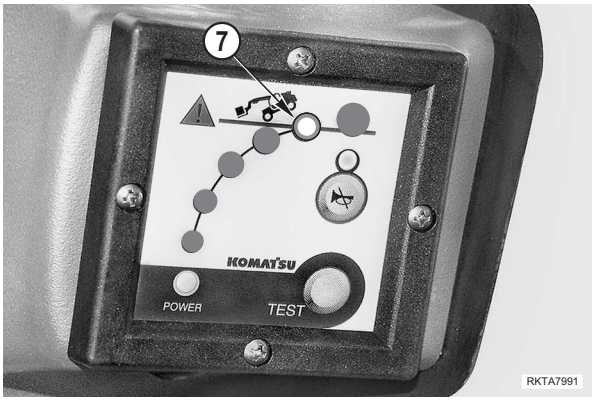
3 - Start the engine to start the overturn prevention unit calibration procedure. The calibration mode is indicated by the green lamp (5).



4 - Press the “TEST” button (6) to save the first value in the load range.
Now, the LED (5) will start blinking for 8 seconds to indicate that the value of minimum load without outriggers is being learnt.

5 - Learning ends when the green LED (5) turns off and is confirmed by an audible tone which is emitted for 2 seconds.

6 - When the tone stops, the red lamp (7) turns on. The red lamp indicates maximum load.



BOOM CHAINS

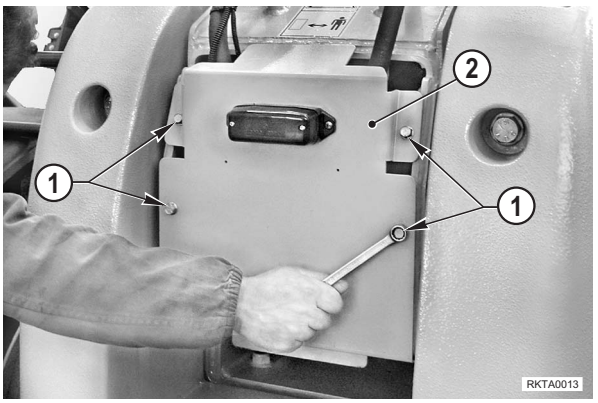
• Oxidation inspection

1 - Position the machine on level ground with enough free space at the front to be able to fully extend the boom.

2 - Move the boom to its horizontal position without load and apply the parking brakes.

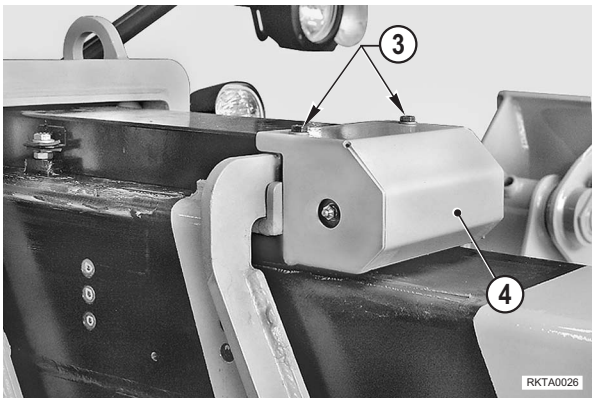
3 - Lower the outriggers, if equipped.
If the machine is not equipped with outriggers, place a safety block under the centre portion of the front frame.

4 - Remove the screws (1) and remove the rear cover (2).

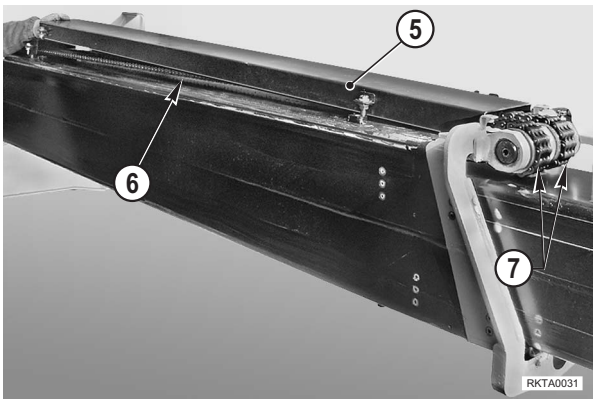


5 - Remove the screws (3) and remove the extension chain protective cover (4).

6 - While an assistant slowly extends the booms, another assistant should visually check the links of the extension chain for oxidation or oxide-contaminated lubricant.



7 - With the boom fully extended, stop the engine, remove the covers (5) and inspect the covered portion of the extension chains (6) and the guide rollers (7).

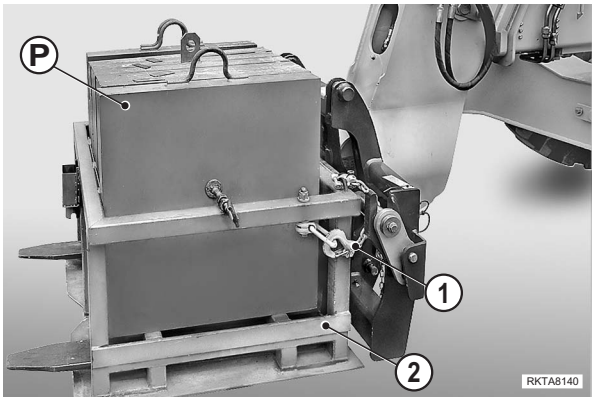


ANALYSIS OF THE CAUSES RESPONSIBLE FOR HYDRAULIC DRIFT

★ If the boom, equipment, stabilizer, axle-locking, and frame levelling cylinders are affected by hydraulic drift, it is necessary to check whether the cause lies with the safety valves or with the cylinder gaskets.

★ Check conditions applicable to all drift inspections:
- Engine: at operating temperature.
- Hydraulic oil: 45–55 °C.
- Test-weight "**P**" on the forks (secured with chains to the equipment crate):

MACHINE	P
WH 609 - WH613	3500 kg
WH 713	3700 kg
WH714 - WH716	4000 kg
WH 714H	4500 kg

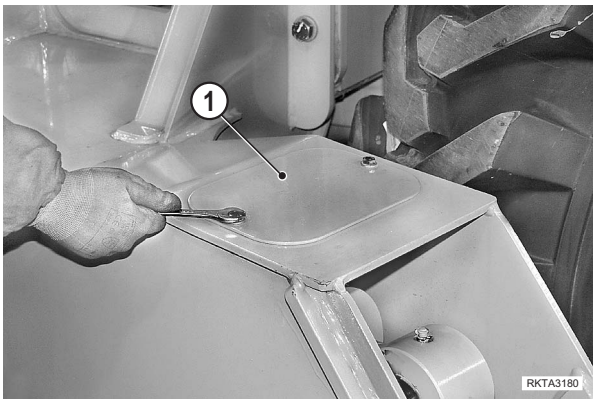


1. Checking procedure for stabilizers (if equipped)

★ Test one stabilizer at a time.

★ Check conditions:
- Boom fully retracted and lowered to the ground.

1 -Remove the upper cover (1) to gain access to the safety valve (2).



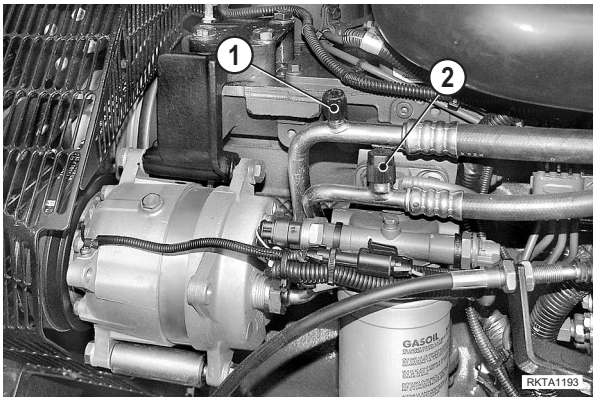
AIR CONDITIONING SYSTEM MAINTENANCE

- **Emptying and filling the air conditioning system**

1 - Connect the maintenance station to the service valves (1 and 2) and follow the maintenance station instructions for emptying the system.

2 - Carefully check the quantity of antifreeze oil that is collected and/or contained in the parts that have been removed because the same quantity shall have to be put back into the system when filling.

3 - Once the necessary repairs have been performed on the A/C system (hose or other part replacement), fill the system by introducing the previously recovered antifreeze oil as well as the coolant gas.
For the filling procedure, follow the maintenance station instructions relevant to A/C system fill.



SPECIAL TOOLS

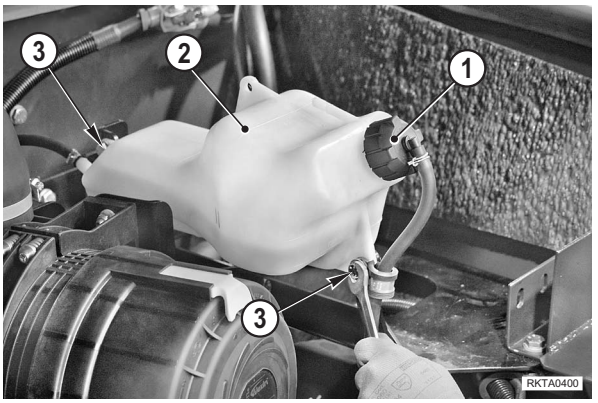
Nature of work	Symbol		Code	Description	Q.ty	Notes
Removal of telescopic boom	A	1	ATR201501	Tool	1	–
Disassembly/Assembly of steering unit	B	1	00239496	Tool	1	Removal of inner gasket
		2	00239497	Tool	1	Removal of dust seal
		3	00239498	Tool	1	Mounting of inner gasket
		4	00239499	Tool	1	Mounting of dust seal
Assembly of transmission	C	1		Tool	1	Removal regolator group
Disassembly/Assembly axles	D	1		Wrench	1	–
		2		Tool	1	Removal/installation of differential planetary wheel pins
		3		Bushing	1	
		4		Tool	1	Installation of differential planetary wheel pins
		5		Wrench	1	Flange locking
				Wrench	1	
		6		Wrench	1	Flange ring nut locking
		7		Wrench	1	Pinion locking
		8		Block	1	–
		9		Spacer	1	–
		10		Bearing inner ring installation kit	1	Installation pinion bearing
					1	
					1	
		11		Tool	1	Pinion dimension measuring
		12		Bearing outer ring installation kit	1	Installation pinion bearing
		13		Wrench	1	Installation pinion bearing
		14		Plunger	1	–
		15		Plunger	1	–
		16		Tool	1	Arm alignment

AIR FILTER

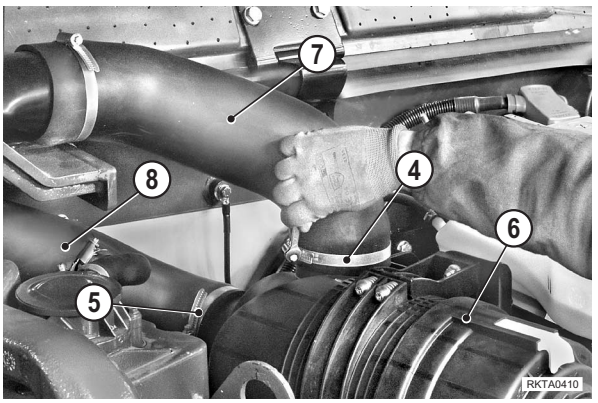
Removal

1 - Unscrew and remove the cap (1) from the surge tank (2).

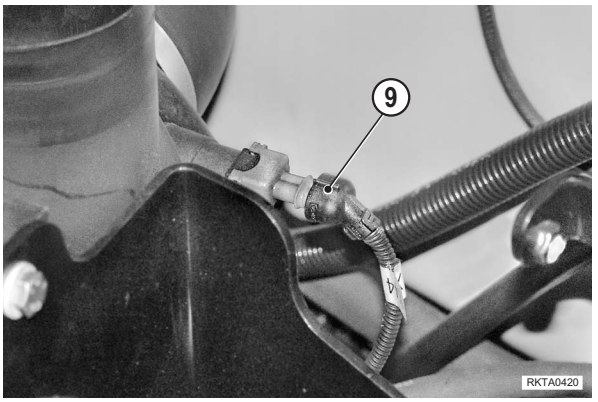
2 - Loosen and remove the screws (3), remove the surge tank (2), and position the tank aside.



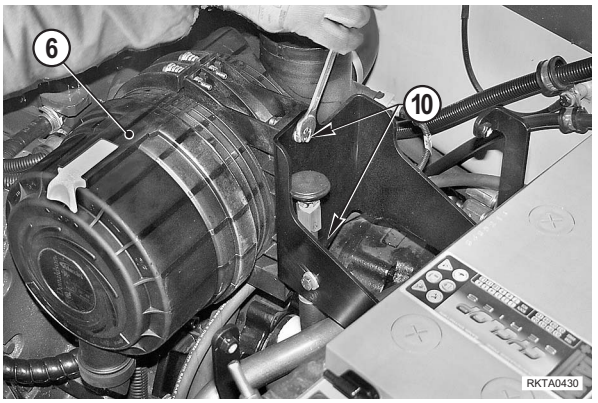
3 - Loosen the clamps (4), (5) and disconnect the outside air inlet hose (7) and engine intake hose (8) from the filter (6).



4 - Disconnect the air cleaner clogging sensor connector (9).



5 - Loosen and remove the screws (10) together with washers and nuts and remove the filter (6).



Installation

- To install, reverse the removal procedure.

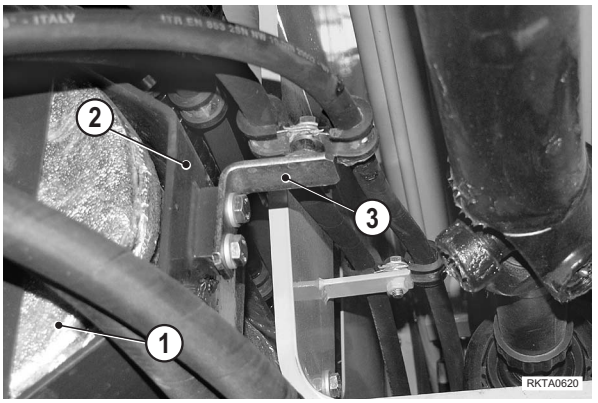
MUFFLER

Removal

1 - Remove both lengths of the exhaust duct.
(For details, see "EXHAUST PIPE").

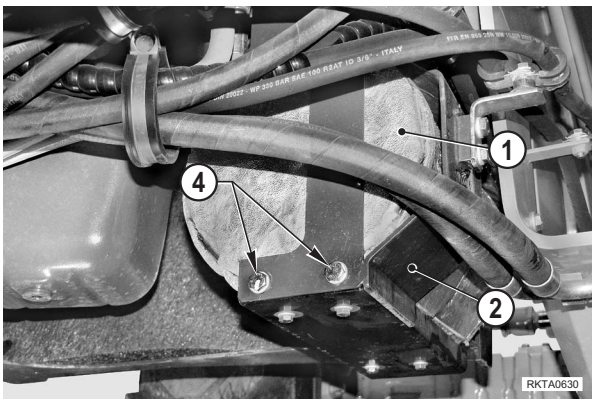
2 - Using a couple of belts, try to support the muffler (1) temporarily.

3 - Disconnect the support (3) from the muffler support (2).



4 - Loosen and remove the rear screws (4) along with their respective washers.

5 - Loosen and remove the support's front screws, remove their respective washers and remove the muffler (1) together with its support (2).

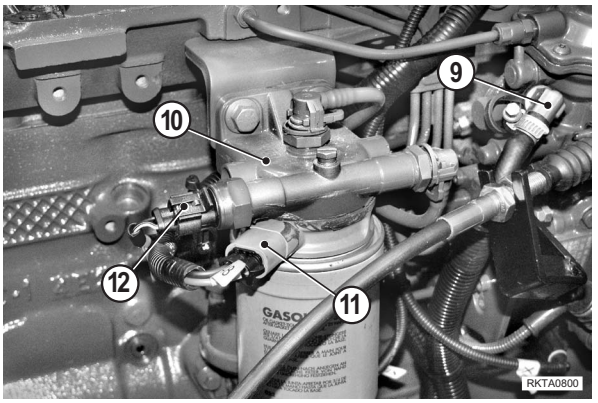


Installation

- To install, reverse the removal procedure.

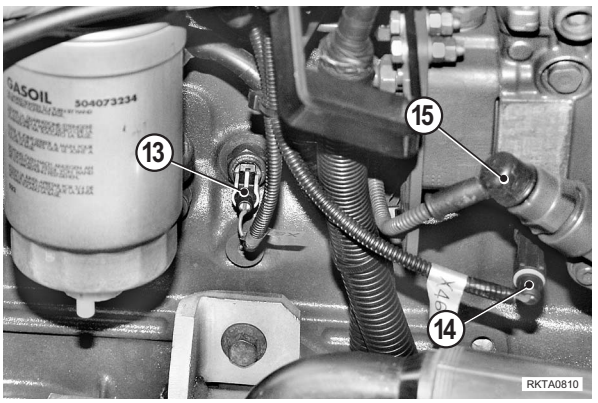
8 - Disconnect the fuel return line (9) from the injection pump.

9 - Disconnect the heating and fuel temperature sensor connectors (11), (12) from the filter support (10).



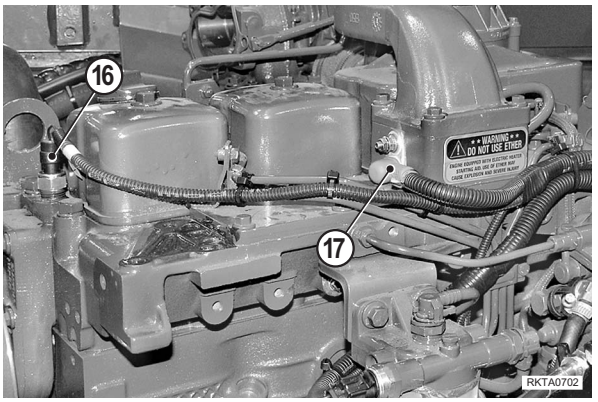
10 - Disconnect the connector (13) from the engine oil pressure sensor.

11 - Disconnect the connector (14) from the engine stop solenoid valve and disconnect the connector (15) from the temperature sensor.

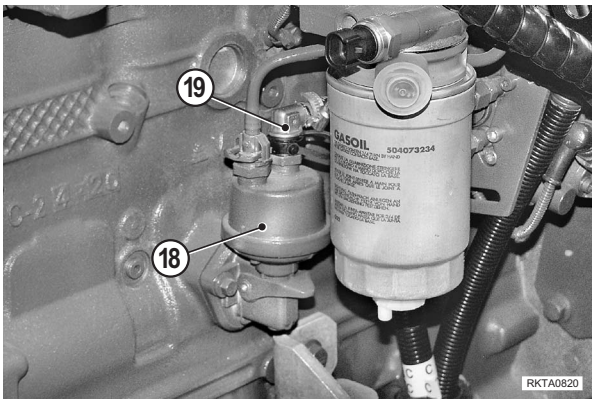


12 - Disconnect the connector (16) from the coolant liquid temperature sensor.

13 - Disconnect the wiring (17) from the thermostart.

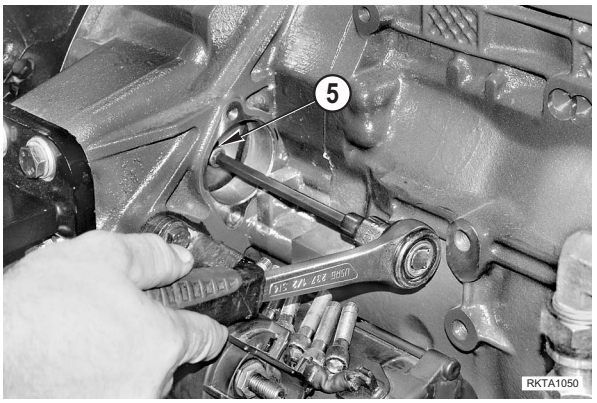


14 - Disconnect the fuel feed line (19) from the pump (18).

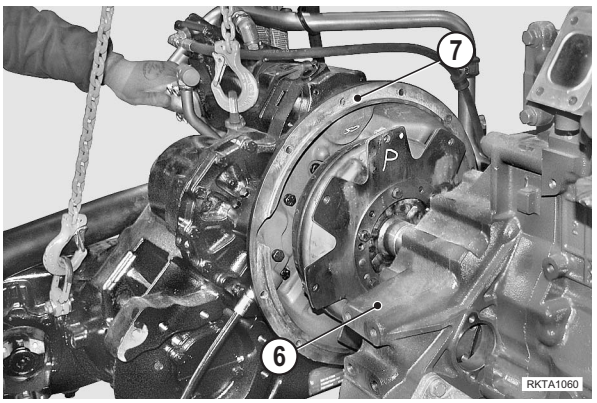


7 - Slightly rotate the engine flywheel until you locate the hydrodynamic coupling retaining screws (5).

8 - Remove the screws (5). [*1]



9 - Loosen and remove the engine mounting screws (6) and the transmission mounting screws (7) and detach one assembly from the other. [*2]



Joining

- To join the assemblies, reverse the detachment procedure.

  ★ Ensure that the coupling surfaces are clean and dent-free.

[*1]

  ★ To ease the joining of the flywheel to the hydrodynamic coupling before attempting to join the engine to the transmission, tighten a threaded stem (A) to the coupling. The stem will serve as guide.

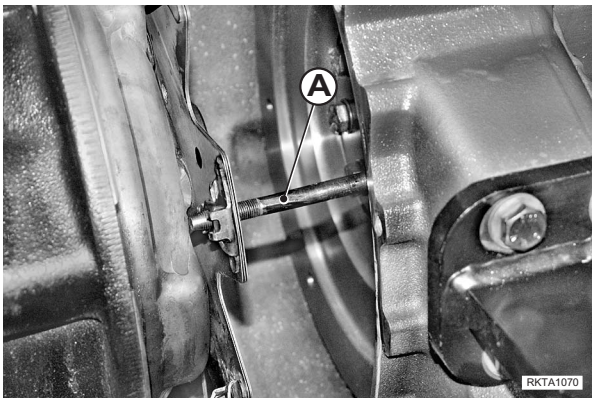
  Screws: Loctite 262

  Screws: 39 Nm

[*2]

  Screws: 49 Nm

  ★ Tighten in an alternate and criss-cross manner.

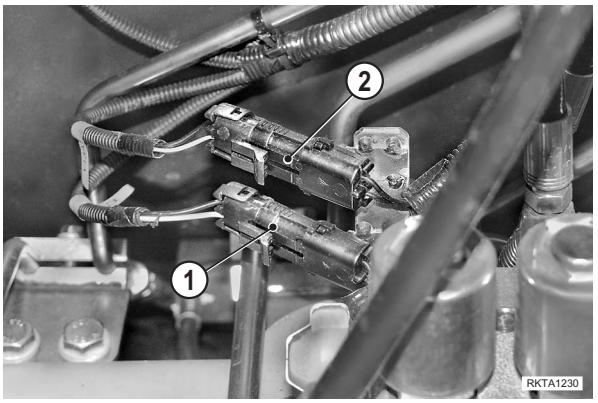


SERVO-CONTROL FEED VALVE

Removal

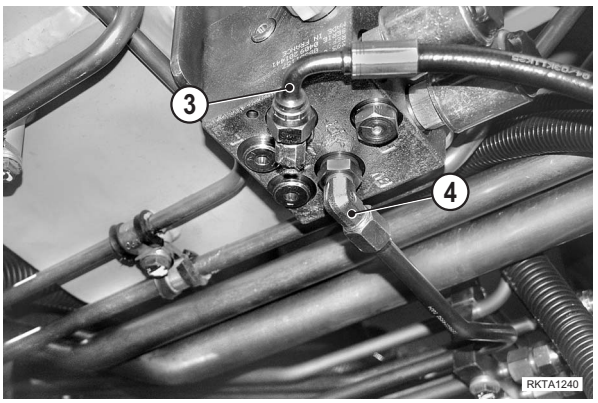
⚠ Lower and fully retract the boom and lower the stabilizers (if equipped) to the ground; apply the parking brake, stop the engine and remove the ignition key.

1 - Mark and then disconnect the connectors (1), (2).



2 - Disconnect the lower hoses (3), (4).

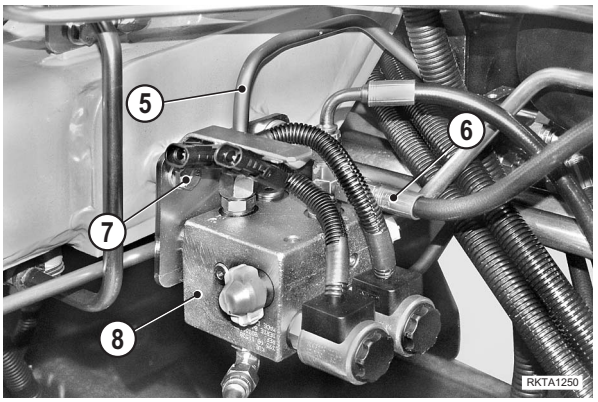
★ Immediately cap the hoses to prevent contaminants from entering the passages.



3 - Disconnect the upper lines (5) and (6).

★ Immediately cap the hoses to prevent contaminants from entering the passages.

4 - Loosen the screws (7), and remove the valve (8).



Installation

- To install, reverse the removal procedure.

1 - Start the engine to allow the oil to circulate and check for any leaks.
Perform several boom and equipment motions in order to bleed the air from the system.

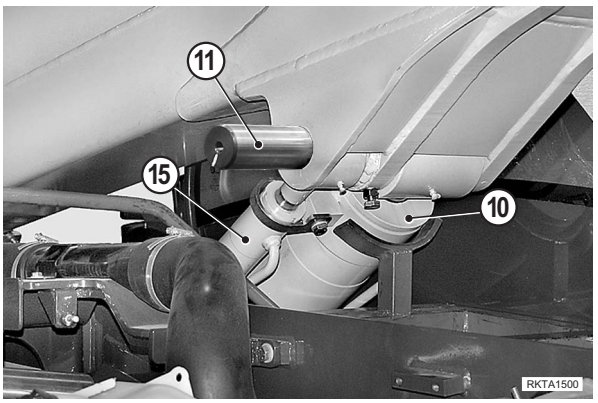
12 - Slightly tension the ropes or chains and pull the fulcrum pin (14) out.

★ Recover the shoulders mounted between the boom and the frame.

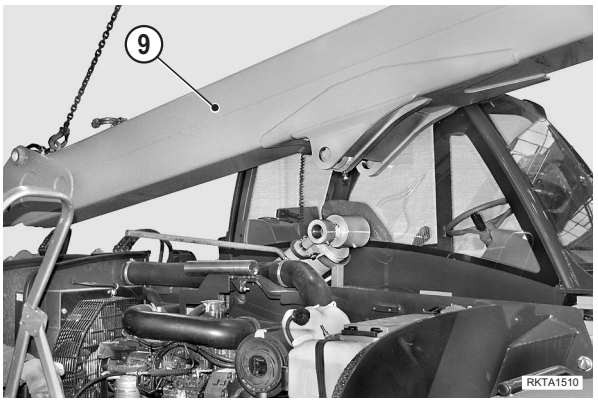
★ Do not mix or invert the position of the shoulders.

13 - Remove the pin (11) providing the attachment for the lift cylinder (10) and offset cylinder (15).

★ If necessary, use a push puller to remove the pin.

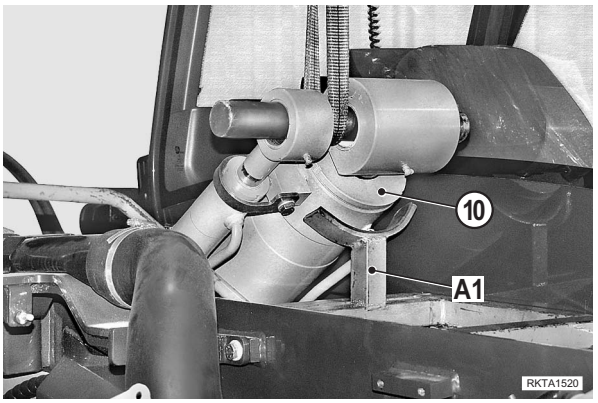


14 - Remove the complete boom (9).

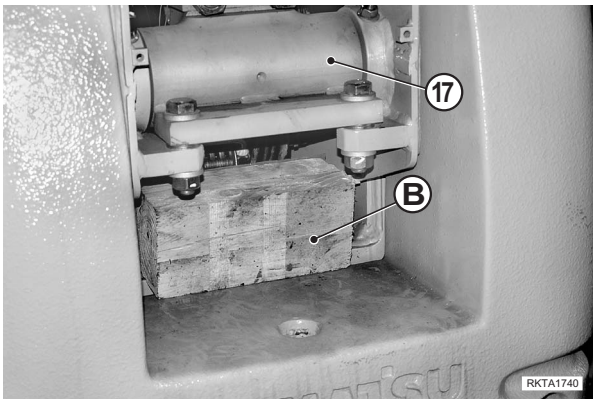


Installation

1 - Install the **A1** tool (code no. ATR201501) under the lift cylinder (10).



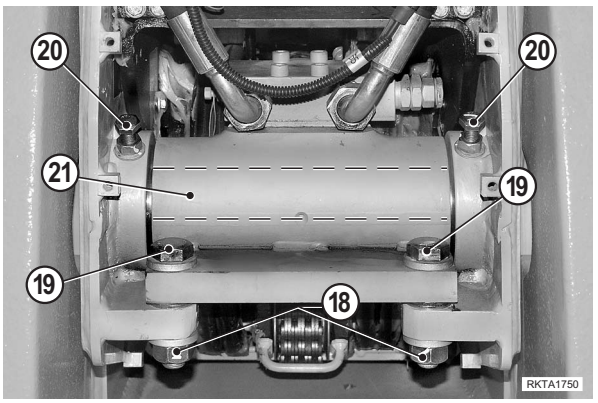
13 - Place a support block (B) under the cylinder head (17).



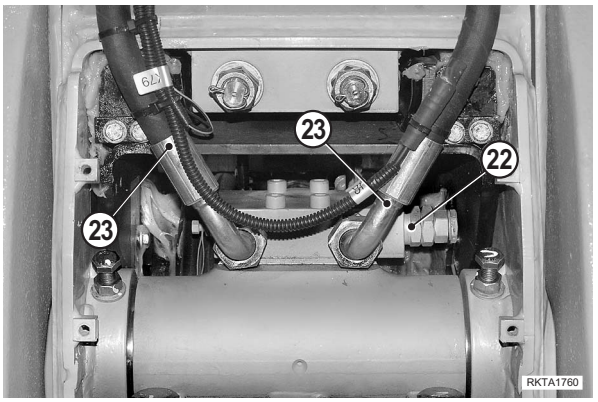
14 - Remove the nuts (18) and screws (19) retaining the extension cylinder rod attachment. [*3]

15 - Loosen and remove the nuts and screws (20) retaining the extension cylinder rod attachment pin (21).

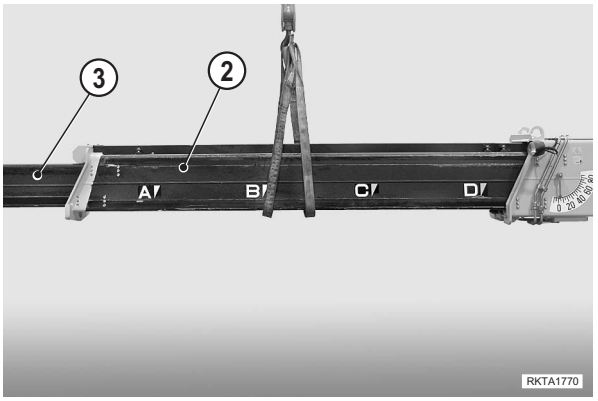
16 - Remove the pin (21) through the ballast holes.



17 - Disconnect the hoses (23) from the safety valve (22).

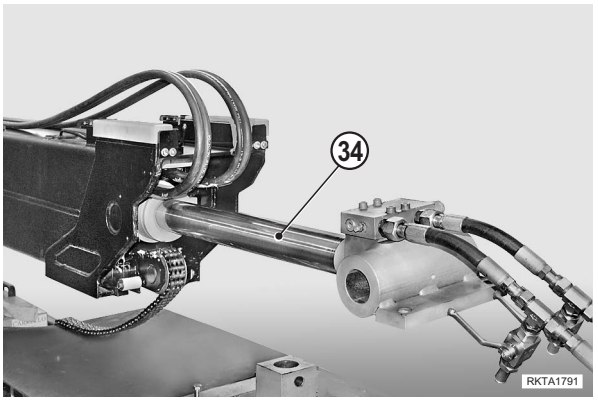


18 - Connect the intermediate boom (2) complete with top boom (3) to a hoist and pull them out from the basic boom.



5 - Connect an external power unit to the cylinder and let the piston (34) slide out of the cylinder by approximately 70-80 cm.

★ Make sure that the external power unit is filled with the same type of hydraulic oil as the machine.

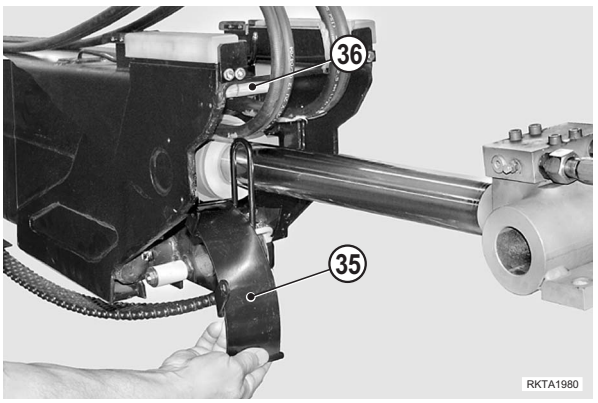


6 - Remove the hose guides (35).

7 - Remove the screws and remove the upper guide rollers (36).

8 - Remove the check plates and remove the shoes complete with shims as described in paragraph "5. Rear upper shoes for intermediate boom".

9 - Install by reversing the removal procedure.



7. Rear lower shoes for intermediate and top boom.

NOTE
This procedure should only be carried out when overhauling the boom or the machine, as the amount of wear on these parts is virtually negligible.

1 - Remove the intermediate and top booms.
(For details, see "INTERMEDIATE AND TOP BOOM").

2 - Remove all side and front guide shoes.
(For details, please refer to paragraphs 1, 2, 3, and 4).

⚠ Do not invert or change the position of the slip clearance adjustment shims.

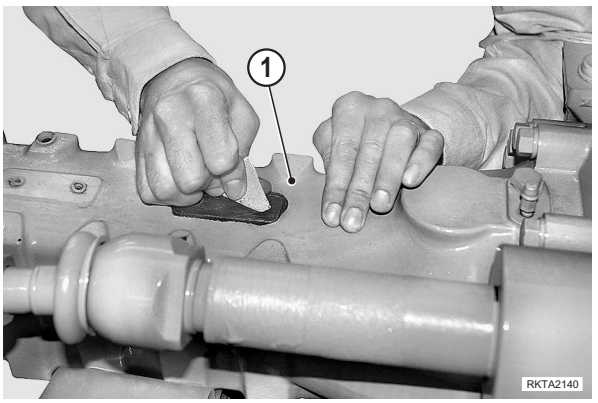
LOAD CELL

Installation

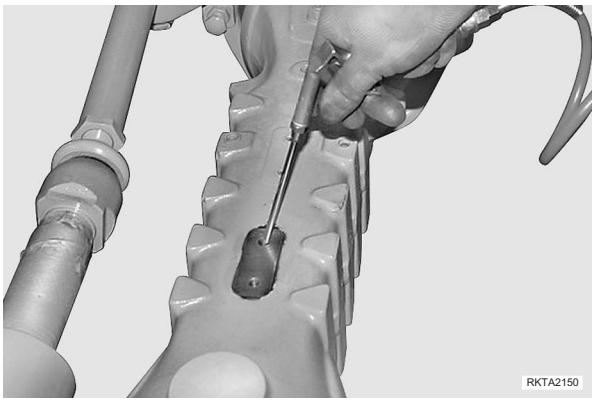
Before attempting to install the load cell, ensure that the sensor output signal (with the cell resting on a surface, i.e. in a free condition) is about 50±1 mA with and average power supply of 12 VDC.

1 - Remove all residues of pre-existing adhesive or protective varnish from the seat provided in the right rear axle shaft (1), and ensure that the surface is free of any deformation due to dents.

2 - To complete the cleaning procedure, rub sandpaper No. 80-120 on the surface making circular movements.



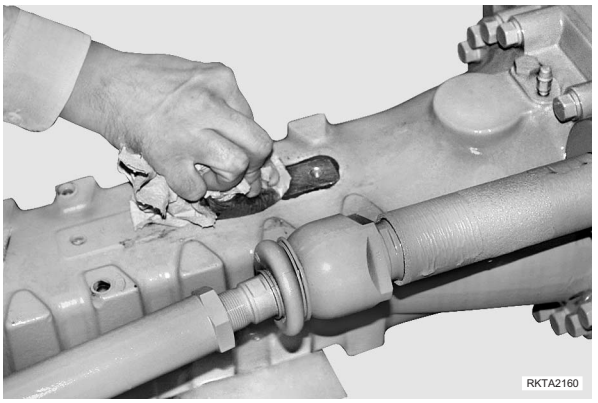
3 - Use compressed air at low pressure to blow out any debris and cleaning residues from the holes provided for the retaining screws.



4 - Degrease the load cell seat using a paper rag previously soaked in a dedicated degreasing agent.

Degreasant: Loctite 7063

Do not use compressed air to dry. Allow the degreasing agent to work until the seat is completely dry.



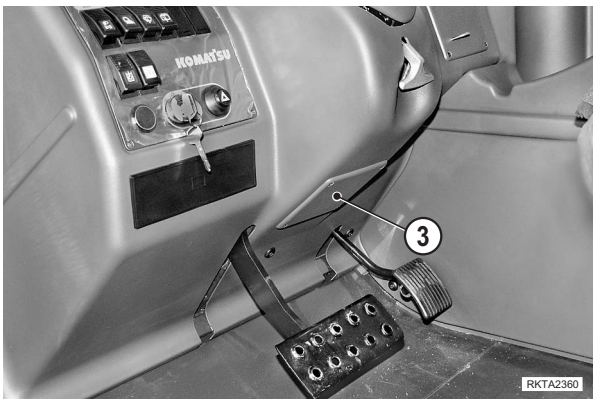
STEERING UNIT

Removal

⚠ Disconnect the cable from the negative (–) battery terminal and apply the parking brake.

1 -Remove the screws (1) and remove the front guard (2).

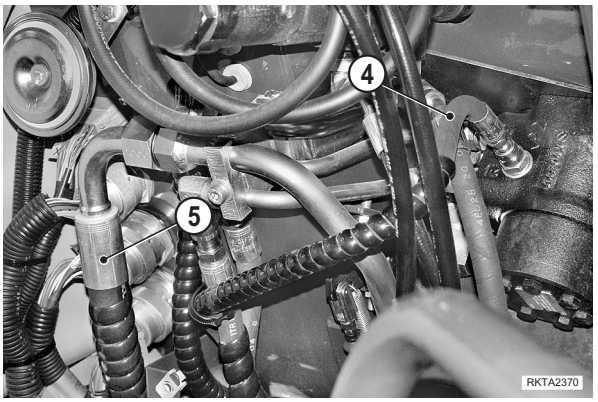
2 -Remove the steering column shield (3).



3 -Disconnect the LS hose (4) from the steering unit.

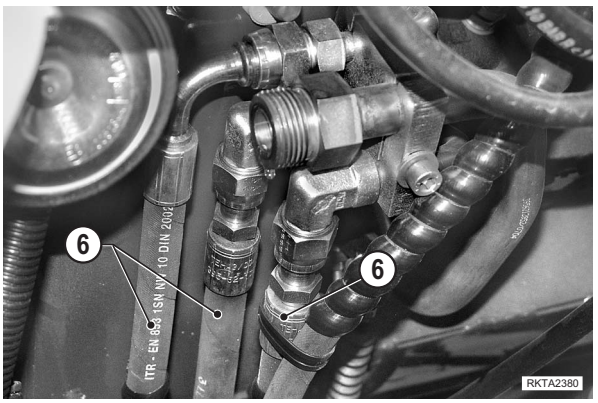
4 -Disconnect the hose (5).

★ Immediately cap the hoses to prevent contaminants from entering the passages.



5 -Mark and then disconnect the hoses (6).

★ Immediately cap the hoses to prevent contaminants from entering the passages.



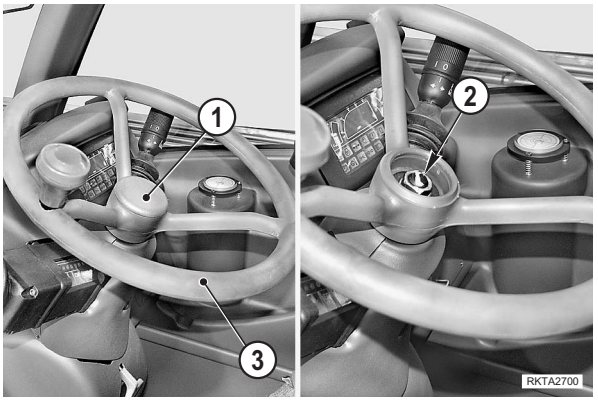
STEERING COLUMN

Removal

⚠ Disconnect the cable from the negative (–) battery terminal and apply the parking brake.

1 - Remove the centre cap (1) and retaining screw (2) from the steering wheel.

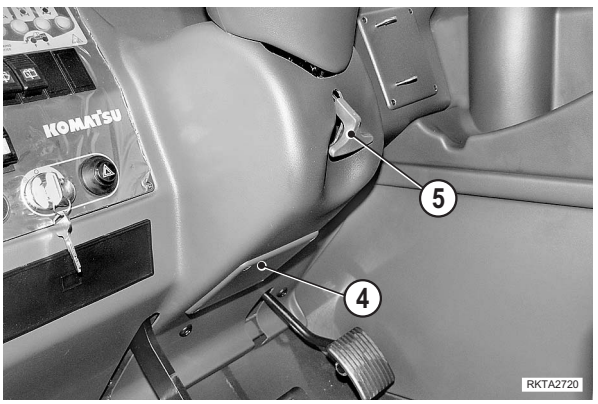
2 - Remove the steering wheel (3).



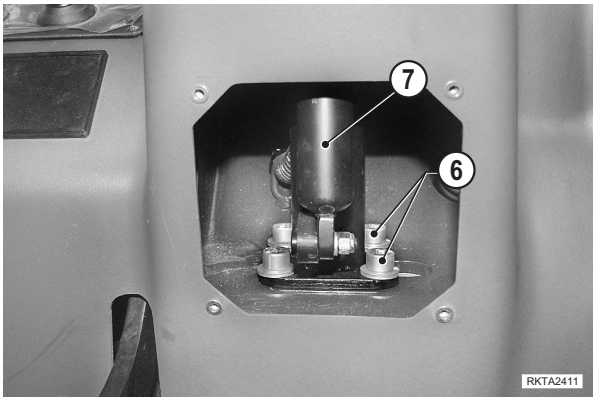
3 - Remove the shift/reversing gear lever and the steering column switch unit/dipswitch assembly.
(For details, see "SHIFT-REVERSING GEAR LEVER ASSEMBLY" e "STEERING COLUMN SWITCH UNIT - DIPSWITCH").

4 - Remove the steering column shield (4).

5 - Remove the steering wheel position adjustment handle (5).



6 - Loosen and remove the screws (6) and their respective washers and slide off the steering column (7) from the top. [*1]



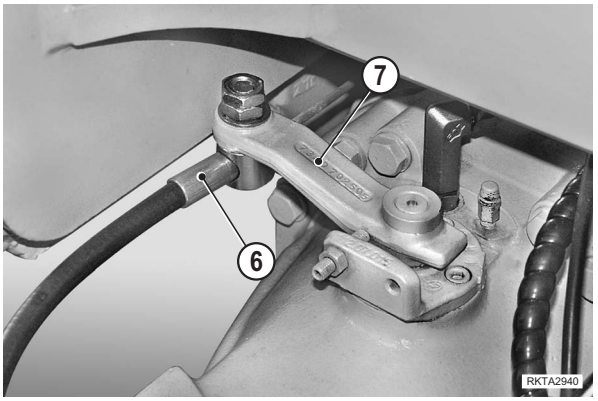
Installation

- To install, reverse the removal procedure.

[*1]

Screws: 63 Nm

7 - Disengage the conduit (6) from the axle lever (7) and slide off the whole transmission.



Installation

- To install, reverse the removal procedure.

1 - Adjust cable tension.
(For details, see "20 TESTING AND ADJUSTMENTS").

FRAME LEVELLING CYLINDER

Removal

1 - Position the machine on firm, level ground with the boom fully lowered and retracted.

2 - Lower the outriggers (if equipped) to the ground in order to prevent any rotation of the frame.

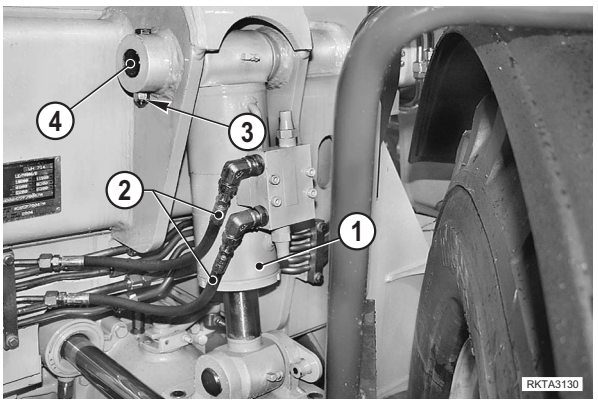
3 - If the machine is not provided with outriggers, place wedges under the rear wheels and force two stands (A) under the sides of the front frame to prevent any rotation.

4 - Turn the front wheels all the way to the right; stop the engine and remove the ignition key.

5 - Disconnect the hoses (2) from the cylinder (1).

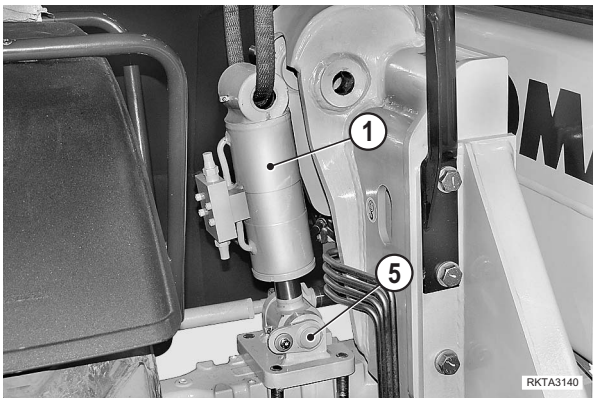
★ Immediately cap the hoses and plug the holes to prevent contaminants from entering the passages.

6 - Loosen and remove the screw (3) and remove the upper pin (4).



7 - Connect the cylinder (1) to a hoist, remove the screw and remove the pin (5) and the cylinder.

Cylinder: WH613 28.7 kg
WH713 28.7 kg
WH714 28.7 kg
WH716 28.7 kg



Installation

• To install, reverse the removal procedure.

1 - Perform the pin and bushing lubrication procedure.

2 - Start the engine and perform full frame-tilt manoeuvres in both directions to bleed the circuit.

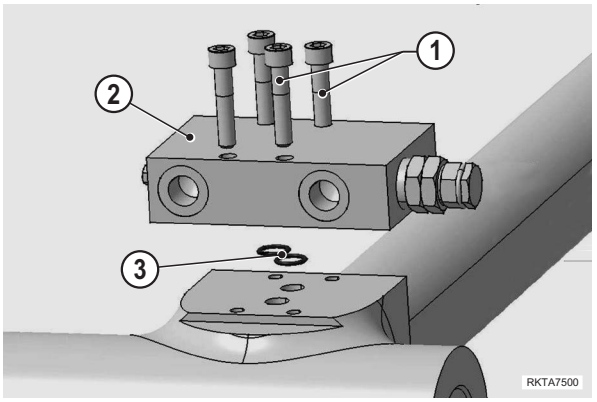
CYLINDERS

Disassembly

1 - Loosen and remove the screws (1), remove the safety valve (2), and the O-rings (3).

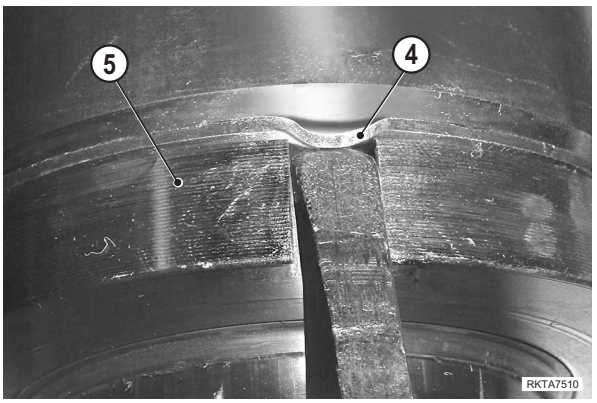
★ Note down the orientation of the valve prior to removal.

★ Replace the O-rings at each disassembly.



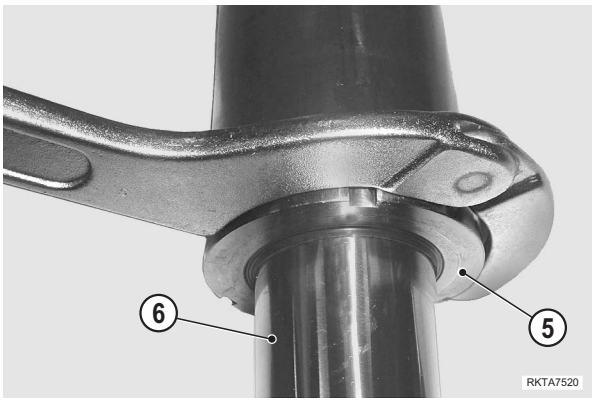
2 - Clamp the cylinder in one or more vices with soft grips.

3 - Lift the caulking of the retainer ring (4). Using a spanner, loosen and remove the cylinder head (4) and the complete piston.

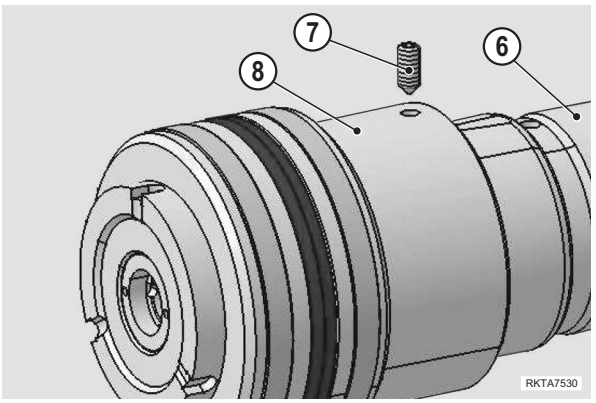


4 - Clamp the piston in one or more vices with soft grips.

5 - Using a spanner, loosen the cylinder head (5) and the braking bush, if installed.
Remove the complete piston rod (6).

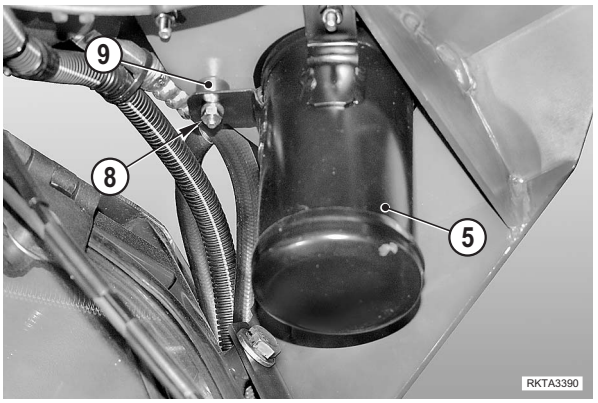


6 - Loosen and remove the retaining screw (7) from the complete piston rod (6)
Remove the piston (8).



7 -Remove the nuts (8) and washers; remove the screws and spacers (9).

8 -Remove the filter (5).



Installation

- To install, reverse the removal procedure.

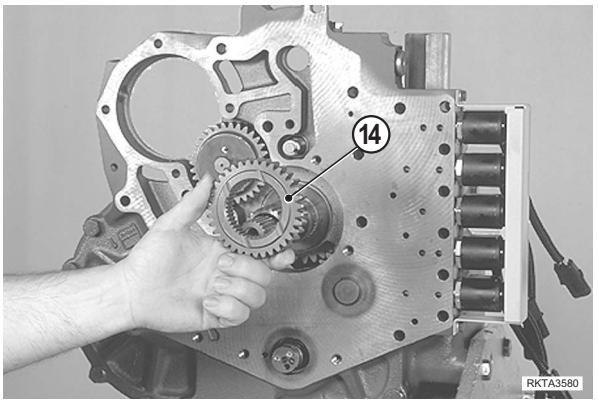
[*1]

★ Ensure that the O-rings are undamaged.

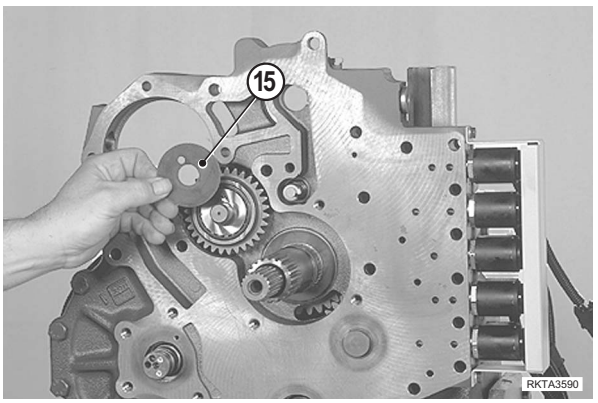
Fittings and O-rings: antifreeze:

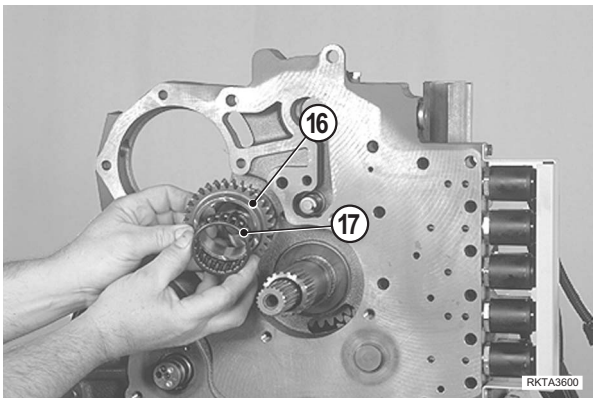
1 -Carry out the system filling procedure.
(For details, see "20 TESTING AND ADJUSTMENTS").

12 -Remove the pump drive gear (14) from the hub.

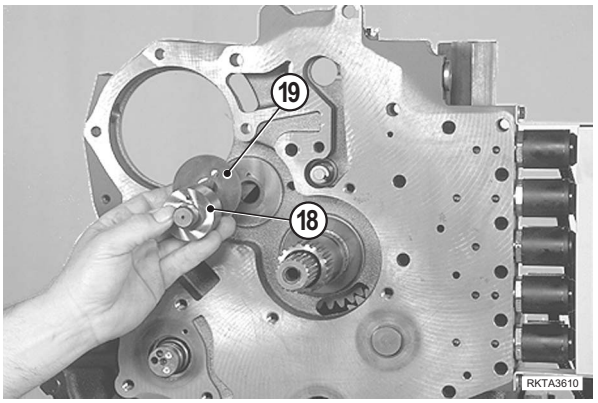


13 -Remove the backing washer (15), the intermediate gear (16) and bearing (17).

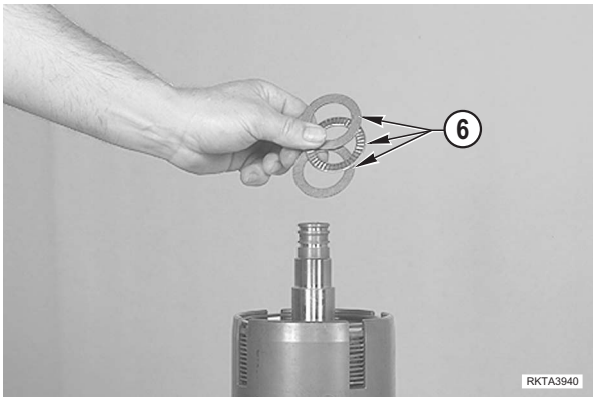




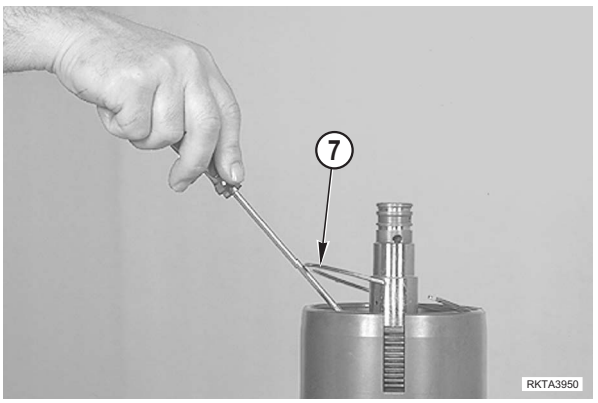
14 -Remove the intermediate shaft (18) and backing washer (19).



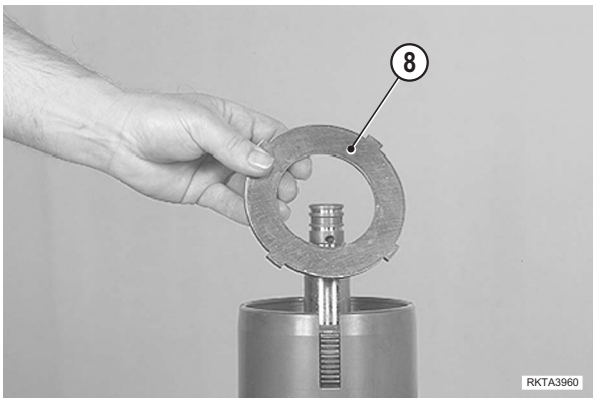
5 -Remove the inner thrust bearing (6).



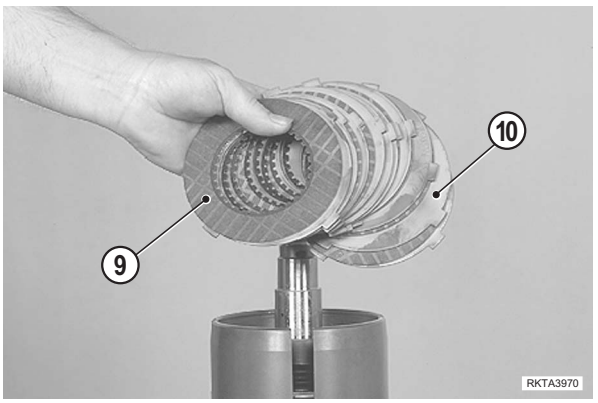
6 -Remove the clutch disc inner retainer ring (7).



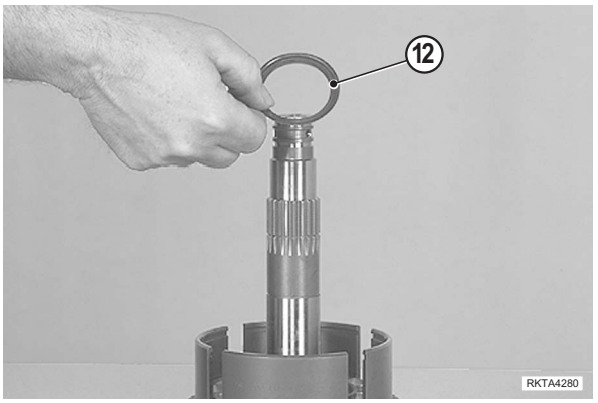
7 -Remove the end plate (8).



8 -Remove the clutch discs (9) and (10). [*1]

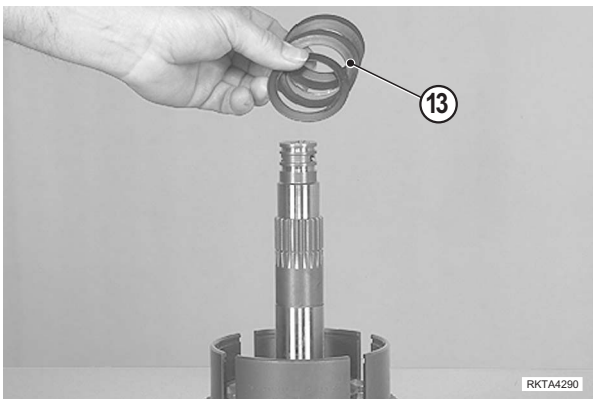


10 -Remove the spring locating ring (12).

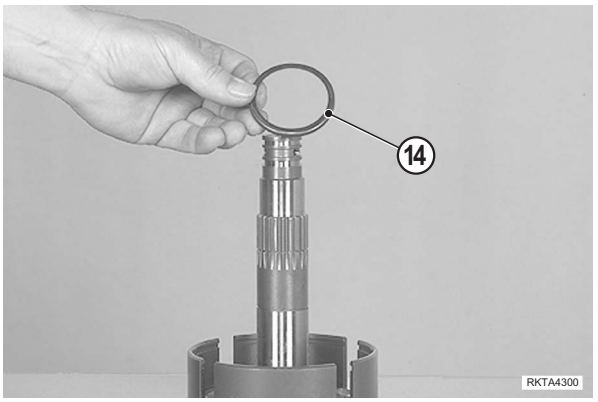


11 -Remove the disc springs (13). [*2]

NOTE
Disc springs are specific for each clutch. Their sequence of installation should never be inverted.
Spare springs are supplied as a pack and are already in their sequence of installation.

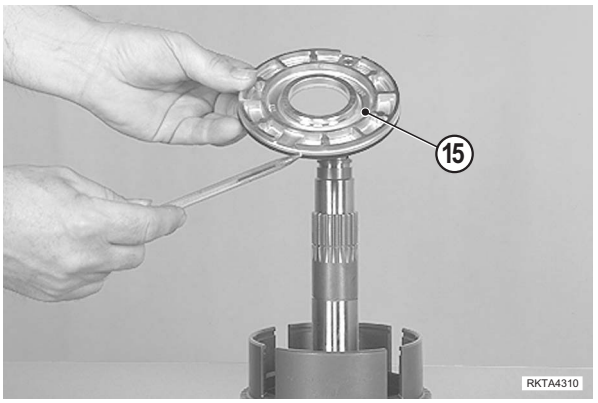


12 -Remove the inner spring locating ring (14).



13 -Turn the clutch over and tap the clutch on a block of soft material to remove the piston (15). [*3]

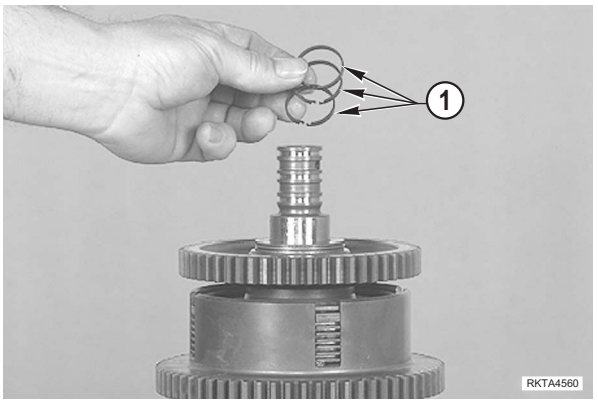
★ Note down the seals assembly sequence.



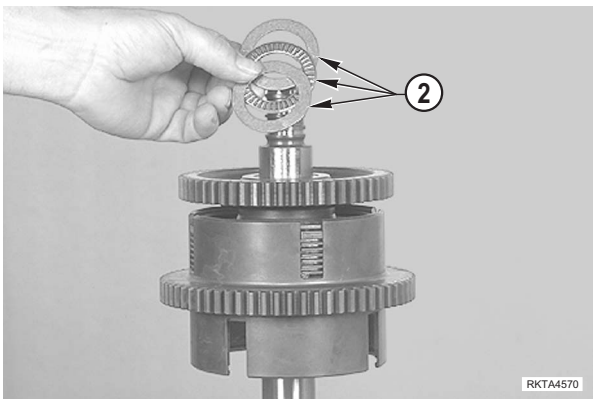
FORWARD CLUTCH

Disassembly

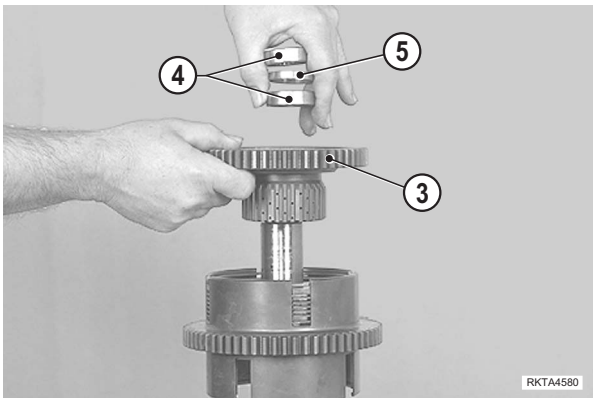
1 -Remove the sealing elements (1).



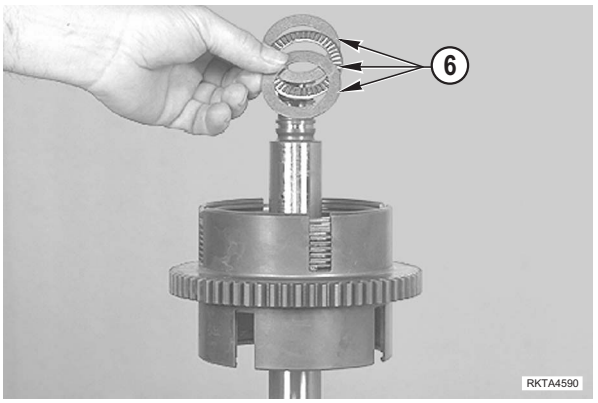
2 -Remove the thrust bearing (2).



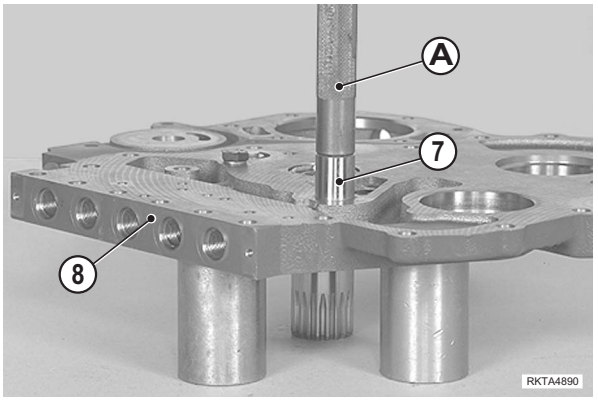
3 -Remove the gear (3), bearings (4), and spacer (5).



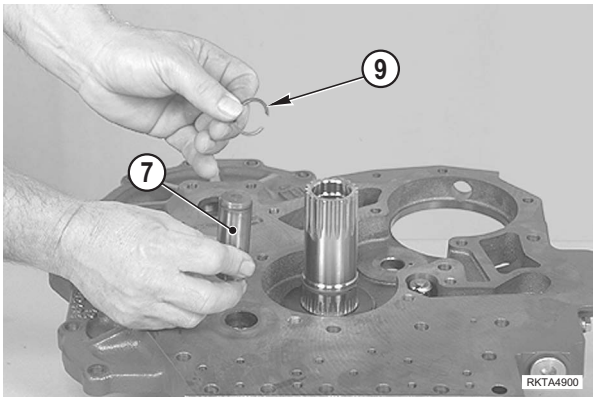
4 -Remove the thrust bearing (6).



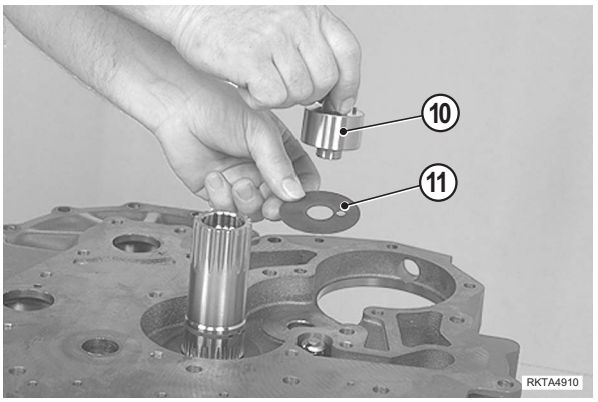
5 - **If you need to replace the shaft** (7) of the idler gear (2), turn the spacer plate (8) upside down and place it on supports, and then pull out the shaft using a puller (A) and a press.



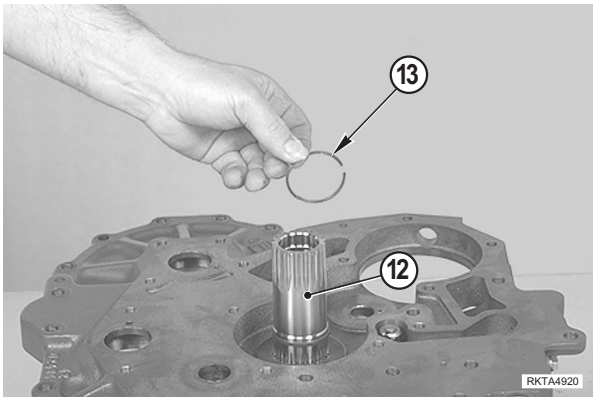
6 - Remove the snap ring (9) from the shaft (7).



7 - Using a puller, remove the pump idler shaft (10) and washer (11).

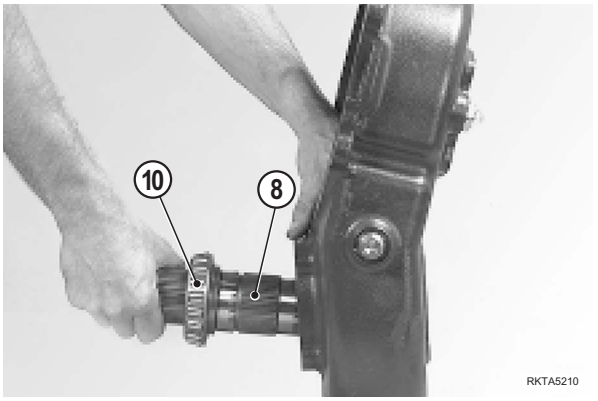


8 - Remove the retainer ring (13) from the stator spline shaft (12).



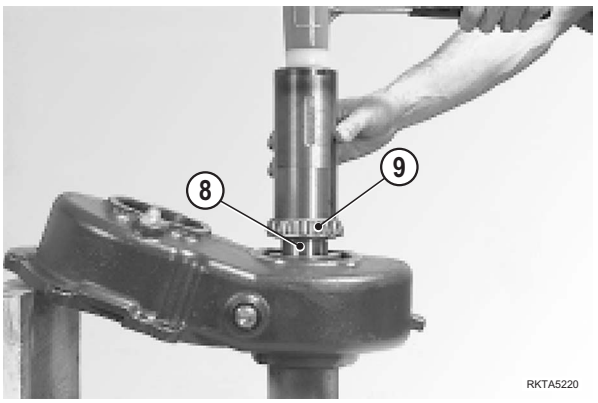
2 - Install the output shaft (8) and front bearing inner race (10).

⚠ To assist installation, heat the bearing inner race at 135±15 °C.

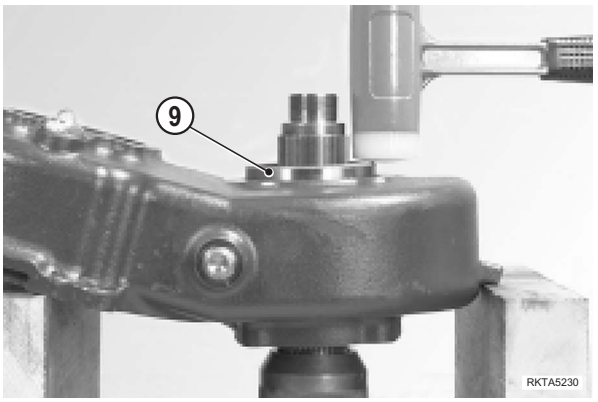


3 - Turn the assembly upside down; place the shaft (8) on a support block and install the inner race (9) to the rear output of the shaft (8).

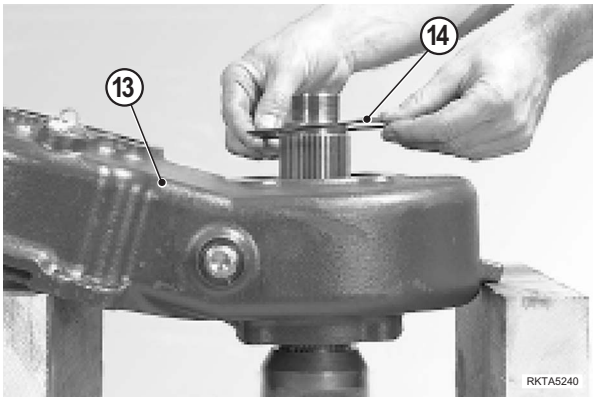
⚠ The bearing can be best fit after heating it at 135±15 °C.



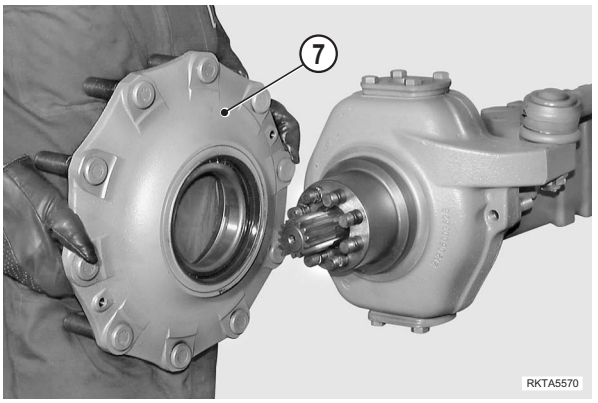
4 - Install the bearing outer race (9) and tap it in place using a plastic hammer.



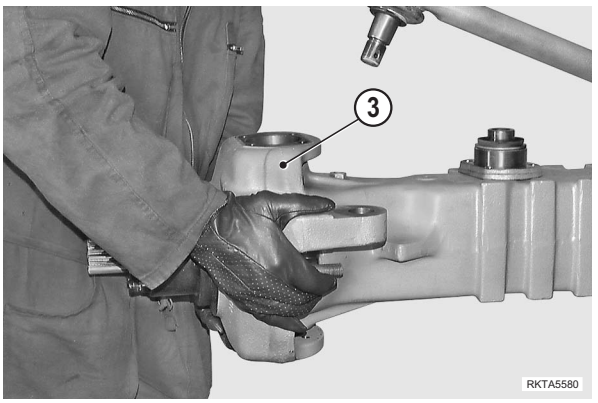
5 - Install the O-ring (14) to the drop box housing (13).



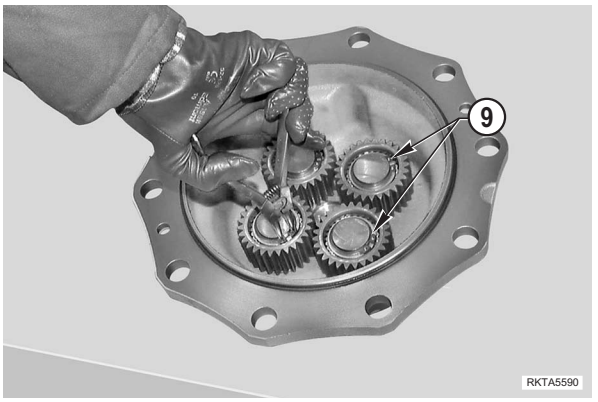
9 -By hand remove the complete hub (7).



10 -Remove the pins and remove the steering case (3).
(For details, see "Steering case").

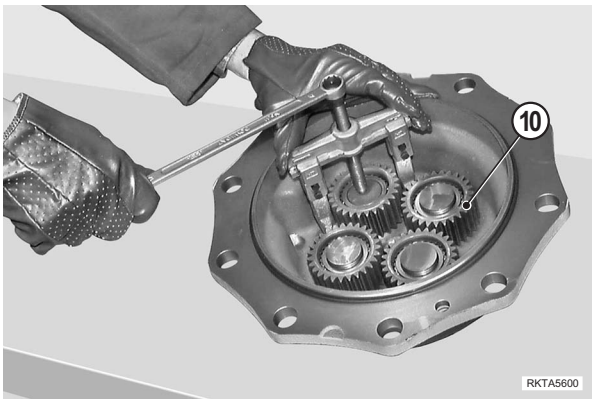


11 -Remove the snap rings (9).

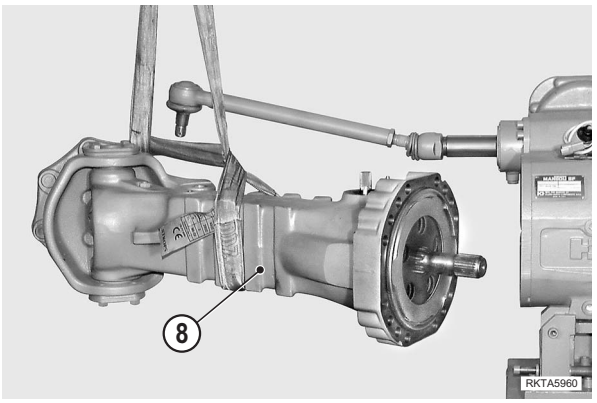


12 -With the help of a puller, remove the planet wheel gears (10).

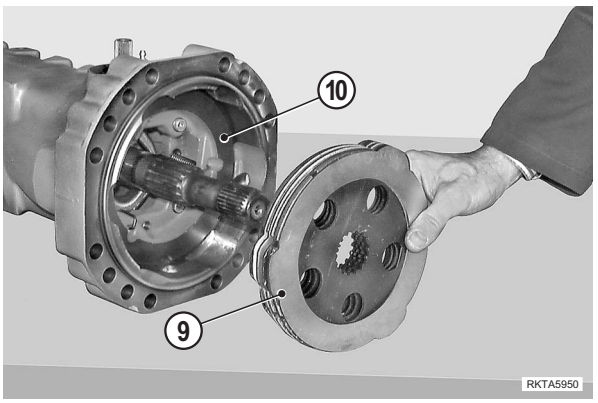
★ Note down the assembly side of planet wheels.



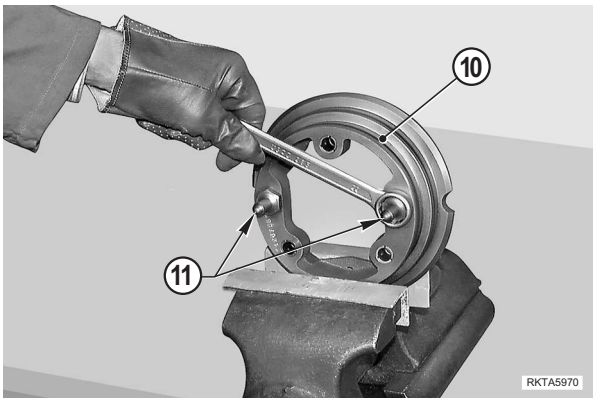
5 - Connect the complete axle shaft (8) to a hoist and slightly tension the rope.
Remove the complete axle shaft.
(For details, see "Brakes").



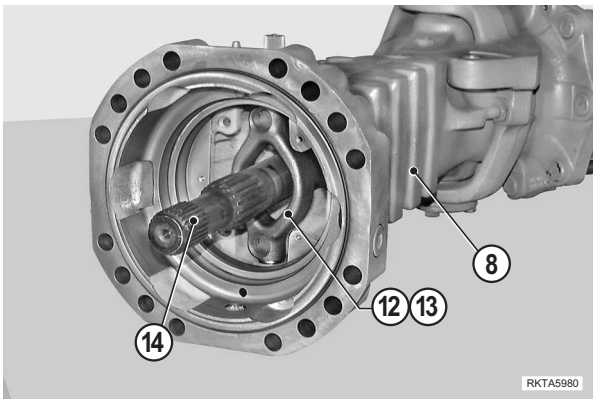
6 - Remove the brake rotors (9) and the complete piston (10).
(For details, see "Brakes").



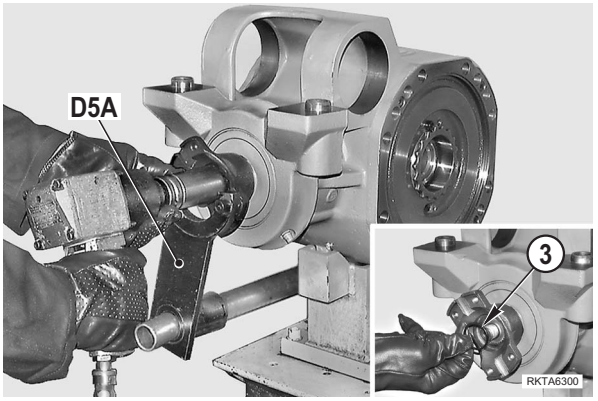
7 - If the points (11) are to be replaced, clamp the piston (10) in a vice with soft grips and remove the points.



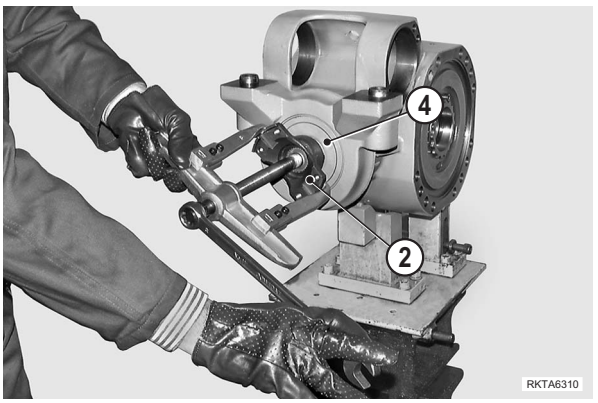
8 - If the thrust levers (12 and 13) are to be replaced, remove the U-joint (14) before removing the axle shafts (8).



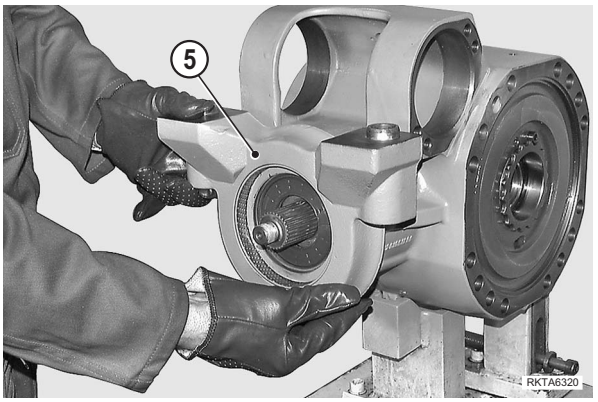
3 - Position tool **D5A** (or **D5B**), so as to avoid pinion rotation. Unloose and remove the nut (1); also remove the O-ring (3).



4 - Remove the flange (2) complete with guard (4) by means of a puller.



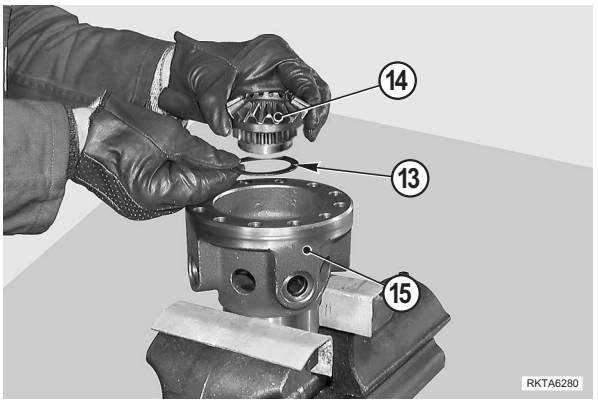
5 - Remove the swinging support (5)



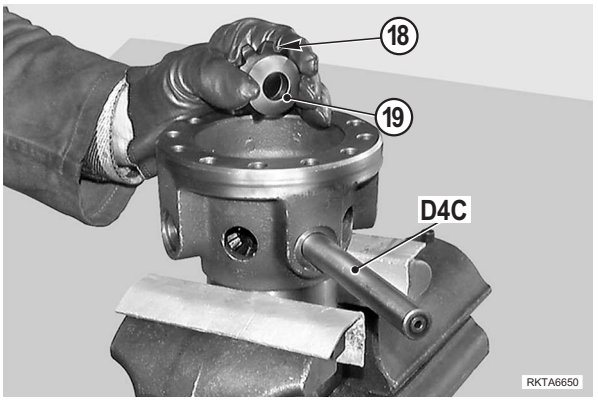
6 - Remove the sealing ring (6).

- **Differential**

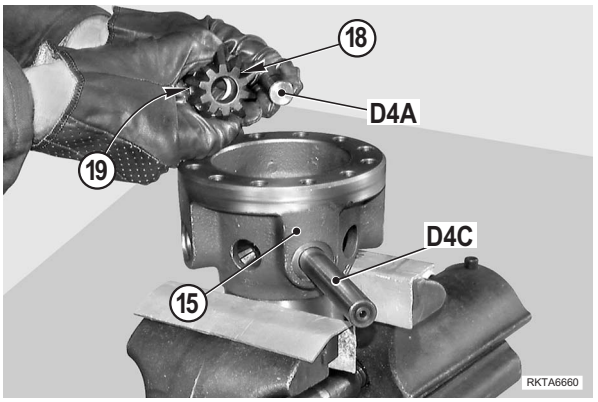
1 - Insert the shim washer (13) and the planetary gear (14) in the differential carrier (15).



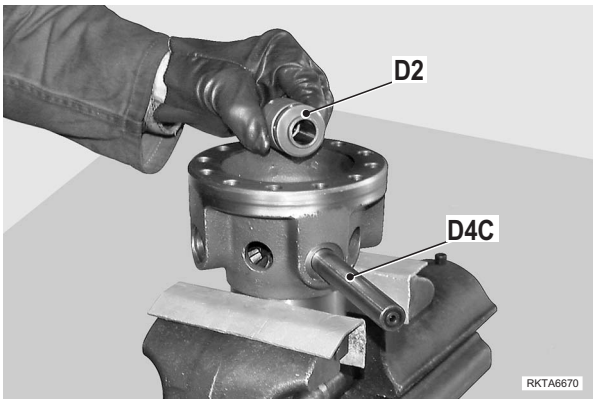
2 - Position the shim washer (19) and the first planet wheel gear (18).
Hold them in position using bar **D4C**.



3 - With the help of gudgeon **D4A**, position the second planet wheel gear (18) and the relative shim washer (19).

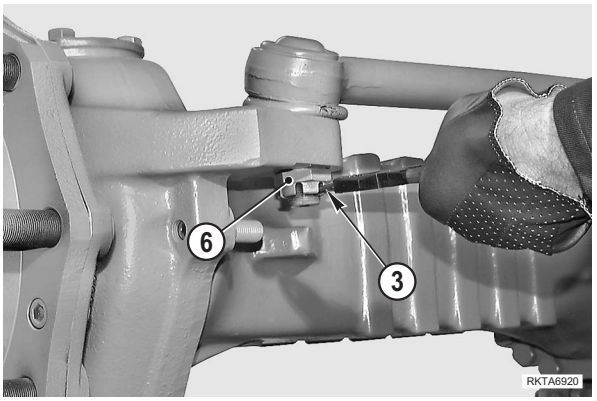


4 - Insert tool **D2** between the two planetary gears (18). Line up the entire unit by pushing bar **D4C** all the way down until gudgeon **D4A** is ejected.



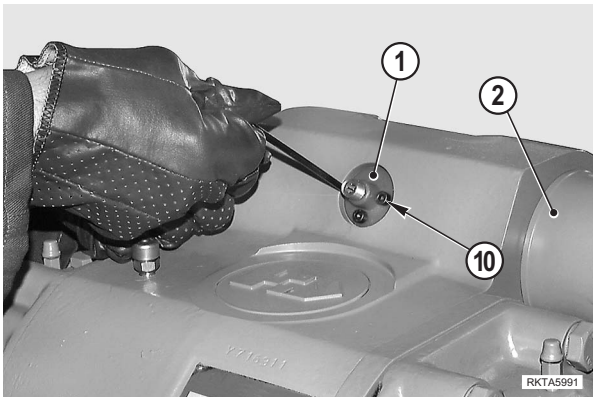
5 - Insert the cotter pins (3) and bend the safety stems.

⚠ Use new cotter pins.

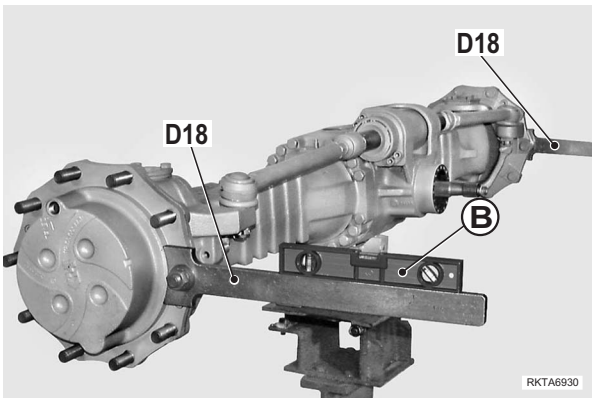


6 Install the proximity (1) for checking piston (2) centring - if applicable - and tighten the screws (10).

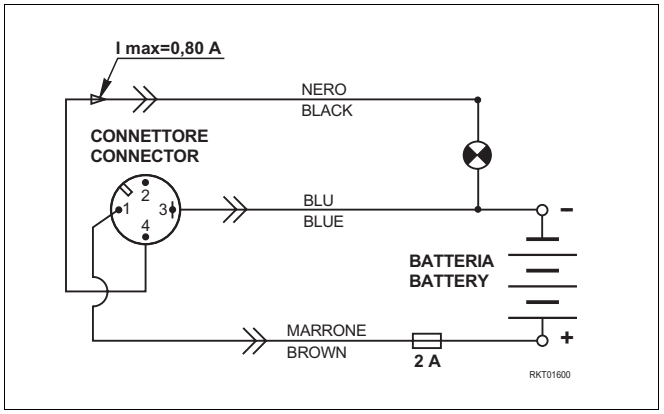
Torque wrench setting: 5–6 Nm

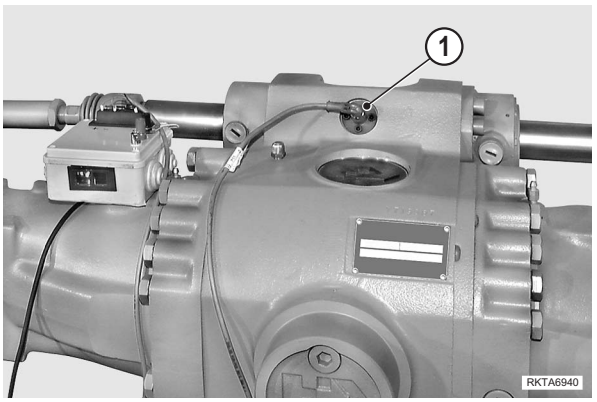


⚠ Eliminate the action of the negative brake, if fitted.Apply tools **D18** to the hubs and lock them.
Using a level "B", check that tools are perfectly flat and parallel to each other.

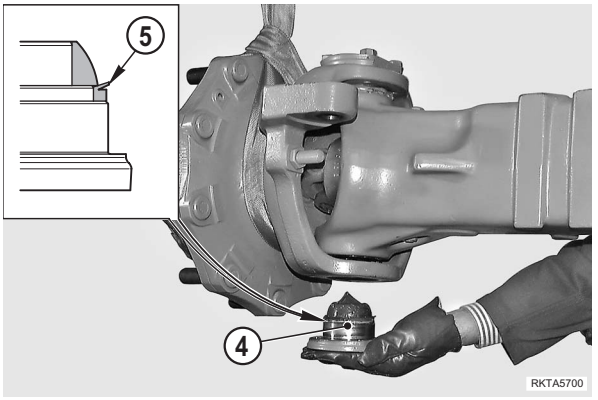


7 - Connect the sensor (1) to the inspection device according to diagram.





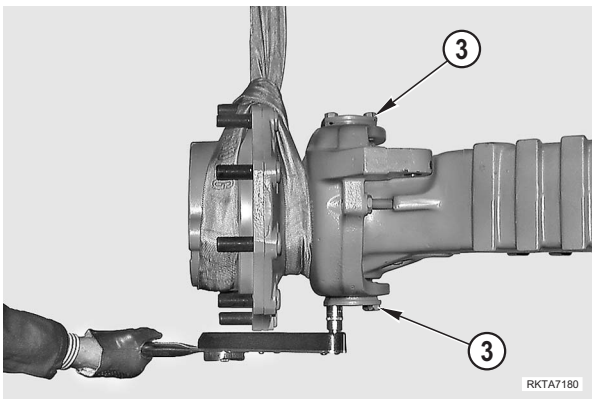
7 - Fit a new seal (5) onto the bottom articulation pin (4). Lubricate and fit the unit in the steering case. Position the screws (3) and lightly tighten.



8 - Check for the correct assembly side of the seal (5).

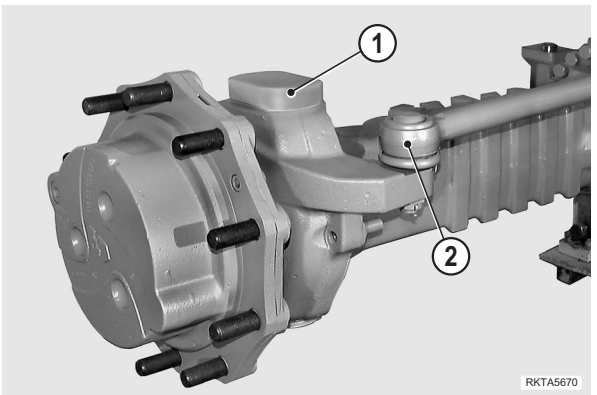
9 - Tighten the new fittin screws (3) of top and bottom articulation pins in sequence using the cross tightening method.

Torque wrench setting: 128–142 Nm



10 - Connect the articulation pin (2).
(For details, see "Steering cylinder").

11 - Lubricate articulations with Molikote and fit the dust cover (1).



- **Planetary reduction**

1 - Lubricate the bushing (18) and the seat of the steering case (3).

2 - Install the bushing (18), using tool **D23**.