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WEBM001000

Shop Manual

WB97R-2

BACKHOE LOADER

SERIAL NUMBERS WB97R-2 97F20001 and up

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July 2007

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IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for the safe operation of your machine.
The service and repair techniques recommended by FKI and describe in this manual are both effective and safe methods of operation. Some of these operations require the use of tools specially designed by FKI for the purpose.

To prevent injury to workers, the symbols ⚠ and ⚠ are used to mark safety precautions in this manual. The cautions accompanying these symbols should always be carefully followed. If any danger arises or may possibly arise, first consider safety, and take necessary steps to face.

SAFETY

GENERAL PRECAUTIONS

Mistakes in operation extremely dangerous.
Read all the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions written on the decals which are suck on the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor.
   Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

7. Before adding or making any repairs, park the machine on hard, level ground, and block the wheels to prevent the machine from moving.
8. Before starting work, lower outrigger, bucket or any other work equipment to the ground. If this is not possible, use blocks to prevent the work equipment from falling down. In addition, be sure to lock all the control levers and hang warning sign on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine.
    Never jump on or off the machine.
    If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

PRECAUTIONS DURING WORK

11. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out.
    Before disconnecting or removing components of the hydraulic circuit and engine cooling circuit, first remove the pressure completely from the circuit.
12. The water and oil in the circuits are not hot when the engine in stopped, so be careful not to get burned.
    Wait for the oil water to cool before carrying out any work on the cooling water circuits.

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13. Before starting work, remove the leads from the battery. Always remove the lead from the negative (–) terminal first.
14. When raising heavy components, use a hoist or crane. Check that the wire rope, chains and hooks are free from damage.
    Always use lifting equipment which has ample capacity. Install the lifting equipment at the correct places.
    Use a hoist or crane and operate slowly to prevent the component from hitting any other part.
    Do not work with any part still raised by the hoist or crane.
15. When removing covers which are under internal pressure or under pressure from a spring, always leave two bolts in position on opposite sides. Slowly release the pressure, then slowly loosen the bolts to remove.
16. When removing components, be careful not to break or damage the wiring.
    Damage wiring may cause electrical fires.
17. When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips on to the floor, wipe it up immediately.
    Fuel or oil on the floor can cause you to slip, or can even start fires.
18. As a general rule, do not use gasoline to wash parts. In particular, use only the minimum of gasoline when washing electrical parts.
19. Be sure to assemble all parts again in their original places. Replace any damage parts with new parts.
    - When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is being operated.
20. When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. Also, check that connecting parts are correctly tightened.
21. When assembling or installing parts, always use specified tightening torques.
    When installing the parts which vibrate violently or rotate at high speed, be particulary careful to check that they are correctly installed.
22. When aligning two holes, never insert your fingers or hand.
23. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurement.
24. Take sure when removing or installing tracks of in particular rubber tracks. When removing the track, the track separates suddenly, so never let anyone stand at either end of the wheel.

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FOREWORD

This shop manual has been prepared as an aid to improve the quality of repairs by giving the operator an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop.

The manual is divided into chapters on each main group of components; these chapters are further divided into the following sections.

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

TESTING AND ADJUSTING

This sections explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs.

Troubleshooting charts correlating «Problems» to «Causes» are also included in this section.

DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

NOTICE

The specifications contained in this shop manual are subject to change at any time and without any notice.
Contact your FKI distributor for the latest information.

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HOW TO READ THE SHOP MANUAL

VOLUMES

Shop manual are issued as a guide to carry out repairs. These various volumes are designed to avoid duplicating the same information.

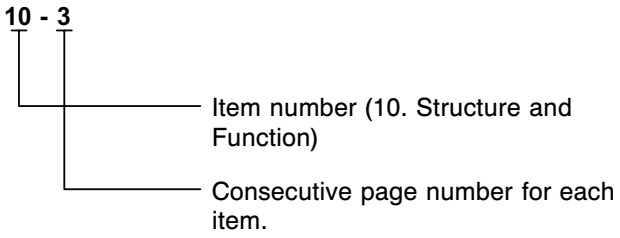
DISTRIBUTION AND UPDATING

Any additions, amendments or other changes will be sent to FKI distributors.
Get the most up-to-date information before you start any work.

FILING METHOD

1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show you how to read the page number.

   Example



3. Additional pages: additional pages are indicated by a hyphen (-) and number after the page number.
   Fle as in the example.
   Example:
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   10-4-2] Added pages
   10-5

REVISED EDITION MARK
(① ② ③ ….)

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

REVISIONS

Revised pages are shown on the LIST OF REVISED PAGES between the title page and SAFETY page.

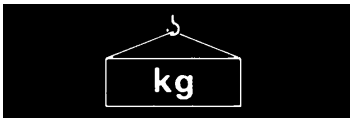
SYMBOLS

In order to make the shop manual greatly chelpful, important points about safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.
	Weight	Weight of parts or systems. Caution necessary when selecting hoisting wire, or when working posture is important, etc.
	Tightening torque	Parts that require special attention for the tightening torque during assembly.
	Coat	Parts to be coated with adhesives and lubricants etc.
	Oil, water	Places where oil, water or fuel must be added, and their quantity.
	Drain	Places where oil or water must be drained, and quantity to be drained.

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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

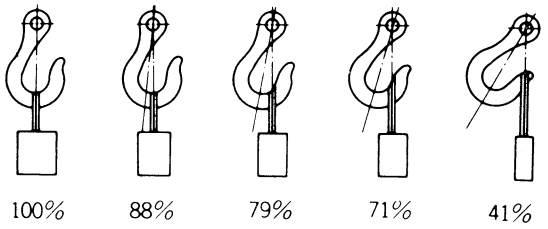
1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

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

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

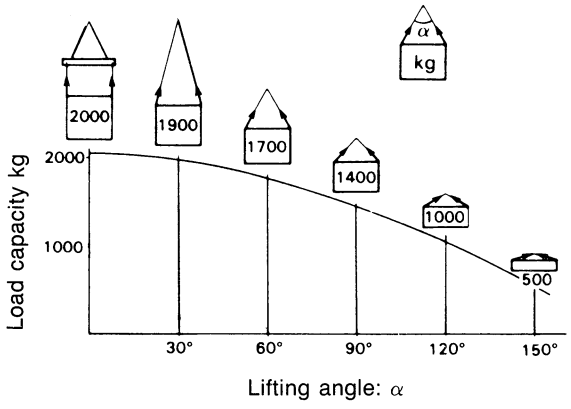
The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

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



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

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



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Nm

STANDARD TIGHTENING TORQUE

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in sections of «**Disassembly and Assembly**».

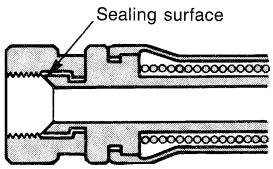
1. STANDARD TIGHTENING TORQUE OF BOLTS AND NUT

Thread diameter of bolts (mm)	Pitch of bolts (mm)	Width across flat (mm)		8.8		10.9	
		S	S	kgm	Nm	kgm	Nm
6	1	10	5	0.96±0.1	9.5±1	1.3±0.15	13.5±1.5
8	1.25	13	6	2.3±0.2	23±2	3.2±0.3	32.2±3.5
10	1.5	17	8	4.6±0.5	45±4.9	6.5±0.6	63±6.5
12	1.75	19	10	7.8±0.8	77±8	11±1	108±11
14	2	22	12	12.5±1	122±13	17.5±2	172±18
16	2	24	14	19.5±2	191±21	27±3	268±29
18	2.5	27	14	27±3	262±28	37±4	366±36
20	2.5	30	17	38±4	372±40	53±6	524±57
22	2.5	32	17	52±6	511±57	73±8	719±80
24	3	36	19	66±7	644±70	92±10	905±98
27	3	41	19	96±10	945±100	135±15	1329±140
30	3.5	46	22	131±14	1287±140	184±20	1810±190
33	3.5	50	24	177±20	1740±200	250±27	2455±270
36	4	55	27	230±25	2250±250	320±35	3150±350
39	4	60	—	295±33	2900±330	410±45	4050±450

This torque table does not apply to bolts or nuts which have to fasten nylon or other parts non-ferrous metal washer.

★ **Nm (Newton meter): 1 Nm = 0.102 kgm**

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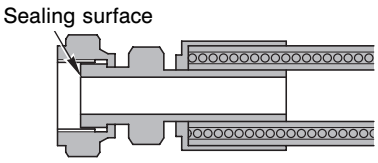


Nm

2. TIGHTENING TORQUE FOR NUTS OF FLARED

Use these torques for nut part of flared.

Thread diameter of nut part (mm)	Width across flats of nut part (mm)	TIGHTENING TORQUE	
		kgm	Nm
1/2" - 20	17	2.6±0.5	25.5±4.9
9/16" - 18	17	4±0.5	39.2±4.9
3/4" - 16	22	6.7±2	65.7±19.6
7/8" - 14	27	8±2	78.5±19.6
1.1/16" - 12	32	9.7±3	95.15±29.4
1.5/16" - 12	38	17±3	166.7±29.4
1.5/8" - 12	50	20±5	196.2±49
22	27	8±2	78.5±19.6
33	41	20±5	196.2±49



Thread diameter of nut part (mm)	Width across flats of nut part (mm)	TIGHTENING TORQUE	
		kgm	Nm
9/16" - 18	17	2.3 – 2.5	23 – 25
11/16" - 16	22	3.4 – 3.9	33 – 38
13/16" - 16	24	5.2 – 5.8	51 – 57
1" - 14	30	8.2 – 9.2	80 – 90
1.3/16" - 12	36	12.2 – 13.3	120 – 130
1.7/16" - 12	41	15.3 – 17.3	150 – 170
1.11/16" - 12	50	18.4 – 20.4	180 – 200
2" - 12	57	20.4 – 24.4	200 – 240

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COATING MATERIALS

The recommended coating materials prescribed in FKI Shop Manuals are listed below:

Nomenclature	Code	Applications
Adhesives	ASL800010	Used to apply rubber pads, rubber gaskets and cork plugs.
	ASL800020	Used to apply resin, rubber, metallic and non-metallic parts when a fast, strong seal is needed.
	Loctite 222	Used for low resistance locking of screws, check nuts and adjustment nuts.
	Loctite 242	To prevent the loosening of bolts, nuts and plugs and the leakage of oil. Used for medium resistance locking of screws and nuts of every type, and for locking keys and bearings.
	Loctite 262	Used for high resistant of threaded parts that can be removed with normal tools.
	Loctite 270	Used for high resistant locking and for sealing threaded parts, bolts and stud bolts.
	Loctite 542	Used for sealing the union threads for hydraulic tubes.
	Loctite 573	Used for sealing rather exact plane surfaces when the option of possible future dismantling is required.
	Loctite 601	Used for high resistant locking of mechanical components that can be removed only after heating
	Loctite 675	Used to lock cylindrical couplings and for the permanent locking of threaded parts, and also to lock shafts to bearings, gears, pulleys, pins, bushings, etc.
Gasket sealant	ASL800060	Used by itself to seal grease fittings, tapered screw fittings and tapered screw fittings in hydraulic circuits of less than 50 mm in diameter.
	Loctite 510	Used by itself on mounting flat surface (Clearance between surfaces within 0.2 mm)
	Loctite 518	Used by itself on mounting flat surface (Clearance between surfaces within 0.5 mm)
Antifriction compound (Lubricant including Molybdenum disulfide)	ASL800040	Applied to bearings and taper shaft to facilitate press-fitting and to prevent sticking, burning or rusting.
Grease (Lithium grease)	ASL800050	Applied to bearings, sliding parts and oil seals for lubrication, rust prevention and facilitation of assembling work.
Vaseline	–	Used for protecting battery electrode terminals from corrosion.

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ELECTRIC WIRE CODE

n the wiring diagrams various colours and symbols are employed to indicate the thickness of wires.
This wire code table will help you understand WIRING DIAGRAMS.
Example: R -N 1.5 indicates a cable having a nominal number 1.5 and red coating with black stripe.

CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)
	Number strands	ø of strands (mm)	Cross section (mm^2)		
1	14	0.30	0.99	2.80	11
1.5	21	0.30	1.48	3.32	14
2.5	35	0.30	2.47	3.80	20
4	56	0.30	3.95	4.60	28
6	84	0.30	5.93	5.20	37
10	84	0.40	10.55	7.10	53
50	399	0.40	50.11	14.00	160

CLASSIFICATION BY COLOUR AND CODE

	Primary	Auxiliary									
Code	A	A-B	–	A-G	–	A-N	A/N	A-R	A/R	A-V	A/V
Colour	Light blue	Light blue - White		Light blue - Yellow		Light blue - Black		Light blue - Red		Light blue - Green	
Code	B	B-G	–	B-N	B/N	B-R	B/R	–	B/V	–	–
Colour	White	White - Yellow		White - Black		White - Red		White - Green		–	
Code	C	C-B	C/B	C-L	–	C-N	–	–	–	–	–
Colour	Orange	Orange - White		Orange - Blue		Orange - Black		–		–	
Code	G	–	G/N	–	G-R	–	G-V	–	–	–	–
Colour	Yellow	Yellow - Black		Yellow - Red		Yellow - Green		–		–	
Code	H	H-L	–	H/N	–	–	–	–	–	–	–
Colour	Gray	Gray - Blue		Gray - Black		–		–		–	
Code	L	L-B	L/B	–	L/N	L-G	–	–	–	–	–
Colour	Blue	Blue - White		Blue - Black		Blue - Yellow		–		–	
Code	M	M-B	–	M-N	M/N	M-V	–	–	–	–	–
Colour	Brown	Brown - White		Brown - Black		Brown - Green		–		–	
Code	N	–	–	–	–	–	–	–	–	–	–
Colour	Black	–		–		–		–		–	
Code	R	R-G	–	R-N	R/N	R-V	–	–	–	–	–
Colour	Red	Red - Yellow		Red - Black		Red - Green		–		–	
Code	S	S-N	–	S-G	–	–	–	–	–	–	–
Colour	Pink	Pink - Black		Pink - Yellow		–		–		–	
Code	V	V-B	–	V-N	V/N	–	–	–	–	–	–
Colour	Green	Green - White		Green - Black		–		–		–	
Code	Z	Z-B	Z/B	Z-N	Z/N	–	–	–	–	–	–
Colour	Violet	Violet - White		Violet - Black		–		–		–	

COMPOSITION OF THE COLOURS

The coloration of two-colour wires is indicated by the composition of the symbols listed.
Example: G-V = Yellow-Green with longitudinal colouring.
G/V = Yellow-Green with transversal colouring.

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WEIGHT TABLE

⚠ This weight table is a guide for use when transporting or handling components.

Unit: kg

Machine model	WB97R-2
From serial no.	97F20001–
Engine assembly - Muffler - Exhaust pipe	410
Radiator - exchanger	37
Hydraulic tank (without hydraulic oil)	—
Fuel tank (without fuel)	—
Front counterweight	300
Engine hood	—
Cab (without seat)	595
Seat	34
Engine - gear-box - pump group	740
Piston pump	38
Transmission	230
Convertor	—
Front axle	316
Rear axle	511
Front wheel Rear wheel	65 163
2-spool control valve	24
3-spool control valve	30
Work equipment	—

Backhoe	
Work equipment	—
Boom	323
Arm	213
Long arm	245
Boom swing bracket	133
Backframe	—
6-spool control valve	47
7-spool control valve	53
8-spool control valve	59
Jig arm	392
Outriggers	—
Boom cylinder	78
Arm cylinder	69
Bucket cylinder	49
Outrigger cylinder	—
Swing cylinder	30

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TABLE OF OIL AND COOLANT QUANTITIES

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE	CAPACITY (ℓ)	
		–20 –10 0 10 20 30°C	Specified	Refill
Crankcase sump	OIL • API CD	FKI 907 10W FKI 907 20W-20 FKI 907 SAE 30 FKI 907 SAE 40	8.6	8.6
Hydraulic circuit	OIL • API CD	FKI 909 10W-30	150	92
Front axle • differential	OIL • UTTO FLUID		6.5	6.5
• final red. gear (each)		FKI 918	1	1
Rear axle: • differential			15	15
• final red. gear (each)			3.5	3.5
Hydraulic transmission	OIL • GM DEXRON® II D (DEXRON® is a registered trademark of General Motors Corporation)	FKI 921	19	16
Braking system		FKI 921	0.8	0.8
Fuel tank	DIESEL OIL	* ASTM D975 N. 2	130	—
Engine coolant system	WATER + ANTI-FREEZE		18	—
	WATER		18	—
	PERMANENT LIQUID	FKI 931	18	—

*** ASTM D975 N. 1**

FKI 907 OLDEN TURBO UNIGRADO
FKI 909 MULTISERVICE 4
FKI 918 SPECIAL TRANSMISSION FLUID 68/F-100
FKI 921 ANDROS FLUID II D
FKI 921 ANTIFROST PRONTO (–25 °C)

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ASTM: America Society of Testing and Materials
SAE: Society of Automotive Engineers
API: American Petroleum Institute
MIL: USA Military Specification
CCMC: Common Market Constructors Committe

First filling quantity: total quantity of oil, including the oil for the components and pipes.

Oil change quantity: quantity of oil necessary to fill the system or unit during the normal inspection and maintenance operations.

NOTE:

(1) When the diesel oil sulphur content is less then 0.5%, change the engine oil according to the periodic maintenance intervals indicated in the operation and maintenance manual. In the diesel oil sulphur content exceeds 0.5% change the engine oil according to the following table:

Sulphur content	Engine oil change interval
from 0.5 to 1.0%	1/2 of regular interval
over 1.0%	1/4 of regular interval

(2) When starting the engine at temperatures below 0 ºC, use engine oil SAE 10W, 20W-20 and 10W-30, even if during the day the temperature increases by 10 ºC.

(3) Use engine oil with CD classification; if oil with CD classification is used, reduce the engine oil change interval by a half.

(4) Use original products, which have characteristics specifically formulated and approved for the engine, the hydraulic circuit of equipment and for reductions.

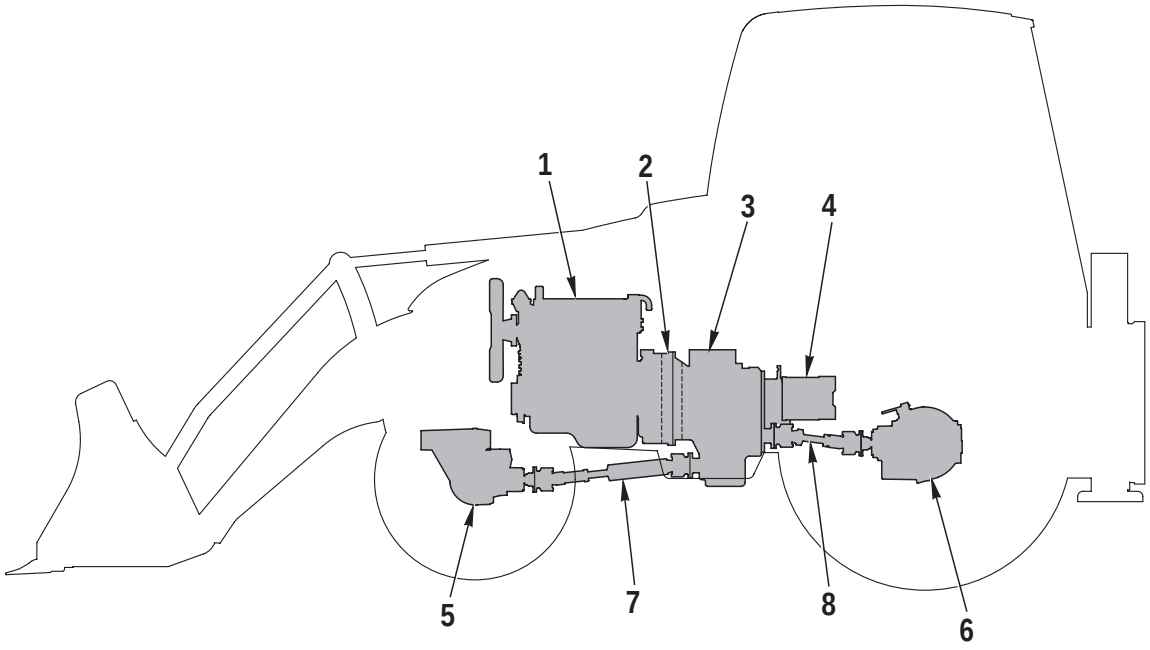
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10 STRUCTURE AND FUNCTION

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POWER TRAIN



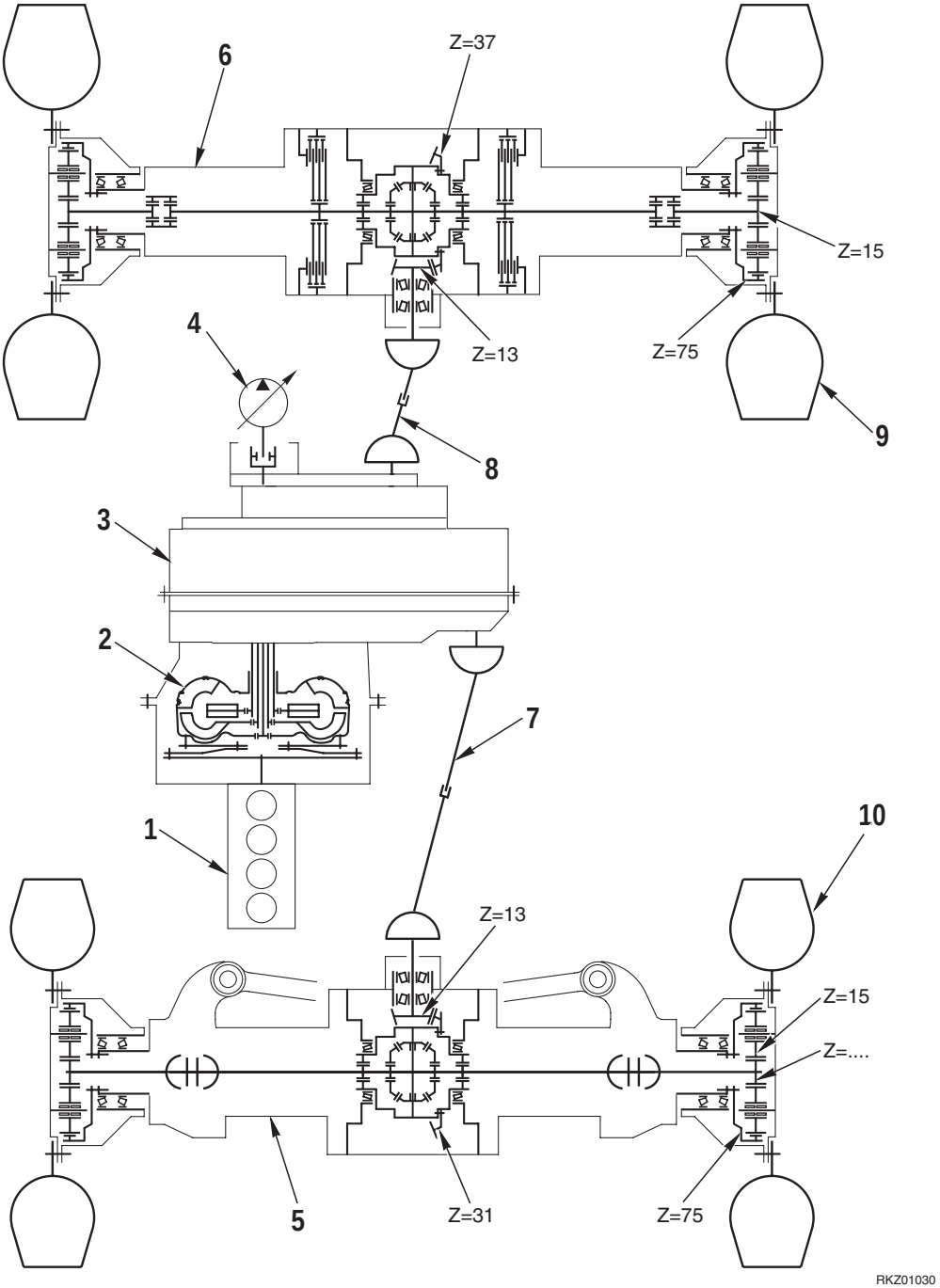
RKZ01060

DESCRIPTION

- The driving power for the engine (1) is transmitted through the flywheel to the converter (2).
  The converter (2) uses hydraulic oil to convert the torque transmitted by the engine (1) into driving power. The converter (2) transmits motion to the drive shaft of the transmission (3) and to the drive shaft of the hydraulic pump (4).
- The transmission (3) has two hydraulically-activated clutches that can be selected by an electrically-controlled gear selector. It also has manual gear selection (four forward gears and four reverse gears).
- The driving power is transmitted from the transmission flanges (3) to the front (5) and rear (6) axles through the Cardan drive shafts (7 and 8).
- The driving power transmitted to the front (5) and rear (6) axles is reduced by the differentials and then transmitted to the planetary gear through the differential shafts.

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

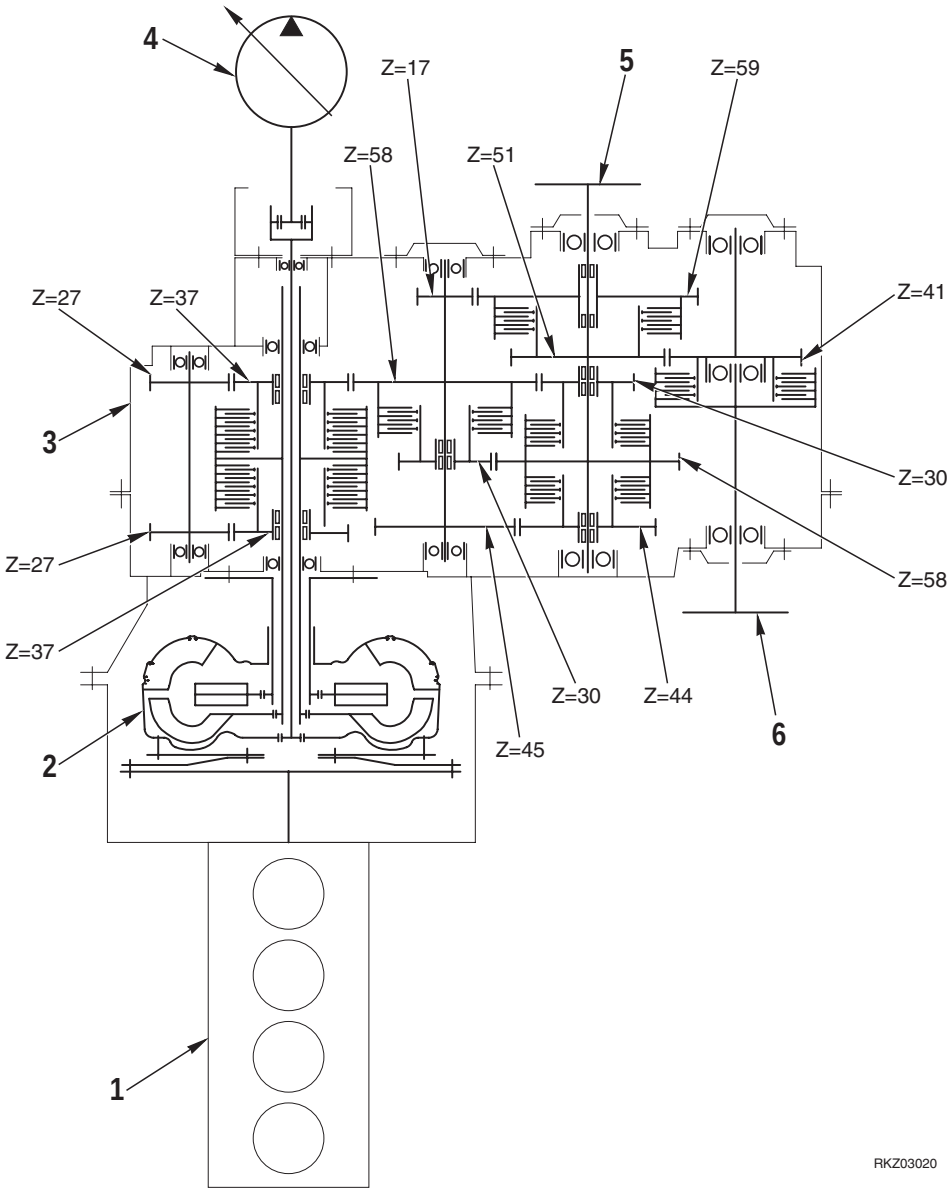


1. Diesel engine
2. Convertor
3. Transmission
4. Hydraulic pump
5. Front axle
6. Rear axle
7. Front Cardan drive shaft
8. Rear Cardan drive shaft
9. Rear wheels
10. Front wheels

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TRANSMISSION

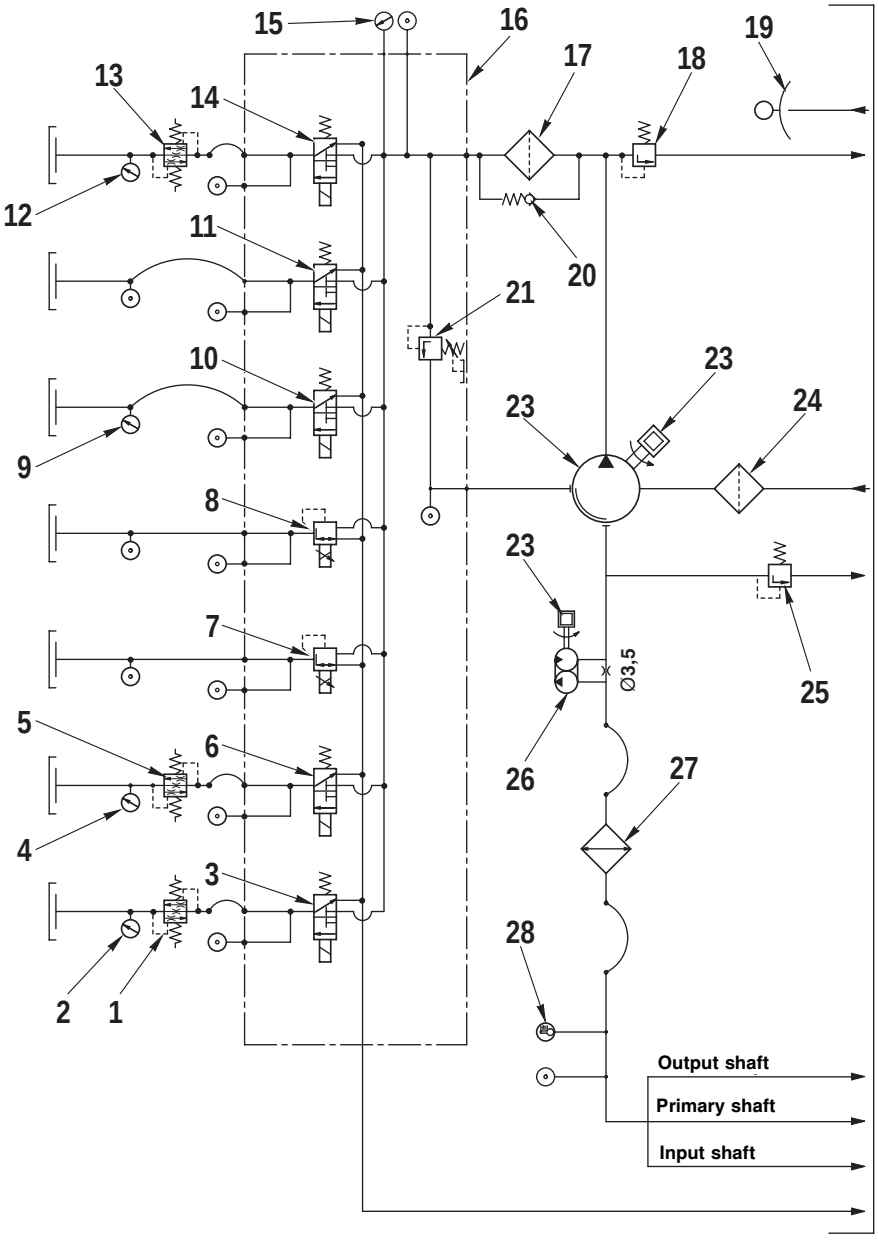
Diagram of the power train



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

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Hydraulic Convertor-Transmission Circuit Diagram

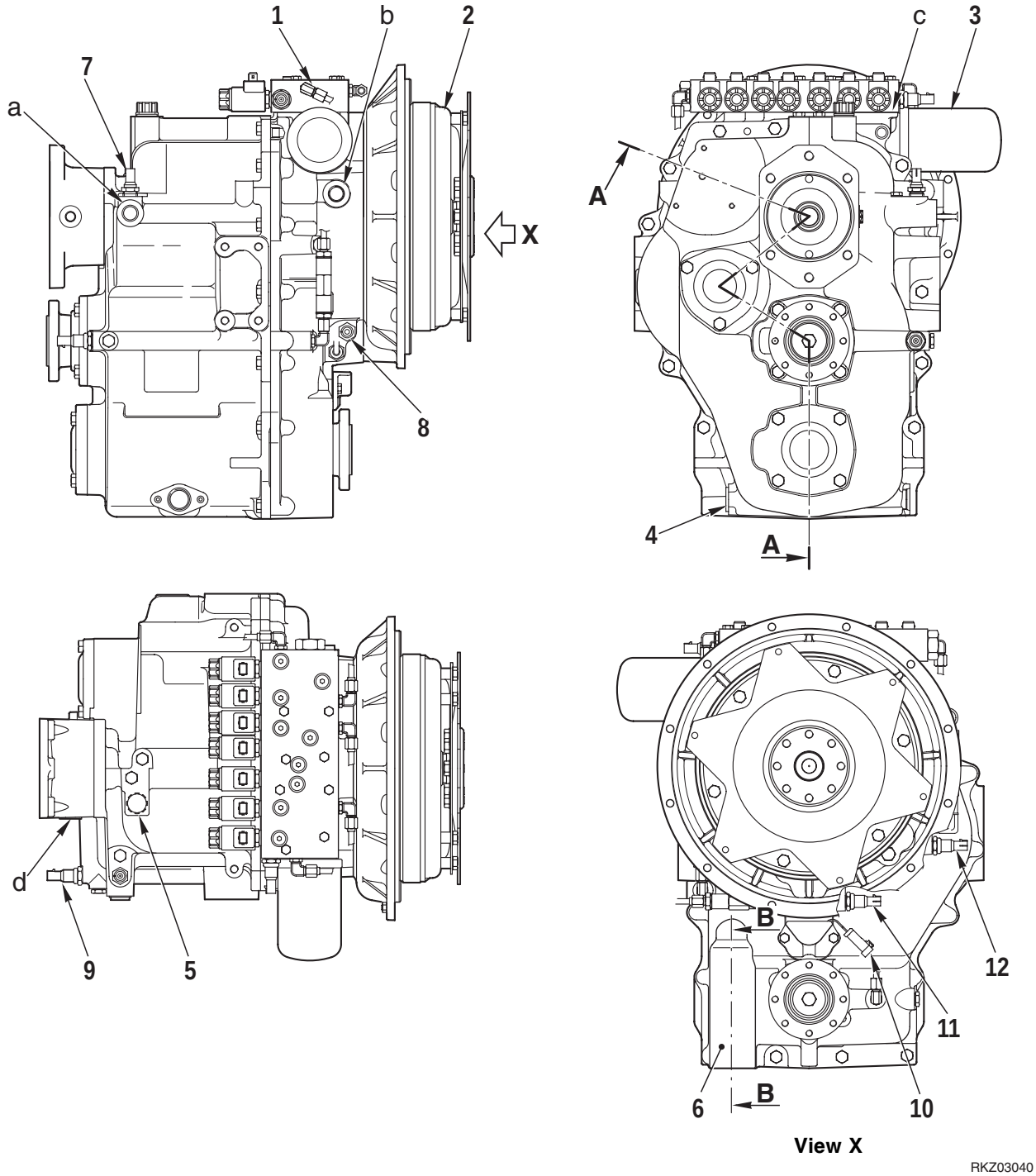


1. 1st gear antishock valve
2. 1st gear filling pressure sensor (C08)
3. 1st gear clutch solenoid valve (C23)
4. 3rd gear filling pressure sensor (C10)
5. 3rd gear antishock valve
6. 3rd gear clutch solenoid valve (C25)
7. Forward clutch proportional solenoid valve (C22)
8. Reverse clutch proportional solenoid valve (C21)
9. 4th gear filling pressure sensor (C11)
10. 4th gear clutch solenoid valve (C26)
11. 4WD disengagement clutch solenoid valve (C27)
12. 2nd gear filling pressure sensor (C09)
13. 2nd gear antishock valve
14. 2nd gear clutch solenoid valve (C24)
15. Oil pressure sensor (alarm) (C07)
16. Control valve group
17. Delivery filter (10 μm)
18. Check valve: set 23 – 26 bar
19. Plug
20. By-pass filter valve: set 3.45 bar
21. Pressure control
22. Pump
23. Engine
24. Suction filter (250 μm)
25. Convertor pressurization valve: set 5.5 bar
26. Convertor
27. Exchange
28. Transmission oil temperature sensor

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TRANSMISSION

Views

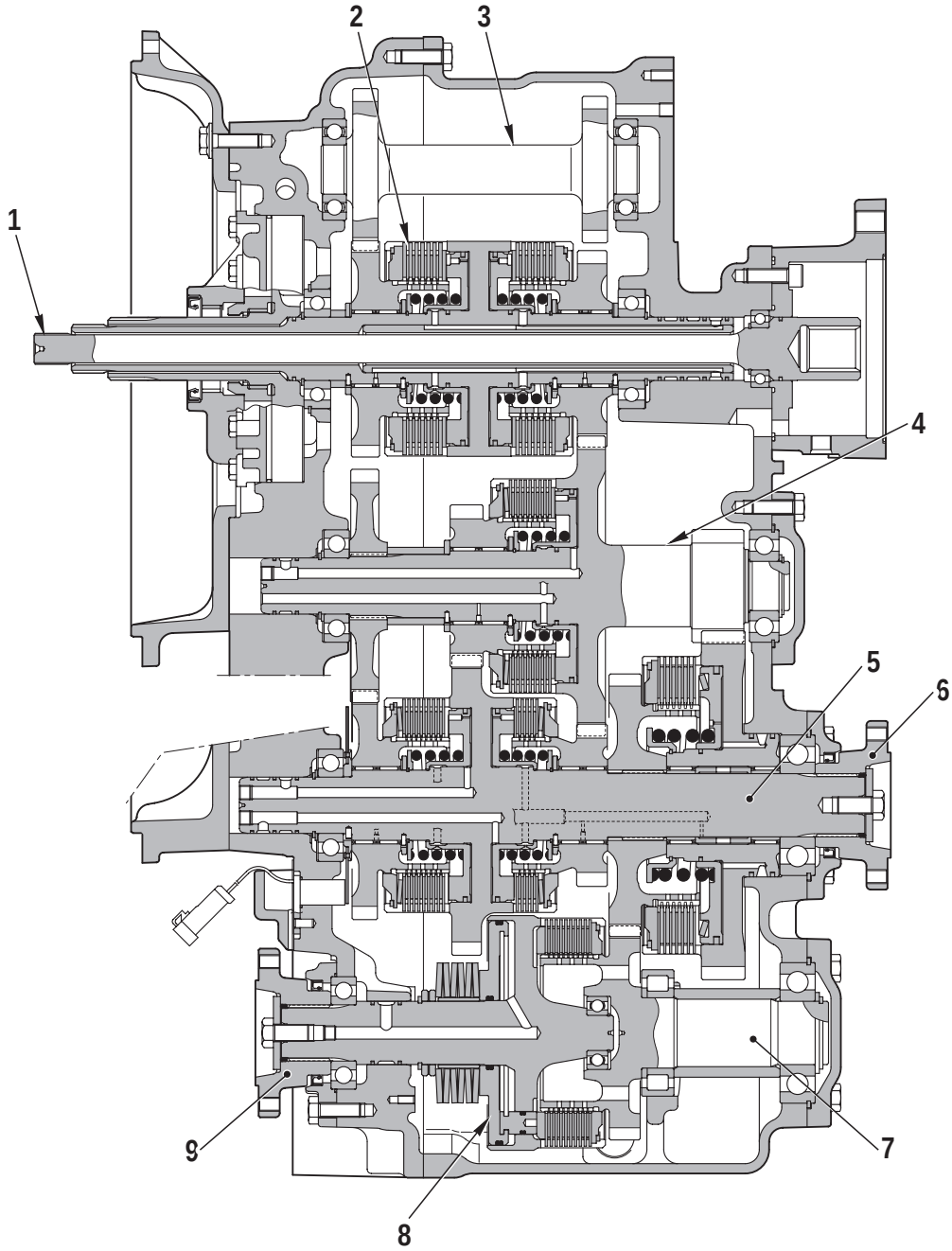


RKZ03040

a. From the oil cooler
b. To the oil cooler
c. To the solenoid valve group ST1 (Port P)
d. From the solenoid valve group ST1 (Port T)

1. Control valve group
2. Convertor
3. Filter
4. Plug
5. Plug
6. Suction filter
7. Oil temperature sensor (C16)
8. 4th gear filling pressure sensor (C11)
9. 1st gear filling pressure sensor (C08)
10. Speedmeter sensor (C02)
11. 3rd gear filling pressure sensor (C10)
12. 2nd gear filling pressure sensor (C09)

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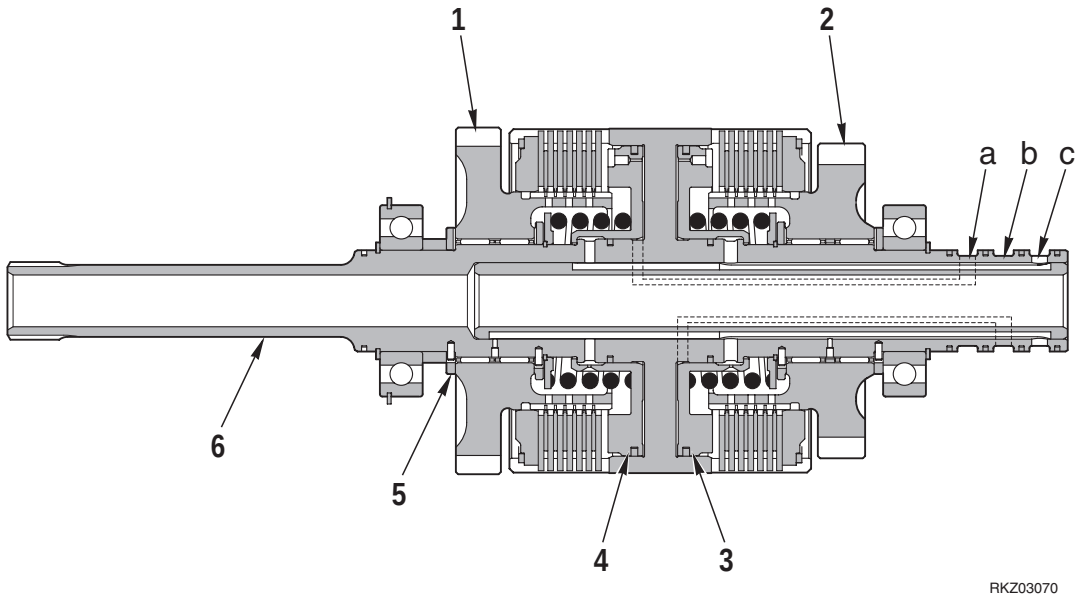
Section A – A

1. Hydraulic pump drive shaft
2. Propeller shaft
3. Reverse gears idler shaft
4. Drive shaft
5. Rear output shaft
6. Flange
7. Front output shaft
8. 4WD engagement device
9. Flange

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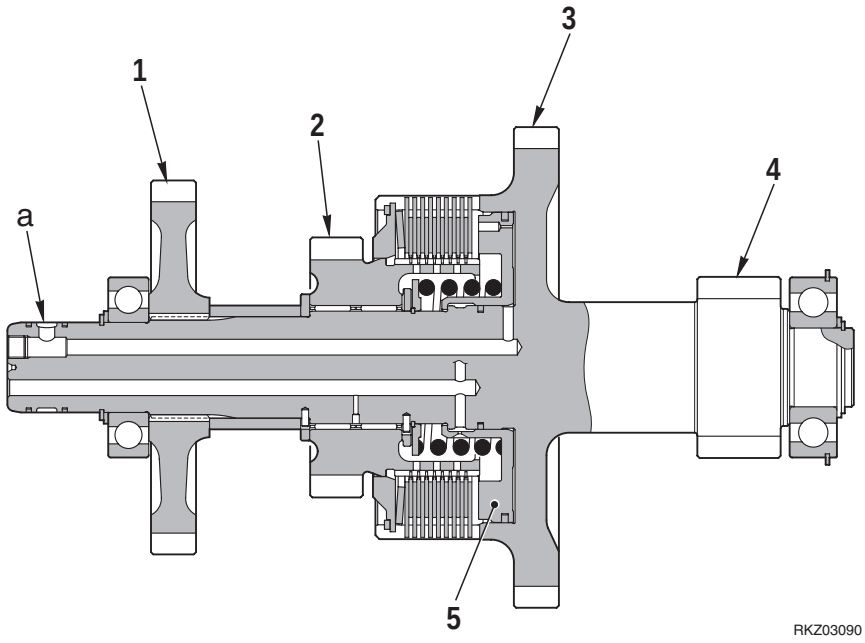
DRIVE SHAFTS

Drive shaft for forward and reverse movement



a. Port commanding reverse clutch
b. Port commanding forward clutch
c. Lubrication port
1. Reverse gear clutch (Z = 37)
2. Forward gear clutch (Z = 37)
3. Reverse clutch piston
4. Forward clutch piston
5. Thrust ring
6. Driven shaft

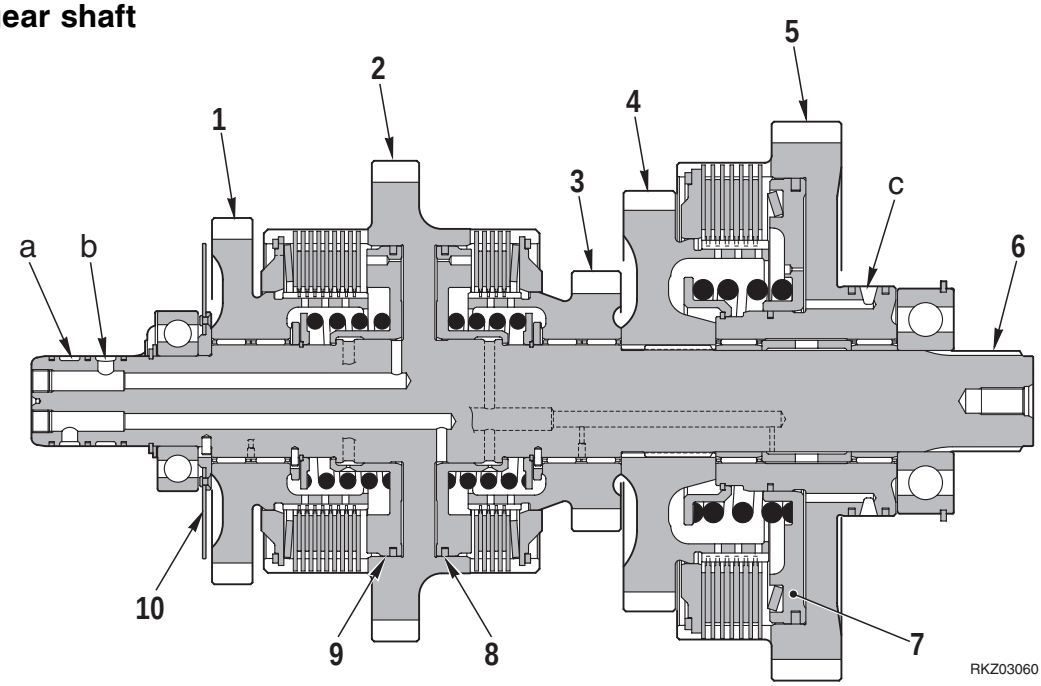
Drive shaft



a. Drive gear for 2nd gear
1. Drive gear 3rd gear (Z = 45)
2. Drive gear 2nd gear (Z = 30)
3. Drive gear 4th gear (Z = 58)
4. Drive gear 1st gear (Z = 17)
5. Control piston 2nd gear

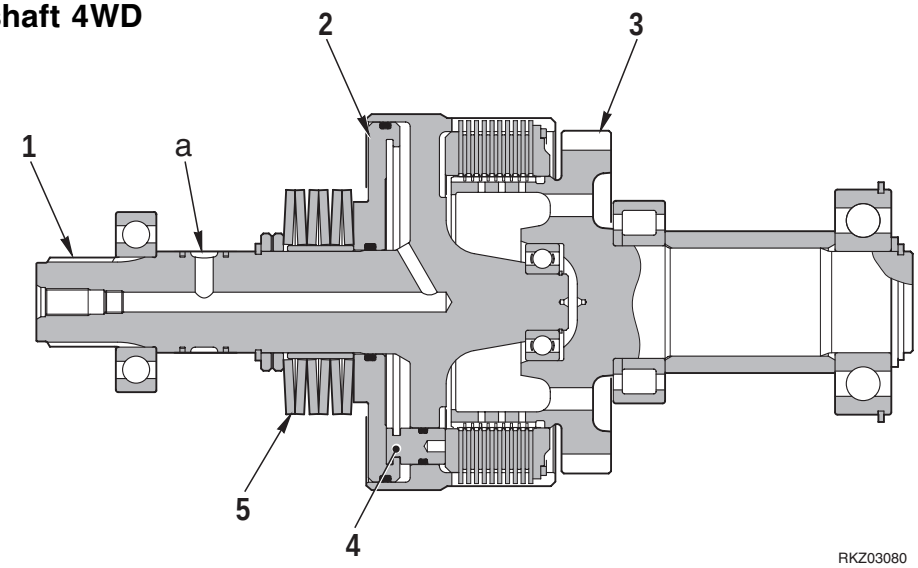
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Driven gear shaft



a. Port commanding 4th gear
b. Port commanding 3rd gear
c. Port commanding 1st gear
1. Driven gear for 3rd gear (Z = 44)
2. Driven gear for 2nd gear (Z = 58)
3. Driven gear for 4th gear (Z = 30)
4. Drive gear for 4WD (Z = 51)
5. Driven gear for 1st gear (Z = 59)
6. Rear output shaft
7. Control piston 1st gear
8. Control piston 4th gear
9. Control piston 3rd gear
10. Speedmeter disc

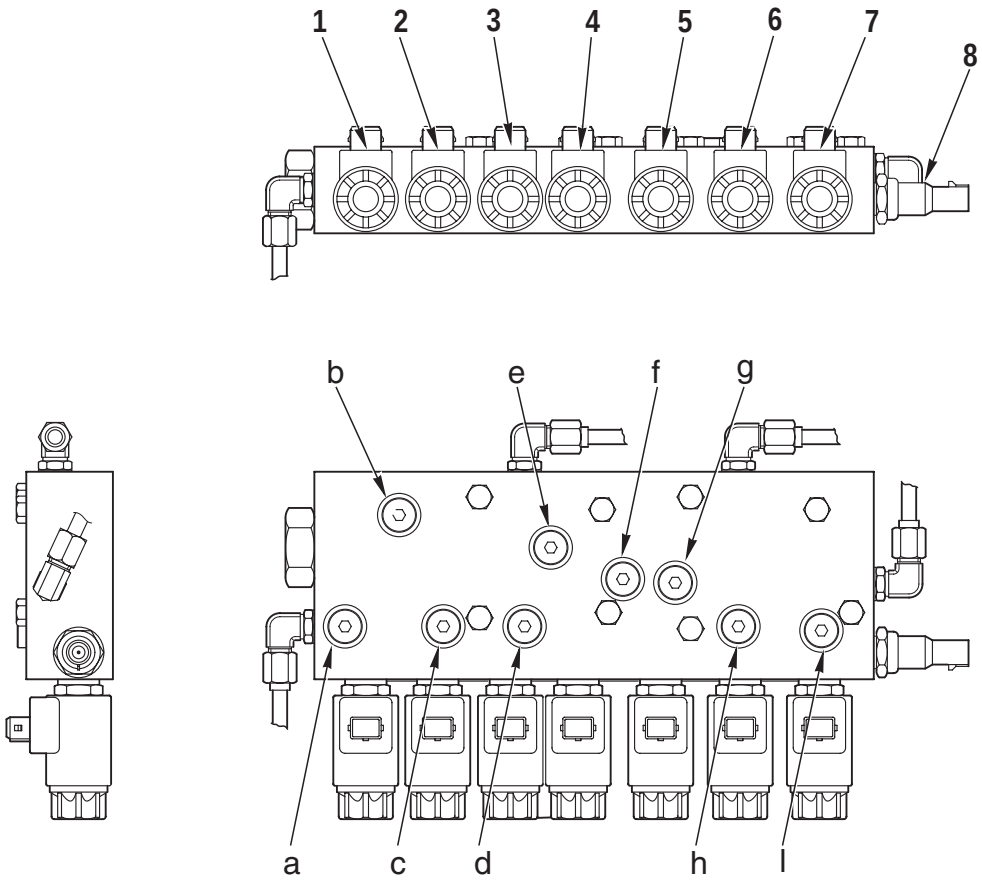
Driven shaft 4WD



a. 4WD disengagement command port
1. Front output shaft
2. 4WD disengagement command piston
3. 4WD driven gear
4. Piston (No. 3)
5. Spring

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CONTROL VALVE BLOCK



ELECTRICAL COMPONENT

1. C24 - 2nd gear clutch solenoid valve
2. C27 - 4WD disengagement clutch solenoid valve
3. C26 - 4th gear clutch solenoid valve
4. C21 - Reverse clutch proportional solenoid valve
5. C22 - Forward clutch proportional solenoid valve
6. C25 - 3rd gear clutch solenoid valve
7. C23 - 1st gear clutch solenoid valve
8. C07 - Oil pressure sensor (alarm)

CHECK POINT

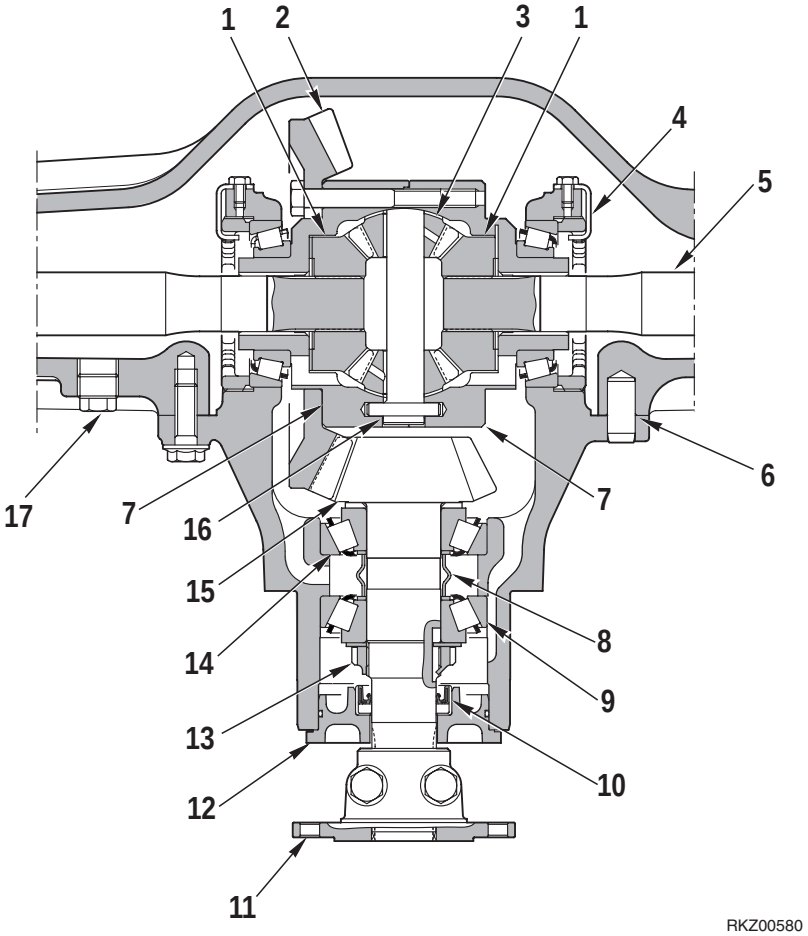
a. 2nd gear pressure
b. Torque converter pressure
c. 4WD disengagement pressure
d. 4th gear pressure
e. General oil clucth pressure
f. Reverse clucth pressure
g. Forward clucth pressure
h. 3rd gear pressure
l. 1st gear pressure

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FRONT AXLE

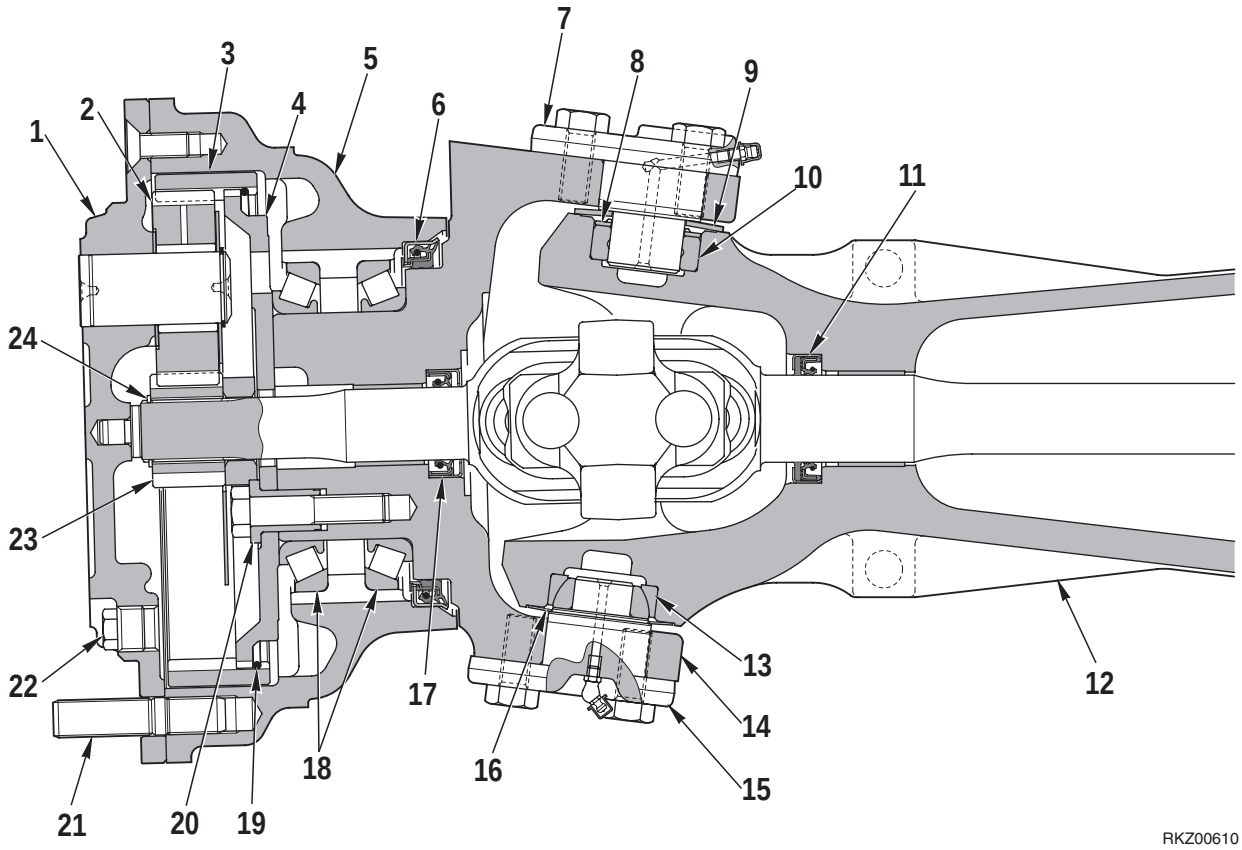
Differential



1. Planetary gear
2. Ring bevel gear (Z = 31)
3. Bevel gear
4. Lock nut
5. Half-axle
6. Pin
7. Differential housing
8. Spacer
9. Bearing
10. Seal
11. Flange
12. Cover
13. Lock nut
14. Bearing
15. Bevel pinion (Z = 13)
16. Pin
17. Oil drain plug

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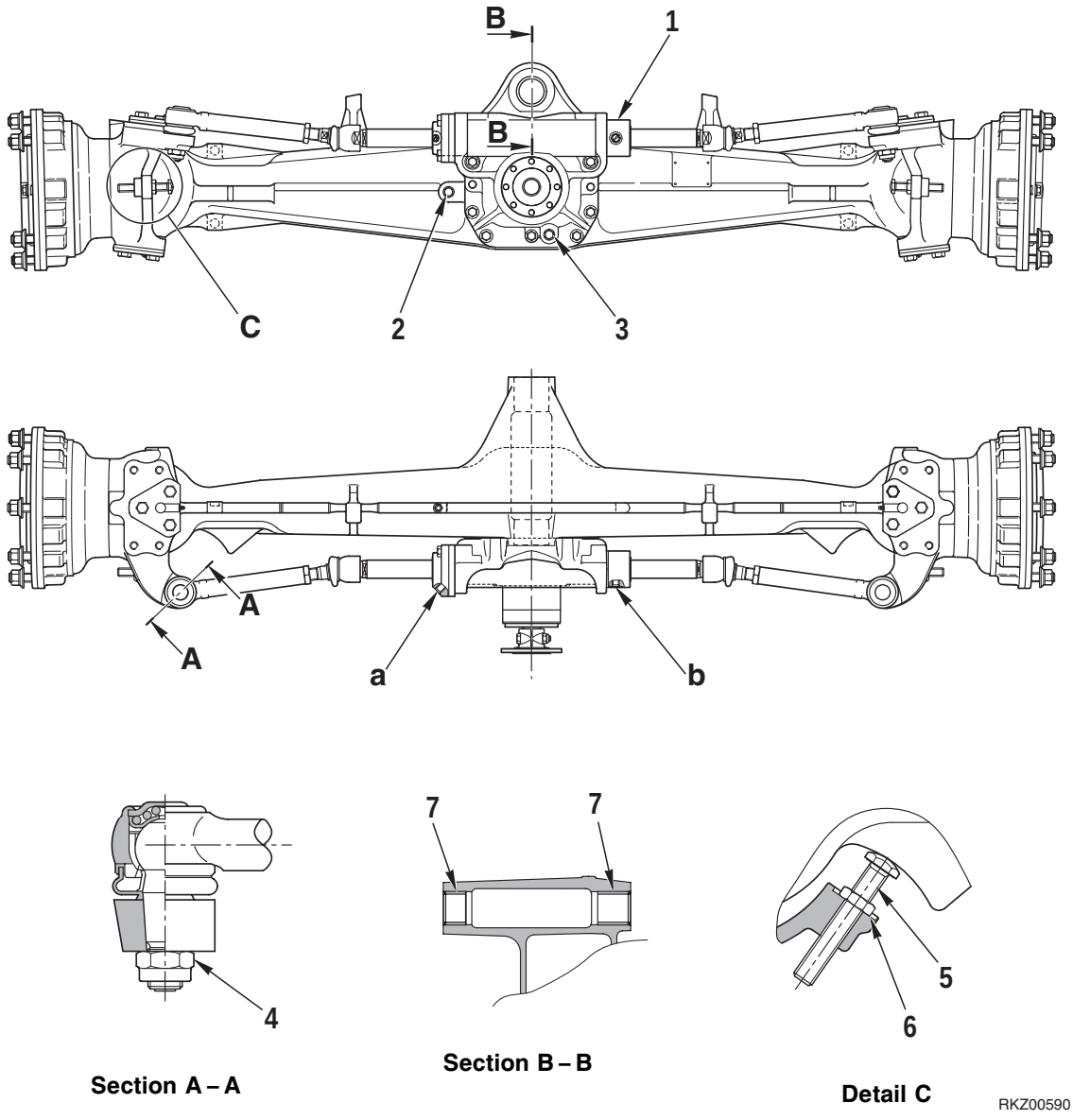
Final reduction-Joint



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

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Steering cylinder



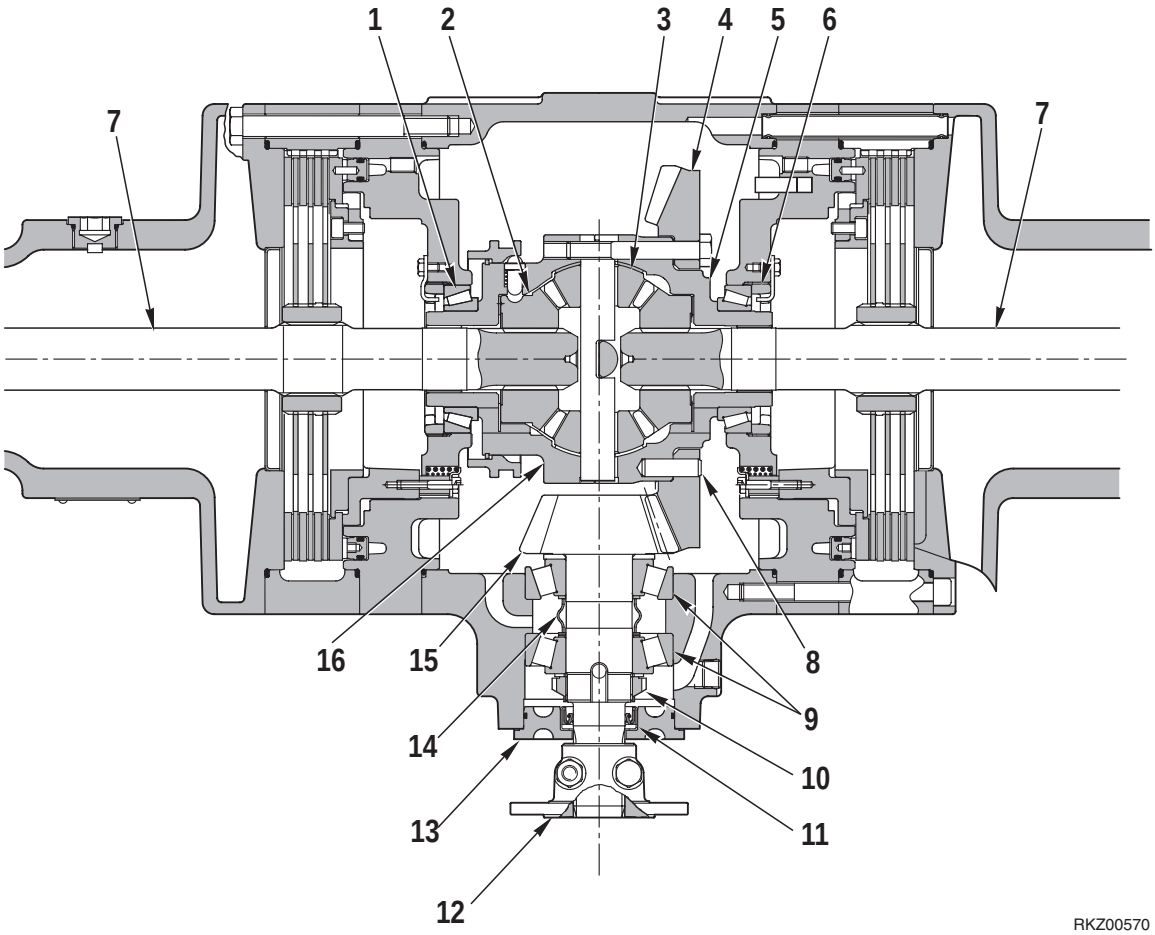
1. Steady pin
2. Oil refilling plug
3. Oil drain plug
4. Nut
5. Adjustment screw
6. Nut

Port a - From the steering unit (Port L)
Port b - From the steering unit (Port R)

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REAR AXLE

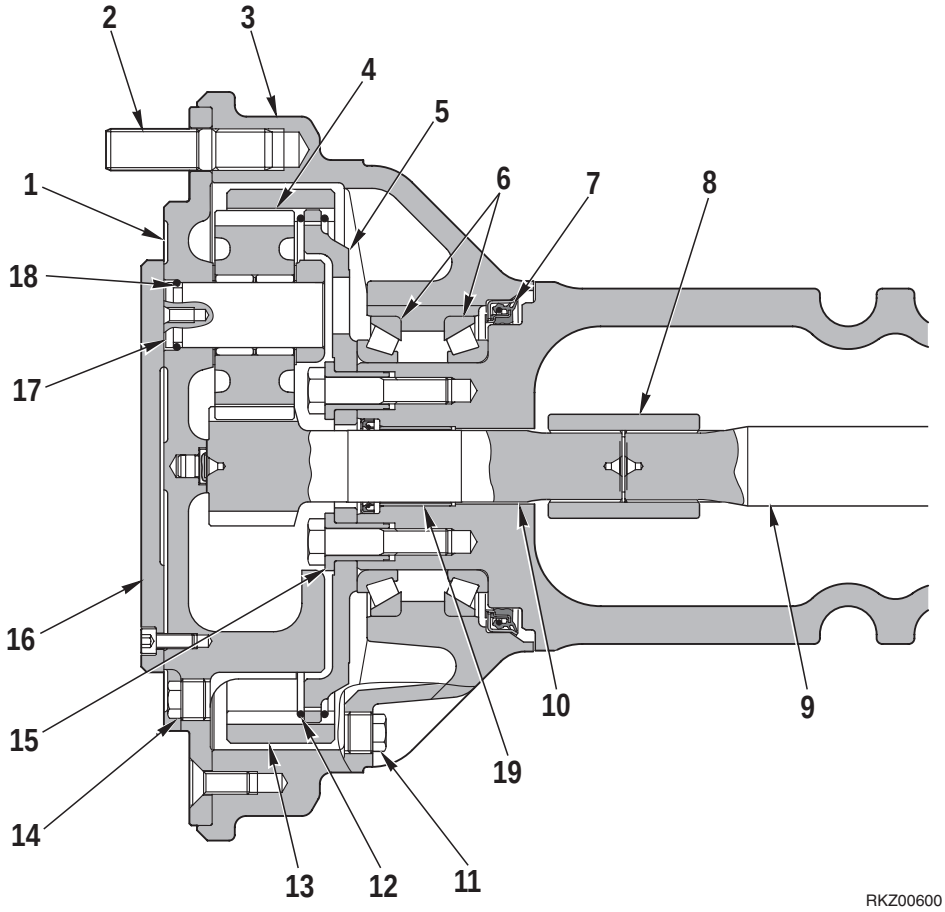
Differential



1. Bearing
2. Planetary gear
3. Bevel gear
4. Ring bevel gear (Z = 37)
5. Differential housing
6. Lock nut
7. Half-axle
8. Pin
9. Bearing
10. Nut
11. Seal
12. Flange
13. Cover
14. Spacer
15. Bevel pinion (Z = 13)
16. Differential housing

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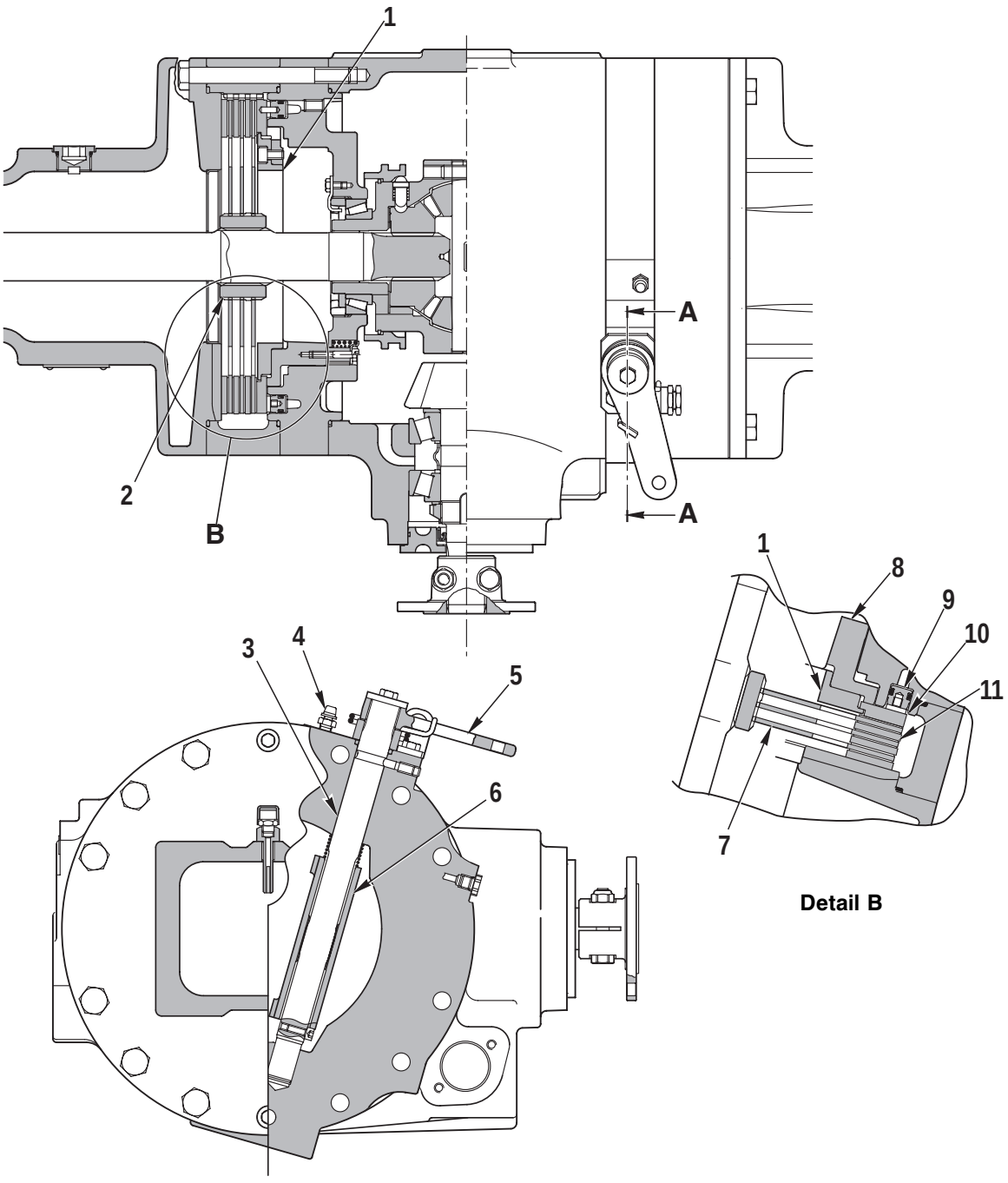
Final Reduction



1. Planetary gear carrier
2. Stud bolt
3. Wheel hub
4. Planetary gears (Z = ...)
5. Ring bevel gear carrier
6. Bearing
7. Seal
8. Joint
9. Half-axle
10. Planetary gear (Z = 15)
11. Oil drain plug
12. Snap ring
13. Ring gear (Z = 75)
14. Oil refilling plug
15. Steady pin
16. Cover
17. Pin
18. Snap ring

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Brakes



Detail B

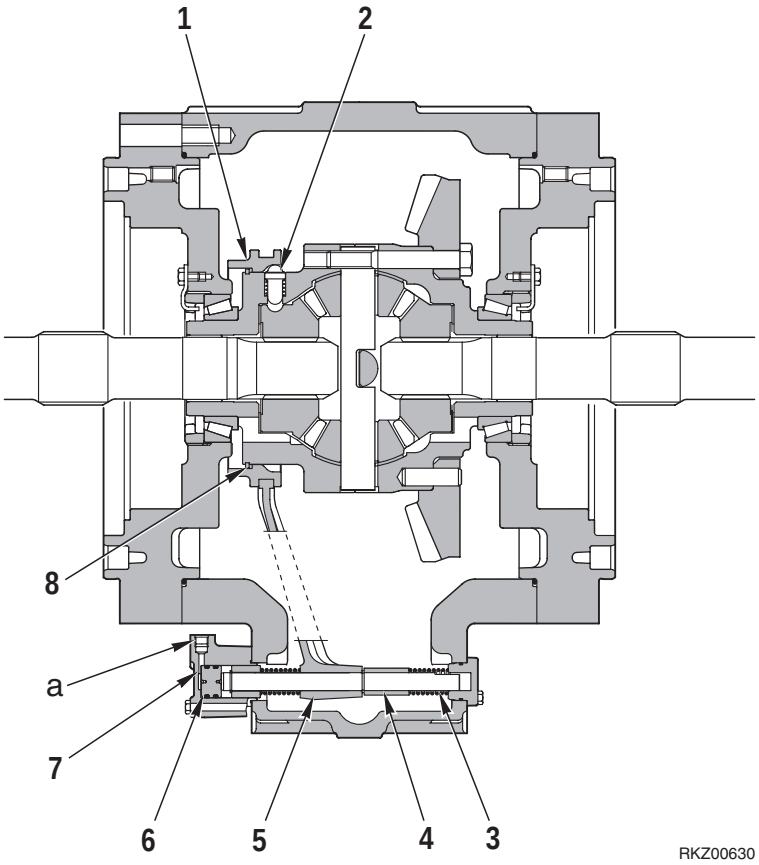
Section A – A

RKZ00620

1. Retainer ring
2. Bushing
3. Parking brake control rod
4. Bleeder valve
5. Parking brake lever
6. Parking brake control cam
7. Brake disk
8. External flange
9. Service brake piston
10. Pressure disk
11. Center reaction plate

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Differential locking



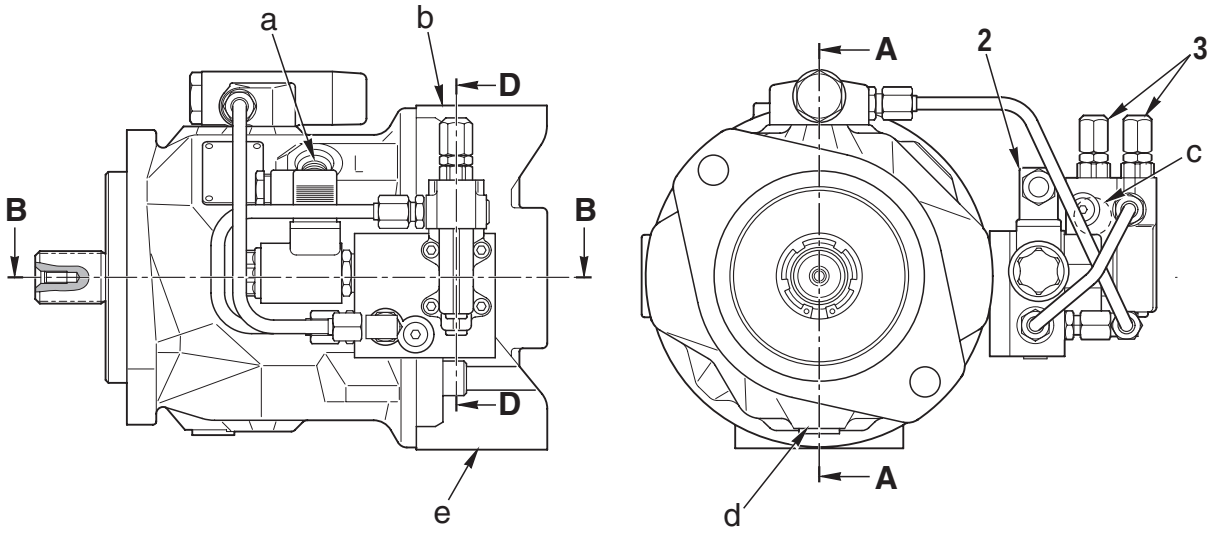
a. From the solenoid valve block ST1 (Port2)

1. Sleeve
2. Pin
3. Control rod
4. Spacer
5. Fork
6. Piston
7. Cover
8. Snap ring

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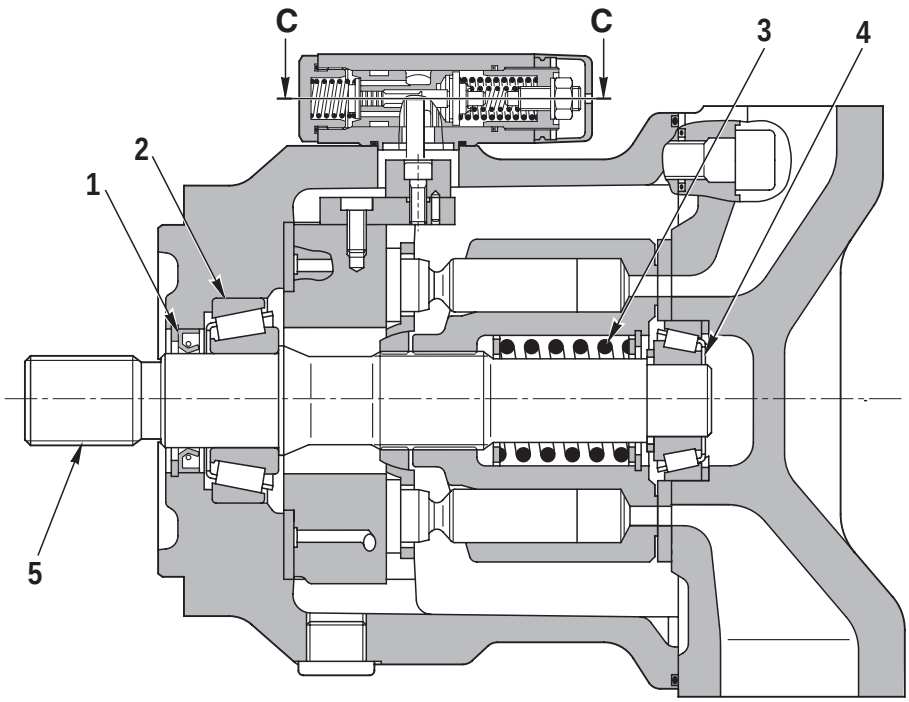
HYDRAULIC PUMP



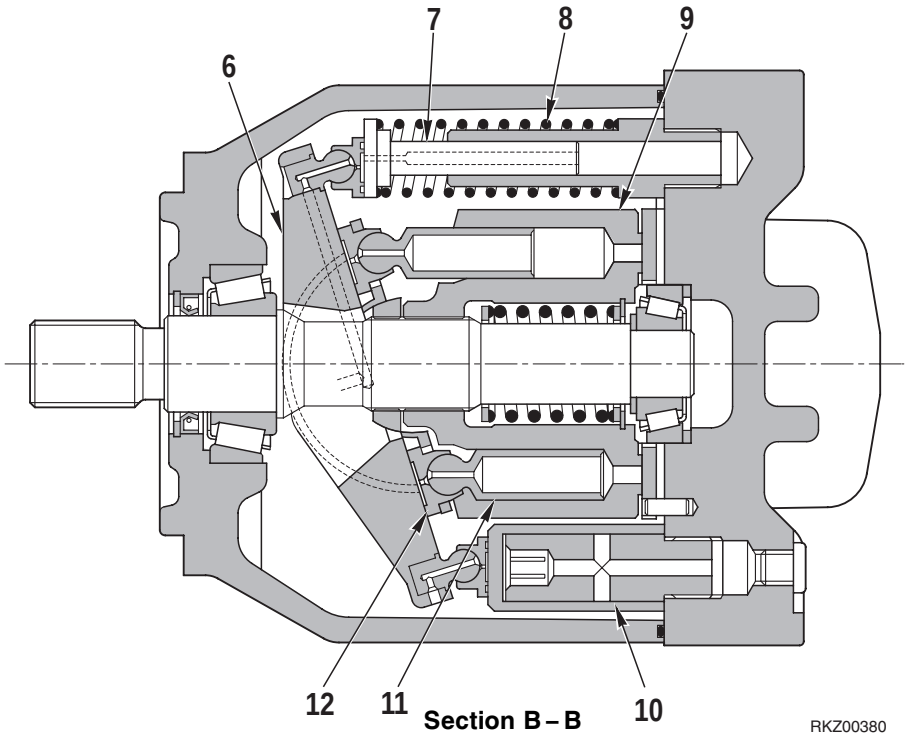
1. Delivery variation group
2. Working mode selection solenoid .....
3. Delivery control valve

a. Port L1 - To the intake flange (Spool Port)
b. Port B - To the shovel control valve (Port P)
c. Port X2 - From the shovel control valve (Port LS)
d. Port L - To the hydraulic oil tank
e. Port S - To the hydraulic oil tank

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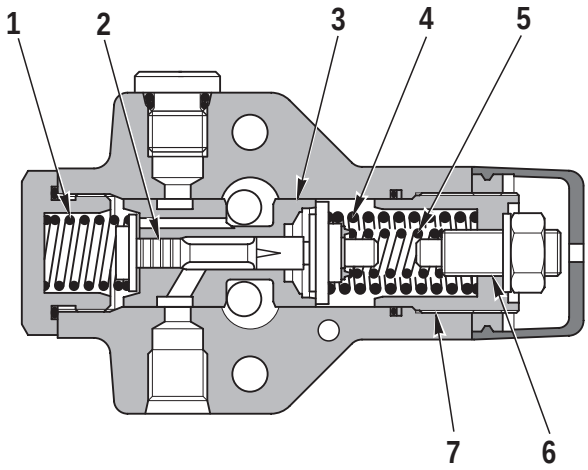
Section A – A



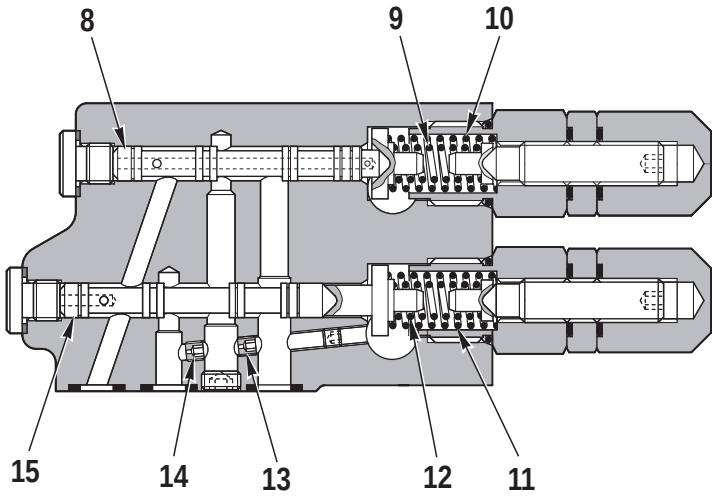
Section B – B

1. Seal
2. Bearing
3. Central spring
4. Bearing
5. Control rod
6. Swash plate
7. Positioning piston
8. Spring
9. Cylinder block
10. Positioning piston
11. Piston
12. Guide shoe

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Section C – C



RKZ00640

Section D – D

POWER GOVERNOR

1. Spring
2. Piston rod
3. Bushing
4. Initial adjustment spring
5. Spring
6. Pressure cut calibration screw
7. Initial adjustment calibration screw

PC VALVE

8. Spool
9. Spring (internal)
10. Spring (external)

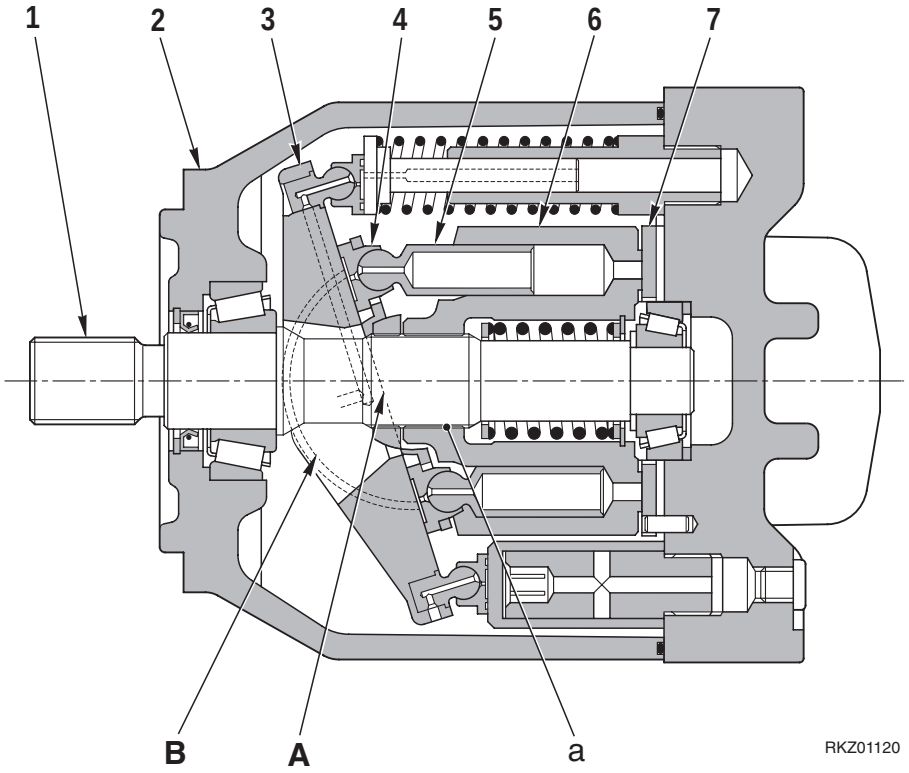
LS VALVE

11. External spring
12. Internal spring
13. Throttles (ø ....)
14. Throttles (ø ....)
15. Spool

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FUNCTION

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



STRUCTURE

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

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OPERATION

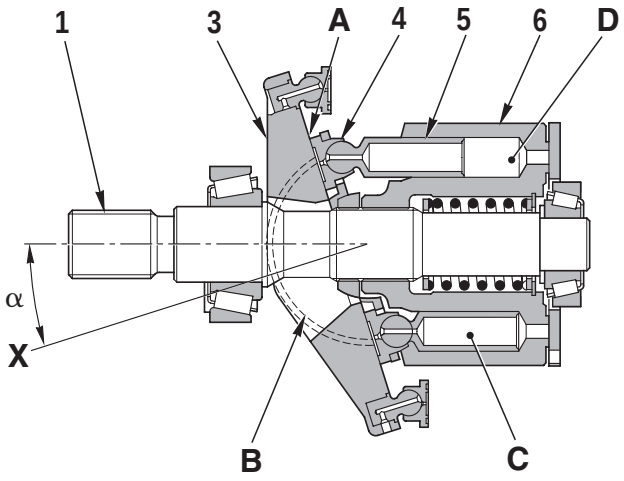
1. Pump operation

1 - The cylinder block (7) rotates together with the shaft (1) and the shoe (4) slides on the flat surface «**A**». The swash plate (3) moves along the cylindrical surface «**B**». The angle «**α**» formed between the center line of the shaft (1) and the center line **X** of the swash plate (3) changes, thus modifying the axial position of the pistons in relation to the cylinder block.
The angle «**α**» is known as the swash plate angle.

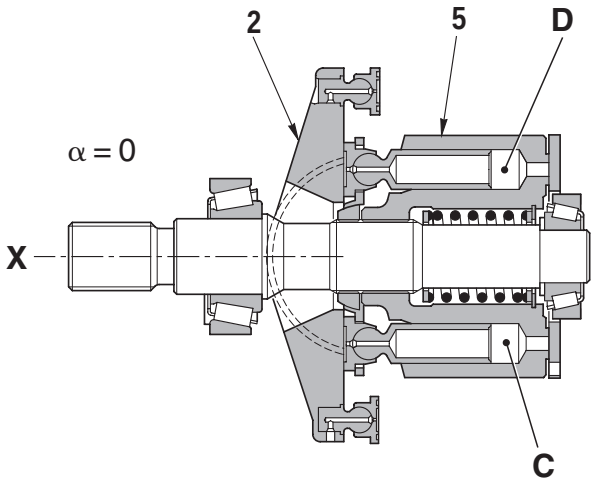
2 - When the center line **X** of the swash plate (3) maintains the angle «**α**» in relation to the center line of the shaft (1), and hence also of the cylinder block (6), the flat surface **A** acts as a cam for the shoe (4). As the piston (5) rotates and slides inside the cylinder block (6), it therefore creates a difference between the volumes **C** and **D** which provokes intake and discharge of the oil in quantities equal to the difference between the volumes (**D** – **C** = delivery).
In other words, as the cylinder block (6) rotates, chamber **D** loses volume while the volume of chamber **C** is increased, thus provoking an intake of oil.
(The figure indicates the state of the pump when the intake of chamber **D** and the delivery of chamber **C** have been completed).

3 - When the center line **X** of the swash plate (3) and the center line of the cylinder block (6) are perfectly aligned (the swash plate angle «**α**» = 0), the difference between the volumes **C** and **D** within the cylinder block (6) becomes 0 and the pump does not take in or deliver any oil. (In practice the swash plate angle «**α**» never becomes = 0)

4 - In other words, pump delivery is directly proportional to the swash plate angle «**α**».



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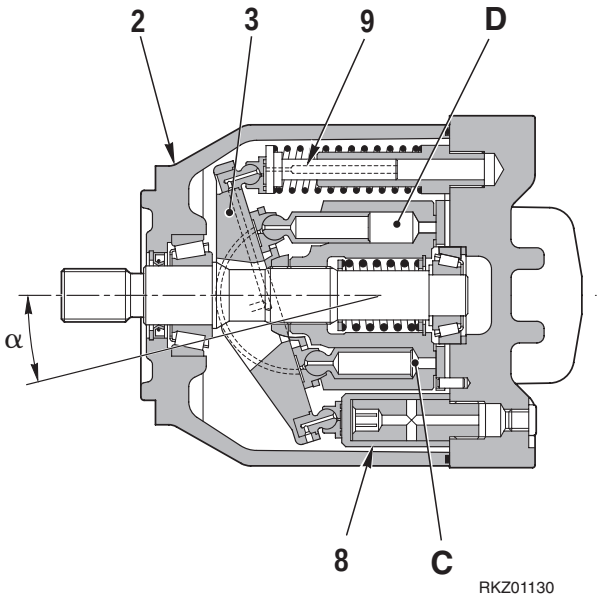


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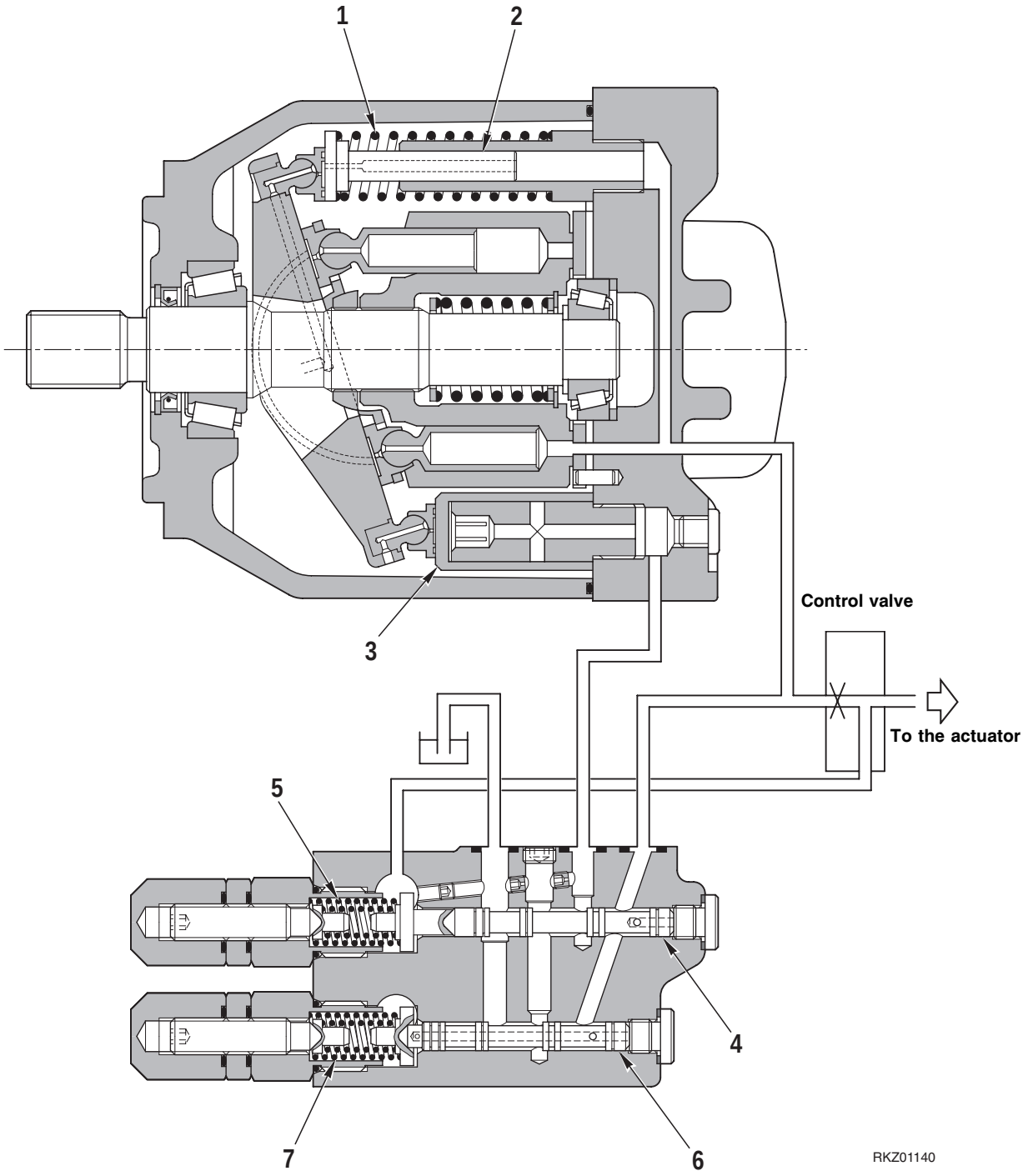
2. Control of Delivery

- As the swash plate angle «α» grows larger, the difference between volumes **C** and **D** increases, and the delivery **Q** also increases.
  The swash plate angle is modified by servo-pistons (8) and (9).
- The servo-piston (8) moves in a reciprocating linear motion (⟷) caused by pressure signals from the **PC** and **LS** valves.
  The linear movement is transmitted to the swash plate (3), which is supported by the cylindrical surface of the cradle (7). The swash plate therefore has a semi-circular reciprocating movement (⥁).
- The surfaces of the servo-pistons receiving the pressures **PP** and **LS** are dissimilar. The delivery pressure **PP** of the main pump is always passed into the smaller (upper) pressure chamber, whereas the pressure **PEN** coming from the **LS** valve is passed into the larger (lower) pressure chamber.
  The movement of the servo-piston is governed by the relationship between pressures **PP** and **PEN**, as well by the proportions between the surfaces (larger and smaller) of the servo-piston.



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2. PC VALVE, LS VALVE SERVO-PISTON



SERVO-PISTON

1. Spring
2. Servo-piston
3. Servo-piston

LS VALVE

4. Piston
5. Spring

PC VALVE

6. Servo-piston
7. Spring

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LS VALVE

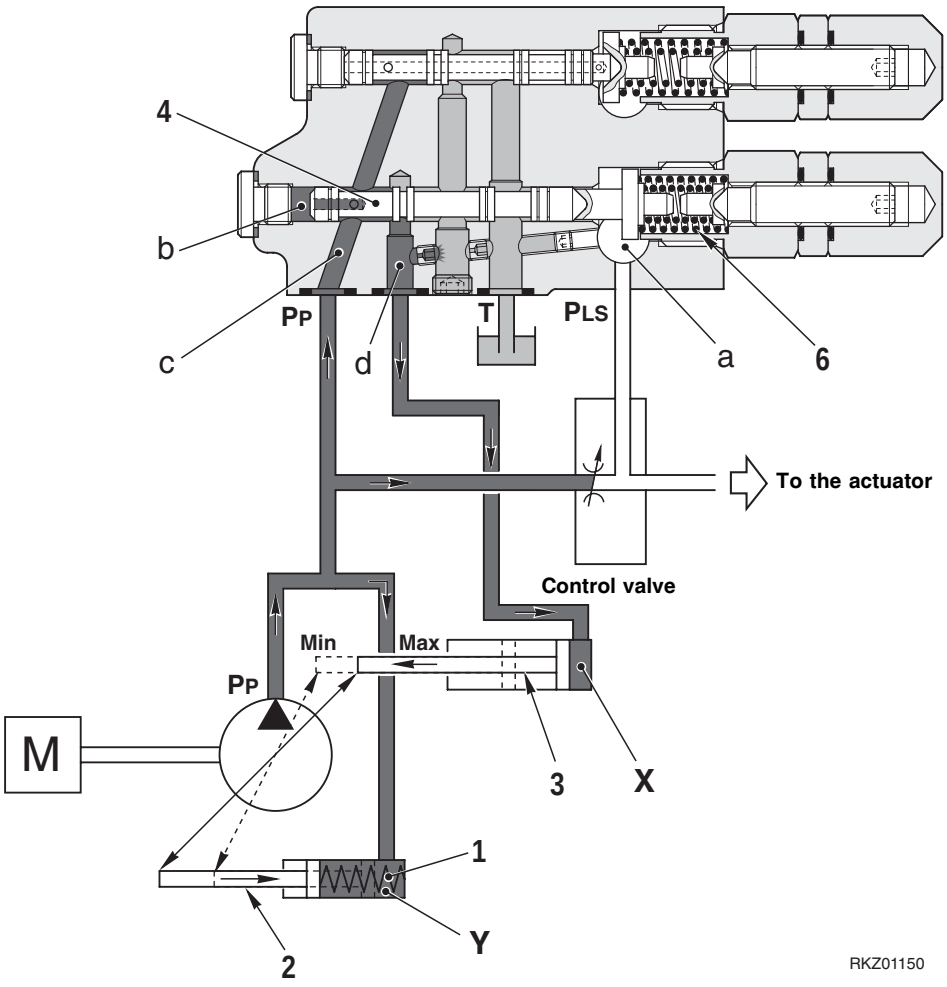
FUNCTION

- The **LS** valve controls the pump delivery according to the stroke of the control valve level, i.e., in function of the delivery demands made by the actuators.
- The **LS** valve detects the actuator's delivery needs by means of the differential pressure **ΔPLS** existing between the pump delivery pressure **PP** and the pressure **PLS** coming from the control valve. This reading permits control of the main pump delivery **Q**.
  (**PP**, **PLS** and **ΔPLS** are, respectively, the pump pressure, the Load Sensing pressure, and the difference in pressure between these two values).
- In other words, the **LS** valve detects the pressure difference **ΔPLS** generated by the passage of the oil flow through the surface freed by the control valve spool, and controls the pump delivery **Q** so as to keep the pressure drop constant.
- It can therefore be assumed that the pump delivery is proportional to the demands made known by the control valve.

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OPERATION

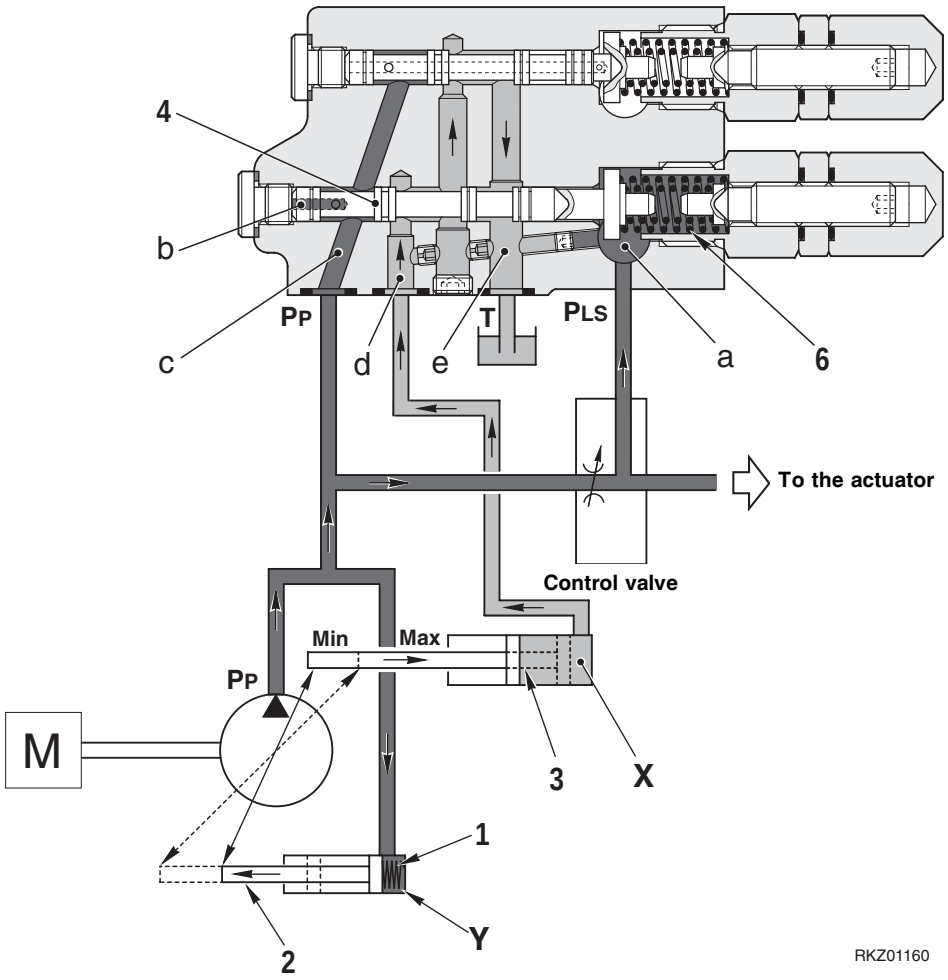
1. When the control valve is in a «NEUTRAL» position.



- The pressure **PLS** of the **LS** coming from the control valve outlet passes into chamber **a** of the spring of the **LS** valve. The pressure **PP** of the pump passes into chamber **b** of the opposite side.
- The piston rod movement (4) is determined by the combination of the force generated by the pressure **PLS**, the force of the spring (6) and the force generated on the side opposite the piston rod by the pressure **PP**.
- Before the engine is started the servo-piston (3) is pushed to the right by the spring (1) (corresponding to the maximum angle of the swash plate).
- If all the control valve spools are in their «NEUTRAL» position when the engine is started, the pressure **PLS** of the **LS** will remain at 0 bar (0 bar) because no oil is flowing through the control valve. At the same time the pump pressure **PP** increases and is maintained at a value of about 21 bar (21.3 kg/cm^2).
- For this reason the piston (4) is thrust to the right (→) and a passage is formed between the delivery lines c and d. This opening enables the pump pressure **PP** to enter chamber **X** of the servo-piston (3).
- Although the pump pressure **PP** is always passed into chamber **Y** of the servo-piston (2), since the force exerted by that pressure on piston (3) exceeds the force exerted on piston (2), the servo-piston (1) moves to the right (→), i.e. towards the side of the minimum angle of the swash plate.

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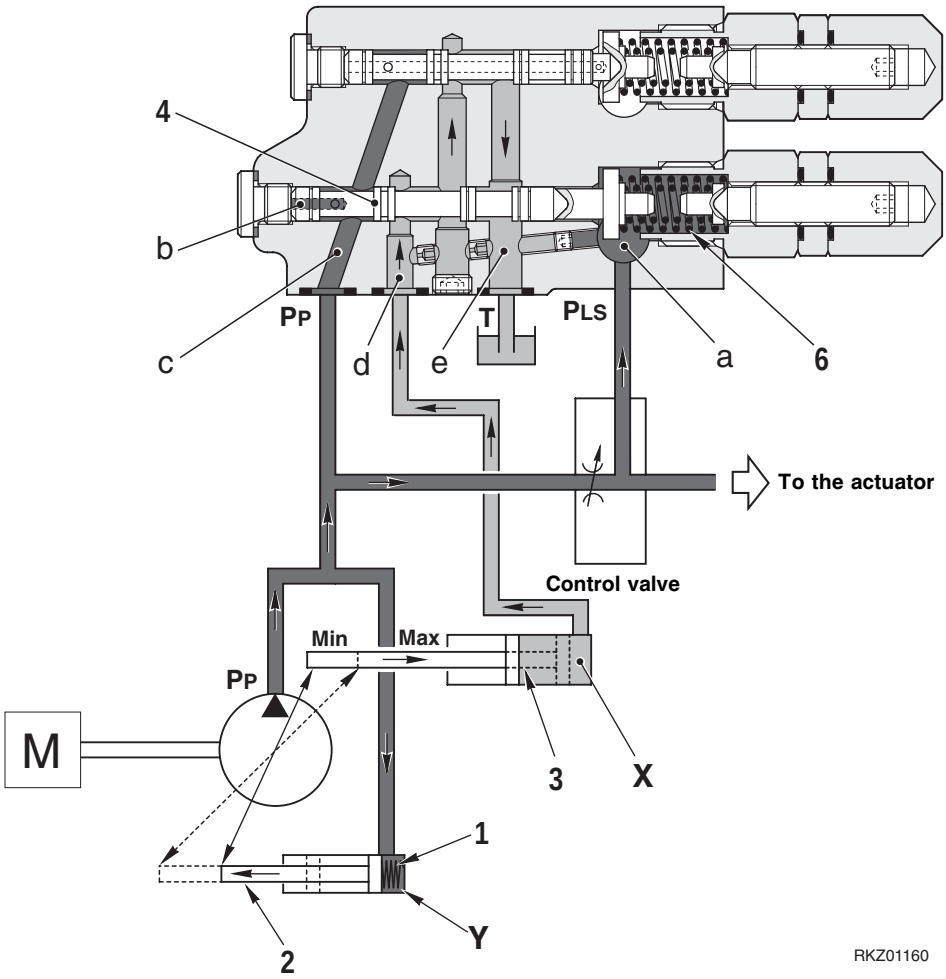
2. When a control valve lever is activated



- 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.

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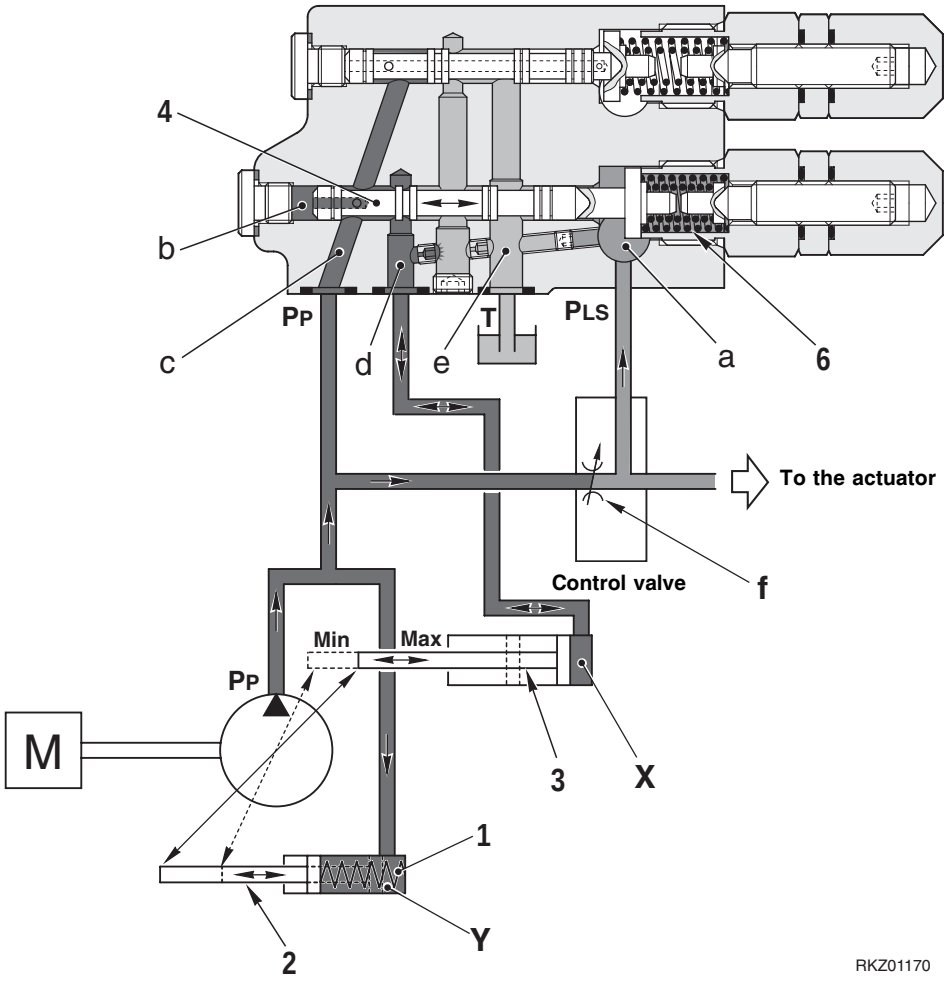
3. When the control valve opening is at its maximum (lever at the end of its stroke)



- When the control lever is moved to full stroke, in other words, when the spool opening reaches its maximum, the difference between the pump pressure **PP** and the **LS** pressure **PLS** becomes smaller (differential pressure **ΔPLS**).
- The **LS** pressure **PLS** introduced into the chamber a of the **LS** valve becomes about the same as the pump pressure **PP** and the piston (4) is moved to the left (←) by the combined forces generated by the pressure **PLS** and the spring (6).
  The piston movement closes the delivery line **c** and forms a passage between lines **d** and **e**.
- The pressurized oil present in the chamber **X** of the servo-cylinder (3) flows through the lines **d** and **e** and reaches the pump drainage chamber, so that the pressure in chamber **X** of the servo-cylinder (1) becomes equal to the drainage pressure.
- The servo-piston (3) is thus moved to the right (→) by swash plate movement due to the pressure **PP** in the chamber **Y** of the servo-cylinder (2).
  In other words, it is drawn in the direction of the increase in angle of the swash plate.

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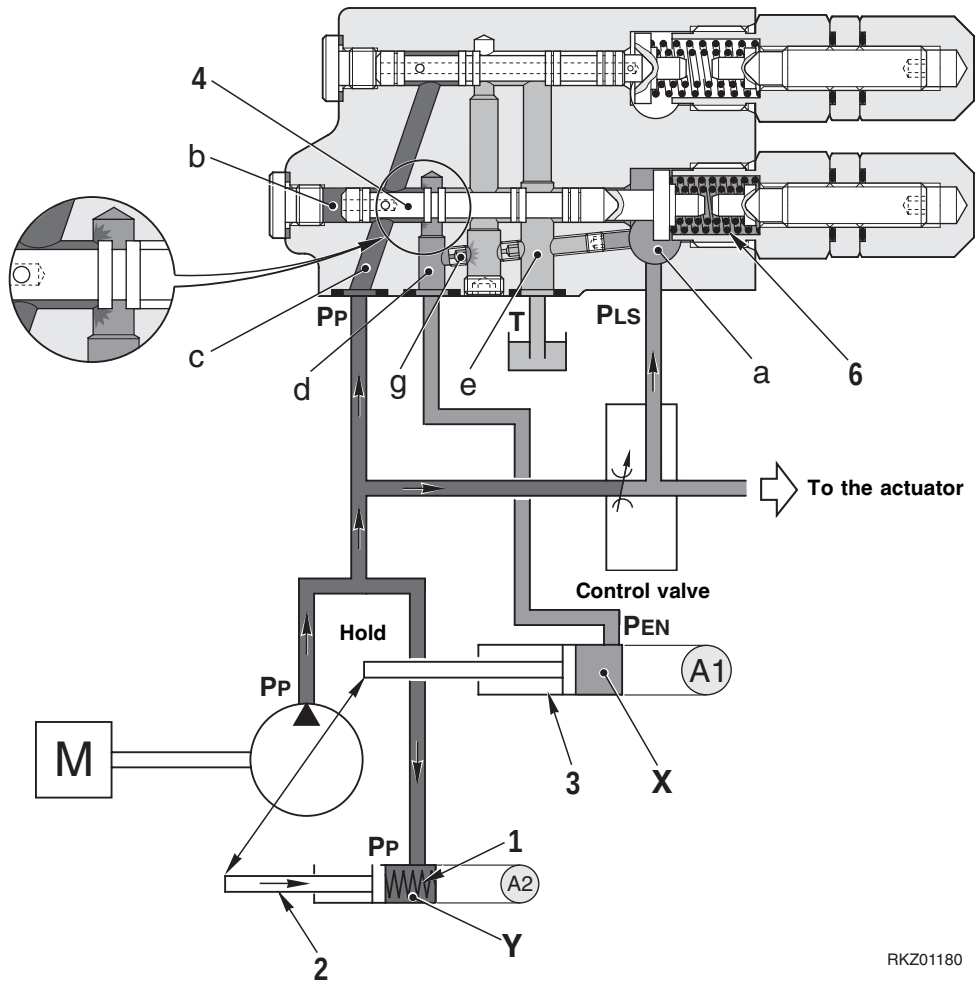
4. When the spool makes very small movements (fine-control)



- When the control valve lever moves in very small increments towards the «NEUTRAL» position, i.e. when the control valve opening **f** diminishes, the differential pressure **ΔPLS** between the pump pressure PP and the **LS** pressure **PLS** increases.
- If the differential pressure **ΔPLS** generates on the spool (4) a difference in force that exceeds the force exerted by the spring (6), the spool moves to the right (→) and a passage is formed between the delivery lines **c** and **d**. The pressure **PP** is introduced into the chamber **X** and the swash plate moves towards its minimum angle.
- When the control valve lever performs small movements towards the position of maximum opening, i.e. when the opening **f** of the control valve increases, the differential pressure **ΔPLS** diminishes.
- If the differential pressure **ΔPLS** generates on the spool (4) a force difference that does not exceed the force exerted by the spring (6), the spool (4) moves to the left (←) and a passage is formed between the delivery lines **d** and **e**.
  The chamber **X** loses pressure and the servo-piston provokes a movement of the swash plate 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 hence the passage between delivery lines **c** and **d** is also re-opened.

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5. When pump flow matches the demands of the control valve



- Let **A1** be the surface of the servo-piston (3), **A2** the surface of the servo-piston (2), **PEN** the pressure acting on the piston (1) and **PP** the pressure acting on the piston side (2).
- When pump delivery reaches the quantity demanded by the control valve, the pump pressure **PP** in chamber **b** of the **LS** valve is in equilibrium with the combined forces of the **LS** pressure **PLS** in chamber a, and the force exerted by the spring (6). Once equilibrium has been reached the piston (4) stops in the central position.
- In this condition the passage from chamber c to chamber d remains only slightly open in order to maintain pressure in chamber **d**.

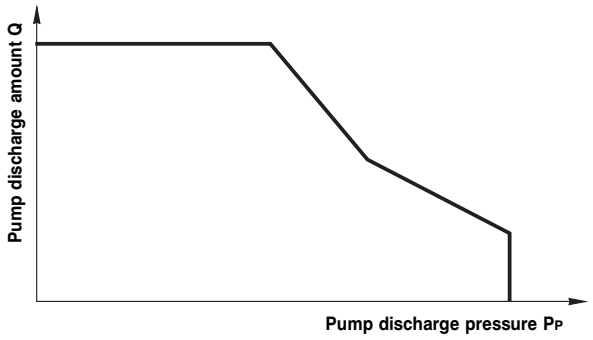
  A flow of oil is introduced into the servo-cylinder (3) at a pressure that balances the force generated by the pump pressure **PP** in the cylinder (2) (**PEN** x **A1** = **PP** x **A2**).
- The stability of the equilibrium is guaranteed by a flow stabilized by the throttle **g**.
- The force of the spring (6) is regulated so that the piston (4) is in equilibrium when **PP** – **PLS** = **ΔPLS** = 18 bar (18.4 kg/cm^2).
- In practice, the pump flow is made proportional to the section of the opening of the control valve, which maintains the differential pressure **ΔPLS** = 18 bar (18.4 kg/cm^2).

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PC VALVE

FUNCTION

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

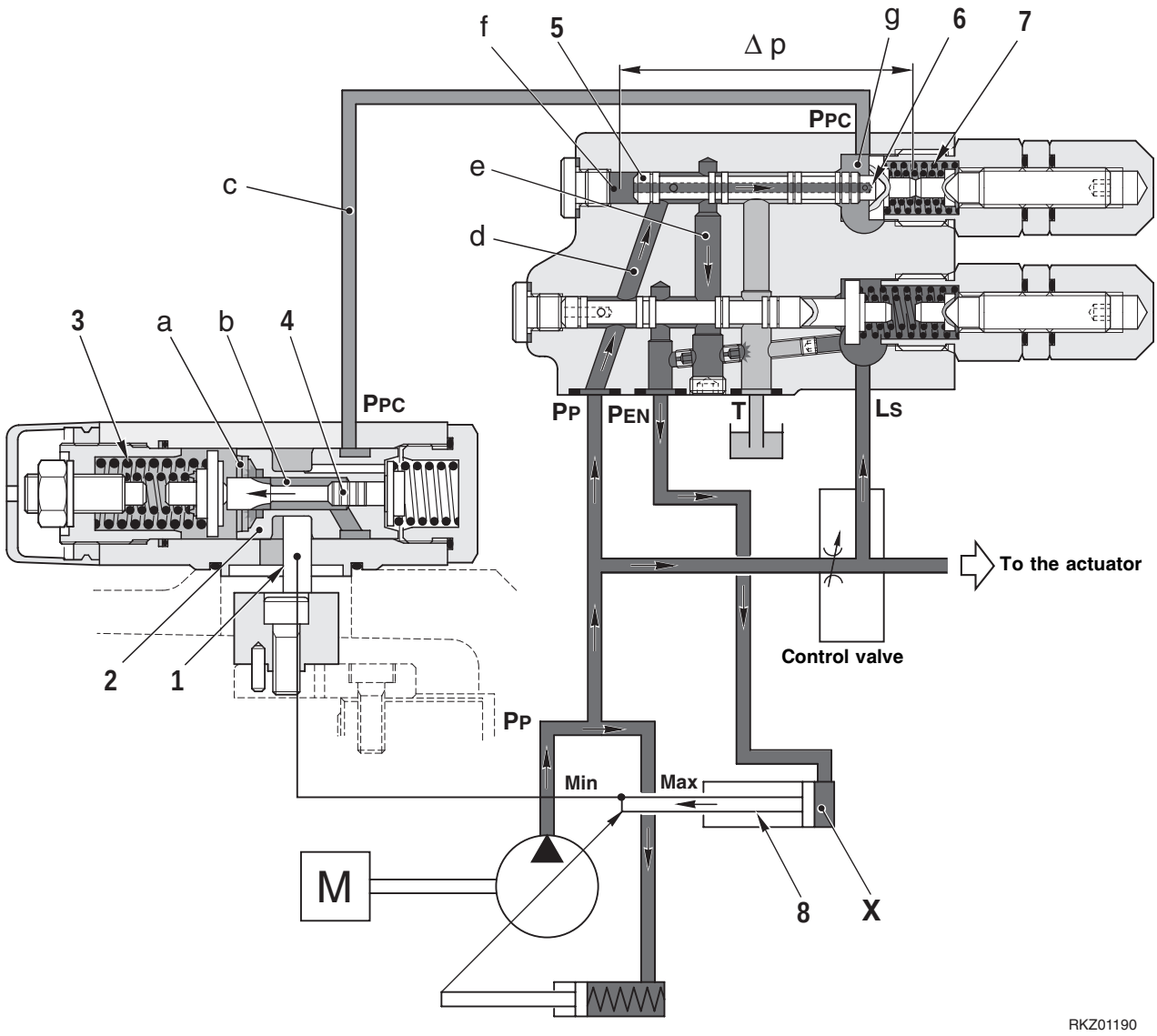


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OPERATION

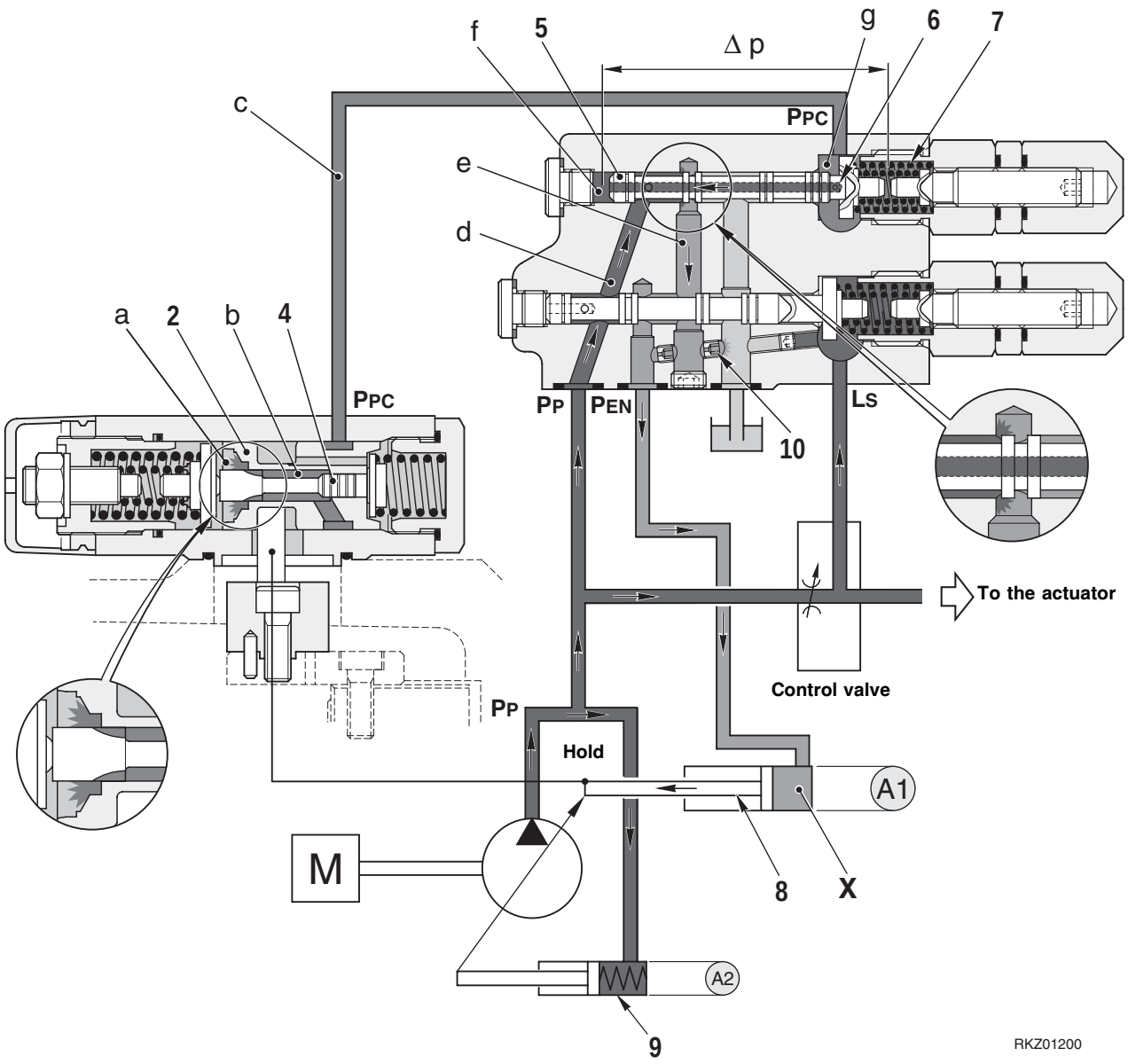
1. When the load on the actuators is heavy (high pump delivery pressure)



- When a higher delivery is required, the **LS** valve receives a signal from the control valve to bring the pump up to maximum displacement.
  When the swash plate moves it also moves the bushing (2) joined to it (by the pin (1)), which releases the spring (3). As the pressure of the actuators increases, pressure also increases in the delivery line **c**. When the calibrated setting of the spring (3) is reached, the piston rod (4) is thrust to the left (←) and the passage between chamber b and the pump drainage chamber a is opened.
- The opening of the passage between the chambers **b** and **a** generates a flow of oil and hence, due to the calibrated hole (6), a **ΔP** is generated between chambers **f** and **g** at the sides opposite the spool (5). (**ΔP = PP – PPC**)
- When the value of **PP** exceeds the value of the spring loading (7) the spool (5) moves to the right (→), opening the passage between the delivery lines d and e and sending the pump pressure PP towards the servo-cylinder (8).
- The pressure **PP** introduced into chamber **X** of the cylinder (8) pushes it towards the minimum angle of the swash plate (←).

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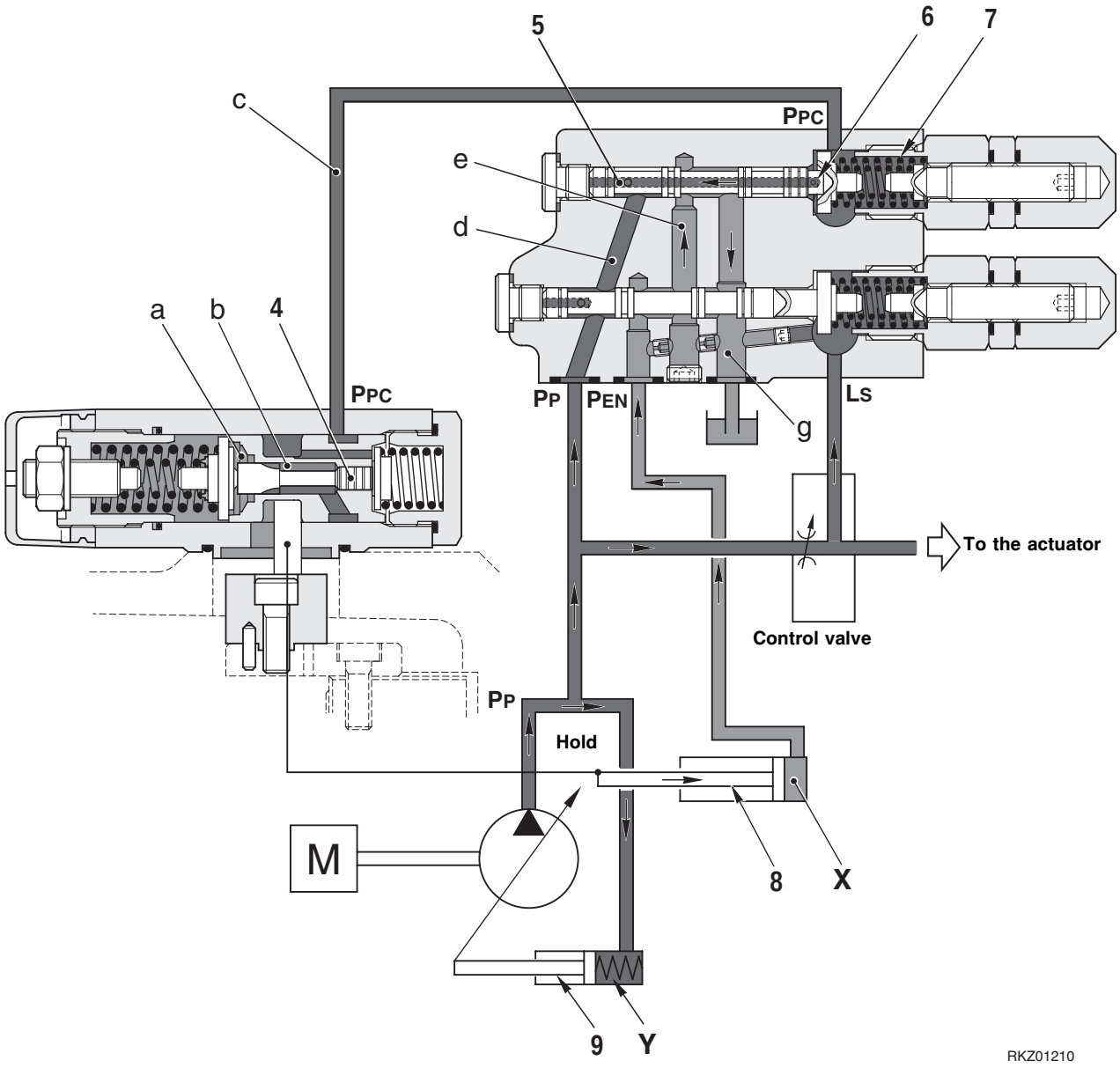
2. When equilibrium has been reached



- When the piston (8) is pushed to the left (←) the bushing (2) is also moved.
  The oil flow between the chambers **b** and **a** is reduced and the **PPC** pressure tends to approach the **PP** pressure value.
  The **ΔP** decreases and the spool (5) is pushed to the left (←) by the force of the spring (7).
- Equilibrium is reached when the force generated by the **PP** pressure, the force generated by the **PPC** pressure, and the force of the spring (7) are all balanced. (The force generated by **PP** = the force generated by the **PPC** + the spring force (7)).
- In this condition the passage from chamber **d** to chamber **e** remains only slightly open in order to maintain pressure in chamber **e**. A flow of oil is introduced into the cylinder (8) at a pressure that balances the force generated by the pump pressure **PP** acting on the cylinder (9). (**PEN** x **A1** = **PP** x **A2**)
- The stability of this equilibrium is generated by a continuous stabilized flow from the throttle (10).

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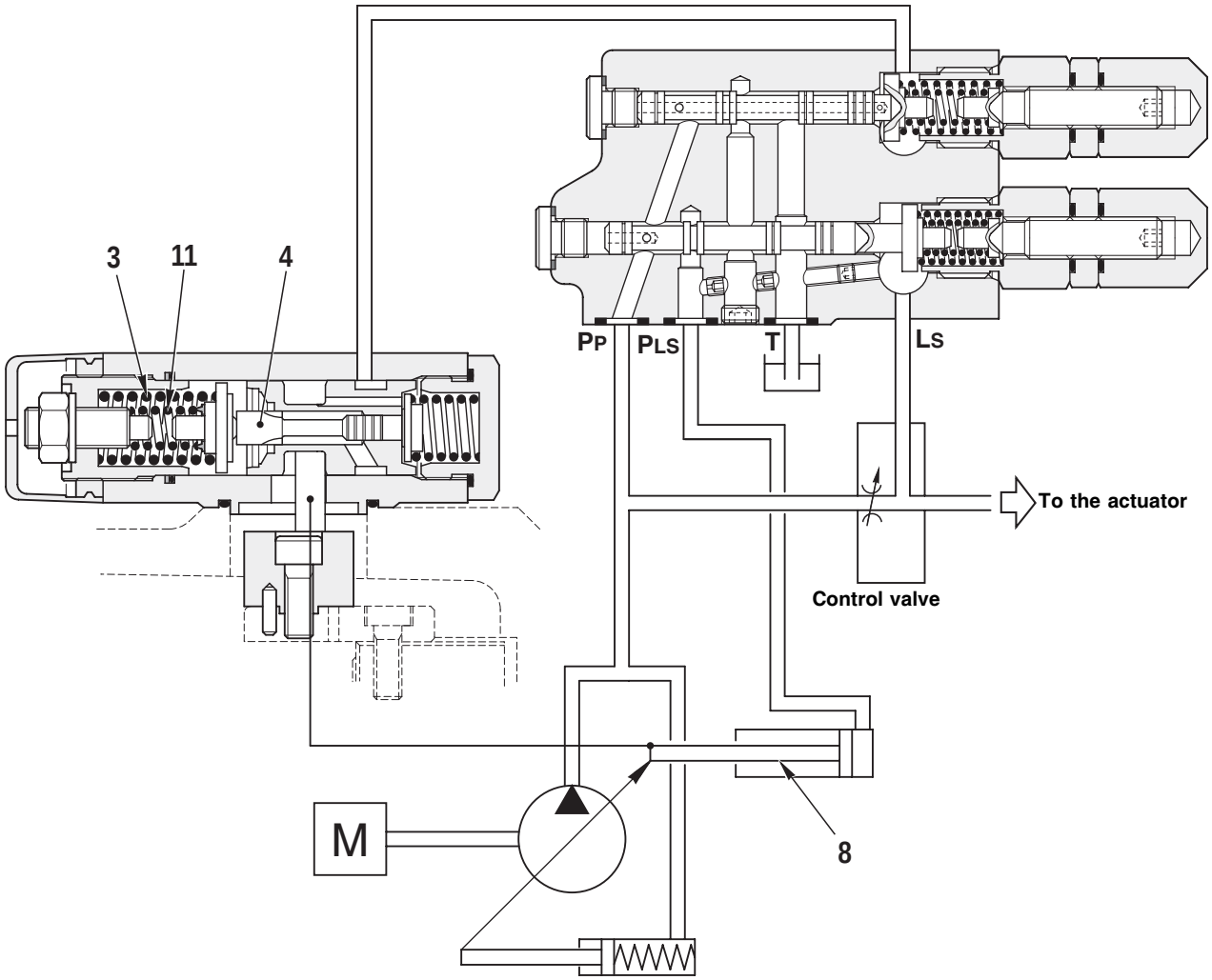
3. When the load on the actuators decreases (pump delivery pressure drops)



- When the load on the actuators diminishes and the pump delivery pressure **PP** drops, the **PPC**. pressure also drops.
- The reduction in the **PPC** causes the spool (4) to move and the passage between chambers **b**, **d** and **a** is closed.
  The **PPC** pressure and the **PP** pressure of the pump are equalised due to the interruption of the oil flow through the calibrated hole (6) and hence the DP becomes zero ($\Delta P = P_P - P_{PC} = 0$).
- The spring (7) pushes the spool (5) to the left (←), closing the passage between the chambers **d** and **e** and opening the passage between chambers **e** and **g**.
- The pressurized oil present in chamber **X** of the servo-cylinder (8) passes through chambers **e** and **g** and reaches the pump drainage chamber, so that the pressure in chamber **X** of the servo-cylinder (7) becomes equal to the drainage pressure.
- Therefore the servo-piston (7) is caused to move by the **PP** pressure in chamber **Y** of the servo-cylinder (9), i.e. in the direction of the increase in the angle of the swash plate.

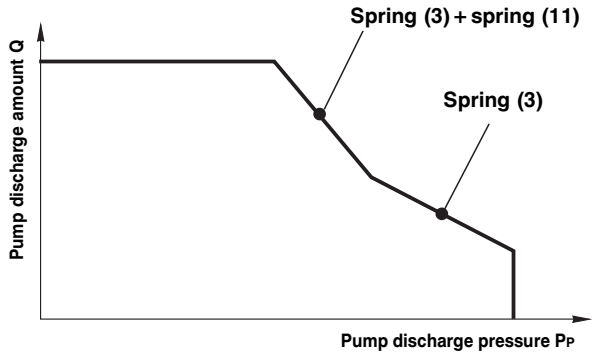
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4. The function of the spring



RKZ01220

- The loading on the springs (3) and (11) of the **PC** valve changes in proportion to the angle of inclination of the pump swash plate.
- The compression of the spring (3) varies with the movements of the servo-piston (8).
- When the piston (8) moves to the left (←) the spring (3) is compressed.
  If the piston (8) moves even further to the left (←), the spring (11) comes into action to increase the loading.
  In other words, the overall loading of the springs is varied by the piston (8), which either compresses or releases them.
- The pump absorption torque curve, which indicates the relationship between the pump delivery pressure **PP** and the delivery **Q**, is a broken line (as illustrated in the diagram).



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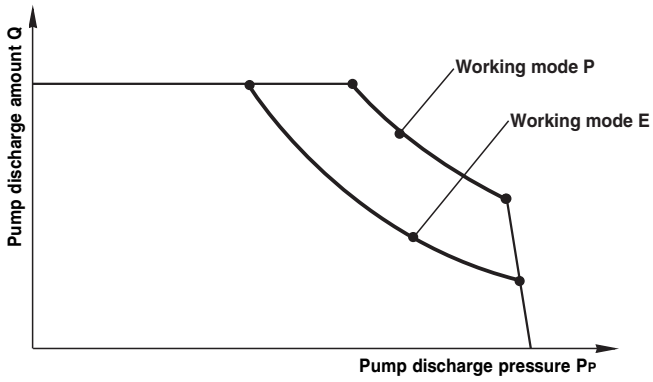
- The position in which the piston (8) stops, i.e. the pump absorption torque, is determined by the position in which the **PPC** pressure applied to the spool (4) is balanced by the force exerted by the springs (3) and (11).
- In practice, as the pump delivery pressure **PP** increases, the delivery **Q** decreases, and as the pressure **PP** diminishes the pump delivery **Q** increases.

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WORKING MODE SOLENOID VALVE

FUNCTION

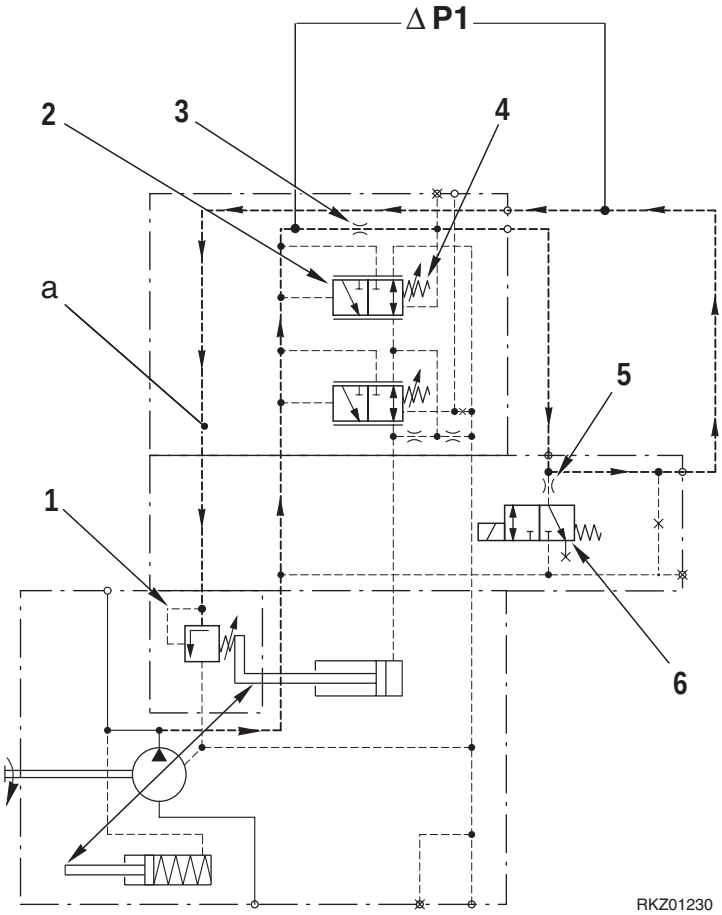
- Calibration of the pump absorption torque is normally performed for the working mode **E**.
  When the solenoid valve of the working mode is commutated the absorbed power of the pump is increased, as indicated by the working mode curve.



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OPERATION

1. WORKING MODE E (Economy)

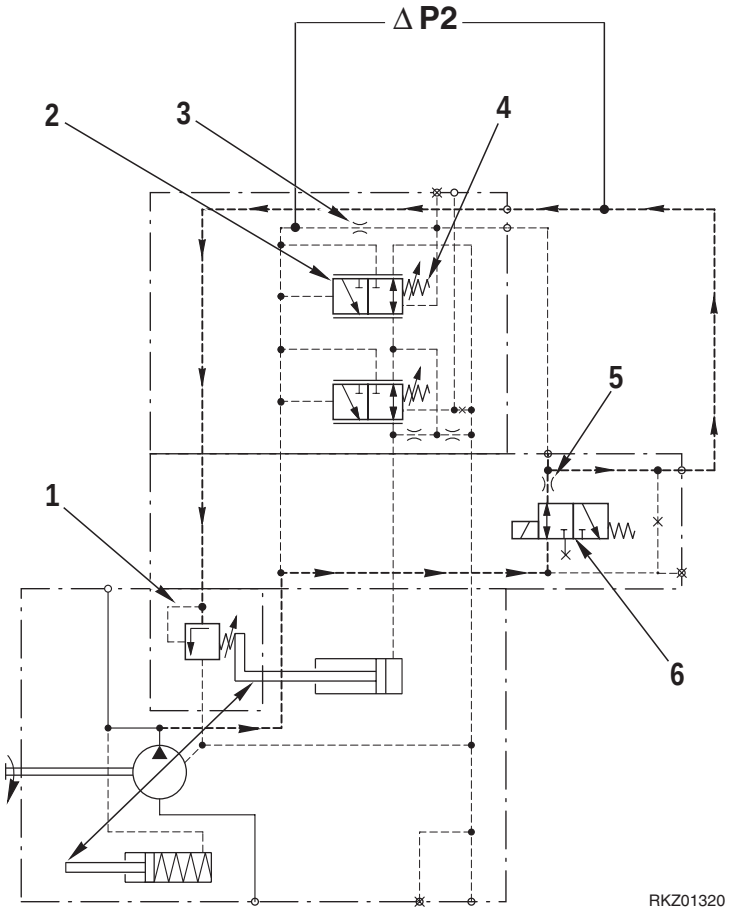


RKZ01230

- During normal operation (Working mode **E**), the **PC** valve intervenes when a ΔP_1 is generated equal to the loading on the spring (4).
- The ΔP_1 is generated by the calibrated hole (3) in the spool of the **PC** valve (2) when, at a determined pump delivery pressure P_1, the valve (1) puts the delivery line a into discharge, thus generating a flow F_1 in the delivery line **a**.

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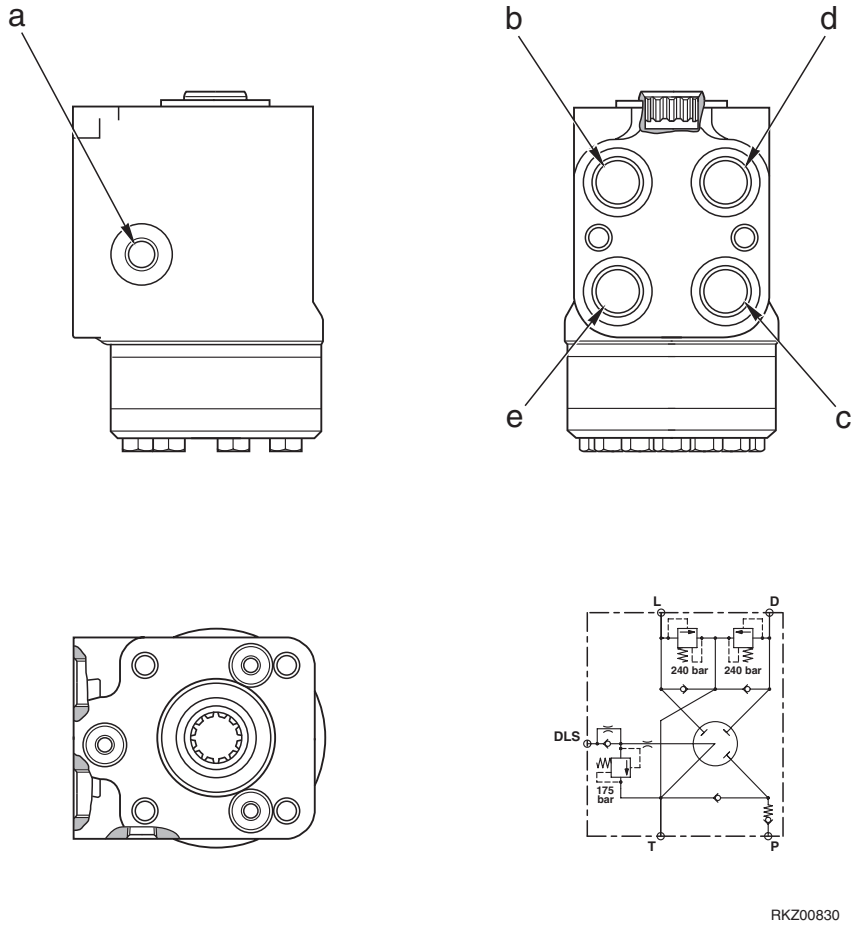
2. WORKING MODE P (Power)



- When the solenoid valve (6) is commutated (Working Mode **P**) the pressurized oil coming from the pump changes its route and passes through the throttle (5), which has a larger diameter than the calibrated hole (3).
- Because the throttle (5) has a larger diameter, the **ΔP2** generated is less than is needed to overcome the force generated by the spring (4). The spool of the **Pc** valve (2) is therefore pushed to the left (←) by the force of the spring (4).
- This shift obliges the pump to increase displacement and hence the delivery (See «PC VALVE: 3. When the load on the actuators decreases» third paragraph).
- The increase in flow causes an increment of the **ΔP2** which, when the loading value of the spring is reached, allows the spool to shift to the right (→).
- The pump starts to work in normal fashion once again, and all the valves recommence normal functioning.

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HYDRAULIC STEERING SYSTEM



a. Port LS - From the shovel control valve (Port DLS)
b. Port T - To the hydraulic oil tank
c. Port L - To the steering cylinder (Port a)
d. Port R - To the steering cylinder (Port b)
e. Port P - From the shovel control valve (Port D)

TECHNICAL DATA

Steering unit type: LAGCSDS160P
Displacement: 160 cc/kgm

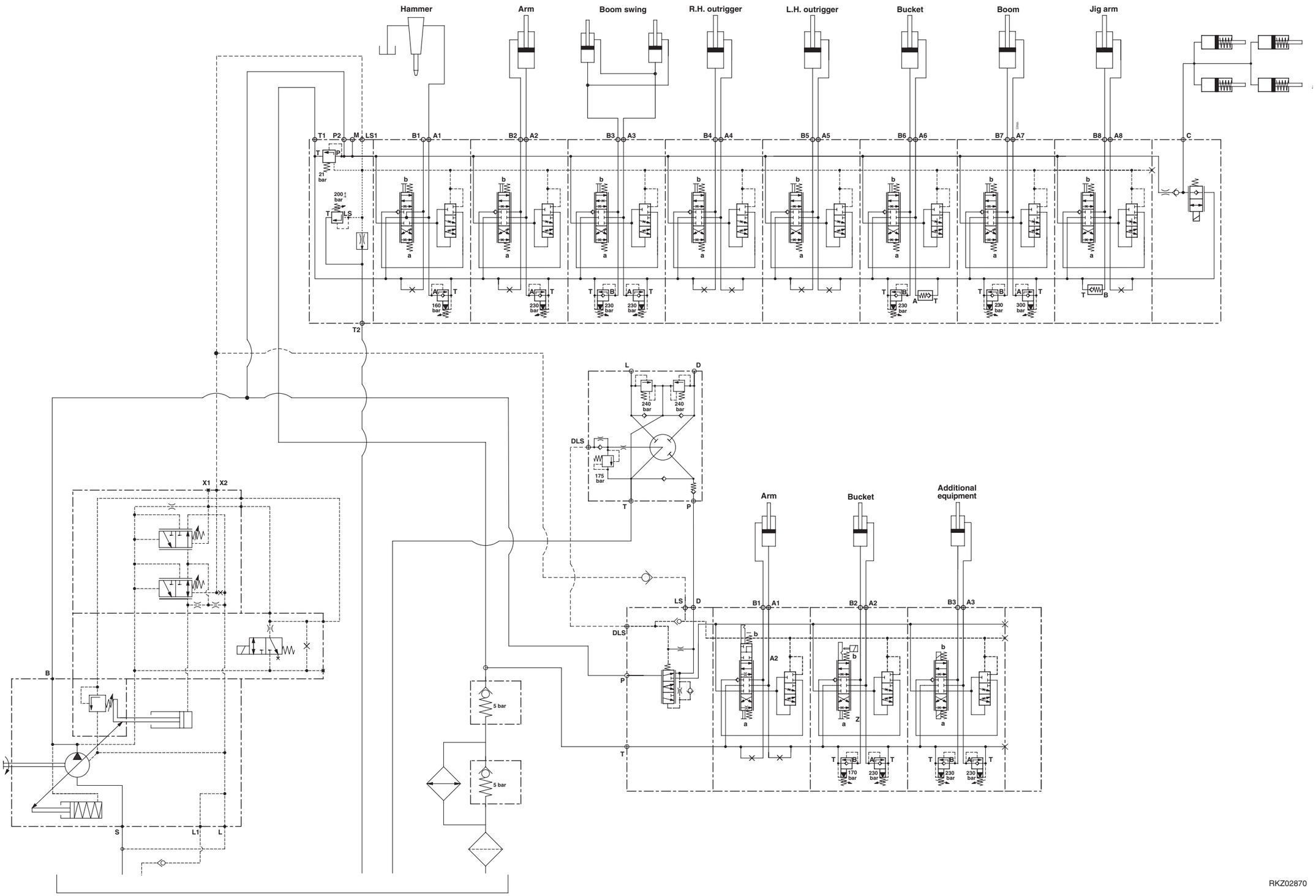
OPERATION

- The steering unit is composed of a control valve and a rotating oil dispenser, and is of the hydrostatic type.
- When the steering wheel is turned, the control valve sends oil from the pump P2 (by means of the rotating oil dispenser) to one of the sides of the steering cylinder.
  The rotating dispenser ensures that the volume of oil supplied to the cylinder is proportionate to the angle of rotation of the steering wheel.
- In the event of malfunction, the oil dispenser will function automatically as a hand-pump, thus guaranteeing emergency steering.

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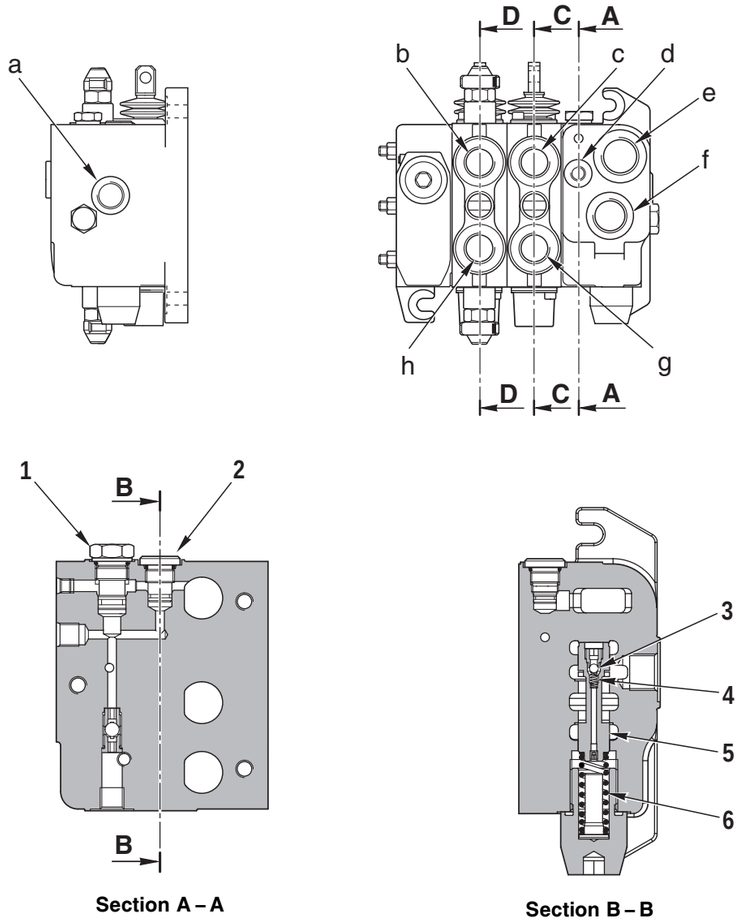
HYDRAULIC CIRCUIT



https://truckmanualshub.com/

SHOVEL CONTROL VALVE

2-Spool



Section A – A

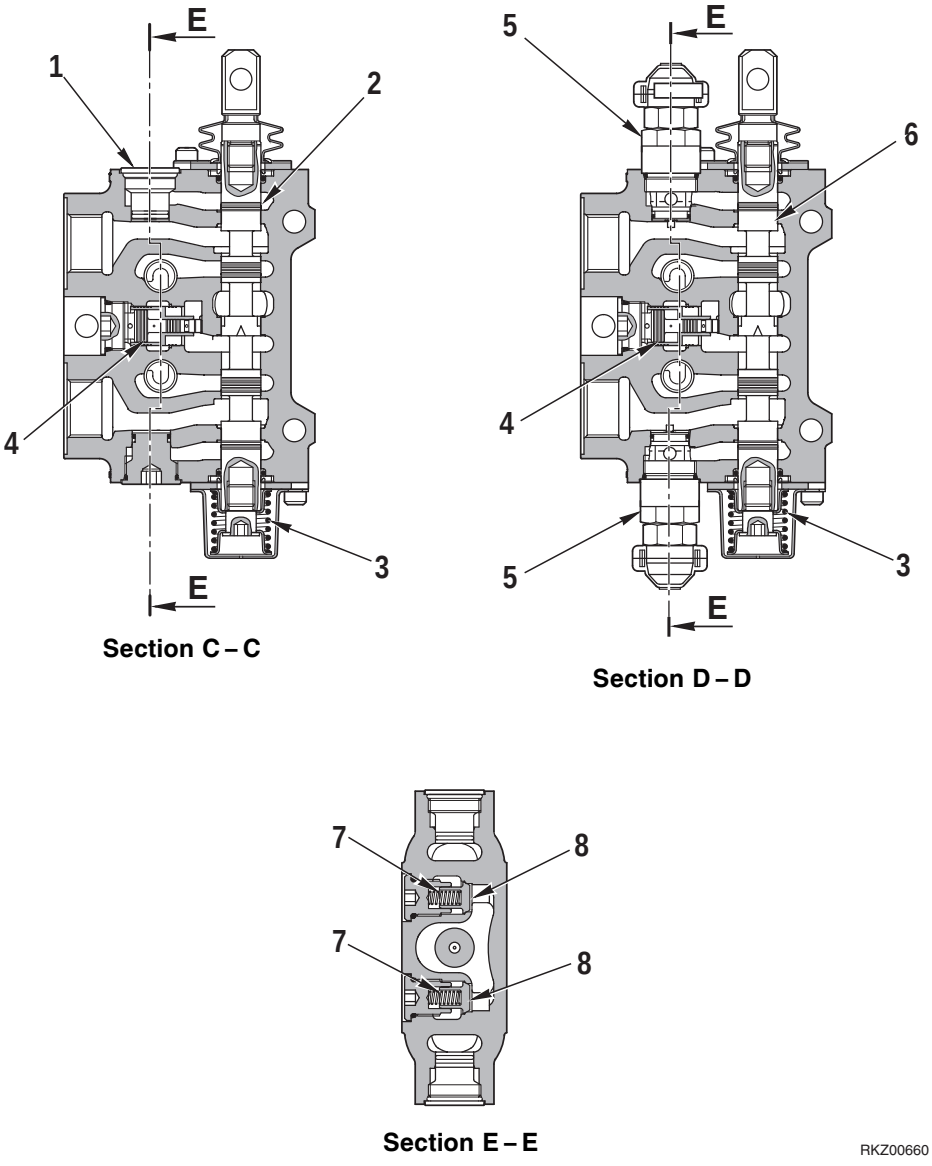
Section B – B

RKZ01080

a. Port D - To the hydraulic steering unit (Port P)
b. Port A2 - To the bucket cylinders (Head side)
c. Port A1 - To the shovel-raising cylinders (Base side)
d. Port LS - To the pump (Port X2)
e. Port T - To the hydraulic oil tank
f. Port P - From the pump (Port B)
g. Port B1 - To the shovel-raising cylinders (Head side)
h. Port B2 - To the bucket cylinders (Base side)

1. Plug
2. Plug
3. Ball
4. Spring
5. Priority valve piston rod
6. Priority valve spring

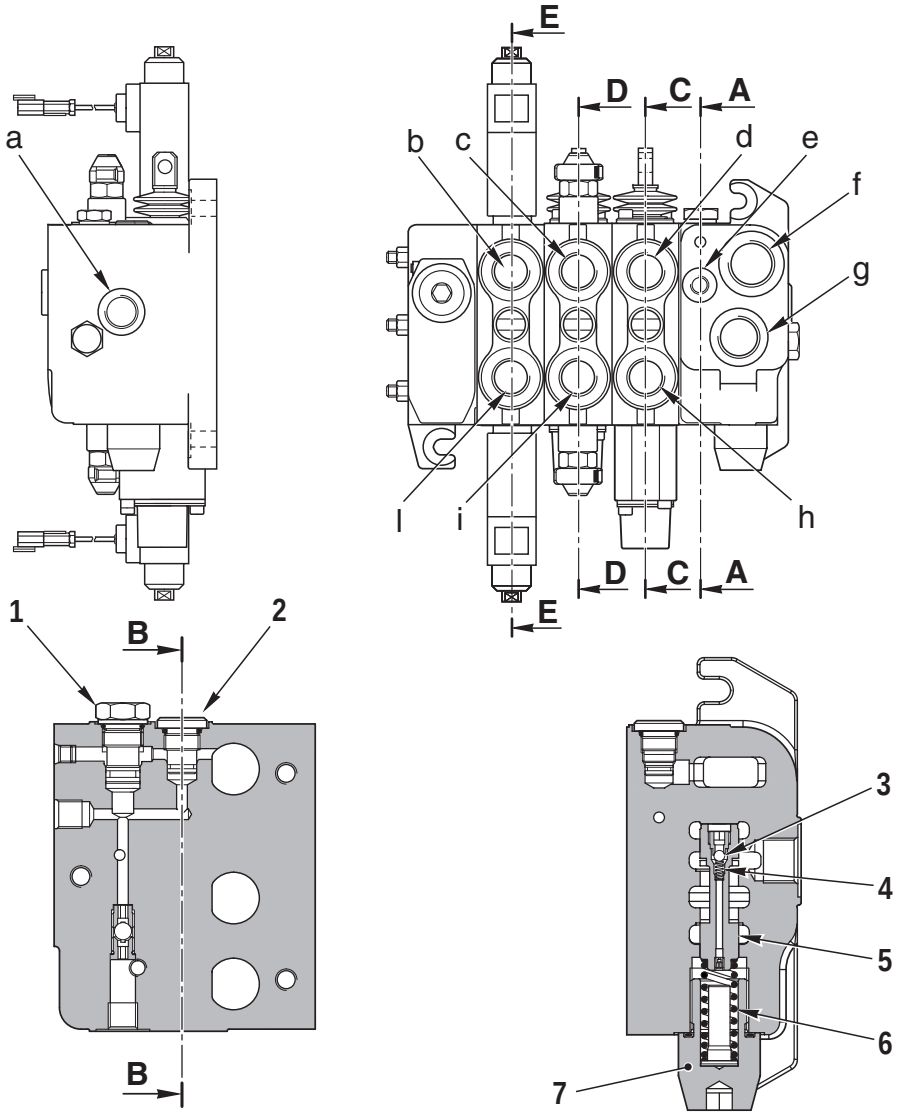
https://truckmanualshub.com/



1. Plug
2. Raising command spool
3. Spool return spring
4. Compensator
5. Antishock/anticavitation valve
6. Bucket dump command spool
7. Spring
8. Check valve

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3-spool control valve



Section A – A

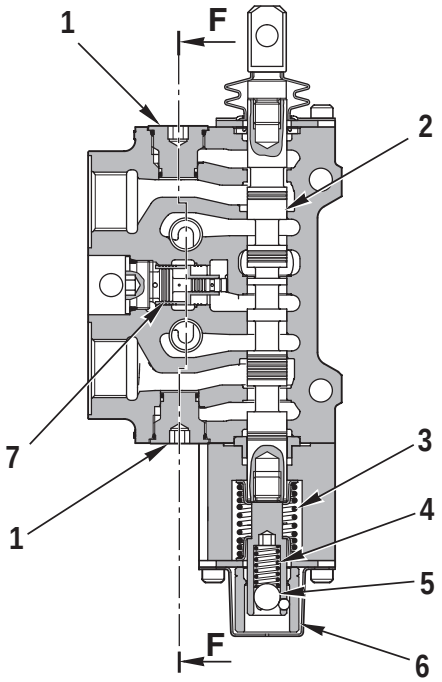
Section B – B

RKZ01070

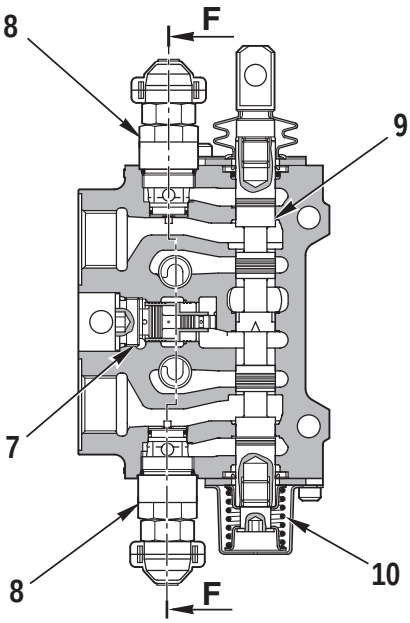
a. Port D - To the hydraulic steering unit (Port P)
b. Port A3 - To the auxiliary equipment (Left side)
c. Port A2 - To the bucket cylinders (Head side)
d. Port A1 - To the shovel-raising cylinders (Base side)
e. Port LS - To the pump (Port X2)
f. Port T - To the hydraulic oil tank
g. Port P - From the pump (Port B)
h. Port B1 - To the shovel-raising cylinders (Head side)
i. Port B2 - To the bucket cylinders (Base side)
l. Port B3 - To the auxiliary equipment (Right side)

1. Plug
2. Plug
3. Ball
4. Spring
5. Priority valve piston rod
6. Priority valve spring
7. Plug

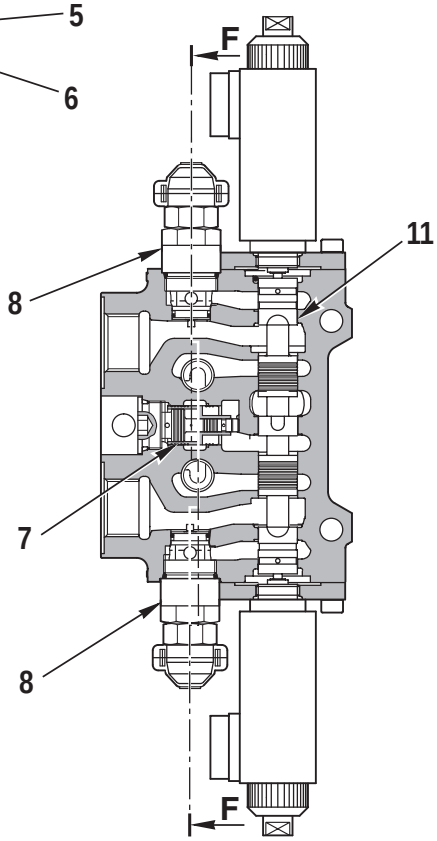
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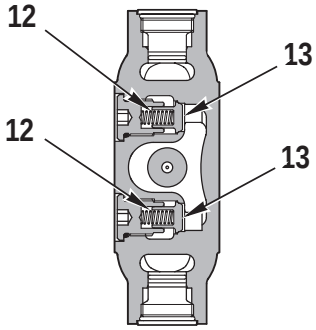
Section C – C



Section D – D



Section E – E



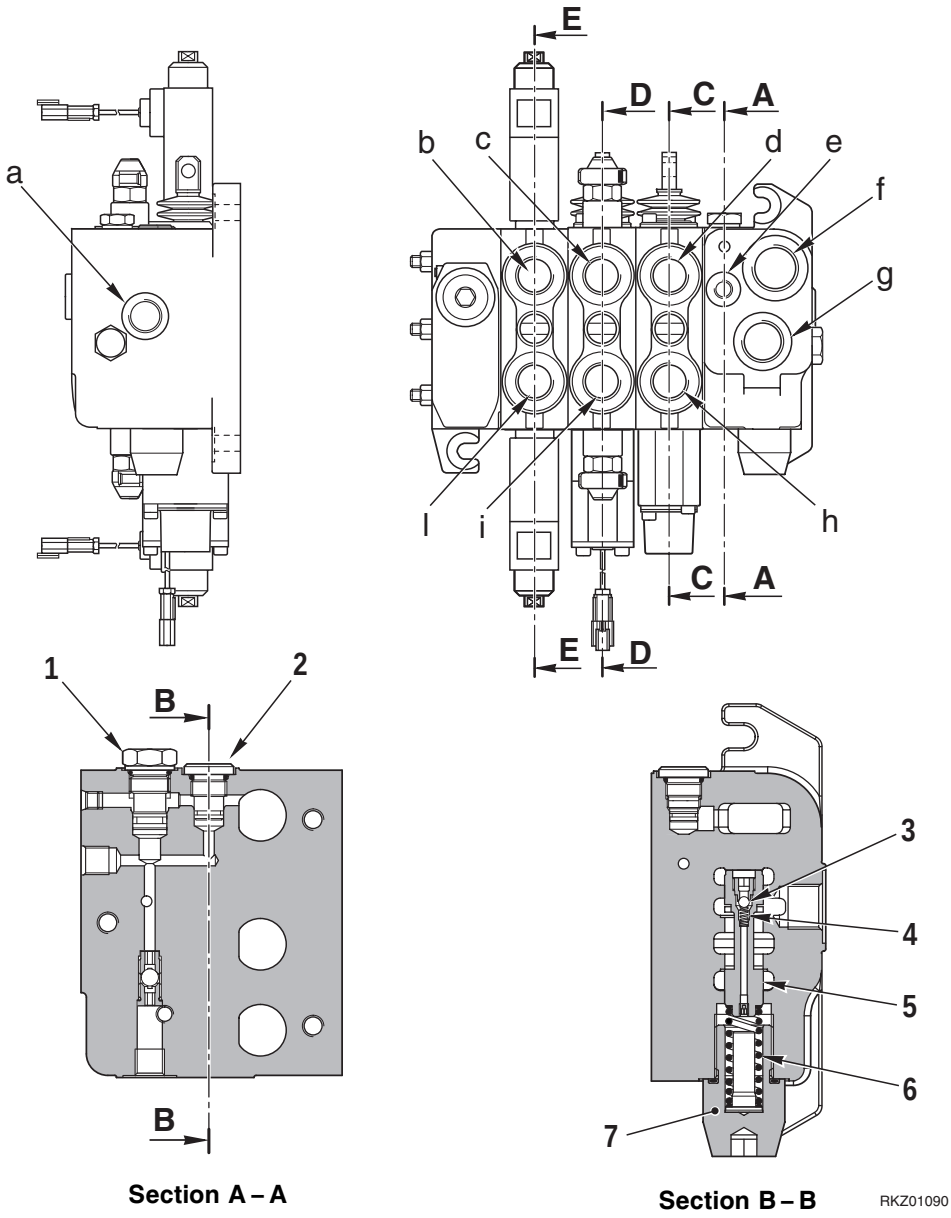
Section F – F

RKZ00690

1. Plug
2. Raising command spool
3. Spool return spring
4. Spring
5. Ball
6. Ball
7. Compensator
8. Antishock/anticavitation valve
9. Bucket dump command spool
10. Spool return spring
11. Optional equipment command spool
12. Spring
13. Check valve

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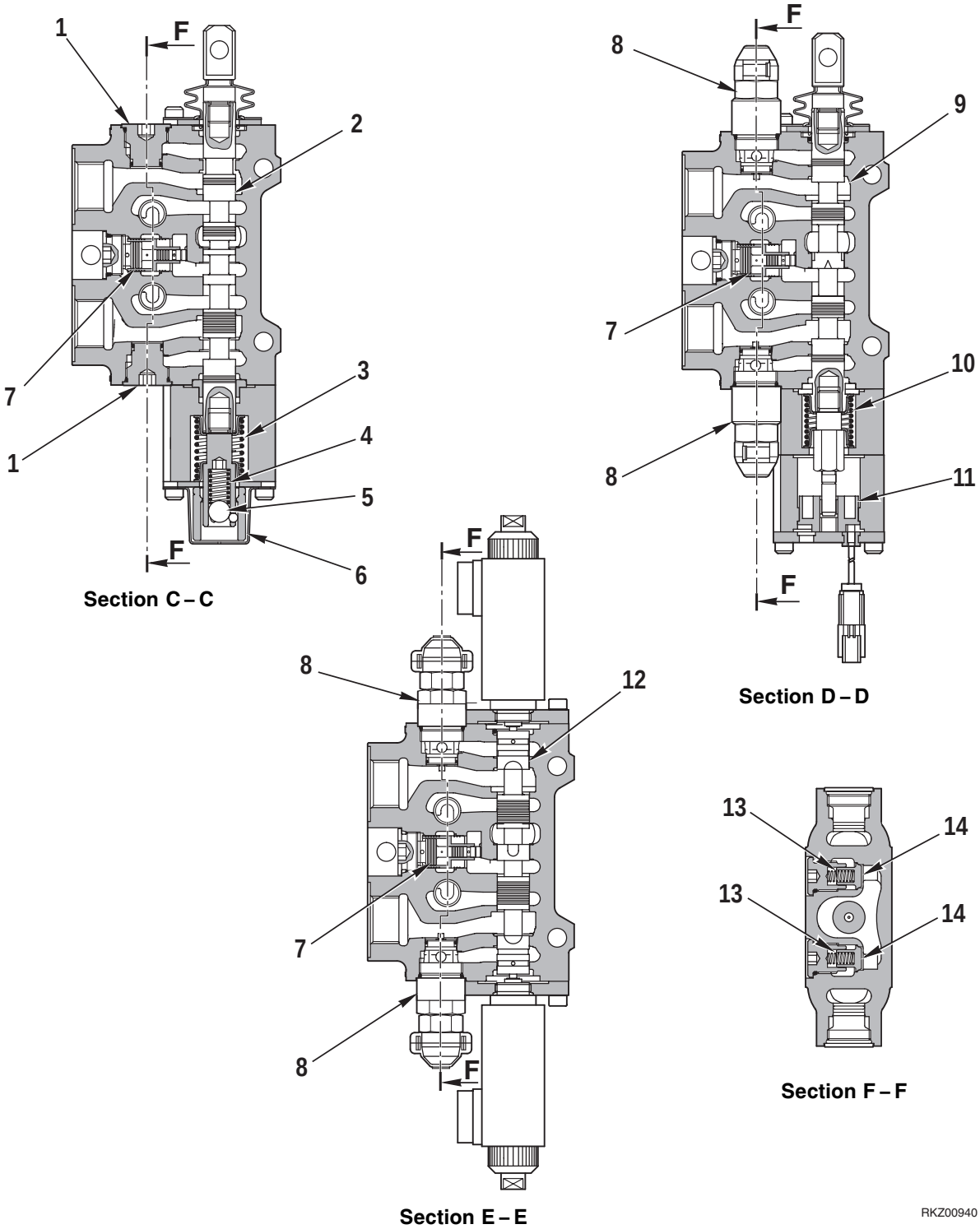
3-spool control valve (with return to dig)



a. Port D - To the hydraulic steering unit (Port P)
b. Port A3 - To the auxiliary equipment (Left side)
c. Port A2 - To the bucket cylinders (Head side)
d. Port A1 - To the shovel-raising cylinders (Base side)
e. Port LS - To the pump (Port X2)
f. Port T - To the hydraulic oil tank
g. Port P - From the pump (Port B)
h. Port B1 - To the shovel-raising cylinders (Head side)
i. Port B2 - To the bucket cylinders (Base side)
l. Port B3 - To the auxiliary equipment (Right side)

1. Plug
2. Plug
3. Ball
4. Spring
5. Priority valve piston rod
6. Priority valve spring
7. Plug

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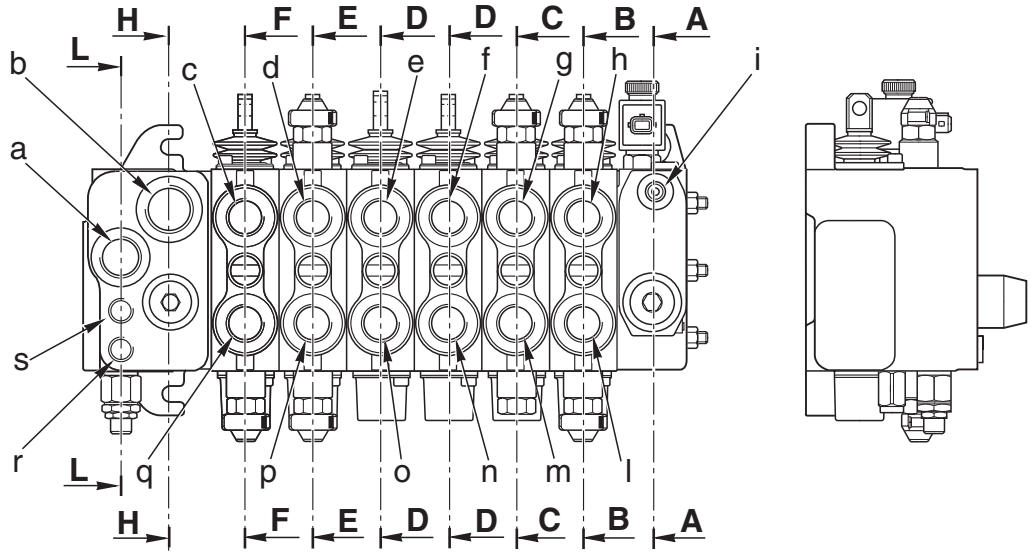


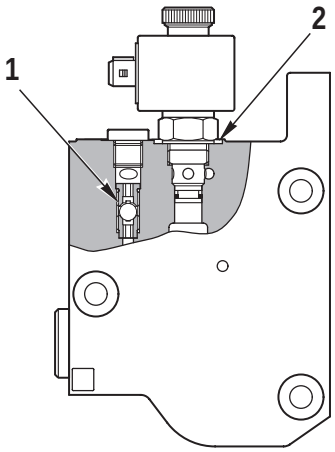
1. Plug
2. Raising command spool
3. Spool return spring
4. Spring
5. Ball
6. Ball
7. Compensator
8. Antishock/anticavitation valve
9. Bucket dump command spool
10. Spool return spring
11. Coil
12. Optional equipment command spool
13. Spring
14. Check valve

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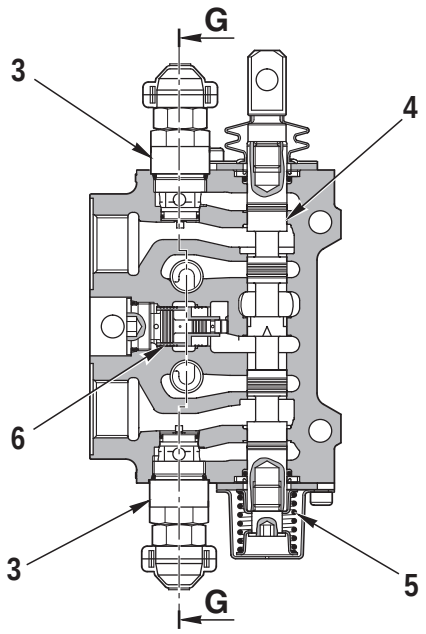
BACKHOE CONTROL VALVE

6-spool





Section A – A

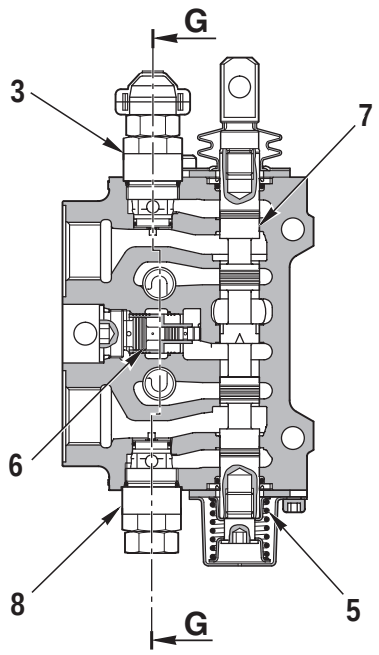


Section B – B

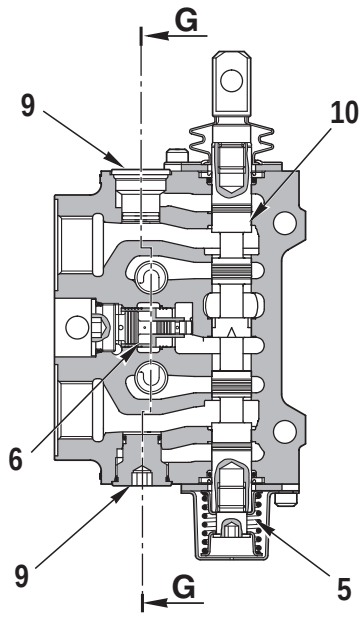
RKZ00230

a. Port P - From the pump (Port B)
b. Port T - To the hydraulic oil tank
c. Port B1 - To the arm cylinder (Base side)
d. Port B2 - To the arm LH swing cylinder (Base side)
e. Port B3 - To the RH outrigger cylinder (Base side)
f. Port B4 - To the LH outrigger cylinder (Base side)
g. Port B5 - To the bucket cylinder (Base side)
h. Port B6 - To the boom cylinder (Head side)
i. Port C - To the backhoe backframe lock cylinders
l. Port A6 - To the boom cylinder (Base side)
m. Port A5 - To the bucket cylinder (Head side)
n. Port A4 - To the LH outrigger cylinder (Head side)
o. Port A3 - To the RH outrigger cylinder (Head side)
p. Port A2 - To the RH boom swing cylinder (Base side)
q. Port A1 - To the arm cylinder (Head side)
r. Port T1 - To the hydraulic oil tank
s. Port LS - To the pump (Port X2)

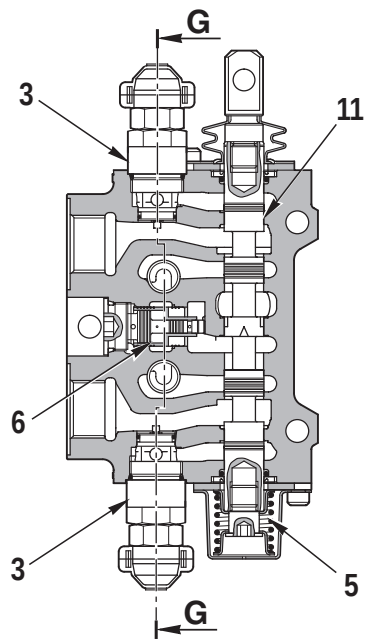
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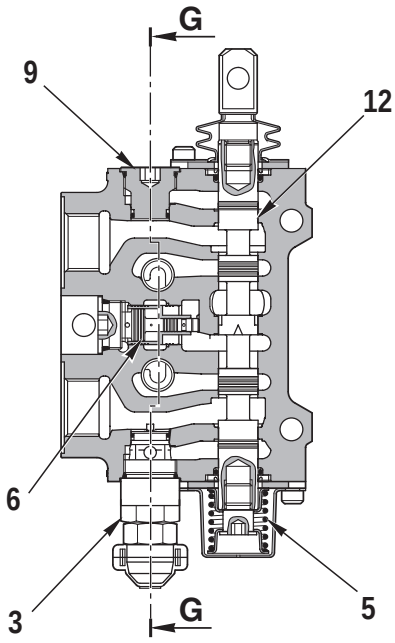
Section C – C



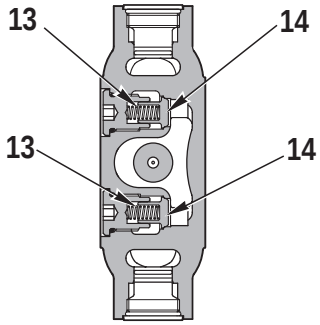
Section D – D



Section E – E



Section F – F

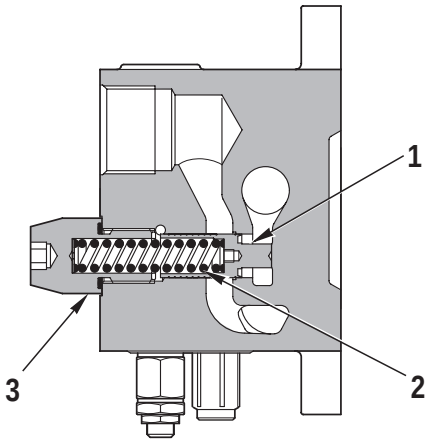


Section G – G

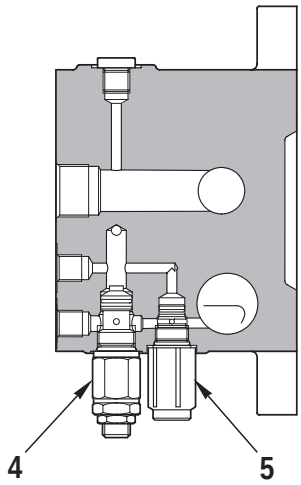
RKZ00760

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

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Section H – H



Section L – L

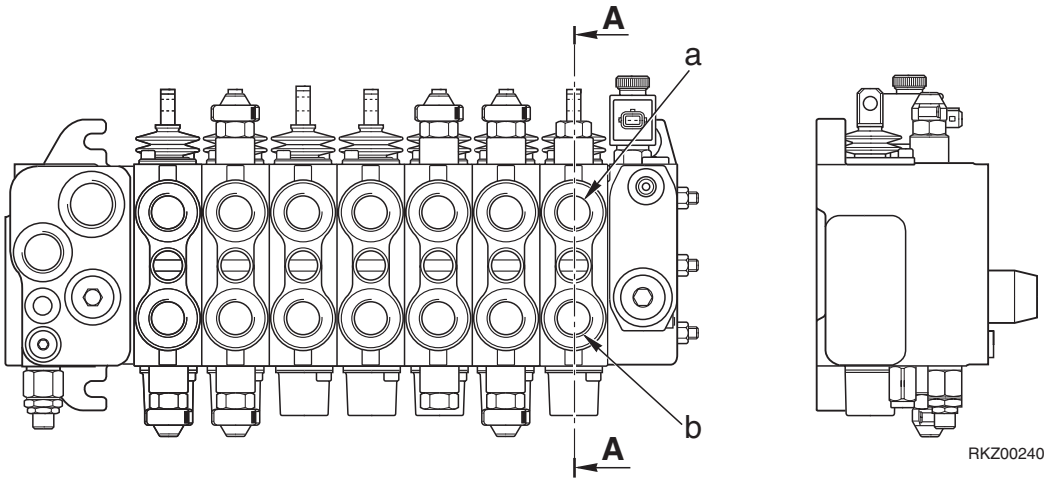
RKZ00790

1. Valve
2. Spring
3. Plug
4. Pressure cut-out valve
5. Unloading valve

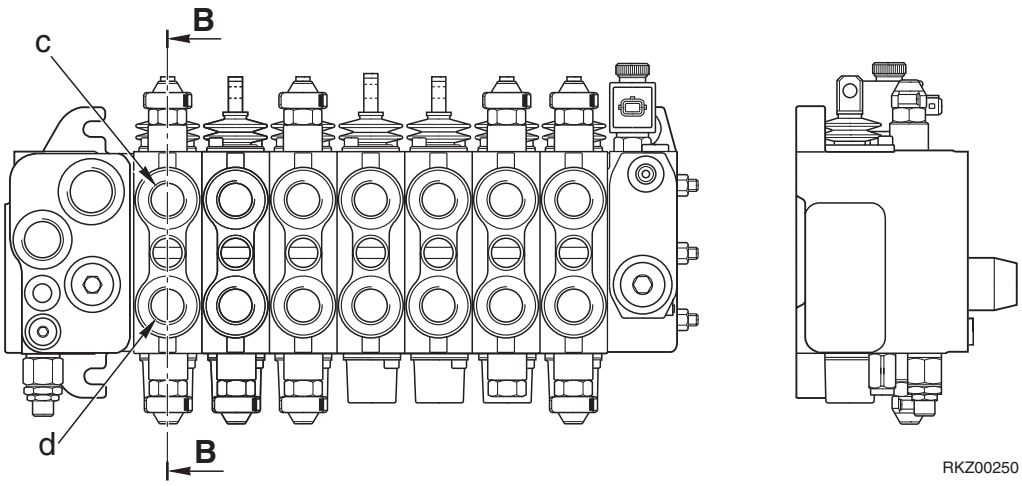
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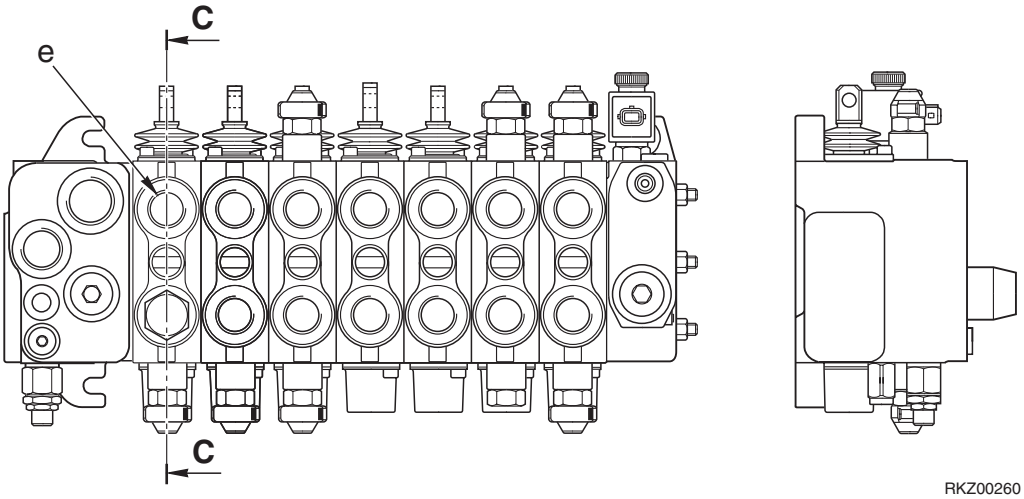
7-spool control valve



RKZ00240



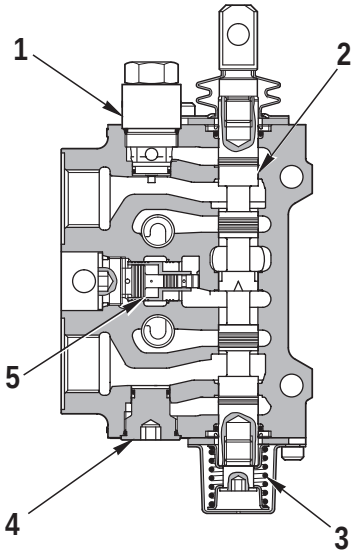
RKZ00250



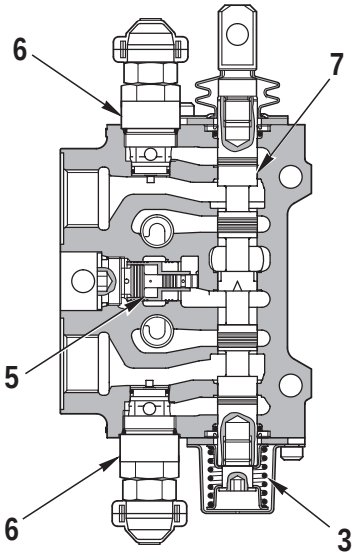
RKZ00260

a. Port B7 - To the jig arm cylinder (Base side)
b. Port A7 - To the jig arm cylinder (Head side)
c. Port B7 - To the side digging boom cylinder (Base side)
d. Port A7 - To the side digging boom cylinder (Head side)
e. Port B7 - To the hydraulic hammer (Left side)

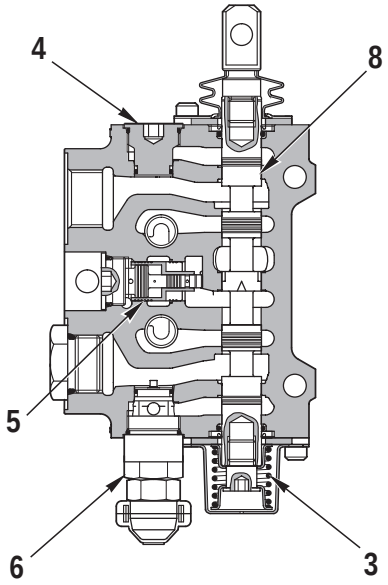
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Section A – A



Section B – B



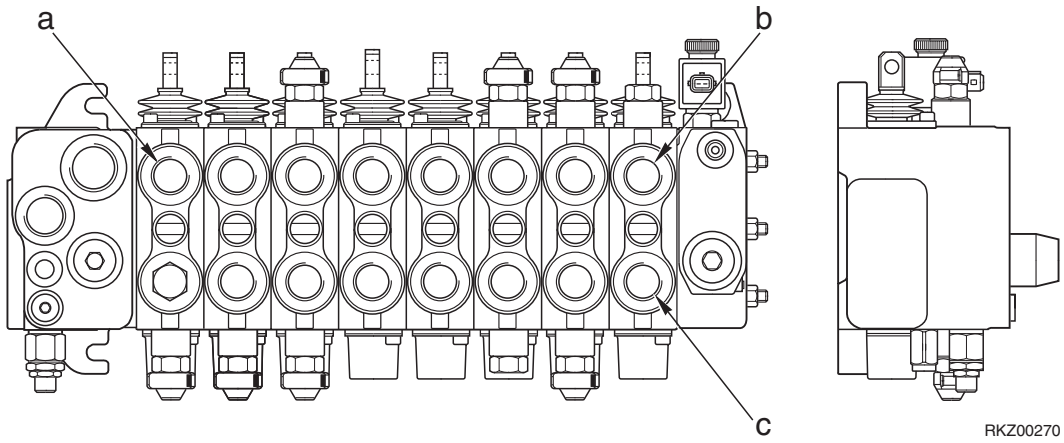
Section C – C

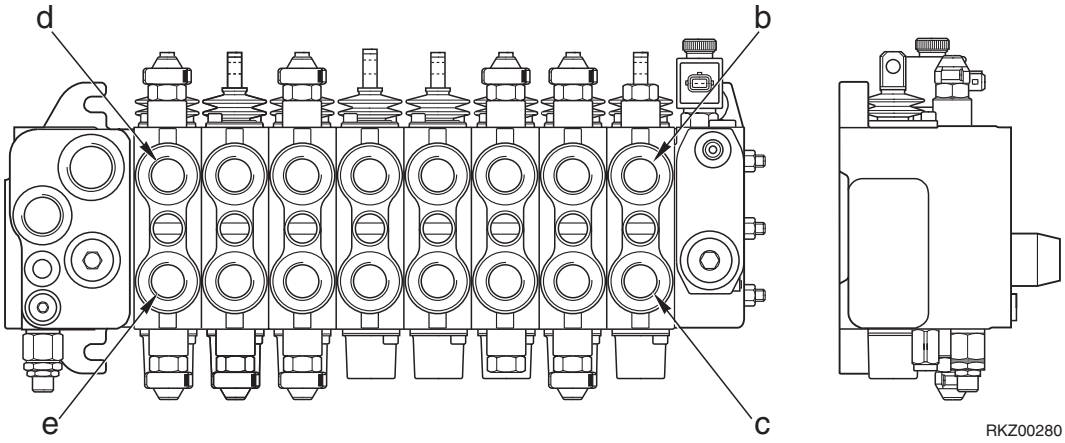
RKZ00960

1. Anticavitation valve
2. Jig arm command spool
3. Spool return spring
4. Plug
5. Compensator
6. Anti-shock/anticavitation valve
7. Side digging boom command spool
8. Hammer command spool

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8-spool control valve





a. Port B7 - To the hydraulic hammer (L.H. side)
b. Port B8 - To the jig arm cylinder (Base side)
c. Port A8 - To the jig arm cylinder (Head side)
d. Port B7 - To the side digging boom cylinder (Base side)
e. Port A7 - To the side digging boom cylinder (Head side)

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CLSS

1. DESCRIPTION

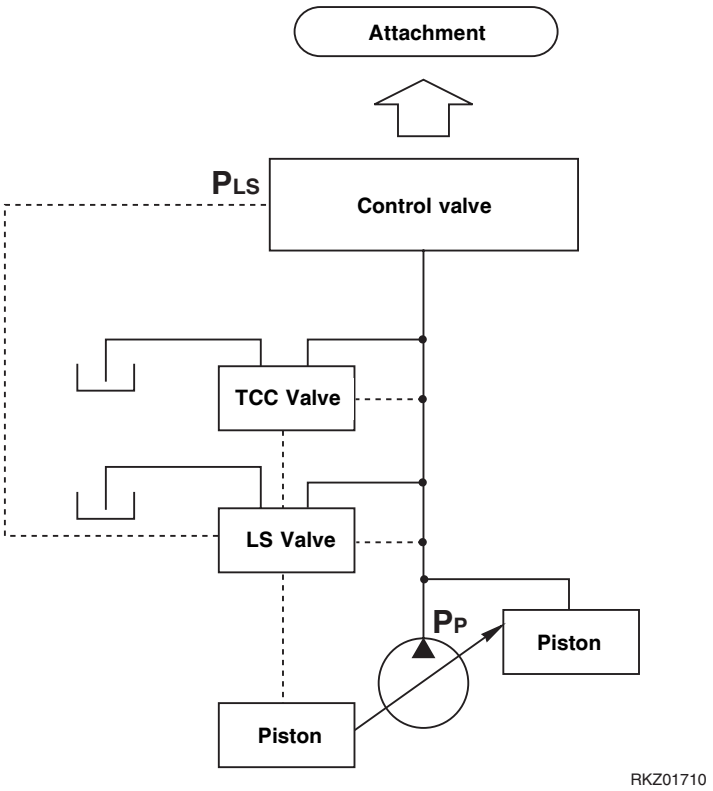
CHARACTERISTICS

The term **CLSS** means Closed Center Load Sensing System, which has the following characteristics:

a) High precision control that is independent of the load applied to the movement;
b) High precision control of digging action even during delicate manoeuvres;
c) Ability to perform complex operations, guaranteed by control of oil flow in function of the aperture surfaces of the shuttles;
d) Energy savings guaranteed by control of pump delivery.

STRUCTURE

- The **CLSS** system includes the variable flow pump, the control valve and the working equipment.
- The pump includes the main pump, the **TCC** valve and the **LS** valve.



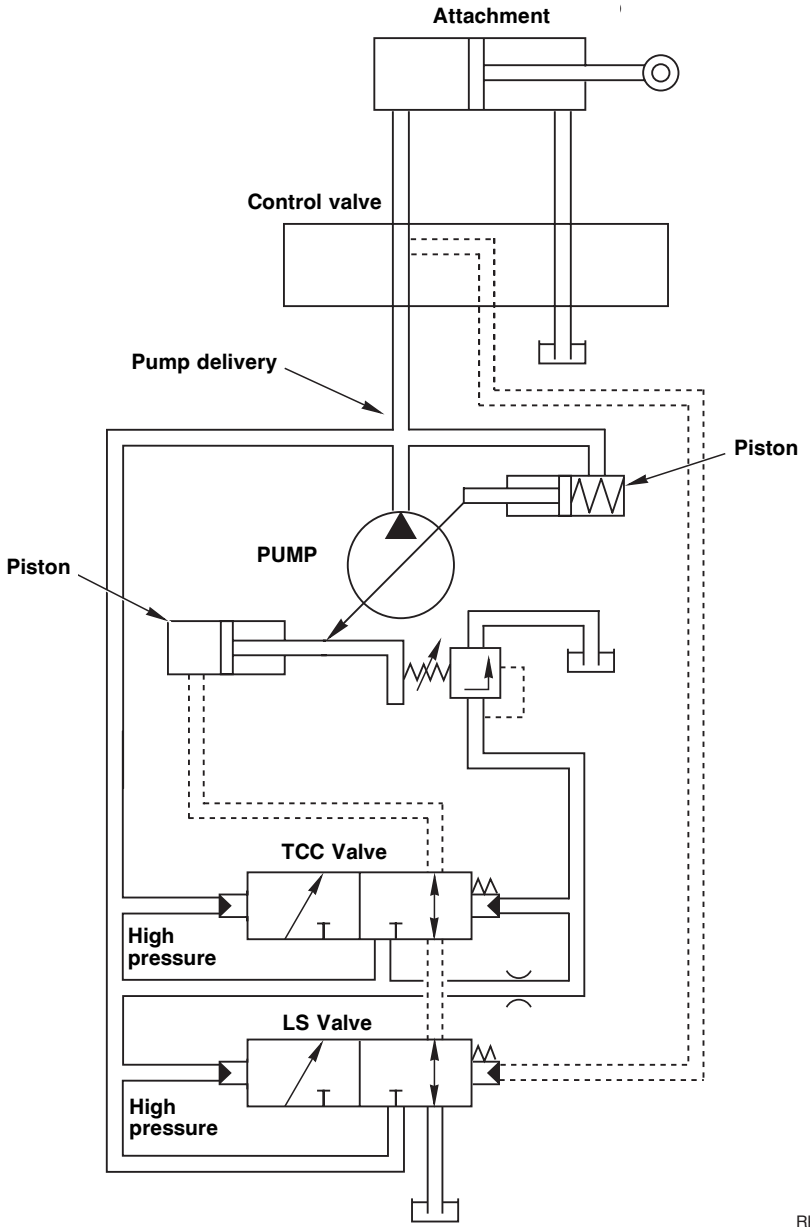
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2. OPERATING PRINCIPLES

1. Control of the angle of the pumping plate.

- The angle of the swash plate (and hence the pump delivery) is controlled in such a way that the differential pressure ΔP_{LS} between the delivery pressure P_P of the pump and the pressure P_{LS} at the outlet of the control valve towards the actuator is maintained at a constant value. (ΔP_{LS} = pump delivery pressure P_P – pressure P_{LS} of delivery to the actuator).
- If the differential pressure ΔP_{LS} becomes lower than the set pressure of the **LS** valve, the angle of the swash plate increases (delivery increasing).
  If the differential pressure ΔP_{LS} increases, the angle of the swash plate decreases.

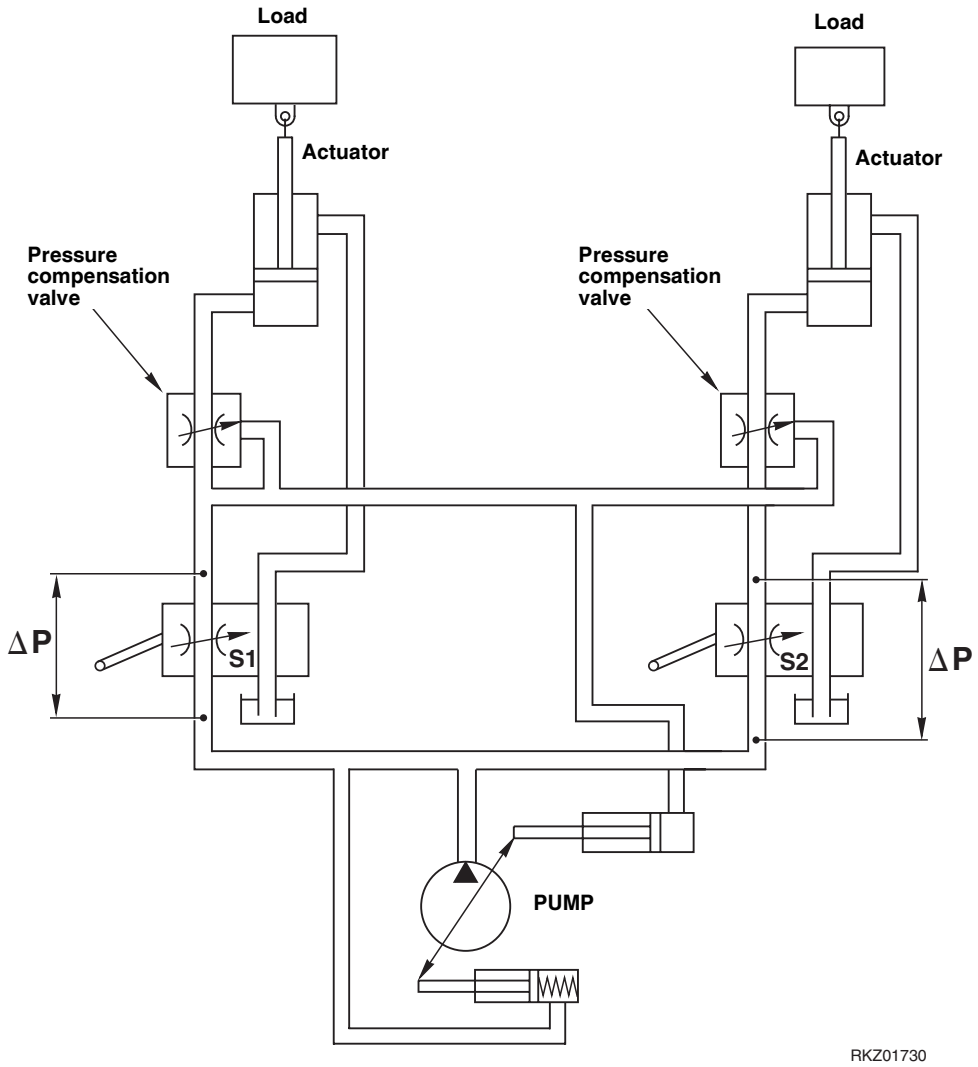
★ For details about this movement, see the description of the «HYDRAULIC PUMP».



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2. Pressure compensation control

- The pressure compensation valves are installed downstream from the control valve in order to balance the differential pressure between the loads..
  When two or more movements (cylinders) are activated simultaneously, the pressure differences **ΔP** between the delivery at the control valve inlet and outlets of the control valve are compensated by these valves.
  We obtain the distribution of the pump flow in proportion to the areas of passage **S1** and **S2** of each valve.

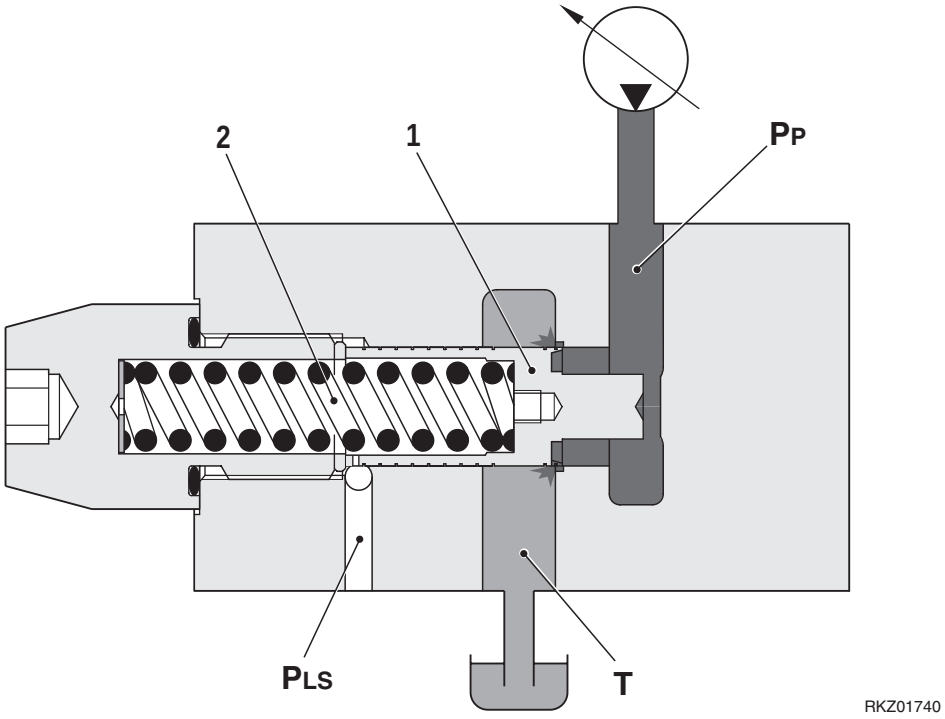


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3. Unloading valve

FUNCTION

1. When the control valve is in «NEUTRAL» position, the flow **Q** of the pump (due to the swash plate being in the minimum angle position) is sent to the control valve.
   In these conditions, the pump delivery pressure P_P is regulated to 21 bar (21.4 kg/cm^2) by the spring (2) inside the valve.
   (**LS** signal with pressure $P_{LS} = 0$ bar (0 kg/cm^2))



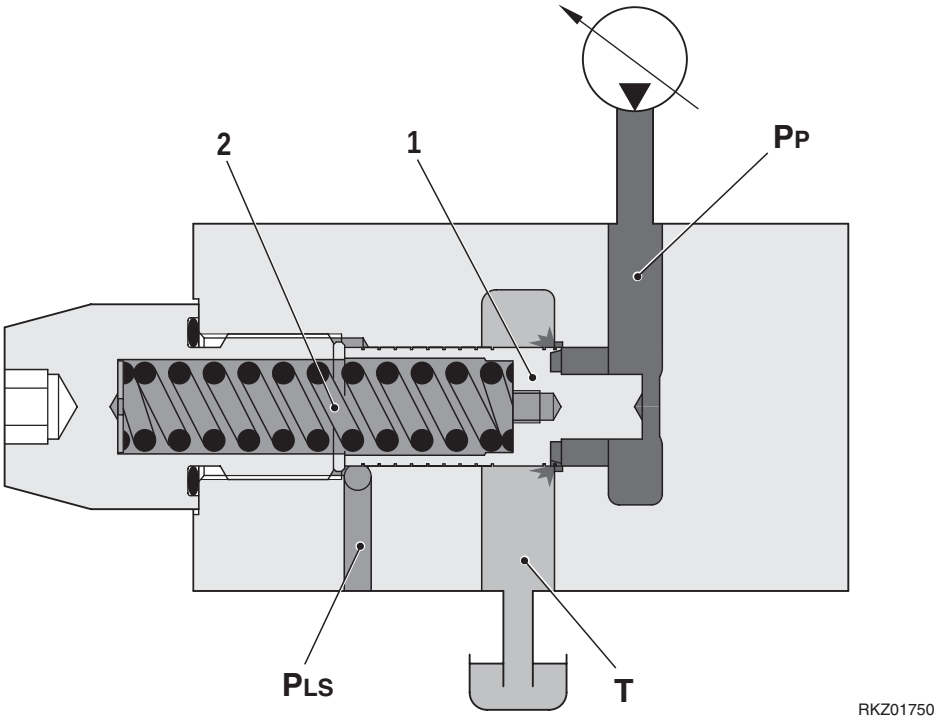
OPERATION

When the control valve is in «NEUTRAL» position.

- On the two surfaces of the shuttle (1), the pump pressure P_P acts on the right-hand side, while the **LS** signal with pressure P_{LS} acts on the left-hand side.
- Because no **LS** signal is generated with a pressure P_{LS}, when the control valve is in «NEUTRAL» position, only the pump delivery pressure P_P regulated by the compression of the spring (2), acts on the shuttle (1).
- While the pump delivery pressure P_P increases until it compensates for the loading on the spring (2) (21 bar (21.4 kg/cm^2)), the shuttle (1) moves to the left (←) and the P_P circuit is put into communication with the tank circuit **T**.
- This system ensures that the pump delivery pressure P_P stays regulated at 21 bar (21.4 kg/cm^2).

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2. If, during the precision regulations of the control valve, the request for oil flow to the actuators in 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** + 21 bar (21.4 kg/cm^2).
   Because the unloading valve opens when the differential pressure between the pump delivery pressure **PP** and the **PLS LS** pressure becomes equivalent to the loading of the spring (2) (21 bar (21.4 kg/cm^2)), the differential **LS** pressure Δ**PLS** del **LS** becomes 21 bar (21.4 kg/cm^2).



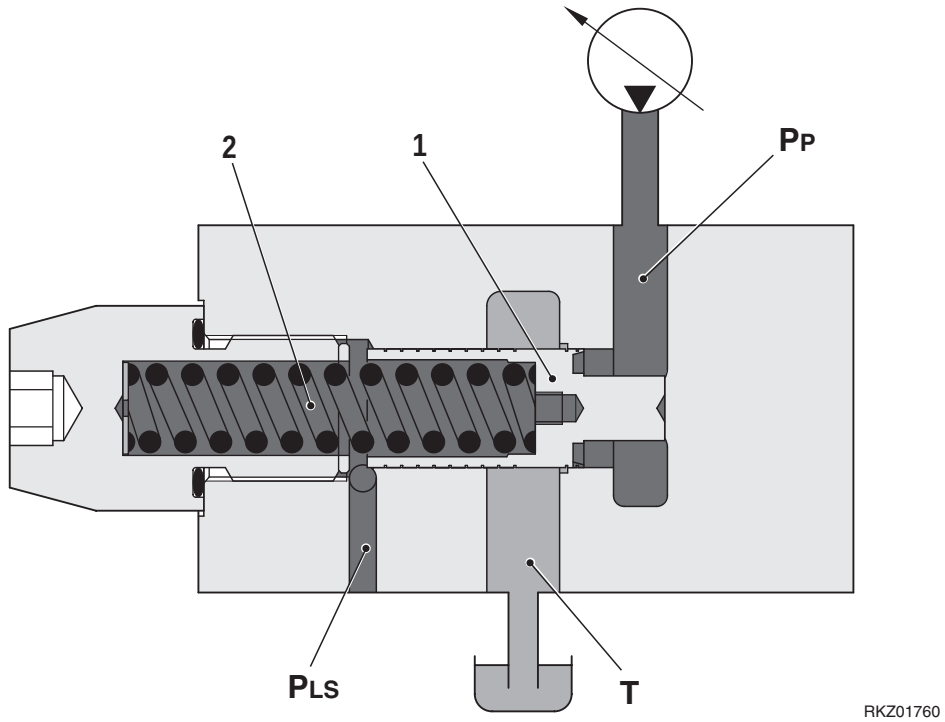
OPERATION

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) (21 bar (21.4 kg/cm^2)), 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 (21 bar (21.4 kg/cm^2)) and by the **LS** pressure **PLS**, i.e. when the pressure differential Δ**PLS** reaches the value of 21 bar (21.4 kg/cm^2).

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3. When the request for oil flow from the actuators exceeds the minimum delivery of the pump during use of the control valve, the connection to the tank circuit is eliminated and the entire pump delivery **Q** is sent to the actuators.



OPERATION

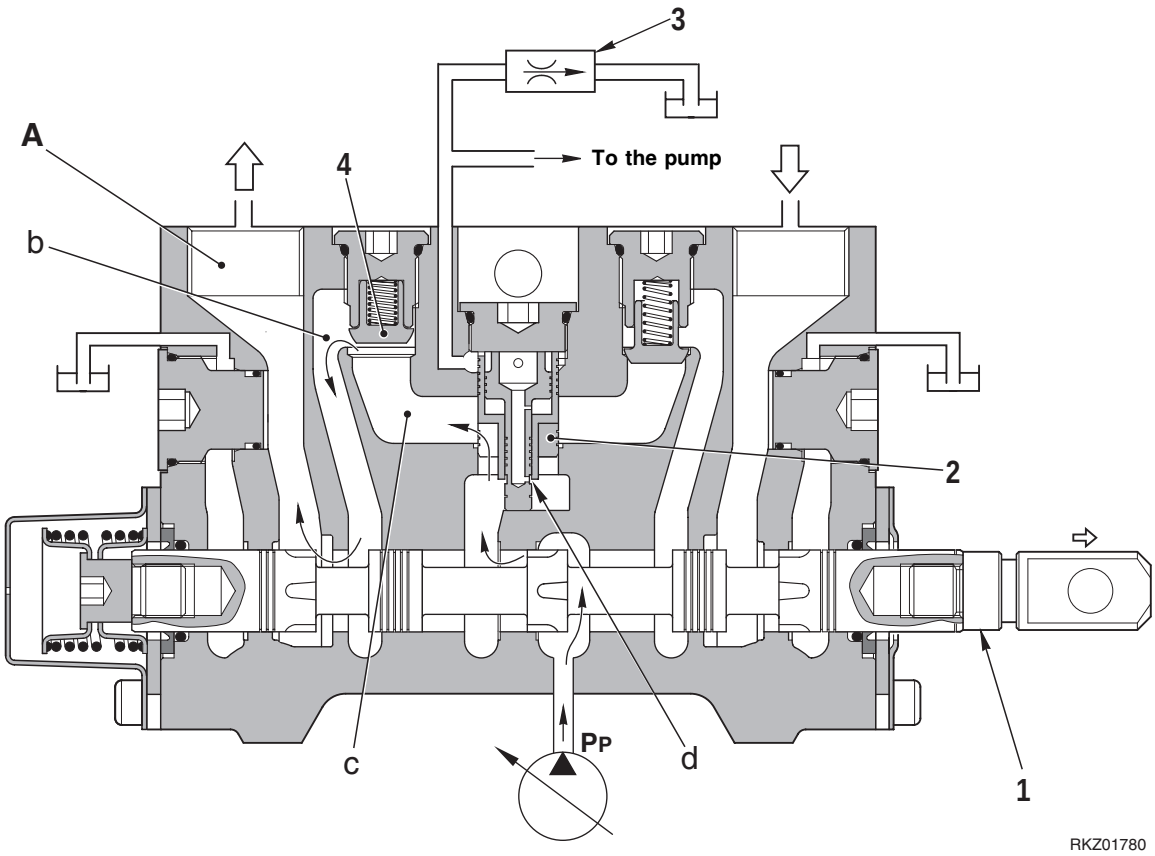
When the control valve is in use

- When the control valve shuttle is operated to execute a bigger stroke, the opening section of spool becomes bigger and consequently the controlled delivery.
  Because the control valve passage is large, the difference between the **LS** pressure P_{LS} and the pump delivery pressure P_P is reduced up to 16 bar (16.3 kg/cm^2) (**LS** pump valve setting).
- Because the differential pressure between the pump delivery pressure P_P and the **LS** pressure P_{LS} is not equal to the pressure given by the spring loading (2) (21 bar (21.4 kg/cm^2)), the shuttle (1) is pushed to the right (→) of the spring (2).
- The result is that the connection between the pump delivery circuit P_P and the tank circuit **T** is excluded and the entire pump delivery **Q** is sent to the actuators.

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4. Introduction of the LS pressure

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



OPERATION

- When the shuttle (1) is activated, the pump pressure P_P starts to flow into the actuator circuit **A** through the duct **b**.
- At the same time the compensator (2) moves upwards (↑) so that the flow controlled by spool (1) can flow towards the actuator **A**.
  Check valve (4) do not allow any flow up to when pressure in chamber **c** is higher than pressure in chamber **b**.
  Pressure downstream spool (1) flows in the P_{LS} circuit downstream the compensator valve throught the orifice **d**.
- The P_{LS} circuit of the **LS** is thus in communication with the tank circuit **T** by means of the **LS** decompression valve (3). (See the description of the **LS** decompression valve).
- The system stabilizes when a pressure difference of 16 bar (16.3 kg/cm^2) is generated across the shuttle (1) between pump pressure P_P and P_{LS} pressure.

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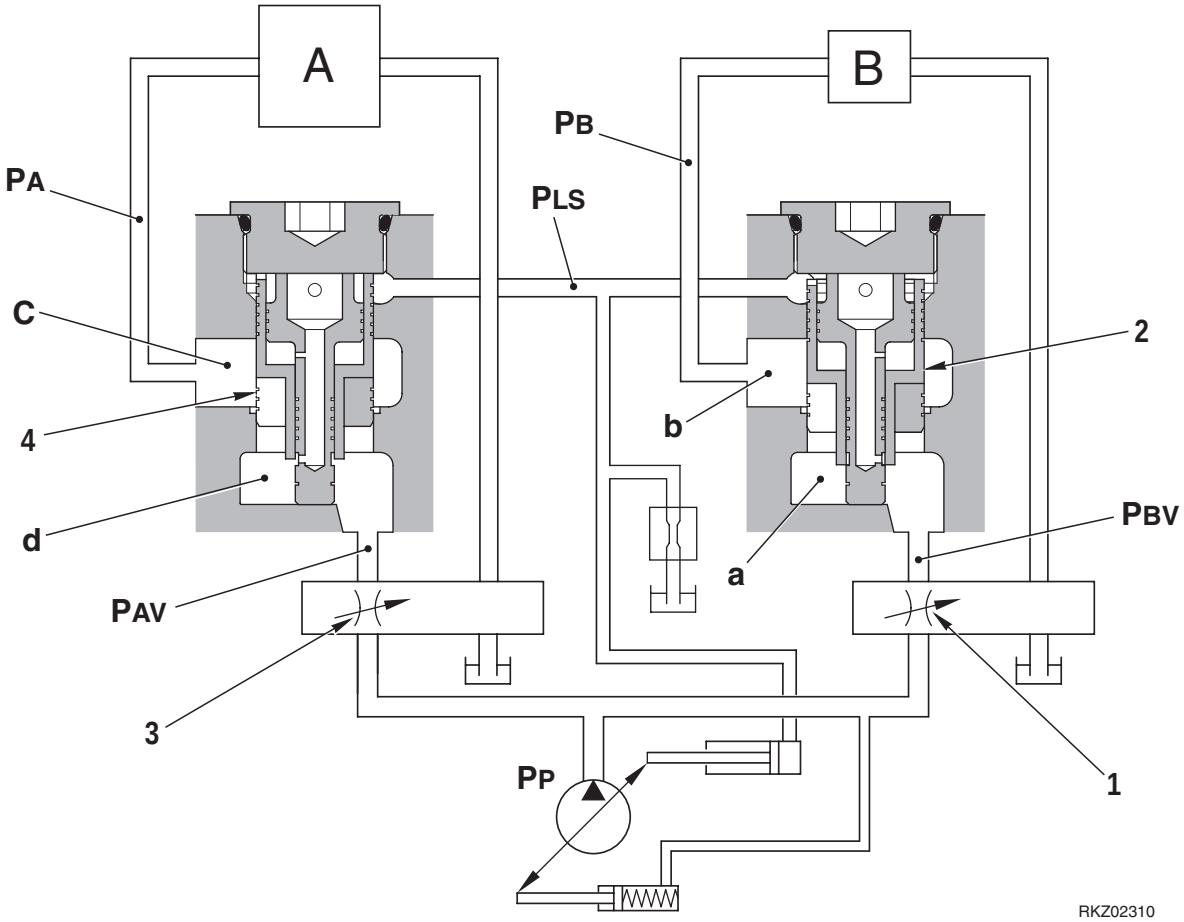
5. DELIVERY COMPENSATION

INTRODUCTION

The flow sent to each actuator is controlled by the opening area of each spool.
While performing complex control, in traditional control valves the difference between actuators pressure might cause sudden and unexpected movements acceleration in those actuators operal at lower pressure.
The adoption of the pressure compensation valve allow to control those situation guaranting the proportionality between each actuator

FUNCTION

Compensation of actuator deliveries occurs when, during the simultaneous activation of two or more movements, the pressure of one actuator drops lower than that of the other, and pump delivery, if not controlled, tends to be supplied the actuator operating at lower. (In the diagram the actuator on the right is requesting higher pressure).



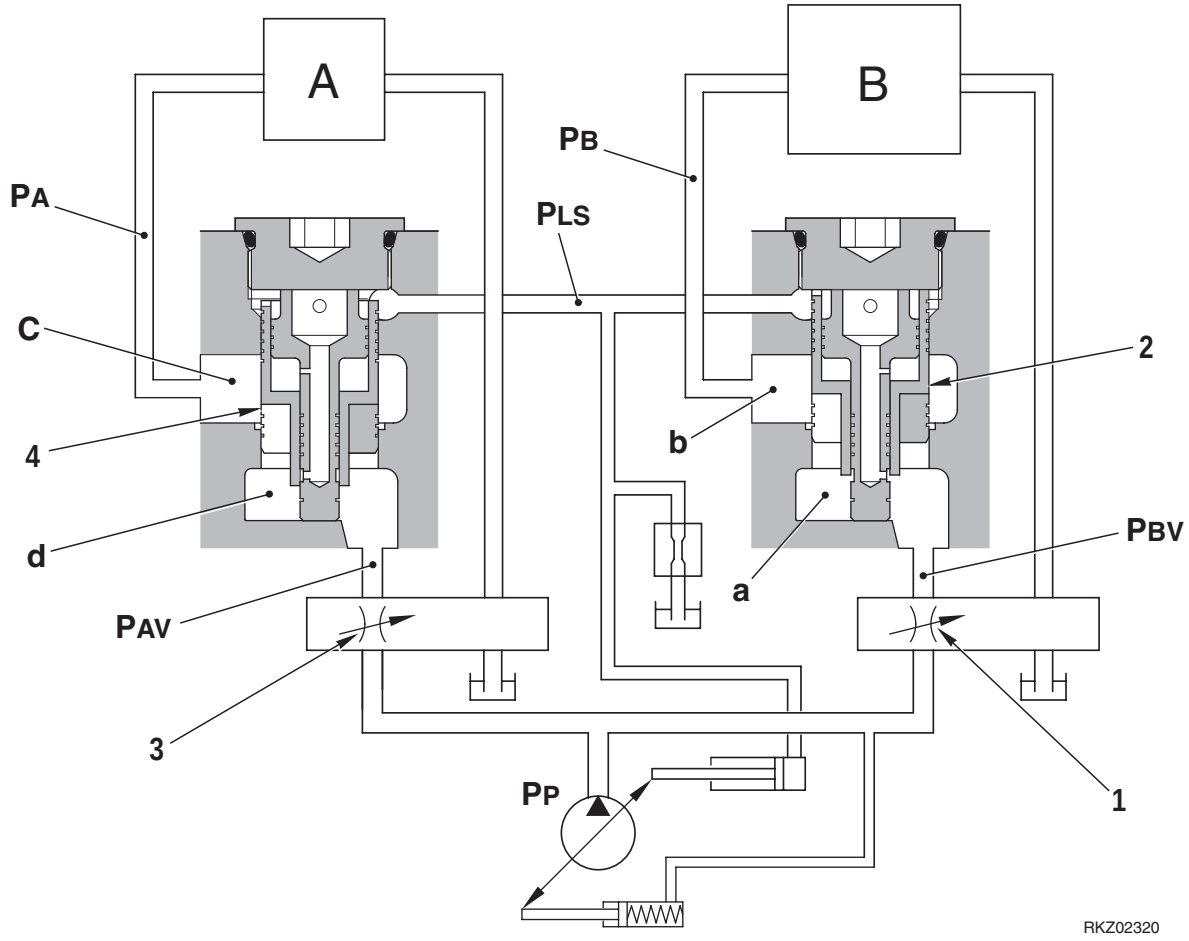
OPERATION

1. When activating an actuator at a pressure lower than the one already working. (While operating actuator A starts operating actuator B)

- Until the pressure P_{BV} downstream from the shuttle (1) reaches the same value requested by actuator **B**, no oil passes.
- When the pressure requested by actuator **B** is exceeded, movement can commence. This creates a flow that adding to the one controlled by spool (3) reduces the pressure upstream of spool (1) and (3) and therefore the ΔP between P_{LS} and P_P.
- The pump compares the delivery pressures P_P and P_{LS} and senses that the difference $\Delta P < 16$ bar (16.3 kg/cm^2). This variation in ΔP causes an increase in oil flow increasing the swash plate angle. (For the detail see «Hydraulic pump»).
- Until the pump does not realize a ΔP of 16 bar (16.3 kg/cm^2), i.e. until the increase in oil flow compensates the requirements of the two actuators, the pump will continue to increase delivery.
- ΔP of 16 bar (16.3 kg/cm^2) will stabilize as soon as it is restored to.
- The compensator (2) is moved upwards by the oil flow and stops when the aperture between the chambers **a** and **b** reduces the passage sufficiently to reduce the pressure in chamber **a** to be sent to the actuator.

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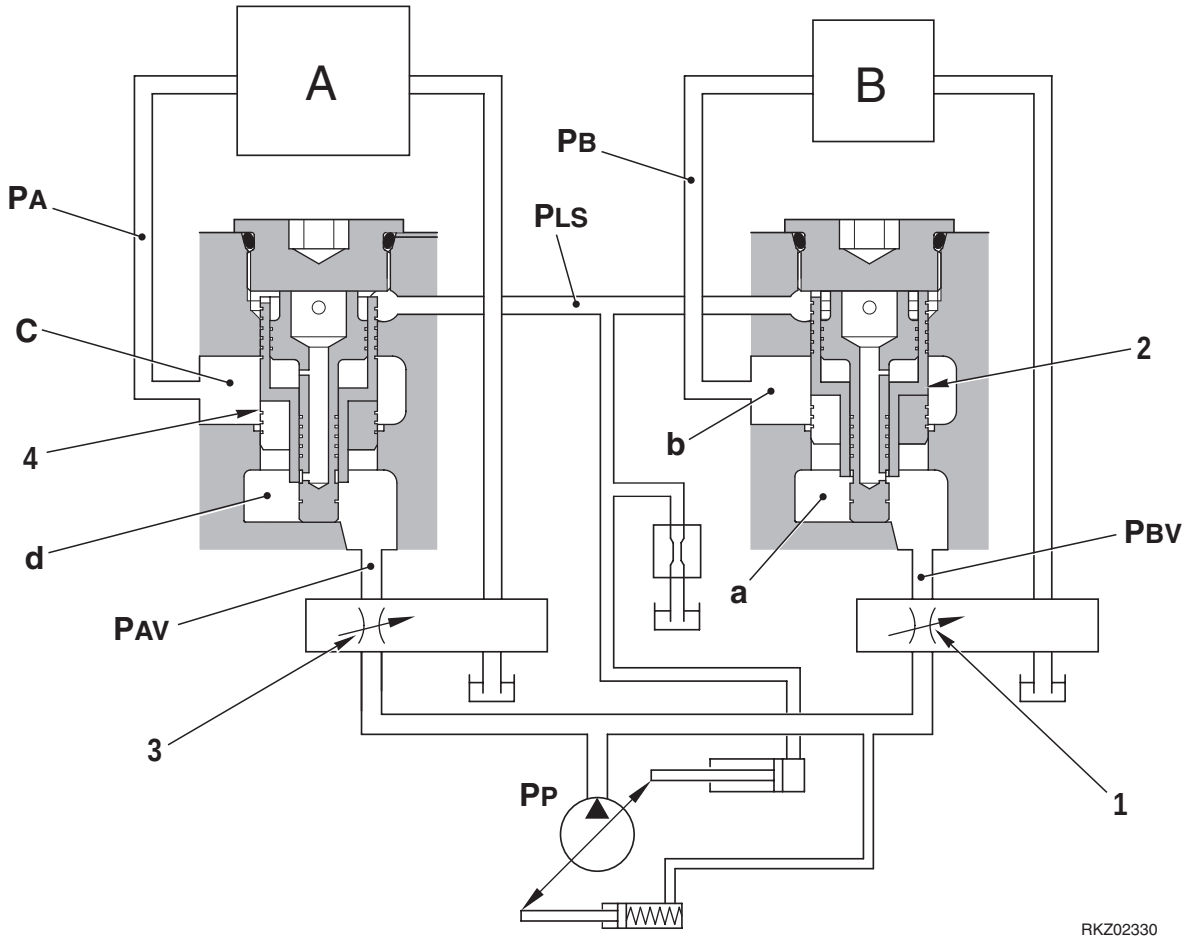
2. When a low pressure actuator needs to work at a higher pressure than the other



- If the actuator **B** needs to work at a higher pressure ($P_B > P_A$), the pressure P_B will start to increase.
- Since pressure P_B is increasing, the compensator (2) moves upwards to restore the ΔP between the chambers **a** and **b**, and therefore the ΔP does not vary upstream or downstream from the shuttle (1).
- When pressure P_B exceeds pressure P_A, the compensator (2) is fully open and the pressure P_B is introduced into the **LS** circuit.
- The increase in pressure in the **LS** circuit obliges the pump to increase delivery until the ΔP is restored to 16 bar (16.3 kg/cm^2).
- Simultaneously the increase in pressure upstream from the shuttle (3) generates an increase in ΔP upstream and downstream from the shuttle.
  ($P_{AV} < P_{LS} < P_P$)
- Because the pressure P_{LS} which is equal to the pressure P_B acts on the upper side of the compensator (4), and since the pressure P_{AV} is lower, the compensator (4) is pushed downwards.
- The compensator stops when the aperture between the chambers **c** and **d** generates a reduction of the passage sufficient to reduce the pressure to be sent to the actuator, and to increase the pressure P_{AV} until the ΔP is restored to the 16 bar (16.3 kg/cm^2) necessary for equilibrium.

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3. When an increase in delivery is required by an actuator



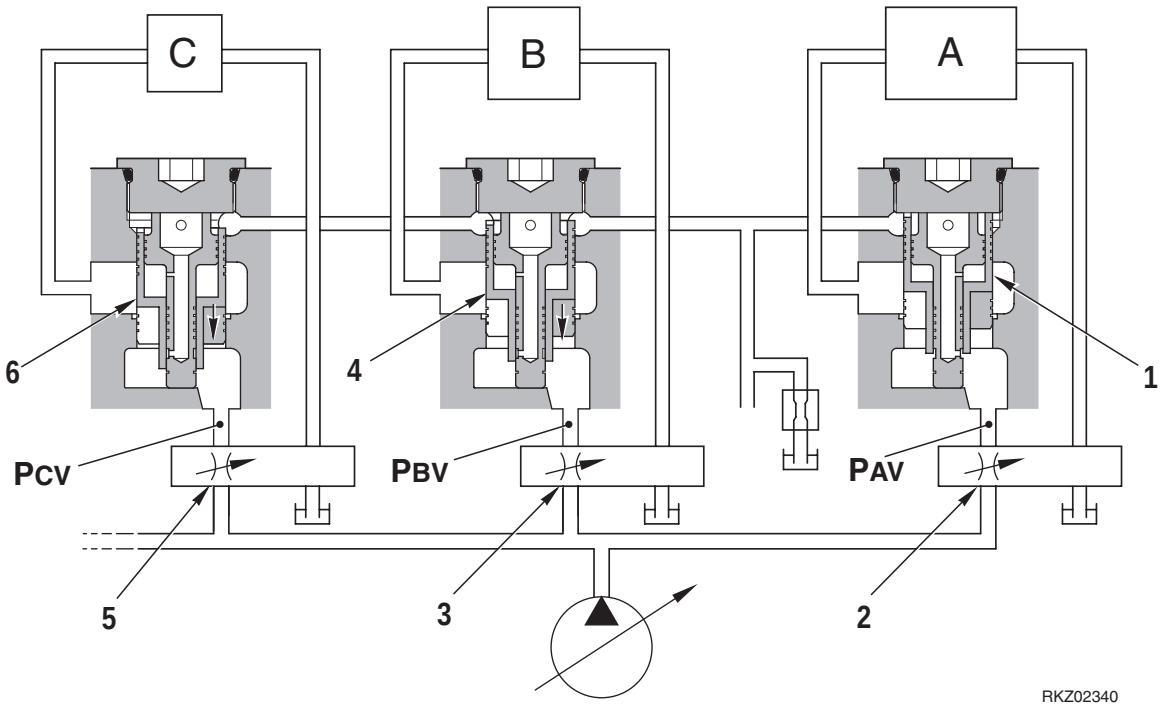
- When an increased delivery is required by actuator **A**, i.e. when the shuttle (3) is asked to execute a bigger movement, the section of the aperture increases.
- The increase in aperture provokes a drop in ΔP between the two sides of the shuttles (2) and (3), because the flow, which has remained unchanged until now, is divided between both the actuators.
- At the same time the pump senses the variation in ΔP and increases the oil flow until the ΔP is restored to ΔP of 16 bar (16.3 kg/cm^2) between the two sides of the shuttle (1) and the compensator (4) changes position in order to restore the ΔP upstream and downstream from the shuttle (3).

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6. LIFD CONTROL SYSTEM

FUNCTION

- The Load Independence Flow Divider (LIFD) intervenes automatically when the oil-flow requested by the actuators exceeds the maximum delivery guaranteed by the pump.
  In this case, the oil-flow is divided between the various actuators in proportion to their requirements.



OPERATION

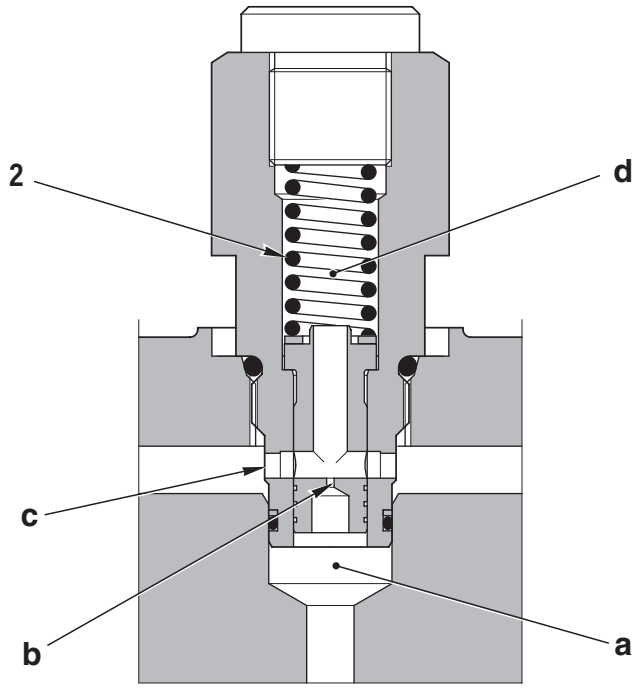
- When, during the simultaneous operation of more than one actuator, one of them needs a higher pressure and the characteristics of the pump are exceeded, the pump guarantees a delivery limited by its calibration curve.
- At this point less oil than requested is distributed to all the actuators.
- Because the sections of the apertures remain unchanged, the pressure upstream and downstream from the shuttles drops. Since the position of the compensator (4) is determined by the pressure of the **LS** signal, by the pressure P_{BV} downstream from the shuttle (3) and by the flow of oil needed for the movement, the compensator is pushed downwards by the higher pressure in the upper chamber until the pressure P_{BV} downstream from the shuttle becomes equal to the pressure P_{AV} downstream from the shuttle (1). This equalizes the pressure Δ_P of the shuttle (1).
- Thus the flow of each actuator is reduced by a percentage equal to the reduction or absence of pump delivery.
- In other words, when the request for performance is excessive, the system can nevertheless guarantee proportionality and graduality for the movements in any load conditions.
- If an increase in delivery is requested, rather than an increase in pressure, and the characteristics of the pump are exceeded, the system will function in the same way as described for the above case.

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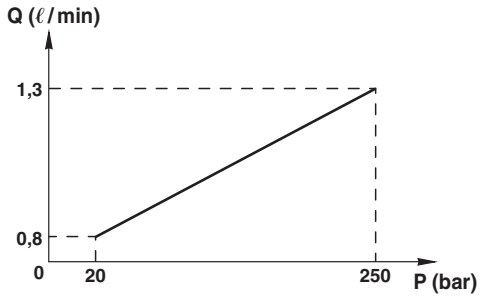
7. LS DECOMPRESSION VALVE

DESCRIPTION

The **LS** decompression valve is a throttle that continuously releases a small quantity of oil from the **LS** circuit and that, when the shuttles are brought back to a neutral position, releases the residual **LS** pressure.
This continued flow renders the P_{LS} pressure increment more gentle and gradual, and increases stability and control during the phases of reducing the **LS** pressure.



RKZ02350



RKZ02360

OPERATION

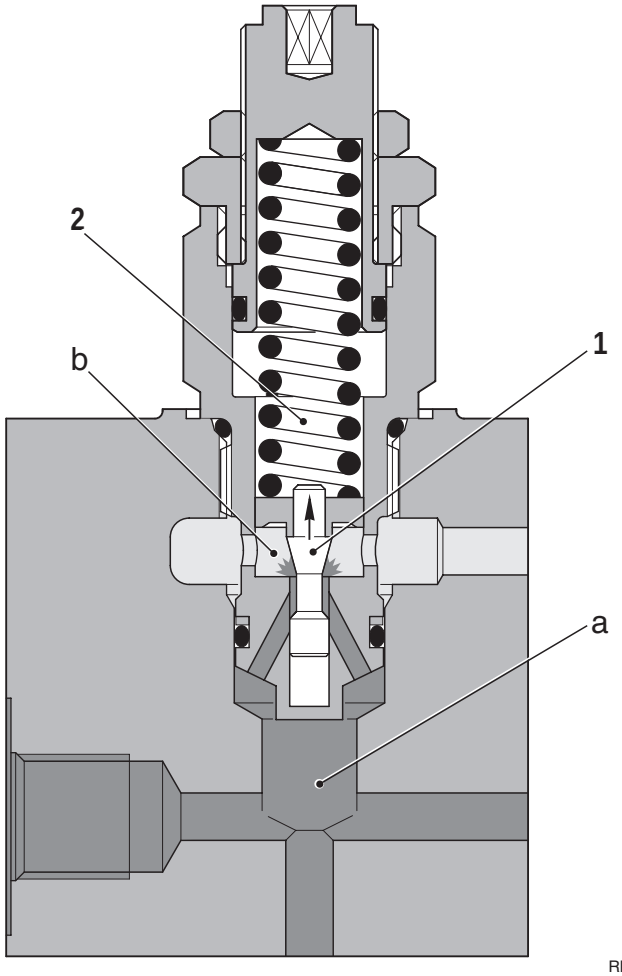
- When the **LS** pressure reaches chamber a of the valve, it generates a force that opposes the force of the spring (2).
- Until the force generated by the **LS** pressure exceeds the force of the spring (2) (**LS** pressure low) the shuttle (1) remains «at rest» and oil flows through the calibrated orifice a in the tank circuit.
- When the force generated by the **LS** pressure exceeds the force of the spring (2), the shuttle is pushed upwards (↑) and the passages **c** are closed. Oil continues to flow into the chamber d until the force generated by the pressure contained in chamber d, together with the force of the spring (2), exceeds the force generated by the **LS** pressure.
- The shuttle is pushed downwards (↓) and passage **c** is opened.
- The system is in equilibrium (i.e. the shuttle is at rest), when the quantity of oil allowed to flow into the tank circuit is equivalent to the quantity that generates a pressure difference Δ_P such that $(P_{LS} \times S) = [(P_{LS1} \times S) + F]$ where:
  P_{LS} = **LS** pressure
  P_{LS1} = **LS** pressure contained in chamber **d**
  S = section of the shuttle
  F = force of the spring.

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8. PRESSURE CUT-OFF VALVE

DESCRIPTION

The function of the pressure cut-off valve is to regulate the maximum pressure of the Load Sensing signal and hence also the pressure of the pump.



OPERATION

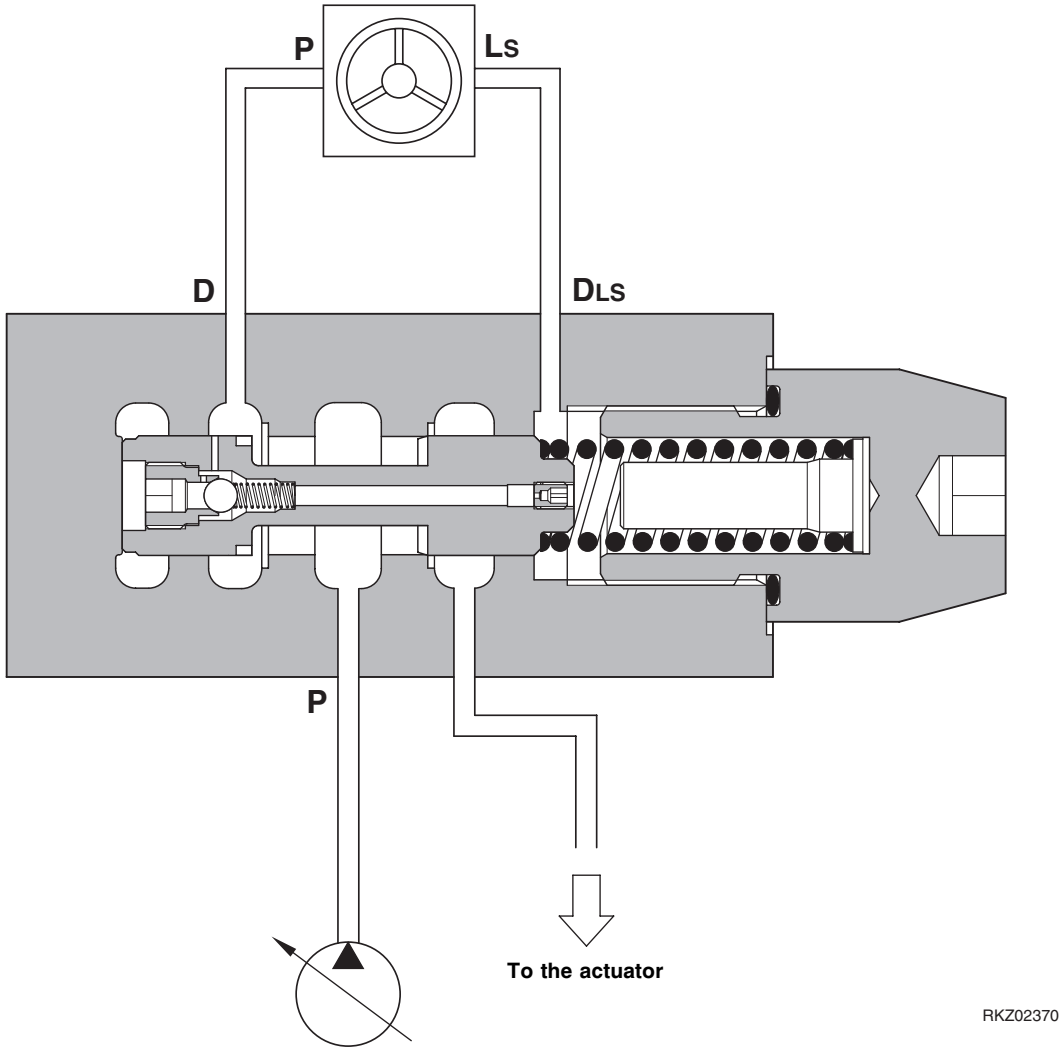
- The pressurized oil of the **LS** reaches the chamber **a** of the valve.
- When the force generated by the **LS** pressure on the valve (1) exceeds the force of the spring (2), the valve (1) is pushed upwards (↑) opening the passage between the chamber **a** and the tank circuit.

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9. PRIORITY VALVE (ONLY FOR THE 2-3 SPOOL CONTROL VALVE)

FUNCTION

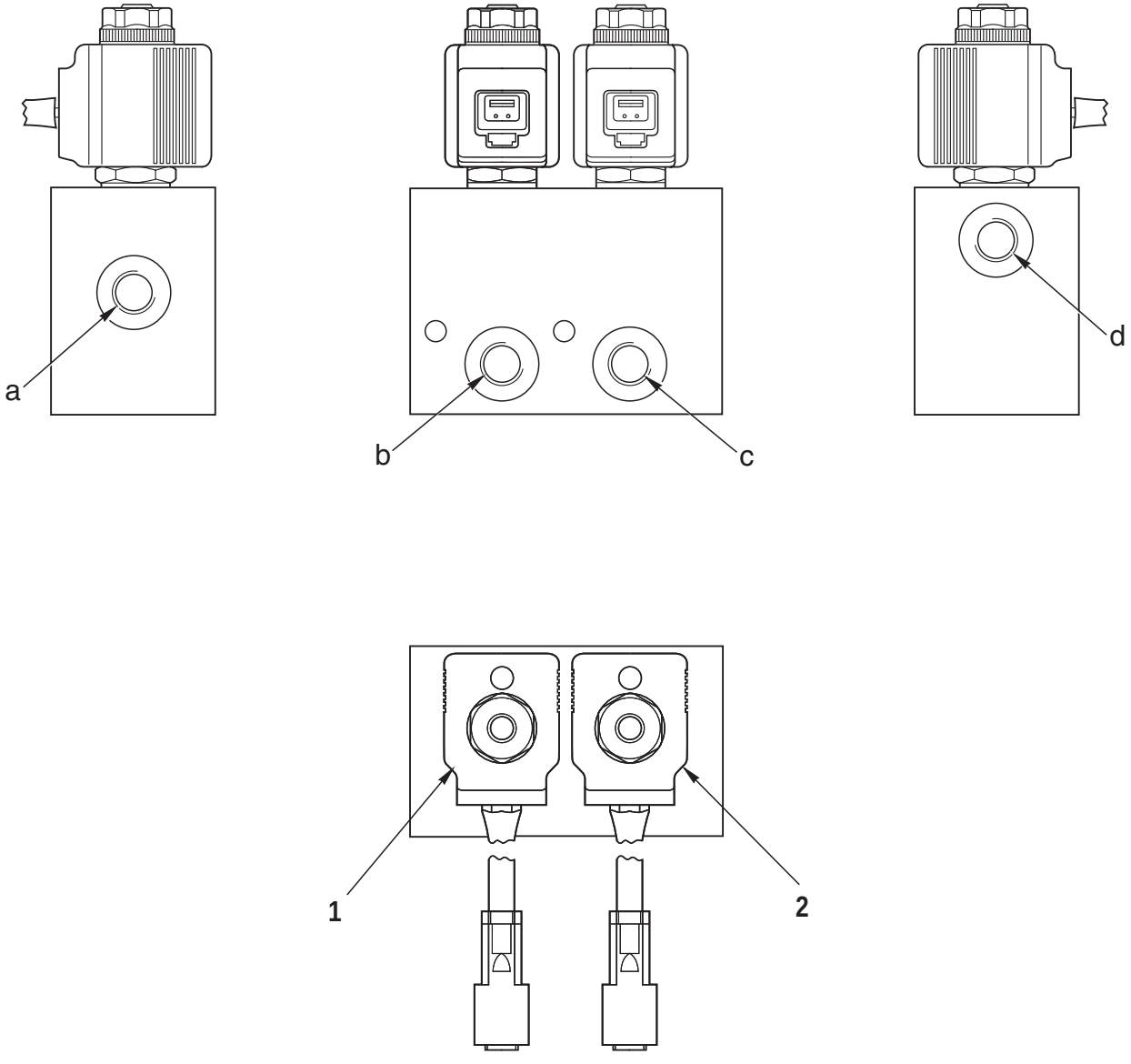
The function of the priority valve is to distribute oil to the steering unit and to the other hydraulic components. Distribution is determined by the position of the valve of the priority valve in function of the **LS** signal, oil delivery from the pump, the pressure of the steering unit and the pressure of the hydraulic circuit. The position of the valve is such as to guarantee that delivery to the steering unit will always correspond to the actual need.



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SOLENOID VALVE

Solenoid valve block ST1
Differential locking - backhoe boom locking



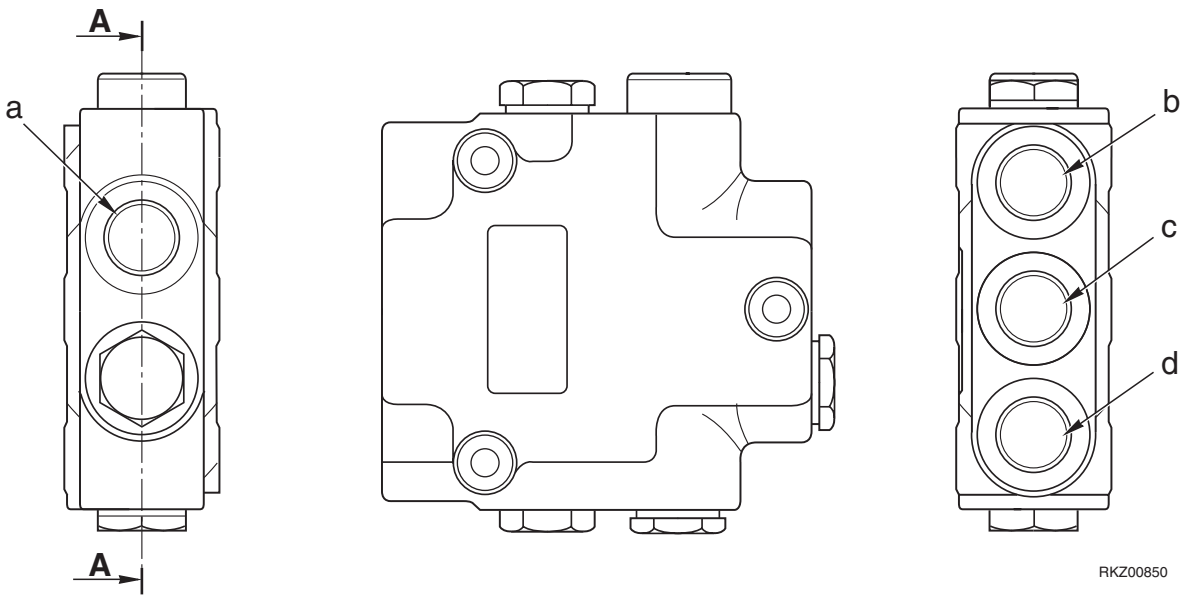
RKZ00650

1. EV4 - Backhoe boom locking
2. EV3 - Differential locking

a. Port T - To the transmission
b. Port 1 - Boom-locking cylinder
c. Port 2 - To the rear axle
d. Port P - From the transmission

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SAFETY VALVE



Shovel raise

a. Port Y - to the raising cylinders (Head side)
b. Port A - From the shovel control valve (Port A1)
c. Port X - To the raising cylinders (Base side)
d. Port B - From the shovel control valve (Port B1)

Bucket Dump

a. Port Y - To the dump cylinders (Head side)
b. Port A - From the shovel control valve (Port B2)
c. Port X - To the dump cylinders (Base side)
d. Port B - From the shovel control valve (Port A2)

Boom

a. Port Y - To the boom cylinder (Head side)
b. Port A - From the backhoe control valve (Port A6)
c. Port X - To the boom cylinder (Base side)
d. Port B - From the backhoe control valve (Port B6)

Arm

a. Port Y - To the arm cylinder (Head side)
b. Port A - From the backhoe control valve (Port B1)
c. Port X - To the arm cylinder (Base side)
d. Port B - From the backhoe control valve (Port A1)

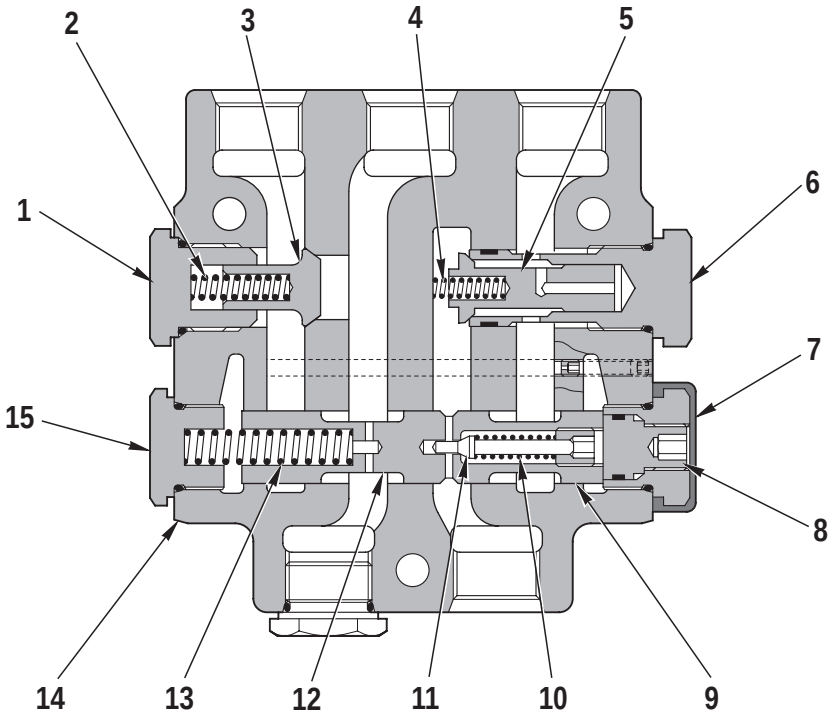
CHARACTERISTICS

Safety valve calibration

Shovel dump:	230 bar
Boom:	350 bar
Arm:	230 bar

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★ **The drawing represents the boom safety valve**



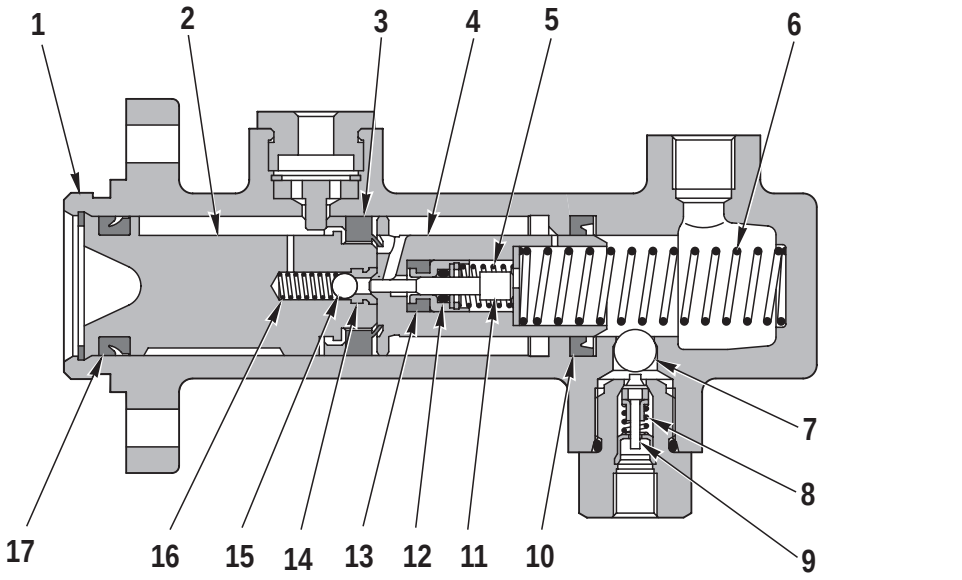
RKZ01050

Section A – A

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

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BRAKE PUMP



RKZ00930

1. Pump body
2. Main piston
3. Seal
4. Differential piston
5. Spring
6. Pump spring
7. Spring
8. Check valve
9. Ball
10. Seal
11. Pin
12. Seal
13. Seal
14. Seal
15. Ball
16. Spring
17. Seal

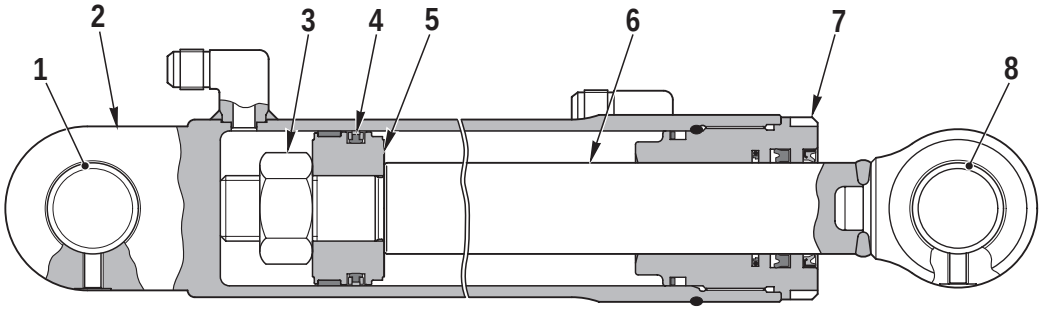
CHARACTERISTICS:

Stroke:	36 mm
Displacement:	15 – 28 cc
Max. pressure:	150 bar

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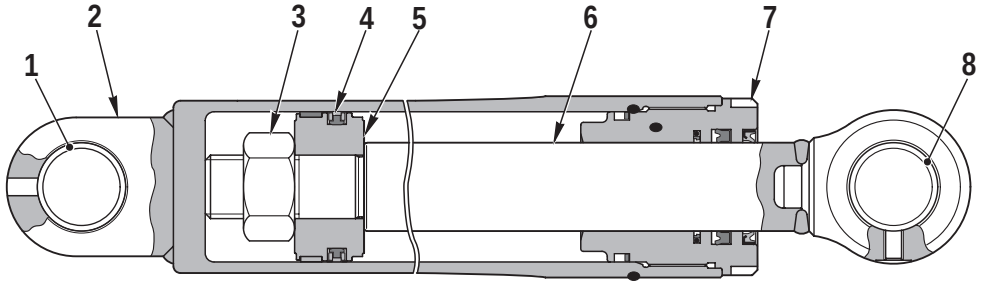
SHOVEL CYLINDERS

RAISING CYLINDER



RKZ00310

DUMPING CYLINDER



RKZ00300

1. Bushing, base side
2. Cylinder
3. Nut
4. Piston seal
5. Piston
6. Piston rod
7. Cylinder
8. Bushing, head side

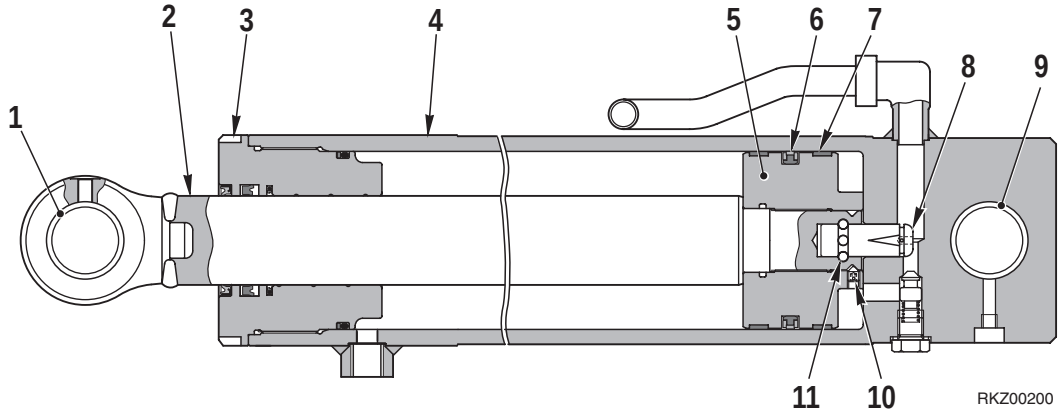
CHARACTERISTICS

Cylinder	Raising	Dumping	
Piston rod diameter	50	50	
Internal cylinder diameter	85	85	
Piston stroke	730	755	
Max. cylinder length	1880	2145	
Min. cylinder length	1150	1390	
Key size for piston safety nut	55	55	

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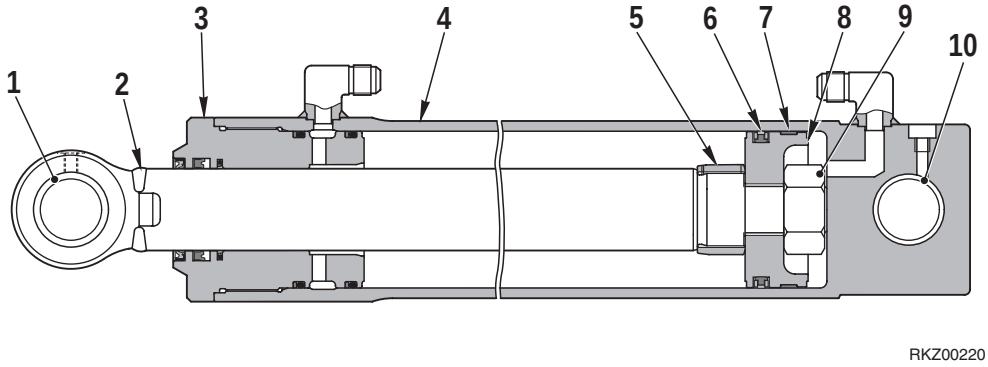
BACKHOE CYLINDERS

BOOM



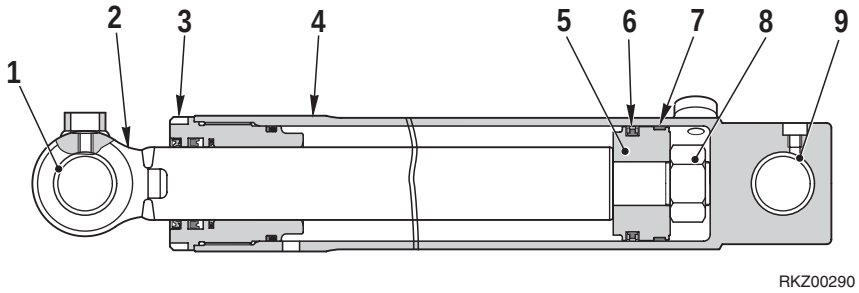
1. Head bushing, piston rod side
2. Piston rod
3. Cylinder head
4. Cylinder
5. Piston
6. Piston ring
7. Guide ring
8. Cushion plunger
9. Bottom bushing
10. Dowel bolt
11. Ball-bearings (9)

ARM



1. Head bushing
2. Piston rod
3. Cylinder head
4. Cylinder
5. Bushing
6. Piston ring
7. Guide ring
8. Piston
9. Nut
10. Bottom bushing

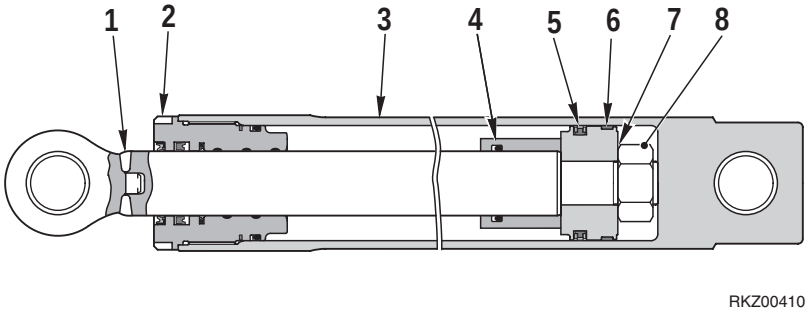
BUCKET



1. Head bushing
2. Piston rod
3. Cylinder head
4. Cylinder
5. Piston
6. Piston ring
7. Guide ring
8. Nut
9. Bottom bushing

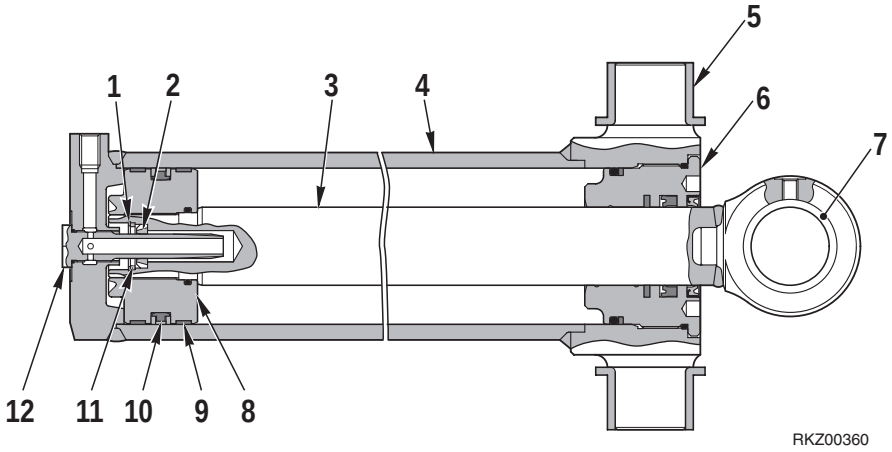
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OUTRIGGERS



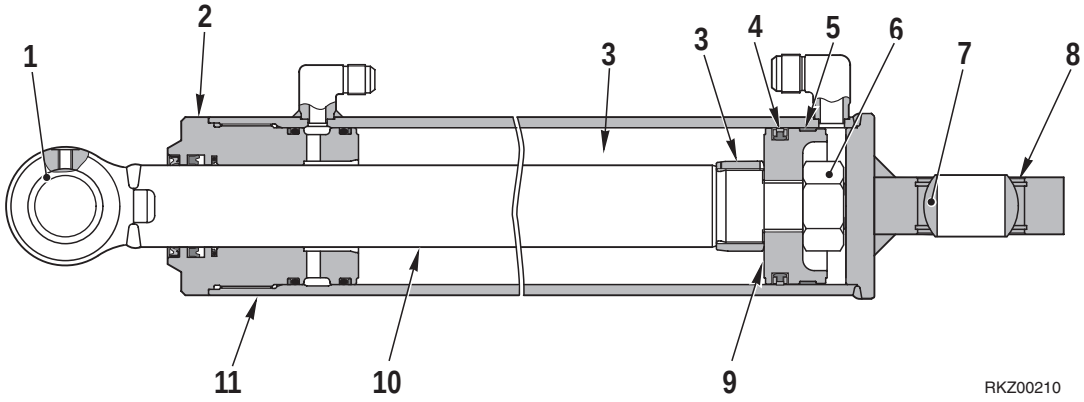
1. Piston rod
2. Cylinder head
3. Cylinder
4. Spacer
5. Piston ring
6. Guide ring
7. Piston
8. Nut

BOOM SWING



1. Retaining ring
2. Throttling ring
3. Piston rod
4. Cylinder
5. Swing bushing
6. Cylinder head
7. Head bushing
8. Piston
9. Guide ring
10. Piston ring
11. Spacer
12. Cushion plunger

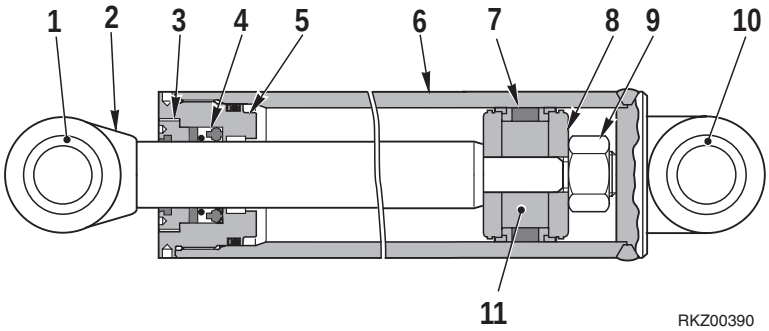
ARM (for side digging boom)



1. Head bushing
2. Cylinder head
3. Throttling ring
4. Piston ring
5. Guide ring
6. Nut
7. Bearing
8. Piston
9. Piston
10. Piston rod
11. Cylinder

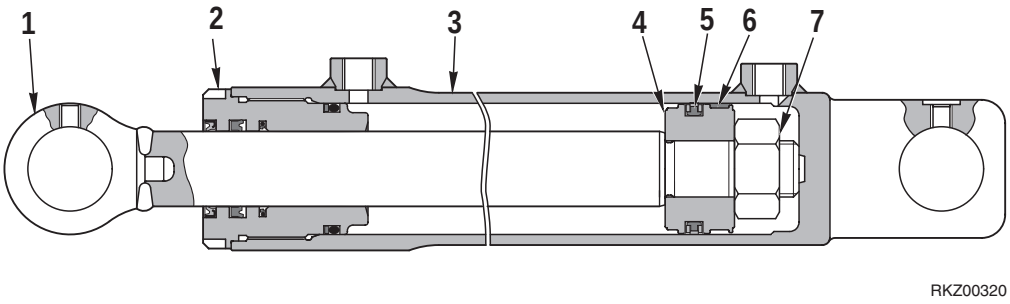
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SIDE DIGGING BOOM



1. Head bushing
2. Piston rod
3. Ring nut
4. Gasket
5. Cylinder head
6. Cylinder
7. Piston ring
8. Ring
9. Nut
10. Bottom bushing
11. Spacer

JIG ARM



1. Piston rod
2 Cylinder head
3. Cylinder
4. Piston
5. Piston ring
6. Guide ring
7. Nut

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CHARACTERISTICS

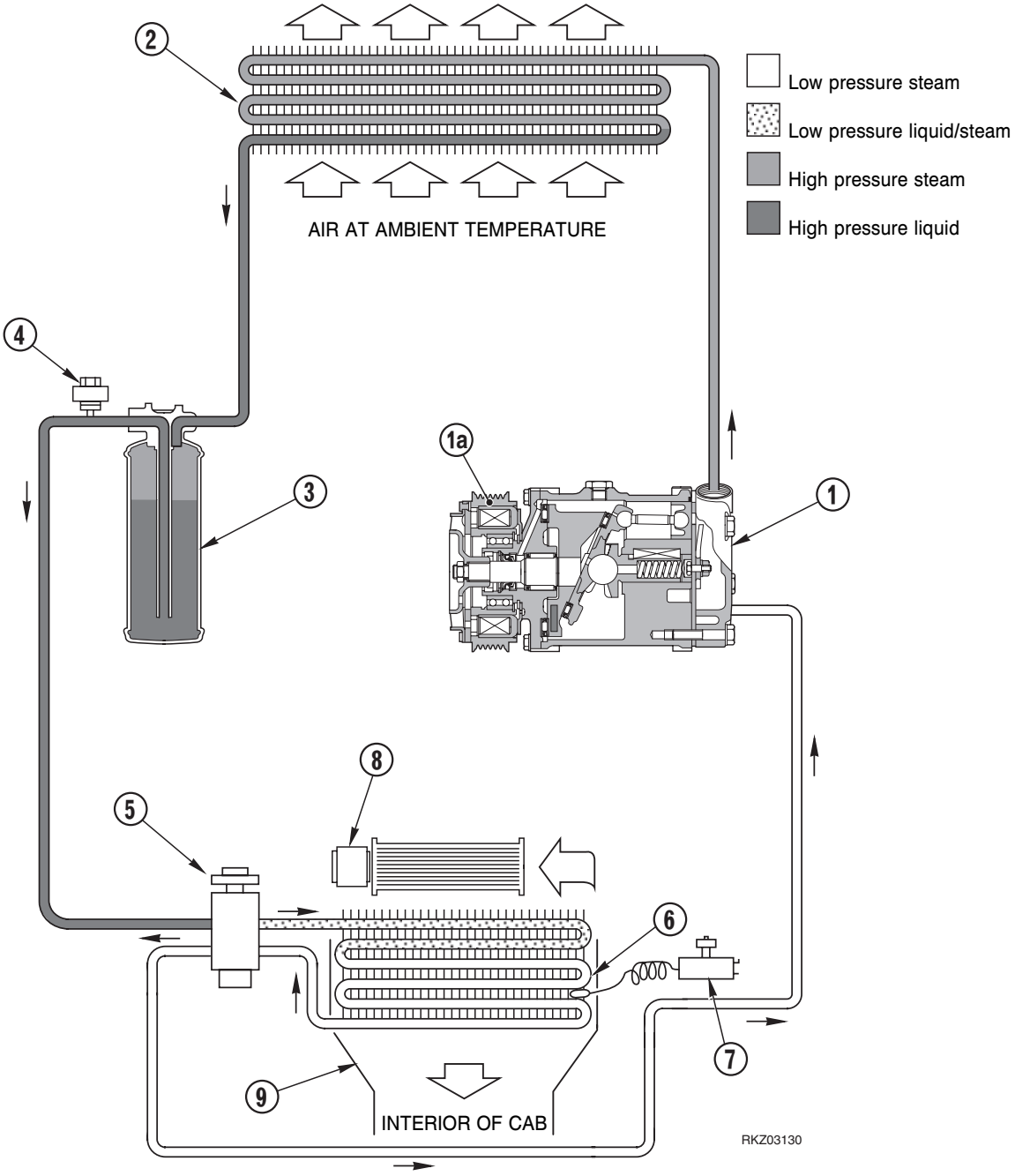
Cylinder	Boom		Arm		Bucket
	From S/N 97F20001 to S/N 97F20171	From S/N 97F20172-	Standard	With side digging boom	
Piston rod diameter	55	60	60	60	60
Internal Cylinder diameter	115	120	110	110	95
Piston stroke	849	849	920	910	765
Max. cylinder length	2049	2050	2175	2170	1850
Min. cylinder length	1200	1040	1255	1260	1085
Key size for piston safety nut	65	65	55	55	55

CHARACTERISTICS

Cylinder	Outriggers	Boom swing	Side digging boom	Jig arm
Piston rod diameter	40	50	45	40
Internal Cylinder diameter	80	100	85	70
Piston stroke	635	230	365	1140
Max. cylinder length	1690	319	830	2590
Min. cylinder length	1055	89	565	1450
Key size for piston safety nut	46	—	46	46

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AIR-CONDITIONING UNIT



1. Compressor
2. Condenser
3. Drying-filter tank
4. Safety pressure
5. Expansion valve
6. Evaporator
7. Thermostatic clutch control sensor
8. Air-circulation fan in cab
9. Air conveyor

TECHNICAL DATA

- Operating pressure in circuit with engine at 2500 rpm and ambient temperature at 25 – 30°C:
  Normal pressure: 15 – 17 bar
  Low pressure: 1.6 – 1.8 bar
- Safety pressures:
  High pressure: 26 bar
  Low pressure: 2,5 bar
- Coolant fluid: R134a
- Quantity of coolant: 1100 g (+ 50 / – 30)

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HOW THE AIR-CONDITIONING UNIT FUNCTIONS

The compressor (1) is driven directly by the engine shaft by means of a belt, and made to rotatby 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.

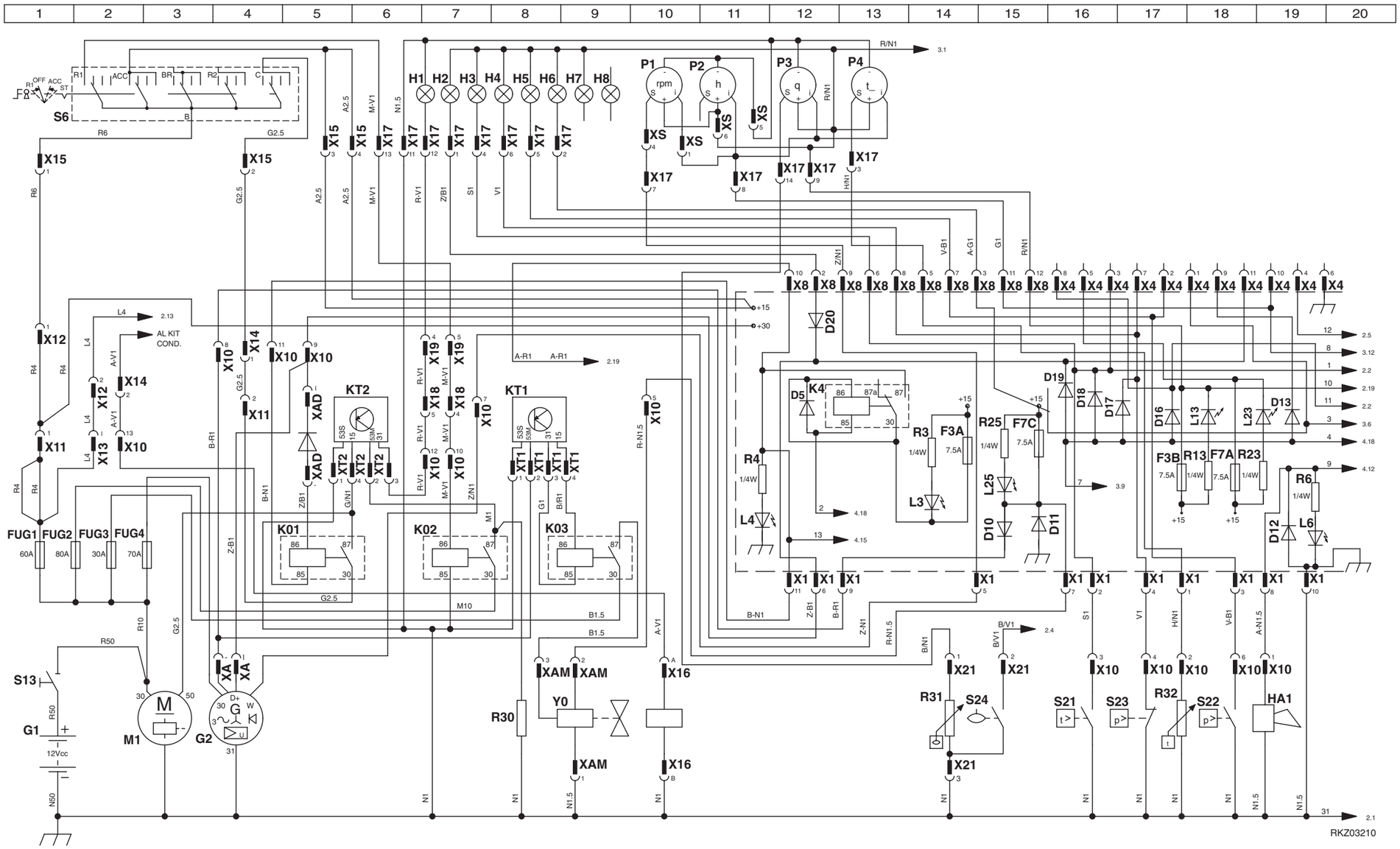
A fixed quantity of anti-freeze oil is also introduced into the circuit, with the function of lubricating all the mechanical parts of the unit. A percentage of this oil circulates constantly throughout the unit in nebulized form, lubricating the compressor (pistons and bearings) and the expansion valve.

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.

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ELECTRICAL DIAGRAM (1/7)



COMPONENTS

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

CONNECTORS

- X1 - 11-ways connector front line (engine)
- X4 - 11-ways connector monitor
- X8 - 17-ways connector lateral dashboard
- X10 - 13-ways connector front line - engine line
- X11 - 3-ways connector power
- X12 - 3-ways connector front line - cross line
- X13 - 2-ways connector front line - engine line
- X14 - 4-ways connector front line - cross line
- X15 - 4-ways connector start key
- X16 - 2-ways connector conditioner clutch
- X17 - 21-ways connector lateral dashboard
- X18 - 5-ways connector power box
- X19 - 9-ways connector front dashboard
- X21 - 3-ways connector fuel level indicator
- XA - 2-ways connector alternator
- XAD - 2-ways connector diode
- XAM - 3-ways connector shut off valve
- XS - 6-ways connector instrument
- XT1 - 4-ways connector timer stop engine
- XT2 - 4-ways connector timer preheater

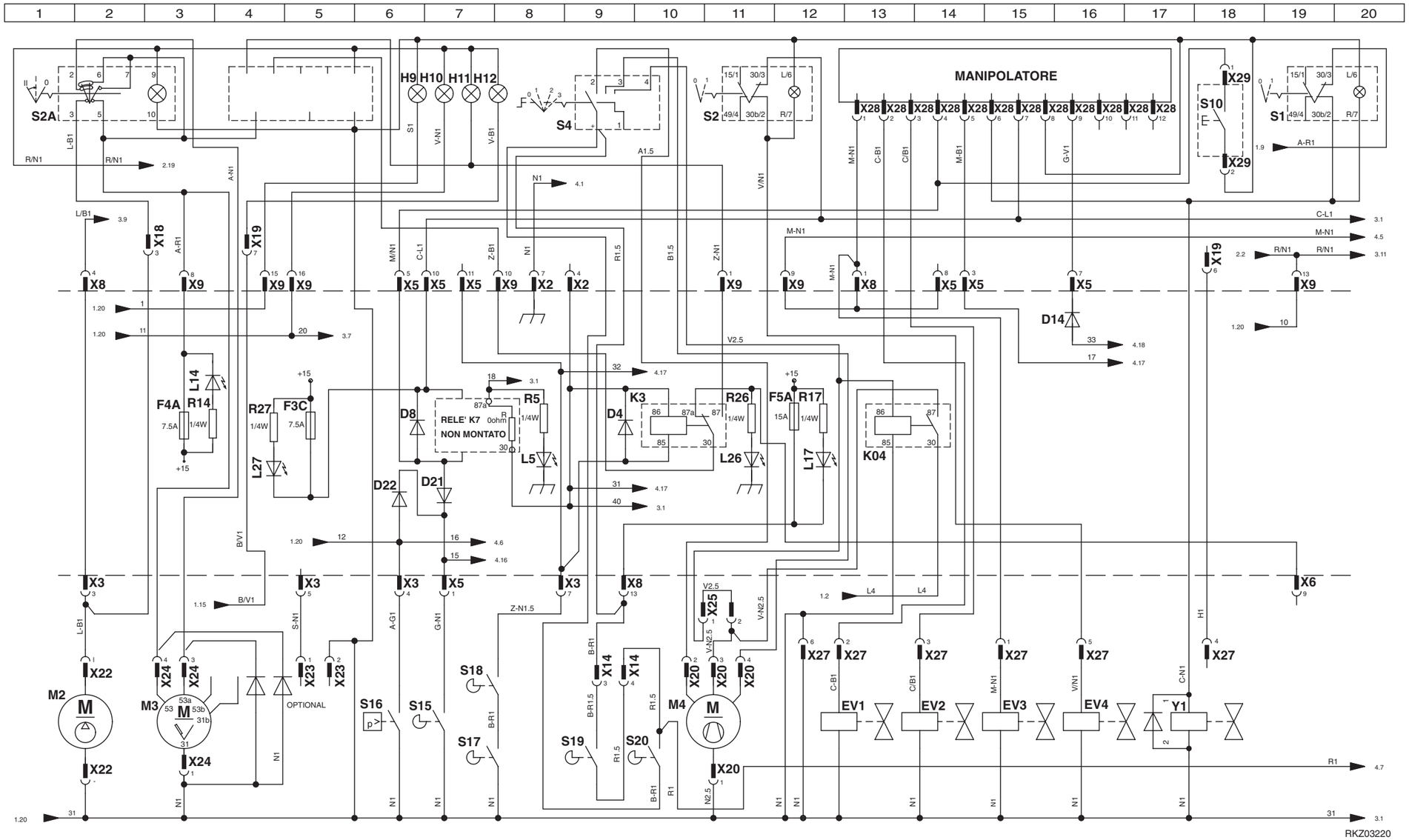
FUSES

- F3B - Switch + warning light fuse 7.5A
- F4A - 4WD-windshield wiper fuse 7.5A
- F7A - Monitor fuse 7.5A
- F7C - Fuel shut off fuse 7.5A
- FUG1 - General fuse 60A
- FUG2 - Preheater fuse 80A
- FUG3 - Stop motor fuse 30A
- FUG4 - Alternator fuse 70A

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ELECTRICAL DIAGRAM (2/7)



COMPONENTS

EV1 - Opened grab solenoid valve
EV2 - Closed grab solenoid valve
EV3 - Differential lock solenoid valve
EV4 - Boom unlock solenoid valve
H10 - Engine water high temperature warning light
H11 - Engine oil high temperature warning light
H12 - Fuel reserve warning light
H9 - 4WD warning lamp
K04 - Powered blower relay
K3 - 4WD relay
M2 - Washer pump
M3 - Windshield wiper motor
M4 - Blower motor
S1 - Economy power switch
S10 - Hammer button
S15 - Hand brake switch
S16 - Brake oil low level switch
S17 - Stop switch
S18 - Stop switch
S19 - Stop light switch
S2 - Boom unlock switch
S20 - Stop light switch
S2A - Windshield wiper-washer switch on front dashboard
S4 - Blower motor switch
Y1 - Economy power solenoid valve

CONNECTORS

X2 - 9-ways connector light switch and rear shift line
X3 - 11-ways connector front line
X5 - 11-ways connector cabin command
X6 - 9-ways connector solenoid valves line
X8 - 17-ways connector lateral dashboard
X9 - 17-ways connector front dashboard
X14 - 4-ways connector front line - cross line
X18 - 5-ways connector power box
X19 - 9-ways connector front dashboard
X20 - 4-ways connector blower motor
X22 - 2-ways connector windshield washer pump
X23 - 2-ways connector optional
X24 - 4-ways connector windshield wiper
X25 - 2-ways connector powered blower motor
X27 - 6-ways connector solenoid valve line
X28 - 12-ways connector joystick
X29 - 12-ways connector convert detachment button

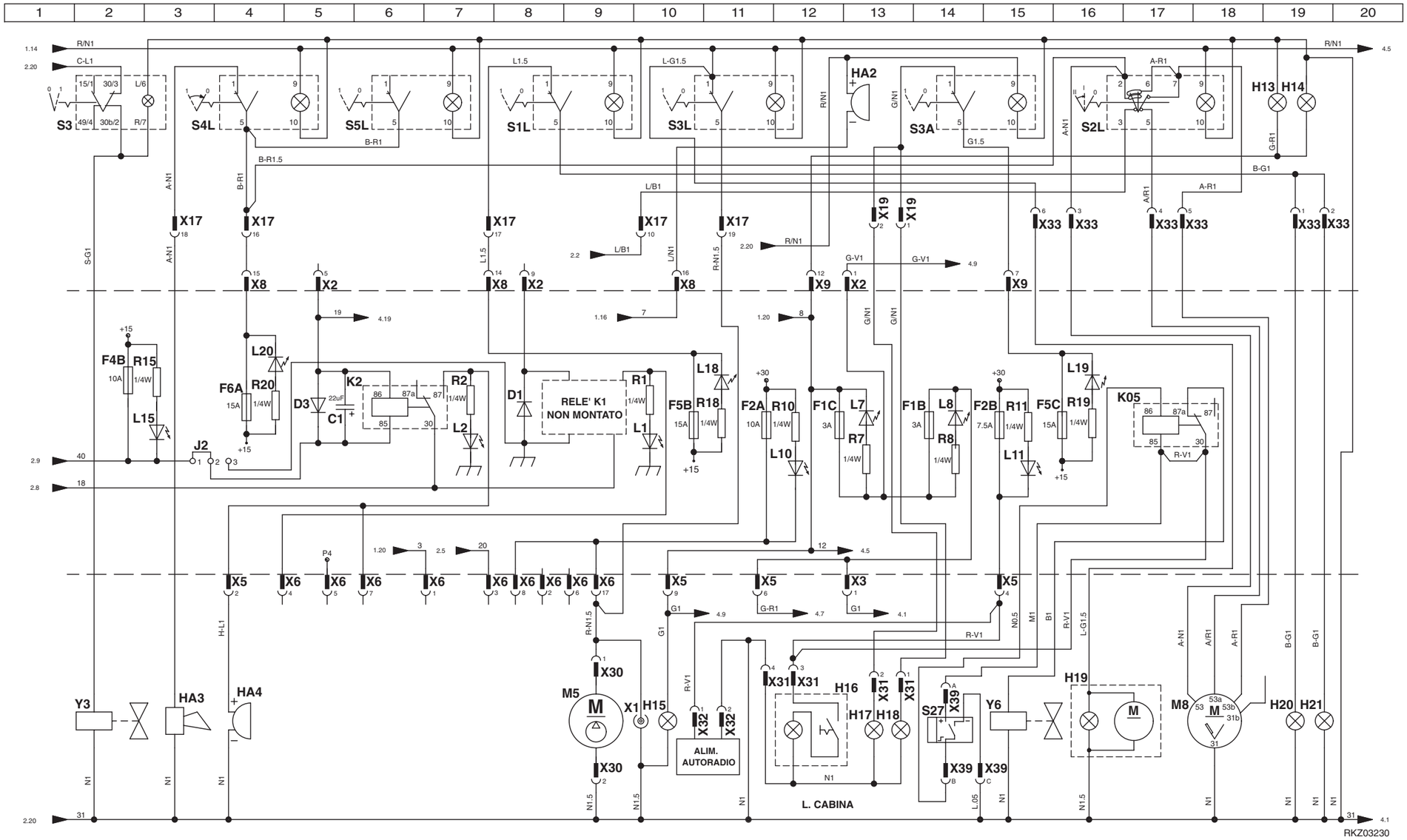
FUSES

F3C - Optional solenoid valve fuse 7.5A
F4A - 4WD-windshield wiper fuse 7.5A
F5A - Blower motor switch fuse 15A

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ELECTRICAL DIAGRAM (3/7)



COMPONENTS

- H13 - Dashboard light
- H14 - Dashboard light
- H15 - Cigarette lighter lamp
- H16 - Cabin lamp
- H17 - Front working lamp
- H18 - Front working lamp
- H19 - Beacon lamp
- H20 - Rear working lamp
- H21 - Rear working lamp
- HA2 - Buzzer
- HA3 - Rear horn
- HA4 - Buzzer
- K05 - Return to dig relay
- K2 - Reverse speed relay
- M5 - Fuel pump
- M8 - Windshield wiper motor
- S1L - Rear working light switch on lateral dashboard
- S27 - Proximity return to dig
- S2L - Windshield wiper on lateral dashboard switch
- S3 - Plate lock switch
- S3A - Front working light switch on front dashboard
- S3L - Beacon switch on lateral dashboard
- S4L - Horn switch on lateral dashboard
- S5L - Optional switch on lateral dashboard
- Y3 - Plate unlock solenoid valve
- Y6 - Return to dig solenoid valve

CONNECTORS

- X1 - 11-ways connector front line
- X2 - 9-ways connector light switch and gear shift line
- X3 - 11-ways connector front line
- X5 - 11-ways connector cabin command
- X6 - 9-ways connector solenoid valve line
- X8 - 17-ways connector lateral dashboard
- X9 - 17-ways connector front line
- X17 - 21-ways connector lateral dashboard
- X19 - 9-ways connector front dashboard
- X30 - 2-ways connector fuel pump
- X31 - 5-ways connector cabin
- X32 - 2-ways connector radio power
- X33 - 7-ways connector lateral dashboard
- X39 - 3-ways connector proximity

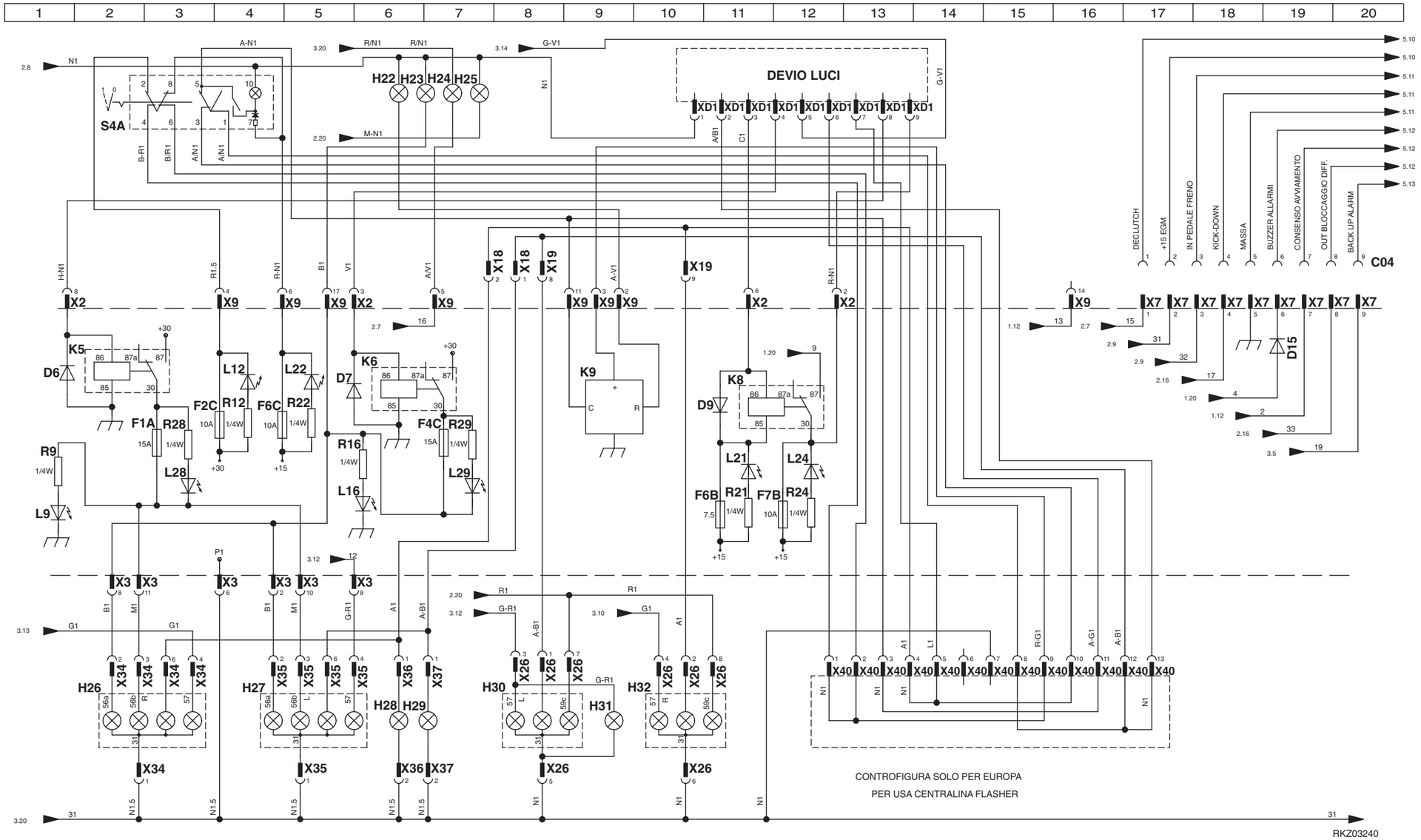
FUSES

- F1B - Right traffic light fuse 3A
- F1C - Left traffic light fuse 3A
- F2A - Rotary beam fuse 10A
- F2B - Radio and cabin lamp fuse 7.5A
- F4B - Forward-reverse speed fuse 10A
- F5B - Rear working light switch fuse 15A
- F5C - Front working light switch fuse 15A
- F6A - Windshield wiper-washer switch fuse 15A

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ELECTRICAL DIAGRAM (4/7)



COMPONENTS

H22 - Indicators warning light
H23 - Main beam warning light
H24 - Low level brake oil warning light
H25 - Differential lock warning light
H26 - Right front lamp
H27 - Left front lamp
H28 - Right front indicators lamp
H29 - Left front indicators lamp
H30 - Left rear lamp
H31 - Number plate lamp
H32 - Right rear lamp
K5 - Low beam relay
K6 - Main beam relay
K8 - Horn relay
K9 - Flasher unit
S4A - warning switch on front dashboard

CONNECTORS

X2 - 9-ways connector light switch and gear shift line
X3 - 11-ways connector front line
X7 - 9-ways connector
X9 - 17-ways connector front dashboard
X18 - 5-ways connector power box
X19 - 9-ways connector front dashboard
X26 - 8-ways connector rear line
X34 - 6-ways connector right front light
X35 - 6-ways connector left front light
X36 - 2-ways connector right front indicator
X37 - 2-ways connector left front indicator
X40 - 13-ways connector flasher unit
XD1 - 9-ways connector lights switch

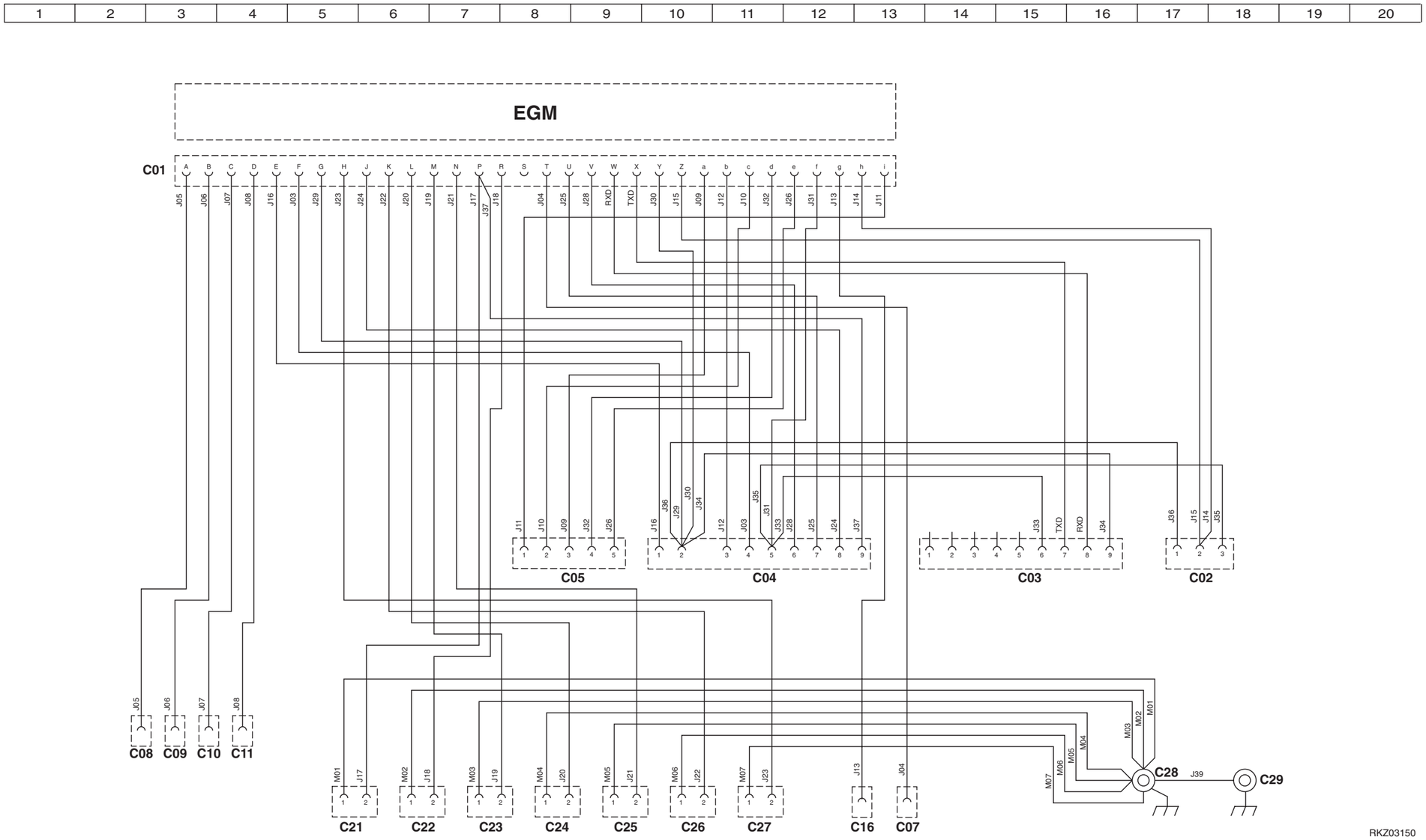
FUSES

F1A - Low beam fuse 15A
F2C - Warning fuse 10A
F4C - Main beam fuse 15A
F6B - Light switch fuse 7.5A
F6C - Warning power fuse 10A
F7B - Horn fuse 10A

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ELECTRICAL DIAGRAM (5/7)



RKZ03150

CONNECTORS

C01 - EGM connector
C02 - Speedmeter sensor
C03 - Diagnostic connector
C04 - Main box connector
C05 - Not used
C07 - Oil pressure sensor (alarm)
C08 - 1st gear filling pressure sensor
C09 - 2nd gear filling pressure sensor
C10 - 3rd gear filling pressure sensor
C11 - 4th gear filling pressure sensor
C16 - Oil temperature sensor
C21 - Reverse clutch proportional solenoid valve
C22 - Forward clutch proportional solenoid valve
C23 - 1st gear clutch solenoid valve
C24 - 2nd gear clutch solenoid valve
C25 - 3rd gear clutch solenoid valve
C26 - 4th gear clutch solenoid valve
C27 - 4WD disengagement clutch solenoid valve

CABLE ID.

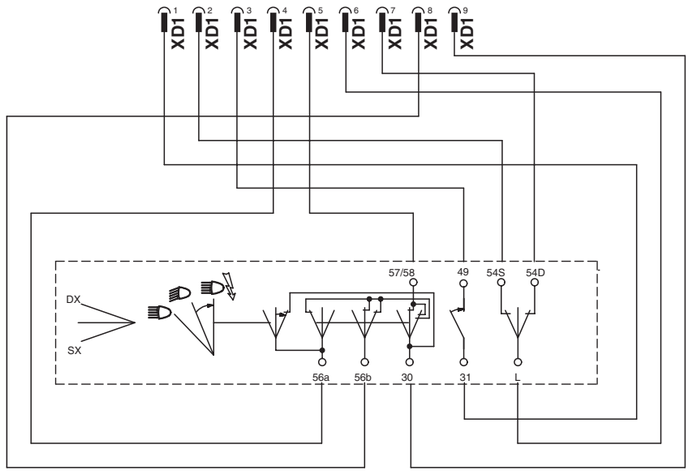
J03 - Kick Down
J04 - Main pressure sensor
J05 - 1st gear pressure sensor
J06 - 2nd gear pressure sensor
J07 - 3rd gear pressure sensor
J08 - 4th gear pressure sensor
J09 - Not used
J10 - Not used
J11 - Not used
J12 - Brake engaged (4WD)
J13 - Oil temperature sensor
J14 - RPM1 sensor
J15 - RPM2 sensor
J16 - Declutch
J17 - Reverse gear solenoid valve
J18 - Forward gear solenoid valve
J19 - 1st gear solenoid valve
J20 - 2nd gear solenoid valve
J21 - 3rd gear solenoid valve
J22 - 4th gear solenoid valve
J23 - 4WD solenoid valve
J24 - Differential lock
J25 - Engine start inhibition
J26 - 4th gear inserted (4WS)
J27 - Lock-up T.C.
J28 - Buzzer
J29 - Alimentation
J30 - Alimentation
J31 - Ground
J32 - Revolution speed meter

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ELECTRICAL DIAGRAM (6/7)

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



LIGHT SWITCH

RKZ03250

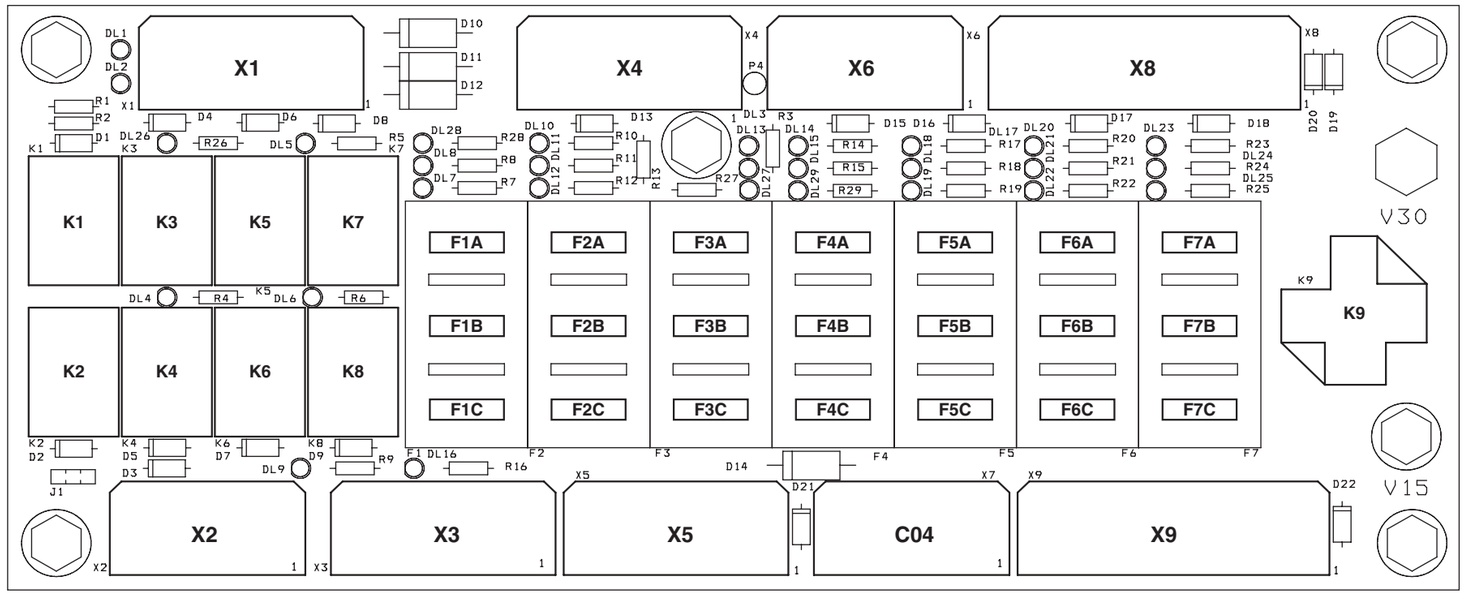
CONNECTORS

XD1 - 9-ways connector lights switch

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ELECTRICAL DIAGRAM (7/7)



RKZ03140

COMPONENTS

K1 - Forward speed relay
K2 - Reverse speed relay
K3 - 4 Wheels drive relay
K4 - Key safety start relay
K5 - Low beam relay
K6 - Main beam relay
K7 - Lights switch relay
K8 - Horn relay
K9 - Flasher unit

FUSE

F1A - Low beam fuse 15A
F1B - Right traffic light fuse 3A
F1C - Left traffic light fuse 3A
F2A - Rotary beam fuse 10A
F2B - Radio and cabin lamp fuse 7.5A
F2C - Warning fuse 10A
F3A - Safety start fuse 7.5A
F3B - Switch + warning light fuse 7.5A
F3C - Optional solenoid valve fuse 7.5A
F4A - 4WD-windshield wiper fuse 7.5A
F4B - Forward-reverse speed fuse 10A
F4C - Main beam fuse 15A
F5A - Blower motor switch fuse 15A
F5B - Rear working light switch fuse 15A
F5C - Front working light switch fuse 15A
F6A - Windshield wiper-washer switch fuse 15A
F6B - Light switch fuse 7.5A
F6C - Warning power fuse 10A
F7A - Monitor fuse 7.5A
F7B - Horn fuse 10A
F7C - Fuel shut off fuse 7.5A

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20 TESTING AND ADJUSTMENTS

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⚠ When carrying out controls, adjustments or analyses for troubleshooting, park the machine on firm, level ground. Apply all the machine safety devices and use blocks to prevent any machine movement.

⚠ When more than one person is engaged in the work, use the prescribed notices that indicate that the machine is undergoing maintenance. Do not allow any unauthorised persons to remain in the vicinity.

⚠ When checking the level of the cooling liquid, wait until this liquid has cooled. If the radiator cap is removed while the liquid is still hot and under pressure, it may cause severe burns.

⚠ Take great care not to get entangled in moving parts (fan, alternator belt or any of the rotating elements).

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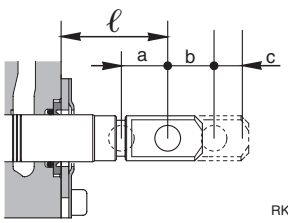
NORMAL OR STANDARD TECHNICAL DATA

• FOR ENGINE

Machine model			WB97R-2	
Engine			S4D106-1FA	
Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed	High idling Low idling Set speed	rpm rpm rpm	2375±50 1050±50 2200	2375 – 2425 1000 – 1100 —
Exhaust gas colour	Sudden acceleration At high idling speed	Bosch index	0.9 0.5	1.5 1.0
Valve clearance	Intake valve (20°C) Exhaust valve (20°C)	mm mm	0.3±0.5 0.3±0.5	Max. 0.35 Max. 0.35
Compression pressure (SAE30 oil)	Oil temperature 69 – 72°C (Engine speed)	kg/cm^2 rpm	35±1 250	28±1 250
Blow - by pressure (oil SAE30)	Water temperature in operating range At high idling speed	mm H_2O	— —	— —
Engine oil pressure	Max. idling (in cold state) At set speed At low idling	kg/cm^2 kg/cm^2 kg/cm^2	Max. 6 4.5 1	Max. 6 4 – 5 Min. 1
Oil temperature	Entire speed range	°C	120°	Max. 120°
Fuel injection timing	B.T.D.C.	degrees	12.5	11.5 – 13.5
Fan belt tension	Deflection when pressed with finge force of approx. 10 kg	mm	10	10 – 15

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• FOR MACHINE

Machine model					WB97R-2								
Classification	Check item	Test conditions		Unit	Standard value				Permissible value				
Engine speed	Accelerator pedal	• Hydraulic oil temperature: 45 – 55 °C. • Converter oil temperature: 80 °C • Engine oil temperature cooling circuit: in the limits.	Max.	rpm	2375±50				2325 – 2425				
			Min.		1050±50				1000 – 1100				
	Accelerator fuel	• Hydraulic oil temperature: 45 – 55 °C. • Converter oil temperature: 80 °C • Engine oil temperature cooling circuit: in the limits.	Max.		1900±50				1850 – 1950				
			Min.		1050±50				1000 – 1100				
Control valve	All controls (front bucket and backhoe)			mm	ℓ	a	b	c	ℓ	a	b	c	
					41.5	8	8	—	—	—	—	—	
	For front shovel arm command only (with floating arm)				41.5	8	8	5	—	—	—	—	
Travel of levers and pedals	Front bucket tilt lever control	• Engine stopped • At the centre of knob lever • Valve reading at the end of working stroke • Attachments on the ground	Neutral → Raise / Lower	mm	80				60 – 110				
	Front bucket control lever		Neutral → Dump / Curled		115				90 – 140				
	Front bucket 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				35 – 65				
	Fuel control lever		Min. → Max.		70				50 – 90				
	Jig arm control pedal		Neutral → Out / In		15 30				10 – 20 20 – 40				
	Hammer and side digging boom control pedal		Neutral → Right / Left		15 30				10 – 20 20 – 40				

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• FOR MACHINE

Machine model				WB97R-2	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Travel of levers and pedals	Accelerator pedal	• Engine stopped • At the centre of knob lever • Valve reading at the end of working stroke • Attachments on the ground Min. → Max.	mm	80	60 – 100
	Wheel swing	Right → Left Left → Right	rev.	Max. 2.5	2.2 – 2.5
Force for levers and pedals operation	Front bucket tilt lever control	• Engine speed: max. • Oil temperature: 45 – 55°C • Tool connection at the centre of knob (for levers) • Tool connection on edge (for pedals)	kg	2.5	2 – 3
	Front bucket control lever			2.5	2 – 3
	Boom control lever			1.5	1 – 2
	Arm control lever			1.5	1 – 2
	Bucket control lever			1.5	1 – 2
	Boom swing control lever			1.5	1 – 2
	Outriggers control lever			3	2.5 – 3.5
	Fuel control lever			12	10 – 14
	Jig arm control pedal	In Out		4 8	3 – 4 6 – 10
	Hammer and side digging boom control pedal			8	6 – 10
	Accelerator pedal			3	2 – 4
	Brake pedal			30	Max. 60

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• FOR MACHINE

Machine model				WB97R-2	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Main valve pressure	2-3-Spool control valve	• Engine speed: max. • Oil temperature: 45 – 55°C – 55 °C	bar	185	185±7
	6-7-8-Spool control valve			185	185±7
	Steering unit (safety)	• Check on test bench		240	240±7
Pressures of secondary valves circuits	Front bucket (curled) ✻	• Engine speed: max. • Oil temperature: 45 – 55°C • Check one circuit at the time ✻ Check on test bench	bar	230	230±7
	Front bucket (dump)			170	170±7
	Boom (raising) ✻			300	300±7
	Boom (lowering)			230	230±7
	Arm (Closing)			230	230±7
	Boom swing			240	240±7
	Bucket (curled)			230	230±7
	Side digging boom (right-left)			270	270±7
	Hammer (delivery)			160	160±7
	Steering unit			175	175±7

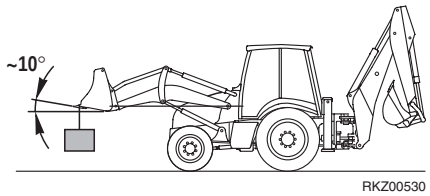
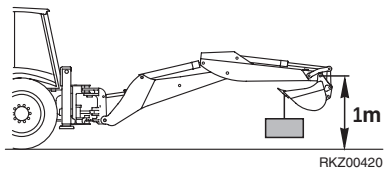
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• FOR MACHINE

Machine model				WB97R-2	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed (with load) Converter	With converter	• Engine speed (without load): 2375±50 • Hydraulic oil temperature: 45 – 55°C • Converter oil temperature: 80°C • Machine in 4th gear • Working brakes applied	rpm	2275±50	2225 – 2525
	With converter and hydraulic circuit	• Engine speed: 2375±50 • Hydraulic oil temperature: 45 – 55°C • Converter oil temperature: 80°C • Machine in 4th gear • Working brakes applied • Front bucket curled stop • Steering stop		2200±50	2150 – 2250
	With converter (TBG version)	• Engine speed: 2375±50 • Hydraulic oil temperature: 45 – 55 °C • Converter oil temperature: 80 °C • Machine in 3rd gear • Working brakes applied		2200±50	2150 – 2250
	With converter and hydraulic circuit (TBG version)	• Engine speed (without load): 2375±50 • Hydraulic oil temperature: 45 – 55 °C • Converter oil temperature: 80 °C • Machine in 3rd gear • Working brakes applied • Front bucket curled stop		2200±50	2150 – 2250

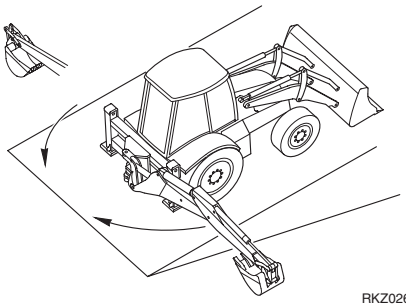
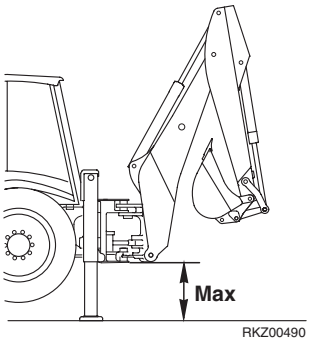
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• FOR MACHINE

Machine model					WB97R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Hydraulic drift working equipment	Front bucket	Complete working equipment (Tip lowering of bucket teeth)	Measuring posture  RKZ00530 • In this position check in feedback of each cylinder and the leakage with applied load on the tip of bucket teeth. • Ground level. • Bucket: normal load (1500 kg) • Engine stopped • Oil temperature: 45 – 55°C • Check measures as soon as engine stops. • Check changes every 5 min. and the total change in 15 min.	mm	250	400
		Cylinders (cylinder in)			30	45
		Bucket cylinder (cylinder in)			15	25
	Backhoe	Complete working equipment (Tip lowering of bucket teeth)	Measuring posture  RKZ00420 • In this position check the extension of each cylinder and the leakage with normal load on the bucket. • On level ground. • Bucket : normal load (450 kg) • Engine stopped • Oil temperature: 45 – 55°C • Check measures as soon as engine stops. • Check changes every 5 min. and the total change in 15 min.	mm	300	450
		Boom cylinders (cylinder out)			35	50
		Arm cylinder (cylinder out)			15	25
		Bucket cylinder (Cylinder in)			10	15

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• FOR MACHINE

Machine model					WB97R-2	
Classification		Check item	Test conditions	Unit	Standard value	Permissible value
Hydraulic drift working equipment	Backhoe	Boom swing	 RKZ02670 • Oil temperature: 45 – 55 °C • Backhoe balanced on the guides bucket in transport condition. • Arm and bucket cylinder in. Put the bucket link pin at 1 meter from ground and swing at end of boom stroke in one of the two direction. • Move the machine on a chute of 15° and apply the parking brake. • Stop the engine and, after 1 minute, check the cylinder feed back opposite to the boom every 5 min. for a total of 15 minutes. ★ Make the test for each swing direction.	mm	15	25
		Outriggers	 RKZ00490 • Oil temperature: 45 – 55°C • Backhoe balanced. • Boom and arm cylinders in, bucket cylinder out • Outriggers at maximum extension. • Engine stopped. • Check the frame lowering for each side every 5 min. for a total of 15 minutes.		15	25

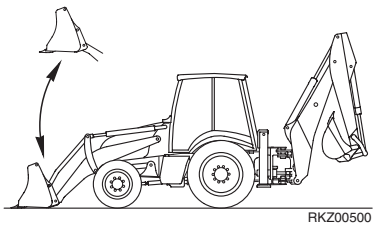
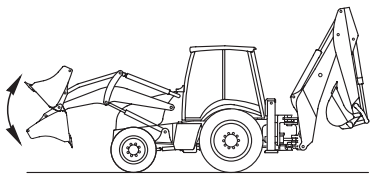
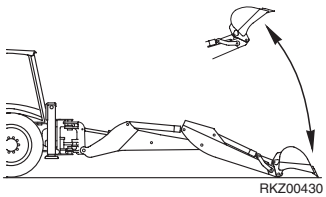
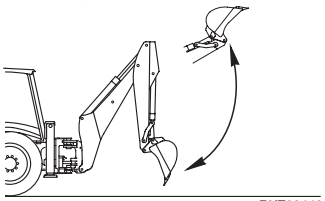
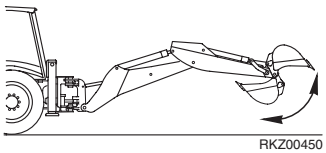
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• FOR MACHINE

Machine model					WB97R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Cylinder leaking	Front bucket	Boom	• Engine: Max. speed • Oil temperature: 45 – 55°C • Leaking check: on the cylinder opposite side to the pressure one. ★ Check 1 cylinder at a time. ★ For tilt front bucket, front bucket and for swing, check the two cylinders separately.	mm	2.0 (each cylinder)	Max. 8.0
		Bucket			1.6 (each cylinder)	Max. 6.0
	Backhoe	Boom			3.3	Max. 13.5
		Arm			3.0	Max. 12.0
		Bucket			2.4	Max. 9.5
		Boom swing			3.2	Max. 13.0
		Outriggers			3.3	Max. 13.5
		Side digging			2.0	Max. 8.0
		Jig arm			1.6	Max. 6.0

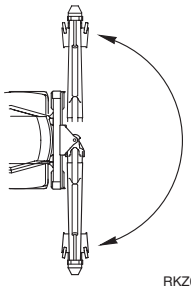
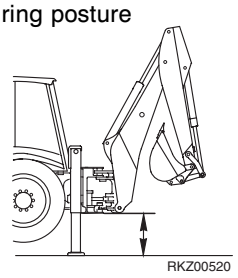
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• FOR MACHINE

Machine model						WB97R-2	
Classification		Check item	Test conditions		Unit	Standard value	Permissible value
Work equipment speed	Front bucket	Tilt lever front bucket Bucket on level ground ↕ Cylinders extended out	Measuring posture  RKZ00500 ● Engine speed: Max. ● Oil temperature: 45 – 55°C	Raised	sec.	3.9	3.3 – 4.5
				Lowered		2.6	2.2 – 3.0
		Arm Cylinder in ↕ Cylinder out	Measuring posture  RKZ00510 ● Engine speed: Max. ● Oil temperature: 45 – 55°C	Curled		2.6	2.2 – 3.0
				Dump		3.5	3.0 – 4.0
	Backhoe	Boom Teeth bucket on level ground ↕ Cylinder in	Measuring posture  RKZ00430 ● Engine speed: Max. ● Oil temperature: 45 – 55°C ● Backhoe balanced	Raised		2.6	2.2 – 3.0
				Lowered		1.9	1.6 – 2.2
		Arm Cylinder in ↕ Cylinder out	Measuring posture  RKZ00440 ● Engine speed: Max. ● Oil temperature: 45 – 55°C ● Backhoe balanced	Closing		4.5	3.9 – 5.1
				Opening		3.6	3.1 – 4.1
		Bucket Cylinder in ↕ Cylinder out	Measuring posture  RKZ00450 ● Engine speed: Max. ● Oil temperature: 45 – 55°C ● Backhoe balanced	Curled		3.1	2.7 – 3.5
				Dump		2.6	2.2 – 3.0

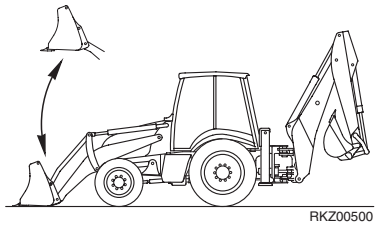
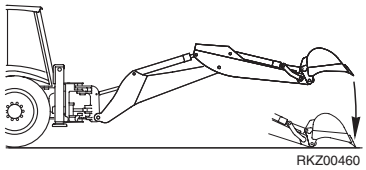
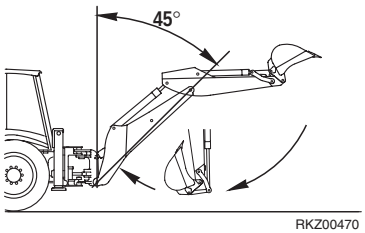
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• FOR MACHINE

Machine model					WB97R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Work equipment speed	Backhoe	Boom swing Left end travel ↕ Right end travel	Measuring posture  RKZ02570 ● Engine speed: Max. ● Oil temperature: 45 – 55°C ● Backhoe balanced ● Arm vertical	Right	sec.	4.5	3.9 – 5.1
				Left		4.5	3.9 – 5.1
		Outriggers All extended ↕ All raised	Measuring posture  RKZ00520 ● Engine speed: Max. ● Oil temperature: 45 – 55°C ● Backhoe balanced ● Dowel joint locking: applied ● Rear wheels raised ● Outriggers at maximum extension	Lifting		2	1.8 – 2.2
				Lowering		2	1.8 – 2.2

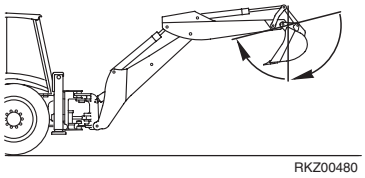
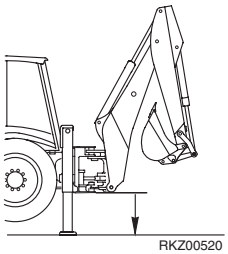
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• FOR MACHINE

Machine model					WB97R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Work equipment	Time lags	Tilt lever front bucket	Measuring posture  RKZ00500 • Engine speed: Min. • Oil temperature: 45 – 55°C • Check the time necessary to lift bucket from level ground.	sec.	0	Max. 2
		Boom	Measuring posture  RKZ00460 • Engine speed: Min. • Oil temperature: 45 – 55°C • With attachments fully extended, lower the boom and check the necessary time from the beginning of machine lifting until bucket is on level ground.		0	Max. 2
		Arm	Measuring posture  RKZ00470 • Engine speed: Min. • Oil temperature: 45 – 55°C • Put boom at 45°, open completely the arm with curled bucket. Extend arm cylinder and check the time passing between arm stop at dead centre and the restart movement.		0	Max. 2

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• FOR MACHINE

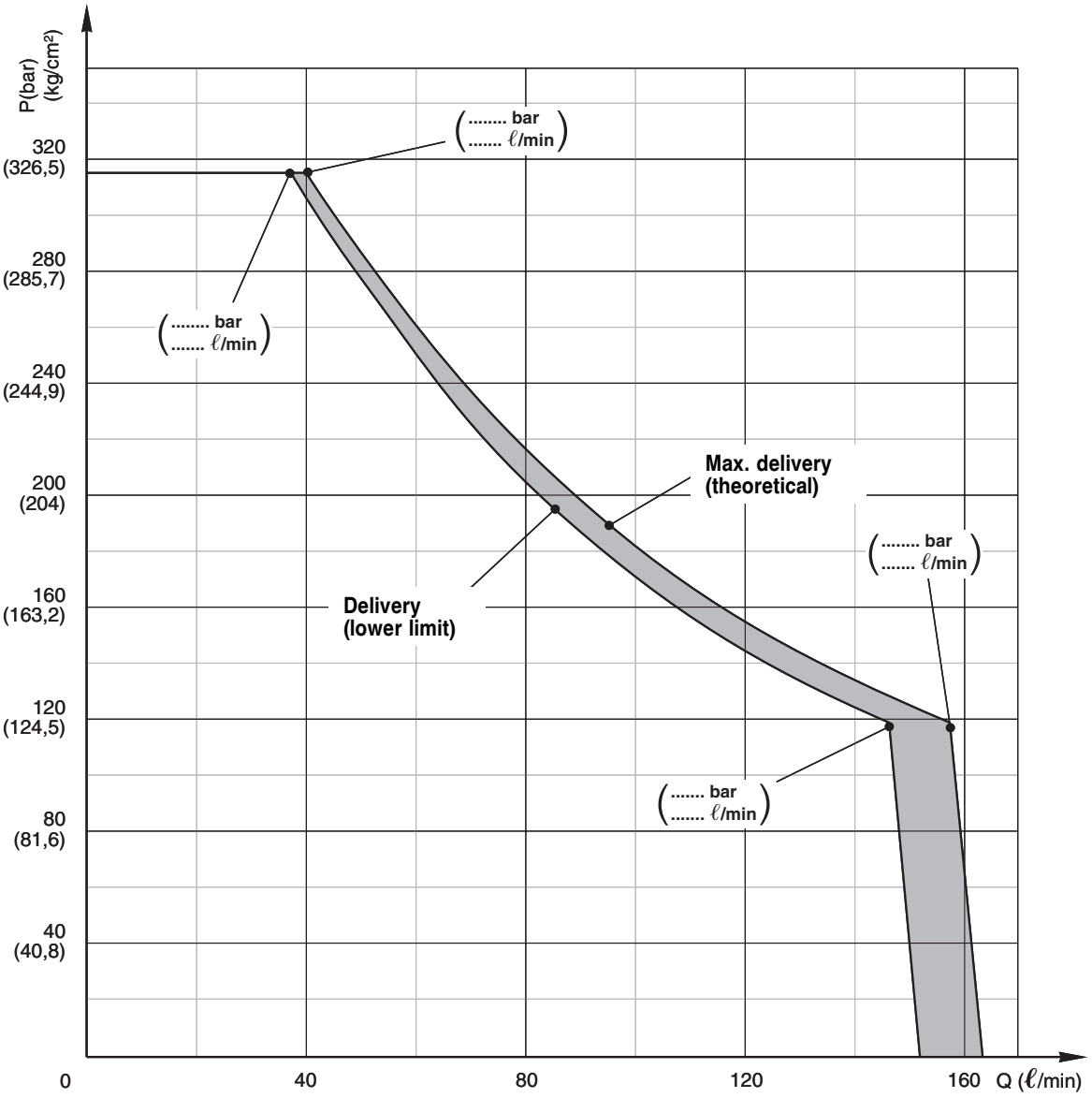
Machine model					WB97R-2	
Classification	Check item		Test conditions	Unit	Standard value	Permissible value
Work equipment	Time lags	Bucket	Measuring posture  RKZ00480 ● Engine speed: Min. ● Oil temperature: 45 – 55°C ● Put arm in horizontal position. Tilt back bucket cylinder an then extend it. Check the time passing between bucket stop at dead centre and the restart movement.	sec.	0	Max. 2
		Outriggers	Measuring posture  RKZ00520 ● 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

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Classification

- Piston pump P1 delivery.
- Working mode: Economy.
- Pump speed: 2200 rpm
- Hydraulic oil temperature: 45 – 55°C.

Pumps characteristics



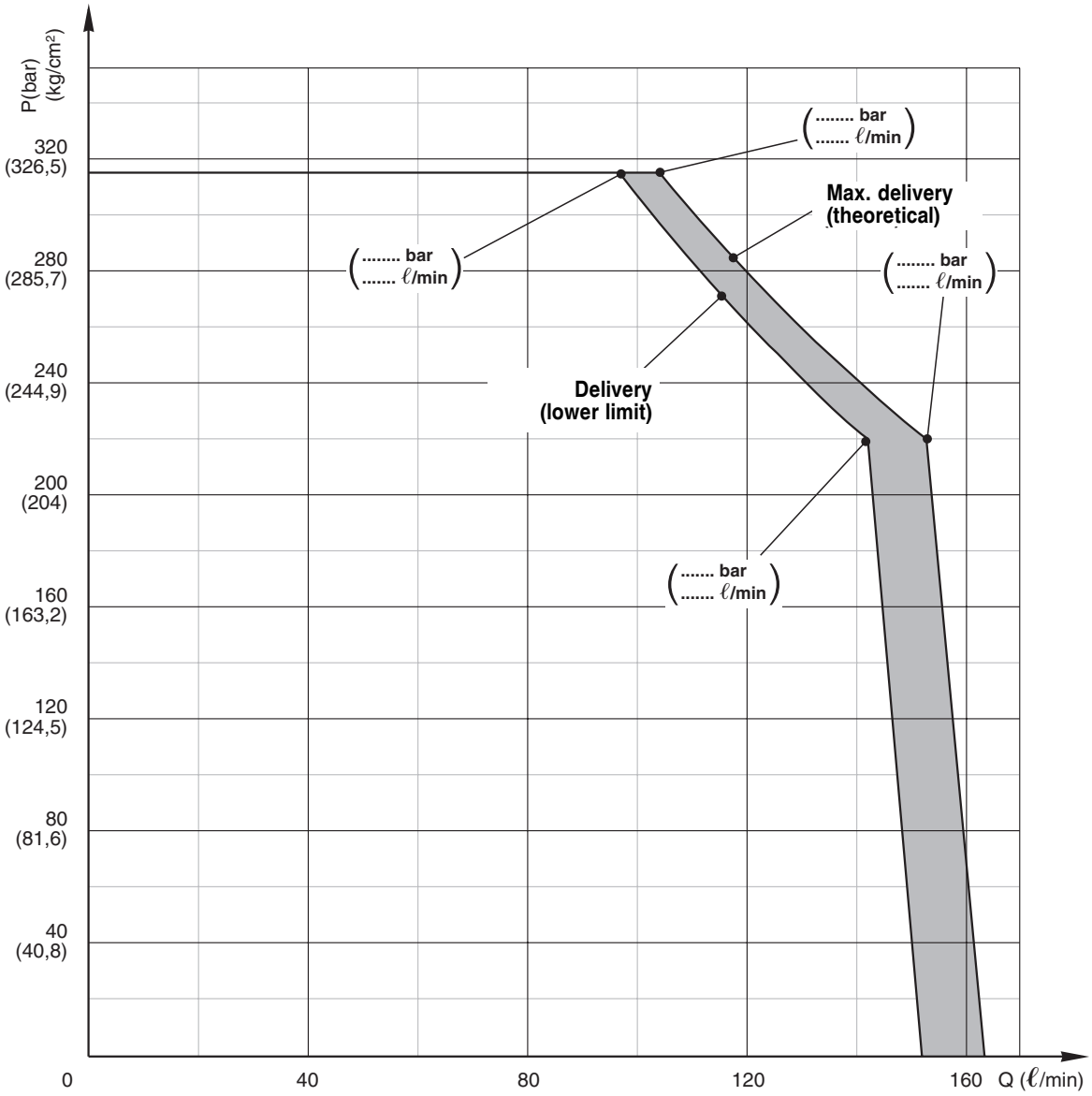
★ When measuring deliveries with the pump mounted on the machine, it becomes difficult to use the accelerator to set the number of engine rpm corresponding to the test speed prescribed for the pump. Measure the delivery with the engine set to .... rpm, and perform a proportional calculation to find the delivery value required for the test.

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Classification

- Piston pump P1 delivery.
- Working mode: Power
- Pump speed: 2200 rpm
- Hydraulic oil temperature: 45 – 55°C.

Pumps characteristics



★ When measuring deliveries with the pump mounted on the machine, it becomes difficult to use the accelerator to set the number of engine rpm corresponding to the test speed prescribed for the pump. Measure the delivery with the engine set to .... rpm, and perform a proportional calculation to find the delivery value required for the test.

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SPECIAL TOOLS

Measurement check point	Symbol		Code	Name	Q.ty	Note
Valve clearance	A	1	Commercially available	Feeler gauge	1	—
Compression pressure	B	1		Compression gauge	1	0-60 kg/cm^2
		2		Adapter	1	—
Engine speed	C	1		Multiscale tachometer	1	20 - 4000 rpm
		2		Stroboscopic tachometer	1	6 - 30000 rpm
Oil and water temperature	D	1	Commercially available	Digital thermometer	1	– 50 - 1200 °C
Hydraulic pressure	E	1		Pressure gauge	2	Full scale 60 bar
		2		Pressure gauge	1	Full scale 250 bar
		3		Pressure gauge	1	Full scale 400 bar
		4		Pressure gauge	1	Full scale 600 bar
		5		Servocontrol kit Differential pressure gauge	1	—
		6		Digital pressure gauge	1	0 – .....
	F	1		Flow-meter	1	Delivery: ..... – .....
		2		Pipe fitting kit	1	—
	G	1		Tank cap	1	Pump air bleeding
Braking group	H	1		Tool to check leaktightness of brakes	1	—
		2		Union kit	1	—
Hand brake	L	1	Commercially available	Spring dynamometer	1	Full scale 20 kg
Air-conditioning unit	M	1	Commercially available	Maintenance station	1	For Coolant R134a
		2	Commercially available	Thermometer-Hygrometer	1	Sampling every 15 seconds
		3	Commercially available	Leak detector	1	For coolant R134a

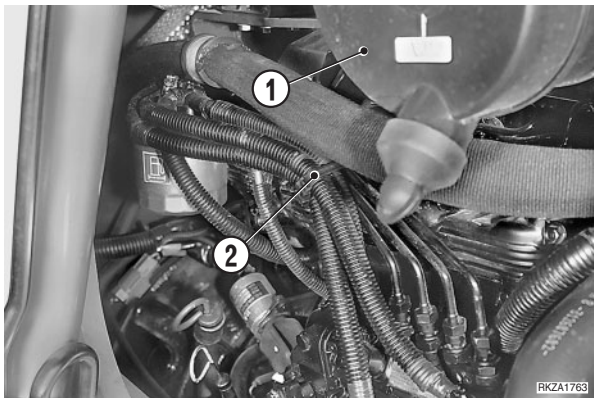
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MEASURING ENGINE SPEED

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

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

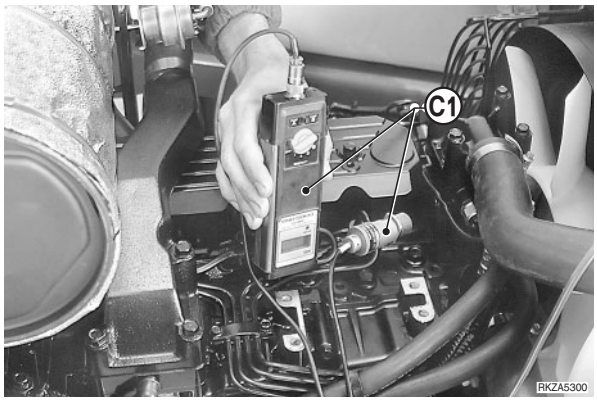
1 - Remove the air filter (1) and release the heating lines from the hose-clamp (2).



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

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

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



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ADJUSTING VALVE CLEARANCE

★ Engine: in cold state.

★ Adjust clearance between valves and rocker levers as follows:

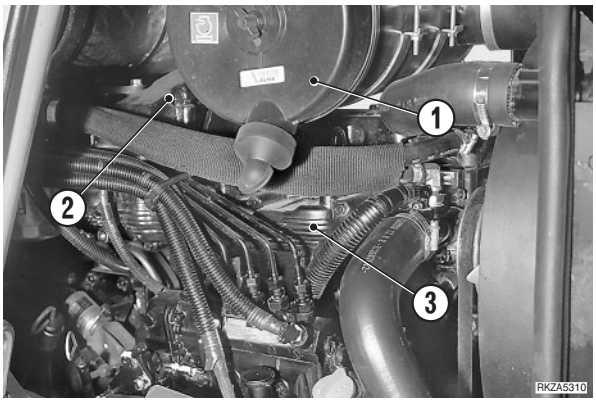
Unit: mm

At cold engine	Intake-exhaust
	0.30±0.05

★ Firing order: 1-3-4-2-1..... at 180° step.

★ Normal rotation sense: counterclockwise from flywheel

★ The cylinder N° 1 is on the opposite fan side.



- **Adjusting procedure**

1 - Remove air cleaner (1), intake manifold (2) and valves cover (3).

2 - Rotate crankshaft in normal direction as long as cylinder piston to be checked is at compression Top Dead Center (PMS).

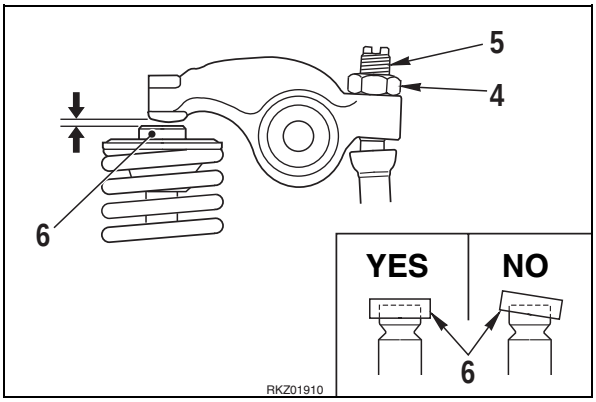
★ In this position intake and exhaust valves are closed.

3 - Loose lock nut (4) and unscrew tappet (5) of about 1 turn.

★ Check that valve insert (6) is laying flat on valve stem and that it is not worn askew.

1 - If valve inserts (6) are damaged, replaced them with new ones.

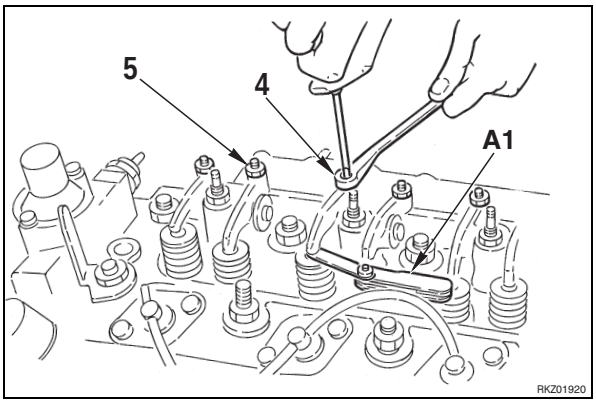
2 - Make sure that inserts feet and lay flat on valve stem.



4 - Connect **A1** feeler gauge between insert and rocker lever to adjust; rotate the tappet (5) until touching **A1** feeler gauge.
Tight tappet (5) with lock nut (4).

Nm Nut: 14.7 – 19.6 Nm

★ After tightening the lock nut, check the clearance again.



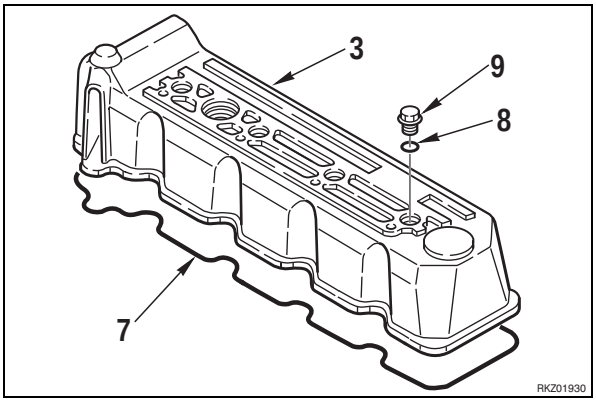
5 - Adjust with same procedures second cylinder valve and repeat same operation for the other cylinders, according to the firing order.

- **Cover valves installation**

1 - Check condition of cover valves (3), gasket (7), O-Rings (8) and lock nuts (9); clean carefully contact surface on cylinder head.

2 - Install valves cover (3), fit O-Rings (8) and lock nuts (9).

Nm Cover lock nut: 25±3 Nm

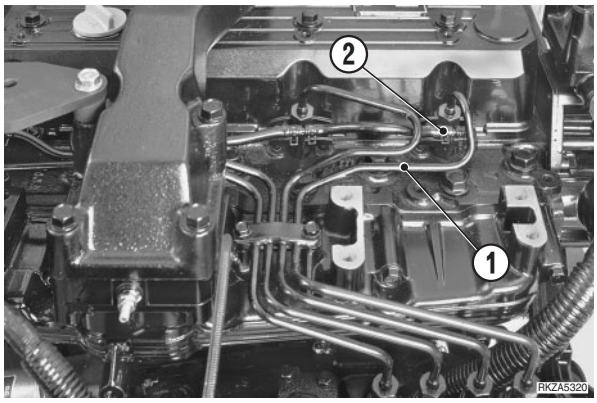


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MEASURING COMPRESSION PRESSURE

⚠
- When measuring the compression pressure be careful not to get caught in cooling fan, in the alternator belt or in other rotating parts.
- For this measurement the engine should be up to working temperature. Take every precaution against burns.
- Check all cylinders.

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

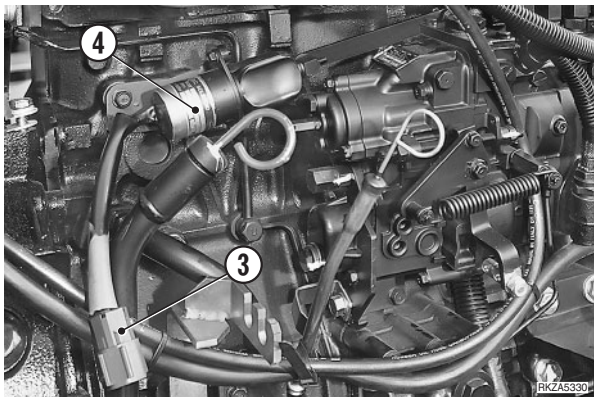


1 - Disconnect high pressure pipe (1).

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

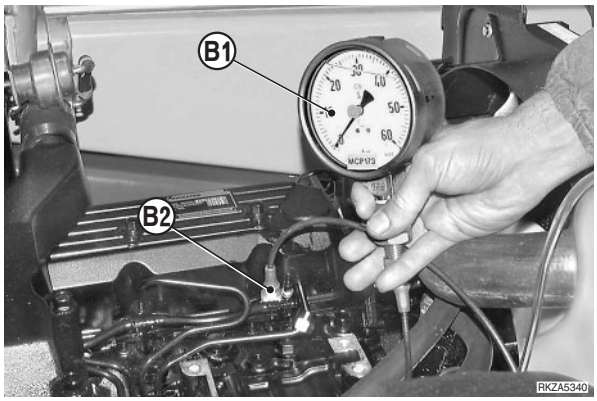
3 - Disconnect connector (3) of fuel cut-off solenoid valve (4).

4 - Crank engine with starting motor.

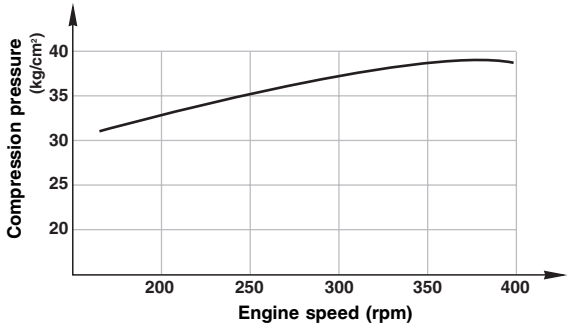


5 - Install **B2** adapter and connect **B1** pressure gauge
- ★ Check that seal is installed in the adapter and that it is not damaged.

6 - Crank engine with starting motor and measure compression pressure.
- ★ Measure the compression pressure at the point where the pressure gauge indicator remains steady.
- ★ When measuring the compression pressure, check also engine speed with **C2** stroboscopic tachometer; if speed is not within the specified range, refer to diagram.
- ★ Compression value:
  Normal: 35±1 kg/cm^2 at 250 rpm
  Minimum permissible: 28±1 kg/cm^2 at 250 rpm
- ★ Difference between cylinders: 2 – 3 kg/cm^2



7 - After measuring, install the nozzle holder assembly (2), connect high pressure pipe, feedback pipe and connector (3).
- Nm Nozzle holder collar bolts: 9.8 – 11.8 Nm
- Nm High pressure union: 19.6 – 24.5 Nm



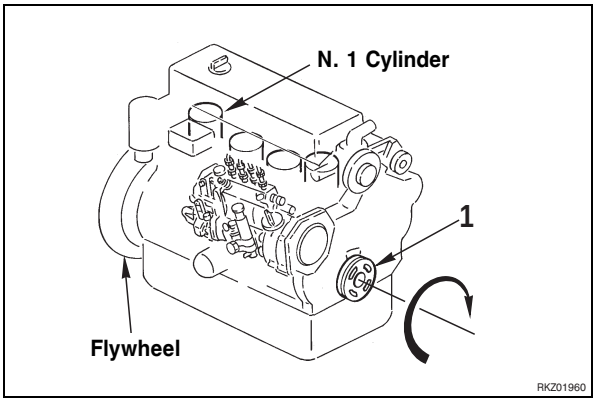
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TESTING AND ADJUSTING FUEL INJECTION TIMING

★ Check fuel injection timing of N.1 cylinder by means of N.1 delivery valve of injection pump.

★ Cylinders are numbered 1-2-3-4 starting from flywheel side.

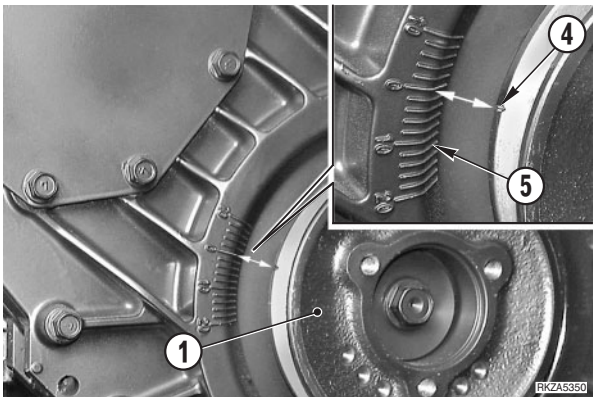
1 - Rotate crankshaft using engine pulley and put N. 1cylinder piston at top dead centre (PMS).



★ Top dead centre (PMS) is shown by notch (4) on pulley (1) positioned on «zero» of the scale (5) and by closing of both cylinder N. 1 valves.

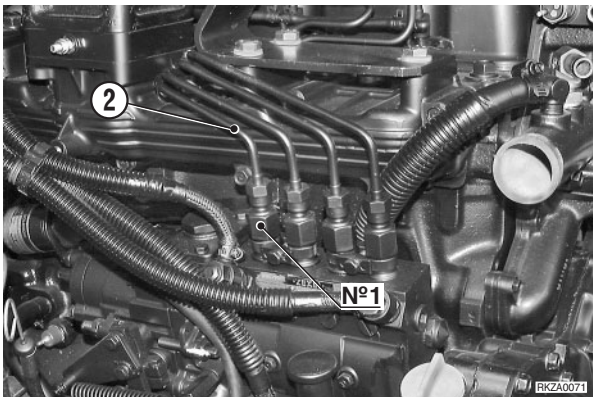
★ If the notch (4) of pulley (1) is in «zero» position on the scale (5) but cylinders N. 1 valves are not closed, rotate the crankshaft of 1 turn.

★ After recognition of PMS, rotate the crankshaft in counterclockwise direction (from pulley side view) of about 20°.

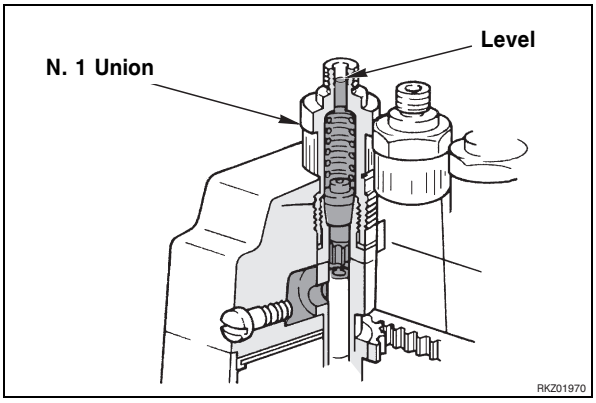


2 - Disconnect cylinder N.1 high pressure pipe (2) from injection pump.

3 - Rotate crankshaft slowly in clockwise direction from pulley side view, checking fuel level into the N. 1 delivery of injection pump.



4 - Stop pulley (1) rotation as soon as fuel level starts to increase.

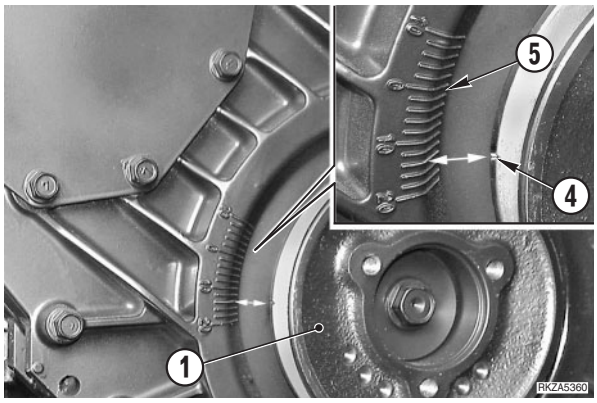


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5 - Check notch (4) position on crankshaft pulley (1) compared with scale (5); reading value corresponds to angle of fuel injection timing.

★ Standard fuel injection timing: 12.5° ± 1°

NOTE. Repeat checking more than once.



6 - If injection timing is not on standard value, rotate injection pump (6) toward external or toward engine after loosening pump nuts (7) (quantity 4) and pump lock nuts (8) fixing the bracket (9) to injection pump.

- To RETARD injection, rotate pump (6) toward external.
- To ADVANCE injection, rotate pump (6) toward cylinders block.

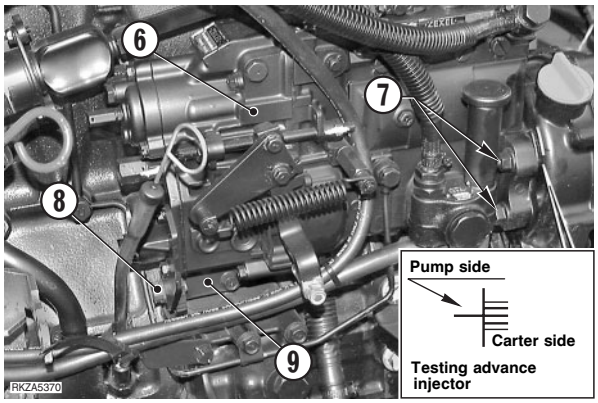
7 - Tight the pump lock nuts (7) at cylinder block and pump lock nut (8) at bracket (9).

Nm Nuts: 34.2 – 44.1 Nm

Nm Bracket lock nut: 44.1 – 53.9 Nm

8 - Connect fuel delivery pipe (2) to pump

Nm Delivery pipe union: 19.6 – 24.5 Nm



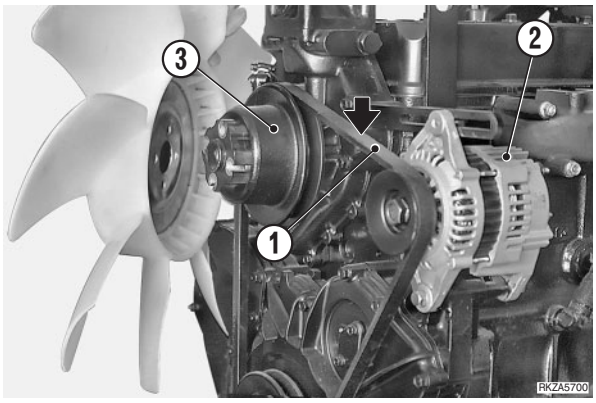
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CHECKING AND TIGHTENING THE FAN - BELT

1. Tension check

1 - Push fan belt (1) at midway point between alternator (2) and pulley (3) operating water pump; check the deflection.
With a pressure of 10 kg, deflection should be of 10 – 15 mm; if this value is not reached, tension fan belt.

★ With new belt, deflection must be of 7 – 9 mm.



2 . Fan belt tension

1 - Loosen mounting bolt (4) of the alternator (2) and mounting bolt (5) of adjustment plate.

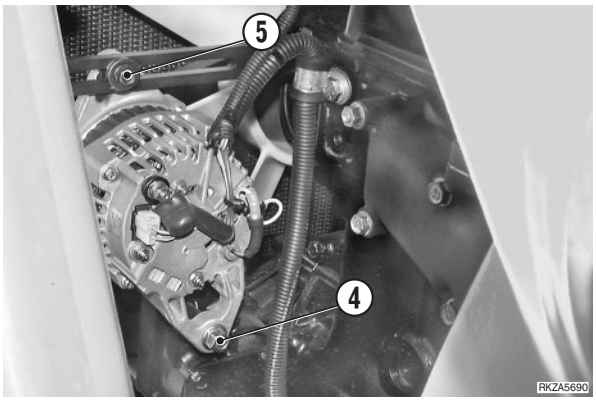
2 - Rotate the alternator (2) to give correct tension to fan belt (1) and tighten mounting bolts (4) and (5).

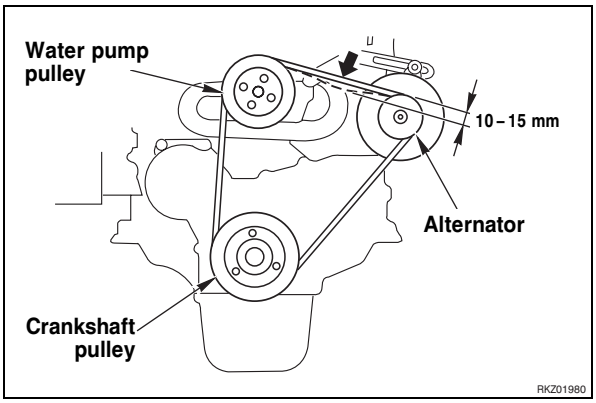
3 - Check fan belt (1) tension.

★ If belt has been replaced, check tension again after about 20 operating hours.

Nm Bolts (4): 44.1 – 53.9 Nm

Nm Bolts (5): 22.5 – 28.4 Nm





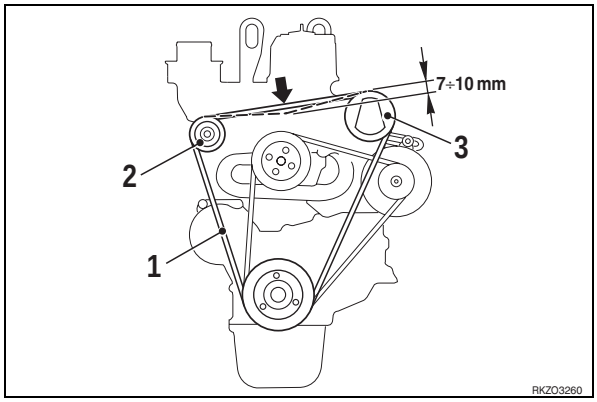
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CHECKING AND TIGHTENING THE COMPRESSOR FAN - BELT

1. Checking tension

1 - Push fan belt (1) at midway point between compressor (2) and pulley (3).
Check the deflection.
With a pressure of 10 kg, deflection should be of 7 – 10 mm; if this value is not reached, tension fan belt.

★ With new belt, deflection must be of 4 – 6 mm.



2 . Fan belt tension

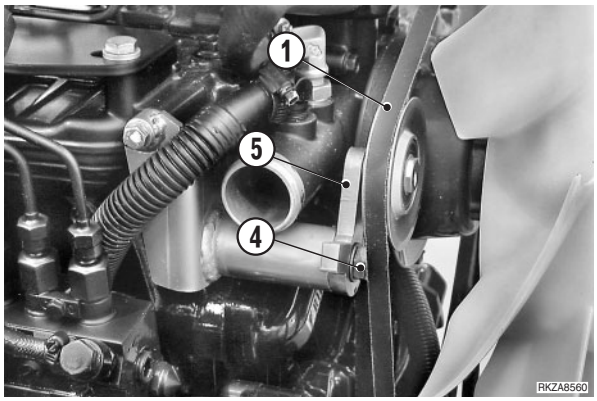
1 - Loosen mounting bolt (4) of the eccentric (5).

2 - Apply tube on eccentric (5), give correct tension to fan belt and lock with bolt (4).

3 - Check fan belt (1) tension

★ If belt has been replaced, check tension again after about 20 operating hours.

Nm Bolt: 123 Nm



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MEASURING ACCELERATOR PEDAL OPERATING TRAVEL AND ACCELERATOR LEVER

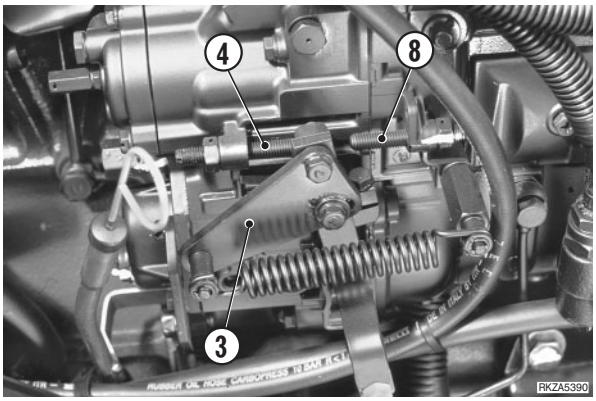
★ Work condition:
- Machine: in safety conditions.
- Engine stopped and at working temperature
- Low and high idling speed: within permissible value.
  - ★ In order to check high speed engine idling, push the accelerator pedal (1) manually.



1. Accelerator pedal travel adjusting

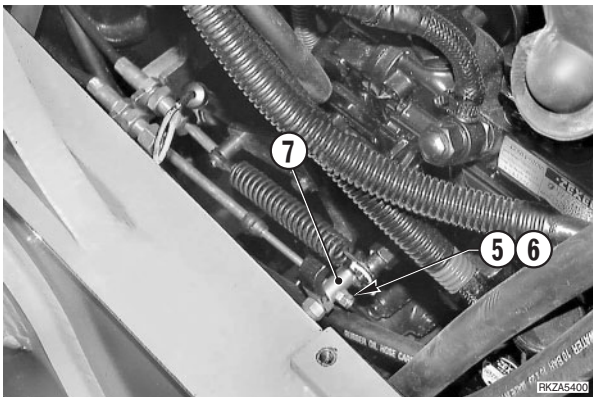
1 - Make sure that accelerator pedal (1) is fully raised and accelerator lever (2) is at minimum stroke.

2 - Check that accelerator lever (3) is in contact with low idling speed adjusting screw (4).



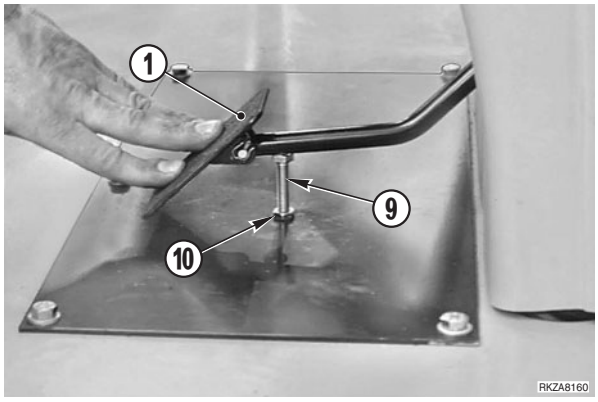
3 - Adjust nut (5) and lock nut (6) of accelerator pedal cables and hand accelerator at a distance of 0.2 – 0.3 mm from lever (7).

4 - Push accelerator pedal until accelerator lever (3) contacts the high idling adjusting screw (8).



5 - Adjust the end travel stopper (9) of accelerator pedal (1) in this position and lock it with nut (10).

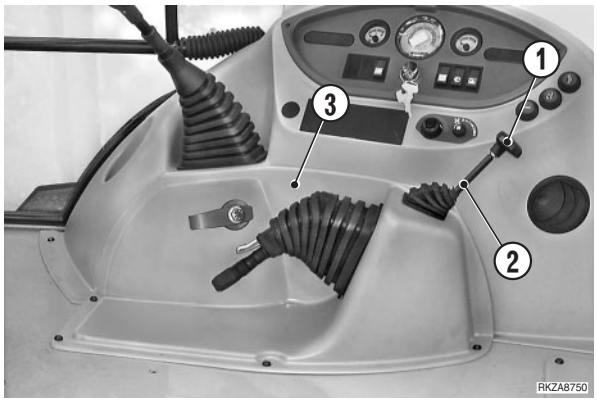
6 - Release the accelerator pedal (1).



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2. Accelerator lever travel adjusting

1 - Remove knob (1), accelerator lever (2) and lateral cover (3).



2 - Temporally, re-assembly accelerator lever (2); loosen nut (4) and tight the end lever travel bolt (5) of some turns.

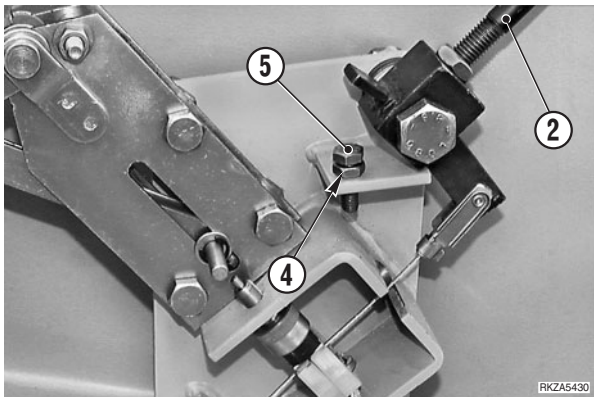
3 - Start engine and bring it to the defined idling speed for accelerator lever.

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

★ Engine idling speed: 1900±50 rpm

4 - Loosen end lever travel bolt (5) up to it is in contact with lever (2) and looked with nut (4).

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

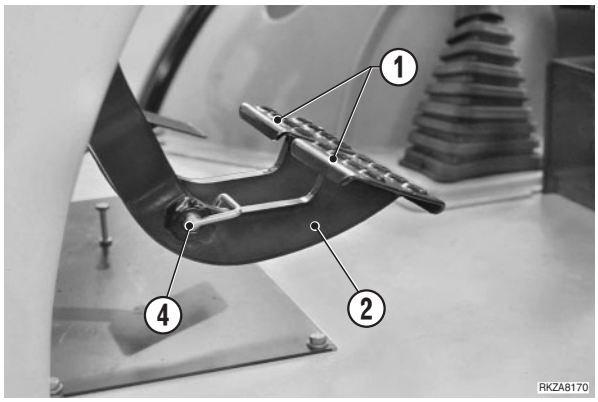


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ADJUSTING BRAKE PEDAL TRAVEL, BRAKE ALIGNMENT, MICROSWITCHES

★ Working condition:
- Engine stopped
- Machine with attachments on ground level

1 - Remove the rubber cover pedal (1).



2 - Check that pedal (2) is near to the stopper (3) and the pedals lower sides (2) are at standard measure from cab level.
If necessary, adjust height acting on the stopper (3).
- ★ Pedals lower sides height: 170.5 mm.
- ★ Check that pin (4) can freely run and lock the two pedals (2) together.

3 - Loosen nuts (5) locking the adjusting rod (6) and tighten them inside forks (7).

4 - Lock pedals (2) with pin (4); push pedals up to an height of 154.4 mm.

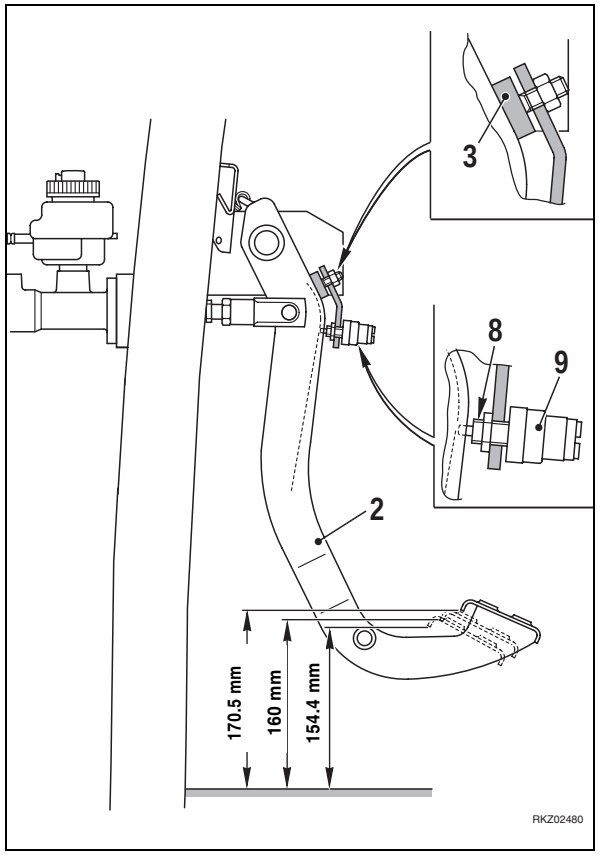
5 - Mantening this position, loosen adjusting rods (6) until they touch the brake pump piston seat.

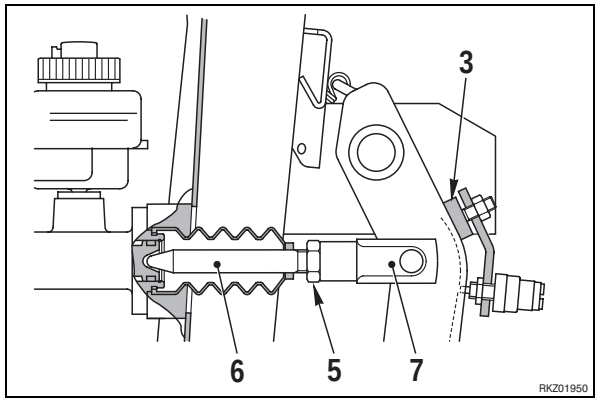
6 - Stop in this position with nut (5).
- ★ After tightened nuts (5), check that the adjusting rod (6) touch the brake pump piston seat simultaneously and at an height of 154.4 mm.

7 - Loosen microswitches (for 4 wheel brake) locking nuts (8).
Push pedals (2) up to an height of 160 mm.

8 - Mantening this position, adjust microswitches (9) up to they touch the pedal levers (2).

9 - Stop microswitches (9) in this position with nuts (8).
Nm Nut:..... Nm





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AIR BLEEDING - RELEASING RESIDUAL PRESSURE

1. Air bleeding from pump

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

The air bleeding is obtained as follows:

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

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

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

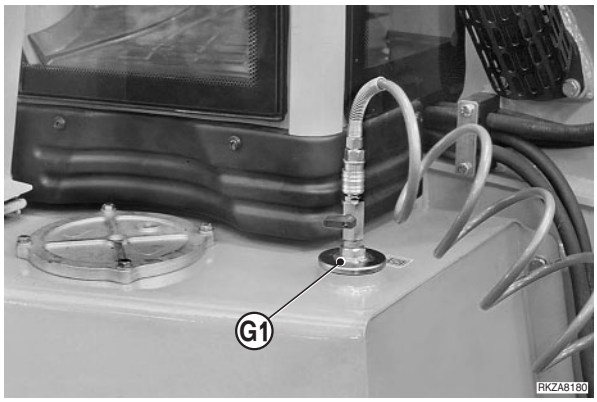
4 - Introduce slowly and intermittently air compressed in the hydraulic tank until when flows out oil without air bubbles.

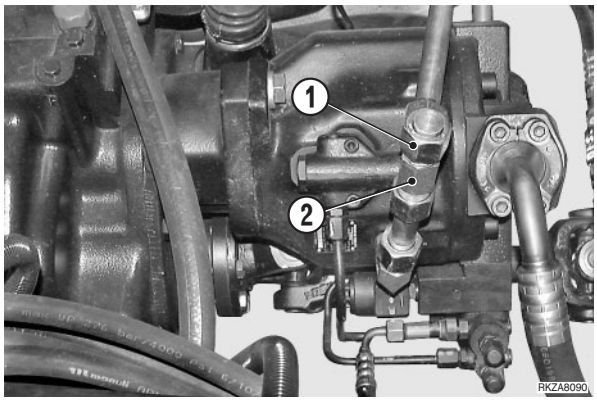
★ Max. pressure in tank: 0.5 bar

5 - Mount plug (1) and lock it.

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

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





2. Air bleeding from cylinders

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

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

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

2 - Return engine at low idling speed, extend and retract the interested piston 4-5 times.

★ Extend, lower and retract pistons until about 100 mm from their end of stroke.

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

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

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3. Air bleeding from oil tank

1 - Put the machine in oil level check position and remove the tank plug.
   ★ If necessary add oil until reaching the correct level.

2 - After stopping the engine wait for some minutes, until air bubbles on oil surface are fully disappeared.

3 - Install tank plug.

4. Hydraulic oil tank pressurization

1 - With engine at low idling speed extend slowly, up to end of stroke, all cylinders.

2 - Stop the engine and remove tank plug.

3 - Check the condition of gasket and reassemble plug.
   ★ Avoid to increase the engine speed before completing all air bleeding procedures and after the pressurization of oil tank.
   ★ After air bleeding procedures, operate engine at low Idling speed for about 10 minutes before starting to work.

5. Releasing residual pressure from the circuits

1 - Put work attachments on level ground, stop the engine.

2 - Move all control levers in all directions to release completely cylinders and main circuit remain pressure.

3 - Loosen slowly oil filler tank to remove remain pressure.

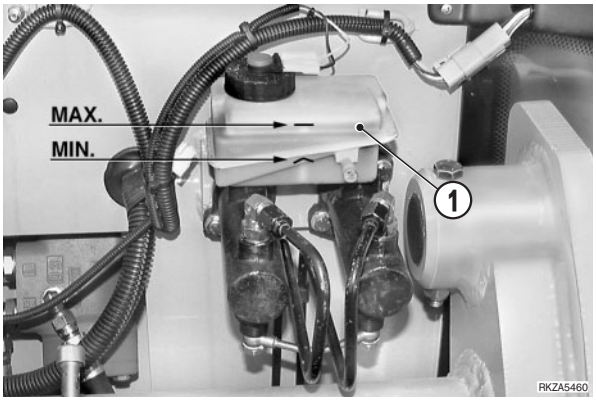
6. Air bleeding from braking circuit

★ Above operation is to be carried out every time maintenance is made on braking circuit to remove or replace a component, or when air entered into the circuit.

★ Machine must be stopped with attachments on level ground.

1 - Make sure that oil in brake system tank (1) is at maximum level.

2 - Remove pedal lock pin.



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3 - Remove safety plugs and applied to bleeding screws (2) a vinyl hose (3) to catch oil.

4 - Push one brake pedal to bottom and, keeping it pushed, loosen bleeding screw (2) of one of two braking units until the pedal reaches end of its stroke.

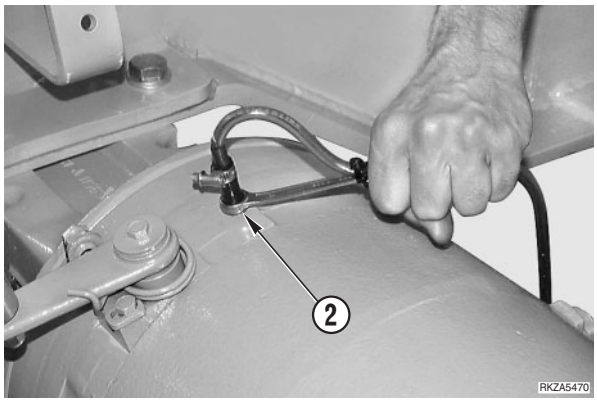
5 - Keeping pedal at the end stroke, tighten bleeding screw (2).

6 - Release braking unit pedal during air bleeding, wait for few seconds and repeat above operations until from bleeding screw, oil flows out without air bubbles.

7 - Repeat same operations for the other braking unit.

★ Check frequently the oil level in the tank and carry out filling every time level approaches to minimum.

★ After air bleeding apply on screws (2) safety plugs.

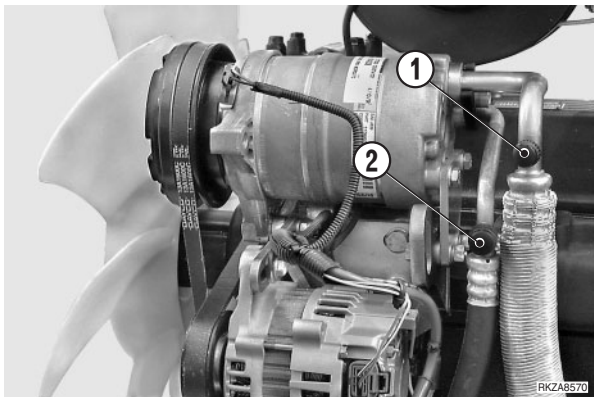


7. Emptying the air-conditioning unit

1 - Connect the maintenance station **M1** to the service valves (1) and (2) and follow the specific maintenance station instructions relative to the drainage of the unit.

2 - Disconnect the group to be substituted or reconditioned immediately after switching off the maintenance station. **Plug the removed or disconnected connection tubes tightly and with a minimum of delay.**

3 - Carefully check the quantity of anti-freeze oil recovered and contained in the disassembled parts, since the same quantity must be replaced when the air-conditioning unit is refilled.



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CHECKING AND SETTING PRESSURE IN THE ATTACHMENTS HYDRAULIC CIRCUIT

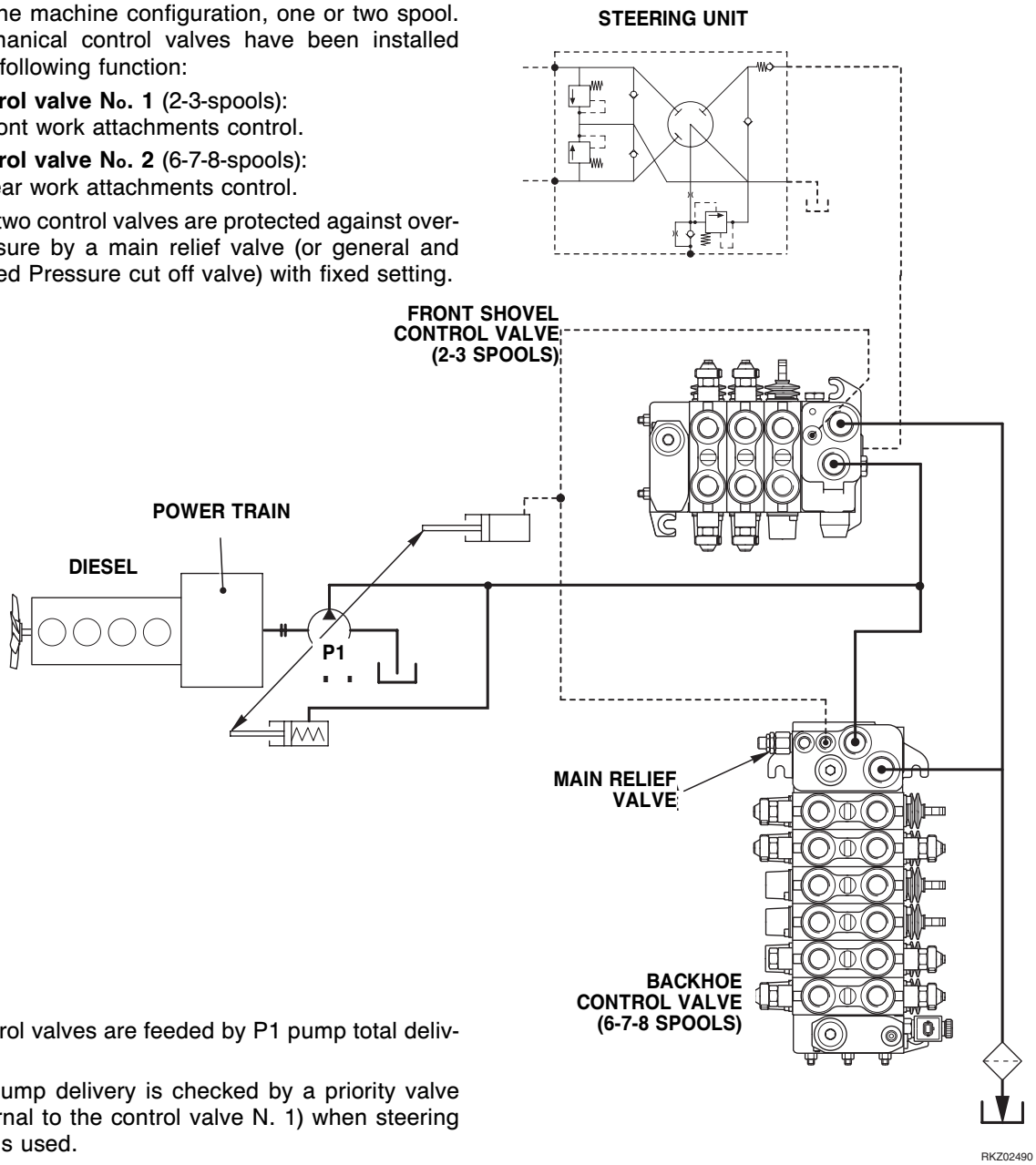
1. Introduction

- On the machine configuration, one or two spool. Mechanical control valves have been installed with following function:

  Control valve No. 1 (2-3-spools):
  for front work attachments control.

  Control valve No. 2 (6-7-8-spools):
  for rear work attachments control.

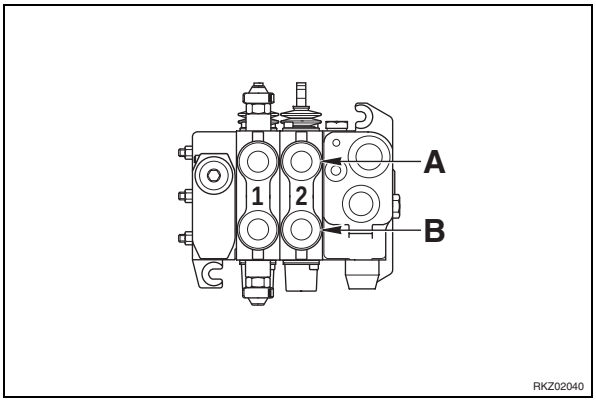
- The two control valves are protected against over-pressure by a main relief valve (or general and named Pressure cut off valve) with fixed setting.



- Control valves are feeded by P1 pump total delivery.
- P1 pump delivery is checked by a priority valve (internal to the control valve N. 1) when steering unit is used.
- Control valves include spools controlling:

2-SPOOL CONTROL VALVE

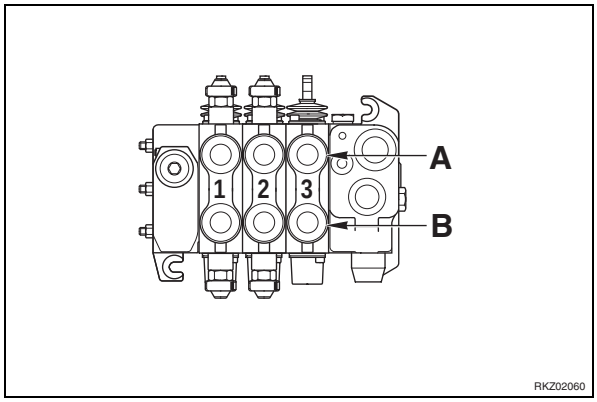
Control	Port
Front bucket (curled - dump)	A1-B1
Front bucket (lifting - lowering)	A2-B2



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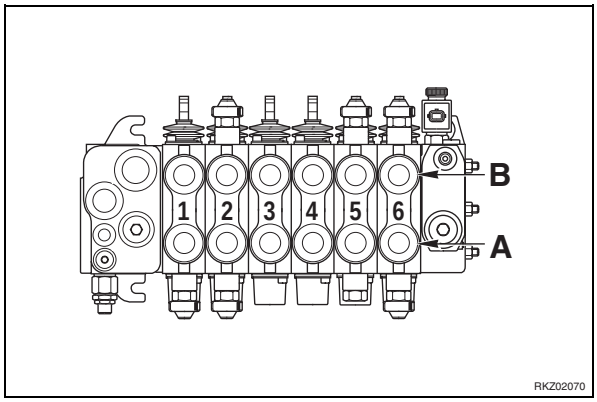
3-SPOOL CONTROL VALVE

Control	Port
Optional attachment	A1-B1
Front bucket (curled - dump)	A2-B2
Front bucket (lifting - lowering)	A3-B3



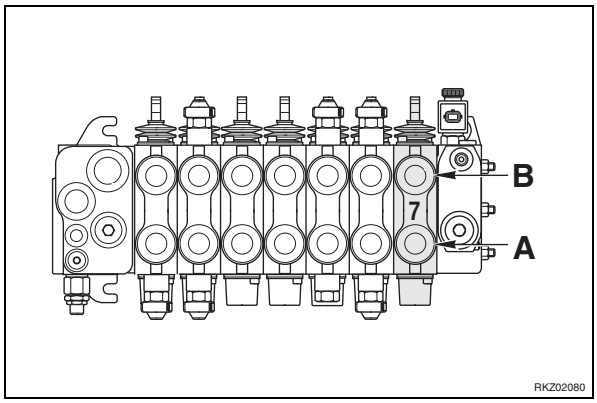
6-SPOOL CONTROL VALVE

Control	Port
Arm (opening - closing)	A1-B1
Boom swing (left - right)	A2-B2
R.H. outrigger (up - down)	A3-B3
L.H. outrigger (up - down)	A4-B4
Bucket cylinder (dump - curled)	A5-B5
Boom cylinder (lifting - lowering)	A6-B6



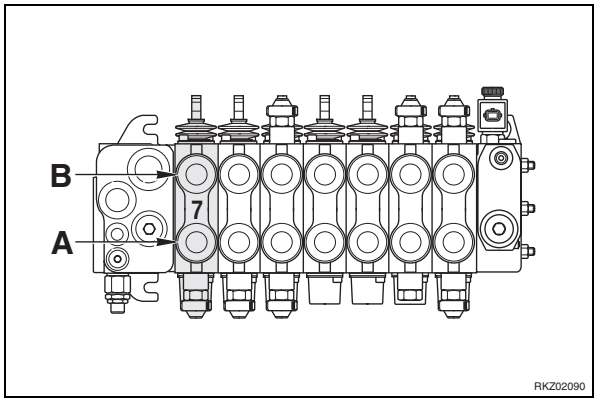
7-SPOOL CONTROL VALVE (For jig arm)

Control	Port
Jig arm (in - out)	A7-B7



7-SPOOL CONTROL VALVE (For hammer - side digging boom)

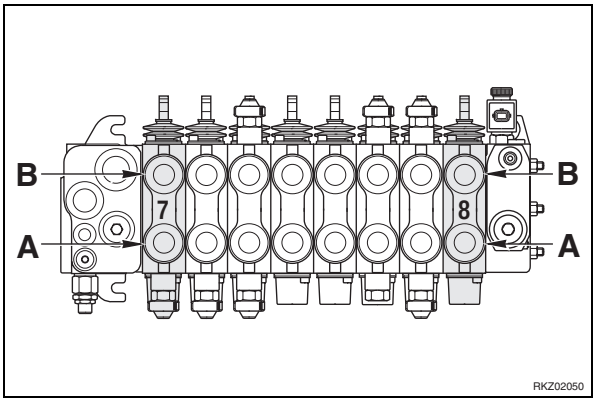
Control	Port
Hammer (R.H. side - L.H. side)	A7-B7
Side digging boom (left - right)	A7-B7



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8-SPOOL CONTROL VALVE
(For hammer and jig arm)

Control	Port
Hammer (R.H. side - L.H. side)	A7-B7
Jig arm (in - out)	A8-B8

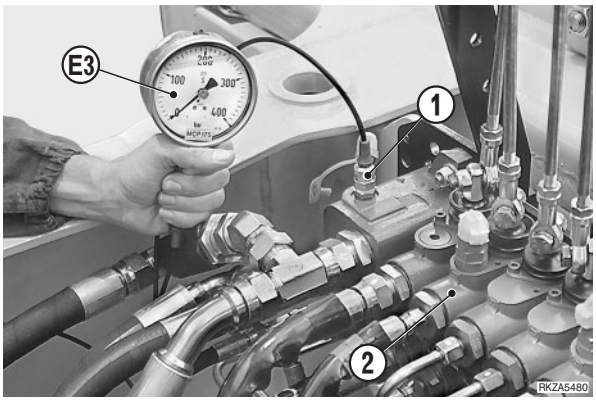


2. Testing and setting general valves (Pressure cut off valve)

★ Test condition:
- Engine: at operating temperature
- Hydraulic oil: 45 – 55 °C
- Working brakes applied

1 - Connect the pressure gauge **E3** (400 bar) to the pressure adapter (1) of the front shovel control valve (2).

2 - Start the engine, bring the hand accelerator lever up to 1050 rpm and check the nominal pressure of the main relief valve (pressure cut-off valve) by forcing the front bucket to rise to the end of its stroke.
★ Nominal pressure: 200±7 bar
★ If the main relief valve pressure do not correspond to the nominal values, they must be re-set (See «SETTING THE MAIN RELIEF VALVES AND THE REDUCING VALVES»).



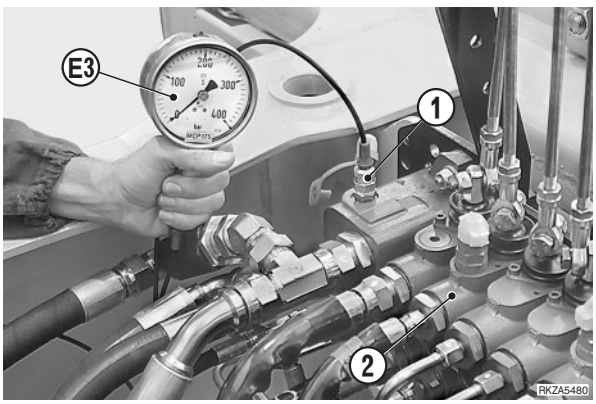
3. Testing and setting secondary valves

★ Test condition:
- Engine: at operating temperature.
- Hydraulic oil: 55 – 60 °C.
- Parking brake: applied.

★ The pressure readings are to be operated from the same check point.

1 - Connect the pressure gauge **E3** (400 bar) to the pressure adapter (1) of the backhoe control valve (2).

2 - Start the engine and bring the hand accelerator lever up to 1050 rpm.



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3 - Set the main relief valve (pressure cut-off valve) to a value 30 bar higher than the maximum pressure to be tested.
4 - Check the single movements pressure.

⚠ The secondary valve of backhoe boom lifting, **must be checked and settled on test bench only.**

Setting 2-spool control valve secondary valves

Unit: bar

Cylinder and movement		Port	Setting
Front bucket	Lifting	A1	—
	Lowering	B1	—
Front bucket	Curled	A2	230±7
	Dump ✻	B2	170±7

✻ This setting can be carried without modifing the general valve pressure.

Setting 3-spool control valve secondary valves

Unit: bar

Cylinder and movement		Port	Setting
Front bucket	Lifting	A1	—
	Lowering	B1	—
Front bucket	Curled	A2	230±7
	Dump ✻	B2	170±7
Optional attachment		A3	230±7
		B3	230±7

✻ This setting can be carried without modifing the general valve pressure.

Setting 6-spool control valve secondary valves

Unit: bar

Cylinder and movement		Port	Setting
Arm	Closing	A1	230±7
	Opening	B1	—
Boom swing	Left	A2	240±7
	Right	B2	240±7
Right outrigger	Up	A3	—
	Down	B3	—
Left outrigger	Up	A4	—
	Down	B4	—
Bucket cylinder	Dump	A5	—
	Curled	B5	230±7
Boom cylinder	Lifting ✻	A6	300±7
	Lowering	B6	230±7

✻ The setting must be carried on test bench only.

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Nominal values of the reducing valves of the 7-8 element control valve (for the other settings, please refer to the 6-element control valve).

Unit: bar

No. of spools	Cylinder and movement		Port	Setting
7	Hammer	R.H. side	A7	165±7
		L.H. side ✻	B7	—
	Side digging boom	Right	A7	270±7
		Left	B7	270±7
	Jig arm	In	A7	—
		Out	B7	—
8	Hammer	R.H. side	A7	—
		L.H. side ✻	B7	—
	Jig arm	In	A8	—
		Out	B8	—

✻ This setting can be carried without modifing the general valve pressure.

★ If valve setting pressure do not correspond to the indicated ones, provide to set them (see «SETTING MAIN AND SECONDARY VALVES»).

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

4. Main and secondary valves setting

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

⚠ For setting, prepare machine as per pressure testing.

1 - Loosen lock nut (2).

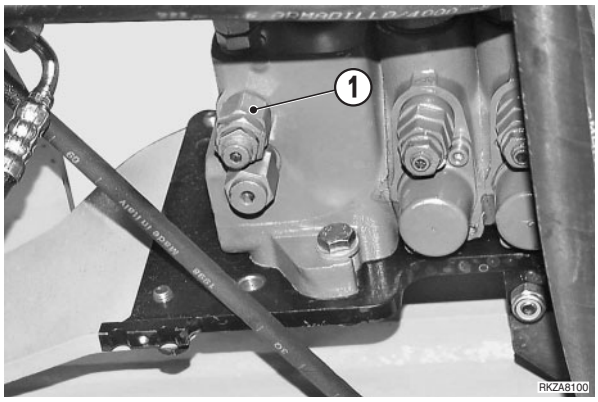
2 - Force to the end of its stroke the lever commanding whichever movement is being used for the tests.

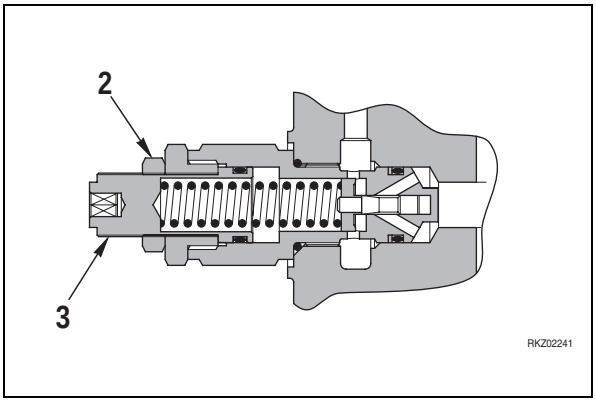
3 - Adjust pressure with adjusting screw (3).

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

4 - Lock position with nut (2).

Nm Lock nut: ..... Nm





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- **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).

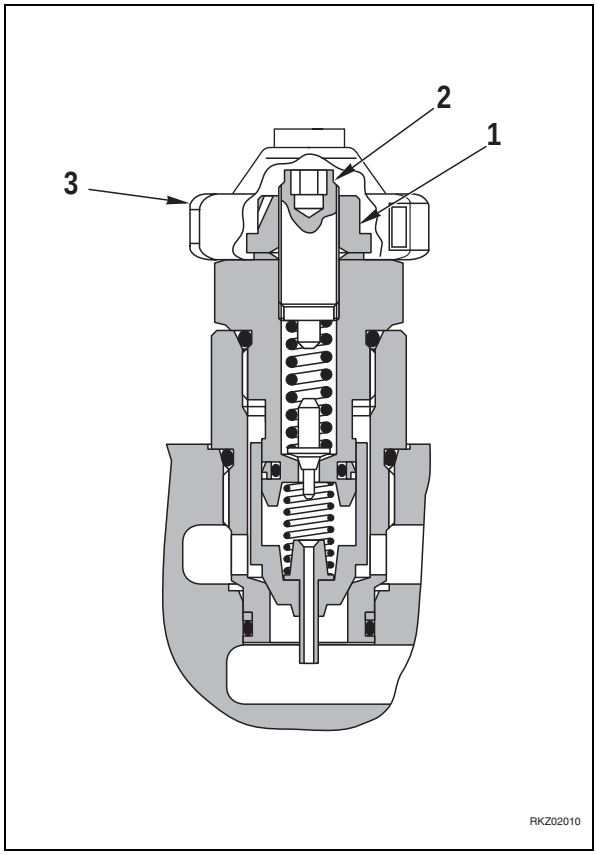
2 - Adjust pressure with adjusting screw (2).
- To INCREASE pressure, rotate in CLOCKWISE direction.
- To DECREASE pressure, rotate in COUNTERCLOCKWISE direction.

3 - Lock position with nut (1).

Nm 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.



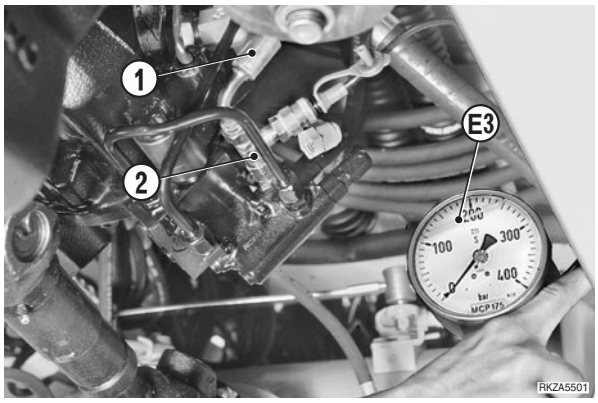
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TESTING AND ADJUSTING OF LOAD SENSING SIGNAL (LS VALVE)

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

1 - Disconnect hose(1) from the Load Sensing line. Install an thee (2) and reconnect hose (1).

2 - Connect to thee (2) a pressure port and gauge **E3** (400 bar).

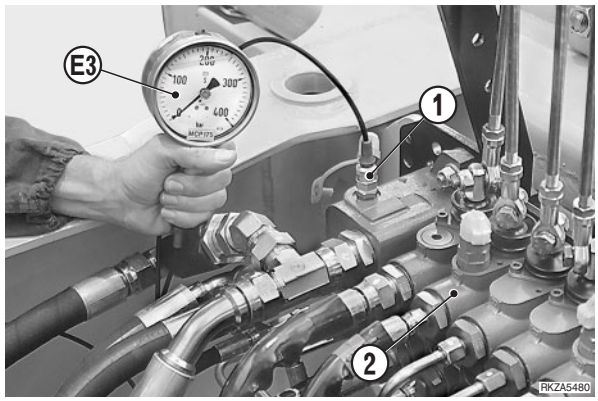


3 - Connect to rear control valve pressure port a pressure gauge **E3** (400 bar).

4 - Start the engine and bring it to 2000 rpm; check that with no movements the Load Sensing pressure is 6±2 bar.

5 - Raise boom up to middle of stroke; force the movement and read the pressure on both gauges.

6 - Calculate the differential pressure (ΔP) substracting the reading from the two gauges (control valve P - Load Sensing P_{LS}).
- ★ Normal ΔP: P – P_{LS} = 18±1 bar
- ★ If the ΔP value is not inside the limits, carry out the Load sensing valve (3) setting.



1. Adjusting of the Load Sensing valve

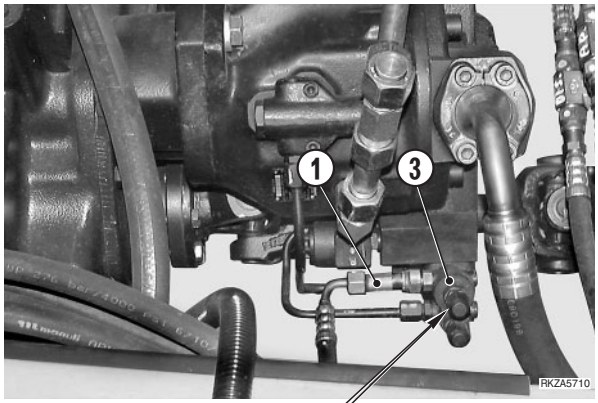
1 - Remove nut (4).

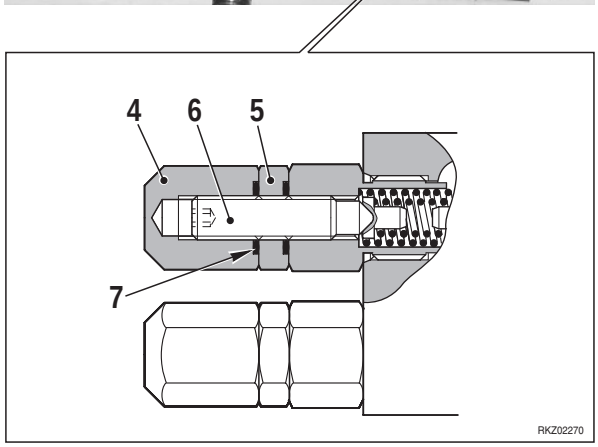
2 - Loosen nut (5).

3 - Adjust pressure using adjusting screw (6).
- To INCREASE pressure, rotate in CLOCKWISE direction.
- To DECREASE pressure, rotate in COUNTERCLOCKWISE direction.

4 - Lock the position with nut (5).
Nm Lock nut: 21 Nm

5 - Check gasket (7) and mount nut (4).
Nm Nut: 21 Nm





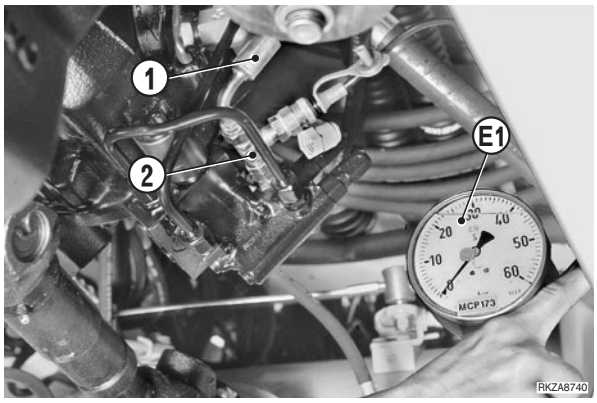
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CHECKING UNLOADING VALVE FUNCTIONALITY

★ Test condition:
- Engine: stopped but at working temperature.
- Low idling: in the permissible limit.
- Hydraulic oil: 45 – 55°C.
- Machine: in safety condition, parking brake applied.
- Control valve lever at neutral position.

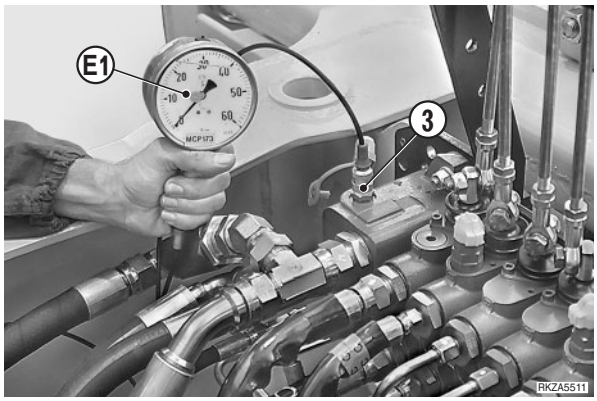
1 - Disconnect hose (1) from the Load Sensing line. Install an thee (2) and reconnect hose (1).

2 - Connect to thee (2) a pressure port and gauge **E1** (60 bar).



3 - Connect gauge **E1** (60 bar) to rear control valve pressure port (3).

4 - Start the engine at low idling and without any movement check pressure on both gauges.
- ★ Normal pressure (P) control valve gauge 27±3 bar
- ★ Normal pressure Load Sensing line gauge (PLS): 6±2 bar
  (This value is due to the influence of the counter-pressure present in the steering circuit).
- ★ If any variations are found, they do not represent a problem provided that the difference of 21±1 bar between the two readings is respected.

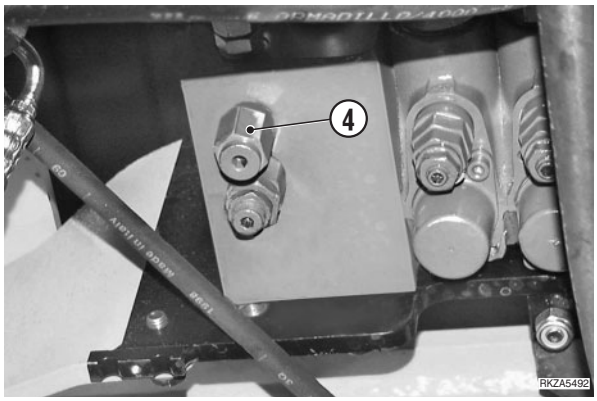


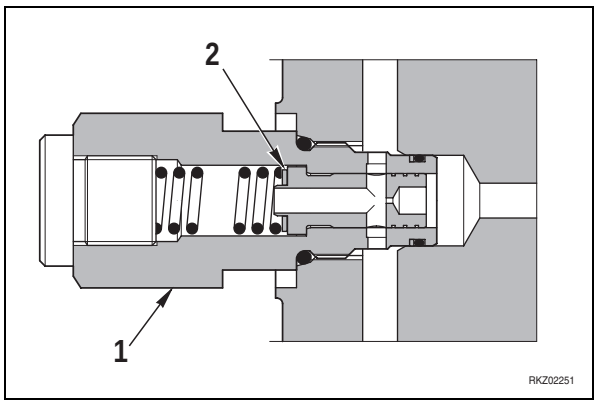
5 - If the difference between the two readings is higher than 21±1 bar, stop the engine and release residual pressures.

6 - Thoroughly clean the valve (4) and re-install it.
Nm Valve: 20 Nm

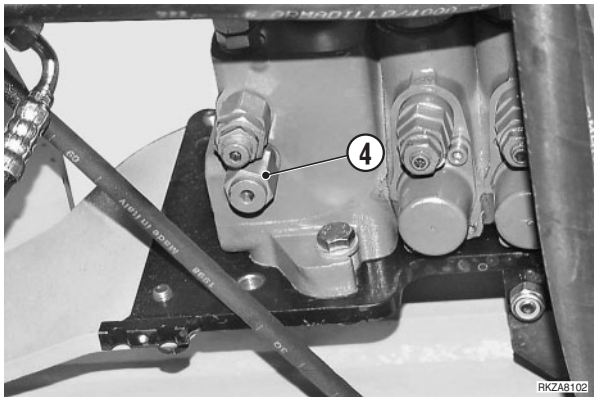
7 - If, in spite of cleaning the valve (4), the value of 21±1 bar still does not fall within the tolerance limits, install a new valve.

From serial number 97F20001 to 97F20171





From serial number 97F20172–



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TESTING PUMP DELIVERY

★ Test condition:
- Engine: stopped but at working temperature.
- Hydraulic oil: 45 – 55°C.
- General valve (Pressure cut off valve) and secondary valve: within normal limits.
- Machine: front equipment on the ground, boom and arm fully extended and bucket fully curled and on the ground.
- Parking brake: applied.

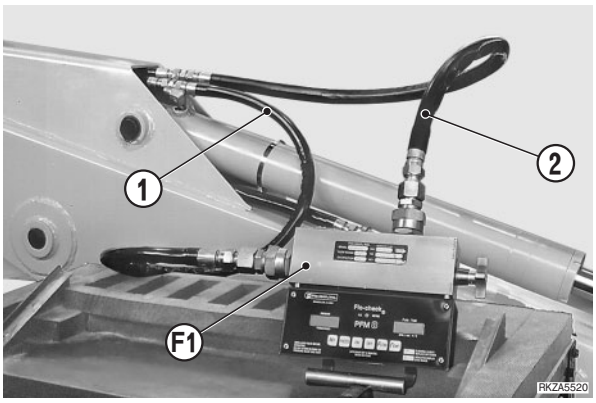
1. Flow-meter connection

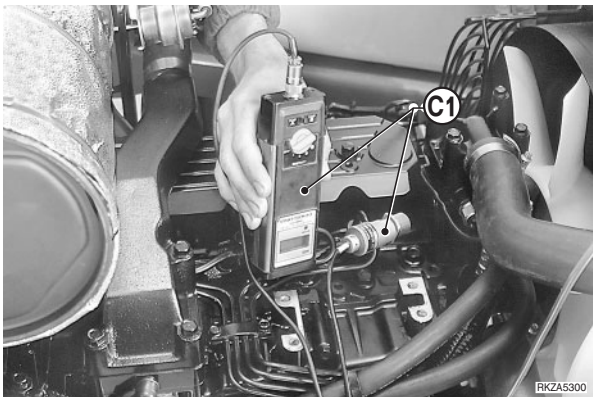
1 - Release residual pressure.

2 - Disconnect bucket bottom side hose (1) and head side (2).
★ Plug holes to avoid impurity inlet.

3 - Connect cylinder bottom side hose (1) to the flowmeter **F1** inlet port and connect the cylinder head side hose to the outlet port.

4 - Use a tachometer **C2** to control that pump delivery is within the rpm limits during the test.
★ If using a multiscale tachometer **C1** mounted on fuel delivery pipe, check that it is mounted far from the pipes retainer.
★ Pumps diagrams are refereed to **constant** idling for all the use range.
★ When measuring the deliveries with the pump mounted on the machine it becomes difficult to use the accelerator to set the engine idling. Make delivery measurements with the engine running at a speed close to the test speed and then make a proportional calculation.





Example:

MEASUREMENT
Engine speed: 2144 rpm
Delivery: 153.97 ℓ/min

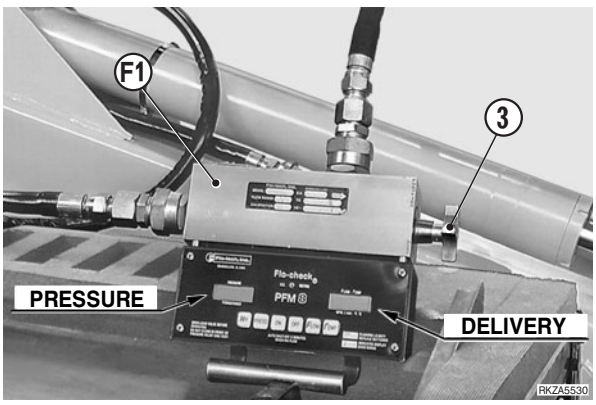
PROPORTIONAL DELIVERY AT 2200 rpm

$$\frac{153.97}{2144} \times 2200 = 158\ \ell/\text{min}$$

2. Measurement

1 - Start the engine and bring it up to 2200 rpm.

2 - Move the bucket curling lever up to end of stroke and, with the lever in this condition, adjust the delivery pressure with the flowmeter **F1** knob (3).



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3 - Check the effective delivery flow and the engine idling speed at each pressure increment, performing different reading each 20 bar pressure increasing, extending the readings to all the working range (up to the maximum value set by the general valve).
   - ★ Perform more than once the reading to have a media of the values.
   - ★ Those tests check the Economy mode curve.
   - ★ After checked the pump characteristic curve is possible to carry out the check of the point of pump initial regulation, that means the point where the pump starts reducing the delivery to preserve the pressure required.
     To obtain the exact position of this diagram point, perform the pressure-delivery-engine speed tests each 10 bar a zone close to the point found in the preceding test.

4 - Release pressure to the minimum value using the flowmeter **F1** knob (3) and insert the Power mode («Speed control» push-button).

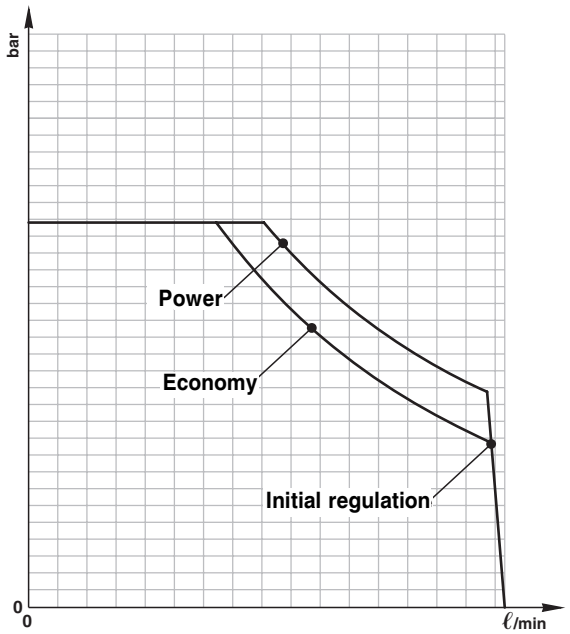
5 - Repeat phase 3 procedure to check Power mode curve (Power mode).

6 - Release the «Speed control» push-button, reduce pressure and stop the engine.

7 - Check the flow - pressure against the value shown on «TECHNICAL SPECIFICATION».
   - ★ If the measured value is lower of more the 7% than the permissible, it is necessary to overhaul of the pump.

8 - Release the residual pressure.

9 - Restore the bucket hoses connection to the cylinder.



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TESTING PRIORITY VALVE OPERATION

★ Test condition:
- Engine: operating temperature
- Hydraulic oil: 55 – 60 °C
- Parking brakes: applied

1. Testing Load Sensing signal

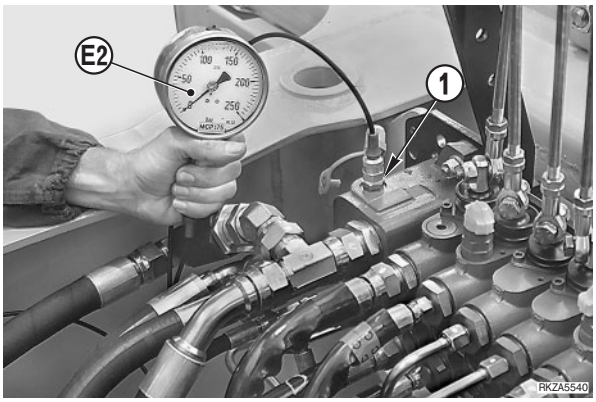
1 - Connect a pressure gauge **E2** (250 bar) to the pressure adapter (1) of the backhoe control valve.

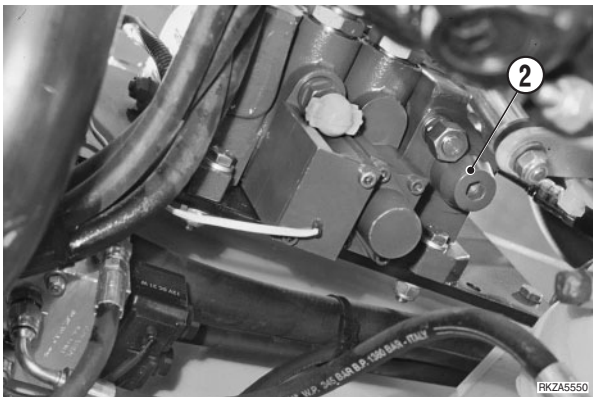
2 - Start the engine and bring it to idle speed of 1500 – 50 rpm.

3 - Check on gauge **E2** pressure value with stopped steering wheel (21 bar).

4 - Start a slight steering and check that pressure increases.

5 - Continue the steering up to end of stroke and check that, forcing the steering wheel, pressure increases till normal value.
- ★ Normal pressure: 175±7 bar.
- ★ If the pressure does not reach the normal value, re-set the pressure of the steering unit.
- ★ If turning the steering wheel the pressure shown by gauge does not change and stress on steering wheel necessary to carry out steering is high, check the priority valve (2).





2. Testing priority valve operation

1 - Remove priority valve plug (3), spring (4) and rod (5).
- ★ Check and make notes on the direction of assembly.

2 - Dismantle the plug (6) and remove the ball (7) of the inside valve and the spring (8).

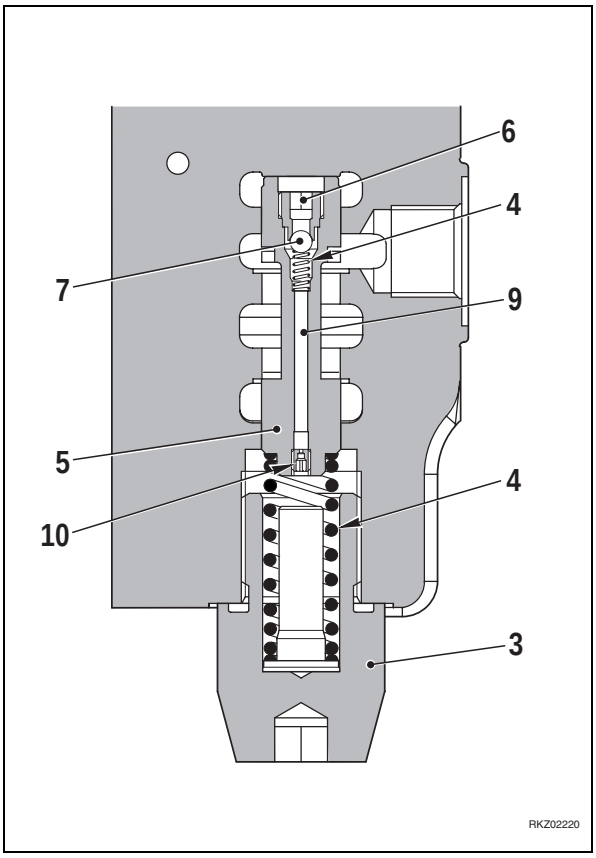
3 - Check that the hole (9) and the nozzle (10) are perfectly clean.

4 - Replace the spring (8), the ball (7) and the plug (6).
- Plug: Loctite 542
- Nm Plug: 20 Nm
- ★ Do not allow any Loctite to enter the hole (9).
- ★ Remove all excess Loctite from the rod (5).

5 - Lubricate the rod (5) and mount it in its seating, ensuring that it slides freely.

6 - Insert the spring (4) and mount the plug (3).
- Nm Plug: 100 Nm

7 - Start the motor, execute several steering manoeuvres and, if the fault is not corrected, replace the complete steering column with a new one.



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TESTING AND SETTING STEERING CONTROL SYSTEM PRESSURE

★ Test condition:
- Engine: operating temperature
- Hydraulic oil: 55 – 60 °C

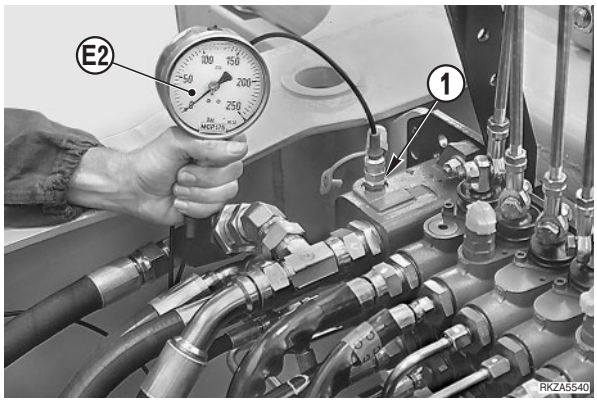
Testing

1 - Connect a pressure gauge **E2** (250 bar) to the pressure adapter (1) of the backhoe control valve.

2 - Start the engine and bring it to idle speed of 1500±50 rpm and carry out a total steering.

3 - Forcing the steering wheel at the end of stroke, check pressure.
★ Normal pressure: 175±7 bar

4 - Check for the other steering direction too.



Setting

If pressure is not within permissible value, carry out setting acting on upper valve (3) of the steering unit.

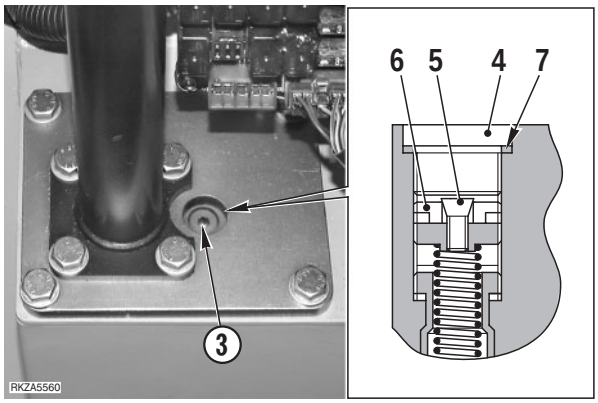
1 - Remove plug (4).

2 - Insert a wrench of 4 mm and loosen screw (5).

3 - Adjust pressure with screw (6).
- To INCREASE pressure rotate in CLOCKWISE direction.
- To DECREASE pressure rotate in COUNTER-CLOCKWISE direction.

4 - Stop engine, lock the adjusting screw (6) position tightening screw (5).

5 - Reassemble plug (4) checking that gasket (7) is on its seat.
Nm Plug: ..... Nm



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TESTING BRAKE SYSTEM

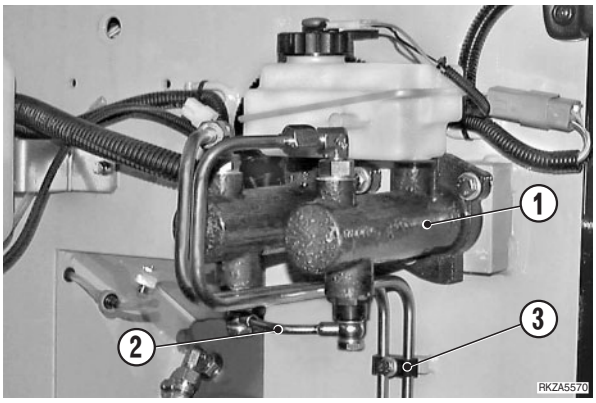
★ Test condition:
- Engine: stopped
- Machine: on solid and level ground, with equipment raised and safety devices engaged.
- Brake pedals: independent, with the container level at maximum.

The system testing provides in two stages:

1 - Testing circuit and brake pump tightness.

2 - Leaktightness test of the braking group.

⚠ If both the tests give a positive result, the leaks must be sought in the pipelines of the braking system.

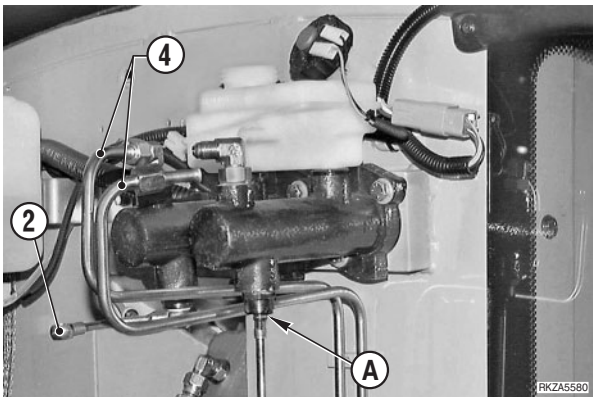


1. Testing circuit and brake pump tightness

1 - Disconnect the connecting pipe (2) of the equalizers from the brake pumps (1) of the circuit to be tested.

2 - Securely plug the equalizer orifice (plug A).

3 - Remove the clamp (3) and disconnect the delivery lines (4) from the pumps. Connect a pressure gauge **E2** (250 bar) to the pump (1) being tested.

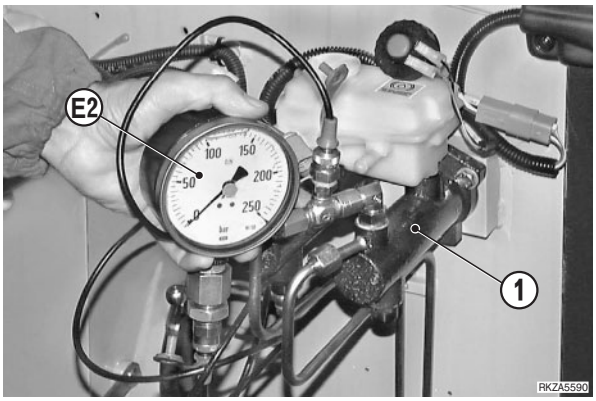


4 - Move the brake pedal corresponding to the pump and bring the circuit up to a pressure of approximately 120 bar.

★ Do not exceed maximum permissible value that is of 150±5 bar.

5 - Keep the pedal pushed for at least 2 minutes and check that pedal pressure and position remain steady.

★ If the position of the pedal must be changed to maintain pressure, the pressure loss is due to leakages inside the pump.
This can be confirmed by checking the oil. If there are leakages, it will show signs of mixing.



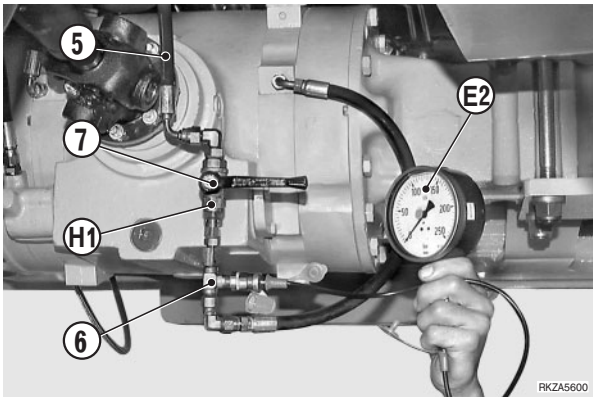
6 - Repeat test for the other brake pump.

2. Testing braking group leaktightness

1 - Disconnect the delivery tube (5) of the braking group being tested.

2 - Connect the tool **H1** between the delivery line (5) and the braking group.

★ Check that the pressure adapter (6) is inserted between the braking group and the exclusion valve (7).



3 - Connect a pressure gauge **E2** (250 bar) to the pressure adapter of the tool **H1** and open the cock (7).

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4 - Operate brake pump to feed pressure into the circuit to maximum pressure of 150±5 bar.

5 - Maintaining pressure, close the valve (7) to maintain pressure in the braking group being tested.

6 - Release the brake pedal and check for 2 minutes the pressure indicated by gauge **E2**.

★ If the pressure value shows a negative change, it means that the braking piston seals are defective.

⚠ Further confirmation of the leak can also be obtained by an increase in the oil level in the axle, which leads to a mixing of the oils. Change all the sealing rings between the axle sections, and carry out a complete lubrication oil change.

7 - Repeat the test for the other braking group, following the same method.

8 - Re-assemble the braking circuit.

⚠ After testing and possible repairs, bleed air from brake units (see «AIR BLEEDING OF BRAKE CIRCUIT»).

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CONTROL OF THE ENGINE SPEED UNDER LOAD

★ Test conditions:
- Engine: stopped but at working temperature.
- Hydraulic oil: 45 – 55°C.
- Power train oil: up to working temperature.
- Brake pedals: connected by a cotter-pin.
- Machine: on solid and level ground with the equipment raised and safety devices engaged.

Two tests must be performed:

1 - Speed test with the torque converter under stress.

2 - Speed test with the torque converter and the hydraulic system under stress.

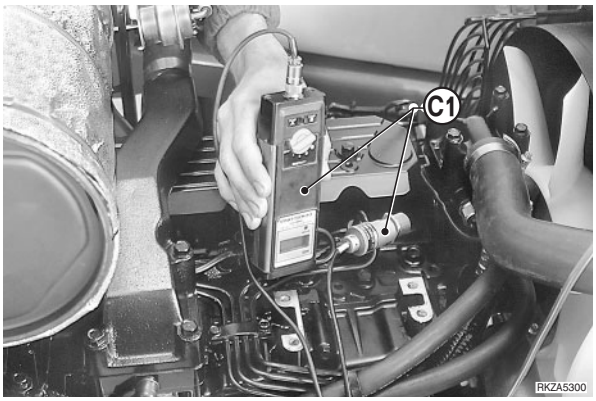
★ The tests must be performed after a no-load test of the engine speed.
(For details, see «ENGINE SPEED TESTS»).

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

a - Release the accelerator immediately and stop the engine.

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





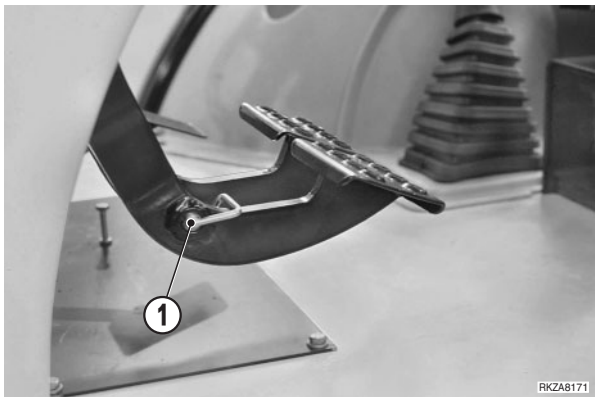
1. Preparing the machine

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 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. Testing with the torque converter under stress

1 - Start the motor at MIN. Engage the highest FORWARD gear and brake hard.

2 - Keeping the machine on the brake, accelerate the engine gradually up to high idling and measure the speed reached.

★ Normal speed: 2275±50 rpm

TBG version: 2200±50 rpm

3 - Release the accelerator pedal and move on to the next test.

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3. Testing the torque converter and hydraulic system under stress

1 - Start the motor at MIN. Engage the highest FORWARD gear and brake hard.

2 - Keeping the machine on the brake, engage the upper FORWARD gear, accelerate the engine gradually and at the same time act on the front bucket closed (curled) command control valve lever.

3 - Once the maximum engine speed and the maximum pressure of the bucket circuit have been reached, measure the speed reached by the engine.

★ Normal speed: 2200±50 rpm
TBG version: 2200±50 rpm

- If the revs of the engine are higher than the permissible limit, in both tests, check the pressure of delivery to the converter and the clutch pressures. (See «TESTING PRESSURES OF THE POWER TRAIN GROUP»).
- If the revs of the engine are lower than the permissible limit, check the condition of the air filter, and the conditions of the engine compression, the timing, the injection pump, and the valve clearances.

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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.



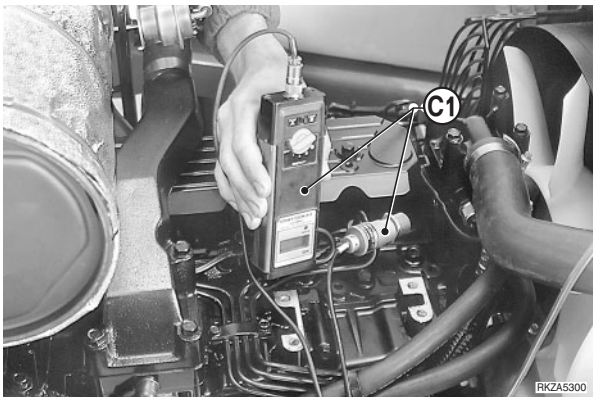
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★ If using a stroboscopic tachometer **C2**, make a clearly visible notch on the engine pulley to facilitate the reading.

⚠ 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**.

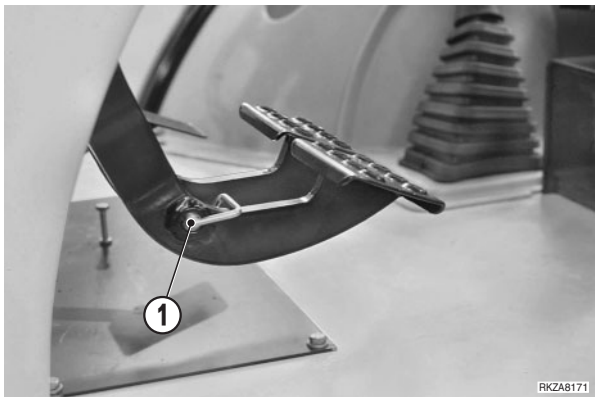
★ Normal pressure: MIN. 1 bar - MAX. 6 bar

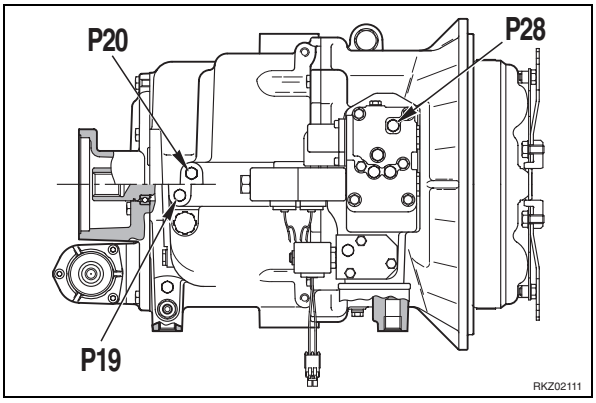
4 - Gradually increase the rev speed to 2200 rpm. Take a new reading from the pressure gauge **E6**.

5 - Bring the engine back to MIN and compare the pressure with the normal value.

★ Normal pressure: MIN. 6 bar - MAX. 11 bar

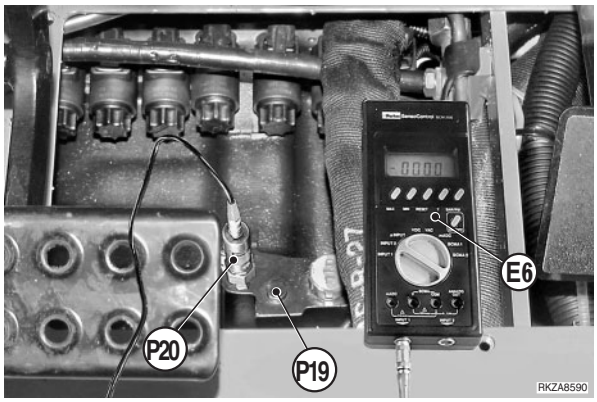
★ If the maximum pressure value drops to below the permissible lower limit, the power train pump needs an overhaul.





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3. Clutch engagement pressure



1 - Remove the cab floor.

2 - Remove the plug (P20) and connect the pressure gauge **E6**.

3 - 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.

4 - Bring the engine up to MIN (idling) and check the pressure on the pressure gauge **E6**.

★ Normal pressure: max 14 – 16 bar

5 - Gradually increase the rev speed up to 2200 rpm. Take a new reading from the pressure gauge **E6**.

6 - Bring the engine back to MIN and compare the pressure with the normal value.

★ Normal pressure: 15 – 17 bar

7 - Remove the pressure adapter and replace the plug (P20).

Nm Cap: 23 Nm

8 - Repeat the same test for the FORWARD gear, reading the pressure from the orifice protected by the plug (P19).

- If the pressures are different for the two travel directions, there is a loss of pressure on the clutch piston with lower pressure.

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TESTING THE CORRECT FUNCTIONING OF THE POWER TRAIN CLUTCHES

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

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

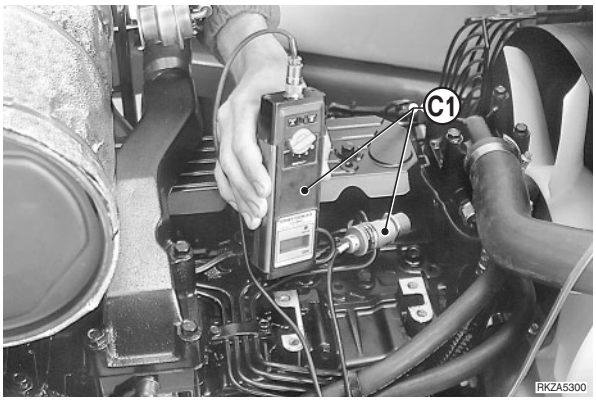


1. Preparation of the machine

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

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

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

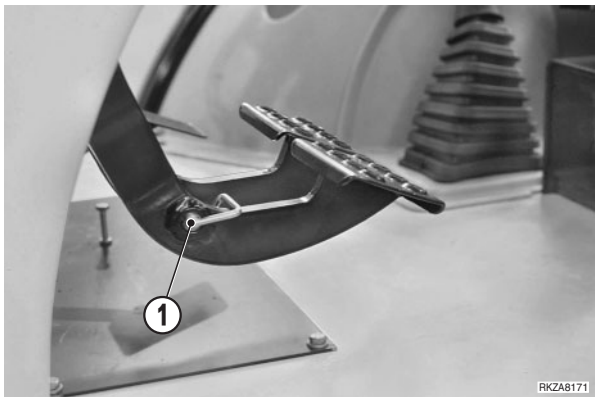


⚠ Make sure that the brake pedals are fastened together by the cotter pin (1).

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

a - Release the accelerator immediately and stop the engine.

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



2. Testing

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

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

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

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

5 - Repeat this test in REVERSE gear.

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

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ADJUSTING THE SENSOR FOR RETURN TO DIG DEVICE

★ Adjustment conditions:
- Machine: on solid and level ground.
- Engine: stopped.
- Hydraulic oil: 45 – 55°C
- Parking brake: engaged.

1 - Rest the bucket on the ground, making sure that the bottom is perfectly parallel to the surface.

2 - Stop the engine and remove the sensor guard (1).

3 - Check that there is a distance 3 – 4 mm between the sensor (2) and the rod (3)

★ If necessary loosen the nuts (4) and adjust the distance, until the indicated measurement is obtained, and secure that position.

Nm Sensor nut:..... Nm

4 - Loosen the locking nuts (5) and (6) of the position-indicating rod (3) and shift the rod towards the front of the machine until it has passed beyond the sensor axis (2).

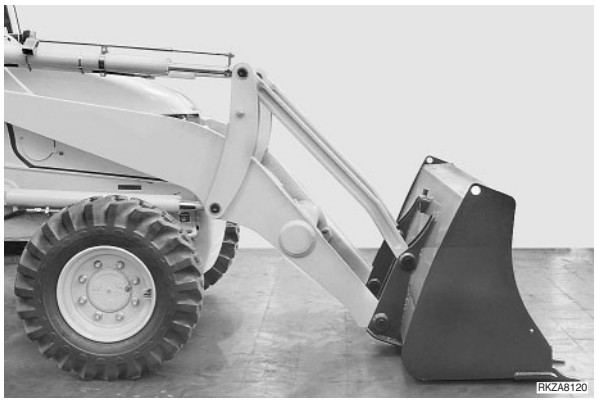
5 - Start the engine at MIN., tighten the rear nut (6) and at the same time unscrew the front nut (5) until the sensor (2) is engaged.

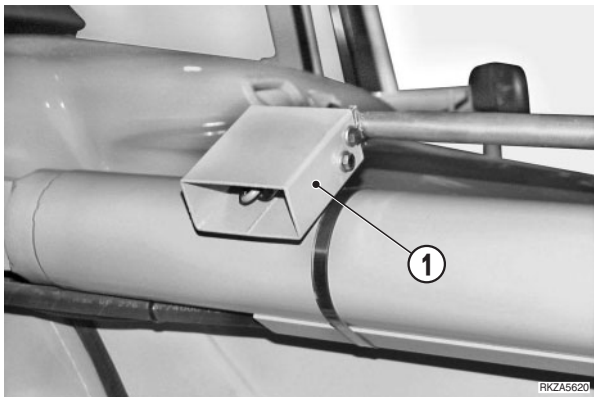
★ When the rod engages the sensor, the pilot light (7) comes on.

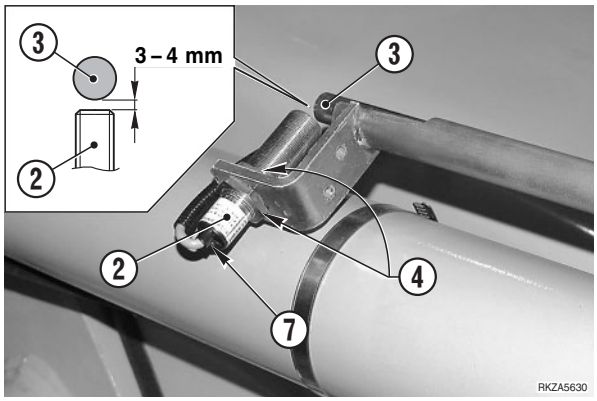
6 - Secure the position of the rod (2) by tightening the nuts (5) and (6) behind the bracket (8).

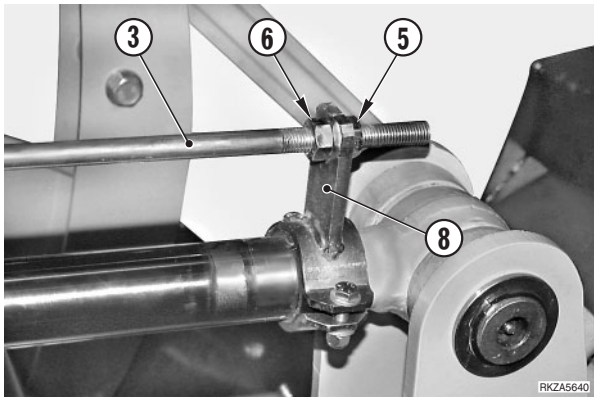
Nm Nuts:..... Nm

7 - Perform several tests by raising the bucket and simulating some dumping manoeuvres. If the bucket is able to rest flat on the ground, replace the sensor guard (1).







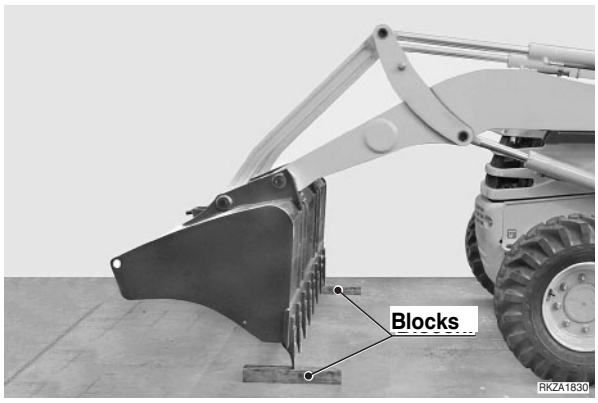


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ANALYSIS OF CAUSES HYDRAULIC DRIFT

★ If working attachments have a hydraulic drift, it is necessary to check if reason is due to cylinders gaskets or to control valve.

★ All testing conditions:
- Engine: at operating temperature
- Hydraulic oil: 45 – 55°C
- Removal and installation of pipes only after remain pressure removal.
  (See «REMOVAL OF REMAIN PRESSURE FROM CIRCUIT»).



FRONT EQUIPMENT

1. Testing of front bucket lifting

1 - Put the machine with bucket teeth on blocks of about 10 cm and in vertical position compared to ground.

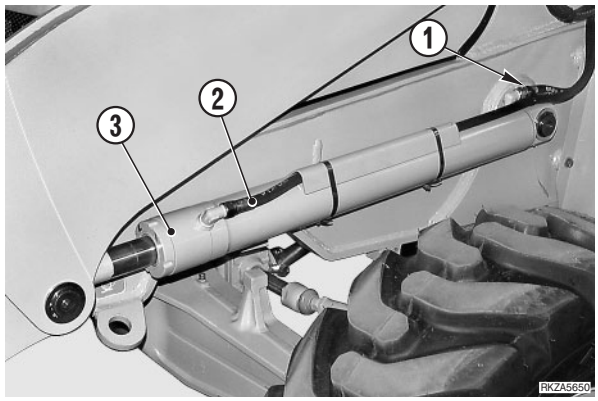
2 - Stop the engine and remove the remain hydraulic pressure.

3 - Disconnect pipes (1) and (2) from lift cylinders (3) and plug them.

4 - Plug cylinders, base side, and apply a temporary pipe, head side, to catch possible oil leakage.

5 - Start the engine and retract the bucket until to bring the teeth in tilt position of about 15°.

6 - Stop the engine and check bucket link position for 5 minutes.
- If bucket link has no lowering movement, drift is due to control valve.



To check each cylinders, proceed as follow:

7 - Carry out with bucket a dump movement to let teeth lean on ground in vertical position.

8 - Remove from one of cylinders the plug as installed on base side at stage 4.

9 - Start the engine and retract the bucket until to bring teeth in tilt position of about 15° towards upper.



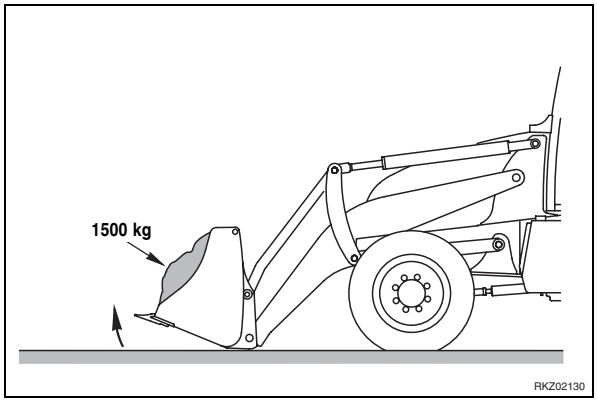
10 - Stop the engine and check the bucket position for 5 minutes.
- If bucket link has a lowering movement, drift is due to gaskets of plugged cylinder.

11 - Repeat operation from stage 8 to stage 10 to check the other cylinder.

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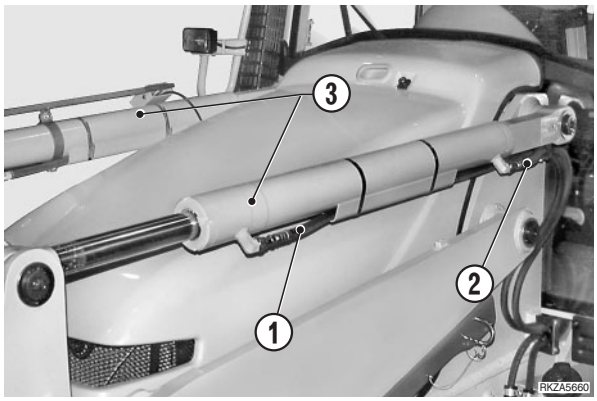
2. Testing of front bucket dumping

1 - Put the machine with bucket on level ground and teeth tilted of about 15°.
Put in the bucket a weight of 1500 kg.



2 - Disconnect pipes (1) and (2) from dump cylinder (3) and plug them to avoid impurity inlet.

3 - Plug dump cylinder hole, base side, and apply a temporary pipe on head side to catch possible oil leakage.



4 - Start the engine and raise the bucket up to the alignment of the bucket hinge and shovel arm hinge.

5 - Stop the engine and check bucket teeth position for 5 minutes.

- If bucket has no swing movement, drift is due to control valve.

To test the individual cylinders, proceed as follows:

6 - Lower the bucket to the ground.

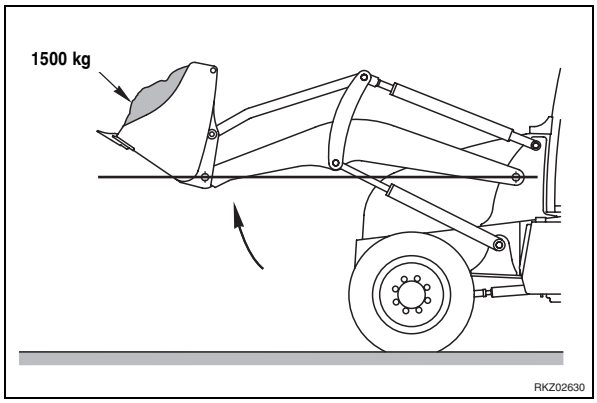
7 - Remove from one of the cylinders the plug fitted on the cylinder bottom side in Phase 3.

8 - Start the engine and raise the bucket as indicated in phase 4.

9 - Stop the engine and check the position of the bucket teeth for 5 minutes.

- If the bucket teeth turn, the drift is due to the gasket seals of the plugged cylinder.

10 - Repeat the operations from phase 6 to phase 9 in order to test the other cylinder.



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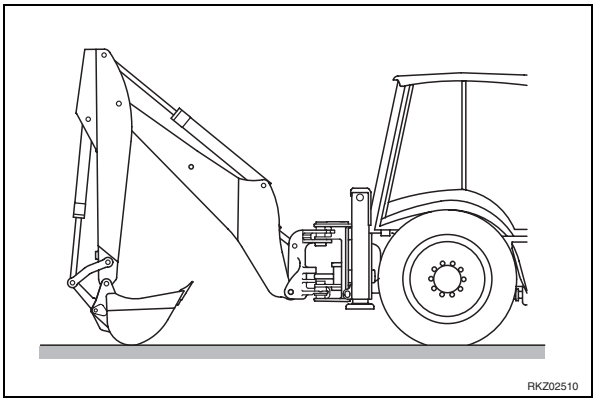
BACKHOE

★ Test condition:
- Backhoe aligned
- Lifted outriggers

1. Boom testing

1 - Set the machine with arm in vertical position and with bucket on level ground leaned on the side.

2 - Stop the engine and remove the remain hydraulic pressure.

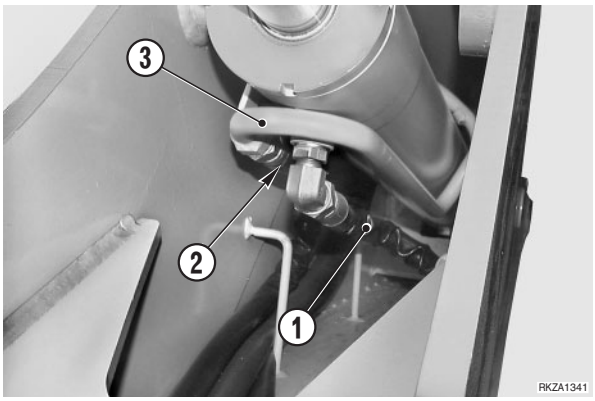


3 - Disconnect hoses (1) and (2) that feed cylinder (5).

4 - Plug the two hoses to avoid impurity inlet.

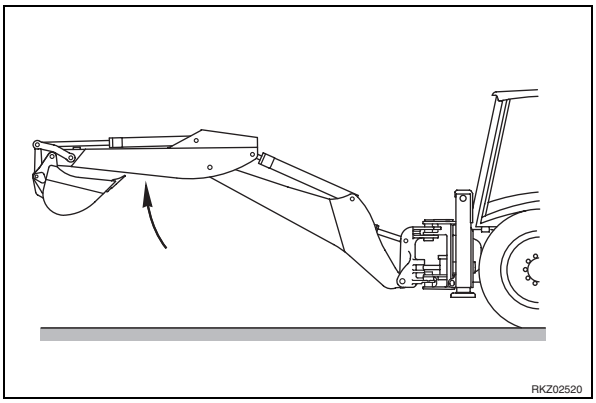
5 - Plug the cylinder head side.

6 - Apply a temporary pipe on pipe (3) base side to catch possible oil leakage.



7 - Start the engine and extend completely the arm.

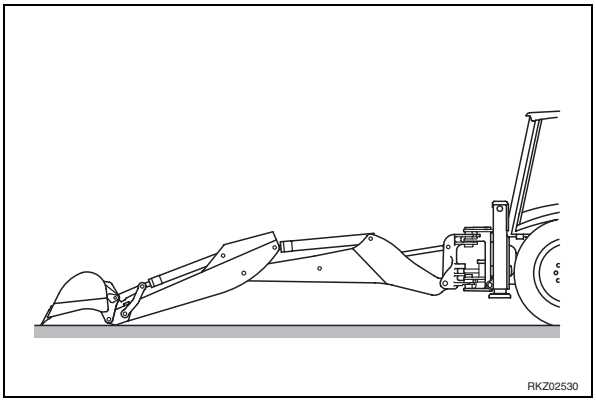
8 - Stop the engine and check the boom position for 5 minutes.
- If boom has a lowering movement, drift is due to cylinder gaskets.
- If boom has no lowering movement, drift is due to control valve.



2. Arm testing

1 - Set the machine with arm fully extended and with bucket teeth on ground.

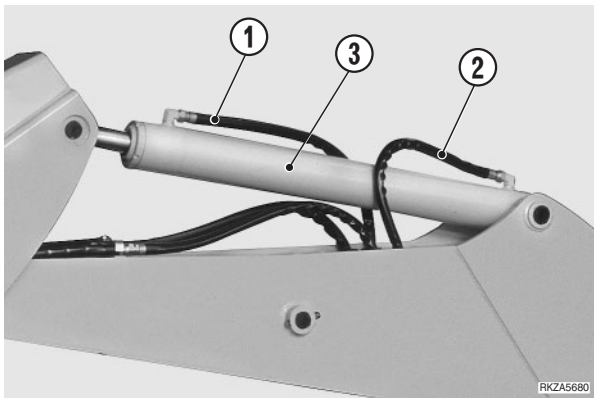
2 - Stop the engine and remove the remain hydraulic pressure.



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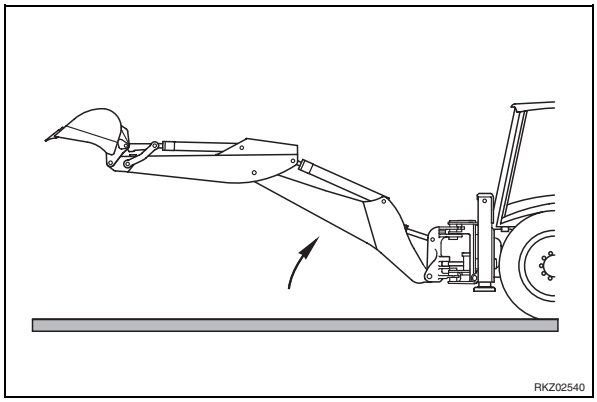
3 - Disconnect pipes (1) and (2) pipes from arm cylinder (3) and plug them to avoid impurity inlet.
★ If safety valve is fitted, provide to removal.

4 - Plug arm cylinder hole on head side and fit a temporary pipe on base side to catch possible oil leakage.



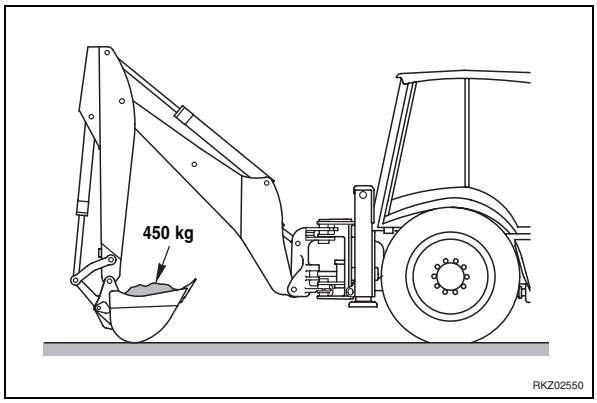
5 - Start the engine and raise the boom.

6 - Stop the engine and check the arm position for 5 minutes.
- If arm has a lowering movement, drift is due to cylinder gaskets.
- If arm has no movement, drift is due to control valve.



3. Bucket testing

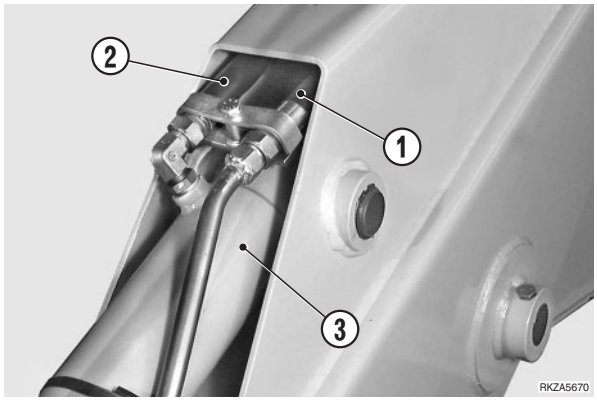
1 - Set the machine with vertical arm and horizontal bucket leaned at level ground on the side.
Put in the bucket a weight of 450 kg or fill it with earth.



2 - Stop the engine and remove the remain hydraulic pressures.

3 - Disconnect bucket cylinders (3) pipes (1) and (2) and plug them to avoid impurity inlet.

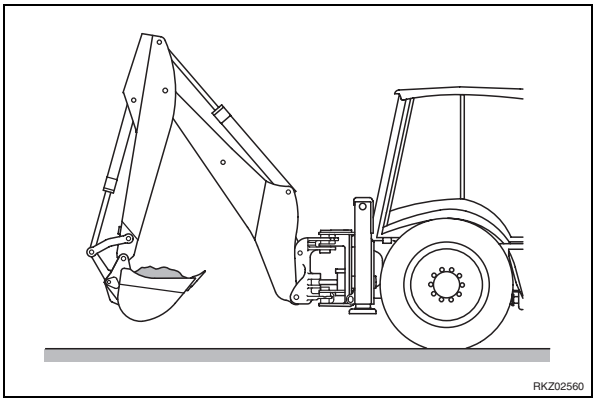
4 - Plug bucket cylinder hole on base side and fit a temporary pipe on head side to catch possible oil leakage.



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5 - Start the engine and raise the boom.

6 - Stop the engine and check the bucket position for 5 minutes.
- If bucket has an opening movement, drift is due to cylinder gaskets.
- If bucket has no movement, drift is due to control valve.

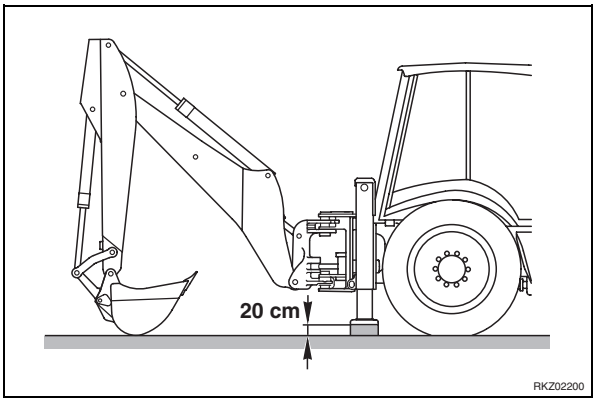


4. Outriggers testing

1 - Set machine with vertical arm and with bucket leaned at ground on the side.

2 - Put blocks of about 20 cm under the outriggers.

3 - Without forcing them, lower the outriggers onto the trestles.

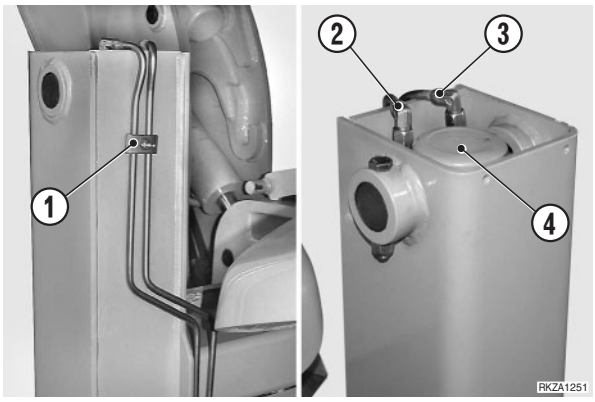


4 - Stop the engine and release residual hydraulic pressures.

5 - Remove clamp (1) and disconnect from cylinders (4) the pipes (2) and (3).

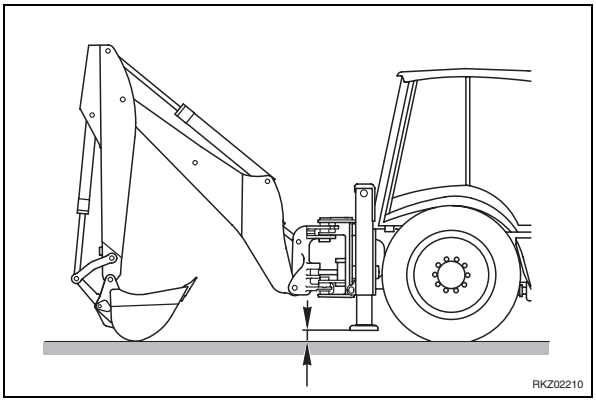
6 - Plug cylinders pipes (2) base side and apply on head sides temporary pipes to catch possible oil leakage.

7 - Start the engine, use force on the boom to raise the machine, and remove the trestles supporting the outriggers.



8 - Lower the machine and stop the engine.

9 - Check the outriggers position for 5 minutes.
- If one or both outriggers have a lowering movement, drift is due to single or both cylinders.
- If there is no lowering, drift is due to control valve.



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TESTING THE AIR-CONDITIONING UNIT

★ Test conditions:
- Machine on level ground with the working equipment raised and in safety conditions
- Parking brake engaged



1. Testing the working temperature

1 - Connect the maintenance station to the high pressure valve (H.P.) and the low pressure valve (L.P.)

2 - Start the engine and bring it up to a speed of 1500 rpm.

3 - Switch on the A/C unit using the switch in the cab.

4 - Select an intermediate ventilation speed inside the cab.

5 - Use the thermometer/hygrometer **M2** to check that the temperature inside the cab is equal to or lower than the ambient temperature.
★ If the temperature of the cab is higher than the ambient temperature, open the doors and widows and wait until the cab temperature stabilizes at the outside value.

6 - Close the doors and windows and let the A/C unit operate in these conditions for 5 - 10 minutes.

7 - Use the thermometer **M2** to check the temperature of the air at the central outlets.
★ Position the probe as close as possible to the air outlets.

8 - Compare the average value of the measured temperatures using the following table:

Ambient temperature (°C)	20°	25°	30°	35°
Outgoing air temperature (°C)	6° – 8°	8° – 10°	8° – 12°	9° – 14°

9 - If the average value of the temperature measured does not fall within the values given in the table, it will be necessary to thoroughly check the unit.

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2. Checking the unit

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
15.5	0.5	3.0	9.5	13.0
21	0.5	3.0	12.5	17.5
26.5	0.5	3.0	14.0	20.5
32	0.5	3.5	16.0	24.0
38.8	0.5	3.5	18.5	25.5
43.0	0.5	3.5	22.0	28.0

The following conditions may be found:

Conditions	Causes - Faults
L.P. high - L.P. normal or low	• Tubes inverted on the compressor • Electromagnetic pulley that slips or does not engage correctly • Expansion valve blocked in open position • Compressor damaged
L.P. low - H.P. high or normal	• 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 evaporator
L.P. normal - H.P. normal	• 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	• 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	• 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.	• Compressor belt missing • Electromagnetic pulley that slips or does not engage • Compressor damaged

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30 REMOVAL AND INSTALLATION

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HOW TO READ THE MANUAL

1. Removal and Installation of the groups

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

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

(Example)

REMOVAL GROUP : ○○○ : ..... Title of operation

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

1 - Remove XXXX (1):..... Step in removal procedure.

★ :..... Technique or important point to remember when removing XXXX (1)

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

3 - Remove □□□□ (3):

..... ℓ: ..... Recovery of oil or water, and the quantity to be recovered.

INSTALLATION GROUP ○○○ :..... Title of operation.

- To install, reverse removal procedure.

[※1] :..... Technique to be used for installation.

★ :..... Technique or important point to remember when removing △△△ (2).

- Addition of water or oil: ..... Step in removal procedure.

★ :..... Point to remember when adding water or oil.

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

3. List of special tools.

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

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

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

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

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PRECAUTIONS TO BE TAKEN WHILE WORKING

★ When dismantling or installing a part, always take the following general precautions.

1. Precautions for removal operations

- If not otherwise indicated, lower the work equipment until it rests on the ground.
- If the coolant liquid contains an anti-freeze substance, follow the instructions given for drainage.
- After having removed flanges and tubes, insert plugs to prevent impurities from entering.
- Before removing a cylinder, fully retract the piston and tie it with wire.
- Use a sufficiently large container to collect the oil.
- Before removing a part from the machine, check the alignment reference marks which show the correct installation position. If necessary add further marks to avoid incorrect installation.
- While dismantling the connectors, always grasp them firmly to avoid undue strain on the wiring.
- If necessary, attach markers to the wires and tubes to avoid muddling them up during installation.
- Check the number and height of the adjustments to a given clearance and store them in a safe place.
- When raising the machine or some parts of it, use adequate equipment for the weight of the part concerned.
- When using screws or eyebolts to remove items of the machinery, screw them alternately, and as deeply as they will go.
- Before removing a piece, clean the surrounding area and, after removal, cover the area to prevent dirt or dust from gaining entrance.

2. Precautions to be taken during installation

- Tighten nuts and screws with the specified tightening torques.
- Install the flexible hoses, taking care not to entangle or twist them.
- Bend the cotter pins and stops in such a way as to secure them.
- When coating the threads with adhesives, clean the piece to remove oil and grease, then apply just enough adhesive to cover the threading in a uniform manner.
- When applying a liquid sealant, clean the surface involved, remove residual oil and grease, check that there are no dents or dirt, then apply the liquid sealant in a uniform manner.
- Clean all the parts, remove dirt, rust, burrs, or dents.
- Apply a film of engine oil over all the moving parts.
- Apply a film of anti-friction grease (ASL800040) over all surfaces assembled with pressure, to avoid sticking.
- After having mounted the snap-rings, check that they are firmly positioned in their seatings.
- When installing electrical system jacks, remove any oil, dust or water that may have penetrated into them, then connect them firmly.
- If using eyebolts, check that they are not distorted, screw them in fully, and then align the eye with the hoisting hook.
- Mount the flanges in a uniform manner, and tighten the screws in criss-cross sequence, to avoid excessive pull on one side only.

3. Precautions to be taken on completion of removal and installation operations.

- If the coolant liquid has been drained away, close the drainage plug and add new liquid up to normal level. Start the engine to circulate the liquid throughout the cooling system and then top up the level once more.
- When the hydraulic equipment has been dismantled, add engine oil to the indicated level. Start up the engine to circulate the oil in the hydraulic circuits, and then top up to the indicated level.
- If hoses or hydraulic equipment, such as hydraulic cylinders, pumps, motors, solenoid valves and valves, are removed for repairs or substitution, bleed air from the hydraulic circuits after having re-assembled the machine.
  ★ For details, see «20. TESTING AND ADJUSTMENTS».
- After having re-assembled cylinder joints or cylinders, or work equipment articulations, lubricate thoroughly.

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SPECIAL TOOLS

Nature of work	Symbol		Code	Description	Q.ty	Notes
Disassembly and assembly cylinders	A	1		Attachment	1	Cylinders disassembly - assembly
		2		Plunger Ø 40	2	Assembly cylinder and rod bushings Cylinder and rod locking on ATR200620
				Plunger Ø 45	2	
				Plunger Ø 50	2	
				Plunger Ø 75	2	
		3		Bushing Ø 45	2	Blocking swing cylinders on ATR200620
		4		Notched wrench for cylinders Ø 70	1	Head disassembly-assembly
				Notched wrench for cylinders Ø 80	1	
				Notched wrench for cylinders Ø 85	1	
				Notched wrench for cylinders Ø 95	1	
				Notched wrench for cylinders Ø 115-120	1	
				Notched wrench for cylinders Ø 110	1	
		5		Notched wrench for side digging boom cylinders	1	Head disassembly-assembly
		6		Notched wrench	1	Disassembly ring nut side digging boom cylinder
				Notched wrench	1	Boom swing head disassembly-assembly
		7		Socket wrench (6-point 46)	1	Pistons removal-installation
				Socket wrench (6-point 55)	1	
				Socket wrench (6-point 65)	1	
		8		Plunger Ø 40	1	Dust seal assembly
				Plunger Ø 50	1	
				Plunger Ø 55	1	
				Plunger Ø 60	1	
		9		Expander Ø 70	1	Piston gaskets assembly
				Expander Ø 80	1	
				Expander Ø 85	1	
				Expander Ø 95	1	
				Expander Ø 100	1	
				Expander Ø 110	1	
				Expander Ø 115	1	
		10		Bushing for rod Ø 40	1	Head assembly on rod
				Bushing for rod Ø 45	1	
				Bushing for rod Ø 50	1	
				Bushing for rod Ø 55	1	
				Bushing for rod Ø 60	1	

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Nature of work	Symbol		Code	Description	Q.ty	Notes
Disassembly and assembly cylinders	A	11		Bushing for piston Ø 70	1	Piston-cylinder assembly
				Bushing for piston Ø 80	1	
				Bushing for piston Ø 85	1	
				Bushing for piston Ø 95	1	
				Bushing for piston Ø 100	1	
				Bushing for piston Ø 110	1	
				Bushing for piston Ø 115	1	
Disassembly and assembly piston pump	B	1		Tool	1	Pump bracket
Disassembly and assembly transmission	C	1		Tool	1	Transmission support
				Set of spacers	1	
Assembly transmission	D	1	Commercially available	Feeler gauge	1	Clutch backlash control
Air-conditioning unit	E	1	Commercially available	Maintenance station	1	Draining and refilling the unit
Disassembly and assembly front axle	F	1		Wrench	1	Adjustment differential lock nuts
		2		Socket wrench	1	Removal-installation pinion lock nut
		3		Socket wrench	1	Removal-installation pinion
		4		Plunger	1	Mounting pinion bearing ring
		5		Gauge block	1	Measuring pinion shims
		6		Gauge tube	1	
		7		Lock nut	2	
		8		Plunger	1	Mounting pinion bearing
		9		Guide ring	1	Mounting pinion output cover
		10		Plunger	1	Mounting pinion bearing ring
		11		Plunger	1	Mounting bronze bushing
		12		Plunger	1	Mounting seal rings
		13		Plunger	1	Mounting bushing for upper and lower joint

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Nature of work	Symbol		Code	Description	Q.ty	Notes
Disassembly and assembly front axle	F	14		Plunger	1	Mounting lower joint bushing
		15		Plunger	1	Mounting final drive bearing ring
		16		Plunger	1	Mounting final drive seal
		17		Plunger	1	Insertion ring bevel gear bushing
Disassembly and assembly rear axle	G	1		Plunger	1	Mounting hub seal
		2		Handle	1	
		3		Plunger	1	Mounting axle shaft seal
		4		Plunger	1	Mounting axle shaft seal
		5		Push-rod	1	Insertion pilot bosses
		6		Wrench	1	Adjustment lock nuts for differential register
		7		Socket wrench	1	Removal-mounting pinion lock nut
		8		Socket wrench	1	Removal-mounting pinion
		9		Plunger	1	Mounting slack adjuster bushing
		10		Tool	1	Mounting pinion bearing ring
		11		Lock nut	1	Measurement of bevel pinion shims
		12		Flange	1	
		13		Gauge block	1	
		14		Plunger	1	Mounting pinion bearing
		15	Commercially available	Dynamometer	1	Checking pre-loading pinion bearings
		16		Plunger	1	Mounting differential bushing
		17		Plunger	1	Mounting differential bearings
		18		Bushing	1	Checking tooth clearance
		19		Bushing	1	Mounting seal on pinion side

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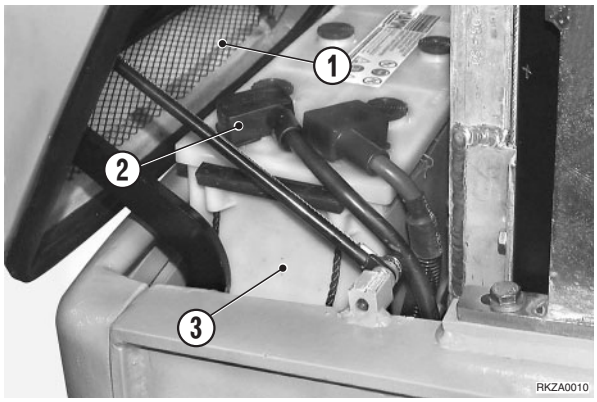
REMOVAL OF THE STARTING MOTOR

⚠ Fully raise the front working equipment and engage the safety stop.

1 - Stop the engine and engage the parking brake.

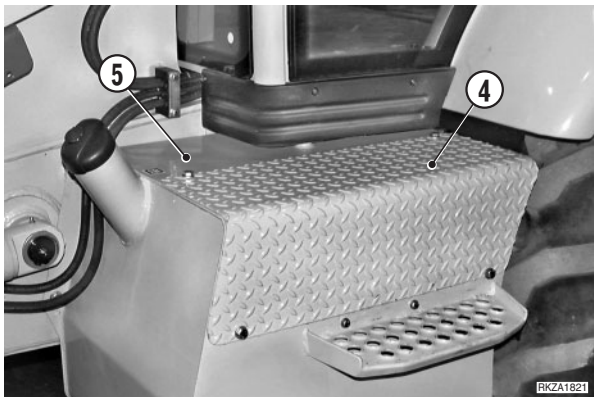
2 - Raise the engine hood (1) and disconnect the clamp (2) from accumulator (3) negative terminal (–).

From serial number 97F20001 to 97F20171



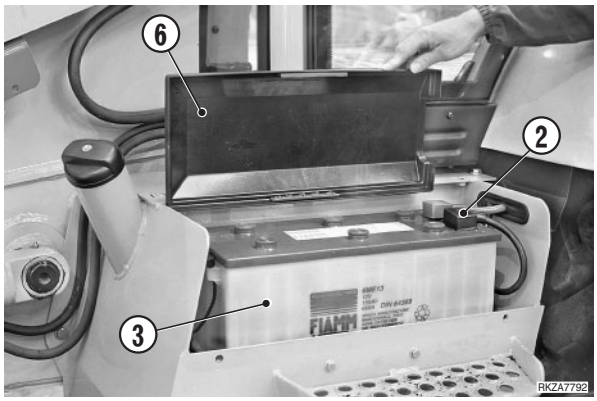
2a - Remove guard (4) from tank (5).

From serial number 97F20172–



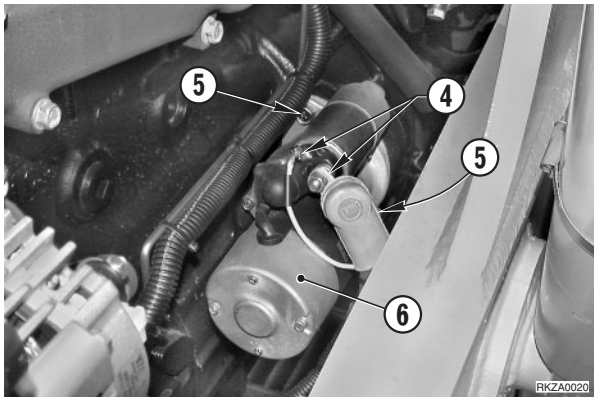
2b - Remove the cover (6).
Disconnect the clamp (2) from accumulator (3) negative terminal (–).

From serial number 97F20172–



3 - Disconnect the electric wiring (4).

4 - Loosen the two screws (5) and remove the starting motor (6). ※1



INSTALLATION OF THE STARTING MOTOR

- To install, reverse the removal procedure.

※1

Nm Starting motor mounting screws:
78.4 – 98 Nm (8 – 10 kgm)

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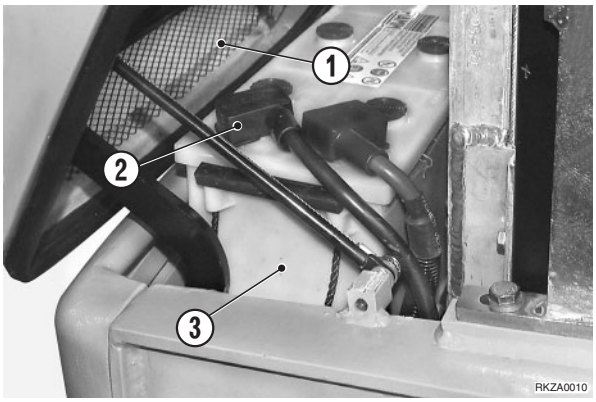
REMOVAL OF THE ALTERNATOR

⚠ Fully raise the front working equipment and engage the safety stop.

1 - Stop the engine and engage the parking brake.

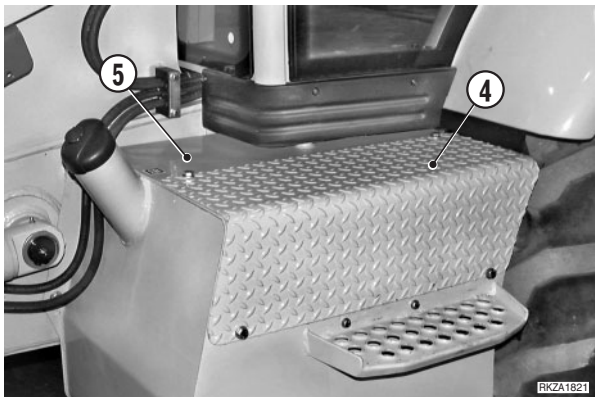
2 - Raise the engine hood (1) and disconnect the clamp (2) from accumulator (3) negative terminal (–).

From serial number 97F20001 to 97F20171



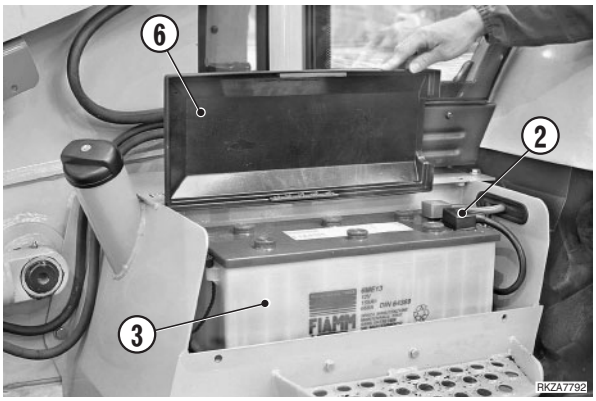
2a - Remove guard (4) from tank (5).

From serial number 97F20172–

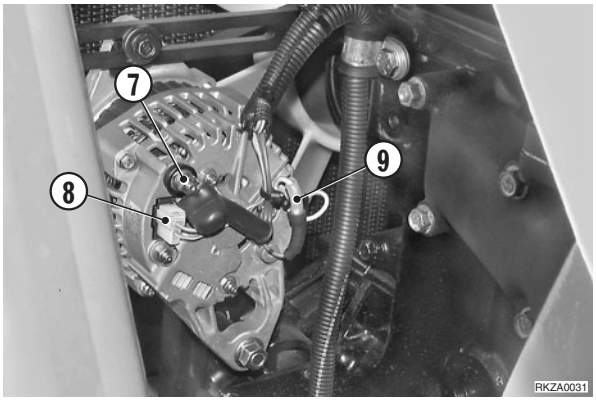


2b - Remove the cover (6).
Disconnect the clamp (2) from accumulator (3) negative terminal (–).

From serial number 97F20172–

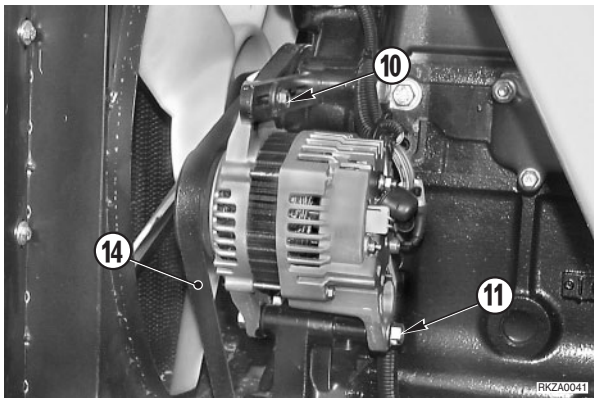


3 - Disconnect the cable (7), the connector (8) and the cotter pin (9).

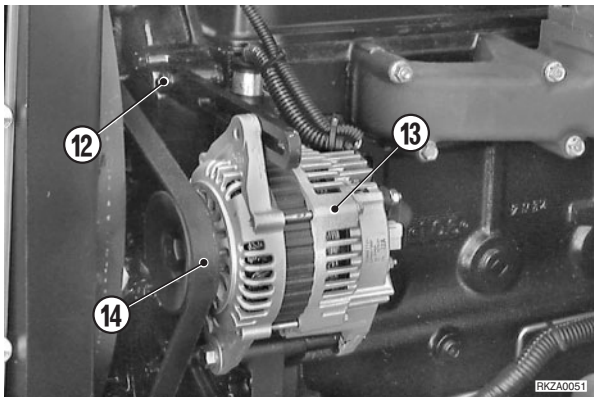


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4 - Loosen the screws (10), (11) and (12) to leave the alternator (13) free to rotate.



5 - Release the belt (14) from the pulley and remove the alternator (13). ※1



INSTALLATION OF THE ALTERNATOR

- To install, reverse the removal procedure.

※1

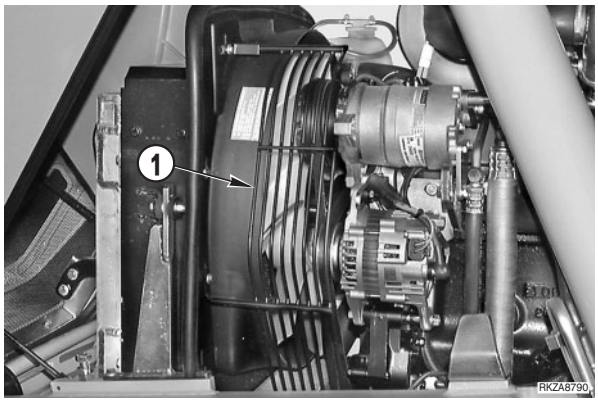
★ Adjust the fan-belt tension. (For details, see «20. TESTING AND ADJUSTMENTS – Fan-belt tension».)

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REMOVAL OF THE AIR-CONDITIONING UNIT COMPRESSOR

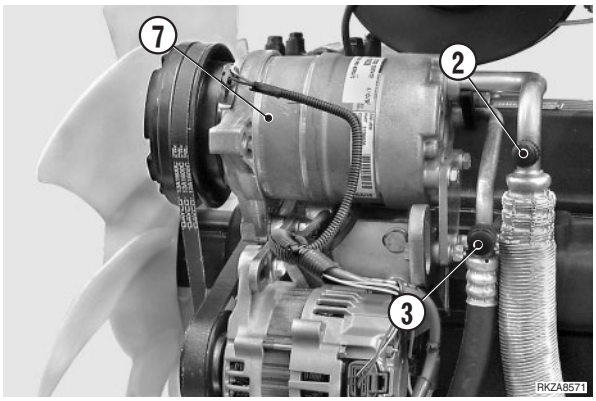
Disconnect the cable from accumulator negative terminal (–).

1 - Remove lateral guard (1).

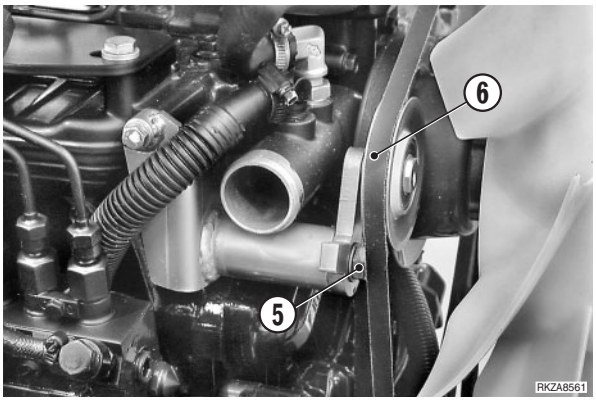


2 - Connect the outlets (2) and (3) to the maintenance station for air-conditioning units **E1** and drain the cooling fluid.

3 - Disconnect the connector (4).

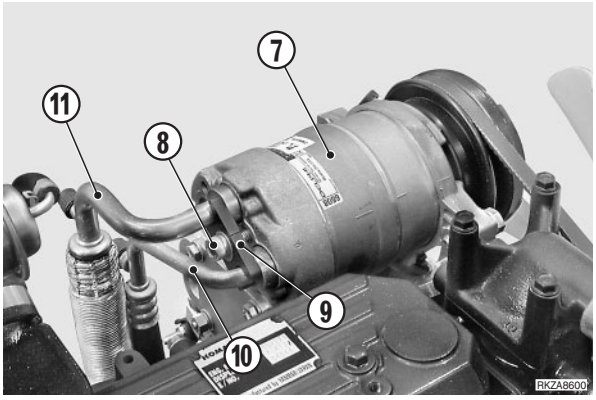


4 - Loosen the screw (5) and remove the belt (6) that drives the compressor (7). ※1



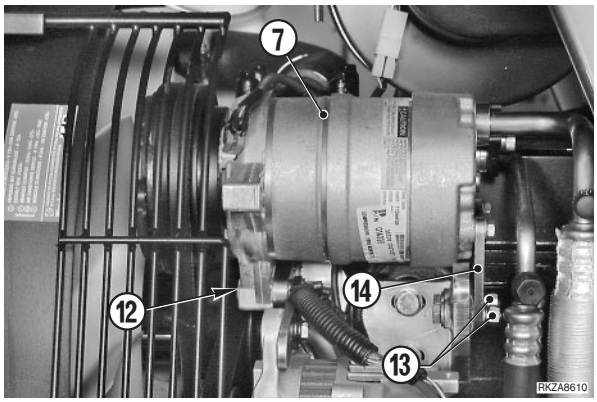
5 - Loosen and remove the screw (8) that holds the bracket (9) that supports the delivery and suction lines (10), (11). ※2

★ Be careful to avoid damaging the seals.



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



INSTALLATION OF THE AIR-CONDITIONING UNIT COMPRESSOR

- To install, reverse the removal procedure.

※1

Nm Belt-tightening screw: 123 Nm

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

※2

★ Tighten until the flanges rest on the compressor.

※3

Nm Compressor retaining screws: 32 Nm

1 - Connect the unit to the maintenance station **E1** and refill it.

★ Quantity of fluid: 1100 g (+50/–30 g)

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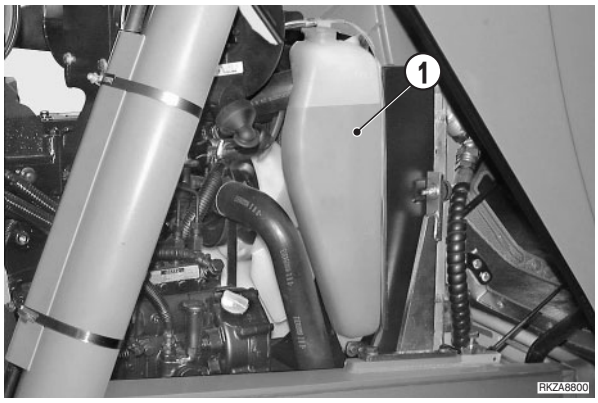
REMOVAL OF THE INJECTION PUMP

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

⚠ Disconnect the cable from accumulator negative terminal (–).

★ Plug all tubes that have been removed or disconnected to prevent entry of impurities.

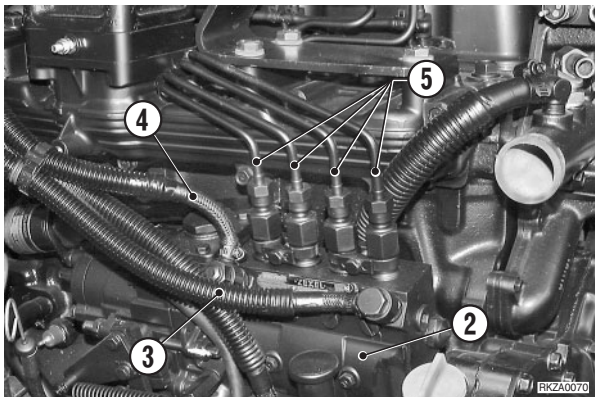
1 - Remove the engine coolant liquid container (1).



2 - Disconnect the fuel supply (3) and flow-back (4) hoses from the injection pump (2).

※1

3 - Disconnect the high-pressure pipes (5). ※2



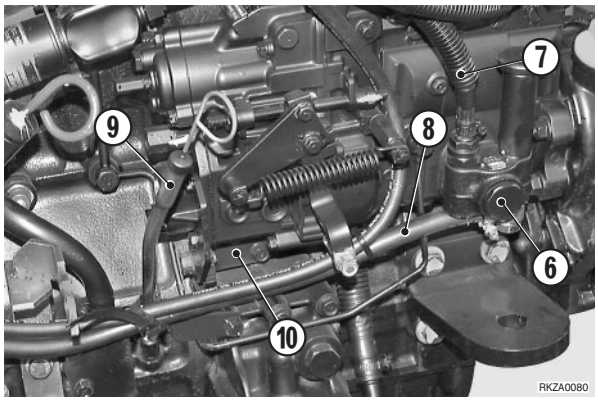
4 - Disconnect the fuel feed hose (7) and delivery tube (9) from the feed pump (6).

※1

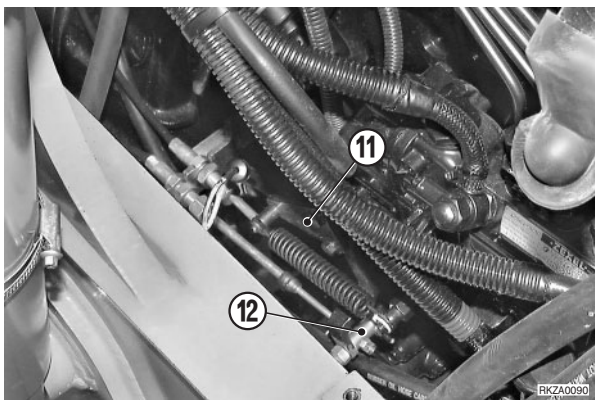
5 - Disconnect the tube (9) from the oil level dip-stick and remove it.

6 - Remove the support-bracket (10) of the pump.

※3



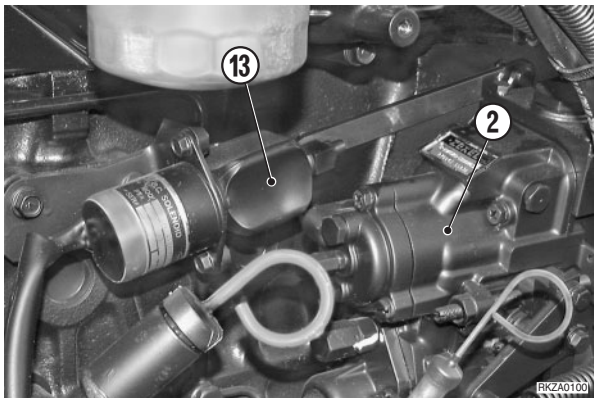
7 - Disconnect the accelerator control cable support (12) from the lever (11).



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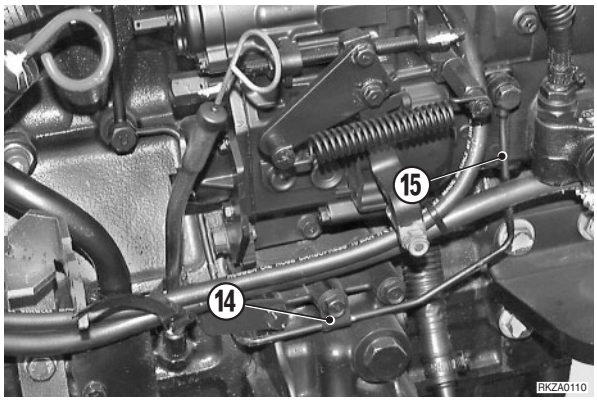
8 - Disconnect the engine-stopping solenoid (13) from the injection pump (2). Lift out the entire group.

※4

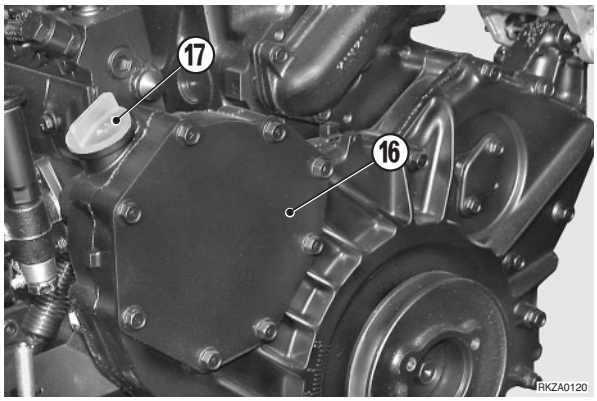


9 - Remove the retaining clip (14) of the injection pump lubrication tube.

10 - Disconnect the lubrication tube (15). ※5

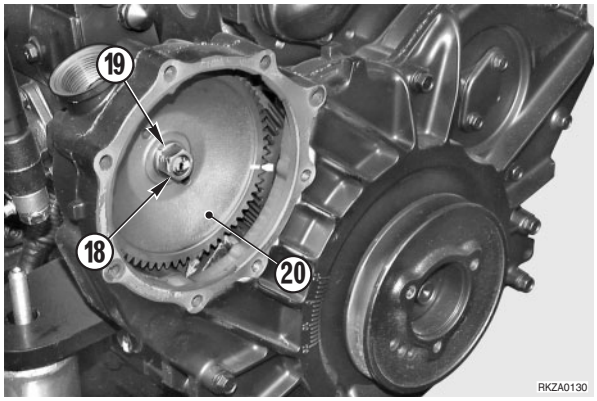


11 - Remove the cover (16) that gives access to the distribution gear and the oil filler plug (17). ※6



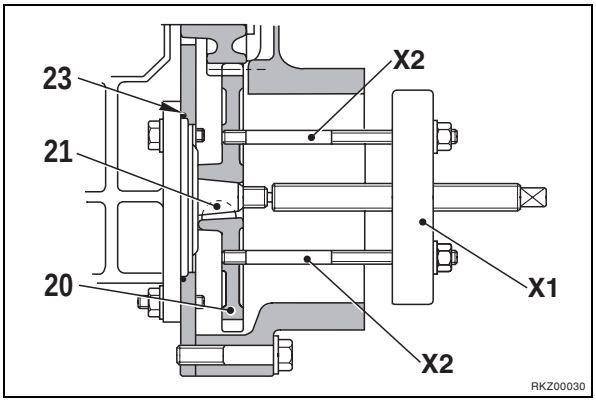
12 - Loosen and lift off the retaining nut (18) and safety washer (19) of the pump driving gear (20). ※7

★ Take great care not to drop the safety washer (19) into the pump casing.

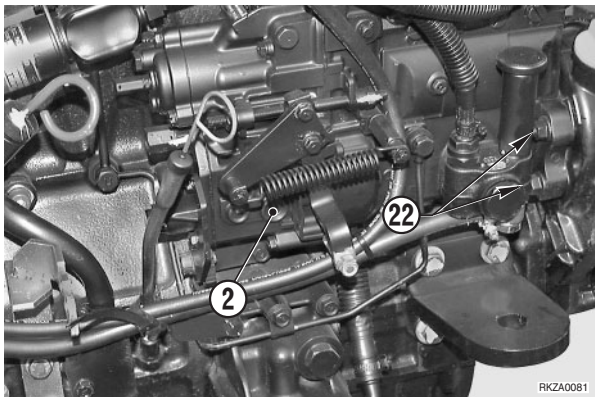


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13 - Remove the driving gear (20) of the pump (2).
- ★ Before removing the pump driving gear, mark its position with respect to the idling gear.
- ★ For removal use a puller (X1). The puller screws (X2) screw directly into the gear (20).
- ★ Take great care not to damage the pump shaft thread.
- ★ During removal, be careful not to let the wrench drop into the housing.



14 - Take out the four nuts (22) and remove the injection pump (2) with its O-ring seal. ※8



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INSTALLATION OF THE INJECTION PUMP

- To install, reverse the removal procedure.

※1

Nm Fuel feed hoses: 24.5 – 34.3 Nm (2.5 – 3.5 kgm)

※2

Nm High pressure hoses:
24.5 – 34.3 Nm (2.5 – 3.5 kgm)

※3

Nm Stiffening bolt screw, pump side:
44.1 – 53.9 Nm (4.5 – 5.5 kgm)

Nm Stiffening bolt screw, pump side:
22.5 – 8.4 Nm (2.3 – 2.9 kgm)

※4

★ Put in a new safety cotter pin.

※5

Nm Lubrication tube, pump side:..... Nm

Nm Lubrication tube, pump side:..... Nm

※6

Cover gasket: ASL800070

Nm Cover bolts for ignition gear system:
18 Nm (1.84 kgm)

※7

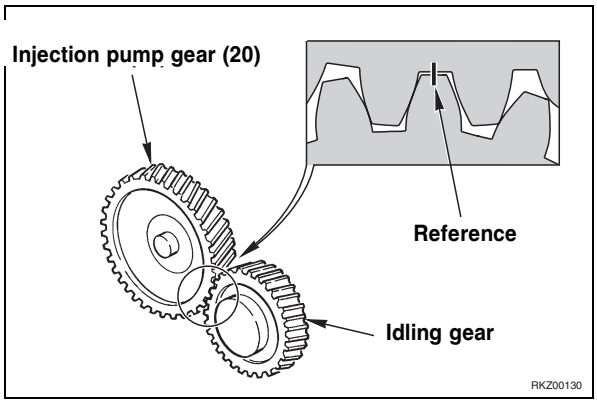
★ Align the marks between the gears before installing the pump and mounting the nut.

Nm Gear-locking nut:
83.3 – 93.1 Nm (8.5 – 9.5 kgm)

※8

Nm Pump-locking nut:
35.2 – 43.1 Nm (34.4 – 42.2 kgm)

1 - Check fuel injection timing.
(For details, see «20. TESTING AND ADJUSTMENTS»)



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REMOVAL OF THE INJECTION NOZZLES

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

⚠ Disconnect the cable from accumulator negative terminal (–).

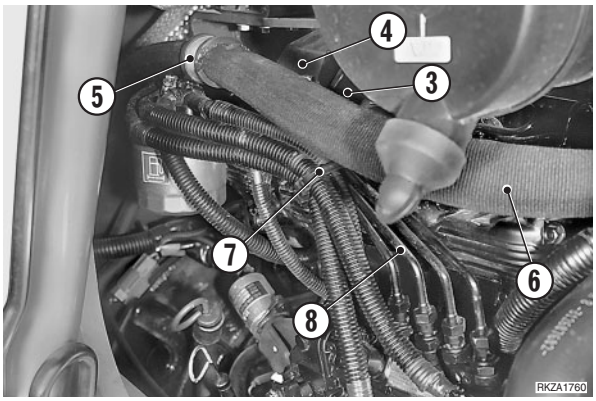
1 - Disconnect the sensor (1) for a clogged air-filter.

2 - Remove the air-filter (2), the supporting bracket (3) and the intake sleeve (4).



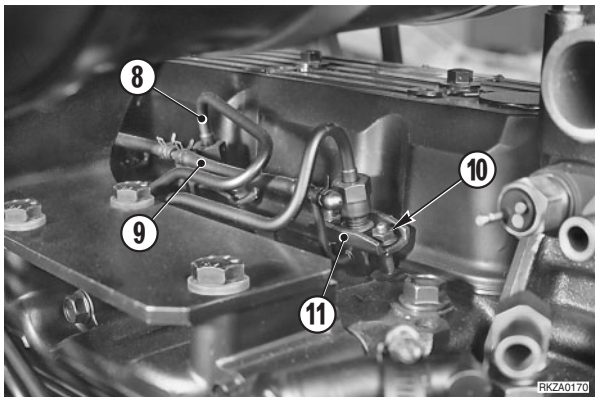
3 - Remove and place to one side the bulldog clip (5) that secures the cab heating pipes.

4 - Loosen the clip (7) and remove the high-pressure pipes (8). ※1



5 - Disconnect the fuel flow-back pipes (9).

6 - Take out the nuts (10) that secure the collar (11) and take out the injector (12), the seating (13) and the protection piece (14). ※2



INSTALLATION OF THE INJECTION NOZZLES

- To install, reverse the removal procedure.

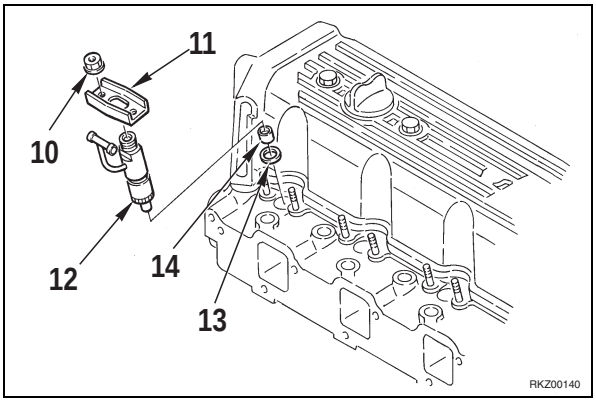
※1

Nm High-pressure pipe:
24.5 – 34.3 Nm (2.5 – 3.5 kgm)

Nm Hose-clamp screws: 9.8 – 11.8 Nm (1 – 1.2 kgm)

※2

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



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REMOVAL OF THE THERMOSTAT

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

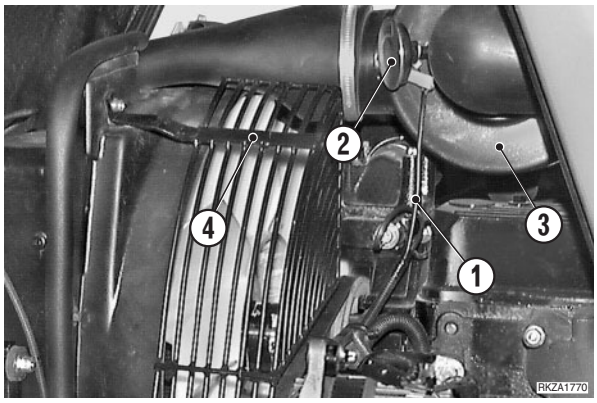
⚠ Disconnect the cable from accumulator negative terminal (–).

★ Drain the engine coolant liquid. ※1

Coolant liquid: 18 ℓ

1 - Disconnect the cable (1) of the clogged filter indicator (2) and remove the entire suction filter (3).

2 - Remove the fan guard (4).

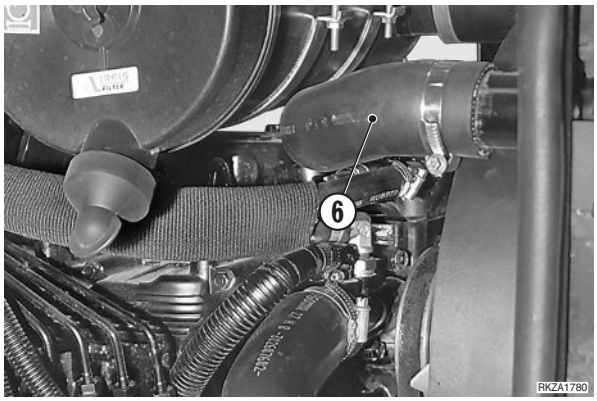


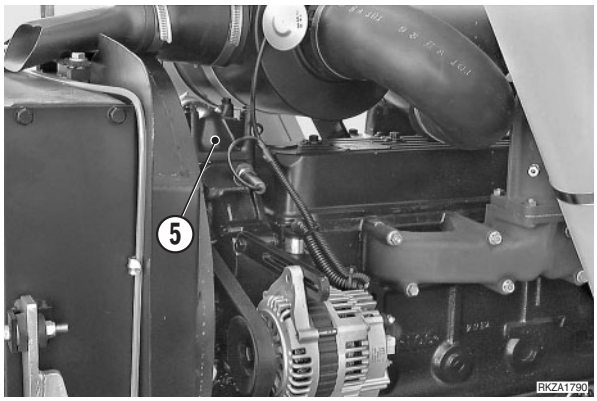
3 - Disconnect the radiator connection sleeve (6) from the thermostat cover (5).

4 - Take out the screws and remove the thermostat cover (5). ※2

5 - Remove the gasket (7), the thermostat (8) and the ring seal (9).

⚠ Put in new seals.





INSTALLATION OF THE THERMOSTAT

- To install, reverse the removal procedure.

※1

1 - Refill the coolant liquid tank.

Coolant liquid: 18 ℓ

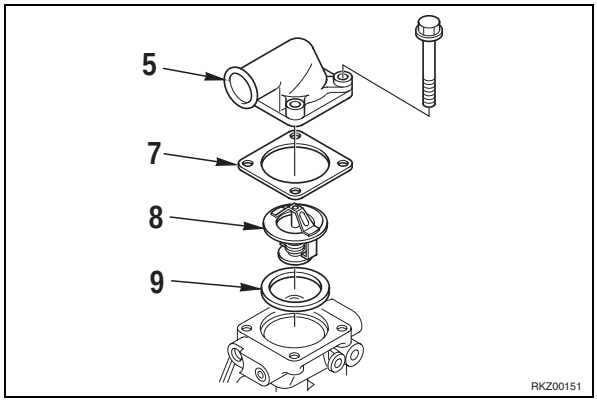
2 - Start the engine at low idling to circulate the coolant liquid through all circuits.

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.

※2

Nm Cover screws: 22 – 27.8 Nm



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REMOVAL OF THE COOLING LIQUID PUMP

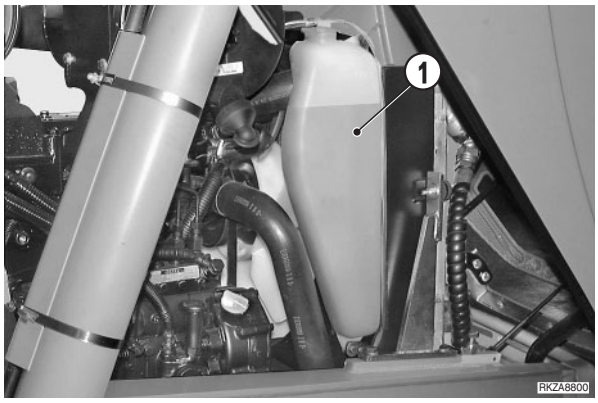
⚠ Fully raise the front working equipment and engage the safety stop. Also make the backhoe safe.

⚠ Disconnect the cable from accumulator negative terminal (–).

★ Drain the engine coolant liquid.

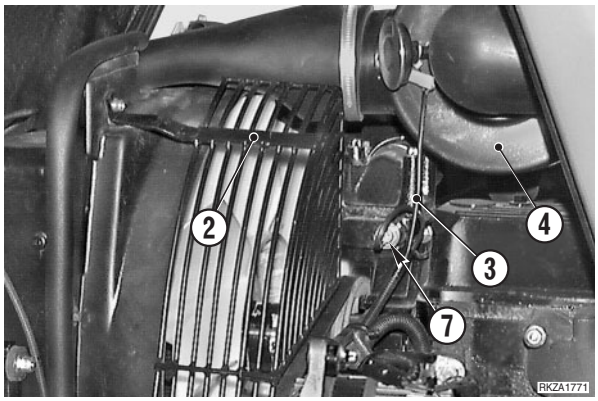
Coolant liquid: 18 ℓ

1 - Remove the engine coolant liquid container (1).

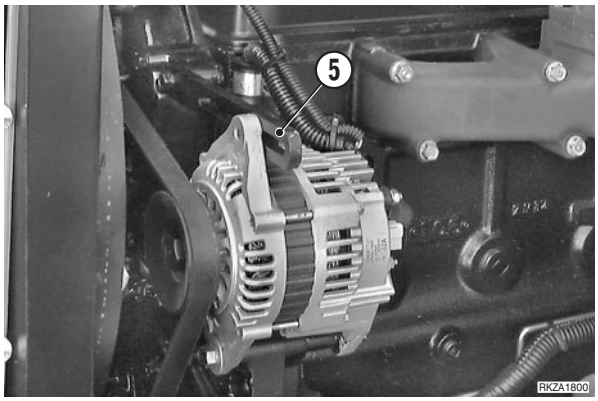


2 - Remove the fan guard (2).

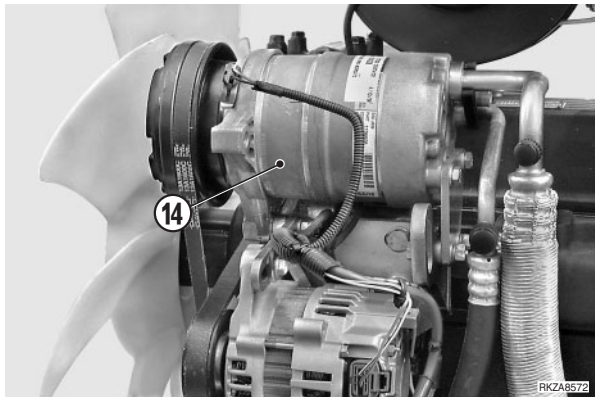
3 - Disconnect the cable (3) of the clogged filter indicator and remove the air filter (4).



4 - Remove the alternator and its support (5) (For details, see «REMOVAL OF THE ALTERNATOR»). ※1



5 - **Only for machines equipped with a compressor**
Remove the air-conditioning unit compressor (14) and its supports. Put the compressor to one side.
(For details, see «REMOVAL OF THE AIR-CONDITIONING UNIT COMPRESSOR»). ※4



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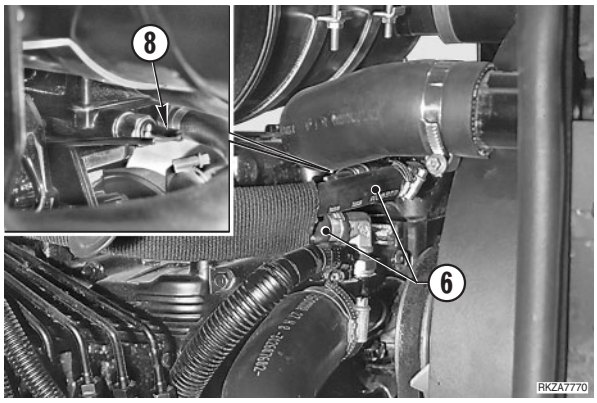
6 - Disconnect the cab heating pipes (6).

7 - Disconnect the temperature sensor cables (7) and (8).

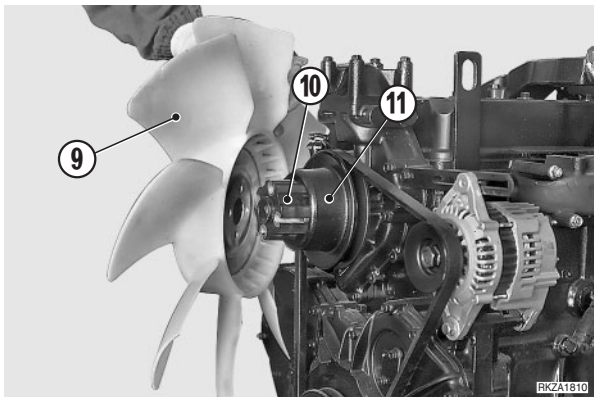
8 - Remove the radiator/oil-cooler group. (For details, see «REMOVAL OF THE RADIATOR - OIL COOLERS»).

9 - Remove the fan (9), the spacer (10) and the pulley (11). ※2

10 - Remove the four screws (12) and then the complete pump (13). ※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

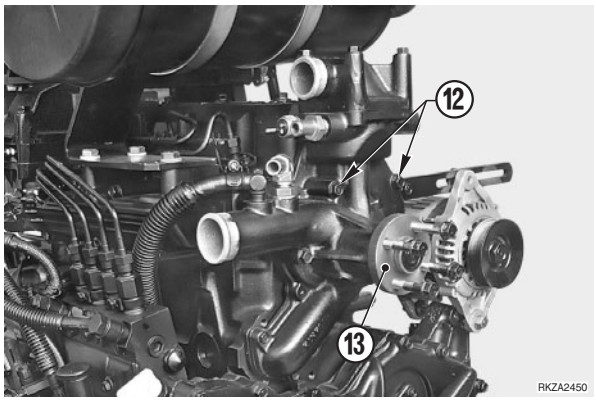
※3

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.

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REMOVAL OF THE TURBOCOMPRESSOR

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

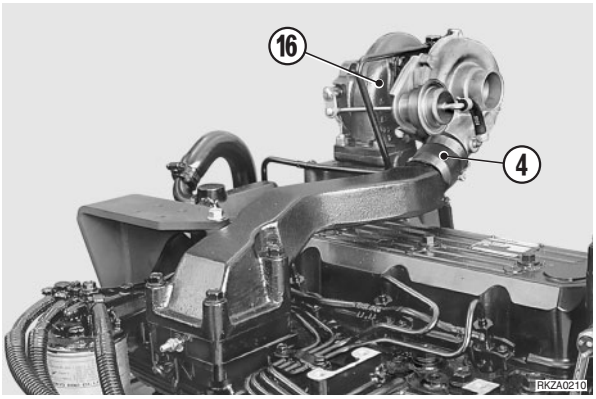
⚠ Disconnect the cable from accumulator negative terminal (–).

1 - Disconnect the clogged air-filter indication cable (1) and remove the entire suction filter (3).

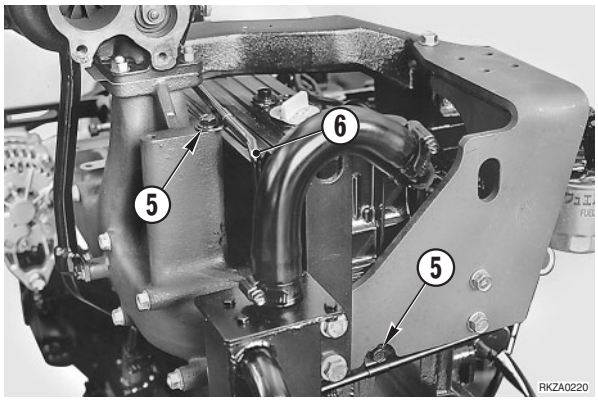
2 - Remove the muffler.
(For details, see «REMOVAL OF THE MUFFLER»).



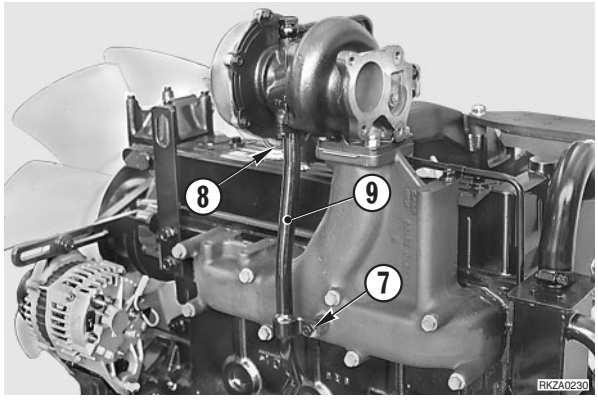
3 - Disconnect the turbocompressor delivery coupling sleeve (4) from the suction manifold.



4 - Take the screws out of the clips (5) and disconnect the tube (6) that delivers the turbocompressor lubrication oil.



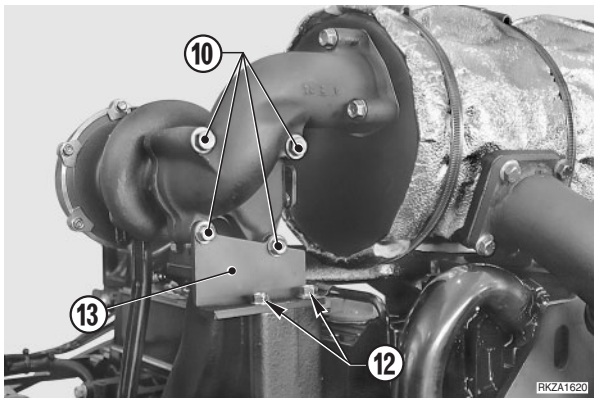
5 - Take out the tube-retaining screws (7) and the two screws (8) that secure the flange of the lubrication oil drainage tube (9). ※ 1



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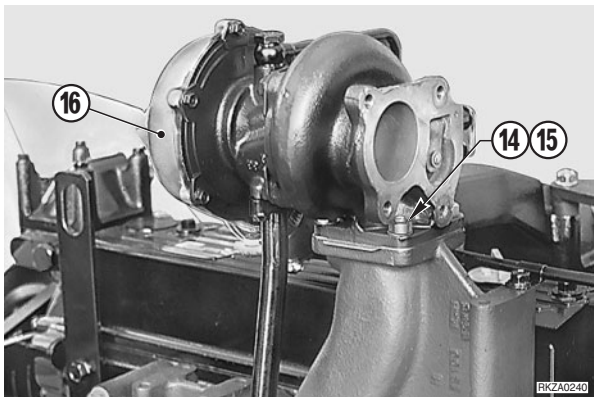
6 - Take out the screws (10) that join the turbocompressor to the coupling sleeve, and remove the coupling sleeve (11). ※2

7 - Take out the screws (12) and remove the bracket (13). ※3



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

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



INSTALLATION OF THE TURBOCOMPRESSOR

- To install, reverse the removal procedure.

※1

Nm Tube retaining screws: 22.5 – 28.4 Nm

Nm Flange screws: 8 – 9 Nm

※2

Nm Coupling joint screws: 22.5 – 28.4 Nm

※3

Nm Bracket screws: 22.5 – 28.4 Nm

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

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REMOVAL OF THE CYLINDER HEAD

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

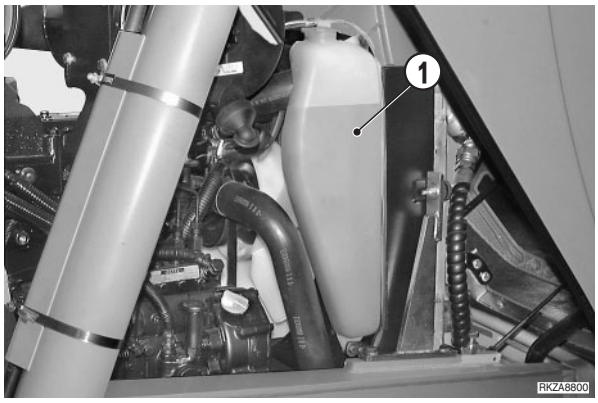
⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

★ Drain the engine coolant liquid.

Coolant liquid: 18 ℓ

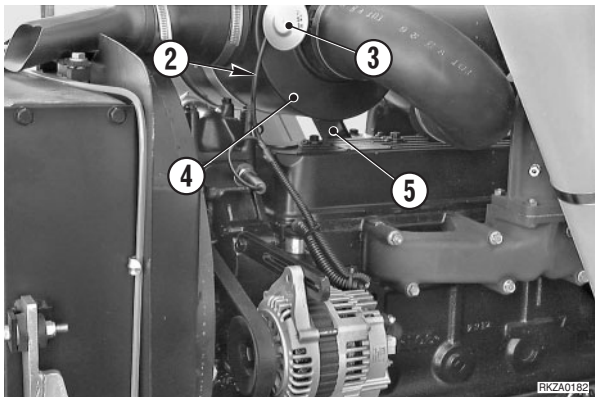
※1

1 - Remove the container (1).

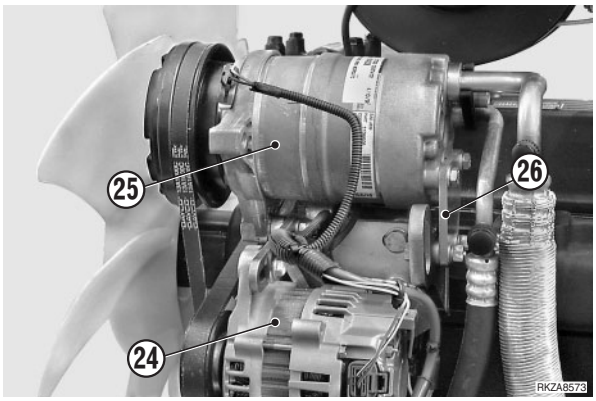


2 - Disconnect the cable (2) of the clogged air-filter sensor and remove the entire suction filter (4) and its support (5). ※2

★ Remove the turbocompressor. (For details, see «REMOVE THE TURBOCOMPRESSOR»).



3 - **Only for machines equipped with an air-conditioning unit**
Remove the alternator (24), the compressor (25) and the supporting bracket (26).
(For details, see «REMOVAL OF THE ALTERNATOR» and «REMOVAL OF THE AIR-CONDITIONING UNIT»). ※3



4 - Remove the support (27). ※4



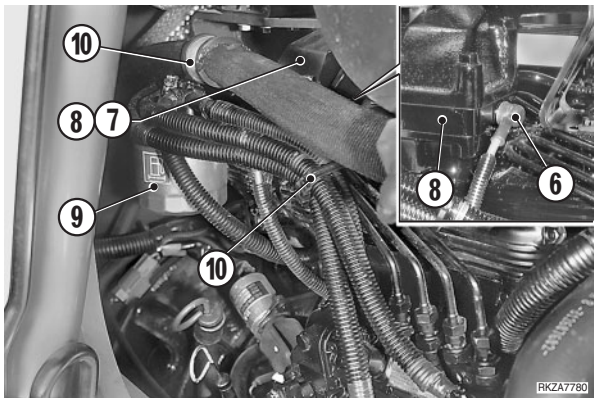
https://truckmanualshub.com/

5 - Disconnect the cable (6) of the cold-start equipment.

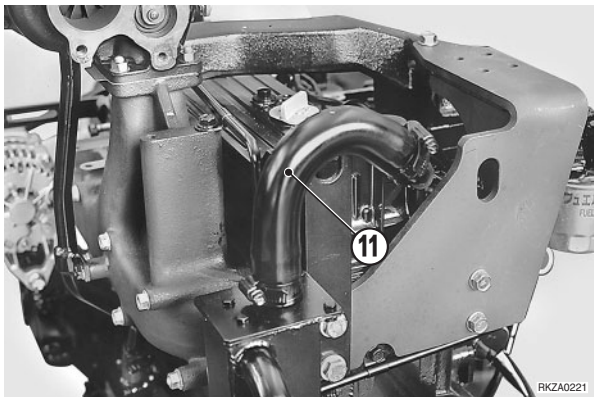
6 - Remove the suction manifold (7) and the cold-start equipment (8). ※5

7 - Remove the diesel fuel filter (9) and place it to one side.

8 - Disconnect the clips that secure the heating pipes.

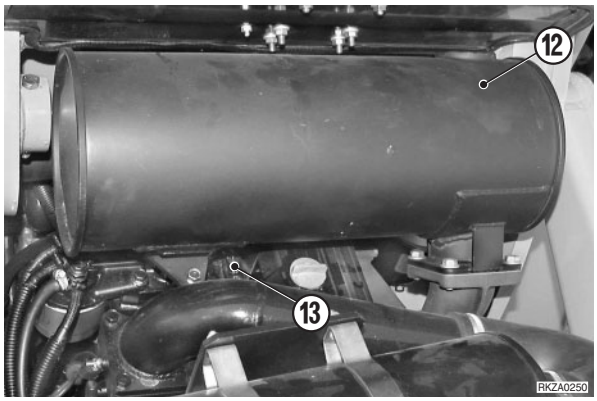


9 - Disconnect the breather tube (11) from the engine head.



10 - Remove the muffler (12).
(For details, see «REMOVAL OF THE MUFFLER»).

11 - Remove the muffler support bracket (13). ※6

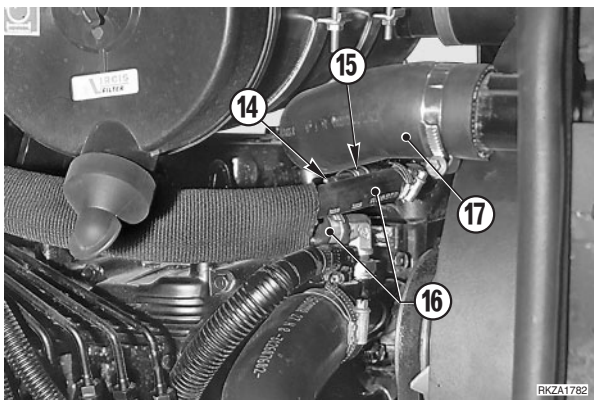


12 - Disconnect the cables (14) from the temperature sensors (15).

13 - Disconnect the heating pipes (16).

14 - Remove the radiator connection pipes (17).

15 - Remove the coolant liquid pump. (For details, see «REMOVAL OF THE COOLANT LIQUID PUMP»).

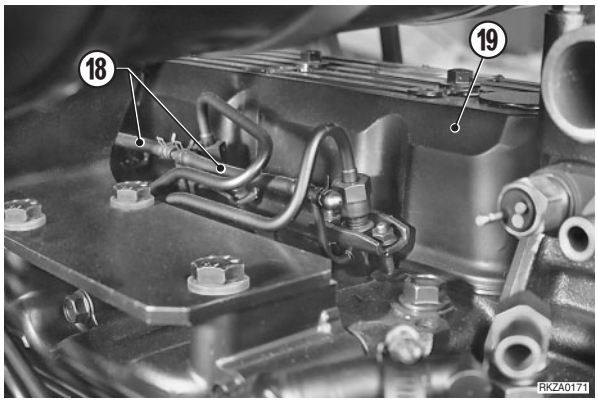


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16 - Disconnect the fuel return hose (18) from the injector nozzles and remove the nozzles. (For details, see «REMOVAL OF THE INJECTOR NOZZLES»).

※6 ※7

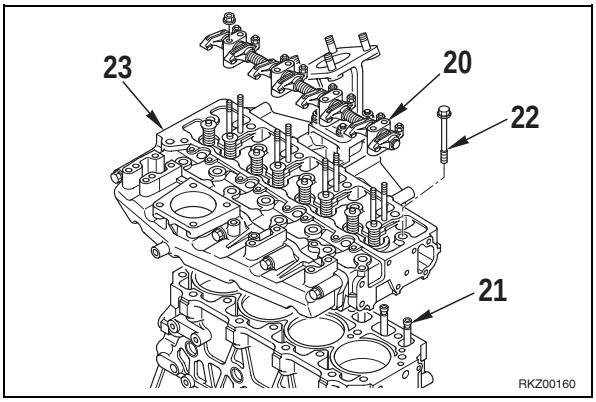
17 - Remove the cover of the tappets (19). ※8



18 - Remove the valve rocker-arm shaft (20).

★ Loosen the nuts and unscrew the tappets by 2-3 turns. ※9

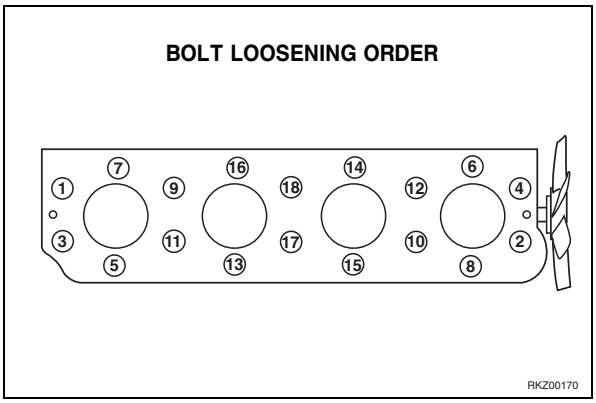
19 - Take out the rocker-arm control rods (21).



20 - Take out the screws (22) and remove the entire cylinder head (23). Follow the indicated sequence for loosening the screws. ※10

★ Sequence to be followed: see drawing.

⚠ Loosen the cylinder head retaining screws in two stages.



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INSTALLATION OF THE CYLINDER HEAD

- To install, reverse the removal procedure.

※1

★ Fill up the cooling circuit.

Coolant liquid: 18 ℓ

★ Check carefully that there are no leaks.

※2

Support screws: 35.2 Nm (3.6 kgm)

※3

Frontal screw (M8): 32 Nm
Lateral screws (M10): 64 Nm

※4

Frontal screws (M10): 64 Nm
Lateral screw (M8): 32 Nm

※5

Bracket screws: 45 – 55 Nm
Screws for intake line: Loctite 262
Screws for intake line: 45 – 55 Nm

※6

High-pressure pipe fittings:
24.5 – 34.3 Nm (2.5 – 3.5 kgm)

※7

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

※8

★ Check the condition of the seals of the tappet cover and the O-rings of the fastening nuts. Thoroughly clean the contact surfaces on the cylinder heads.

Cover fastening nuts: 25±3 Nm

※9

★ Check that the tappets are firmly engaged in their rods and that the valve collars are correctly assembled.

Rods - tappets: Engine oil

★ Start tightening the rocker-arm shaft from the center towards the outside.

Screws and nuts for the rocker-arm shaft:
22.5 – 28.4 Nm (2.3 – 2.9 kgm)

★ Adjust the valve clearances (For details, see «20. TESTING AND ADJUSTMENTS»).

※10

★ Assemble a new gasket.

Bolt and cylinder block threadings: Engine oil.

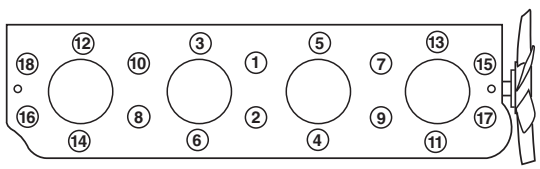
★ Tighten the screws, manually at first, and then in two stages, following the sequence indicated.

Cylinder head bolts.
first tightening: 88.3 – 98.1 Nm (9 – 10 kgm)
Final tightening: 181.4 – 191.2 Nm
(18.5 – 19.5 kgm)

1 - Start the engine at low idling to circulate the coolant liquid through all circuits.

2 - Accelerate gradually up to 1700 rpm. After about one minute, stop the engine and check or top up the level in the container.

BOLTS TIGHTENING ORDER



RKZ00180

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REMOVAL OF THE FRONT COUNTERWEIGHT

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

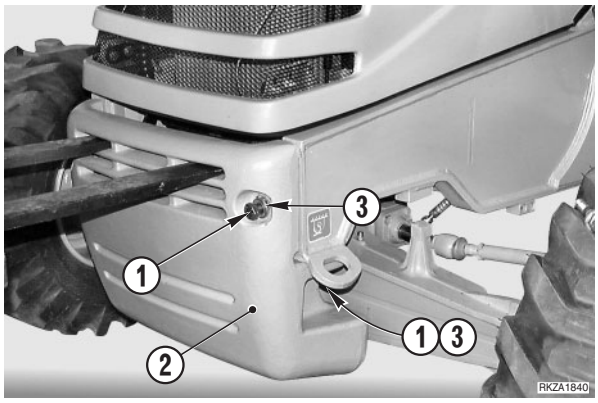
1 - Partially loosen the screws (1) to eliminate the tightening torque, and thus to facilitate the subsequent dismantling procedure. ※1

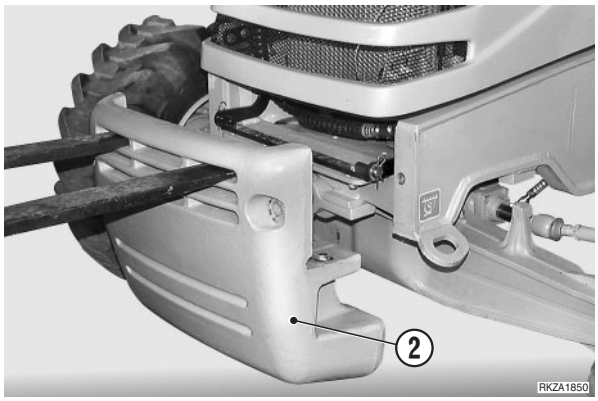
2 - Insert the prongs of a fork-lift truck into the ventilation slits, and force them gently upwards to compensate for the weight of the counterweight (2).

3 - Remove the screws (1) and the washers (3).

4 - Remove the Front counterweight (2).

kg Counterweight: 300 kg





INSTALLATION OF THE FRONT COUNTERWEIGHT

- To install, reverse the removal procedure.

※1

Nm Screws: 300±30 Nm

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REMOVAL OF THE RADIATOR-OIL COOLER UNIT

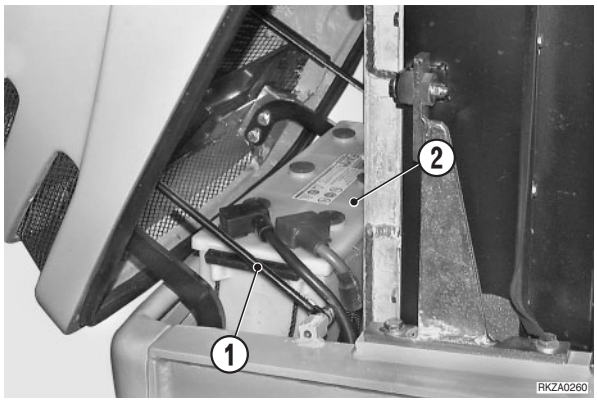
FROM SERIAL NUMBER 97F20001 TO 97F20171

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

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

1 - Disconnect the gas cylinder (1) and cable for maximum opening engine hood. Accompany the hood until it is completely open.

★ Place some soft material between the engine hood and the front closing mechanism.



⚠ Completely eliminate all residual pressures in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

★ Drain the cooling liquid.

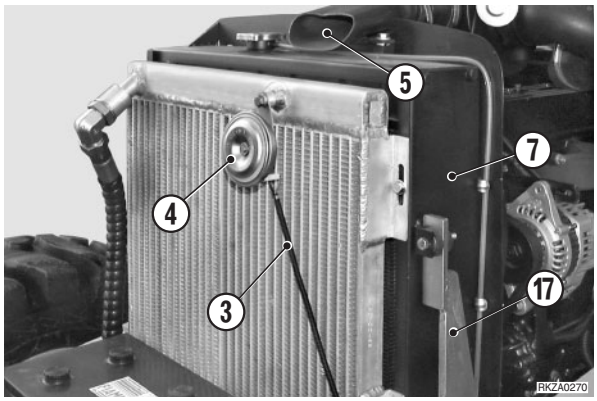
Coolant liquid: 18 ℓ

※1

2 - Disconnect the cable from accumulator positive terminal (+) and remove the accumulator (2). ※2

3 - Disconnect the cable (3) and remove the acoustic alarm (4).

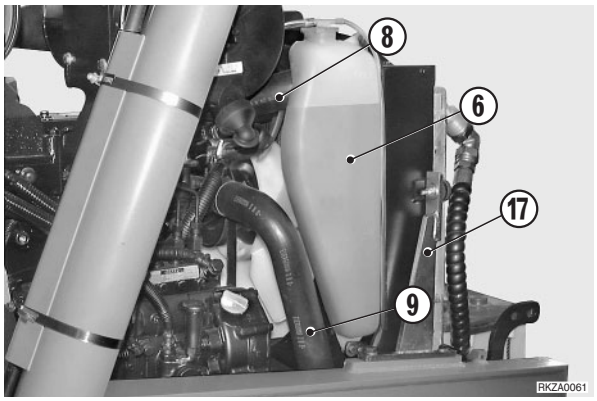
4 - Remove the air filter suction line (5).



5 - Remove the container (6).

6 - Disconnect the engine coolant circuit hoses (8) and (9) from the radiator (7).

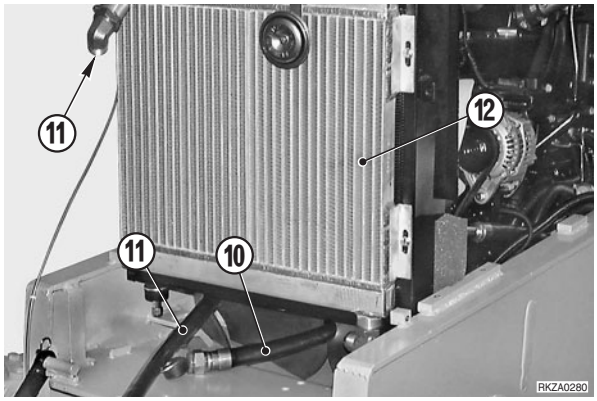
7 - Remove the brackets (17).



8 - Slowly loosen the hoses (10) and (11) to drain the hydraulic oil from the oil cooler (12). When the oil is fully drained, complete disconnection of the hoses, and plug them to prevent entry of impurities.

Hydraulic oil:..... ℓ

※3

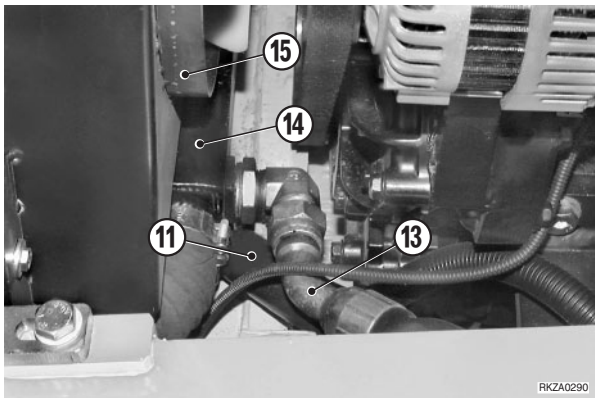


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9 - Slowly loosen the hoses (13) to drain the oil from the transmission oil cooler (14). When the oil is fully drained, complete disconnection of the hoses, and plug them to prevent entry of impurities.

Transmission oil: ..... ℓ

※4

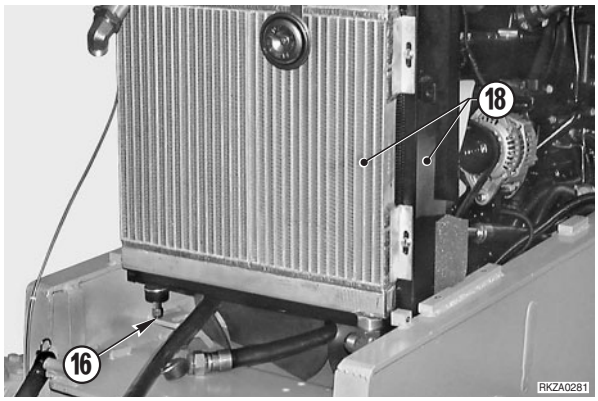


10 - Disconnect the conveyor (15) from the radiator (7) and move it towards the engine.

11 - Take out the nuts (16) of the lower anti-vibration units and remove the entire radiator - oil cooler group (18).

※5

kg Radiator - oil cooler group: ..... kg



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INSTALLATION OF THE RADIATOR – OIL COOLER GROUP

- To install, reverse the removal procedure.

※1

- Refill the coolant liquid circuit.

  Coolant liquid: 18 ℓ

※2

★ First connect the positive pole (+).

※3

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

※4

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

※5

Anti-vibration unit nuts: ..... Nm

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

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.

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REMOVAL OF THE RADIATOR-OIL COOLER UNIT

FROM SERIAL NUMBER 97F20172–

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

⚠ Disconnect the cable from accumulator negative terminal (–). ※1

1 - Disconnect the safety gas cylinders (1) for opening the engine hood. Accompany the hood until it is completely open.

★ Place some soft material between the engine hood and the front closing mechanism.

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

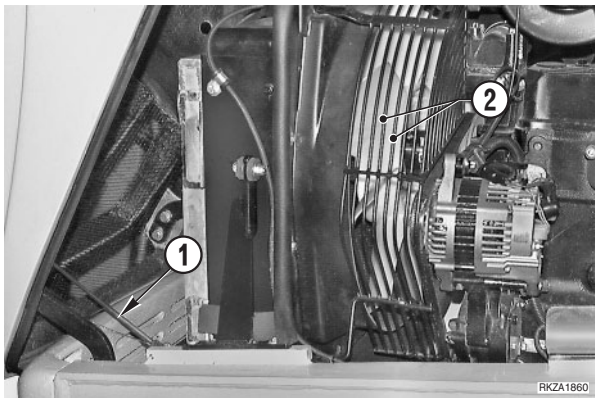
★ Drain the cooling liquid.

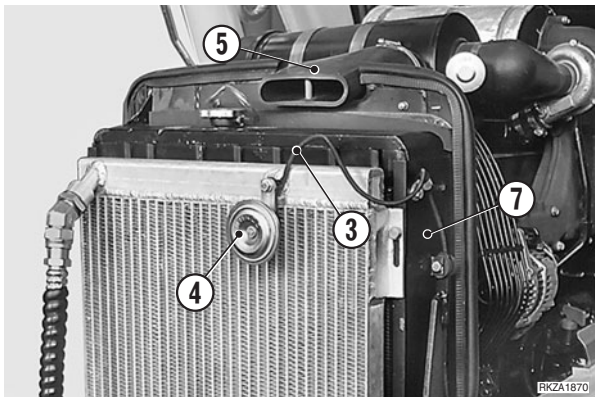
Cooling liquid: 18 ℓ ※2

2 - Remove the fan guard (2).

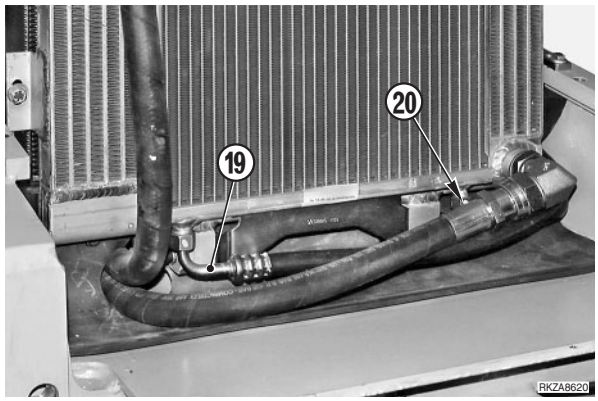
3 - Disconnect the cable (3) and remove the acoustic alarm (4).

4 - Remove the air filter suction line (5).





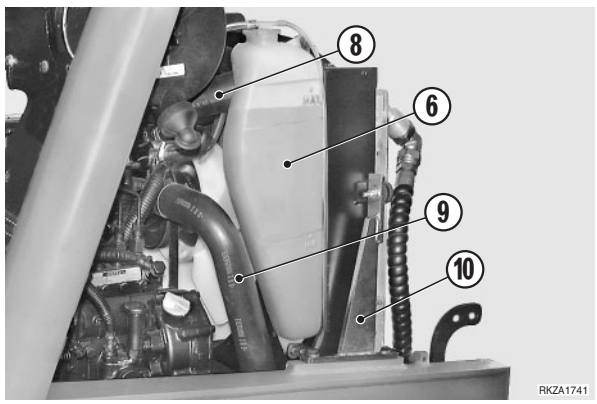
5 - **Only for machines equipped with an air-conditioning unit**
Drain the air conditioning unit, and disconnect the tubes (19), (20).
(For details, see «20. TESTING AND ADJUSTMENTS»). ※3



6 - Remove the container (6).

7 - Disconnect the engine coolant circuit hoses (8) and (9) from the radiator (7).

8 - Remove the brackets (10).

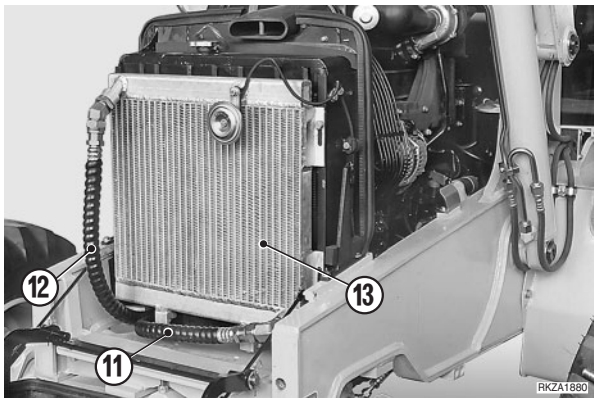


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9 - Slowly loosen the hoses (11) and (12) to drain the hydraulic oil from the oil cooler (13). When the oil is fully drained, complete disconnection of the hoses, and plug them to prevent entry of impurities.

Hydraulic oil:..... ℓ

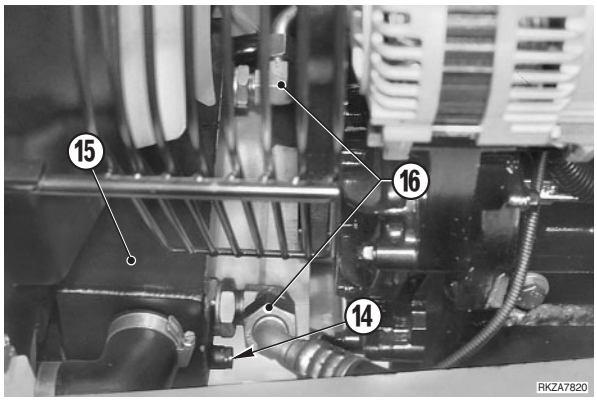
※4



10 - Slowly loosen the hoses (14) to drain the oil from the transmission oil cooler (15). When the oil is fully drained, complete disconnection of the hoses, and plug them to prevent entry of impurities.

Transmission oil:..... ℓ

※5



11 - Disconnect the conveyor (17) from the radiator (7) and move it towards the engine.

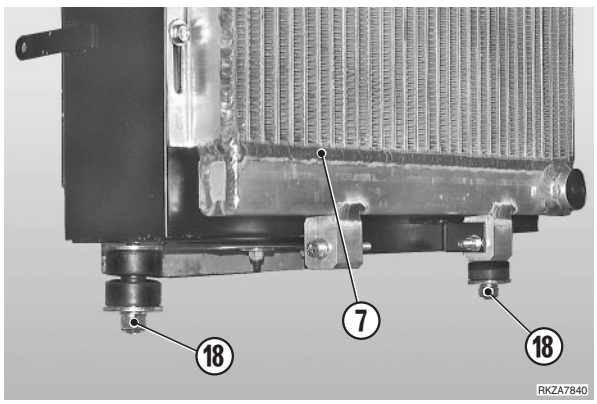


12 - Take out the nuts (18) of the lower anti-vibration units and remove the entire radiator - oil cooler group (7).

※6

kg Radiator - oil cooler group:..... kg

13 - Remove the rubber conveyor situated between chassis and radiator.



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INSTALLATION OF THE RADIATOR – OIL COOLER GROUP

- To install, reverse the removal procedure.

※1

★ First connect the positive pole (+).

※2

- Refill the coolant liquid circuit.

Coolant liquid: 18 ℓ

※3

★ Refill the air-conditioning unit.

Quantity of fluid (R134a): 1100 g (+ 50/–30 g)
Quantity of oil: See the amount recovered.

※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.

※6

Anti-vibration unit nuts:..... Nm

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

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.

3 - Stop the engine and replace the rubber conveyor.

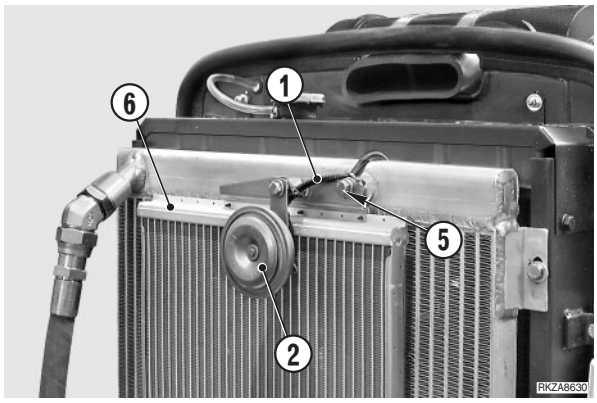
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REMOVAL OF THE CONDENSER (Only for machines equipped with an air-conditioning unit)

⚠ Completely raise the front working equipment and engage the parking brake.
Also place the backhoe in its secure position.

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

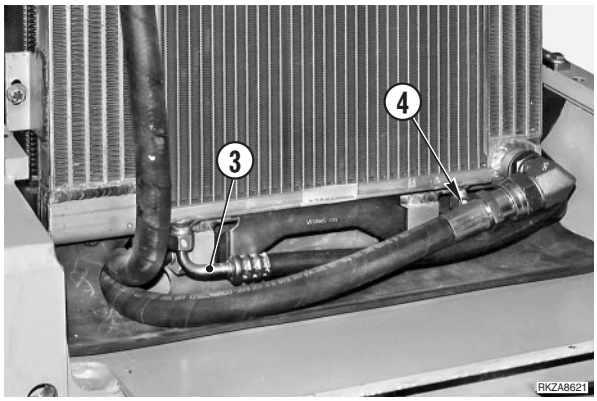
2 - Disconnect the cable (1) and remove the klaxon (2).



3 - Disconnect the tubes (3) and (4).

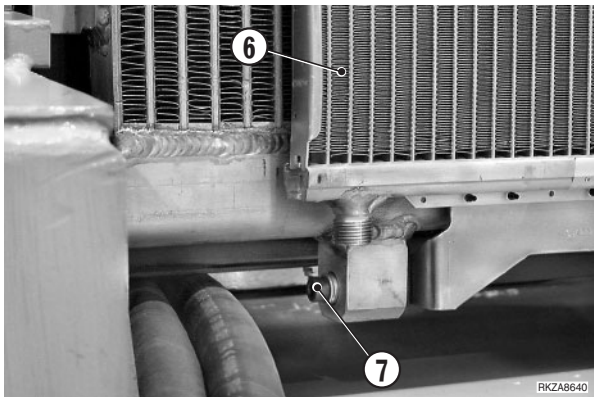
★ Immediately plug the tubes and the condenser tightly to prevent moisture from entering into the air-conditioning circuit.

4 - Loosen the upper retaining screw (5) of the condenser (6), leaving it in position for reasons of safety.



5 - Loosen the screws (7) and remove the locknuts.

6 - Remove the screws (5) and (7) and take out the condenser.



INSTALLATION OF THE CONDENSER

- To install, reverse the removal procedure.

1 - Refill the air-conditioning unit.

Quantity of fluid (R134a): 1100 g (+ 50 / – 30 g)
Quantity of oil: See the amount recovered.

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REMOVAL OF HYDRAULIC OIL COOLER

FROM SERIAL NUMBER 97F20001 TO 97F20171

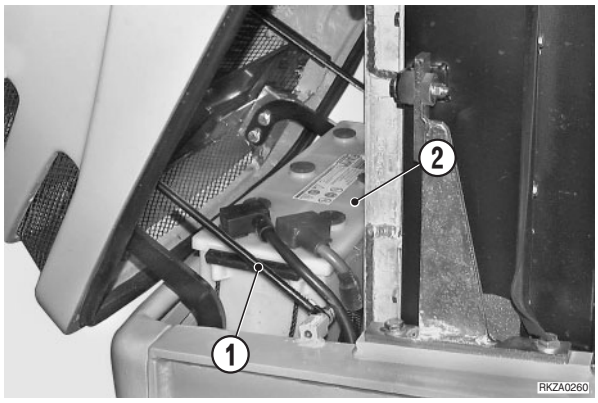
⚠ Fully raise the front working equipment and engage the safety stop. Also make the backhoe safe.

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

1 - Disconnect the gas cylinder (1) and cable for maximum opening engine hood. Accompany the hood until it is completely open.

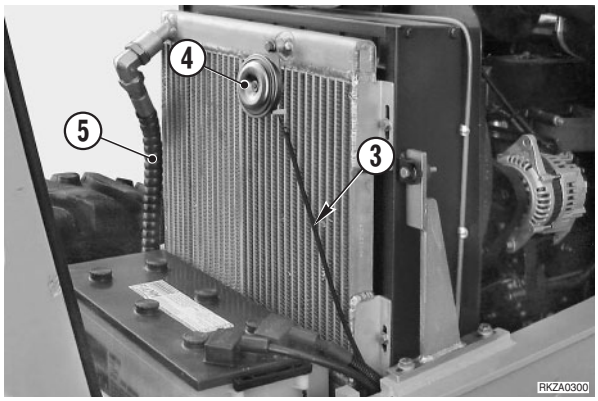
★ Place some soft material between the engine hood and the front closing mechanism.

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



2 - Disconnect the cable from accumulator positive terminal (+) and remove the accumulator (2). ※1

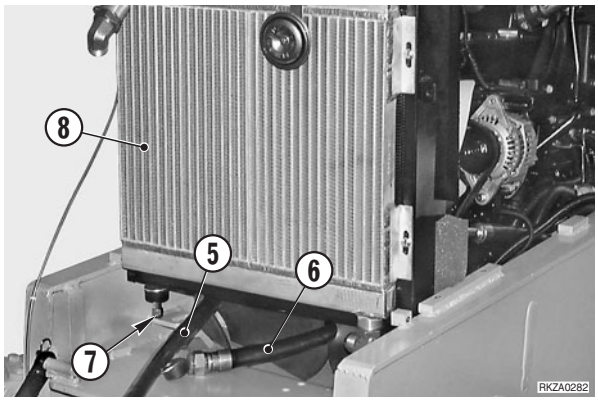
3 - Disconnect the cable (3) and remove the warning horn (4).



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

Hydraulic oil: ..... ℓ
※2

5 - Remove the screws (7) and remove the oil cooler (8).



INSTALLATION OF THE HYDRAULIC OIL COOLER

- To install, reverse the removal procedure.

※1

★ First connect the positive pole (+).

※2

- Make sure that the level of the hydraulic oil in the tank is at maximum.

1 - Start the engine at low idling in order to circulate the oil and fill up the cooler.

2 - Accelerate gradually up to 1700 rpm. After about one minute stop the engine and top up the level of oil in the tank.

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REMOVAL OF HYDRAULIC OIL COOLER

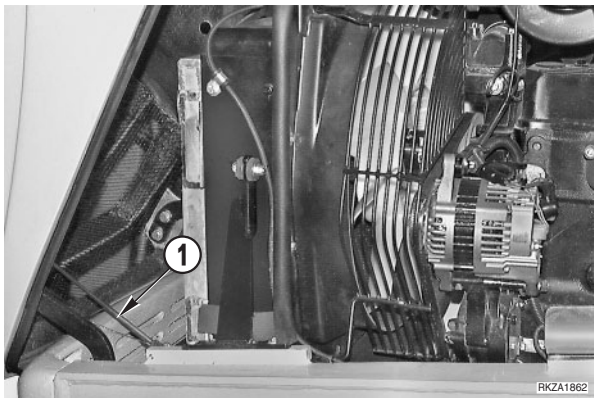
FROM SERIAL NUMBER 97F20172–

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

Disconnect the cable from accumulator negative terminal (–).

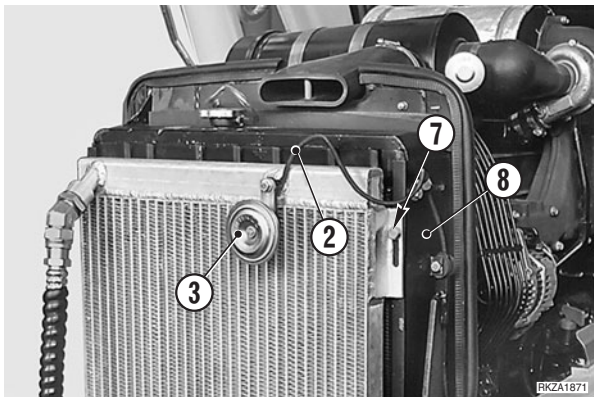
1 - Disconnect the safety gas cylinders (1) from the engine hood. Accompany the hood until it is completely open.

★ Place some soft material between the engine hood and the front closing mechanism.

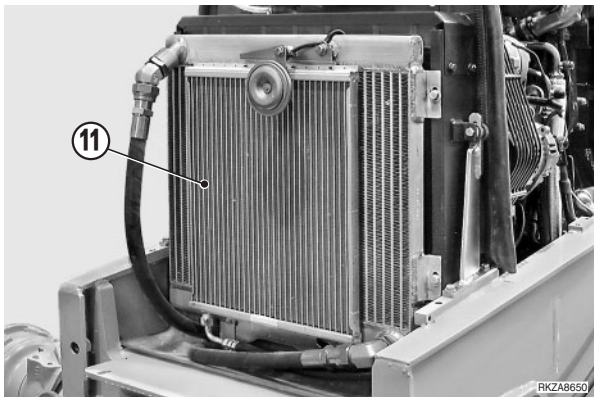


Completely release residual pressures from all circuits.
(For details, see «20. TESTING AND ADJUSTMENTS»).

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



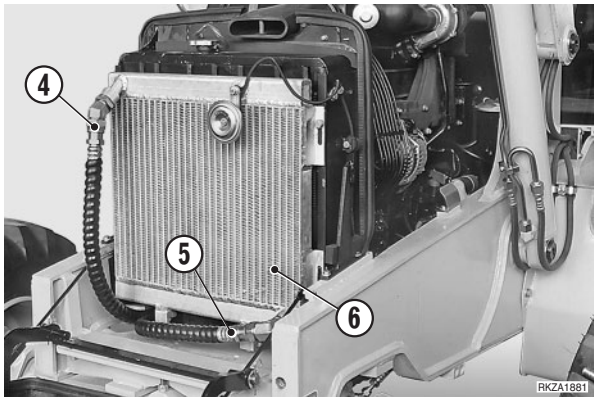
3 - **Only for machines equipped with an air-conditioning unit**
Remove the condenser (11) without detaching the tubes, and put it to one side.



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

Hydraulic oil:..... ℓ

※1

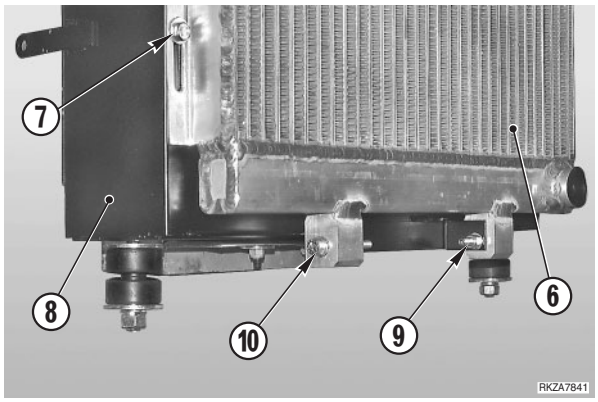


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5 - Remove the screws (7) that fasten the oil cooler (6) to the radiator group (8).

6 - Take out the nuts and washers (9) and remove the fulcrum screws and washers (10).

7 - Remove the rubber conveyor.



INSTALLATION OF THE HYDRAULIC OIL COOLER

- To install, reverse the removal procedure.

※1

- Make sure that the level of the hydraulic oil in the tank is at maximum.

1 - Start the engine at low idling in order to circulate the oil and fill up the cooler.

2 - Accelerate gradually up to 1700 rpm. After about one minute stop the engine and, if necessary, top up the level of oil in the tank.

3 - Replace the rubber conveyor.

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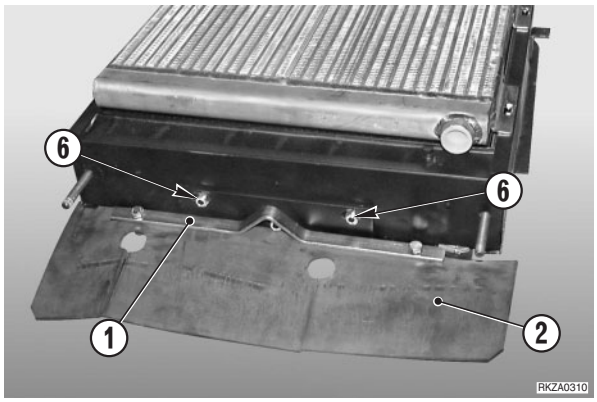
REMOVAL OF THE TRANSMISSION OIL COOLER

FROM SERIAL NUMBER 97F20001 TO 97F20171

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

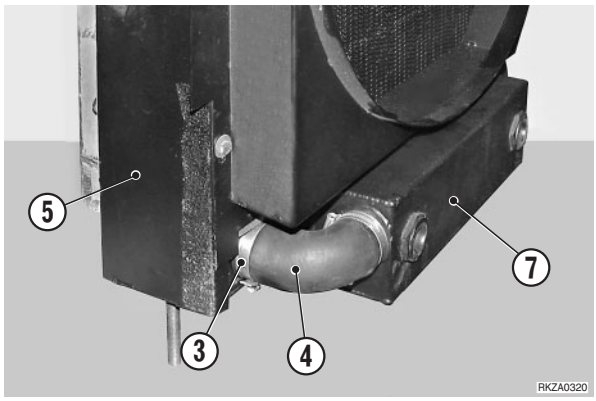
1 - Remove the radiator - oil cooler group. (For details, see «REMOVAL OF THE RADIATOR - OIL COOLER GROUP»). ※1

2 - Remove bracket (1) and rubber sheet (2).



3 - Loosen the retaining clip (3) of the coupling (4) on the radiator (5).

4 - Take out the nuts (6) and remove the oil cooler (7).



INSTALLATION OF THE TRANSMISSION OIL COOLER

- To install, reverse the removal procedure.

※1

- Make sure that the levels of the transmission oil, the hydraulic oil and the engine cooling liquid are all at maximum.

1 - Start the engine at low idling to let the fluids circulate, and fill up the oil coolers.

2 - Gradually accelerate up to 1700 rpm. After about one minute, stop the engine and top up the levels.

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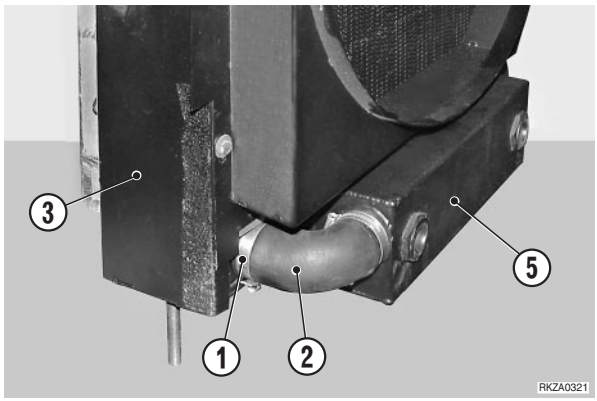
REMOVAL OF THE TRANSMISSION OIL COOLER

FROM SERIAL NUMBER 97F20172–

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

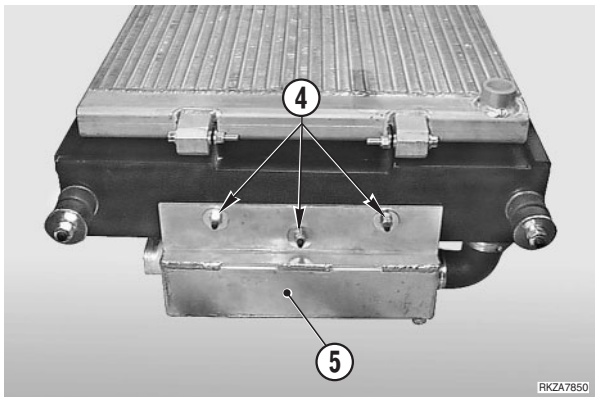
1 - Remove the radiator - oil cooler group. (For details, see «REMOVAL OF THE RADIATOR - OIL COOLER GROUP»). ※1

2 - Remove bracket (1) and rubber sheet (2).



3 - Loosen the retaining clip (3) of the coupling (4) on the radiator (5).

4 - Take out the nuts (6) and remove the oil cooler (7).



INSTALLATION OF THE TRANSMISSION OIL COOLER

- To install, reverse the removal procedure.

※1

- Make sure that the levels of the transmission oil, the hydraulic oil and the engine cooling liquid are all at maximum.

1 - Start the engine at low idling to let the fluids circulate, and fill up the oil coolers.

2 - Gradually accelerate up to 1700 rpm. After about one minute, stop the engine and top up the levels.

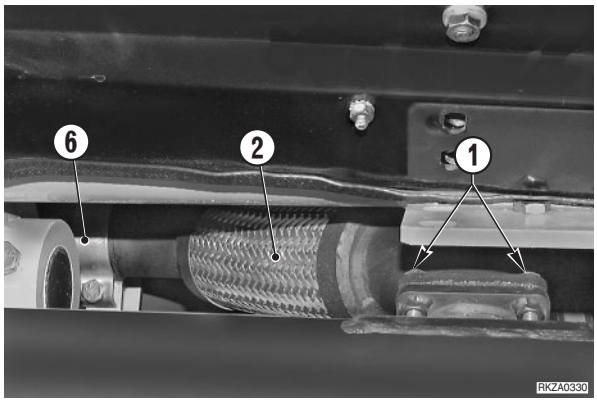
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REMOVAL OF THE MUFFLER

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

1 - Take out the retaining screws (1) of the flexible outlet hose (2).

2 - Take out the two screws (3), the screws (4) and remove the muffler (5). ※1



INSTALLATION OF THE MUFFLER

- To install, reverse the removal procedure.

★ Put in a new sealant.

※1

Nm Muffler: ..... Nm



REMOVAL OF THE EXHAUST PIPE

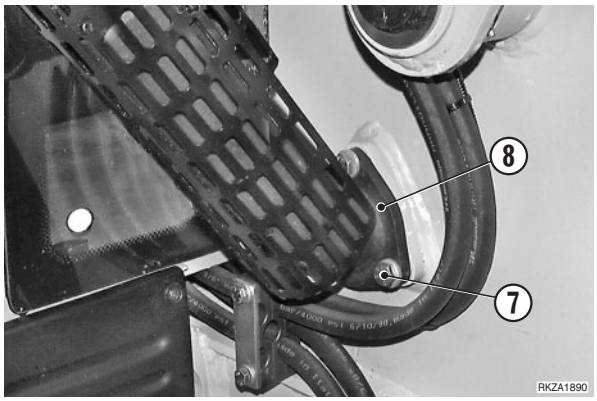
1 - Loosen the clip (6) and disconnect the flexible hose (2).

2 - Take out two of the three lower screws (7) of the connecting flange (8).

★ Loosen the third screw and leave it in place for safety.

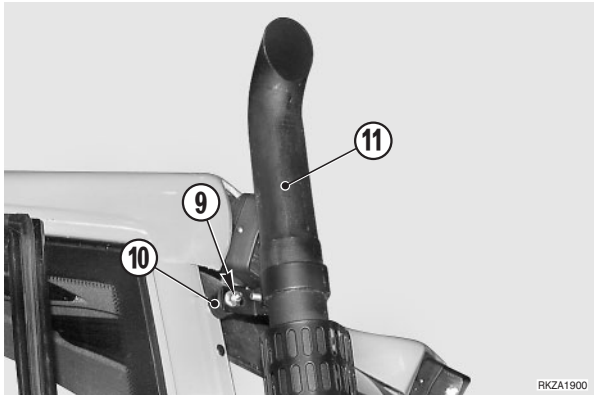
3 - Take out the nut (9) and the washer of the upper anti-vibration unit (10).

4 - Take out the last screw (7) and remove the exhaust pipe (11).



INSTALLATION OF THE EXHAUST PIPE

- To install, reverse the removal procedure.



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REMOVAL OF THE ENGINE HOOD

FROM SERIAL NUMBER 97F20001 TO 97F20171

⚠ Lower the working equipment completely until it is resting on the ground and stop the engine.

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

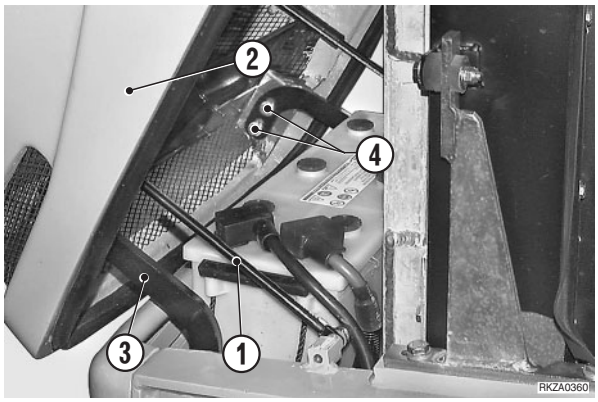
1 - Disconnect the gas cylinder (1) and cable for maximum opening engine hood.

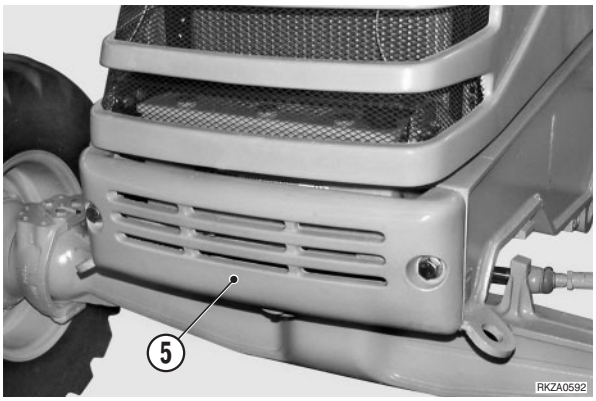
2 - Mark the position of the bracket (3) on the hood (2).

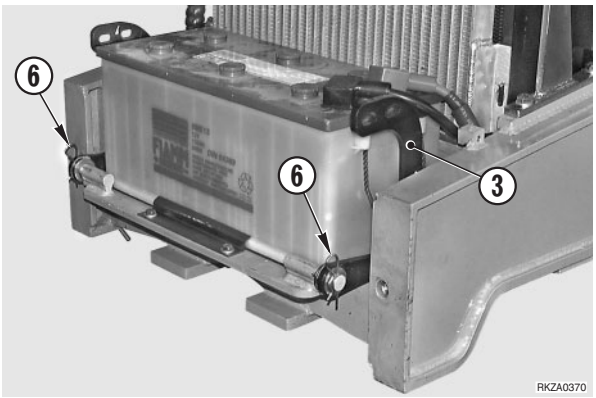
3 - Take out the screws (4) and remove the engine hood (2).

kg Engine hood:..... kg

★ If the hood is removed to aid extraction of the engine-transmission group, remove bracket (3) after remove front counterweight (5), the safety pin (6) and the washer too.
(See «REMOVAL OF FRONT COUNTERWEIGHT»).







INSTALLATION OF THE ENGINE HOOD

- To install, reverse the removal procedure.

★ Check that the hood (2) closes perfectly, and re-attach the screws (7).



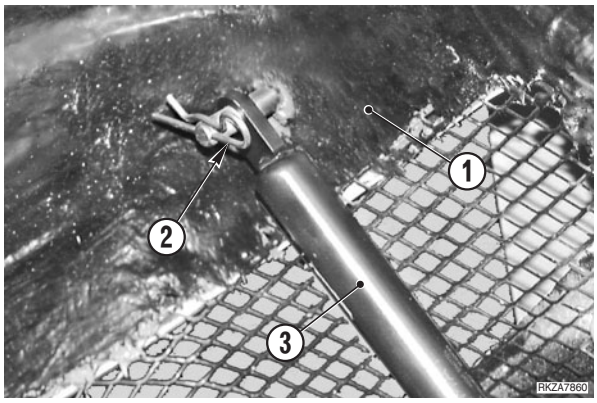
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REMOVAL OF THE ENGINE HOOD

FROM SERIAL NUMBER 97F20172–

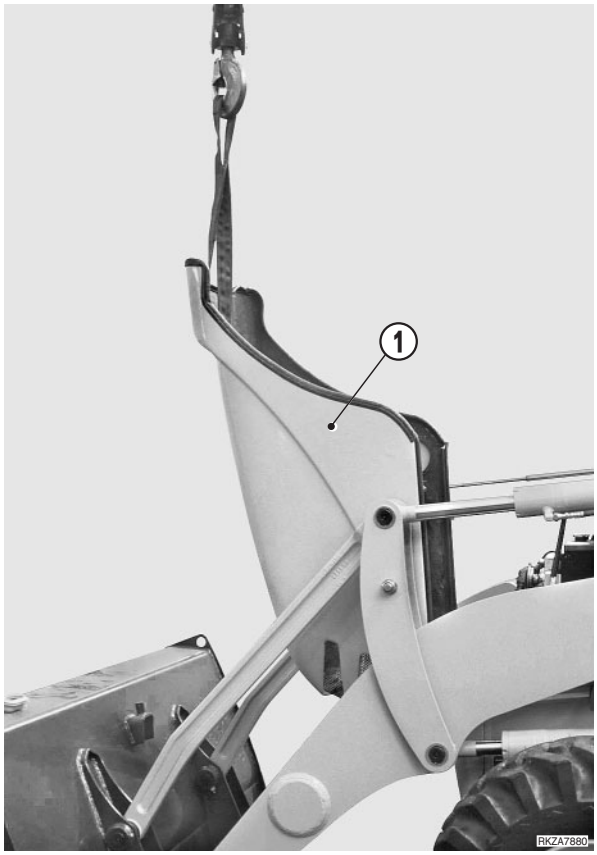
⚠ Lower the working equipment completely until it is resting on the ground. Stop the engine and remove the ignition key.

1 - Open the engine hood (1) take out the safety pins (2) and disconnect the hood from the gas cylinders (3).

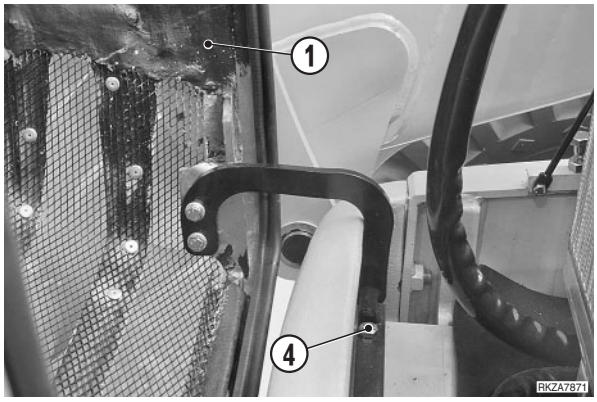


2 - Raise the hood (1) to a vertical position and attach it to some hoisting tackle.

★ To attach it, use the hole in the opening cavity.



3 - Take out the screws (4) and remove the hood (1).

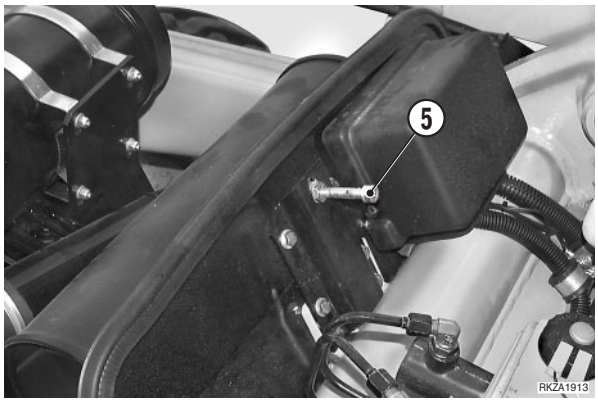


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INSTALLATION OF THE ENGINE HOOD

- To install, reverse the removal procedure.

★ Check that the hood (1) closes perfectly, and re-attach the screws (5).



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REMOVAL OF THE CAB

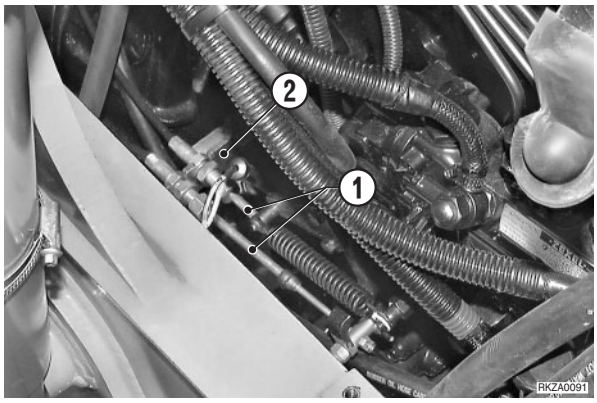
FROM SERIAL NUMBER 97F20001 TO 97F20171

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

⚠ Disconnect the cable from accumulator negative terminal (–).

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

1 - Disconnect the pedal accelerator and hand accelerator cables (1) from the injection pump. Disengage the sheathings from the support (2). ※1

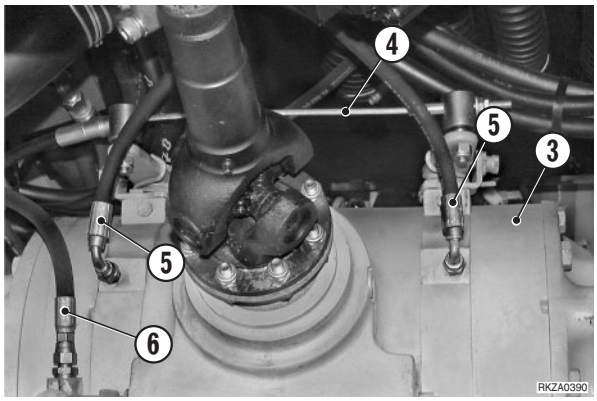


2 - Disconnect the parking brake cable (4) from the rear axle (3). ※2

3 - Disconnect the braking circuit pipes (5) and the differential lock tube (6) from the rear axle.

★ Mark the positions of the pipes to prevent exchange of positions when reconnecting.

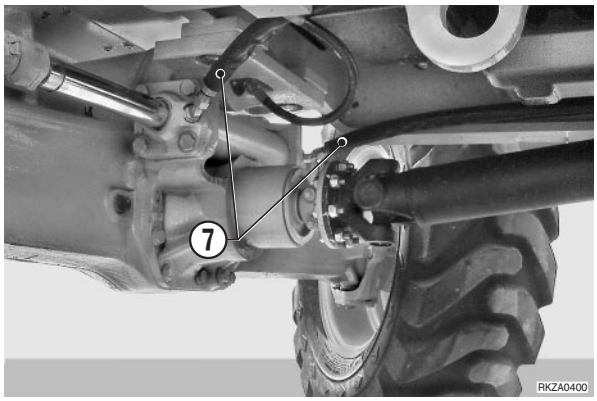
★ Plug the pipes and pipe-fittings to prevent entry of impurities. ※3



4 - Disconnect the steering cylinder pipes (7) from the rear axle. ※4

★ Mark the positions of the pipes to prevent exchanging positions when reconnecting.

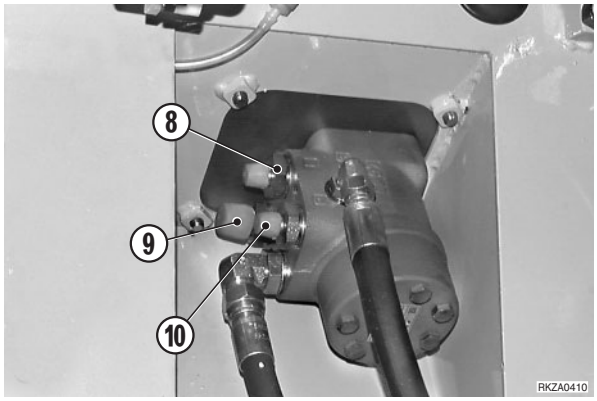
★ Plug the pipes and pipe-fittings to prevent entry of impurities.



5 - Disconnect the pipes of the L - T - P ports (8, 9 and 10) from the steering unit.

★ Mark the positions of the pipes to prevent exchanging positions when reconnecting.

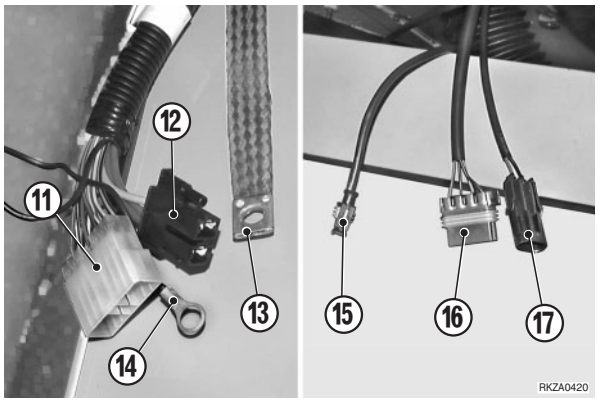
★ Plug the pipes and pipe-fittings to prevent entry of impurities.



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6 - Disconnect the connectors (11) and (12), the grounding plait (13), and the grounding cable (14).

7 - Disconnect the connectors (15), (16) and (17) from the gearbox.



8 - Disconnect the connector (18) of the auxiliary controls set into the bucket control lever.

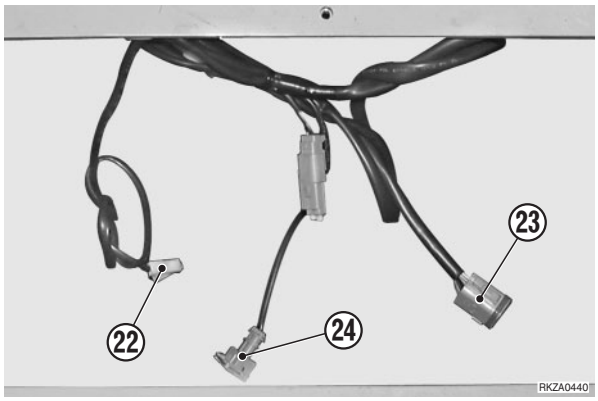
9 - Disconnect the converter disengagement connector (19) set into the gear lever.

10 - Disconnect the connector (20) of the differential disengagement and backhoe boom disengagement solenoids.

11 - Disconnect the power increment solenoid connector (21) installed on the piston pump.



12 - Disconnect the connectors (22) of the rear acoustic alarm, the connector (23) of the rear lights and finally the connector (24) of the solenoid of the backhoe control valve.



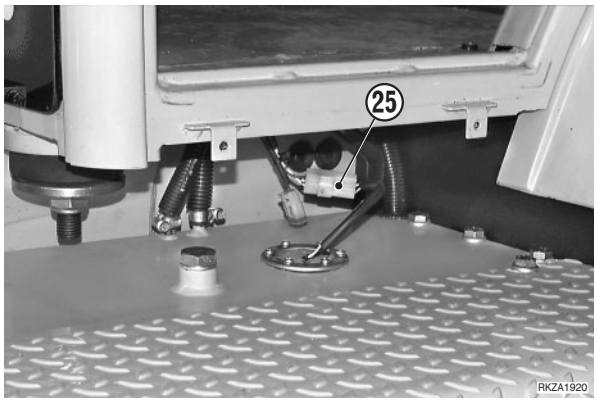
13 - Disconnect the heating unit tubes and the shutter control cable.
(For details, see «REMOVAL OF THE CAB HEATING GROUP»). ※5



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14 - Lift off the lower left-hand guard of the cab and disconnect the connector (25) of the fuel level indicator and the connector of the self-supply pump, if any.

15 - Also lift off the lower right-hand guard.

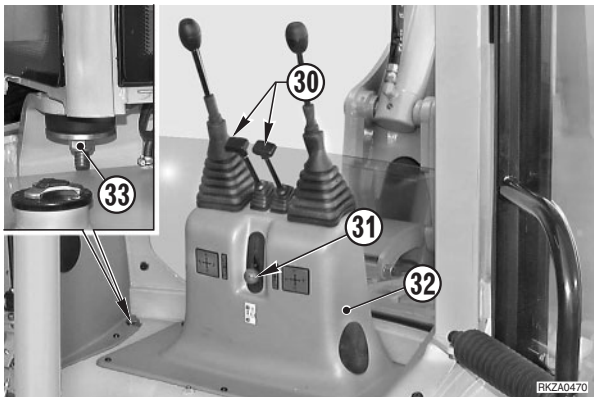


16 - Remove the grip (26) of the hand accelerator and then the inspection cover (27). Push the protective sleeve (28) of the gearbox lever down into the side cover (29).



17 - Remove the grips (30) of the outrigger control levers and the grip (31) of the lever-locking device. Lift off the cover (32) of the control levers.

18 - Take off the self-locking nuts (33) and the four screws that secure the cab. ※5



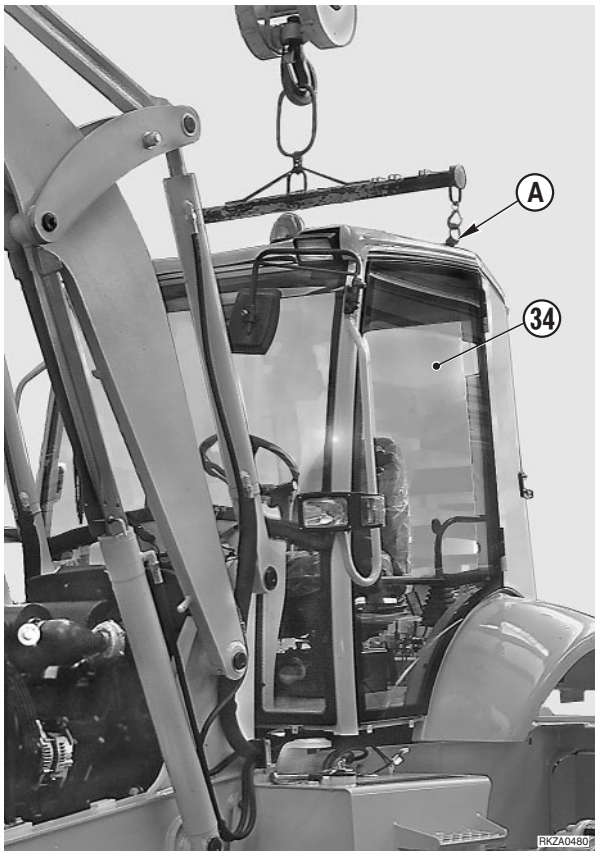
https://truckmanualshub.com/

19 - Take off the protective plugs and screw two eyebolts «**A**» into the holes supplied for hoisting purposes. Attach the cab (34) to the hoisting tackle and apply a slight tension.

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

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

kg Cab: 629 kg



INSTALLATION OF THE CAB

- To install, reverse the removal procedure.

※1

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

※2

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

※3

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

※4

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

※5

Nm Cab retaining screws: 169±9.8 Nm

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REMOVAL OF THE CAB

FROM SERIAL NUMBER Nº 97F20172–

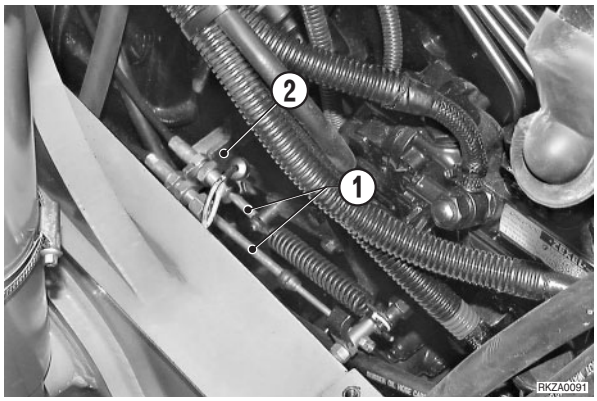
⚠ Lower the working equipment completely until it rests on the ground and stop the engine and remove the ignition key.

⚠ Disconnect the cable from accumulator negative terminal (–).

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

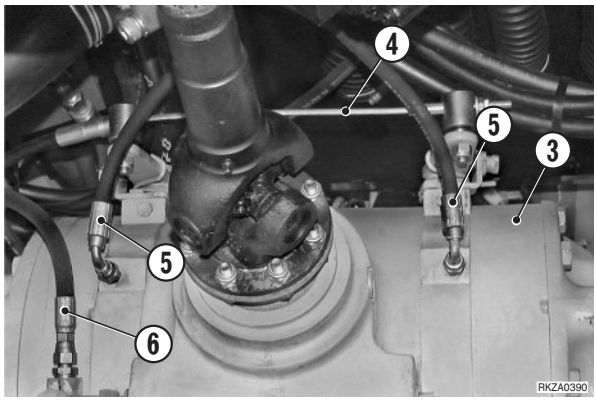
★ **Only for machines equipped with an air-conditioning unit**
Drain the air conditioning unit.
(For details, see «20. TESTING AND ADJUSTMENTS»). ※1

1 - Disconnect the pedal accelerator and hand accelerator cables (1) from the injection pump. Disengage the sheathings from the support (2). ※2

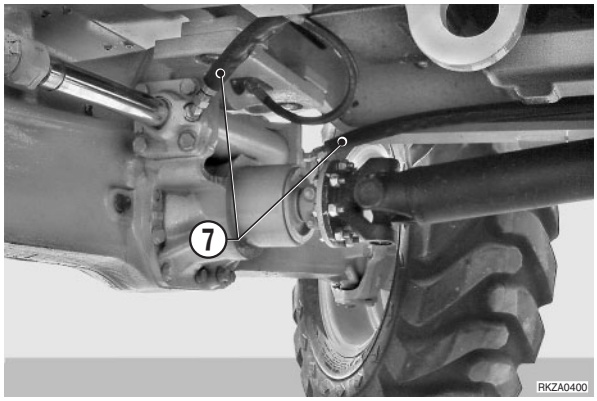


2 - Disconnect the parking brake cable (4) from the rear axle (3). ※3

3 - Disconnect the braking circuit pipes (5) and the differential lock tube (6) from the rear axle.
★ Mark the positions of the pipes to prevent exchange of positions when reconnecting.
★ Plug the pipes and pipe-fittings to prevent entry of impurities. ※4

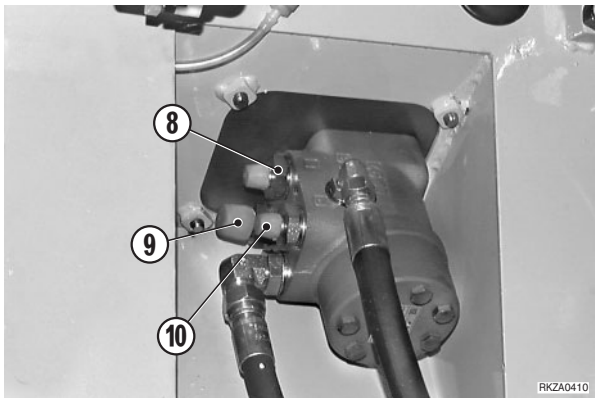


4 - Disconnect the steering cylinder pipes (7) from the rear axle. ※5
★ Mark the positions of the pipes to prevent exchanging positions when reconnecting.
★ Plug the pipes and pipe-fittings to prevent entry of impurities.



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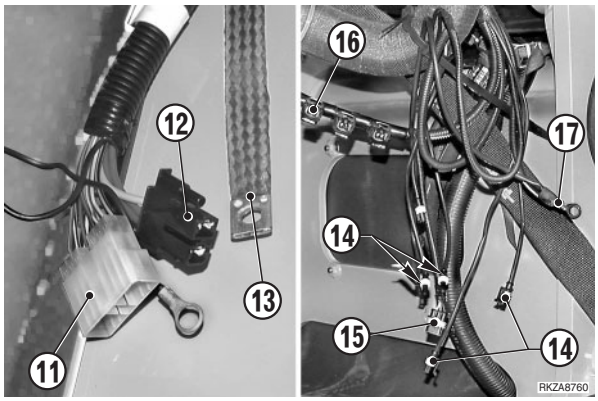
5 - Disconnect the pipes of the L - T - P ports (8, 9 and 10) from the steering unit.
- ★ Mark the positions of the pipes to prevent exchanging positions when reconnecting.
- ★ Plug the pipes and pipe-fittings to prevent entry of impurities.



6 - Disconnect the connectors (11) and (12) and the grounding cable (13).

7 - Disconnect the connectors (14), (15) and (16) from the gearbox.

8 - Disconnect from grounding stud two connectors (17).

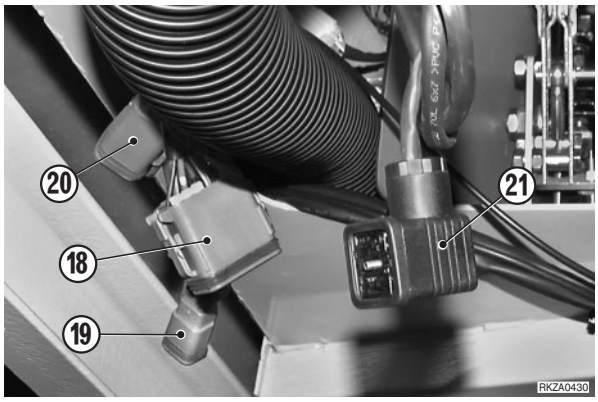


9 - Disconnect the connector (18) of the auxiliary controls set into the bucket control lever.

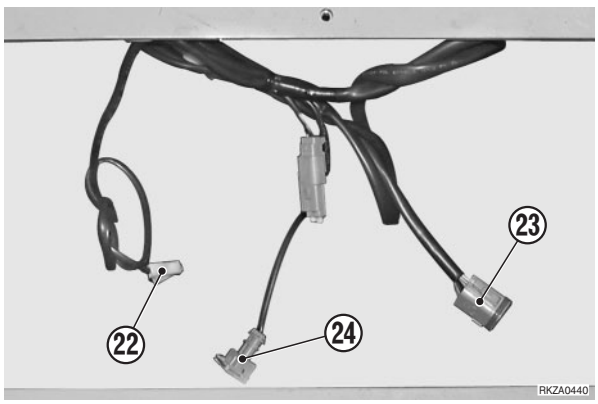
10 - Disconnect the converter disengagement connector (19) set into the gear lever.

11 - Disconnect the connector (20) of the differential disengagement and backhoe boom disengagement solenoids.

12 - Disconnect the power increment solenoid connector (21) installed on the piston pump.



13 - Disconnect the connectors (22) of the rear acoustic alarm, the connector (23) of the rear lights and finally the connector (24) of the solenoid of the backhoe control valve.

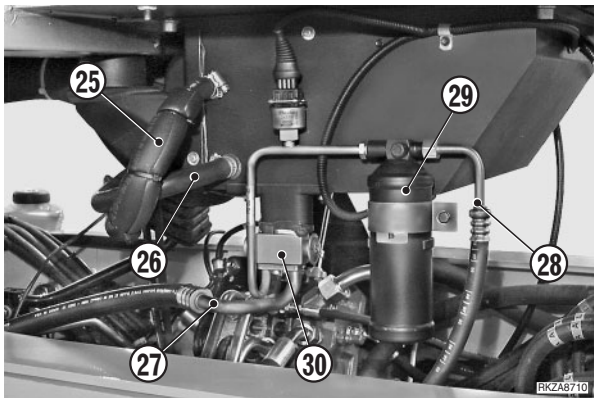


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14 - Disconnect the heating unit tubes (25) and (26). (For details, see «REMOVAL OF THE CAB HEATING GROUP»).

15 - **Only for machines equipped with an air-conditioning unit.**
Disconnect the tubes (27), (28) connecting the unit to the drying filter (29) and the expansion valve (30).

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



16 - Lift off the lower left-hand guard of the cab and disconnect the connector (31) of the fuel level indicator and the connector of the self-supply pump, if any.

17 - Also lift off the lower right-hand guard.

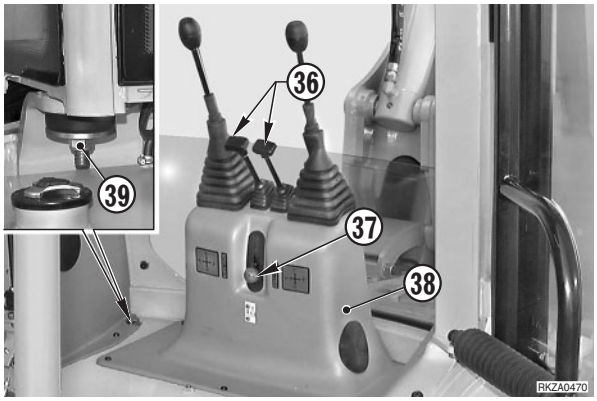


18 - Remove the grip (32) of the hand accelerator and then the inspection cover (33). Push the protective sleeve (34) of the gearbox lever down into the side cover (35).



19 - Remove the grips (36) of the outrigger control levers and the grip (37) of the lever-locking device. Lift off the cover (38) of the control levers.

20 - Take off the self-locking nuts (39) and the four screws that secure the cab. ※6



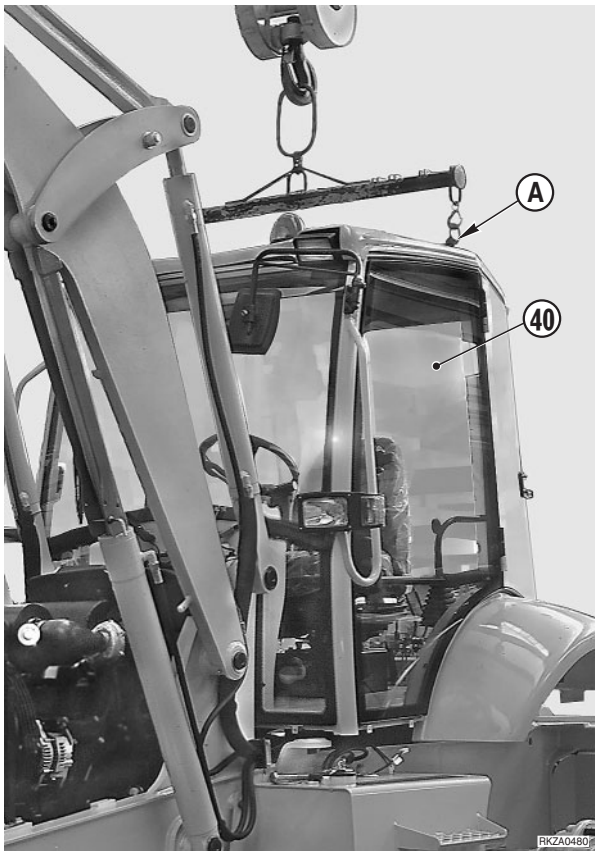
https://truckmanualshub.com/

21 - Take off the protective plugs and screw two eyebolts «**A**» into the holes supplied for hoisting purposes. Attach the cab (40) to the hoisting tackle and apply a slight tension.

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

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

kg Cab: 630 kg



INSTALLATION OF THE CAB

- To install, reverse the removal procedure.

※1

★ Drain and refill the air-conditioning unit.

Quantity of fluid (R134a): 1100 g (+50/–30 g)
Quantity of oil: See the amount recovered.

※2

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

※3

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

※4

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

※5

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

※6

Nm Cab retaining screws: 169±9.8 Nm

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REMOVAL OF THE CAB HEATING GROUP

FROM SERIAL NUMBER 97F20001 TO 97F20171

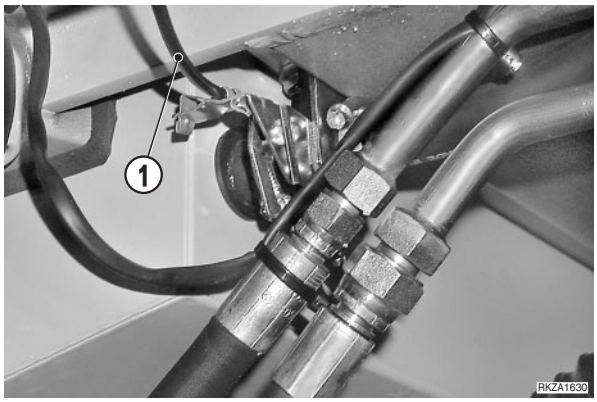
⚠ Lower the working equipment completely until it rests on the ground, and stop the engine.

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

★ Drain the engine cooling liquid.

Coolant liquid: 18 ℓ

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

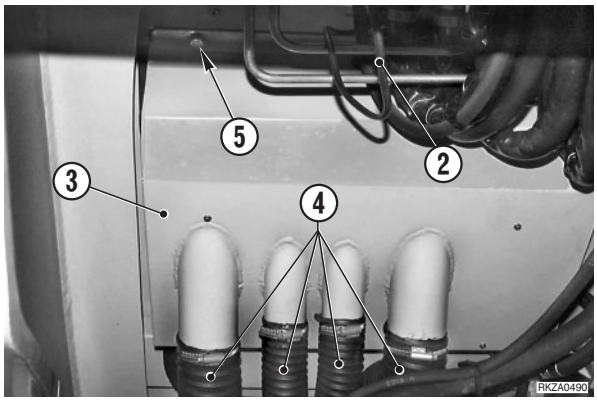


2 - Disconnect the connector of the power-supply cabling (2).

3 - Loosen the clips and disconnect the pipes (4) from the fan-cooler (3).

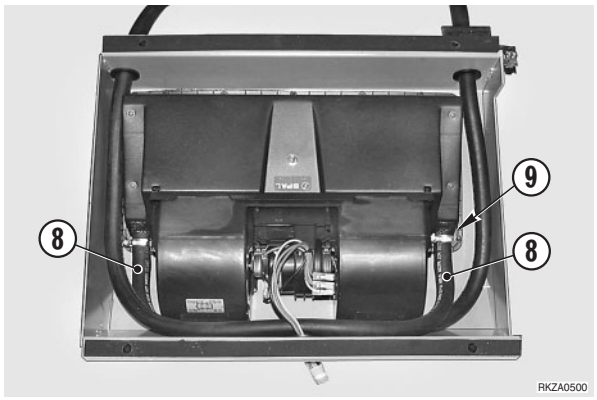
4 - Loosen the four screws (5) and detach the fan-cooling group complete with radiator (6) and fan (7) from the cab.

★ Lower the group in order to disconnect the internal pipes.



5 - Disconnect the tubes (8) that connect with the engine.

6 - Remove the four screws (9) and remove the radiator-fan group, (6) and (7).

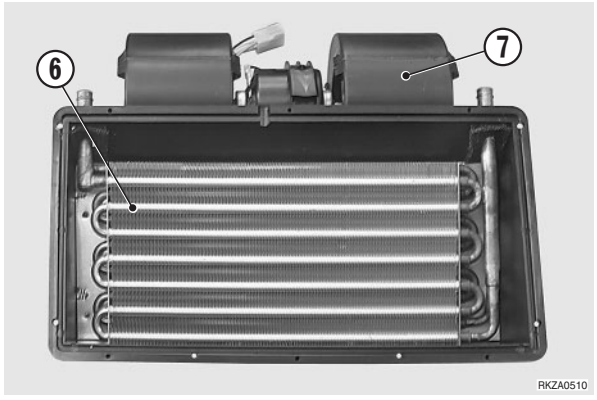


INSTALLATION OF THE CAB HEATING GROUP

- To install, reverse the removal procedure.

1 - Refill the cooling liquid.

Coolant liquid: 18 ℓ



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REMOVAL OF THE HEAT AND AIR-CONDITIONING GROUP

FROM SERIAL NUMBER Nº 97F20172–

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.

⚠ Disconnect the cable from accumulator negative terminal (–).

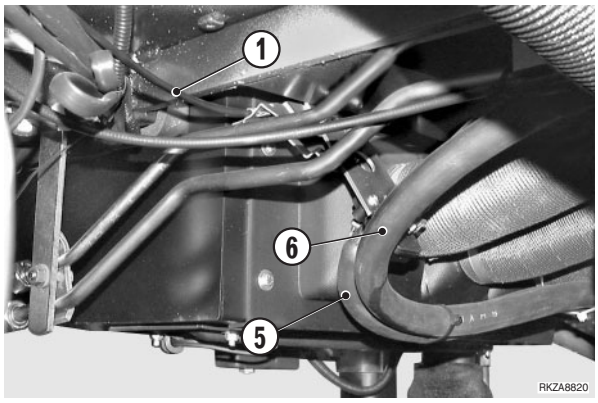
★ Drain the engine cooling liquid.

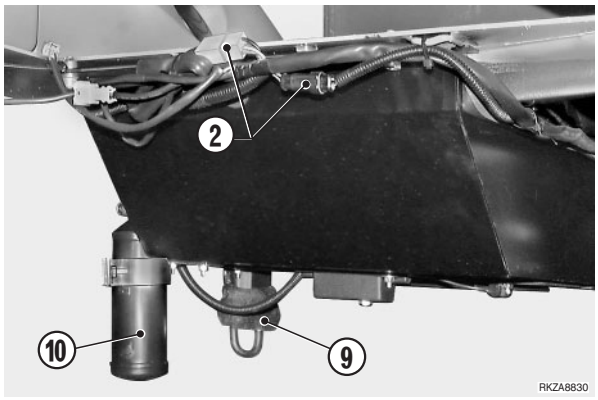
Coolant liquid: 18 ℓ

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.





4 - Disconnect the pipes (4) from the fan-cooler (3).

5 - Disconnect the tubes (5) and (6) that connect with the engine.

6 - Disconnect the connector (8) from the pressure switch (7).

7 - Disconnect the delivery pipe(11) and the return pipe (12) from the expansion valve (9) and the dryer filter (10).

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

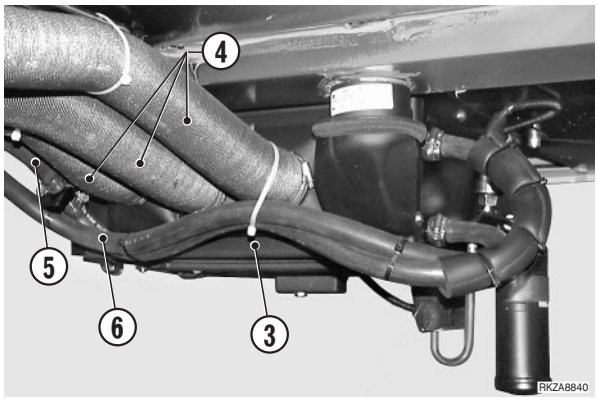
★ Re-use the O-ring.

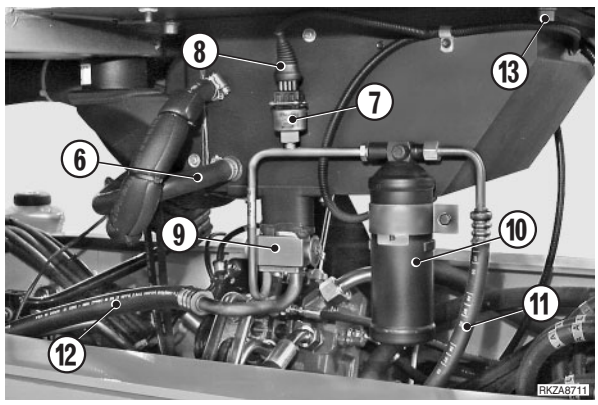
8 - Loosen the clip and remove the drying filter (10).

★ Immediately plug the delivery tube (11) and the expansion valve (9) tightly to prevent moisture from entering into the air-conditioning circuit.

★ Re-use the O-ring.

9 - Remove the four screws (13) and remove the group (3).





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INSTALLATION OF THE HEATING AND AIR-CONDITIONING GROUP

- To install, reverse the removal procedure.

  1 - Refill the cooling liquid.

  Coolant liquid: 18 ℓ

  2 - Drain and refill the air-conditioning unit.

  Quantity of fluid (R134a): 1100 g (+ 50 / – 30 g)
  Quantity of oil: See the amount recovered.

  3 - Start the engine and use a leak detector to check the leaktightness of the air-conditioning unit.

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REMOVAL OF THE FUEL TANK

FROM SERIAL NUMBER 97F20001 TO 97F20171

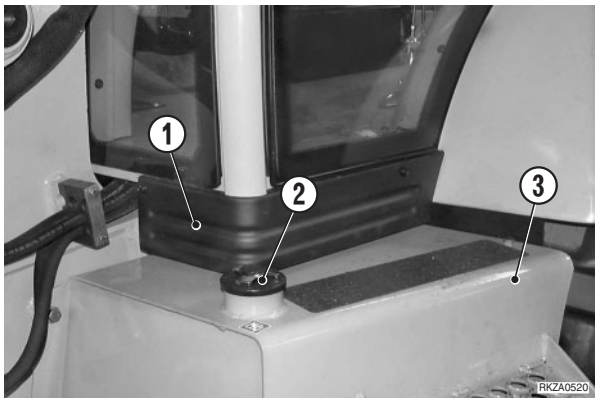
⚠ Lower the working equipment completely until it rests on the ground, and stop the engine.

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

1 - Remove the lower left-hand guard (1) of the cab.

2 - Take the cap (2) off the filling inlet of the fuel tank (3) and remove also the bottom plug in order to drain the fuel.

Fuel: max. 130 ℓ

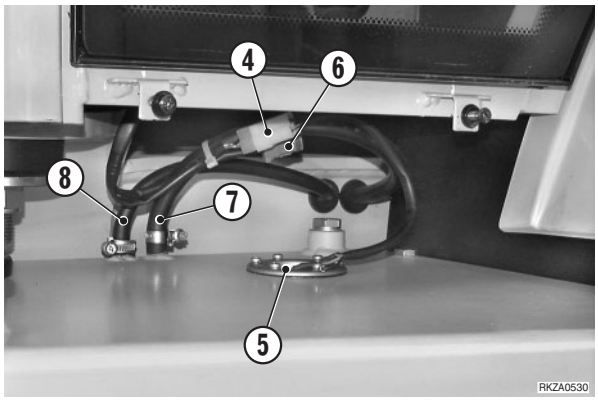


3 - Disconnect the connector (4) of the level indicator (5) and the connector (6) of the self-supply pump, if fitted.

4 - Disconnect the fuel suction and flow-back hoses (7) and (7) and the pipe of the self-supply pump, if fitted.

★ Plug the pipes to prevent entry of impurities.

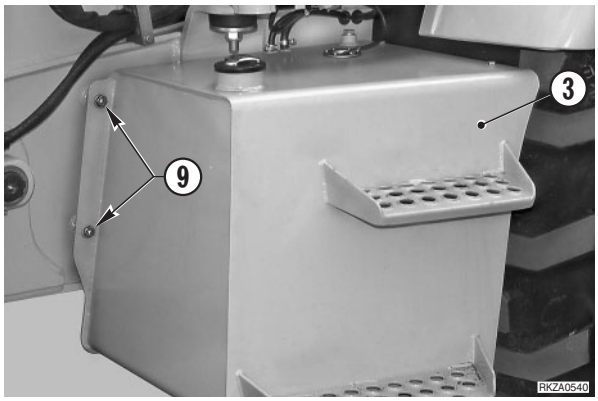
★ Mark the pipes to avoid exchanging them during installation.



5 - Support the fuel tank (3) with hoisting tackle and remove the four retaining screws (9).

6 - Remove the fuel tank (3).

kg Fuel tank: ..... kg



INSTALLATION OF THE FUEL TANK

- To install, reverse the removal procedure.

1 - Refill the fuel tank.

Fuel: max. 130 ℓ

2 - Bleed the air from the fuel circuit.

3 - Start the engine.

https://truckmanualshub.com/

REMOVAL OF THE FUEL TANK

FROM SERIAL NUMBER 97F20172–

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

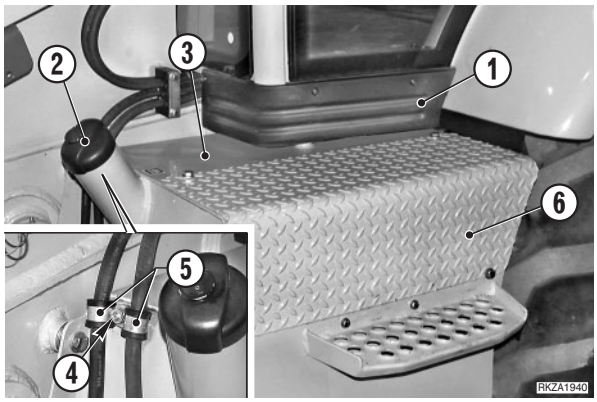
⚠ Cut off the supply of electricity by turning the accumulator-disconnecting switch in a counter-clockwise direction, and remove the handle.

1 - Remove the lower left-hand guard (1) of the cab.

2 - Take the cap (2) off the filling inlet of the fuel tank (3) and remove also the bottom plug in order to drain the fuel.

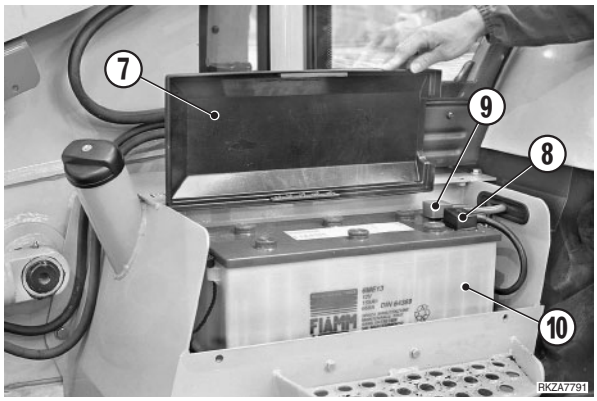
Fuel: max. 130 ℓ

3 - Remove the nut (4) in order to free the clips (5).



4 - Take off the guard (6) and lift off the accumulator cover (7).
Disconnect the clamps (8) and (9) and left out the accumulator (10).

⚠ First remove the negative clamp (–) and then the positive clamp (+).



5 - Disconnect the connector (11) of the level indicator (12) and the connector (13) of the self-supply pump, if fitted.

6 - Disconnect the fuel suction and flow-back hoses (14) and (15) and the pipe of the self-supply pump, if fitted.

★ Plug the pipes to prevent entry of impurities.

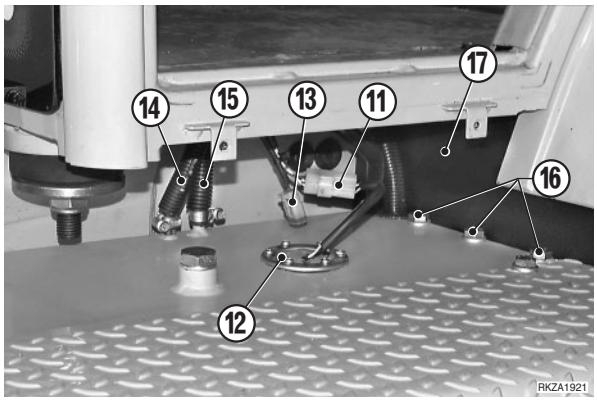
★ Mark the pipes to avoid exchanging them during installation.

7 - Remove the screws (16) and the guard (17).

8 - Support the fuel tank (3) with hoisting tackle and remove the four retaining screws (18). ※1

9 - Remove the fuel tank (3).

kg Fuel tank:..... kg



INSTALLATION OF THE FUEL TANK

- To install, reverse the removal procedure.

※1

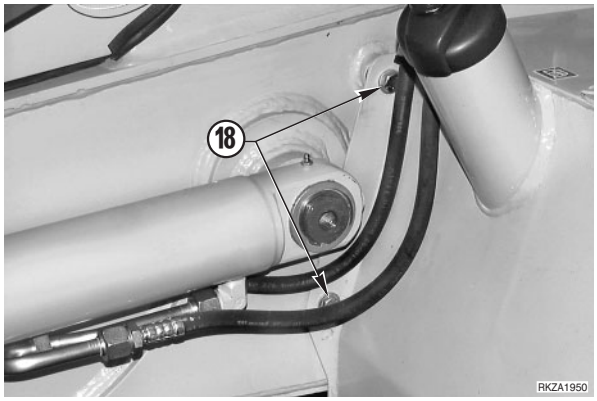
Nm Retaining screws for fuel tank: 120 Nm

1 - Refill the fuel tank.

Fuel: max. 130 ℓ

2 - Bleed the air from the fuel circuit.

3 - Start the engine.



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REMOVAL OF HYDRAULIC OIL TANK

FROM SERIAL NUMBER 97F20001 TO 97F20171

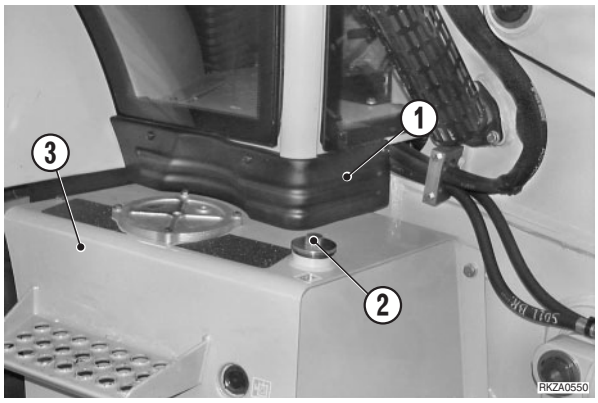
Lower the working equipment completely until it rests on the ground, and stop the engine.

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

★ Drain the hydraulic oil.

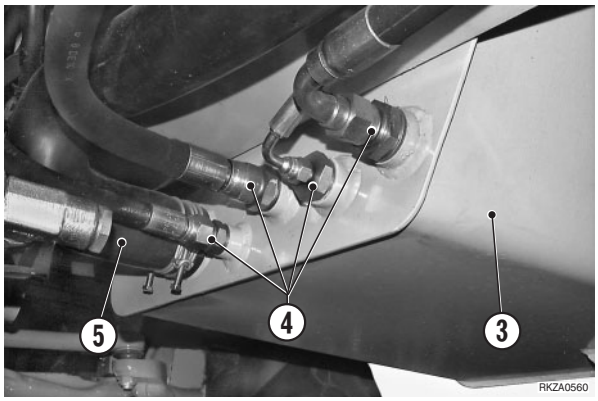
Hydraulic oil: ..... ℓ

1 - Take off the lower right-hand guard (1) of the cab and the plug (2).



2 - Disconnect the pipes (4), (5) and (6) from tank (3).

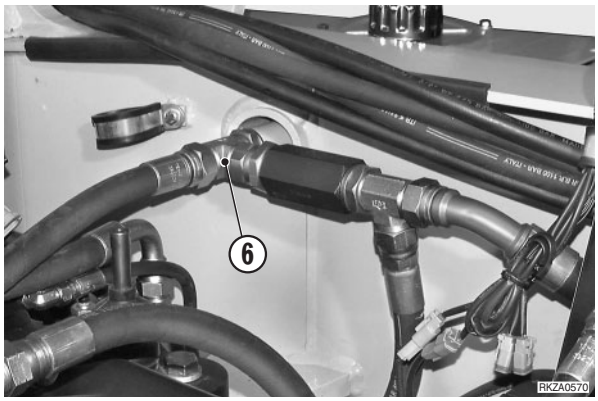
★ Plug the pipes to prevent entry of impurities.



3 - Support the tank (3) with hoisting tackle and remove the four retaining screws (7). ※1

4 - Remove the tank (3).

kg Oil for the tank: ..... kg



INSTALLATION OF THE HYDRAULIC OIL TANK

- To install, reverse the removal procedure.

※1

Nm Tank retaining screw: 120 Nm

1 - Refill the tank.

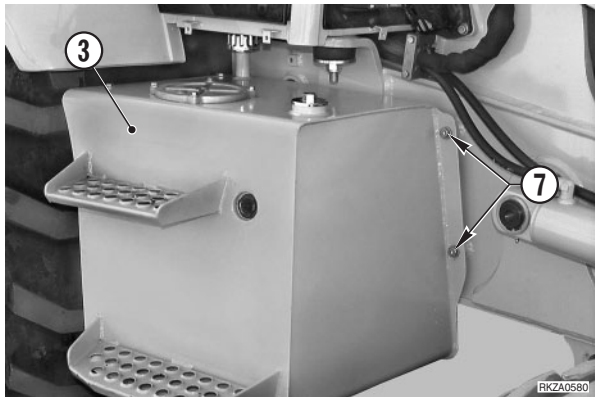
Hydraulic oil: ..... ℓ

2 - Refill the pump (For details, see «20. TESTING AND ADJUSTMENTS»).

3 - Start the engine to let the oil circulate through all the hydraulic systems and check for leaks.

3 - Bleed the air from the hydraulic systems. (For details, see «20. TESTING AND ADJUSTMENTS»).

4 - Stop the engine, check the oil level in the tank, and top it up if necessary.



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REMOVAL OF HYDRAULIC OIL TANK

FROM SERIAL NUMBER 97F20172–

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

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

1 - Take off the lower right-hand guard (1) of the cab.

2 - Remove the guard (2).

3 - Raise the guard (3) and remove the oil drainage cap (4).

★ Drain the hydraulic oil.

Hydraulic oil:..... ℓ

4 - Disconnect the lower suction (6) and drainage (7) hoses from the tank (5).

★ Leave the check valve (8) on the tank.

★ Plug the hoses to prevent entry of impurities.

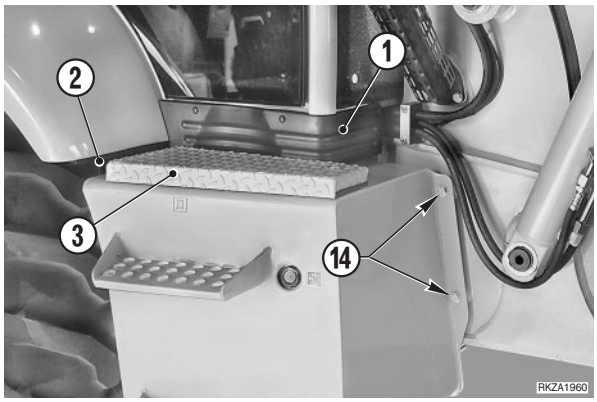
5 - Disconnect the upper pipes (9), (10) and (11), remove the check valve (12) and the T-piece (13).

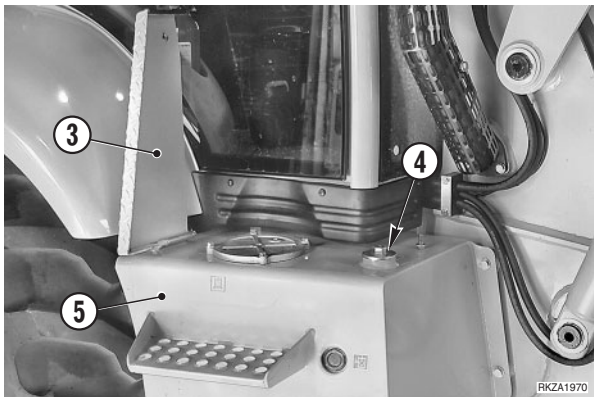
★ Make a note of the assembly sequence.

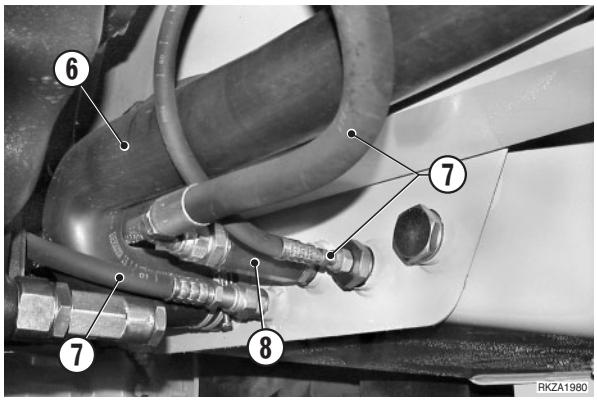
6 - Support the tank (5) with hoisting tackle and remove the four retaining screws (14). ※1

7 - Remove the tank (5).

kg Oil for the tank:..... kg







INSTALLATION OF THE HYDRAULIC OIL TANK

- To install, reverse the removal procedure.

※1

Nm Tank retaining screws: 120 Nm

1 - Refill the tank.

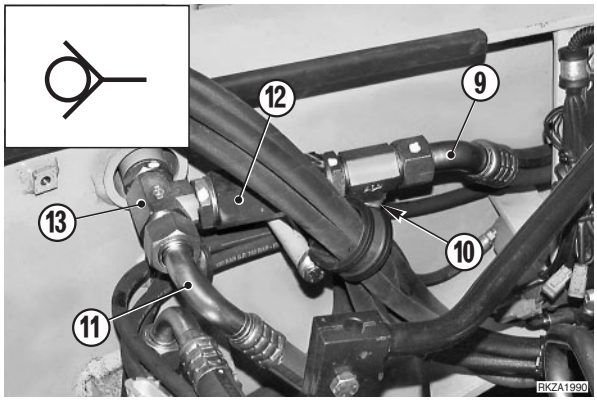
Hydraulic oil:..... ℓ

2 - Refill the pump (For details, see «20. TESTING AND ADJUSTMENTS»).

3 - Start the engine to let the oil circulate through all the hydraulic systems and check for leaks.

3 - Bleed the air from the hydraulic systems. (For details, see «20. TESTING AND ADJUSTMENTS»).

4 - Stop the engine, check the oil level in the tank, and top it up if necessary.



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REMOVAL OF THE ENGINE-GEARBOX-PUMP GROUP

FROM SERIAL NUMBER 97F20001 TO 97F20171

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

Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

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

★ Drain the hydraulic oil.

Hydraulic oil: ..... ℓ

★ Drain the engine cooling liquid.

Coolant liquid: 18 ℓ

★ Drain the oil from the gearbox.

Gearbox oil: ..... ℓ

1 - Remove the front working equipment. (For details, see «REMOVAL OF THE FRONT WORKING EQUIPMENT»).

2 - Take off the accumulator the engine hood. (For details, see «REMOVAL OF THE ENGINE HOOD»).

※1

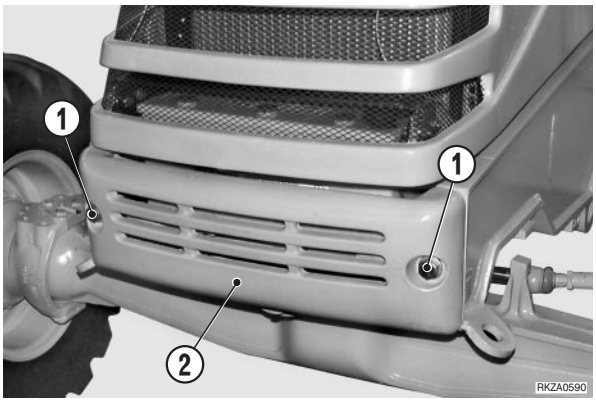
3 - Take out the screws (1) and remove the front counterweight (2). (For details, see «REMOVAL OF THE FRONT COUNTERWEIGHT»). ※2

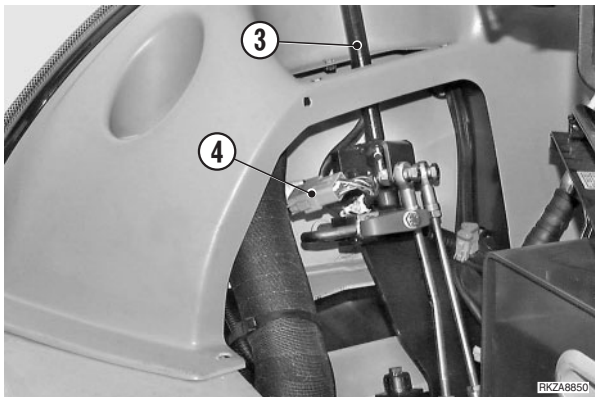
4 - Remove the radiator-oil cooler group. (For details, see «REMOVAL OF THE RADIATOR-OIL COOLER GROUP»).

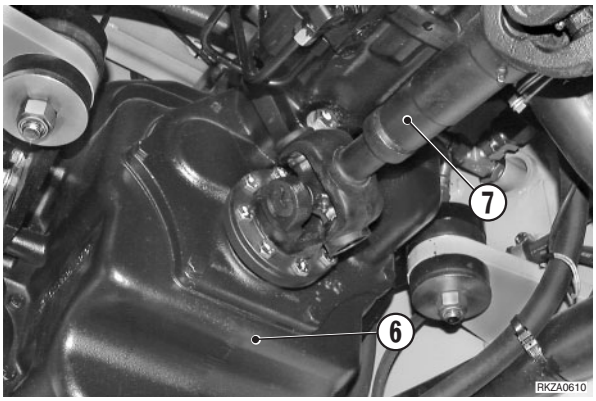
5 - Raise the protective sleeve (3), disconnect the connector (4)

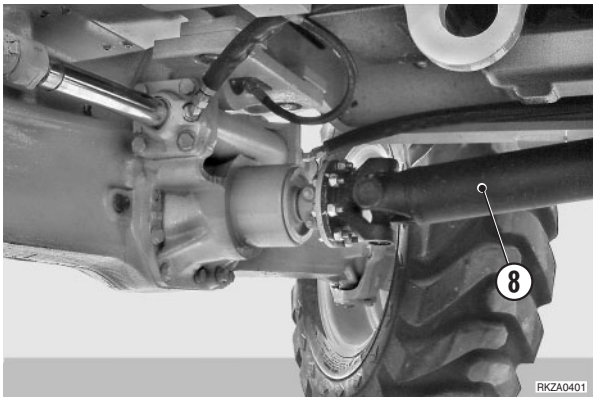
6 - Disconnect the rear cardan shaft (7) from the transmission (6). ※3

7 - Remove the front cardan shaft (8). ※3





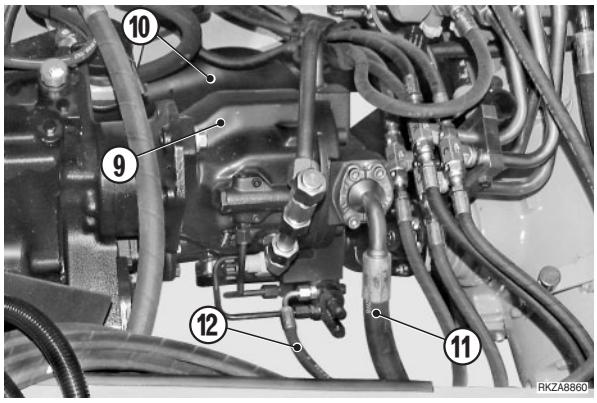




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8 - Disconnect the suction hose (10), the delivery pipe (11) and the Load Sensing signal (12) from the pump (9). Disconnect also the power increment solenoid connector. ※4

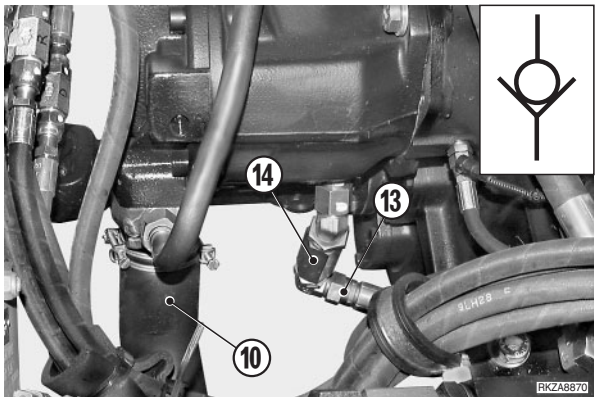
★ Plug the pipes to prevent entry of impurities.



9 - Disconnect the drainage pipe (13).

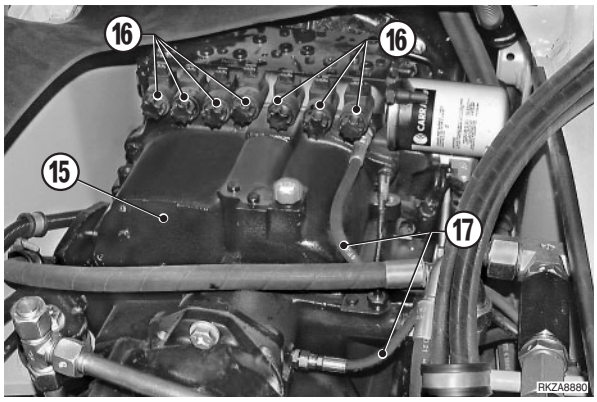
★ Plug the pipes to prevent entry of impurities.

★ Mark the mounting direction if removal of check valve (14) is performed.

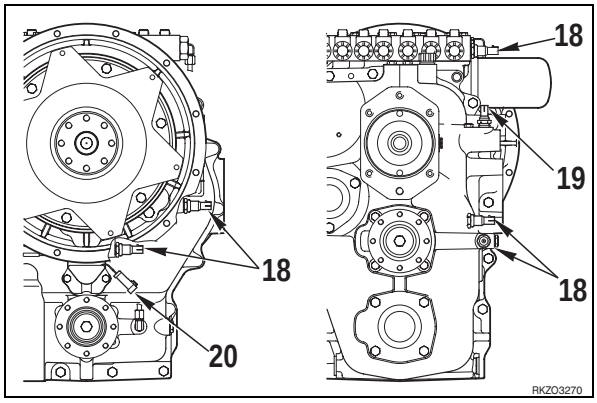


10 - Disconnect from the transmission (15) the connectors (16) and the oil cooling circuit pipes and the control lines (17).

★ Plug the pipes to prevent entry of impurities.



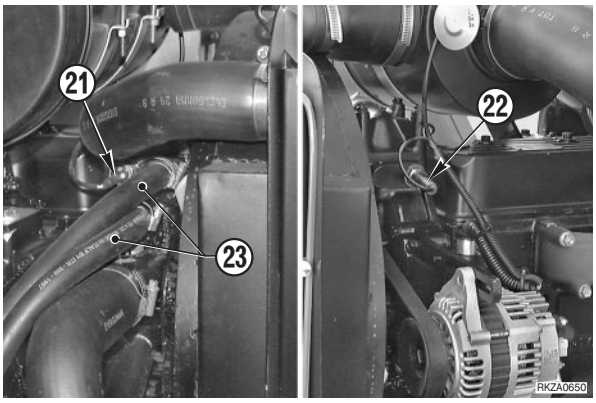
11 - Disconnect the connectors from sensors (18), from thermostat (19) and from speed sensor (20).



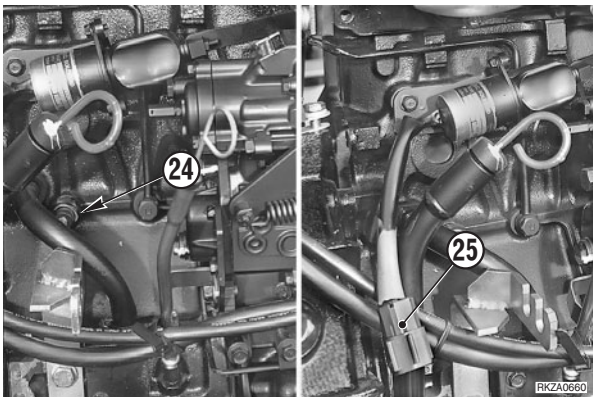
https://truckmanualshub.com/

12 - Disconnect the coolant liquid temperature sensors (21) and (22) from the engine.

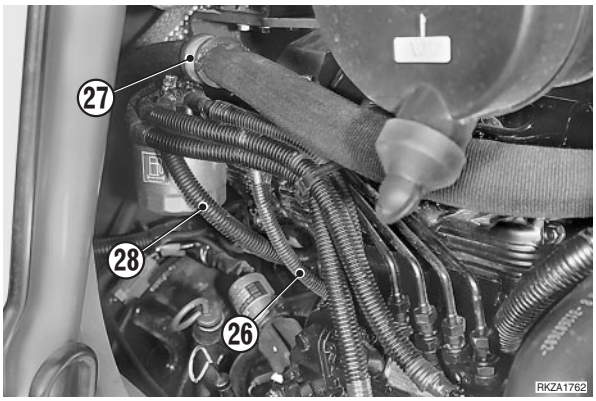
13 - Disconnect the cab heating pipes (23) from the coolant pump.



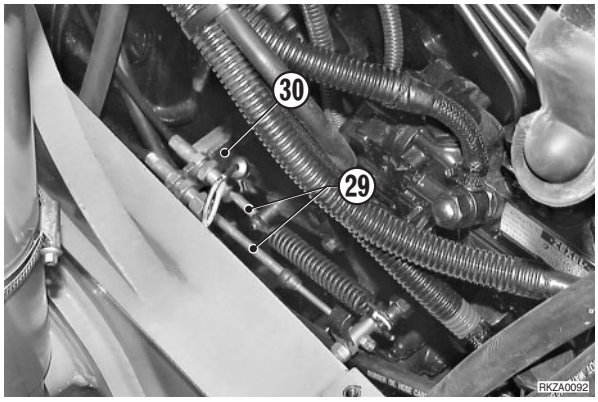
14 - Disconnect the connector (24) of the oil pressure sensor and the connector (25) of the solenoid that stops the engine.



15 - Disconnect the cable (26) of the cold-start equipment, the cab heating-pipe support clip (27), and the fuel tank flow-back hose (28). ※5



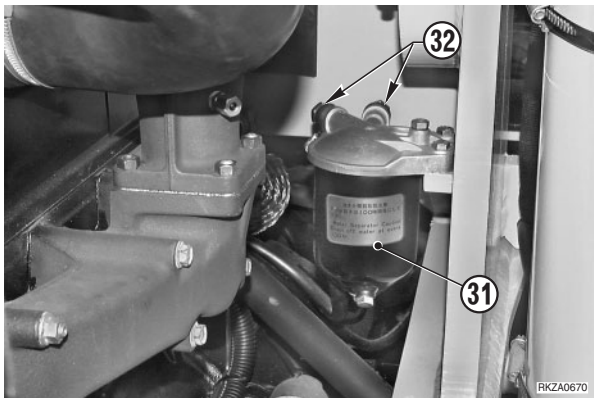
16 - Disconnect the cables (29) of the pedal and hand accelerators. Disengage the support sheathing (30).



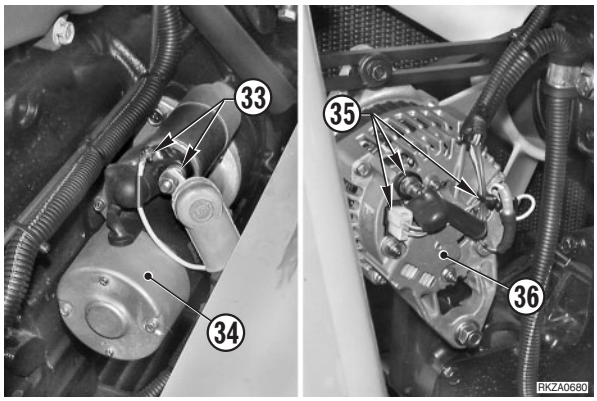
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17 - Disconnect the fuel lines (32) from the separator (31) and plug them.

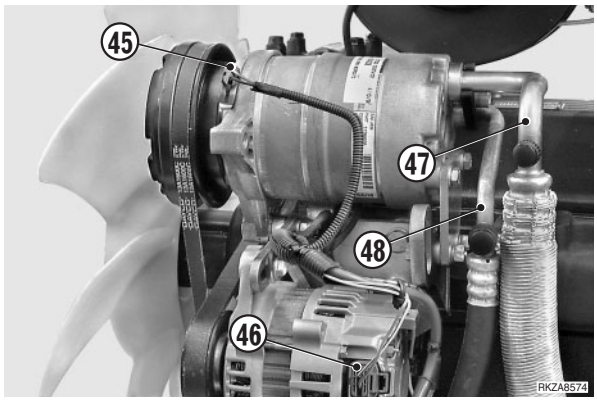
18 - Remove the separator.



19 - Disconnect the cables (33) from the starting motor (34) and the cables (35) from the alternator (36).



20 - **Only for machines equipped with an air-conditioning unit.**
Disconnect the connectors (45), (46) of the air-conditioning unit, save the coolant R134a and disconnect the tubes (47) and (48) (plug immediately).
(For details, see «REMOVAL OF THE AIR-CONDITIONING UNIT COMPRESSOR»). ※6

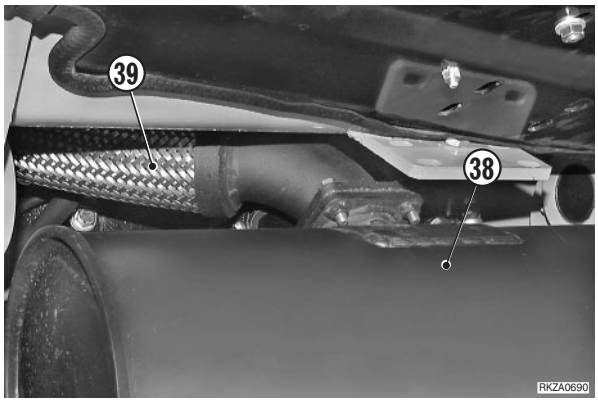


21 - Remove the plate (37) and push it towards the back of the machine.

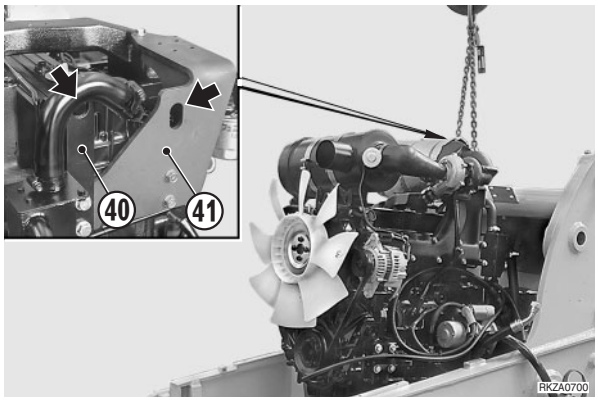


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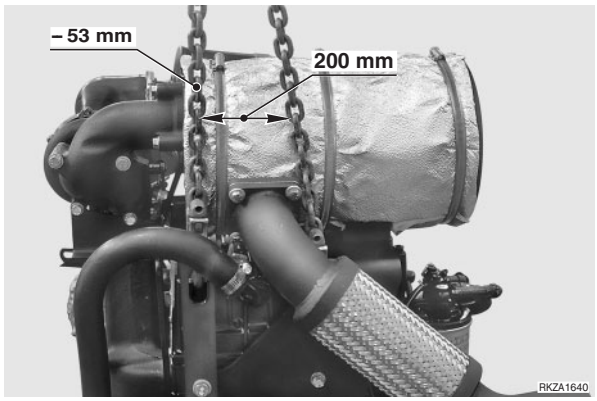
22 - Disconnect the flexible return hose (39) from the muffler (38).



23 - Attach the entire group to some hoisting tackle using the engine bracket (40) and the muffler support (41). Apply a slight tension to the hoisting chains.



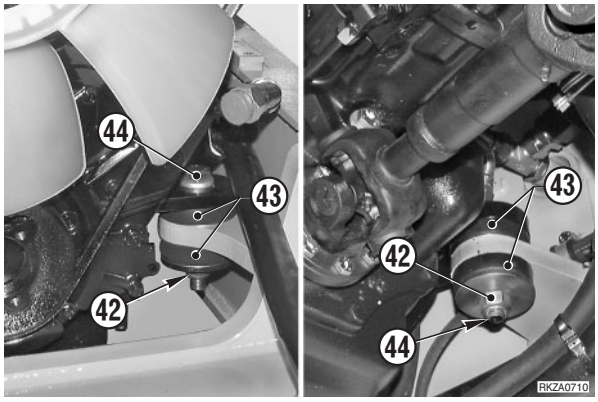
★ The chains should have a total length of about 800 mm and a difference between the arms of 53 mm.
★ The shortest length should be attached to the bracket (40).
★ When under tension the cables should be about 200 mm apart at the height of the muffler.



24 - Loosen and remove the nuts (42) of the anti-vibration supports (43) of the engine and gearbox, and take out the screws (44). ※7

25 - Raise the entire group until the chassis supports are disengaged, and than accompany the group in order to slide it away from the front part of the chassis.

kg Engine-gearbox-pump group:.....kg



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INSTALLATION OF THE ENGINE GEARBOX-PUMP GROUP

- To install, reverse the removal procedure.

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

Hydraulic oil:..... ℓ

2 - Fill the gearbox up to its maximum level.

Gearbox oil:..... ℓ

3 - Refill the coolant liquid.

Coolant liquid: 18 ℓ

※1

★ First connect the positive pole clamp (+).

※2

Screws for front counterweight: 300±30 Nm

※3

Screws on gearbox side: 70 Nm

Nuts on axle side: 70 Nm

※4

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

※5

★ Bleed the air from the fuel lines.

※6

Quantity of fluid (R134a): 1100 g (+ 50/−30 g)
Quantity of oil: See the amount recovered.

※7

Nuts from the anti-vibration supports
196±19.6 Nm

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

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

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

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REMOVAL OF THE ENGINE-GEARBOX-PUMP GROUP

FROM SERIAL NUMBER 97F20172–

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

⚠ Disconnect the cable from accumulator negative terminal (–).

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

★ Drain the hydraulic oil.

Hydraulic oil: ..... ℓ

★ Drain the engine cooling liquid.

Coolant liquid: 18 ℓ

★ Drain the oil from the gearbox.

Gearbox oil: ..... ℓ

1 - **Only for machines equipped with an air-conditioning unit.**
Drain the air conditioning unit.
(For details, see «20. TESTING AND ADJUSTMENTS»).

2 - Remove the front working equipment. (For details, see «REMOVAL OF THE FRONT WORKING EQUIPMENT»).

3 - Take off the engine hood. (For details, see «REMOVAL OF THE ENGINE HOOD»).

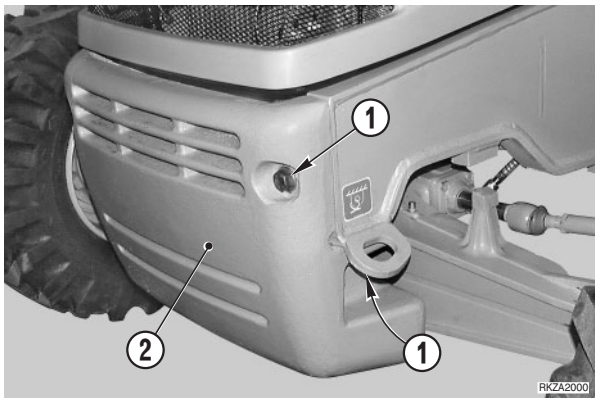
4 - Take out the screws (1) and remove the front counterweight (2). (For details, see «REMOVAL OF THE FRONT COUNTERWEIGHT»). ※1

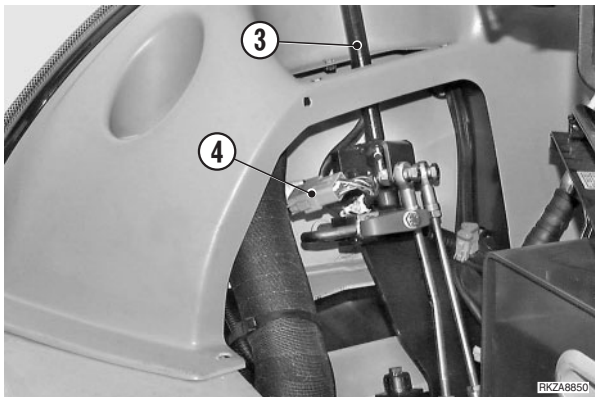
5 - Remove the radiator-oil cooler group. (For details, see «REMOVAL OF THE RADIATOR-OIL COOLER GROUP»).

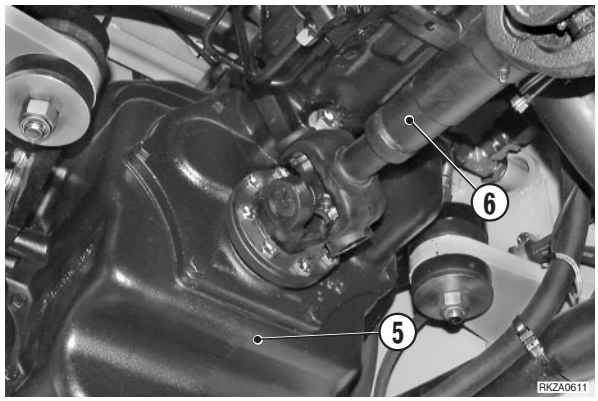
6 - Raise the protective sleeve (3), disconnect the connector (4).

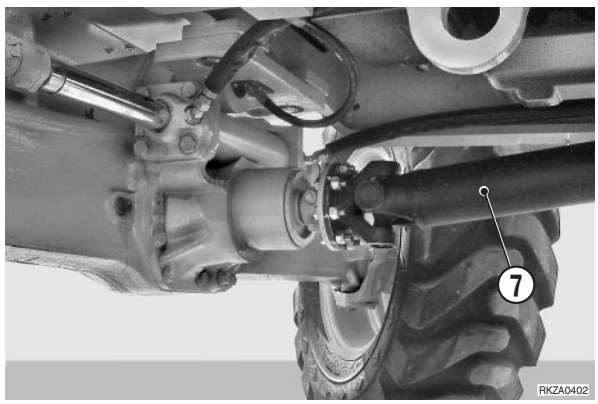
7 - Disconnect the rear cardan shaft (6) from the gearbox (5). ※2

8 - Remove the front cardan shaft (7). ※3



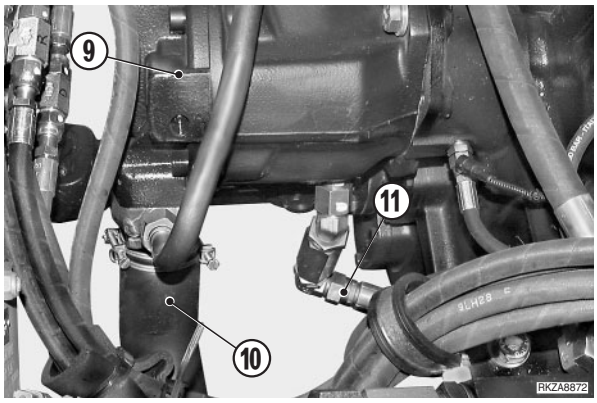




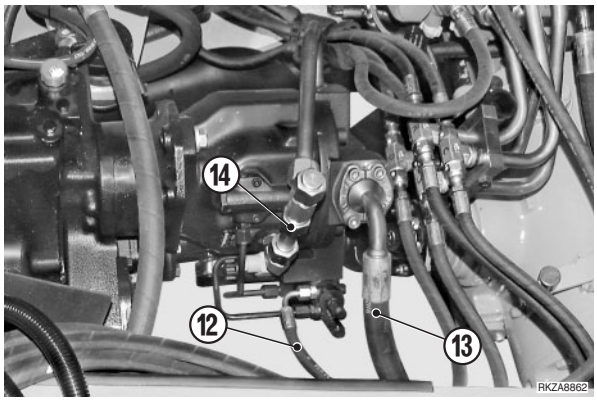


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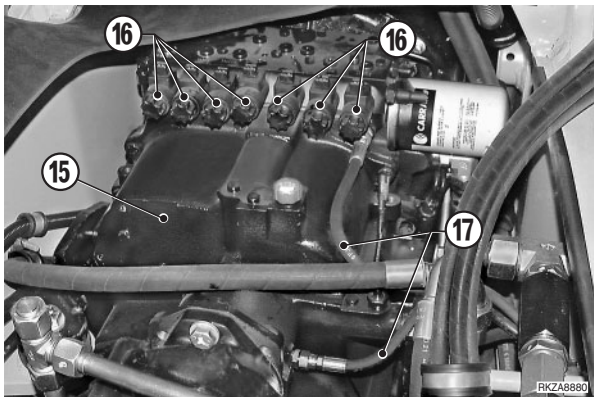
9 - Disconnect the suction hose (10) and the drainage pipe (11) from the pump (9).
Disconnect also the power increment solenoid connector. ※4
★ Plug the pipes to prevent entry of impurities.



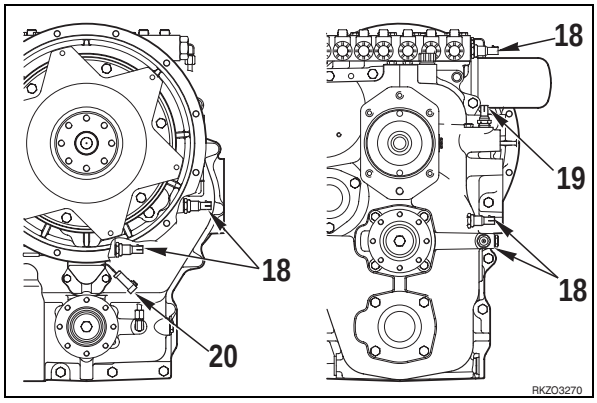
10 - Disconnect the Load Sensing signal pipe (12) and the delivery pipe (13) from valve (14).
★ Plug the pipes to prevent entry of impurities.



11 - Disconnect from the transmission (15) the connectors (16) and the oil cooling circuit pipes and the control lines (17).
★ Plug the pipes to prevent entry of impurities.



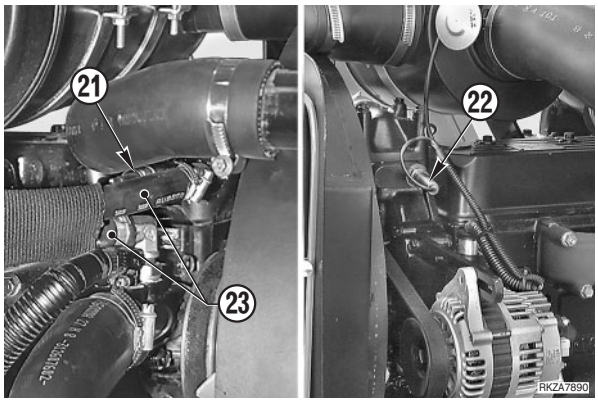
12 - Disconnect the connectors from sensors (18), from thermostat (19) and from speed sensor (20).



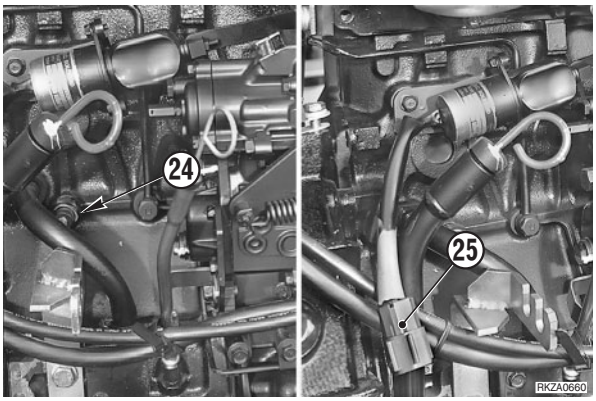
https://truckmanualshub.com/

13 - Disconnect the coolant liquid temperature sensors (21) and (22) from the engine.

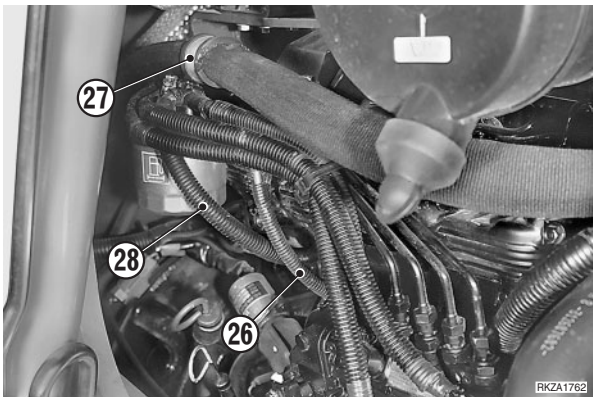
14 - Disconnect the cab heating pipes (23) from the coolant pump.



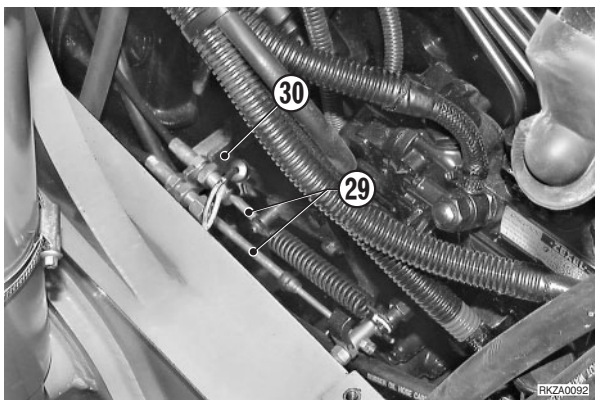
15 - Disconnect the connector (24) of the oil pressure sensor and the connector (25) of the solenoid that stops the engine.



16 - Disconnect the cable (26) of the cold-start equipment, the cab heating-pipe support clip (27), and the fuel tank flow-back hose (28). ※5



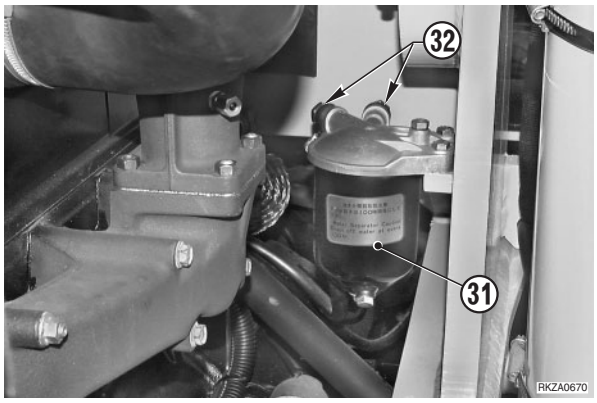
17 - Disconnect the cables (29) of the pedal and hand accelerators. Disengage the support sheathing (30).



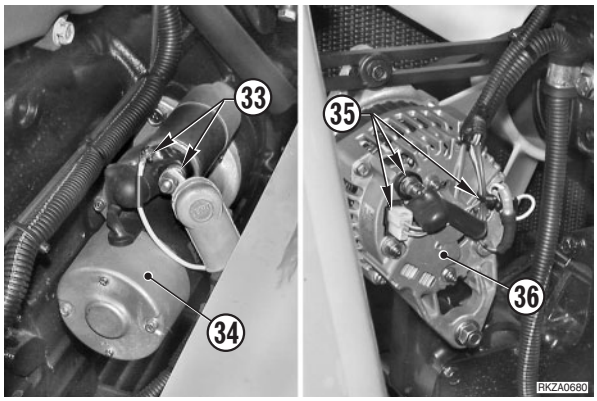
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18 - Disconnect the fuel lines (32) from the separator (31) and plug them.

19 - Remove the separator.



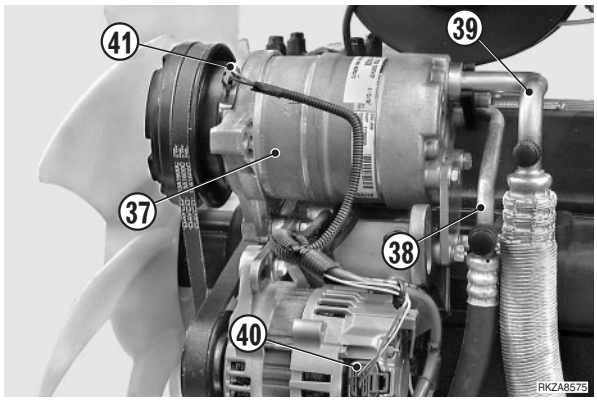
20 - Disconnect the cables (33) from the starting motor (34) and the cables (35) from the alternator (36).



21 - **Only for machines equipped with an air-conditioning unit.**
Save the coolant R134a and disconnect the delivery tubes (38) and suction tubes (39) from the compressor (37).

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

★ Disconnect the air-conditioning unit connectors (40) and (41).

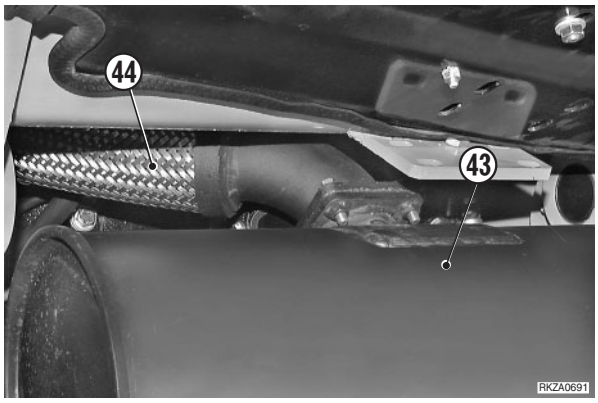


22 - Remove the plate (42) and push it towards the back of the machine.

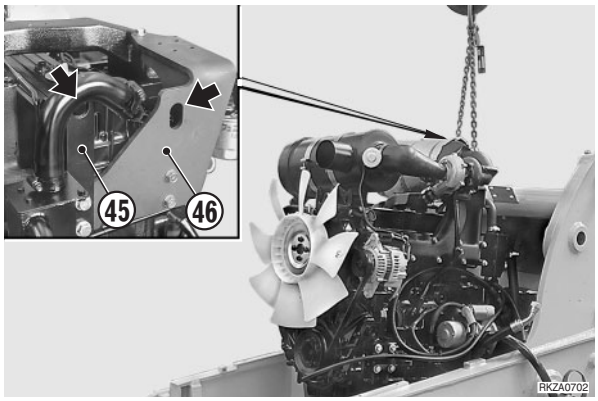


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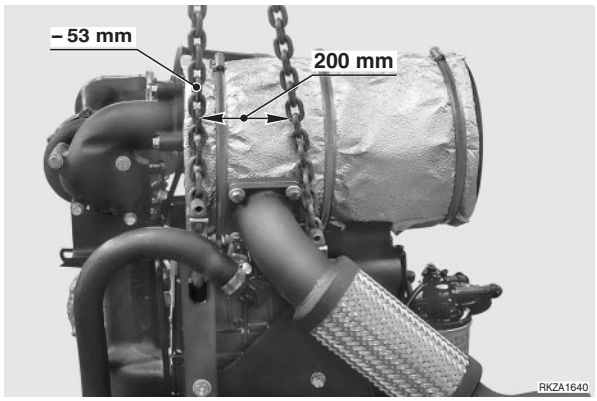
23 - Disconnect the flexible return hose (44) from the muffler (43).



24 - Attach the entire group to some hoisting tackle using the engine bracket (45) and the muffler support (46). Apply a slight tension to the hoisting chains.



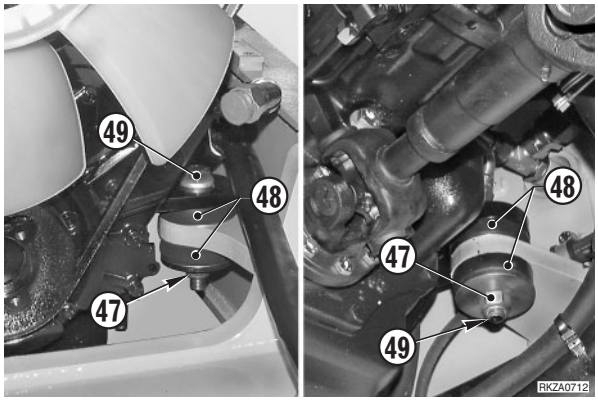
★ The chains should have a total length of about 800 mm and a difference between the arms of 53 mm.
★ The shortest length should be attached to the bracket (45).
★ When under tension the cables should be about 200 mm apart at the height of the muffler.



25 - Loosen and remove the nuts (47) of the anti-vibration supports (48) of the engine and gearbox, and take out the screws (49). ※7

26 - Raise the entire group until the chassis supports are disengaged, and than accompany the group in order to slide it away from the front part of the chassis.

kg Engine-gearbox-pump group:.....kg



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INSTALLATION OF THE ENGINE GEARBOX-PUMP GROUP

- To install, reverse the removal procedure.

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

Hydraulic oil:..... ℓ

2 - Fill the gearbox up to its maximum level.

Gearbox oil:..... ℓ

3 - Refill the coolant liquid.

Coolant liquid: 18 ℓ

4 - Drain and refill the air-conditioning unit.

Quantity of fluid (R134a): 1100 g (+50/–30 g)
Quantity of oil: See the amount recovered.

※1

Screws for front counterweight: 300±30 Nm

※2

Screws on gearbox side: 70 Nm

Screws on gearbox side: Loctite 262

※3

Nut on axle side 70 Nm

※4

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

※5

★ Bleed the air from the fuel lines.

※6

Nuts from the anti-vibration supports:
196±19,6 Nm

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

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

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

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

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REMOVAL OF THE PISTON PUMP

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

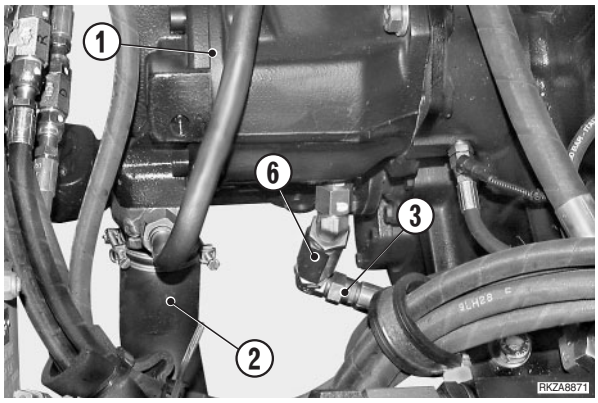
⚠ Cut off the supply of electricity by turning the accumulator-disconnecting switch in a counter-clockwise direction, and remove the handle.

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

★ Drain the hydraulic oil.

Quantity of oil: ..... ℓ

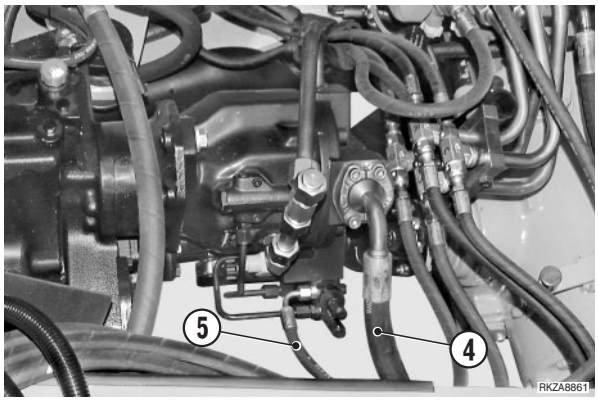
1 - Disconnect the suction hose (2) and the drainage pipe (3) from piston pump (1). ※1



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

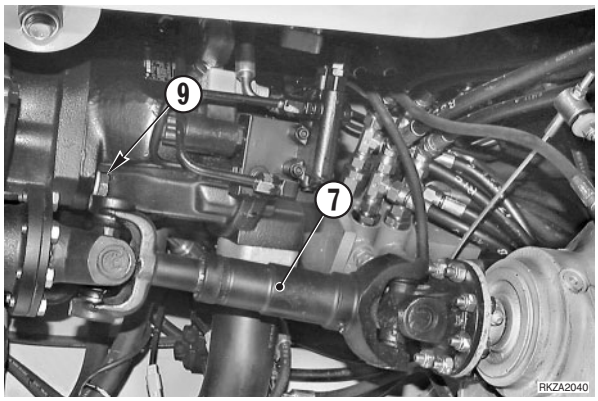
★ Plug the pipes to prevent entry of impurities.

3 - Disconnect the solenoid connector (6).



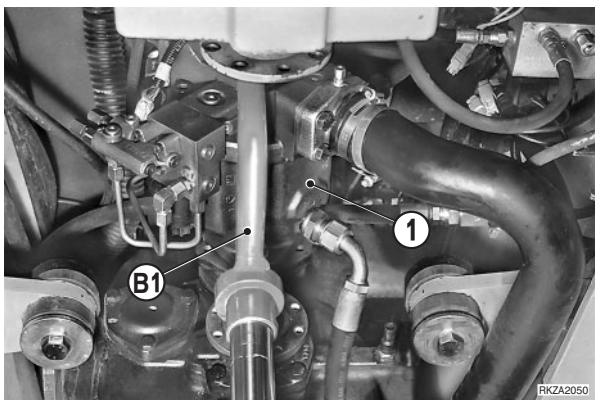
4 - Take out the rear cardan shaft (7).

※2 ※3



5 - Attach the pump (1) to the tool **B1** mounted on a pit jack.

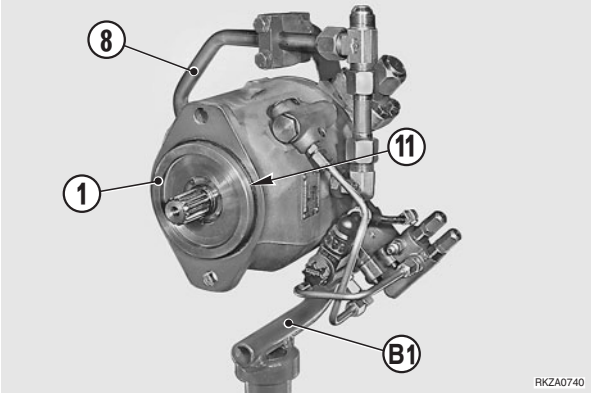
★ For attachment purposes, use the pump body filling pipe (8).



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6 - Take out the two screws (9) and remove the pump (1) complete with its O-ring (10). ※3

Nm Pump: ..... kg



INSTALLATION OF THE PISTON PUMP

- To install, reverse the removal procedure.

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

Hydraulic oil:..... ℓ

※1

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

Nm Screws for suction flange: 100 Nm

Nm Screws for delivery flange: 60 Nm

※2

Screws on gearbox side: Loctite 262

Nm Screws on gearbox side: 70 Nm

Nm Nut on axle side: 70 Nm

※3

Pump retaining screws: Loctite 262

Nm Pump retaining screws: 220 Nm

2 - Start the engine to circulate the oil in all hydraulic circuits.

3 - Stop the engine, check the oil level in the tank and, if necessary, top it up.

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REMOVAL OF THE TRANSMISSION

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

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

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

★ Drain the hydraulic oil. ※1

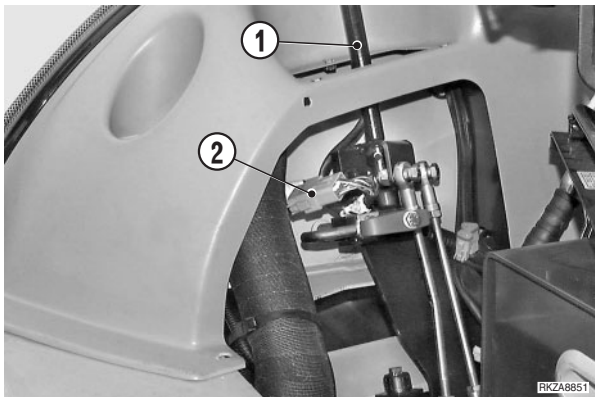
Hydraulic oil:: ..... ℓ

★ Drain the oil from the gearbox. ※2

Gearbox oil:..... ℓ

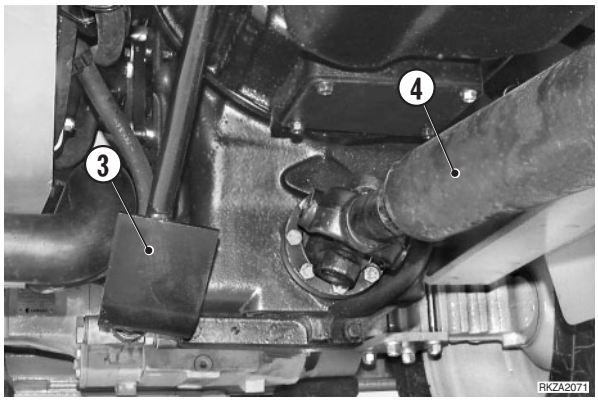
1 - Remove the piston pump. (For details, see «REMOVAL OF THE PISTON PUMP»). ※3

2 - Raise the protective sleeve (1), disconnect the connector (2) of the transmission disengagement and remove the gear lever (3). ※4

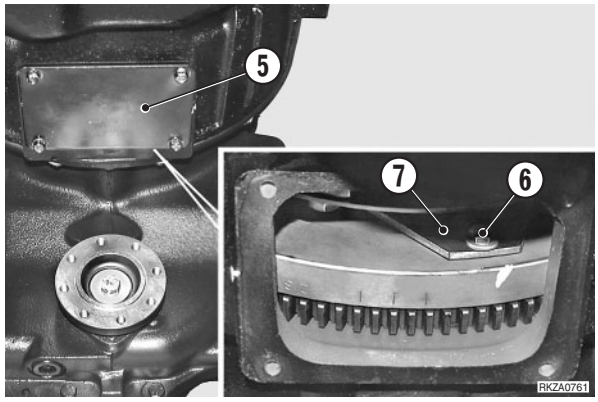


3 - Disconnect the pipe (4) that fills the gearbox with oil. ※5

4 - Take out the front cardan shaft (5). ※6



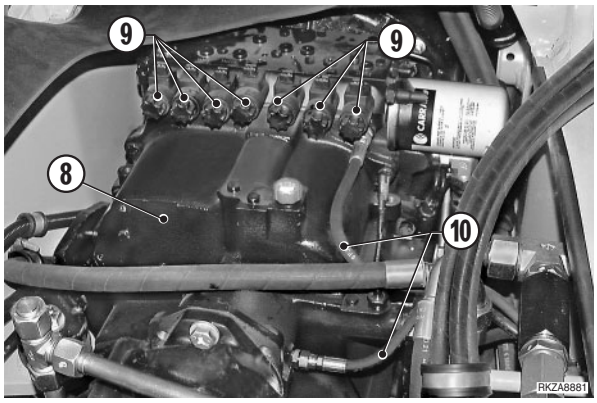
5 - Take off the cover (6) of the flywheel oil-sump and take out the six retaining screws (7) of the converter coupling flange (8). ※7



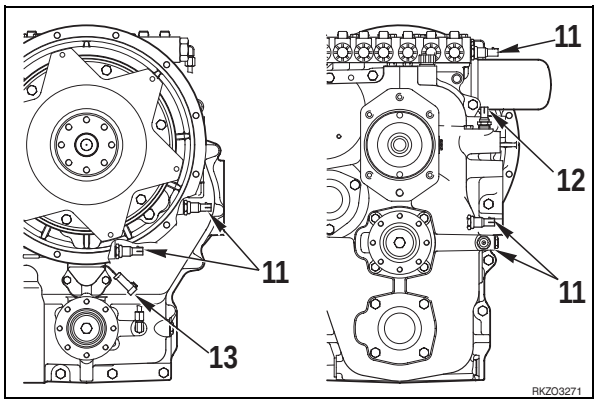
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6 - Disconnect the connectors (9) of the solenoids and the tubes (10) for oil circulation and controls from transmission (8).

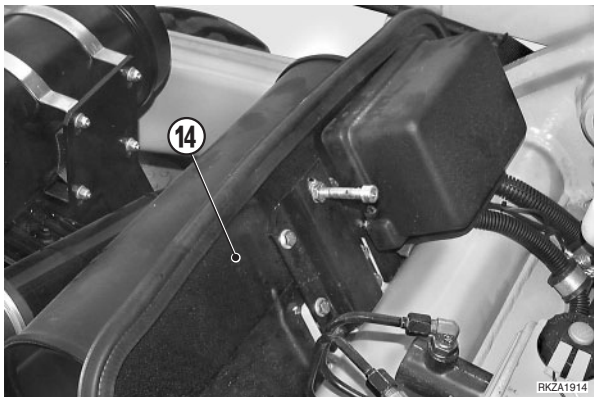
★ Plug the pipes to prevent entry of impurities.



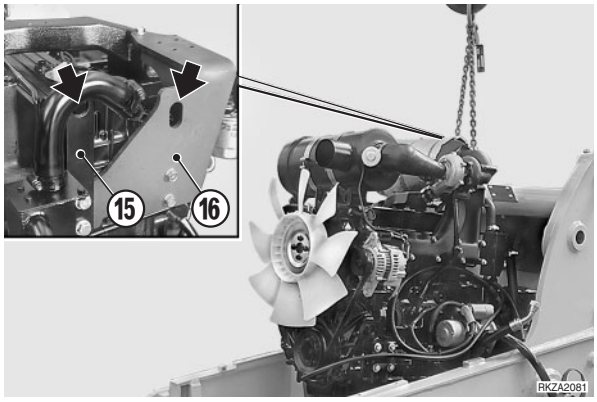
7 - Disconnect the connectors from sensors (11), from thermostat (12) and from speed sensor (13).



8 - Remove the plate (14) and push it towards the back of the machine.



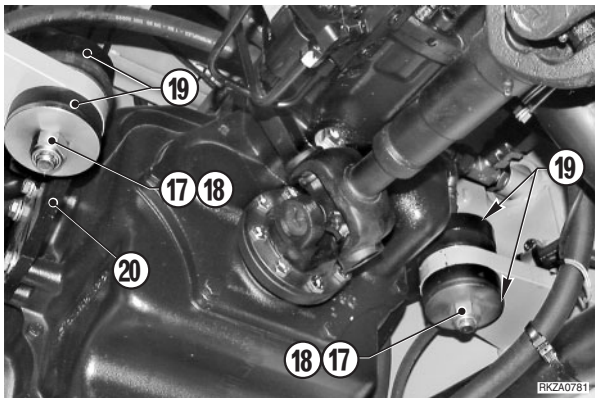
9 - Attach the engine-gearbox group to the hoisting tackle using the engine bracket (15) and the muffler support (16). Apply tension to the hoisting chains.



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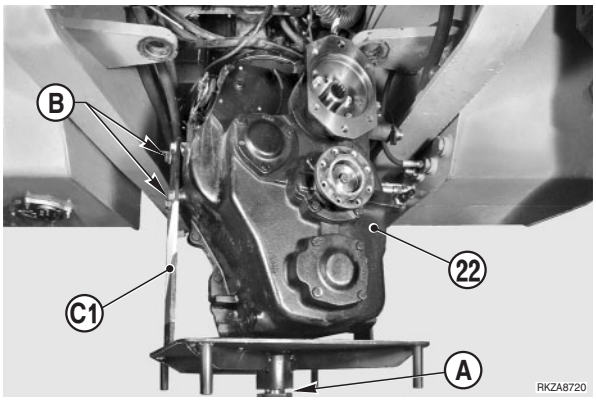
10 - Loosen and remove the nuts (17), and screws (18) and the anti-vibration nuts (19). ※8

11 - Remove the gearbox supports (20). ※9



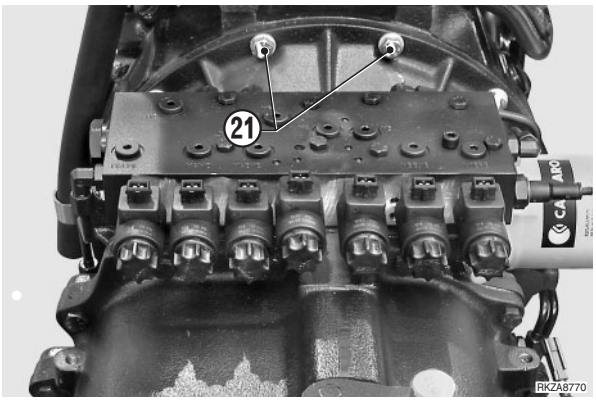
12 - Attach in the place of the supports (20), the tool **C1** mounted on a pit jack «**A**» which can be lowered by approx. 60 cm.

★ Secure the tool **C1** and screws «**B**» M12x40.



13 - Loosen and remove the twelve screws (21) that hold the engine and gearbox together. ※10

14 - Remove the entire gearbox, by shifting it towards the back of the machine in order to disengage the convertor. Lower it slowly and turn the group in a clockwise direction to disengage it from the chassis in order to extract it.



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INSTALLATION OF THE TRANSMISSION

- To install, reverse the removal procedure.

※1

Hydraulic oil:..... ℓ

※2

Gearbox oil:..... ℓ

※3

★ Fill the pump body and the pump in order to pressurise the tank.
For the method, see «20. TESTING AND ADJUSTMENTS».

※4

Screws for securing lever: 120 Nm

※5

Screws: Loctite 262

※6

Screws on gearbox side: Loctite 262
Screws on gearbox side: 70 Nm
Nuts on axle side: 70 Nm

※7

Flange screws: Loctite 262
Flange screws: ..... Nm

※8

Anti-vibration nuts: 196±19.6 Nm

※9

Support screws: Loctite 262
Support screws: 90 Nm

※10

Engine-gearbox screws: Loctite 262
Engine-gearbox screws: 90 Nm

1 - Start the engine to circulate the oil. Check that there are no leaks.

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

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

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REMOVAL OF THE CONVERTOR

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

Disconnect the cable from accumulator negative terminal (–).

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

★ Drain the hydraulic oil.

Hydraulic oil: ..... ℓ

★ Drain the oil from the gearbox.

Gearbox oil: ..... ℓ

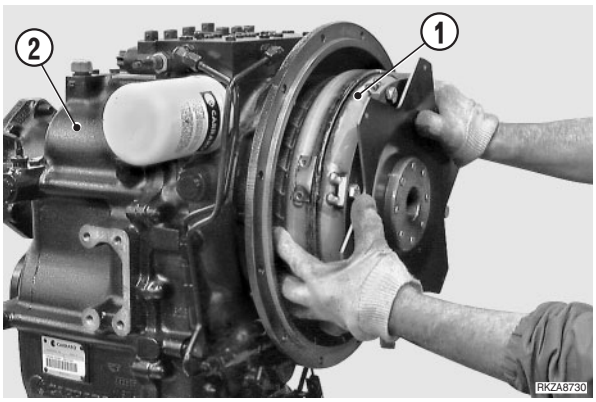
1 - Remove the piston pump. (For details, see «REMOVAL OF THE PISTON PUMP»). ※1

2 - Remove the gearbox (For details, see «REMOVAL OF THE GEARBOX»).

3 - Slide the convertor (1) away from the gearbox shafts (2), (primary and secondary).

★ If necessary, use two levers applied in opposed positions.

★ Take great care not to damage the centering hub of the gearbox.



INSTALLATION OF THE CONVERTOR

• To install, reverse the removal procedure.

★ Engage the two shafts (primary and secondary) by slowly rotating the body of the convertor.

1 - Refill the tank with hydraulic oil up to maximum level.

Hydraulic oil: ..... ℓ

※1

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

2 - Refill the gearbox.

Gearbox oil: ..... ℓ

3 - Start the engine to circulate the oil in all circuits. Check that there are no leaks.

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

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

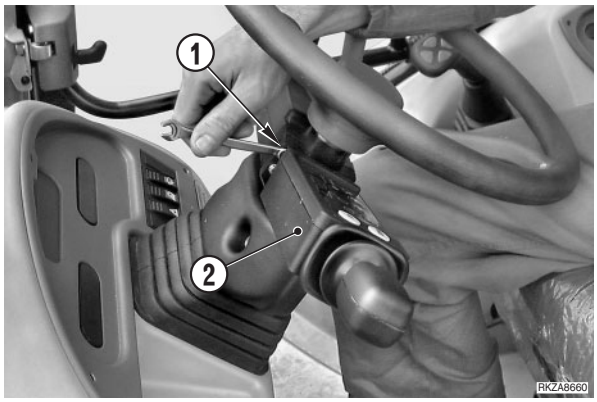
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REMOVAL OF THE TRANSMISSION-REVERSE, DIRECTION INDICATOR AND HEADLIGHT DIPPER BEAM CONTROL GROUP

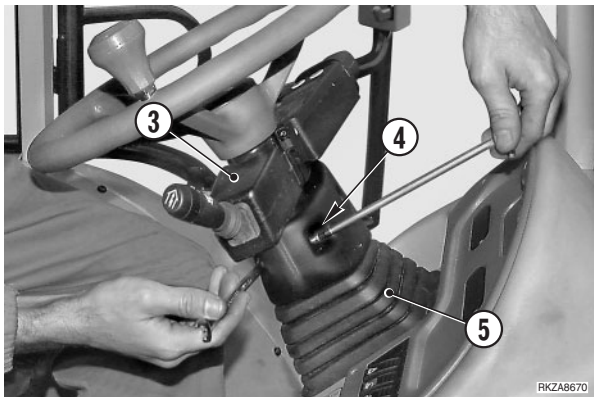
⚠ Lower the working equipment completely until it rests on the ground, and stop the engine.

⚠ Disconnect the cable from accumulator negative terminal (–).

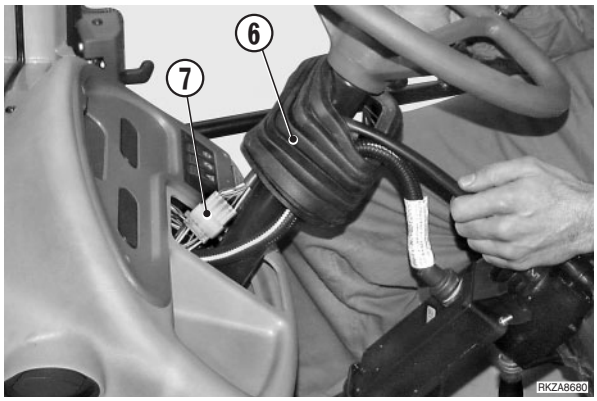
1 - Remove four nut (1) and divide the transmission-reverse (2) from direction and headlight dipper beam control group (3).



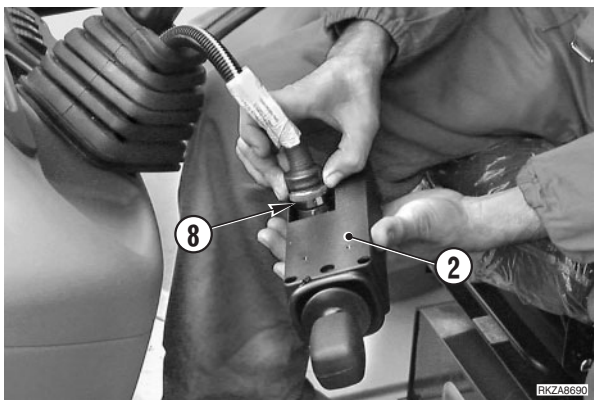
2 - Remove four screw (4) and guard (5).



3 - Raise the protective sleeve (6) and disconnect the connector (7); remove the direction and headlight dipper beam control group.



4 - Rotate in counterclockwise direction the ring (8) and disconnect the control group (2).



INSTALLATION OF THE TRANSMISSION-REVERSE, DIRECTION INDICATOR AND HEADLIGHT DIPPER BEAM CONTROL GROUP

- To install, reverse the removal procedure.

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REMOVAL OF THE STEERING UNIT

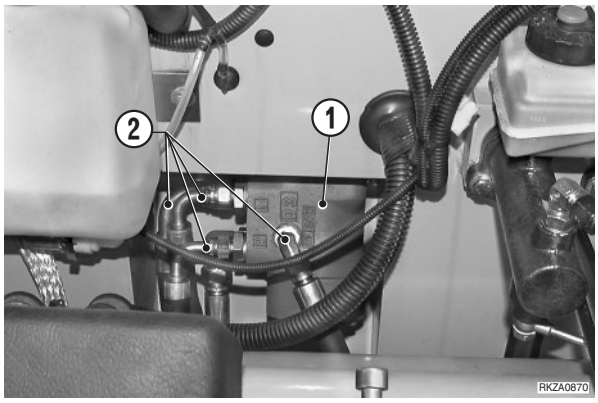
⚠ Lower the working equipment completely until it rests on the ground and stop the engine and remove the ignition wrench.

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

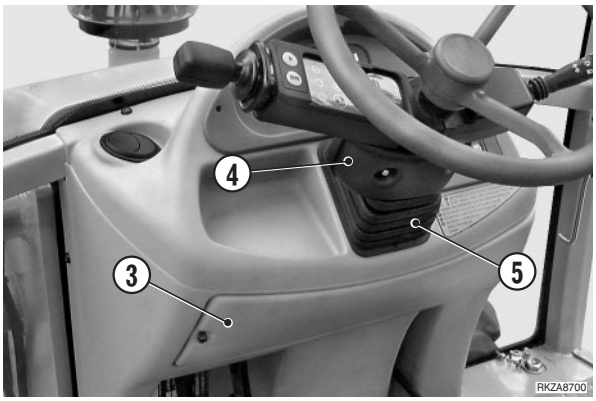
⚠ Disconnect the cable from accumulator negative terminal (–).

1 - Disconnect the five pipes (2) from the steering unit (1) and plug them to prevent entry of impurities. ※1

★ Mark the positions to prevent exchanges during re-connection.



2 - Remove the central guard (3) beneath the steering wheel.



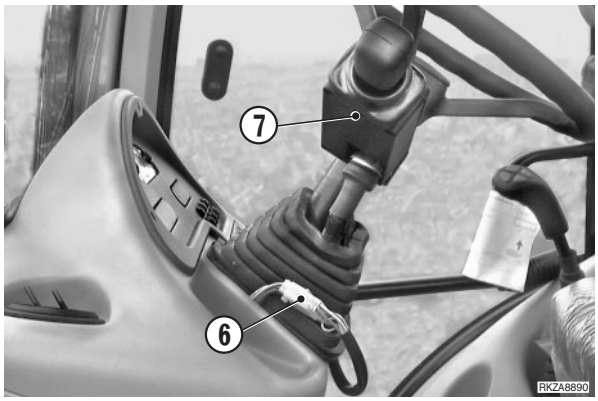
3 - Remove the guard (4) raise the protective sleeve (5) and disconnect the connectors (6) and (7).

4 - Disconnect the connector (8) and the relay (9).

5 - Loosen the steering column (11) retaining screws (10) and the steering unit (1).

6 - Take out the screws (12) and remove the plate (13) that supports the steering column and the steering unit.

7 - Take out the screws (10) and remove the steering unit (1).



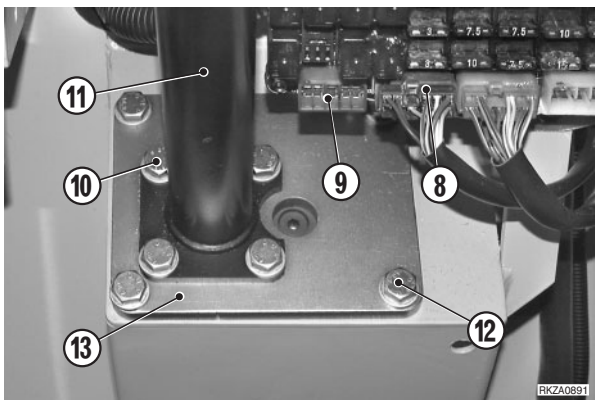
INSTALLATION OF THE STEERING UNIT

- To install, reverse the removal procedure.

※1

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

★ Start the engine and perform several complete steering manoeuvres in both directions, to bleed the air out of the steering system.



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REMOVAL OF THE WORKING BRAKE PUMP GROUP

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

⚠ Disconnect the cable from accumulator negative terminal (–)

1 - Remove the cap (1) of the oil tank (2) and draw out the oil contained inside it.

2 - Remove the oil tank (2).

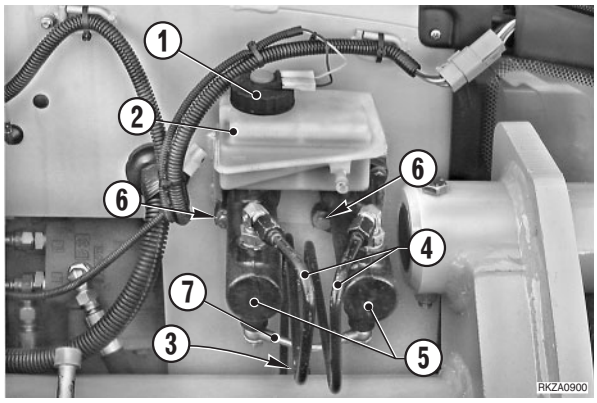
3 - Remove the clip (3) that holds the delivery lines (4).

4 - Remove the delivery lines (4) from the pumps (5).

※1

5 - Take out the four screws (6) and remove the pump group (5). ※2

★ If only one pump is to be removed, also disconnect the pressure- equalizing pipe (7). ※3



INSTALLATION OF THE WORKING BRAKE PUMP GROUP

- To install, reverse the removal procedure.

※1

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

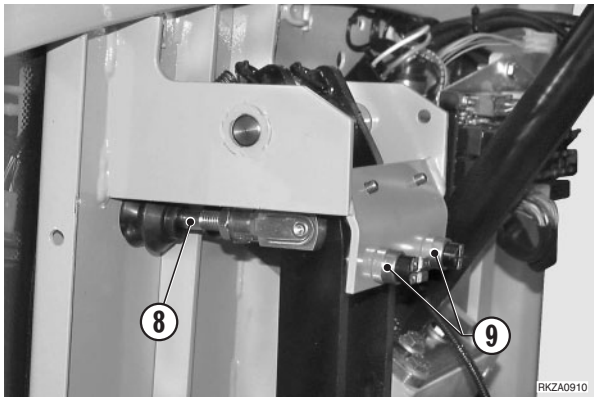
※2

★ Make sure that the push-rods (8) center the seating of the pistons.

★ After installation, check the idle stroke and parallelism of the brake pedals and, if necessary, adjust the coupling microswitches for 4-wheel brake control. (For details, see «20. TESTING AND ADJUSTMENTS»).

※3

Nm Pipe fitting: 20 Nm



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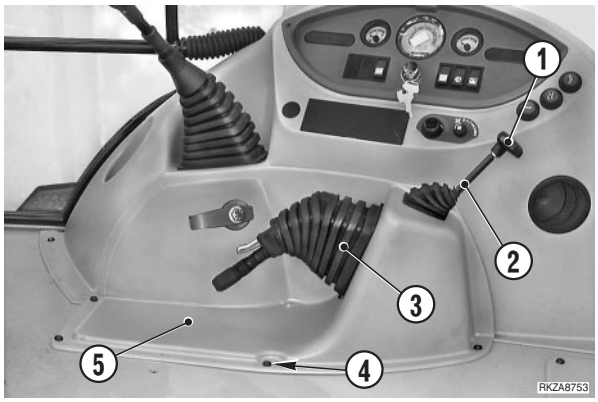
REMOVAL OF THE FRONT WORKING EQUIPMENT CONTROL VALVE

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

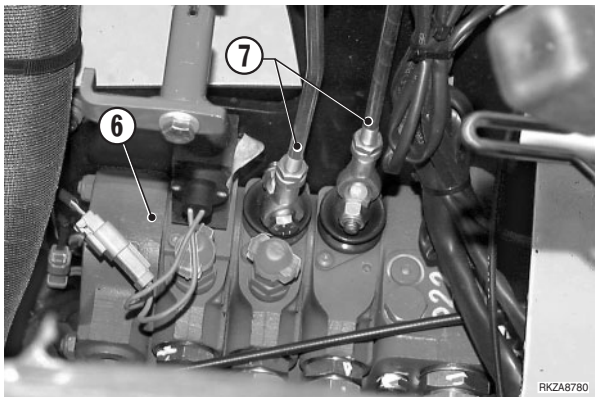
Release all residual pressure in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

1 - Remove the grip (1) of the hand accelerator and disengage the protective sleeves (2) and (3).

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



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

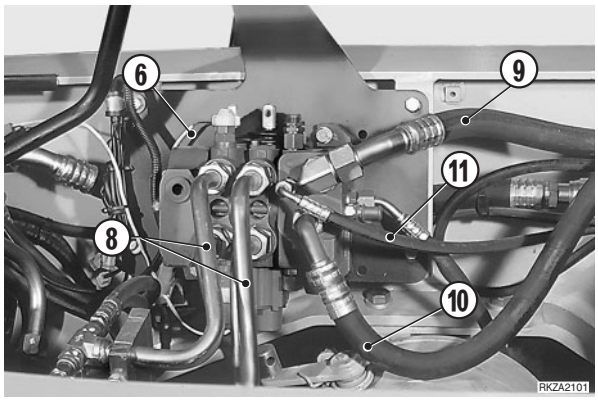


4 - Disconnect from the control valve all pipes and lines for the actuators (8), pump delivery (9), drainage (10), Load Sensing (11) and plug them.

★ Mark the pipes to avoid exchanging positions during reconnection.

5 - Take out the four control valve retaining screws.

6 - Remove the control valve (6).



INSTALLATION OF THE FRONT WORKING EQUIPMENT CONTROL VALVE

- To install, reverse the removal procedure.

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

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

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

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REMOVAL OF THE FRONT AXLE

1 - Start the engine and force the front bucket downwards in order to raise the machine and the front wheels.

2 - Place two stands «**A**» and some blocks beneath the chassis.

3 - Slowly lower the machine onto the blocks, checking that the wheels remain at least 5 cm above the ground.

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

4 - Engage the parking brake.

5 - Stop the engine and eliminate residual pressure from all circuits. (See «20. TESTING AND ADJUSTMENTS»).

⚠ Raise the engine hood and disconnect the cable from accumulator negative terminal (–).

6 - Take off the front wheels (1). ※1

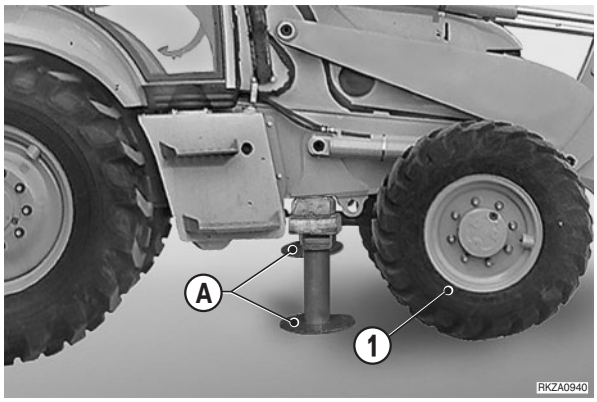
kg Wheel: 65 kg

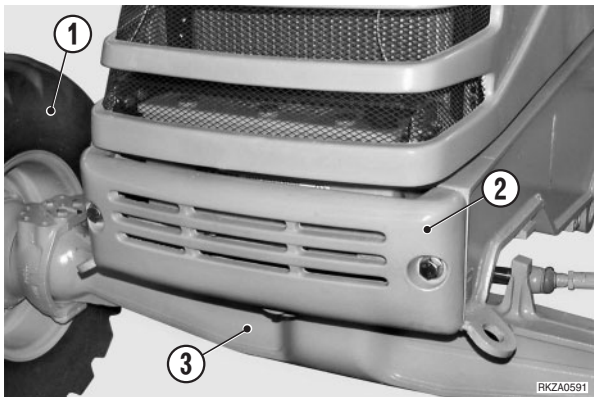
7 - Remove the front guard (2). (For details, see «REMOVAL OF FRONT GUARD»). ※2

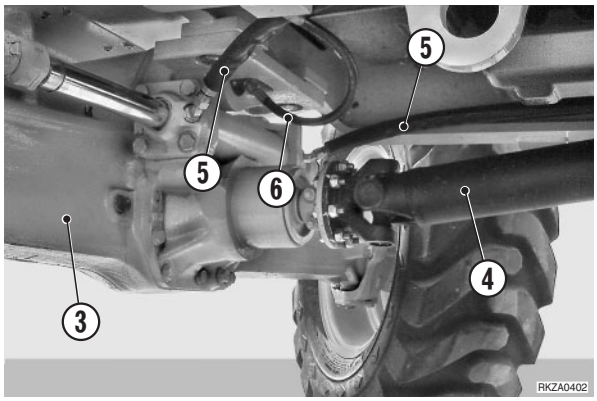
8 - Disconnect the cardan shaft (4) from the axle (3). ※3

9 - Disconnect the lines (5) from the steering cylinder and plug them to prevent entry of impurities ※4

10 - Disconnect the lubrication tube (6) for the axle oscillation pin (7).

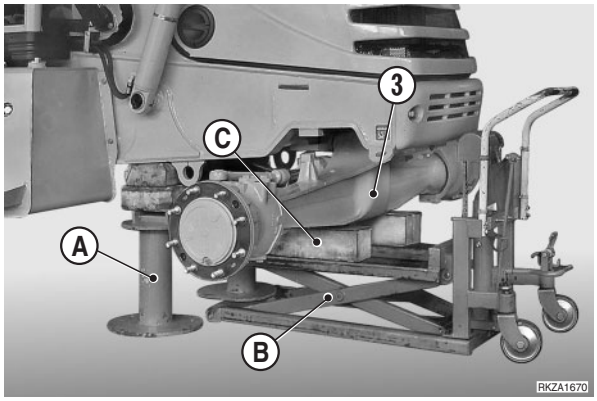






11 - Position a jack «**B**» and some blocks «**C**» beneath the axle. Raise the jack until the blocks can be forced under the axle arms (3).

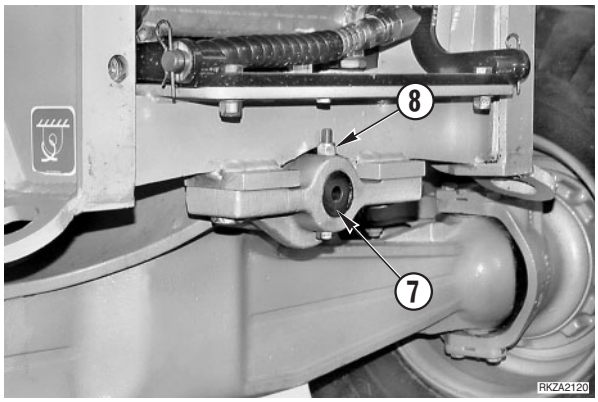
★ It should be possible to lower the jack 10 cm in order to disengage the axle from the fulcrum supports.



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12 - Take out the nut and remove the retaining screw (7) of the axle oscillation pin (7).

13 - Screw an eyebolt into the central hole of the axle oscillation pin (7). Extract the axle oscillation pin. ※5



14 - Lower the jack until the axle is disengaged.

15 - Extract the entire axle (3).

kg Front axle: 316 kg

INSTALLATION OF THE FRONT AXLE

- To install, reverse the removal procedure.

※1

Nm Nuts for front wheels: 350±9.8 Nm

※2

Nm Front closing screws: 300±30 Nm

※3

Nm Screws on gearbox side: 70 Nm

Nm Self-locking nuts on axle side: 70 Nm

※4

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

※5

Axle oscillation pin - bushings: ASL800050

1 - Check the oil level in the tank and start the engine.

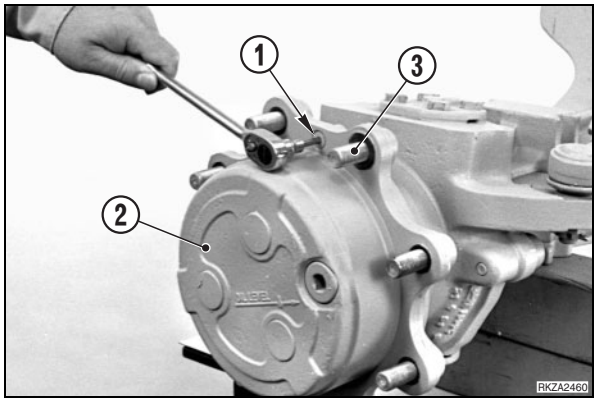
2 - Perform a few complete steering manoeuvres in both directions to bleed the air from the steering circuit.

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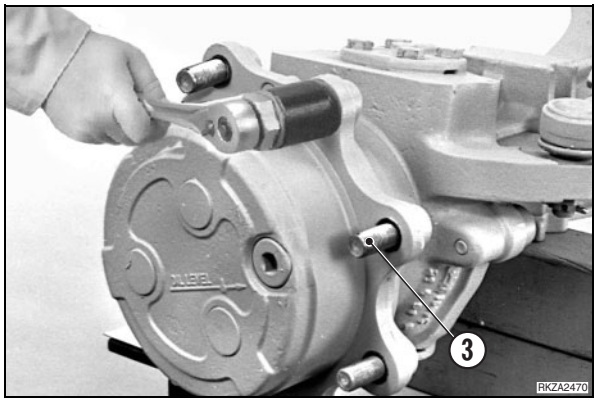
DISASSEMBLY OF FRONT AXLE

1. Final Drive

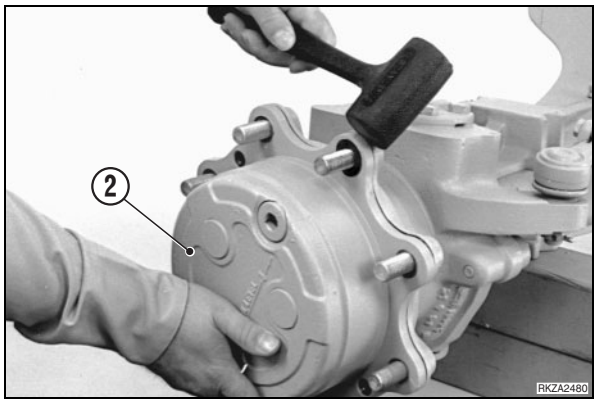
1 - Remove the screws (1) that secure the planetary carrier (2).



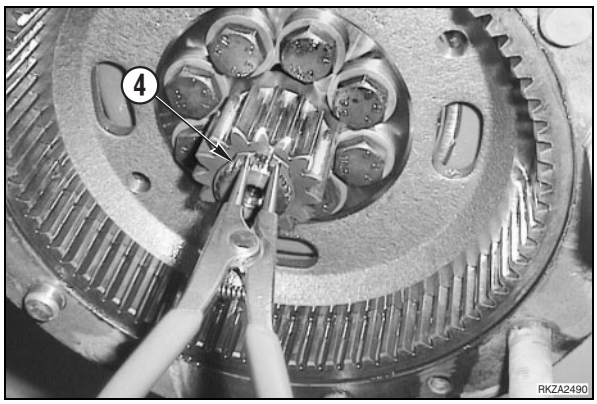
2 - Use a puller to remove the shoulder studs (3).



3 - Use a plastic mallet to separate the complete planetary carrier (2) from the axle and remove it.

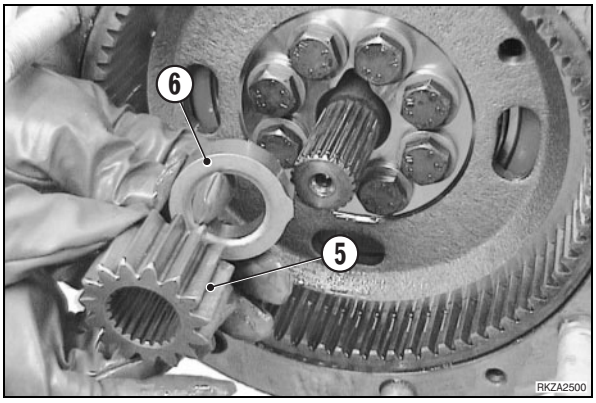


4 - Remove the snap ring (4).

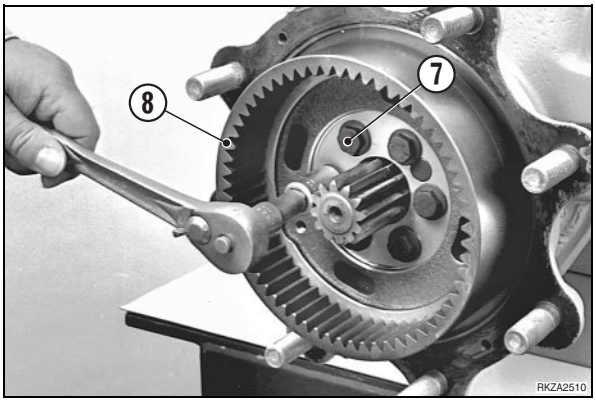


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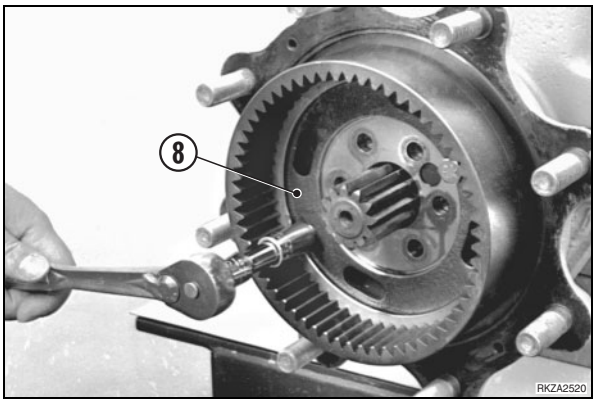
5 - Remove the pinion (5) and the spacer (6).



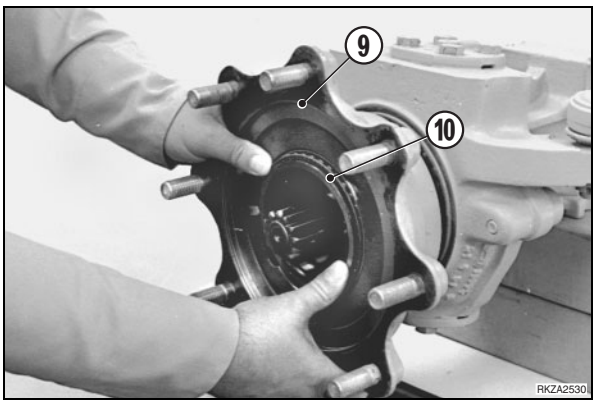
6 - Remove the screws (7) that secure the complete ring bevel gear group (8).



7 - Screw two M10 screws into the threaded holes of the planetary carrier (8). Act on these two screws alternately until the entire bevel ring gear group (8) has been extracted, complete with the centering bushings.

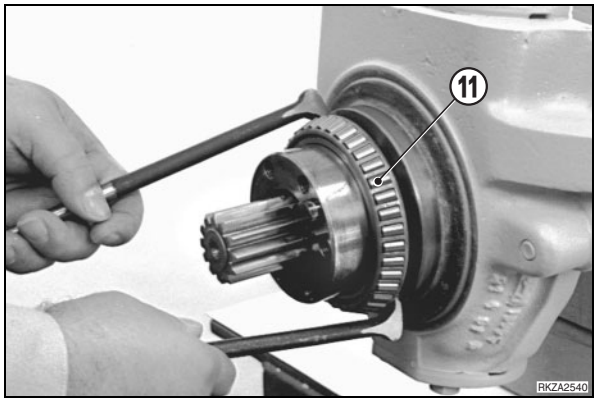


8 - Use a puller to remove the hub (9) and outer bearing (10) from the swivel housing.

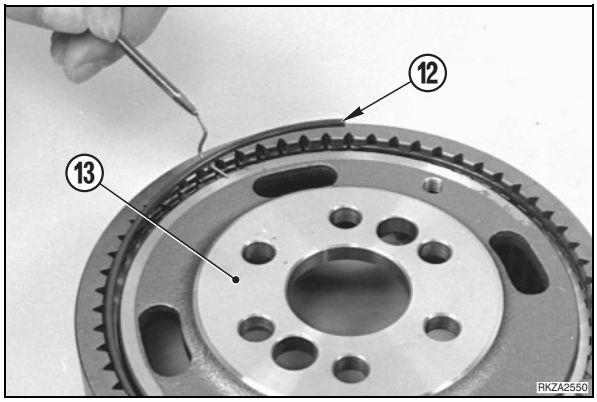


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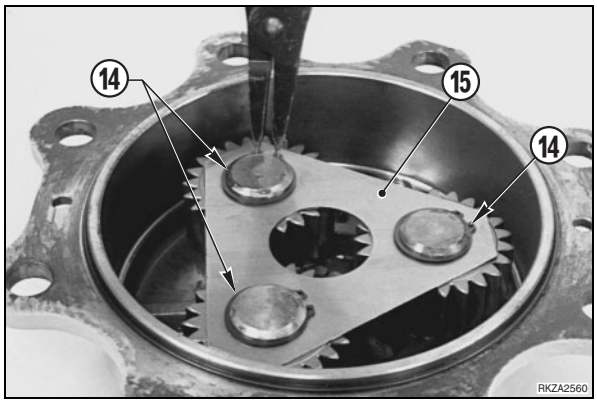
9 - Use two levers to remove the inner bearing (11).
★ Take great care not to damage the bearing.



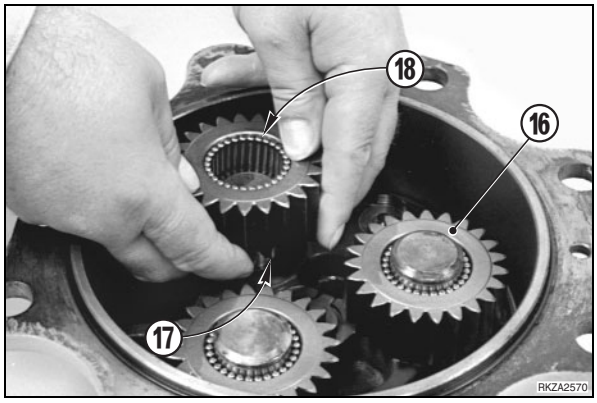
10 - Remove the snap ring (12) that secures the planetary carrier. Remove the planetary carrier (13).



11 - Remove the snap rings (14) and lift out the planetary gear retainer (15).



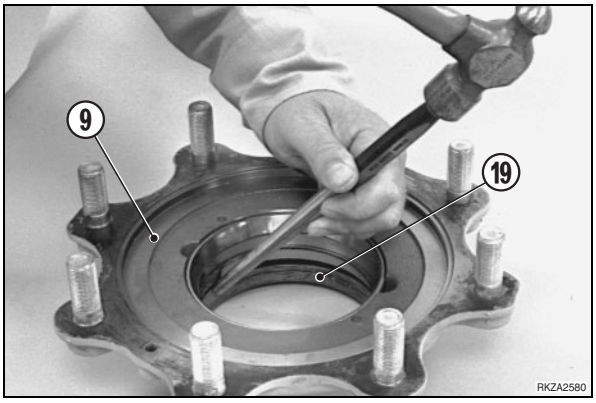
12 - Remove the complete planetary gears (16) together with the lower retainer (17) and the roller bearings (18).

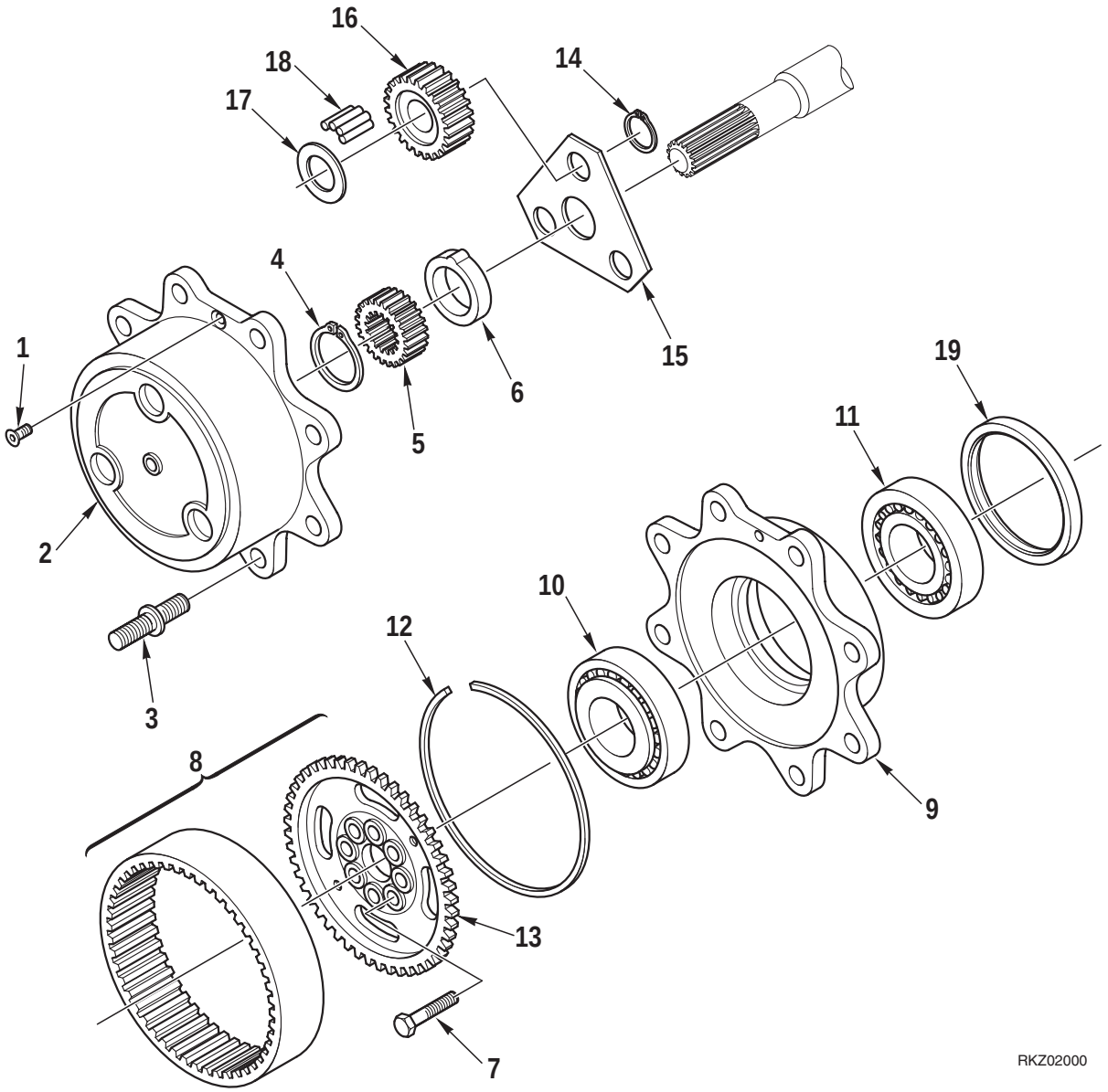


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Only where necessary

13 - Remove the outer retainers (10) and (11) and the seal ring (19) from the wheel hub (9).





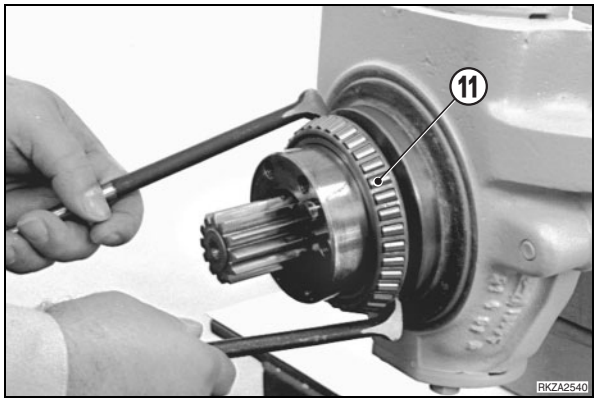
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2. Removal of the swivel housing

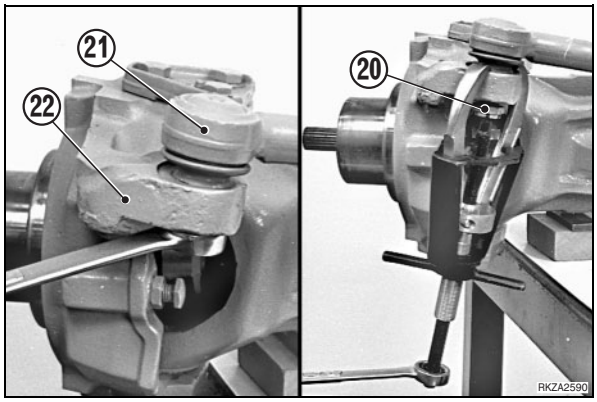
★ Remove the final drive. (For details, see previous paragraph).

1 - Remove the inner bearing (11).

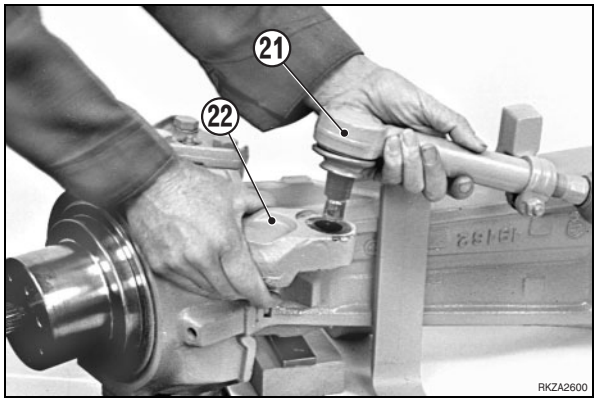
★ Take great care not to damage the bearing.



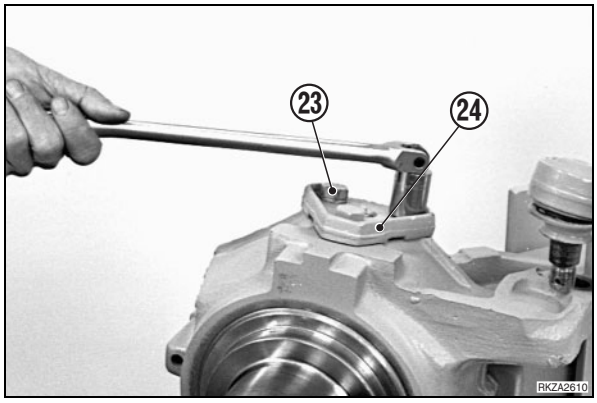
2 - Loosen the nut (20) on the ball joint (21), but do not remove it.
Use a puller to detach the joint (21) from the swivel housing (22).



3 - Remove the nut (20) and detach the ball joint (21) from the swivel housing (22).

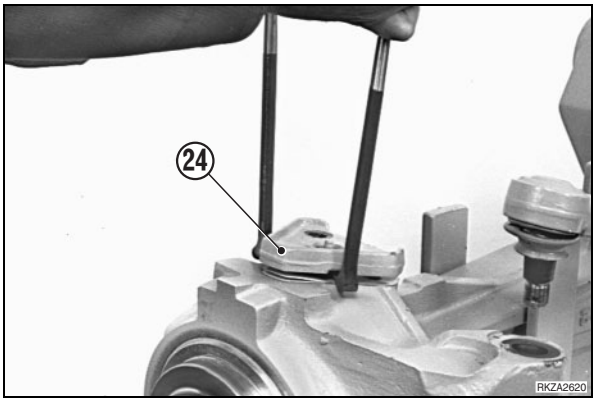


4 - Remove the screws (23) that secure the upper (24) and lower (25) knuckle pins.

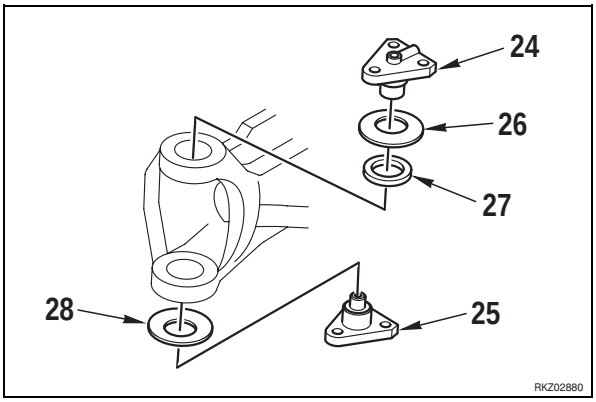


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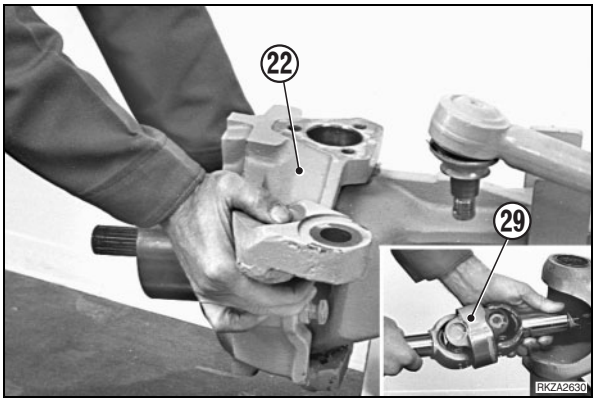
5 - Use two levers to remove first the upper knuckle pin (24) and then the lower knuckle pin (25).



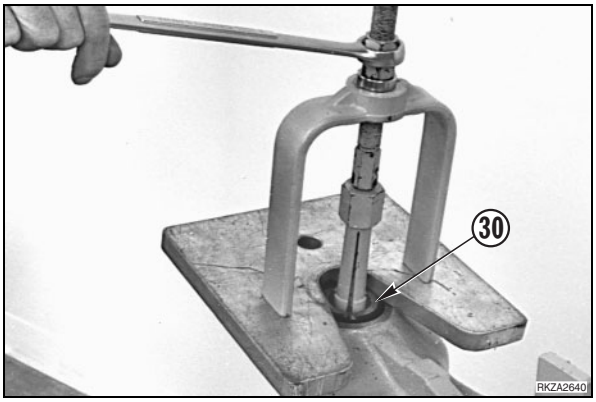
6 - Remove the Belleville washer (26), the upper ball joint washer (27) and the Belleville washer (28) of the lower ball joint.



7 - Remove the swivel housing (22) and extract the axle shaft (29).

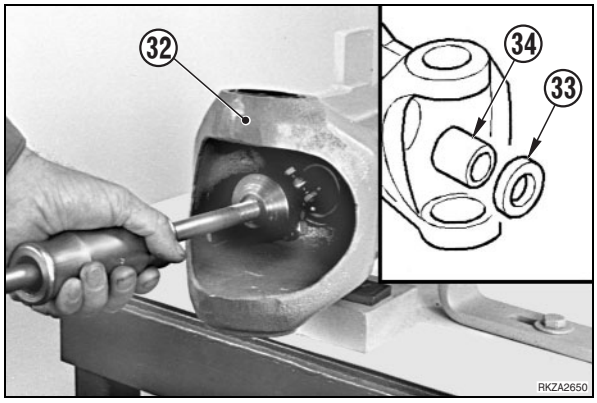


8 - Use a puller to remove the upper bushing (30) and the spherical seating of the lower bushing (31).

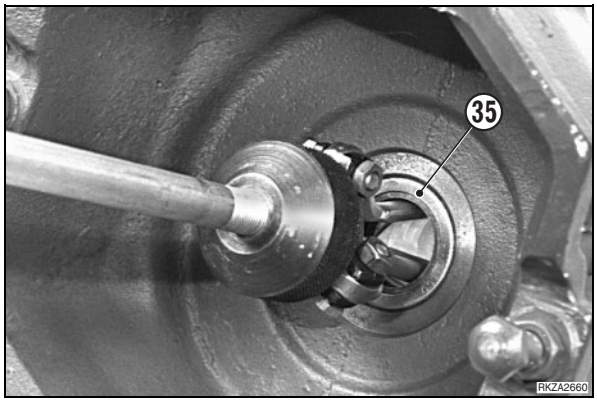


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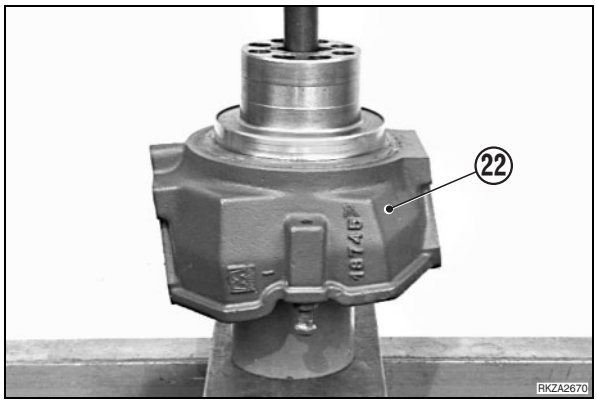
9 - Use a puller to remove the seal ring (33) and the bushing (34) from the axle body (32).



10 - Use a puller to remove the seal ring (35) from the swivel housing (22).

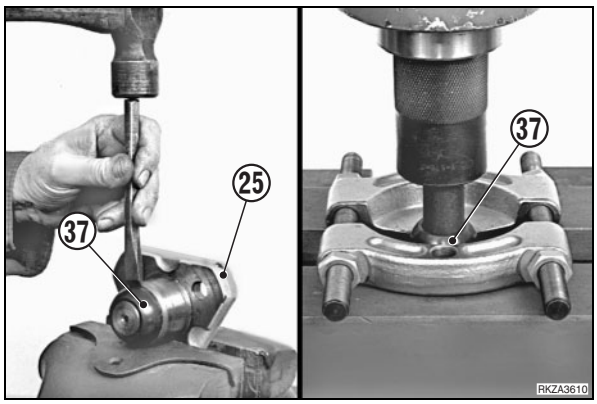


11 - Place the swivel housing (22) beneath a press and extract the bushing (36).

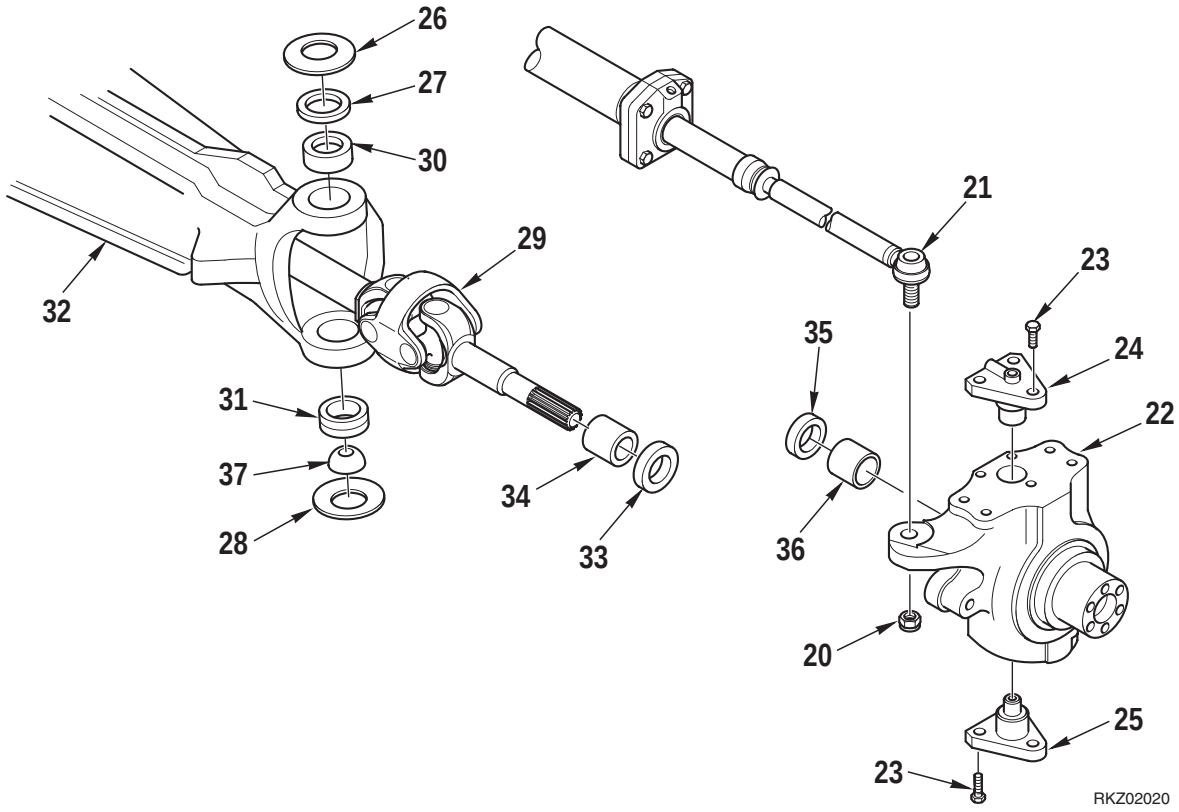


Only where necessary

12 - Using an extremely sharp chisel, partially remove the spherical bushing (37) from the lower knuckle pin (25).
Complete the extraction of the bushing (37) using a separator and a press.

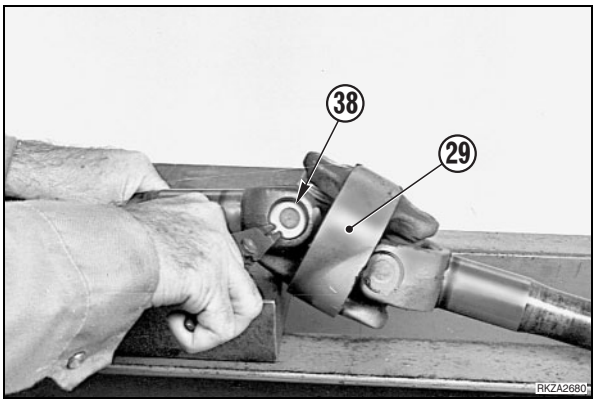


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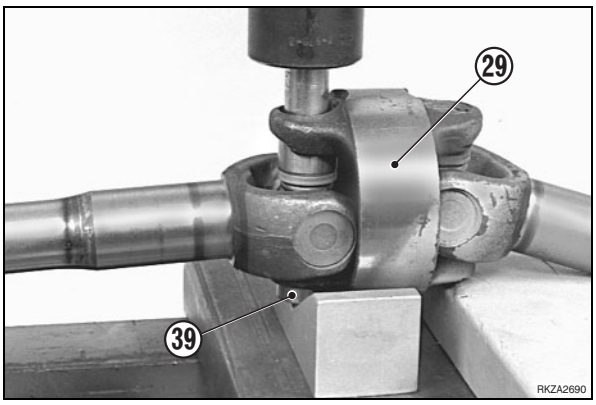


3. Dismantling the universal joint

1 - Remove the four snap rings (38).

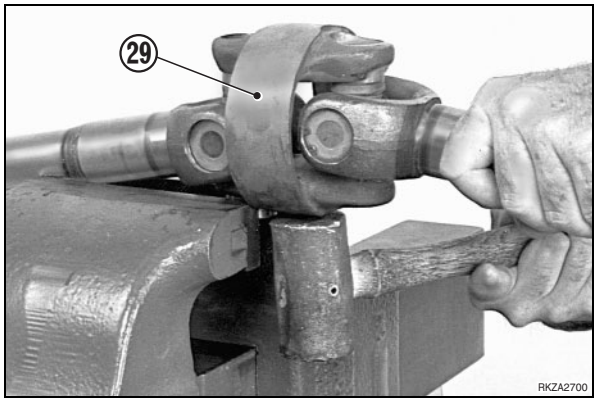


2 - Position the joint (29) on a «**V**»-shaped block beneath a press.
With the appropriate plunger, press the lower bearing cover (39) down until it rests on the «**V**»-shaped block.

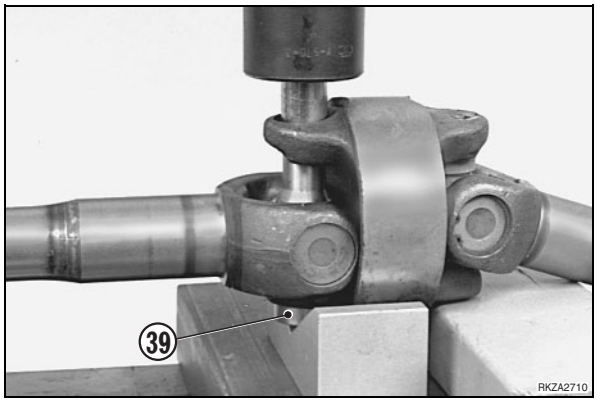


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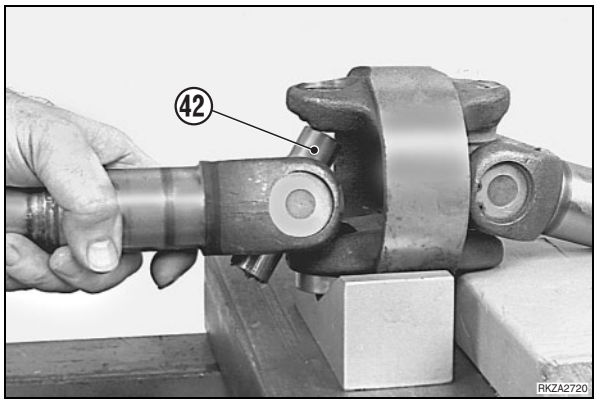
3 - Place the bearing cover (39) in a vise and use a copper mallet to extract the joint (29) from the bearing cover.



4 - Reposition the joint (29) upside down on the «**V**»-shaped block and press the second bearing cover (39).

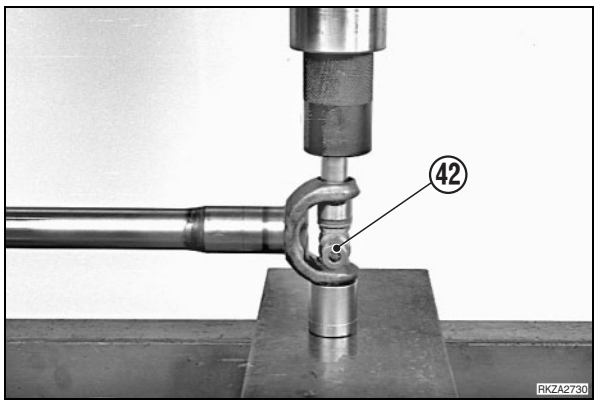


5 - Remove the fork (40) or (41) complete with cross-journal (42).
Remove the second bearing cover from the joint following the same procedure described under point 3 above.



6 - Position the fork complete with cross-journal (42) beneath the press and remove in sequence the first bearing cover, the cross-journal and the second bearing cover.

★ Follow the procedures described in points 2 and 3.

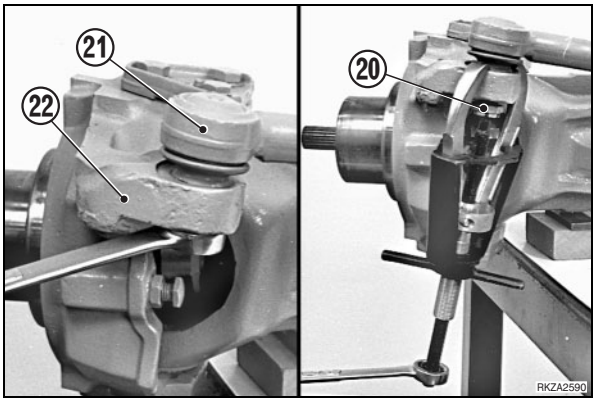


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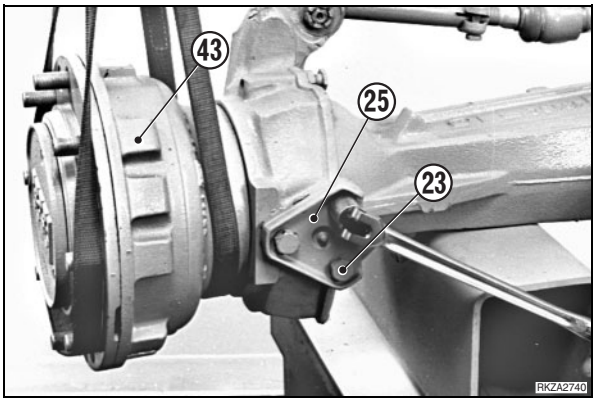
4. Removal and dismantling of the differential group

★ Perform the same operations for both final drive groups.

1 - Loosen the nut (20) of the ball joint (21) but do not take it out.
Use a puller to extract the joint (21) from the swivel housing (22).



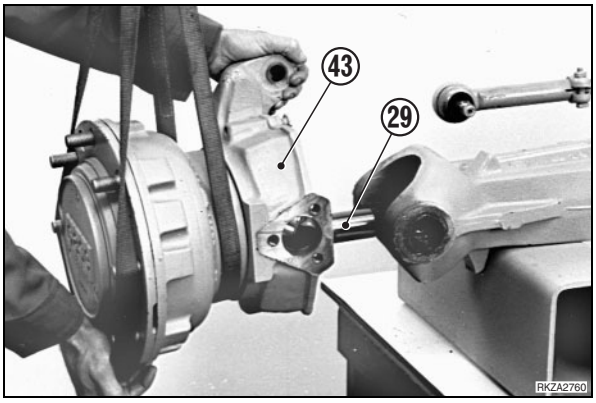
2 - Put a sling round the final drive group (43) as shown, and attach it to a hoisting tackle.
Remove the screws (23) of the knuckle pins (24) and (25). Remove the nut (20) and detach the ball joint (21) from the swivel housing (22).



3 - Remove the upper (24) and lower (25) knuckle pins together with their Belleville washers and shims.
★ Make a note of the assembly sequence and the arrangement.

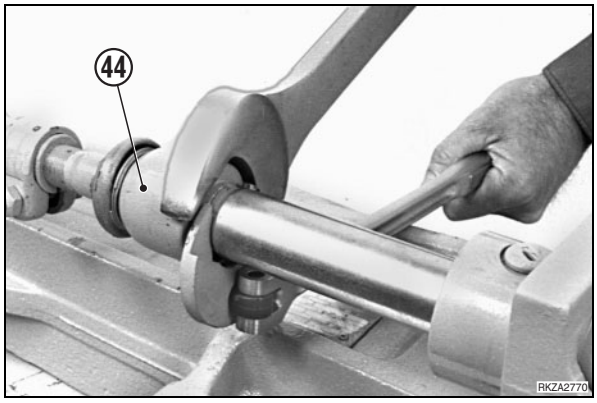


4 - Remove the final drive group (43) complete with the axle shaft (29).

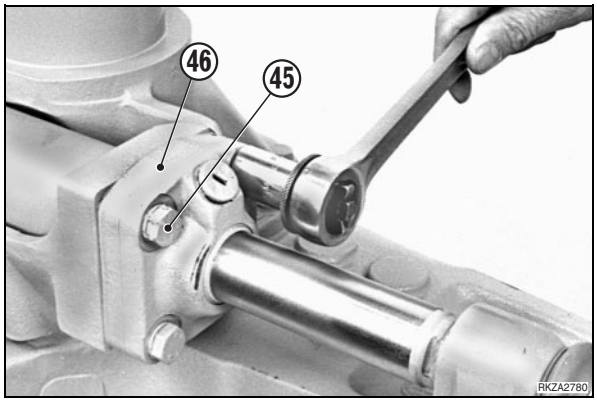


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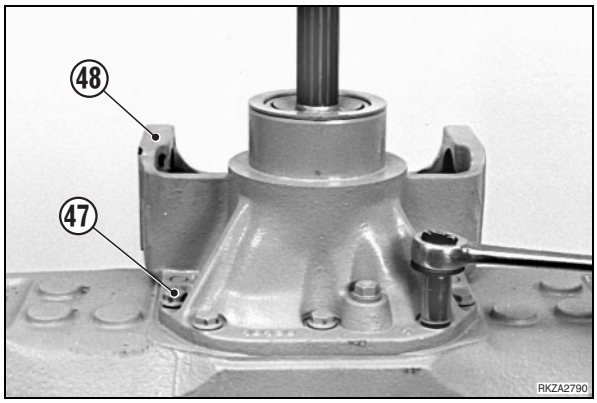
5 - Loosen and remove the RH tie-rod (44).



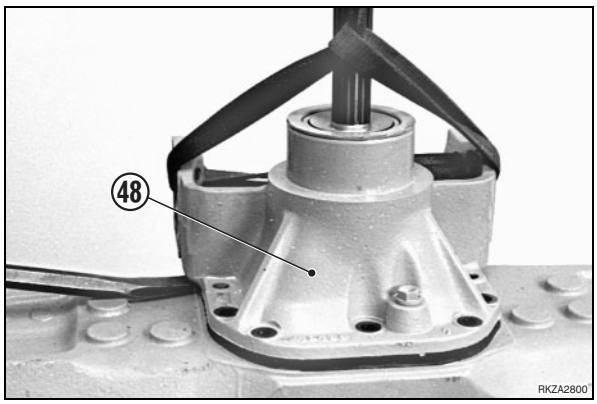
6 - Loosen and remove the screws (45) that secure the steering cylinder (46).
Use a plastic mallet to remove the cylinder (46).



7 - Loosen and remove the screws (47) that secure the differential group (48).

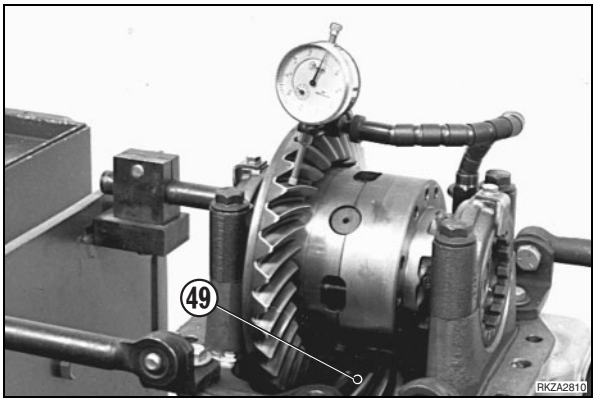


8 - Put a sling around the differential group (48) and lift it off with the help of a lever.
Place the differential group on a work-bench for repairs.

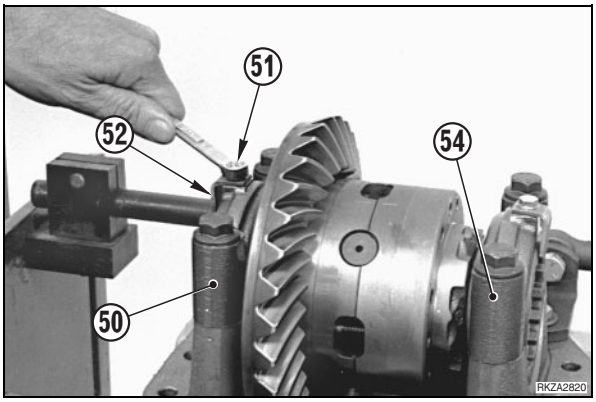


https://truckmanualshub.com/

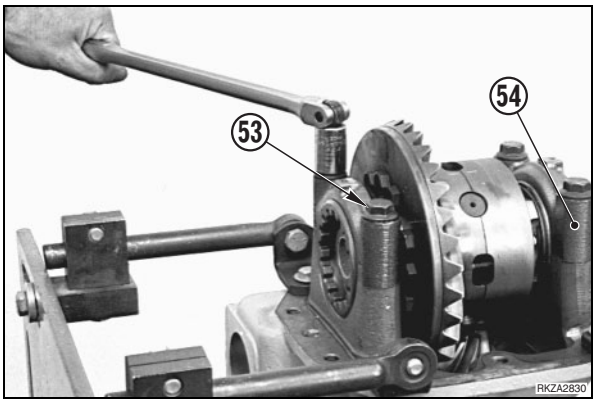
9 - Hold the bevel pinion (49) steady and measure the clearance of the ring bevel gear with a centesimal comparator.
★ Make a note of the value measured.



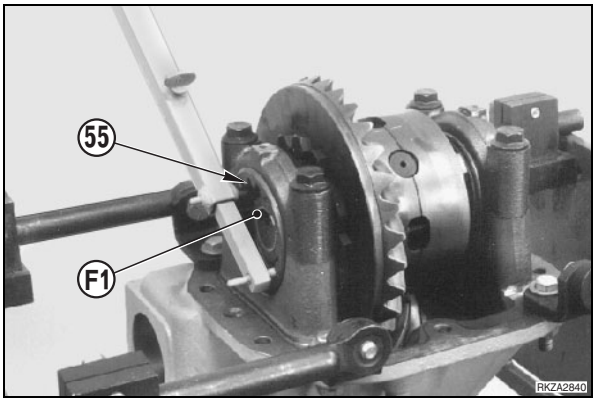
10 - Make a mark on the bearing support (50) on the ring bevel gear side and remove the screws (51) and the lock nut retainers (52).



11 - Loosen the screws (53) that secure the bearing covers (50) and (54).

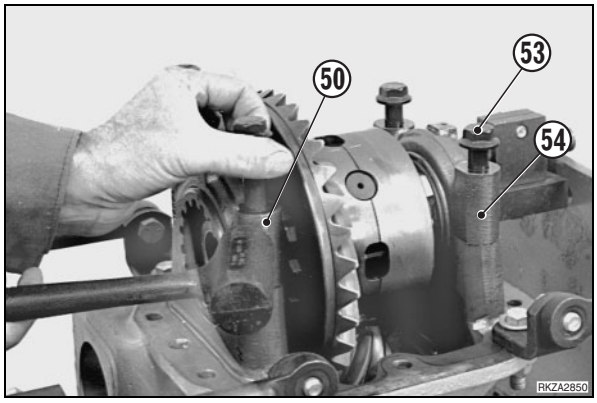


12 - Use the tool **F1** to loosen the clearance adjustment lock nuts (55).

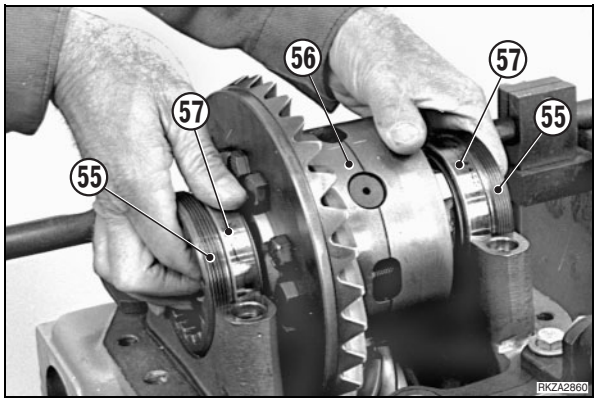


https://truckmanualshub.com/

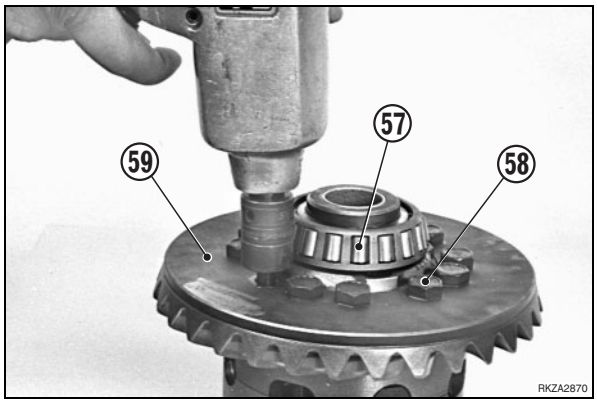
13 - Take out the screws (53) and remove the bearing covers (50) and (54).



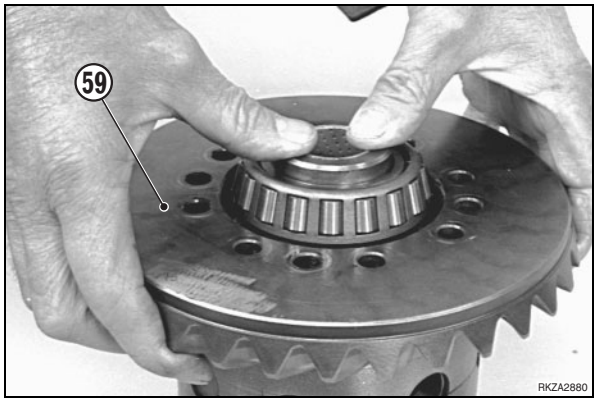
14 - Remove the differential (56) complete with adjustment lock nuts (55) and the bearings (57). Remove the outer rings from the bearings.



15 - Loosen and remove the screws (58) that secure the ring bevel gear (59).

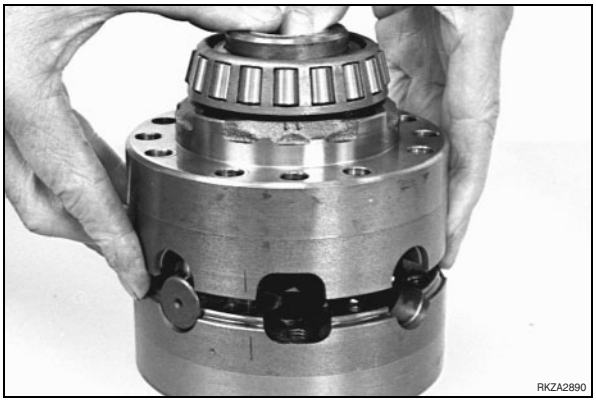


16 - Remove the ring bevel gear (59).

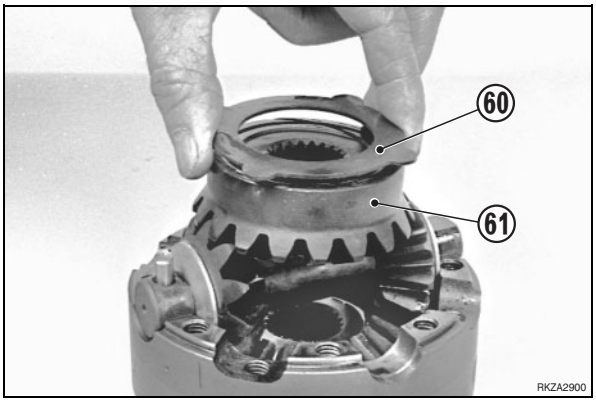


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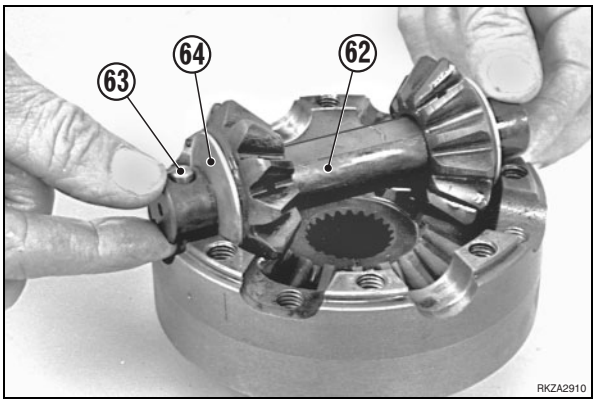
17 - Separate the two half boxes of the differential.
★ Mark the two half boxes for re-assembly.



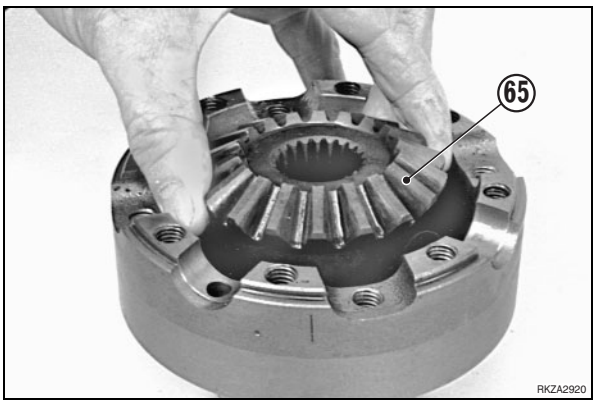
18 - Take out the thrush washer (60) and the differential gear (61).



19 - Take out the planetary gear group (62) complete with pin (63) and shims (64).

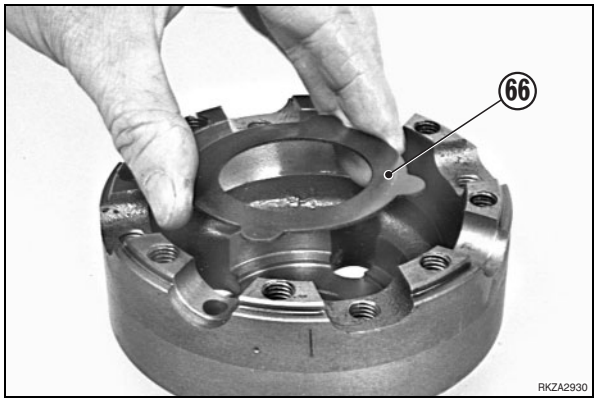


20 - Take out the second differential gear (65).

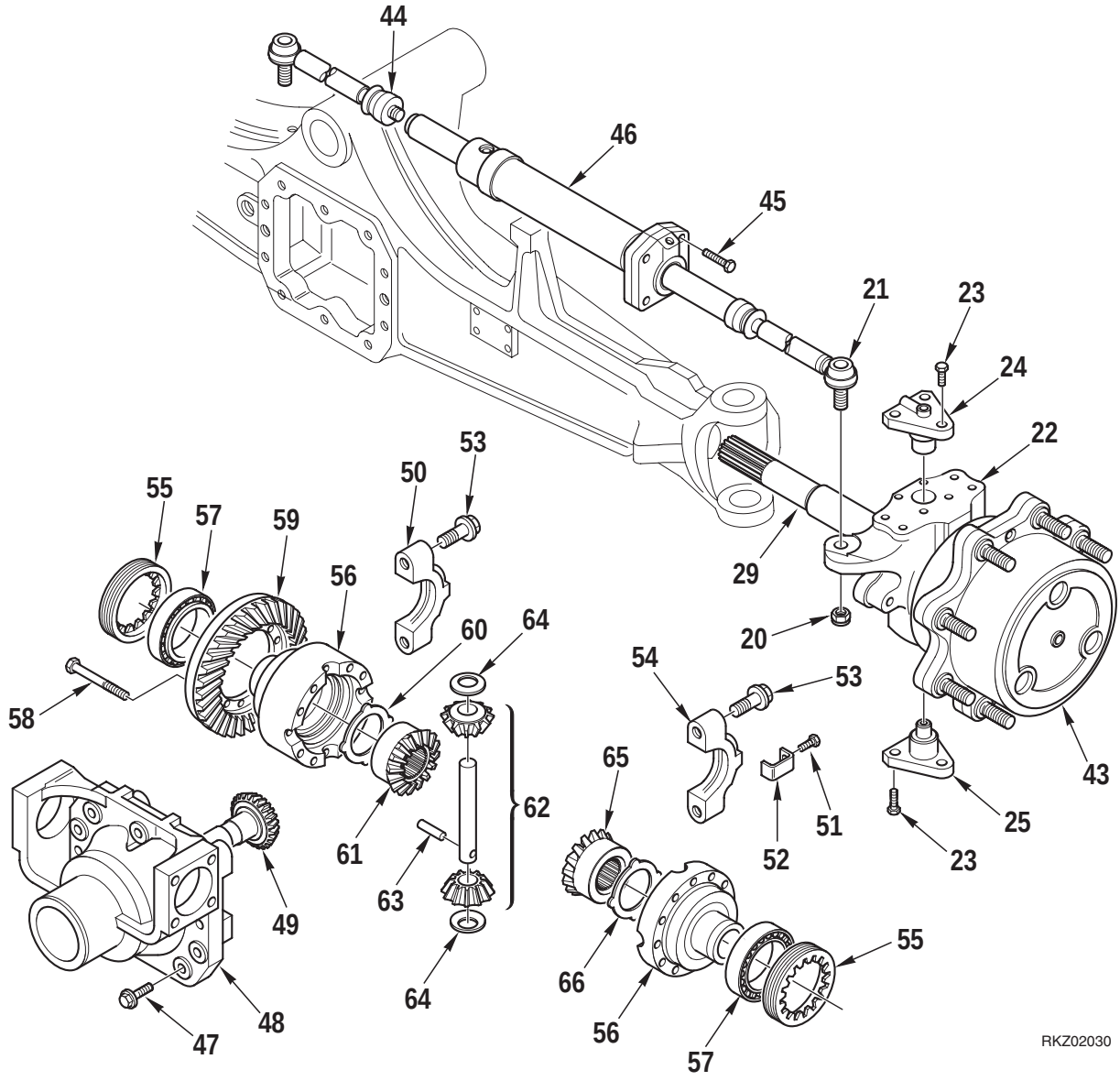


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21 - Take out the thrush washer (66).



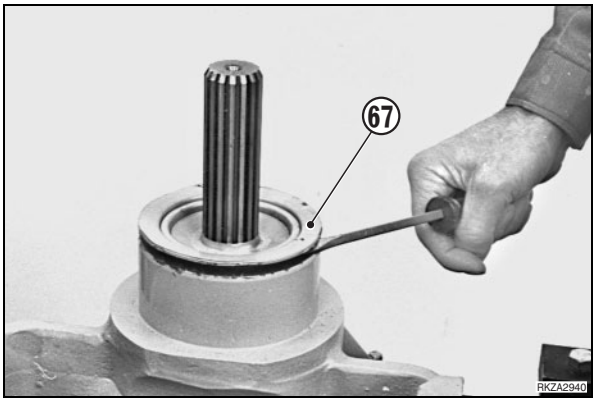
22 - Use a separator and a press to remove the bearings (57) from the half boxes.



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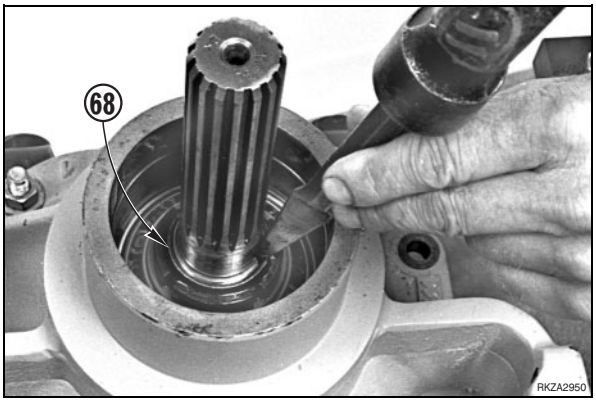
5. Removal of the bevel pinion

1 - Remove the cover (67).

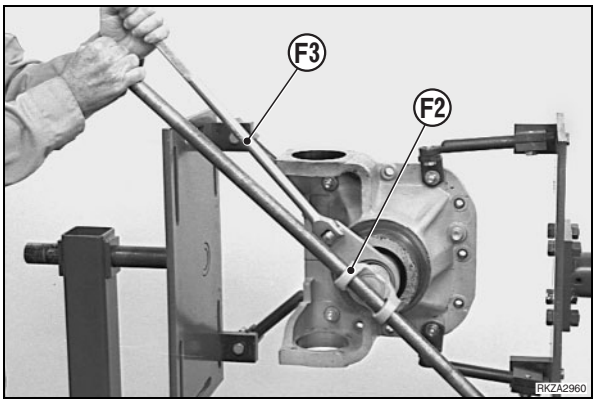


2 - Use a narrow-bladed chisel to remove the lock nut (68) caulking from the bevel pinion well.

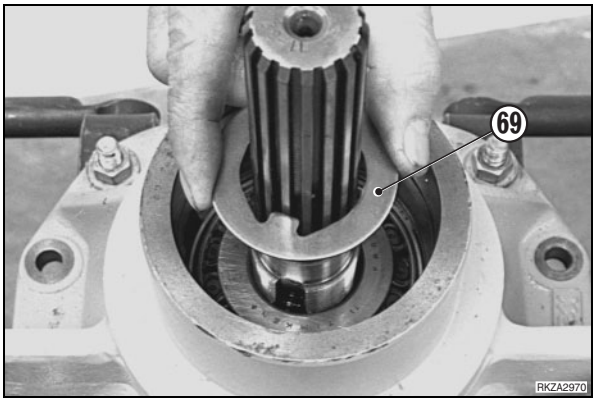
★ Take great care not to damage the pinion threading.



3 - Use tools **F2** and **F3** to remove the lock nut (68).

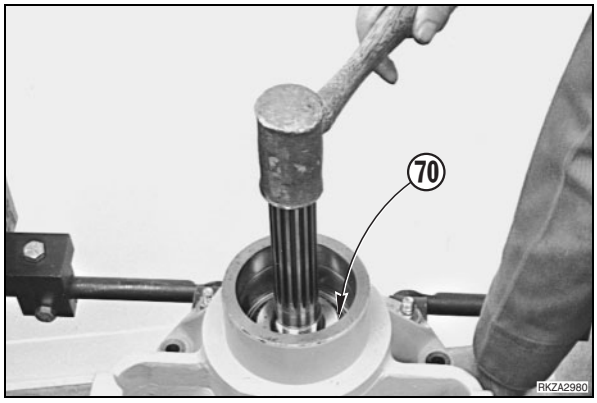


4 - Remove the tabbed washer (69) of the lock nut (68).



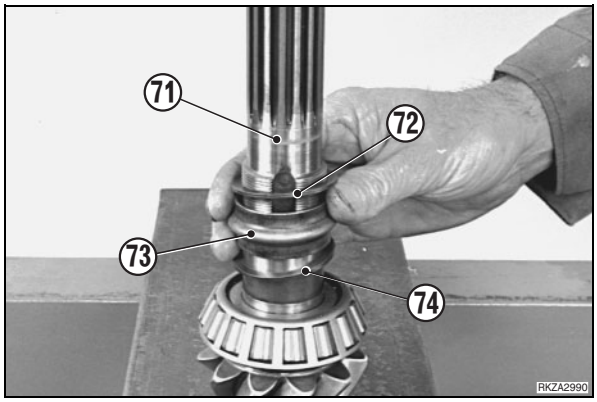
https://truckmanualshub.com/

5 - Use a soft mallet to extract the bevel pinion from the outer bearing (70).

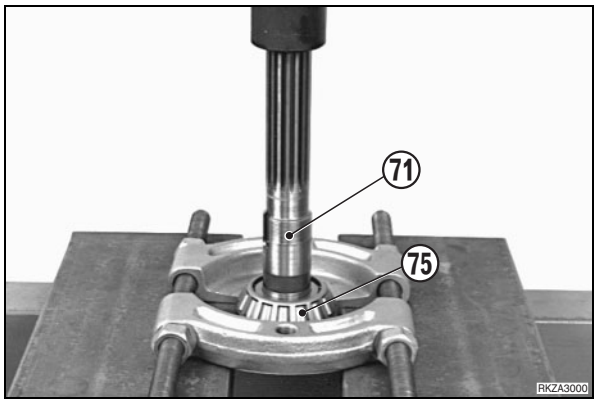


6 - Remove from the pinion (71) the washer (72), the spacer (73) and the second washer (74).

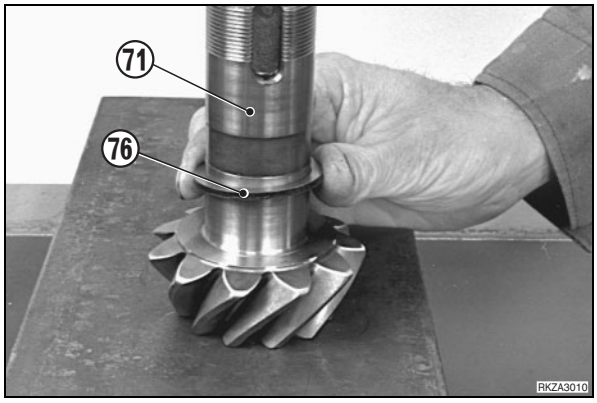
⚠ The spacer (73) cannot be used again, and must be replaced by a new one every time it is dismantled.



7 - Place the pinion (71) beneath a press and use a separator to remove the inner bearing (75).



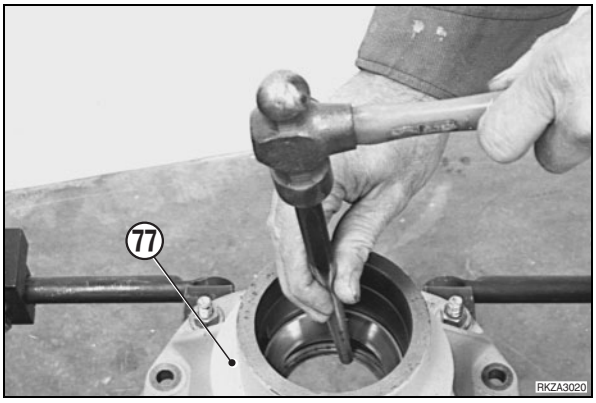
8 - Remove the shim (76) from the pinion (71).



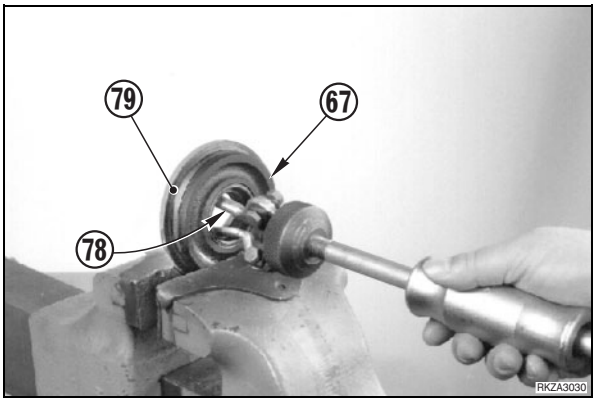
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Only if the bearings need replacing

9 - Remove the differential support (77), and the outer bearing-rings (70) and (75).



10 - Remove the seal ring (78) and the O-ring (79) from the cover (67).

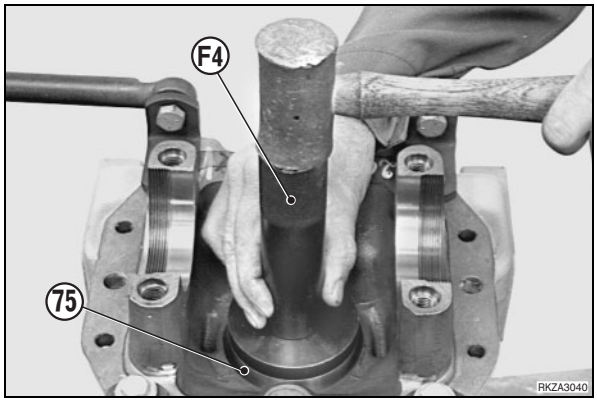


https://truckmanualshub.com/

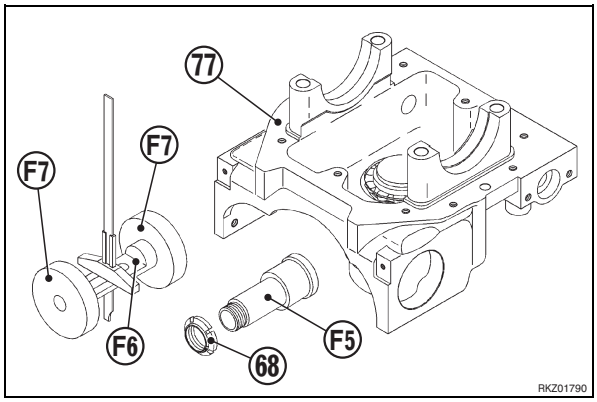
ASSEMBLY OF FRONT AXLE

1. Re-assembly of the bevel pinion

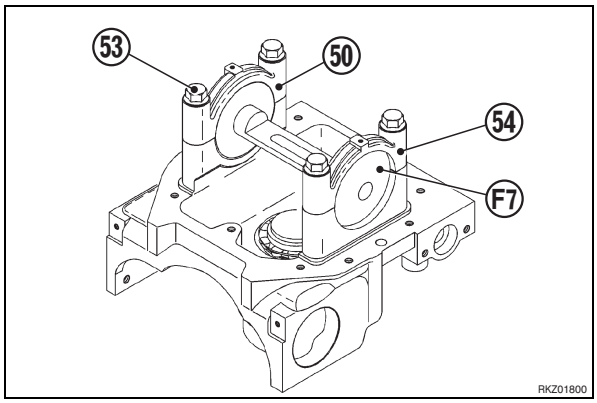
1 - Using the tool **F4**, insert the outer retainers of the pinion bearings (70) and (75).



2 - Mount into the differential support (77) the bearings (70) and (75), the gauge block **F5**, with the lock nut (68), the gauge tube **F6**, and the lock nuts **F7**.
In order to pre-load the bearings (70) and (75) tighten the lock nut (68) until the pinion becomes hard to turn.

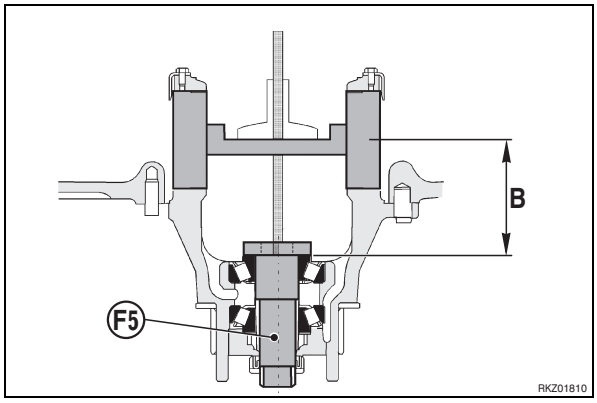


3 - Mount the bearing covers (50) and (54) and tighten the screws (53) uniformly until the lock nuts **F7** are held fast.



4 - Use a deep calliper to take the measurement «**B**» between the gauge tube **F6**, and the surface inside the gauge **F5**.

★ Write down the «**B**» measurement.

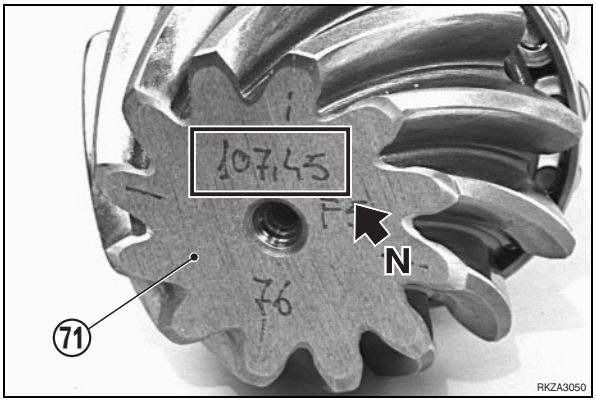


https://truckmanualshub.com/

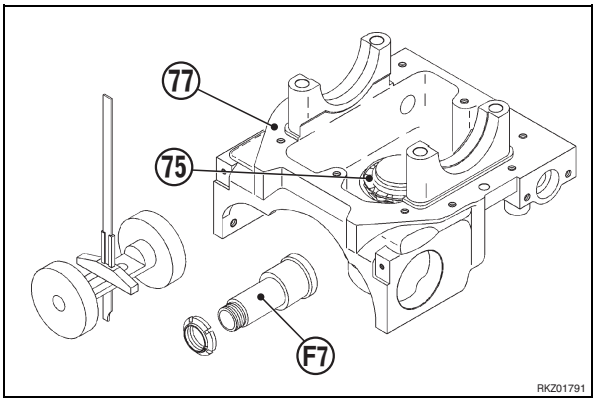
5 - Make a note of the value «**N**» marked on the head of the pinion (71).
Calculate the thickness «**S**» to be installed beneath the pinion, using the formula:

$$S = B - N$$

★ «**S**» is the thickness of the shim (76).

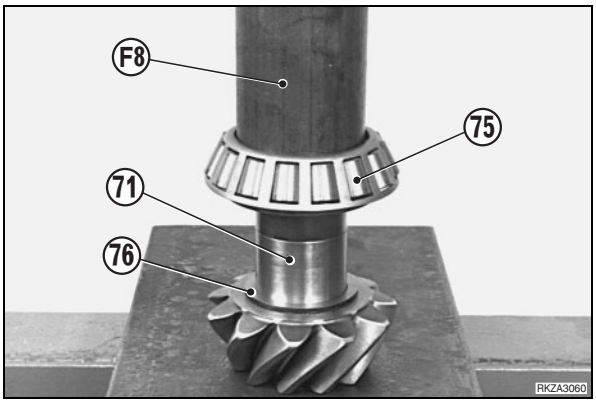


6 - Dismantle the special tools and remove the bearings (70) and (75) from the differential support (77).

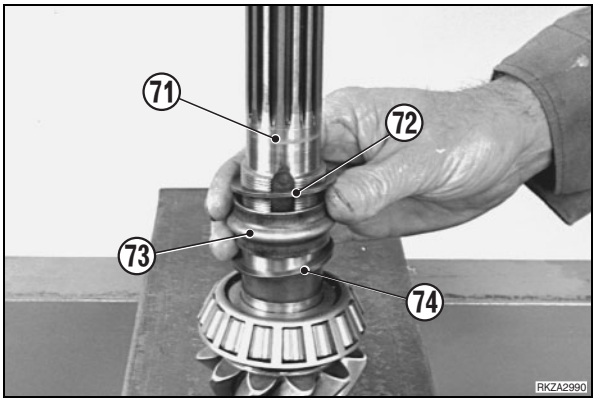


7 - Mount the shim (76) onto the pinion (71) and press the inner bearing (75) using the tool **F8**.

★ The chamfer on the inner diameter of the shim must face the toothing.

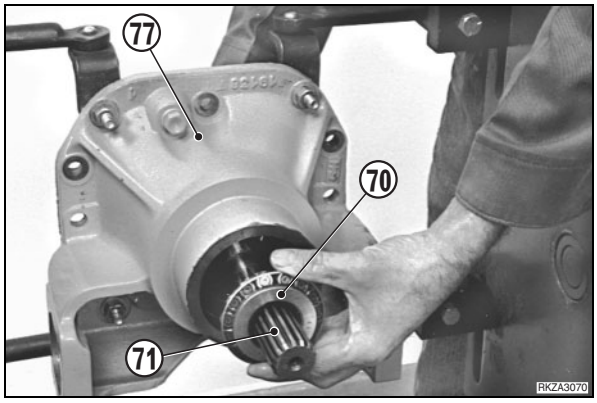


8 - Mount onto the pinion the first washer (74), the new spacer (73) and the second washer (72).

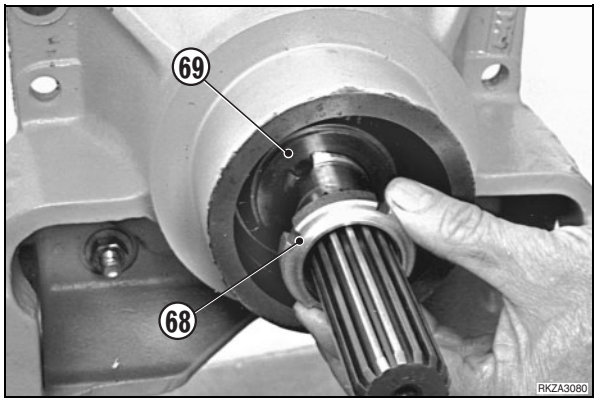


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9 - Lubricate the bearings with gear oil. Mount the pinion group (71) into the differential support (77) and position the outer bearing (70).

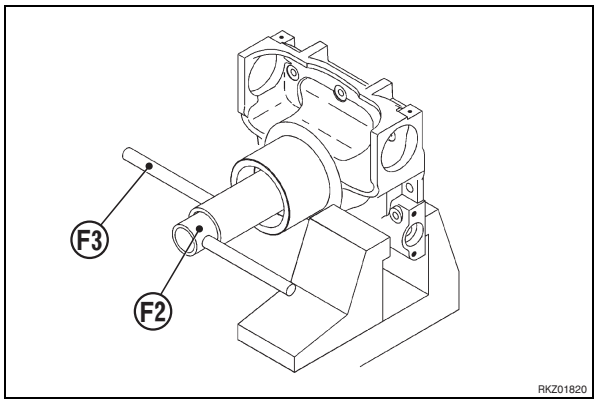


10 - Mount the tabbed washer (69) and the lock nut (68).



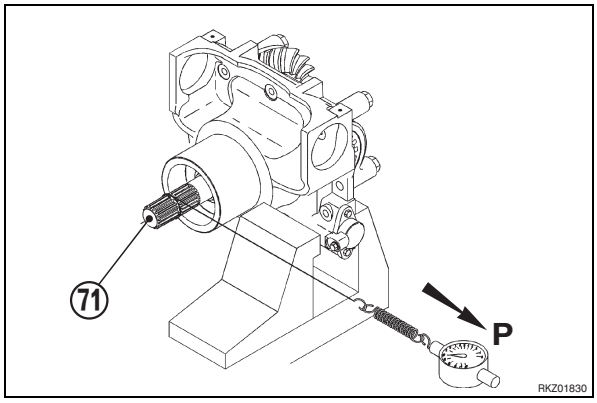
11 - Use the tools **F2** and **F3** to tighten the lock nut (68) a little at a time until the clearance is eliminated and the bearings are slightly pre-loaded.

★ Rotate the gauge tube by a few turns between one lock nut tightening increment and the next.



12 - Wind a wire line round the pinion (71), uniformly and without overlapping. Connect it to a dynamometer and check the force «**P**» required to rotate the shaft.

⚠ The force should be that needed for continual rotation. Do not take into consideration the thrust force.



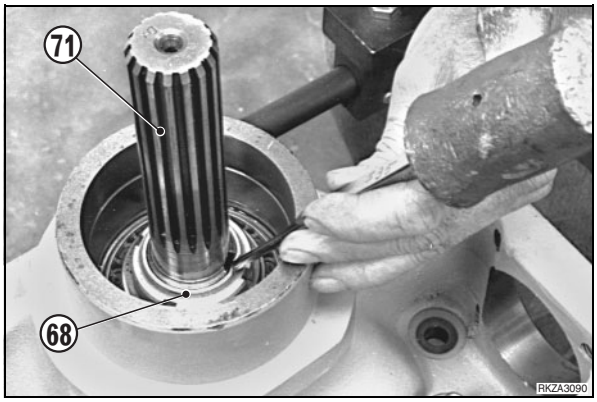
https://truckmanualshub.com/

13 - Using the tools mentioned in point 11, tighten the lock nut (68) taking dynamometric measurements at intervals until the indicated force «**P**» has been obtained.

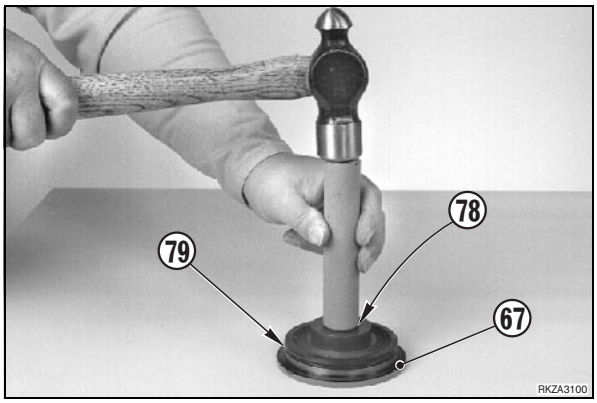
★ If the maximum permissible value is exceeded, a new spacer must be fitted and all the bearing pre-loading operations must be repeated.

P = (9.2–13,7) daN
(1 daN = 10N)

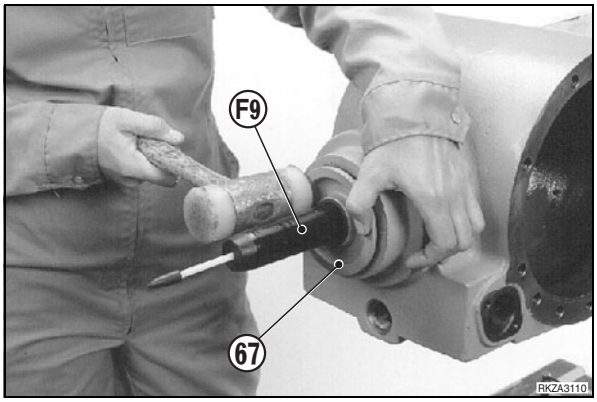
14 - Once the correct pre-loading has been achieved, caulk the lip of the lock nut (68) to correspond to the well of the pinion (71).



15 - Mount the seal ring (78) and the O-ring (79) in the cover (67).



16 - Lubricate the O-ring (79) and the seal ring (78) and use the tool **F9** to mount the cover (67).



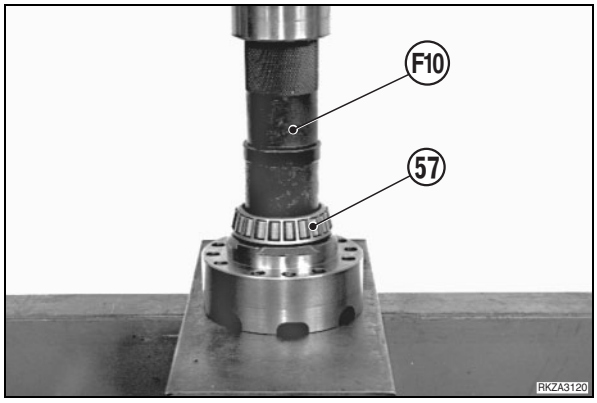
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2. Re-assembling and mounting the differential

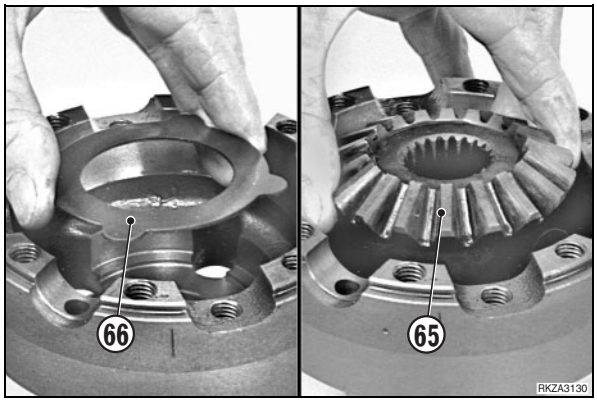
1 - Using the tool **F10**, mount the bearings (57) on the two half boxes.

★ All the components parts of the differential must be lubricated with oil beforehand.

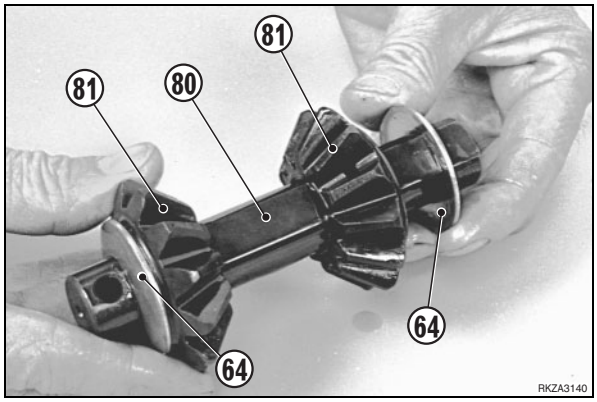
★ Thoroughly decrease the threaded holes in the half box.



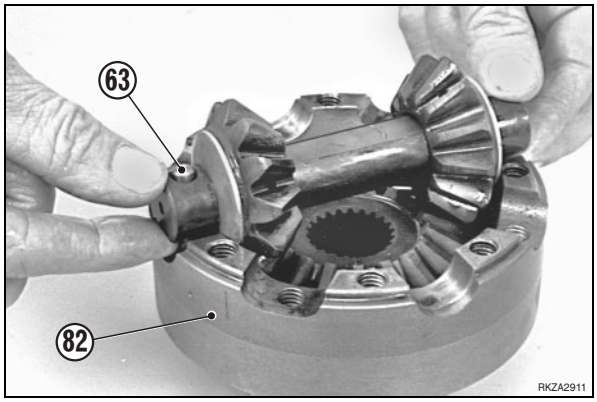
2 - Mount the thrust washer (66) and the planetary gear (65) in the half box with the threaded holes.



3 - Mount the bevel gears (81) and the spherical shim washers (64) on the pinion (80).



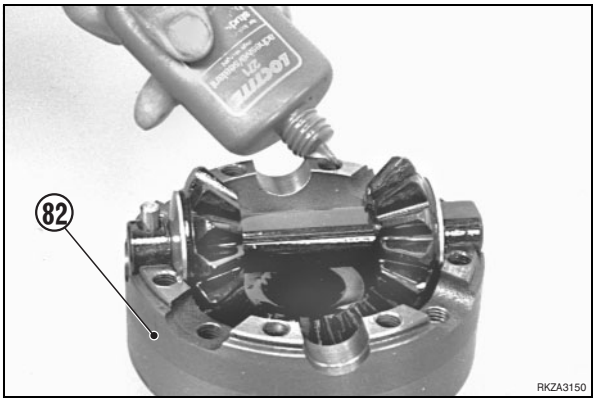
4 - Mount the pin (63) and the complete bevel gear group in the half box (82).



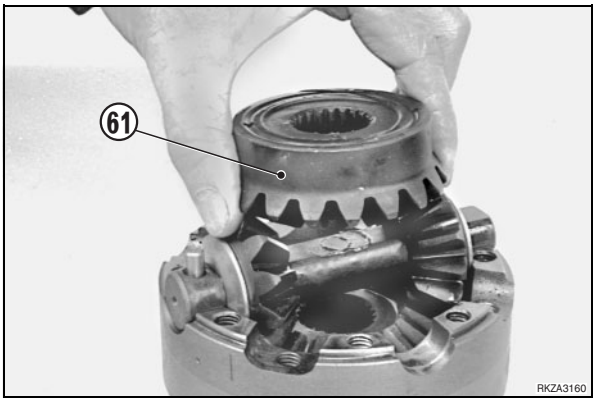
https://truckmanualshub.com/

5 - Coat the threaded holes of the half box (82) with Loctite.

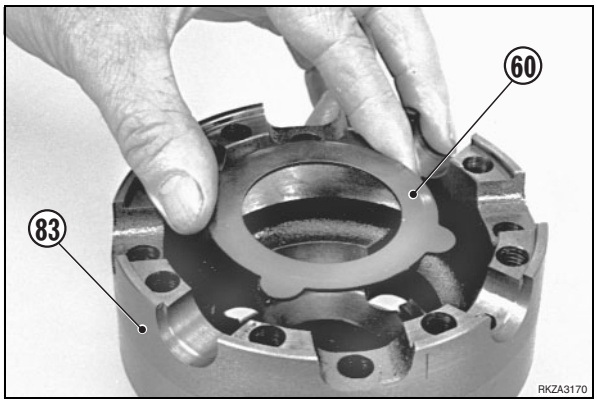
Holes: Loctite 270



6 - Mount the second differential gear (61).

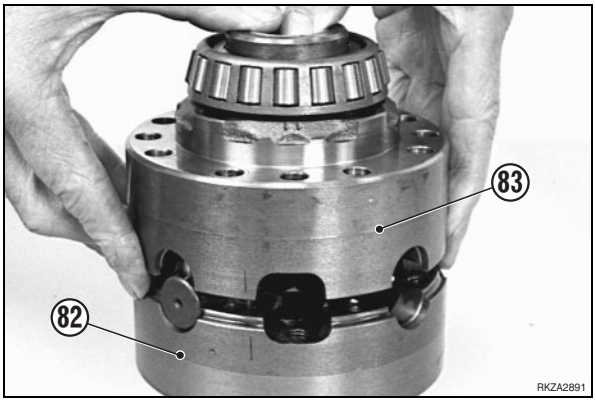


7 - Mount the thrust washer (60) in the other half box.



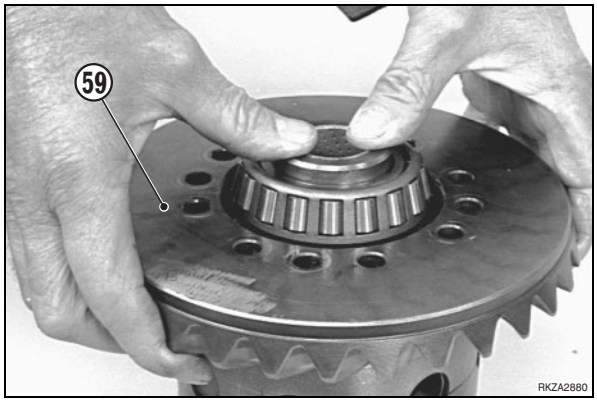
8 - Assemble the two half boxes (82) and (83).

★ Respect the markings.



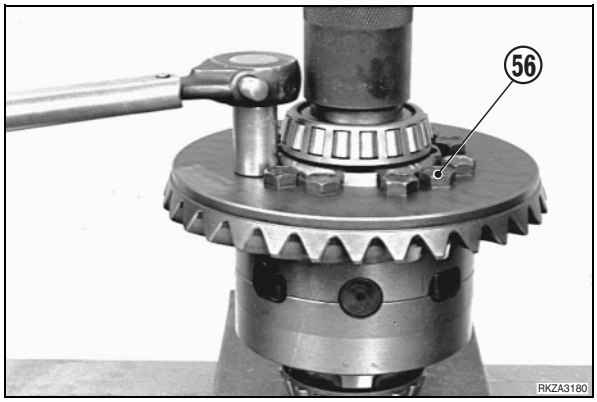
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9 - Make sure that the surfaces are perfectly clean and mount the toothed ring gear (59).



10 - Place the group beneath a press to stop it rotating. Place the screws (58) in the holes and tighten them employing the crosswise alternate method.

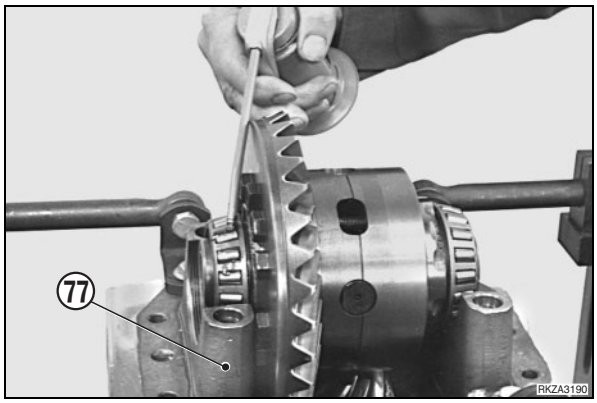
Nm Screws: 95 Nm



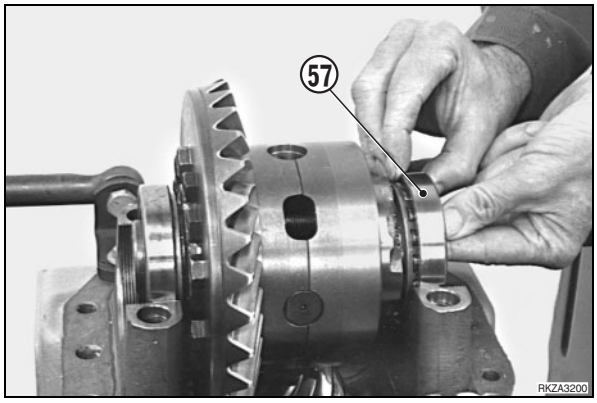
11 - Position the assembled differential group in the differential support (77).

★ The toothed ring gear should face the markings on the support.

★ Lubricate the bearings with gear oil.

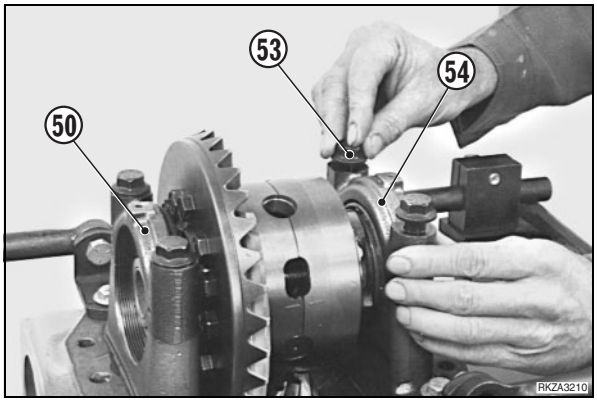


12 - Mount the outer retainers (57).

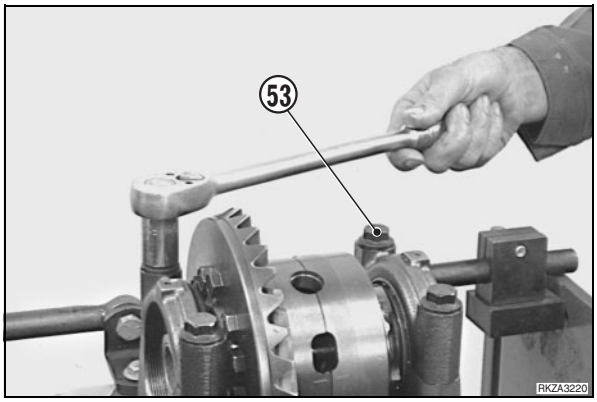


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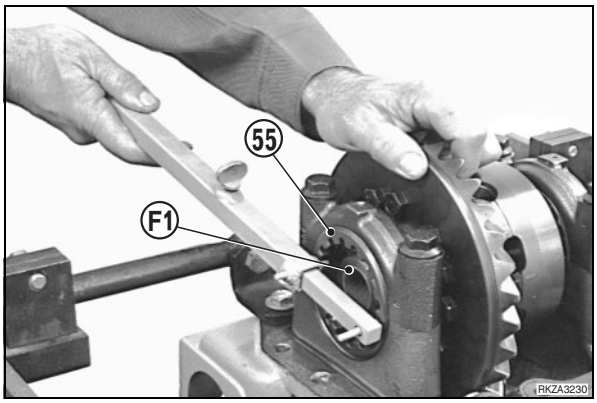
13 - Mount the bearing covers (50) and (54).
★ Respect the markings made while dismantling. Mount the screws (53).



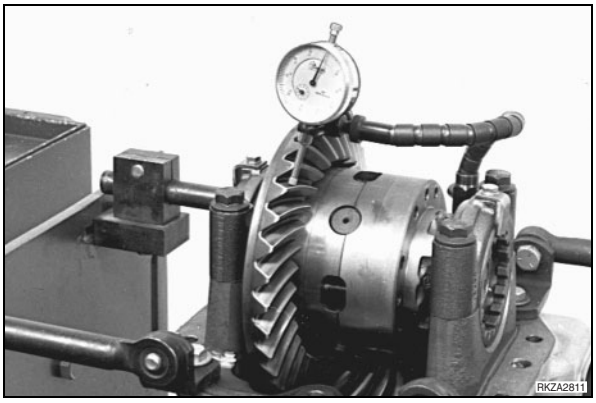
14 - Tighten the screws (53) as much as is necessary to hold in position and catch the outer bearing lock nuts.



15 - Screw down the adjustment lock nuts (55) and tighten them, taking care to leave some clearance between the pinion and the ring bevel gear. Use the tool **F1** to tighten the lock nuts (55).



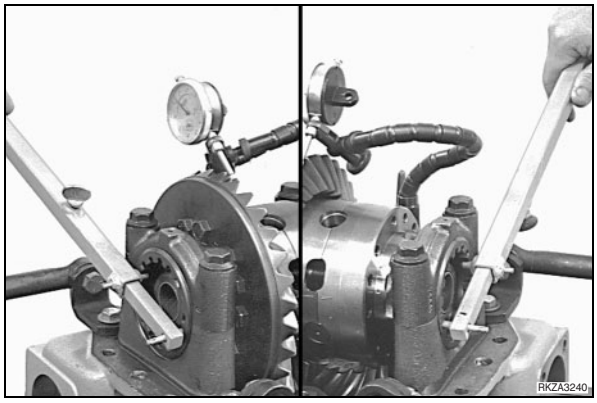
16 - Position a centesimal comparator and measure the clearance at four points at 90°.
★ If differences are found, adjust the clearance where the measurement is lower.
★ Clearance limit: 0.17 – 0.23 mm
★ If neither the pinion nor the ring bevel gear have been substituted, the clearance should be the same as that measured when dismantling.



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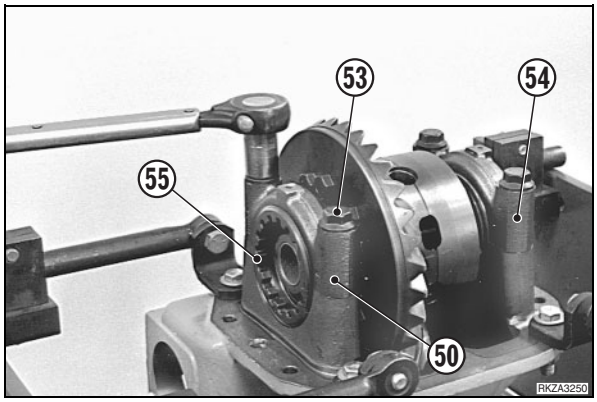
17 - To increase the clearance, loosen the lock nut on the ring bevel gear side by one notch and tighten the opposite lock nut by one notch. To decrease the clearance, reverse these actions.

★ Before measuring the clearance, knock lightly on the bearing covers with a mallet to ensure that they are securely positioned.



18 - When the clearance between pinion and ring bevel gear is correct, tighten the screws (53) of the bearing covers (50) and (54) until the adjustment lock nuts (55) are locked.

★ Final tightening should be performed after the following checks.



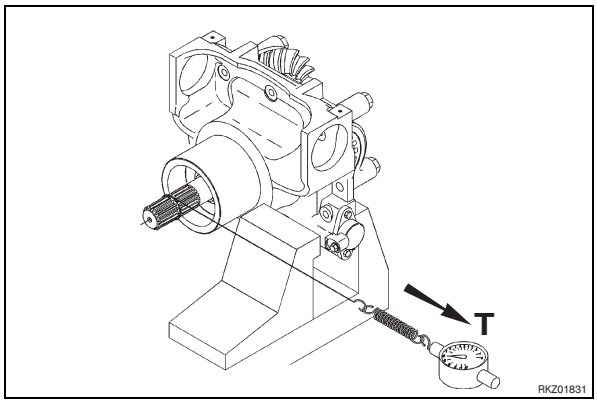
19 - Using the same method employed to check the pinion rotation torque, check the force «**T**» required to rotate the entire group.

★ Force required:

$$T = (P + 3.9) - (P + 5.9)\ daN$$

(P = the force found for the pinion)

★ The force should be that of continual rotation. Do not take the thrust force into consideration.



20 - If the force is not within permissible limits:

a - **Tighten** both the lock nuts to the same extent to **increase** the force «**T**».

b - **Loosen** both the lock nuts to the same extent to **decrease** the force «**T**».

⚠ The clearance between the ring bevel gear and the pinion must remain within permissible limits.

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21 - Check the centering of the contact area using the following procedure:

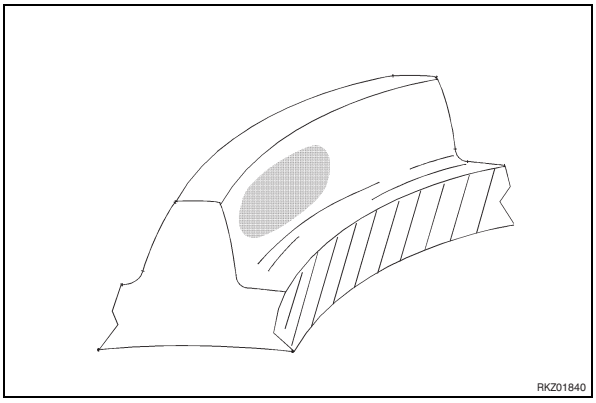
a -Coat both surfaces of the teeth of the ring bevel gear with a marking substance.

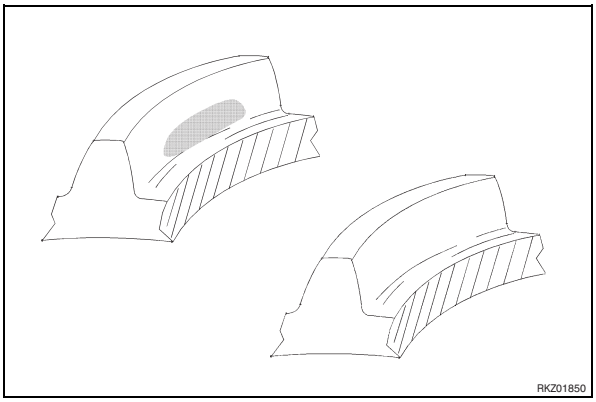
b -Rotate the pinion.

If the contact area is excessive near to the edge of the teeth, the ring bevel gear must be brought closer to the pinion.

If the contact area is excessive on the side of the teeth, the ring bevel gear must be moved away from the pinion.

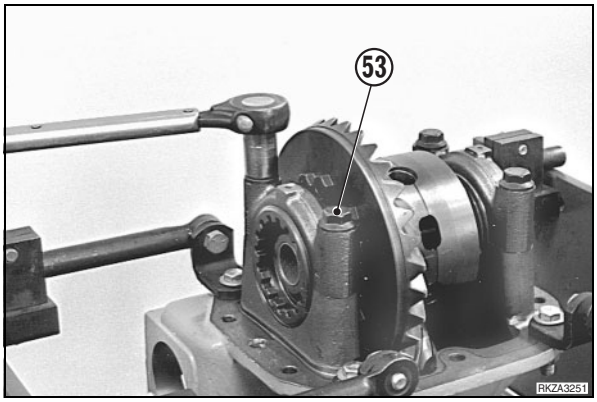
⚠ When moving the ring bevel gear away from the pinion, the lock nuts must be turned to an equal extent in the opposite direction.





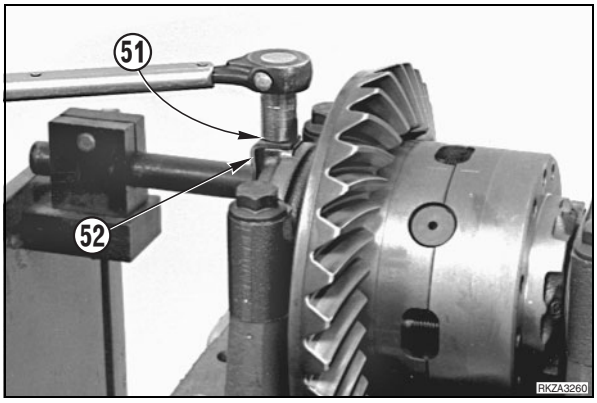
22 - Give the screws (53) a final tightening.

Nm Screws: 266 Nm



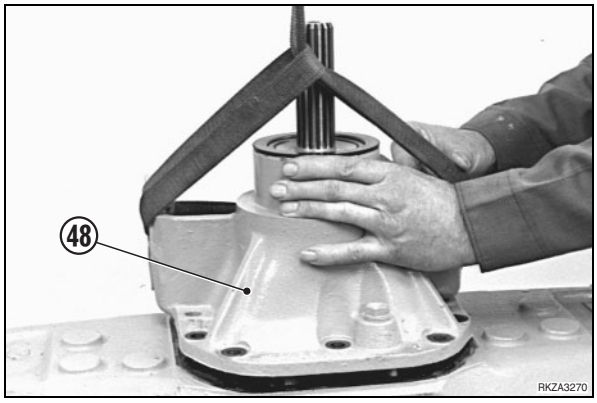
23 - Mount the lock nut retainers (52) and secure them with the screws (51).

Nm Screws: 13 Nm

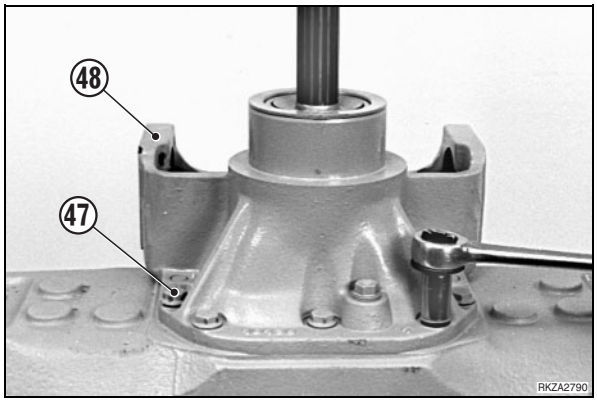


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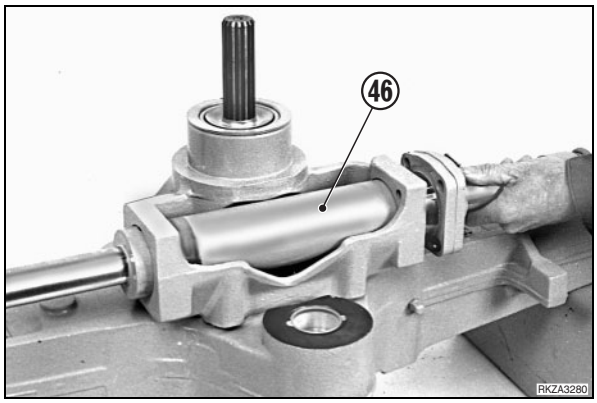
24 - Coat the supporting surface and install the differential group (48).
Surface: Loctite 510



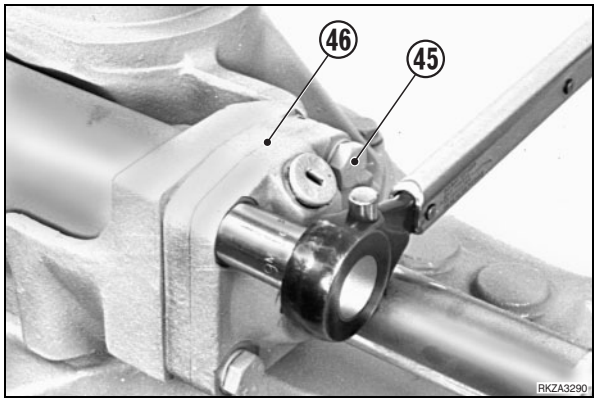
25 - Secure the group (48) with the screws (47).
Nm Screws: 169 Nm
★ Tighten the screws employing the crosswise alternate method.



26 - Mount the steering cylinder (46).

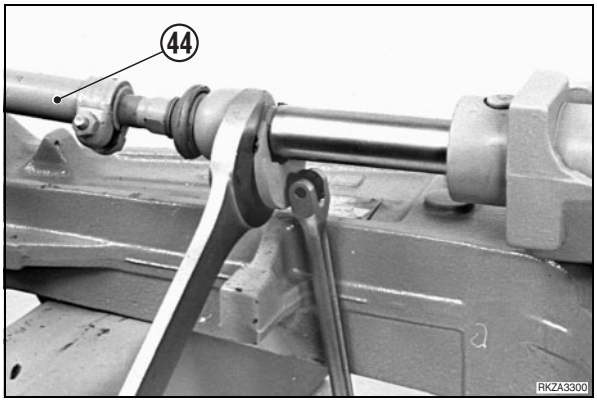


27 - Secure the cylinder (46) with the screws (45).
Nm Screws: 120 Nm

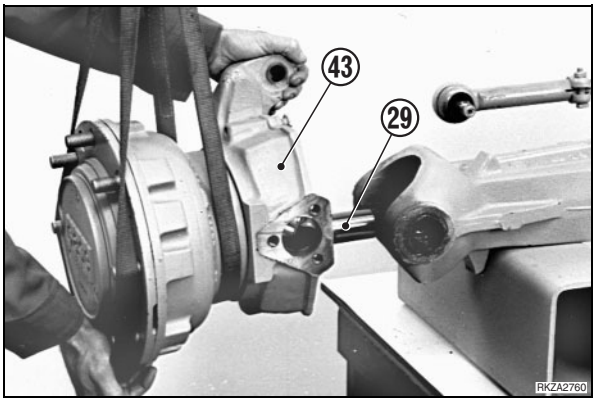


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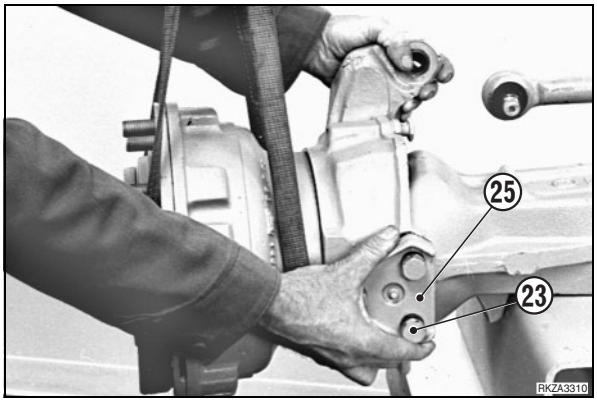
28 - Connect and tighten the RH tie-rod (44).
Nm Tie-rod: 300 Nm



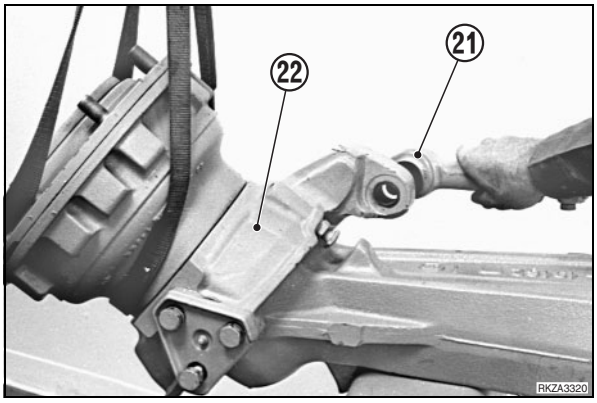
29 - Install the final drive group (43) complete with the axle shaft (29).
★ Take great care not to damage the seal ring inside the axle body.
★ The assistance of a second person may be required to rotate the pinion.



30 - Mount the knuckle pins (24) and (25), the shim (27), the Belleville washers (26) and (28) and the self-locking screws (23).
★ For details, see «4. Installation of the swivel housing».

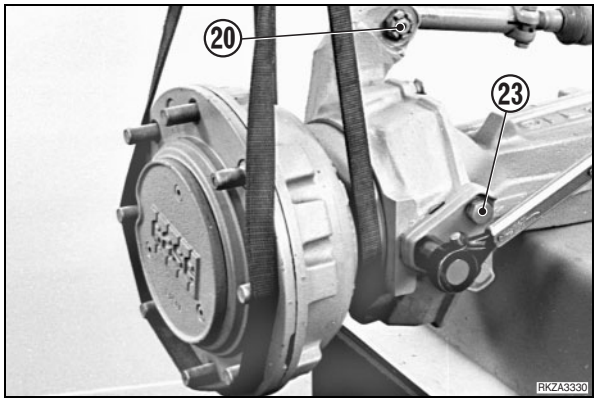


31 - Connect the ball joint (21) to the swivel housing (22) and mount the nut (20).

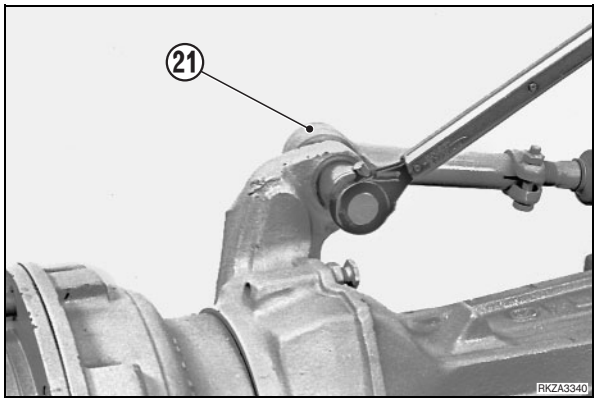


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32 - Secure the knuckle pins with the screws (23).
Nm Screws: 190 Nm

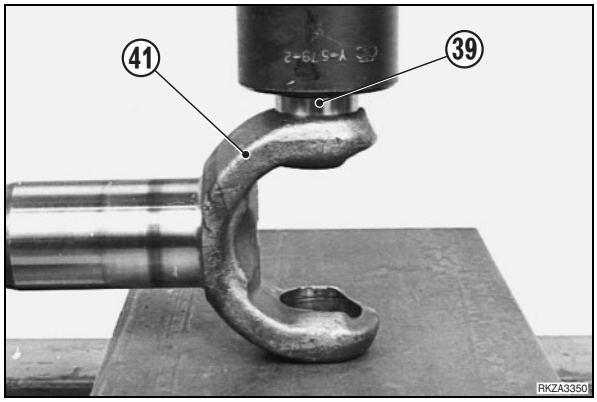


33 - Secure the ball joint (21) with the nut (20).
Nm Nut: 220 Nm

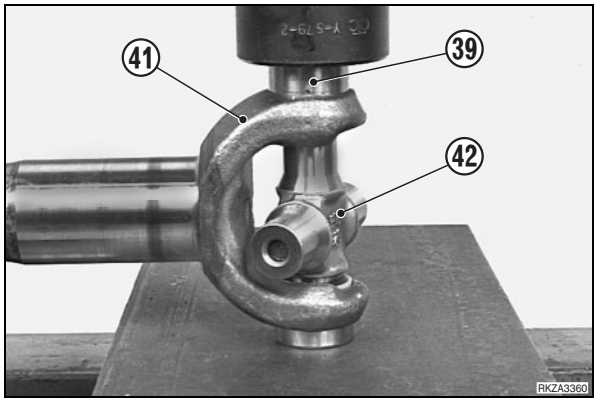


3. Assembling the universal joint

1 - Press a bearing cover (39) into a fork (41).
★ Press until the cover protrudes through the fork by 6 mm.

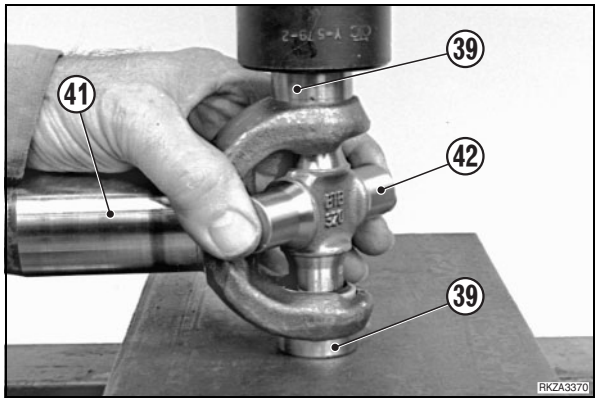


2 - Turn the fork (41) upside down, position the cross-journal (42) by centering the bearing cover assembled during phase 1.
Position the second bearing cover (39) and press it into the fork.
★ Press until the cover protrudes through the fork by 9 mm.

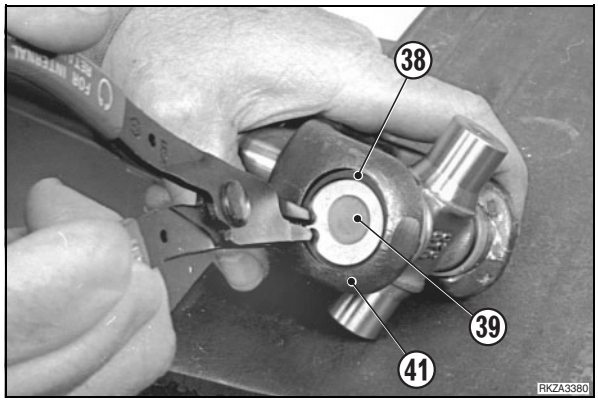


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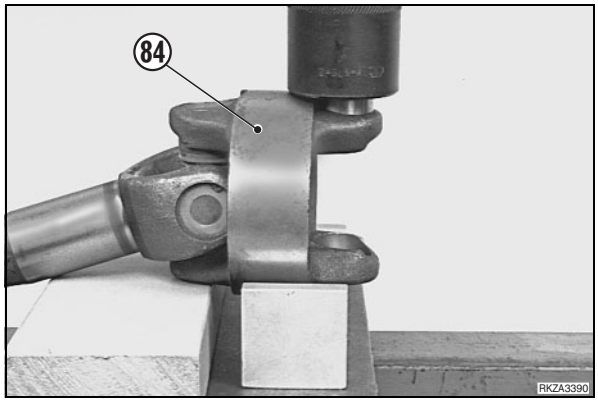
3 - Raise the cross-journal (42) and, keeping it engaged in the two bearing covers (39), press the covers into the fork (41).



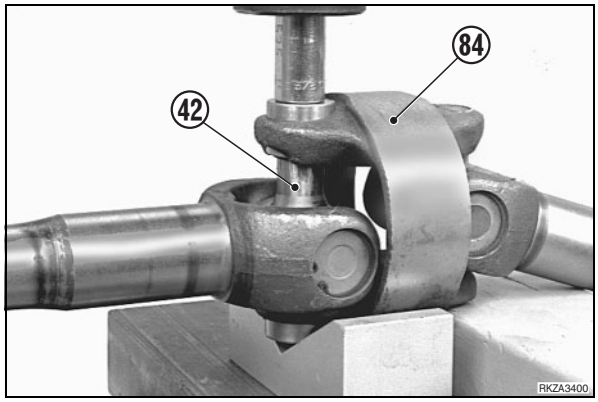
4 - Using the appropriate plunger, press the bearing covers (39) into the fork (41) in order to mount the snap rings (38).
Mount the snap rings.



5 - Use a «**V**»-shaped block to support the joint (84) and press a bearing cover until it is flush with the outer diameter of the joint (84).

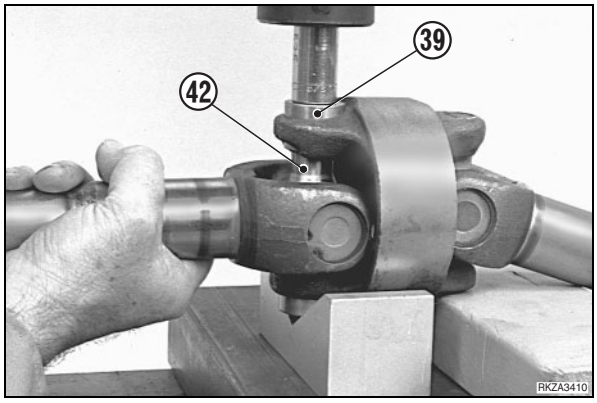


6 - Turn the joint (84) upside down and position the cross-journal (42) by centering the bearing cover mounted during phase 5.
Position the second bearing cover and press it into the joint until it protrudes by 6 mm.

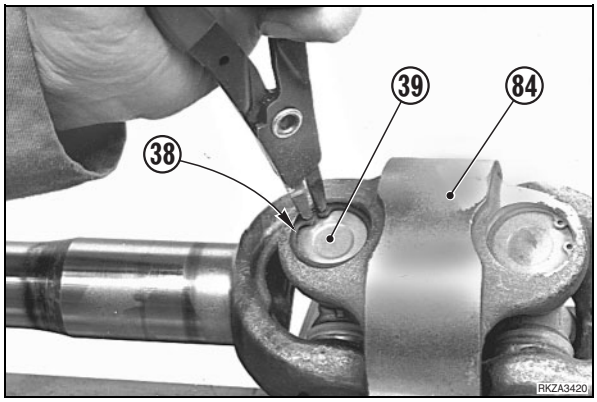


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7 - Raise the cross-journal (42) and, holding it steady in the two bearing covers (39), press the covers into the joint.



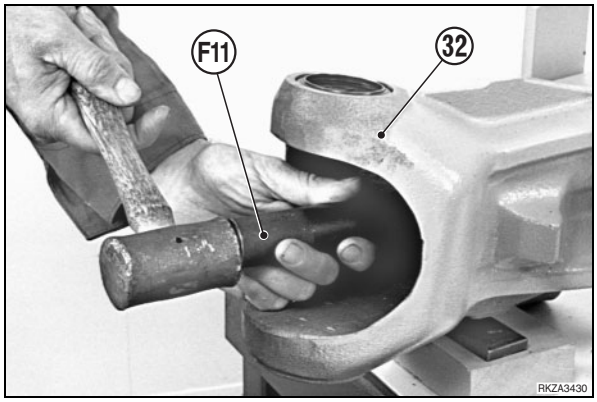
8 - Using the appropriate plunger, press the bearing covers (39) into the joint (84) in order to mount the snap rings (38).
Mount the snap rings.



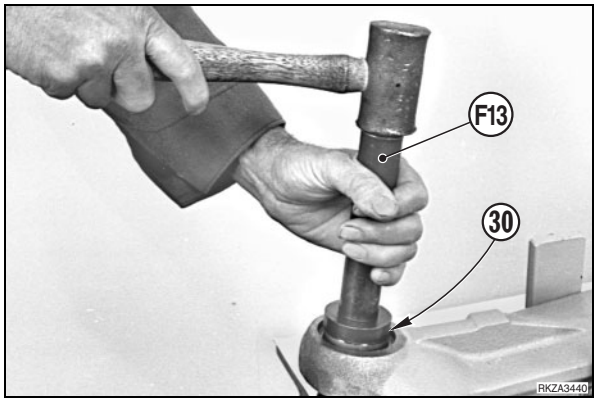
4. Installation of the swivel housing

1 - Use the tool **F11** to mount the bushings (34) and (36) in the axle body (32) and in the swivel housing (22). Insert it to protrude 8 mm beyond the edge of the hole of the axle body and 4 mm beyond the edge of the hole of the swivel housing.
Use the tool **F12** to mount the seal rings (33) and (35) of the axle body (32) and of the swivel housing (22).

★ Check the direction of assembly of the seal rings.

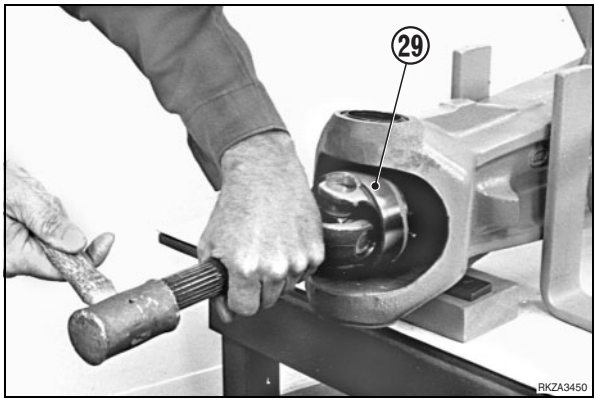


2 - Use the tool **F13** to push the upper bushing (30) home in the axle body.
With the tools **F13** and **F14**, insert the lower bushing (37).

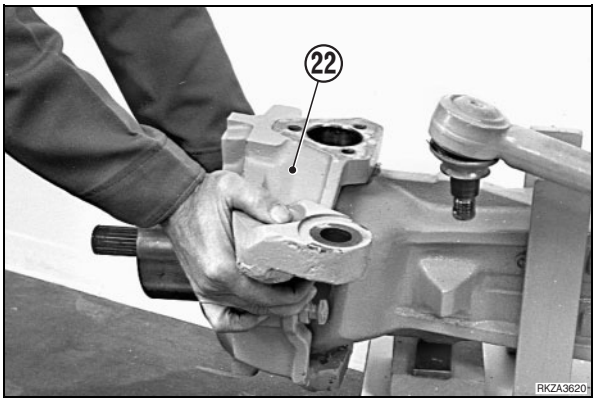


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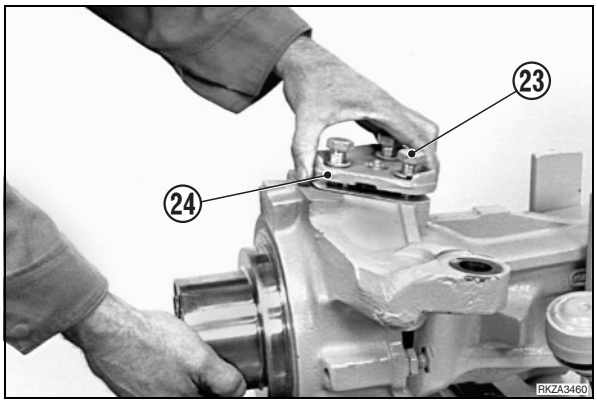
3 - Install the axle shaft (29).
★ Take great care not to damage the seal ring (33).



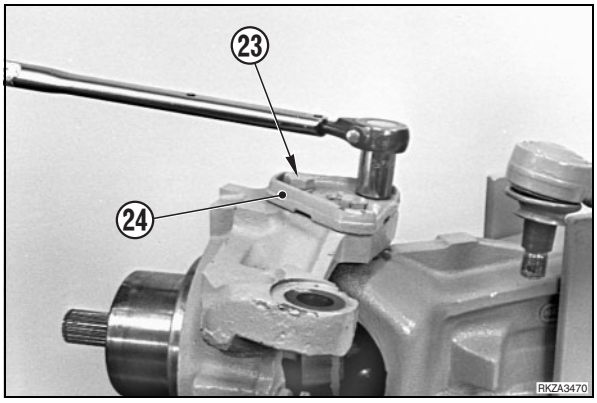
4 - Install the swivel housing (22).
★ Take great care not to damage the seal ring (35).



5 - Mount the shim (27), the Belleville washer (26), the upper knuckle pin (24) and the self-locking screws (23).



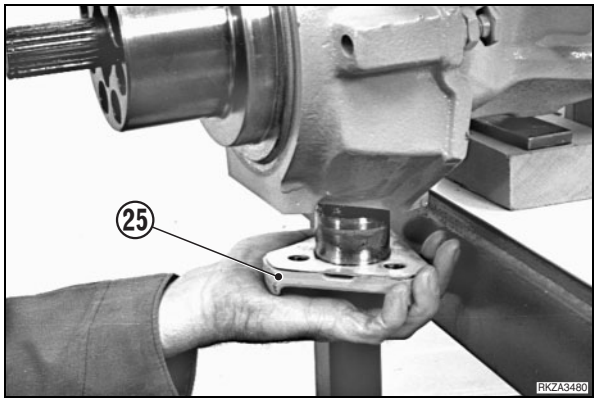
6 - Tighten the screws (23) to secure the knuckle pin (24).
Nm Screws: 190 Nm



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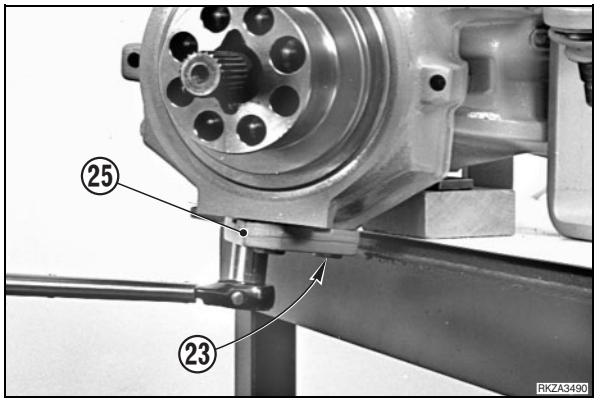
7 - Install the lower knuckle pin (25), the Belleville washer (28) and the self-locking screws (23).

★ If the spherical swivel housing has been removed, use a press to mount the new swivel housing before installing the knuckle pin (25).



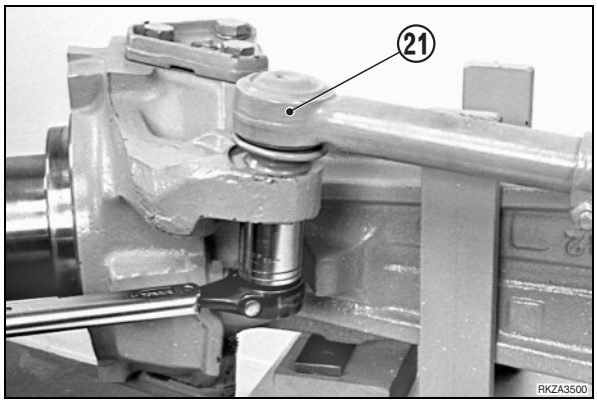
8 - Tighten the screws (23) to secure the knuckle pin (24).

Nm Screws: 190 Nm



9 - Engage the ball joint (21) and tighten the nut (20) to hold it in place.

Nm Nut: 220 Nm

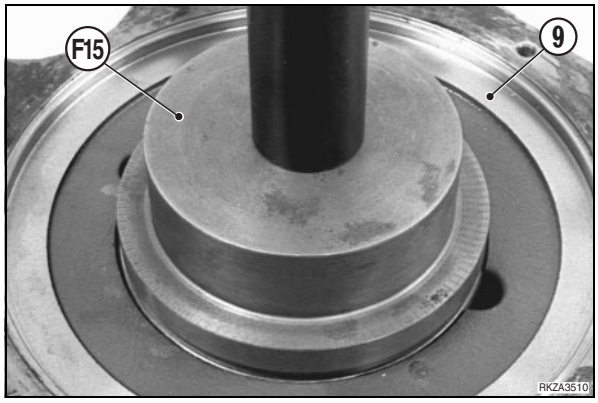


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5. Assembly of the final drive

1 - If the retainers (10) and (11) have been removed, use the tool **F15** to install them in the hub (9).

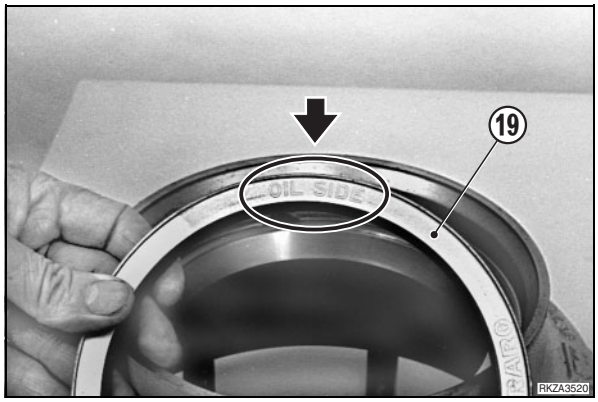
★ Check the orientation.



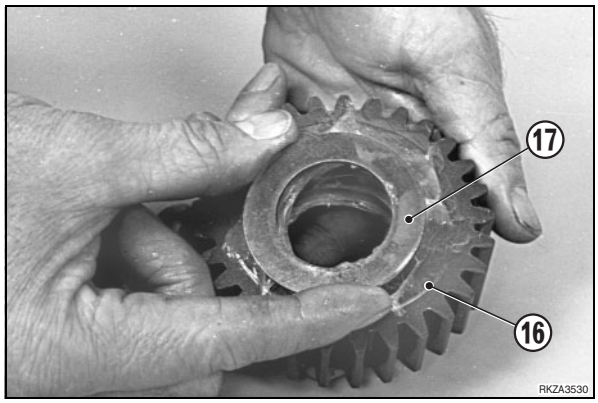
2 - Use the tool **F16** to install the new seal (19).

★ The words «OIL SIDE» should face towards the inside of the hub.

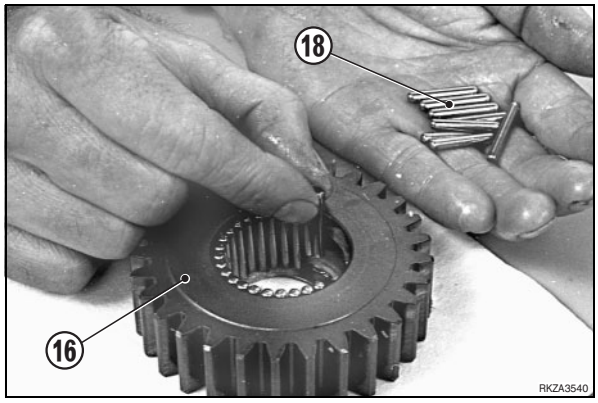
★ Take care not to damage the seal (19).



3 - Coat ASL800050 grease on one side of the bevel gears (16) and inside the hole, and install the retainer (17).



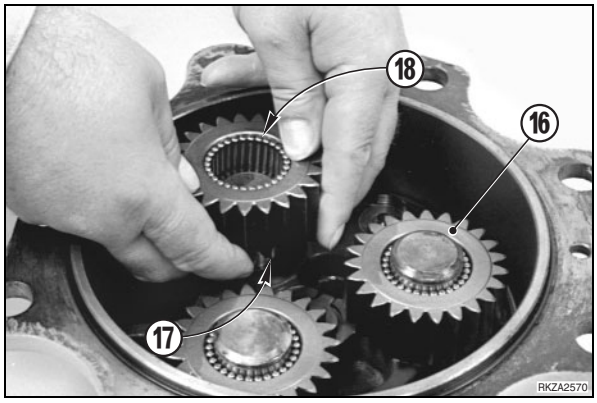
4 - Turn the bevel gears upside down (16) and insert eighteen roller bearings (18) into each gear.



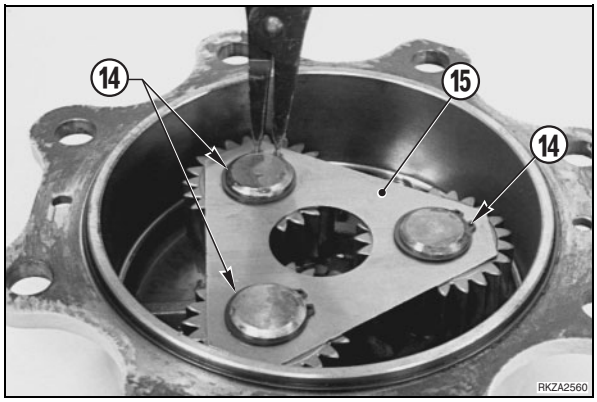
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5 - Mount the gears (16) complete with roller bearings (18) and ring (17) on the shafts of the planetary carriers.

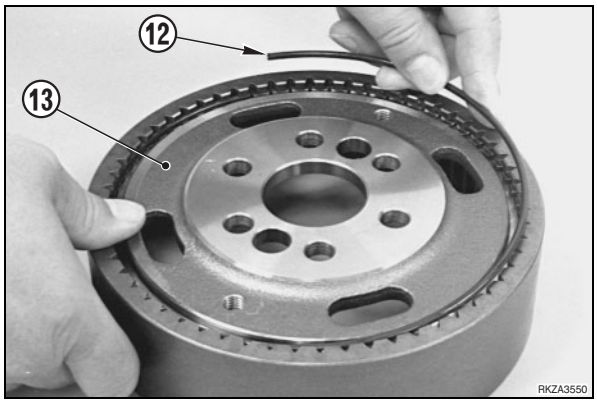
★ The retainer should touch the planetary carriers (2).



6 - Mount the retainer of the planetary carriers (15) and hold it in position with snap rings (14).

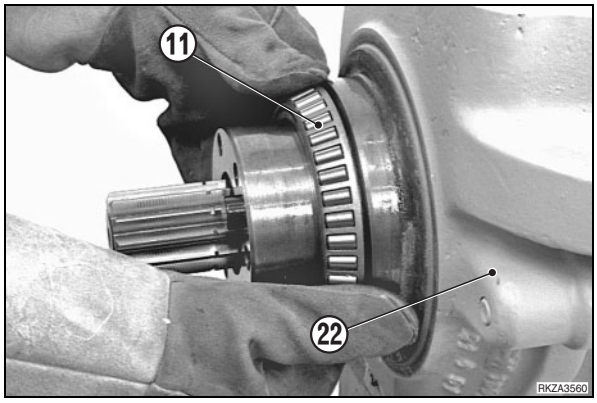


7 - Mount the ring bevel gear carrier (13) in the gear and hold it in position with a snap ring (12).



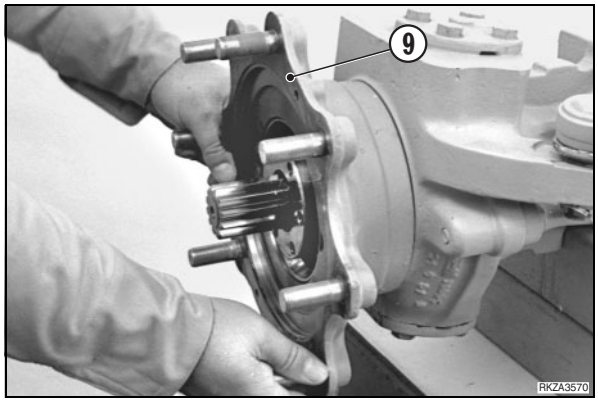
8 - Heat the internal bearing (11) to approx. 120 °C and mount it in the swivel housing (22).

★ Do not heat beyond 149 °C.



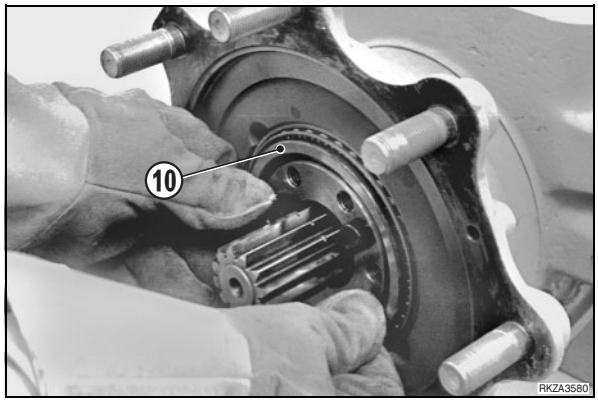
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9 - Lubricate the bearing (11) with oil and mount the hub (9).



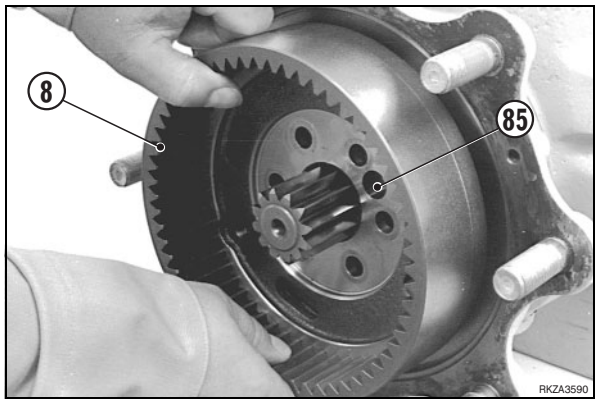
10 - Heat the external bearing (10) to approx. 120 °C and mount it on the swivel housing (22).

★ Do not heat beyond 149 °C.



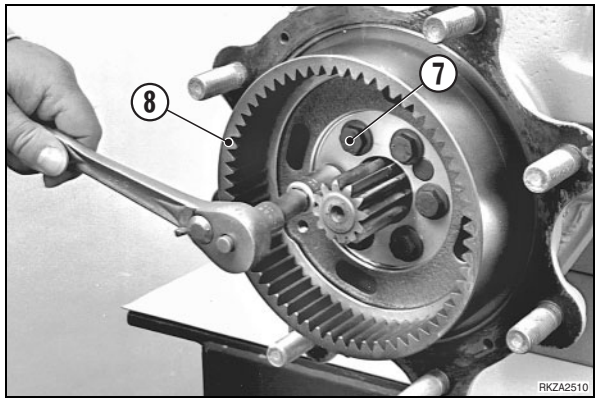
11 - Mount the complete ring bevel gear (8), aligning the holes with the bushings (85).
Use the tool **F17** to push the bushings (85) home.

★ Insert the bushings a little at a time, employing the crosswise alternate method.



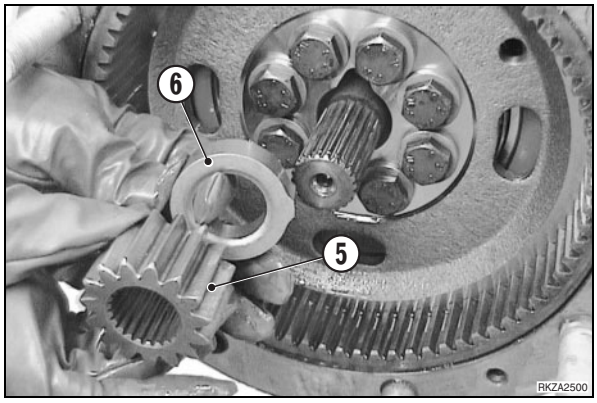
12 - Insert the screws (7) and tighten them as much as possible, employing the crosswise alternate method.

Nm Screws: 230 Nm

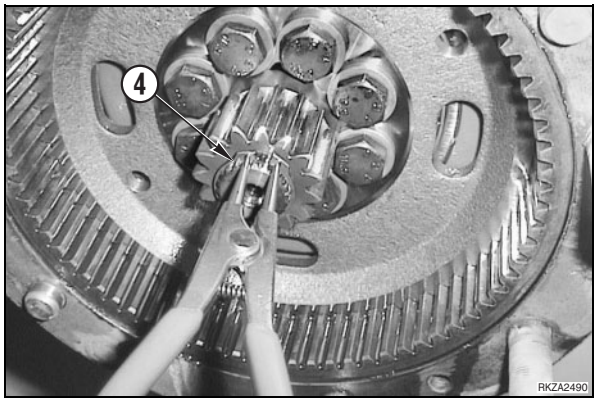


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13 - Mount the spacer (6) and the pinion (5) on the shaft.



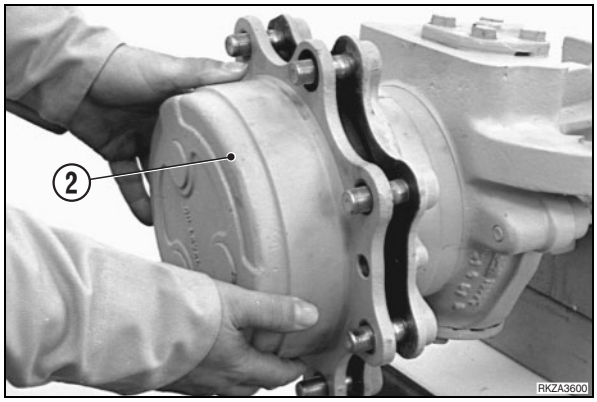
14 - Mount the snap ring (4).



15 - Thoroughly decrease the coupling surfaces and coat the hub surfaces with liquid sealant.

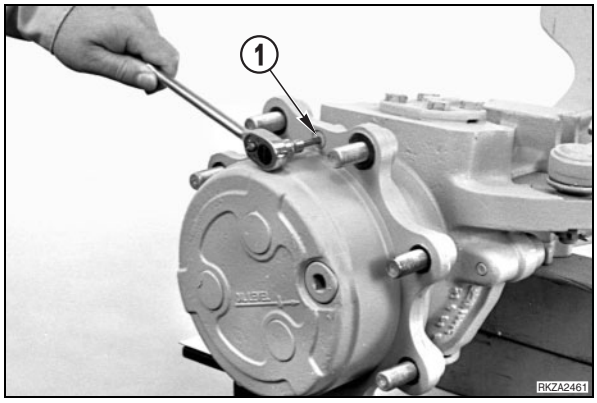
Hub: Loctite 510

Mount the complete planetary carrier (2).



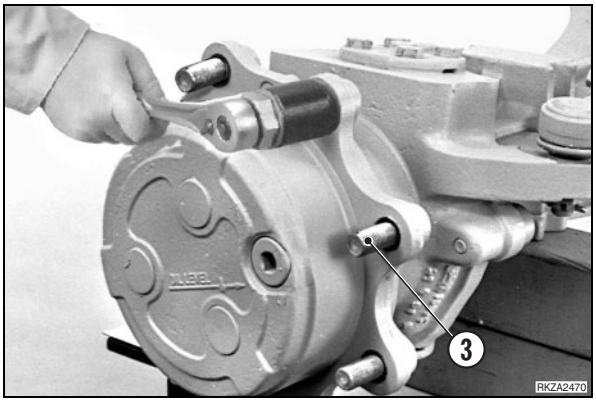
16 - Mount the screws (1) that secure the planetary carrier.

Nm Screws: 80 Nm



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17 - Mount the shoulder studs (3) and tighten them.
Shoulder studs: Loctite 542
Shoulder studs: 70 Nm



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REMOVAL OF THE REAR AXLE

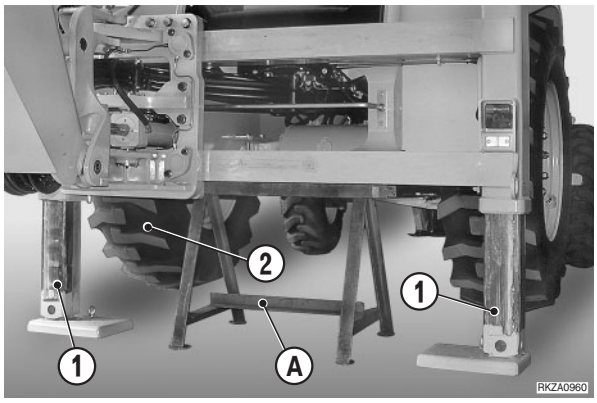
1 - Lower the backhoe outriggers (1) and force them downwards in order to raise the rear wheels (2) by approx. .... cm.

2 - Prepare a safety stand «**A**», approx. 65 cm high, beneath the backhoe chassis. Pull up the outriggers until the machine is resting on the stand «**A**».

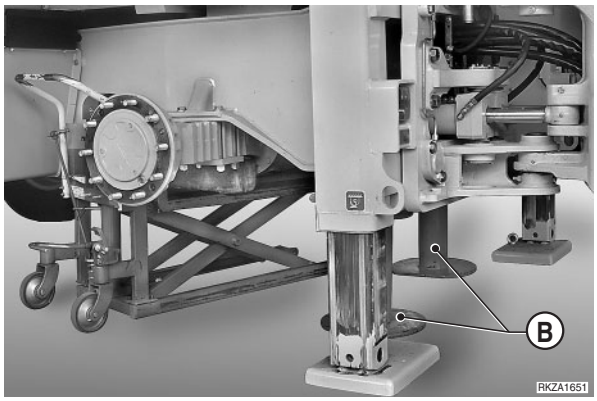
3 - Stop the engine and take off the rear wheels (2).

※1

kg Wheel: 163 kg

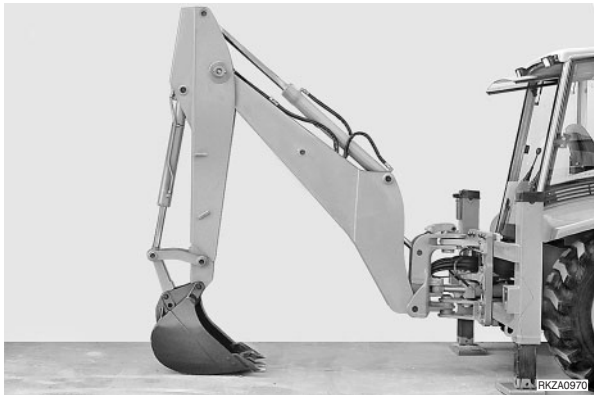


4 - Start engine, remove the stand "**A**" and set two stands "**B**" 50 cm high under the frame.
Pull up the outriggers until the machine is resting on the stands "**B**".



5 - For safety's sake, rest the backhoe bucket with its back on the ground, keeping the arm vertical. Also rest the front bucket on the ground.

5 - Stop the engine and completely release residual pressures from all the circuits. (For details, see «20.TESTING AND ADJUSTMENTS»).



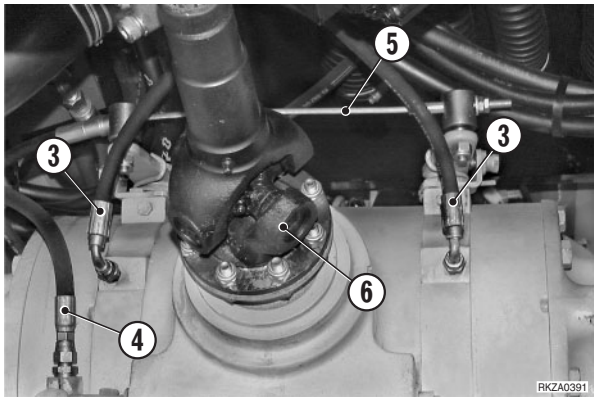
7 - Disconnect the working brake hoses (3) and the differential lock tube (4) from the axle. ※2

★ Plug the pipes to prevent entry of impurities.

8 - Disconnect the parking brake command cable (5). ※3

9 - Disconnect the cardan shaft (6) from the rear axle.

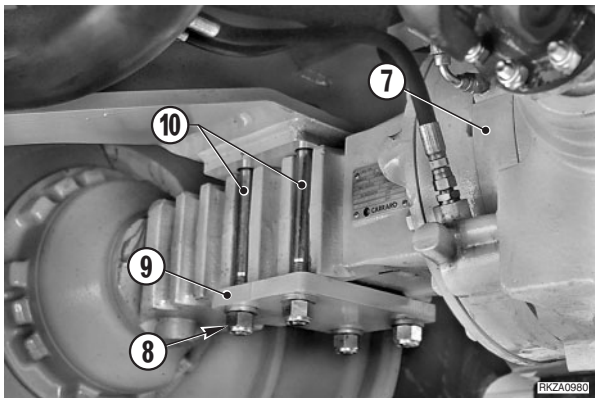
※4



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10 - Partially loosen the self-locking nuts (8) in order to eliminate the tightening torque and thus facilitate subsequent dismantling. ※5

★ Loosen the nuts in criss-cross sequence.



11 - Place a jack «**C**» and some blocks beneath the axle (7). Raise the jack until the blocks can be forced under the arms of the axle.

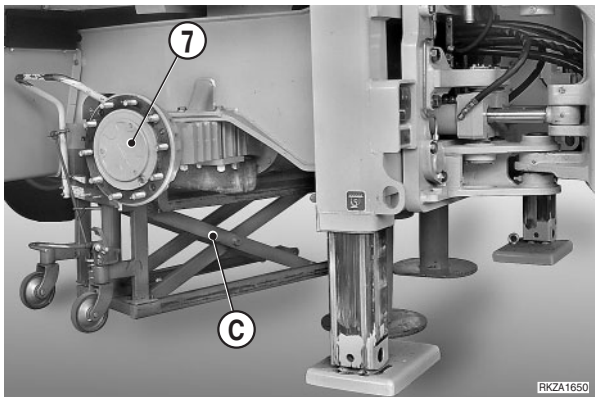
★ Leave free the nuts (8) and plates (9) that secure the axle.

★ It should be possible to lower the jack by approx. 20 cm.

12 - Remove the self-locking nuts (8), the plates (9) and the screws (10).

12 - Lower the jack until the axle (7) is disengaged from the chassis.

13 - Extract the entire axle (7).



INSTALLATION OF THE REAR AXLE

- To install, reverse the removal procedure.

※1

Nm Wheel nuts: 500±9.8 Nm

※2

★ Bleed the air from the braking circuits. (See «20. TESTING AND ADJUSTMENTS»).

※3

★ Adjust the stroke of the parking brake lever. (See «20. TESTING AND ADJUSTMENTS»).

※4

Nm Self-locking nuts on axle side: 70 Nm

Nm Screws on gearbox side: 70 Nm

※5

Nm Self-locking nuts for securing axle: 570 Nm

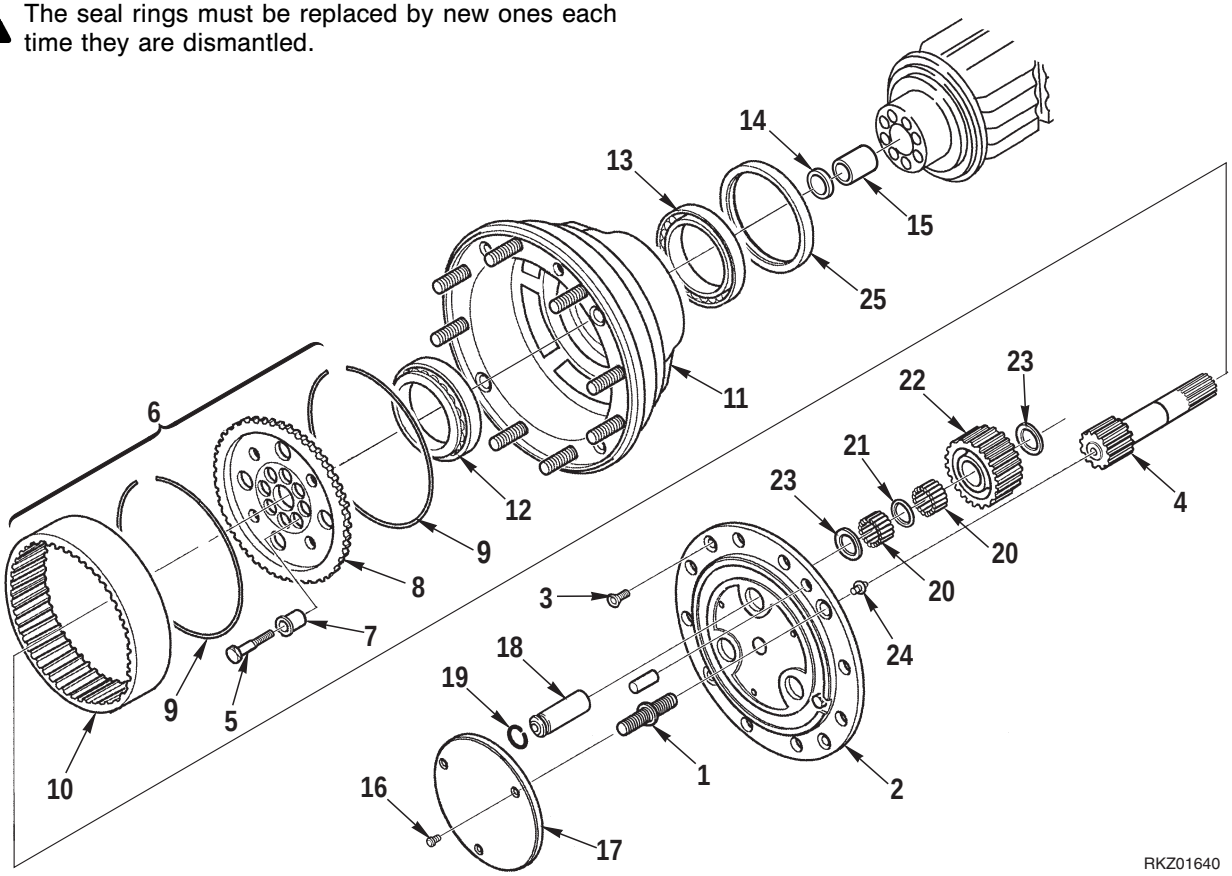
★ Tighten in two stages, using the criss-cross method.

1 - Check the level in the tank and start the engine.

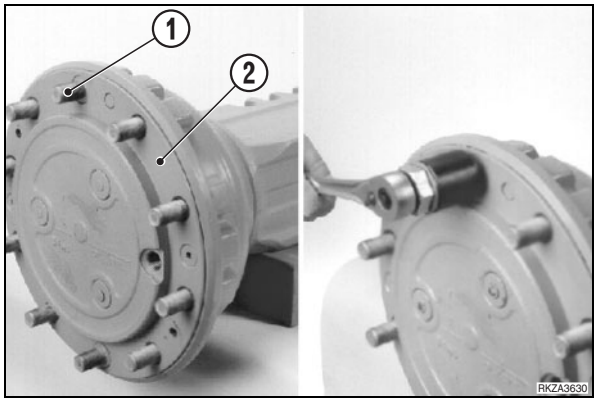
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DISASSEMBLY OF REAR AXLE FINAL DRIVE

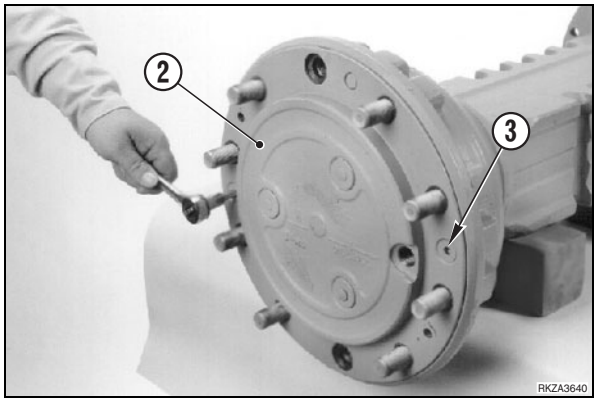
⚠ The seal rings must be replaced by new ones each time they are dismantled.



1 - Apply a stud bolt puller and remove the two shoulder studs (1) that secure the planetary carrier (2).

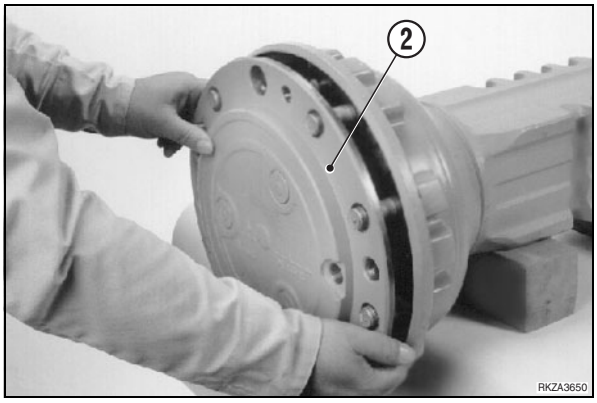


2 - Remove the two screws (3) that secure the planetary carrier (2).

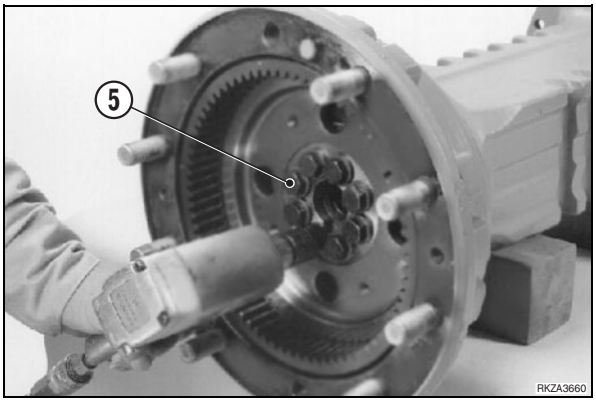


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3 - Remove the planetary carrier (2) and the half-axles (4).

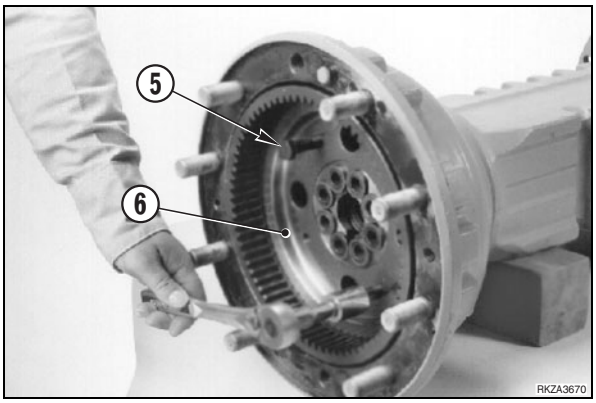


4 - Loosen and take out the eight screws (5).

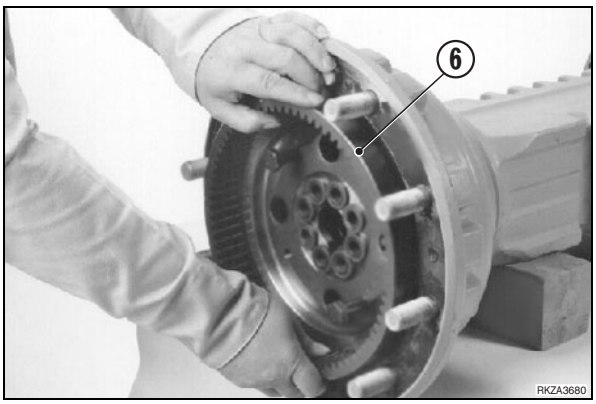


5 - Screw into two threaded holes in the planetary carrier (6) the two screws (5) removed in the preceding phase.
Tighten the screws alternately in order to extract the ring bevel gear group (6) from the bushings (7).

★ If extraction proves difficult, use four screws (5).

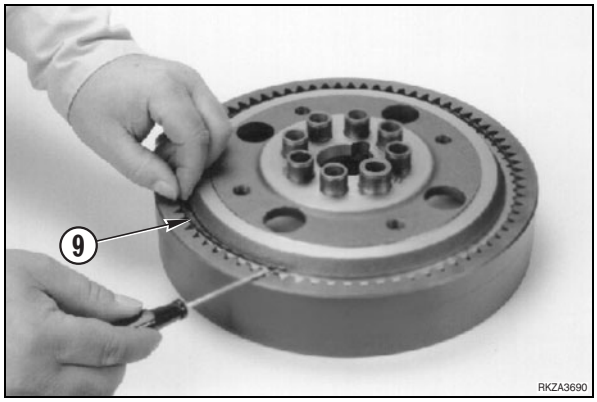


6 - Remove the complete planetary group (6).

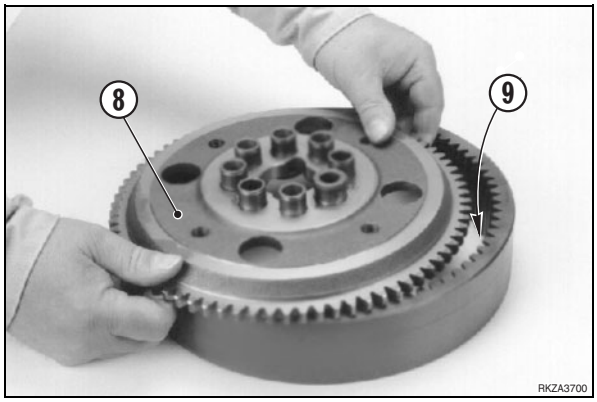


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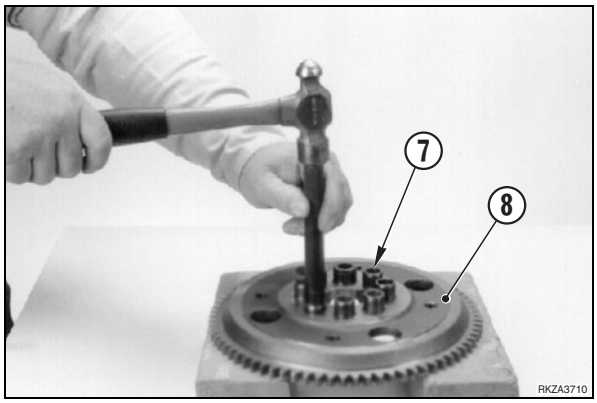
7 - Remove the outer snap ring (9).



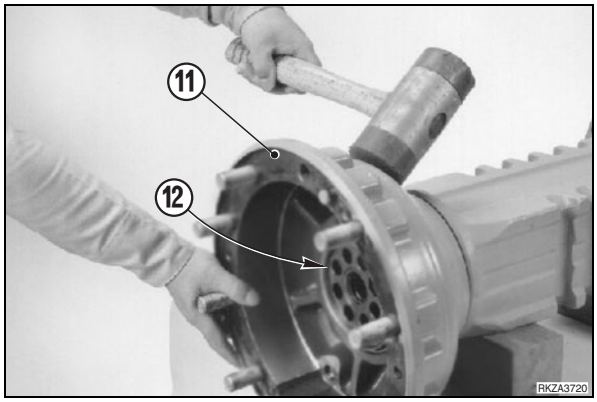
8 - Remove the planetary carrier (8) and the inner snap ring (9).



9 - Using a plunger with appropriate guide, extract the bushings (7) from the planetary carrier.

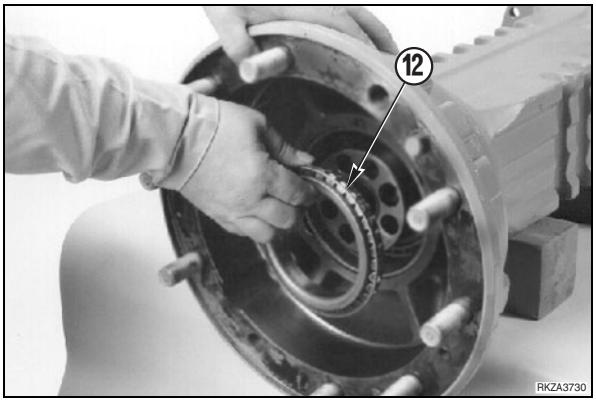


10 - Use a plastic mallet to strike some blows all round the circumference of the wheel hub (11) in order to loosen the outer bearing (12).

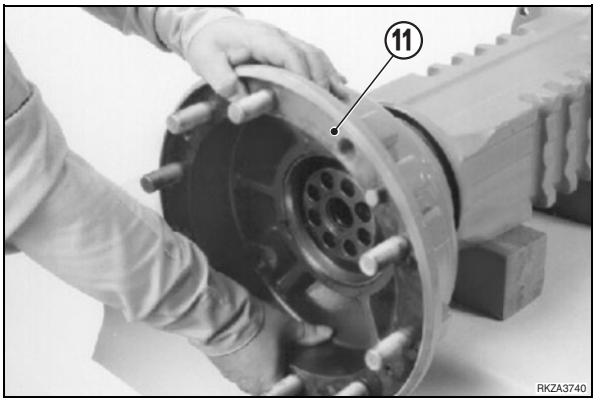


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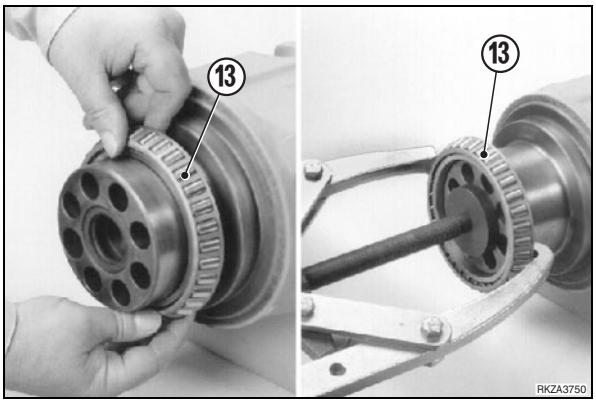
11 - Remove the outer bearing (12).



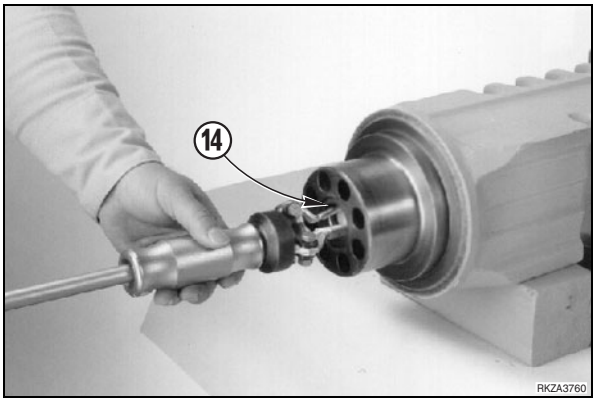
12 - Remove the wheel hub (11).



13 - Remove the inner bearing (13).
★ If necessary use a puller.

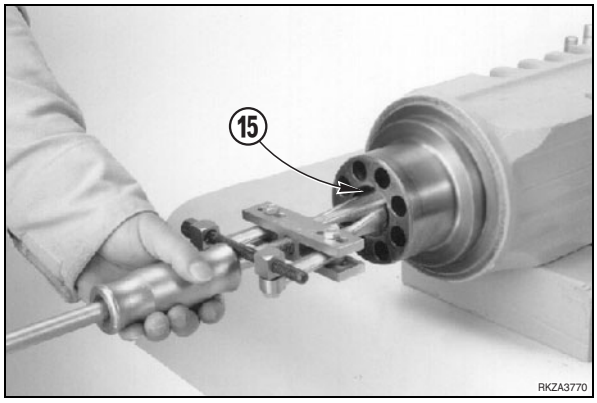


14 - Use a puller to remove the seal ring (14).

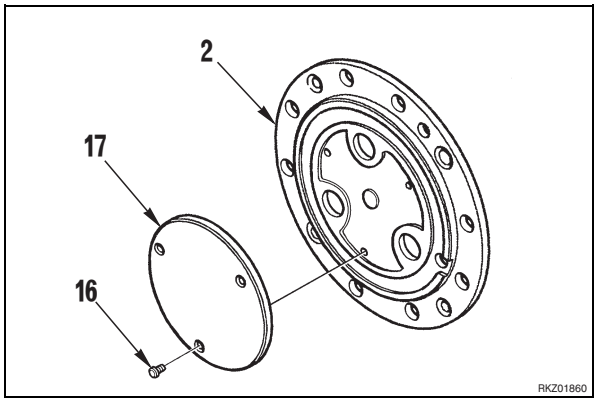


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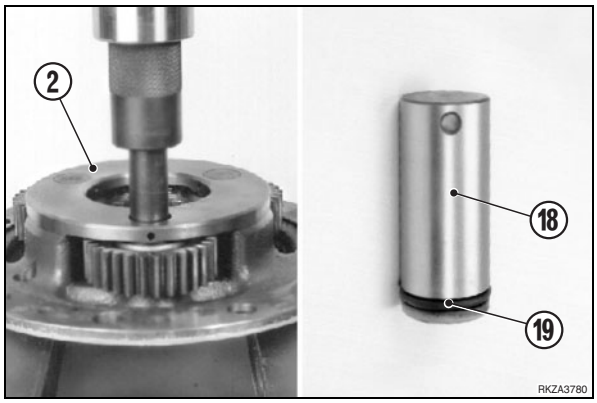
15 - Use a puller to remove the bronze bushing (15).



16 - Remove the screws (16) and then the cover (17) from the planetary carrier (2).

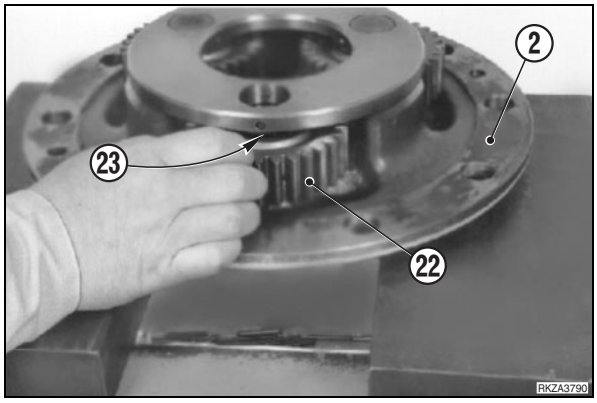


17 - Place the planetary carrier (2) beneath a press and, using an appropriate plunger, remove the shaft (18), complete with O-ring (19).



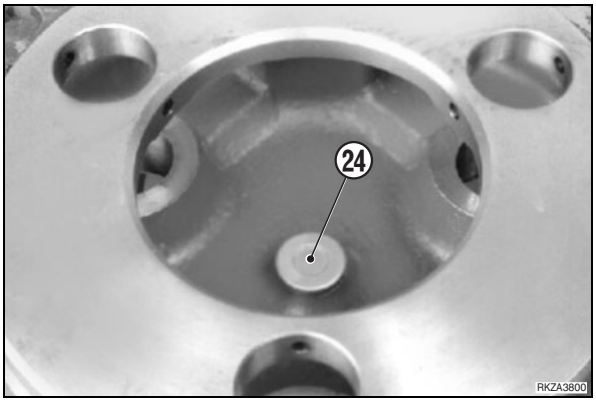
18 - Beneath the planetary carrier (2) place a container in which to catch the roller bearings (20) and the retainer (21). Take out the bevel gear (22) and the upper and lower shims (23).

★ Repeat these last two operations for all the planetary gears.

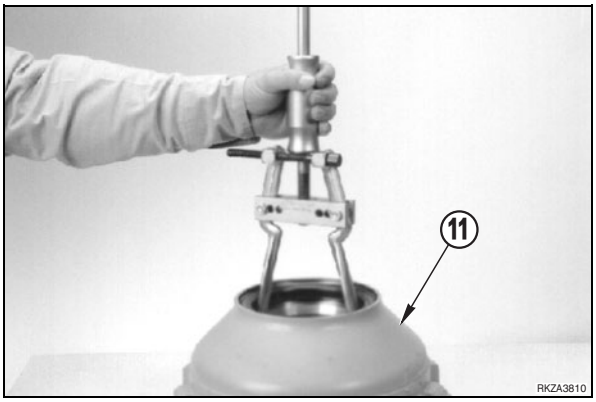


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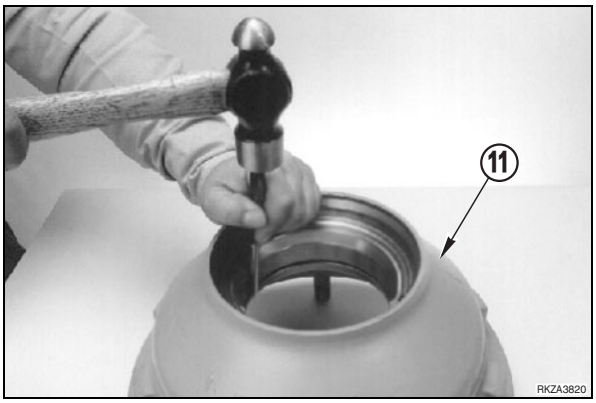
19 - **Only if substitution is necessary.**
Remove the shim (24).



20 - Use a puller to remove the seal ring (25) from the wheel hub (11).



21 - If the bearings (12) and (13) need replacing, remove the outer rings from the wheel hub (11).

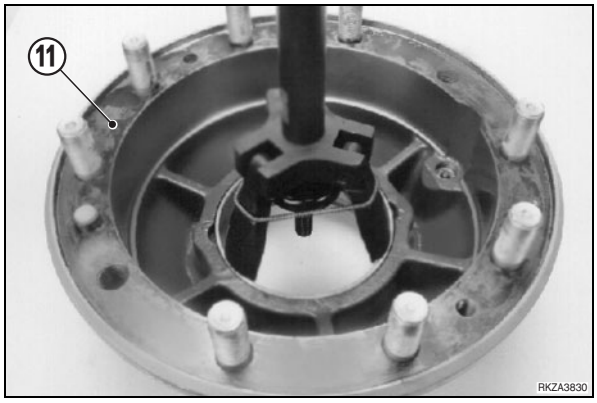


NOTE.
1 - Thoroughly clean all parts with a light solvent.
2 - Throw away all seals and O-rings.
3 - Carefully check bearings, bushings, gears and half-axles. If any pitting, scratching, flattened areas, general wear and tear or any other damage is found, replace the parts.

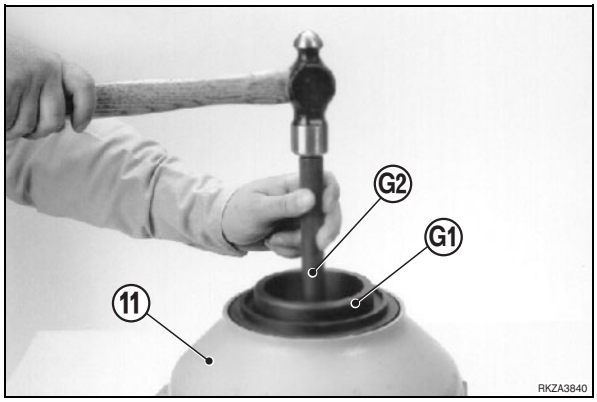
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ASSEMBLY OF REAR AXLE FINAL DRIVE

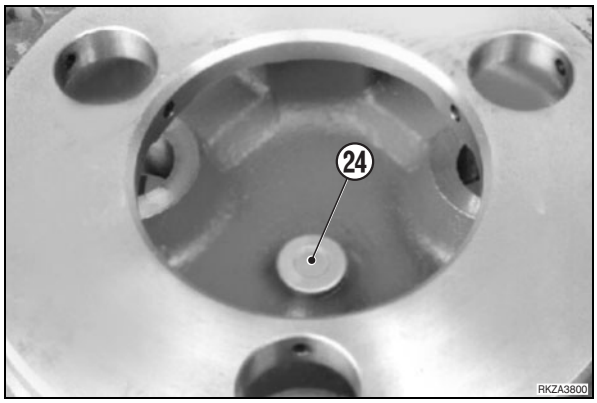
1 - Mount the outer rings of the bearings (12) and (13) in the wheel hub (11).
(Use a universal tool for bearing rings, or any other suitable tool).
★ Check the orientation.



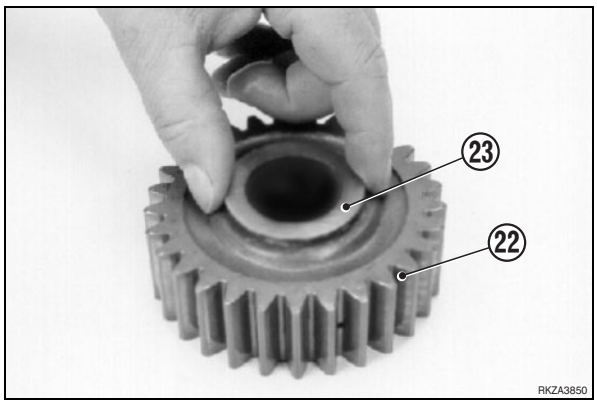
2 - Use tools **G1** and **G2** to mount the seal ring (25) in the wheel hub (11).
★ The side on which is written «OIL SIDE» should face towards the inside of the wheel hub.
★ The seal ring (25) must rest on the shoulder. Any further pressure might damage the ring.



3 - **Only if the shim has been moved**
Press the shim (24) into the seating of the planetary carrier (2).

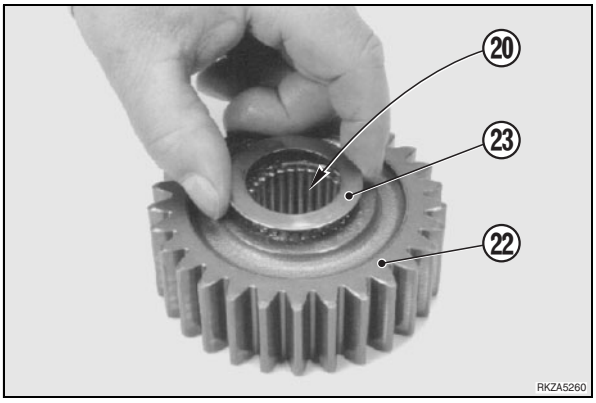


4 - Coat the hole and the shim part of the gears (22) with a layer of ASL800050 grease and place a shim (23) in position.
★ Make sure that the shim (23) has adhered to the gear (22).

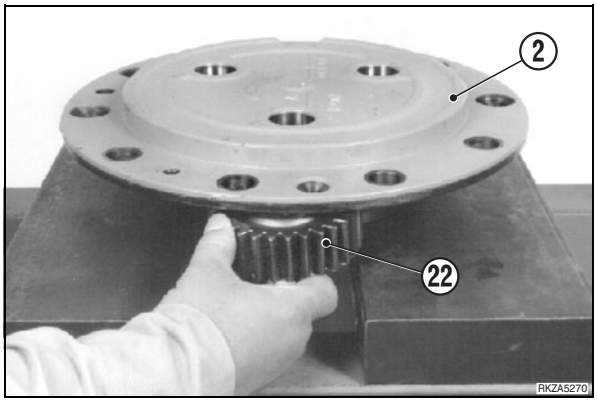


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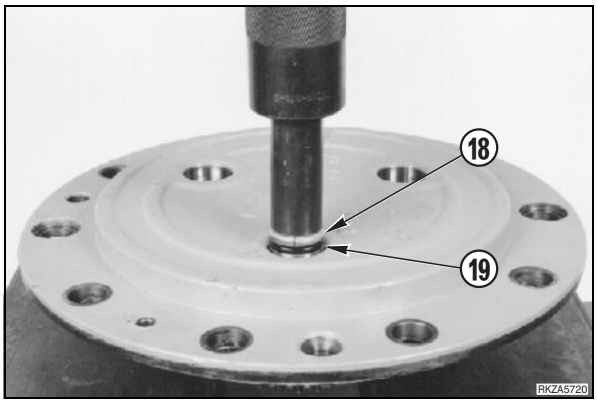
5 - Turn the planetary gear (22) upside down and mount the first set of roller bearings (20) in the hole.
Mount the bearing ring (21), coat the upper part and the shim surface with ASL800050.
Mount the second set of roller bearings (20) and the shim (23).
★ Make sure that the roller bearings have adhered to the hole.



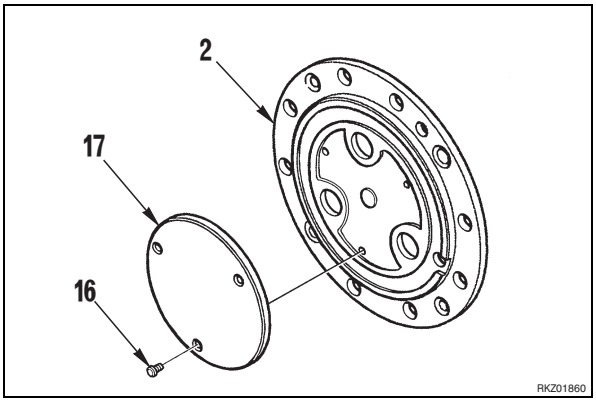
6 - Place the planetary gear group (22) in the planetary carrier (2), using the pin (18) to align the holes.
★ Make sure that the shim holes (23) are correctly aligned.



7 - Mount the new O-ring (19) on the pin (18).
Lubricate the pin (18) and the O-ring (19) with oil and mount them in the planetary carrier (2), centering the pinion group (22) and the shims (23).
Press the pin completely home.

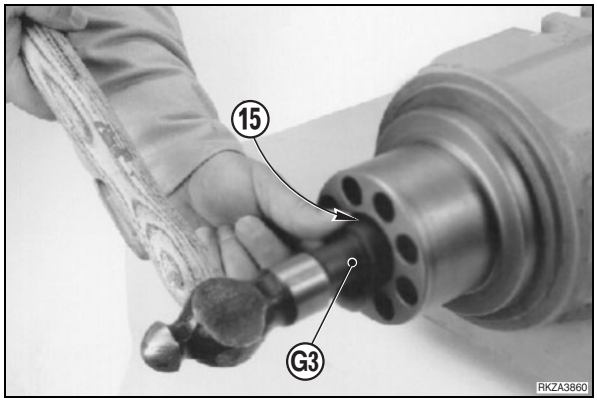


8 - Mount the cover (17) on the planetary carrier (2) and secure it with the screws (16).
Nm Screw: 23 Nm
Cover: Loctite 518

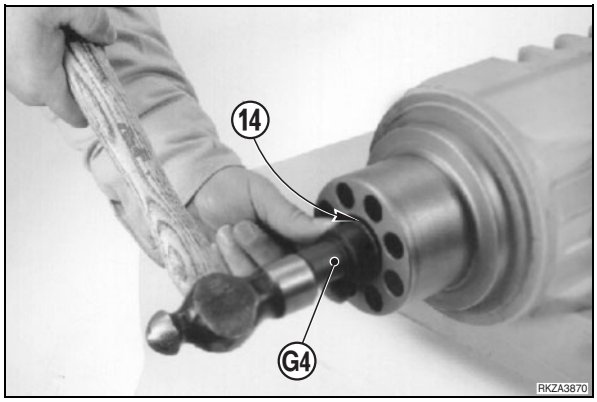


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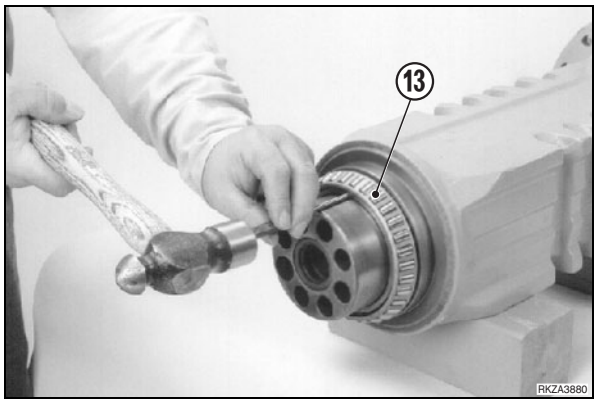
9 - Lubricate the bronze bushing (15) with oil and use the tool **G3** to mount the bushing in the arm.
★ Insert it to the point where the tool makes contact with the shoulder.



10 - Lubricate the ring (14) with oil and use the tool **G4** to mount the ring in the arm.
★ Check the orientation.
★ Insert it to the point where the tool makes contact with the arm.

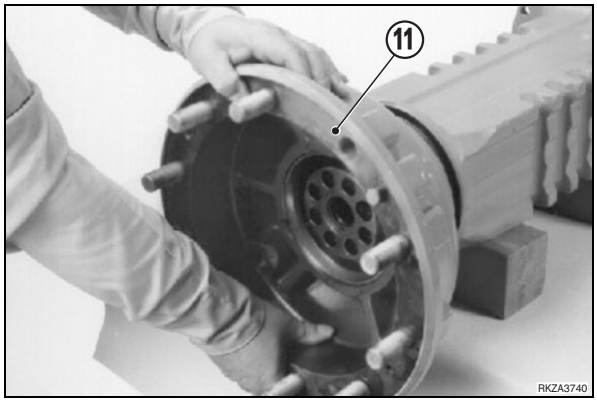


11 - Lubricate the inside of the bearing (13) with oil and use a punch and hammer to knock it home on the shoulder of the arm.
★ Strike light blows round the entire circumference.



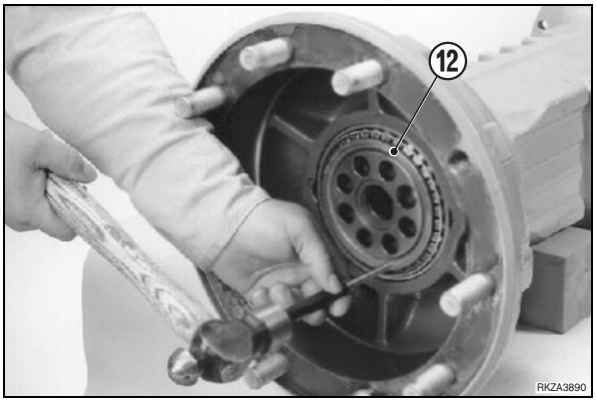
12 - With a solution of 50% white spirit and 50% water, clean the sealing edge of the ring seal (25) of the hub (11) and the sealing area of the axle in order to remove all traces of lubricant.
★ Mount the hub.

⚠ Do not oil the sealing area of the ring (25).

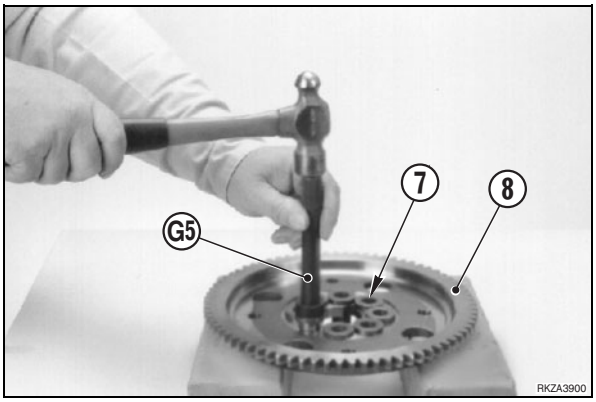


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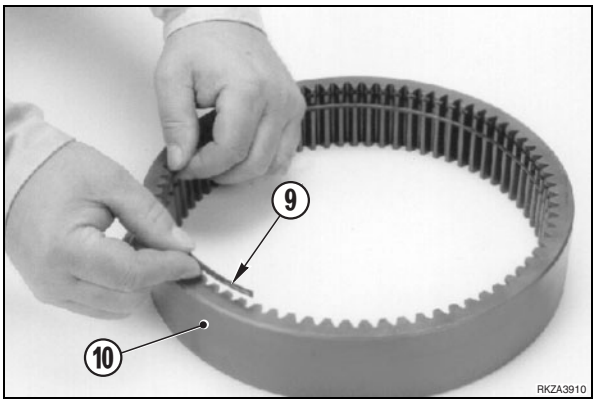
13 - Lubricate with oil the inside of the bearing (12) and mount it on the arm.
Use a punch and hammer to knock the bearing home.
★ Strike lightly over the entire circumference.



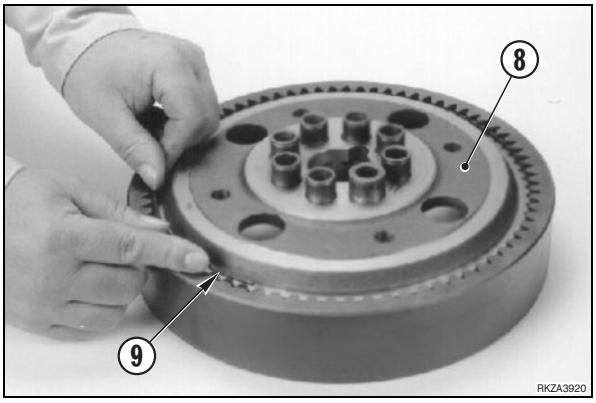
14 - Use the tool **G5** to mount the pilot bosses (7) in the ring bevel gear carrier disc (8).



15 - Mount the inner snap ring (9) in the ring bevel gear (10).

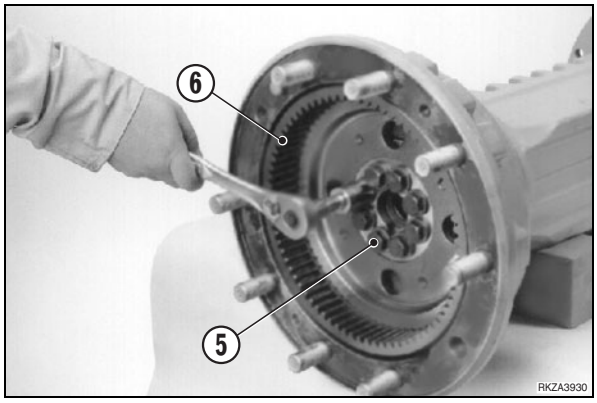


16 - Install the ring bevel gear carrier disc (8) and the outer snap ring (9).

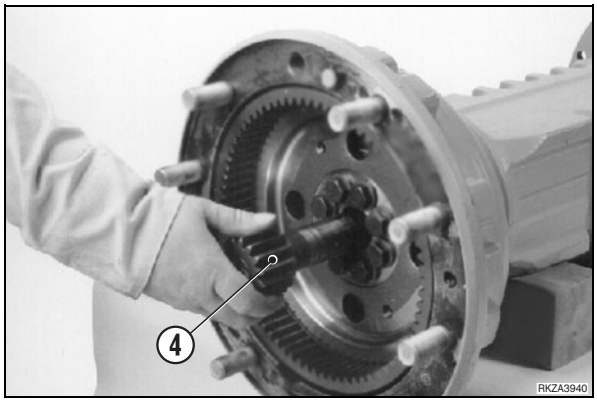


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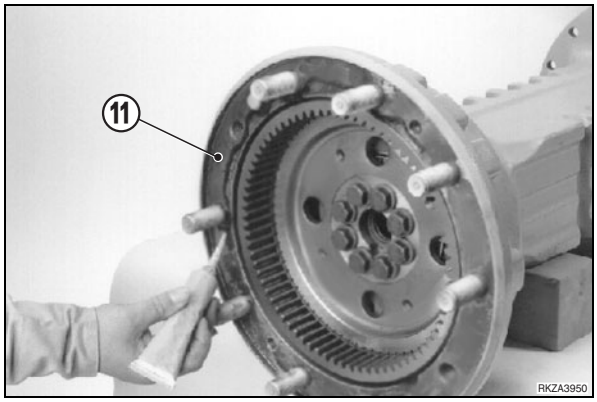
17 - Install the complete ring bevel gear group (6) and use the screws (5) to hold it in position.
Tighten the screws, employing the alternating crosswise method, until the ring bevel gear carrier rests on the arm.
Carry out the final tightening.
Nm Screws: 230 Nm



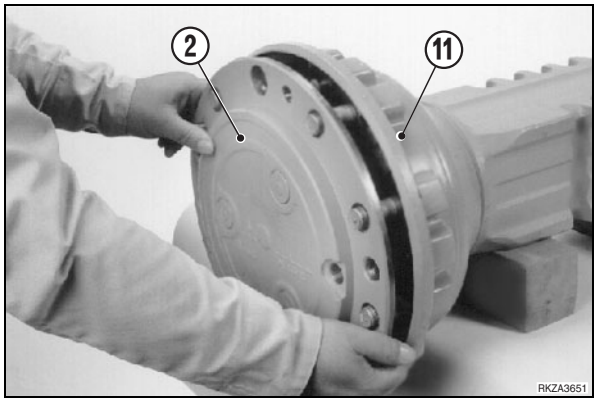
18 - Install the axle shafts (4) by engaging them in the inner joint.
★ Take great care not to damage the seal ring (14).



19 - Apply an unbroken trace of sealant around the hub flange (11) inside the line of stud bolts and threaded holes.
Flange: .....



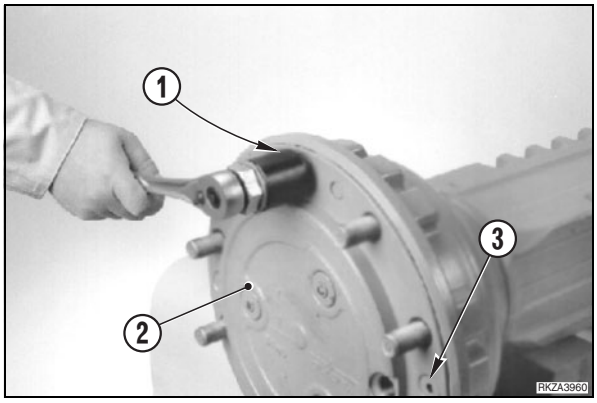
20 - Install the complete planetary carrier group (2) on the hub (11).
★ Rotate the group (11) in both directions to facilitate the engagement of the gears.



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21 - Mount the two screws (3) and secure the planetary carrier (2).
Screws: 80 Nm

22 - Partially insert the shoulder studs (1). Screw in and lock two nuts M22x15, and fully tighten the studs (1).
Stud bolts: 70 Nm
Stud bolts: Loctite.....

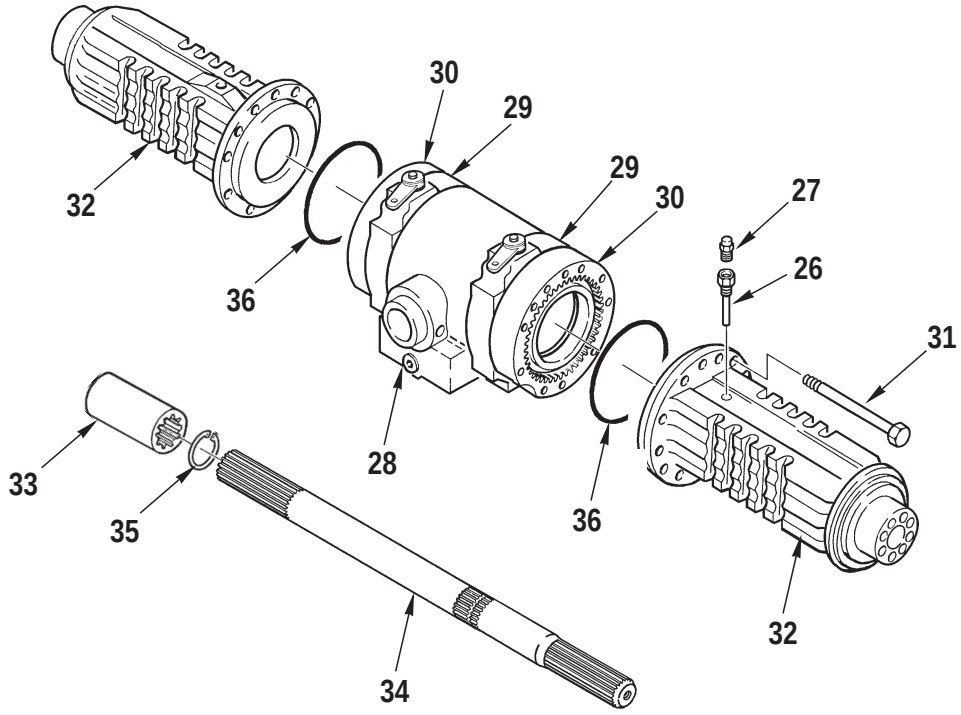


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DISASSEMBLY OF REAR AXLE

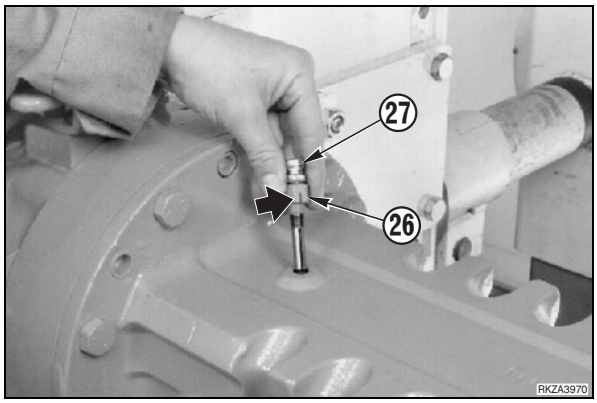
1. Removal of the axle arms

⚠ Seal rings must be changed each time they are dismantled.

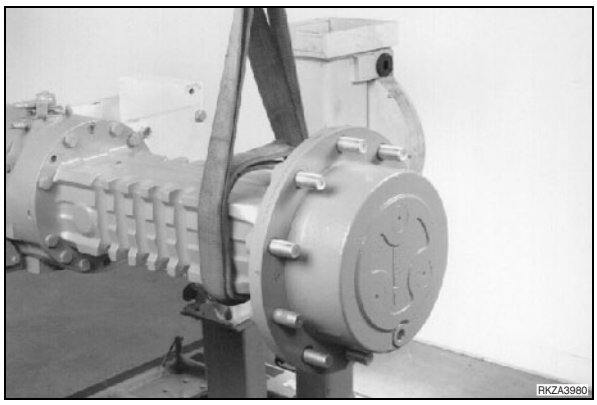


1 - Loosen and remove the breather-pipe assembly. Make a reference mark on the hexagonal-head screw of the pipe (26) to correspond to the grooving.

★ Detach the vent plug (27) from the pipe (26) only if it needs replacing.

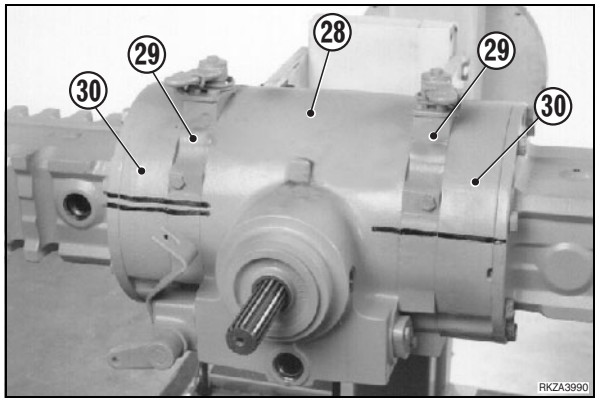


2 - Attach the complete arm group to some hoisting tackle.

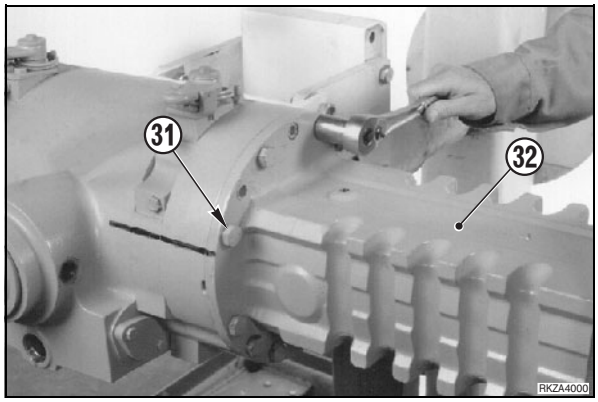


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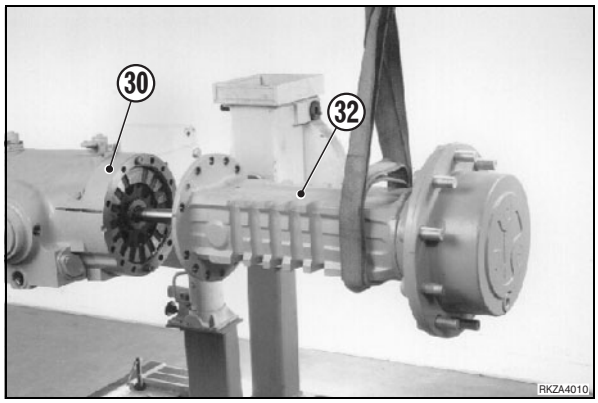
3 - Make a mark on the central body (28), the brake cylinders (29) and the seatings of the brake disks (30), to prevent exchanges during re-assembly.



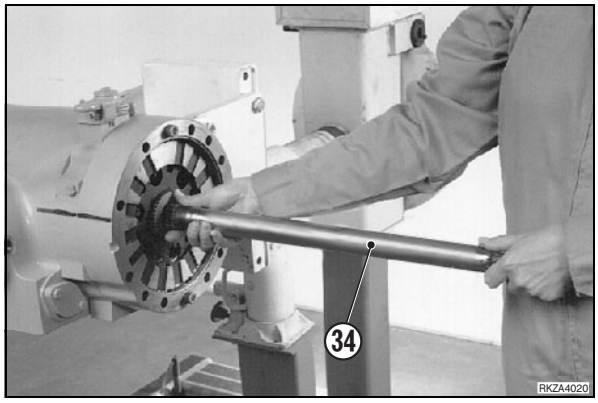
4 - Loosen and remove the screws (31), with the exception of the top screw.
Slowly loosen the remaining top screw, adjust the hoisting cable to balance the axle arm (32) and take out the last screw (31).



5 - Keep the axle arm (32) level and separate it from the brake group (30).

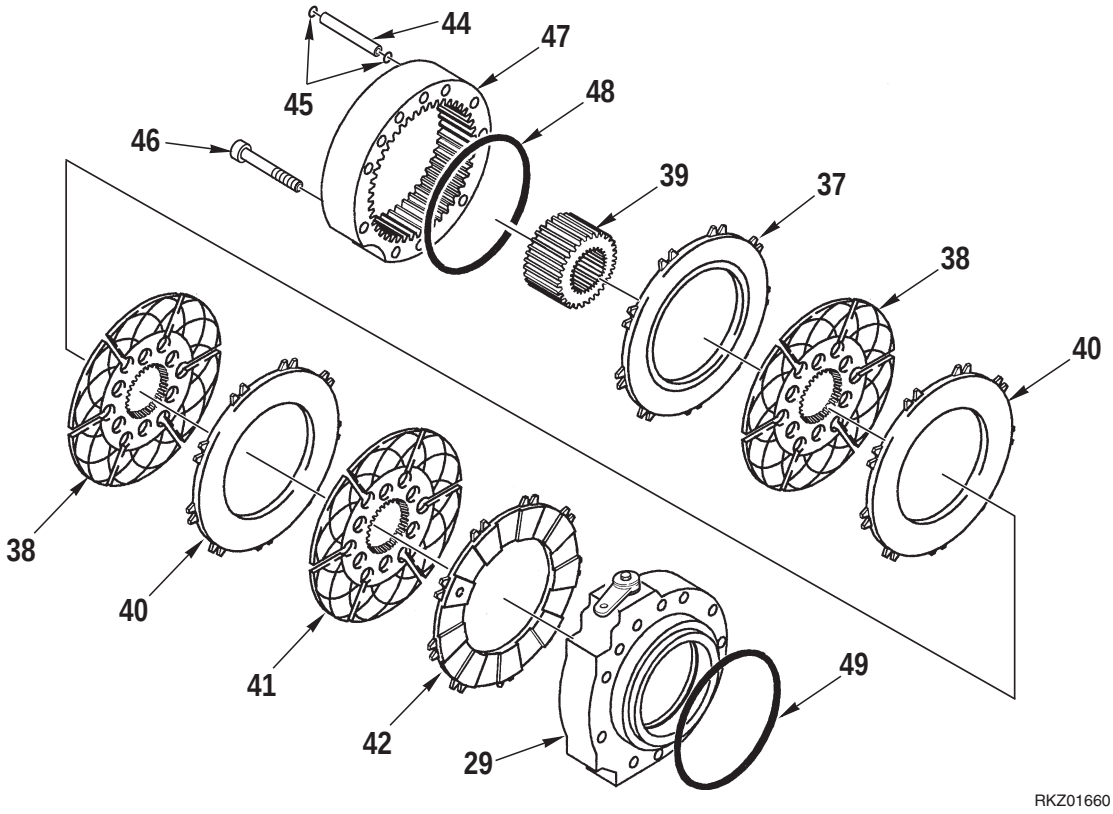


6 - Remove the joint (33) complete with snap ring (35) and extract the half axle (34) from the central body (28).
★ Throw away the O-ring seal (36).

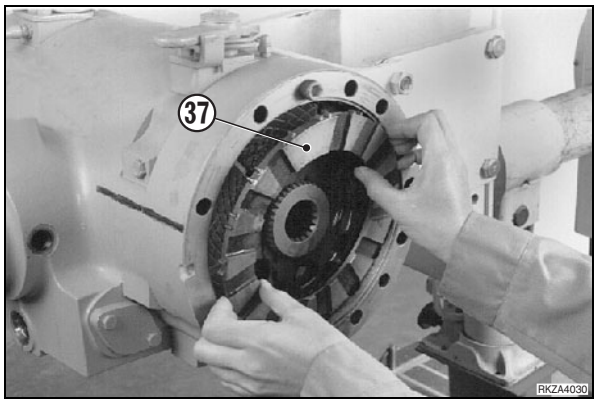


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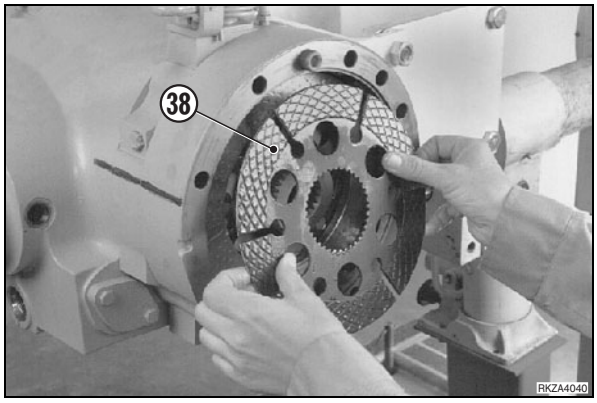
2. Removal of the brake cylinder and disk seatings



1 - Remove the outer reaction plate (37).



2 - Remove the clutch plate (38).

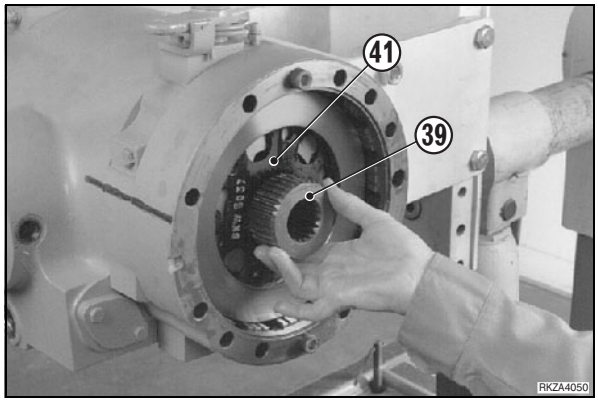


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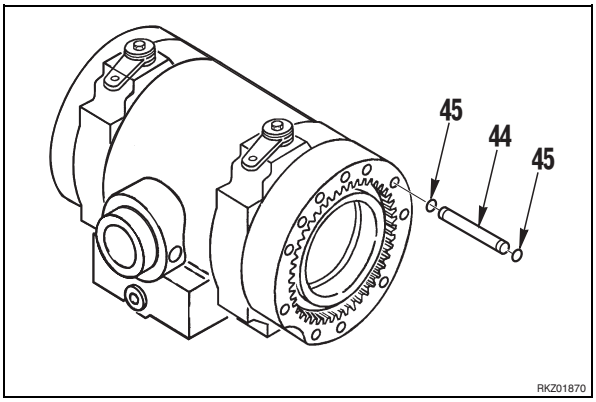
3 - Remove the sleeve (39) and the remaining clutch group (intermediate reaction plate (40) and the clutch plate (41).

★ The internal reaction plate (42) remains in its seating on the cylinder (43).

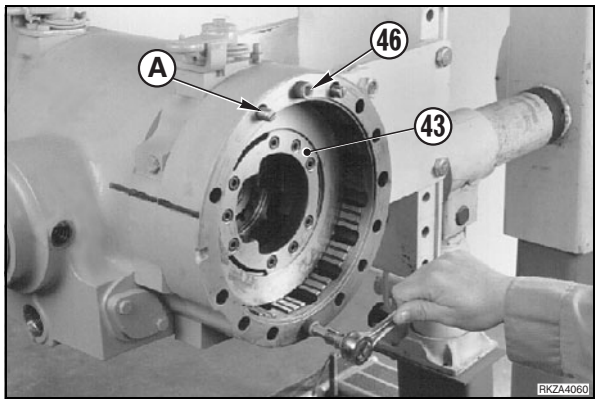
★ Continue dismantling the 2nd brake disc (38) and the 2nd reaction plate (40), following the previously-described procedures.



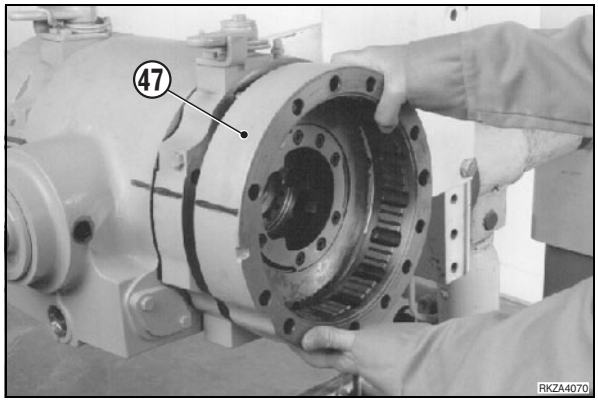
4 - Remove the oil-recirculation pipe (44), complete with O-ring (45).



5 -Push two supporting pins "**A**" into the two upper holes and remove the screws (46).

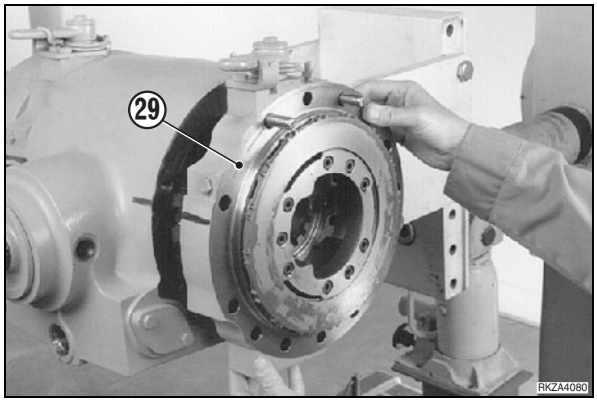


6 - Remove the seatings (47) of the clutch plates.

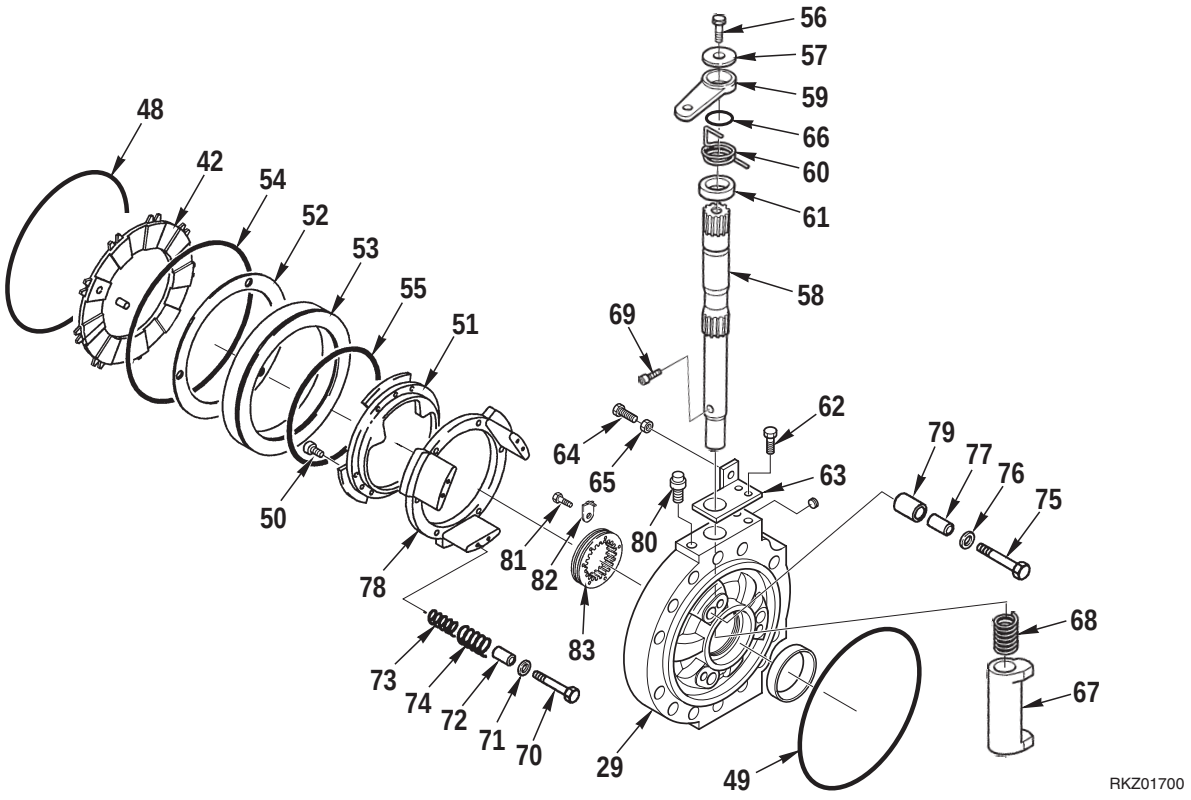


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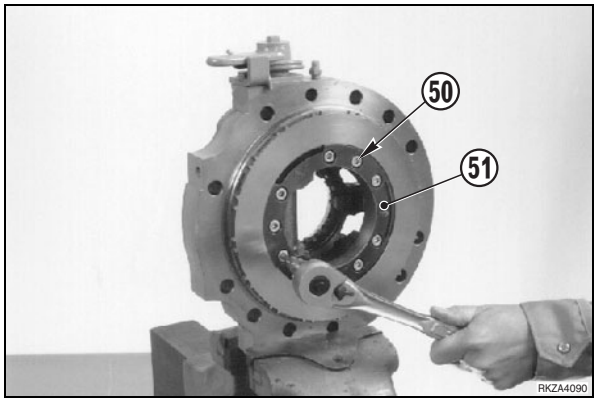
7 - Remove the O-ring (48) and the braking cylinder group (29) complete with O-ring (49).



3. Braking cylinder

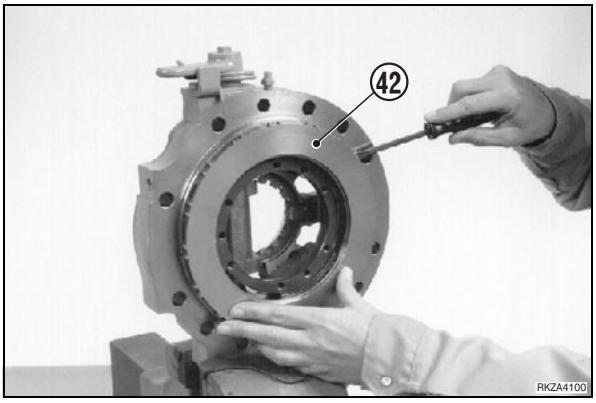


1 - Loosen and remove the screws (50) and remove the flange (51).

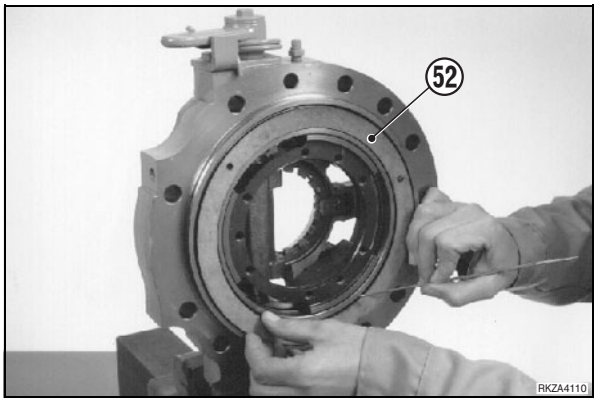


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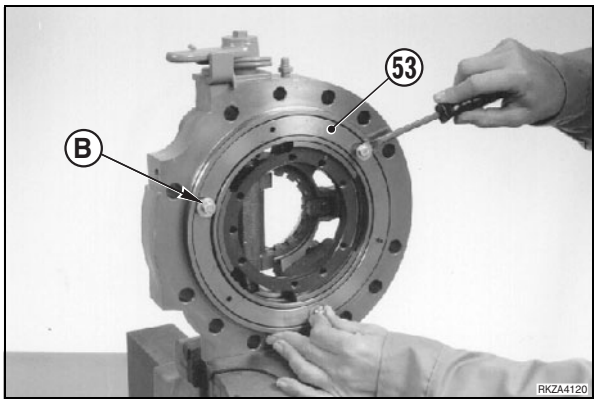
2 - Remove the complete internal reaction plate (42).
★ The isolator ring (52) and the piston could fall and be damaged.



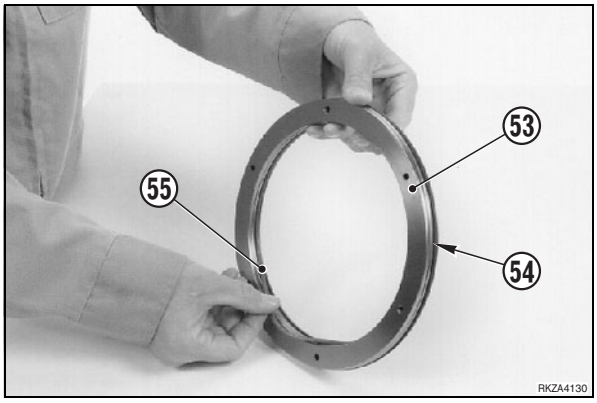
3 - Remove the isolator ring (52).



4 - Screw three screws "**B**" into the holes in the piston (53) and, using a screwdriver as a lever, remove the piston (53).

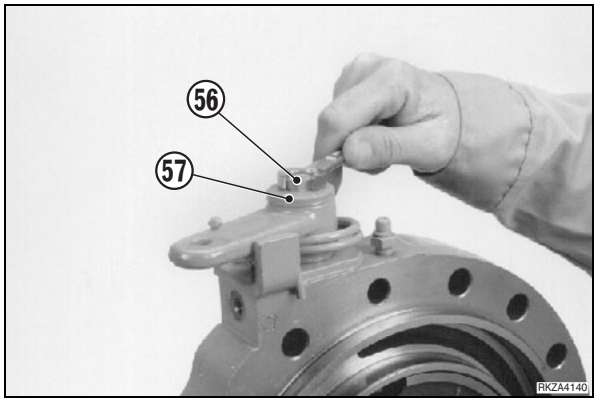


5 - Remove the external O-ring (54) and the internal O-ring (55) from the piston (53).

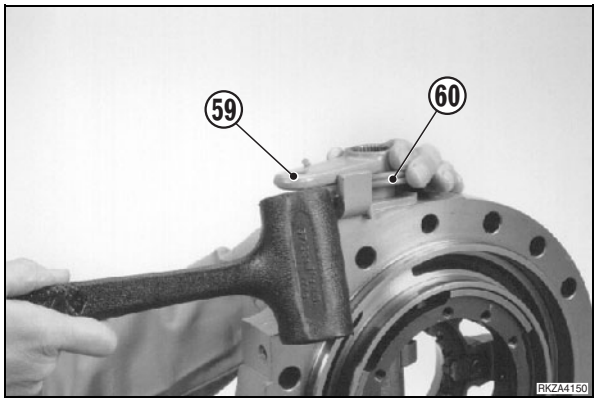


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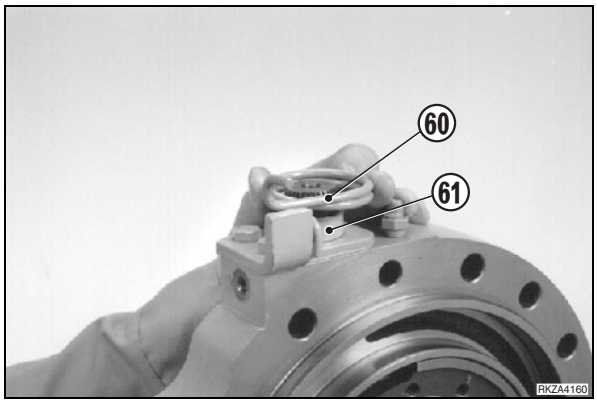
6 - Remove the screw (56) and the washer (57).



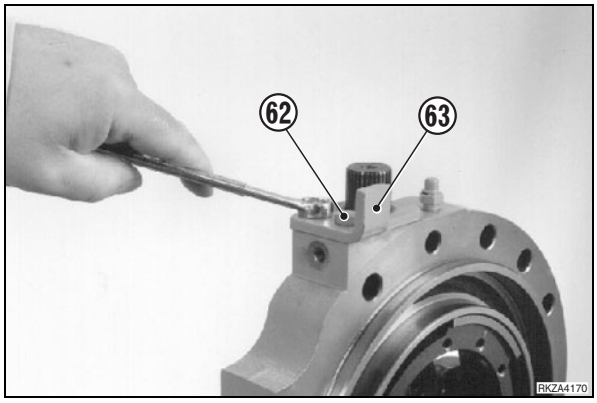
7 - Mark the position between the shaft (58) and the lever (59).
Use a mallet to raise the lever (59) until a rotation is obtained that cancels out the action of the spring (60).



8 - Remove the lever (59), and spring (60) and the spacer (61).

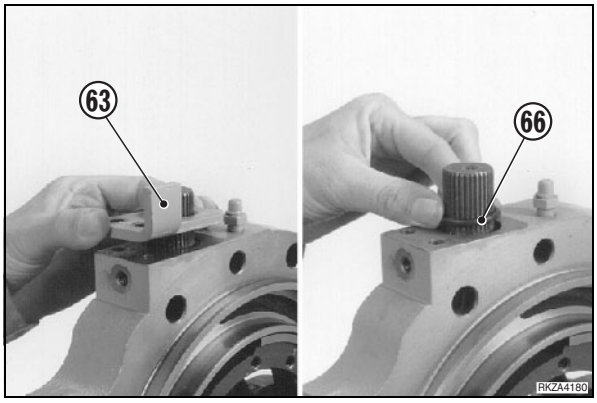


9 - Remove the retaining screws (62) of the support (63).



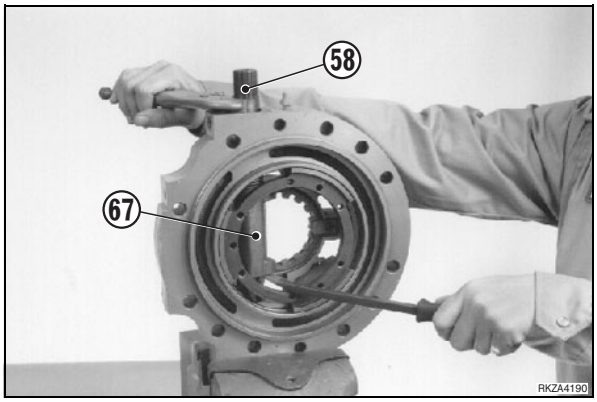
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10 - Remove the support (63) complete with adjustment screws (64) and nut (65) and the O-ring seal (66).

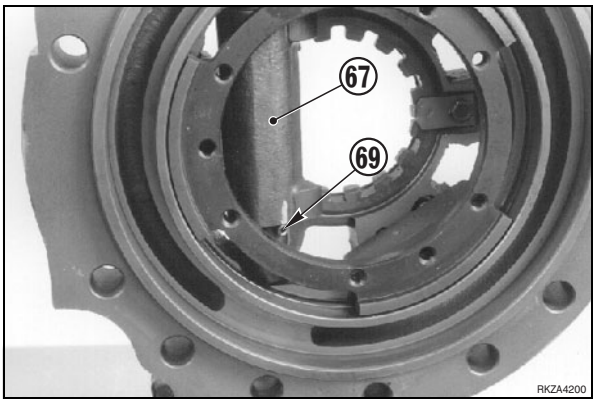


11 - Use a lever to raise the cam (67) to cancel out the action of the spring (68). Apply a pair of self-locking pliers to hold the shaft (58) in position.

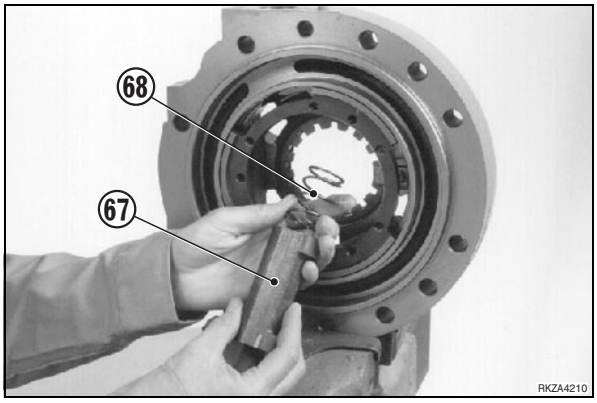
★ Take care not to damage the shaft (58).



12 - Mark on the cam (67) its position in relation to the screw (69).
Remove the screw (69).

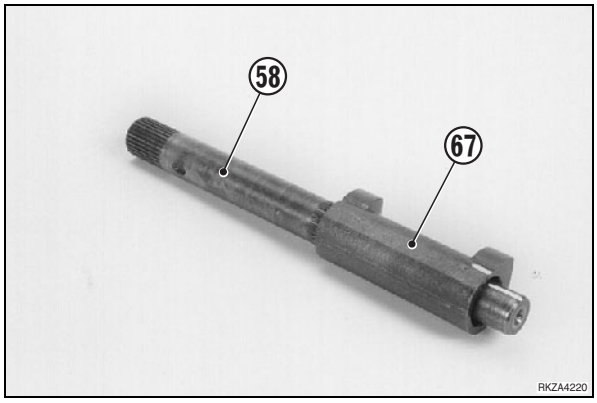


13 - Remove the shaft (58), the cam (67) and the spring (68).

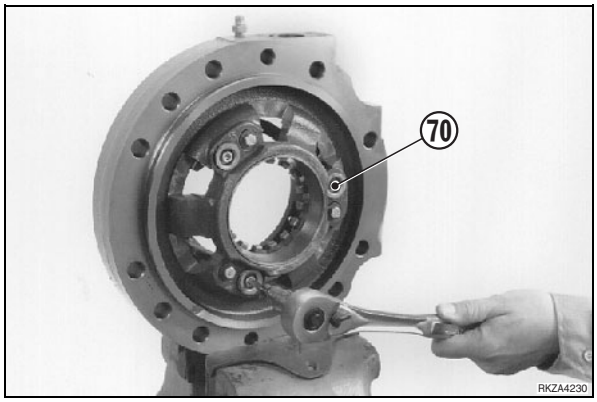


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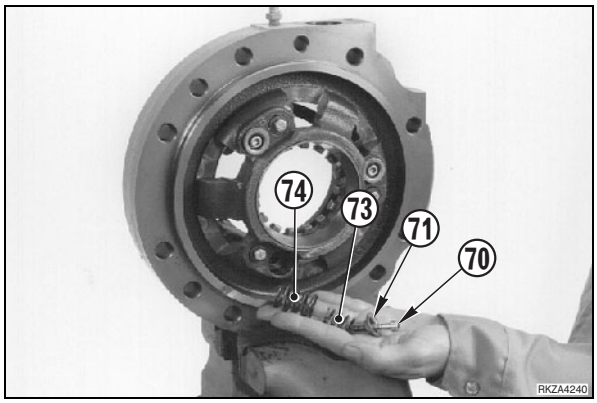
14 - On the shaft (58) trace a alignment sign between the cam (67) and the screw hole (69).



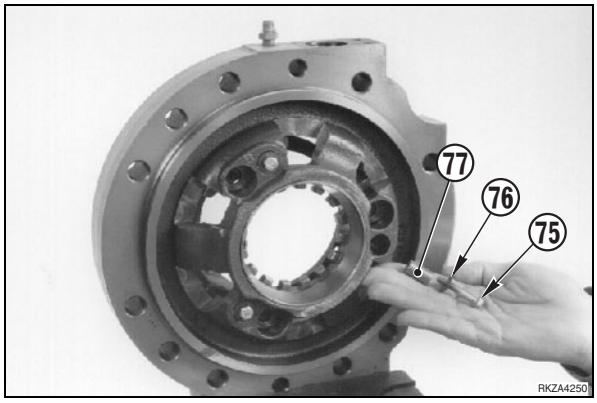
15 - Loosen the screws (70) to release the action of the piston return springs.



16 - Remove the screws (70), then remove the spring retainers (71), the centering bushings (72), the internal springs (73) and external springs (74).

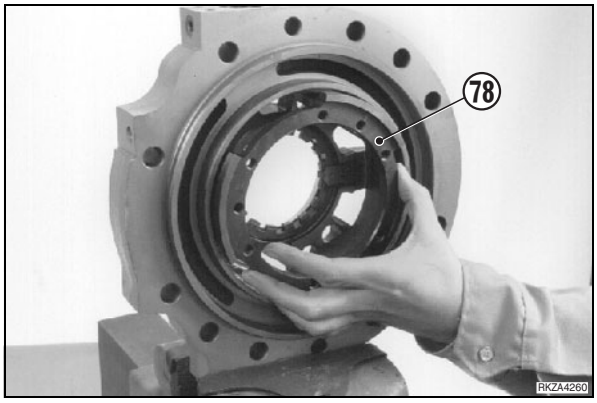


17 - Loosen and remove the screws (75), the washers (76) and the centering bushings (77).



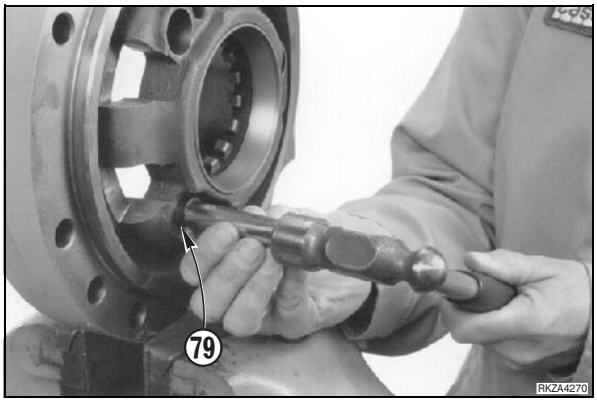
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18 - Remove the flange (78).

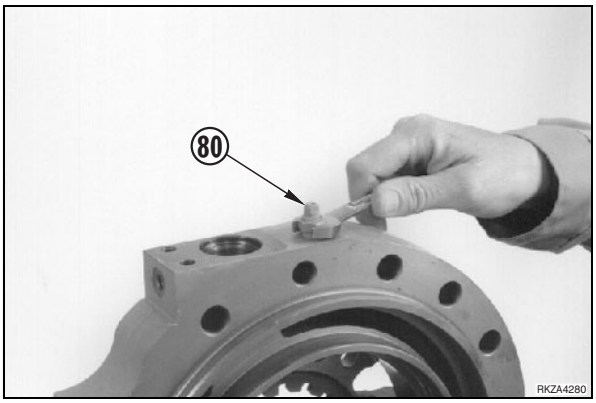


19 - Remove from the cylinder the slack adjuster bushings (79).

★ Be very careful because the bushings (79) are compressed.

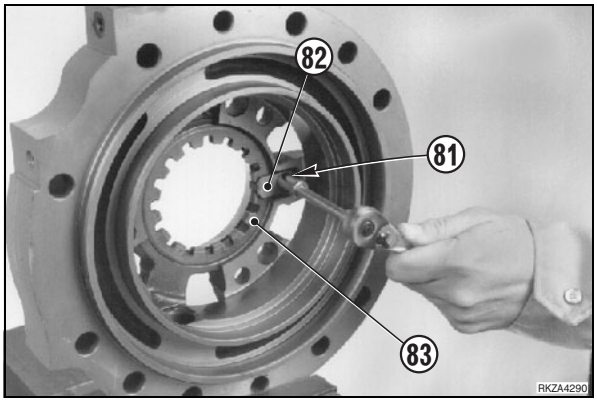


20 - Remove the air bleeder screw (80).



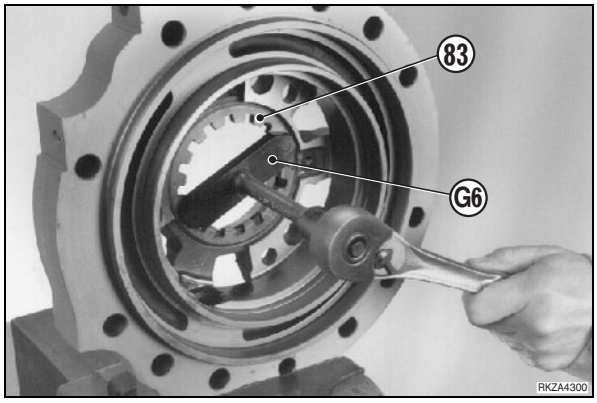
★ The following operations are only to be carried out if the differential bearings and pinion or the bevel gear pair need to be replaced.

21 - Loosen and take out the screw (81) and remove the stop (82) of the adjustment lock nut (83).

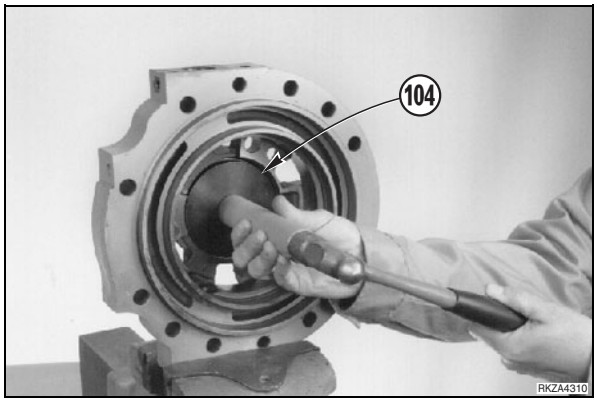


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22 - Use the tool **G6** to remove the adjustment lock nut (83).

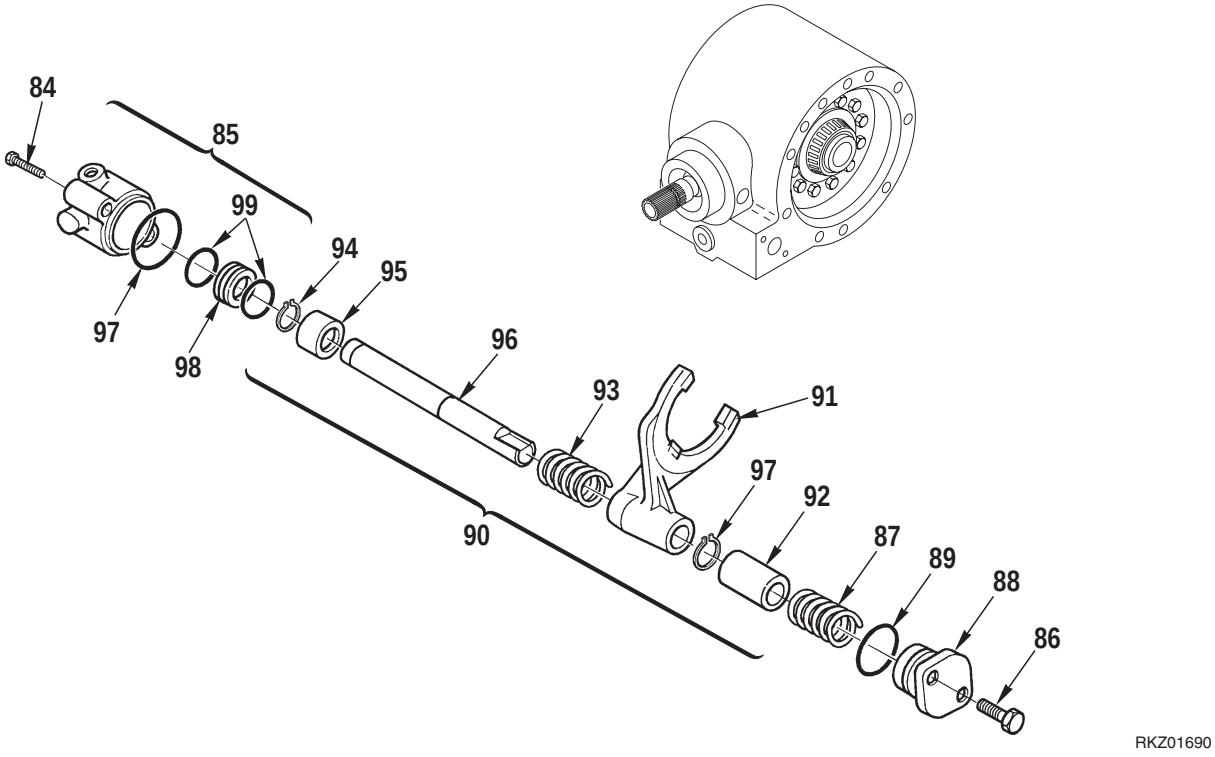


23 - Use a plunger to remove the outer ring (104) of the differential bearing.



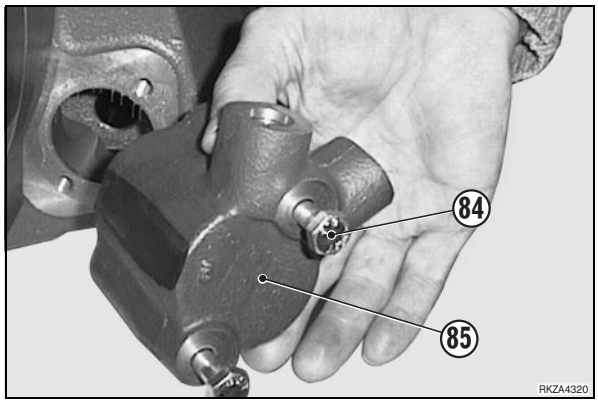
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4. Dismantling the differential locking group

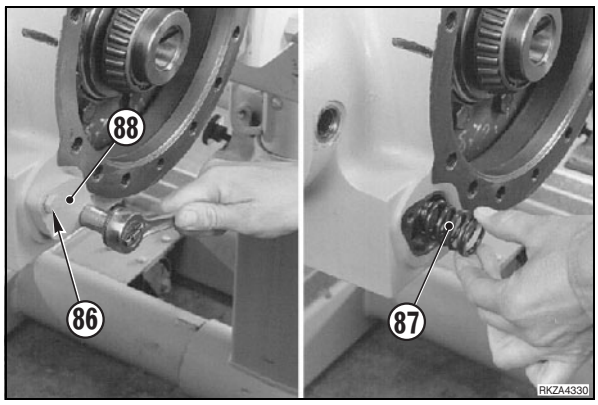


★ Remove the axle arms and the braking groups. (For details, see «2. Removal of brake cylinders»).

1 - Loosen and take out the screws (84) and the remove the complete cylinder (85).

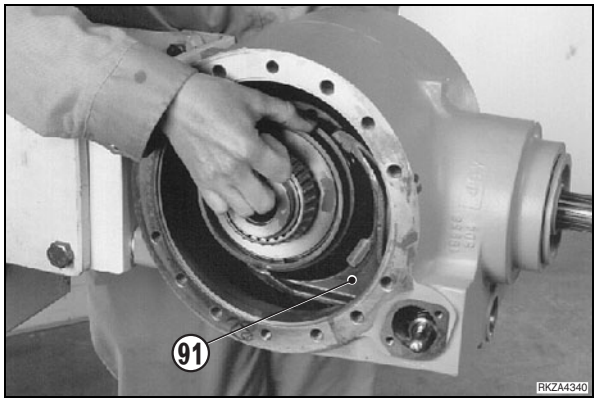


2 - Slowly and alternately loosen the screws (86) until the action of the spring (87) has been cancelled.
Take out the screws (86), the cover (88) complete with the O-ring (89) and the spring (87).

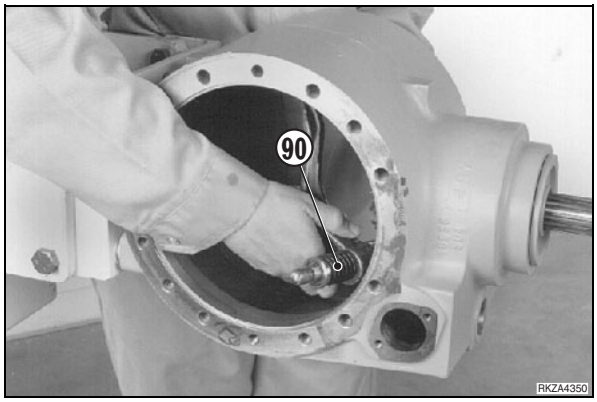


https://truckmanualshub.com/

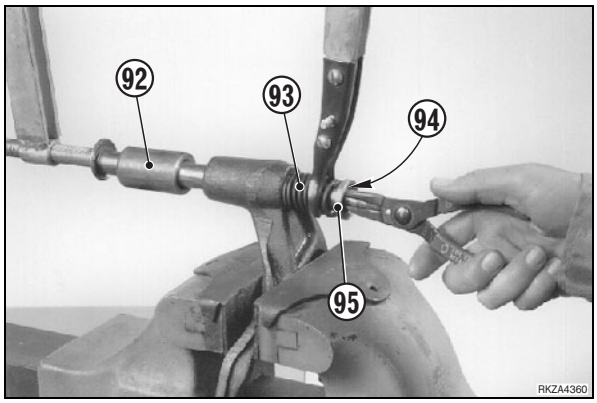
3 - Move the complete differential in such a way as to detach it from the fork (91).
Extract the differential from the ring bevel gear side.



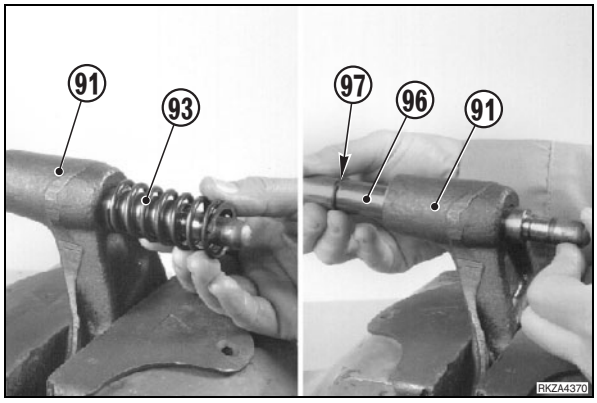
4 - Remove the complete fork group (90) from the central housing.



5 - Compress the spring (93) and remove the snap ring (94) and the spacer (95). Take out the spacer (92).

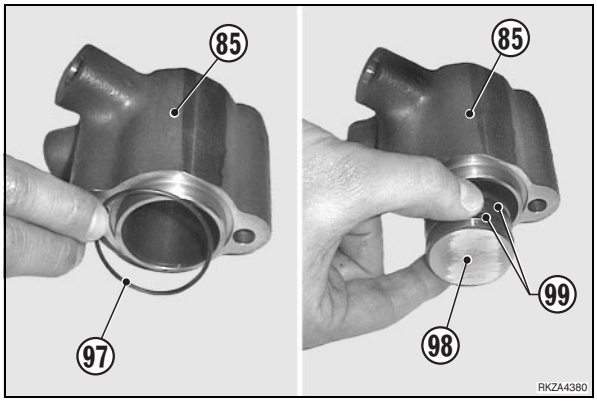


6 - Remove the spring (93) and slide the shaft (96), complete with snap ring (97) out of the fork (91).

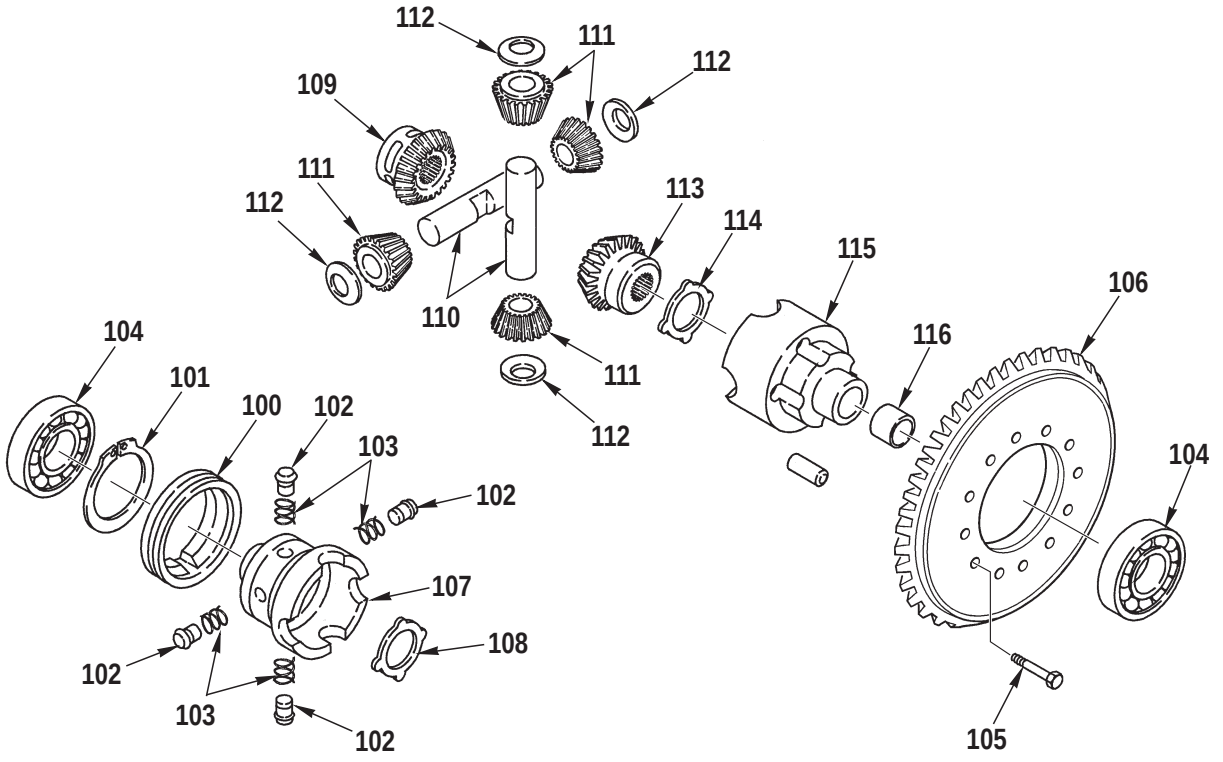


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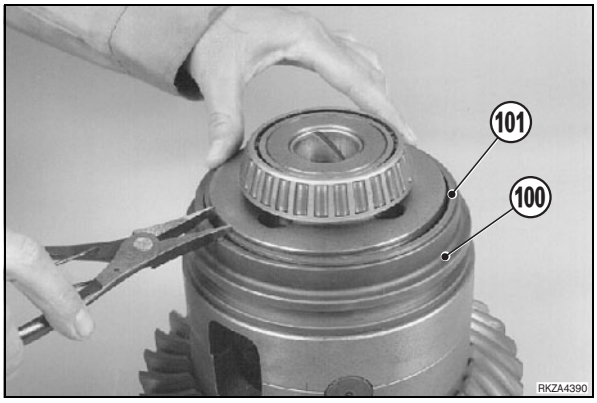
7 - Remove from the cylinder (85) the O-ring (97) and the piston (98) complete with O-rings (99).
Take out the O-rings (99).



5. Dismantling the differential

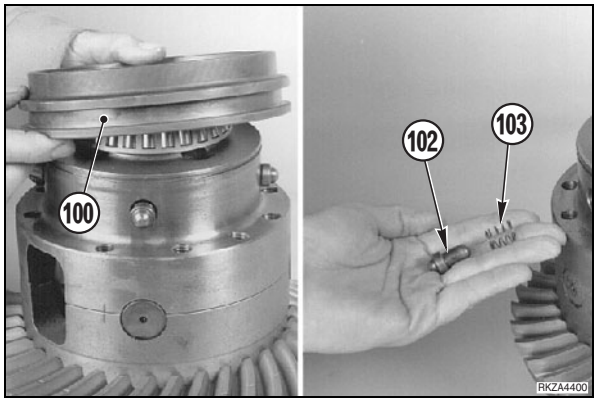


1 - Push the differential lock ring (100) downwards and remove the snap ring (101).

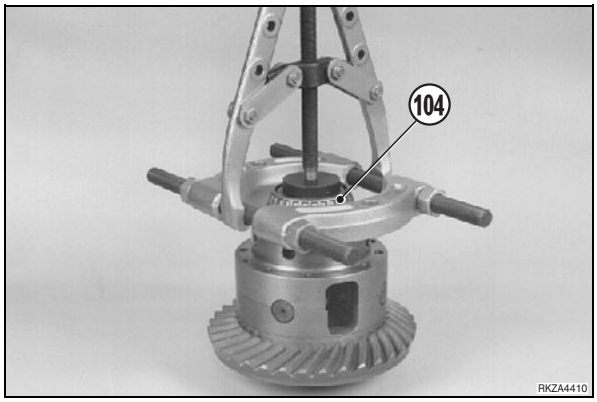


https://truckmanualshub.com/

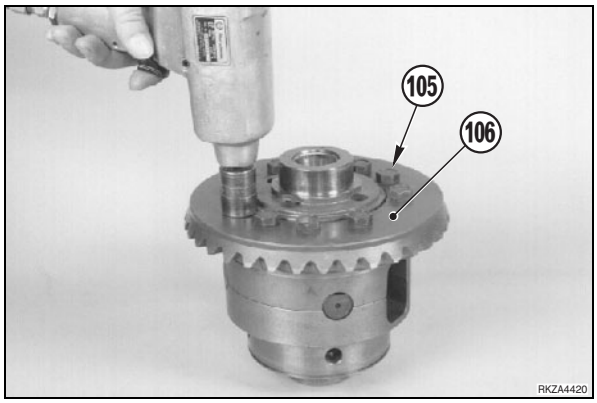
2 - Remove the lock ring (100), the pegs (102) and the springs (103) from the differential.



3 - Use a puller to remove the bearings (104) from the differential.

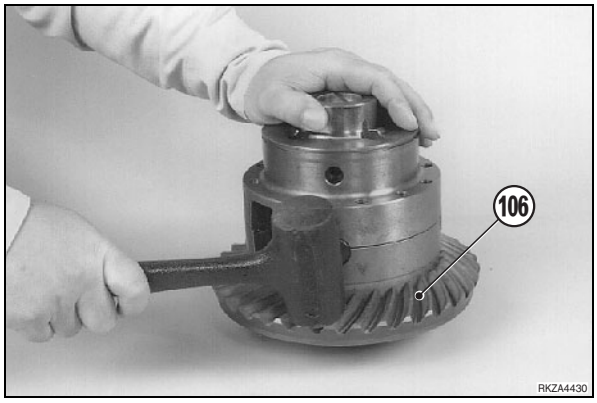


4 - Remove the screws (105) that secure the ring bevel gear (106).



5 - Turn the differential upside down and remove the ring bevel gear (106).

★ Use a plastic mallet to strike blows all round the circumference.



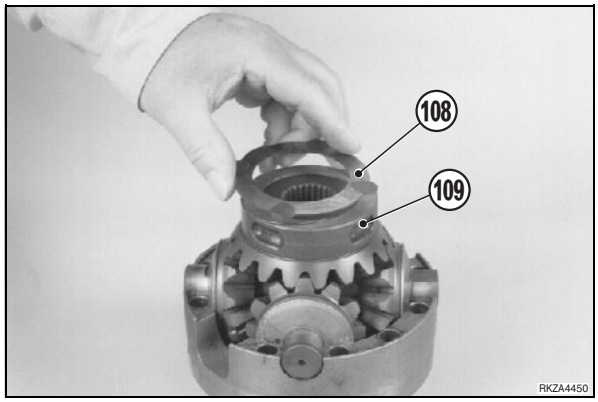
https://truckmanualshub.com/

6 - Remove the differential half box (107) on the locking side.

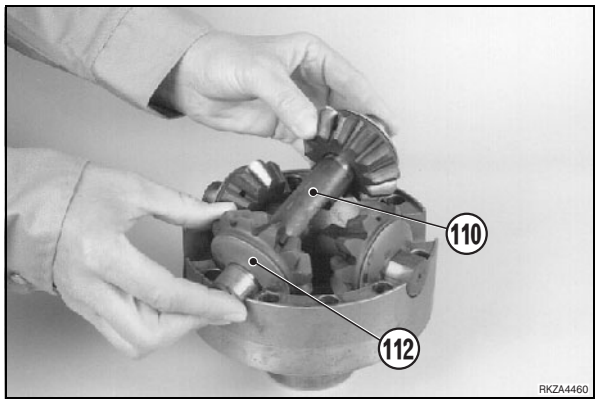
★ The differential half boxes are both marked to facilitate re-assembly.



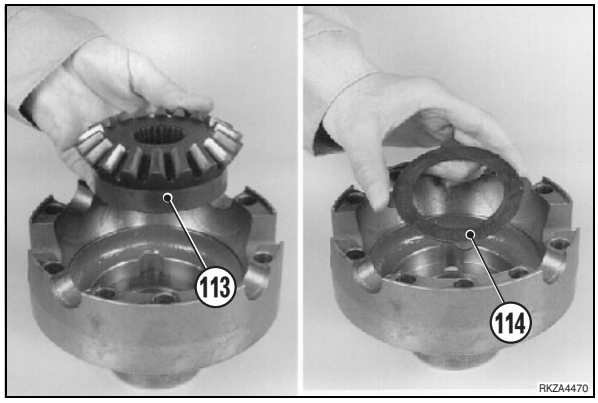
7 - Remove the thrust washer (108) and the differential gear (109).



8 - Remove the shafts (110) that form the cross journal, the bevel gears (111) and the spherical thrust washers (112).

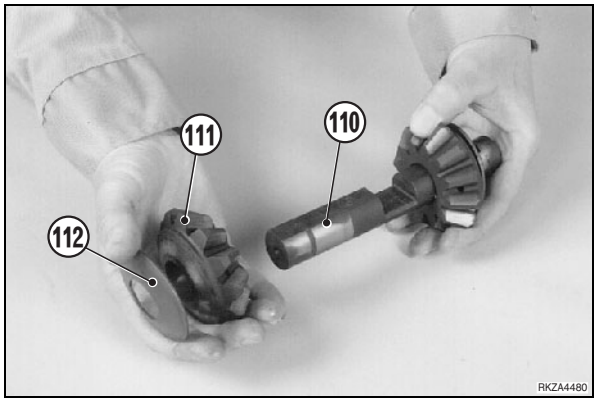


9 - Remove the second differential gear (113) and its shim (114).

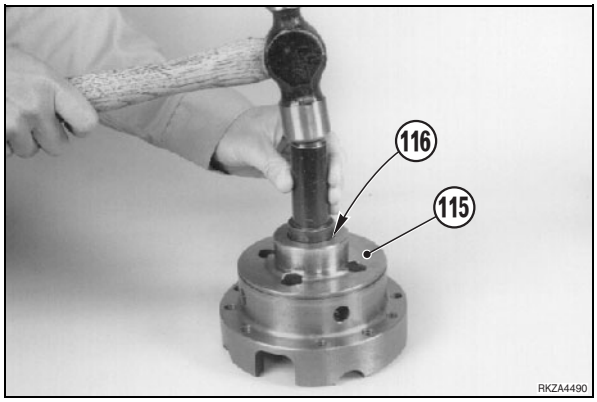


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10 - Take the cross journal shafts (110) to pieces by removing the bevel gears (111) and the thrust washers (112).

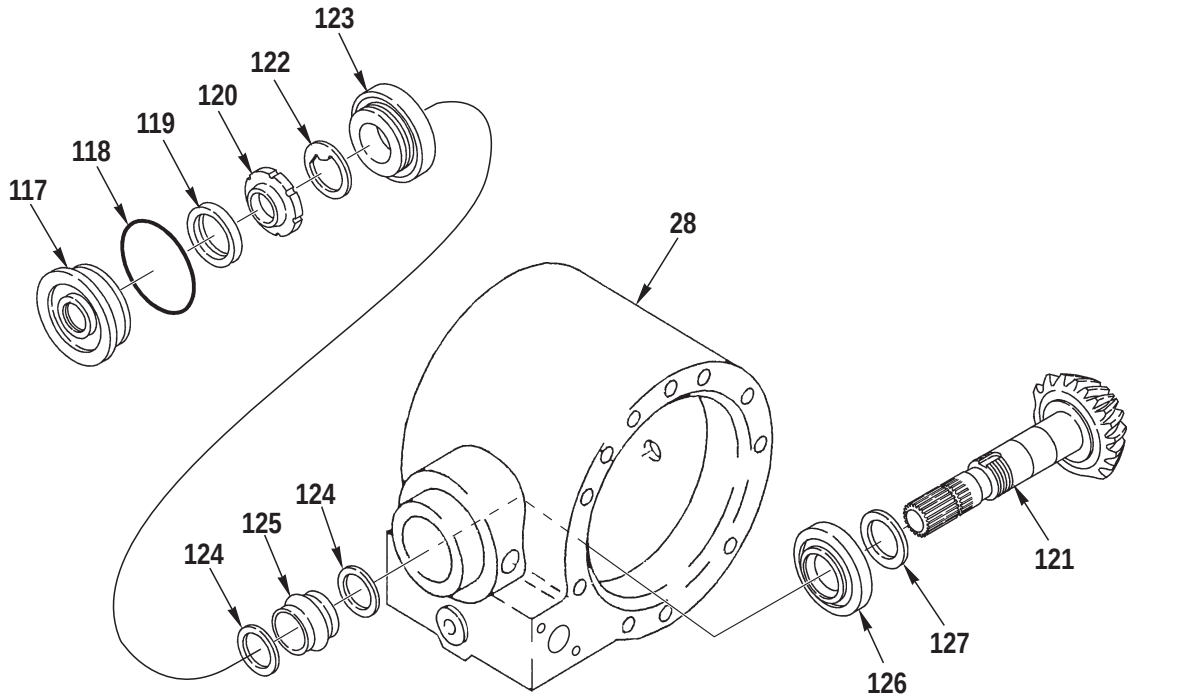


11 - **Only if necessary**
Extract the bushing (116) from the half box (115) on the ring bevel gear side.



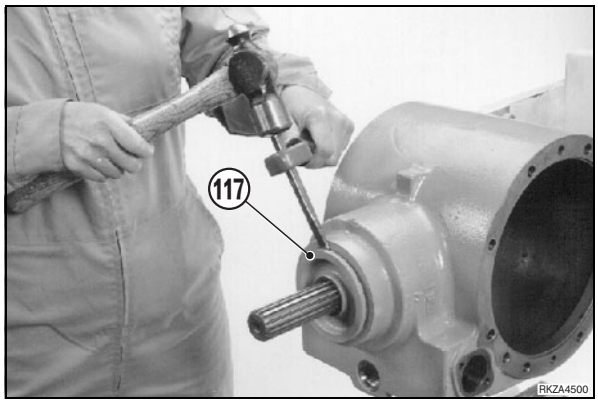
https://truckmanualshub.com/

6. Dismantling the bevel pinion

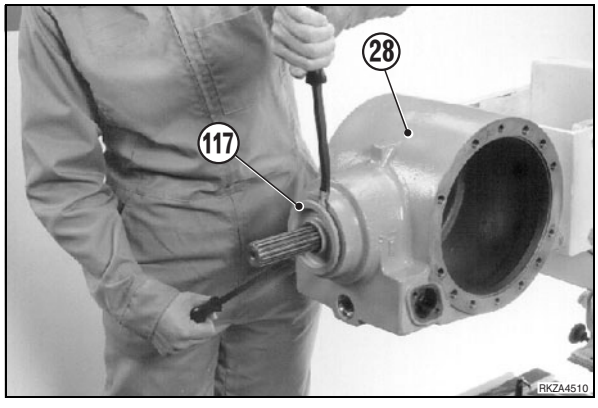


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1 - Use a chisel to move the cover (117).

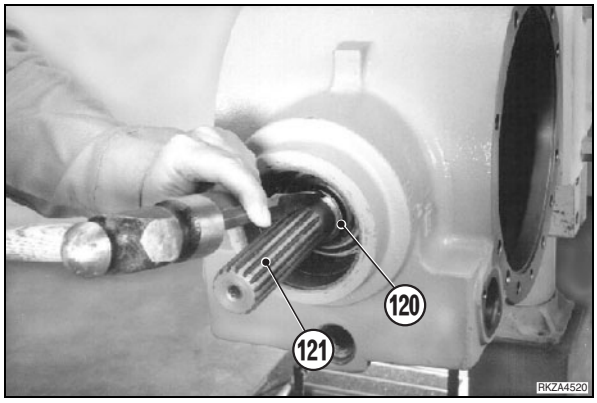


2 - Use two levers on opposite sides to extract the cover (117) complete with O-ring (118) and the seal ring (119) from the central housing (28).

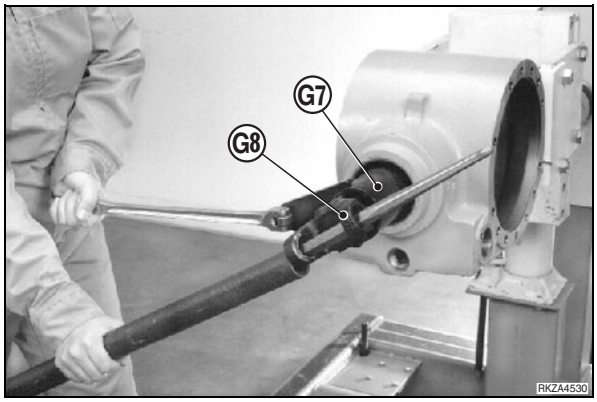


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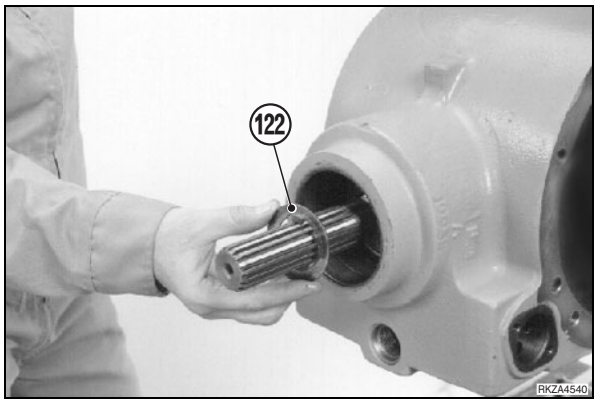
3 - Use a chisel to raise the caulked area of the lock nut (120) from the pinion grooving (121).



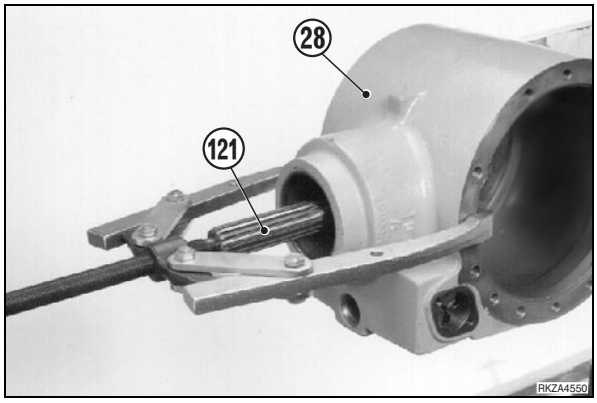
4 - Use the tools **G7** and **G8**, to loosen the lock nut (120) of the pinion (121).



5 - Take out the lock nut (120) and the special washer (122).



6 - Use a puller as demonstrated in the figure to push the pinion (121) into the central housing (28).



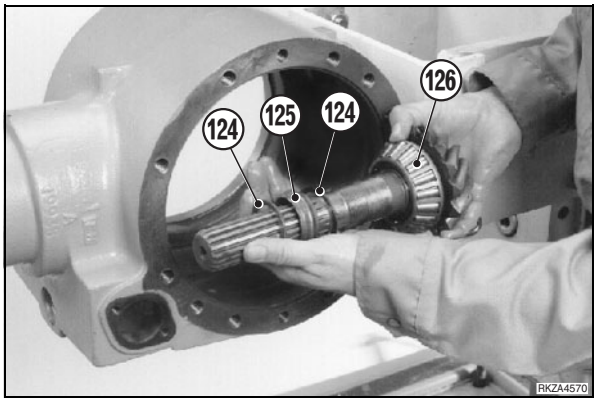
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7 - Remove the outer bearing (123).

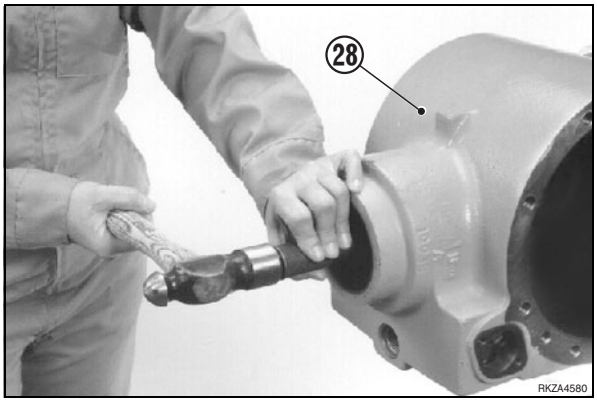


8 - Remove the pinion (121) complete with washers (124), spacer (125), inner bearing (126) and thrust washer (127).

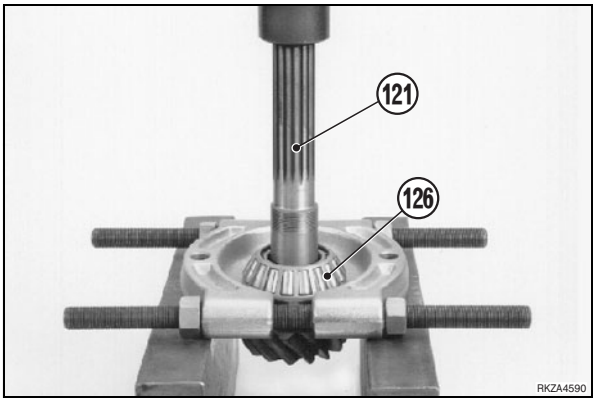
★ Throw away the spacer (125), which should be replaced every time it is dismantled.



9 - Take the outer bearing rings (123) and (126) out of the central housing (28).

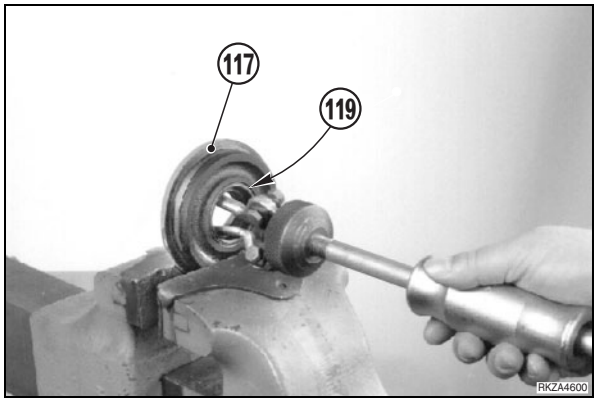


10 - Apply a separator "**C**" and, using a press, extract the bearing (126) and the shim (127) from the pinion (121).

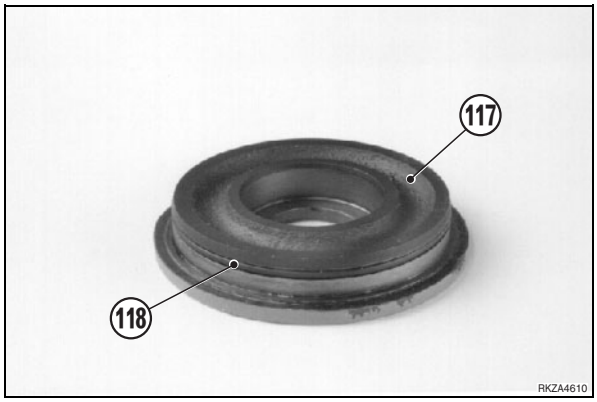


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11 - Use a puller to take the seal ring (119) out of the cover (117).



12 - Take the O-ring (118) out of the cover (117).



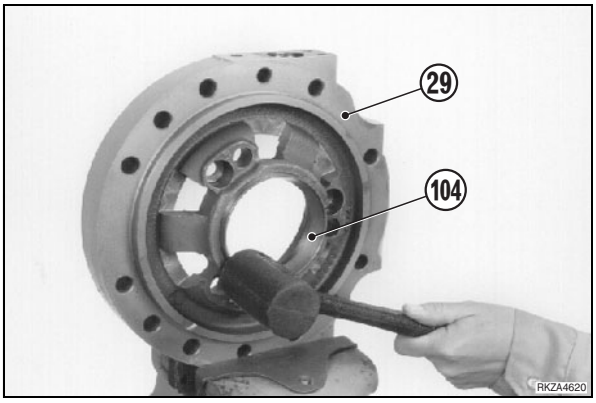
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ASSEMBLY OF THE REAR AXLE

1. Braking cylinder

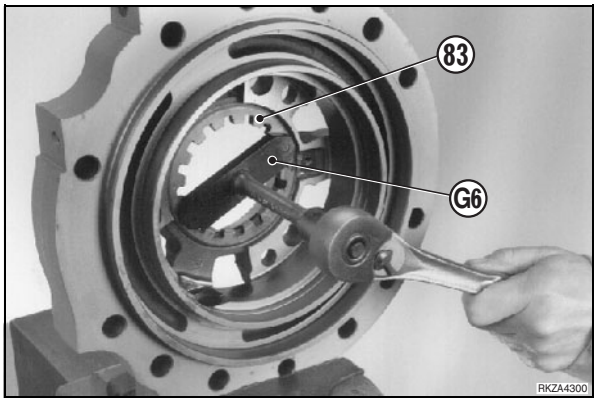
1 - Mount into the cylinder (29) the outer bearing ring (104) of the differential.

★ The ring (104) should lie just beneath the edge of the hole.



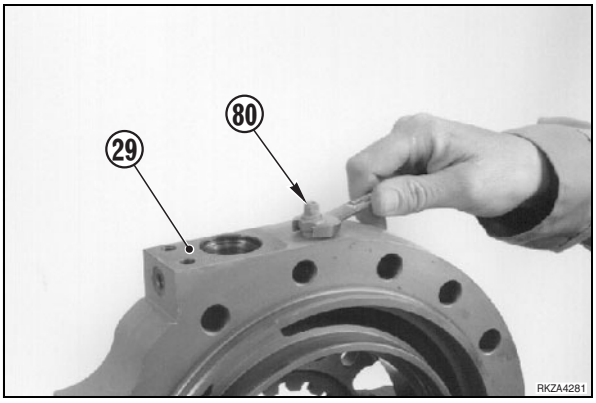
2 - Use the tool **G6** to screw in the lock nut (83).

★ Do not lock the lock nut at this point.

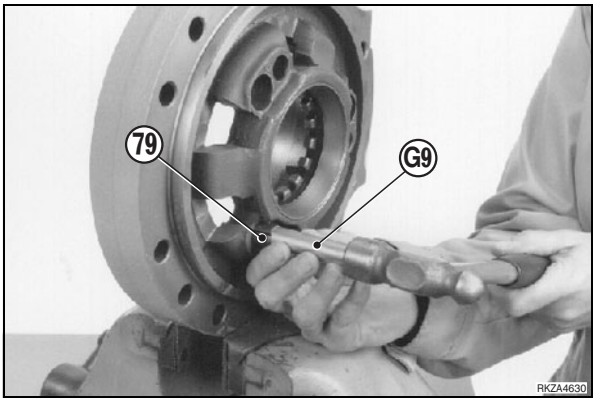


3 - Mount the air vent plug (80) in the cylinder (29).

Nm Plug: 8 – 12 Nm

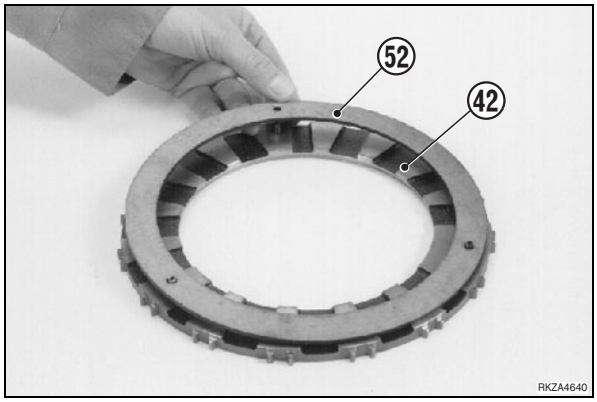


4 - Use the tool **G9** to mount the bushings (79) up to the edge of the hole.

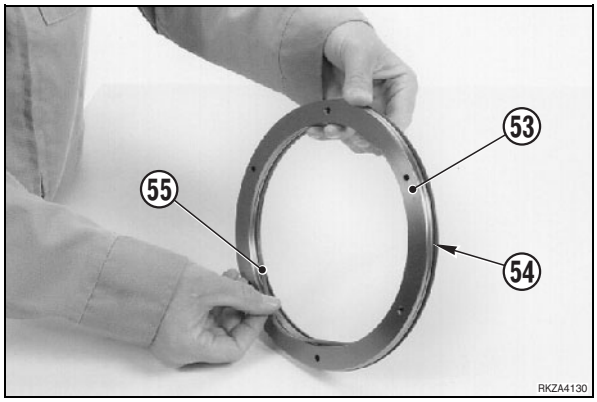


https://truckmanualshub.com/

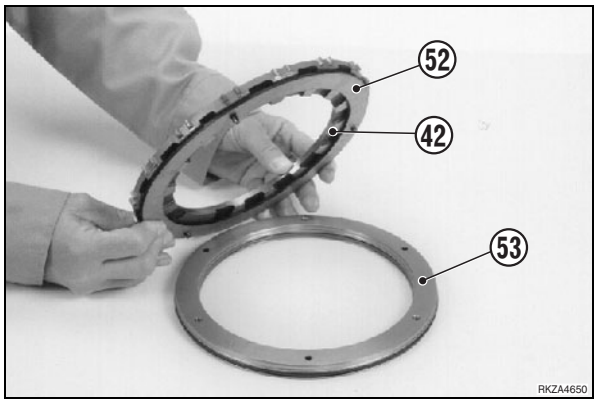
5 - Mount the isolator ring (52) onto the inner reaction plate (42).



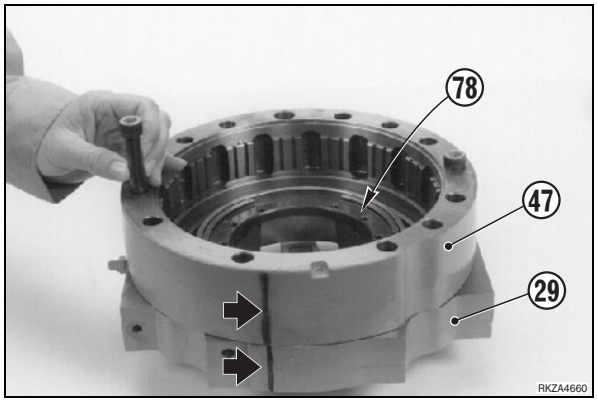
6 - Mount the outer O-ring (54) and the inner O-ring (55) onto the piston (53).
Lubricate the O-rings with ASL800050



7 - Position the group formed by the inner reaction plate (42) and the isolator ring (52) on the piston (53).

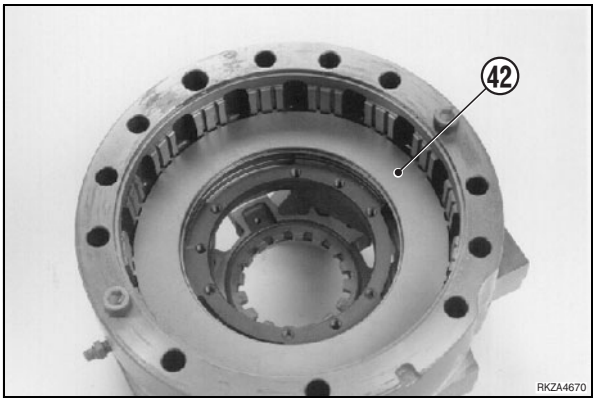


8 - Insert the flange (78) into the cylinder (29).
Place the brake seating (47) on the cylinder (29), taking care that the marks coincide.
In order to maintain the alignment, provisionally insert the two retaining screws of the brake seating into the cylinder.

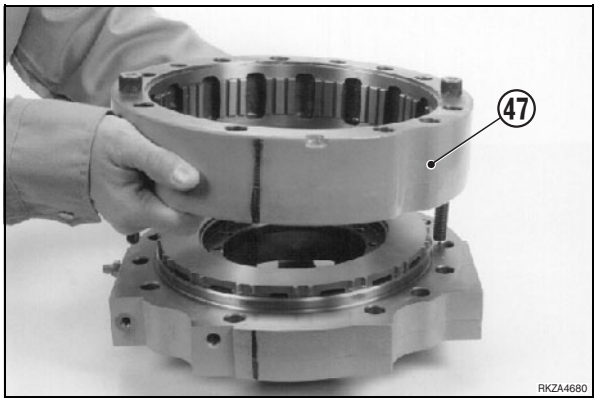


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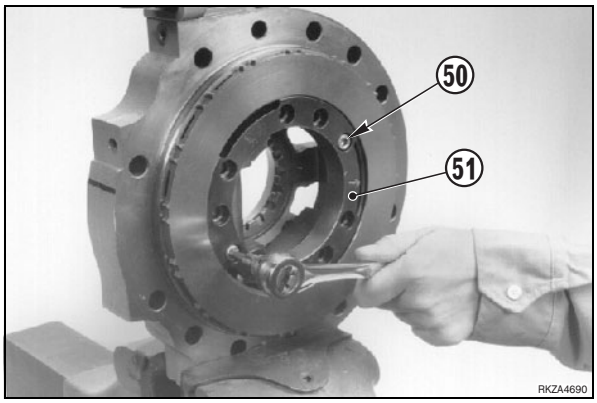
9 - Install the piston group (53) complete with the reaction plate (42) in the brake seating and push it into the cylinder (29).
- ★ If necessary use a rubber mallet to strike blows all round the circumference, in order to insert the piston into the cylinder.
- ★ Align the grooves in the reaction plate with the grooves in the brake seating.



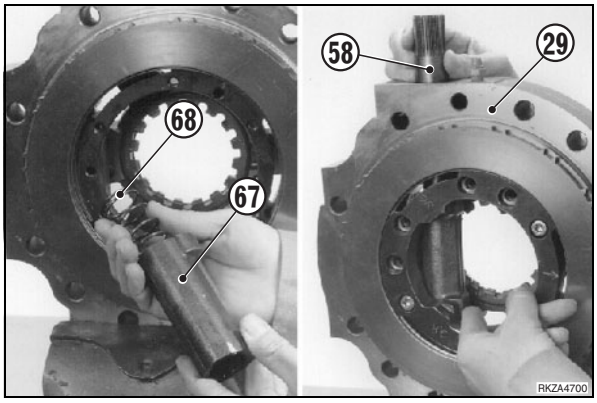
10 - Remove the brake seating (47) and the screws.



11 - Install the flange (51) and hold it steady with two screws (50) mounted opposite to each other, and secured provisionally.

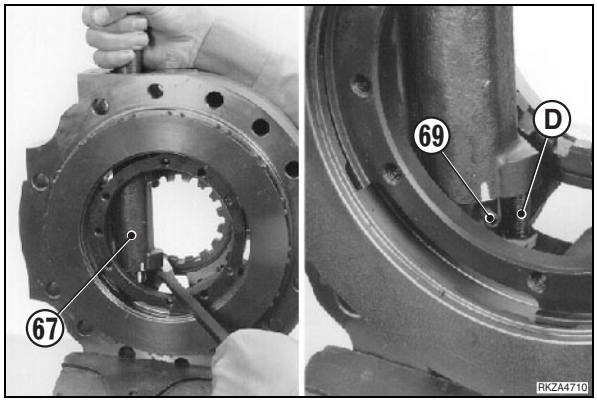


12 - Mount into the cylinder (29) the spring (68), the cam (67) and the shaft (58), aligning the reference marks made during the dismantling phase.
- ★ Check that the thrust surface of the cam (67) faces towards the contact surface of the flange (51).

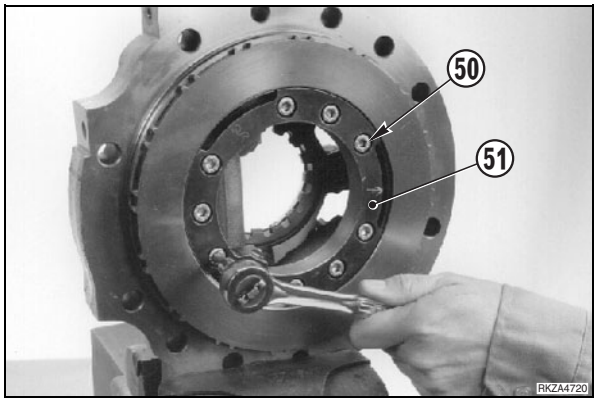


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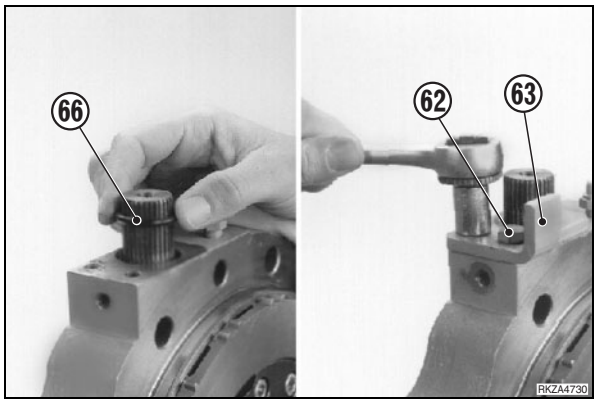
13 - Raise the cam (67) with a lever, insert a shim "**D**" and install the screw (69).
Nm Screw: 10 Nm
★ Remove the shim "**D**".



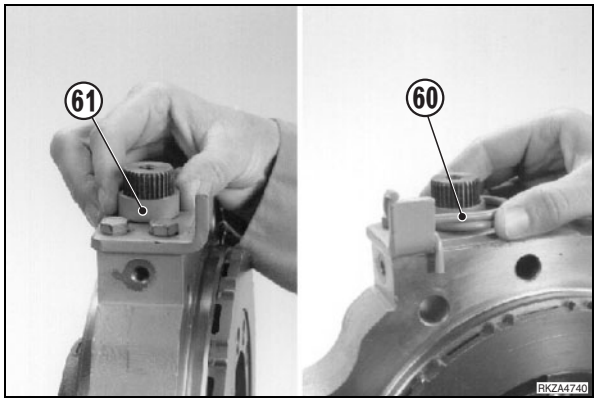
14 - Install the flange (51) with the screws (50), tightened provisionally.
★ The screws (50) will be locked in place finally after adjustment of the differential bearings.



15 - Lubricate the O-ring (66) with oil and push it into its seating. Mount the support (63) and secure it with the screws (62).
★ Do not tighten the screws at this point.

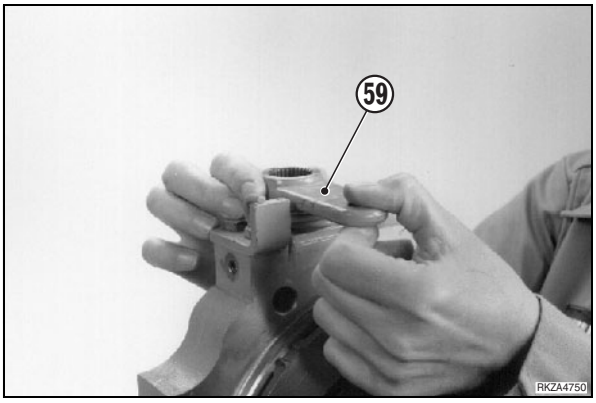


16 - Mount the spacer (61) and position the spring (60).

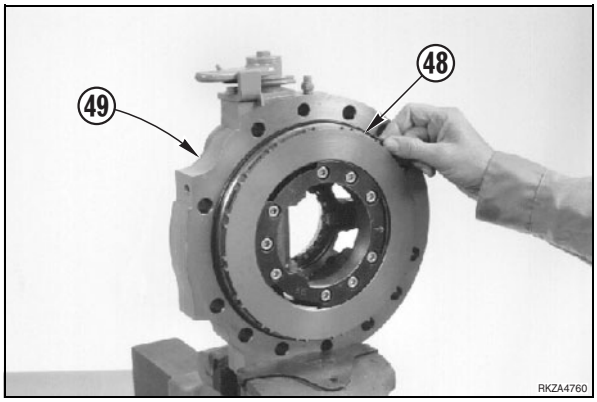


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17 - Position the lever (59), aligning the reference marks made during the dismantling phase.
★ Do not hook up the spring (60).



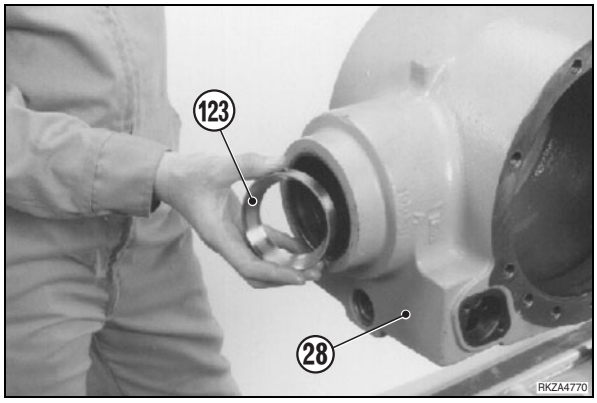
18 - Mount new O-ring seals, (48) and (49), on both sides of the brake cylinder.



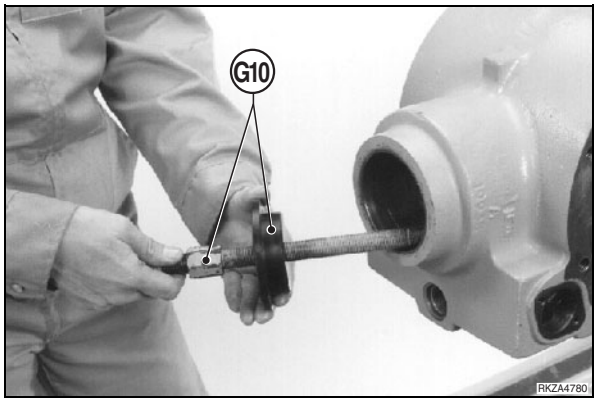
https://truckmanualshub.com/

2. Installation of the pinion

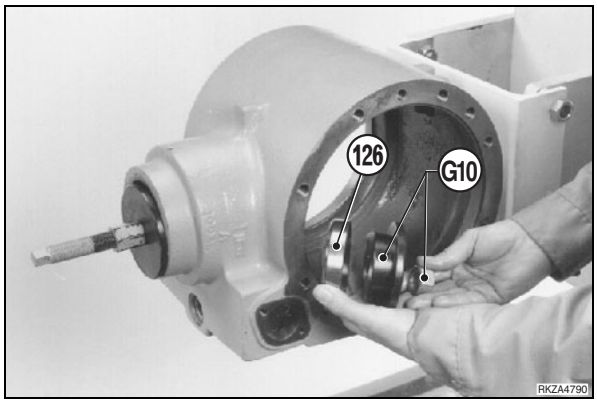
1 - Place the outer bearing ring (123) of the pinion in the central section (28).
★ Carefully check the orientation of the bearing ring.



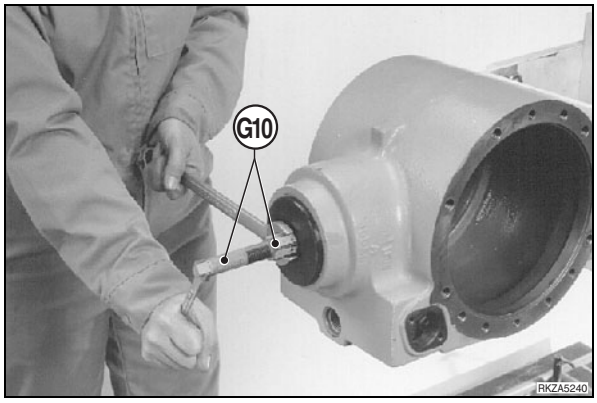
2 - Position the tool **G10** from the front of the central housing.



3 - Assemble the tool **G10** by inserting the inner bearing ring (126) of the pinion.
★ Carefully check the orientation of the bearing ring.

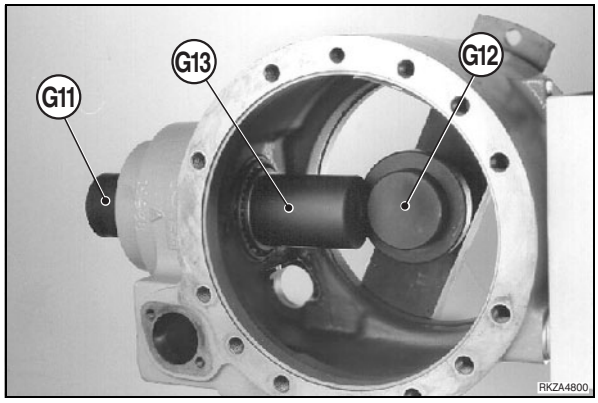


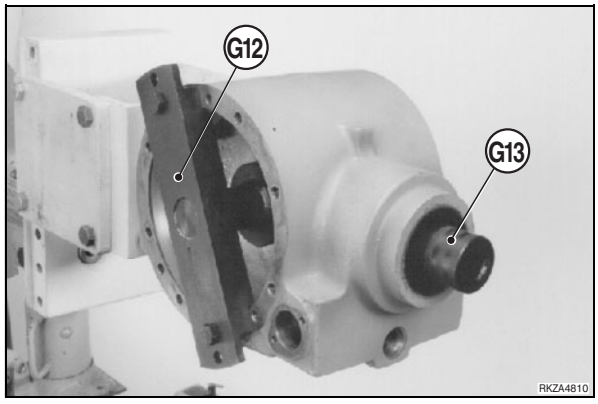
4 - Keep the central rod of the tool **G10**, locked in position and screw in the nut until the bearing ring is completely inserted.
Remove the tool **G10**.



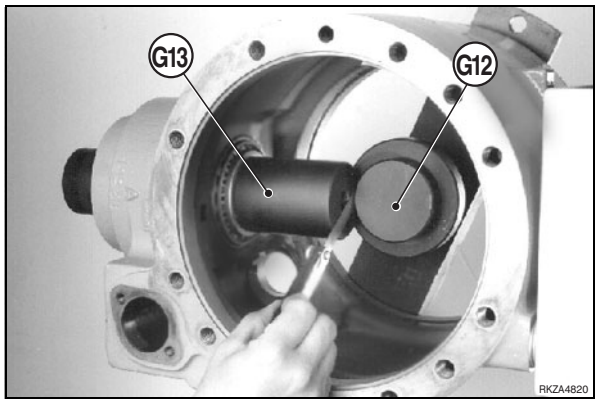
https://truckmanualshub.com/

5 - Install the bearings (123) and (126) and the special tools **G11, G12, G13** which are needed to measure the depth of the pinion.





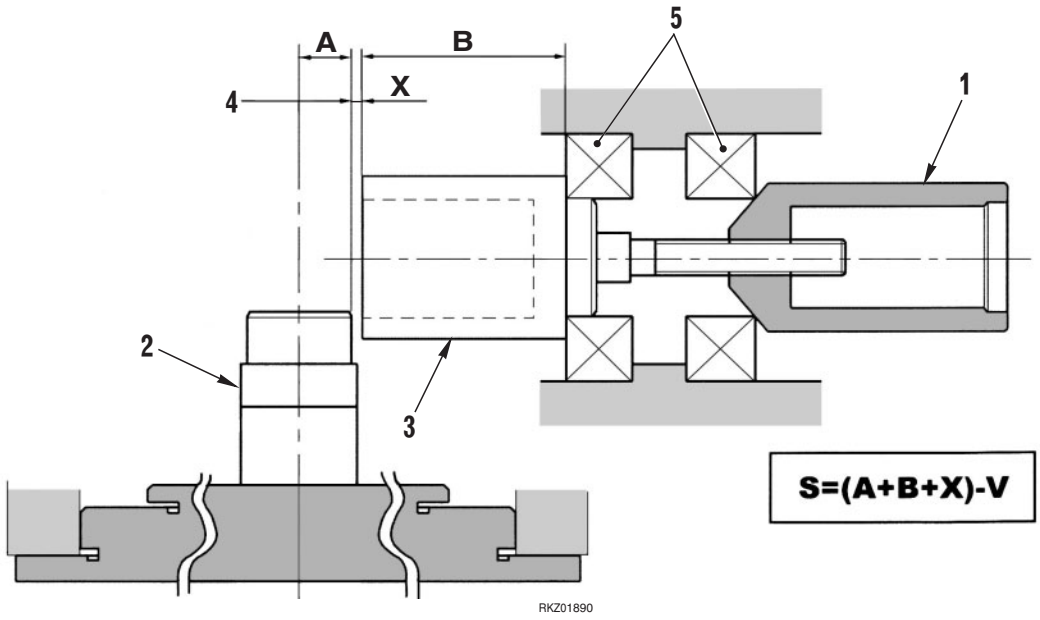
6 - Use a thickness gauge to measure the space "**X**" between the gauge block **G12** and the pinion depth gauge **G13**.
Insert the value "**X**" into the formula shown in the diagram on the next page.



7 - Measure the height "**V**" marked on the pinion and insert it into the formula shown in the diagram on the next page.



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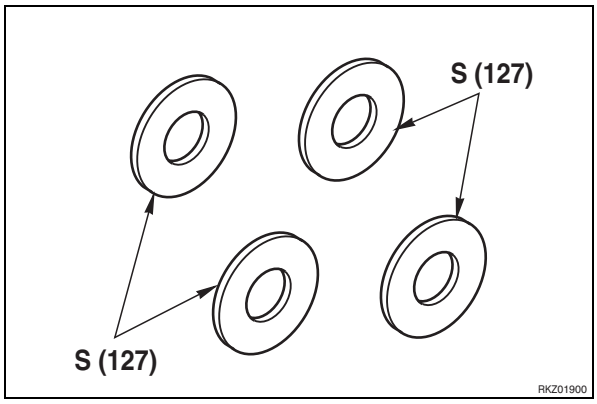


1 - Tool G11
2 - Tool G12
3 - Tool G13
4 - Clearance measured
5 - Bearing group

S = Shim measurement
A = Tool measurement (constant)
B = Tool measurement (constant)
X = Clearance measured
V = Value of pinion reading

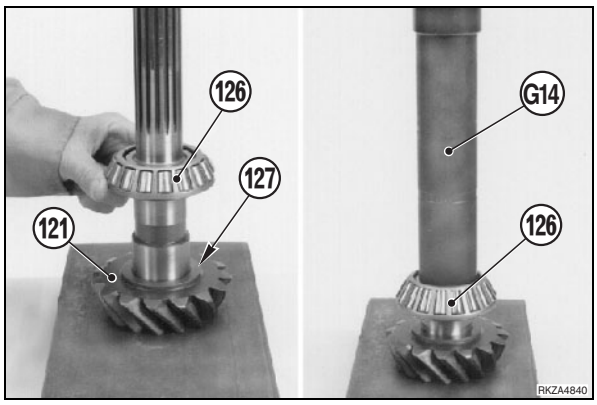
8 - Select the shim "**S**" (127) from amongst the various shims available.
- ★ Range of shims: 2.5 – 3.4 mm with an increment of 0.1 mm.
- ★ The shim "**S**" (127) should be mounted between the pinion (121) and the inner bearing (126).

9 - Take away the special tools.



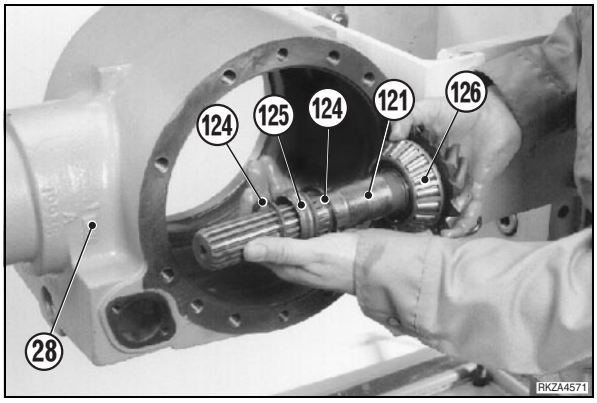
10 - Position the pinion (121) on the bed of a press and mount the shim (127) and the bearing (126).
- ★ Pay attention to the orientation of the bearing.

11 - Use the tool **G14** to press the bearing (126) onto the back of the shim (127).

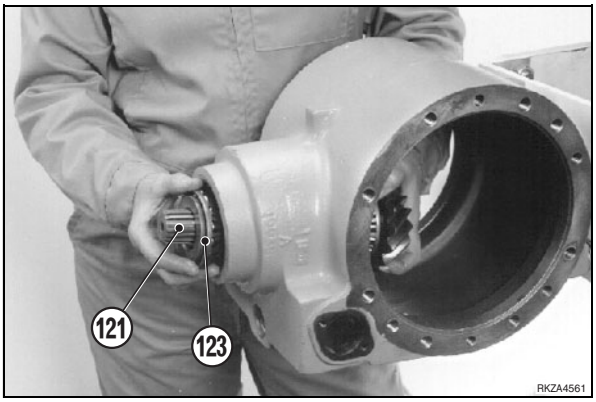


https://truckmanualshub.com/

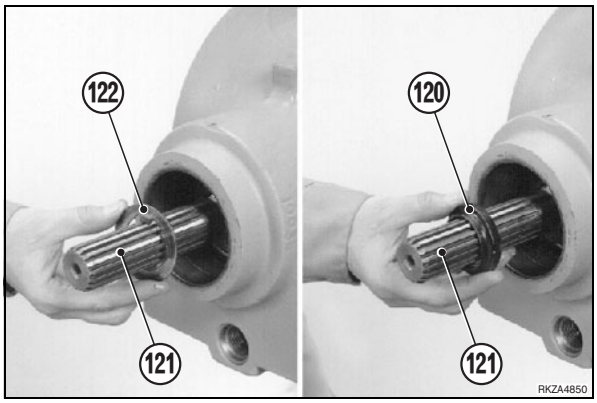
12 - Lubricate the inner bearing (126) with gear oil, then mount the first washer (124), the new spacer (125) and finally the second washer (124) onto the pinion (121).
Insert the group into the central housing (28).



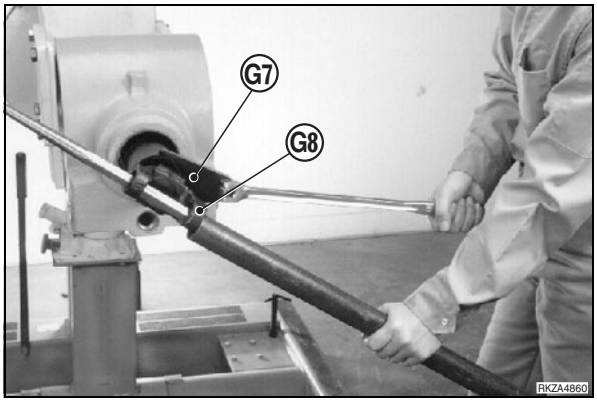
13 - Lubricate the outer bearing (123) with gear oil and press it onto the pinion (121).



14 - Mount the special washer (122) and the lock nut (120) onto the pinion (121).



15 - Use the tools **G7** and **G8** to tighten the lock nut (120) until the bearing group is tightly assembled.



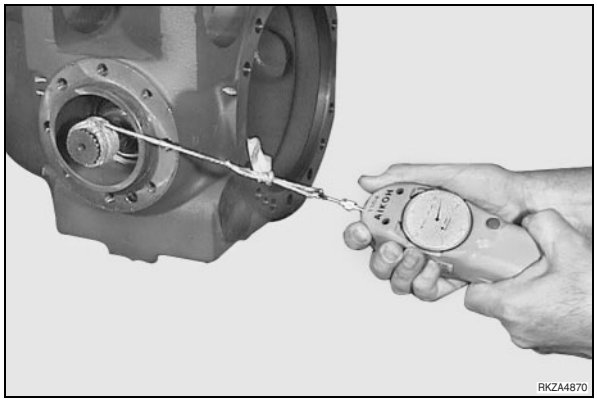
https://truckmanualshub.com/

16 - Measure the preloading "**P**" of the bearings with a dynamometer and a line wound round the pinion (121).

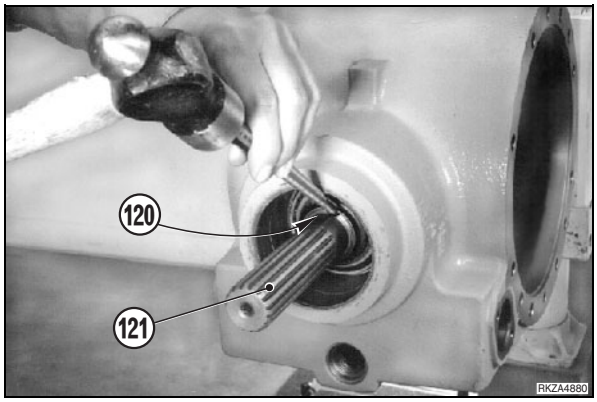
★ Preloading **P**: 9.2 – 13.8 daN
(1 daN = 10 N)

17 - Gradually adjust by tightening the lock nut (120) with small rotation increments.

★ The reloading must be controlled without seal rings.

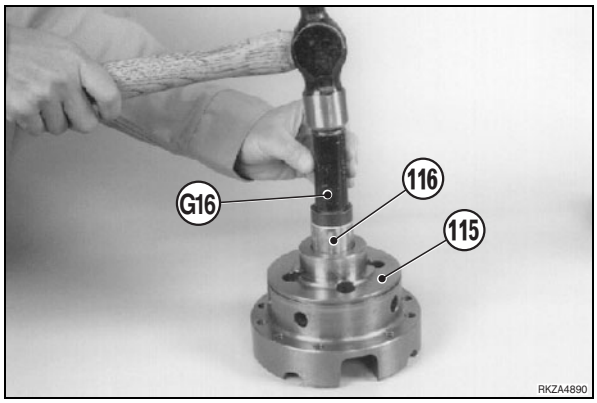


18 - Caulk the lip of the lock nut (120) into the pinion groove (121).

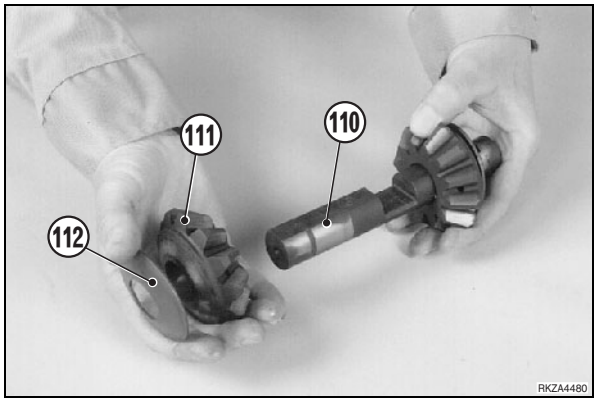


3. Re-assembly of the differential

1 - If the bushing (116) has been moved, insert it into the half box (115) on the ring bevel gear side.
For insertion, use the tool **G16**.

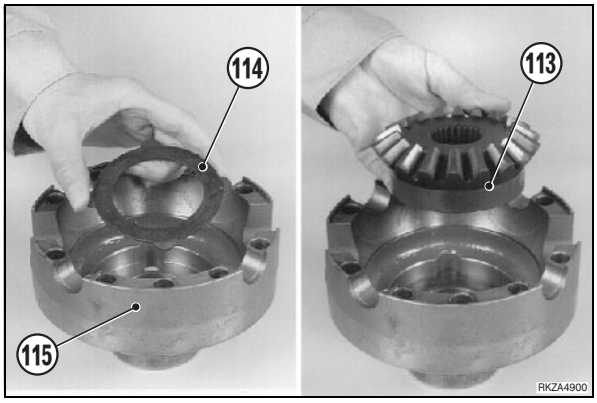


2 - Lubricate the thrust washers (112), the differential gears (111) and the cross-journal shafts (110).
Install the groups.

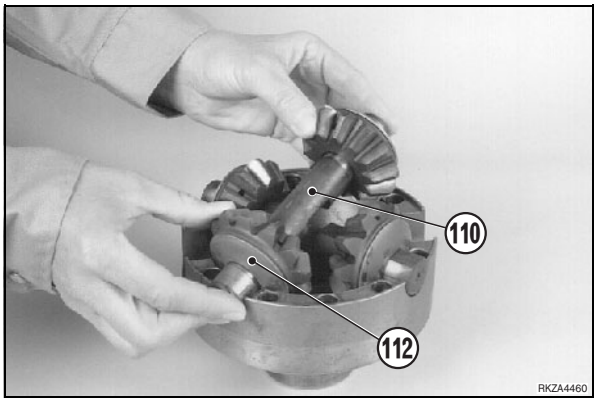


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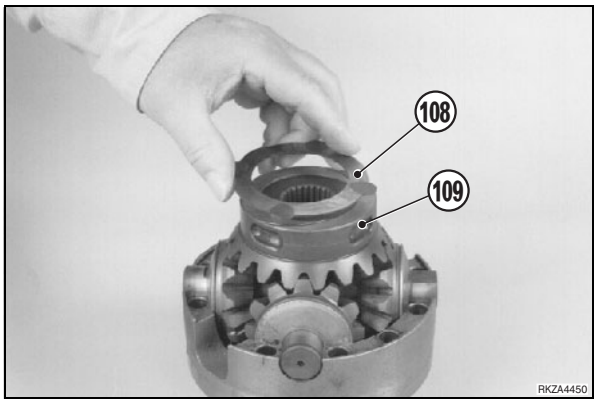
3 - Lubricate the inside surface of the half box (115) with grease and install the shim (114) and the differential gear (113).
Surface: ASL800050



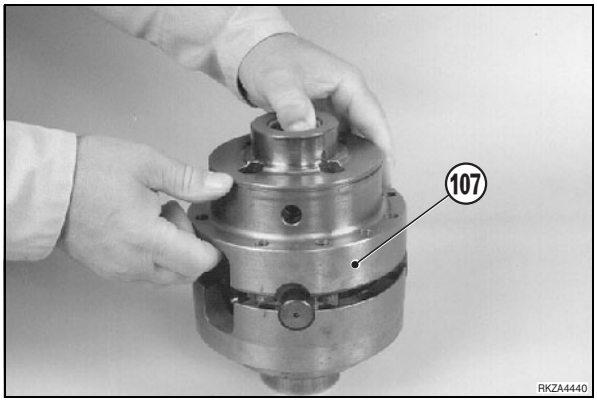
4 - Install the shafts (110) that form the cross-journal complete with the bevel gears (111) and the shims (112).



5 - Position the differential gear (109) and the thrust washer (108).
★ The protruding parts of the thrust washer should be oriented for insertion into the wells of the differential half case.

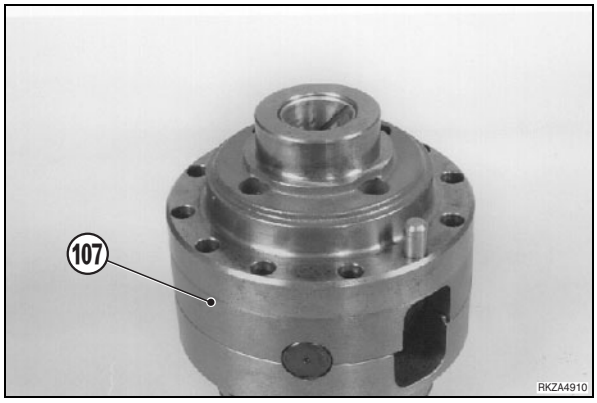


6 - Mount the half box (107) on the locking side, taking care to respect the alignment marks.



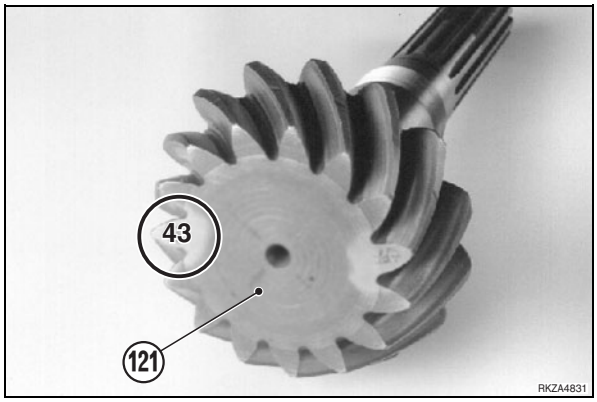
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7 - Turn the group upside down and check that both the surface of the half box and the reference pin of the ring bevel gear are perfectly clean.



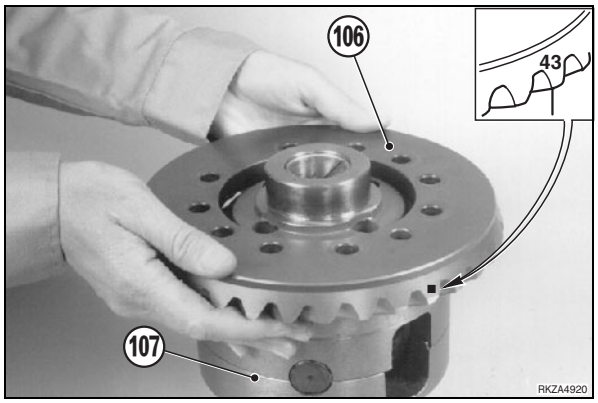
8 - The pinion (121) and the ring bevel gear (106) belong to one single set and have been marked.

★ Make sure that the number marked on the pinion corresponds to the number marked on the ring bevel gear.



9 - Coat the coupling surface of the differential box (107) with adhesive and mount the ring bevel gear (106), centering it on the reference pin.

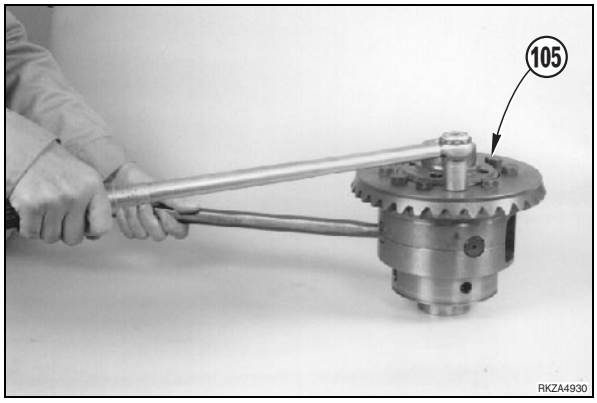
Adhesive: Loctite 638



10 - Fix the entire differential group with screws (105) and tighten them using the alternating crosswise method.

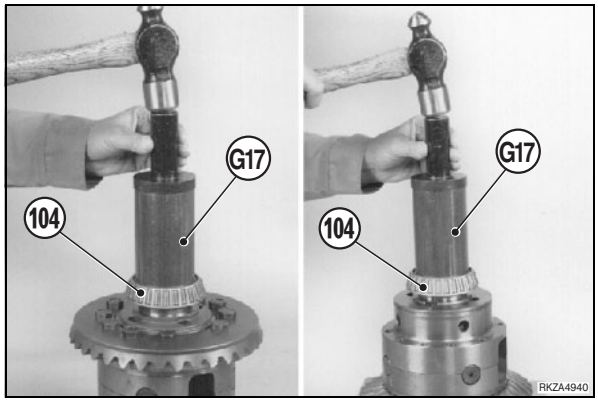
Nm Screws: 155 Nm

Screws: Loctite 270

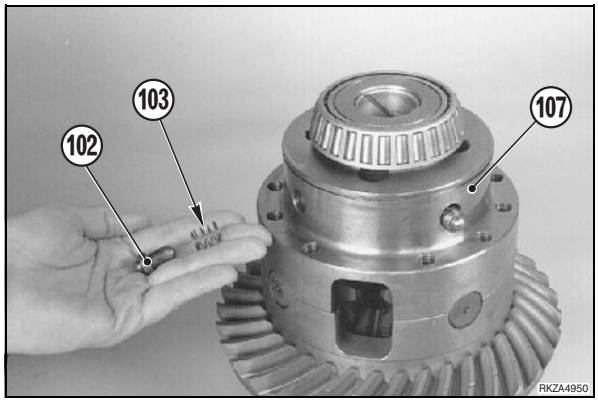


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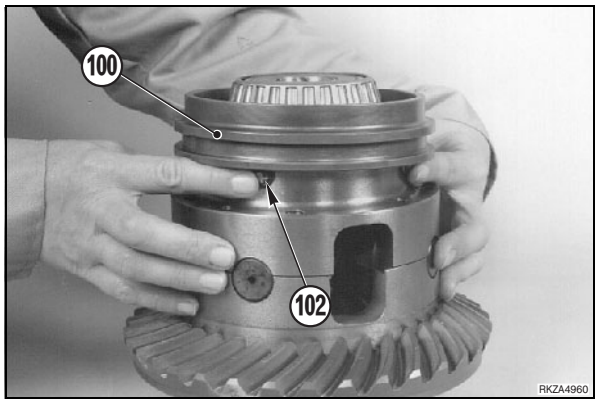
11 - Use the tool **G17**, to mount the bearings (104).



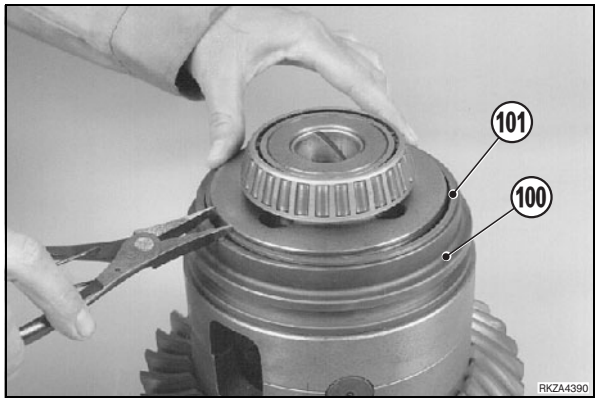
12 - Mount the springs (103) and the pegs (102) into the differential box (107).



13 - Position the differential-locking ring (100) and, pressing on the pegs (102), push it home.



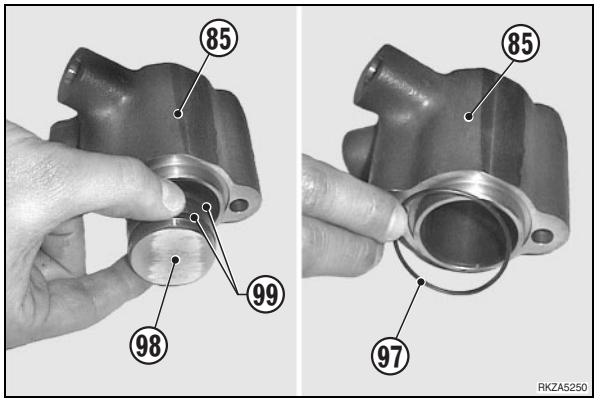
14 - Install the snap ring (101).



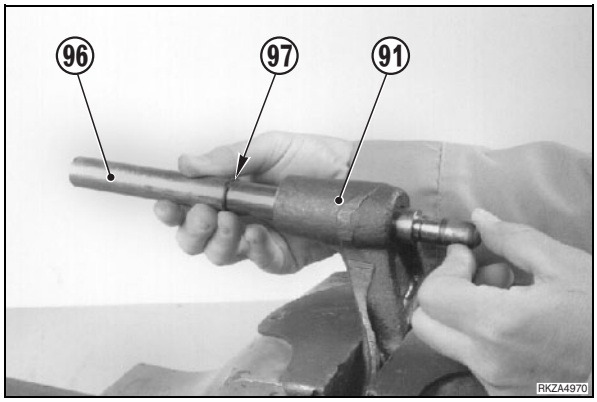
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4. Installation of the differential lock

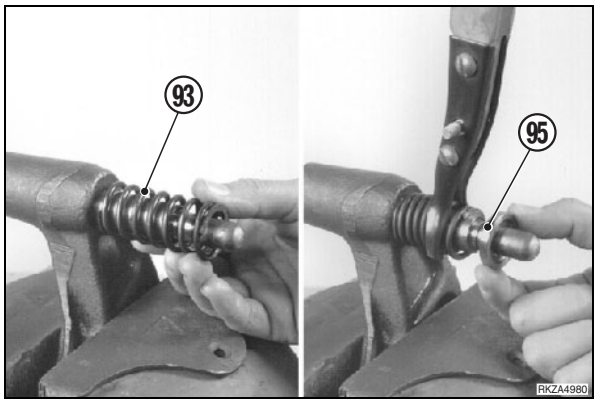
1 - Mount new O-rings (99) onto the piston (98).
Lubricate the seals and insert the complete piston into the cylinder (85).
Mount a new O-ring (97) onto the cylinder.



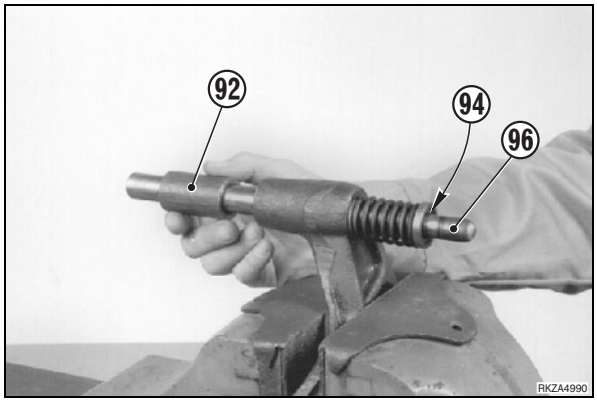
2 - Mount the shaft (96) complete with snap ring (97) into the fork (91).



3 - Install the spring (93) onto the shaft (96).
Compress the spring (93) and install the spacer (95).

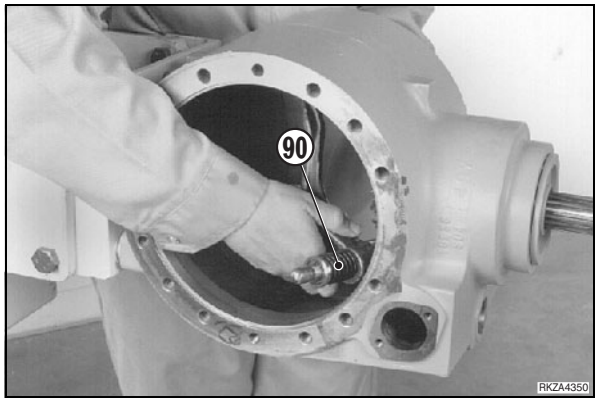


4 - Install the snap ring (94) and release the spring (93).
Mount the spacer (92) on the shaft (96).

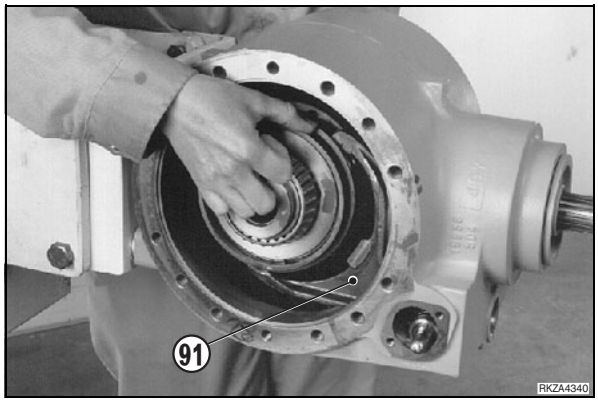


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5 - Install the fork group (90) in the central housing.

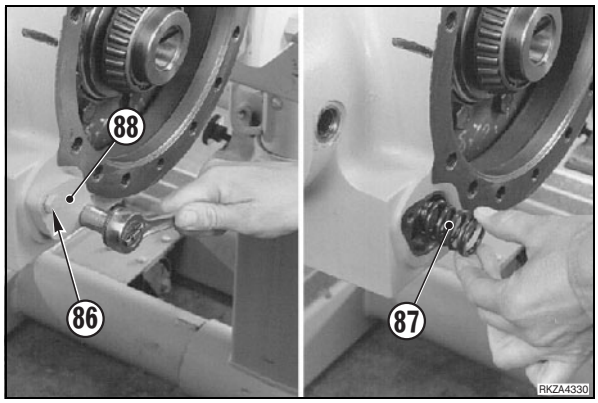


6 - Install the complete differential group, moving it so as to engage the fork (90) in the differential lock ring.



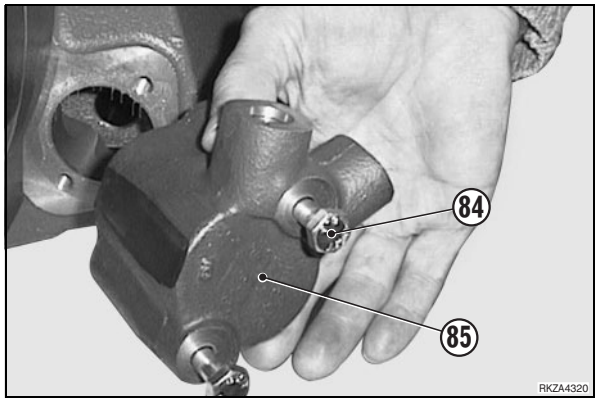
7 - Install the spring (87) in the central housing and mount the cover (88) complete with O-ring (89).
Fasten the cover with the screws (86), employing the alternating crosswise method.

Nm Screws: 23 Nm



8 - Lubricate the seals (97) of the cylinder (85) and mount the cylinder in the central housing.
Fasten the group with the screws (84), employing the alternating crosswise method.

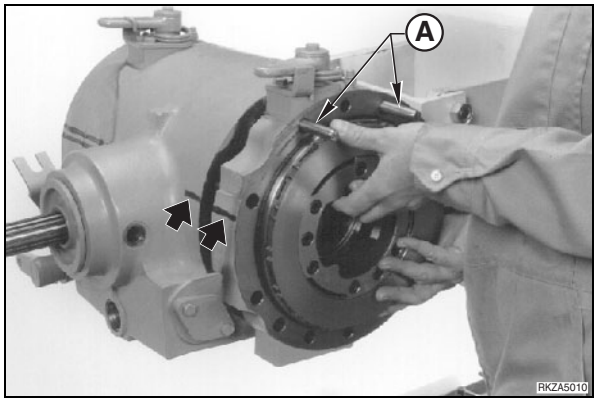
Nm Screws: 23 Nm



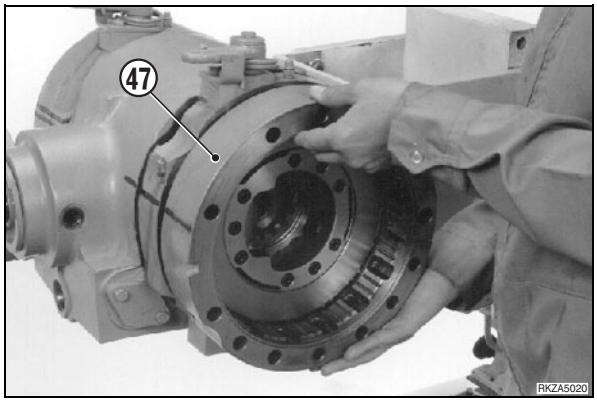
https://truckmanualshub.com/

5. Completing the assembly of the axle

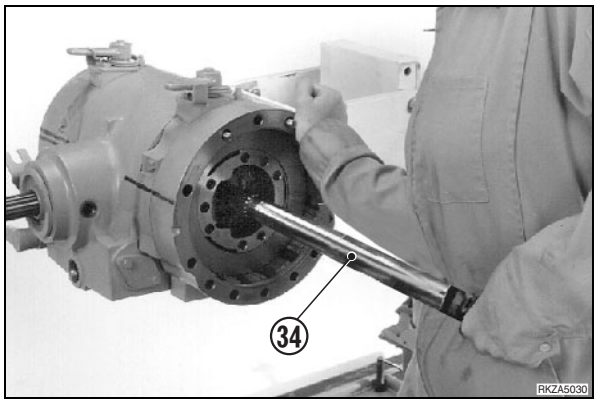
1 - Install two guide pins "**A**" in the central housing. Lubricate the O-ring seals (48) and (49) of the brake cylinder group (29).
Install the group on the central housing.
★ Check that the markings correspond.



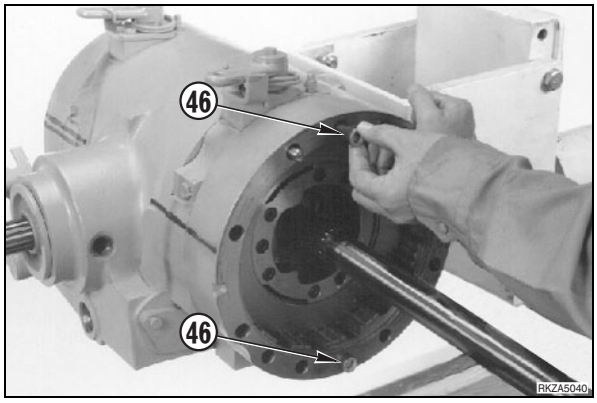
2 - Install the brake disk seating (47) on the guides "**A**".
★ Check that the markings correspond.



3 - Use the axle shaft (34) to raise the differential group into position for centering some bearings in the outer bearing ring of the brake cylinder.
Push the brake cylinder and the brake disc seating against the central housing.



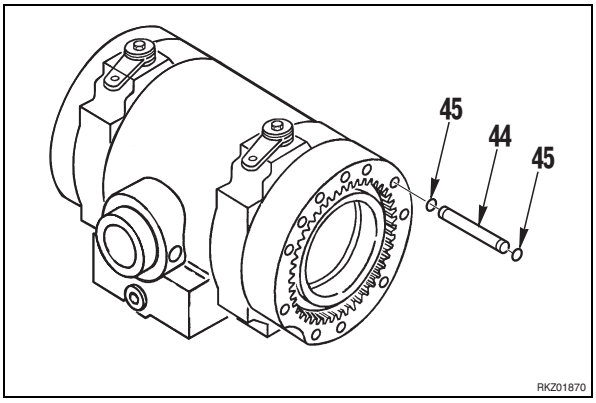
4 - Use the axle shaft to hold the group in position and completely insert the two screws (46).
★ Do not lock the screws at this point.



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5 - Lubricate the O-ring seals (45) and insert the oil re-circulation pipe (44).

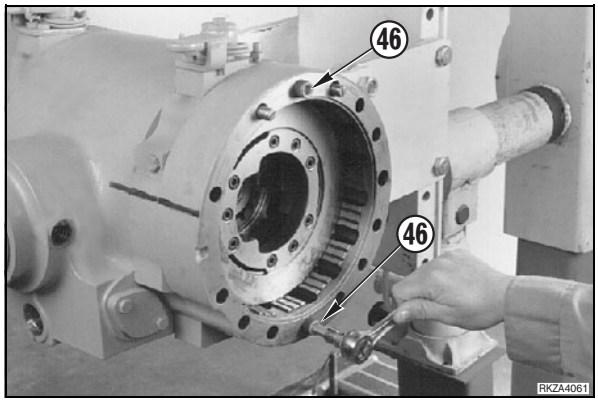
★ Make sure that the pipe (44) has been pushed completely home in the central housing.



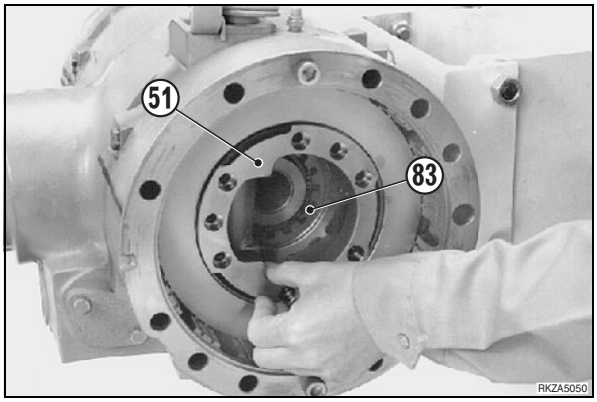
6 - Give a final tightening to the screws (46) that secure the cylinder (29) and the brake disk seating (47).

Nm Screws: 120 Nm

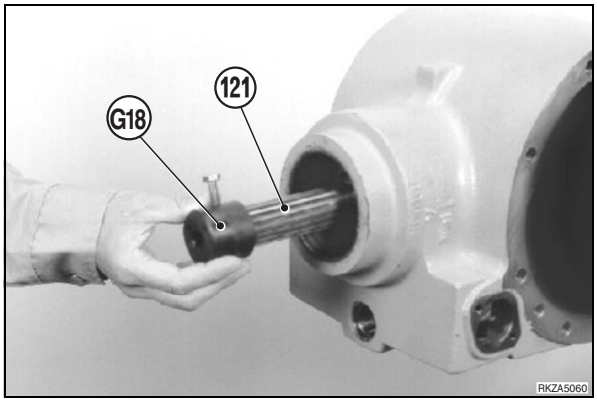
★ Repeat the assembly operations for the brake cylinder (29) and the brake disk seating (47) also on the other side.



7 - Remove the flange (51) in order to reach the lock nuts (83) that adjust the differential.



8 - Mount the tool **G18** on the pinion (121).

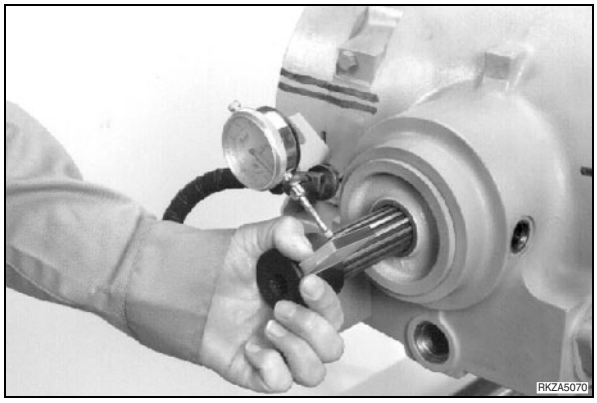


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9 - Attach a centesimal comparator perpendicular to the notch "**W**" cut into the gauge block. Pre-load the comparator by about 4 mm.

10 - Rotate the pinion by hand in both directions to check the clearance between the differential pinion teeth.

★ Clearance allowed between the teeth:
0.2 – 0.28 mm



11 - If the clearance between the teeth does not fall within the permissible values, proceed as follows:

1 - Clearance above the limit

a - Unscrew the adjustment lock nut (1) by one notch.

b - Screw in the lock nut (2) by one notch.

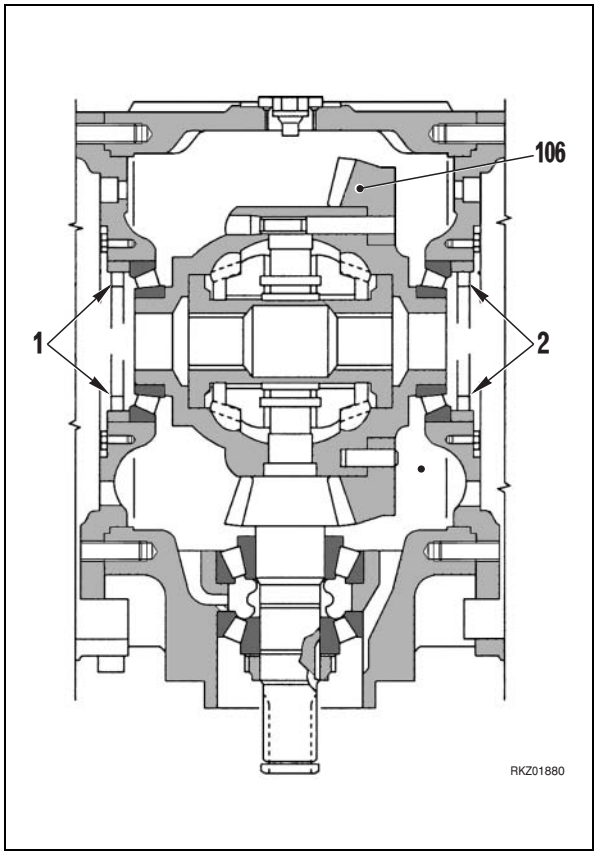
2 - Clearance below limit

a - Unscrew the adjustment lock nut (2) by one notch.

b - Screw in the lock nut (1) by one notch.

★ Repeat these operations until the clearance fall within permissible limits.

★ Use the tool **G6** to turn the lock nuts.



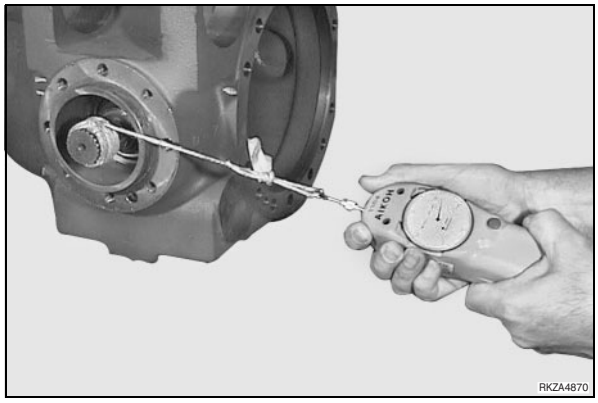
https://truckmanualshub.com/

12 - Once the clearance between the teeth has been determined, check that the total pre-loading "**T**" of the bearings falls within permissible limits.

★ Pre-loading: **T** = (P + 3.23)/(P + 4.84) daN
(1 daN = 10 N)

★ P = pre-loading of the pinion bearings.

This check is performed in the same was as the check on the pre-loading **P** of the pinion bearings.



13 - If the pre-loading does not fall within permissible limits, proceed as follows:

1 - Pre-loading above the limit

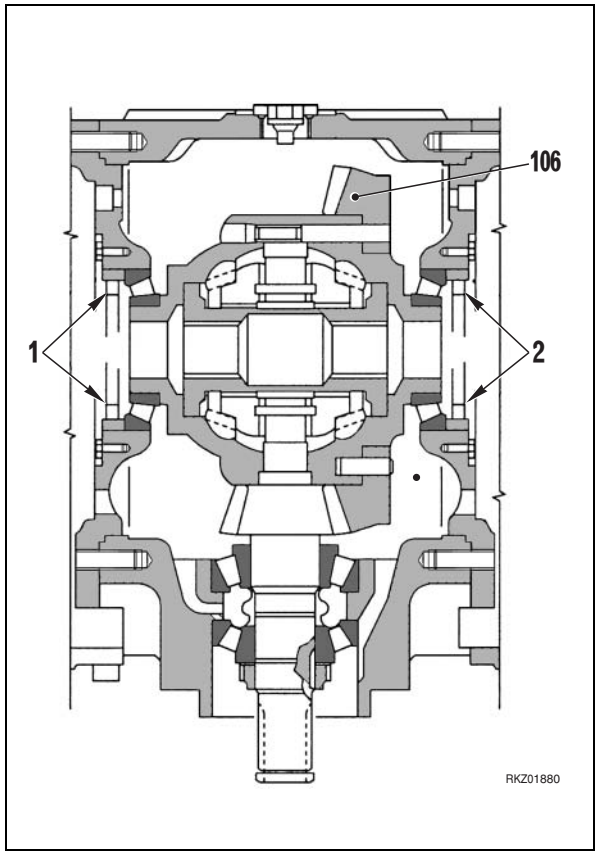
a - Unscrew the lock nuts (1) and (2) by one notch.

2 - Pre-loading below the limit

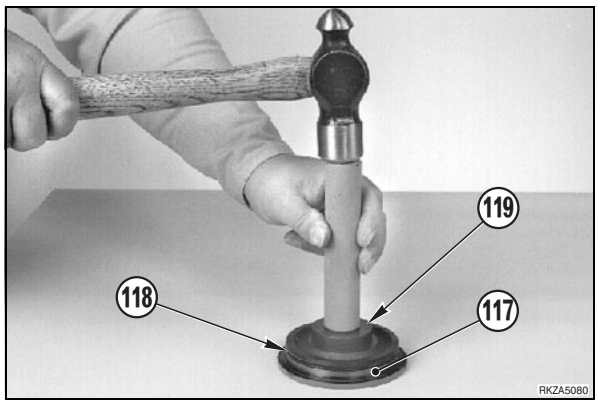
a - Screw in the lock nuts (1) and (2) by one notch.

★ Repeat these operations until the pre-loading falls within permissible limits.

★ Use the tool **G6** to turn the lock nuts.

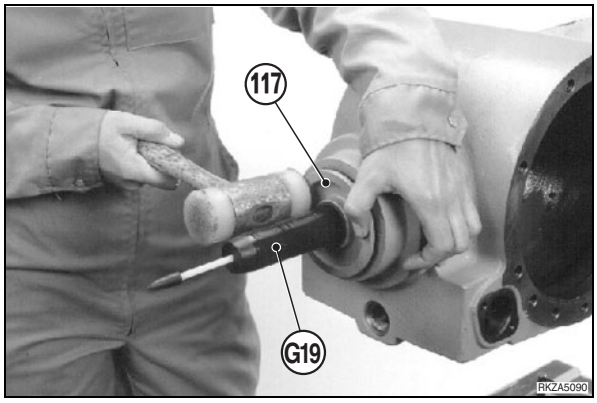


14 - Lubricate the seal ring (119) with oil and, using the tool **G16**, insert it into the cover (117).
Also mount the O-ring (118).

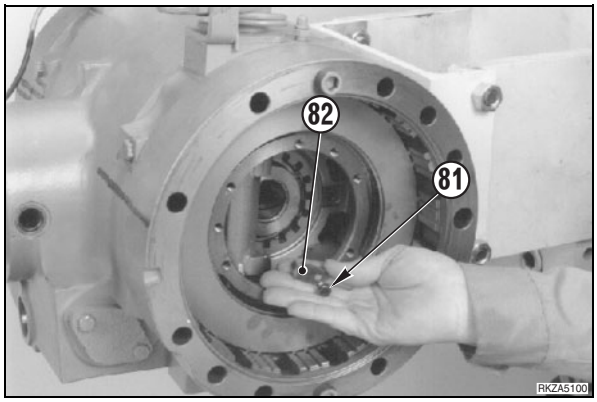


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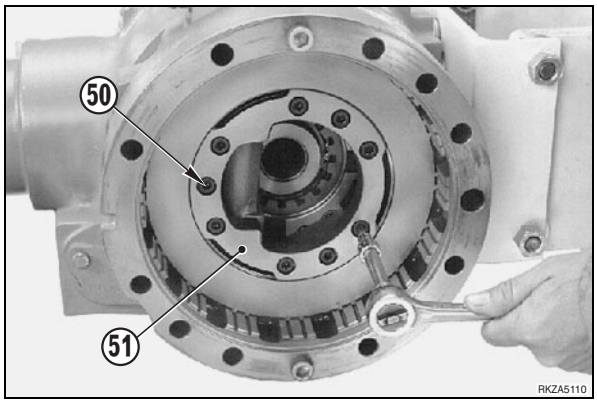
15 - Lubricate the O-ring (118) and, using the tool **G19**, mount the complete cover (117) into the central housing.
Remove the tool **G19**.



16 - Mount the adjusting ring locks (82) and block them with the screws (81).
Nm Screws: 13 Nm

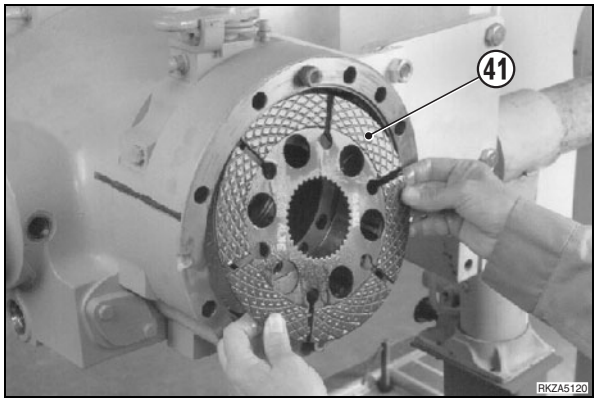


17 - Place the flange (51) in its final position and secure it with the screws (50) tightening them progressively.
Nm Screws: 23 Nm



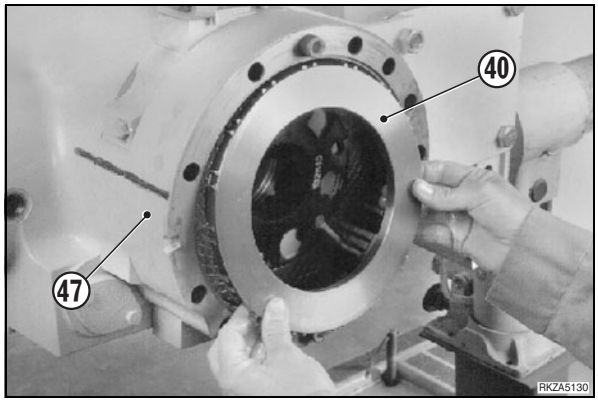
★ If new brake disks (41) and (38) are to be installed, make sure that the disks have been soaked in oil. At the very least the disks should be lubricated on both sides.

18 - Install the first brake disk (41).



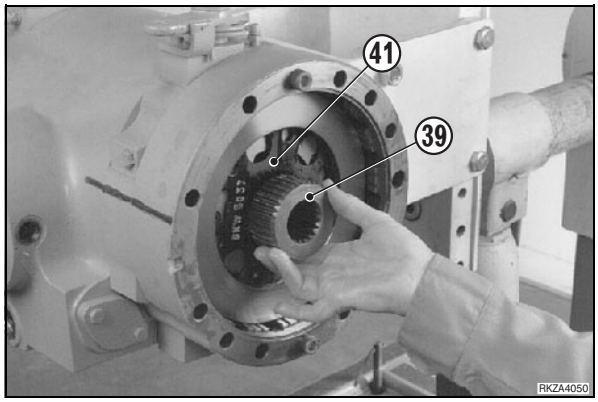
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19 - Install the intermediate reaction plate (40), making sure that the teeth of the outer circumference are engaged in the slots in the seating (47).



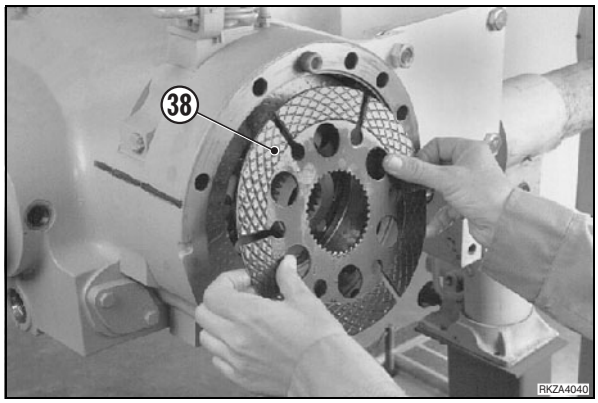
20 - Install the sleeve (39), engaging the toothing in the brake disk (41).

★ Engage the brake disk in the short grooved part of the sleeve.



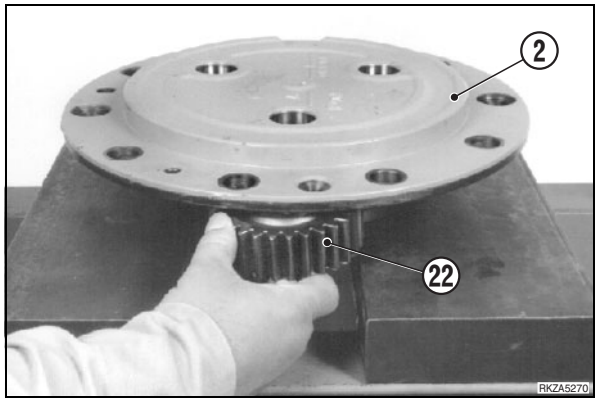
21 - Install the second brake disk (38), aligning the holes with those of the first disk.

★ Continue the assembly with the second reaction plate (40) and the third brake disk (38), following the previous procedures.



22 - Install the outer reaction plate (37), making sure that the teeth of the outer circumference are engaged in the slots of the seating (47).

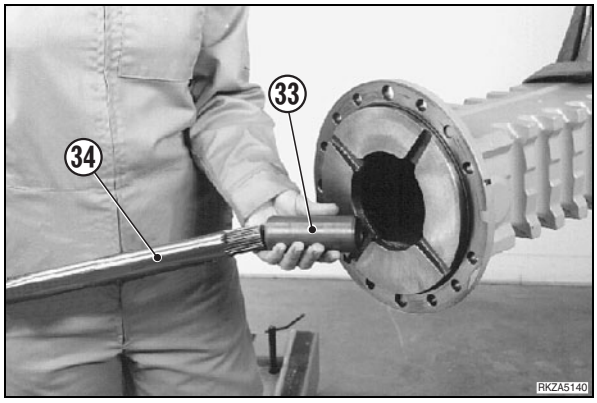
★ The marked face should be turned towards the outside of the central housing.



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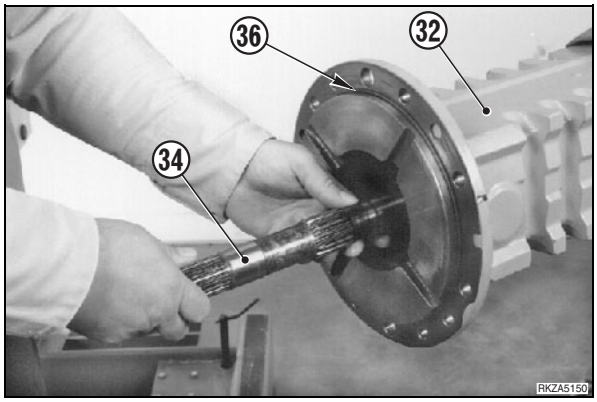
23 - If the joint (33) on the axle shaft (34) has been moved, re-assemble it.

★ Check that the coupling (35) is mounted inside the joint (33).



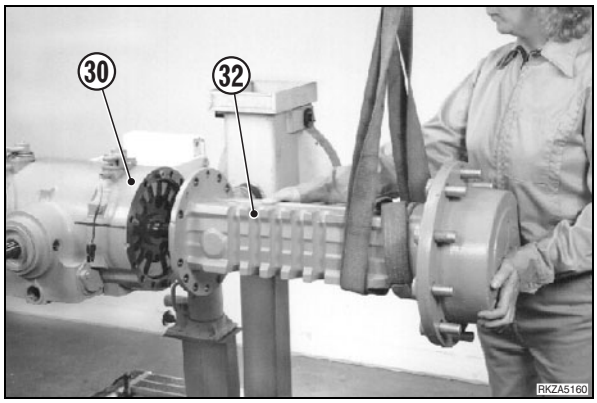
24 - Install the shaft (34) in the axle arm (32).

★ Make sure that the joint is engaged on the axle shaft (4) of the final drive.
Lubricate the O-ring (36) and mount it on the flange of the axle arm (32).



25 - Raise the complete axle arm (32) horizontally and engage the axle shaft (34) with the brake group (30).

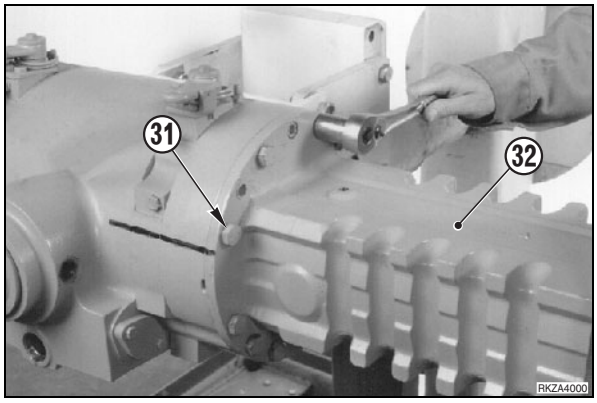
★ If necessary rotate the bevel pinion to engage the shaft (34).



26 - Push the axle body (32) against the central housing. Mount the screws (31) and employ the alternating crosswise method to tighten them.

Nm Screws: 130 Nm

★ Repeat these assembly operations for the other axle body.



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6. Final re-assembly

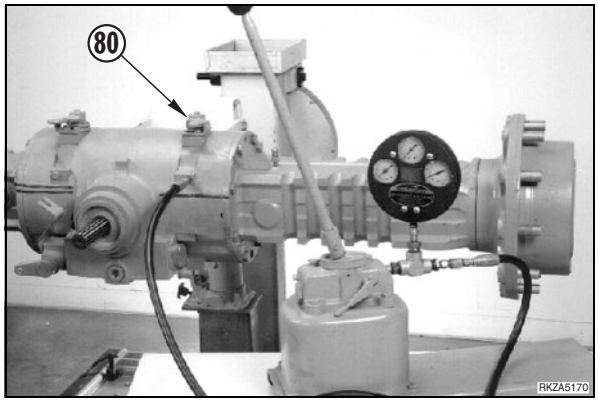
1 - Loosen the air breather plugs (80).

2 - Connect a hand-pump, supplied with braking circuit oil and a pressure gauge, to a braking group.

3 - Pump the oil in, and tighten the breather plug when oil comes out without any trace of air.

4 - Bring the pressure up to 40 bar to settle the braking group.

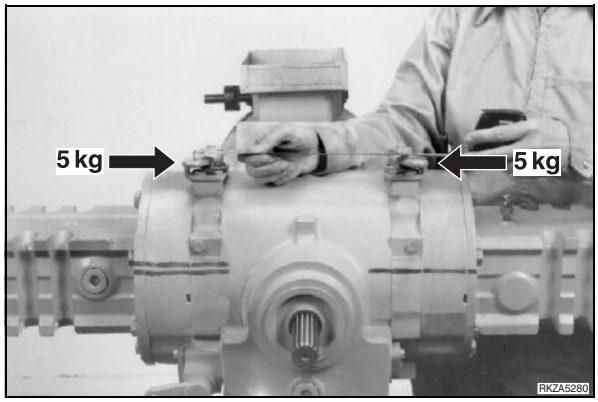
5 - Repeat these operations for the other group and remove the pump.



6 - Tighten the two levers (59) of the parking brake by applying a force of 5 kg on each lever, and checking that the center distance between the holes is 300 – 310 mm with the levers inclined symmetrically.

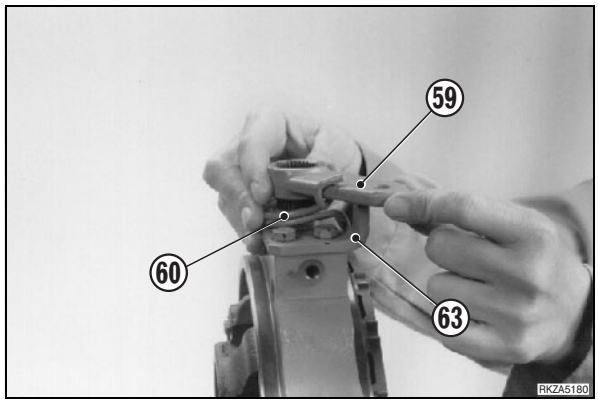
★ If necessary, raise the levers and engage them on the grooves of the shaft in a different position, making marks to indicate the new position.

★ Check that each lever makes a return stroke of at least 3 mm (center distance measurement 306 – 316 mm).



8 - Raise the levers (59) and the springs (60). Hook up the springs and pre-load them by rotating the levers inside the supports (63).

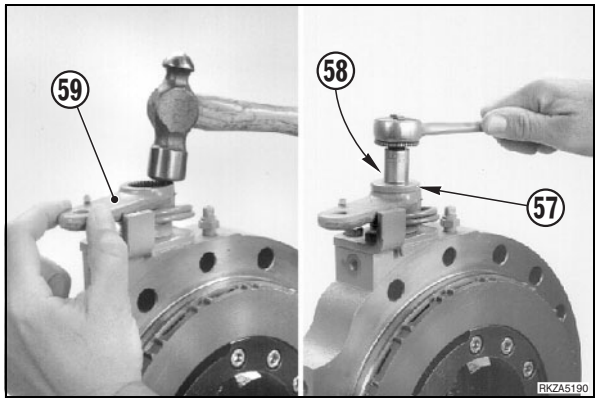
★ Make sure that the shaft rotates with the levers.



9 - Use a mallet to push the levers (59) home on the shaft (58).

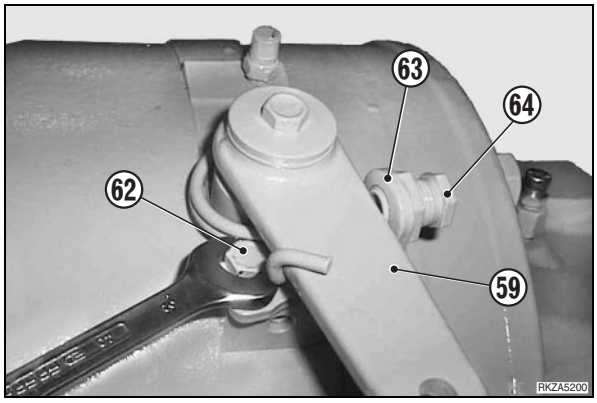
10 - Install the retaining washer (57) and the screw (56).

Nm Screw: 35 Nm

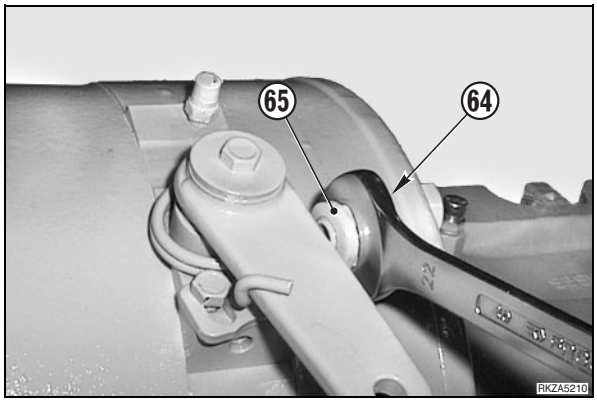


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11 - Move the supports (63) until the adjustment screws (64) are perpendicular to the levers (59). Lock them in position with the screws (62).

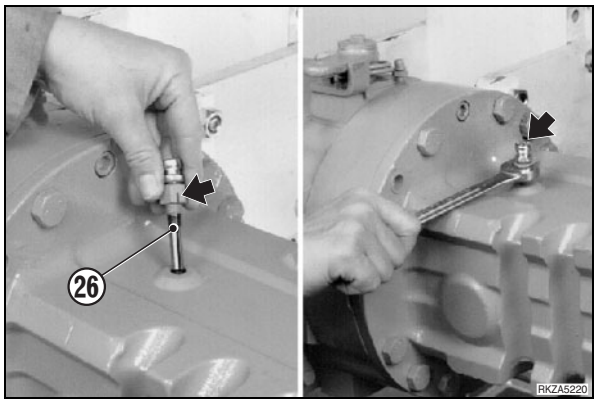


12 - Adjust the return stroke of the levers from the braking position to 3 mm, and lock the adjustment screws (64) with the nuts (65).



13 - Install the breather pipe (26) and tighten it until the reference mark made during the dismantling phase is in the correct position.

Nm Breather pipe: 10 Nm

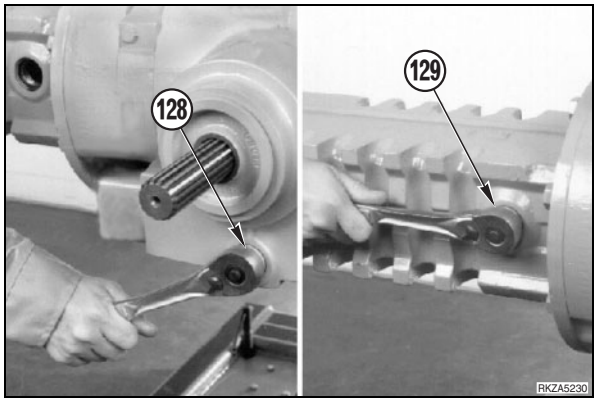


14 - If the plug (128) has been removed to drain the oil, replace it in the central housing.

Nm Plug: 80 Nm

15 - Fill the axle up with oil and replace the cap (129).

Nm Plug: 80 Nm



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REMOVAL OF THE FRONT BUCKET BOOM-RAISING CYLINDER

FROM SERIAL NUMBER 97F20001 TO 97F20171

⚠ 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).

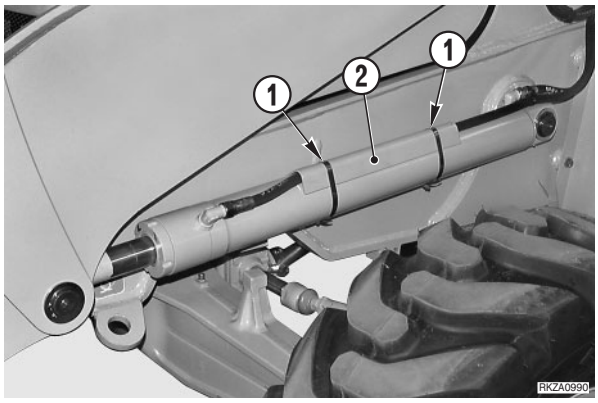
2 - Put a sling round the cylinder (3) and insert some blocks «A» between the boom (4) and the fulcrum lever spacer (5).

3 - Take off the snap-ring and the internal retaining spacer for the piston attachment pin (6).

4 - Take out the pin (6) in order to free the piston head (7), but leave the fulcrum lever engaged (5).

5 - Start the engine to retract the piston (7).

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



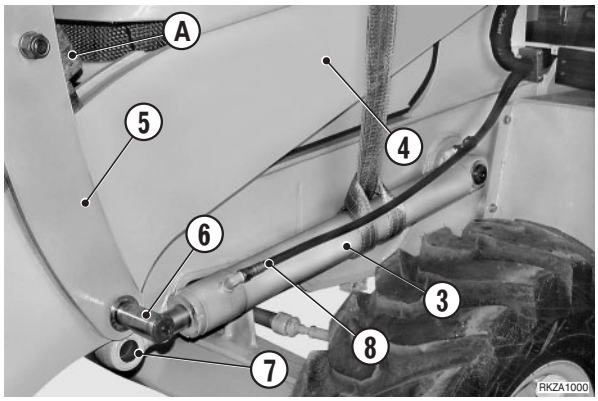
※1 ※2

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

6 - Disconnect the tubes (8) and (9) and plug them to prevent entry of impurities.

7 - Remove the snap-ring (10) and the spacer (11).

8 - Remove the cylinder (3).

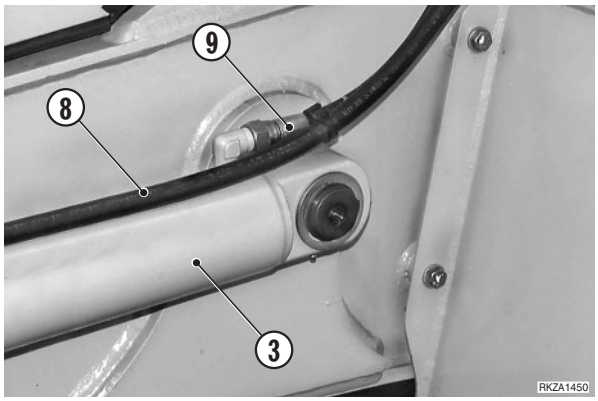


INSTALLATION OF FRONT BUCKET BOOM-RAISING CYLINDER

- 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.

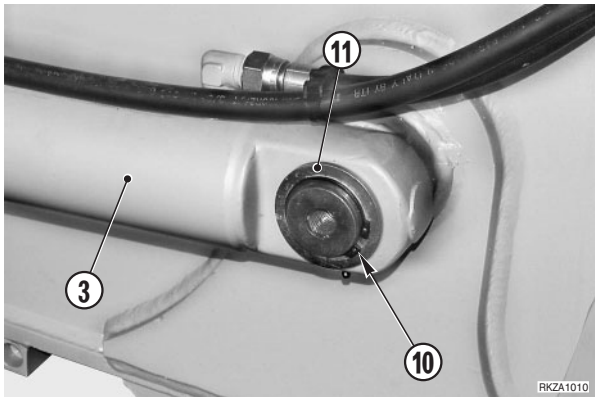


※2

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.



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REMOVAL OF THE FRONT BUCKET BOOM-RAISING CYLINDER

FROM SERIAL NUMBER 97F20172–

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

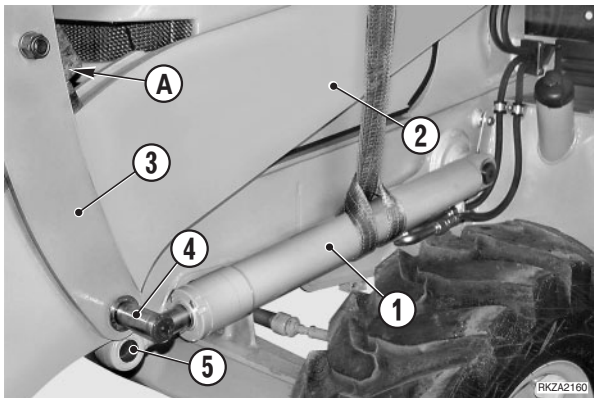
1 - Put a sling round the cylinder (1) and insert some blocks «A» between the boom (2) and the fulcrum lever spacer (3).

2 - Take off the snap-ring and the internal retaining spacer for the piston attachment pin (4).

3 - Take out the pin (4) in order to free the piston head (5), but leave the fulcrum lever engaged (3).

4 - Start the engine to retract the piston (1).

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



※1 ※2

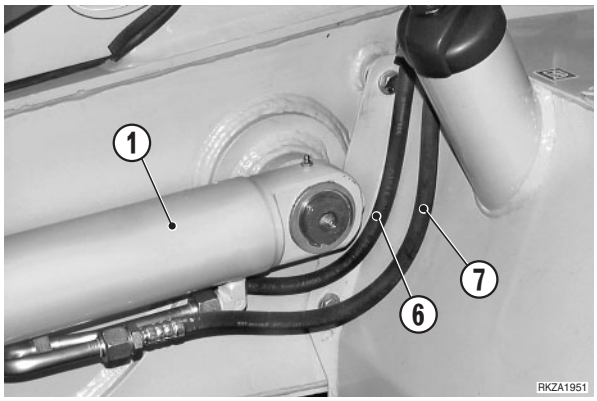
Release all residual pressure in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

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

5 - Disconnect the tubes (6) and (7) and plug them to prevent entry of impurities.

6 - Remove the snap-ring (8) and the spacer (9).

7 - Remove the cylinder (1).

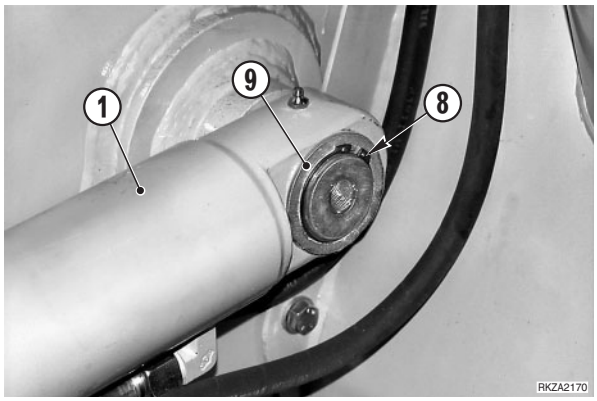


INSTALLATION OF FRONT BUCKET BOOM-RAISING CYLINDER

- 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.

https://truckmanualshub.com/

REMOVAL OF THE FRONT BUCKET TILT CYLINDERS

FROM SERIAL NUMBER 97F20001 TO 97F20171

⚠ 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**
Remove the bucket position indicator (3).

2 - Place a sling round the cylinder (4) and insert a block «**A**» between the spacer (5) of the piston fulcrum lever (7) and the lever (8).

3 - Take off the snap-ring and the internal retaining spacer for the piston attachment pin (8).

4 - Take out the pin (8).

5 - Start the engine to retract the piston (9).

※1 ※2

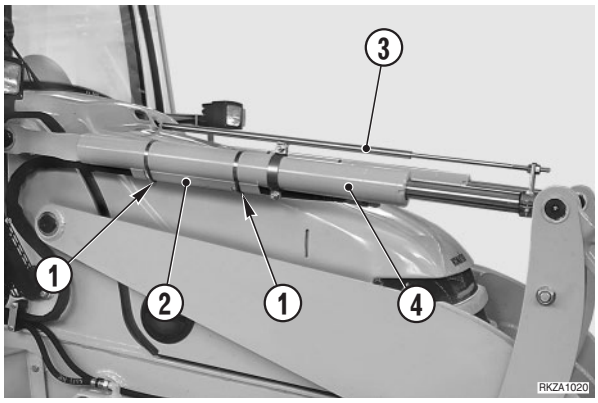
★ Bind the piston head with wire to secure the fully retracted position and stop the engine.

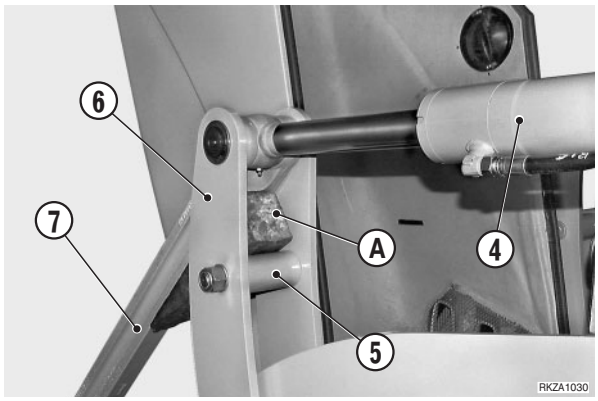
⚠ Release all residual pressure in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

6 - Disconnect the tubes (10) and (11) and plug them to prevent entry of impurities.

7 - Remove the snap-ring (12) and the spacer (13).

8 - Remove the cylinder (4).





INSTALLATION OF THE FRONT BUCKET TILT CYLINDERS

• To install, reverse the removal procedure.

※1

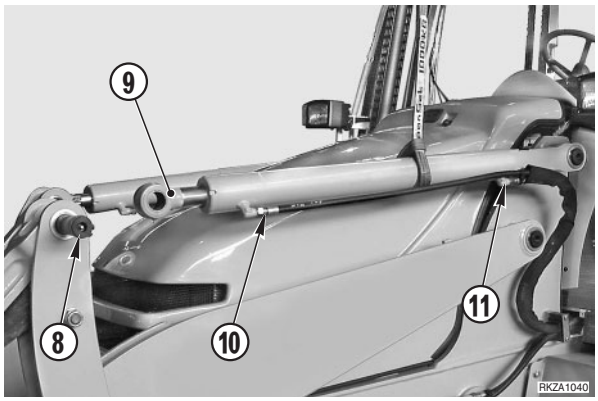
⚠ When aligning the positions between the hole and the pin, turn the engine over at low idling speed.
Do not insert fingers into the holes to check alignment.

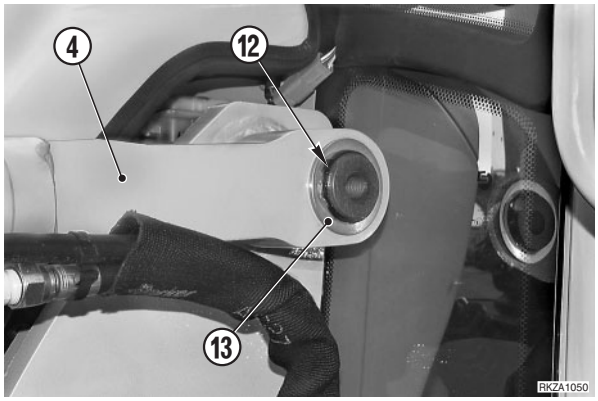
※2

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.





https://truckmanualshub.com/

REMOVAL OF THE FRONT BUCKET TILT CYLINDERS

FROM SERIAL NUMBER 97F20172–

⚠ 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 (7) of the piston fulcrum lever and the lever (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»).

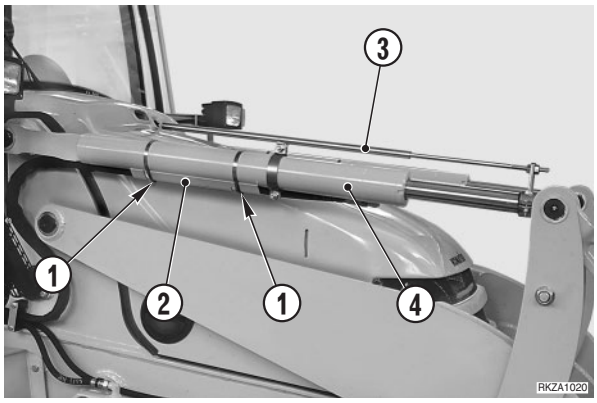
⚠ Cut off the supply of electricity by turning the accumulator-disconnecting switch in a counter-clockwise direction, and remove the handle.

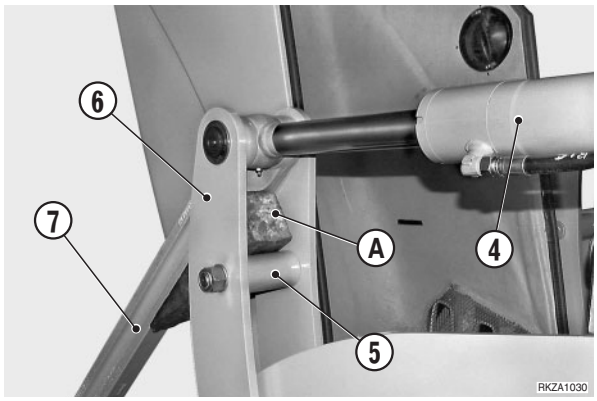
6 - Take out the screw (11) and remove the clamp (12).

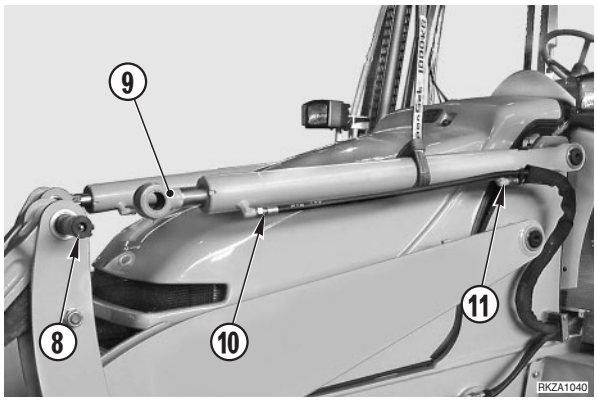
7 - Disconnect the tubes (13) and (14) and plug them to prevent entry of impurities.

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

9 - Remove the cylinder (5).







INSTALLATION OF THE FRONT BUCKET TILT CYLINDERS

- To install, reverse the removal procedure.

※1

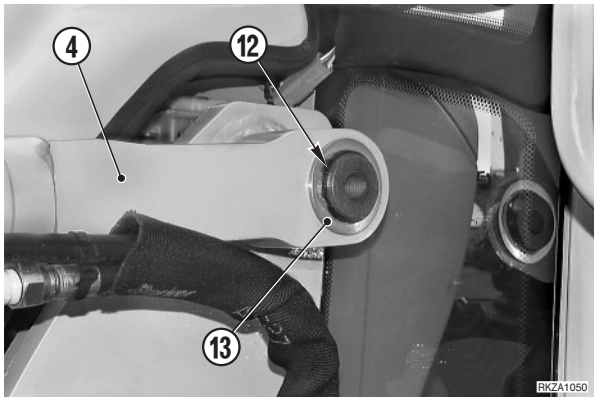
⚠ When aligning the positions between the hole and the pin, turn the engine over at low idling speed.
Do not insert fingers into the holes to check alignment.

※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.



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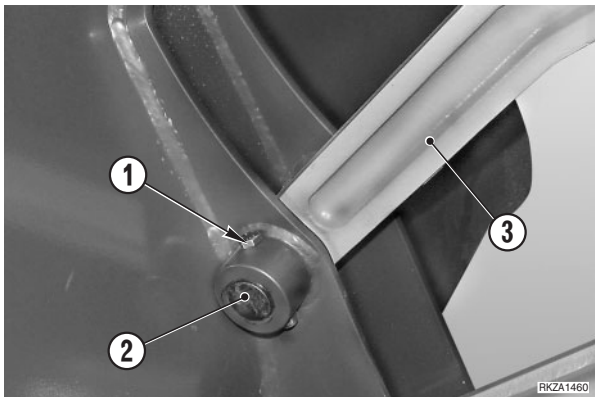
REMOVAL OF THE FRONT BUCKET

⚠ Lower the bucket to the ground, resting on its back, but without forcing it downwards.

1 - Stop the engine and release residual pressures.

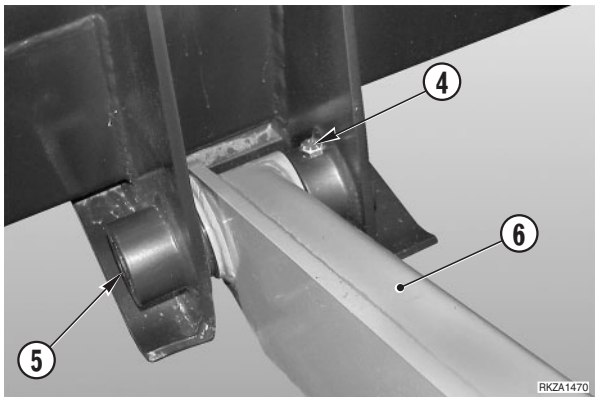


2 - Take out the screws (1) and remove the pins (2) of the lever (3).
Rest the lever (3) on the boom. ※1 ※2



3 - Take out the screws (4) and remove the pins (5) of the bucket fulcrum. ※1 ※2

4 - Start the engine and put the machine into reverse gear in order to disengage the boom (6).



INSTALLATION OF THE FRONT BUCKET

- 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

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REMOVAL OF THE FRONT WORKING EQUIPMENT

FROM SERIAL NUMBER 97F20001 TO 97F20171

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

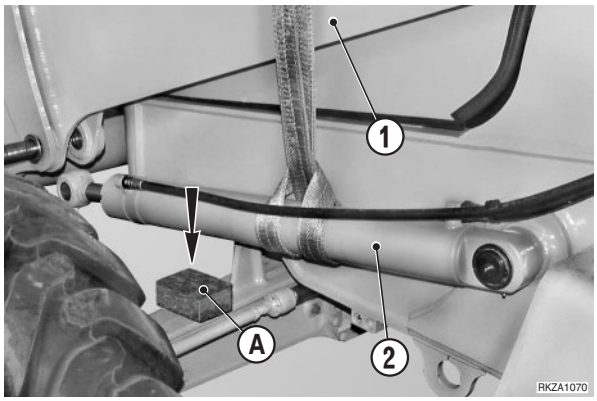
Release all residual pressure in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

1 - Remove the tilt cylinders. (See «REMOVAL OF FRONT BUCKET TILT CYLINDERS»).

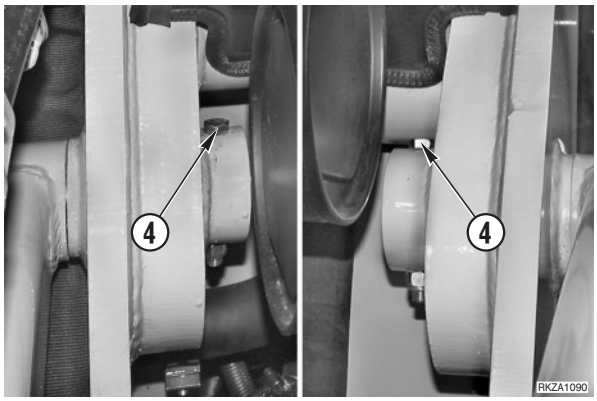


2 - Disconnect the cylinders (2) from the boom and rest them on wooden blocks «**A**» placed on the front axle.

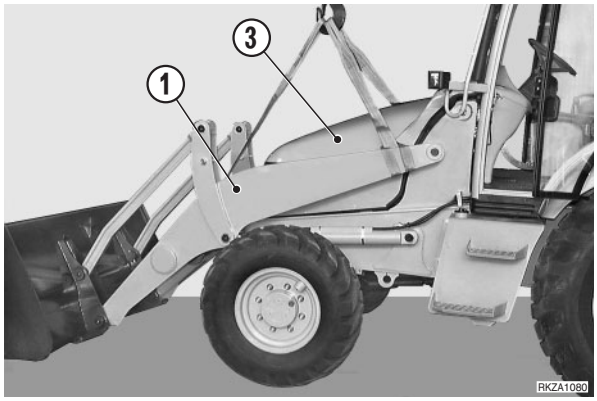
※1 ※2



3 - Put a sling round the boom (1) as shown in the figure, and attach it to the hoisting tackle. Apply a slight tension to the cables.



4 - Open the front hood (3) and take out the screws (4) that lock the axle oscillation pins of the boom (1). Close the front hood.



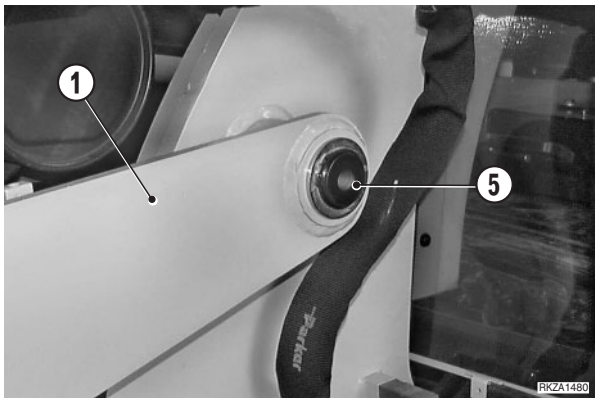
https://truckmanualshub.com/

5 - Using a puller, take out the axle oscillation pins (5) of the boom (1). ※1 ※2

6 - Start the engine and put the machine into reverse gear travel until the boom is disengaged.

★ If the working equipment is to be detached to aid the removal of the engine-gearbox-pump group, and the machine cannot travel automatically, it can be towed using the towing hooks of the backhoe.

7 - Place two stands in position and lower the boom until it is resting on them.



INSTALLATION OF THE FRONT WORKING EQUIPMENT

- To install, reverse the removal procedure, if necessary using the front towing hook.

※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

- 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.

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REMOVAL OF THE FRONT WORKING EQUIPMENT

FROM SERIAL NUMBER 97F20172–

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

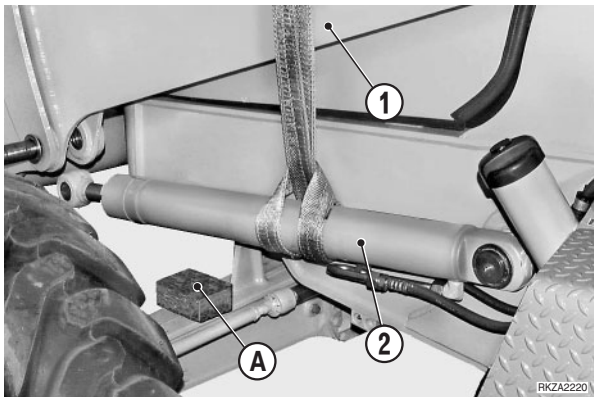
Release all residual pressure in all circuits. (For details, see «20. TESTING AND ADJUSTMENTS»).

1 - Remove the tilt cylinders. (See «REMOVAL OF FRONT BUCKET TILT CYLINDERS»).

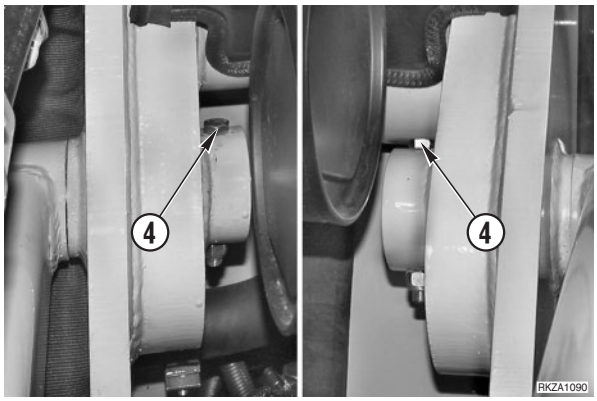


2 - Disconnect the cylinders (2) from the boom and rest them on wooden blocks «**A**» placed on the front axle.

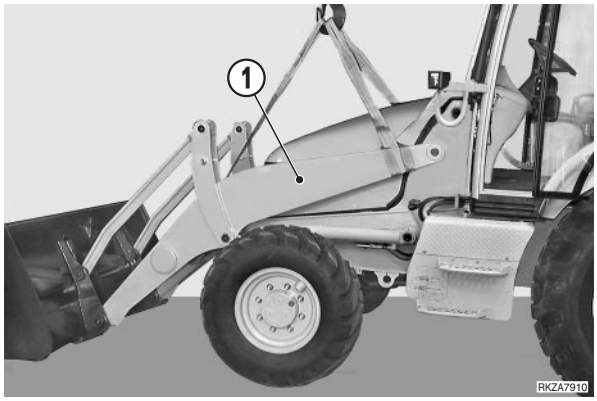
※1 ※2



3 - Put a sling round the boom (1) as shown in the figure, and attach it to the hoisting tackle. Apply a slight tension to the cables.



4 - Open the front hood (3) and take out the screws (4) that lock the axle oscillation pins of the boom (1). Close the front hood.



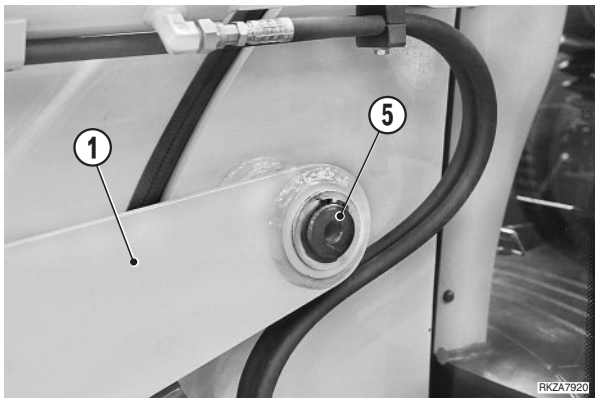
https://truckmanualshub.com/

5 - Using a puller, take out the axle oscillation pins (5) of the boom (1). ※1 ※2

6 - Start the engine and put the machine into reverse gear travel until the boom is disengaged.

★ If the working equipment is to be detached to aid the removal of the engine-gearbox-pump group, and the machine cannot travel automatically, it can be towed using the towing hooks of the backhoe.

7 - Place two stands in position and lower the boom until it is resting on them.



INSTALLATION OF THE FRONT WORKING EQUIPMENT

- To install, reverse the removal procedure, if necessary using the front towing hook.

※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

- 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.

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REMOVAL OF THE BACKHOE CONTROL VALVE

1 - Swing the backhoe completely to the right of the machine, and rotate the boom to approx. 45° to the right.

2 - Lower the outriggers to the ground, open the bucket and rest the arm on a block «**A**», keeping it perpendicular to the ground.

3 - Rest the bucket teeth on the ground, release the backhoe plate and stop the engine.

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

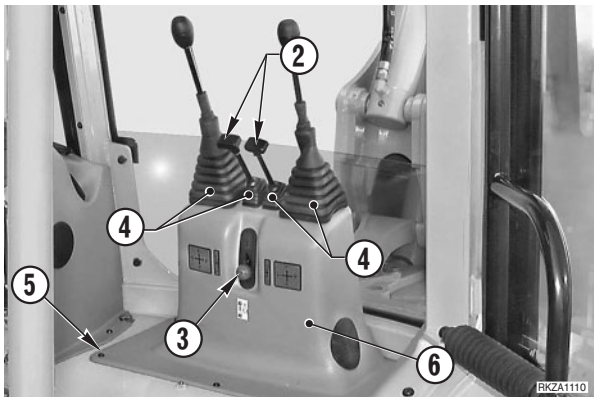


4 - Take out the lower window (1) of the cab and completely raise the upper window.

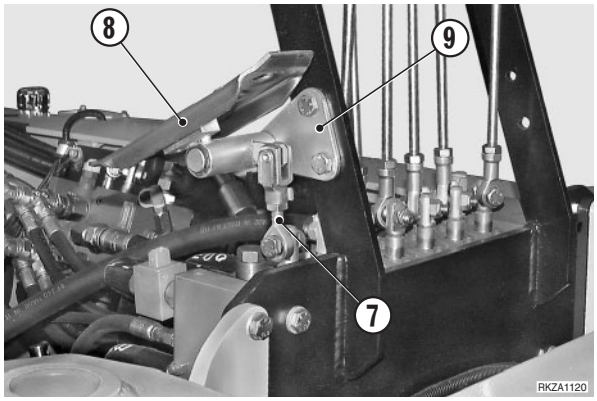


5 - Remove the grips (2) of the control levers of the outriggers and the grip (3) of the lever-locking device.

6 - Raise the protective sleeves (4) of the control levers, take out the screws (5) and remove the cover (6).



★ If any optional devices have been fitted, unhook the spool command tie-rods (7) and remove the pedals (8) and the supports (9).



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

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

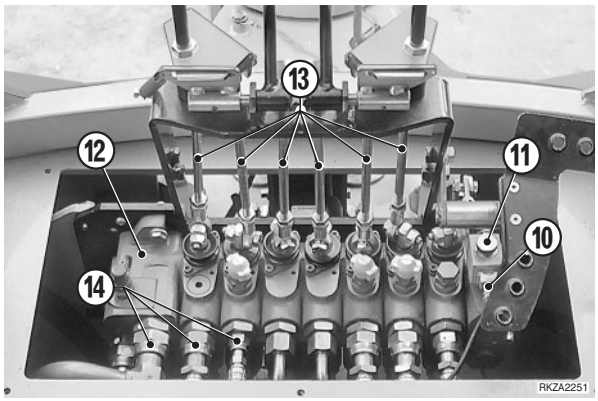
9 - Disconnect from the control valve the pipes (14) (delivery, return, Load Sensing and actuators). Plug them to prevent entry of impurities.

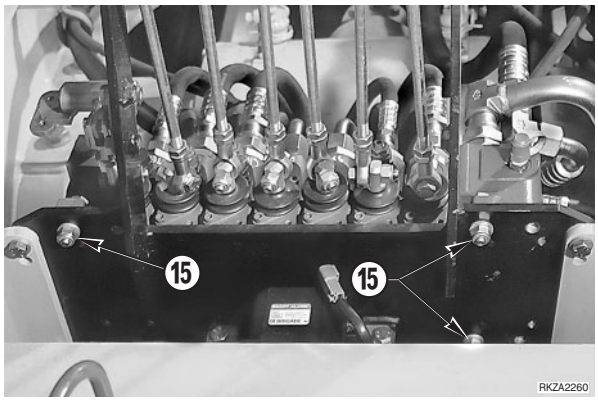
★ Mark the pipes to prevent exchanging positions during re-connection.

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

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

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





INSTALLATION OF THE BACKHOE CONTROL VALVE

- To install, reverse the removal procedure.

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

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REMOVAL OF BACKHOE BOOM CYLINDER

1 - Remove the lubrication nipple and the extension (1).

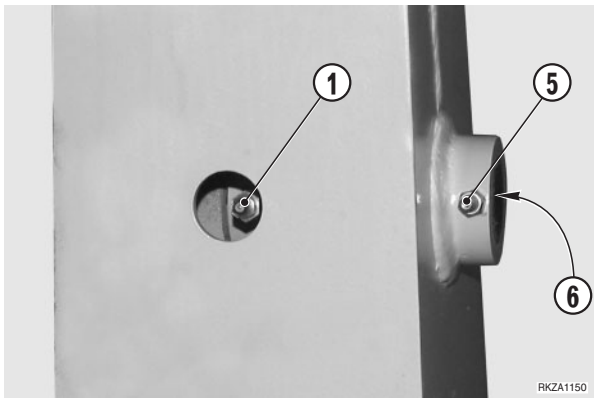
⚠ Extend the arm (2) completely and fully open the bucket (3).
Manoeuvre the front equipment until the bucket teeth are resting on the ground, the arm on a block «**A**» about 10 cm high, and the joint between the arm and the boom on a stand «**B**», about 70 cm high.

2 - Stop the engine and release residual pressures.

3 - Place a sling around the cylinder (4).

4 - Take out the screws (5) and remove the pin (6).

※1 ※2



5 - Start the engine and retract the piston.

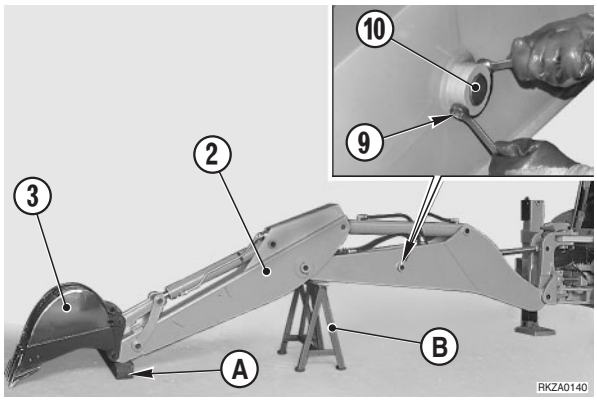
★ Secure the position of total retraction by binding the piston head rod with wire.

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

7 - Disconnect the pipes (7) and (8) and plug them to prevent entry of impurities.

8 - Take out the screw (9) and remove the pin (10).

※1 ※2



9 - Remove the cylinder (4).

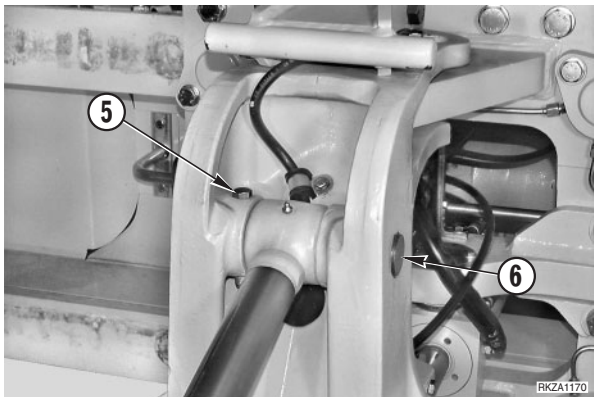
kg Cylinder:..... kg

INSTALLATION OF THE BACKHOE BOOM CYLINDER

- 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.

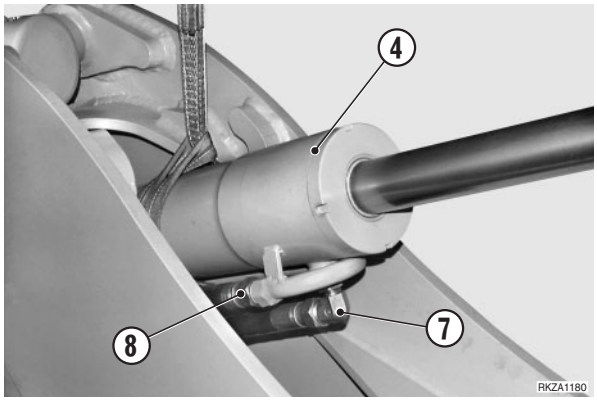


※2

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.



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REMOVAL OF THE BACKHOE ARM CYLINDER

⚠ Extend the arm (1) completely and fully open the bucket (2). Lower the arm (3) until the joint between the arm and the boom is resting on a stand «**A**» about 90 cm high, and tip of the arm on a block «**B**» about 10 cm high. Rest the bucket teeth on the ground.

1 - Stop the engine and release the pressures in the cylinder by moving the control lever several times.

2 - Place a sling around the cylinder (4).

3 - Take out the screws (5) and remove the pin (6).

※1 ※2

4 - Start the engine and retract the piston (7).

★ Secure the position of total retraction of the piston (7) 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»).

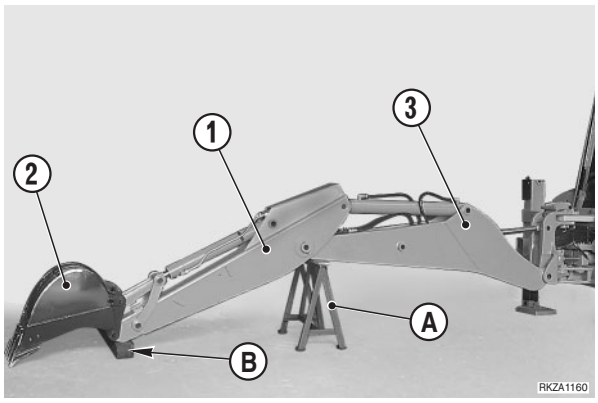
6 - Disconnect the pipes (8) and (9) and plug them to prevent entry of impurities.

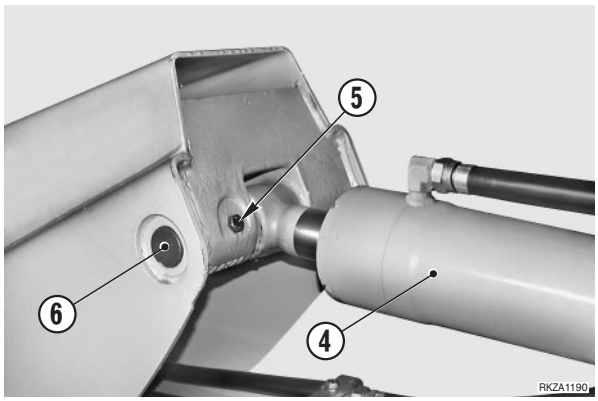
7 - Take out the snap-ring (10) and remove the pin (11).

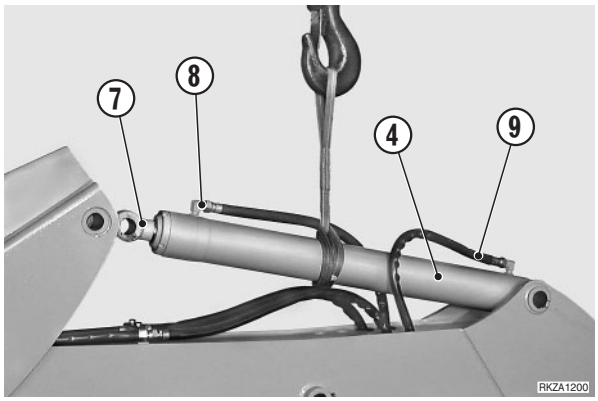
※1 ※2

8 - Remove the cylinder (4).

kg Cylinder: 69 kg







INSTALLATION OF THE BACKHOE ARM CYLINDER

- To install, reverse the removal procedure.

※1

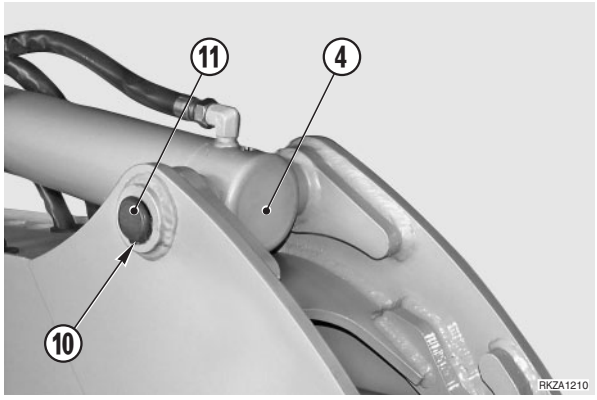
⚠ When aligning the positions between the hole and the pin, turn the engine over at low idling speed. Do not insert fingers into the holes to check alignment.

※2

Internal bushing: ASL800050

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

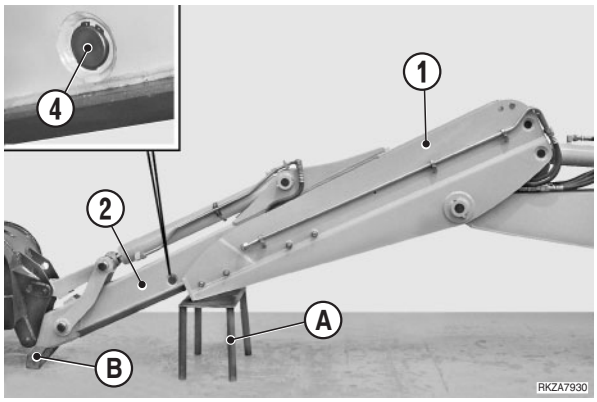
★ After bleeding the air, check the oil level in the tank.



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REMOVAL OF THE JIG ARM CYLINDER

⚠ Open the arm (1) completely and lower it until it rests on a trestle "**A**" that is roughly 40 cm high.
Extend the jig arm (2) until it rests on a block "**B**", and let the bucket teeth rest on the ground.



1 - Stop the engine and release the cylinder (3) pressures, by moving the command pedal several times.

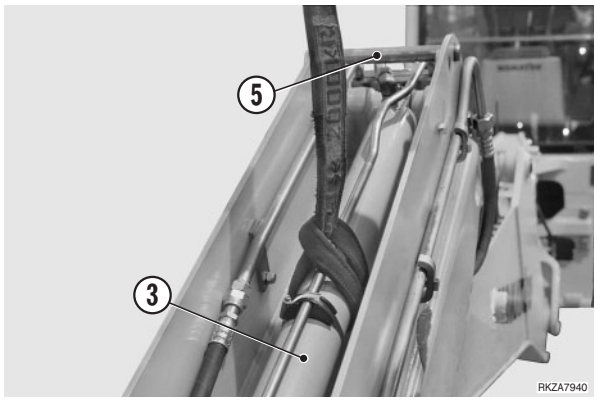
2 - Put a sling around the cylinder (3).

3 - Take off the snap ring and remove the pin (4).

※1 ※2

4 - Start the engine to retract the piston.

★ Secure the fully retracted position of the piston by binding it with wire.



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

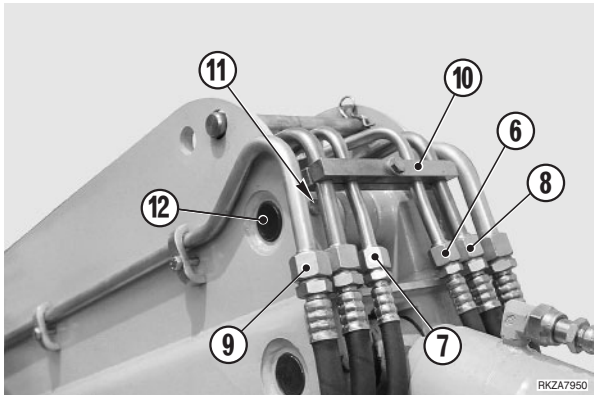
6 - Take out the safety pin (5).

7 - Disconnect the hoses (6), (7), (8) and (9), and plug them to prevent entry of impurities.

8 - Remove the clamp (10).

9 - Remove the screws (11) and the pin (12).

※1 ※2



10 - Remove the cylinder (3).

INSTALLATION OF THE JIG ARM CYLINDER

- To install, reverse the removal procedure.

※1

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

※2

Internal bushings: ASL800050

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

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

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REMOVAL OF THE BACKHOE BUCKET CYLINDER

⚠ Extend the arm (1) completely and fully open the bucket (2). Lower the boom (3) until the arm is resting on a stand «**A**» about 90 cm high, and tip of the arm on a block «**B**» about 10 cm high. Rest the bucket teeth on the ground.

1 - Stop the engine and release the pressures in the cylinder (4) by moving the control lever several times.

2 - Place a sling around the cylinder (4).

3 - Take out the lock-nut (5) and the washer and remove the pin (6). ※1 ※2 ※3

4 - Start the engine and retract the piston (7).

★ 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 bracket (8) and the pipes (9) and (10), and plug them to prevent entry of impurities.

★ For the jig arm, take out the screw (14) and remove the pin (15).

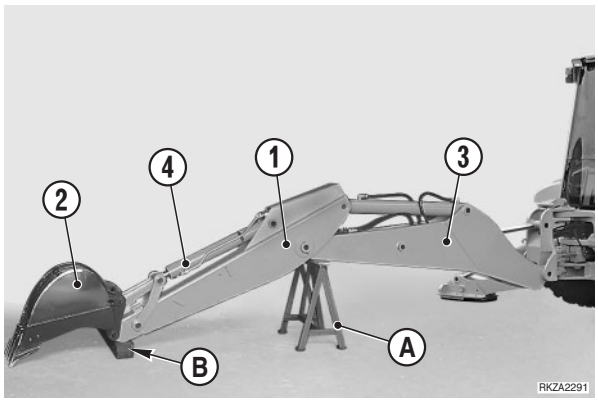
7 - Take out the snap-ring (11) and remove the pin (12).

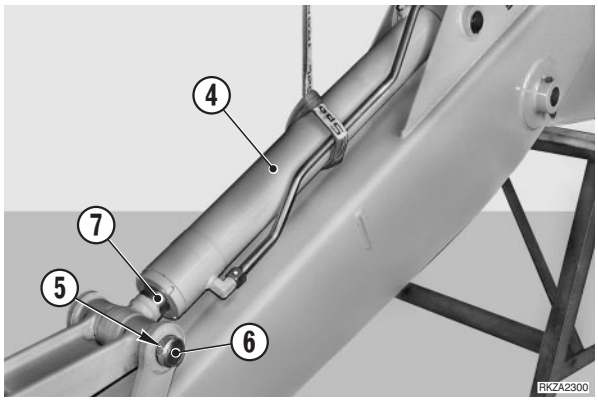
※1 ※2

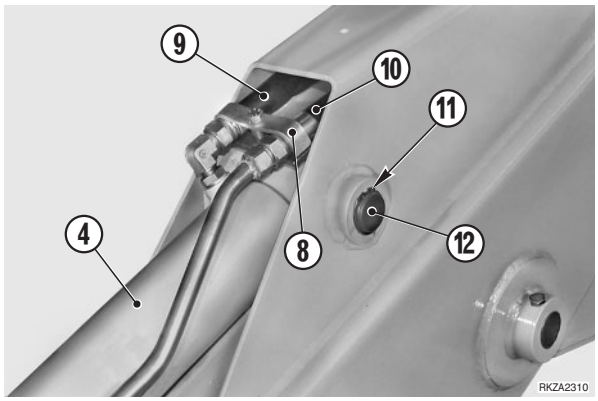
★ For the jig arm, take out the screw (14) and remove the pin (15).

8 - Remove the cylinder (4).

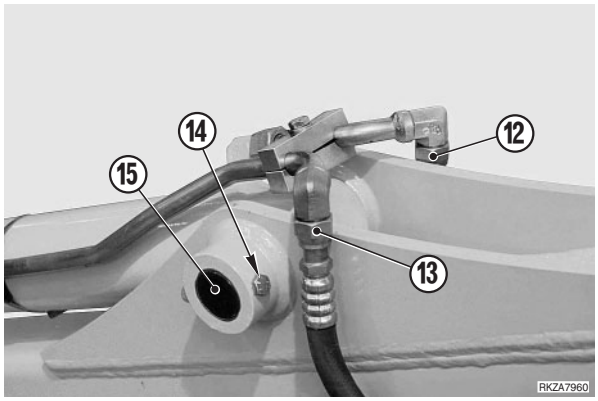
kg Cylinder: ..... kg







For jig arm



INSTALLATION OF THE BACKHOE BUCKET CYLINDER

- To install, reverse removal procedure.

※1

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

※2

Internal bushing: ASL800050

※3

Nm Pin-retaining lock-nut: ..... Nm

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

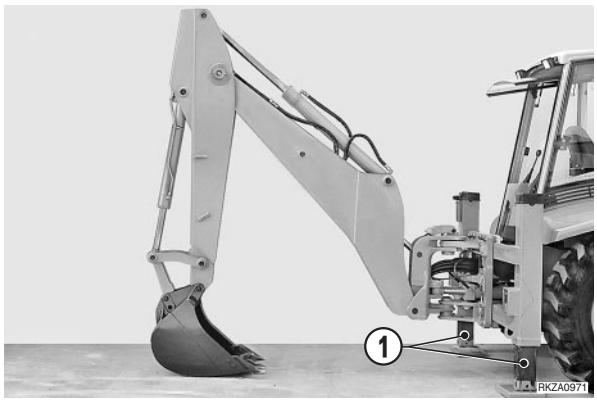
★ After bleeding the air, check the oil level in the tank.

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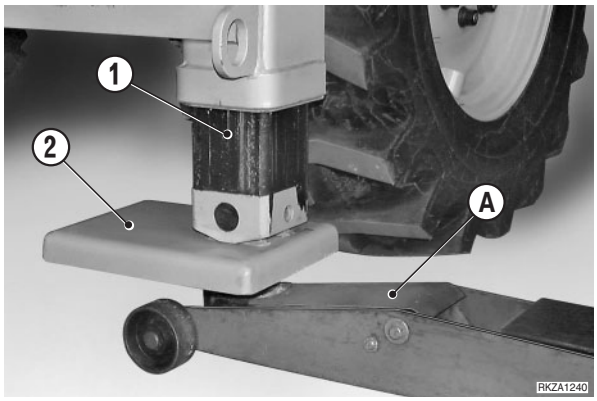
REMOVAL OF THE OUTRIGGER CYLINDERS

⚠ Position the backhoe with the equipment centered, the arm vertical and the back of the bucket resting on the ground.

1 - Extend the outriggers (1) of about 15 cm, stop the engine and release the cylinders pressures.



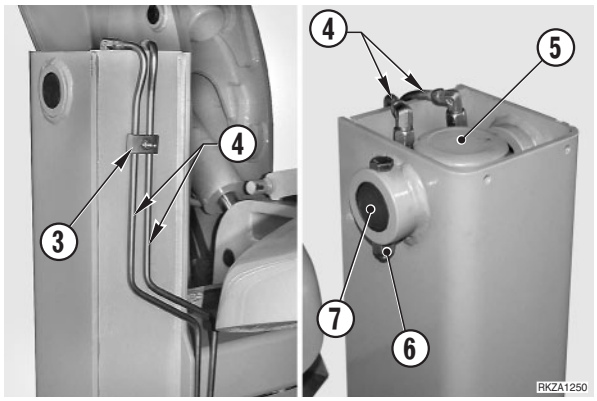
2 - Place a lifting platform "**A**" beneath outrigger (2).
Raise this until it is forced up against the outrigger.



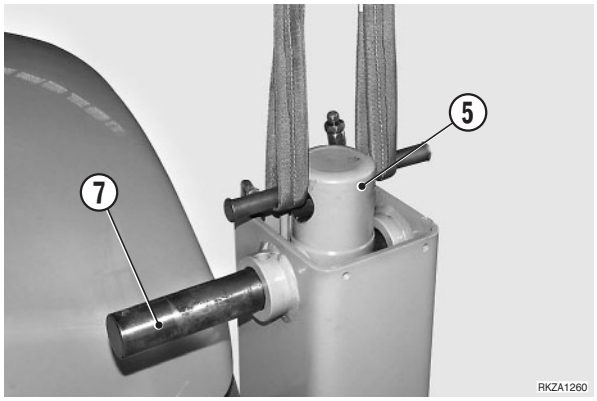
3 - Remove the clamp (3).

4 - Disconnect from cylinder (5) the pipe (4) and plug them to avoid impurity entry.
Plug also the union to avoid the movement of piston.

5 - Remove screw (6) and extract the pin (7) until the cylinder (5) is free. ※1 ※2



6 - Raise the lifting platform "**A**" to disengage the cylinder head (5) from frame.
Place a sling round the cylinder (5) and apply slight tension to the cables.

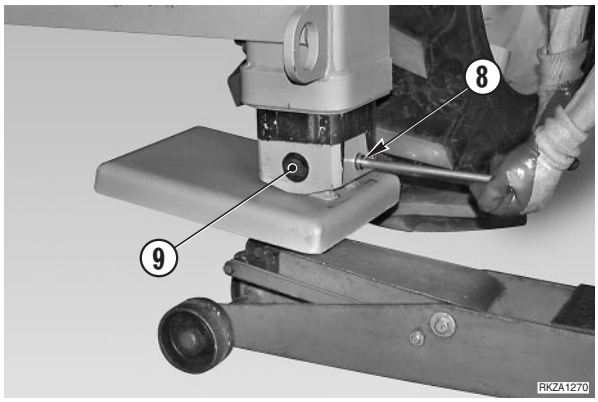


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7 - Take out the screw (9) and remove the pin (10).

※1 ※2

8 - Remove the cylinder (5).



INSTALLATION OF THE OUTRIGGER CYLINDERS

- To install, reverse the removal procedure.

※1

⚠ 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.

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REMOVAL OF THE BACKHOE SWING CYLINDERS

⚠ Position the backhoe with the equipment centered, the arm vertical and the back of the bucket resting on the ground.

1 - Stop the engine and release cylinder pressures by moving the control levers several times.

2 - Take out the screws (1) and remove vertically the upper support (2) of the cylinder fulcrum. ※1 ※3

3 - Disconnect the four tubes (4) from the cylinders (3) and plug them to prevent entry of impurities.

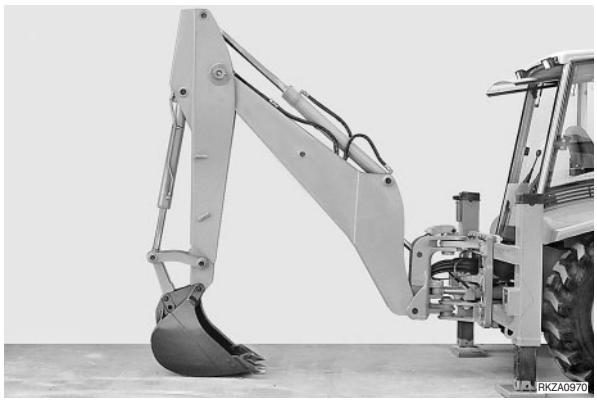
4 - Take out the screws (5) and remove the pins (6).

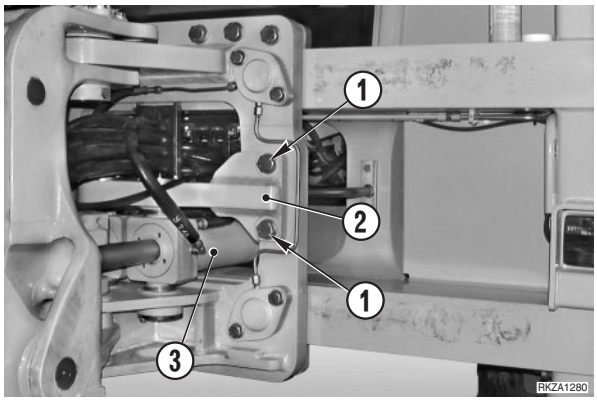
※2 ※3

5 - Rotate the cylinders to disengage the piston heads from the swing bracket (7) and remove the cylinders (3).

※3

kg Cylinder: 30 kg





INSTALLATION OF THE BACKHOE SWING CYLINDERS

1 - Mount the cylinders (3) and the upper cylinder fulcrum support (6). Secure the support with the four screws (1).

※1

Support screw: Loctite 262

Nm Support screw: 100±10 kgm

2 - Connect the four tubes (4) to the cylinders.

3 - Start the engine and swing the boom in order to center one of two pins (8). Secure the 1st pin with the screw (7).
Perform the same operation for the other pin.

※2

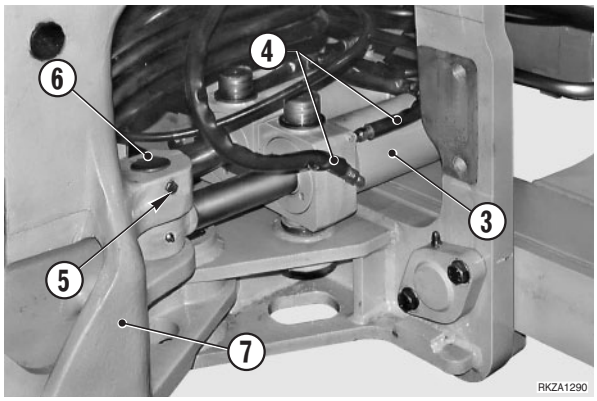
⚠ When aligning the positions between the hole and the pin, turn the engine over at low idling speed.
Do not insert fingers into the holes to check alignment.

※3

Internal bushing: ASL800050

4 - 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.



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REMOVAL OF BACKHOE BACKFRAME LOCK CYLINDER

★ Set the backhoe with the centered attachments with the arm in vertical position and the bucket leaned on the back at level ground.

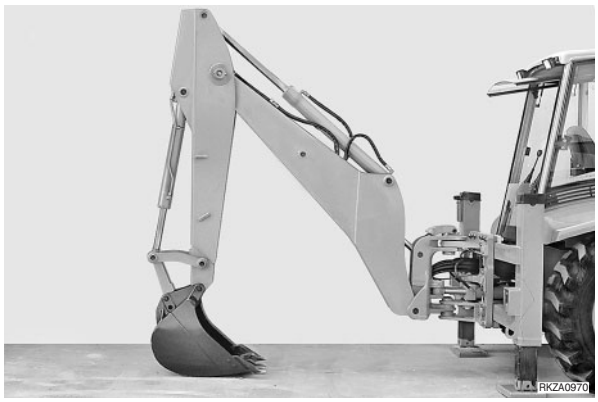
1 - Unlock the backframe (1).

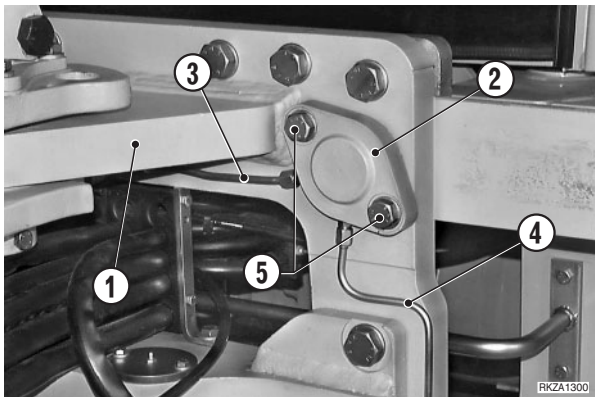
2 - Stop the engine and release the residual hydraulic pressures. (For details, see «20. TESTING AND ADJUSTMENT»).

3 - Disconnect from cylinder (2) the pipes (3) and (4) and plug them to avoid impurity entry.

4 - Remove screws (5) and cylinders (2).

※1 ※2





INSTALLATION OF BACKHOE BACKFRAME LOCK CYLINDER

• To install, reverse the removal procedure.

※1

Locking screw: Loctite 262

Nm Locking screw: 41±4 kgm

※2

Cylinder seat: ASL800050

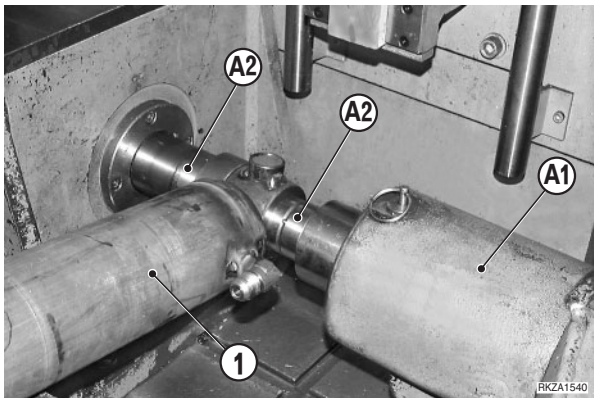
1 - Start the engine, lock and unlock the backframe several times to make the circuit feeling.

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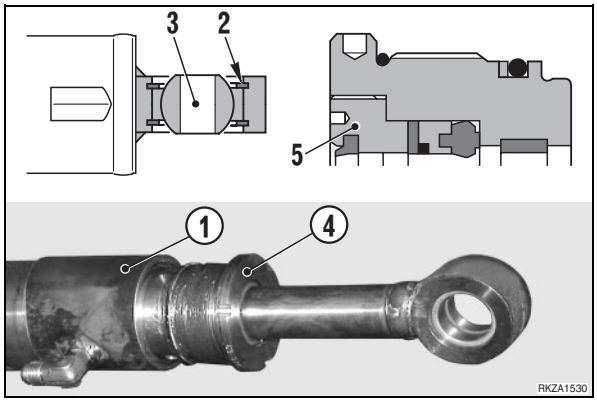
DISASSEMBLY OF CYLINDERS

(Front bucket raise and tilt, boom, arm, bucket, outriggers and jig arm)

1 - Place the cylinder (1) on the tool **A1**. Engage the cylinder head in the tools **A2** appropriate to the diameter of the hole.



⚠ For the arm cylinder with side-digging boom first extract the snap-rings (2) and the ball-and-socket joint (3).



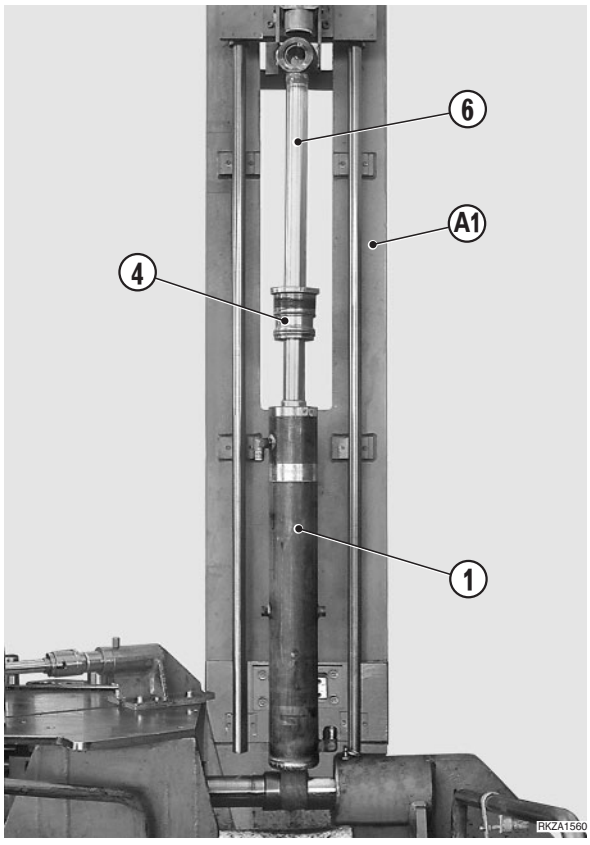
2 - Using the specially-made wrench **A4**, **A5**, **A6** unscrew the cylinder head (4) and extract it from the cylinder (1).

⚠ For the side-digging boom cylinder, first remove the lock-nut (5) that secures the piston-rod seal.

3 - Raise the cylinder (1) and attach the piston head to the mobile group of the tool.

4 - Extract the piston-rod group (6) from the cylinder (1).

5 - Remove the cylinder (1) and the piston-rod group (6).



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

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

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

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

★ Measurement of the socket wrench:

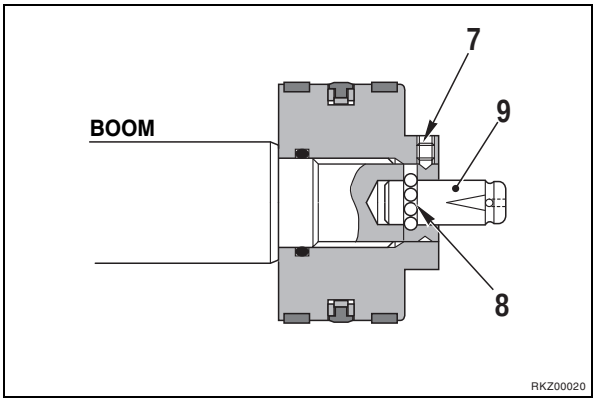
For raising the front bucket:	55 mm
For tilting the front bucket:	55 mm
Boom:	65 mm
Arm:	55 mm
Bucket:	55 mm
Outriggers:	46 mm
Jig arm: 46 mm	
Side digging boom:	46 mm

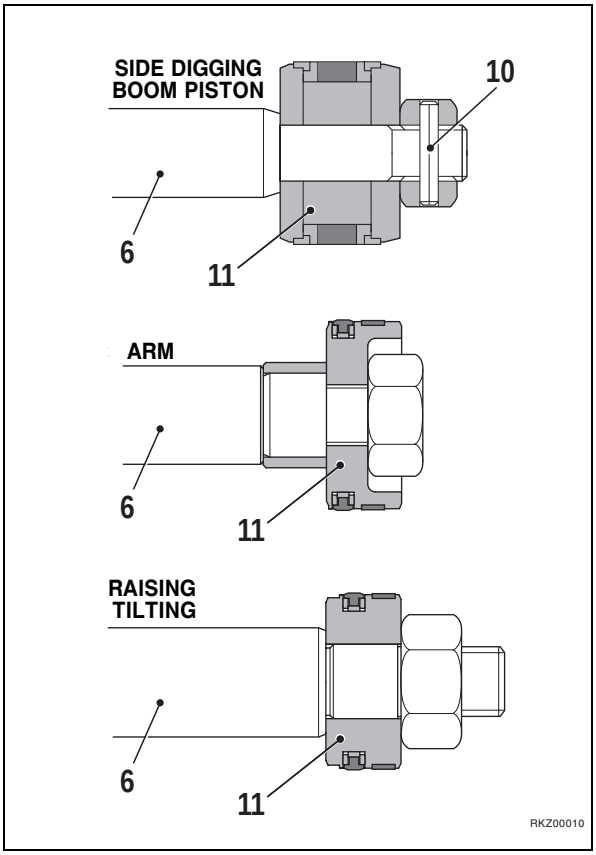
10 - **For the piston rod of the boom cylinder**: Take out the ball bearings (8) and the cushion plunger (9).

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

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

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





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ASSEMBLY OF CYLINDERS

(Front bucket raise and tilt, boom, arm, bucket, outriggers and jig arm)

★ Take great care not to damage the seals and the sliding surfaces.

★ Prepare each individual component before the final assembly.

1. ASSEMBLY OF THE CYLINDER HEAD

1.1 Only for the cylinders for front bucket raise and tilt, boom, arm, bucket, outriggers, jig arm

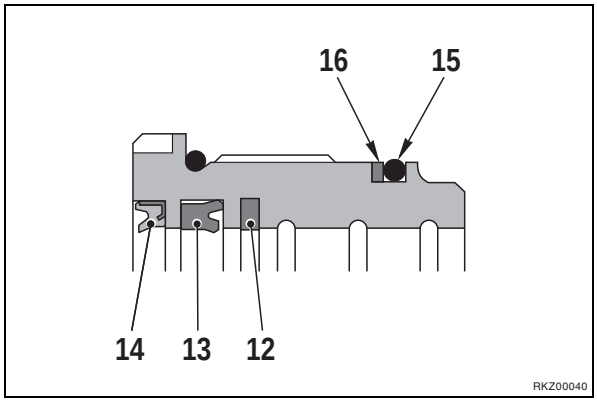
1 - Mount the gasket (12) in the cylinder head.

2 - Mount the gasket (13) in the cylinder head.

★ Make sure that the lips are turned towards the inside of the cylinder.

3 - Mount the guard ring (14) using the tool **A8**.

4 - Mount the O-ring (15) and the anti-extrusion ring (16) on the outside of the cylinder head.



1.2 Cylinder for side digging boom

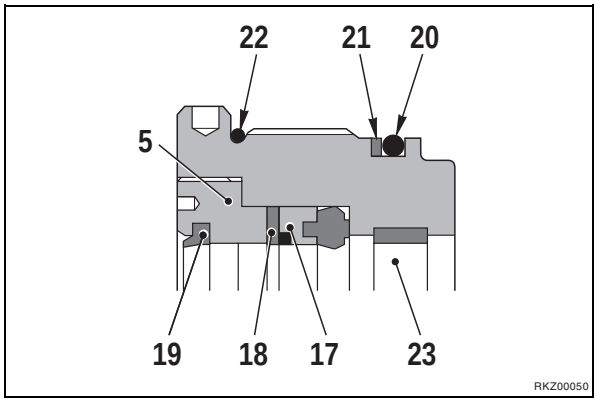
1 - Insert the gasket (17) in the cylinder head, and let it beat on seat bottom, then insert the anti-extrusion ring (18).

★ Check carefully the assembly orientation.

2 - Mount the guard ring (19) in the lock-nut (5).

3 - Tighten the lock nut (5) until leaning lightly on anti-extrusion ring (18).

4 - Assemble on head the O-ring (20), the anti-extrusion (21), the O-ring (22) and the ring (23).



2. RE-ASSEMBLING THE PISTON

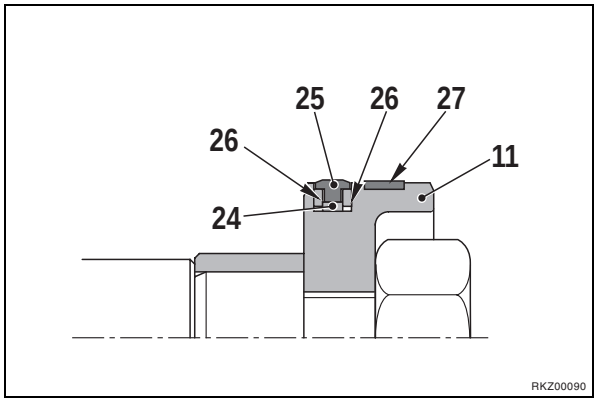
2.1 Only for the cylinders for front bucket raise and tilt, boom, arm, bucket, outriggers, jig arm

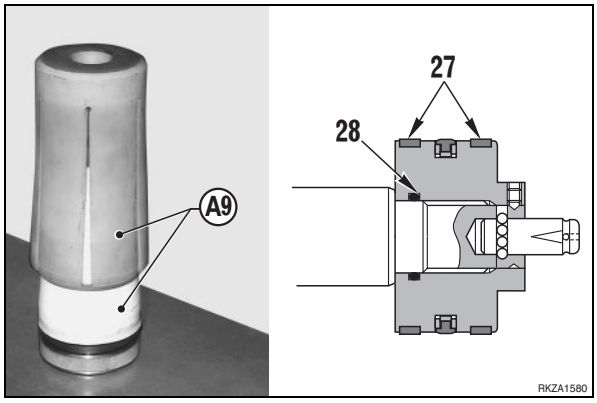
1 - Use the tool **A9** with the appropriate diameter, mount the ring (24) the external ring (25) and the anti-extrusion rings (26) onto the piston (11).

2 - Prepare the guide ring (27).

★ There are two guide rings (27) for the boom piston.

3 - **For the boom piston only:** insert the O-ring (28) into the internal seating.





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2.1 Side digging boom cylinder

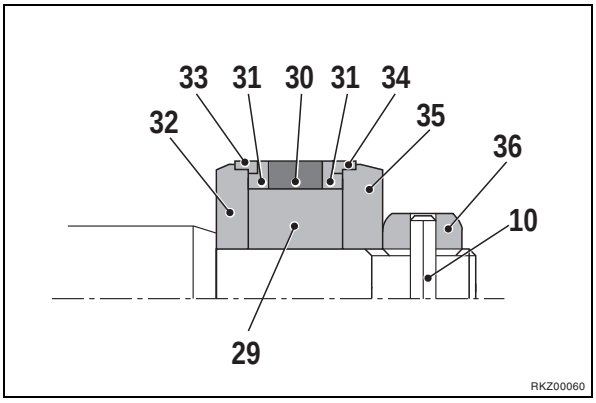
★ This mounting should be performed directly on piston.

1 - Mount central ring (29), rubber ring (30) and anti-extrusion ring (31).

2 - Mount on piston first washer (32), guide ring (33), central ring assembly (29), second guide ring (34) and second washer (35).

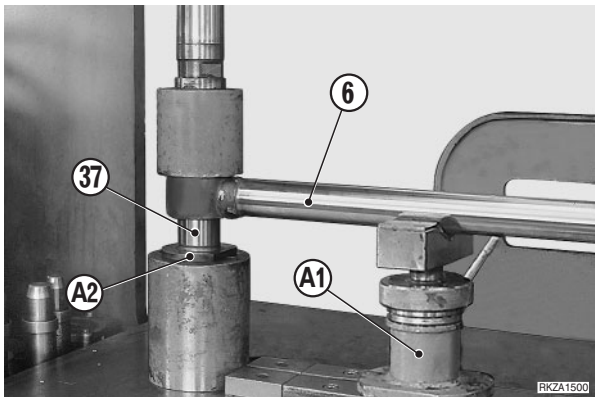
3 - Tighten nut (36) and lock the piston group after locking rod head under the press. (See «3. RE-ASSEMBLING THE PISTON-ROD GROUP»).

4 - Insert the snap ring (10).



3. RE-ASSEMBLING THE PISTON-ROD GROUP

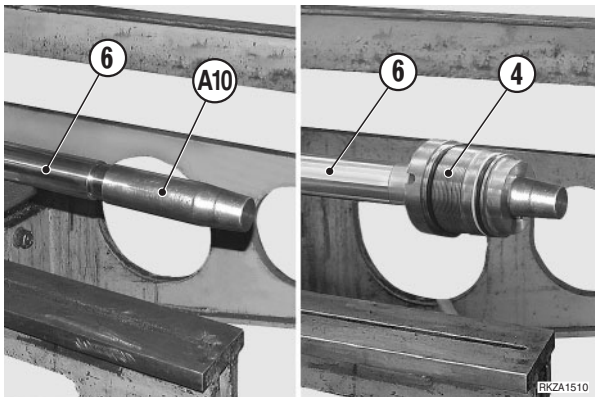
1 - **Only for the cylinders for front bucket raise and tilt, boom, arm, bucket and side digging boom:** using a press and tools **A2** with the appropriate diameter, insert the bushing (37) into the piston head (6).



2 - Mount the bushing **A10** of the correct diameter onto the tip of the piston rod (6).

3 - Slightly lubricate the cylinder head seals (4) and slide the group onto the piston rod (6).

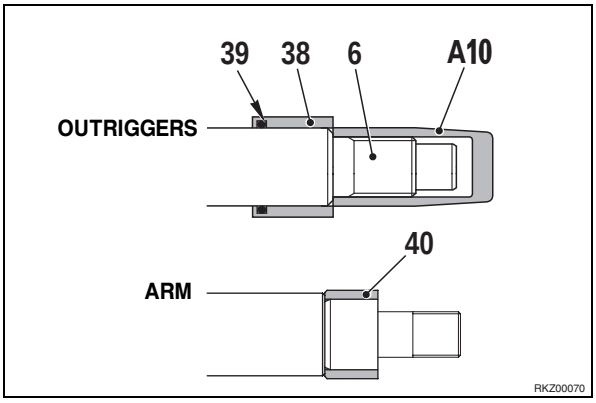
Seals: ASL800050



4 - **For the cylinders of the outriggers only**: mount the spacer (38) with the O-ring (39).

★ Check carefully the assembly orientation.

For the arm cylinder only: insert the spacer (40).



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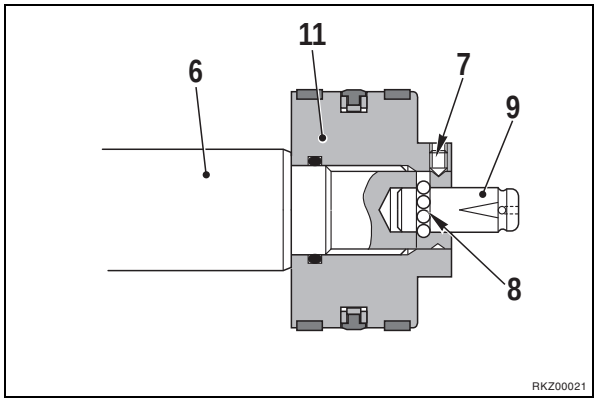
5 - Remove from the tip of the piston rod (6) the bushing **A10** and mount the piston (11) and the nut (36).

★ Grease the piston threading.

Piston locking nut: Loctite 262

Piston locking nut:

Front bucket raise:	290±29 kgm
Front bucket tilt:	290±29 kgm
Arm:	290±29 kgm
Bucket:	290±29 kgm
Outriggers:	155±15 kgm
Jig arm:	155±15 kgm



6 - **For the boom cylinder**: mount the cushion plunger (9), slide the eleven ball-bearings (8) into the hole, and mount the dowel bolt (7).

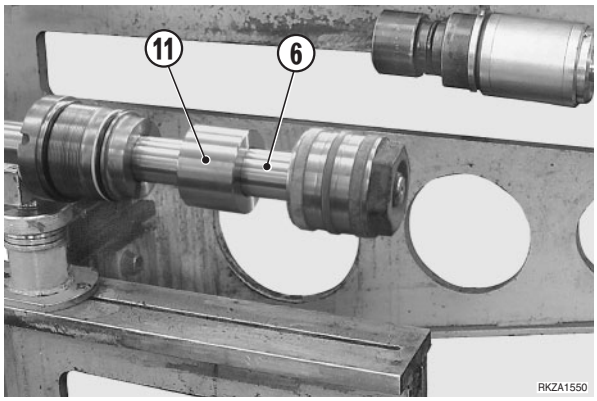
Dowel bolt: Loctite 262

Dowel bolt: 23±2 Nm

7 - Screw the complete piston (11) onto the piston rod, and secure it with the dynamometric wrench.

Piston: 120 – 125 kgm

8 - Caulk the piston (11) to correspond to the slot in the piston rod (6) **not previously used**.



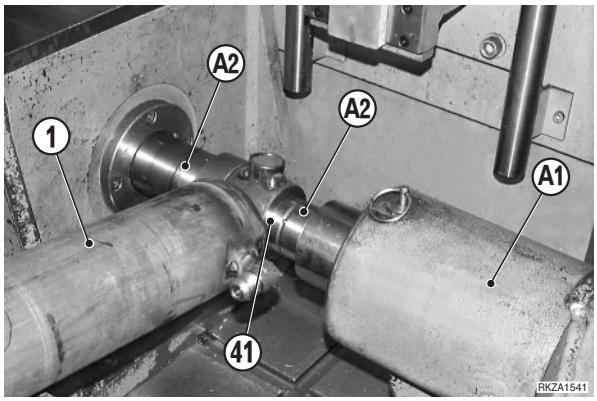
4. RE-ASSEMBLING THE CYLINDERS

1 - Mount onto the apparatus **A1** the tools **A2** with the appropriate diameter.

2 - **For the boom, arm, bucket and side digging boom cylinders only:**
Position the bushing (41) and mount it in the cylinder head (1).

★ There are two bushings for the arm cylinder, with a spacer between them.

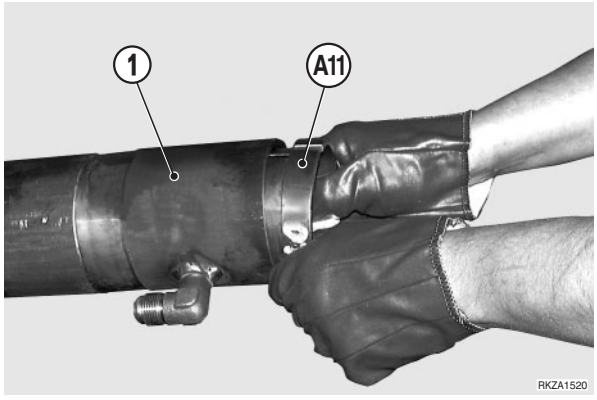
★ Leave the cylinder in position for subsequent assembly.



3 - Lubricate the threading and the first part of the cylinder (1).

Cylinder: ASL800050

4 - Mount the two halves of the tool **A11** with the appropriate diameter at the mouth of the cylinder (1).



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5 - Mount the piston rod group (6) on the apparatus **A1** and raise the mobile part to the end of its stroke.

6 - Place the cylinder (1) in a vertical position and guide the piston into the tool **A11**.

7 - Lower the apparatus that supports the piston rod (6) in order to center the piston in the tool **A11**.

8 - Mount the first guide ring (27) onto the piston and insert part of the piston into the tool **A11**.
For the boom cylinder only: mount the second guide ring (27) and fully insert the piston.

⚠ Insert the piston slowly in order to calibrate the guide rings (27) without overheating them.

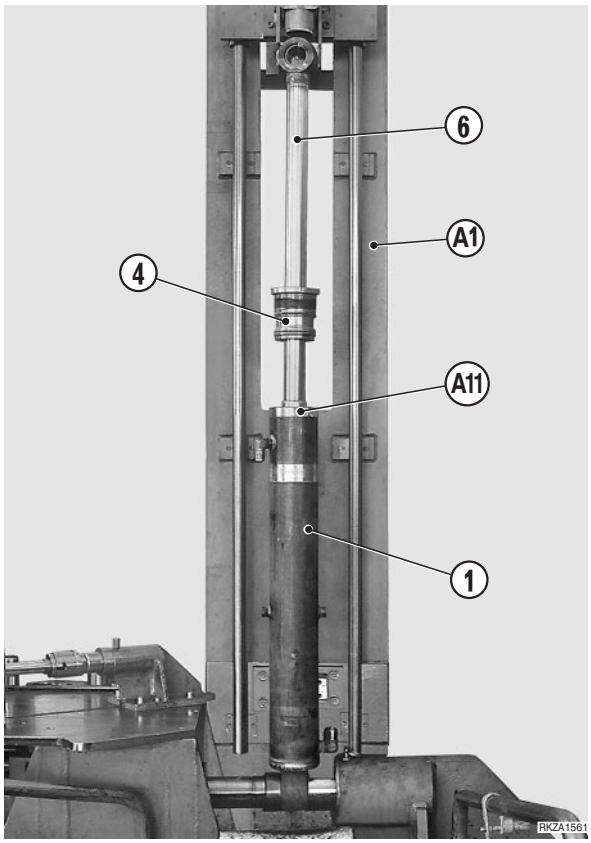
9 - Take the cylinder out of the tool **A11** and then lower the apparatus **A1** further in order to bring the cylinder head (4) and the piston rod head closer to the cylinder.

10 - Bring the cylinder (1) into position for screwing in the cylinder head (4).

11 - Insert the cylinder head into the cylinder and screw it in by hand for several turns.

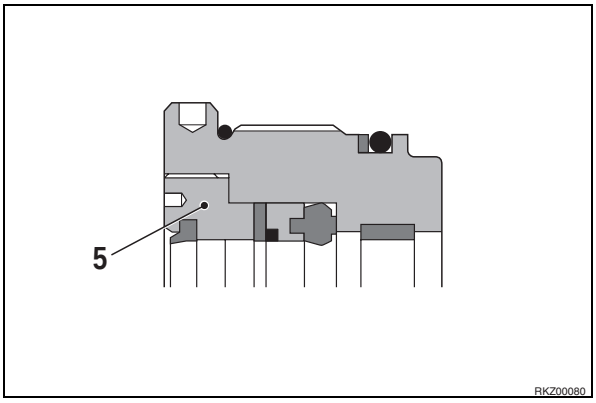
12 - Use the right special wrench **A4**, **A5**, **A6** to screw the cylinder head (4) home.

Nm Cylinder head: 95 – 100 kgm



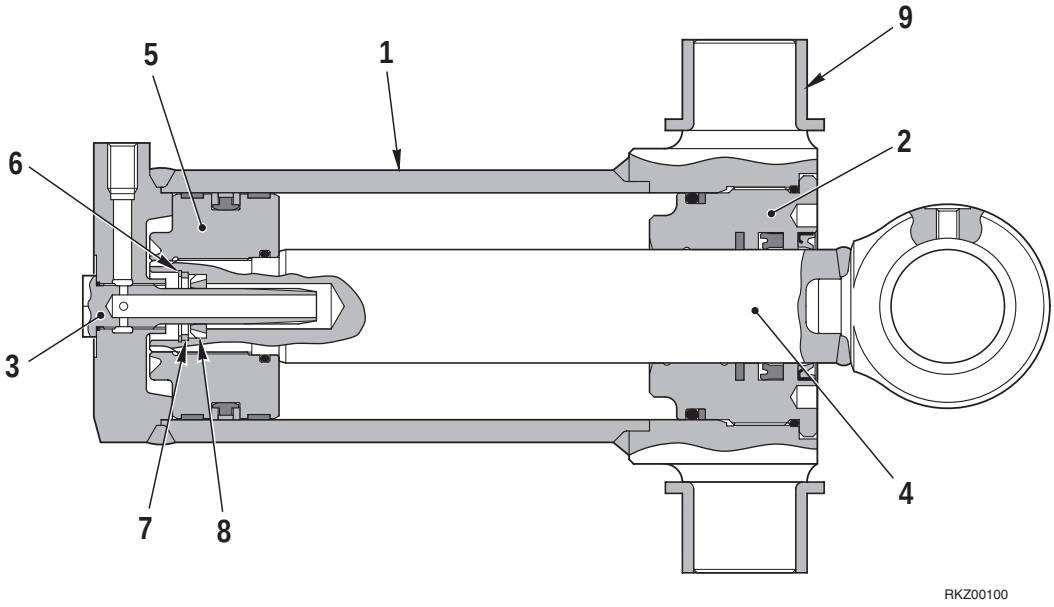
13 - **For the side digging boom cylinders only:** tighten the lock-nut (5).

Nm Lock-nut: 50 kgm



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DISASSEMBLY OF BOOM SWING CYLINDER



1 - Place the cylinder (1) on the apparatus **A1**. Engage the axle oscillation pins in the tools **A3**.

2 - Using the specially-designed wrench **A6**, unscrew the cylinder head (2) and extract it completely from the cylinder (1).

3 - Remove the safety dowel bolt (10).

4 - Raise the cylinder (1) and attach the piston head to the mobile group of the apparatus **A1**.

5 - Extract the piston rod group (4) from the cylinder.

6 - Remove the cylinder and the piston rod group.

7 - Secure the complete piston rod (4) to the apparatus **A1**.

8 - Raise the part caulked for safety purposes and unscrew the piston using the tool **A7**.

⚠ Check the piston (5) carefully. If both safety-caulked areas have been used, the piston must be replaced.

9 - Remove the snap-ring (6) from the piston and extract the ring (7) and the spacer ring (8).

★ Make a note of the order of assembly of the ring (7).

10 - Using a puller remove the swing bushings (9) from the cylinder axle oscillation pins.

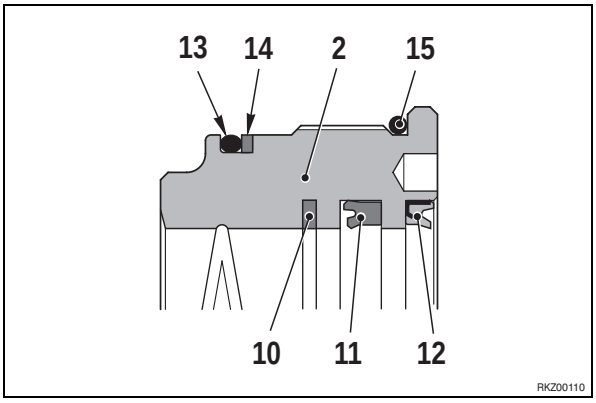
11 - Dismantle the groups by removing all the seals, the guard rings, the guide rings and the piston fulcrum bushing.

⚠ The seals, guard rings and guide rings must not be used again.

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ASSEMBLY OF BOOM SWING CYLINDER

★ Take great care not to damage the seals and the sliding surfaces.
★ Prepare each individual component before the final assembly.

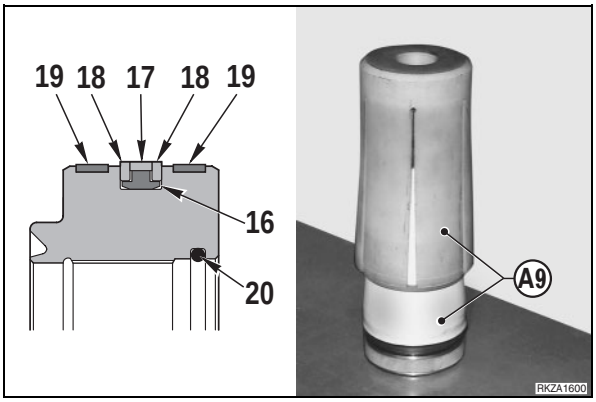


1. Assembly of the cylinder head

1 - Mount the gasket (10) and the gasket (11) in the cylinder head.
  ★ Make sure that the lips are turned towards the inside of the cylinder.

2 - Mount the scraper ring (12).

3 - Mount the O-ring (13), the anti-extrusion ring (14) and lastly the O-ring (15) of the front seal.



2. Re-assembling the piston

1 - Use the tool **A9** with the appropriate diameter, mount the rubber ring (16) and the seal ring (17) onto the piston. Remove the tool **A9** and mount the anti-extrusion rings (18).

2 - Prepare the guide rings (19).

3 - Mount the O-ring (20) in the internal seating of the piston.

3. Re-assembling the piston-rod group

1 - Using a press and tools **A2** with the appropriate diameter, insert the bushing (21) into the piston head (4).

2 - Insert the ring (8) into the piston rod (4).
  ★ Check carefully the direction of assembly of the ring (8).

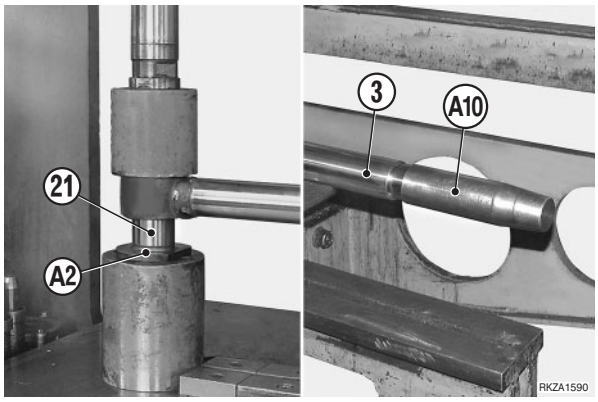
3 - Insert the spacer ring (7) and secure the group with the snap-ring (6).

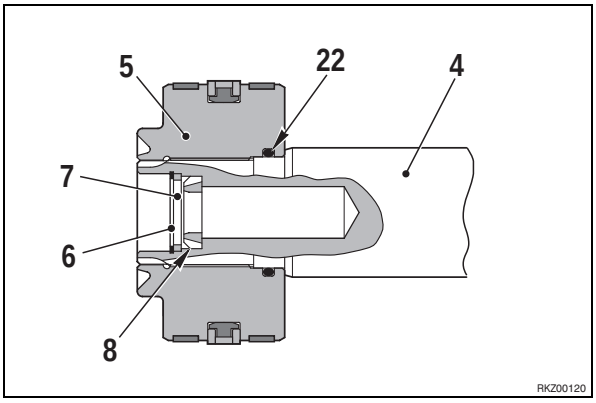
4 - Mount the bushing **A10** of appropriate diameter on the tip of the piston rod (4).

5 - Lightly lubricate the cylinder head gaskets (2) and slide the group onto the piston rod (4).
  Gaskets: ASL800050

6 - Lubricate the O-ring seals (22) and screw the piston (5) onto the piston rod (4) by hand for several turns.
  O-ring seal: ASL800050

7 - Position the group on the tool **A1** and tighten the piston with the round prong wrench **A7**.
  Nm Piston: 95 – 100 kgm





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4. Re-assembling cylinders

1 - Mount on the apparatus **A1** the tool **A3** and engage the cylinder axle oscillation pins (1).

2 - Lubricate the threading and the first part of the cylinder (1).

Cylinder: ASL800050

3 - Mount the two halves of the tool **A11** with the appropriate diameter at the mouth of the cylinder (1).

4 - Mount the piston rod group on the apparatus **A1** and raise the mobile part up to the end of its stroke.

5 - Place the cylinder (1) in a vertical position.

6 - Lower the mobile part of the apparatus in order to center the piston (5) in the tool **A11**.

7 - Wind the first guide ring (19) round the piston and insert part of the piston into the tool **A11**. Wind the second guide ring (19) and fully insert the piston.

Insert the piston slowly in order to calibrate the guide rings (19) without overheating them.

8 - Insert the cylinder head (2) and screw it in by hand for several turns.

9 - Use the special wrench **A6** to screw the cylinder head (4) home.

Cylinder head: 95 – 100 kgm

10 - Screw the brake cylinder (3) into the cylinder (1).

Brake cylinder: Loctite 270

Brake cylinder: 8^{0}_{+2} kgm

11 - Remove the cylinder from the equipment.

12 - Using and press and the appropriate tool **A3** mount the swing bushings (9).

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DISASSEMBLY OF BACKHOE BACKFRAME LOCK CYLINDER

1 - Plug one of the two cylinder (1) ports.

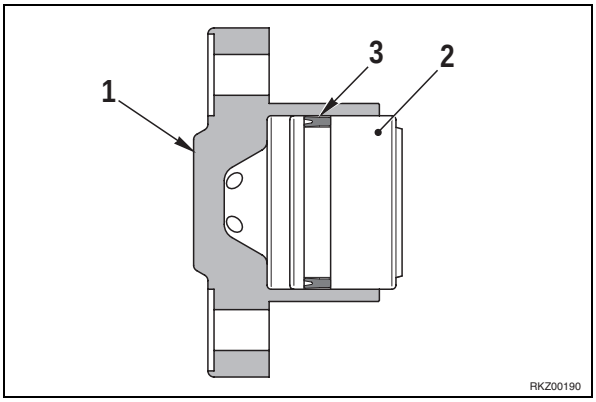
2 - Connect to the other port compressed air (max. 3 bar).

3 - Slowly insert pressure up to piston (2) comes out.

★ Retain piston and protect from oil using gloves and a protection.

4 - Remove gasket (3).

⚠ The gasket has be replaced.



ASSEMBLY OF BACKHOE BACKFRAME LOCK CYLINDER

1 - Use the tool **A9** with the appropriate diameter, mount the seal ring (3) onto the piston (2).

★ Make sure that the lips are turned towards the inside of the cylinder.

2 - Put the piston (2) onto cylinder (1).

Cylinder: ASL800050

3 - Apply an elastic band for piston ring and using a press insert the piston.

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REMOVAL OF THE BOOM SAFETY CYLINDER

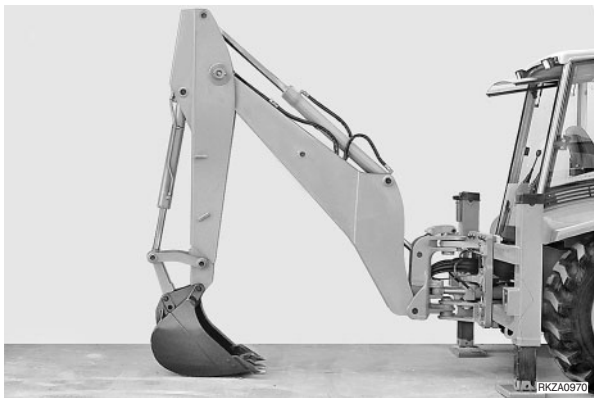
⚠ Center the backhoe with the arm vertical and the back of the bucket on the ground.

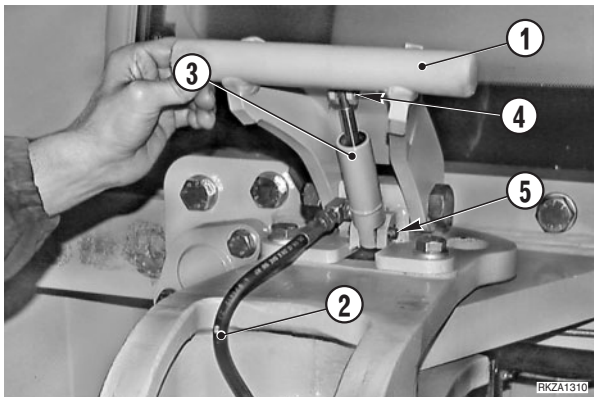
1 - Make sure that the safety stop (1) is raised.

2 - Stop the engine and release the residual hydraulic pressures.

3 - Disconnect the tube (2) that feeds the cylinder (3). Plug the tube to prevent entry of impurities.

4 - Take out the cotter pins, remove the pins (4) and (5) and the cylinder (3). ※1 ※2





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.

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REMOVAL OF THE BACKHOE WORKING EQUIPMENT

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

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

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

3 - Take out the bracket (1) mounted inside the boom. Disconnect the tubes (2) from the arm cylinders and the bucket. Plug all tubes to prevent entry of impurities.

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

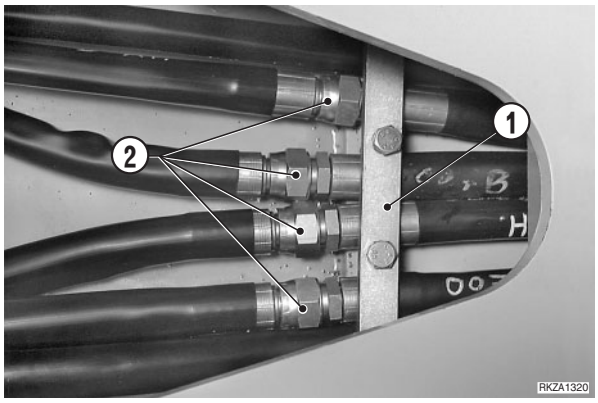
4 - Put a sling round the equipment (3) and apply slight tension to the cables.

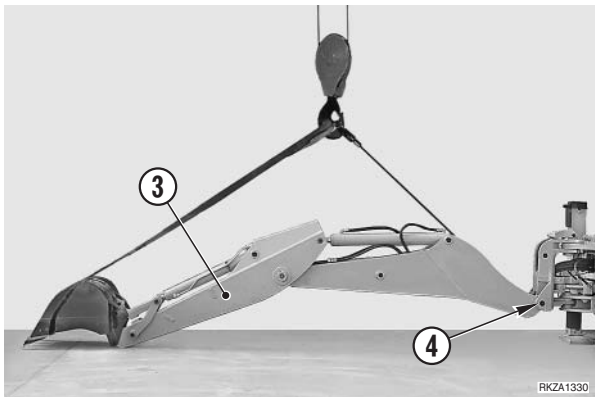
5 - Take out the snap-rings and remove the pin (4).

※1 ※2

6 - Remove the working equipment (3). ※3

kg Working equipment:..... kg





INSTALLATION OF THE BACKHOE WORKING EQUIPMENT

- To install, reverse the removal procedure.

※1

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

※2

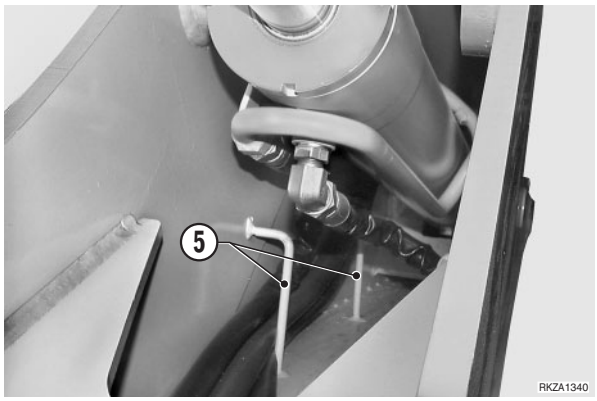
Internal bushing: ASL800050

※3

★ Pass the tubes of the cylinders inside the brackets (5).

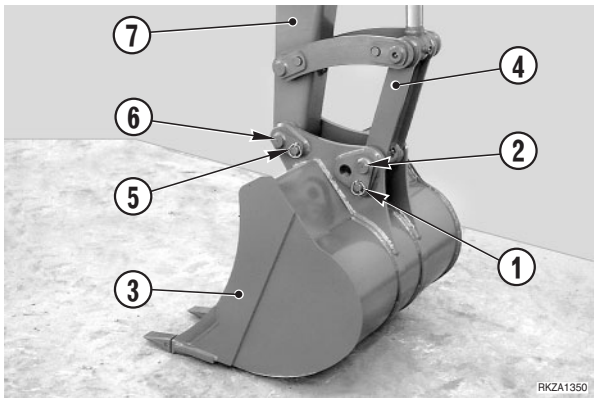
1 - Start the engine and bleed the air from the cylinders. (For details, see «20. TESTING AND ADJUSTMENTS»).

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



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REMOVAL OF THE BACKHOE BUCKET



⚠ Place the bucket on a level surface, resting on its back.

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

※1 ※2

2 - Take out the safety pin (5) and remove the pin (6) that attaches the bucket to the arm. ※1 ※2

INSTALLATION OF THE BACKHOE BUCKET

- 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

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REMOVAL OF THE ARM

1 - Remove the bucket. (For details, see «REMOVAL OF BUCKET»).

2 - Remove the bucket cylinder and the lever (1). (For details, see «REMOVAL OF THE BUCKET CYLINDER»).

3 - Take off the lock-nut (2), and the washers, and remove the pin (3) and the lever (4). ※1 ※2

4 - Start the engine, bring the arm into a vertical position and lower it to the ground.

5 - Stop the engine and release residual pressures from the cylinder.

6 - Put a sling around the arm cylinder (5), remove the screws (6) and remove the pin (7). ※2 ※3

7 - Start the engine and retract the piston completely (8).

★ Secure the fully retracted position by binding the piston head with wire.

8 - Rest the cylinder (5) on a block «**A**».

9 - Stop the engine.

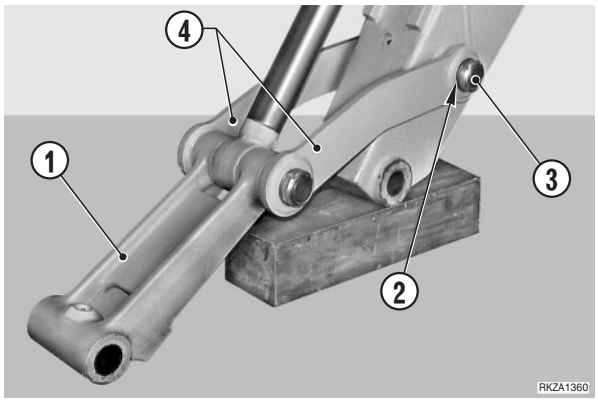
10 - Attach the arm (9) to the hoisting tackle and apply a slight tension to the cable.

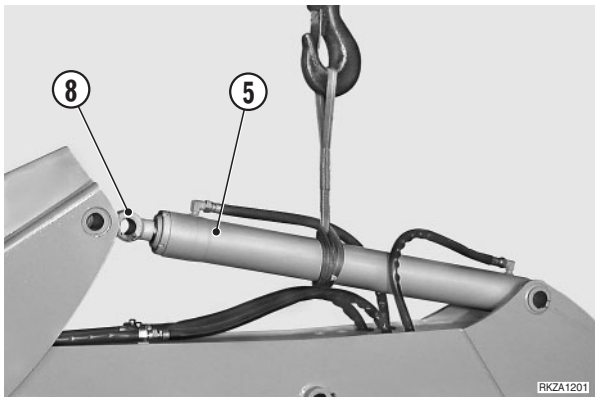
11 - Take out the screws and remove the pin (10).

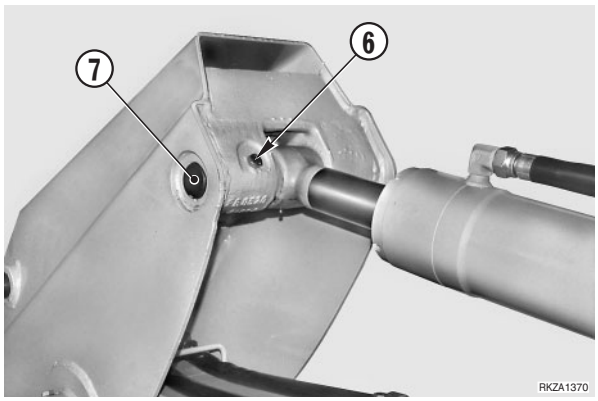
※1 ※2

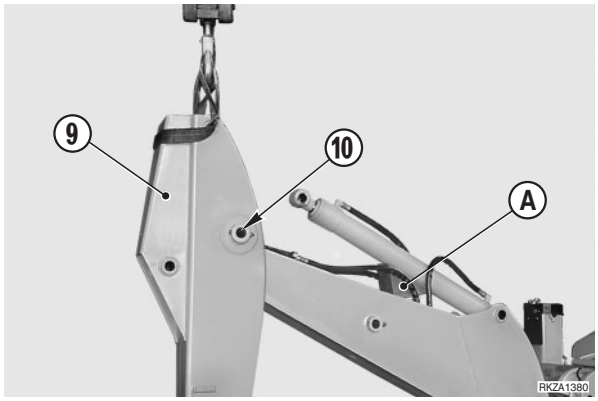
12 - Remove the arm (9).

kg Arm: 213 kg









INSTALLATION OF THE ARM

- To install, reverse the removal procedure.

※1

⚠ When aligning the positions between the hole and the pin, do not insert fingers into the holes to check alignment.

※2

Internal bushing: ASL800050

Nm Pin-retaining lock nut: ..... Nm

※3

⚠ 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.

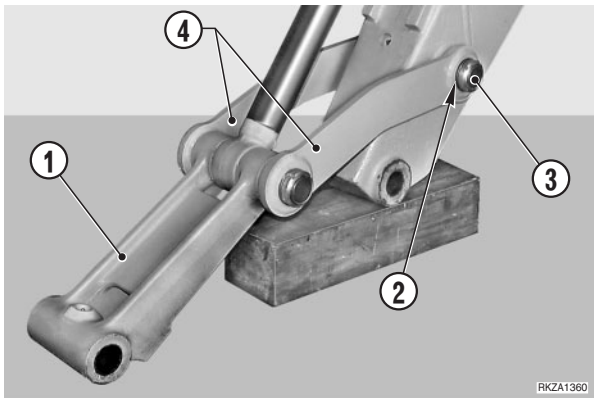
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REMOVAL OF COMPLETE JIG ARM

1 - Remove the bucket. (For details, see «REMOVAL OF BUCKET»).

2 - Remove the bucket cylinder and the link (1). (For details, see REMOVAL OF BUCKET CYLINDER«).

3 - Take out the lock nut (2) and the washer, and remove the pin (3) and the cylinder link (4). ※1 ※2



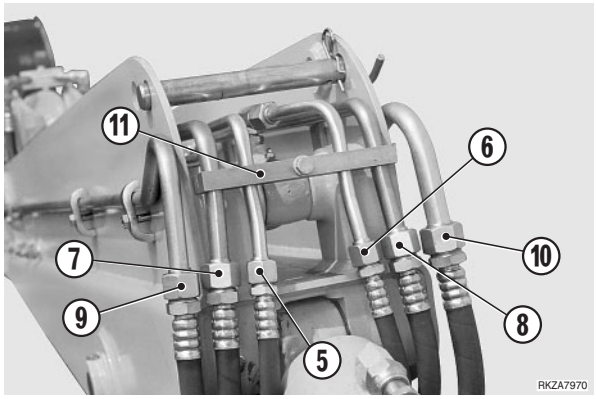
4 - Disconnect the jig arm hoses (5) and (6), the bucket cylinder hoses (7) and (8), and the hoses of the auxiliary equipment (9) and (10).

★ Mark the hoses to avoid exchanging them during INSTALLATION.

5 - Remove the clamp (11).

6 - Proceed with the removal as for the arm. (See «REMOVAL OF THE ARM»).

kg Jig arm cylinder: ..... kg



INSTALLATION OF THE COMPLETE JIG ARM

- To install reverse the removal procedure.

※1

⚠ When aligning positions between hole and pin, do not insert fingers into the holes to check on alignment.

※2

Internal bushings: ASL800050

Nm Pin-retaining lock nut: ..... Nm

※3

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

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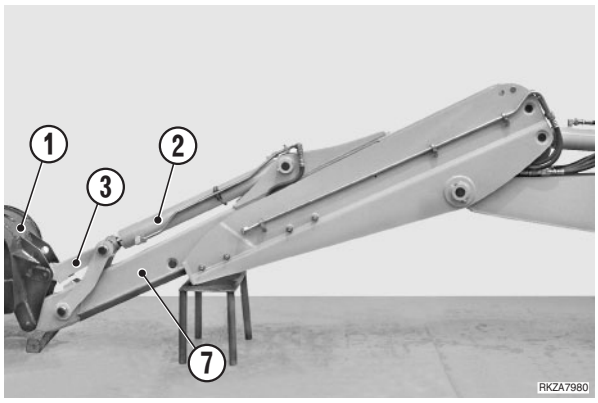
REMOVAL OF 2nd ARM

1 - Remove the bucket (1). (For details, see «REMOVAL OF BUCKET»).

2 - Remove the bucket cylinder (2) and the link (3). (For details, see «REMOVAL OF THE BUCKET CYLINDER»).

3 - Remove the 2nd arm cylinder. (For details, see «REMOVAL OF THE 2nd ARM CYLINDER»).

⚠ For safety, tightly plug all the disconnected hoses.



4 - Take out the lock nut (4), and the washers and remove the pins (5) and the links (6).

※1 ※2 ※3

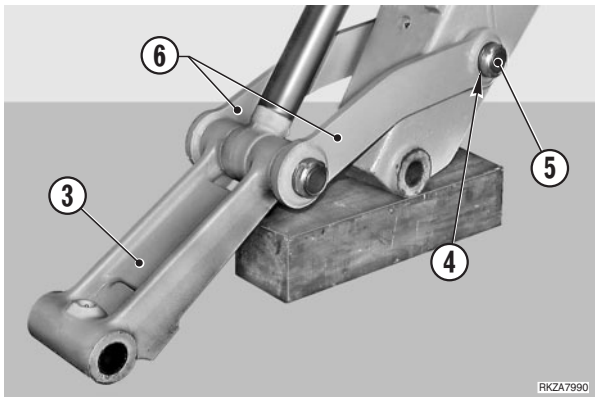
5 - Connect the 2nd arm (7) to some hoisting tackle.

★ Use the bucket pin hole and the safety pin holes.

6 - Start the engine and, maintaining constant tension on the section of cable or chain connected to the bucket coupling, slowly raise the boom until both sections of cable or chain are under slight tension.

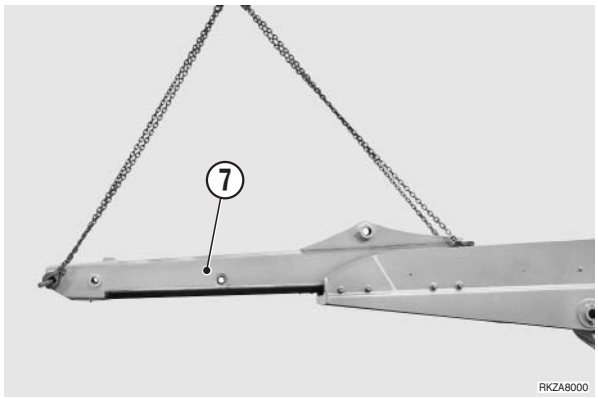
7 - Stop the engine and loosen by several turns the gib adjustment screws.

★ Loosen the screws on both sides.



8 - Slide out the 2nd arm (7).

kg 2nd arm: ..... kg



INSTALLATION OF 2nd ARM

- To install, reverse the removal procedure.

※1

⚠ When aligning the positions between hole and pin, do not insert fingers into the holes to check on alignment.

※2

Internal bushings: ASL800050

※3

Nm Pin-retaining lock nut: ..... Nm

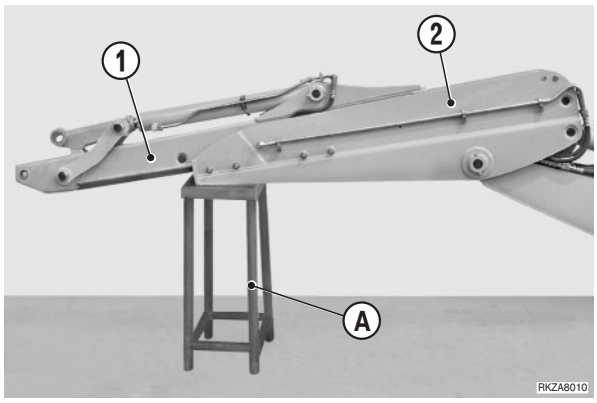
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REMOVAL OF 2nd ARM GUIDES

1 - Remove the bucket (1). (For details, see «REMOVAL OF BUCKET»).

2 - Partially extend the 2nd arm (1).

3 - Rest the arm (2) on a trestle "**A**" about 80 cm (3.5 ft.) high.

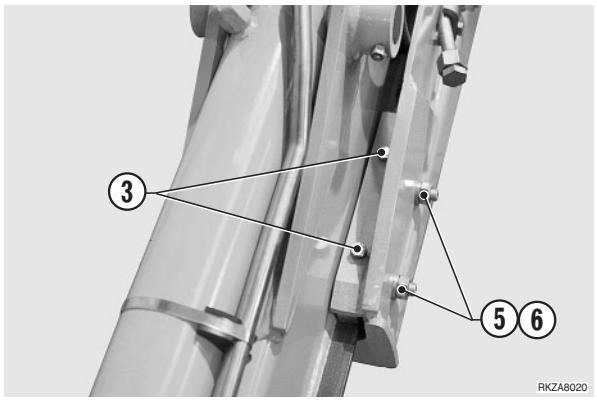


4 - Loosen and remove the screws (3), the spring washers and remove the upper guides (4). ※1 ※2

5 - Connect the 2nd arm (1) to some hoisting tackle.

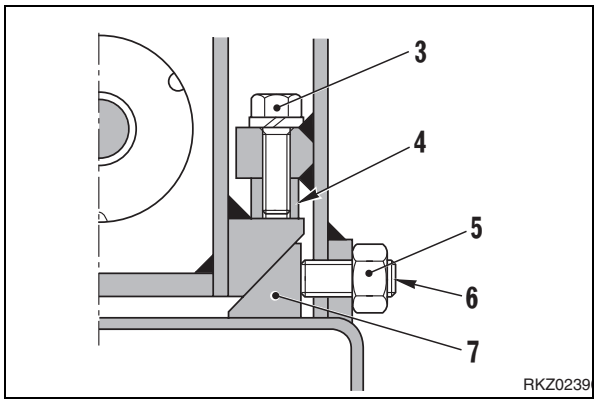
★ Use the bucket pin hole and the safety pin holes.

6 - Slowly raise the 2nd arm (1) until it rests on the supporting surfaces of the upper guides.



7 - Loosen the nuts (5) and remove the adjustment dowel bolts (6).

8 - Raise the lower guides (7) and slide them out. ※2



INSTALLATION OF 2nd ARM GUIDES

- To install, reverse the removal procedure.

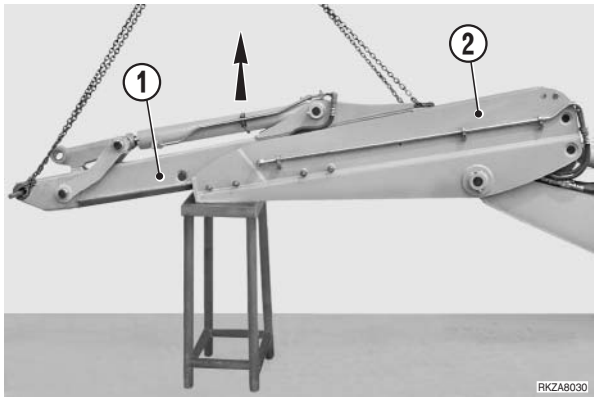
※1

Nm Guide screws: ..... Nm

※2

Guides and 2nd arm guides: ASL800040

1 - Adjust the clearances, keeping the jig arm (1) aligned with respect to the 2nd arm (2). (for details, see «20. TESTS AND ADJUSTMENTS»).



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REMOVAL OF THE BACKHOE BOOM

1 - Remove the arm. (For details, see «REMOVAL OF THE ARM»).

2 - Remove the arm cylinder. (For details, see «REMOVAL OF THE ARM CYLINDER»).

3 - Start the engine and rest the boom on the ground.

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

5 - Take out the bracket (1) and disconnect the tubes (2) from the arm cylinders and the bucket. Plug all tubes to prevent entry of impurities.

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

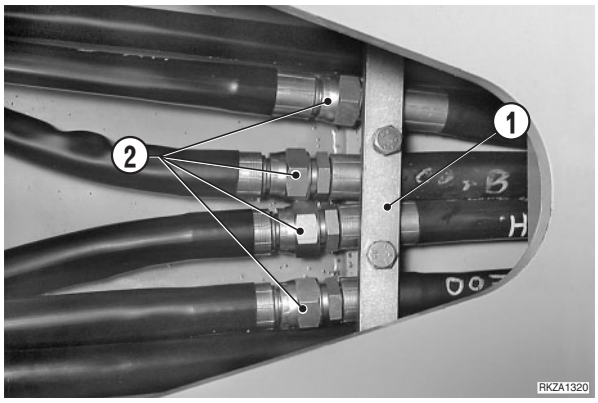
6 - Put a sling round the boom (3).

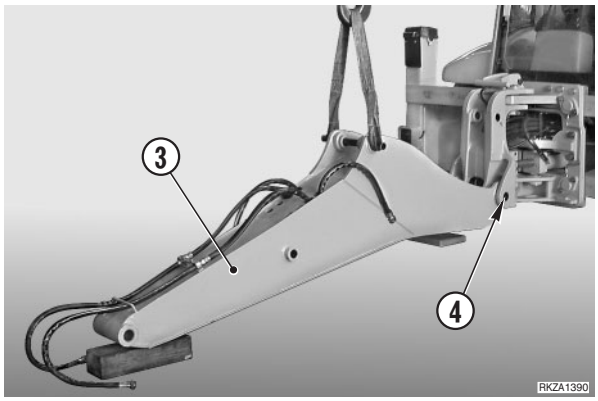
7 - Take out the snap-rings and remove the pin (4).

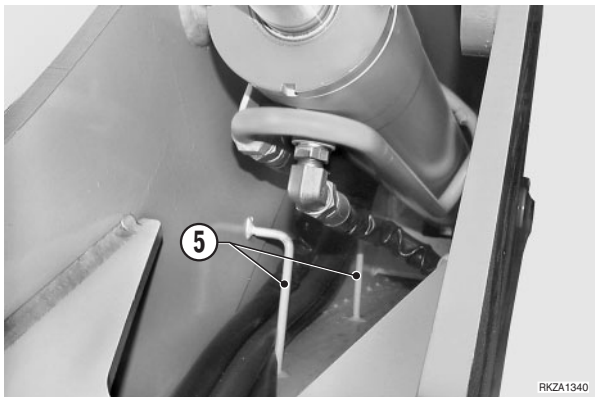
※1 ※2

8 - Remove the boom (3). ※3

kg Boom: 323 kg







INSTALLATION OF THE BACKHOE BOOM

- To install, reverse the removal procedure.

※1

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

※2

Internal bushing: ASL800050

※3

★ Pass the cylinder tubes inside the brackets (5).

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.

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REMOVAL OF THE BACKHOE SWING BRACKET

1 - Remove the working equipment. (For details, see «REMOVAL OF THE WORKING EQUIPMENT»).

2 - Take out the screws (1) and remove the pins (2) that connect the swing cylinders (3). ※1 ※2

3 - Disconnect the tube (4) of the boom safety cylinder (5) and remove the retaining clip (6). Plug the tube to prevent entry of impurities.

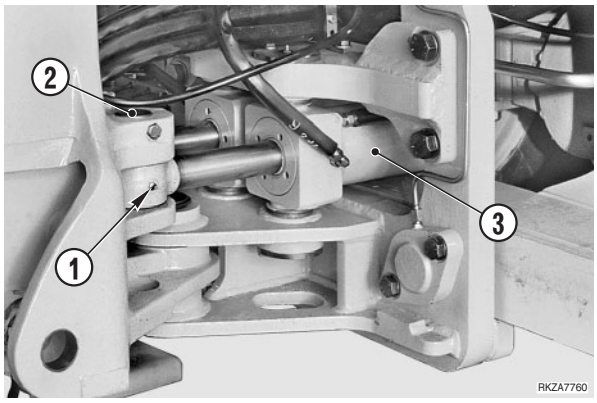
4 - Take out the four screws (7) and remove the boom safety group (8). ※3

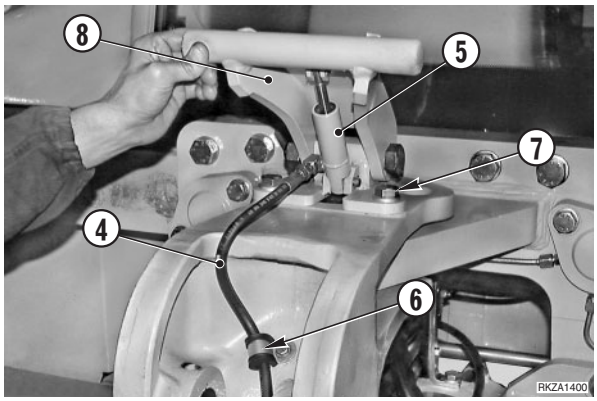
5 - Put a sling round the swing bracket (9).

6 - Take out the screws (10) and (11) and remove the swing bracket axle oscillation pins (12) and (13). ※1 ※2

7 - Remove the swing bracket (9) and the relative shim adjustments to given clearance. ※4

kg Bracket: 133 kg





INSTALLATION OF THE BACKHOE SWING BRACKET

- To install, reverse the removal procedure.

※1

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

※2

Internal bushing: ASL800050

※3

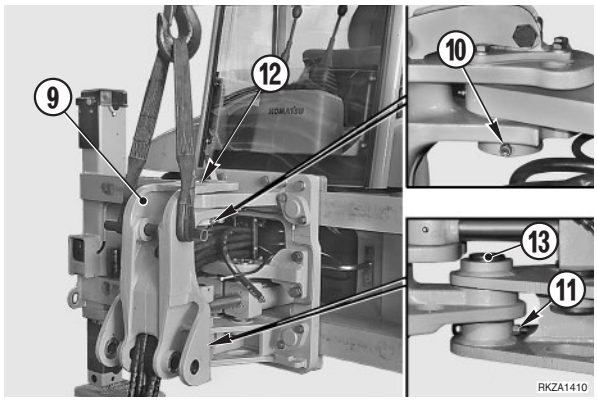
Nm Safety group screws: 27±3 kgm

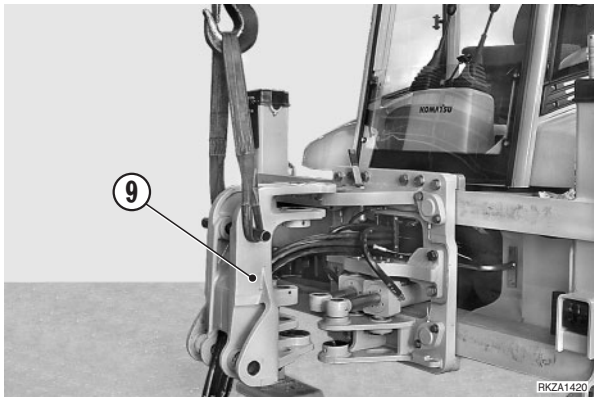
※4

★ Insert the shims.

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.





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REMOVAL OF BACKHOE BACKFRAME

1 - Remove the equipment. (For detail see «REMOVAL OF BACKHOE WORKING EQUIPMENT»).

2 - Remove the swing cylinders. (For detail see «REMOVAL OF SWING CYLINDER»).

3 - Remove the swing bracket. (For detail see «REMOVAL OF SWING BRACKET»).

4 - Disconnect from union (1) the feeding pipes (2) of backhoe backframe and plug them to avoid impurity entry.

5 - Loose nuts (4) and remove washers (5) and four screw (6).
Loose partially lateral nuts (4) to remove backframe (3) from frame (8). ※1

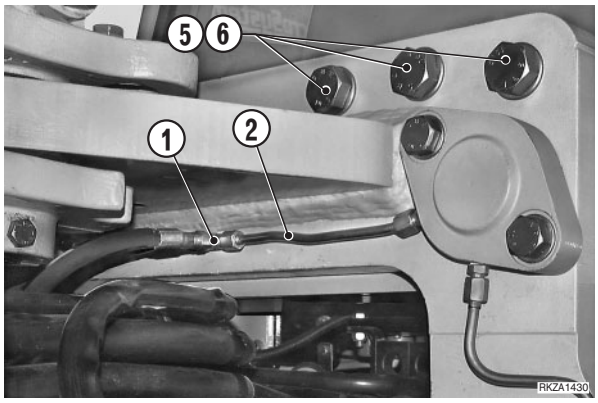
6 - Put a sling round the backframe (3) and apply slight tension to the cables.

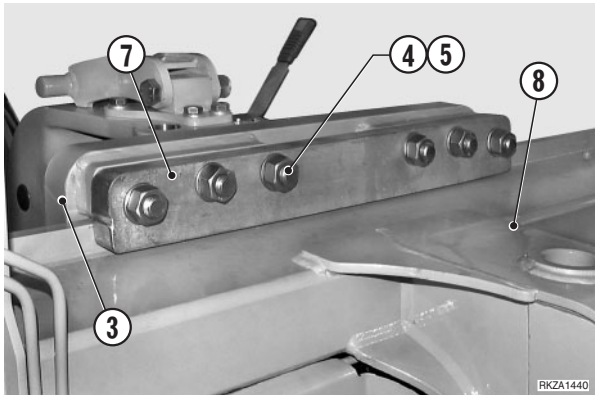
7 - Remove external nuts (4), washers (5) and screws (6).

※1

8 - Remove the sliding piece (7) and then lower the backframe and remove it.

kg Backframe:.....kg





INSTALLATION OF BACKHOE BACKFRAME

- To install, reverse the removal procedure.

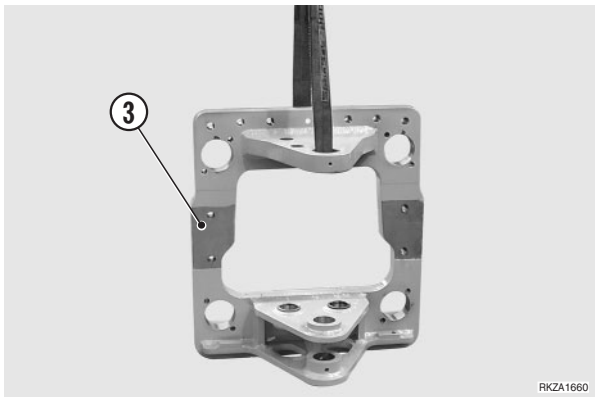
※1

Nut: Loctite 262

Nm Nut: 100±10 kgm

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.



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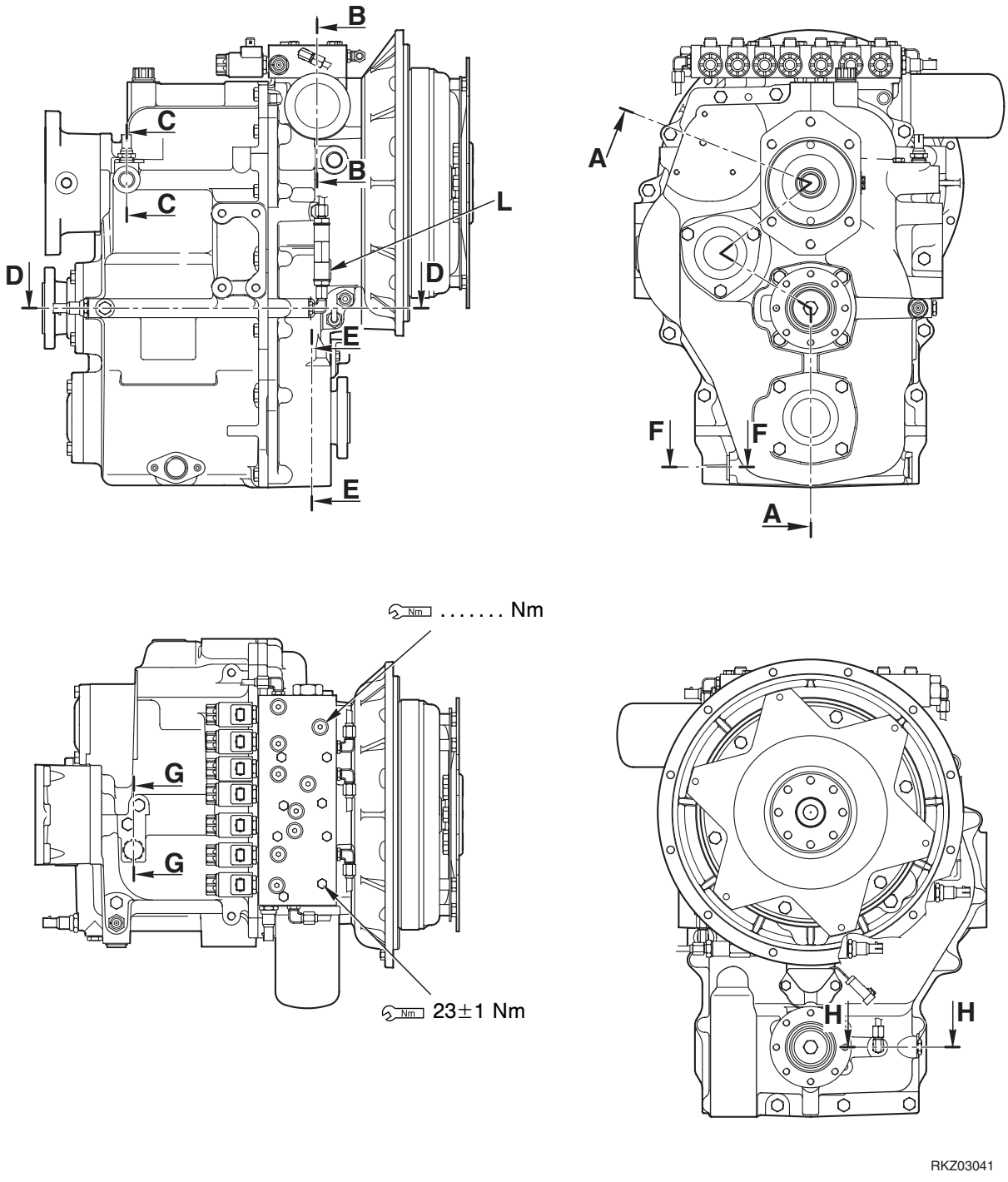
40 STANDARD MAINTENANCE

Transmission 3
Front axle 6
Rear axle 9
Hydraulic pump 14
2-Spool control valve 16
3-Spool control valve 18
6-Spool control valve 22
7-Spool control valve 25
8-Spool control valve 27
Brake pump 29
Shovel cylinder 30
Backhoe cylinder 32
Front working equipment 36
Swing bracket 38
Backhoe working equipment 40

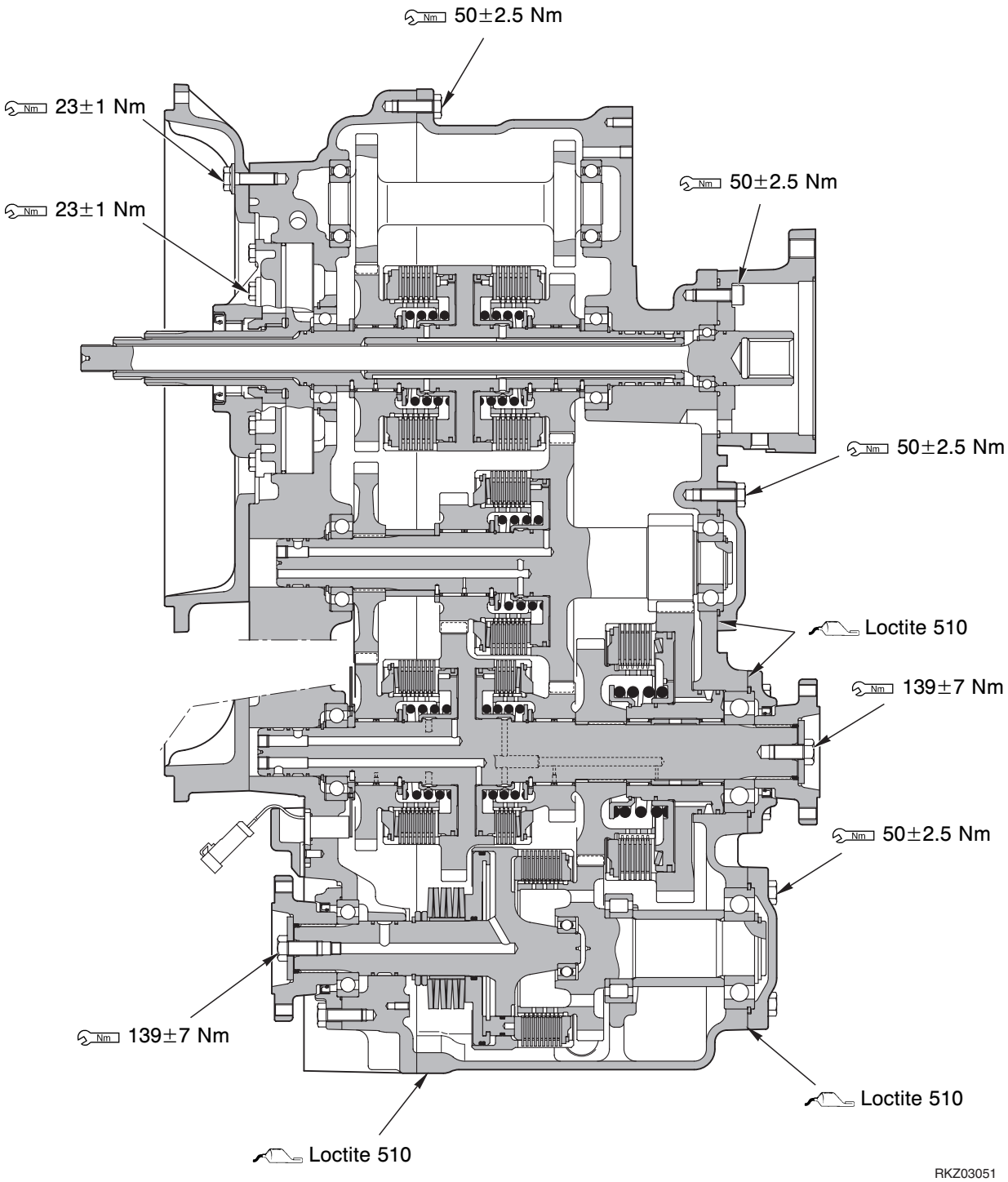
https://truckmanualshub.com/

https://truckmanualshub.com/

TRANSMISSION

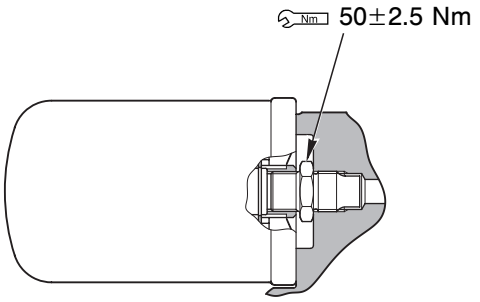


https://truckmanualshub.com/

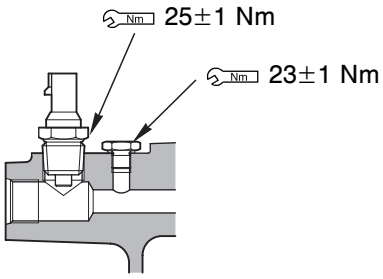


Section A - A

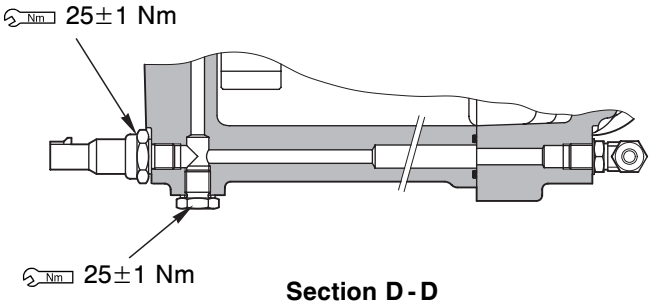
https://truckmanualshub.com/



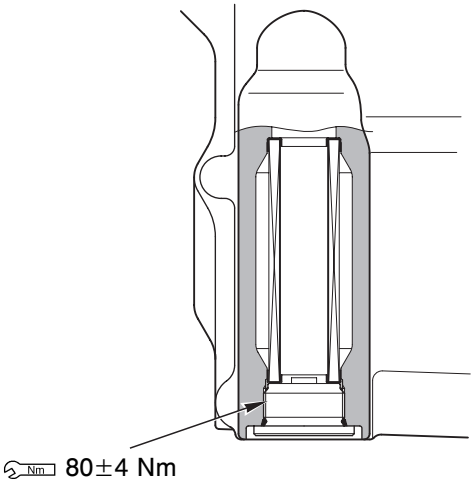
Section B - B



Section C - C

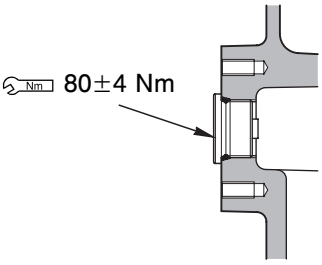


Section D - D

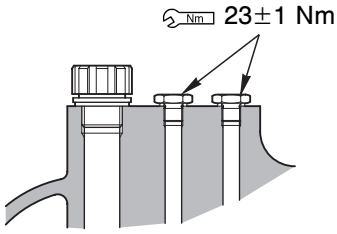


Section E - E

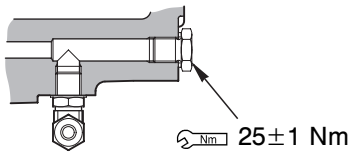
RZ03110



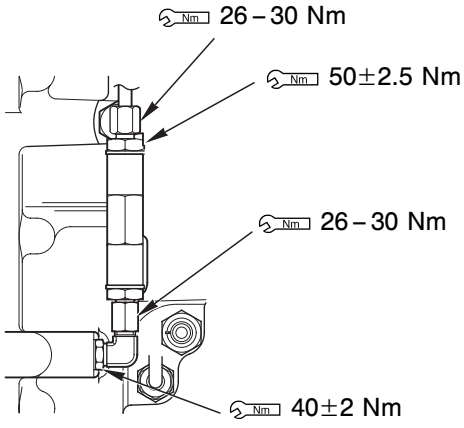
Section F - F



Section G - G



Section H - H



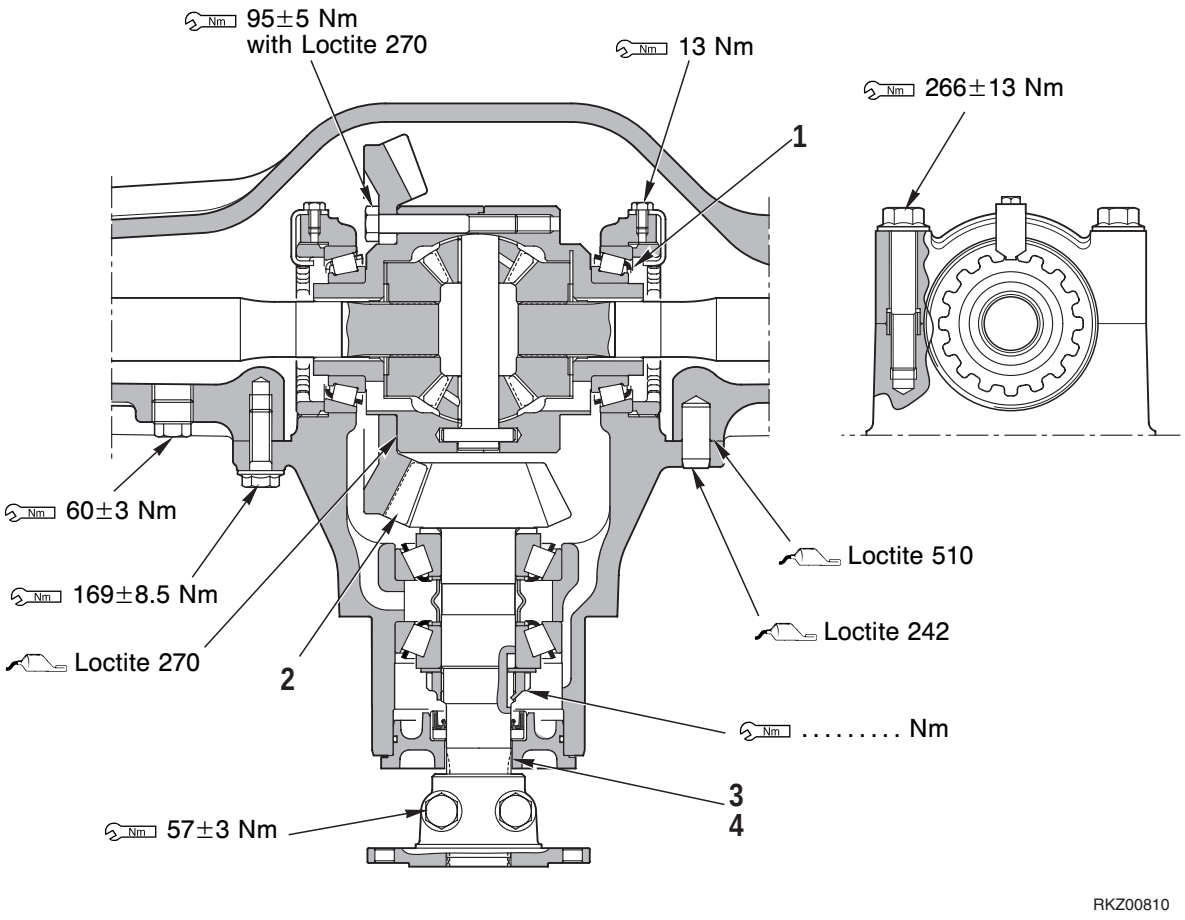
Detail L

RZ03120

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FRONT AXLE

Differential

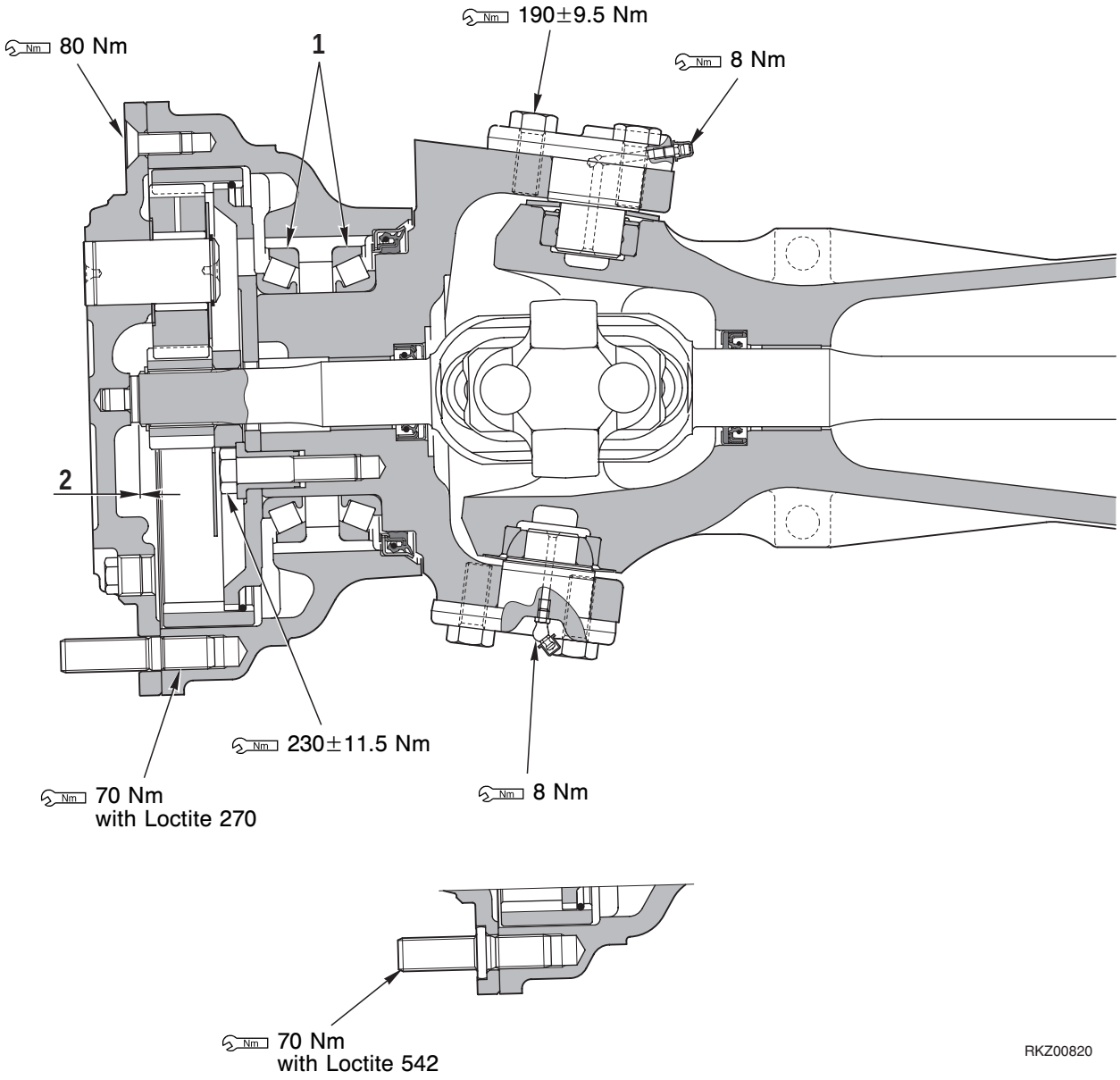


Unit: mm

Nº	Check item	Criteria		Remedy
1	Axle clearance	Standard clearance	Clearance limit	Adjust
2	Backlash of crown wheel and pinion	0.17 – 0.23		
3	Pinion preload (without seal ring)	9.2 – 13.7 daN		
4	Pinion-crown wheel preload (without seal ring)			

https://truckmanualshub.com/

Planetary - Joint

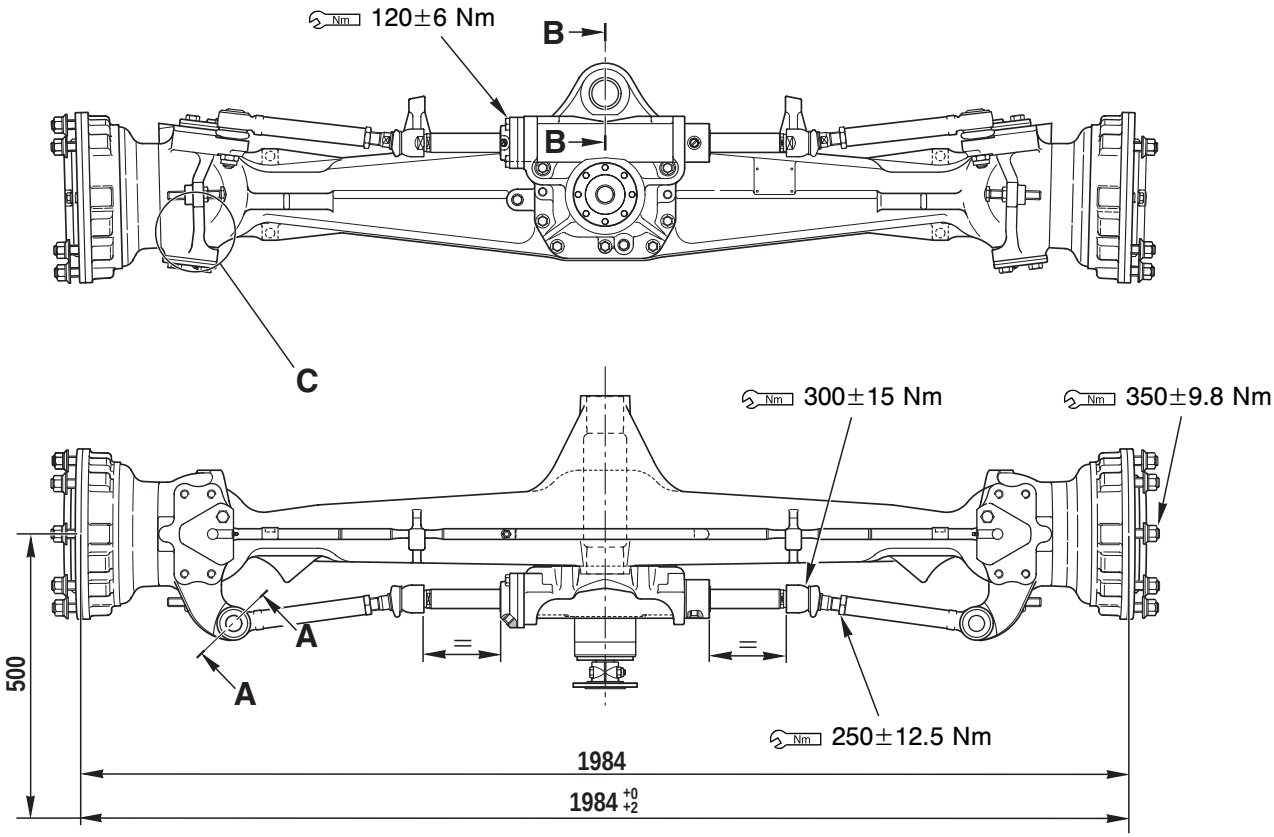


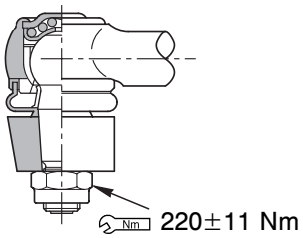
Unit: mm

Nº	Check item	Criteria	Remedy
1	Hub rotation torque		Adjust
2	Drive shaft axle clearance		Replace

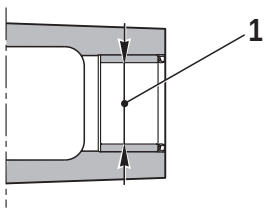
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Steering unit cylinder

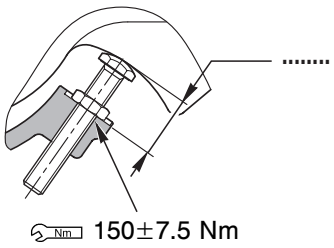




Section A - A



Section B - B



Detail C

RKZ00840

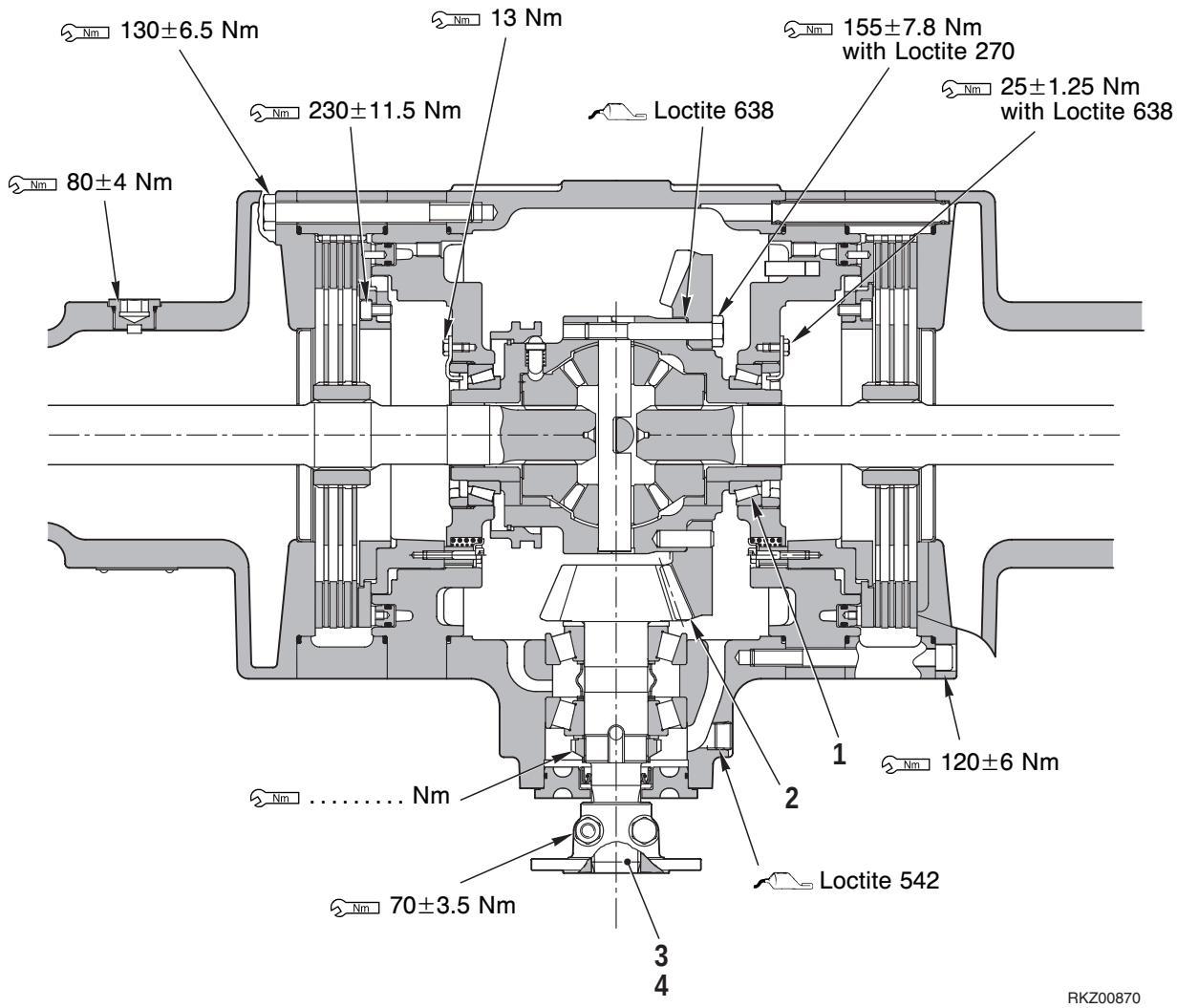
Unit: mm

N°	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between bushing and pin	50					Replace bushing and pin

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REAR AXLE

Differential

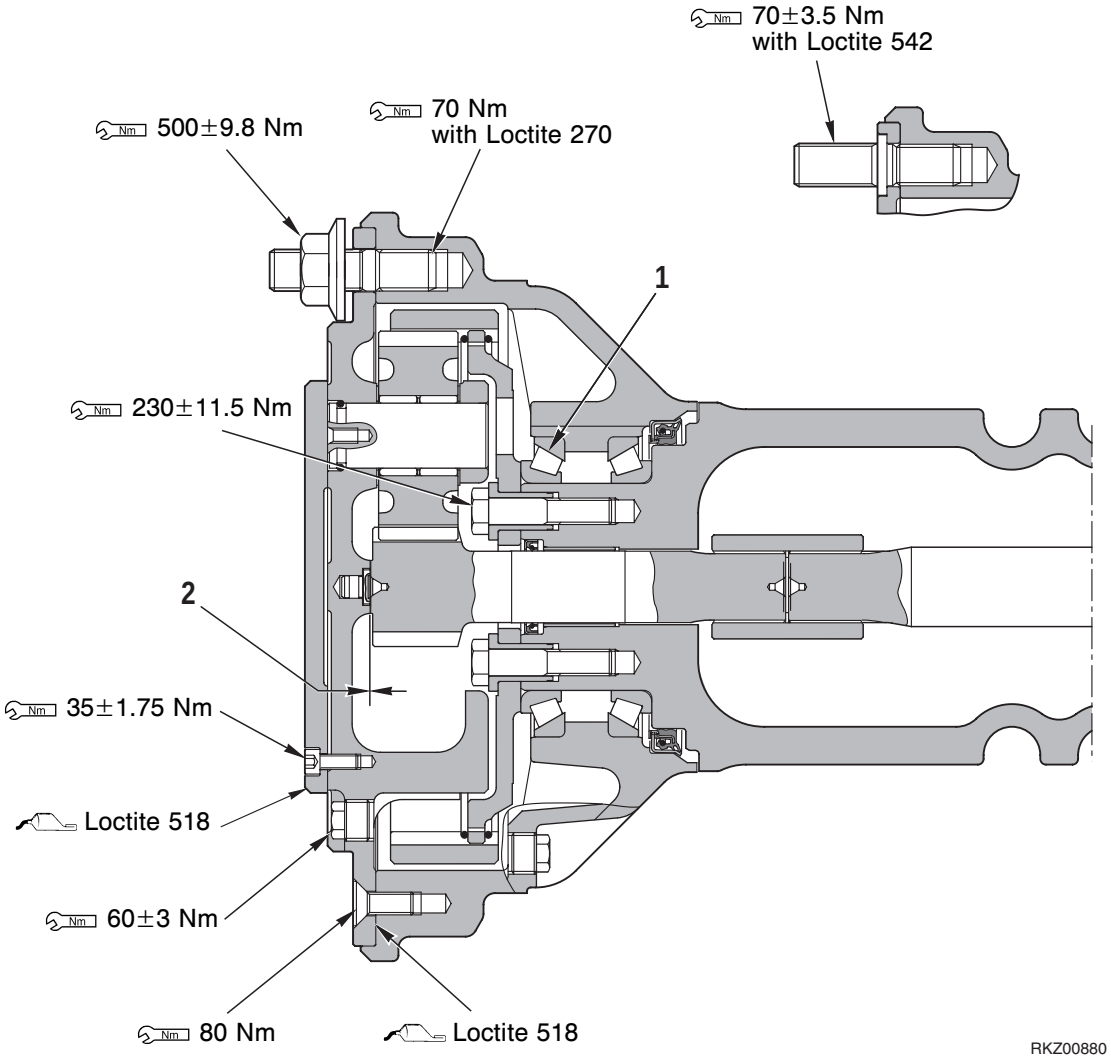


Unit: mm

N°	Check item	Criteria		Remedy
1	Axle clearance	Standard clearance	Clearance limit	Adjust
2	Backlash of crown wheel and pinion			
3	Pinion preload (without seal ring)	9.2 – 13.8 daN		
4	Pinion-crown wheel preload (without seal ring)			

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Planetary - Joint

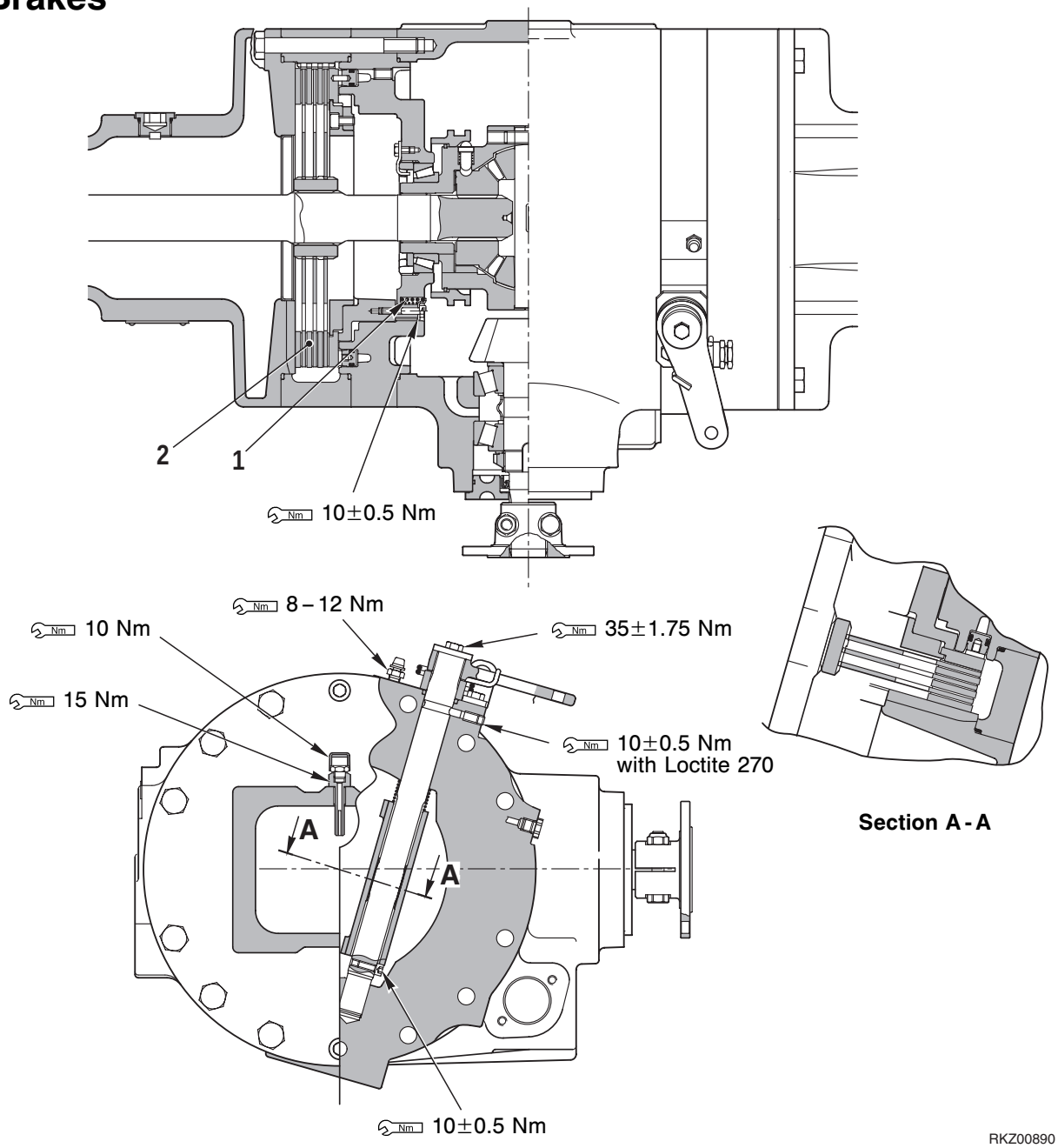


Unit: mm

Nº	Check item	Criteria	Remedy
1	Hub rotation torque		Adjust
2	Drive shaft axle clearance		

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Brakes

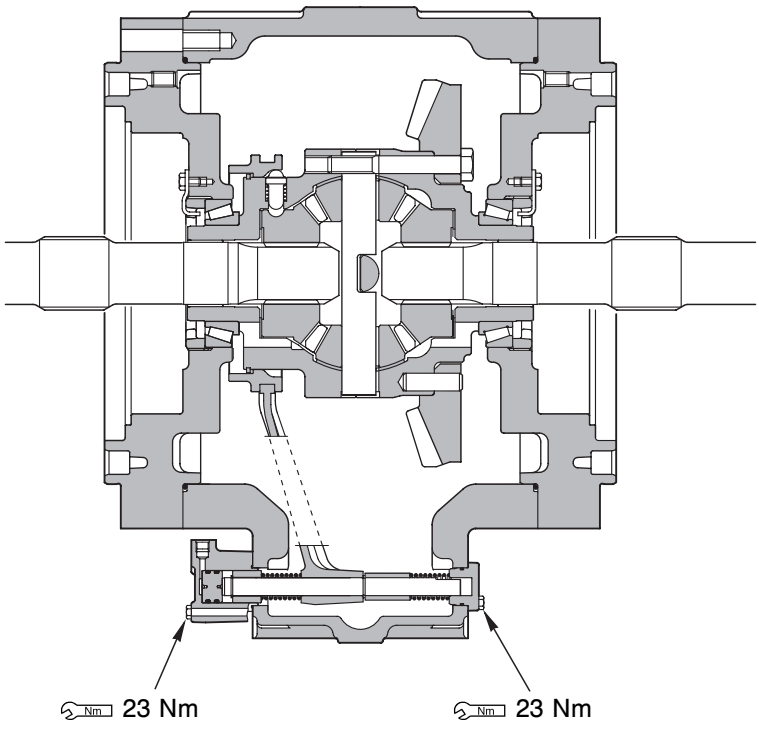


Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Brake disc return spring	Free installed	Installed length	Installed load	Free installed	Installed load	Replace if damaged or deformed
2	Disc thickness	Standard thickness			Min. thickness		Replace

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Differential lock

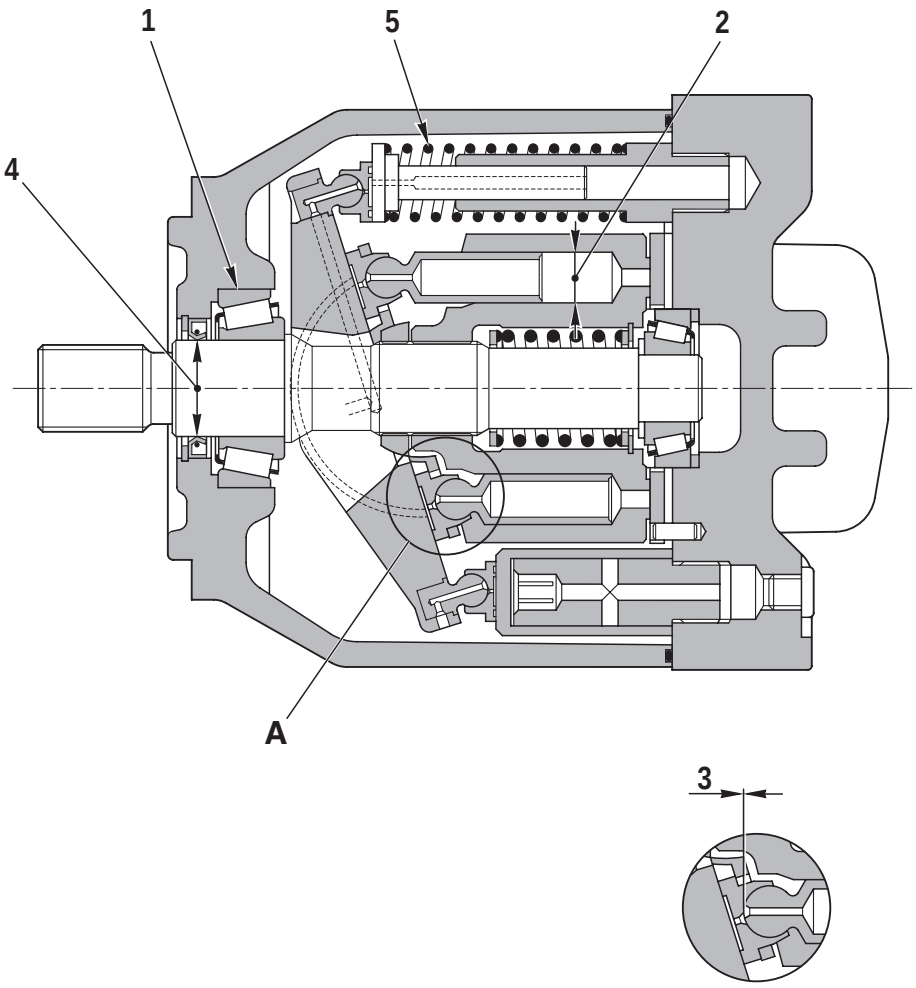


RKZ00900

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HYDRAULIC PUMP



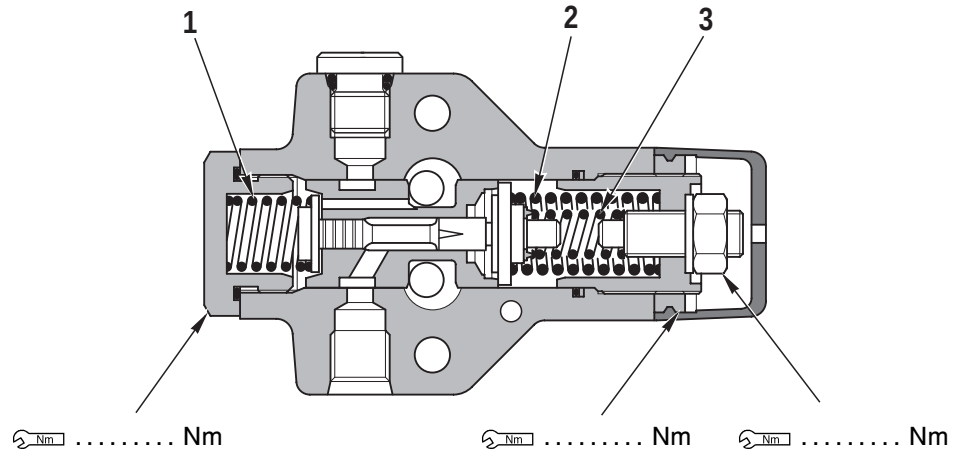
Detail A

RKZ01290

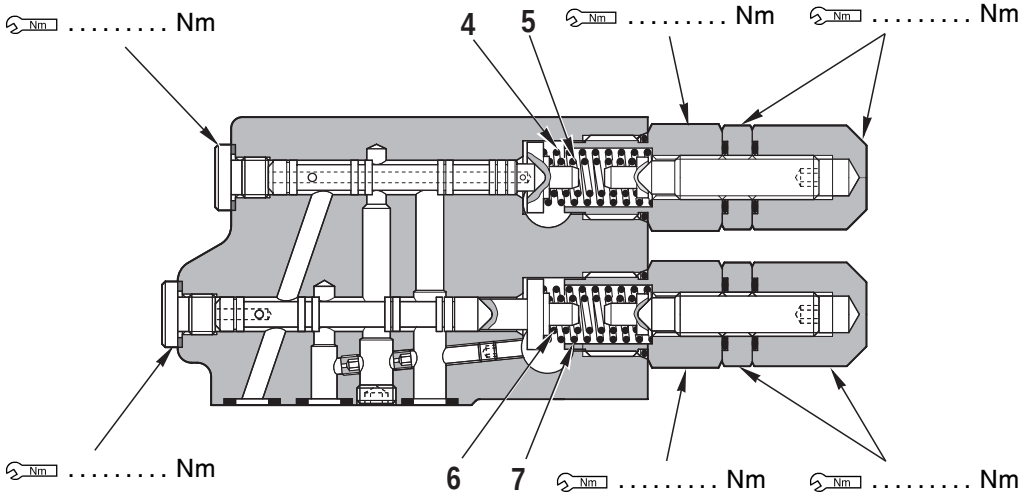
Unit: mm

Nº	Check item	Criteria					Remedy
1	Ball-bearing loading	0 – 0.05					Adjust
2	Backlash between piston and cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
3	Backlash between piston and shoe						
4	Drive shaft diameter	Standard value		Max. value			
5	Spring	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			

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Section C - C



Section D - D

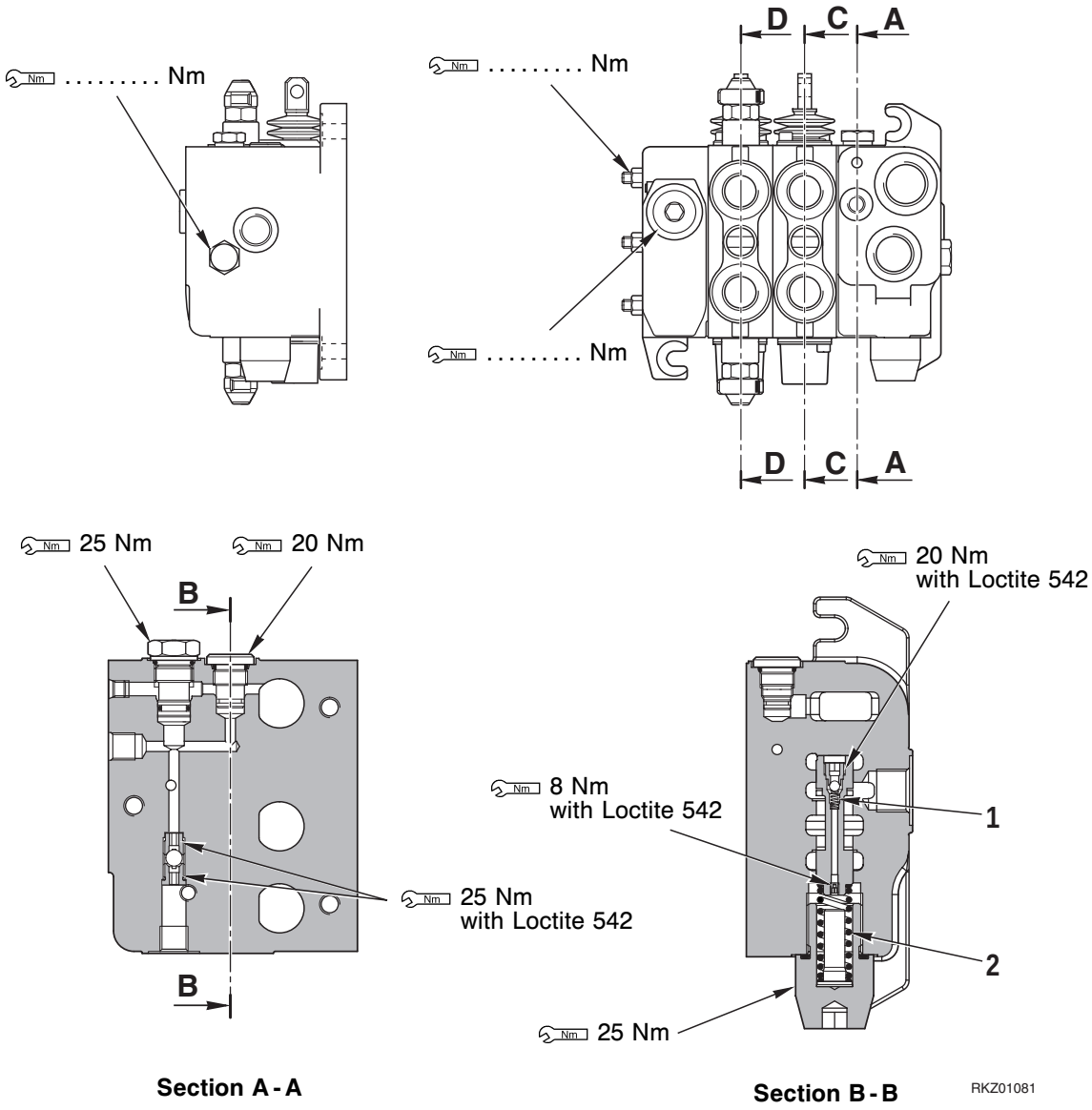
RKZ00641

Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Power regulation spring (external)						
3	Power regulation spring (internal)						
4	PC valve spring (external)						
5	PC valve spring (internal)						
6	LS valve spring (external)						
7	LS valve spring (internal)						

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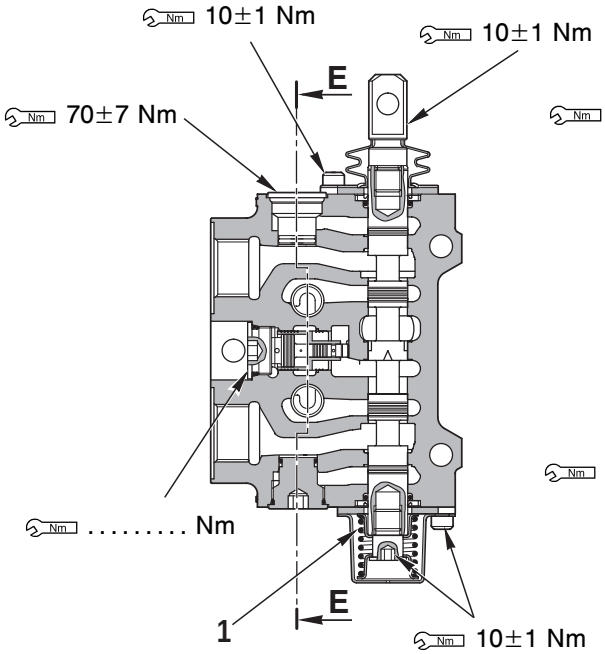
2-SPOOL CONTROL VALVE



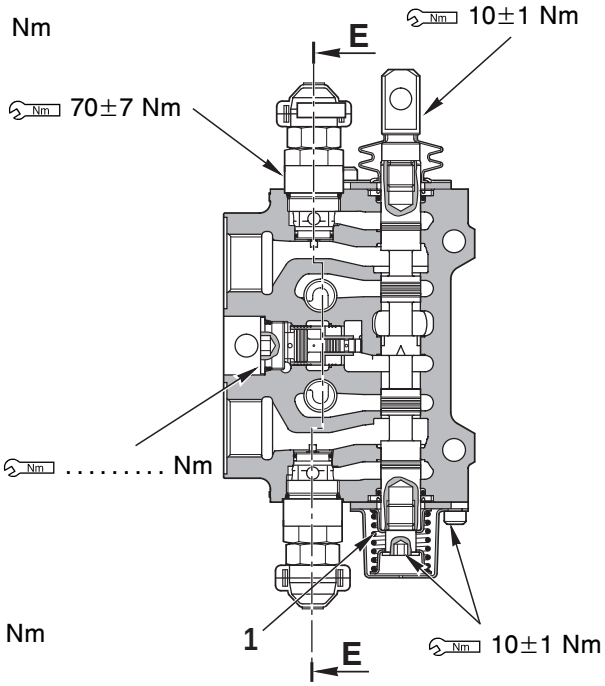
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Check valve spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Priority valve spring						

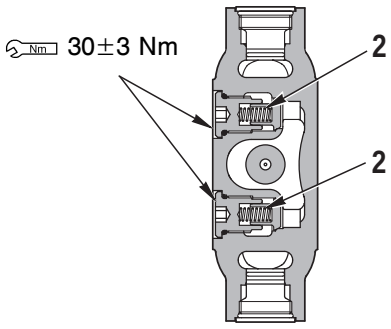
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Section C - C



Section D - D



RKZ00661

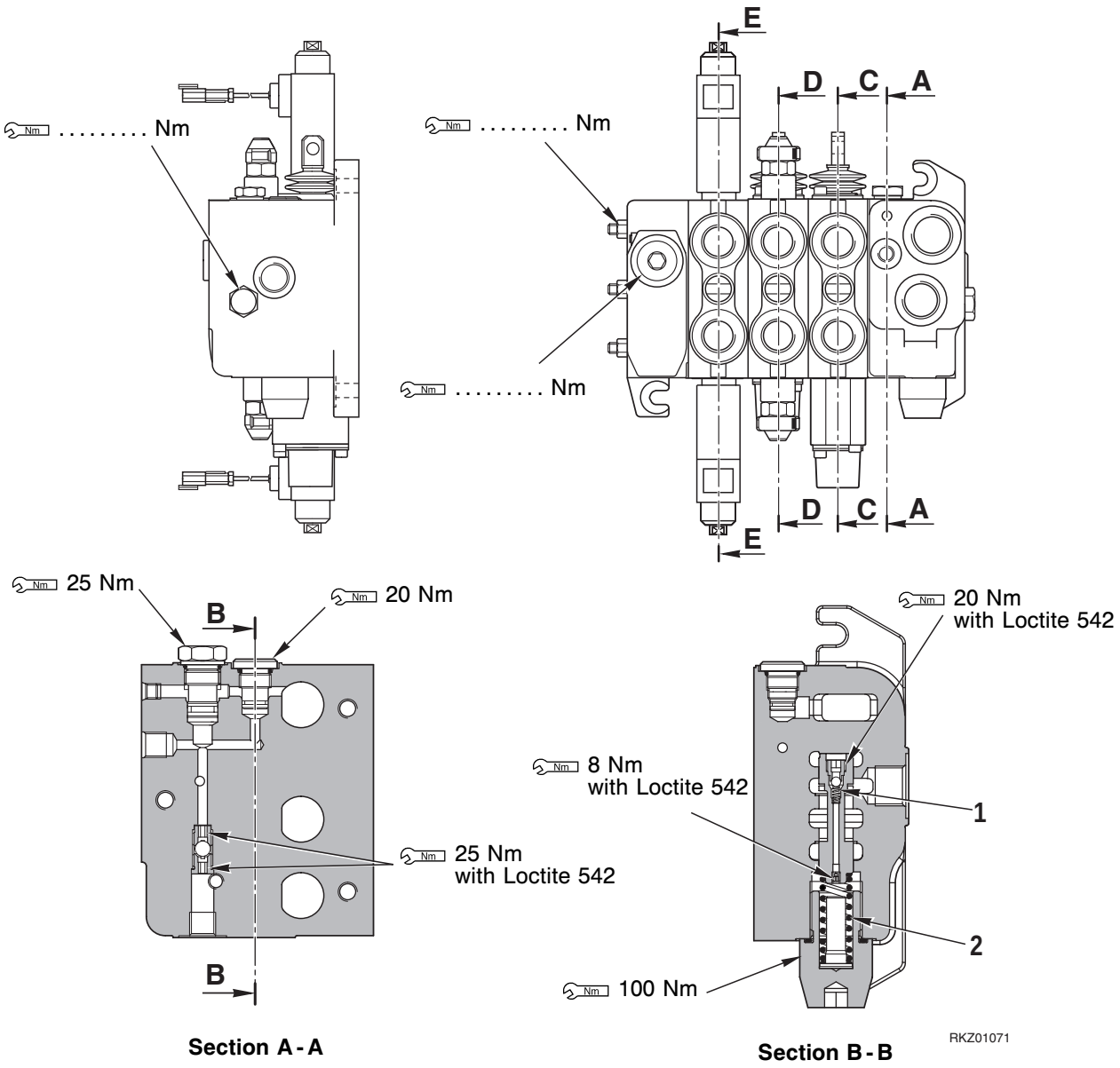
Section E - E

Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Check valve spring						

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3-SPOOL CONTROL VALVE



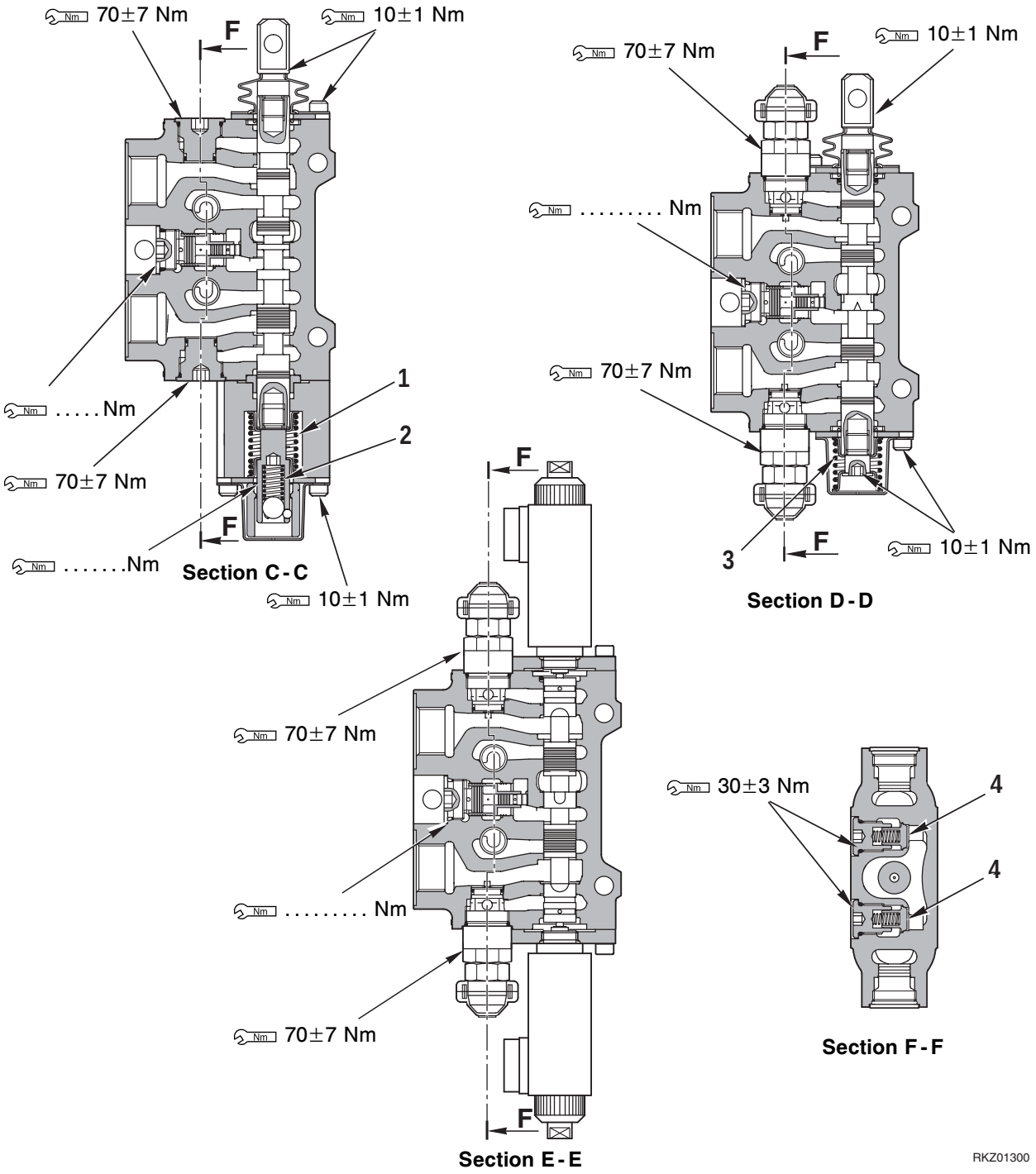
Section A - A

Section B - B

Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Check valve spring						

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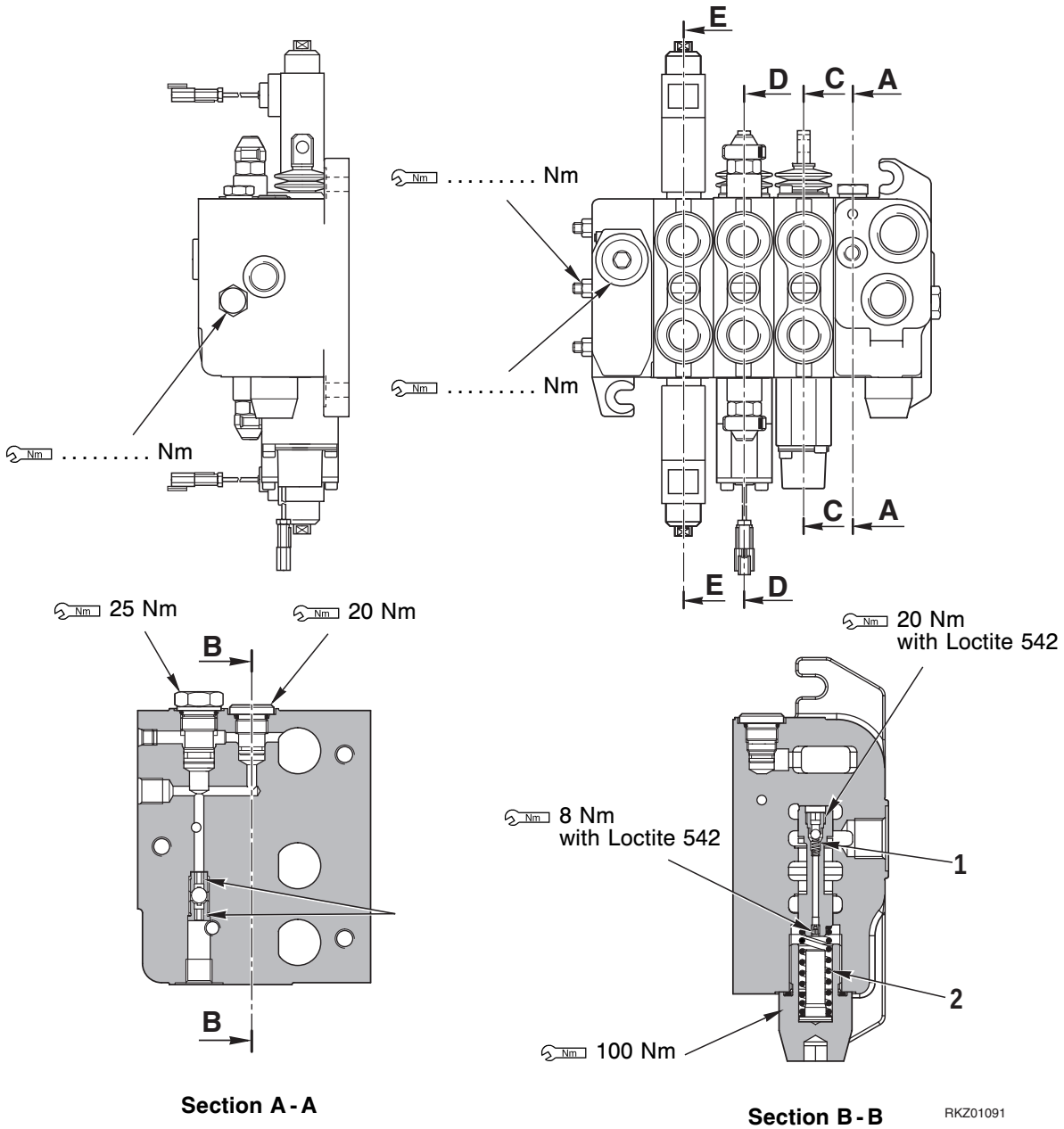
Unit: mm

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

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3-SPOOL CONTROL VALVE

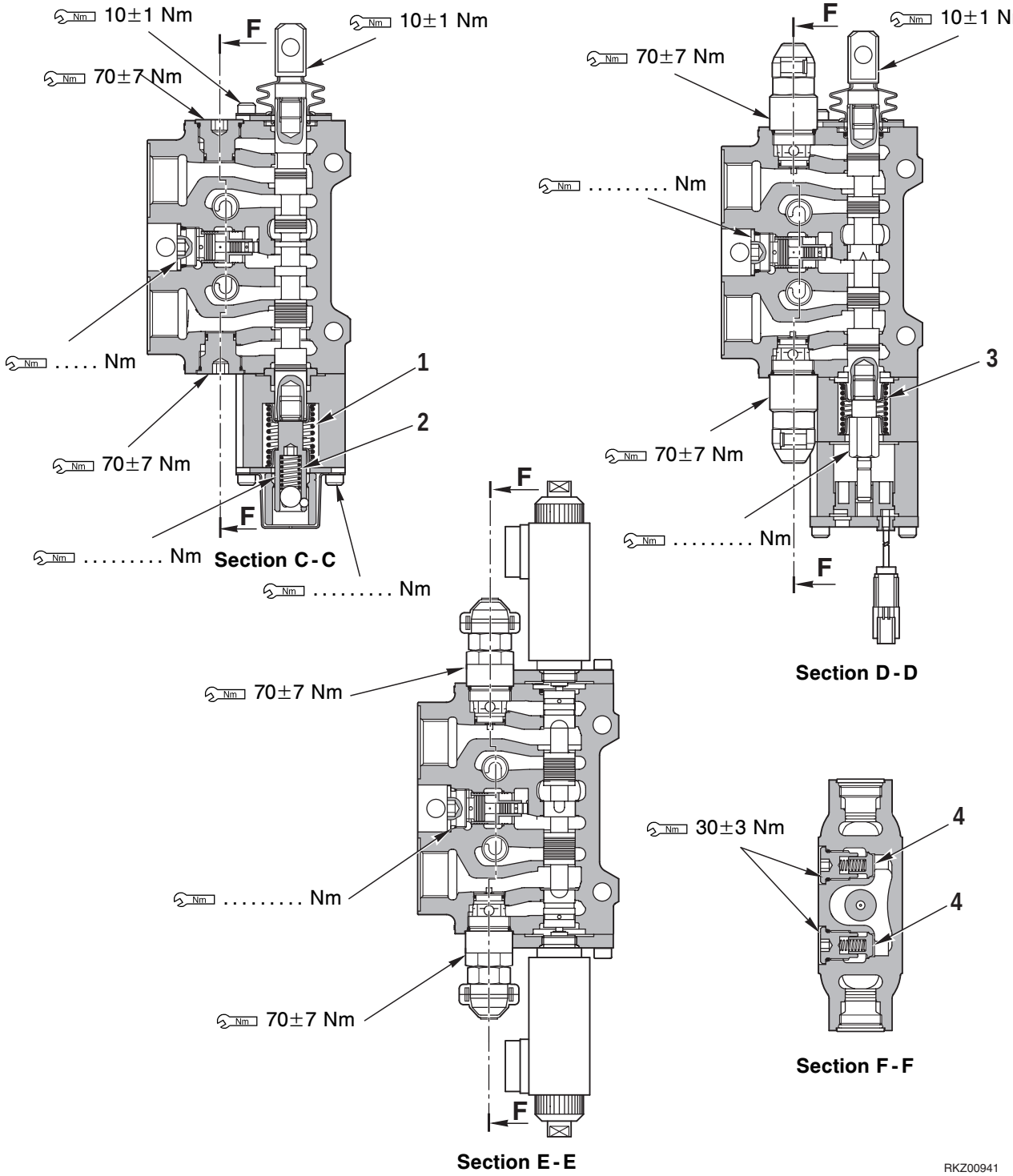
With return to dig



Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Spool locking spring						
3	Spool return spring						
4	Check valve spring						

https://truckmanualshub.com/

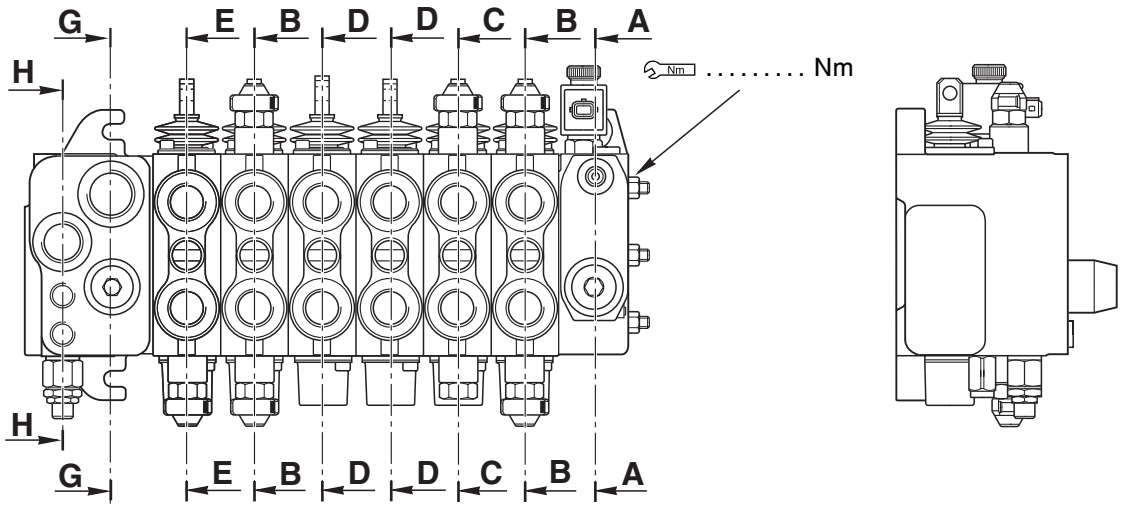


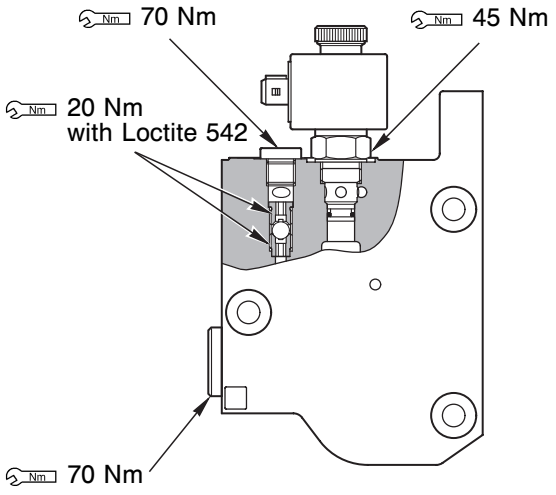
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Spool locking spring						
3	Spool return spring						
4	Spool return spring						
5	Check valve spring						

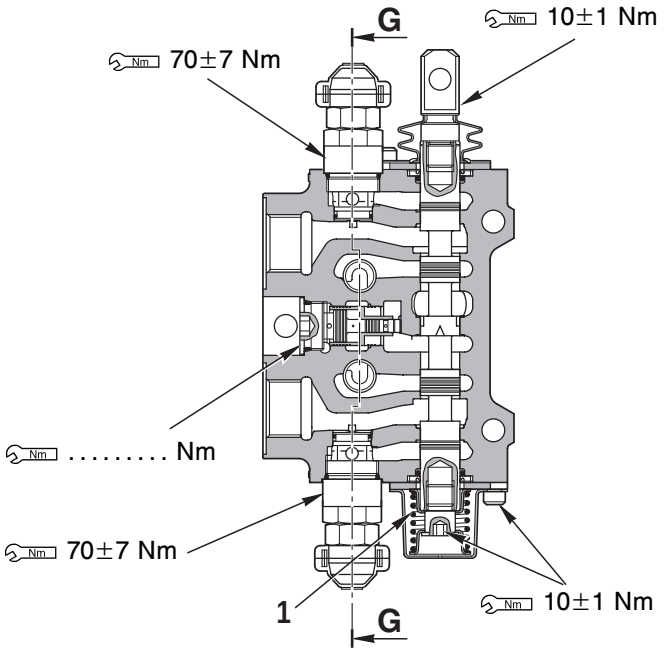
https://truckmanualshub.com/

6-SPOOL CONTROL VALVE





Section A - A



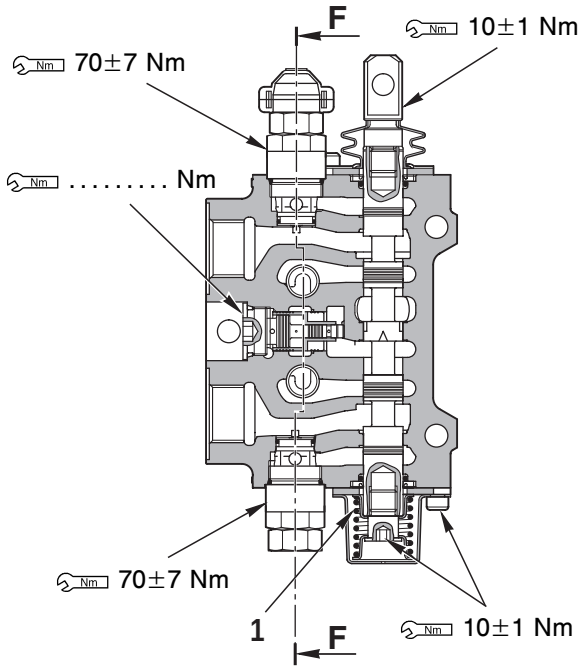
Section B - B

RKZ00231

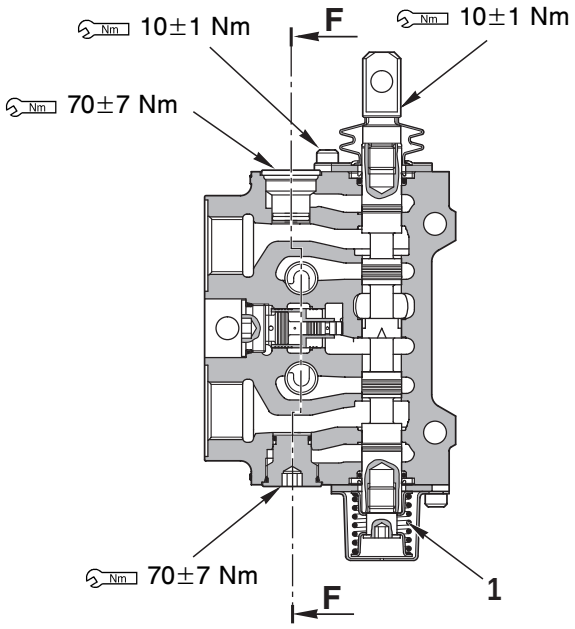
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	

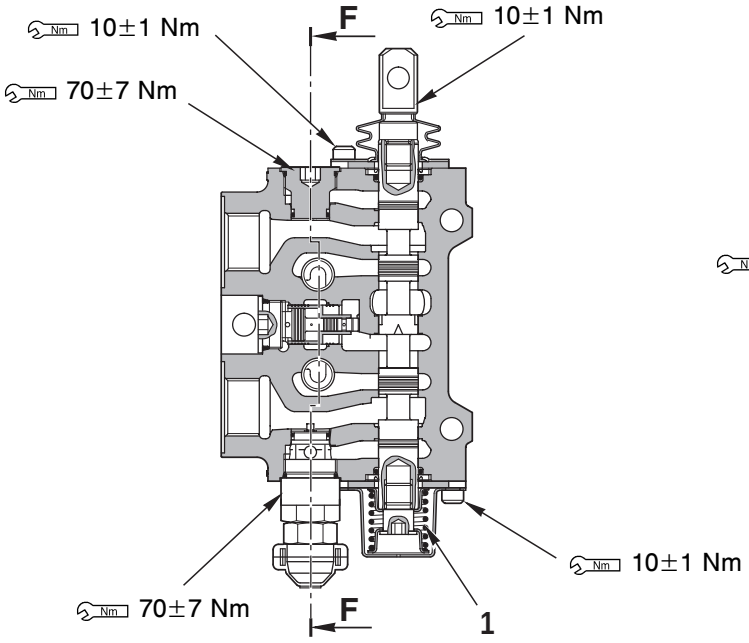
https://truckmanualshub.com/



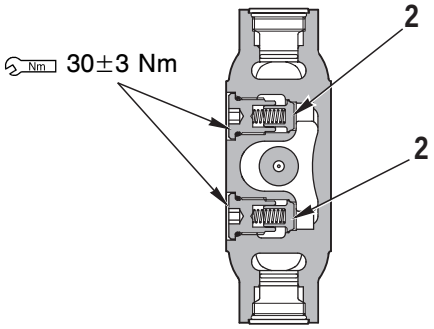
Section C-C



Section D-D



Section E-E



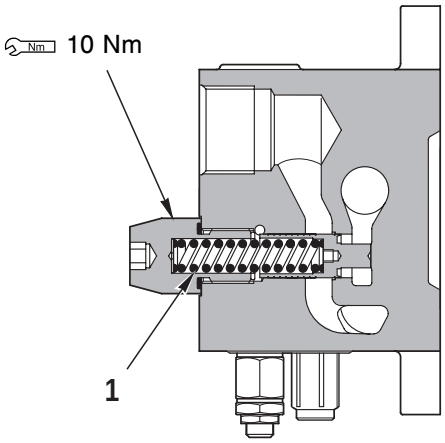
Section F-F

RKZ01310

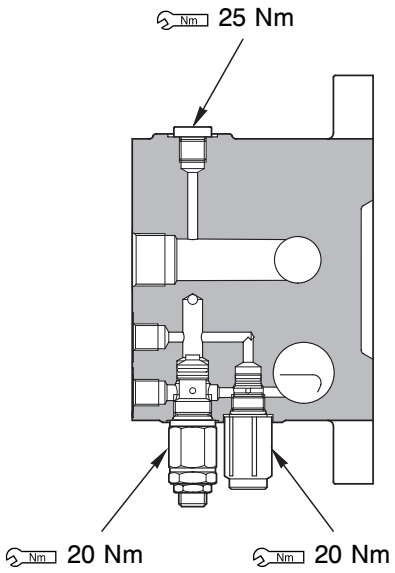
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	
2	Check valve spring						

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Section G - G



RKZ00791

Section H - H

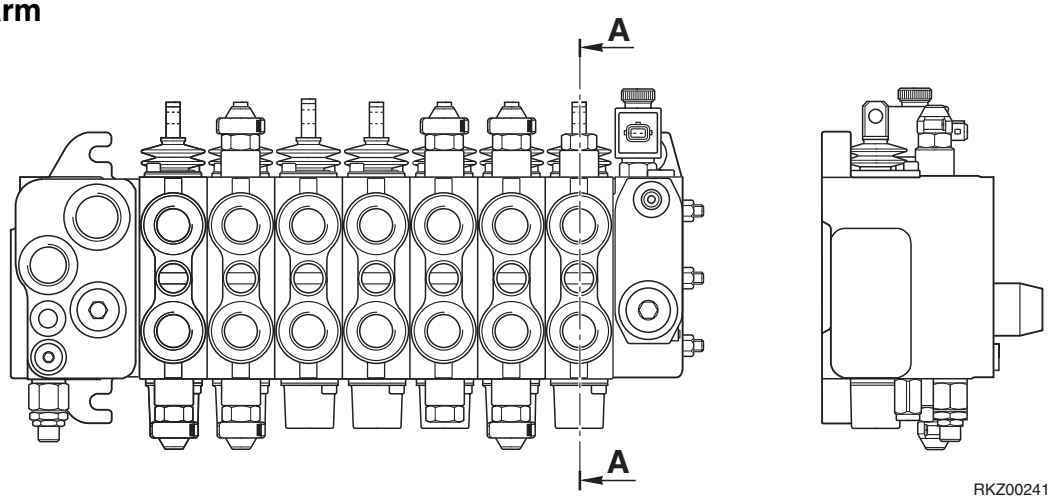
Unit: mm

N°	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Unloading valve spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	

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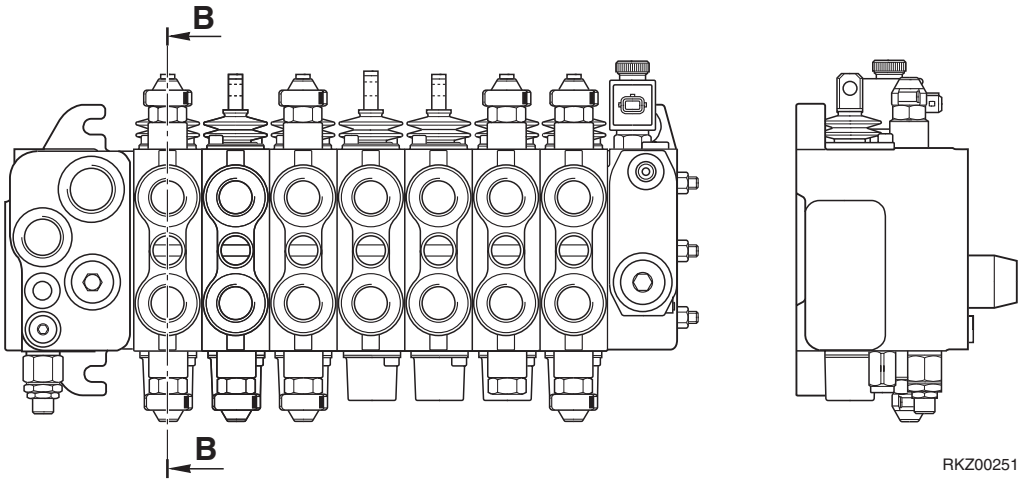
7-SPOOL CONTROL VALVE

For jig arm



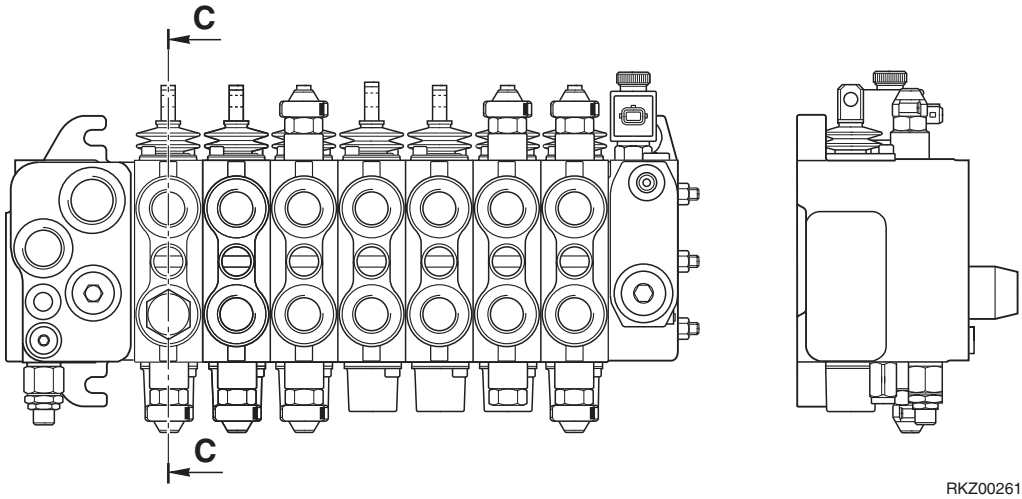
RKZ00241

For side digging boom



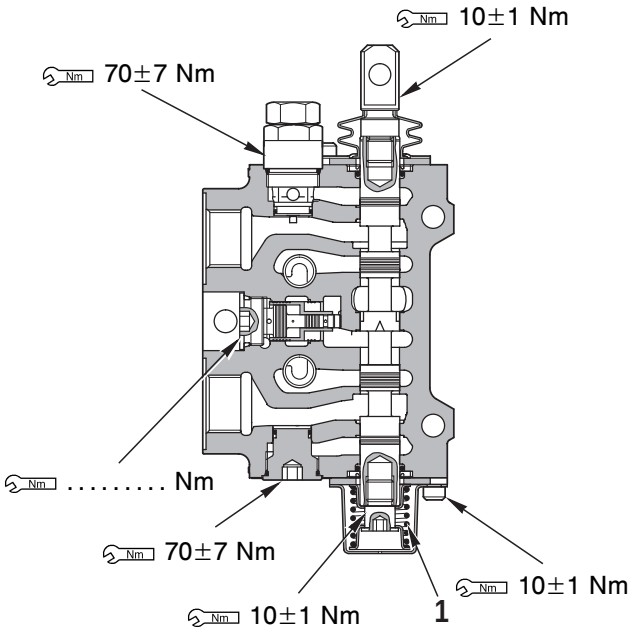
RKZ00251

For hammer

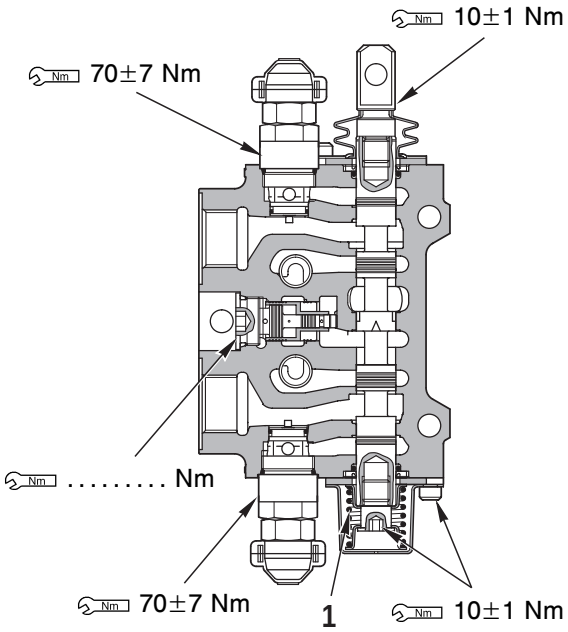


RKZ00261

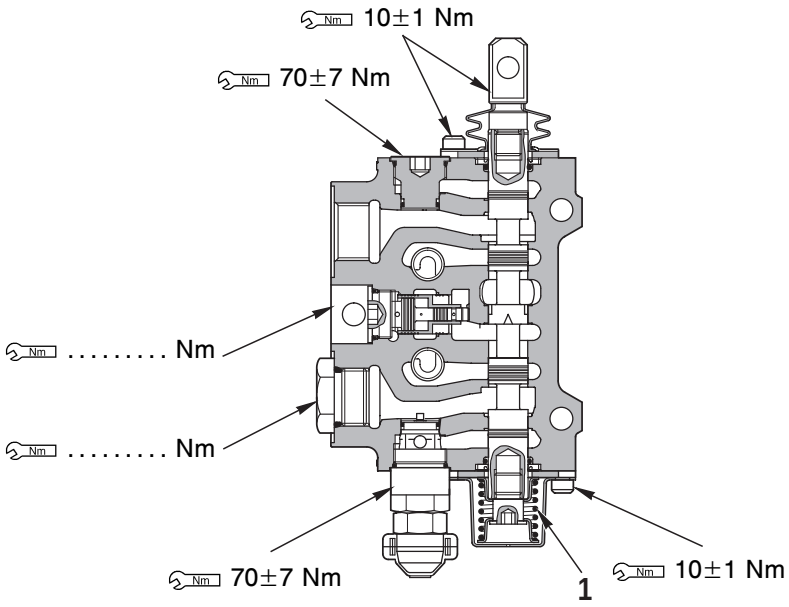
https://truckmanualshub.com/



Section A - A



Section B - B



Section C - C

RKZ00961

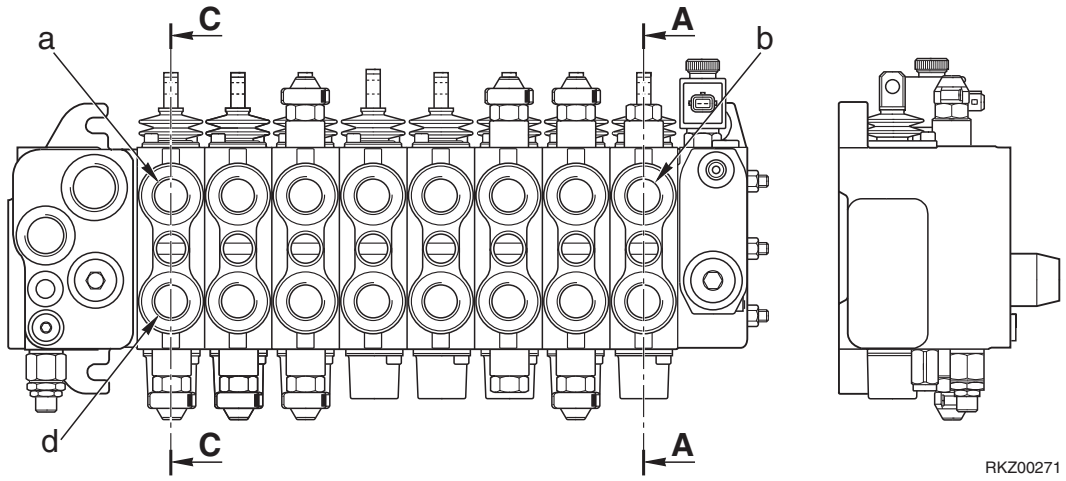
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	

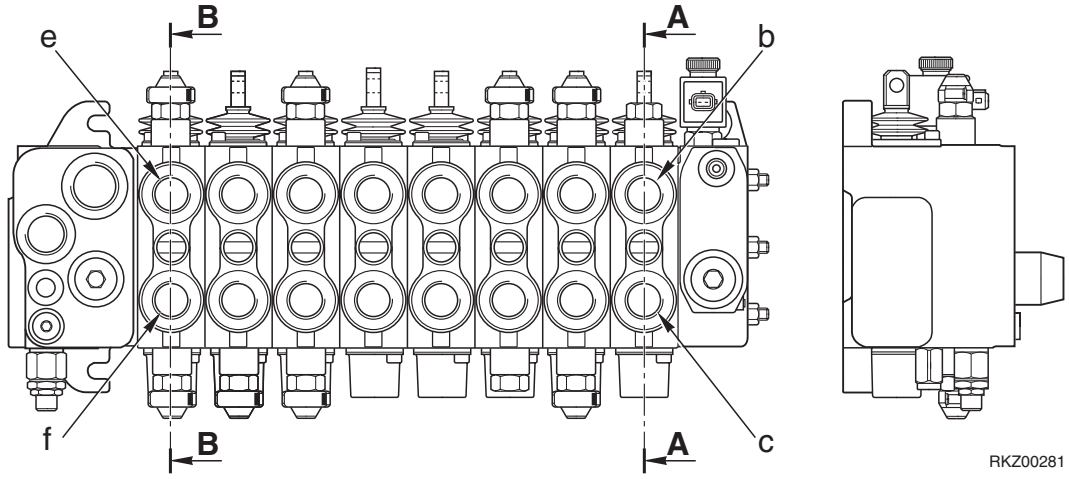
https://truckmanualshub.com/

8-SPOOL CONTROL VALVE

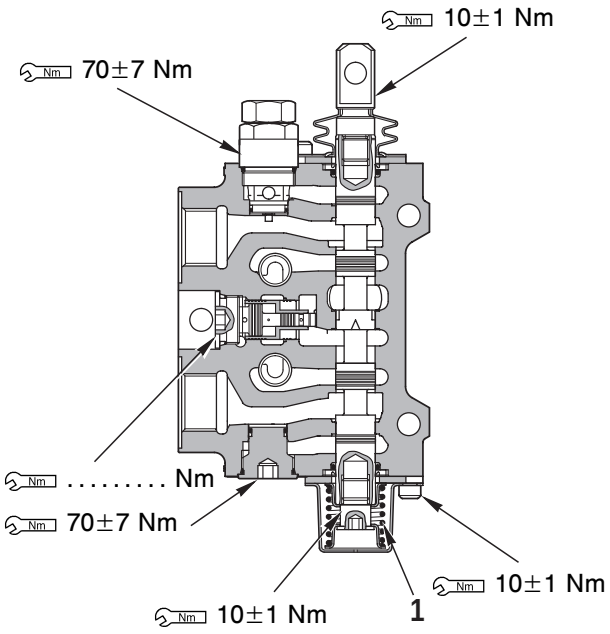
For hammer and jig arm



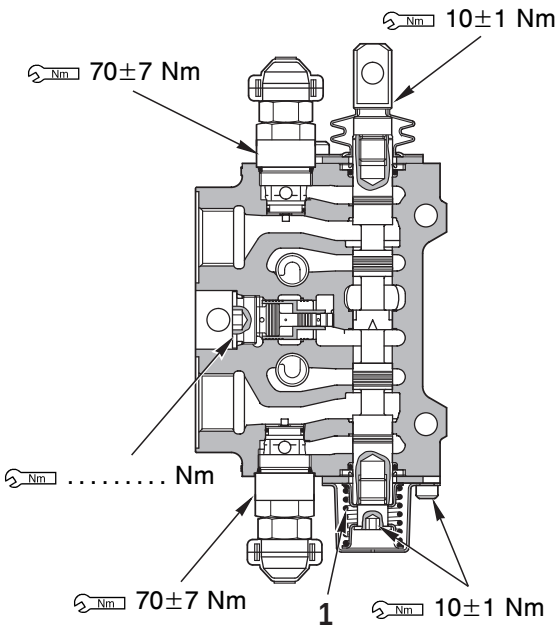
For side digging boom and jig arm



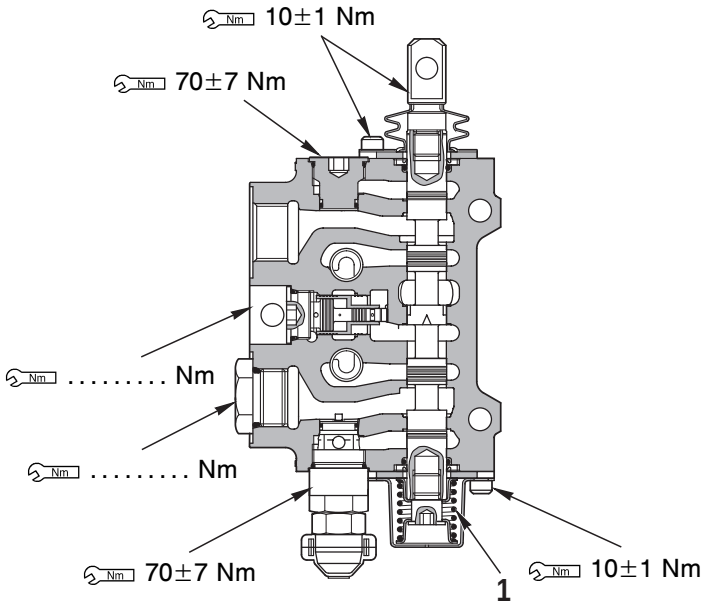
https://truckmanualshub.com/



Section A - A



Section B - B



Section C - C

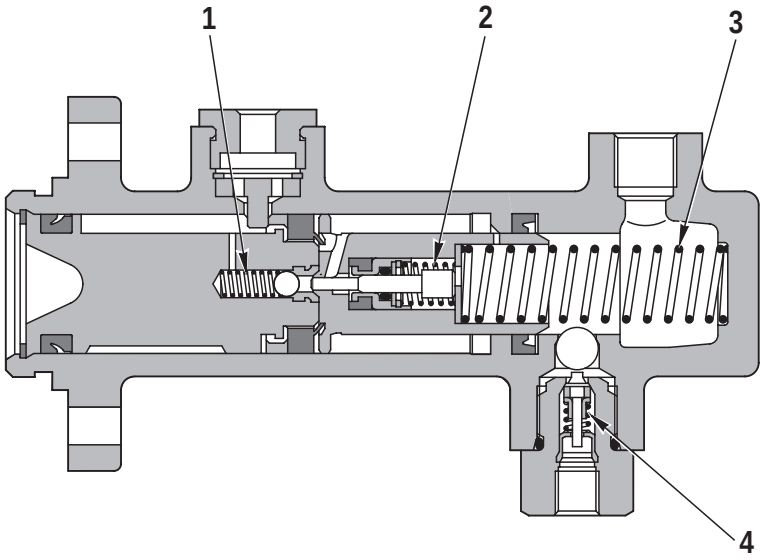
RKZ00961

Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Spool return spring	Free installed x Øe	Installed length	Installed load	Free installed	Installed load	

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BRAKE PUMP



RKZ00931

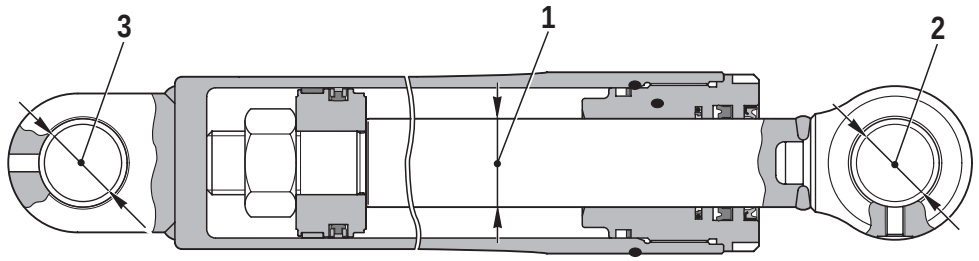
Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size			Repair limit		
1	Ball valve spring	Free installed	Installed length	Installed load	Free installed	Tolerance load	Replace if damaged or deformed
						±8 N	
2	Spring						
3	Pump spring						
4	Spring						

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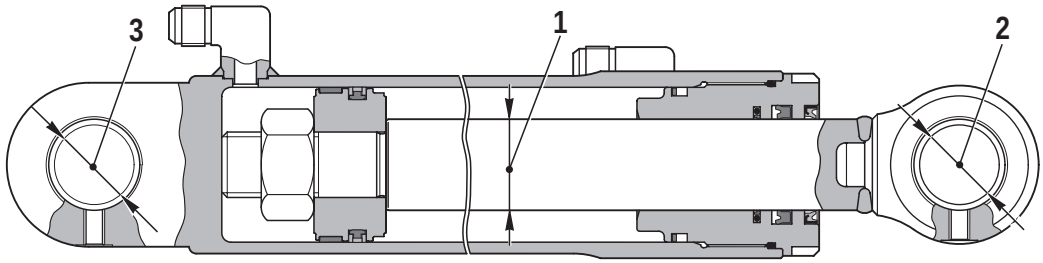
SHOVEL CYLINDER

DUMP CYLINDER



RKZ00780

RAISE CYLINDER



RKZ00770

Unit: mm

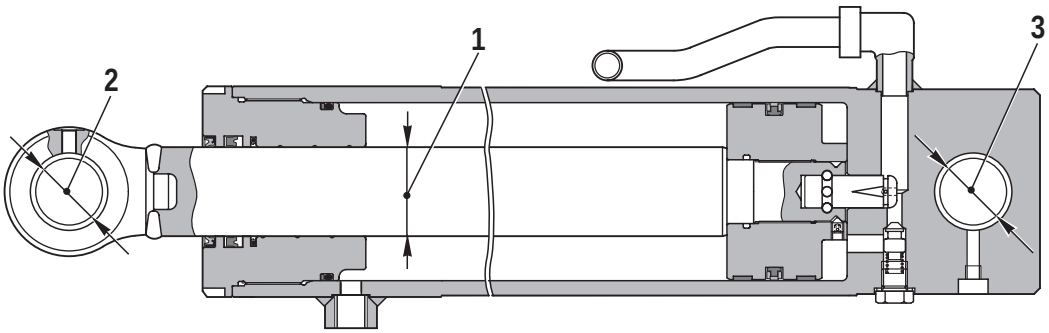
Nº	Check item	Criteria						Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Tolerance between piston rod and cylinder head	Raise	50					
		Dump	50					
2	Tolerance between bushing and piston rod mounting pin	Raise	45					
		Dump	45					
3	Tolerance between bushing and cylinder mounting pin	Raise	50					
		Dump	50					

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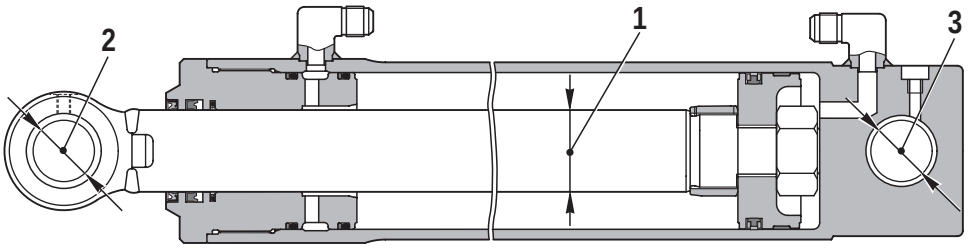
BACKHOE CYLINDER

BOOM



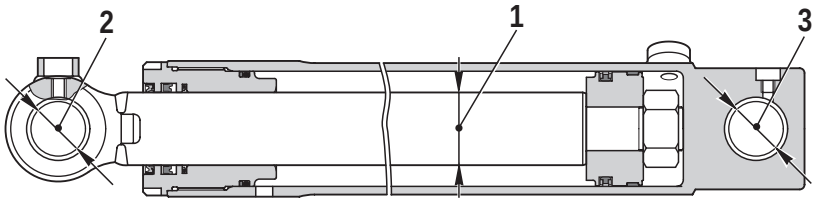
RKZ00750

ARM



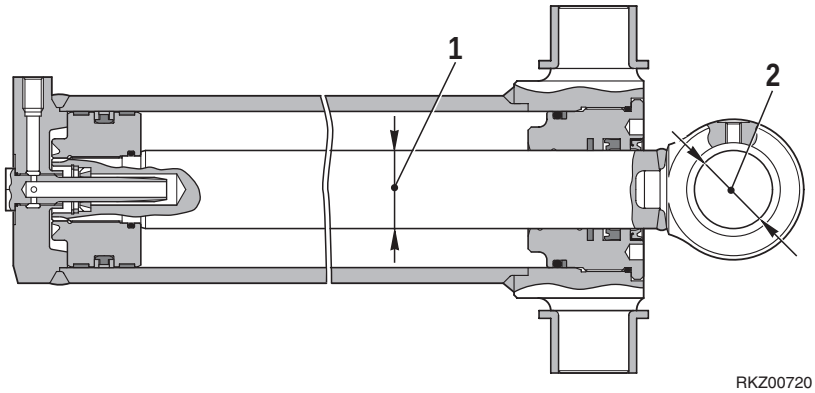
RKZ00740

BUCKET



RKZ00730

BOOM SWING



RKZ00720

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Validity from S/N 97F20001 to 97F20171

Unit: mm

Nº	Check item	Criteria						Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston head and cylinder head	Boom	55					Replace
		Arm	60					
		Bucket	60					
		Boom swing	50					
2	Tolerance between bushing and piston head mounting pin	Boom	45					Replace pin and spring
		Arm	45					
		Bucket	45					
		Boom swing	50					
3	Tolerance between bushing and cylinder mounting pin	Boom	45					
		Arm	45					
		Bucket	45					

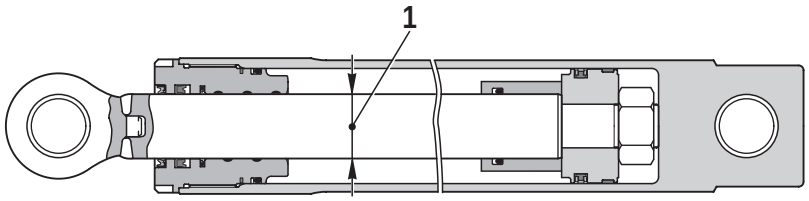
Validity from S/N 97F20272–

Unit: mm

Nº	Check item	Criteria						Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston head and cylinder head	Boom	60					Replace
		Arm	60					
		Bucket	60					
		Boom swing	50					
2	Tolerance between bushing and piston head mounting pin	Boom	45					Replace pin and spring
		Arm	45					
		Bucket	45					
		Boom swing	50					
3	Tolerance between bushing and cylinder mounting pin	Boom	45					
		Arm	45					
		Bucket	45					

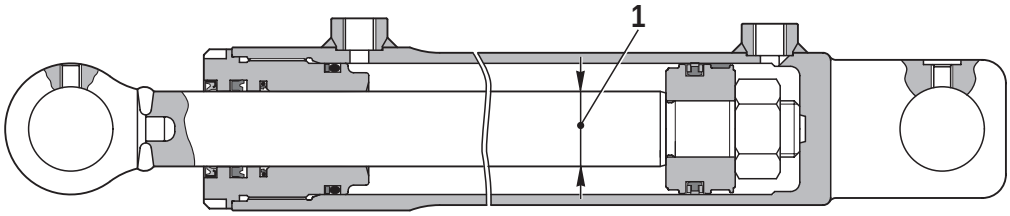
https://truckmanualshub.com/

OUTRIGGER



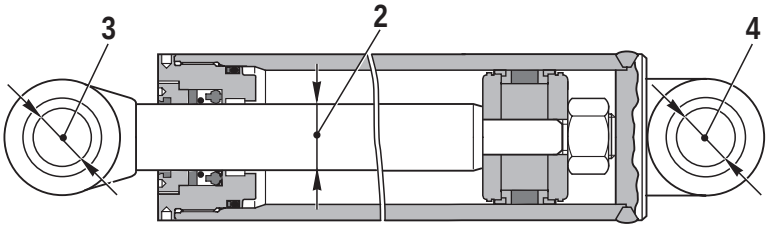
RKZ00710

JIG ARM



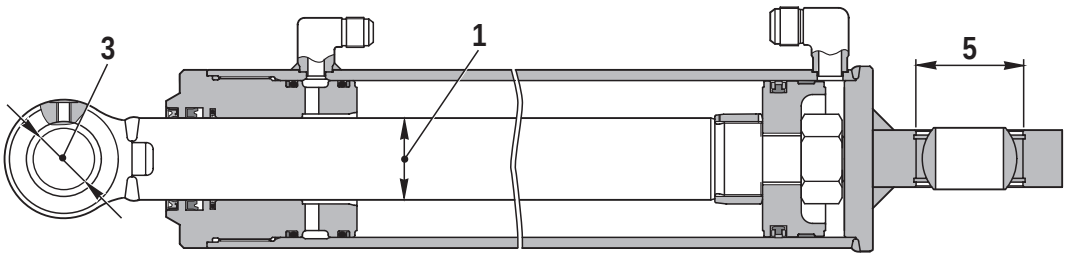
RKZ00700

SIDE DIGGING BOOM



RKZ00680

ARM (for side digging boom)



RKZ00670

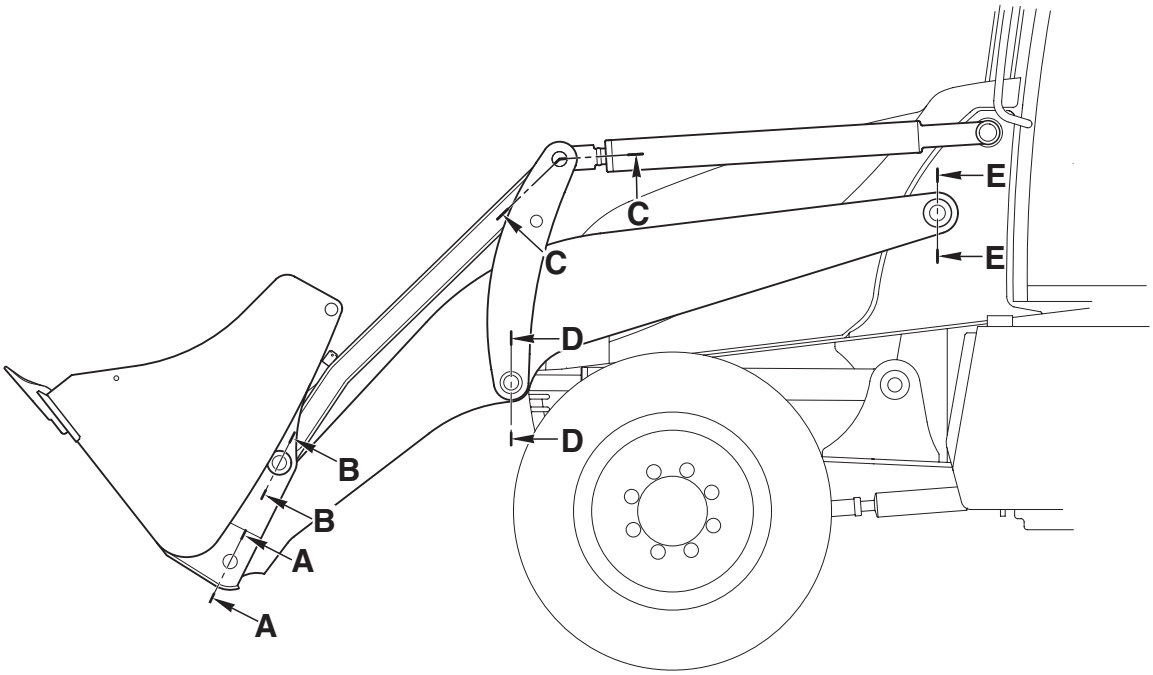
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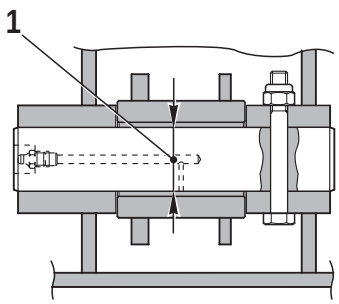
Unit: mm

Nº	Check item	Criteria						Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	Clearance limit	
				Shaft	Hole			
1	Clearance between piston rod and cylinder head	Outrigger	40					Replace
		Arm for side digging boom	60					
		Jig arm	40					
2	Clearance between piston rod and bushing	Side digging boom	45					
3	Tolerance between bushing and piston rod mounting pin	Side digging boom	40					
		Arm for side digging boom	45					
4	Tolerance between bushing and cylinder mounting pin	Side digging boom	40					
5	Clearance between bearing and bearing seat	Arm for side digging boom	75					

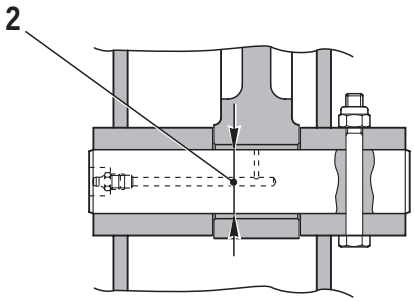
https://truckmanualshub.com/

FRONT WORKING EQUIPMENT

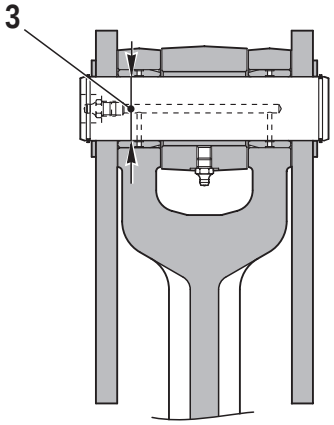




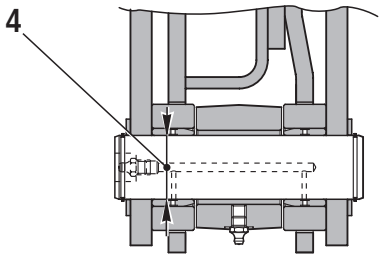
Section A - A



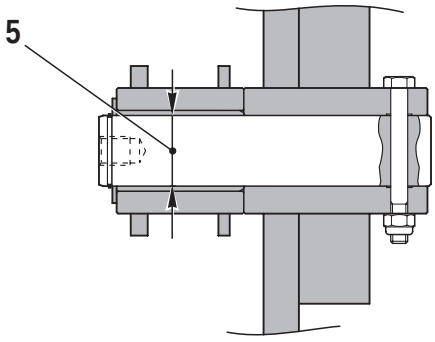
Section B - B



Section C - C



Section D - D



Section E - E

RKZ02270

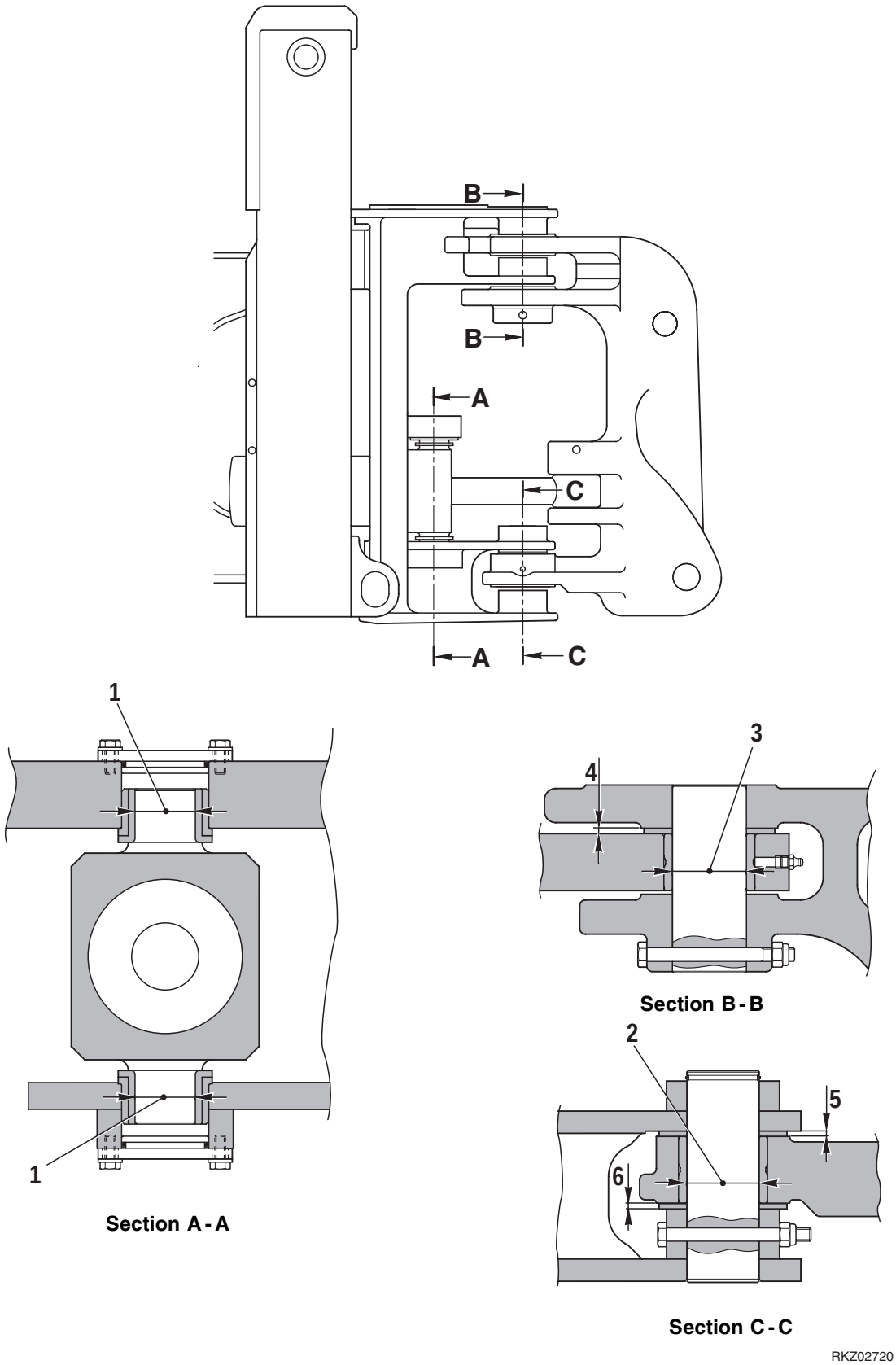
https://truckmanualshub.com/

Unit: mm

N°	Check item	Criteria					Remedy
1	Clearance between bushing and bucket mounting pin	Standard size	Tolerance		Standard clearance	Clearance limit	Replace
			Shaft	Hole			
		45	–0.050 –0.089	+0.080 +0.240	0.130 – 0.329		
2	Clearance between bushing and link mounting pin	45	–0.050 –0.089	+0.080 +0.240	0.130 – 0.329		
3	Clearance between bushing and tilt lever mounting pin	45	–0.050 –0.089	+0.080 +0.119	0.130 – 0.208		
4	Clearance between bushing and link mounting pin	45	–0.050 –0.089	+0.080 +0.119	0.130 – 0.208		
5	Clearance between bushing and boom mounting pin	50	–0.038 –0.093	+0.080 +0.240	0.118 – 0.323		

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SWING BRACKET



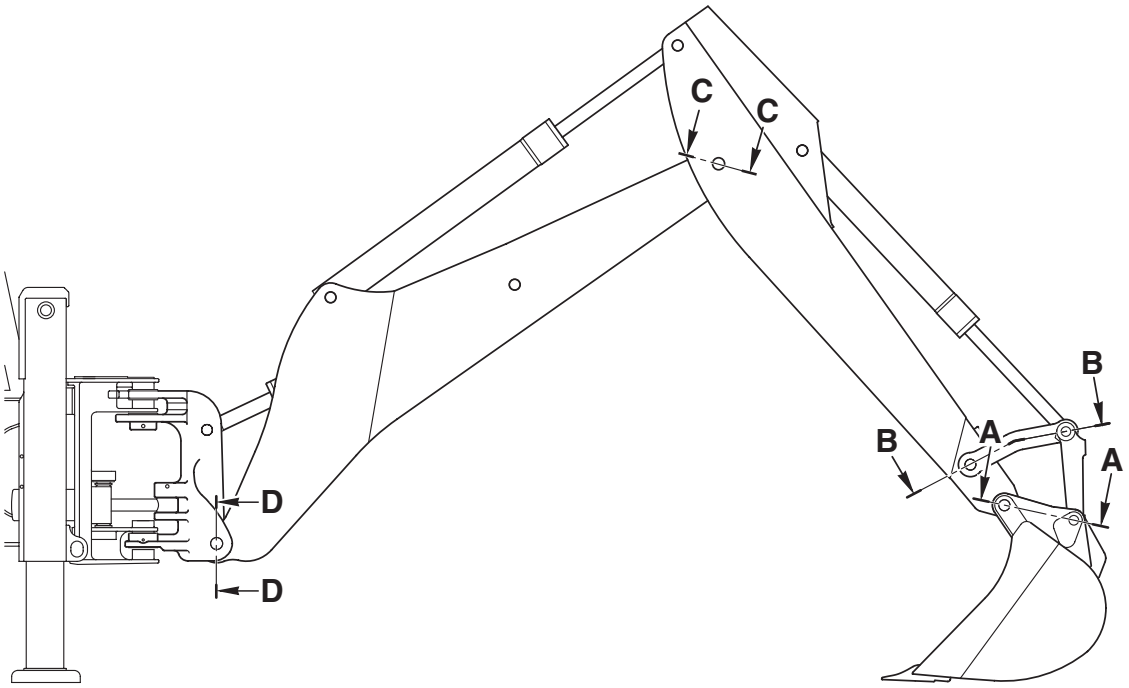
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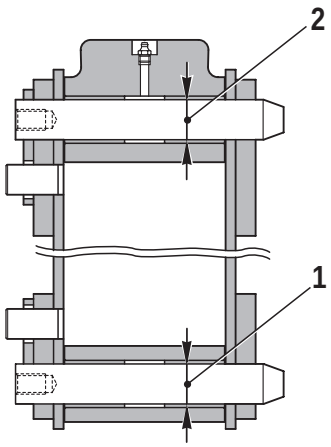
Unit: mm

N°	Check item	Criteria					Remedy
1	Clearance between rotating bushing and boom swing cylinder bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing and pin
			Shaft	Hole			
		55	− 0.060 − 0.106	+ 0.090 + 0.060	0.120 – 0.196		
2	Clearance between bushing and (lower) swing bracket rotating pin	65	− 0.060 − 0.106	+ 0.190 + 0.264	0.250 – 0.370		
3	Clearance between bushing and (upper) swing bracket rotating pin	65	− 0.060 − 0.106	+ 0.190 + 0.264	0.250 – 0.370		
4	Clearance between bushing and mounting pin	Standard size		Limit size			
		$4.75^{0}_{-0.1}$					
5	Central shim thickness	$4.75^{0}_{-0.1}$					
6	Lower shim thickness	$4.75^{0}_{-0.1}$					

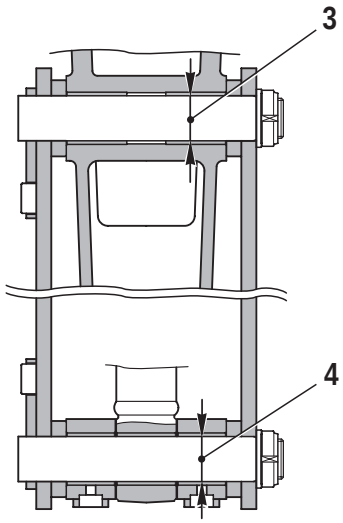
https://truckmanualshub.com/

BACKHOE WORKING EQUIPMENT

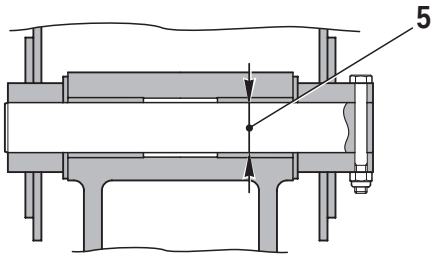




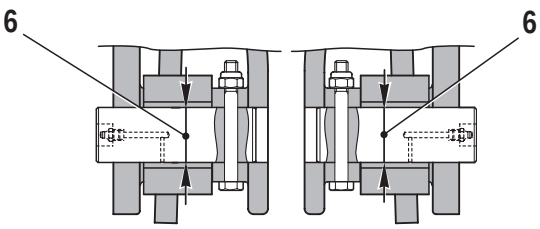
Section A - A



Section B - B



Section C - C



Section D - D

RKZ02900

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Unit: mm

Nº	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between link bushings and bucket mounting pin	40	– 0.050 – 0.089	– 0.080 – 0.240	0.130 – 0.329		Replace spring and pin
2	Clearance between arm bushings and bucket mounting pin	40	– 0.050 – 0.089	– 0.080 – 0.240	0.130 – 0.329		
3	Clearance between arm bushings and lever mounting pin	45	– 0.050 – 0.089	– 0.080 – 0.240	0.130 – 0.329		
4	Clearance between bushings and tilt lever mounting pin	45	– 0.050 – 0.089	– 0.080 – 0.240	0.130 – 0.329		
5	Clearance between bushings and arm mounting pin	50	– 0.050 – 0.089	– 0.080 – 0.119	0.130 – 0.208		
6	Clearance between bushings and boom mounting pin	50	– 0.038 – 0.083	– 0.080 – 0.119	0.118 – 0.202		

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