

SECTION 8 DISASSEMBLY AND ASSEMBLY

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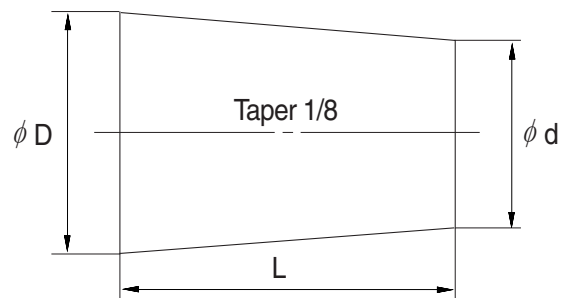
SECTION 8 DISASSEMBLY AND ASSEMBLY

GROUP 1 PRECAUTIONS

1. REMOVAL WORK

- 1) Lower the work equipment completely to the ground.
If the coolant contains antifreeze, dispose of it correctly.
- 2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- 3) When draining oil, prepare a container of adequate size to catch the oil.
- 4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- 5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
- 6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- 7) Check the number and thickness of the shims, and keep in a safe place.
- 8) When raising components, be sure to use lifting equipment of ample strength.
- 9) When using forcing screws to remove any components, tighten the forcing screws alternately.
- 10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
- 11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
- 12) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



2. INSTALL WORK

- 1) Tighten all bolts and nuts (sleeve nuts) to the specified torque.
- 2) Install the hoses without twisting or interference.
- 3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- 4) Bend the cotter pin or lock plate securely.
- 5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.
- 6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- 7) Clean all parts, and correct any damage, dents, burrs, or rust.
- 8) Coat rotating parts and sliding parts with engine oil.
- 9) When press fitting parts, coat the surface with antifriction compound (LM-P).
- 10) After installing snap rings, check that the snap ring is fitted securely in the ring groove (check that the snap ring moves in the direction of rotation).
- 11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- 12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.
- 13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.
- 14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:
 - (1) Start the engine and run at low idling.
 - (2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100mm before the end of the stroke.
 - (3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (The air bleed valve is actuated to bleed the air.)
 - (4) After completing this operation, raise the engine speed to the normal operating condition.
 - ※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to the work equipment.
 - ※ Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

3. COMPLETING WORK

- 1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
- 2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- 3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
- 4) Add the specified amount of grease (molybdenum disulphied grease) to the work equipment related parts.

GROUP 2 TIGHTENING TORQUE

1. MAJOR COMPONENTS

No.	Descriptions	Bolt size	Torque		
			kgf · m	lbf · ft	
1	Engine	Engine mounting bolt (bracket-frame, FR)	M16 × 2.0	29.7±3.0	215±32.5
2		Engine mounting bolt (bracket-frame, RR)	M16 × 2.0	29.7±3.0	215±32.5
3		Engine mounting bolt (engine-bracket)	M12 × 1.75	11.5±1.0	83.2±7.2
4		Radiator mounting bolt, nut	M16 × 2.0	29.7±4.5	215±32.5
5		Fuel tank mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
6		Coupling mounting socket bolt	M16 × 2.0	22.0±1.0	159±7.2
7	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.5±0.7	47.0±5.1
8		Main pump mounting socket bolt	M20 × 2.5	57.9±8.7	419±62.9
9		Main control valve mounting bolt	M12 × 1.75	12.2±1.3	88.2±9.4
10		Travel motor mounting socket bolt	M16 × 2.0	29.6±3.2	214±23.1
11		Hydraulic oil tank mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
12		Turning joint mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
13	Power train system	Swing motor mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
14		Swing bearing upper mounting bolt	M20 × 2.5	57.9±6.0	419±43.4
15		Swing bearing lower mounting bolt	M20 × 2.5	57.9±6.0	419±43.4
16		Real axle mounting bolt, nut	M20 × 2.5	58.0±6.3	420±45.6
17		Transmission bracket mounting bolt	M20 × 2.5	58.0±6.3	420±45.6
18		Transmission mounting bolt	M20 × 2.5	39.0±4.2	282±30.4
19		Oscillating cylinder mounting bolt	M22 × 1.5	83.2±9.2	602±66.5
20		Oscillating cylinder support mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
21		Wheel nut	M22 × 1.5	60±5.0	434±36.2
22		Front drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
23		Rear drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
24		Fan & brake pump mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1
25	Others	Counterweight mounting bolt	M36 × 3.0	308±46	2228±333
26		Cab mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
27		Operator's seat mounting bolt	M 8 × 1.25	4.05±0.8	29.3±5.8
28		Under cover mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7

※ For tightening torque of engine and hydraulic components, see engine maintenance guide and service manual.

2. TORQUE CHART

The torques given are standard figures. Any figures specifically described in this manual has priority.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 6 × 1.0	0.9 ~ 1.3	6.5 ~ 9.4	1.1 ~ 1.7	8.0 ~ 12.3
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60.0
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130.2
1"	41	21	151.9
1-1/4"	50	35	253.2

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130.2
1-7/16-12	41	21	151.9
1-11/16-12	50	35	253.2

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130.2
1"	41	21	151.9
1-1/4"	50	35	253.2

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- (4) Loosen the drain plug under the hydraulic tank.

· Hydraulic tank quantity : 103 ℓ
(27.2 U.S. gal)

- (5) Remove socket bolts (13) and disconnect hoses (1, 2).

- (6) Disconnect pilot line hoses (5, 6, 7, 8, 9).

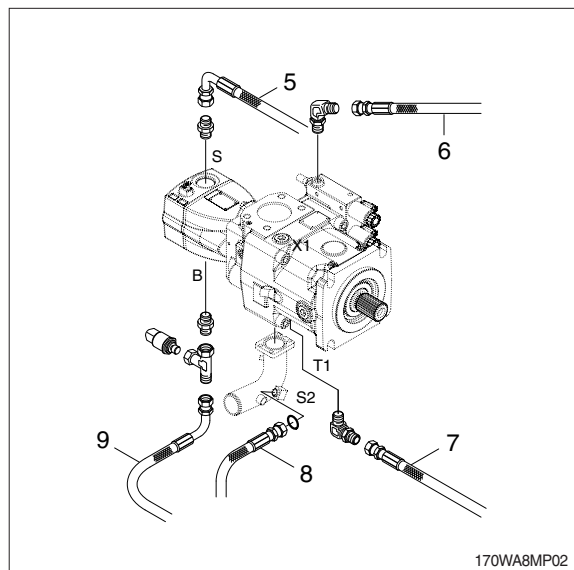
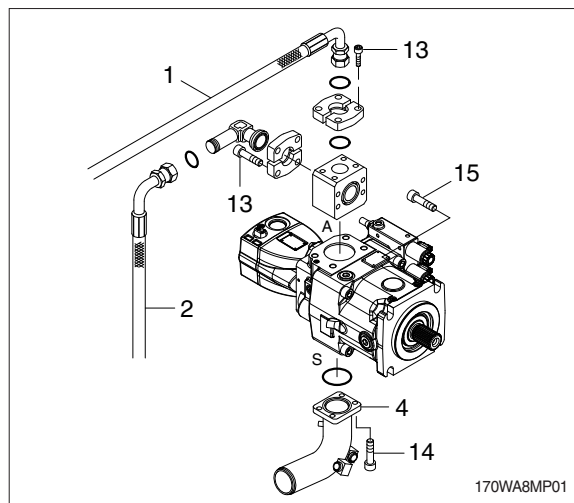
- (7) Remove socket bolts (14) and disconnect pump suction pipe (4).

※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (8) Sling the pump assembly and remove the pump mounting bolts (15).

· Weight : 91 kg (200 lb)
· Tightening torque : 57.9 ± 8.7 kgf·m
(419 ± 62.9 lbf·ft)

※ Pull out the pump assembly from housing.
When removing the pump assembly, check that all the hoses have been disconnected.

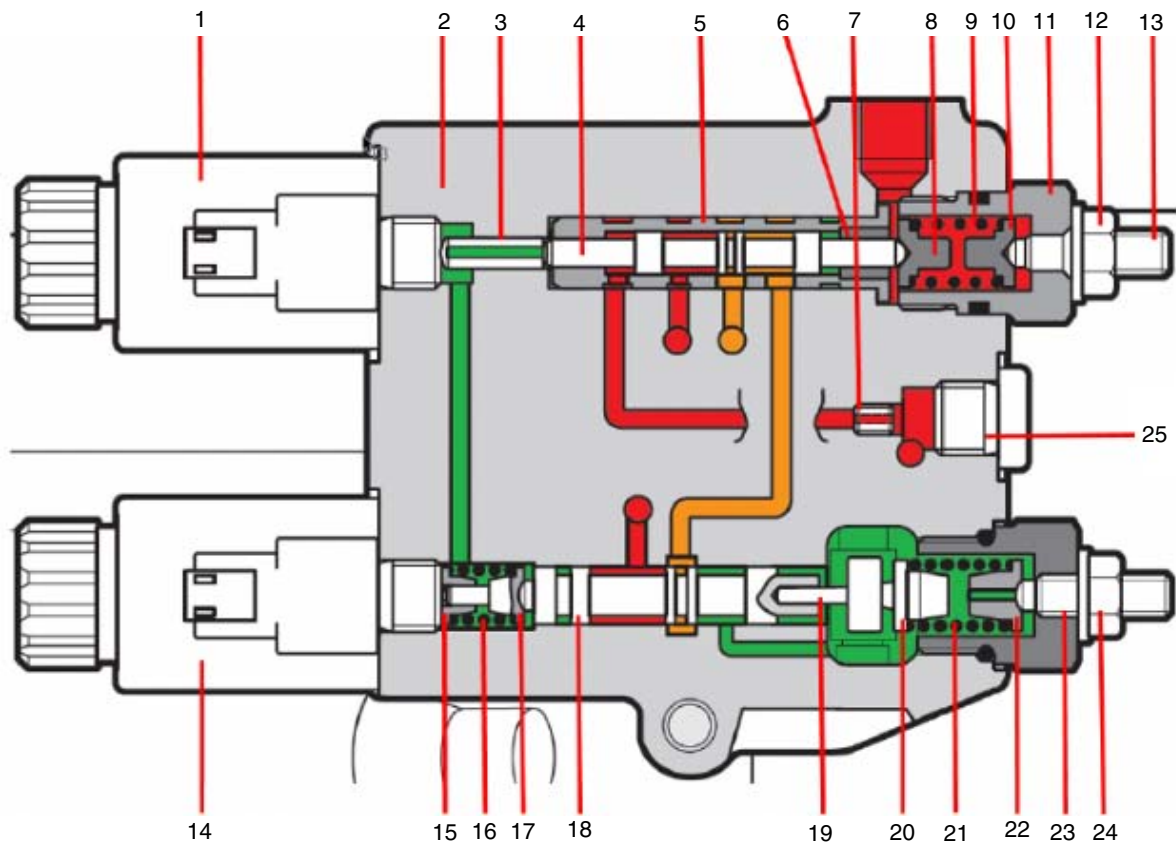


2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Remove the suction strainer and clean it.
- (3) Replace return filter with new one.
- (4) Remove breather and clean it.
- (5) After adding oil to the hydraulic tank to the specified level.
- (6) Bleed the air from the hydraulic pump.
 - ① Remove the air vent plug (2EA).
 - ② Tighten plug lightly.
 - ③ Start the engine, run at low idling, and check oil come out from plug.
 - ④ Tighten plug.
- (7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.
- (8) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. MAIN PUMP

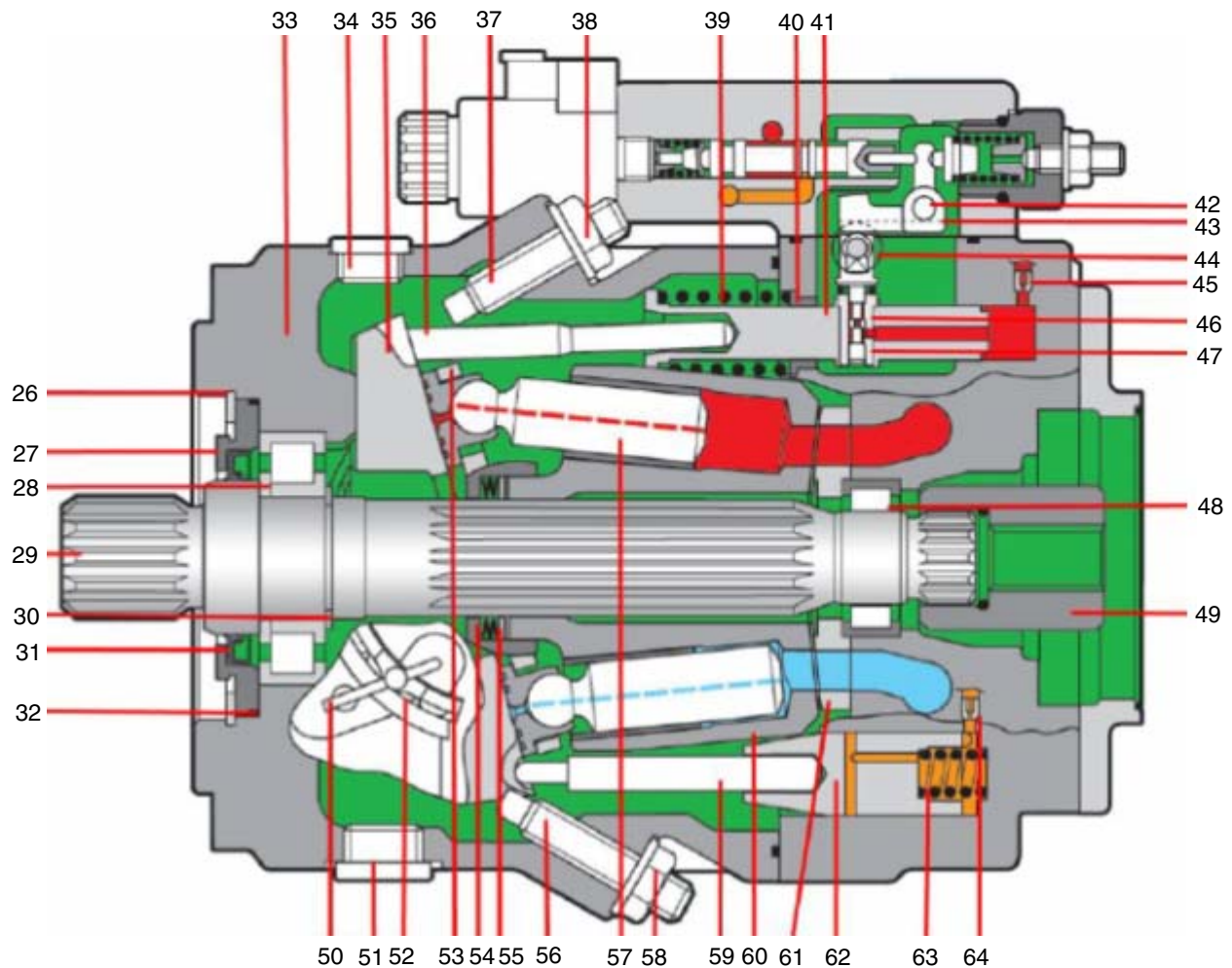
1) STRUCTURE (1/2)



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1	Prop. solenoid	10	Spring cup	19	Bolt
2	Control housing	11	Screw plug	20	Spring bolt
3	Pin	12	Sealing nut	21	Spring cup
4	Control piston LS	13	Set screw	22	Set screw
5	Control bushing LS	14	Prop. solenoid	23	Sealing nut
6	Bushing	15	Spring cup	24	Seal screw
7	Orifice	16	Spring	25	Screw plug
8	Spring cup	17	Spring cup		
9	Spring LS	18	Control piston LR		

STRUCTURE (2/2)



140WA2MP05

26	Snap ring	39	Spring	52	Cage pair
27	Locking ring	40	Bushing	53	Retaining plate
28	Cylindrical roller bearing	41	Adjusting bushing small	54	Retaining ball
29	Drive shaft	42	Bolt	55	Cup spring stack
30	Snap ring	43	Angle lever	56	Adjusting screw
31	Shaft seal ring	44	Measuring roll	57	Piston pad
32	O-ring	45	Orifice	58	Sealing nut
33	Housing	46	Measuring bushing	59	Adjusting rod big
34	Screw plug	47	Measuring piston	60	Cylinder
35	Cradle	48	Cylindrical roller bearing	61	Control plate
36	Adjusting rod small	49	Coupling hub	62	Adjusting bushing big
37	Adjusting screw	50	Wire	63	Spring
38	Sealing nut	51	Screw plug	64	Orifice

2) GENERAL PRECAUTIONS

(1) Disassembly

- ① Before disassembling the main pump, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.
- ② To disassemble the main pump, use the disassembling procedures described in section 2) and select a clean place.
- ③ Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the main pump to be serviced.
- ④ During disassembly, give a match mark to the mating surfaces of each part.
- ⑤ Arrange removed parts in order so that they will not become damaged or missing during disassembly.
- ⑥ Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

(2) Assembly

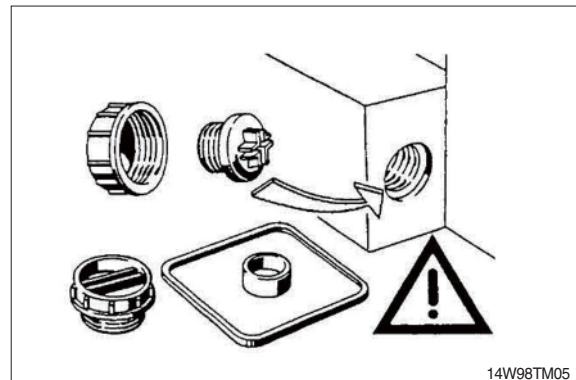
- ① Reassemble in a work area that is clean and free from dust and grit.
- ② Handle parts with bare hands to keep them free of lint contaminants.
- ③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.
- ④ Do not reuse O-ring and seal ring that were removed in disassembly.
Provide the new parts.
- ⑤ Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
- ⑥ When reassembling oil motor components of main pump, be sure to coat the sliding parts of the main pump and valve with fresh hydraulic oil. (NAS class 9 or above)
- ⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified.

3) GENERAL REPAIR INSTRUCTIONS

Observe the following notices when carrying out repair work at hydraulic aggregates.

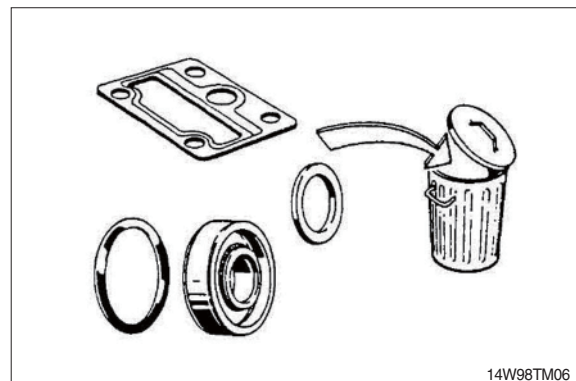


(1) Close all ports of the hydraulic aggregates.



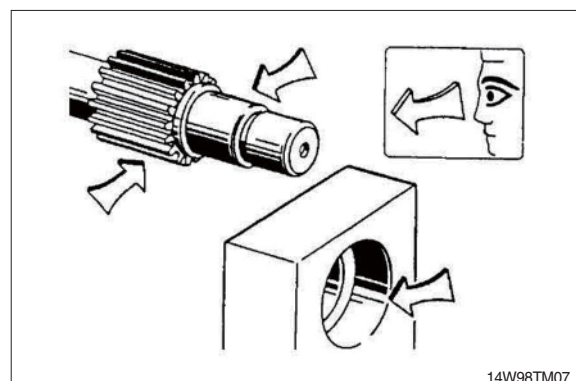
(2) Replace all seals.

Use only Hyundai original spare parts.

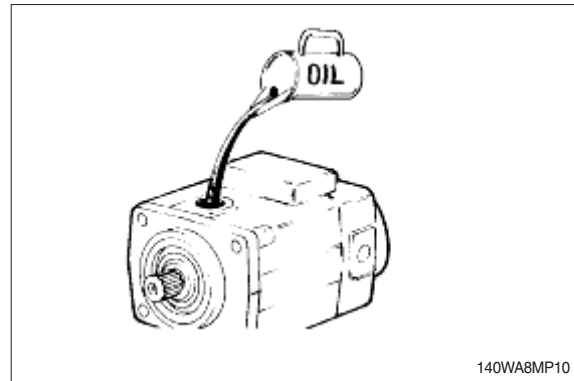


(3) Check all seal and sliding surfaces for wear.

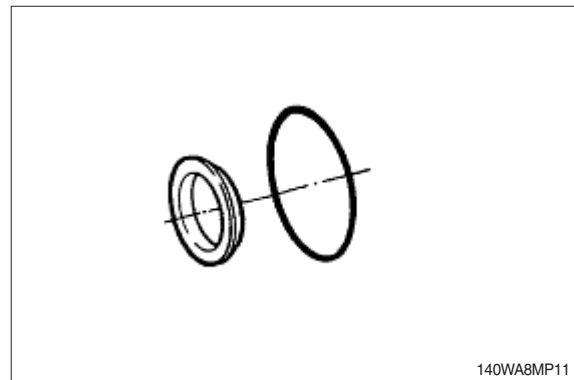
※ Rework of sealing area f.ex. with abrasive paper can damage surface.



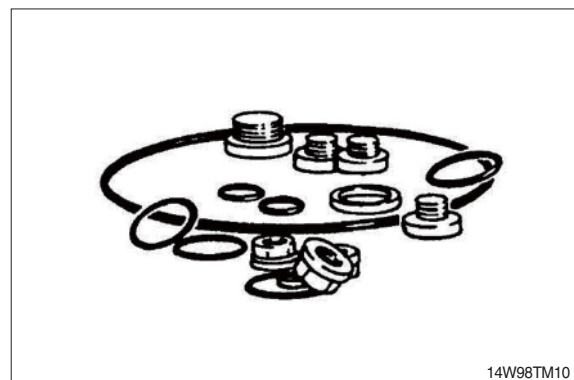
- (4) Fill up hydraulic aggregates with hydraulic oil respectively deaerate before start up.



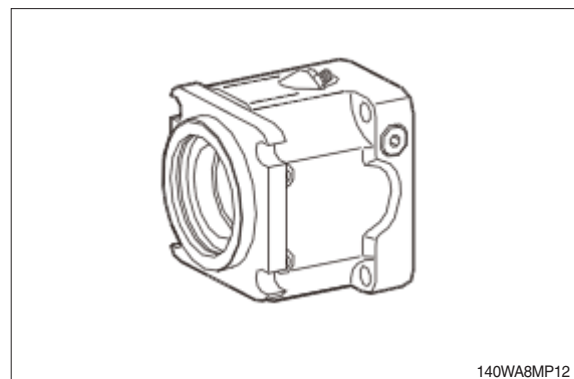
- (5) Seal kit for drive shaft



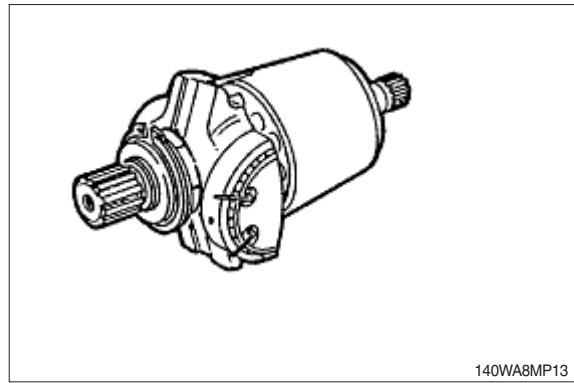
- (6) External seal kit.



- (7) Housing.



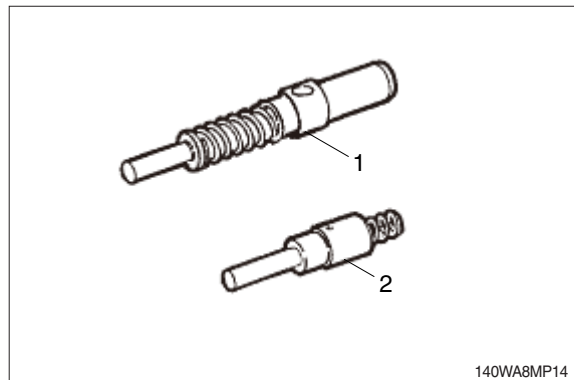
(8) Complete rotary group.



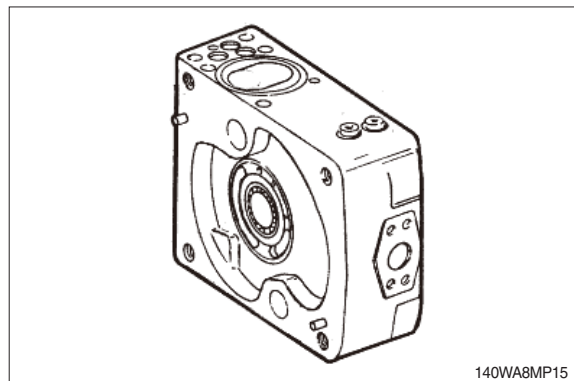
(9) Hydraulic control

1 Small size

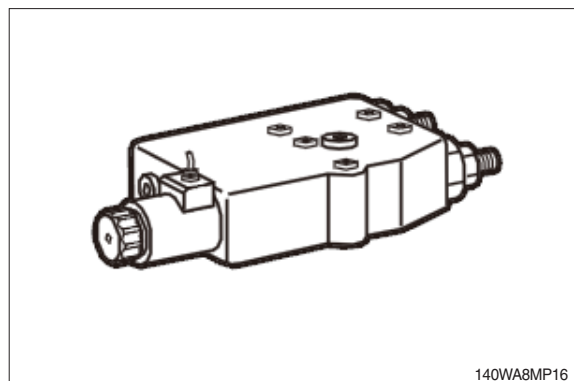
2 Big size



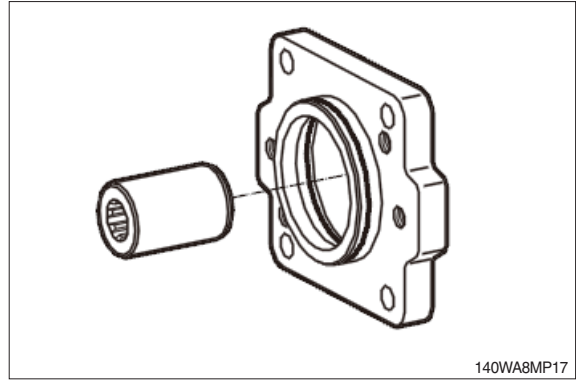
(10) Port plate



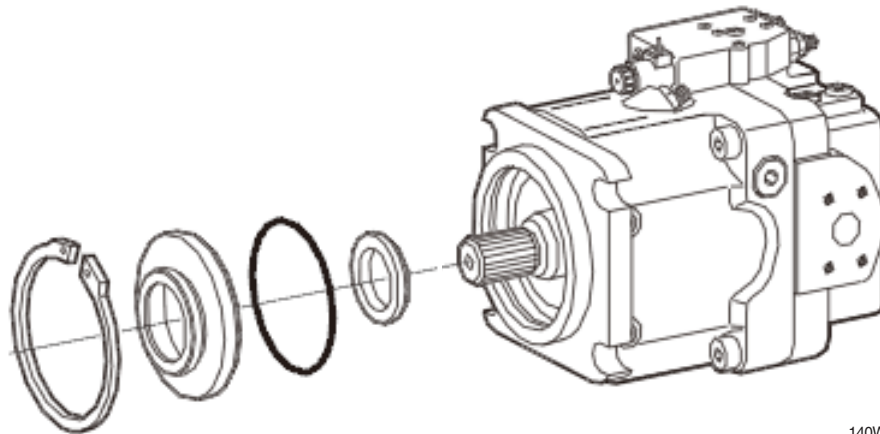
(11) Complete regulator



(12) Pump support plate

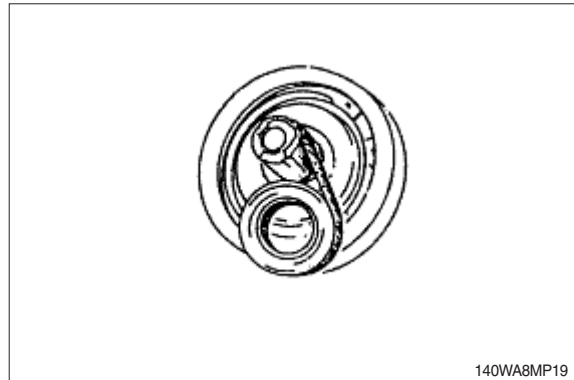


4) SEALING OF THE DRIVE SHAFT



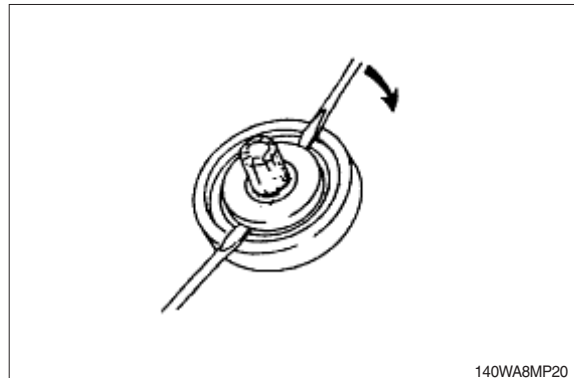
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(1) Protect the drive shaft.



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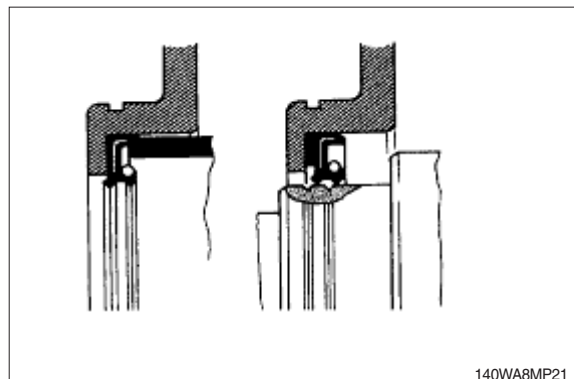
(2) Loosen retaining ring and remove it, press away front cover.



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(3) Press in the shaft seal ring to the correct position with a suitable sleeve.

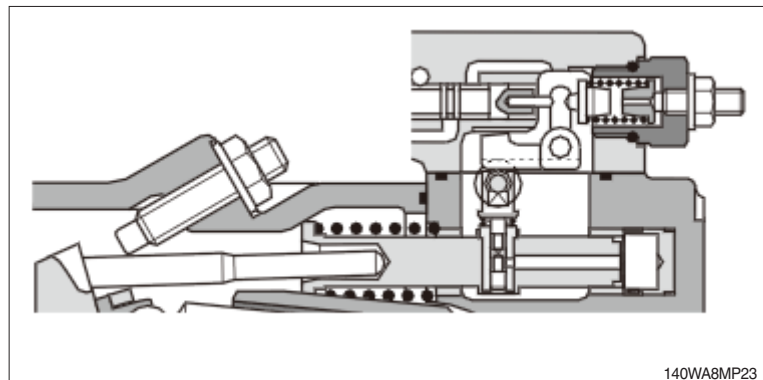
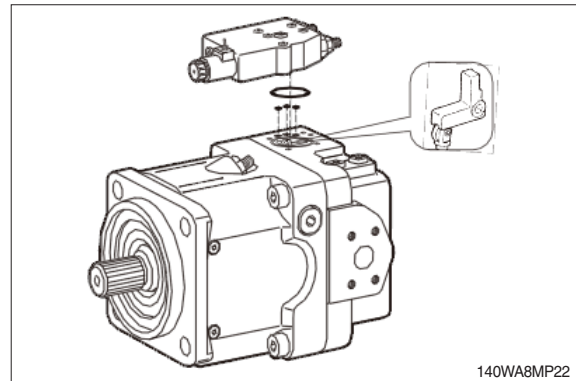
※ If the shaft is deeply grooved, insert shim behind seal.



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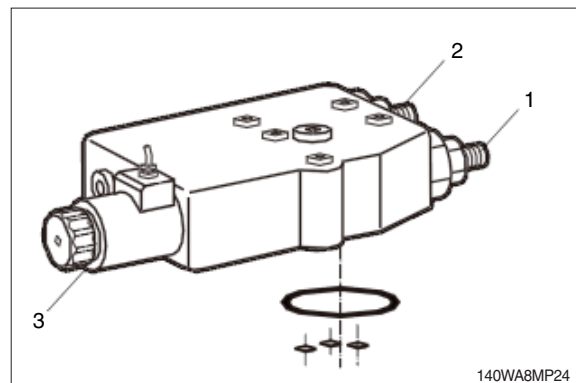
5) SEALING OF THE REGULATOR HOUSING

- (1) Remove screws and press off regulator, thereby make sure that sealing surface is not damaged.

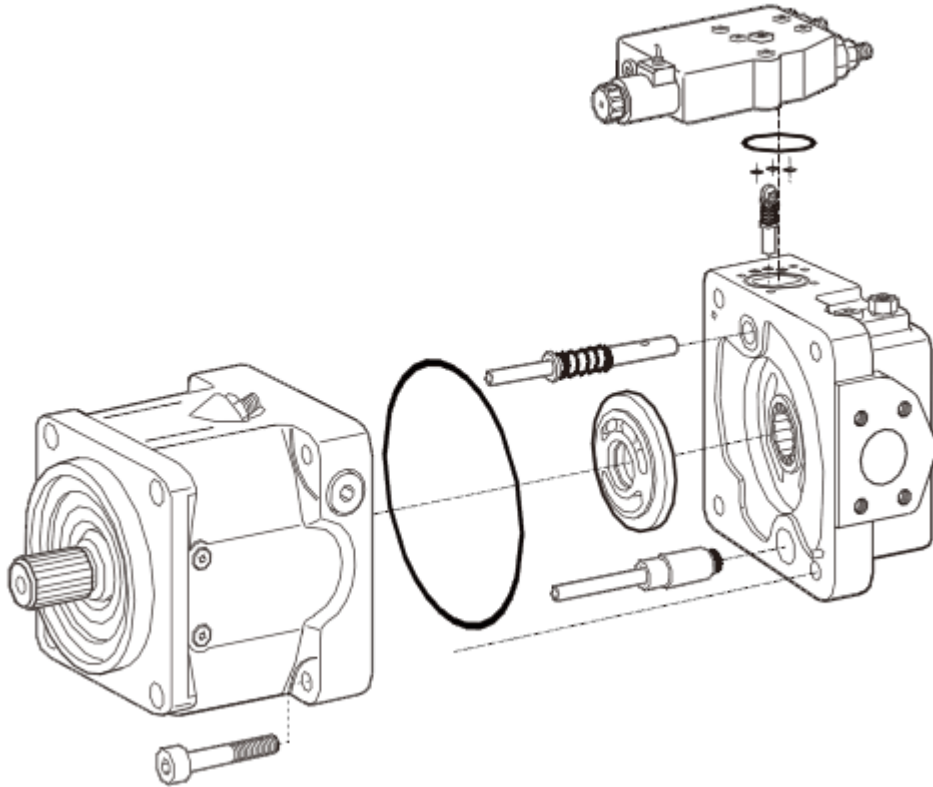


- 1 Power control
- 2 Load sensing control
- 3 Solenoid for power override

- ※ Do not change position of adjustment screws.
Remove complete set of threaded bush with adjustment screws.

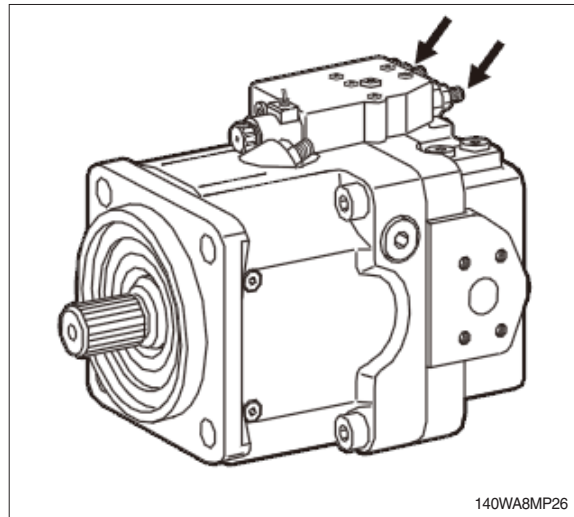


6) REMOVE PORT PLATE, REGULATOR

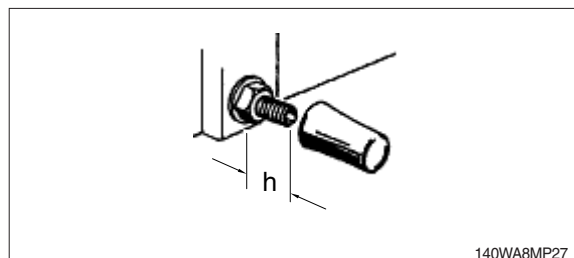


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- (1) Remove protection cover.
Measure and note adjustment height "h".

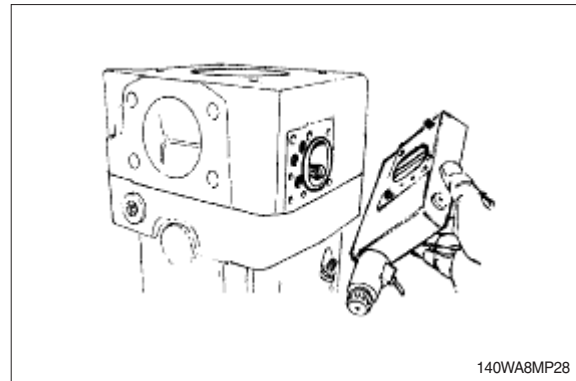


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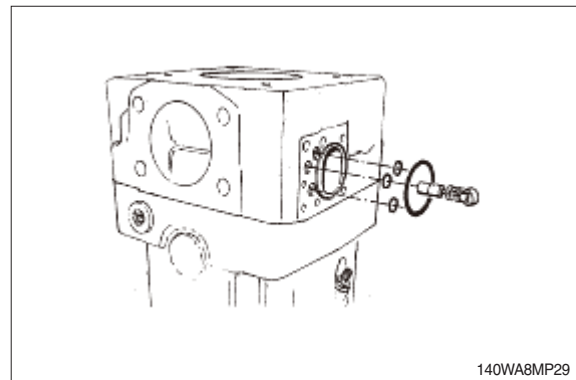


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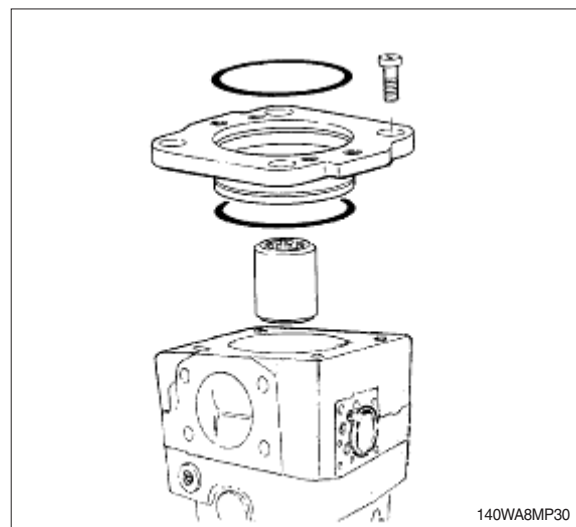
(2) Remove regulator housing.



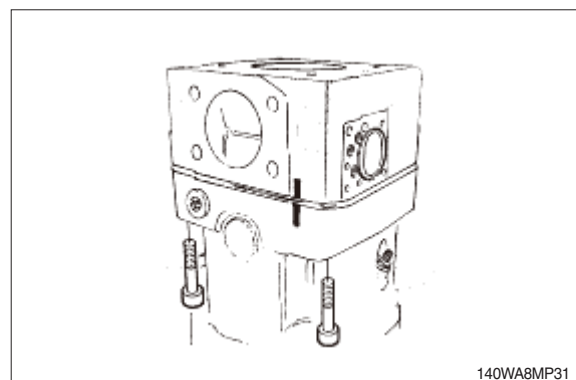
(3) Remove O-ring, measuring piston with bushing and spring.



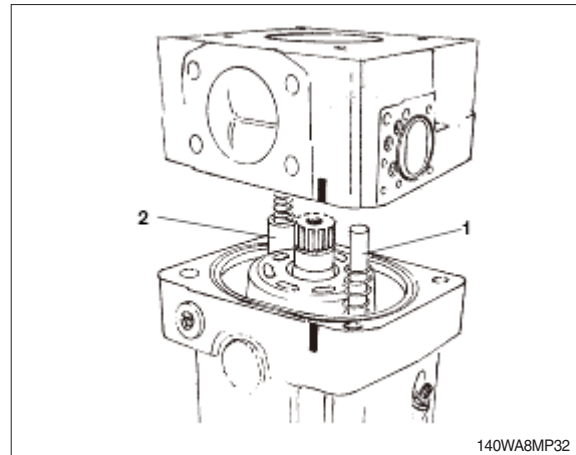
(4) Remove pump support plate.



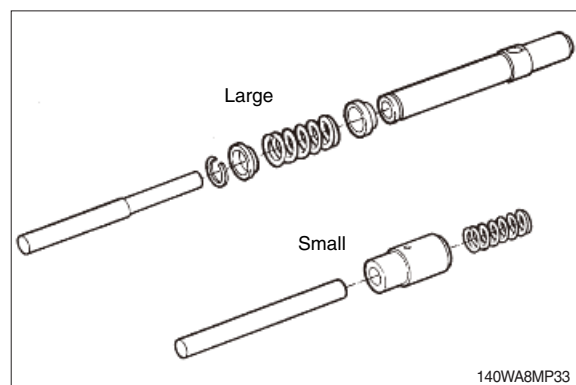
(5) Mark position of the connection plate.
Loosen connection plate fixation.



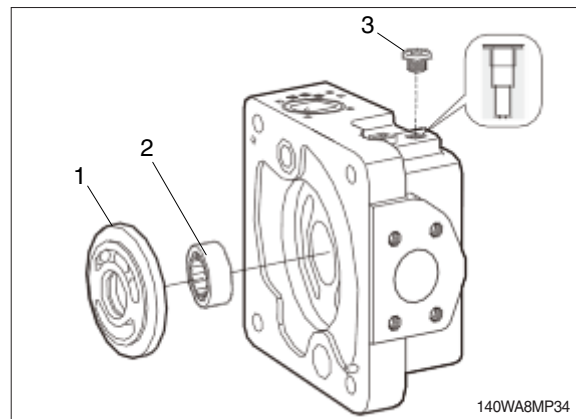
- (6) Remove port plate with control plate.
Disassemble regulator.



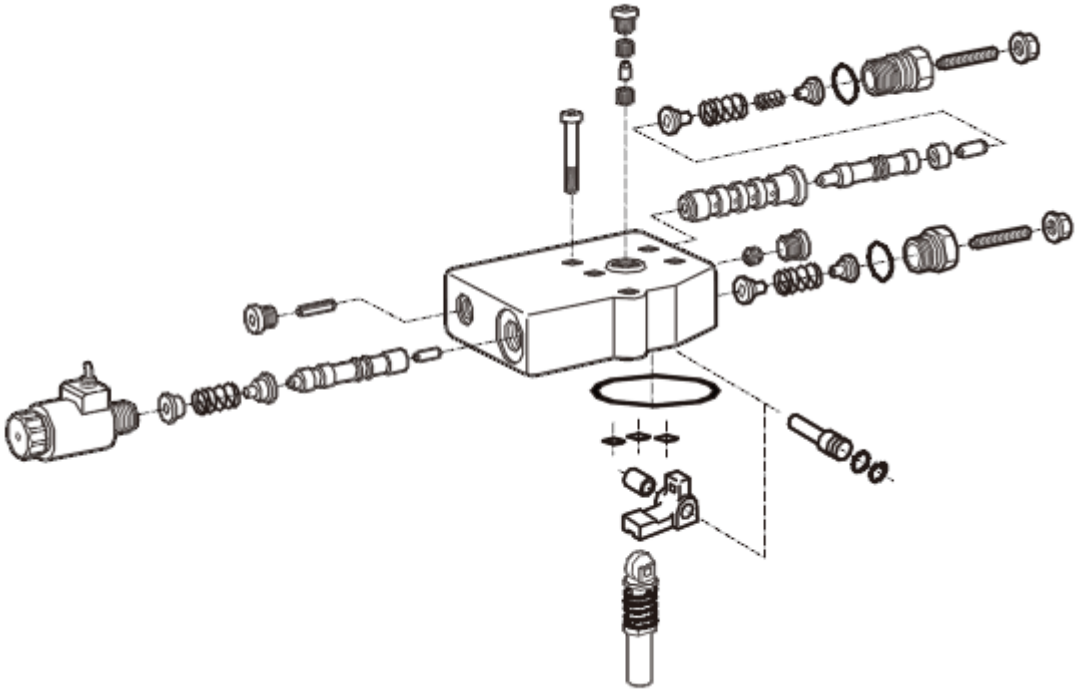
- 1 Hydraulic control - small
2 Hydraulic control - large



- 1 Control plate
2 Cylinder roller bearing
3 Port "G"

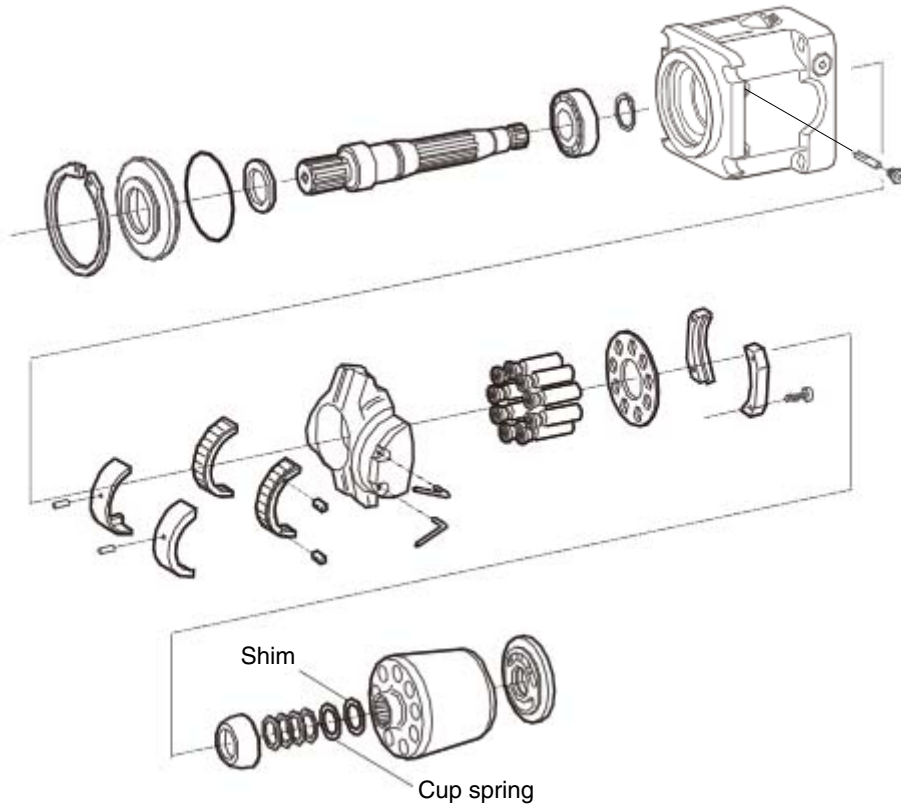


7) REMOVE REGULATOR



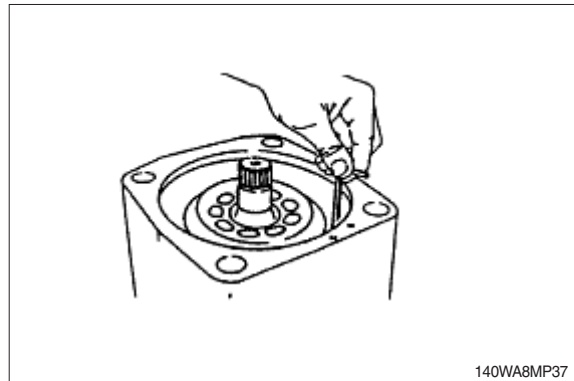
140WA8MP35

8) REMOVE ROTARY GROUP



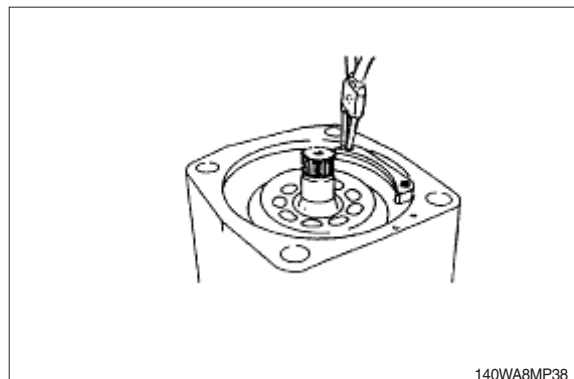
140WA8MP36

(1) Loosen fixing of the retaining segments.



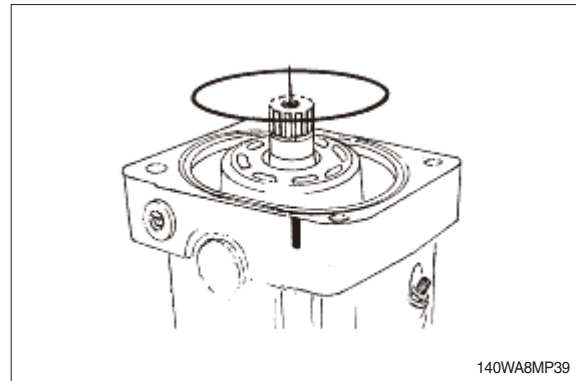
140WA8MP37

(2) Remove retaining segments with screws.

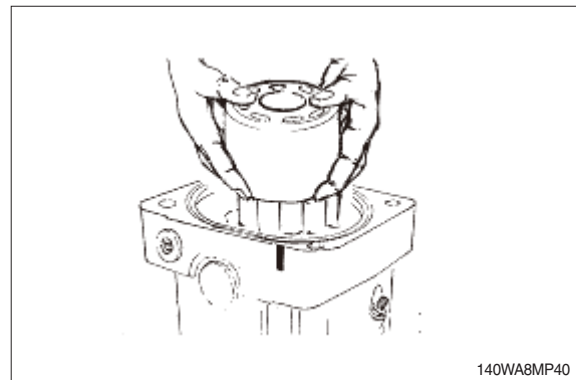


140WA8MP38

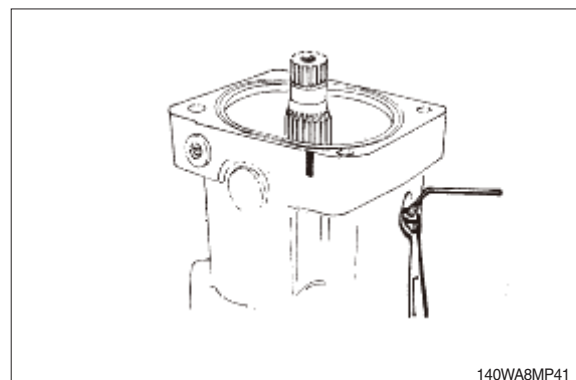
(3) Remove O-ring.



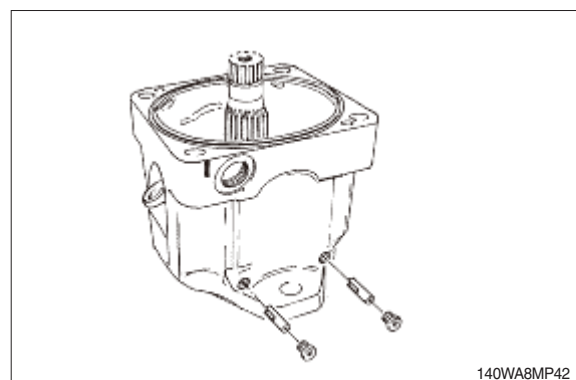
(4) Remove cylinder with pistons.



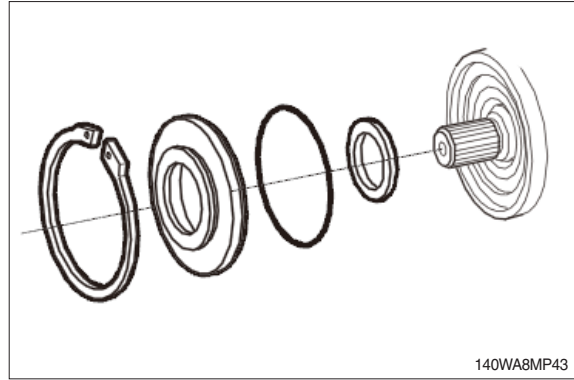
(5) Remove Q-min and Q-max screws after noting down adjustment dimension.



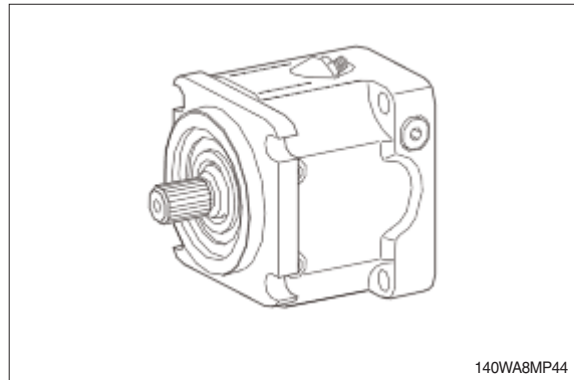
(6) Remove joint pin for swivel cradle.



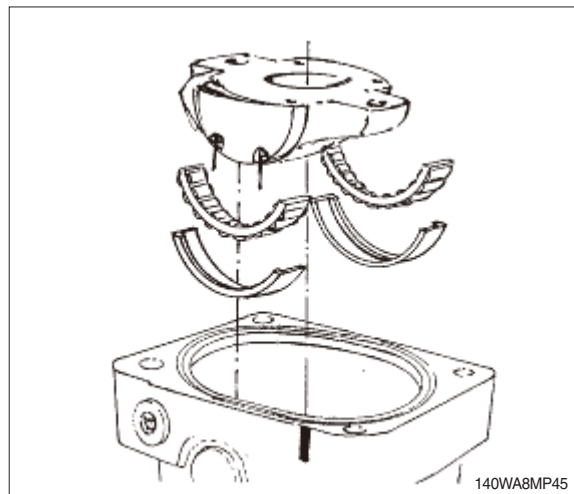
(7) Remove completely cover ring.



(8) Press out drive shaft.



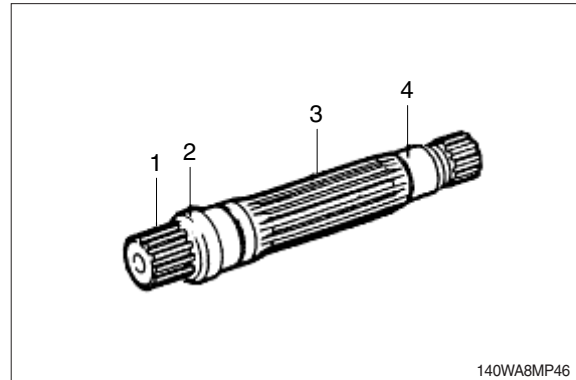
(9) Remove swivel cradle with bearing as well as bearing case.



9) GENERAL REPAIR INSTRUCTIONS

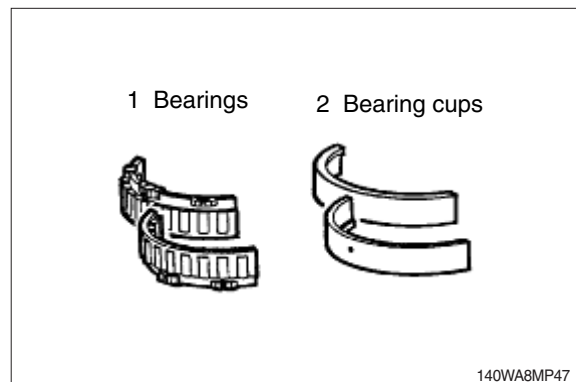
(1) Check

- ① Gears (1); Contact area shaft seal (2);
Gears (3); Bearing seat (4).
- ② Sliding surface (1) free of scoring.



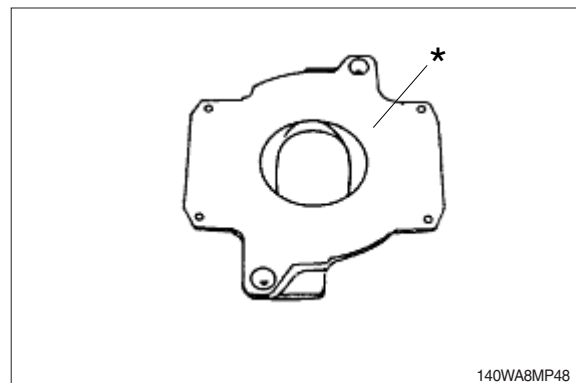
(2) Check

- ① Bearings (1).
- ② Bearing cups (2).



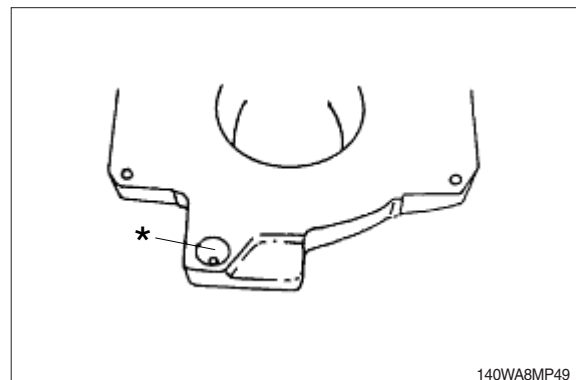
(3) Check

- ① Contact area (*).



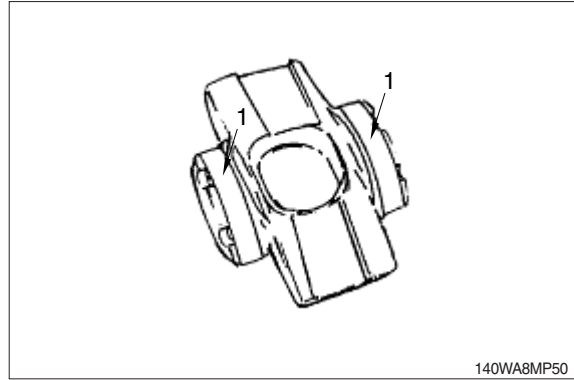
(4) Check

- ① Socket for regulator (*).



(5) Check

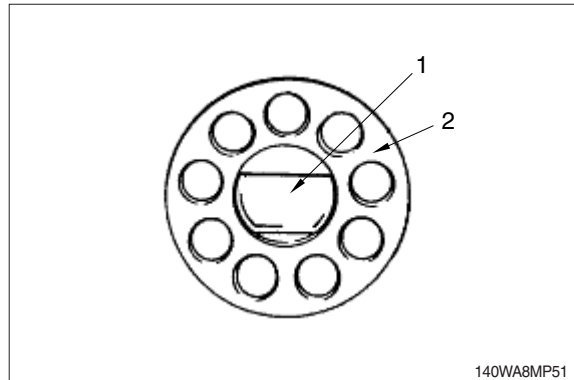
- ① Contact area of bearing (1).



140WA8MP50

(6) Inspection

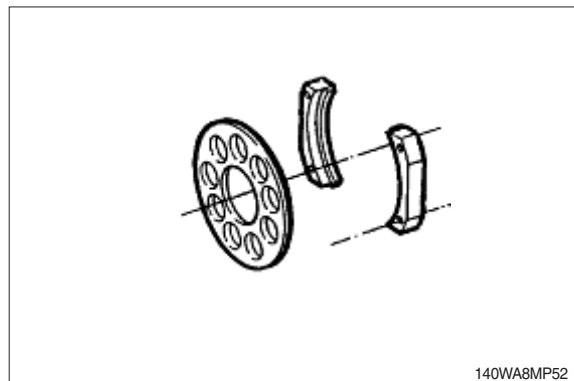
- ① Retaining ball (1)
- ② Retaining plate (2).



140WA8MP51

(7) Inspection

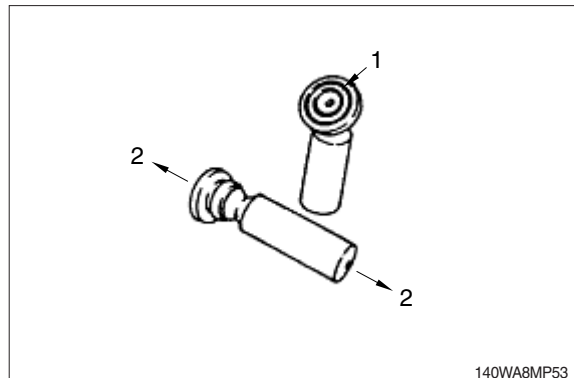
- ① Fixing segments



140WA8MP52

(8) Inspection

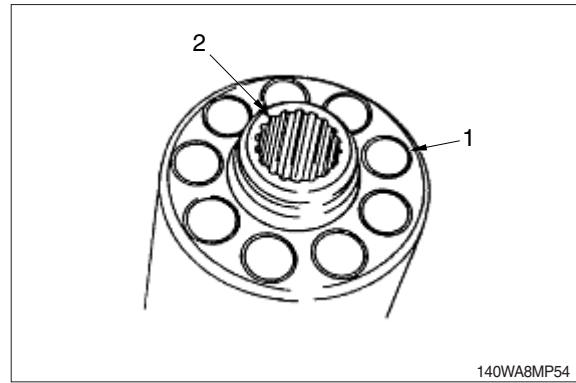
- ① Slipperpads (1),
- ② Axial backlash (2).



140WA8MP53

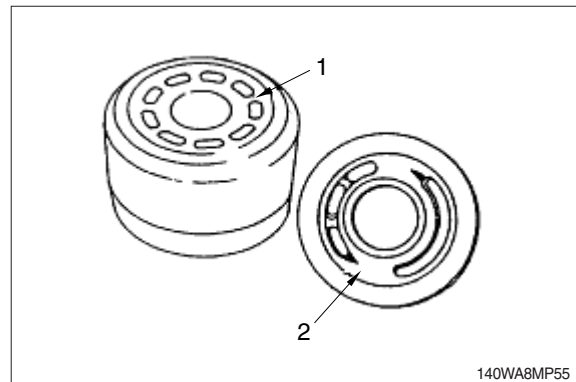
(9) Inspection

- ① Cylinder boring (1),
- ② Gears (2).



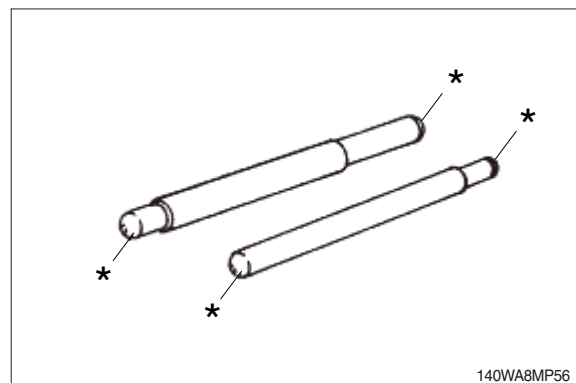
(10) Inspection

- ① Cylinder contact area (1).
- ② Contact area control plate (2).



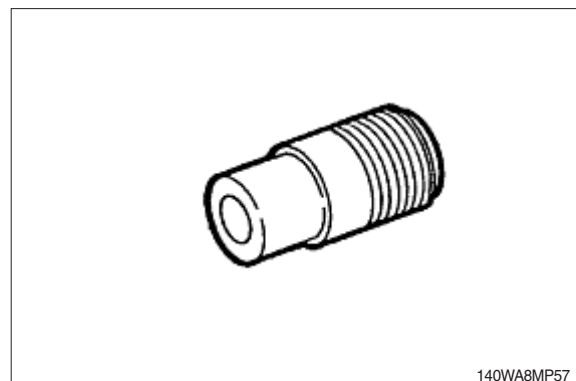
(11) Inspection

- ① Fixing segments
- ▲ Assemble the grinded side to the cradle!



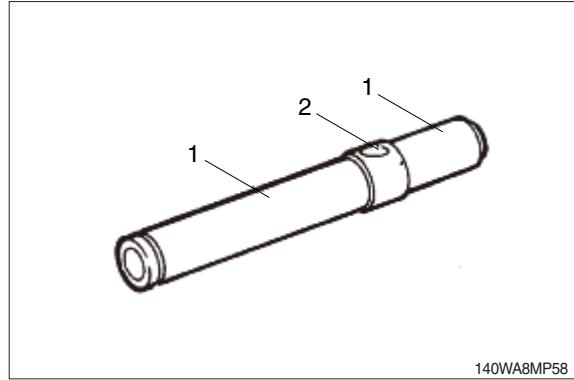
(12) Inspection

- ① Piston (*)
- Adjustment



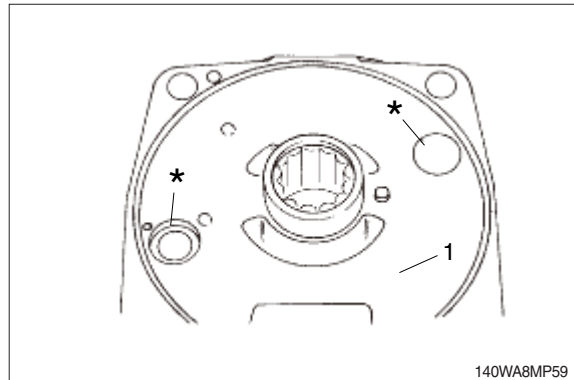
(13) Inspection

- ① Positioning piston (1),
- ② Boring - control bush (2).



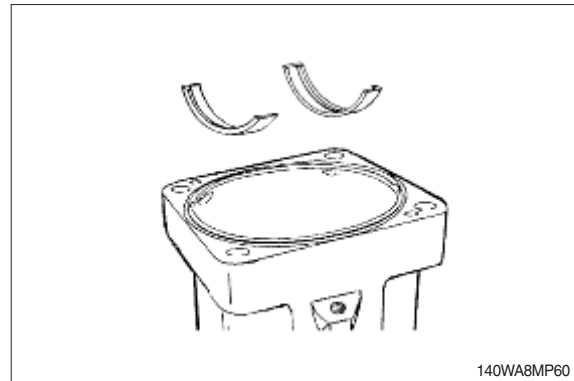
(14) Inspection

- ① Boring (*),
- ② Contact area control plate (1).

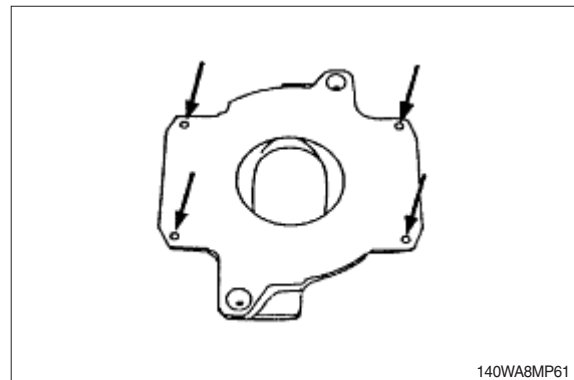


10) PUMP ASSEMBLY

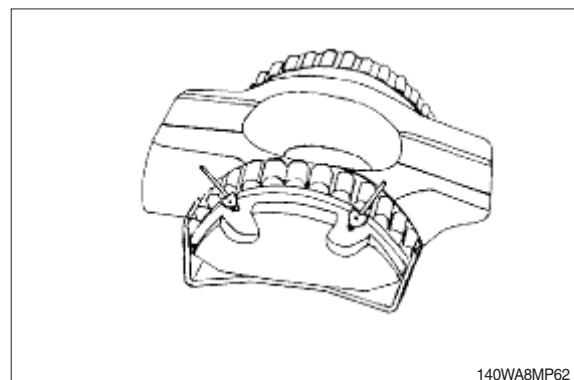
(1) Insert bearing bell.



(2) Clean threaded borings.

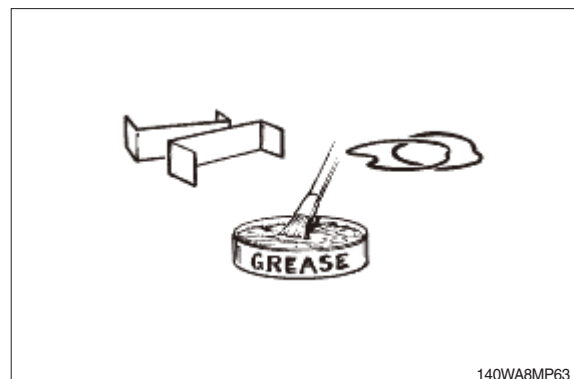


(3) Install bearings with wire guide on swivel cradle.
Fixing with auxiliary device.

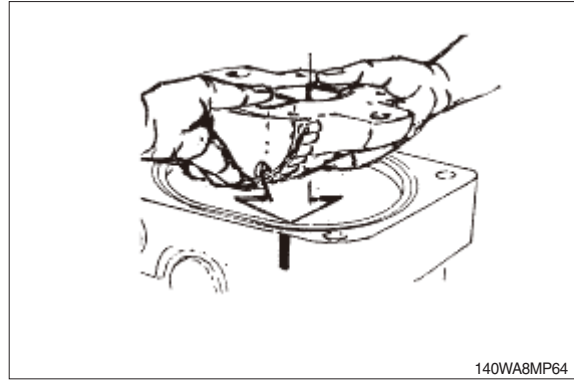


(4) Auxiliary devices e. g.

- ① Clamp
- ② Rubber rings
- ② Grease

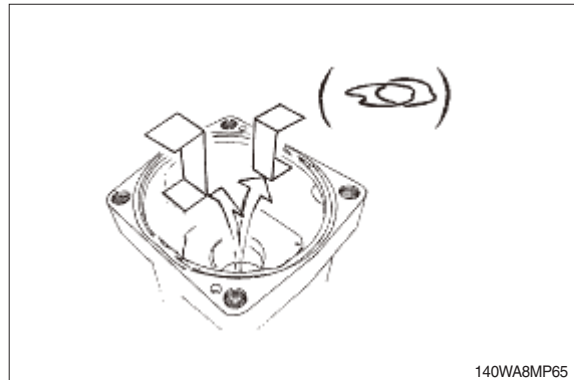


- (5) Place swivel cradle with bearing into bearing shell.
 ※ Installation position.



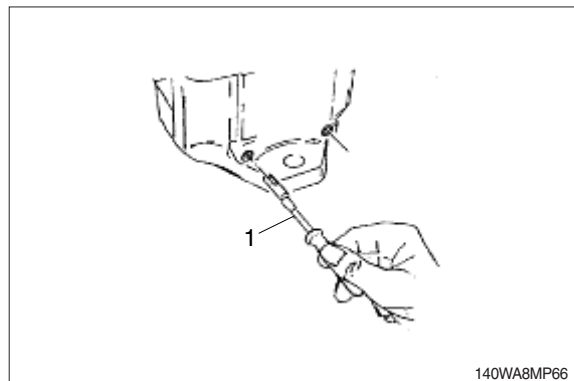
140WA8MP64

- (6) Remove auxiliary devices.
 ▲ Check bearing seats.



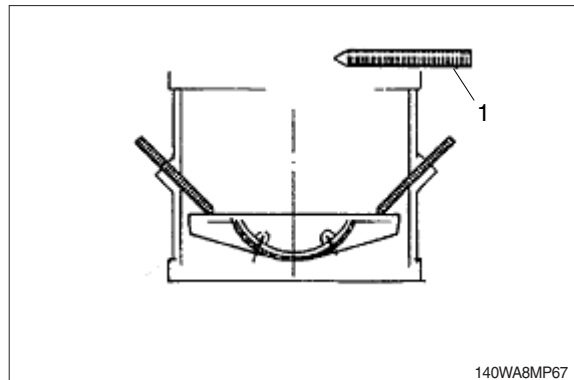
140WA8MP65

- (7) Adjust guide wire. Install joint pins.
 Install locking screws.
 1 Auxiliary device screw driver



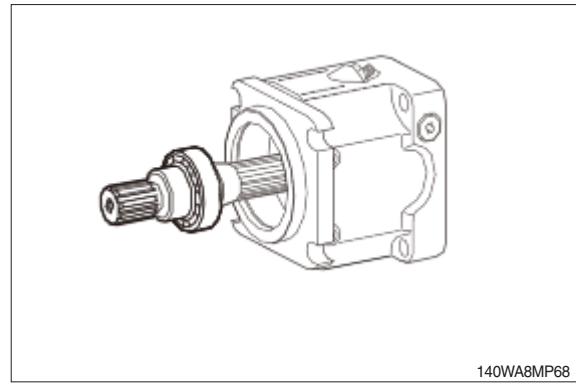
140WA8MP66

- (8) Fit swivel cradle with threaded pin in zero position.
 1 Auxiliary device (threaded pins 2x).

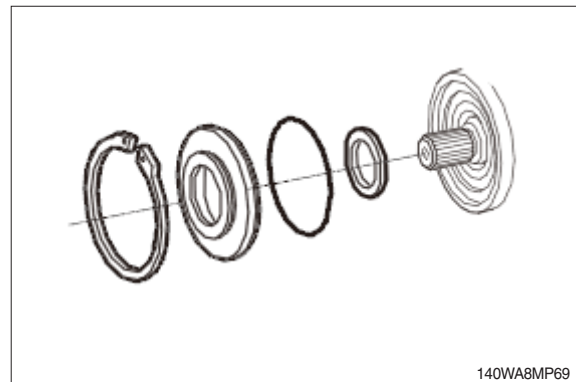


140WA8MP67

(9) Install drive shaft.

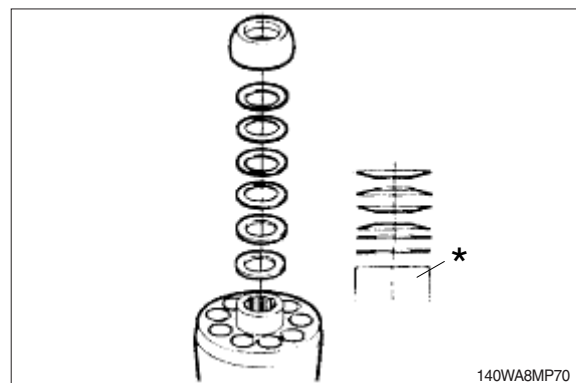


(10) Mount cover ring.



(11) Mount shims, springs and retaining ball.

▲ Observe correct mounting position*.



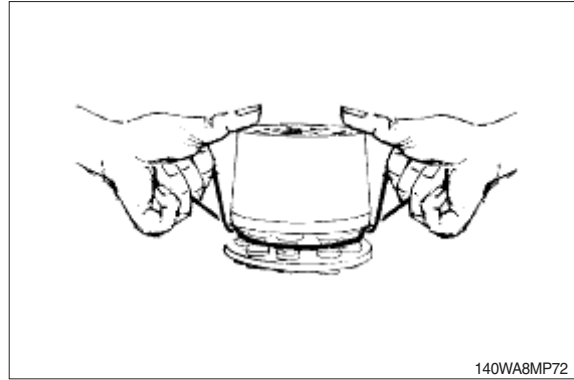
(12) Place retaining plate with piston into cylinder.

▲ Align gearing of retaining ball / cylinder.



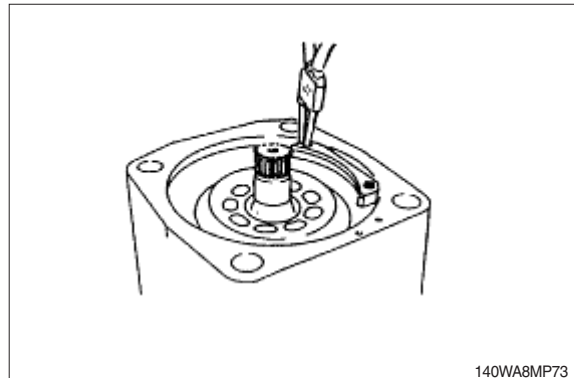
(13) Assembly hint

Fix with O-ring via piston retaining assembly.



140WA8MP72

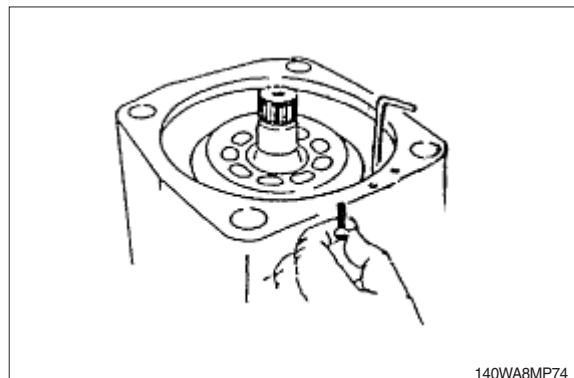
(14) Insert fixing segments.



140WA8MP73

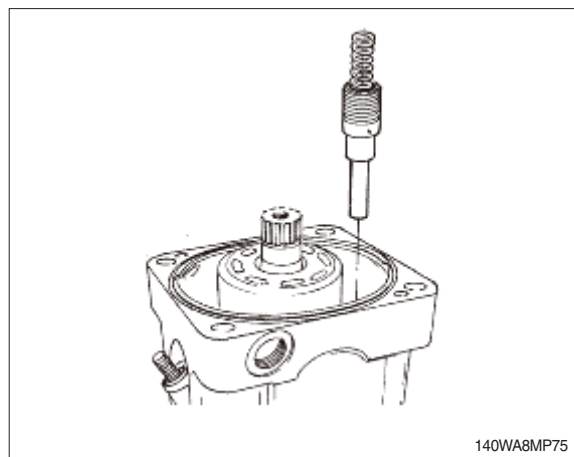
(15) Install screws with Precote.

- ▲ Pay attention with hardening time.
- Tight screws with torque value.



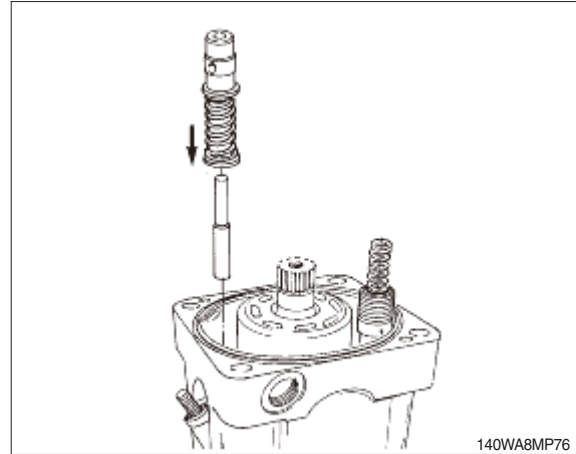
140WA8MP74

(16) Hydraulic control rod - big size



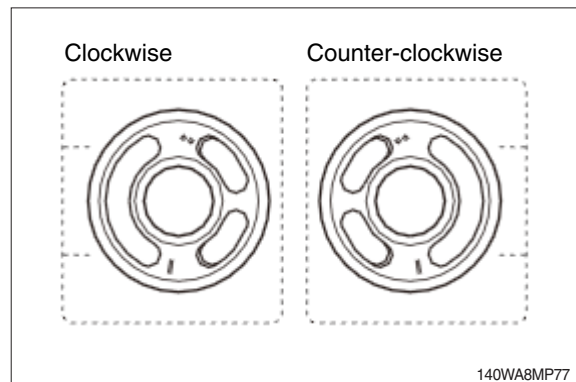
140WA8MP75

(17) Hydraulic control rod - small size.

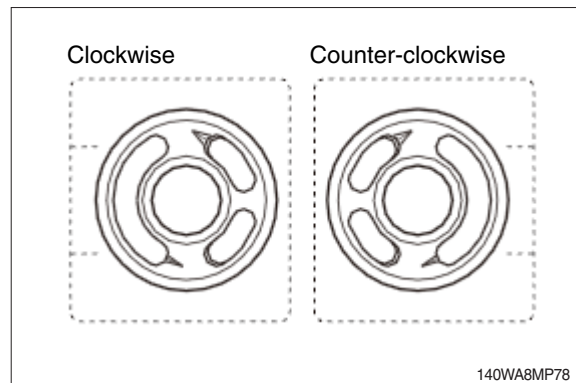


(18) Direction of rotation

① Standard type

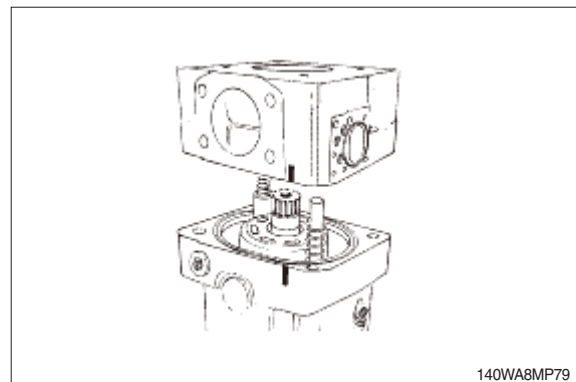


② Special type



(19) Install control plate.

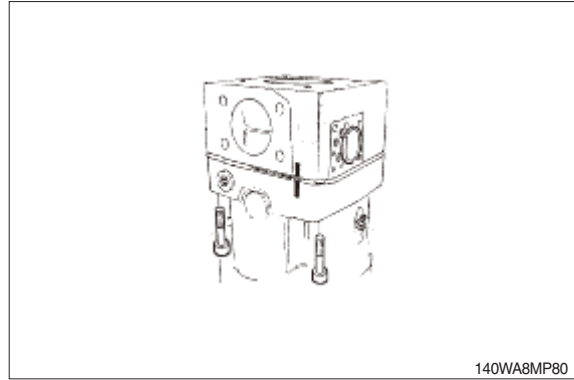
※ Installation position (direction of rotation).



(20) Fix port plate, assembly with screws.

※ Tightening torque

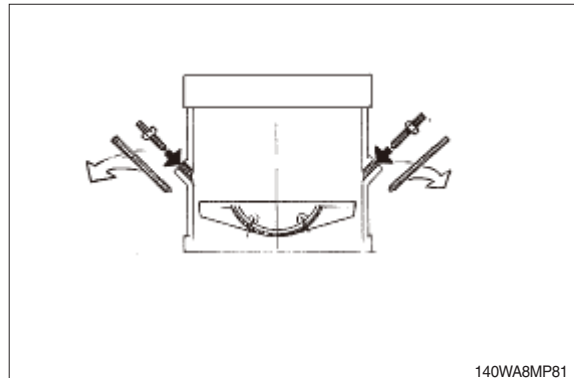
- Tightening torque : 40.8 kgf·m (295 lbf·ft)



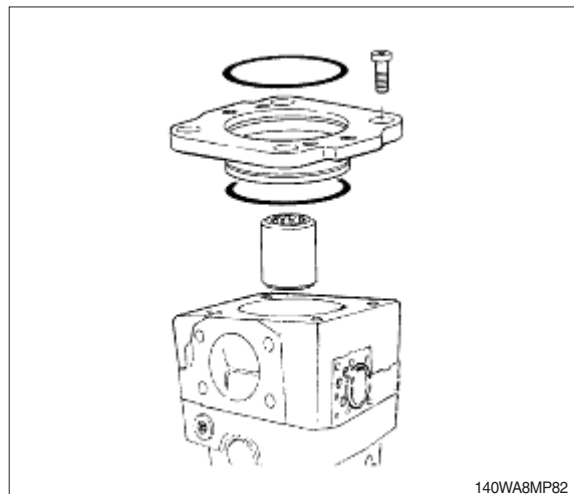
(21) Remove threaded pins.

① Install Q-min, Q-max- screws.

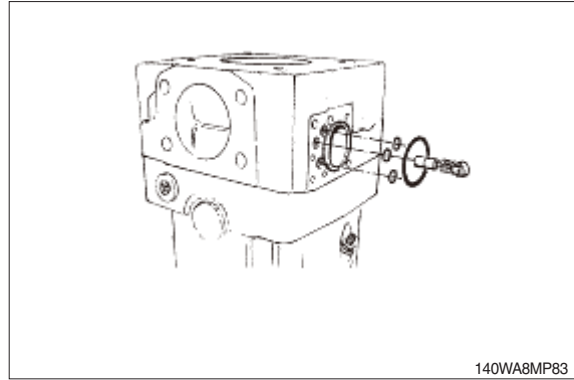
② Adjustment measure



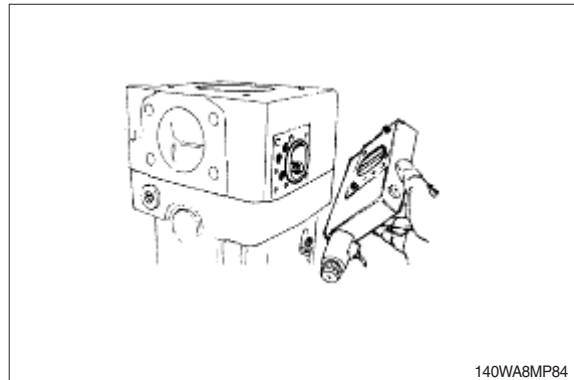
▲ Assemble pump support plate.



(22) Install measuring piston with O-rings.

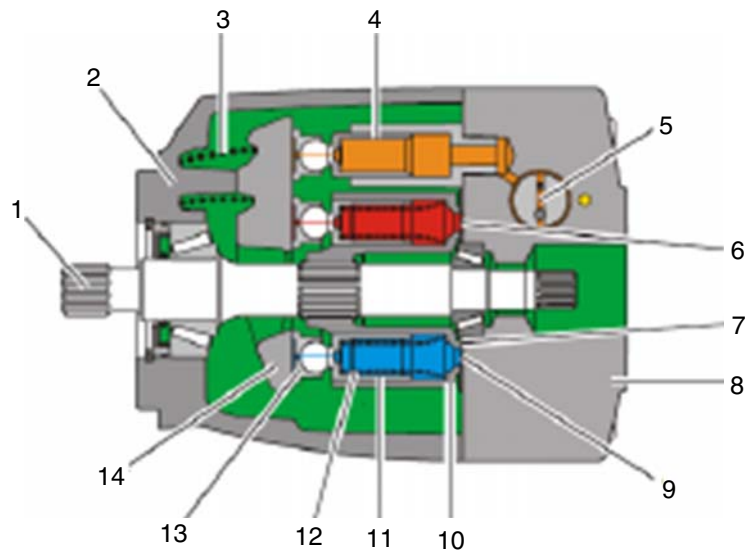


(23) Place regulator.



3. STEERING PUMP

1) STRUCTURE

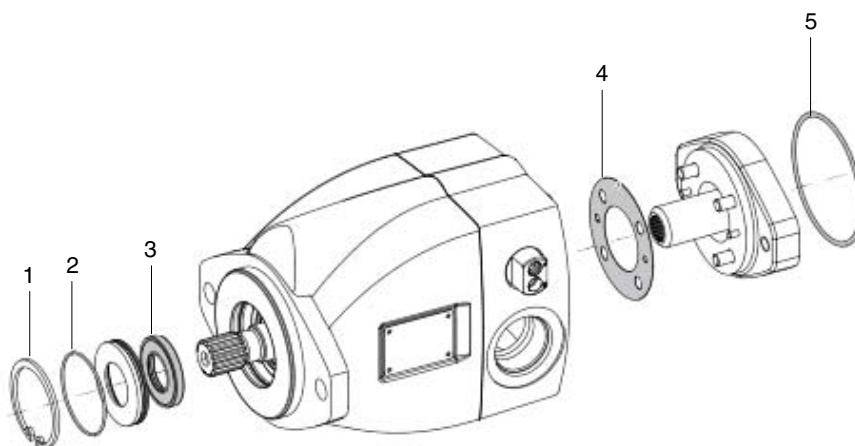


140WA2MP06

- | | | |
|-----------------|----------------------|---------------------|
| 1 Drive shaft | 6 High pressure side | 11 Piston |
| 2 Case | 7 Control plate | 12 Spring in piston |
| 3 Spring | 8 Port plate | 13 Slipper pad |
| 4 Stroke piston | 9 Suction side | 14 Swash plate |
| 5 Control valve | 10 Cylinder | |

2) SEALING OF ASSEMBLY GROUPS

Seal kit for control valves and basic unit



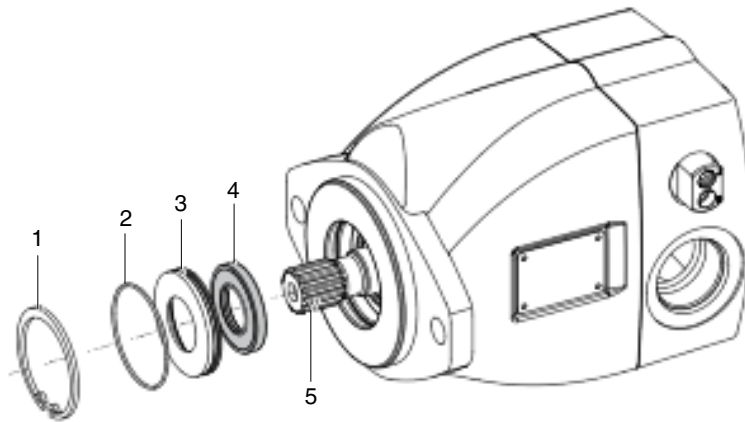
140WA8MP100

- | | | |
|-------------|---------------|----------|
| 1 Snap ring | 3 Shaft seal | 5 O-ring |
| 2 O-ring | 4 Flat gasket | |

3) REPLACING SHAFT SEAL

※ Special tools are needed

(1) Removing shaft seal



140WA8MP101

1 Snap ring

2 O-ring

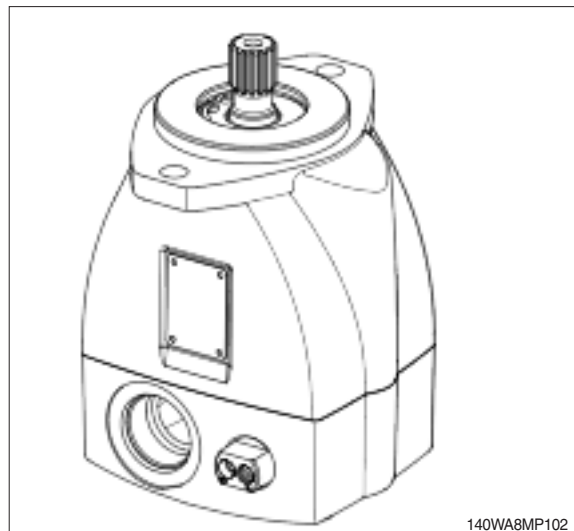
3 Bearing cover

4 Shaft seal

5 Drive shaft

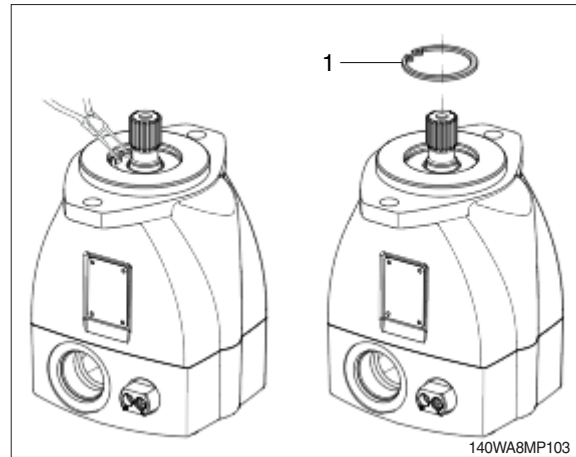
(2) Removal and installation position

In order to replace the shaft seal bring the axial piston unit in an upright position i.e. drive shaft upwards



140WA8MP102

- (3) Remove the snap ring or shim ring (1).
- ※ When removing, the snap ring may release in a project-like manner and spring into your face.
 - ※ Wear safety glasses.

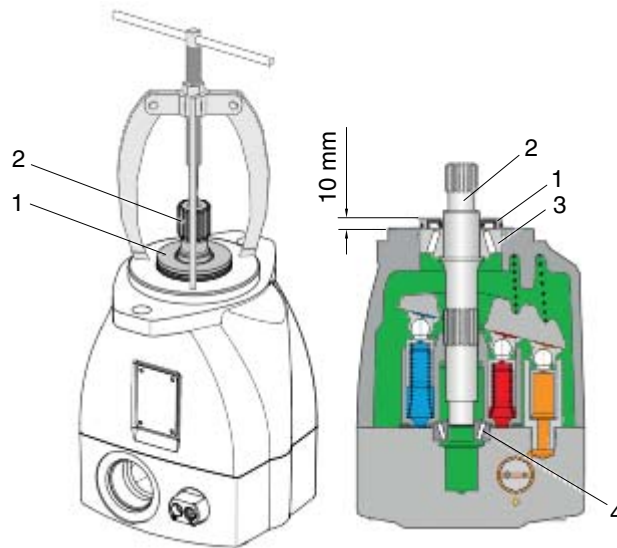


- (4) Pull-off tool for removal of bearing cover.
- Use a suitable tool when removing the bearing cover.
- The relevant thread size in the drive shaft can be found in the installation drawing.



(5) Removal of shaft seal

- 1 Bearing cover
- 2 Drive shaft
- 3 Tapered roller bearing
- 4 Tapered roller bearing



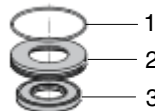
140WA8MP105

- ① Pull the drive shaft (2) out far enough to be able to remove the bearing cover (1) without a problem. CAUTION however not more than 10 mm. When removing the bearing cover, pay attention, that the drive shaft is not pulled out any further.
 - ※ Pulling the drive shaft too far out, can cause considerable problems during re-installation or when inserting the drive shaft into the bearing(4) and can lead to rotary group damage.
- ② Remove the pull-off tool without lifting the drive shaft out any further.
- ③ After removal of the bearing cover (1) bring the drive shaft (2) with the tapered roller bearing and the outer ring (3) back into the initial position i.e. push back as far as possible into the bearing (4) or tapered roller bearing with outer ring (3) to stop collar drive shaft. Leave the axial piston unit in the upright position.

(6) Replacement of O-ring and shaft seal

A special tool is needed to replace the shaft seal

- 1 O-ring
- 2 Bearing cover
- 3 Shaft seal



140WA8MP106

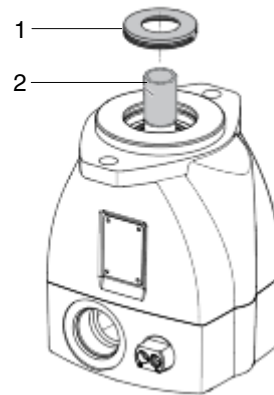
- ① Press the shaft seal (3) with a suitable special tool out of the bearing cover (2).
- ② Remove the O-ring (1).
- ③ Press the new shaft seal (3) with a suitable special tool in.
- ④ Use and install now the new O-ring (1) from the seal kit as the old O-ring is being destroyed with the removal.

4) INSTALLATION OF BEARING COVER (with new shaft seal and O-ring)

(1) Bearing cover

- 1 Bearing cover with shaft seal and O-ring
- 2 Mounting sleeve

- ① Bring the mounting sleeve (2) over the drive shaft.
- ② Lightly grease the new shaft seal between the sealing lip and dust lip to prevent dry running.
- ③ Push the bearing cover (1) correctly positioned over the mounting sleeve (2) without canting and without using force to the stop into the housing.

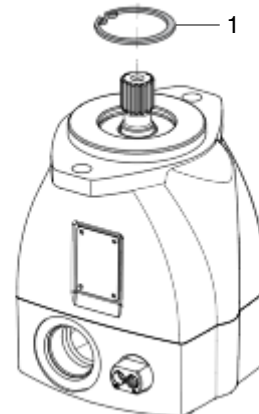


140WA8MP107

(2) Snap ring/shim ring

- 1 Snap ring

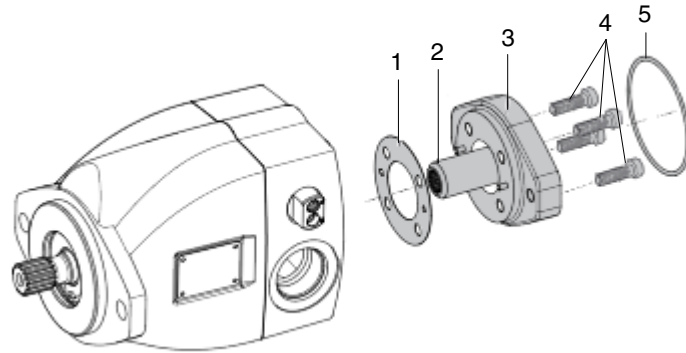
- ① Install the snap ring (1) correctly positioned in the housing.
 - ② Make sure, that the snap ring snaps completely into the groove.
- ※ If the snap ring must be replaced, it is necessary that the new, rough snap ring from the seal kit is ground the exactly the same height (shim measurement) as the old snap ring.



140WA8MP108

5) SEALING OF THE UNIVERSAL THROUGH DRIVE

- 1 Flat gasket
- 2 Splined hub
- 3 Adapter flange
- 4 Mounting bolts
- 5 O-ring



140WA8MP109

(1) Removal

- ① Remove the O-ring (5).
- ② Loosen and remove the mounting bolts (4).
- ③ Remove the adapter flange (3).
- ④ Remove the splined hub (2).
- ⑤ Remove the flat gasket (1).
- ⑥ Check the sealing surface for damage.

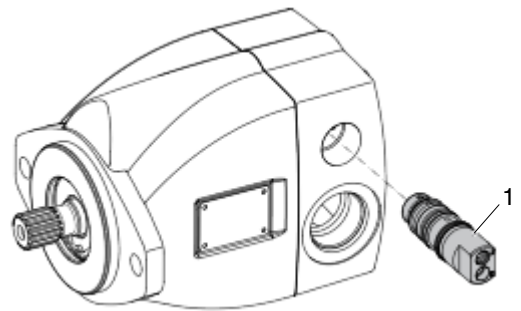
(2) Installation

- ① Put the flat gasket (1) correctly positioned onto the adapter flange, cylinder pins are used as guide.
 - ※ Pins are not pressed in and can fall out.
- ② Install the adapter flange (3) with flat gasket (1) onto the port plate.
- ③ Screw the mounting bolts (4) in by hand and tighten these with the correct tightening torque.
- ④ Put the O-ring (5) into the appropriate groove.
- ⑤ Put the splined hub (2) correctly positioned onto the drive shaft.

6) SEALING OF CONTROL VALVE

In case of leakage, the complete control valve must be replaced.

1 Control valve



140WA6MP110

(1) Replace the control valve

- ① Loosen and unscrew the control valve (1) out of the port plate.
- ② Screw the new control valve (1) in by hand, tighten with a torque of $6.1 \pm 1.0 \text{ kgf} \cdot \text{m}$ ($44.3 \pm 7.4 \text{ lbf} \cdot \text{ft}$).

GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL OF MOTOR

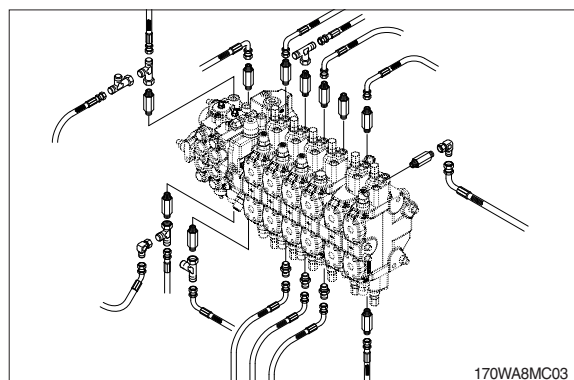
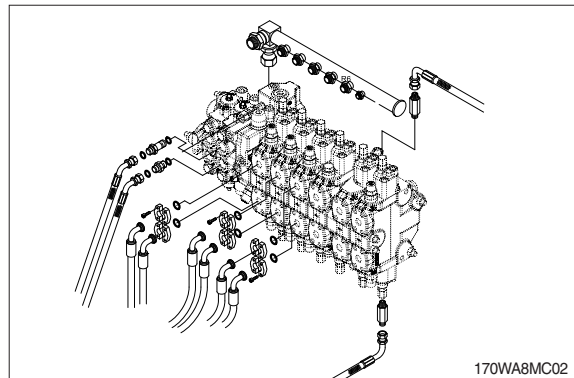
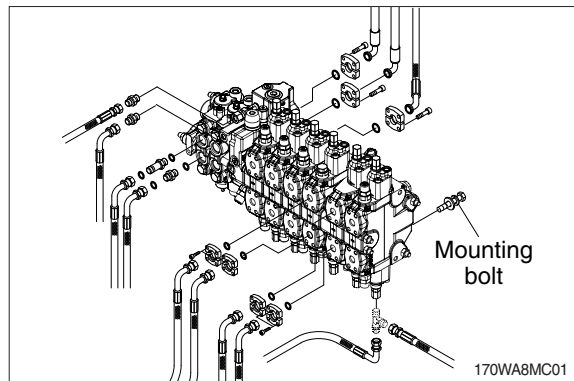
1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
 - (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
 - (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.**
- ※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (4) Remove the wirings for the pressure sensor and so on.
 - (5) Remove bolts and disconnect pipe.
 - (6) Disconnect pilot line hoses.
 - (7) Disconnect pilot piping.

- (8) Sling the control valve assembly and remove the control valve mounting bolt and bracket.
 - Weight : 144 kg (317 lb)
 - Tightening torque : $12.2 \pm 1.3 \text{ kgf} \cdot \text{m}$
($88.2 \pm 9.4 \text{ lbf} \cdot \text{ft}$)
- (9) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.

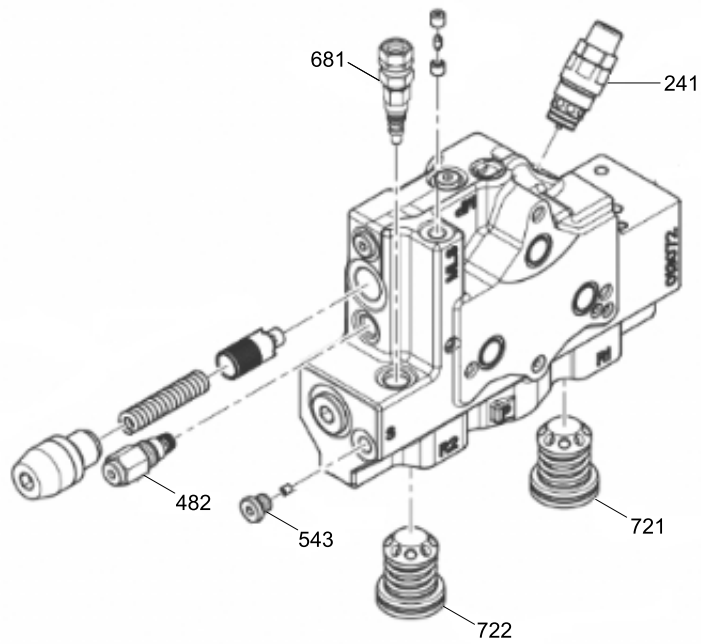
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from below items.
 - ① Cylinder (Boom, arm, bucket)
 - ② Swing motor
 - ③ Travel motor※ See each item removal and install.
- (3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.



2. STRUCTURE

1) INLET SECTION



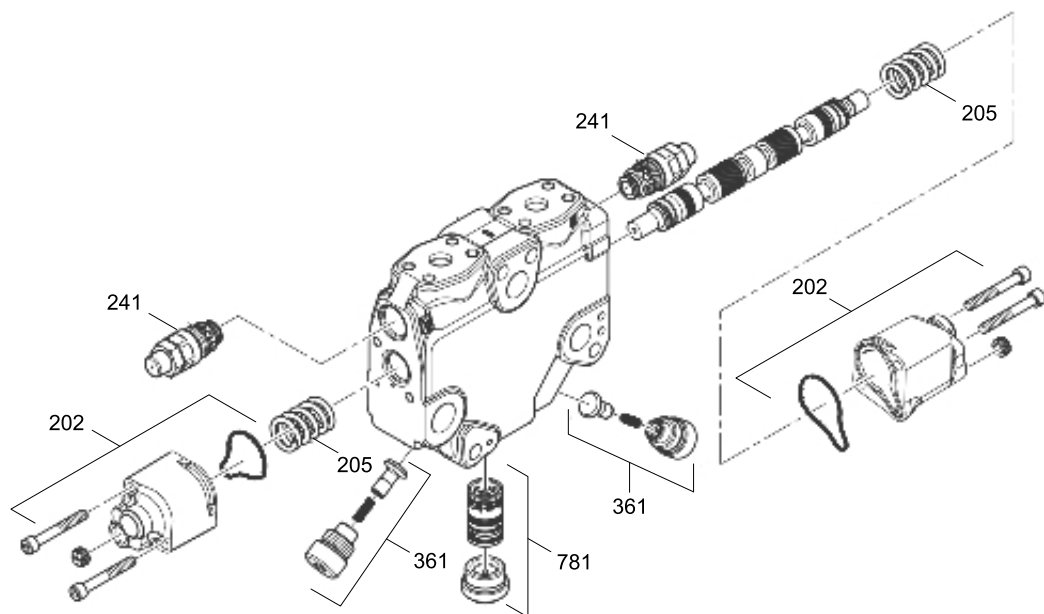
140WA2MC02

241 Pressure relief valve
482 Flow valve

543 Screw
681 Pressure relief valve

721 Check valve
722 Check valve

2) BOOM SECTION



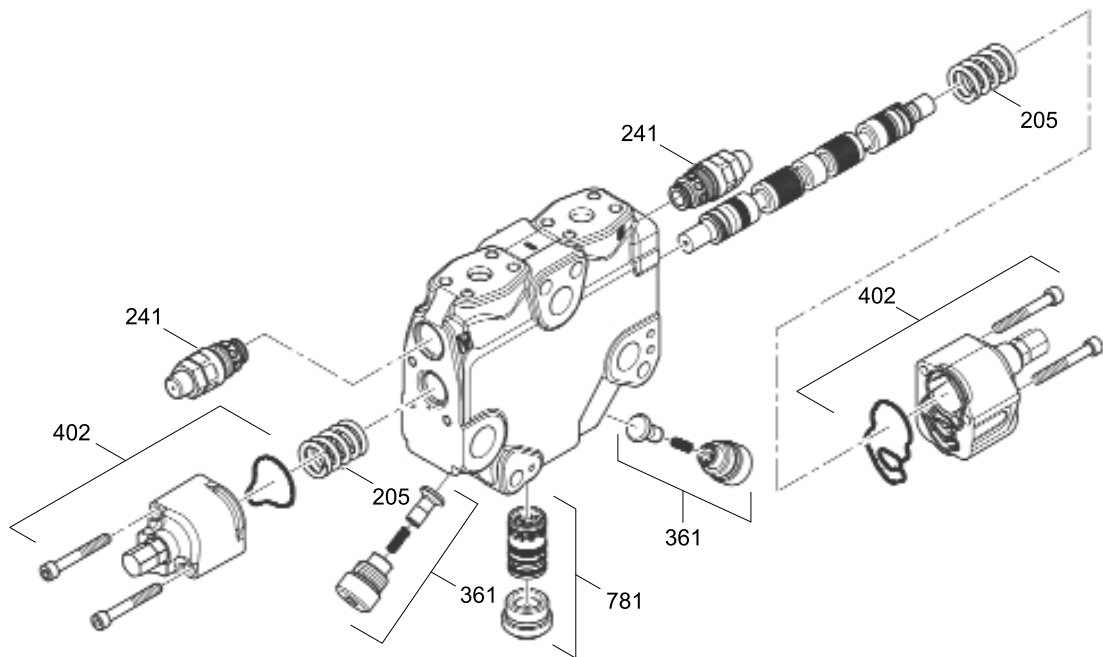
140WA2MC03

202 Cover assy
205 Spring

241 Pressure relief valve
361 Spool assy

781 Spool assy

3) ARM SECTION



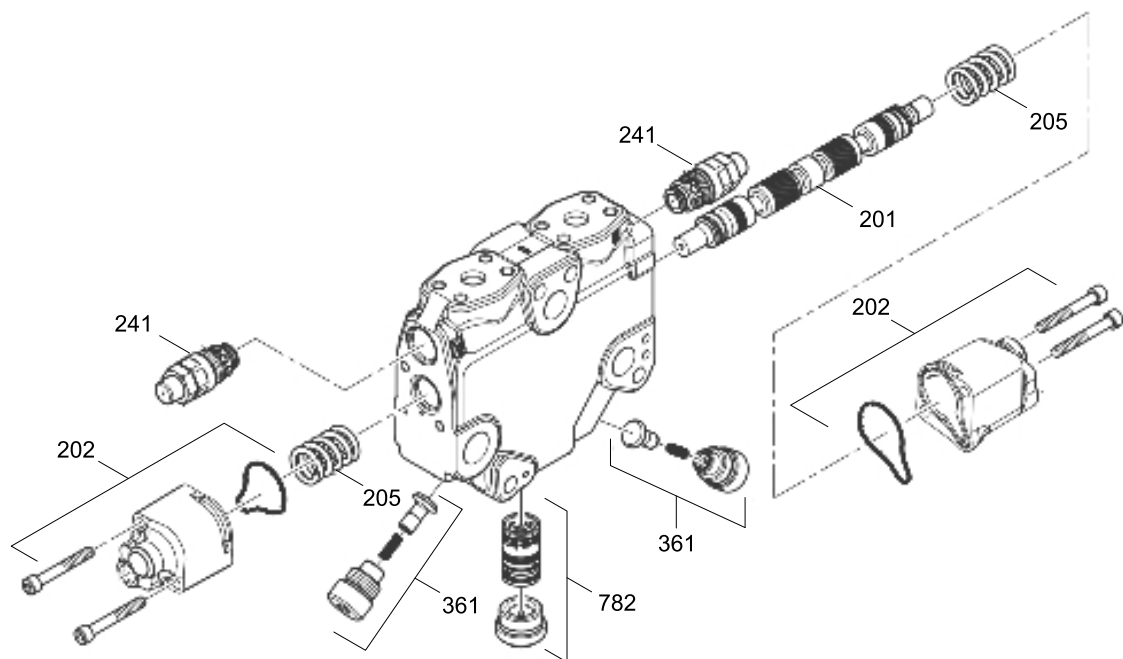
140WA2MC04

205 Spring
241 Pressure relief valve

361 Spool assy
402 Cover assy

781 Spool assy

4) BUCKET SECTION



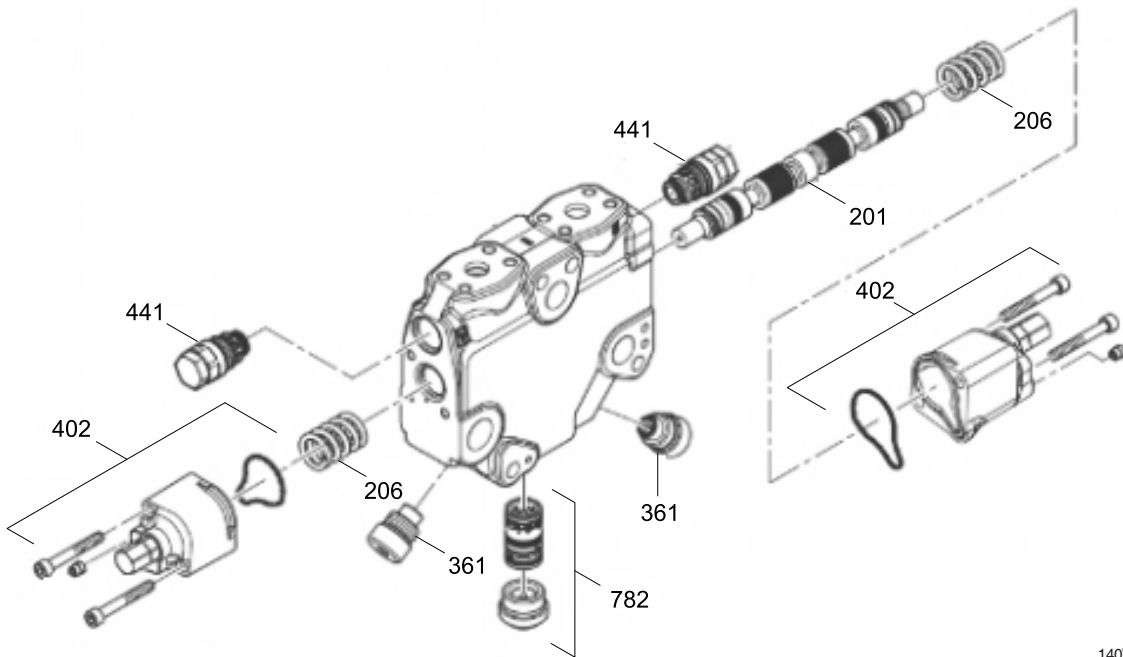
140WA2MC05

201 Spool assy
202 Cover assy

205 Spring
241 Pressure relief valve

361 Spool assy
782 Spool assy

5) TRAVEL SECTION



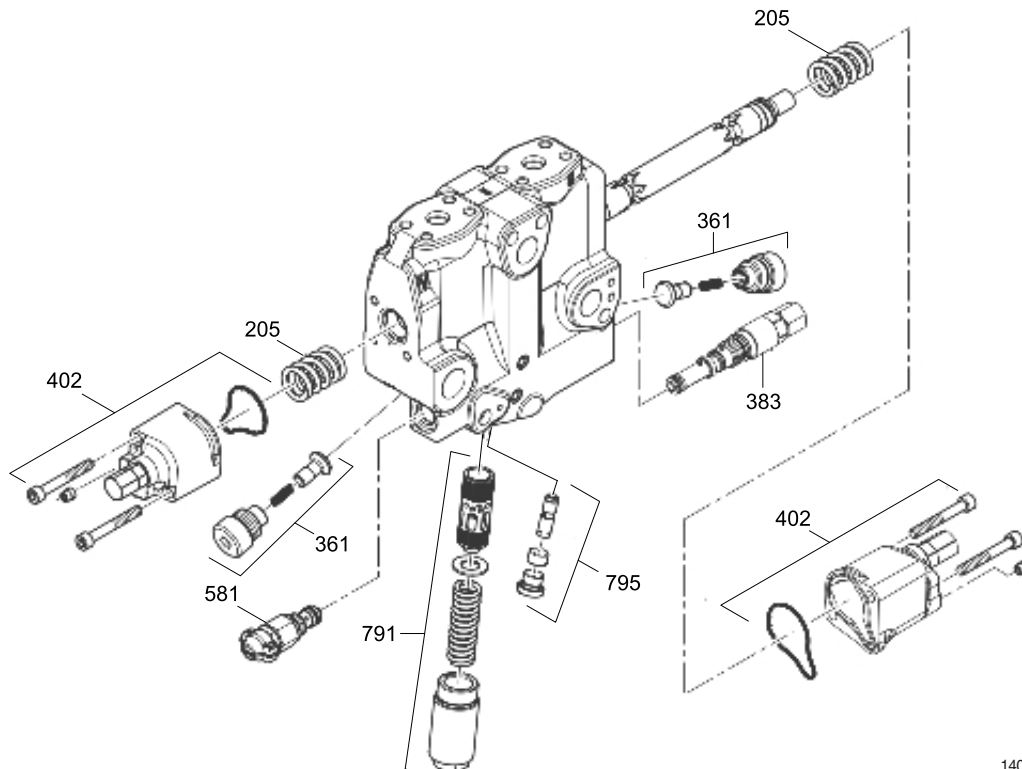
140WA2MC06

201 Spool assy
206 Spring

361 Spool assy
402 Cover assy

441 Pressure relief valve
782 Spool assy

6) SWING SECTION



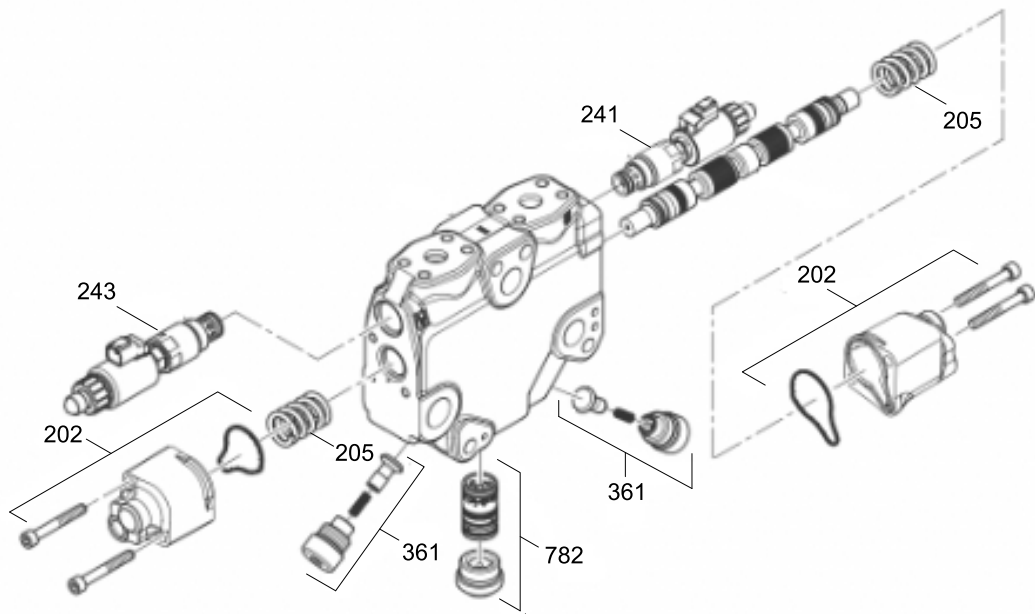
140WA2MC07

205 Spring
361 Spool assy
383 Spool assy

402 Cover assy
581 Relief valve
791 Spool assy

795 Spool assy

7) OPTION SECTION



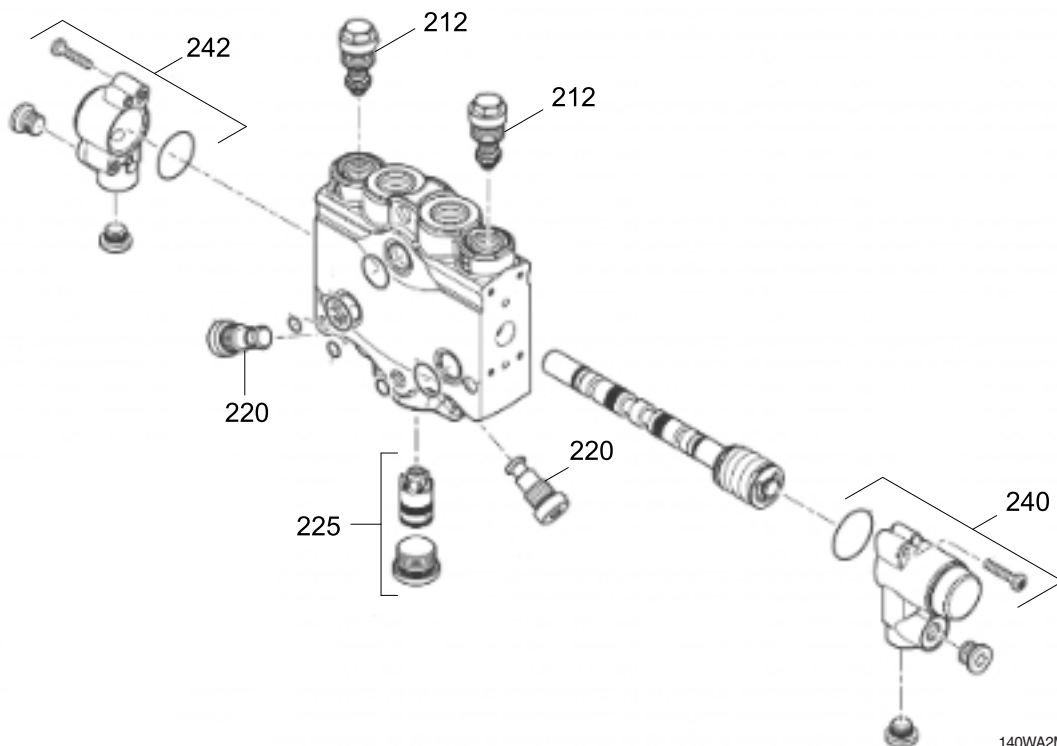
140WA2MC08

202 Spool assy
205 Spring

225 Spool assy
243 Pressure relief valve

361 Spool assy
781 Spool assy

8) 2 PIECE BOOM SECTION



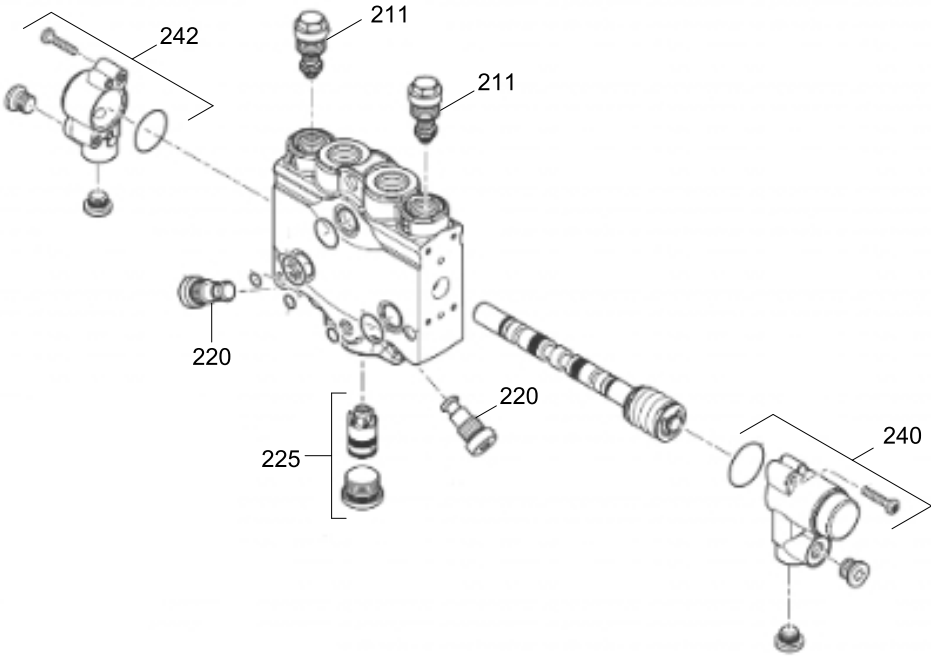
140WA2MC09

212 Pressure relief valve
220 Check vavle

225 Spool assy
240 Cover kit

242 Cover kit

9) DOZER (OUTRIGGER) SECTION



140WA2MC10

211 Pressure relief valve
 220 Check valve

225 Spool assy
 240 Cover kit

242 Cover kit

GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

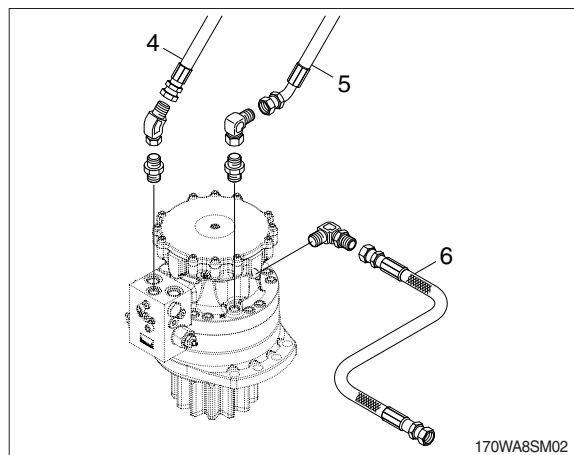
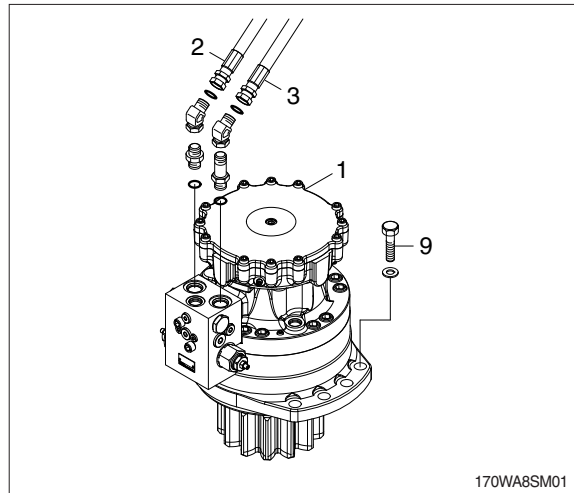
- (4) Disconnect hose assembly (2).
- (5) Disconnect pilot line hoses (3, 4, 5, 6).
- (6) Sling the swing motor assembly (1) and remove the swing motor mounting socket bolts (9).

- Motor device weight : 148 kg (326 lb)
- Tightening torque : 57.9 ± 6.4 kgf · m
(419 ± 46.3 lbf · ft)

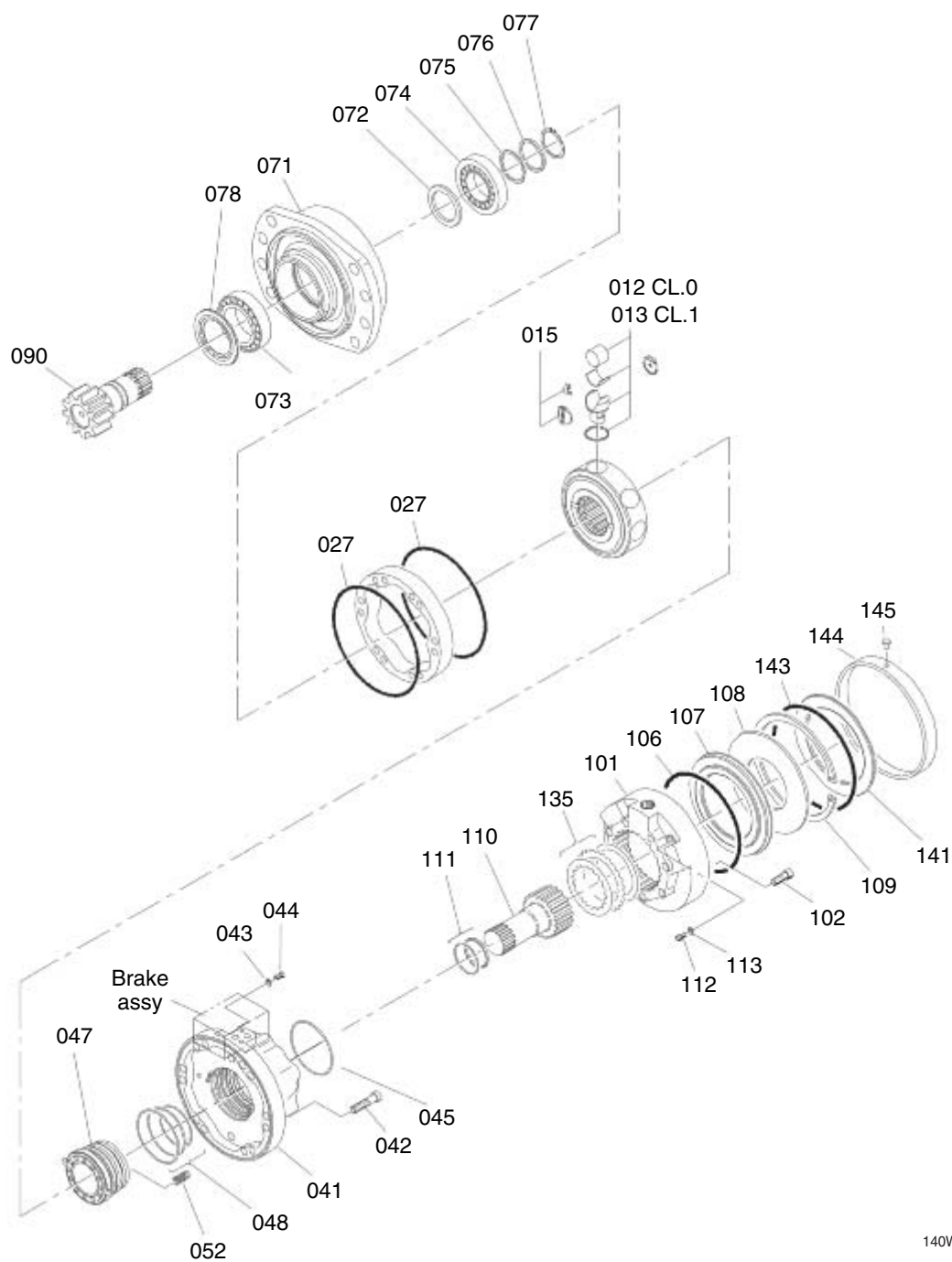
- (7) Remove the swing motor assembly.
※ When removing the swing motor assembly, check that all the piping have been disconnected.

2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the swing motor.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it overflows from the port.
 - ③ Tighten plug lightly.
 - ④ Start the engine, run at low idling and check oil come out from plug.
 - ⑤ Tighten plug fully.
- (3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



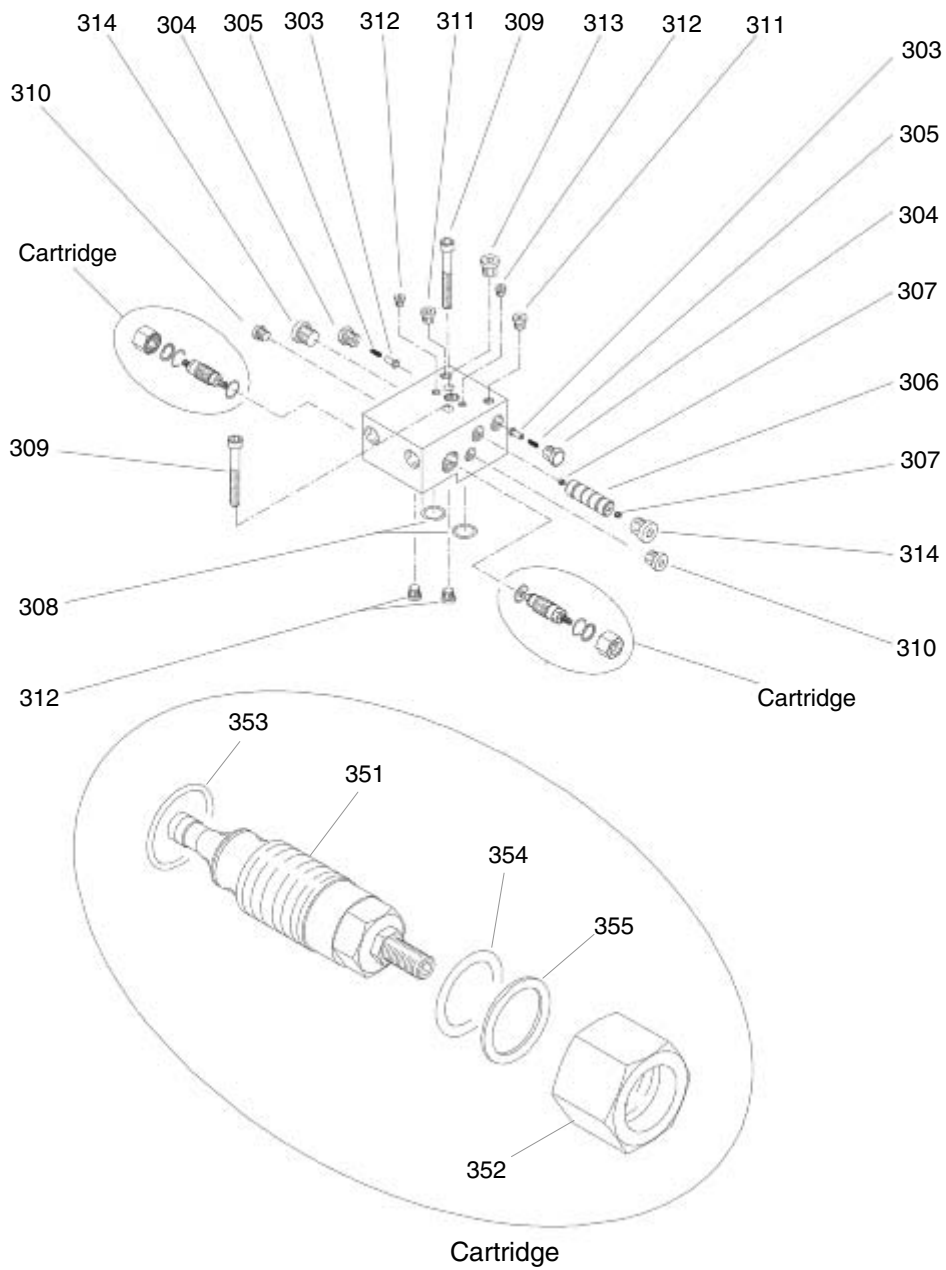
2. SPARE PARTS (1/2)



140WA8SM05

012	Piston sub-assy Cl.0	071	Bearing support part	107	Brake piston
013	Piston sub-assy Cl.1	072	Radial lip seal	108	Spring washer
015	Repair kit	073	Roller bearing	109	Snap ring
027	Joint seal	074	Roller bearing	110	Brake shaft
041	Valve cover part	075	Set of shims	111	Seal
042	Screw	076	Thrust ring	112	Screw
043	Seal washer	077	Snap ring	113	Sealing ring
044	Screw	078	Lip seal	135	Brake kit
045	O-ring	090	Shaft	141	Protector
047	Valve	101	Brake body	143	O-ring
048	Seal kit	102	Screw	144	Protection plate
052	Spring	106	O-ring	145	Dowel

SPARE PARTS (2/2)



302 Cartridge
 303 Valve
 304 Plug
 305 Spring
 306 Valve spool
 307 Nozzle

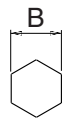
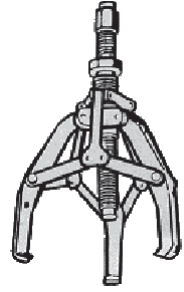
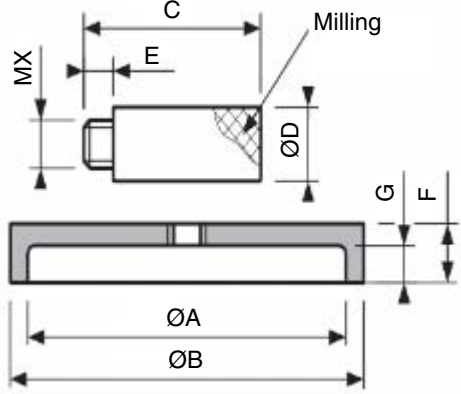
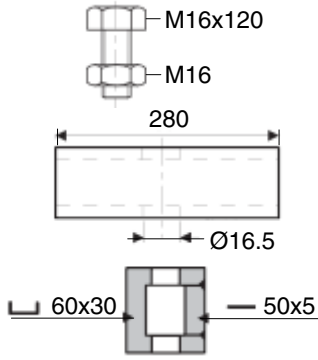
308 O-ring
 309 Screw
 310 Plug
 311 Plug
 312 Plug
 313 Plug

314 Plug
 353 O-ring
 354 O-ring
 355 Back-up

140WA8SM06

3. DISASSEMBLY AND ASSEMBLY

1) TOOLS

Tool name		Remark																																													
Allen wrench (5, 6, 8, 10, 12, 14)	6																																														
Hexagon wrench (13, 17, 19, 22, 24, 27, 41)	22																																														
	27																																														
Torque wrench	Capable of tightening with the specified torques																																														
Internal snap ring pliers	For snap ring with 65 mm (2.56") to 120 mm (4.72") in diameter.																																														
3-leg puller	<p>- Spread : 12 mm (0.98") to 260 mm (10.23") dia. - Max. pulling force : 7138 kgf (15736 lbf).</p>  <p style="text-align: right;">140WA8SM08</p>																																														
Mandrels for the brake 1) For reassembling the brake cover. 2) To compress the spring washer.	 <p style="text-align: right;">140WA8SM09</p>																																														
<table border="1"> <thead> <tr> <th rowspan="2">Item</th> <th colspan="2">Mandrel 1</th> <th colspan="2">Mandrel 2</th> </tr> <tr> <th>mm</th> <th>Inch</th> <th>mm</th> <th>Inch</th> </tr> </thead> <tbody> <tr> <td>ØA</td> <td>180</td> <td>7.09</td> <td>180</td> <td>7.09</td> </tr> <tr> <td>ØB</td> <td>190</td> <td>7.48</td> <td>190</td> <td>7.48</td> </tr> <tr> <td>C</td> <td>100</td> <td>3.93</td> <td>100</td> <td>3.93</td> </tr> <tr> <td>ØD</td> <td>35</td> <td>1.37</td> <td>35</td> <td>1.37</td> </tr> <tr> <td>E</td> <td>10</td> <td>0.39</td> <td>10</td> <td>0.39</td> </tr> <tr> <td>F</td> <td>10</td> <td>0.39</td> <td>10</td> <td>0.39</td> </tr> <tr> <td>G</td> <td>20</td> <td>0.78</td> <td>20</td> <td>0.78</td> </tr> </tbody> </table>	Item	Mandrel 1		Mandrel 2		mm	Inch	mm	Inch	ØA	180	7.09	180	7.09	ØB	190	7.48	190	7.48	C	100	3.93	100	3.93	ØD	35	1.37	35	1.37	E	10	0.39	10	0.39	F	10	0.39	10	0.39	G	20	0.78	20	0.78	 <p style="text-align: right;">140WA8SM07</p>		
Item		Mandrel 1		Mandrel 2																																											
	mm	Inch	mm	Inch																																											
ØA	180	7.09	180	7.09																																											
ØB	190	7.48	190	7.48																																											
C	100	3.93	100	3.93																																											
ØD	35	1.37	35	1.37																																											
E	10	0.39	10	0.39																																											
F	10	0.39	10	0.39																																											
G	20	0.78	20	0.78																																											
Tool for mechanical brake release																																															

2) MECHANICAL BRAKE RELEASE

In certain service situations, it may be necessary to release the motor brake.

※ Plan to supply dowels (145), the brake cover (141) and the O-ring (143).

- (1) Extract the dowels (145).
- (2) Remove the protective plate (144).



- (3) Remove and discard the brake cover (141).



- (4) Tighten the screw in the piston and tighten the nut until the motor shaft turns freely.



3) REPLACEMENT OF THE O-RING OF THE BRAKE PISTON

(1) Disassembly

- ① Place the motor on the bearing support.
- ※ Plan to supply dowels (145), the brake cover (141) and the O-ring (143).

- ② Extract the dowels (145).
- ③ Remove the protective plate (144).



- ④ Remove and discard the brake cover (141).



- ⑤ Extract and discard the O-ring (143).

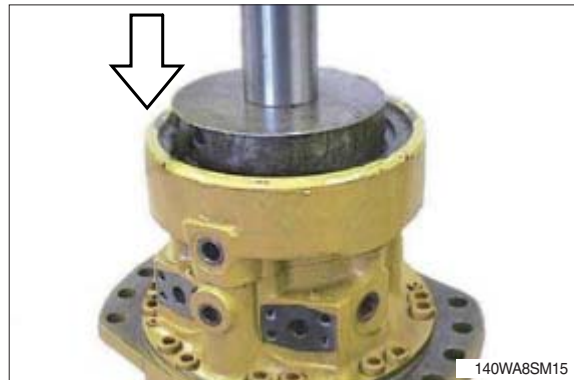


⑥ Compress the washer (108)

- Using a mandrel and an extractor
- Using a mandrel and a press



※ Mark the mounting direction of the snap ring.

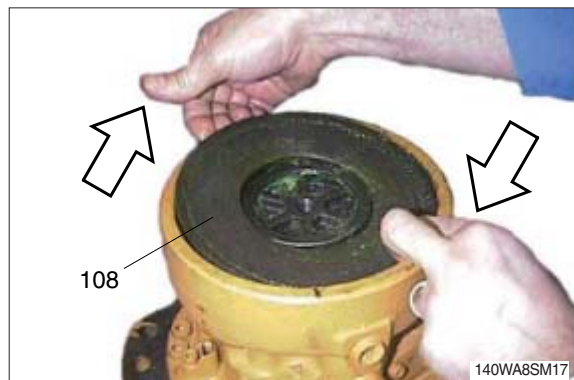


⑦ Remove the snap ring (109) with an internal snap ring pliers.

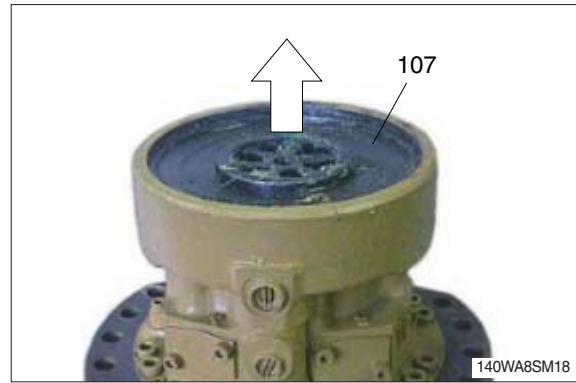
- Extractor and pliers : figure 6504 and 6505.
- Press and pliers : figure 6505 and 6507.



⑧ Extract the washer (108).



⑨ Extract the brake piston (107).



⑩ Remove and discard the O-ring (106).

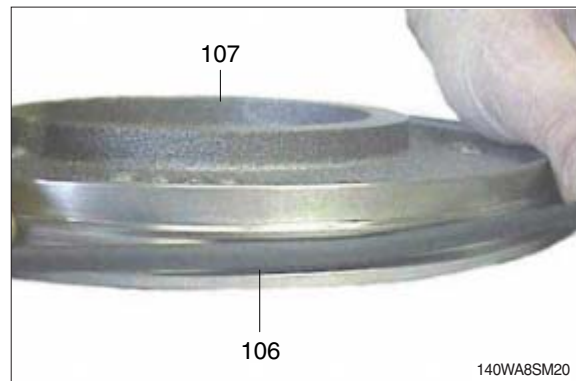


(2) Ressembly

- ※ Before assembling, it is necessary to make sure that all parts, sealing surfaces and grooves are clean.
- ※ All traces of rust, mud, water must be removed.
- ① Coat with anti-oxidizing grease the grooves, the top of the brake piston, the spring washer, the snap ring and the piston seal contact surface in the brake body.

- ② Install a new O-ring (106) in the piston (107).

- ※ The ring should be tight on the piston and not twisted.

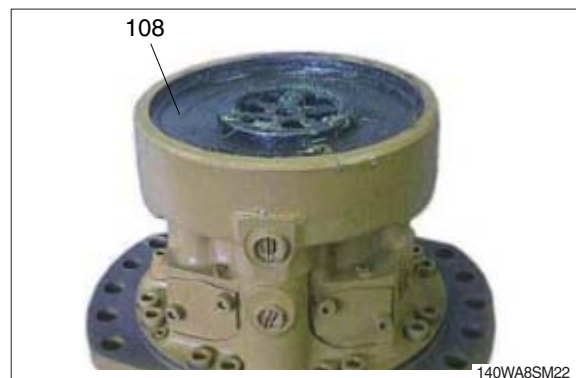


- ③ Install the brake piston (107).

- ※ Take care when passing the seal over the snap ring groove.

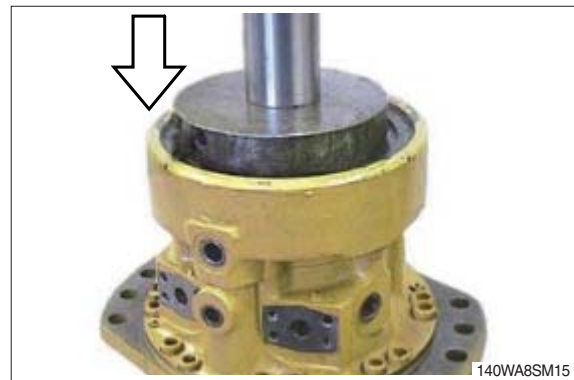


- ④ Install the spring washer (108).



⑤ Compress the washer (108) :

- Using a mandrel and an extractor
- Using a mandrel and a press.

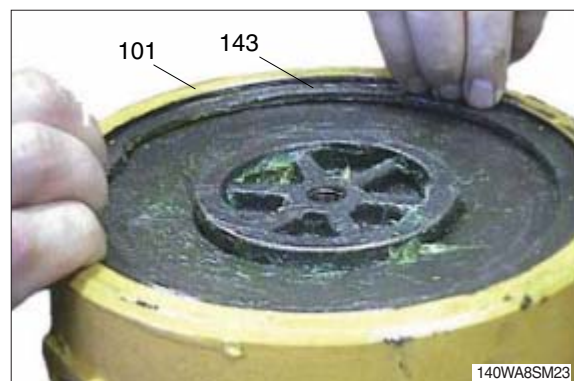


⑥ Install the snap ring (109) with an internal snap ring pliers in line with the mark made during disassembly.

- Extractor and pliers: fig. 6504 and 6505.
- Press and pliers : fig. 6505 and 6507.



⑦ Install a new O-ring (143) coated with anti-oxidizing grease in the groove of brake body (101).



- ⑧ Place the new cover (141) on the entry chamfer.



- ⑨ Click the cover into place using the right mandrel.
- ※ Make sure that the outer edge of the cover is engaged in the groove.



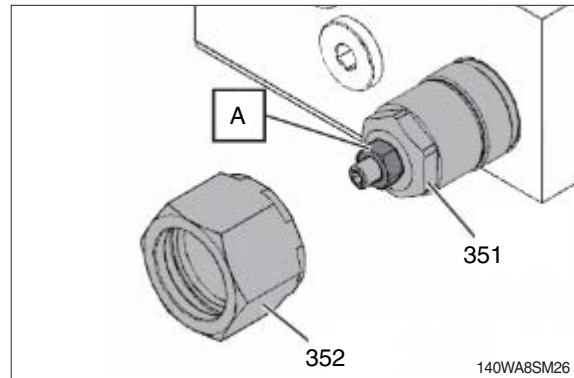
- ⑩ Install the protective plate (144).
- ⑪ Drive the dowels (145).



- ⑫ Install the motor.

4) REPLACEMENT OF A CARTRIDGE (302) OR RING (353, 354 AND 355) OF THE BLOCK ASSEMBLY

- ※ Never loosen the locknut [A] that set the cartridge pressure during the disassembly and reassembly of nut (352) and cartridge (351).

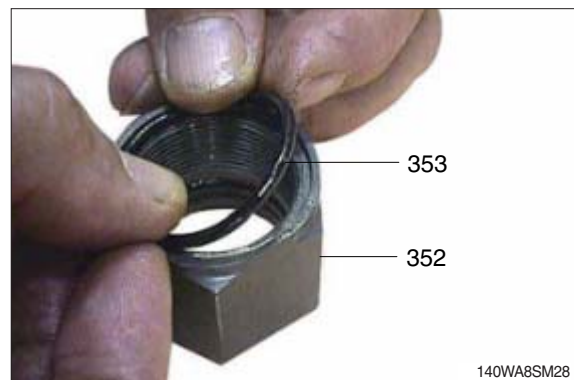


(1) Disassembly

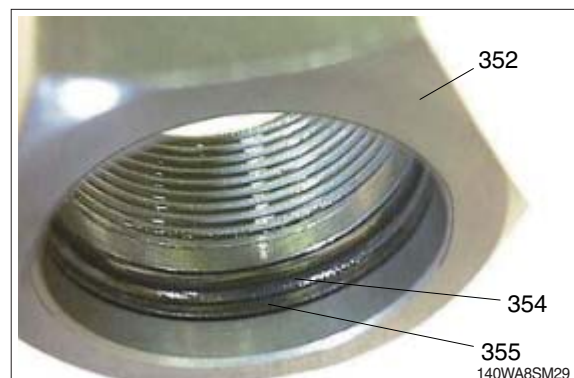
- ① Release the pressure in the supply circuit.
- ② Remove the nut (352) then the cartridge body (351).



- ③ Discard the O-ring (353).



- ④ Discard the O-ring (354) and the back-up ring (355).



(2) Reassembly

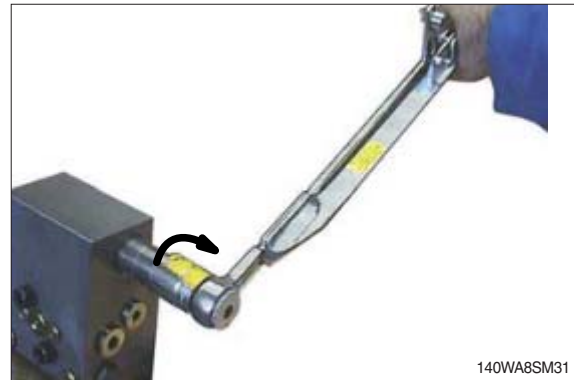
※ Make sure that the contact surfaces between the cartridge and the block are clean.

- ① Install the cartridge (351) without nut (352).



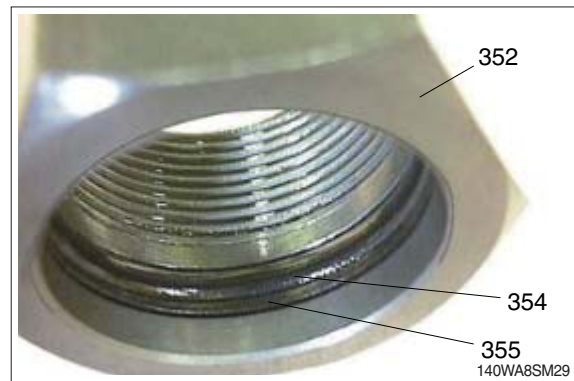
- ② Tighten the cartridge to the required torque.

· Tightening torque : $20.3 \pm 2.1 \text{ kgf} \cdot \text{m}$
($147 \pm 15 \text{ lbf} \cdot \text{ft}$)

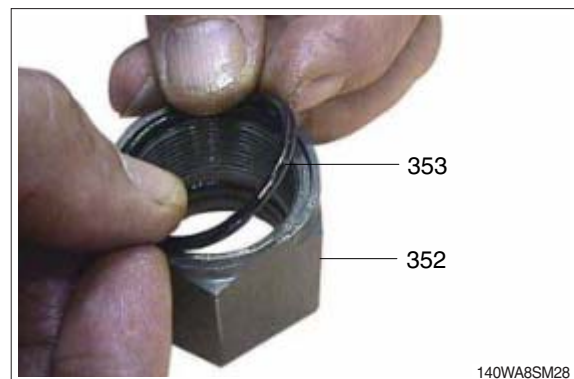


- ③ Grease and install the back-up (355) and the O-ring (354) in the nut groove (352).

※ The O-ring (354) must be installed towards the thread.



- ④ Grease and install the O-ring (353) in the nut spot facing (352).



⑤ Install and tighten the nut (352) to the required torque.

- Tightening torque : $6.1 \pm 0.6 \text{ kgf} \cdot \text{m}$
($44.2 \pm 4.4 \text{ lbf} \cdot \text{ft}$)

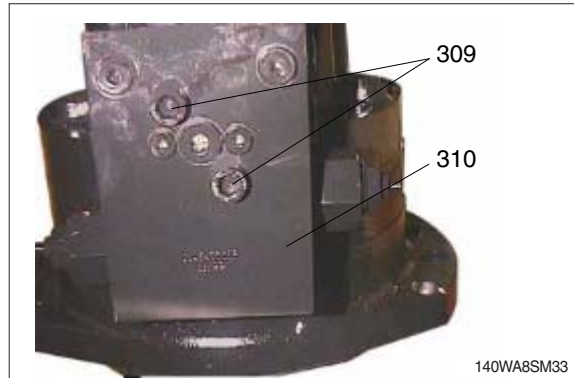


5) REPLACEMENT OF THE BLOCK ASSEMBLY

(1) Removal

- ① Release the pressure in the supply circuit.
- ② Disconnect the drain line at the tank level to avoid its siphoning.
- ③ Disconnect and plug the pipes or hoses which are connected to the block.

- ④ Remove the mounting screws (309).



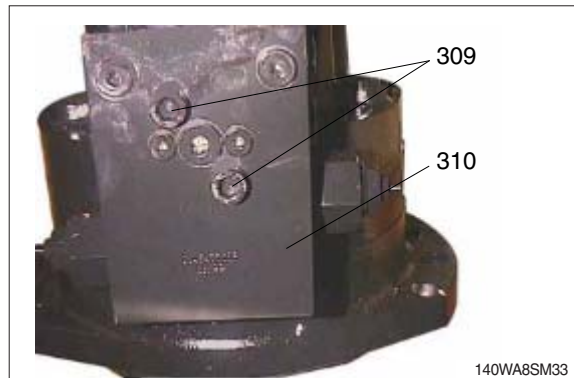
- ⑤ Remove the block (300) and discard the O-rings (308). (See spare parts).

(2) Installation

※ Make sure that the mounting face is clean.

- ① Grease and install new O-rings (308).
- ② Install the block, the mounting face allows one mounting position only.

- ③ Install and tighten the mounting screws (309) to the required torque.



GROUP 6 TRAVEL MOTOR

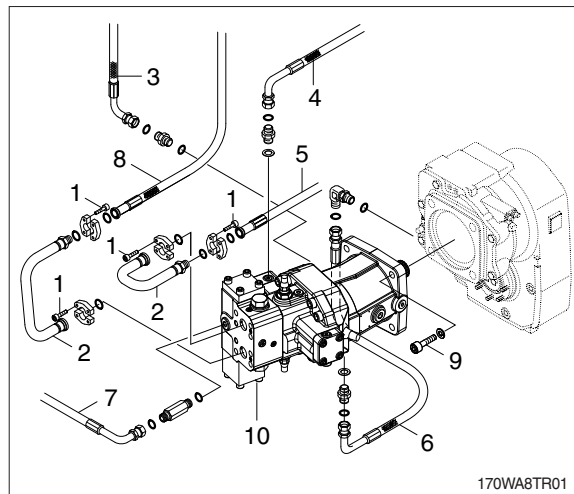
1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- (4) Loosen the socket bolt (1) and remove the pipes (2).
 - (5) Disconnect hoses (3, 4, 5, 6, 7, 8).
 - (6) Loosen the socket bolt (9) and remove travel motor (10).
 - Weight : 80 kg (180 lb)
 - Tightening torque : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214 \pm 23.1 \text{ lbf} \cdot \text{ft}$)
- ※ When removing the travel motor assembly, check that all the hoses have been disconnected.



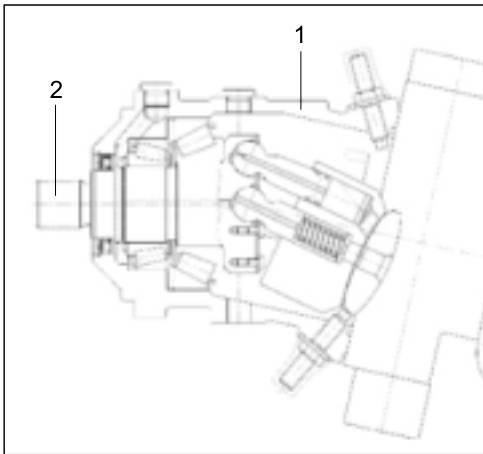
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. STRUCTURE (1/3)

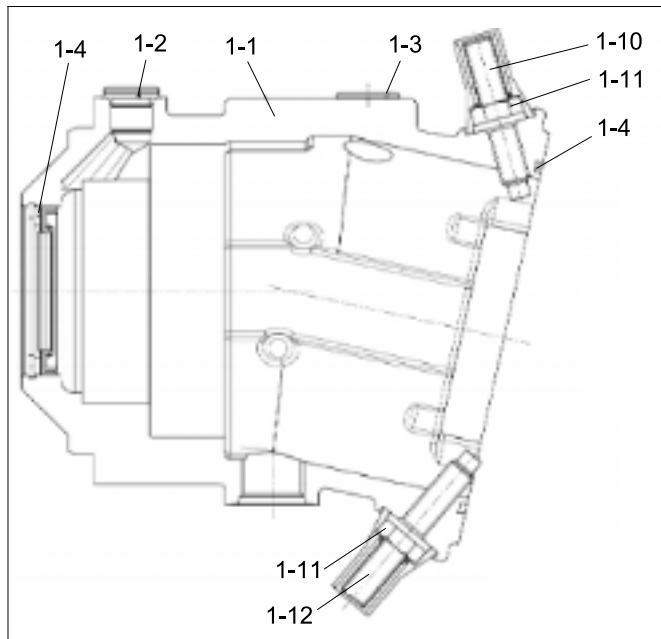
1) HIGH SPEED

MOTOR ASSY

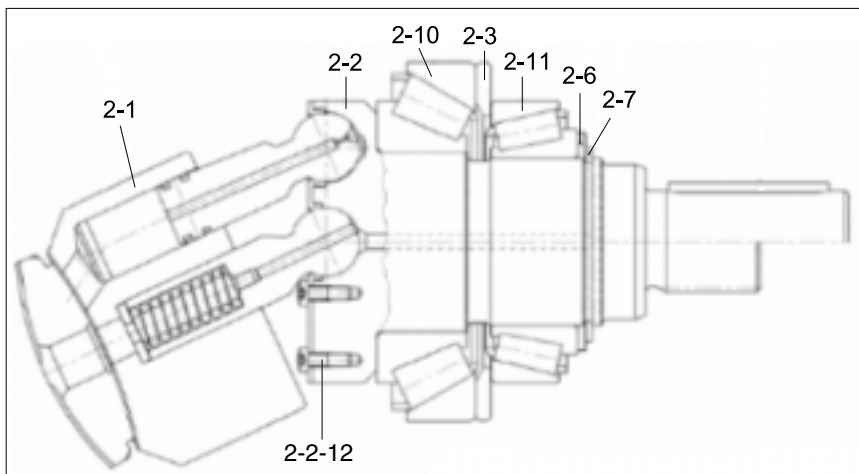


- 1 Motor housing assy
- 2 Rotary kit

ITEM 1



ITEM 2

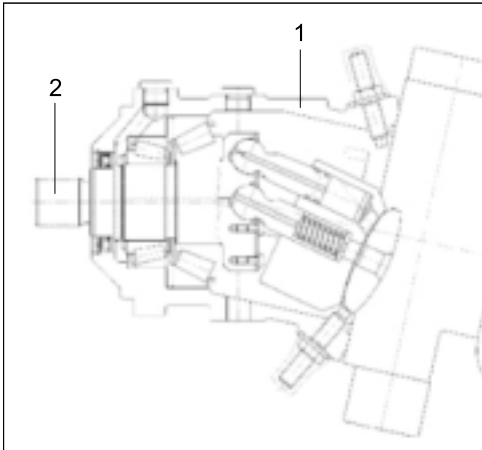


140WA2TR10

- | | | |
|--------------------|------------------------------|---------------------|
| 1-1 Housing | 1-11 Sealing nut | 2-3 Shim |
| 1-2 Lock screw | 1-12 Threaded pin | 2-6 Backup plate |
| 1-3 Lock screw | 2-1 Hydraulic rotary section | 2-7 Retainer ring |
| 1-4 Motor seal kit | 2-2 Drive shaft | 2-10 Roller bearing |
| 1-10 Threaded pin | 2-2-12 Screw | 2-11 Roller bearing |

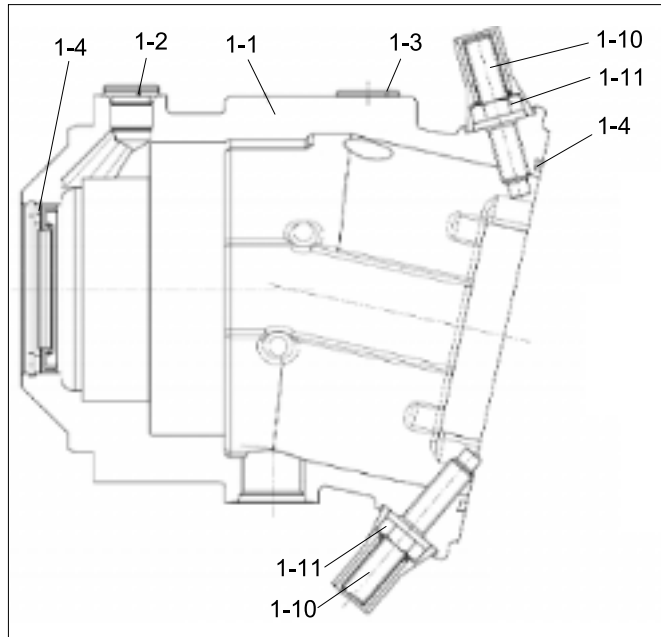
2) LOW SPEED

MOTOR ASSY

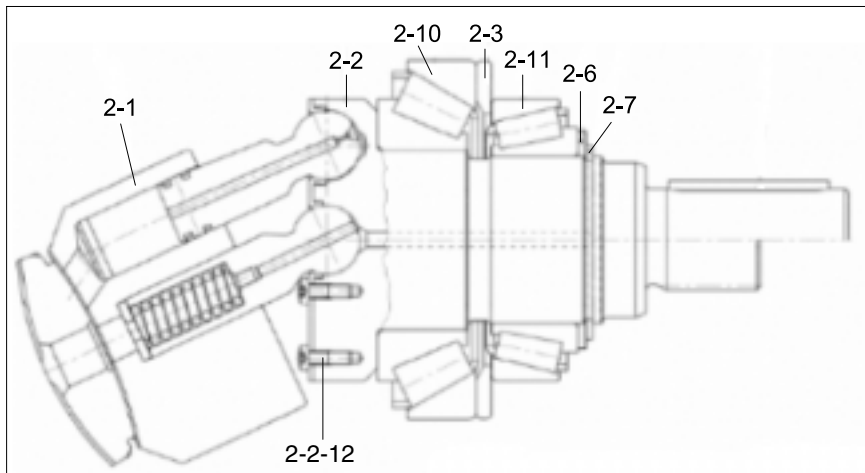


- 1 Motor housing assy
- 2 Rotary kit

ITEM 1



ITEM 2



140WA2TR11

- | | | |
|--------------------|------------------------------|---------------------|
| 1-1 Housing | 1-11 Sealing nut | 2-6 Backup plate |
| 1-2 Lock screw | 2-1 Hydraulic rotary section | 2-7 Retainer ring |
| 1-3 Lock screw | 2-2 Drive shaft | 2-10 Roller bearing |
| 1-4 Motor seal kit | 2-2-12 Screw | 2-11 Roller bearing |
| 1-10 Threaded pin | 2-3 Shim | |

STRUCTURE (2/3)

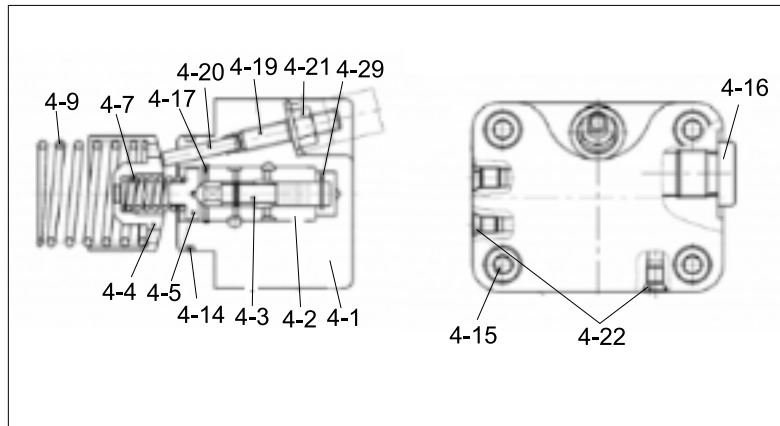
1) HIGH SPEED

MOTOR ASSY

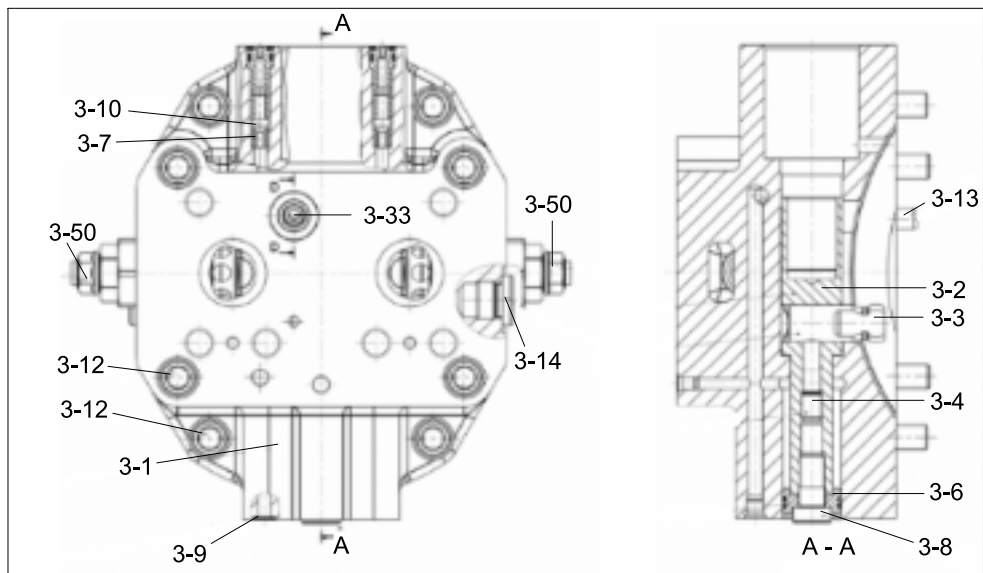


- 3 Port plate assy
- 4 Control unit

ITEM 4



ITEM 3

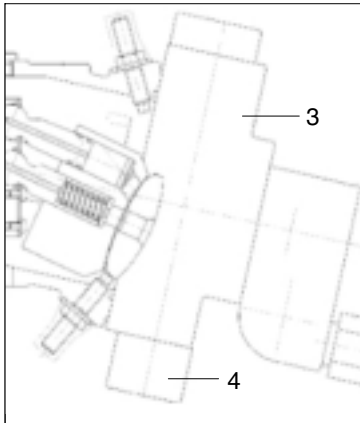


160WA2TR12

- | | | |
|--------------------------|---------------------|---------------------|
| 3-1 Port plate | 3-13 Cylinder pin | 4-9 Pressure spring |
| 3-2 Positioning piston | 3-14 Locking screw | 4-14 O-ring |
| 3-3 Positioning trunnion | 3-33 O-ring | 4-15 Socket screw |
| 3-4 Threaded pin | 3-50 Relief valve | 4-16 Locking screw |
| 3-6 Piston ring | 4-1 Control housing | 4-17 Retainer ring |
| 3-7 Bushing | 4-2 Control bushing | 4-19 Thread pin |
| 3-8 Socket screw | 4-3 Control piston | 4-20 Cylinder pin |
| 3-9 O-ring | 4-4 Adjust bushing | 4-21 Seal lock nut |
| 3-10 Check valve | 4-5 Spring collar | 4-22 Break pin |
| 3-12 Socket screw | 4-7 Pressure spring | 4-29 Retainer disc |

2) LOW SPEED

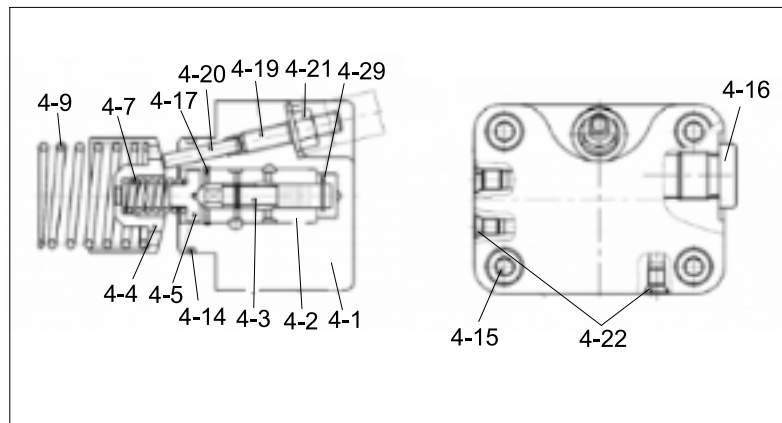
MOTOR ASSY



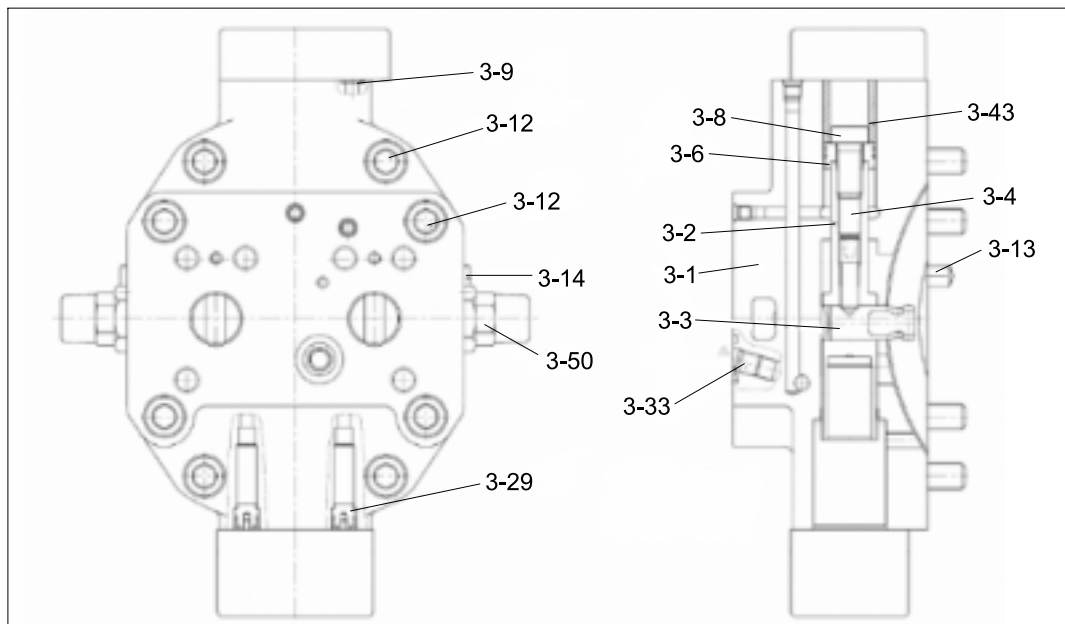
3 Port plate assy

4 Control unit

ITEM 4



ITEM 3



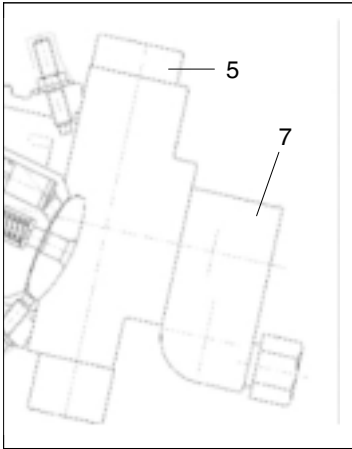
160WA2TR13

- | | | |
|--------------------------|---------------------|---------------------|
| 3-1 Port plate | 3-29 Plug | 4-9 Pressure spring |
| 3-2 Positioning piston | 3-33 O-ring | 4-14 O-ring |
| 3-3 Positioning trunnion | 3-43 Stop bushing | 4-15 Socket screw |
| 3-4 Threaded pin | 3-50 Relief valve | 4-16 Locking screw |
| 3-6 Piston ring | 4-1 Control housing | 4-17 Retainer ring |
| 3-8 Socket screw | 4-2 Control bushing | 4-19 Thread pin |
| 3-9 O-ring | 4-3 Control piston | 4-20 Cylinder pin |
| 3-12 Socket screw | 4-4 Adjust bushing | 4-21 Seal lock nut |
| 3-13 Cylinder pin | 4-5 Spring collar | 4-22 Break pin |
| 3-14 Locking screw | 4-7 Pressure spring | 4-29 Retainer disc |

STRUCTURE (3/3)

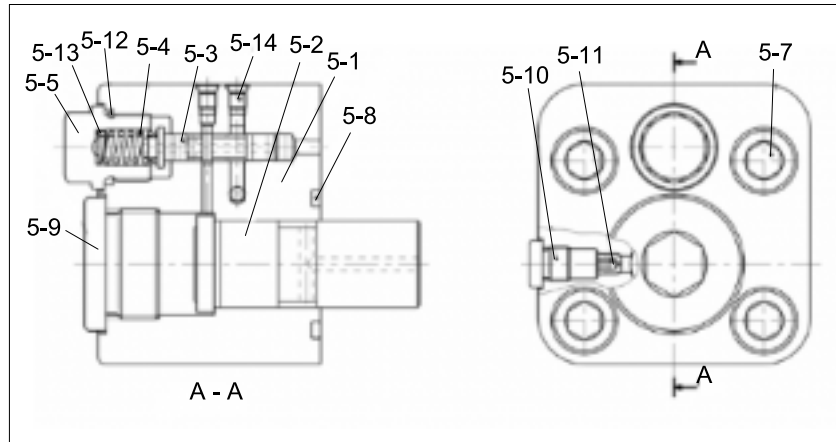
1) HIGH SPEED

MOTOR ASSY

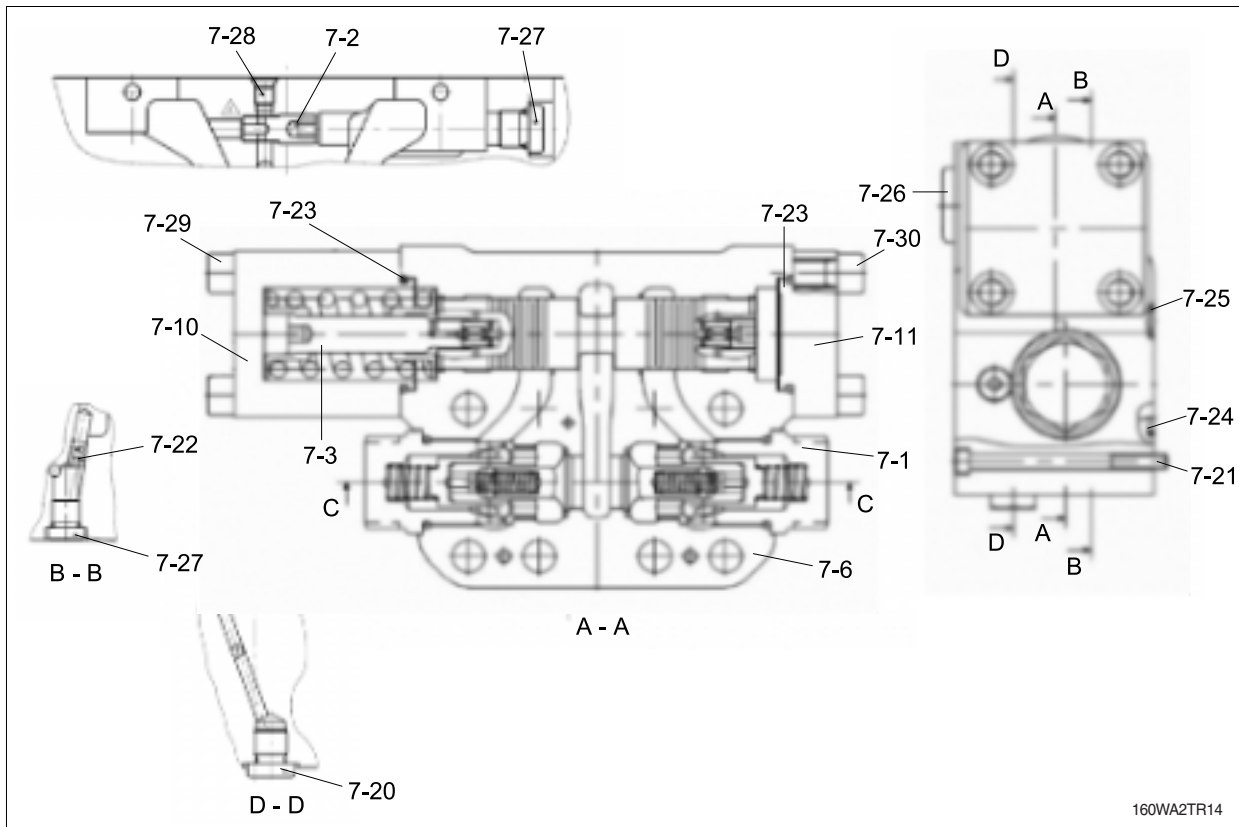


- 5 Hydraulic stroke limiter
- 7 Motion control valve assy

ITEM 5



ITEM 7

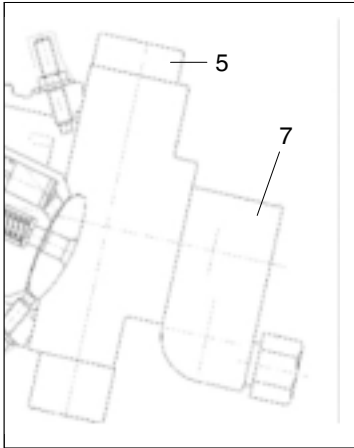


160WA2TR14

- | | | |
|---------------------|------------------------|--------------------|
| 5-1 Limiter housing | 5-12 O-ring | 7-21 Socket screw |
| 5-2 Piston | 5-13 Shim | 7-22 Plug |
| 5-3 Control piston | 5-14 Break pin | 7-23 O-ring |
| 5-4 Pressure spring | 7-1 Control valve assy | 7-24 O-ring |
| 5-5 Lock screw | 7-2 Shuttle valve | 7-25 O-ring |
| 5-7 Cap screw | 7-3 Brake piston assy | 7-26 Locking screw |
| 5-8 O-ring | 7-6 Housing | 7-27 Locking screw |
| 5-9 Lock screw | 7-10 Cover | 7-28 Break pin |
| 5-10 Lock screw | 7-11 Cover | 7-29 Socket screw |
| 5-11 Orifice | 7-20 Locking screw | 7-30 Socket screw |

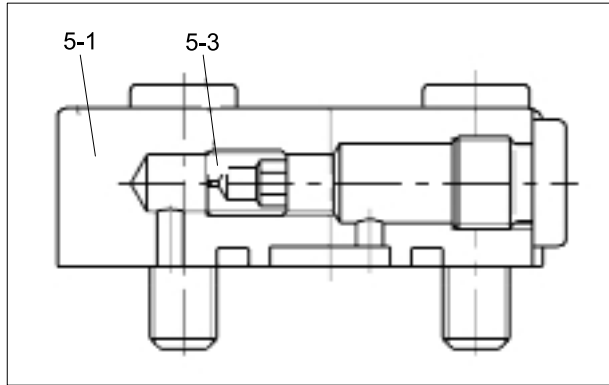
2) LOW SPEED

MOTOR ASSY

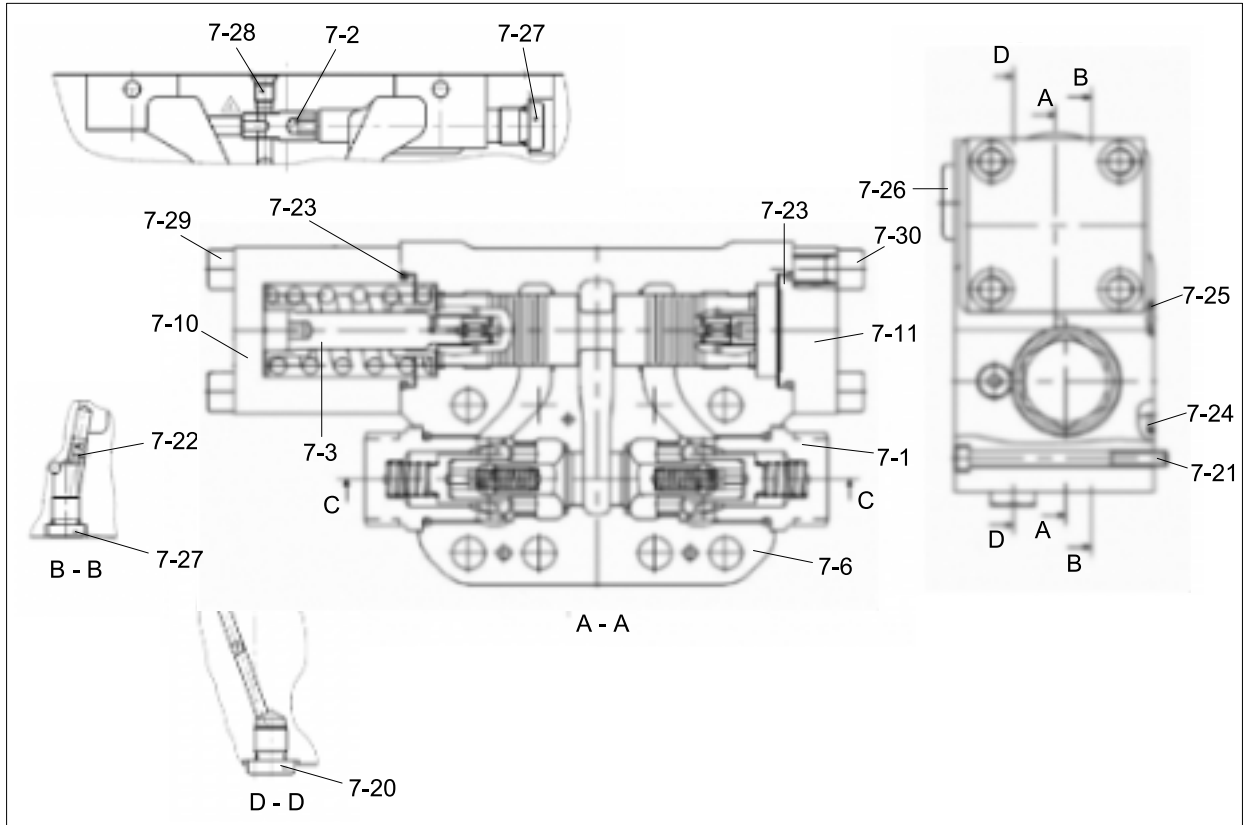


- 5 Hydraulic stroke limiter
- 7 Motion control valve assy

ITEM 5



ITEM 7



- 5-1 Cover
- 5-3 Throttle screw
- 7-1 Control valve assy
- 7-2 Shuttle valve
- 7-3 Brake piston assy
- 7-6 Housing
- 7-10 Cover

- 7-11 Cover
- 7-20 Locking screw
- 7-21 Socket screw
- 7-22 Plug
- 7-23 O-ring
- 7-24 O-ring
- 7-25 O-ring

- 7-26 Locking screw
- 7-27 Locking screw
- 7-28 Break pin
- 7-29 Socket screw
- 7-30 Socket screw

160WA2TR15

3. TIGHTENING TORQUE

The torques given are standard figures. Any figures specifically described in the procedure has priority.

Page	Item	Size	kgf · m	lbf · ft
8-54, 55	1-2	M22 × 1.5	6.1	44
	1-3	M26 × 1.5	7.1	51
	1-11	M12	7.0	50.9
	2-2-12	M 6 × 20	1.4	10.3
8-58	5-5	-	32.6	236
	5-7	M10 × 1.0	5.2	37.6

4. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

(1) Disassembly

- ① Before disassembling the motor, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.
- ② To disassemble the motor, use the disassembling procedures described in section 2) and select a clean place.
- ③ Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.
- ④ During disassembly, give a match mark to the mating surfaces of each part.
- ⑤ Arrange removed parts in order so that they will not become damaged or missing during disassembly.
- ⑥ Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

(2) Assembly

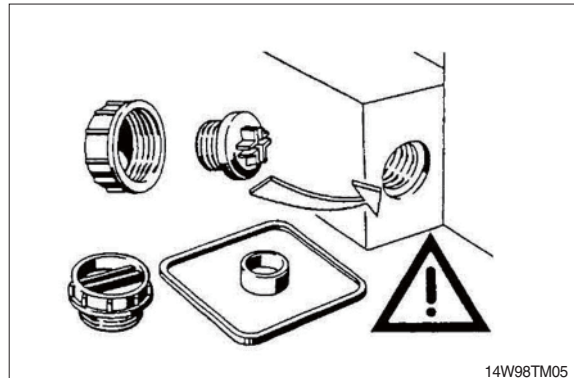
- ① Reassemble in a work area that is clean and free from dust and grit.
- ② Handle parts with bare hands to keep them free of linty contaminants.
- ③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.
- ④ Do not reuse O-ring oil seal and floating seal that were removed in disassembly.
Provide the new parts.
- ⑤ Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
- ⑥ When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above)
- ⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

2) SEAL KITS AND COMPONENT GROUPS

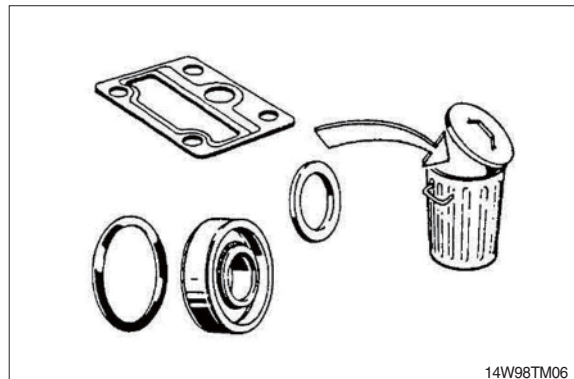
Observe the following notices when carrying out repair work at hydraulic aggregates.



(1) Close all ports of the hydraulic aggregates.

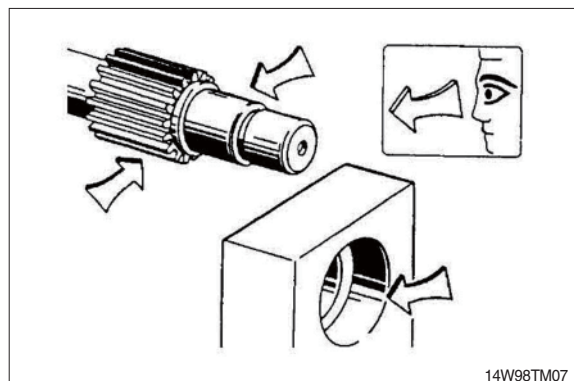


(2) Replace all seals.
Use only original spare parts.

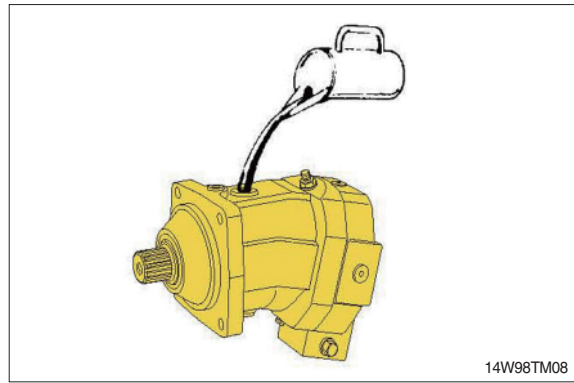


(3) Check all seal and sliding surfaces for wear.

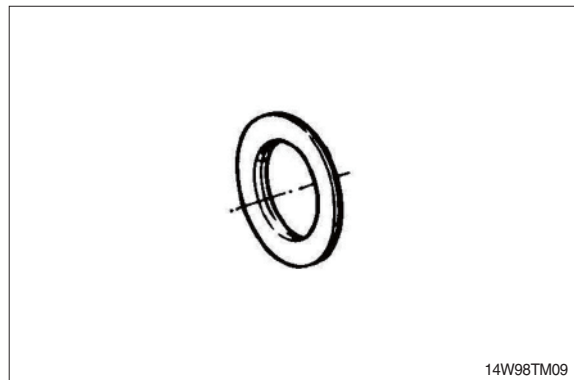
※ Rework of sealing area f.ex. with abrasive paper can damage surface.



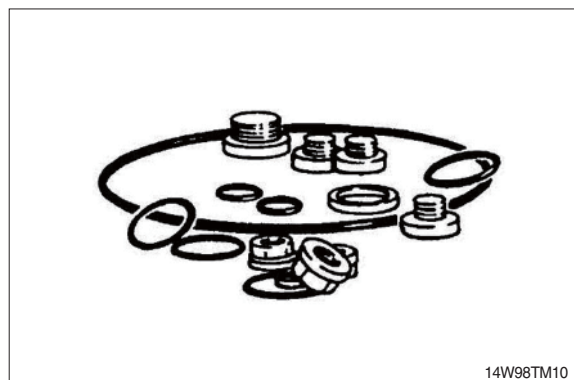
- (4) Fill up hydraulic aggregates with hydraulic oil before start up.
※ Without fill up bearing damage happens!



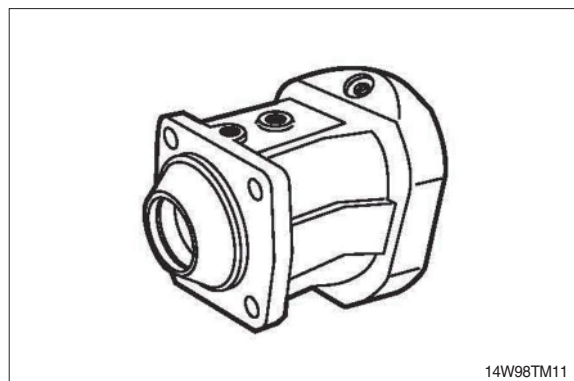
- (5) Seal kit for drive shaft



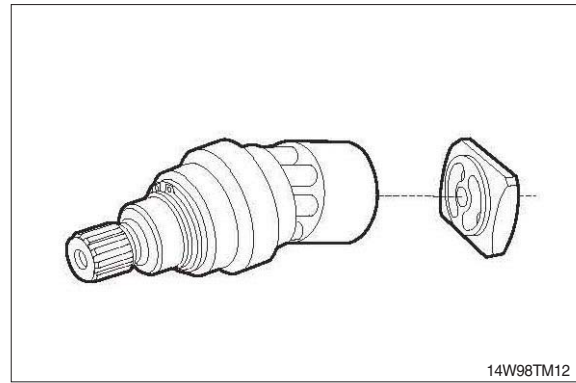
- (6) External seal kit.



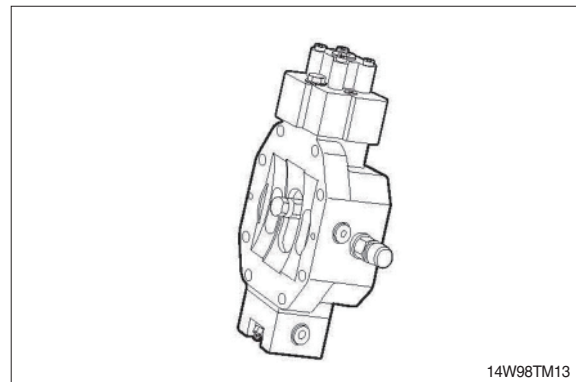
- (7) Housing.



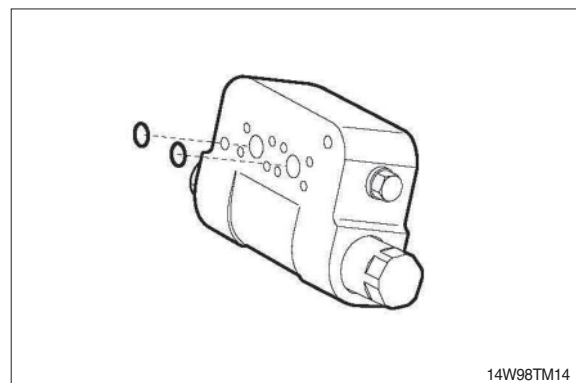
(8) Complete rotary group.



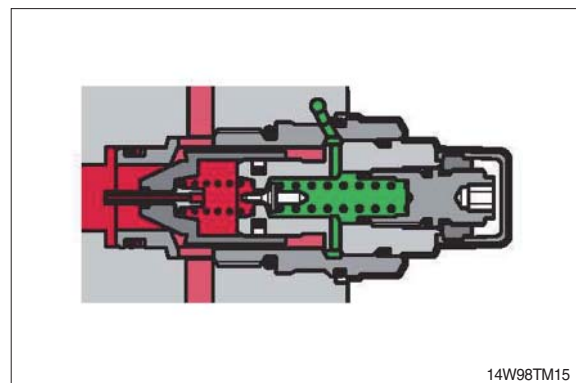
(9) Port plate with control piston.



(10) Counter balance valve.

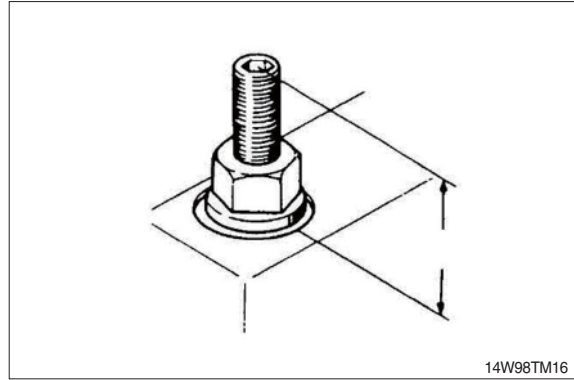


(11) Relief valve.

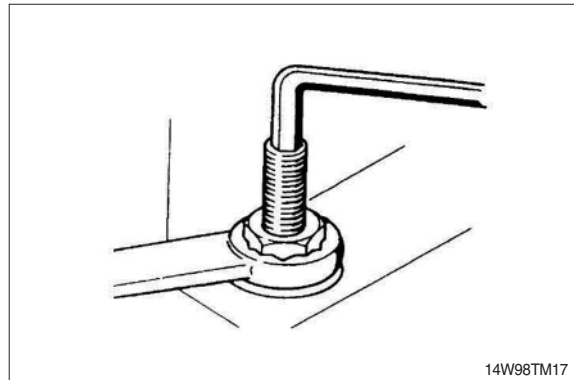


3) SEAL NUT

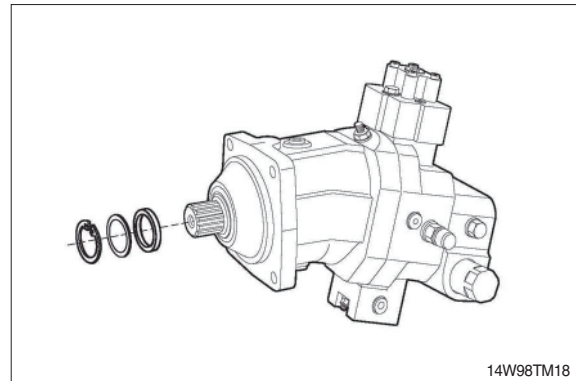
- (1) Replace seal nut.
First measure and record setting height.



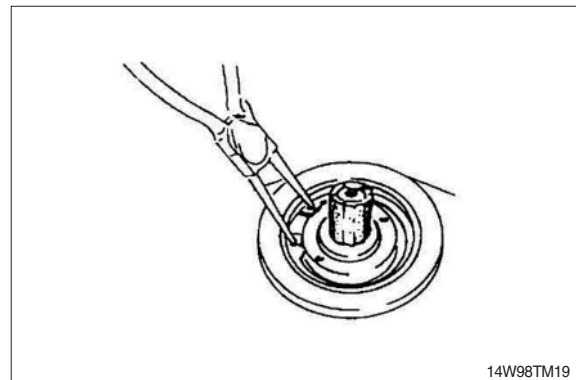
- (2) When tightening, counterhold setting screw, then check setting height.



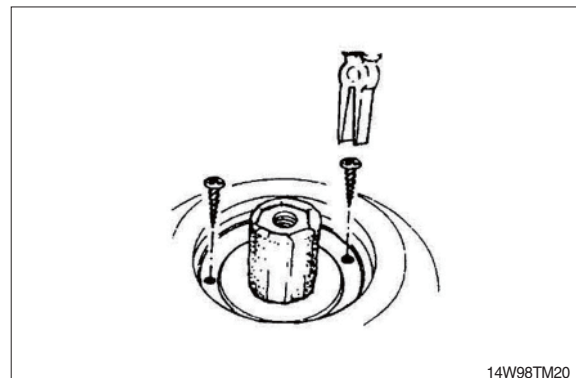
4) SEALING THE DRIVE SHAFT



- (1) Protecting the drive shaft.
Remove retaining ring and shim.



- (2) Screw in sheet metal screw into the holes fitted with rubber.
Pull out seal with pliers.

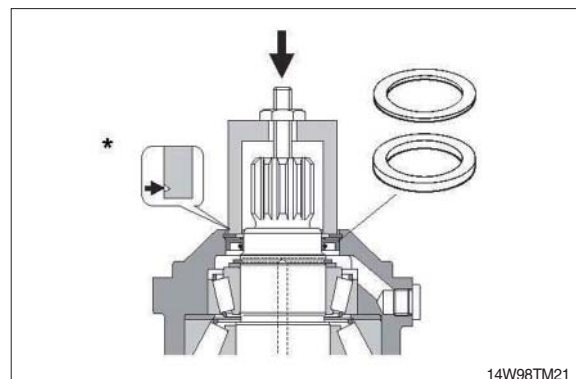


- (3) Press in shaft seal and shim with bush to stop.

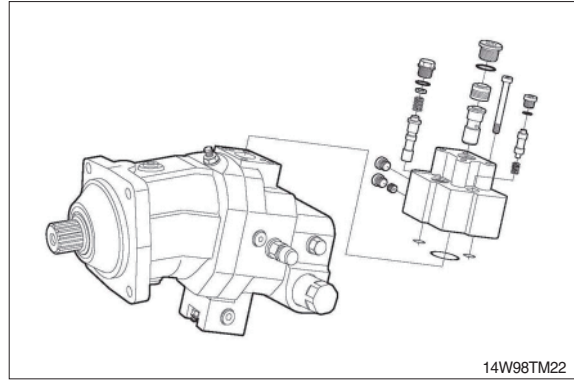
▲ Pay attention to pressing depth.

* Mark for pressing depth.

Assemble retaining ring.

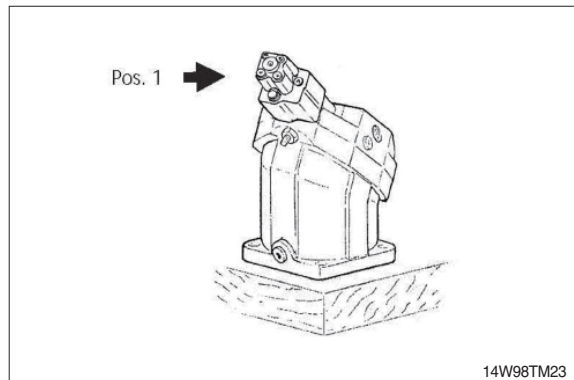


5) SEALING OF THE CONTROL PARTS



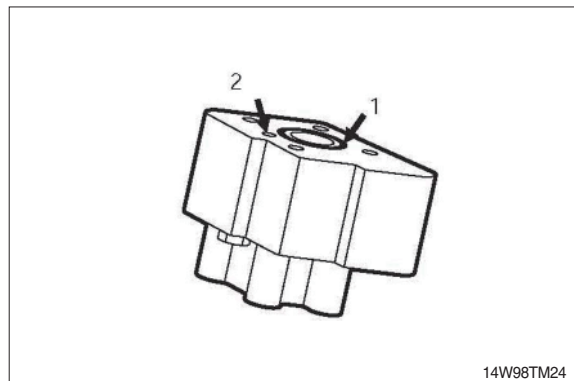
(1) Disassembly position

Remove cover pos. 1.

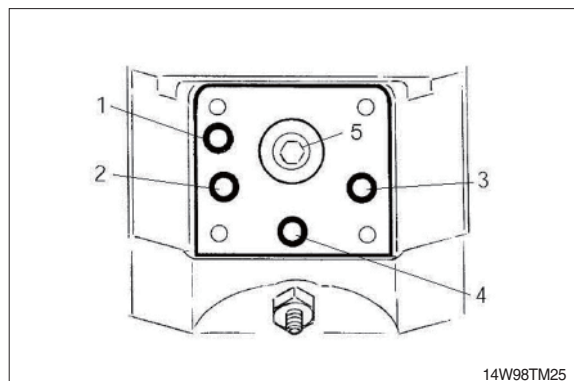


- 1 O-ring
- 2 Input flow of oil control

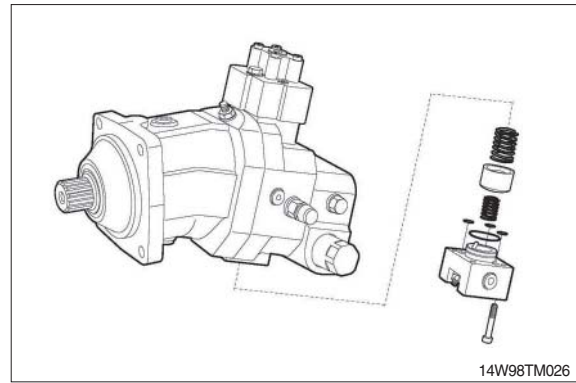
※ Installation position differs according to the control components.



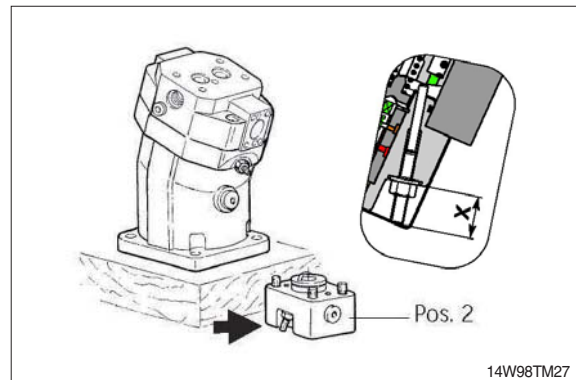
- 1 Input flow of oil control
- 2 High pressure / Low pressure
- 3 High pressure / Low pressure
- 4 Leakage oil
- 5 Control piston



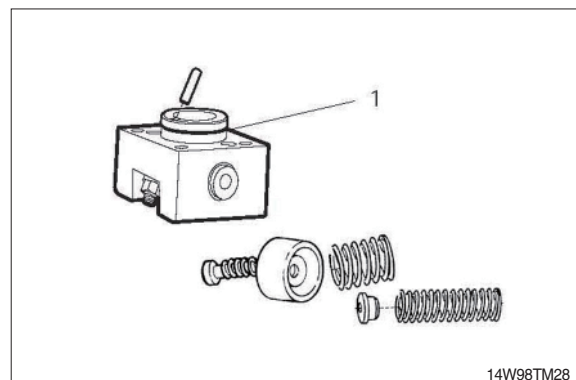
- (2) Disassembly position : Remove cover 2.
- ※ Attention spring load.



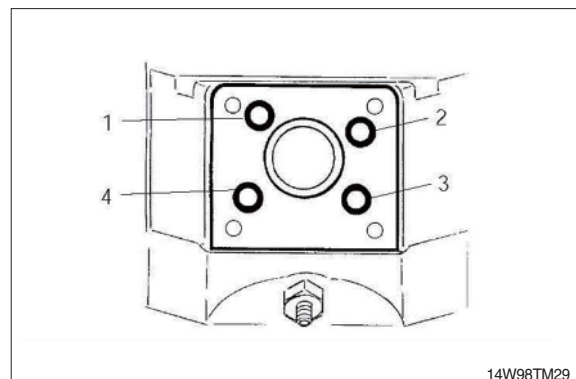
- ※ Dimension X : Note dimension (begin of regulation)



1 Check of O-ring

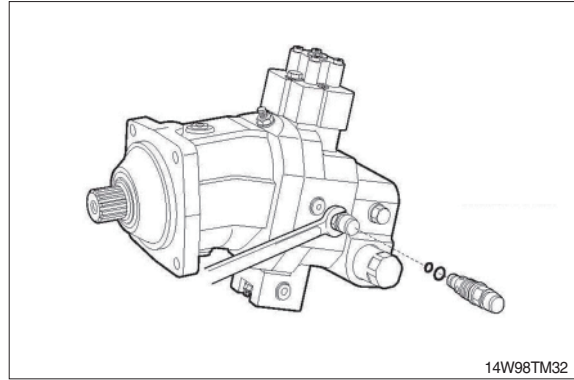


- 1 O-ring / High pressure-small control position side
- 2 O-ring / Control pressure
- 3 O-ring / High pressure-check valve
- 4 O-ring / High pressure-check valve

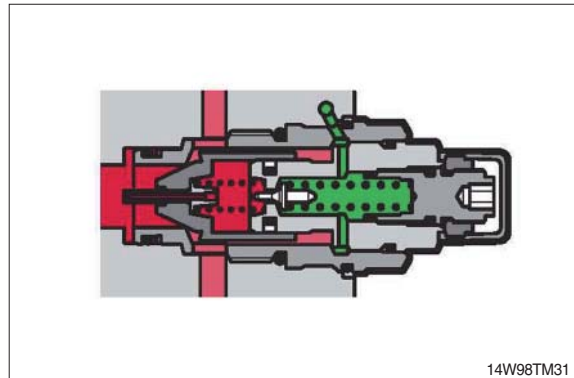


6) SEALING OF THE RELIEF VALVE / COUNTER BALANCE VALVE

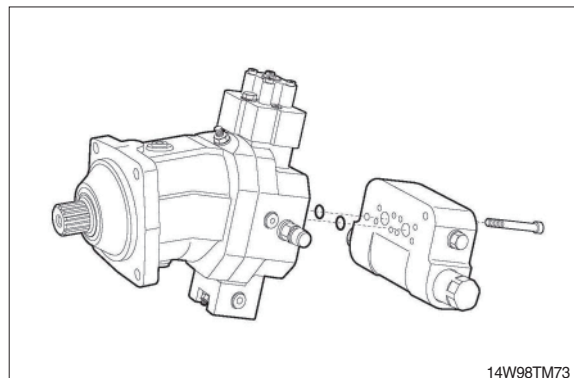
(1) Remove relief valve.



(2) Inspect
O-ring



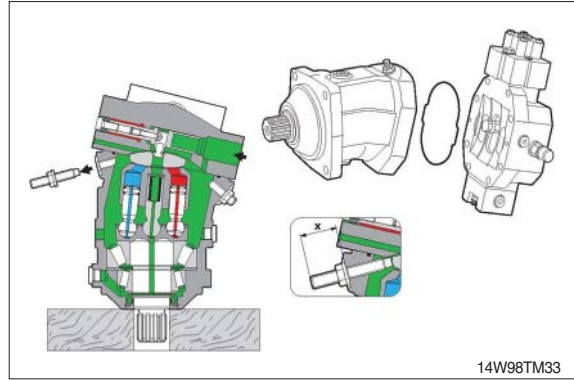
(3) Remove counter-balance valve.
Inspect
O-ring



7) DISASSEMBLY OF THE PORT PLATE

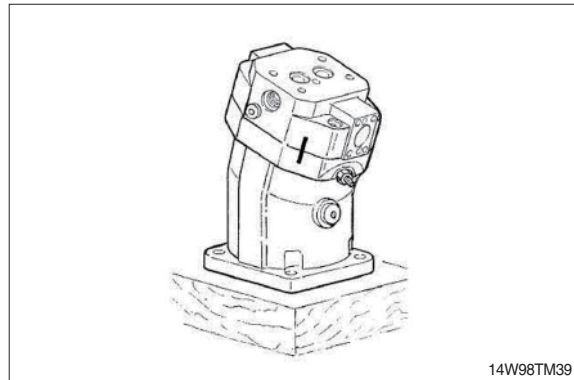
- Note dimension X
- Remove Q_{min} screw
- Swivel rotary group to zero P

※ For disassembly of the port plate, swivel always rotary group to zero position. Piston rings to hang out of the cylinder boring.



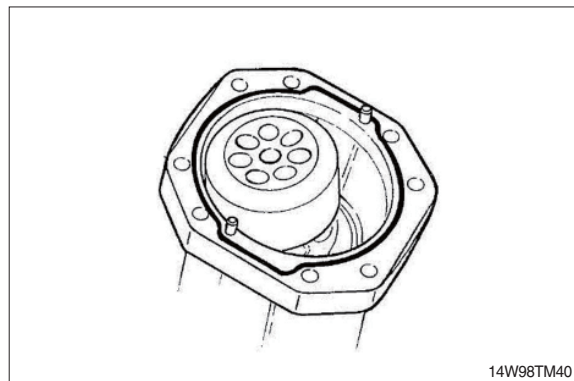
(1) Port plate.

Mark position. Loosen screws.
Removal.

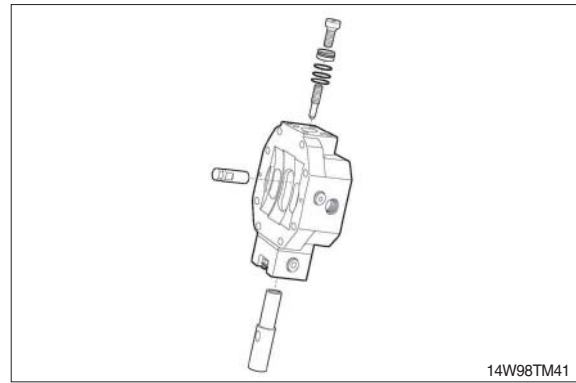


(2) Check O-ring.

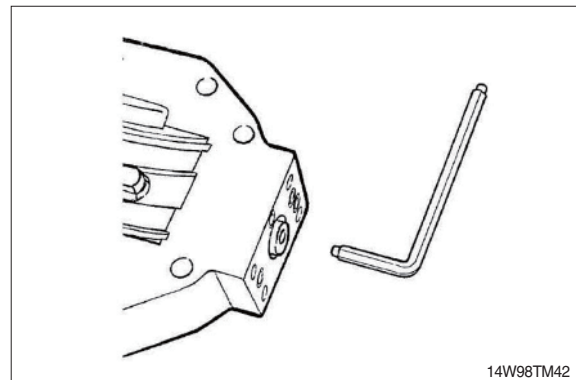
※ Stick new O-ring with some grease.
Do not swivel rotary group.
Piston rings to hang out from the
cylinder boring.



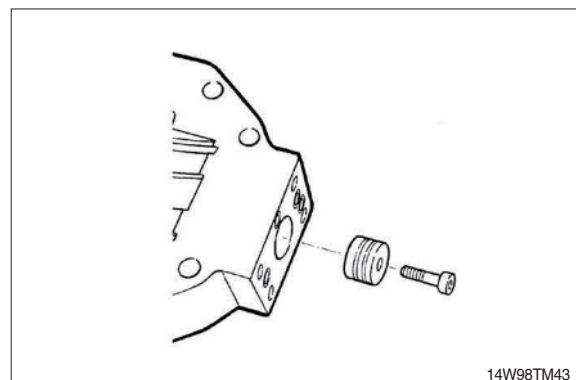
8) REMOVE OF THE POSITIONING PISTON



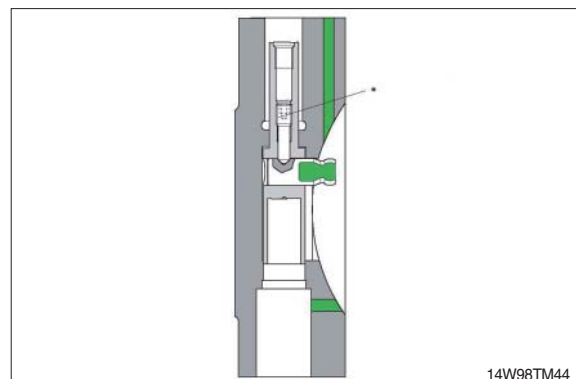
- (1) Loosen fixing screw.
Use only socket wrench.



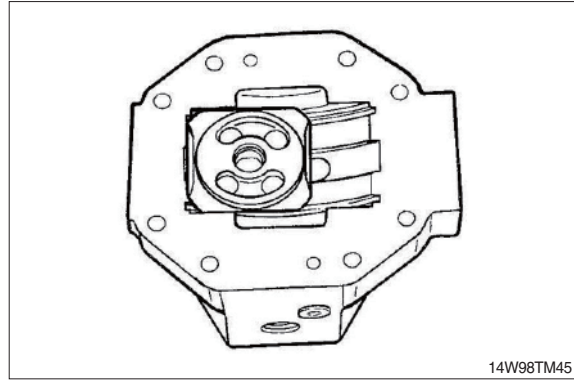
- (2) Remove piston with piston ring.



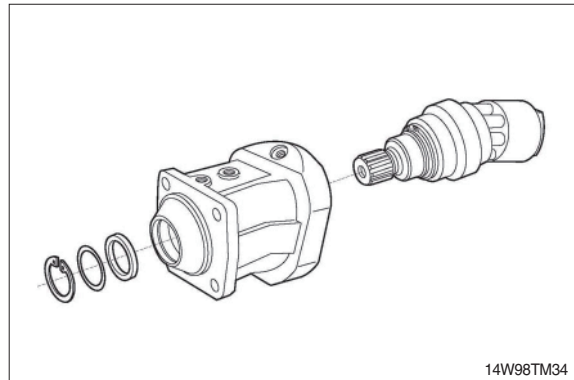
- (3) Warm up fixation screw * for positioning plug via boring (screw glued-to turn out).
※ Use new screw.
Precote coating.
Note tightening torque.



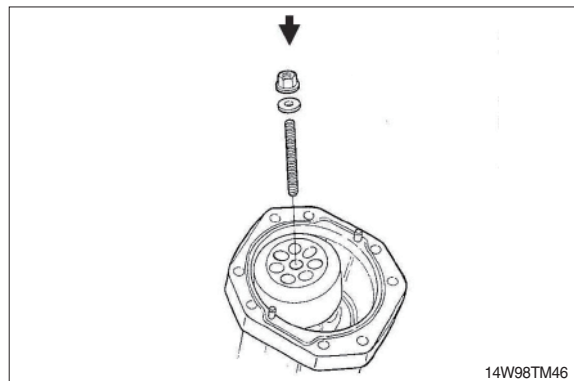
- ※ Stick control lens in sliding surface with grease. Assembly in reversal order. Mount port plate.
- ※ Rotary group vertical.



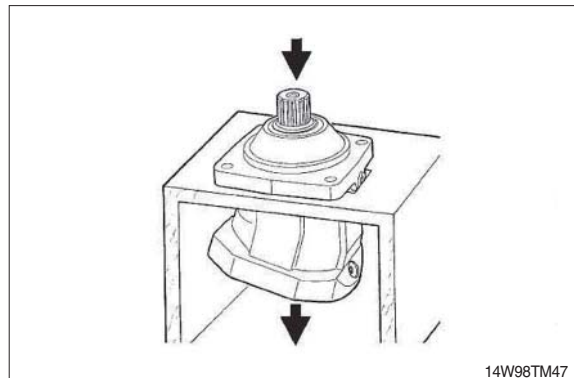
9) REMOVE ROTARY GROUP



- (1) Screw in threaded pin into center pin.
Fix the cylinder with disc and locknut.
M8×105 ℓ

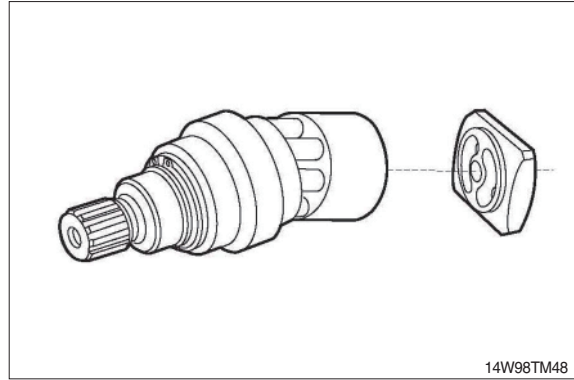


- (2) Press out rotary group.
 - ※ If the bearings are used again do not hit on the drive shaft.



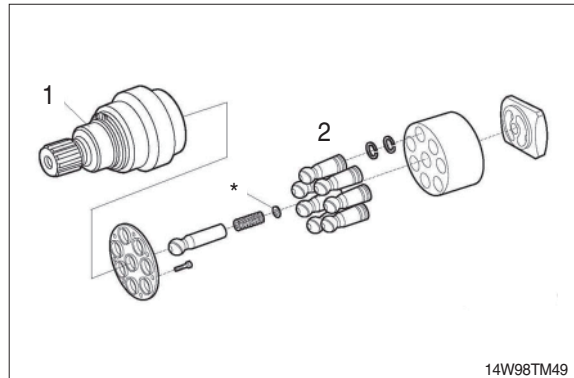
10) EXCHANGING OF THE ROTARY GROUP

- ※ Complete rotary group
Setting of hydraulic part necessary.

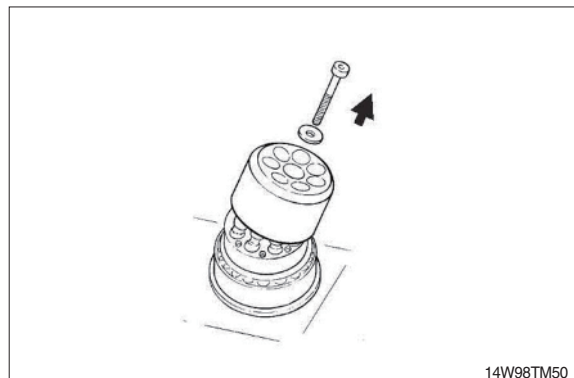


Rotary group

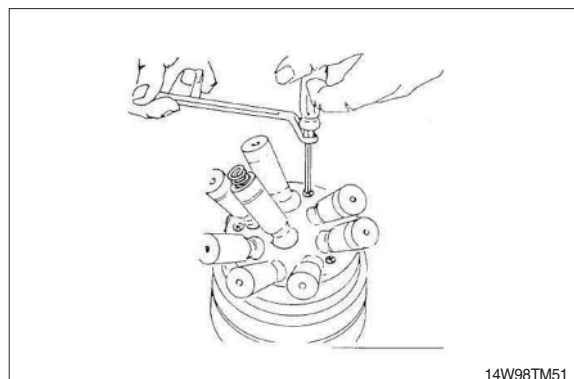
- 1 Mechanical part : Adjust drive shaft with bearing
- 2 Hydraulic part : Adjustment necessary



- (1) Remove fixing screw (cylinder).
Remove cylinder.

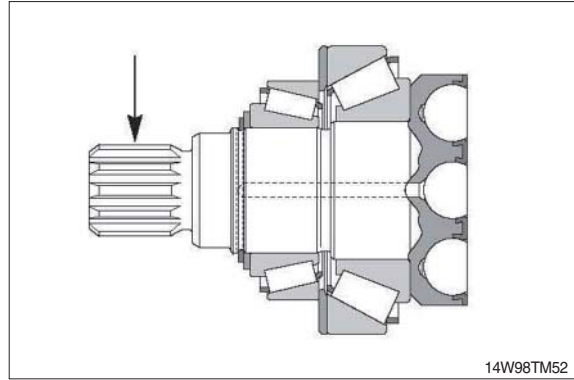


- (2) Disassemble retaining plate.
 - ※ Screws are glued.
 - Use Torx tools.



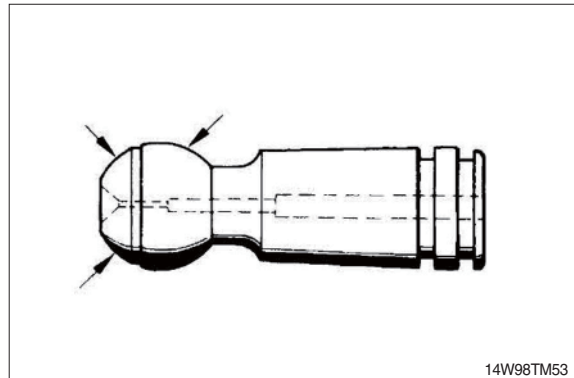
11) INSPECTION INSTRUCTIONS

- (1) Free of corrosion, erosion or fretting; No damage to splines or keyways.



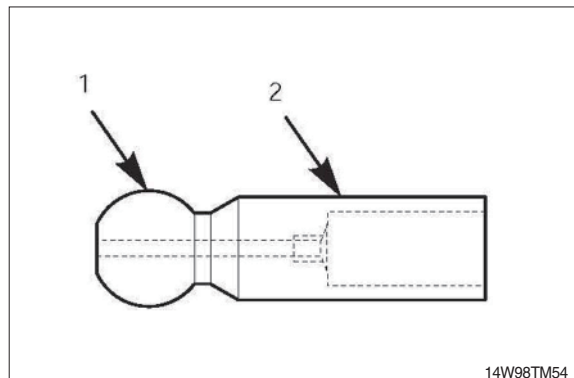
(2) Pistons

- No scoring and no pittings.



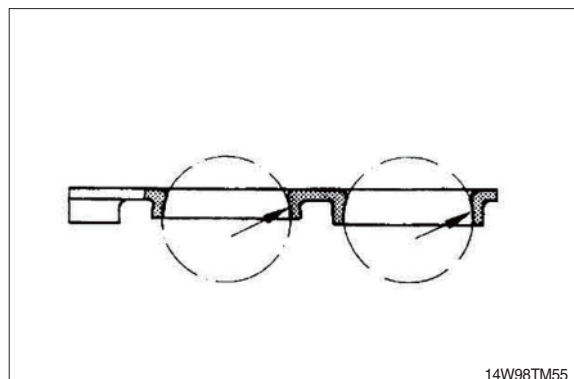
(3) Center pin

- No scoring and no pittings.



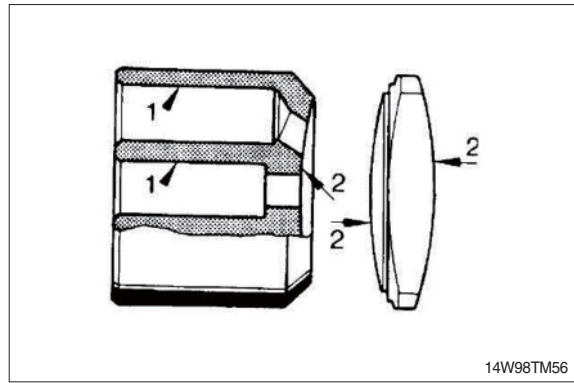
(4) Retaining plate

- No scoring and no evidence of wear.



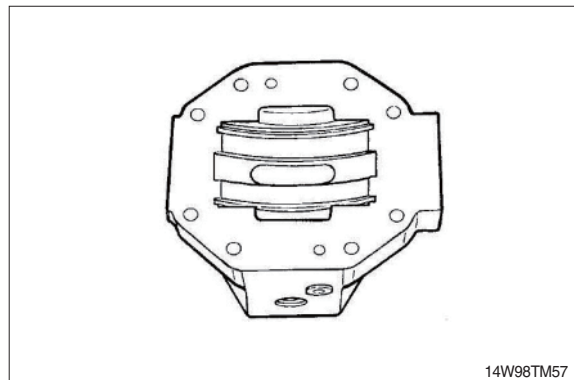
(5) Cylinder block / Control lens

- 1 Bores free of scoring, no evidence of wear
- 2 Faces smooth and even, free of cracks and scoring



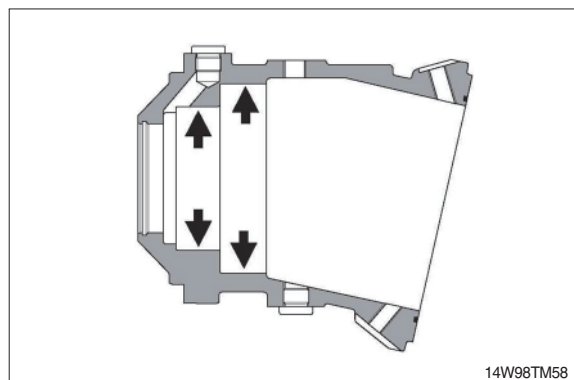
(6) Control housing

Sliding surface and side guides free of scoring and no wear.



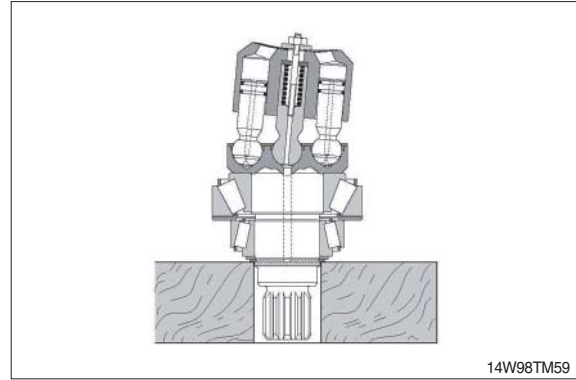
(7) Visual check

Bearing areas free of scoring and no evidence of wear.

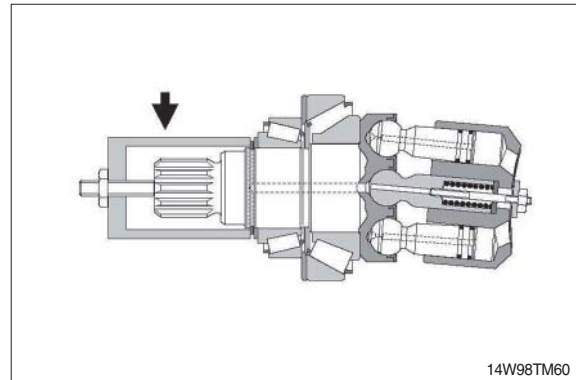


12) ROTARY GROUP ASSEMBLY

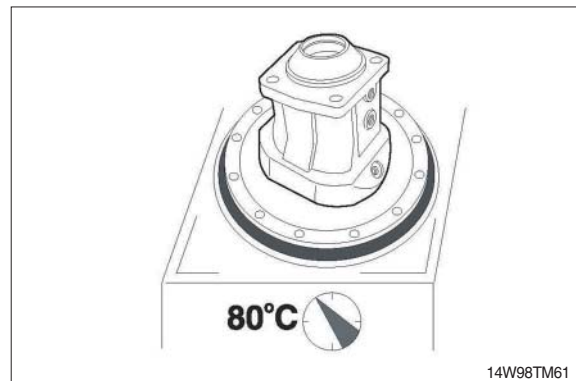
- (1) Rotary group completely assembled ready for assembly.



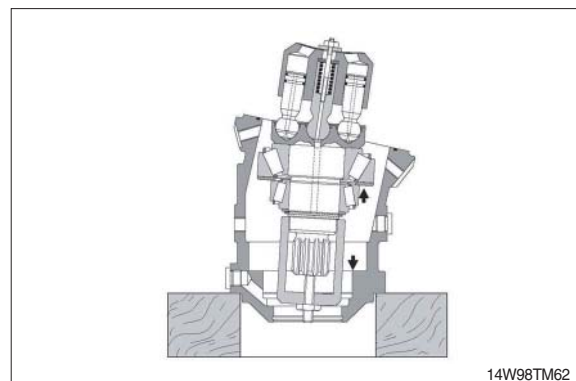
- (2) Place assembly sleeve.



- (3) Warm up housing to 80°C.

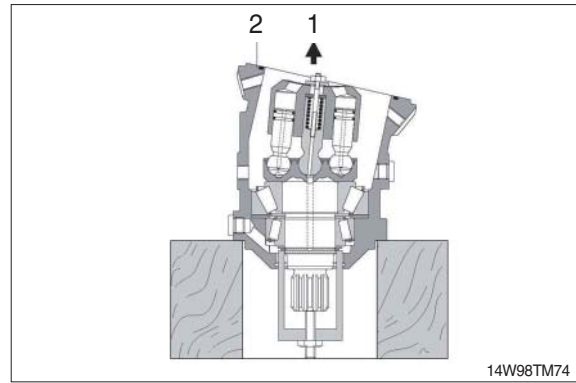


- (4) Insert rotary group into housing to seat position.



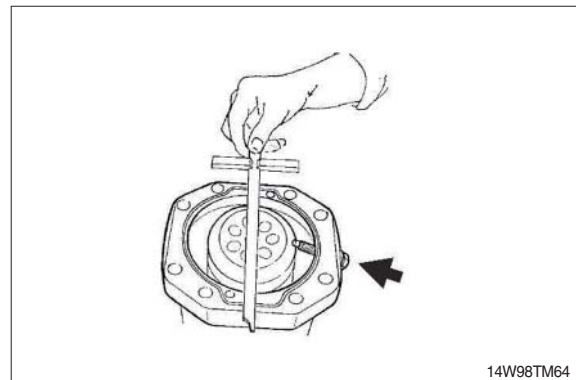
(5) Fix zero position of cylinder with Q_{max} screw.

- 1 Disassemble cylinder fixing screw
- 2 Insert O-ring

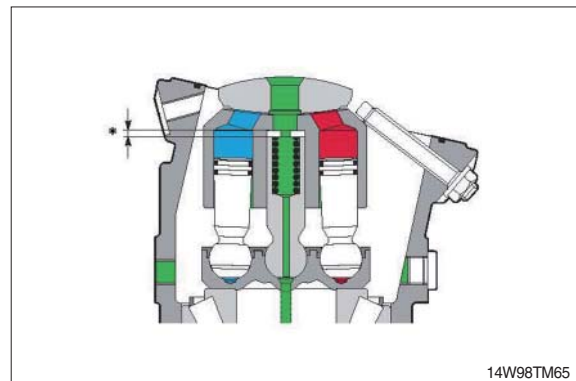


13) ROTARY GROUP ADJUSTMENT

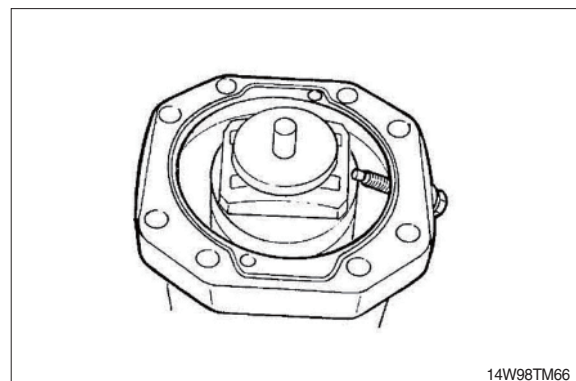
(1) Determine cylinder swivel range to max angle with screw.



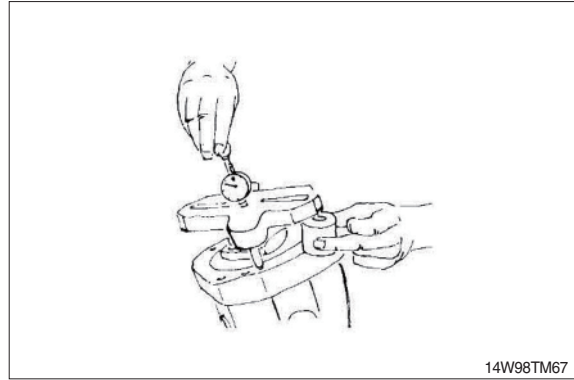
(2) * Disc



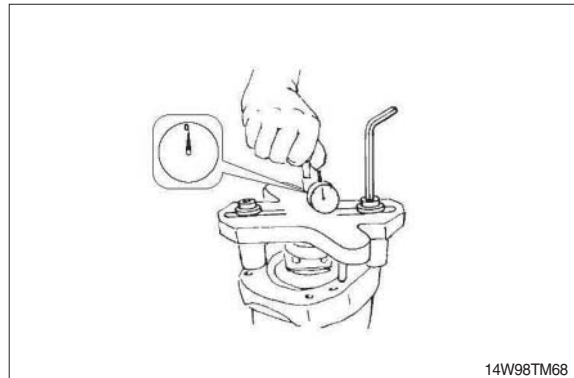
(3) Place centering disc.



(4) Mount measuring device.

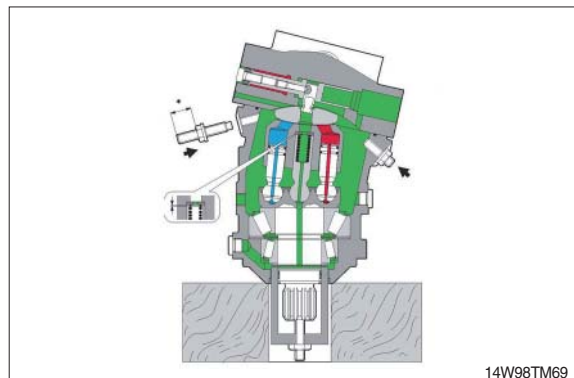


(5) Check dimension X.

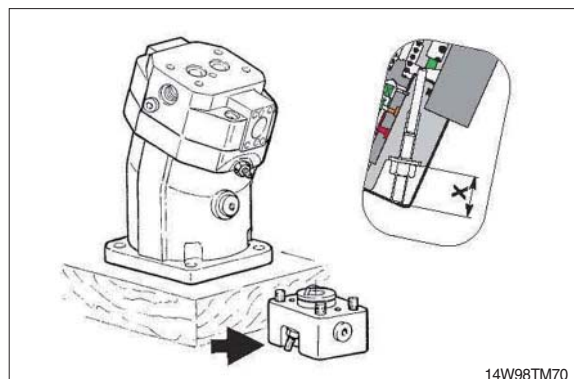


14) ASSEMBLY OF THE PORT PLATE

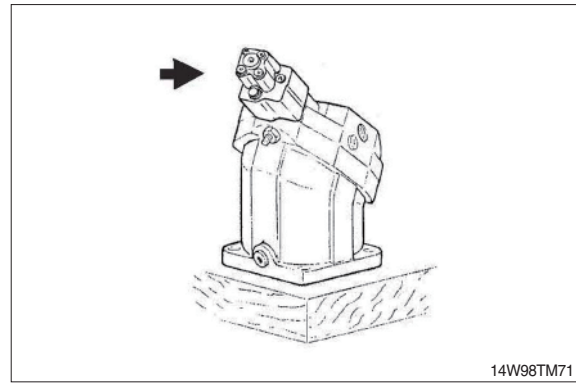
- (1) Assemble port plate.
※ Take care of assembly design.
Tighten fixing screws with torque.
- (2) Set Q_{min} screw to dimension(*).
- (3) Assemble plug.
- (4) Remove assembly sleeve.



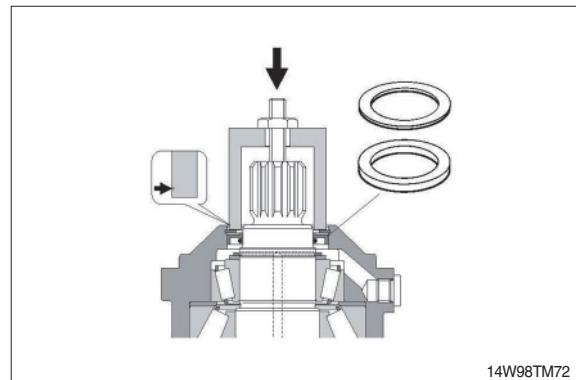
(5) Assemble control components.



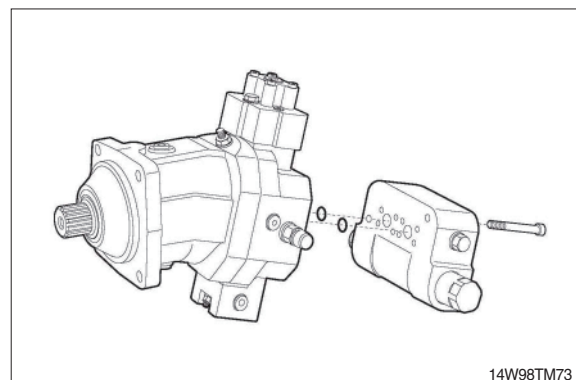
(6) Assemble cover.



(7) Assemble shaft seal, disc and safety ring.
Press in with assembly sleeve.
※ Take care of press in depth.



(8) Assemble counter balance valve.



GROUP 7 TRANSMISSION

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Swing the work equipment 90° and lower it completely to the ground.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Remove the transmission guard plate if equipped.
- (5) Remove the propeller shaft mounting nuts (2).

· Tightening torque : $5.9 \pm 0.6 \text{ kgf} \cdot \text{m}$
($42.7 \pm 4.3 \text{ lbf} \cdot \text{ft}$)

- (6) Remove the travel motor mounting bolt (3).

· Tightening torque : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214 \pm 23.1 \text{ lbf} \cdot \text{ft}$)

- (7) Remove the hoses (4, 6).

Fit blind plugs to the disconnected hoses.

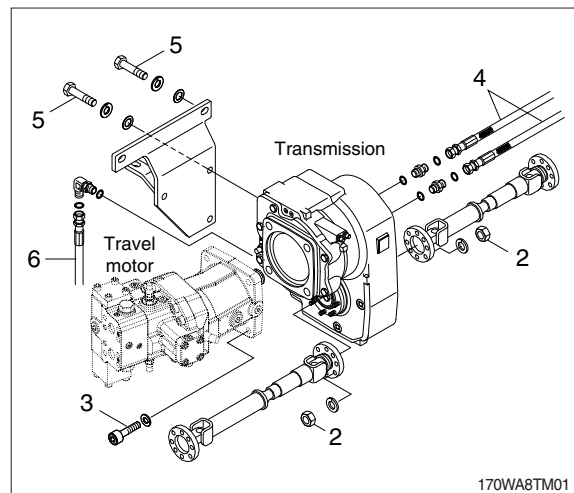
- (8) Remove the mounting bolts (5), then remove the transmission device assembly.

· Weight : 135 kg (298 lb)

· Tightening torque : $39.0 \pm 4.2 \text{ kgf} \cdot \text{m}$
($282 \pm 30.4 \text{ lbf} \cdot \text{ft}$)

2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the transmission.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it overflows from the port.
 - ③ Tighten plug lightly.
 - ④ Start the engine, run at low idling, and check oil come out from plug.
 - ⑤ Tighten plug fully.
- (3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

- (1) This manual has been developed for the skilled serviceman, trained by manufacturer.
- (2) During all operations, pay attention to cleanliness and skilled working.
Therefore, transmission removed from the machine must be cleaned prior to open them.
- (3) We assume that the special tools, specified by manufacturer, will be used.
The special tools are available from manufacturer.
- (4) After the disassembly, all components must be cleaned, especially corners, cavities and recesses of housing and covers.
- (5) The old sealing compound must be carefully removed.
- (6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.
- (7) The latter refers especially to new parts.
- (8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..
- (9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.
- (10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.
- (11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.
- (12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100°C.
- (13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.
- (14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.
- (15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.
- (16) After the repair, units are filled up with oil.
- (17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

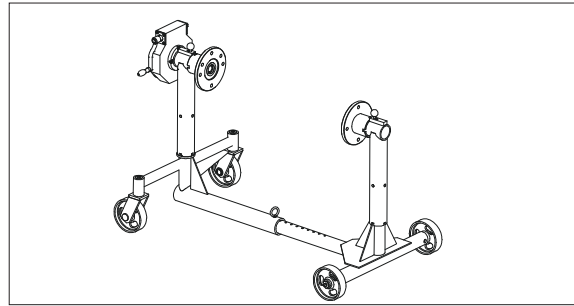
2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

- (1) In principle, repairers are themselves responsible for the labour safety.
- (2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.
- (3) Before starting the work, the repairers have to make themselves familiar with these regulations.
- (4) The proper repair of these products requires especially trained personnel.
- (5) The repairer himself is obliged to provide for the training.

3. SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

1) Assembly truck assy with tilting device

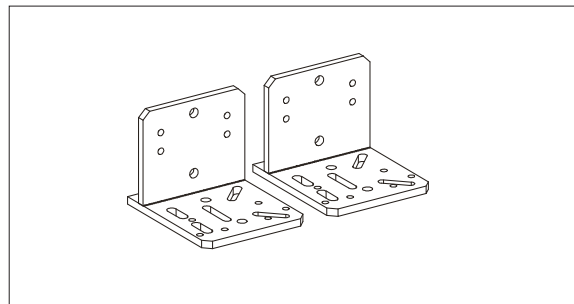
5870 350 000



14WF8TM01

2) Supporting bracket

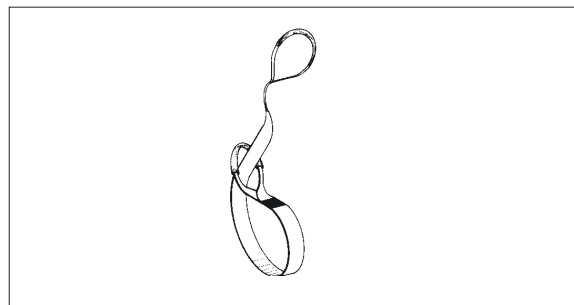
5870 350 106



14WF8TM02

3) Lifting strap

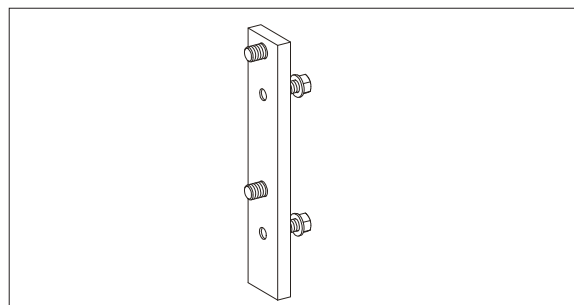
5870 281 026



14WF8TM03

4) Fixture

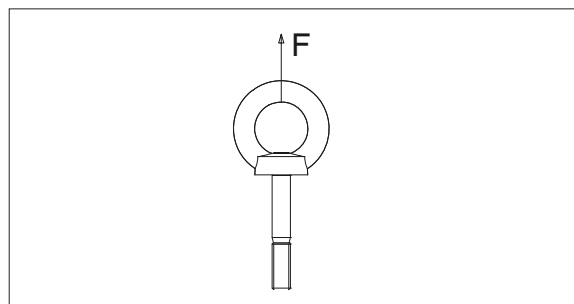
5870 350 079



14WF8TM04

5) Eye bolt assortment

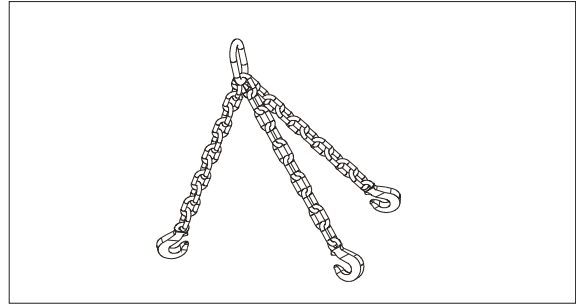
5870 204 002



14WF8TM05

6) Lifting chain

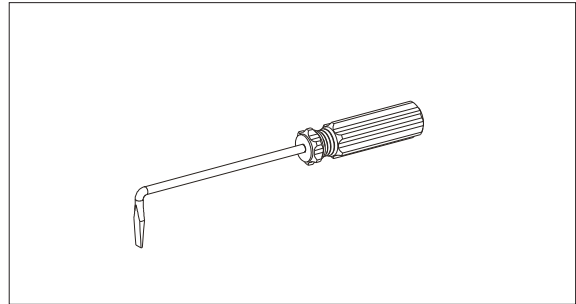
5870 221 047



14WF8TM06

7) Resetting device

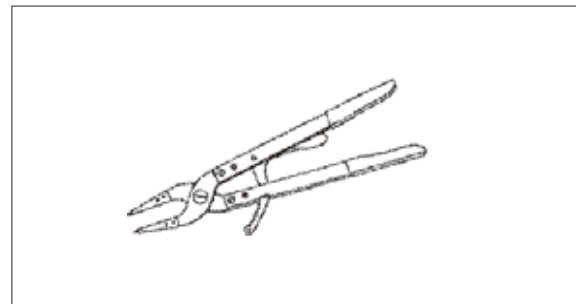
5870 400 001



14WF8TM07

8) Clamping pliers

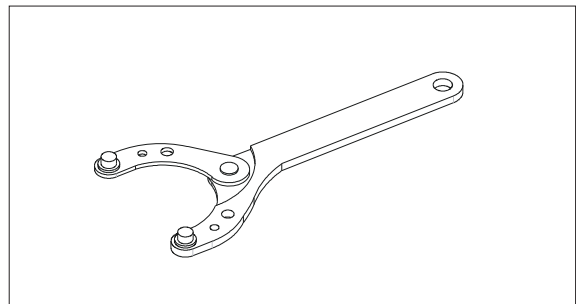
5870 900 021



14WF8TM08

9) Clamping fork

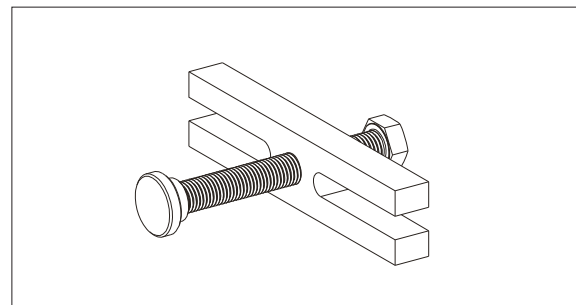
5870 240 025



14WF8TM09

10) Extractor

5870 000 017



14WF8TM10

11) Rapid grip

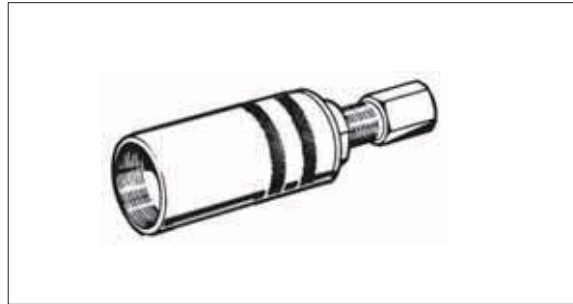
5873 012 021



14WF8TM11

12) Basic tool

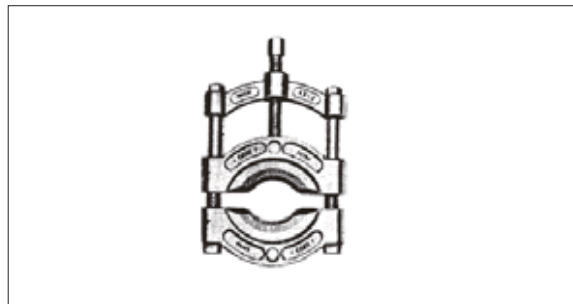
5873 002 001



14WF8TM12

13) Cut-off device

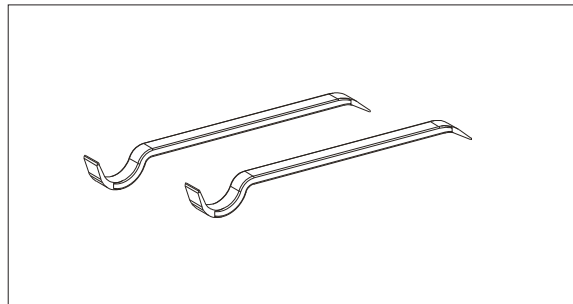
5870 300 028



14WF8TM13

14) Assembly lever

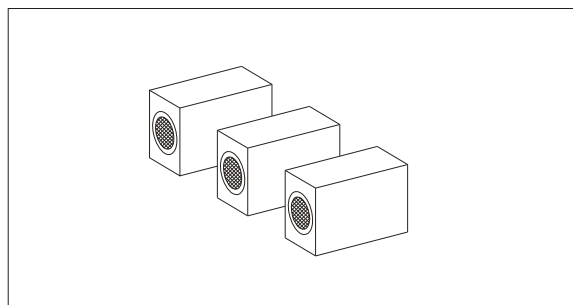
5870 345 036



14WF8TM14

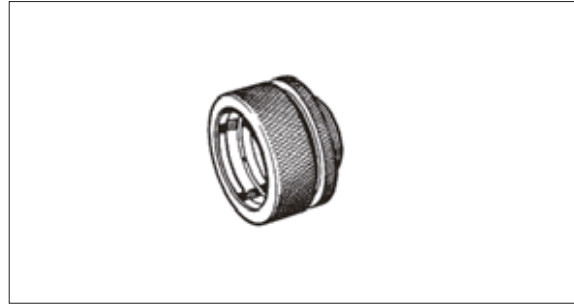
15) Solenoid block

5870 450 003



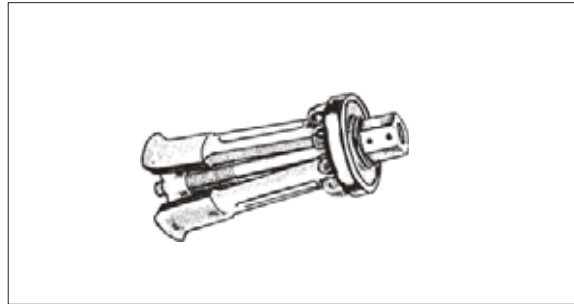
14WF8TM15

16) Grab sleeve
5873 001 037



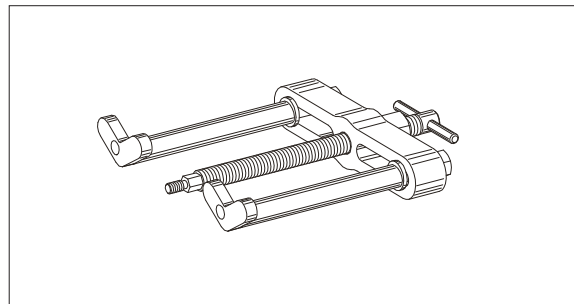
14WF8TM16

17) Inner extractor
5870 300 019



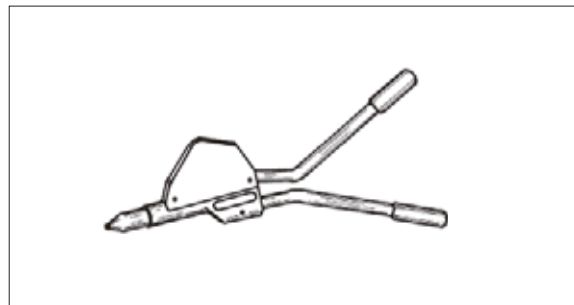
14WF8TM17

18) Counter support
5870 300 020



14WF8TM18

19) Lever riveting tongs
5870 320 016



14WF8TM19

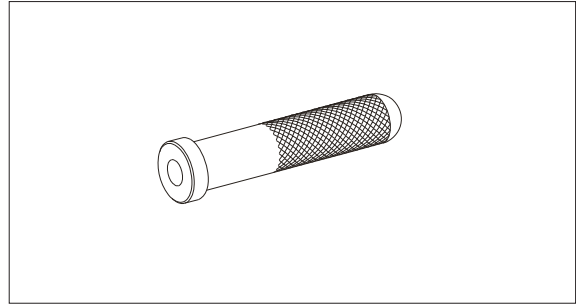
20) Driver tool
5870 058 073



14WF8TM20

21) Handle

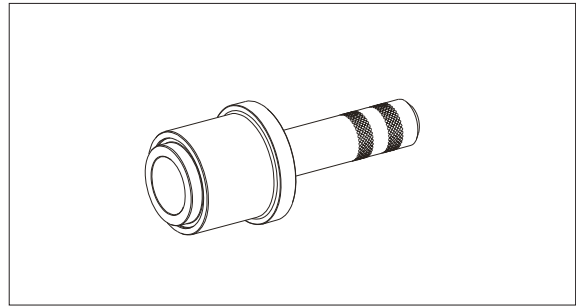
5870 260 002



14WF8TM21

22) Driver tool

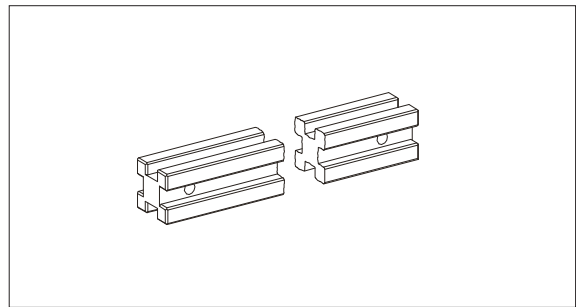
5870 048 281



14WF8TM22

23) Straightedge

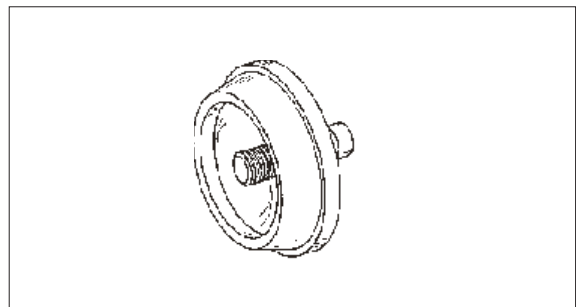
5870 200 108



14WF8TM23

24) Driver tool

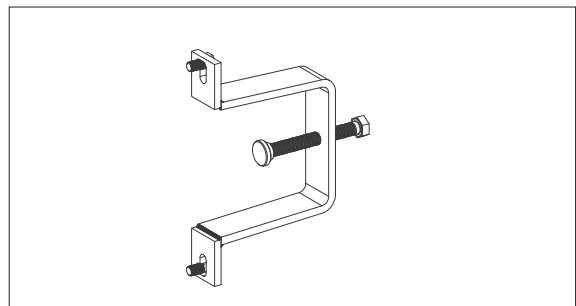
5870 058 078



14WF8TM24

25) Clamping bar

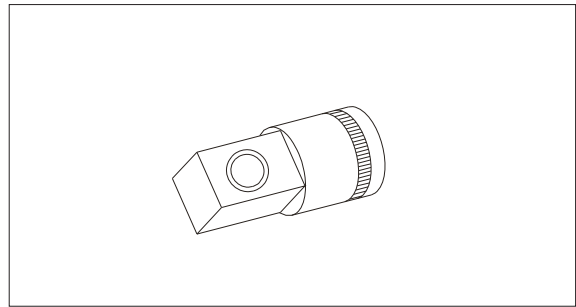
5870 654 049



14WF8TM25

26) Reduction

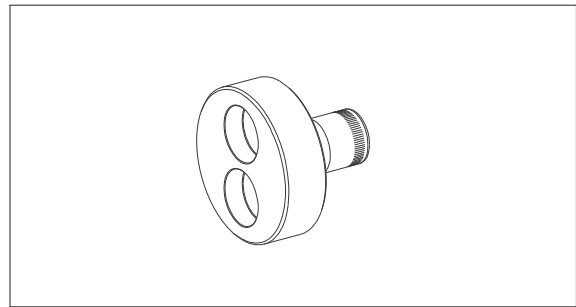
5870 656 056



14WF8TM26

27) Plug insert

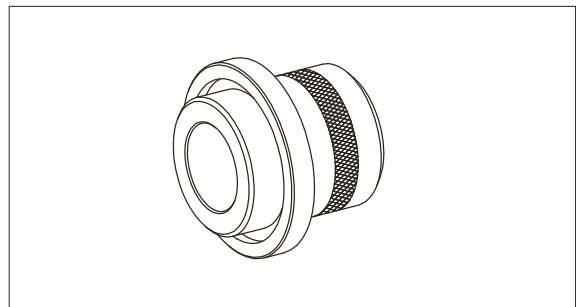
AA00 392 461



14WF8TM27

28) Driver tool

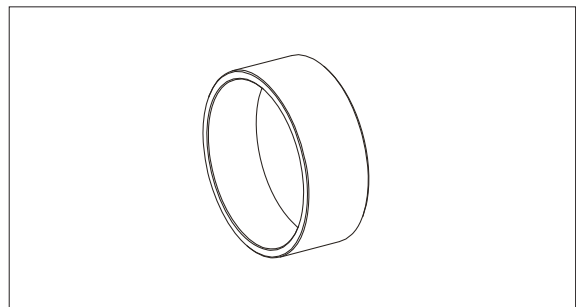
5870 048 279



14WF8TM28

29) Pressure piece

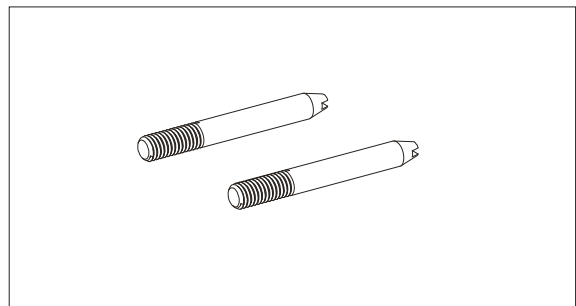
5870 506 150



14WF8TM29

30) Adjusting screws (M12)

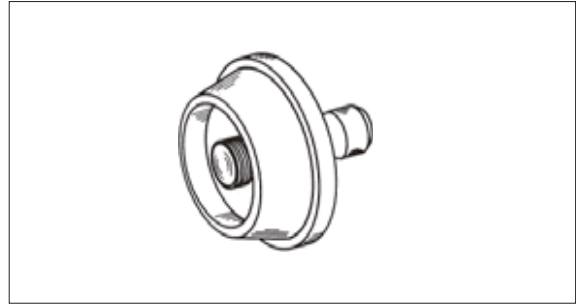
5870 204 021



14WF8TM30

31) Driver tool

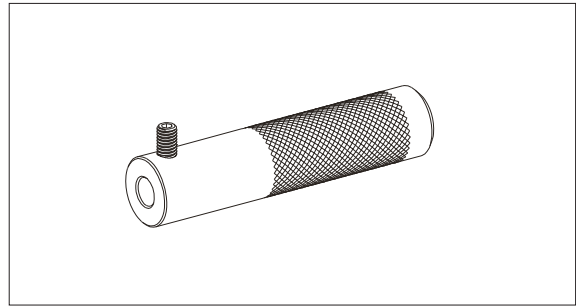
5870 058 051



14WF8TM31

32) Press-fit mandrel

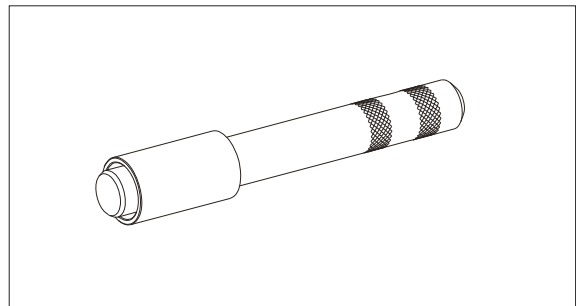
AA00 392 151



14WF8TM32

33) Driver tool

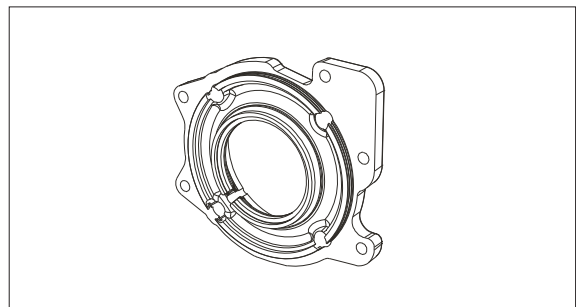
5870 048 283



14WF8TM33

34) Measuring device

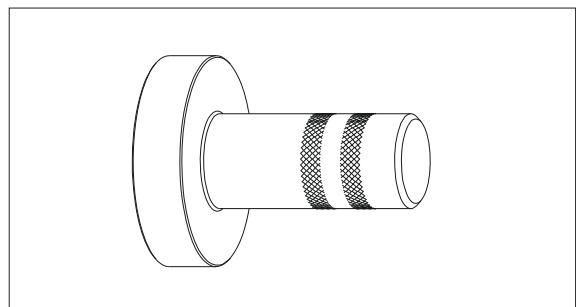
5870 200 131



14WF8TM34

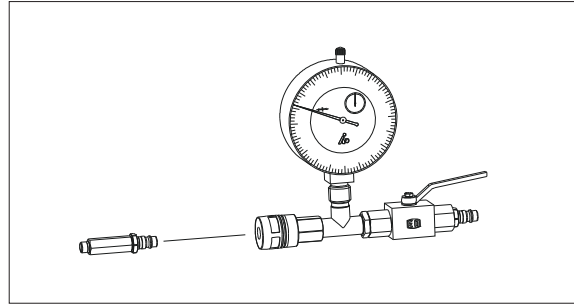
35) Driver tool

5870 506 161



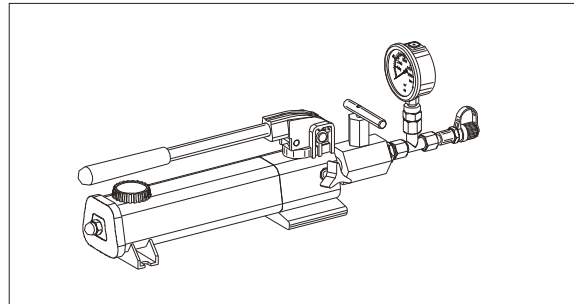
14WF8TM35

36) Air connection
5870 505 012



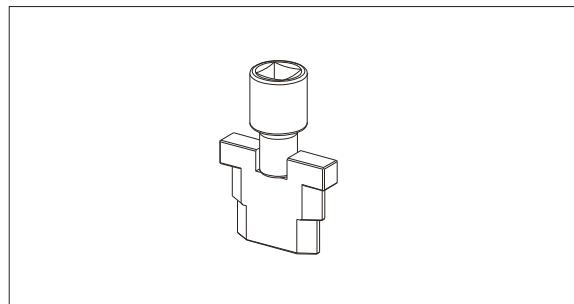
14WF8TM36

37) HP pump
5870 287 007



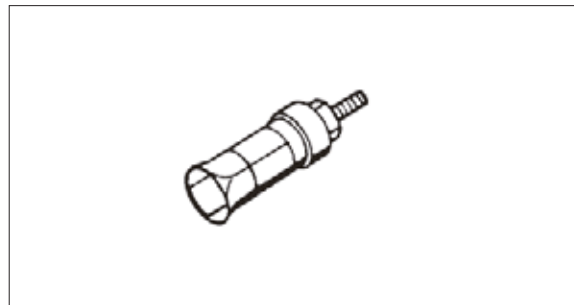
14WF8TM37

38) Spline mandrel
5870 510 039



14WF8TM38

39) Inner extractor
5870 300 012



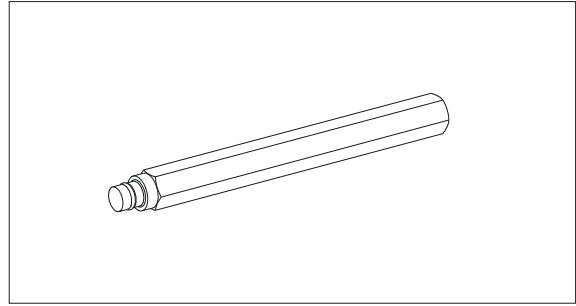
14WF8TM39

40) Counter support
5870 300 011



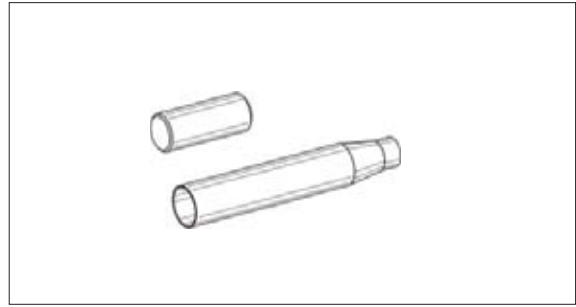
14WF8TM40

41) Driver tool
5870 705 003



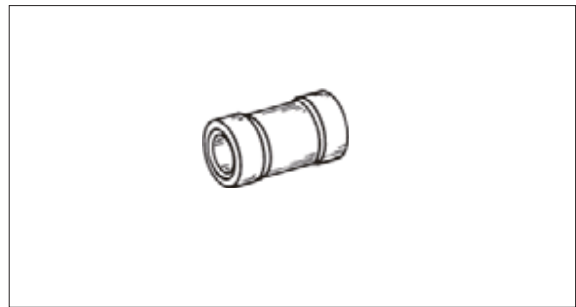
14WF8TM41

42) Inner installer
5870 651 055



14WF8TM42

43) Calibrating mandrel
5870 651 056



14WF8TM43

4. COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

1) Magnetic stand

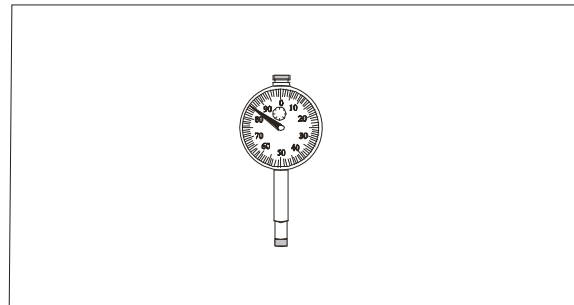
5870 200 055



14WF8TM44

2) Dial indicator

5870 200 057



14WF8TM45

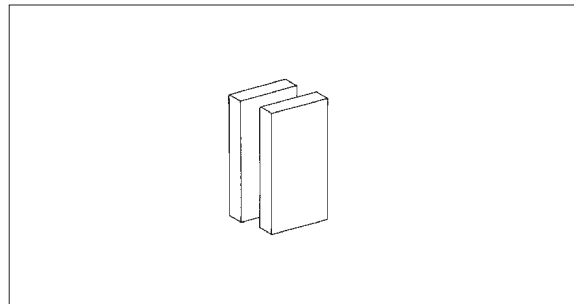
3) Gauge blocks

5870 200 066

70 mm

5870 200 067

100 mm



14WF8TM46

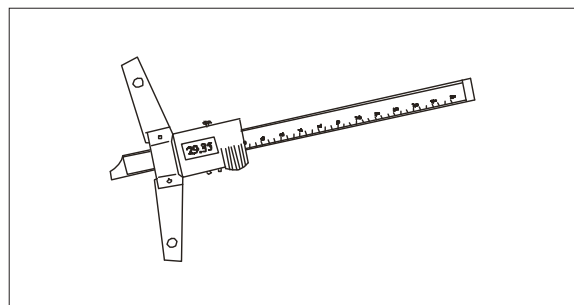
4) Digital depth gauge

5870 200 072

200 mm

5870 200 114

300 mm



14WF8TM47

5) Digital caliper gauge

5870 200 109

150 mm



14WF8TM48

6) Torque wrench

5870 203 030	0.6 -6.0 Nm
5870 203 031	1.0 – 12 Nm
5870 203 032	3.0 – 23 Nm
5870 203 033	5.0 – 45 Nm
5870 203 034	10 – 90 Nm
5870 203 039	80 – 400 Nm
5870 203 016	140 – 750 Nm
5870 203 011	750 - 2000 Nm



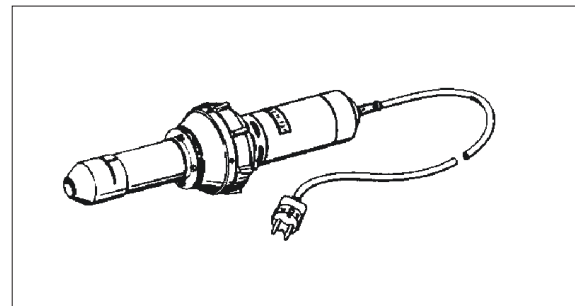
14WF8TM49



14WF8TM50

7) Hot air blower

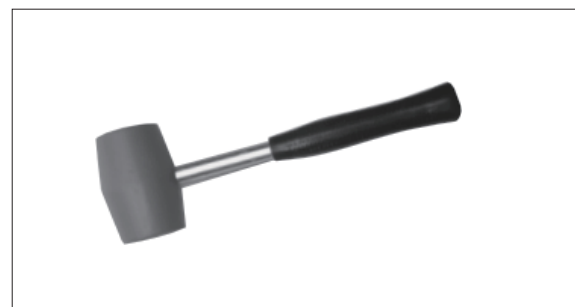
5870 221 500	230 V
5870 221 501	115 V



14WF8TM51

8) Plastic hammer

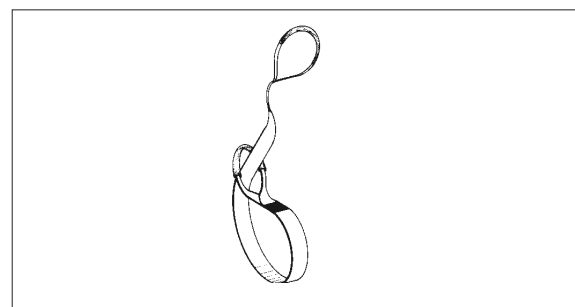
5870 280 004	Ø 60 mm
Substitute nylon insert	
5870 280 006	



14WF8TM52

9) Lifting strap

5870 281 026



14WF8TM53

10) Lifting chain
5870 281 047



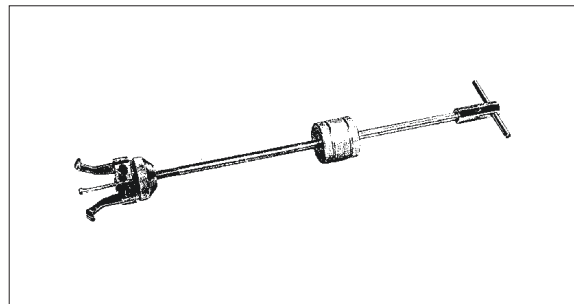
14WF8TM54

11) Pry bar
5870 345 071



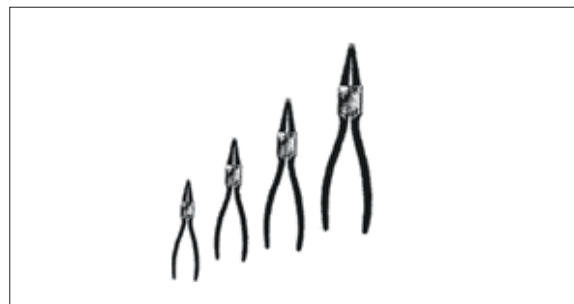
14WF8TM55

12) Striker
5870 650 004



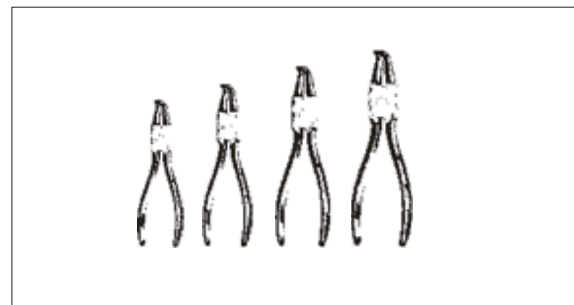
14WF8TM56

13) Set of internal pliers
I1-I2-I3-I4
5870 900 013



14WF8TM57

14) Set of internal pliers
I11-I21-I31-I41 90°
5870 900 014



14WF8TM58

- 15) Set of external pliers
 A1-A2-A3-A4
 5870 900 015



14WF8TM59

- 16) Set of external pliers
 A01-A02-A03-A04 90°
 5870 900 016



14WF8TM60

- 17) Two-armed puller

5870 970 001

Jaw width 80 mm

Throat depth 100 mm

5870 970 002

Jaw width 120 mm

Throat depth 125 mm

5870 970 003

Jaw width 170 mm

Throat depth 125 mm

5870 970 004

Jaw width 200 mm

Throat depth 175 mm

5870 970 006

Jaw width 350 mm

Throat depth 250 mm

5870 970 007

Jaw width 520 mm

Throat depth 300 - 500 mm

5870 970 026

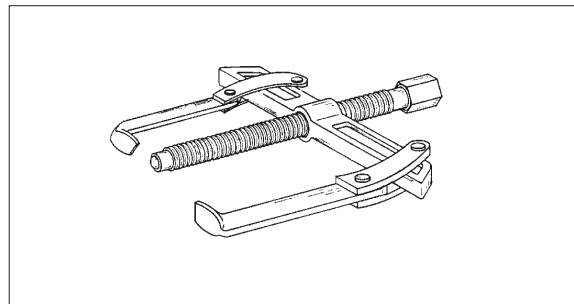
Jaw width 250 mm

Throat depth 200 mm

5870 970 028

Jaw width 380 mm

Throat depth 200 mm



14WF8TM61

18) Three armed puller

5870 971 001

Jaw width 85 mm

Throat depth 65 mm

5870 971 002

Jaw width 130 mm

Throat depth 105 mm

5870 971 003

Jaw width 230 mm

Throat depth 150 mm

5870 971 004

Jaw width 295 mm

Throat depth 235 mm

5870 971 005

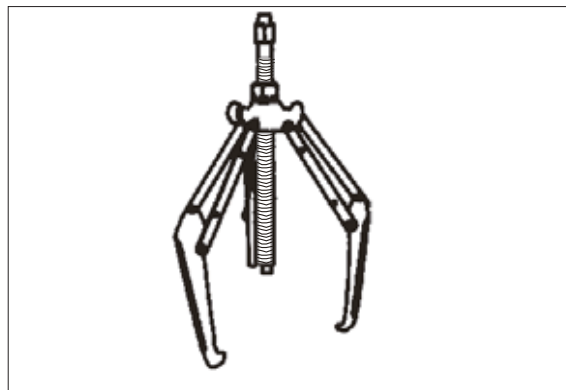
Jaw width 390 mm

Throat depth 230 mm

5870 971 006

Jaw width 640 mm

Throat depth 290 mm



14WF8TM62

5. SEPARATE TRANSMISSION FROM AXLE HOUSING

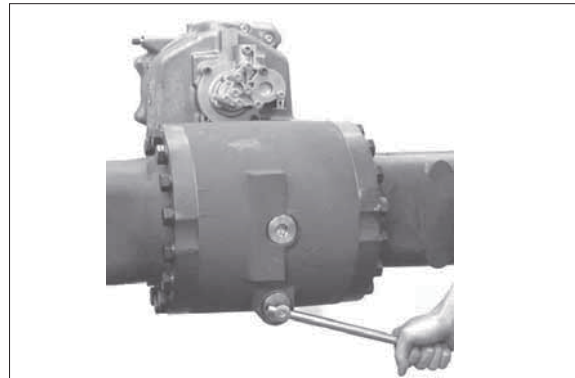
(only for version Axle attachment)

- 1) Drain oil from axle housing – use a suitable oil reservoir.

(S) Assembly truck 5870 350 000

(S) Clamping fork 5870 350 106

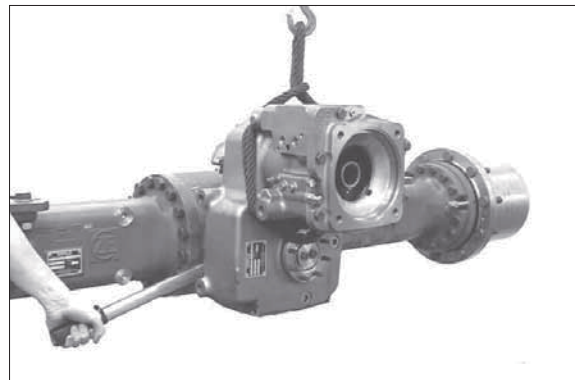
▲ Waste oil to be disposed of ecologically.



14WF8TM63

- 2) Pick-up Transmission by means of lifting tackle, loosen threaded joint and separate complete Transmission from axle housing.

(S) Lifting strap 5870 281 026



14WF8TM64

6. DISASSEMBLY – BRAKE / CLUTCH / PLANETARY CARRIER

1) Mount transmission to assembly truck.

(S) Assembly truck assy. 5870 350 000

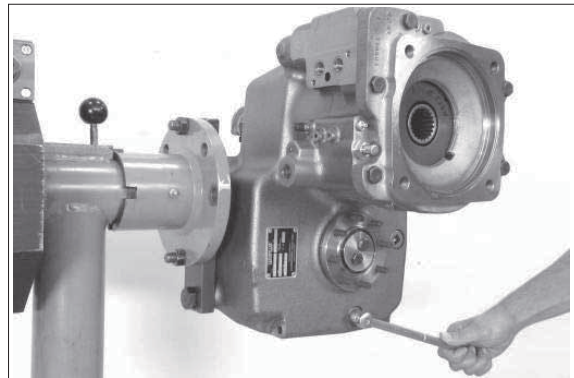
(S) Fixture 5870 350 079



14WF8TM65

2) Loosen screw plug and drain oil – use a suitable oil reservoir.

▲ Waste oil to be disposed of ecologically.

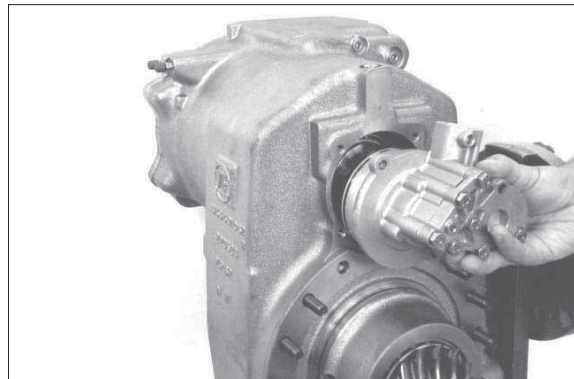


14WF8TM66

Lubrication pump

3) Remove lubrication pump or shift interlock (depending on version, Illustration shows version with Lubrication pump).

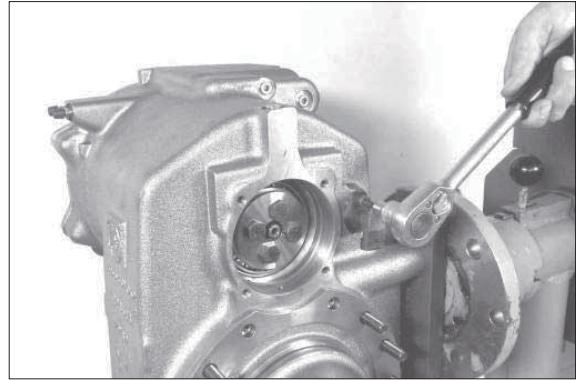
※ Complete disassembly of lubrication pump / shift interlock – see page 8-264.



14WF8TM67

Speed sensor

- 4) Loosen screw and pull off speed sensor.

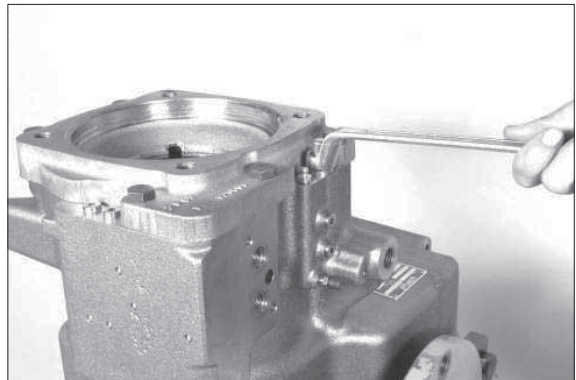


14WF8TM68

Emergency release (Parking brake)

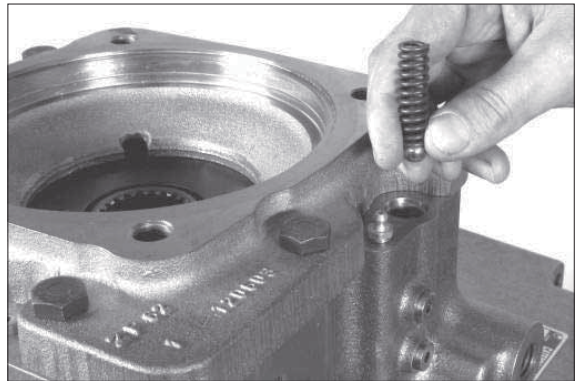
- 5) Remove breather.
(Illustration 14WF8TM69~14WF8TM72 shows version transmission installation position "Vertical")

※ Position of single connections or breather valves /lubrication nipples etc. as to version transmission installation position Horizontal - see 14WF8TM265.



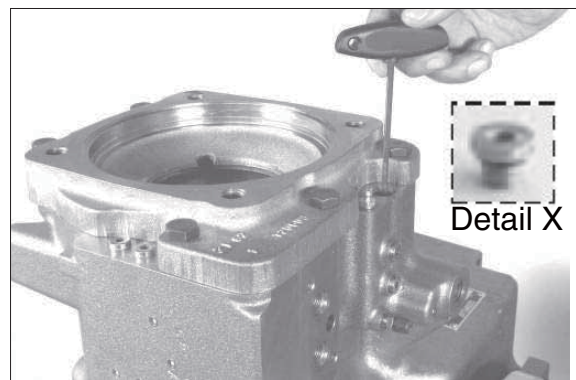
14WF8TM69

- 6) Remove compression spring and ball.



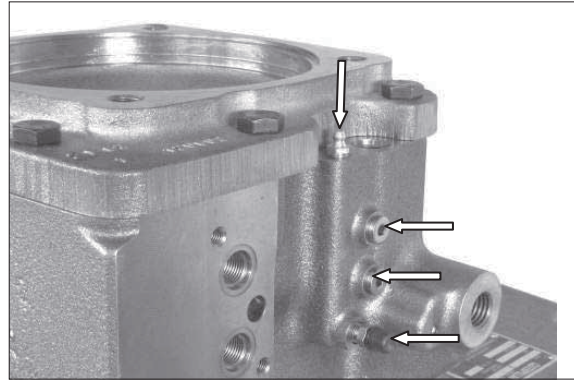
14WF8TM70

- 7) Remove threaded element (see Detail X) with O-ring from hole.



14WF8TM71

- 8) Remove lubrication nipple, both screw plugs and breather valve – see arrow.



14WF8TM72

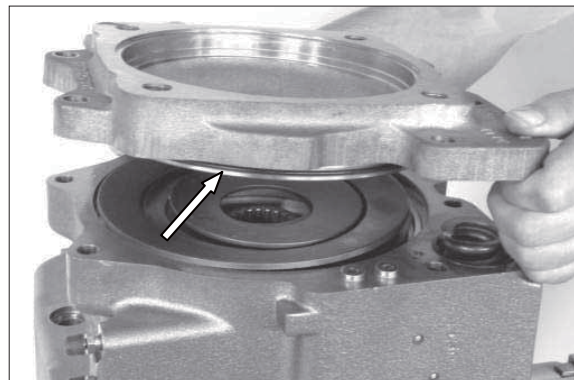
Input housing and modulation valve

- 9) Loosen threaded joint of input housing evenly.
- ※ Input housing is subject to cup spring and compression spring preload.



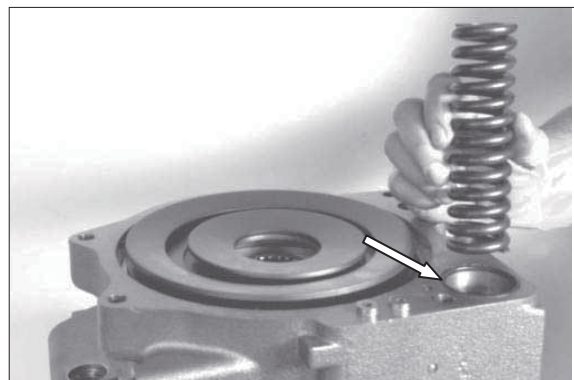
14WF8TM73

- 10) Take off input housing and remove O-ring (arrow).



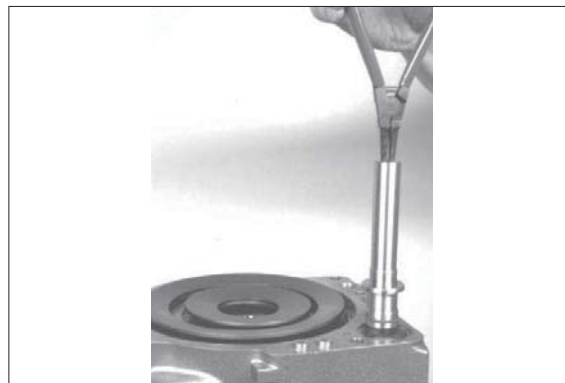
14WF8TM74

- 11) Remove compression spring and O-ring (arrow).



14WF8TM75

12) Pull complete piston out of hole.



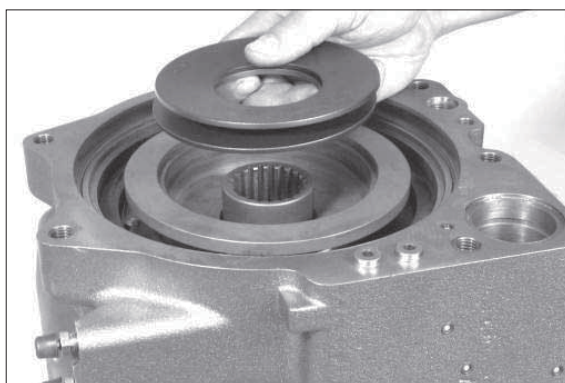
14WF8TM76

Brake and clutch
13) Remove cup springs from brake.



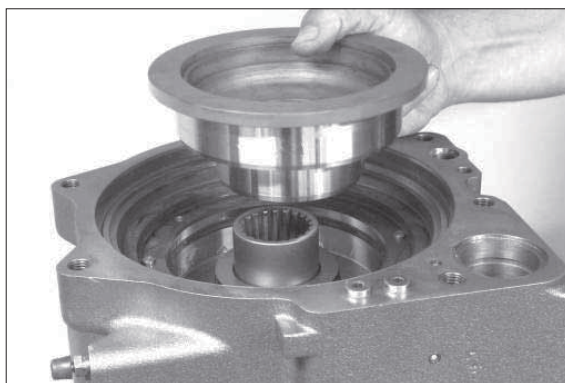
14WF8TM77

14) Remove cup springs from clutch.



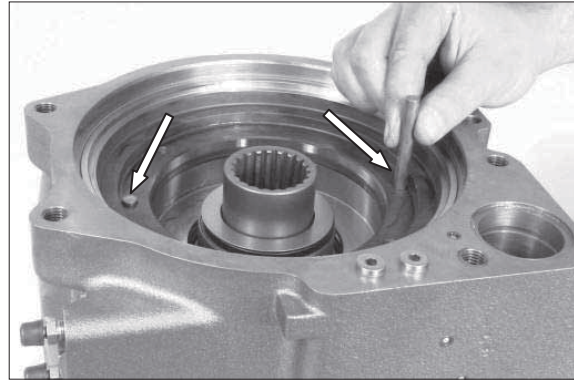
14WF8TM78

15) Remove piston.



14WF8TM79

16) Pull off both cyl. pins (arrows).

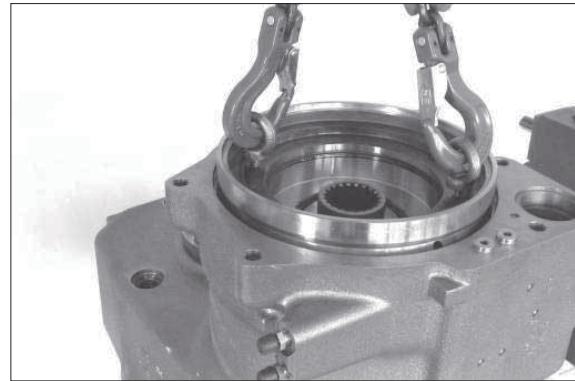


14WF8TM80

17) Attach 2 (two) eyebolts and pull piston cautiously out of housing – risk of damage.

(S) Eyebolt assortment 5870 204 002

(S) Lifting chain 5870 281 047



14WF8TM81

18) Remove both seals (arrows) from piston.



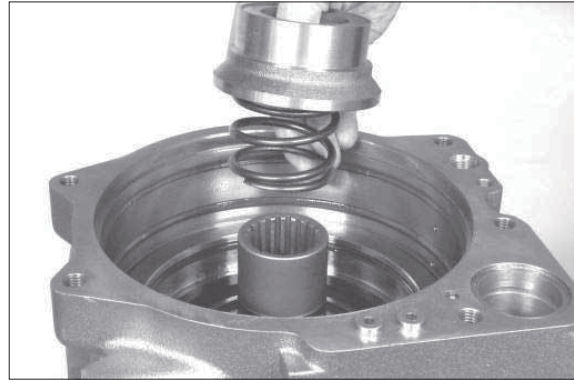
14WF8TM82

19) Remove axial roller cage with both thrust washers.



14WF8TM83

20) Remove pressure piece and compression spring.

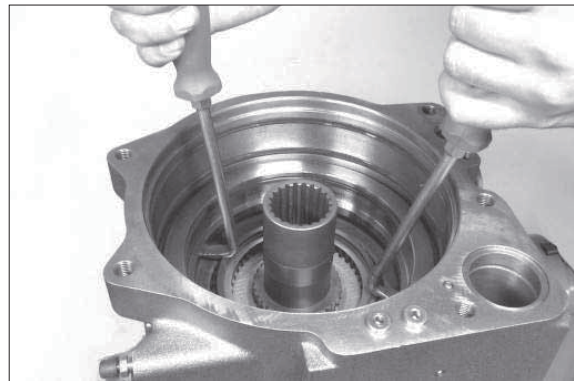


14WF8TM84

21) Remove pressure ring with ring – also see 14WF8TM86 – cautiously with lever – risk of damaging sealing surfaces.

(S) Resetting device 5870 400 001

※ Ring may also remain in housing during disassembly – disassemble ring separately.



14WF8TM85

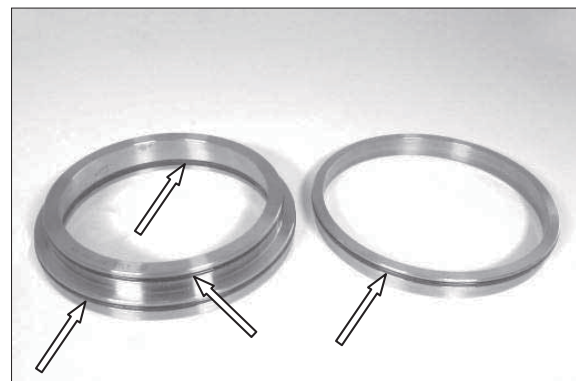
22) Remove pressure ring from ring cautiously with lever – risk of damaging sealing surfaces .

(S) Resetting device 5870 400 001



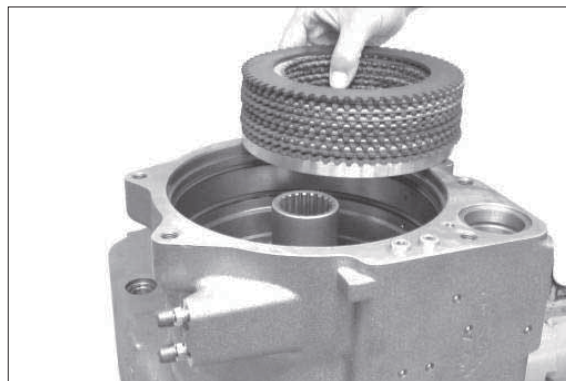
14WF8TM86

23) Remove seal and O-rings (see arrows) from pressure ring and ring.



14WF8TM87

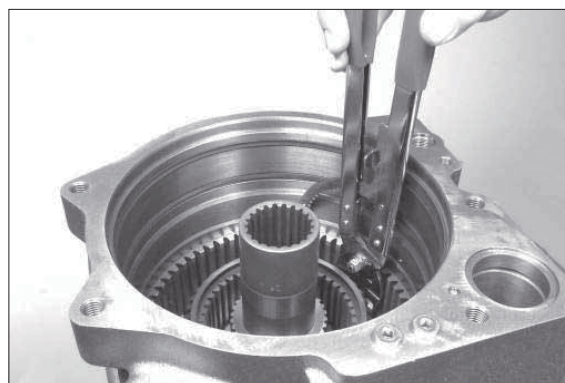
24) Take disk package of brake with end plate(s) out of housing.



14WF8TM88

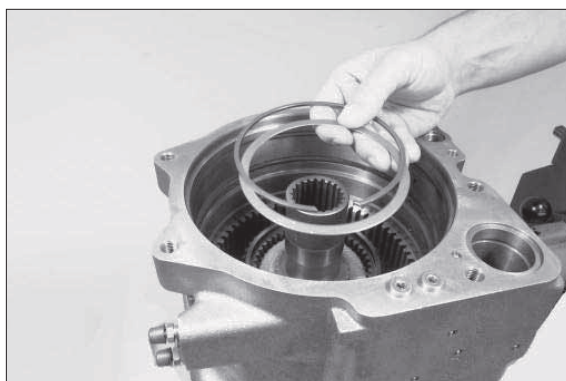
25) Disengage retaining ring.

(S) Clamping pliers 5870 900 021



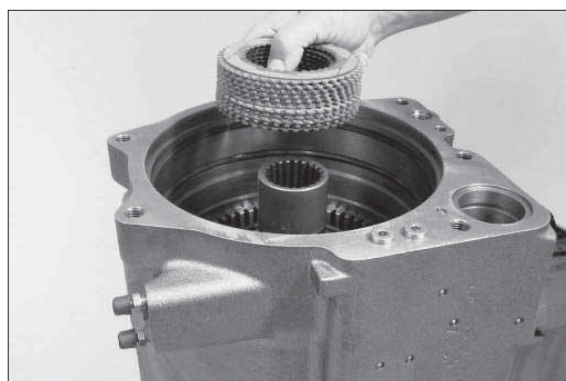
14WF8TM89

26) Remove snap ring and shim.



14WF8TM90

27) Take disk package of clutch with end plate(s) out of ring gear.



14WF8TM91

28) Remove cpl. input shaft with ring gear from housing.



14WF8TM92

29) Unsnap retaining ring.



14WF8TM93

30) Press input shaft out of ball bearing/ring gear.



14WF8TM94

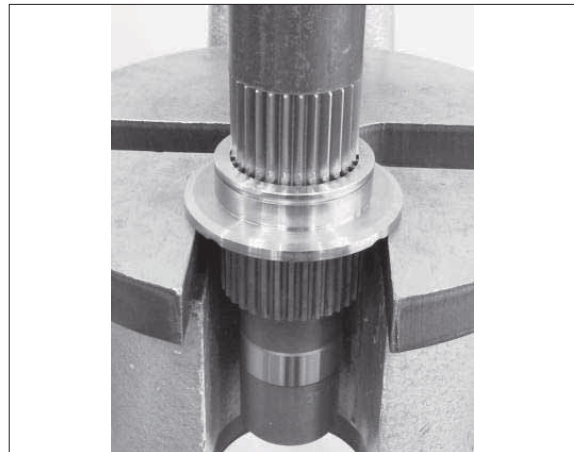
31) Unsnap retaining ring.



14WF8TM95

32) Press centering disk from input shaft.

※ In case of extreme press fit – heat centering disk.



14WF8TM96

33) Unsnap retaining ring and remove ball bearing.

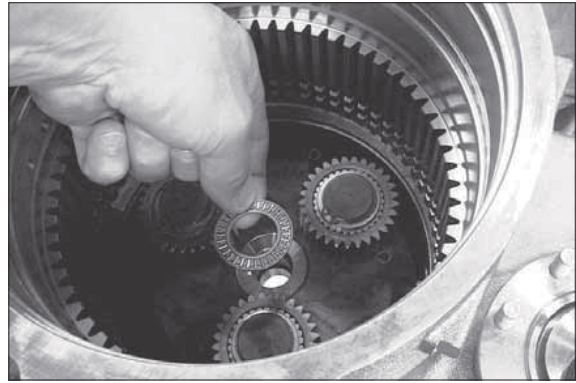
(S) Clamping pliers 5870 900 021



14WF8TM97

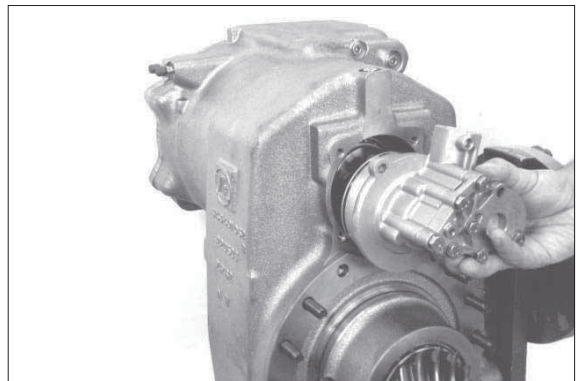
Planetary carrier

34) Remove axial needle cage.



14WF8TM98

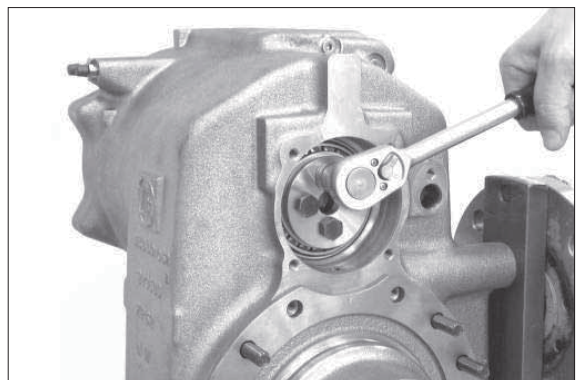
35) If not yet disassembled previously – remove lubrication pump or shift interlock (depending on version). (Illustration shows version - Lubrication pump).



14WF8TM99

36) Loosen threaded joint and remove disk – fasten output flange by means of clamping fork.

(S) Clamping fork 5870 240 025

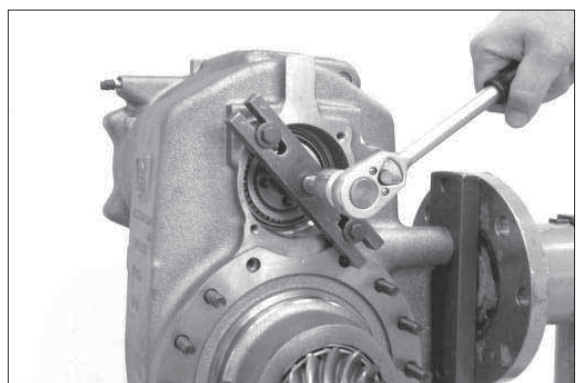


14WF8TM100

37) Press cpl. planetary carrier out of roller bearing.

(S) Extractor 5870 000 017

※ Pay attention to releasing planetary carrier and bearing inner ring.



14WF8TM101

38) Pull second bearing inner ring from planetary carrier.

(S) Rapid grip 5873 012 021

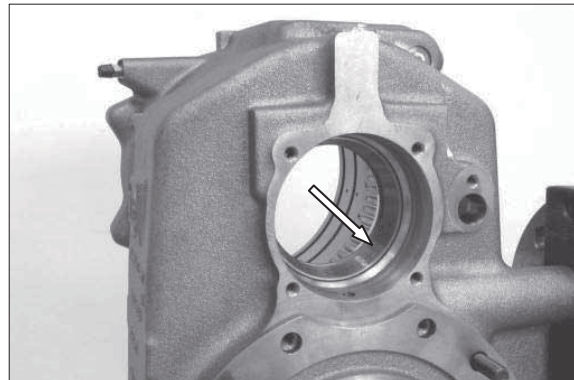
(S) Basic tool 5873 002 001



14WF8TM102

39) If required – force both bearing outer rings (arrow) out of bearing hole.

※ When reusing tapered roller bearings – pay attention to bearing allocation, i.e. respective bearing inner ring to bearing outer ring.



14WF8TM103

40) Unsnap retaining ring.



14WF8TM104

41) Lift planetary gear with resetting device – then disassemble with two armed puller .

(S) Resetting device 5870 400 001

※ If necessary, force out slotted pins (6x).

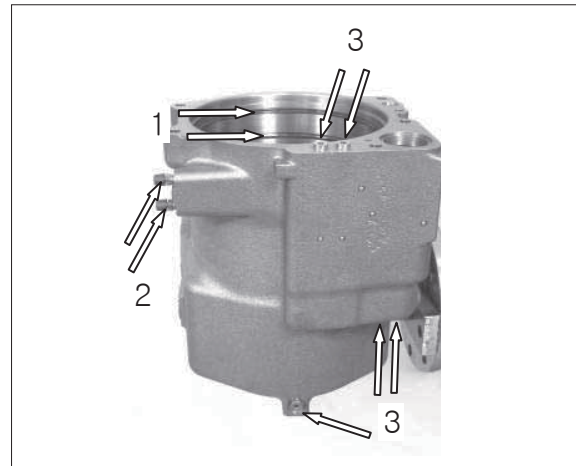


14WF8TM105

42) Remove both seals (1).

Remove breather valves (2) and all screw plugs (3) with seal and O-ring.

※ Illustration shows positions for transmission version Installation position "Vertical".



14WF8TM106

43) Only for version

Transmission installation position "Horizontal" :

Loosen countersunk screws and remove screen sheet.

※ Countersunk screws are installed with locking compound (loctite). If necessary, heat for disassembly .



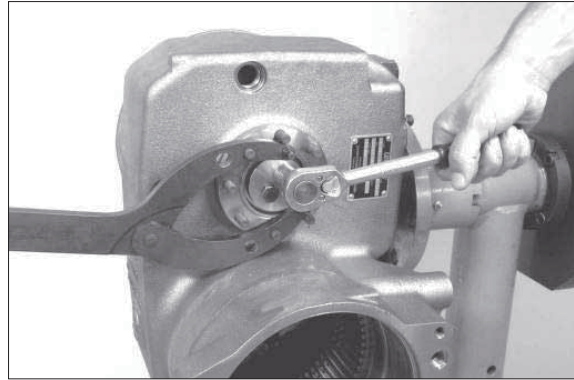
14WF8TM107

7. DISASSEMBLY - OUTPUT

Version "Axle attachment"

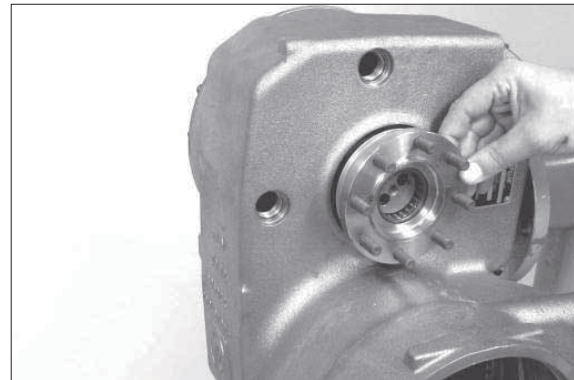
- 1) Loosen threaded joint, remove cover and O-ring.

※ (S) Clamping fork 5870 240 025



14WF8TM108

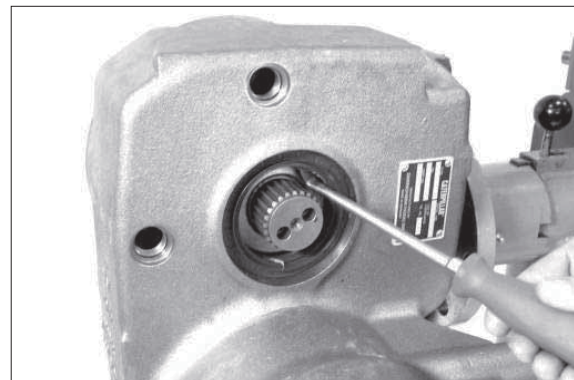
- 2) Pull off flange.



14WF8TM109

- 3) Remove shaft seal with a lever.

※ (S) Resetting device 5870 400 001



14WF8TM110

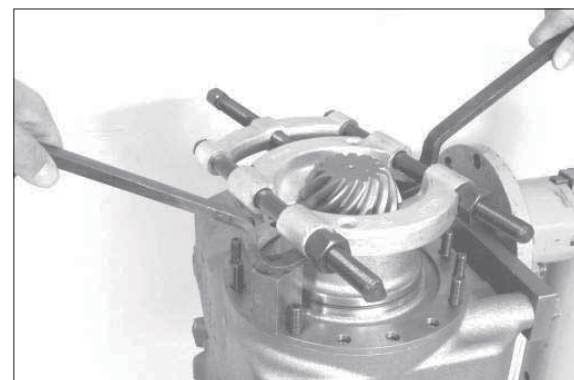
- 4) Fix pinion with fixture and press off.

(S) Cut-off device 5870 300 028

(S) Assembly lever 5870 345 036

(S) Solenoid block 5870 450 003

- ※ Pay attention to releasing bearing inner ring and adjusting ring (rolling torque/pinion bearing) behind.



14WF8TM111

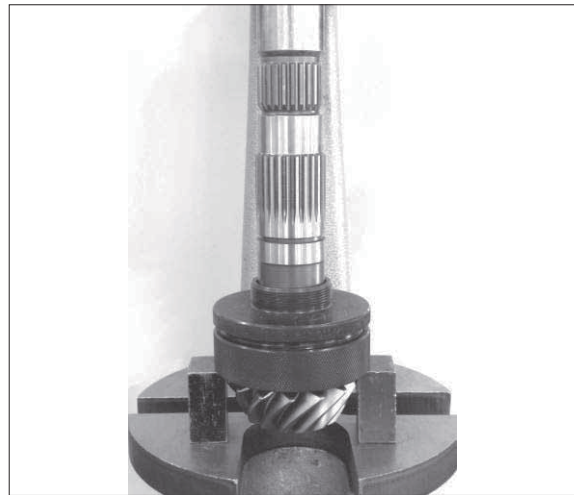
5) Remove O-ring (see arrow) and bush from pinion.



14WF8TM112

6) Press-off bearing inner ring from pinion shaft.

(S) Grab sleeve 5873 001 037
(S) Solenoid block 5870 450 003



14WF8TM113

7) Pull bearing outer ring out of bearing cover.

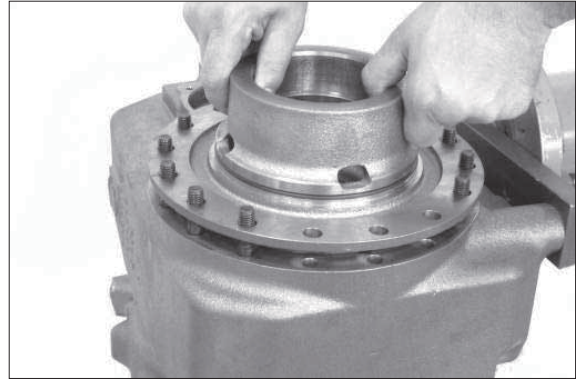
(S) Inner extractor 5870 300 019
(S) Counter support 5870 300 020

※ Pay attention to shim behind (pinion gap setting).



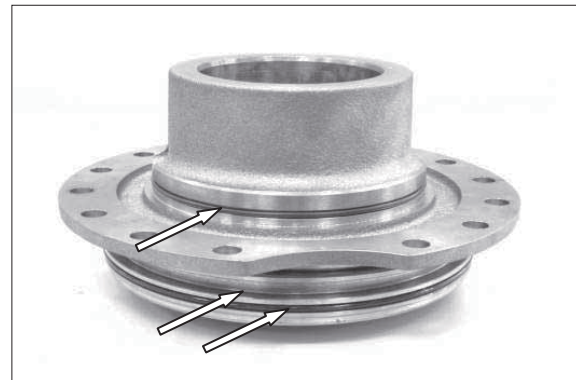
14WF8TM114

8) Pull off bearing cover.



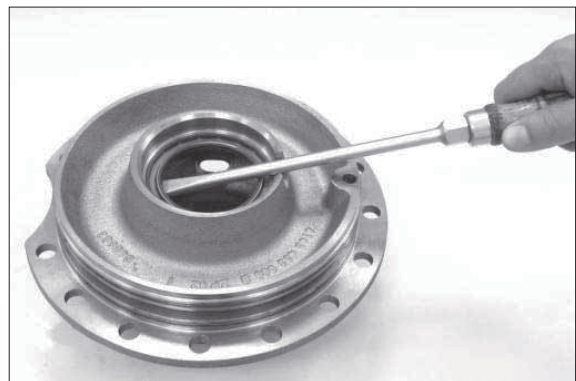
14WF8TM115

9) Remove O-rings (arrows).



14WF8TM116

10) Remove shaft seal.



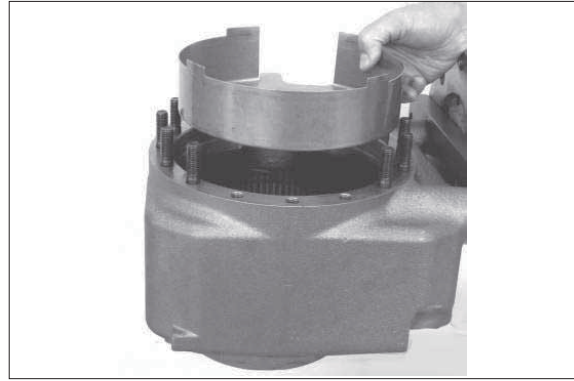
14WF8TM117

11) Lift output gear with oil screen sheet out of housing. Remove oil screen sheet from output gear.



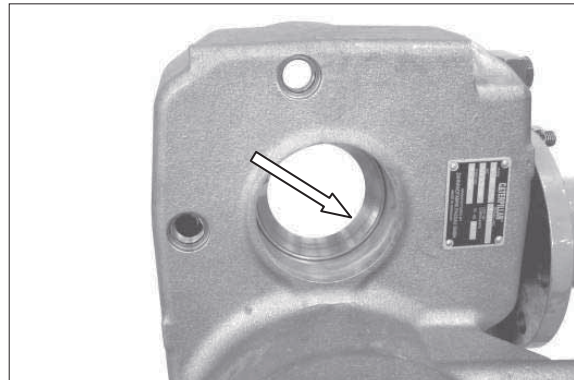
14WF8TM118

12) Remove screen sheet.



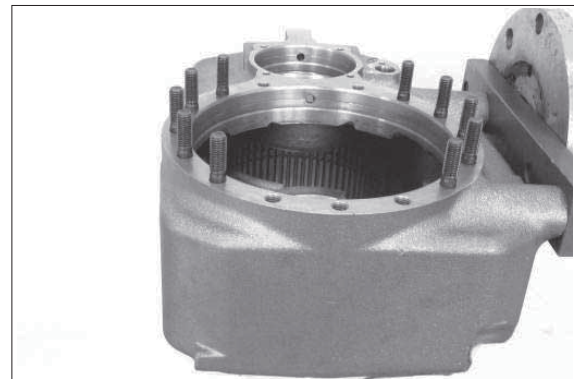
14WF8TM119

13) Disassemble bearing outer ring from housing hole (see arrow).



14WF8TM120

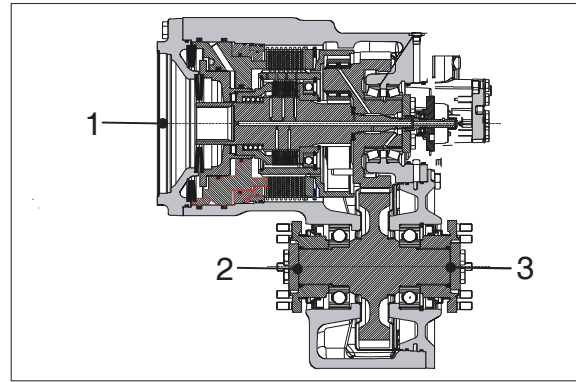
14) If necessary, remove stud bolts.



14WF8TM121

Version "Separate installation"

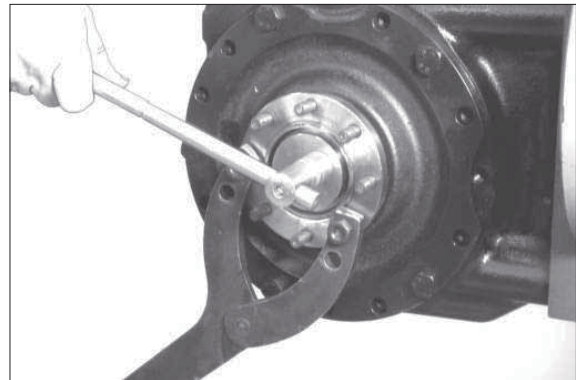
- 15) 1 = Input
- 2 = Output – front axle
- 3 = Output – rear axle



14WF8TM122

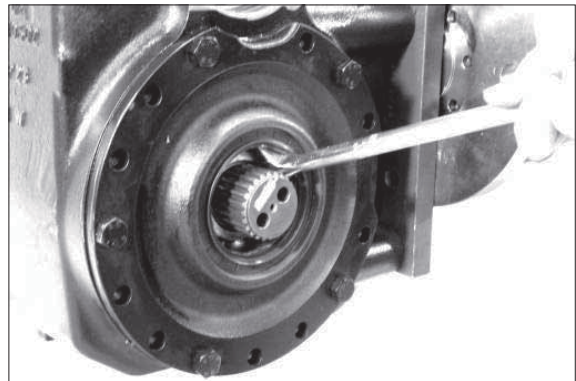
- 16) Use clamping fork to fix output flange.
Loosen threaded joint, pull off disk, O-ring and flange.

(S) Clamping fork 5870 240 025



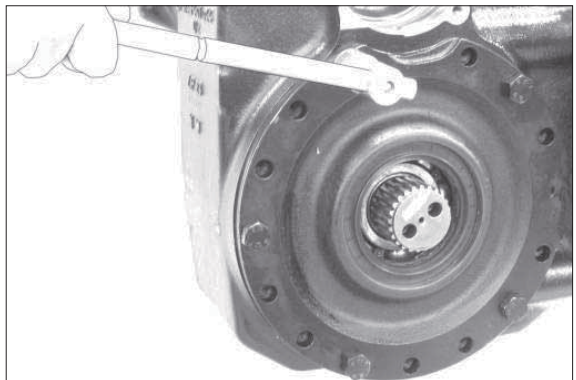
14WF8TM123

- 17) Remove shaft seal with a lever.
※ Disassemble second output flange and shaft seal analogously.



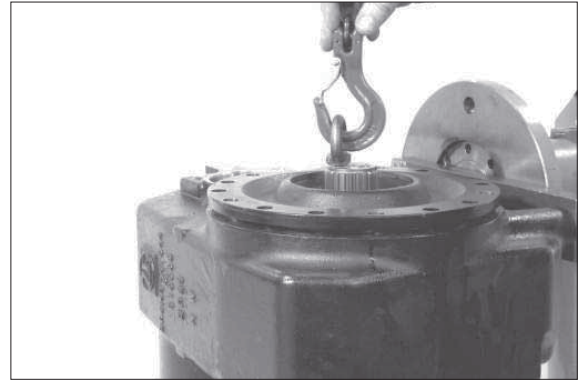
14WF8TM124

- 18) Loosen threaded joint.



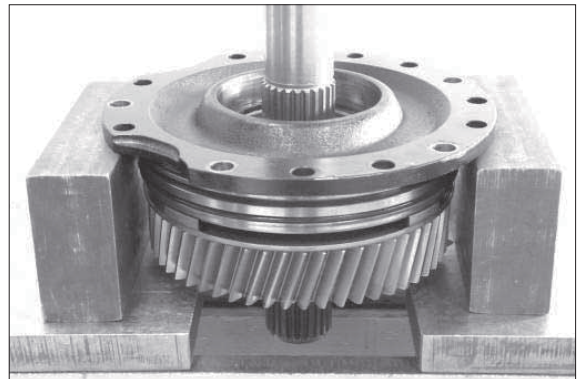
14WF8TM125

19) Use lifting tackle to separate output gear with cover from transmission housing.



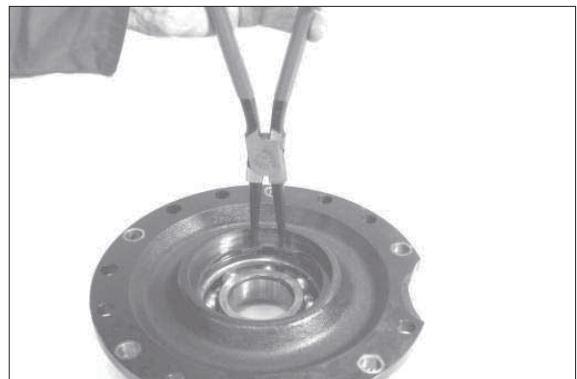
14WF8TM126

20) Press output gear out of ball bearing/cover – remove releasing oil screen sheet.



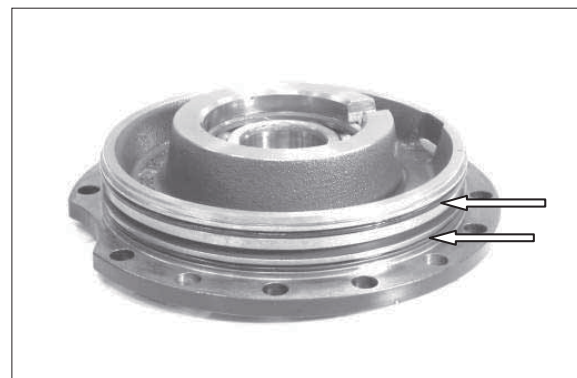
14WF8TM127

21) Unsnap retaining ring and disassemble ball bearing from cover.



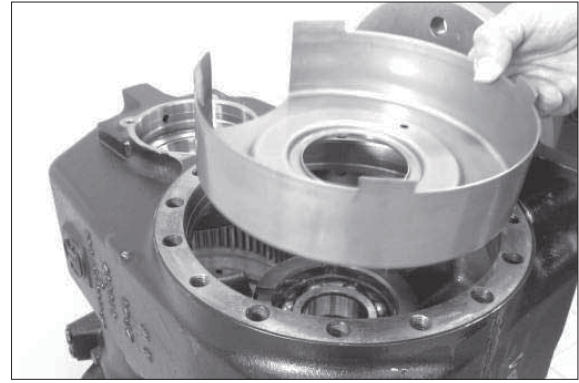
14WF8TM128

22) Remove O-rings (see arrows) from cover.



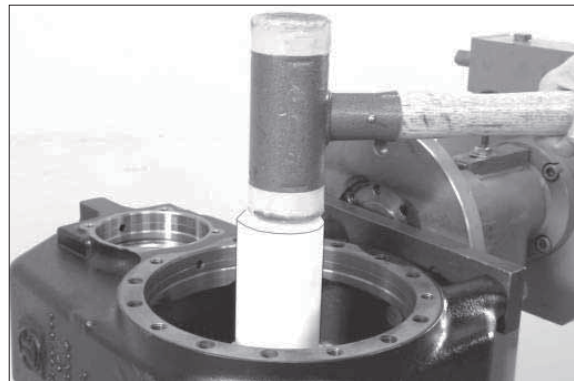
14WF8TM129

23) Remove screen sheet from transmission housing.



14WF8TM130

24) Disassemble ball bearing from housing hole.

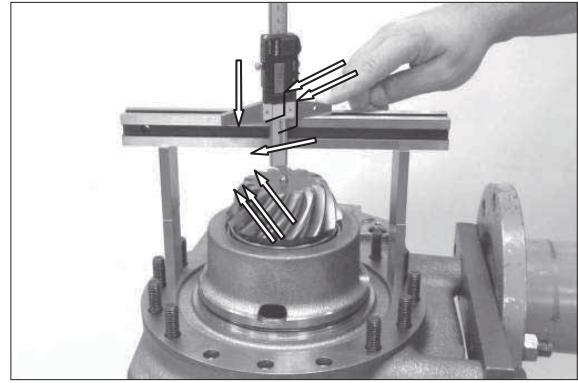


14WF8TM131

8. REASSEMBLY - OUTPUT

- 1) Seal finished holes (8x) of oil supply holes with screw plugs.

(S) Lever riveting tongs 5870 320 016



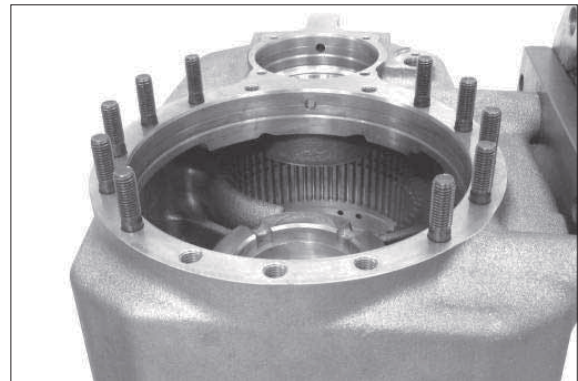
14WF8TM132

Version "Axle attachment"

- 2) Install stud bolts.

Tightening torque $M_A = 27 \text{ Nm}$

※ Pay attention to installation position.

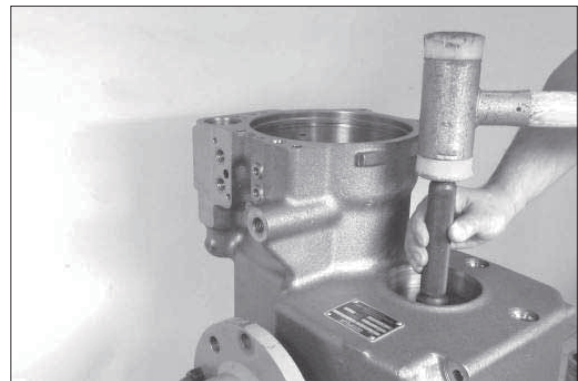


14WF8TM133

- 3) Install bearing outer ring until contact.

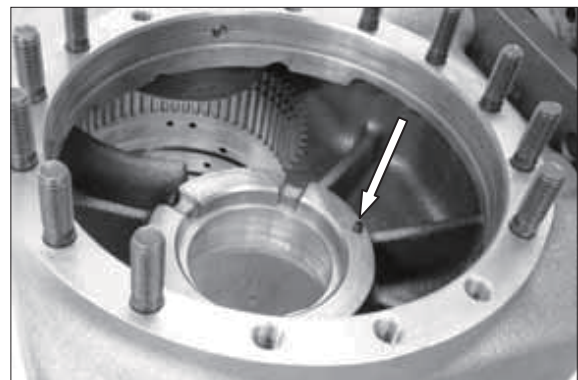
(S) Driver tool 5870 058 073

(S) Handle 5870 260 002



14WF8TM134

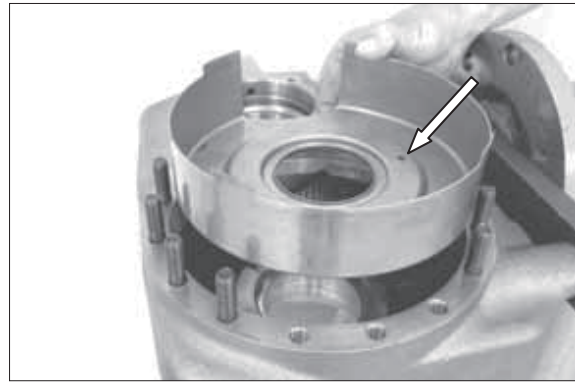
- 4) Insert slotted pin (see arrow) to the bottom.



14WF8TM135

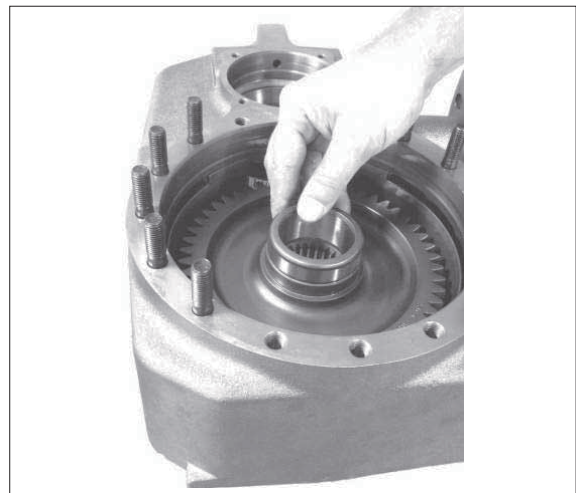
5) Position screen sheet – with slotted pin (see 14WF8TM135) into fixing hole (arrow).

※ Pay attention to installation position, slotted pin = radial fixing of screen sheet.



14WF8TM136

6) Insert output gear with the short collar showing downwards.



14WF8TM137

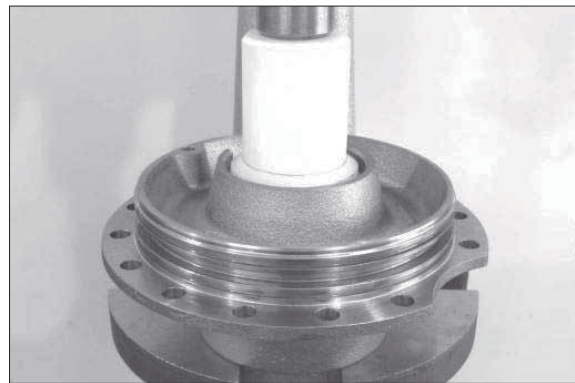
7) Press shaft seal into bearing cover.

(S) Driver tool 5870 048 281

※ For installation wet shaft seal on outer diameter with spirit.

※ Installation position of shaft seal, pay attention that seal lip is showing to oil sump (see 14WF8TM139).

※ Use of specified driver ensures exact installation position of shaft seal.

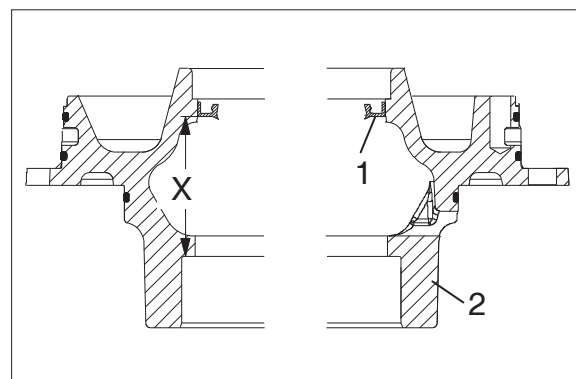


14WF8TM138

8) 1 = Shaft seal

2 = Bearing cover

X = Installation dimension



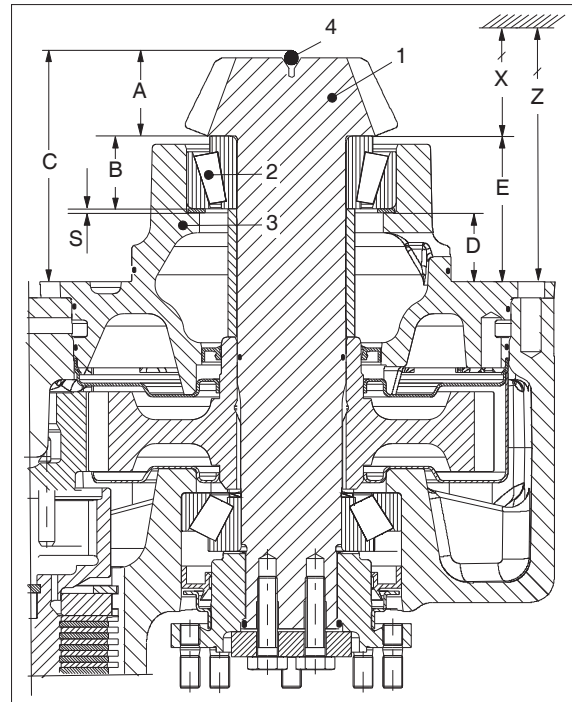
14WF8TM139

Determine shim for pinion gap

- 9) 1 = Pinion
- 2 = Roller bearing
- 3 = Bearing cover
- 4 = Ball ($\varnothing = 7 \text{ mm}$)

- A = Auxiliary dimension
- B = Bearing width
- C = Reference dimension
- D = Contact surface/bearing cover to contact/bearing hole
- E = 73.0 mm (constant value)
- X = Pinion dimension (stamped into pinion)
- Z = 189.0 mm
(contact surface/bearing cover to center/axle housing)

※ For correct installation and positioning of pinion, following steps must be carried out as precisely as possible .



14WF8TM140

10) Determine auxiliary dimension A.

Position ball ($\varnothing = 7 \text{ mm}$) into centering hole of pinion and determine dim. A, from contact surface/pinion shoulder to ball.

Auxiliary dimension A = e.g. 42.56 mm

※ Auxiliary dimension A is obligatory to determine reference dimension C – on installed pinion (Fig. 14WF8TM168).

(S) Straightedge 5870 200 108



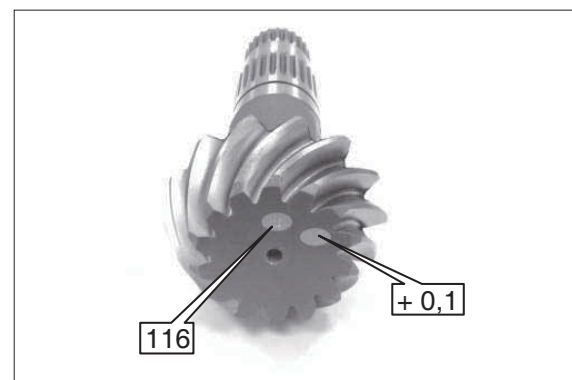
14WF8TM141

11) Read pinion dim. X on pinion (see arrow) or measure it in case of manufacturing-specific + or – deviation from pinion dim. (relating value is marked by hand on pinion e.g. + 0.1).

Pinion dim. X (without + or – deviation) = 116.0 mm

Pinion dim. X with an indicated deviation + 0.1 = 116.1 mm

Pinion dim. X with an indicated deviation - 0.1 = 115.9 mm

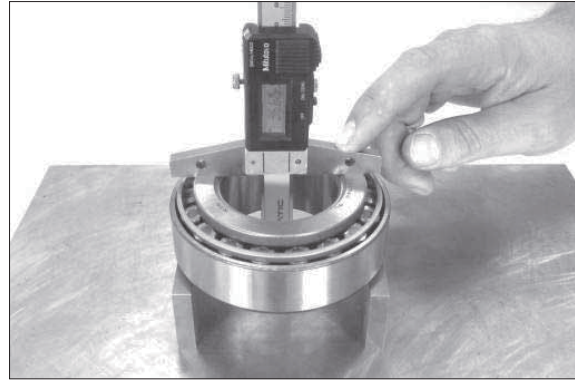


14WF8TM142

12) Determine dim. B bearing width, paying attention that rollers are seated without clearance (roller setting – rotate bearing inner ring in both directions several times).

※ Since installed roller bearing is subject to preload in installation position, deduction of empirical value of – 0.1 mm must be considered.

$$\text{Dim. B} = \text{e.g. } 36.65 \text{ mm} - 0.1 \text{ mm} \rightarrow 36.55 \text{ mm}$$

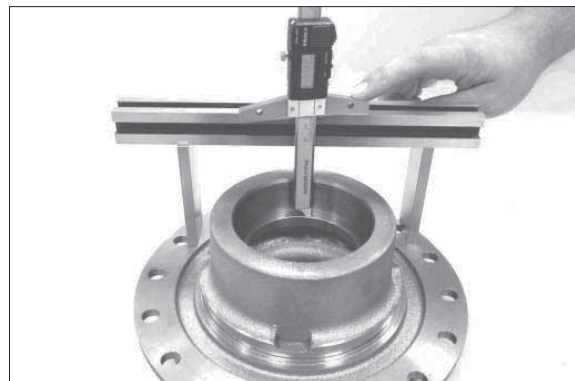


14WF8TM143

13) Determine dim. D (contact surface/bearing cover to contact/bearing hole).

$$\text{Dim. D} = \text{e.g. } 35.10 \text{ mm}$$

(S) Straightedge (2 sets) 5870 200 066

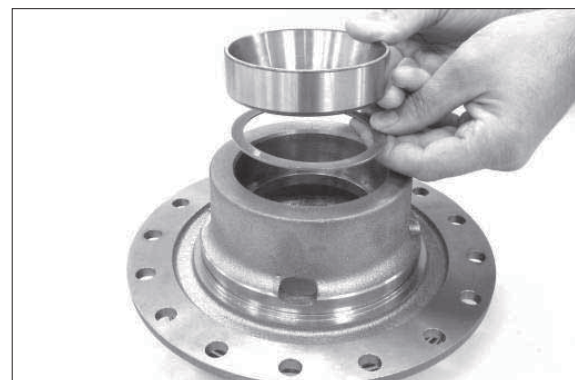


14WF8TM144

14) Insert determined shim(s) S = e.g. 1.35 mm and install bearing outer ring until contact.

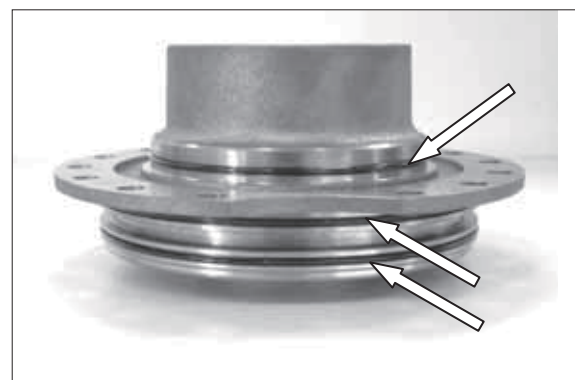
(S) Driver tool 5870 058 078

(S) Handle 5870 260 002



14WF8TM145

15) Oil O-rings (arrows) and insert them into annular grooves of bearing cover.



14WF8TM146

- 16) Bend edges of fixing straps of oil screen sheet slightly – assembly aid (sheet is fixed to bearing cover – see 14WF8TM148).



14WF8TM147

- 17) Mount oil screen sheet on bearing cover.

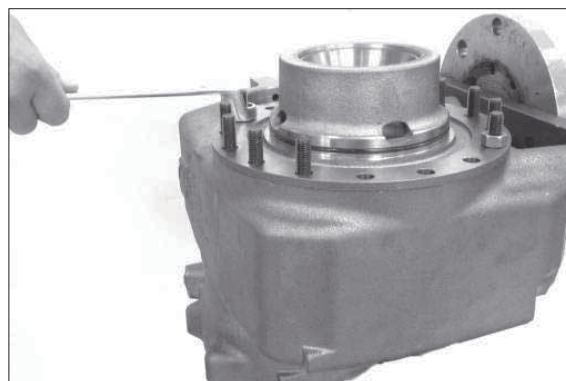
- ※ Pay attention to installation position – place locating tab of oil screen sheet into recess of bearing cover (see arrow).



14WF8TM148

- 18) Mount preassembled bearing cover and locate equally with hexagon nuts until contact. Then remove hexagon nuts again.

- ※ Oil contact face/oil screen sheet/housing (assembly aid).



14WF8TM149

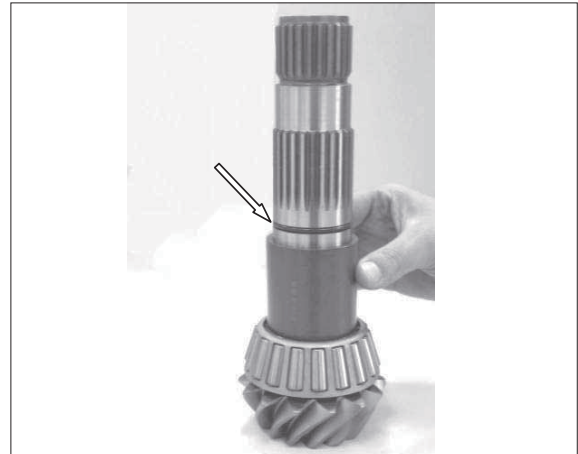
- 19) Install heated bearing inner ring until contact.

- ※ Adjust bearing inner ring after cooling down.



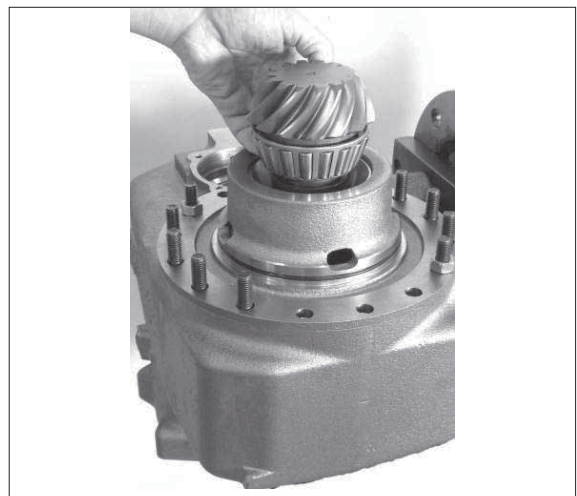
14WF8TM150

20) Mount bush, oil O-ring (arrow) and put it into annular groove.



14WF8TM151

21) Mount preassembled pinion.

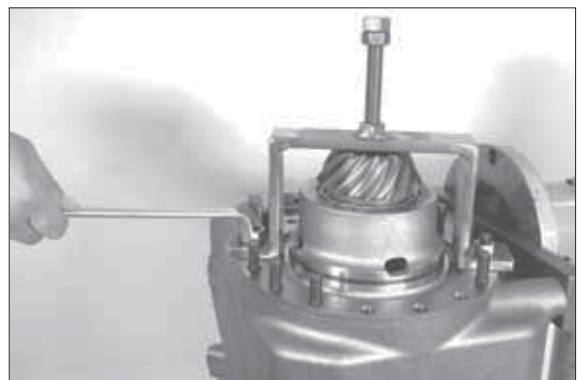


14WF8TM152

22) Fix pinion with clamping bar.

(S) Clamping bar

5870 654 049



14WF8TM153

Determine adjusting ring for rolling torque/pinion bearing :

23) Rotate transmission by 180°.

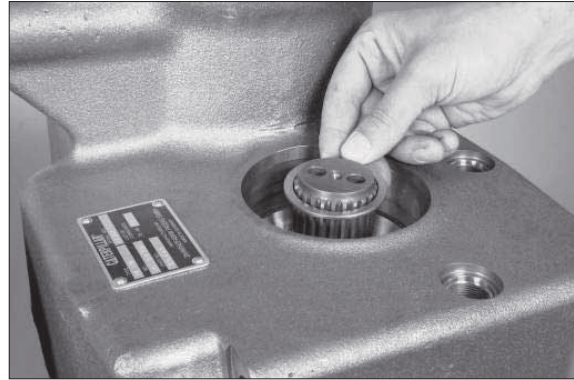
Mount adjusting ring (s = optional).

※ It is recommended to reinstall the adjusting ring (e.g. $s = 1.35 \text{ mm}$) removed during disassembly, if however the required rolling torque of 1.5~4.0 Nm (without shaft seal) is not obtained – see bearing rolling torque check Fig. 14WF8TM159 – bearing rolling torque is to be corrected with an adequate adjusting ring.

※ When shaft seal is installed, try to achieve upper rolling torque value.

24) Insert heated bearing inner ring until contact.

※ Adjust bearing inner ring after cooling down.

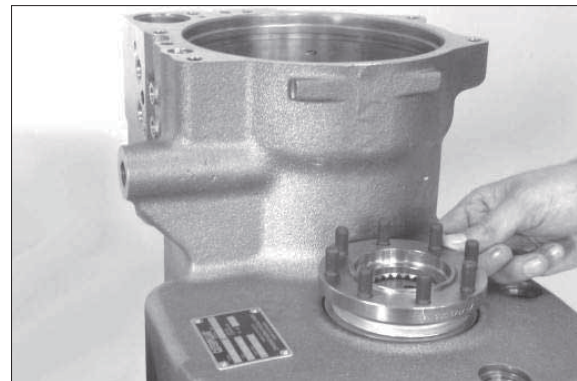


14WF8TM154



14WF8TM155

25) Mount flange.



14WF8TM156

26) Place shim and fix flange with hexagon screws.

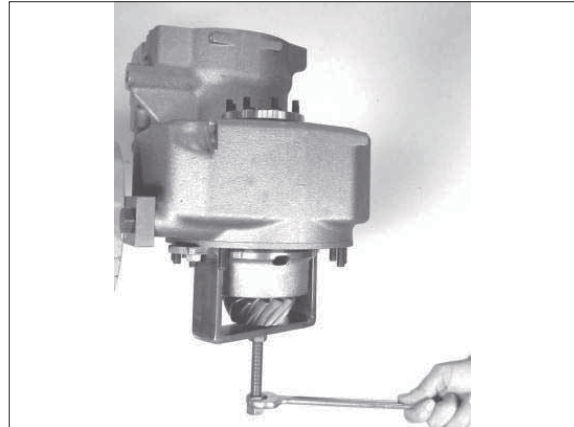
Tightening torque (M 10/10.9) $M_A = 68 \text{ Nm}$
(S) Clamping fork 5870 240 025

※ Rotate pinion – when tightening – in both directions (roller setting) several times .



14WF8TM157

27) Turn back pinion fastening / remove clamping bar.



14WF8TM158

Check rolling torque of pinion bearing

28) Bearing rolling torque (without shaft seal)
1.5~4.0 Nm

- ※ When using new roller bearings /for mounted shaft seal, try to achieve the upper value.
- ※ If the required rolling torque deviates, it must be corrected with an adequate adjusting ring (see 14WF8TM154).

(S) Reduction $\frac{1}{2}$ - $\frac{1}{4}$ 5870 656 056
(S) Plug insert AA00 392 461



14WF8TM159

29) Disassemble flange again.



14WF8TM160

Shaft seal output flange

30) Install new shaft seal.

(S) Driver tool 5870 048 279

- ※ For reassembly wet shaft seal on outer diameter with spirit.
- ※ Pay attention to installation position of shaft seal, seal lip showing to oil sump (see 14WF8TM162).
- ※ Use of specified driver tool ensures exact installation position of shaft seal.



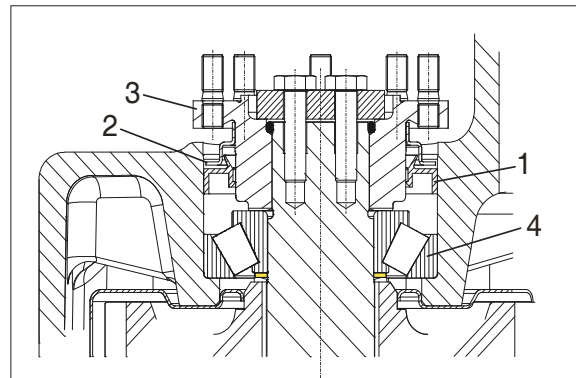
14WF8TM161

31) 1 = Shaft seal

2 = Metal sheet

3 = Output flange

4 = Roller bearing

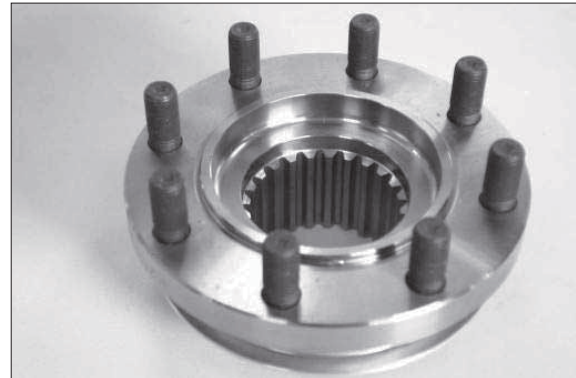


14WF8TM162

32) Install stud bolts.

Tightening torque (M10×1) MA = 20 Nm

- ※ Pay attention to installation position.
- Install stud bolts with short thread length into flange.

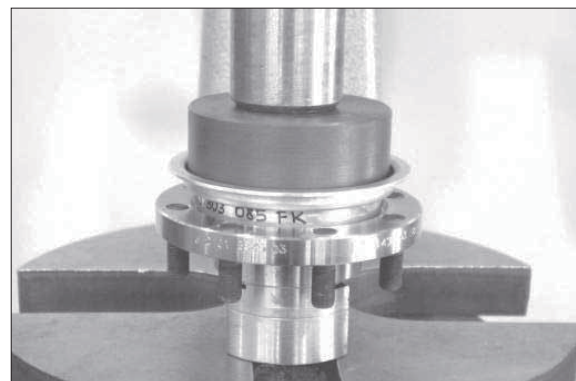


14WF8TM163

33) Install screen sheet (see 14WF8TM162).

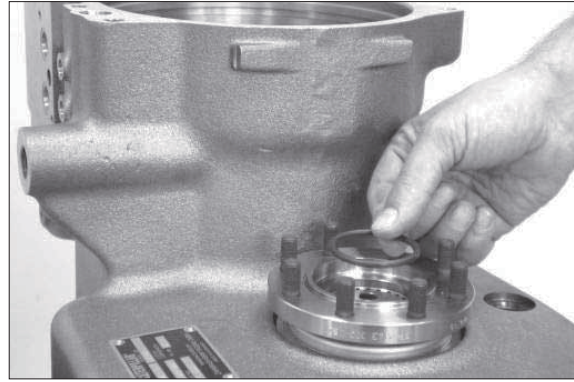
(S) Pressure piece 5870 506 150

- ※ Use of specified driver tool ensures exact installation position of screen sheet.



14WF8TM164

34) Mount preassembled flange and put O-ring into recess.



14WF8TM165

35) Place disk and fix it with hexagon screws.

Tightening torque (M 10/10.9) $M_A = 68 \text{ Nm}$

(S) Clamping fork 5870 240 025



14WF8TM166

Check pinion gap

36) Position ball [use $\varnothing = 7 \text{ mm}$ → ball \varnothing like for determination of auxiliary dimension A into centering hole of the pinion and determine dim. C (see 14WF8TM140), from contact surface/bearing cover to ball.

(S) Straightedge 5870 200 108

▲ If the constant value of dimension E = $73.00 \pm 0.05 \text{ mm}$

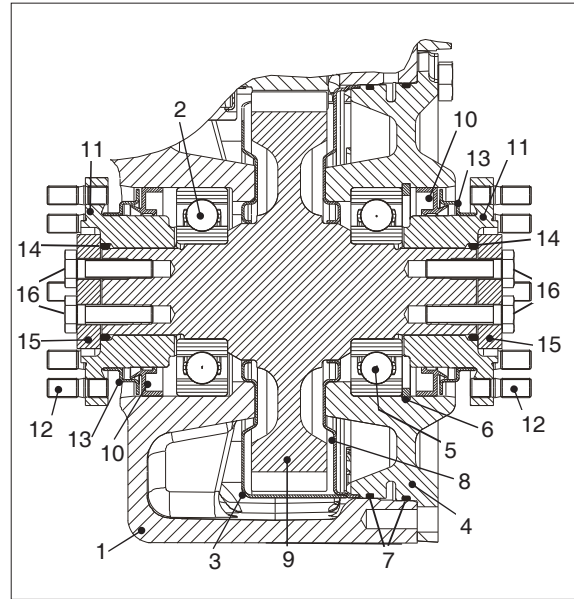
If the constant value of Dim. E = $73.00 \pm 0.05 \text{ mm}$ is not achieved, correct with an adequate shim/pinion gap (see 14WF8TM145).

For a correction of the shim/pinion gap, a counter correction of adjusting ring of rolling moment/ pinion gap – Fig. 14WF8TM154 must also be considered.



14WF8TM167

- 37) 1 = Transmission housing
 2 = Ball bearing
 3 = Screen sheet
 4 = Bearing cover
 5 = Ball bearing
 6 = Retaining ring
 7 = O-ring
 8 = Oil screen sheet
 9 = Output gear
 10 = Shaft seal
 11 = Output flange
 12 = Stud bolt
 13 = Metal sheet
 14 = O-ring
 15 = Disk
 16 = Hexagon screw

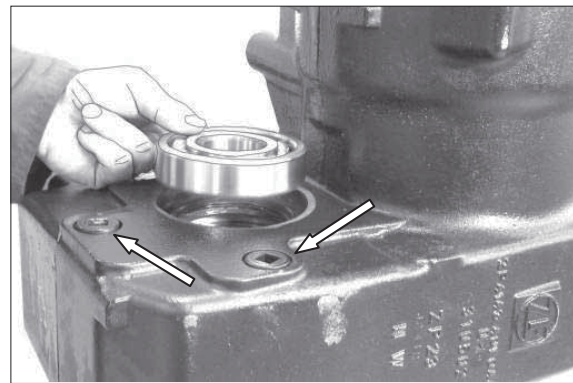


14WF8TM168

38) Provide screw plugs (see arrows) with new O-ring and install it.

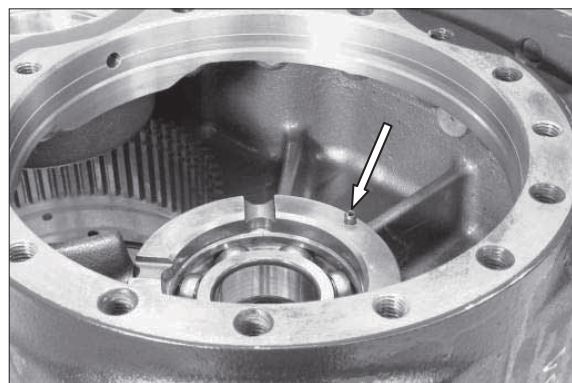
Tightening torque $M_A = 80 \text{ Nm}$

※ Then insert ball bearing (2) until contact.



14WF8TM169

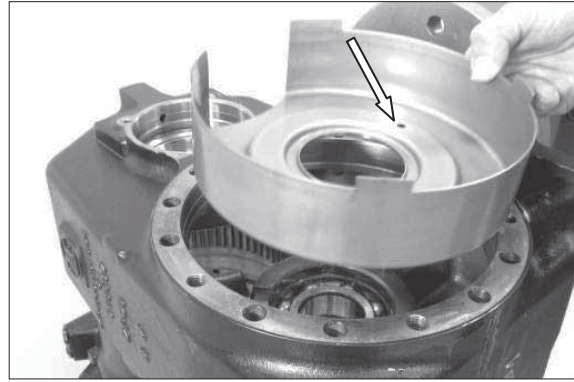
39) Rotate transmission by 180°.
 Insert slotted pin (see arrow) to the bottom.



14WF8TM170

40) Position screen sheet – with slotted pin into fixing hole (arrow).

※ Observe installation position –slotted pin = radial fixing of screen sheet.



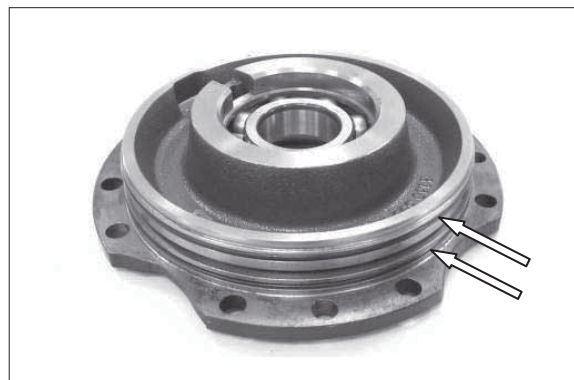
14WF8TM171

41) Insert ball bearing into cover and fix with retaining ring.



14WF8TM172

42) Oil both O-rings (arrows) and insert them into annular grooves of planetary carrier.



14WF8TM173

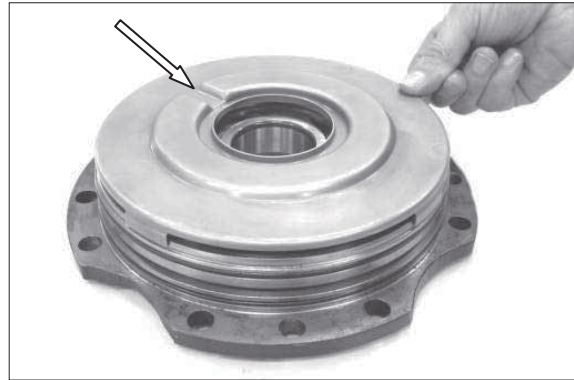
43) Bend edges of fixing straps of oil screen sheet slightly. Assembly aid screen sheet is fixed to bearing cover – see 14WF8TM176).



14WF8TM174

44) Insert oil screen sheet onto bearing cover

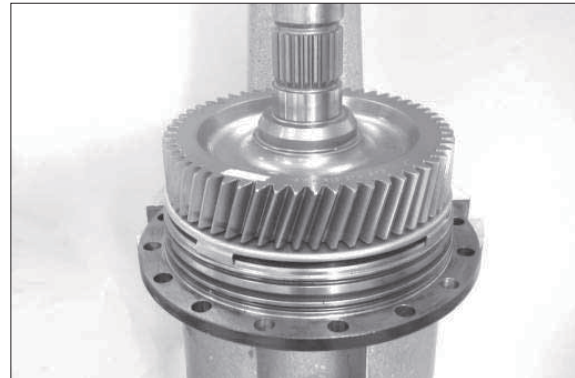
- ※ Observe installation position - place locating tab (see arrow) into recess of bearing cover (radial fixing).



14WF8TM175

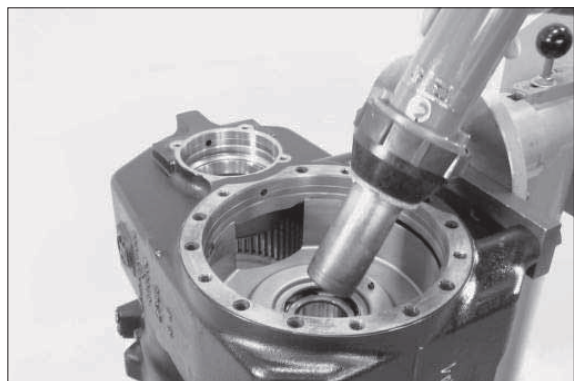
45) Press output gear into ball bearing/bearing cover.

- ※ Support ball bearing onto bearing inner ring.



14WF8TM176

46) Heat bearing inner ring of ball bearing.



14WF8TM177

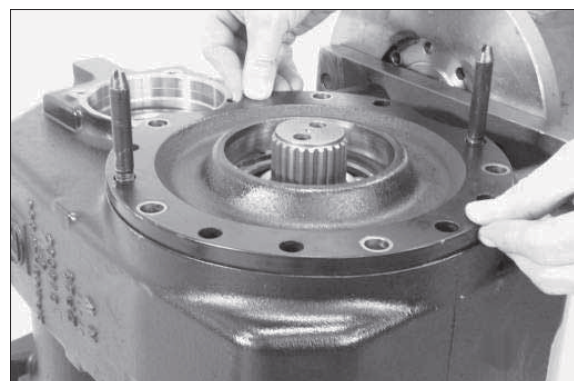
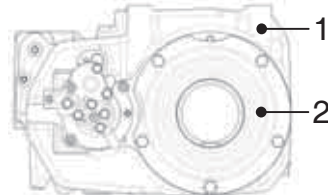
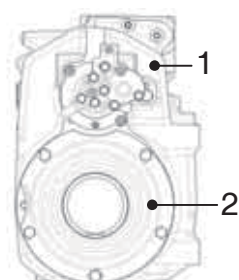
47) Attach two adjusting screws and mount preassembled bearing cover/output gear until contact.

(S) Adjusting screws (M12) 5870 204 021

- ※ Observe installation position of bearing cover (2) in transmission (1) – transmission installation VERTICAL or HORIZONTAL - see detailed sketches below:

<VERTICAL>

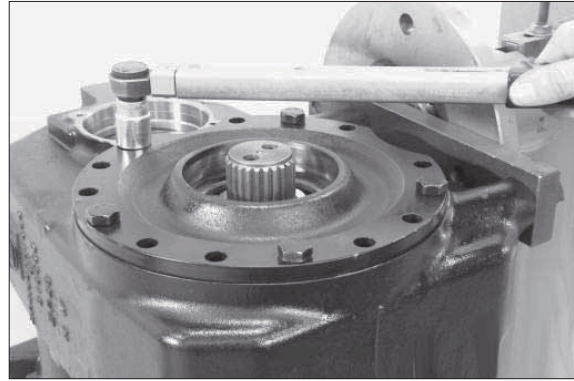
<HORIZONTAL>



14WF8TM178

48) Fix bearing cover by means of hexagon screws.

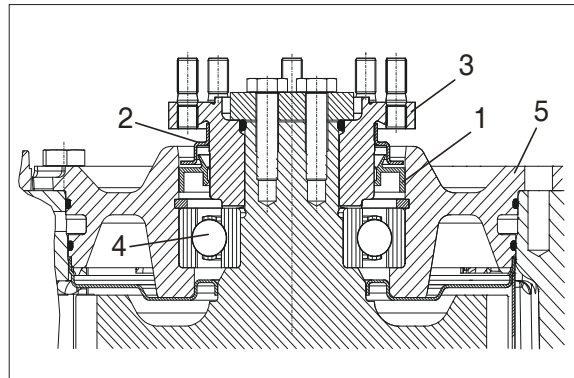
Tightening torque (M 12/8.8) $M_A = 80 \text{ Nm}$



14WF8TM181

Shaft seal output flange

- 49) 1 = Shaft seal
2 = Metal sheet
3 = Output flange
4 = Ball bearing
5 = Bearing cover

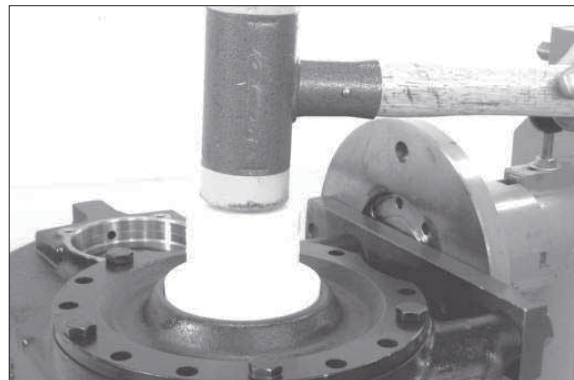


14WF8TM182

50) Install new shaft seal.

(S) Driver tool 5870 048 279

- ※ For reassembly wet shaft seal on outer diameter with spirit.
- ※ Pay attention to installation position of shaft seal, seal lip showing to oil sump.
- ※ Use of specified driver tool ensures exact installation position of shaft seal.



14WF8TM183

51) Install stud bolts.

Tightening torque (M10×1) $M_A = 20 \text{ Nm}$

- ※ Pay attention to installation position.
- Install stud bolts with short thread length into flange.

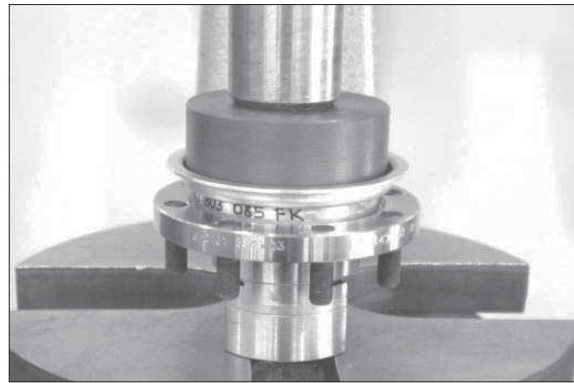


14WF8TM184

52) Install screen sheet (see 14WF8TM183).

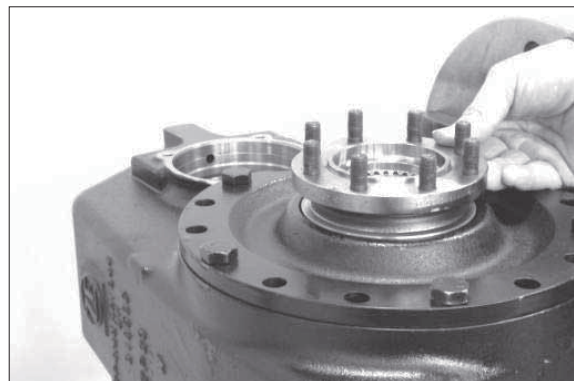
(S) Pressure piece 5870 506 150

※ Use of specified driver tool ensures exact installation position of screen sheet.



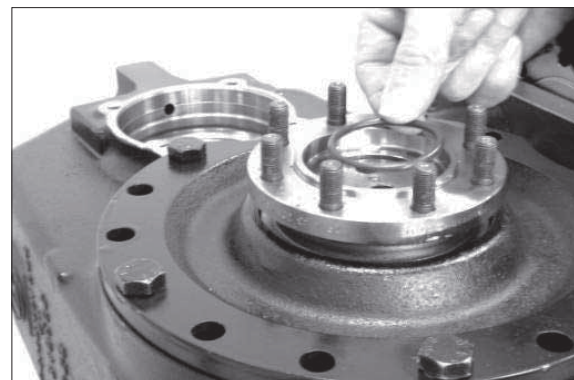
14WF8TM185

53) Install preassembled output flange.



14WF8TM186

54) Insert O-ring.

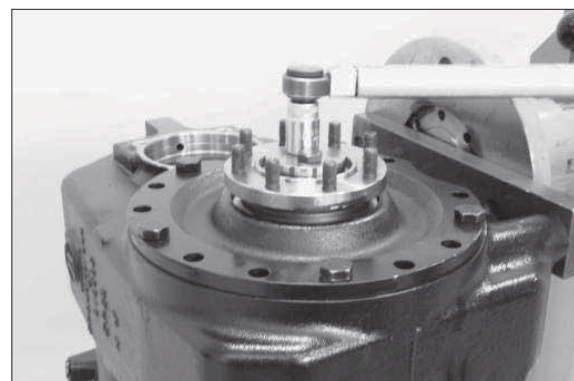


14WF8TM187

55) Position disk and fix output flange by means of hexagon screws.

Tightening torque (M10/10.9) $M_A = 68 \text{ Nm}$

※ Install second shaft seal/output flange (front axle output) analogously.



14WF8TM188

9. REASSEMBLY - BRAKE / CLUTCH / PLANETARY CARRIER

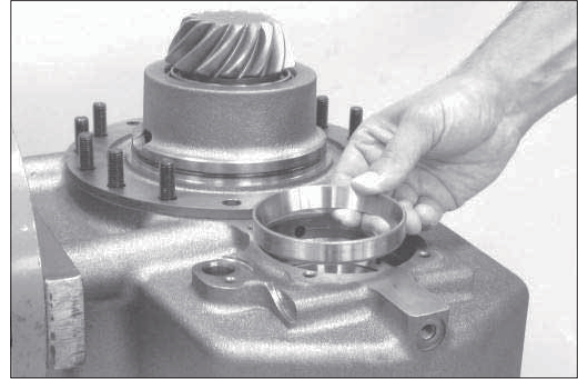
Planetary carrier

1) Install bearing outer ring until contact.

(S) Driver tool 5870 058 051

(S) Handle 5870 260 002

※ Observe bearing allocation – bearing inner ring to bearing outer ring – also see instructions for disassembly, 14WF8TM103.



14WF8TM189

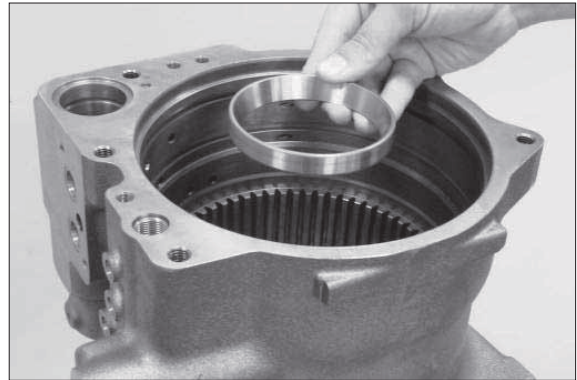
2) Rotate transmission by 180°.

Install second bearing outer ring until contact.

(S) Driver tool 5870 058 051

(S) Handle 5870 260 002

※ Observe bearing allocation – bearing inner ring to bearing outer ring – also see instructions for disassembly 14WF8TM103.



14WF8TM190

3) **Only for version transmission installation position**

※ Insert screen sheet and fasten with countersunk screws.

Tightening torque (M 6/8.8) $M_A = 7.4 \text{ Nm}$

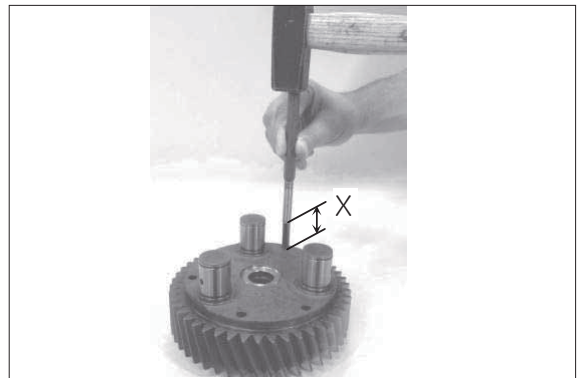
Wet countersunk screws with Loctite type no.243.



14WF8TM191

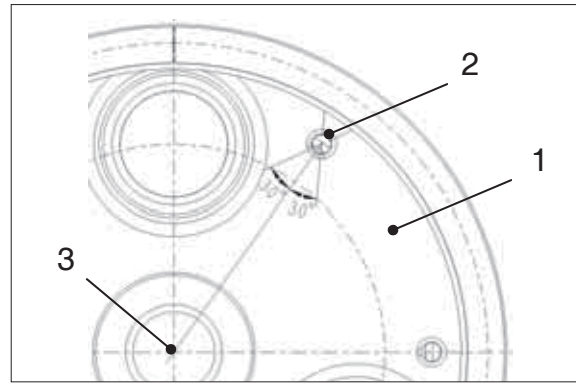
4) Install slotted pins (2) considering installation dimension X and installation position, see 14WF8TM193 (groove showing to center).

(S) Press-fit mandrel AA00 392 151



14WF8TM192

- 5) 1 = Planetary carrier
 2 = Slotted pin (6x)
 3 = Center (planetary carrier)

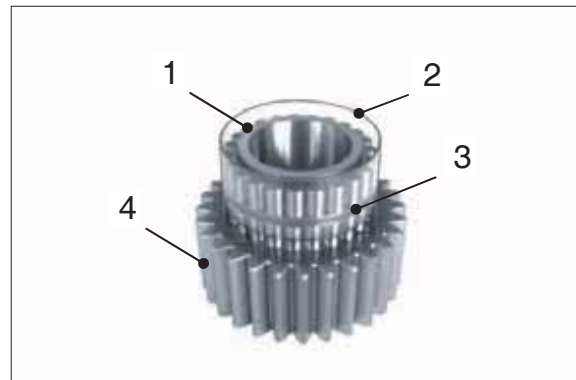


14WF8TM193

- 6) Insert cylindrical roller bearing into planetary gear. Press cylindrical roller bearing through packaging sleeve until snap ring engages into annular groove of planetary gear.

※ Use packaging sleeve to facilitate assembly.

- 1 = Cylindrical roller bearing
 2 = Packaging sleeve
 3 = Snap ring
 4 = Planetary gear

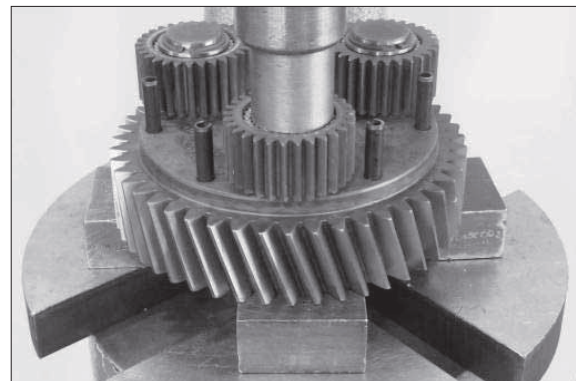


14WF8TM194

- 7) Press on planetary gear over bearing inner ring until contact.

(S) Driver tool 5870 048 283

※ Install planetary gears with large radius on cylindrical roller bearing (downwards) towards planetary carrier.



14WF8TM195

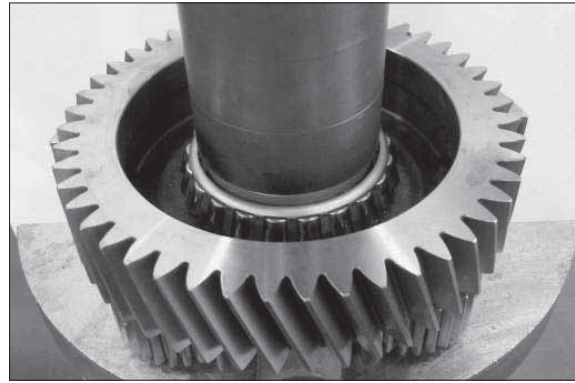
- 8) Engage retaining ring.

※ Adjust retaining ring until contact with groove base.



14WF8TM196

- 9) Press bearing inner ring onto planetary carrier until contact.



14WF8TM197

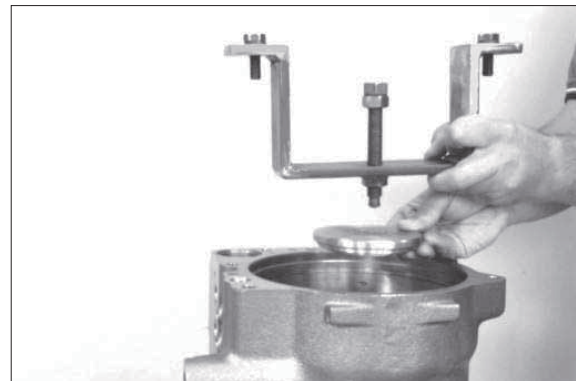
- 10) Insert preassembled planetary carrier.



14WF8TM198

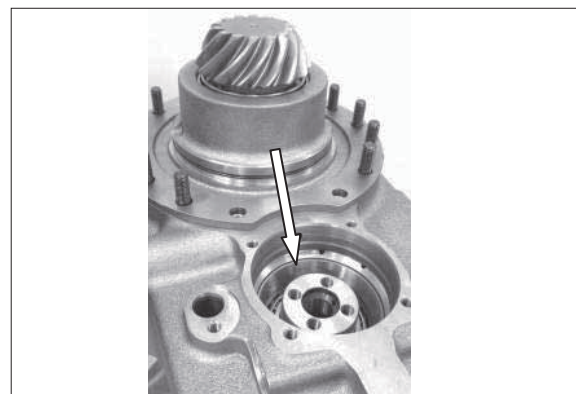
- 11) Fix planetary carrier with pressure plate and clamping bar.

(S) Clamping bar 5870 654 049



14WF8TM199

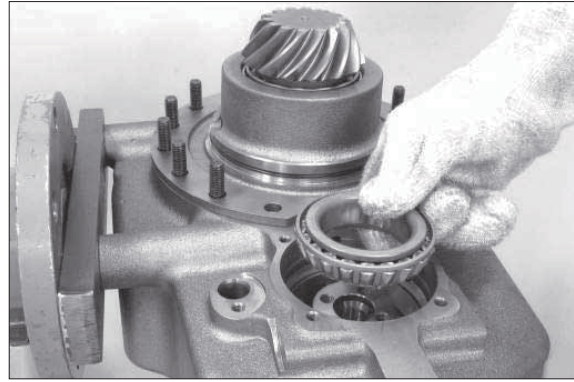
- 12) Rotate transmission by 180°. Check contact of bearing outer ring (see arrow). Reassembly of bearing outer ring, see 14WF8TM189.



14WF8TM200

13) Install heated bearing inner ring until contact.

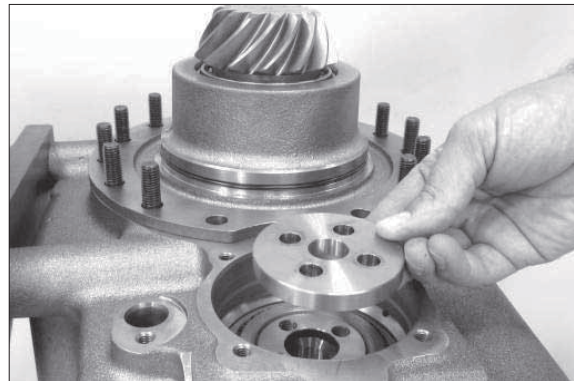
※ Adjust bearing inner ring after cooling down.



14WF8TM201

14) Position disk and manually turn in hexagon screws (fix planetary carrier).

Then remove clamping bar, see 14WF8TM199.



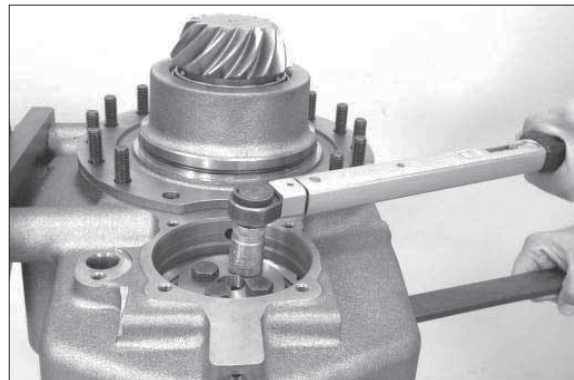
14WF8TM202

15) Fix clamping fork to output flange.

Tighten hexagon screws evenly – risk of strain.

Tightening torque (M 10/10.9) $M_A = 46 \text{ Nm}$
(S) Clamping fork 5870 240 025

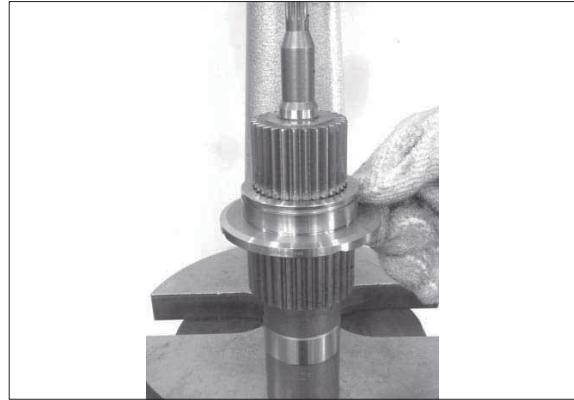
※ While tightening hexagon screws, rotate planetary carrier several times in both directions (roller setting).



14WF8TM203

Brake and clutch

16) Mount heated centering disk and press it until contact.



14WF8TM204

17) Fix centering disk by engaging retaining ring into annular groove of input shaft.



14WF8TM205

18) Insert ball bearing into ring gear and fasten it by engaging retaining ring into annular groove of ring gear.

(S) Clamping pliers 5870 900 021



14WF8TM206

19) Heat bearing inner ring of ball bearing.



14WF8TM207

20) Mount preassembled ring gear to input shaft until contact.



14WF8TM208

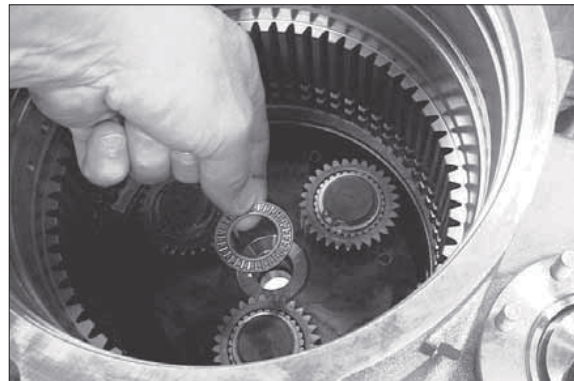
21) Engage retaining ring into annular groove of input shaft.



14WF8TM209

22) Rotate transmission by 180°.
Insert axial needle cage into recess of planetary carrier.

※ Oil axial needle cage for reassembly.



14WF8TM210

23) Insert preassembled input shaft (with ring gear).

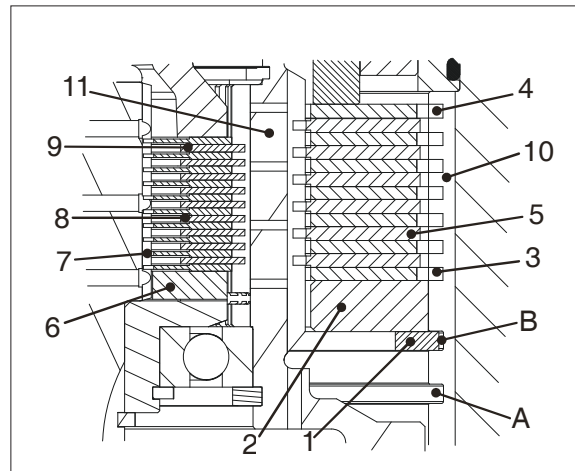


14WF8TM211

Disk components brake and clutch

- 24) A = Lower annular groove (Item retaining ring-1)
B = Upper annular groove (Item retaining ring-1)

- 1 = Retaining ring
- 2 = End plate/Brake (1 pc)
- 3 = Outer disk/Brake (6 pcs.)
- 4 = Outer disk/Brake optional (1 pc)
- 5 = Inner disk/Brake (6 pcs.)
- 6 = End plate/Clutch (1 pc)
- 7 = Lining disk/Clutch (10 pcs.)
- 8 = Outer disk/Clutch (8 pcs.)
- 9 = Outer disk/Clutch optional (1 pc)
- 10 = Transmission housing
- 11 = Disk carrier / Ring gear



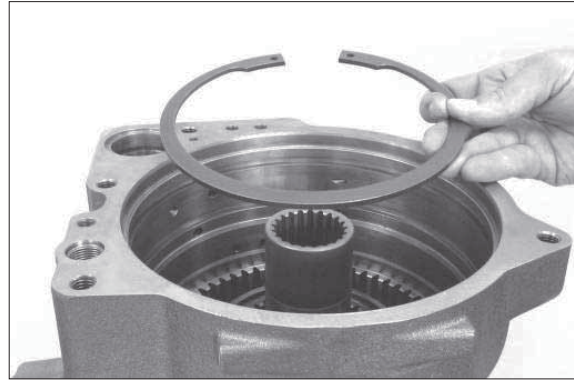
14WF8TM213

Reassembly brake :

25) Engage retaining ring (1) into annular groove (A).

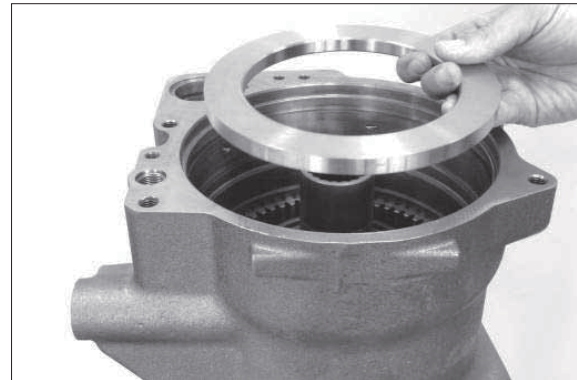
(S) Clamping pliers 5870 900 021

※ Observe installation position of retaining ring (1).



14WF8TM215

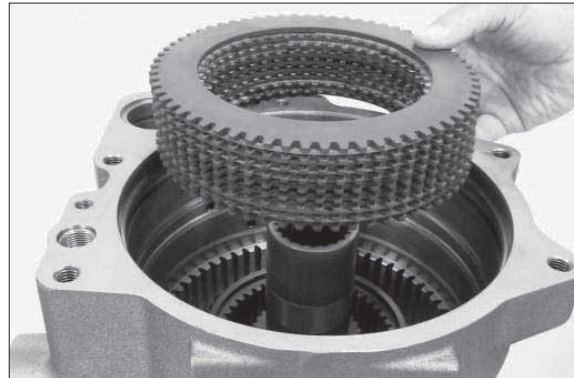
26) Insert end plate (2).



14WF8TM216

27) Insert disk package alternately, beginning with an outer disk.

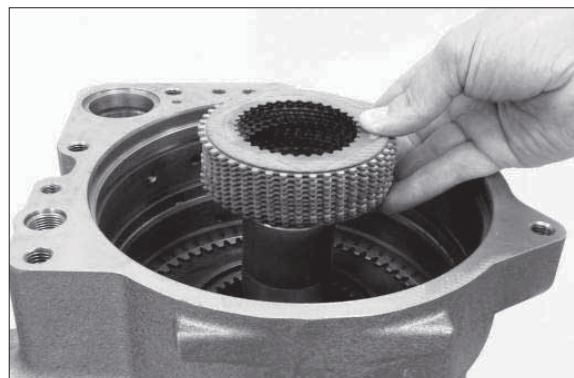
※ Position outer disk (1 pc) $s = \text{variable } 2.8 \sim 3.7 \text{ mm}$ to top of disk package (piston side).
With outer disk $s = \text{variable}$, disk clearance / piston stroke is adjusted - see 14WF8TM229.



14WF8TM217

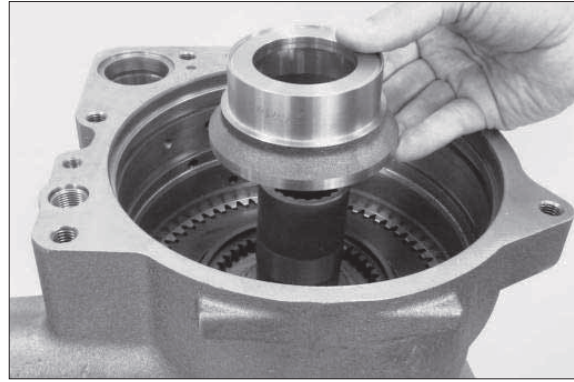
28) Insert disk package alternately, beginning with a lining disk.

※ Position outer disk (1 pc) $s = \text{variable } 1.2 \sim 1.6 \text{ mm}$ to top of disk package (pressure piece side).
With outer disk $s = \text{variable}$, disk clearance / piston stroke is adjusted - see 14WF8TM228.



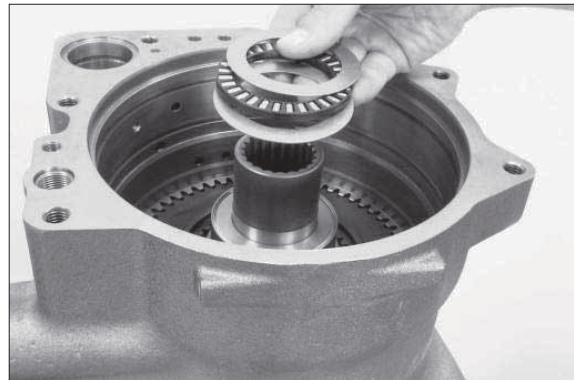
14WF8TM218

29) Mount pressure piece (without compression spring).



14WF8TM219

30) Oil axial roller cage and mount it with both axial washers (1x each, positioned underneath and onto axial needle cage).



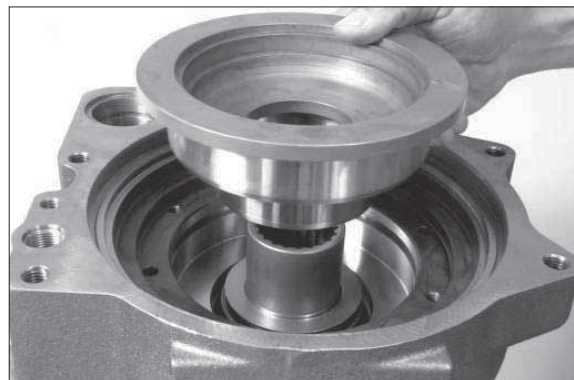
14WF8TM220

31) Insert piston (brake) – without mounted sealing elements.



14WF8TM221

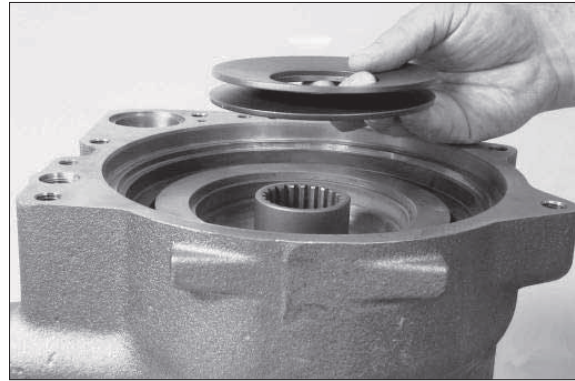
32) Insert piston (clutch) – without mounted sealing elements.



14WF8TM222

33) Insert both cup springs/clutch.

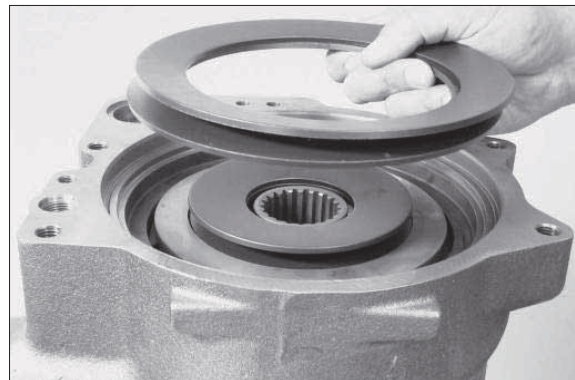
- ※ Fix cup springs with grease and position them centrally.
- ※ Observe installation position, see 14WF8TM225.



14WF8TM223

34) Insert both cup springs/brake.

- ※ Fix cup springs with grease and position them centrally.
- ※ Observe installation position, see 14WF8TM225.



14WF8TM224

35) 1 = Measuring device

2 = Piston/clutch

3 = Cup springs/Clutch

4 = Piston/Brake

5 = Cup springs/Brake

6 = Transmission housing

I = Measuring hole (disk clearance / clutch)

II = Measuring hole (disk clearance / brake)

A = Mounting face/Housing – Front face/Piston

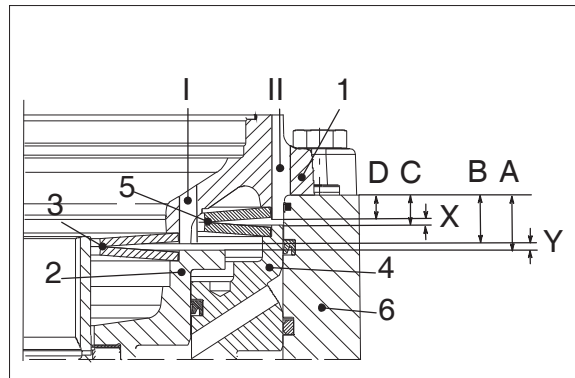
B = Mounting face/Housing – Piston contact/Housing

C = Mounting face/Housing – Front face/Piston

D = Mounting face/Housing – Piston contact/Housing

Y = Disk clearance/Clutch → $2.4 + 0.3$ mm (piston stroke)

X = Disk clearance/Brake → $1.8 + 0.3$ mm (piston stroke)

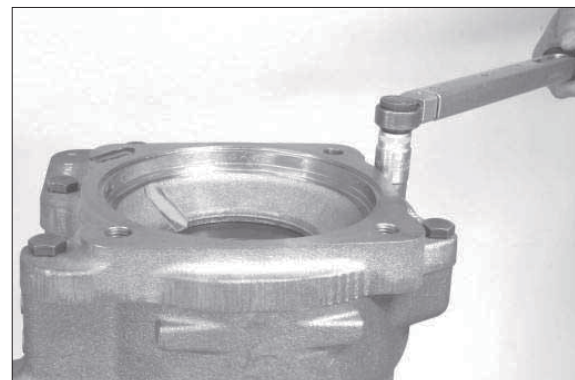


14WF8TM225

36) Locate measuring device evenly with hexagon screws (risk of breakage) until contact.

Tightening torque (M 12/8.8) $M_A = 80$ Nm

(S) Measuring device 5870 200 131

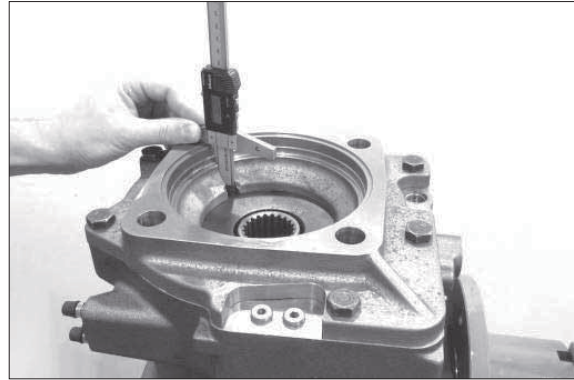


14WF8TM226

37) Determine dim. A (Measuring hole I) from mounting face/housing to front face/piston (clutch).

Dim. A e.g. = 22.45 mm

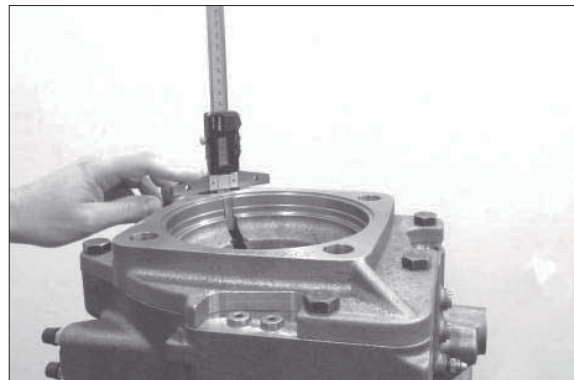
(S) Straightedge 5870 200 108



14WF8TM227

38) Determine Dim. C (Measuring hole II) from mounting face/housing to front face/piston (brake).

Dim. C e.g. = 11.85 mm



14WF8TM228

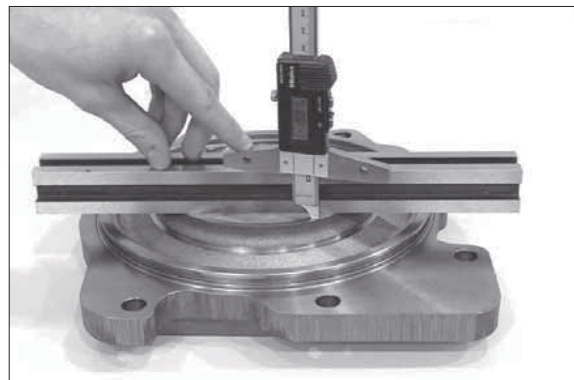
39) Determine Dim. B from mounting face/housing to clutch piston contact/housing.

Dim. B e.g. = 19.95 mm

A-B = 2.50 mm (disk clearance)

Clutch disk clearance (piston stroke) = $2.4^{+0.3}$ mm

▲ If the required disk clearance (piston stroke) is not obtained, correct with a suitable outer disk – see 14WF8TM218.



14WF8TM229

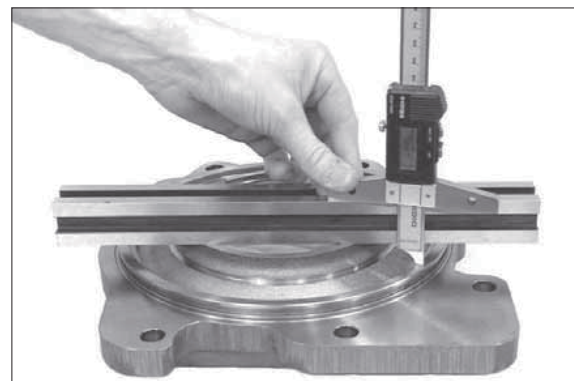
40) Determine Dim. D from mounting face/housing to brake piston contact/housing.

Dim. D e.g. = 9.95 mm

C-D = 1.90 mm (disk clearance)

Disk clearance (piston stroke) Brake = $1.8^{+0.3}$ mm

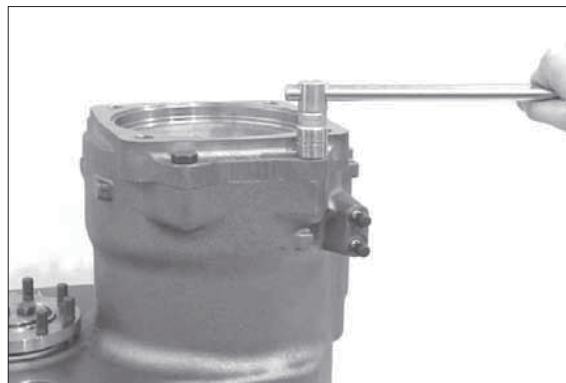
▲ If the required disk clearance (piston stroke) is not obtained, correct with a suitable outer disk – see 14WF8TM217.



14WF8TM230

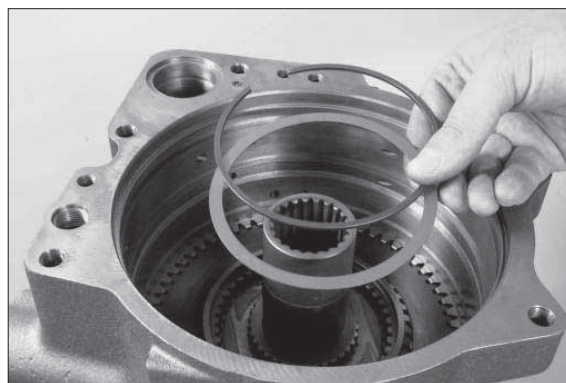
41) Remove measuring device again – loosen screws evenly.

Remove all cup springs, both pistons, axial roller cage with axial washers and pressure piece.



14WF8TM231

42) Insert shim into ring gear and fix by engaging snap ring into annular groove of ring gear.

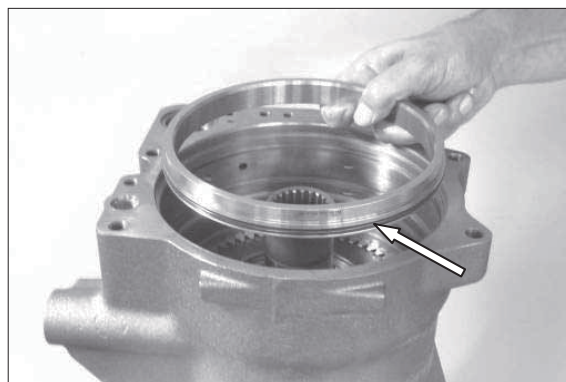


14WF8TM232

43) Place O-ring (see arrow) into groove and insert ring.

※ Oil sealing surfaces in housing and O-ring for reassembly.

※ Observe installation position



14WF8TM233

44) Mount ring with driver tool until contact.

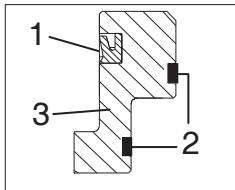
(S) Driver tool

5870 506 161

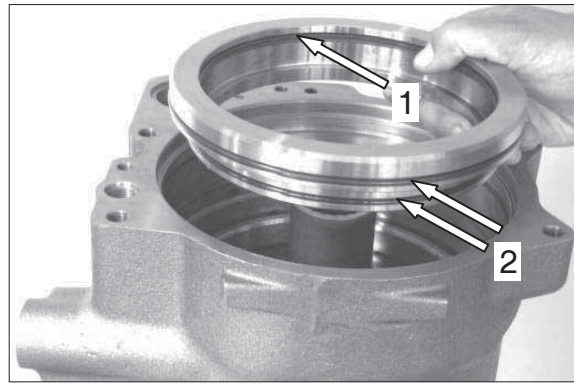


14WF8TM234

45) Oil sealing surfaces in housing and sealing elements. Insert seal (1) with sealing lip showing to oil sump – also see detail sketch.



Put both O-rings (2) into annular grooves of pressure ring (3) and insert preassembled pressure ring into housing.



14WF8TM235

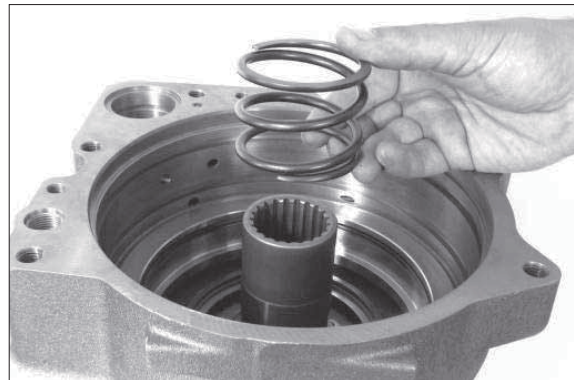
46) Bring pressure ring with driver tool into contact position.

(S) Driver tool 5870 506 161



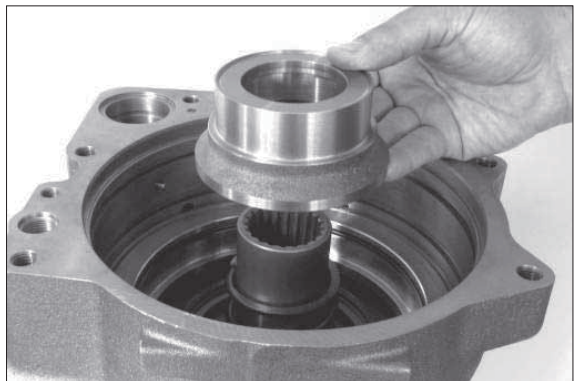
14WF8TM237

47) Insert compression spring until contact.



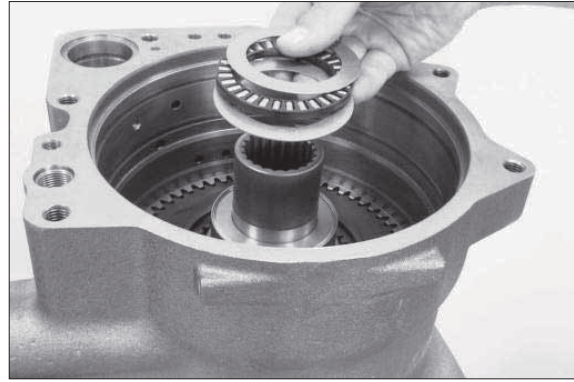
14WF8TM238

48) Insert pressure piece over compression spring until contact.



14WF8TM239

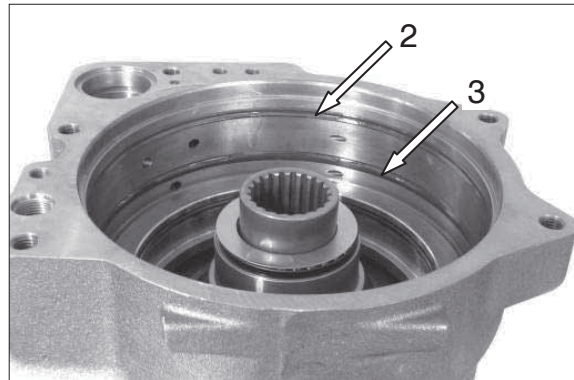
49) Oil axial roller cage and mount it with both axial washers (1x each to be positioned underneath and onto axial needle cage).



14WF8TM240

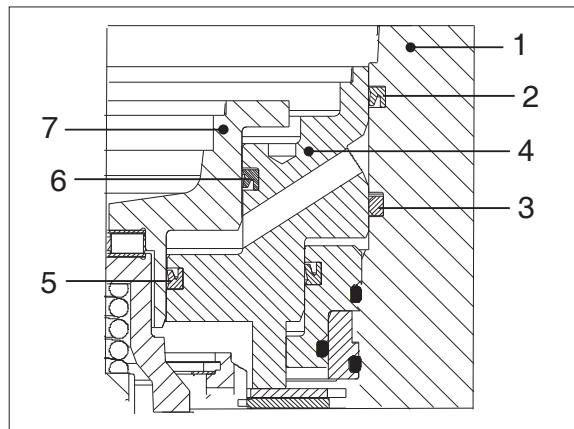
50) Insert seal (2, with sealing lip showing to oil sump) and seal (3) – see 14WF8TM242 into housing (1).

※ Oil sealing elements and sealing surfaces on piston for reassembly.



14WF8TM241

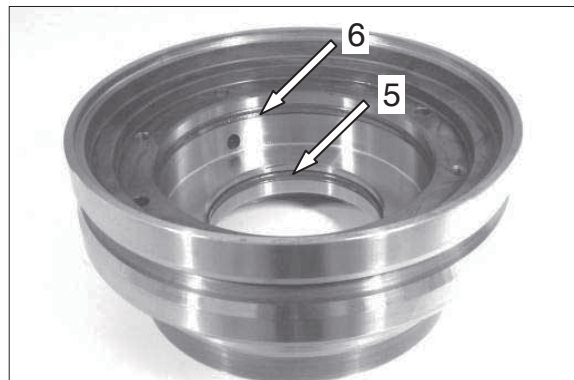
- 51) 1 = Housing
 2 = Seal (with sealing lip)
 3 = Seal
 4 = Piston / Brake
 5 = Seal (with sealing lip)
 6 = Seal (with sealing lip)
 7 = Piston / Clutch



14WF8TM242

52) Insert seals (5 and 6, see 14WF8TM247), with sealing lips showing to oil sump into piston / brake (4).

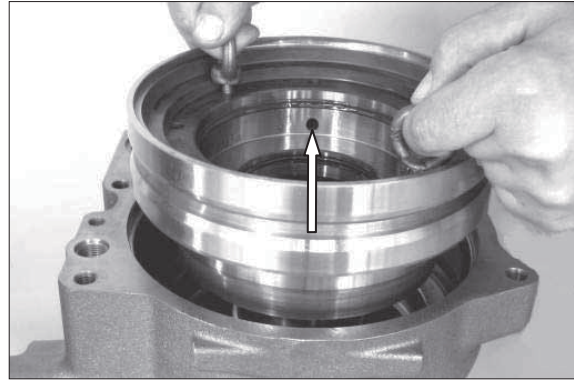
※ Oil sealing surfaces on piston and sealing elements for reassembly.



14WF8TM243

53) Insert preassembled piston/brake until contact.

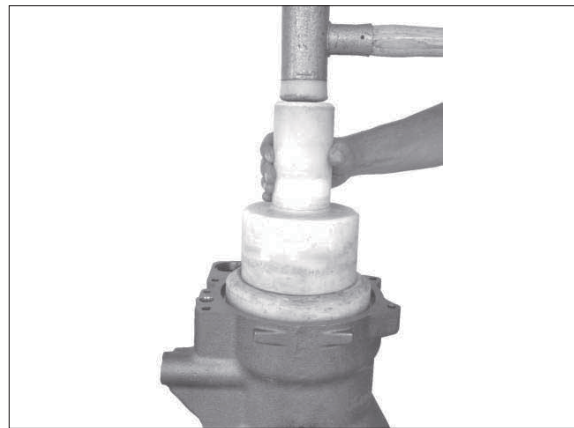
※ Position piston in such a way that oil supply hole (see arrow) is at 12.00 o'clock position. Observe version as to transmission installation position HORIZONTAL – VERTICAL.



14WF8TM244

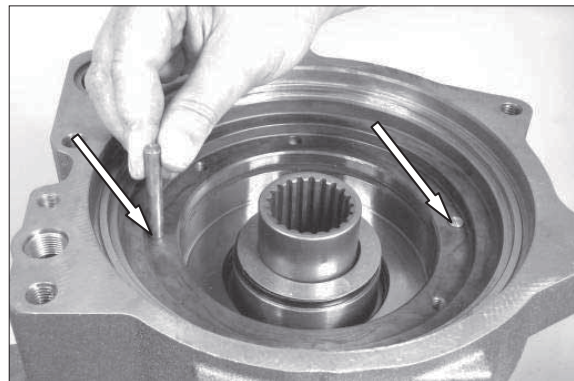
54) Use driver tool to bring piston into contact position.

(S) Driver tool 5870 506 161



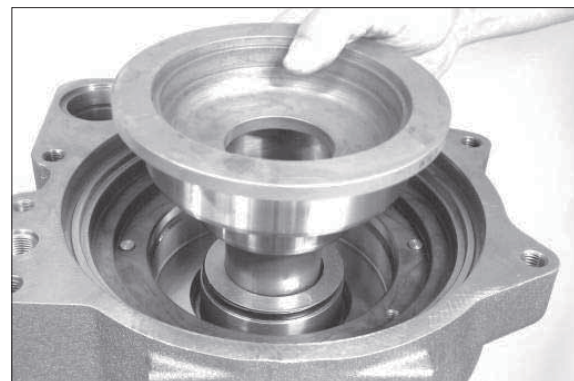
14WF8TM245

55) Insert both cyl. pins (arrow).



14WF8TM246

56) Insert piston/clutch until contact.

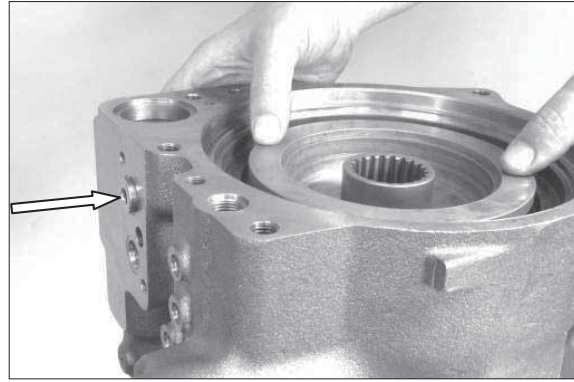


14WF8TM247

- 57) Press piston axially, against compression spring preload.
Provide screw plug with new O-ring and seal pressure oil supply hole (see arrow).

Tightening torque $M_A = 40 \text{ Nm}$

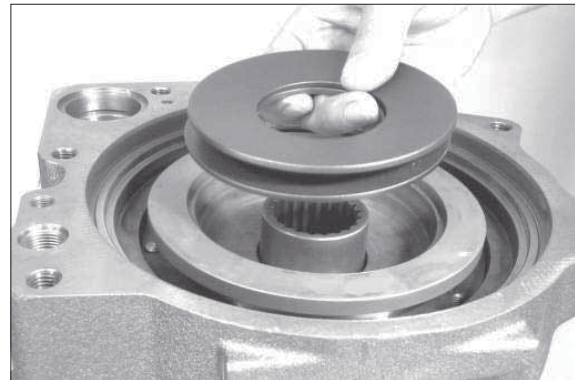
- ※ Axial position of piston is maintained
(Facilitate assembly for installation of input housing, see 14WF8TM254~ 14WF8TM255).



14WF8TM248

- 58) Insert both cup springs/clutch.

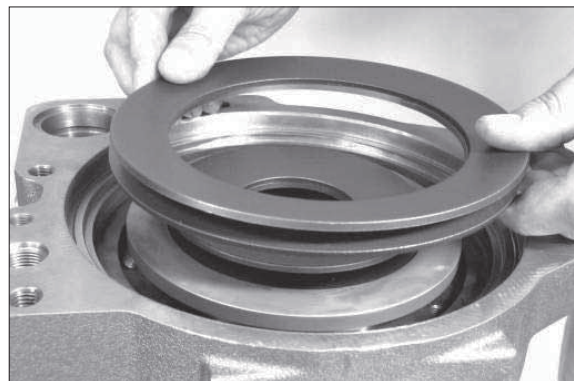
- ※ Observe installation position, see also 14WF8TM225.



14WF8TM249

- 59) Insert both cup springs/brake.

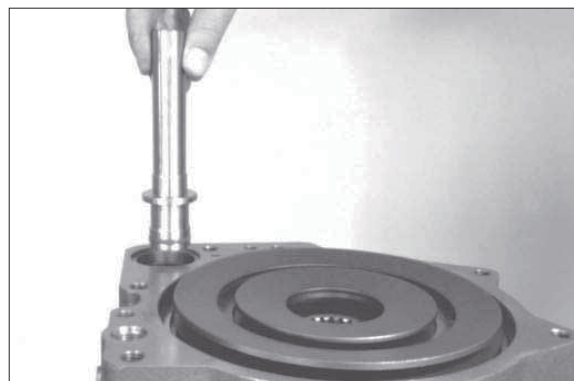
- ※ Observe installation position – see also 14WF8TM225.



14WF8TM250

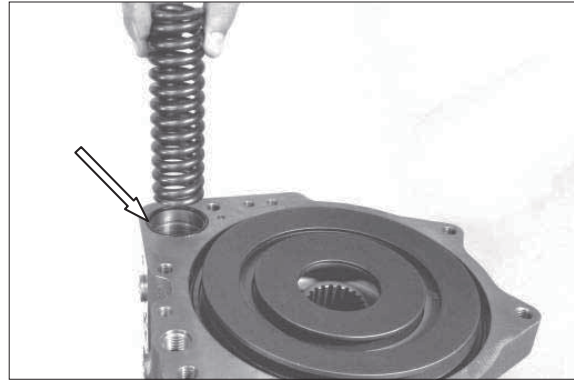
Install modulation valve and input housing

- 60) Insert piston (modulation valve cpl. – can only be replaced as unit).



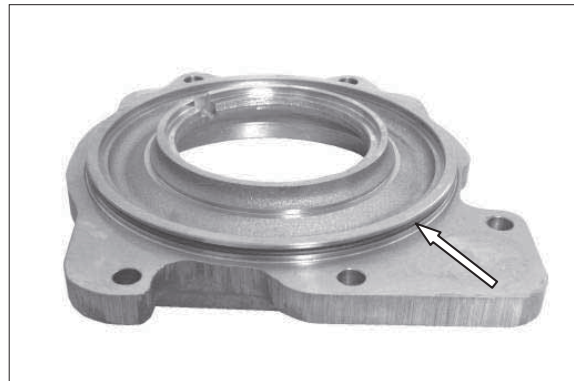
14WF8TM251

61) Place O-ring (see arrow) into annular groove of housing and insert compression spring.



14WF8TM252

62) Oil O-ring and insert it into annular groove of input housing.

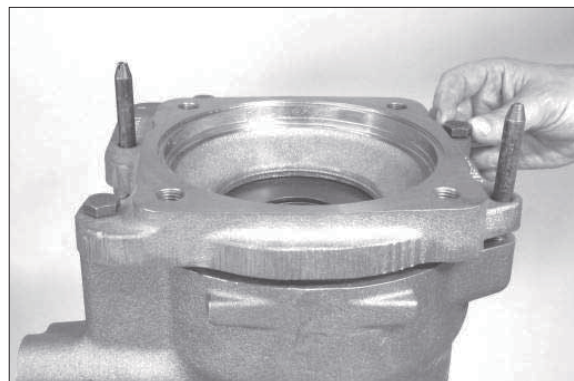


14WF8TM253

63) Insert two adjusting screws (M 12), mount input housing and fix it with hexagon screws.

(S) Adjusting screws (M12) 5870 204 021

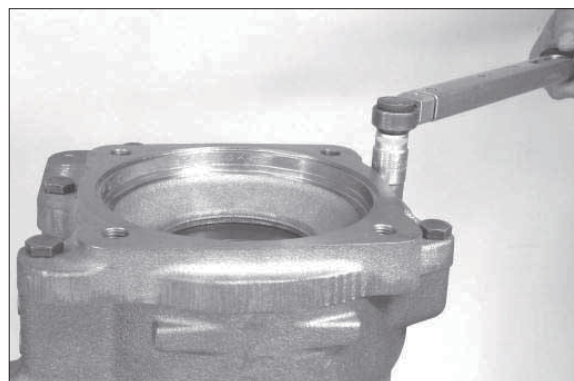
※ For installation of input housing align cup springs centrally.



14WF8TM254

64) Locate input housing evenly with hexagon screws (risk of breakage) until contact.

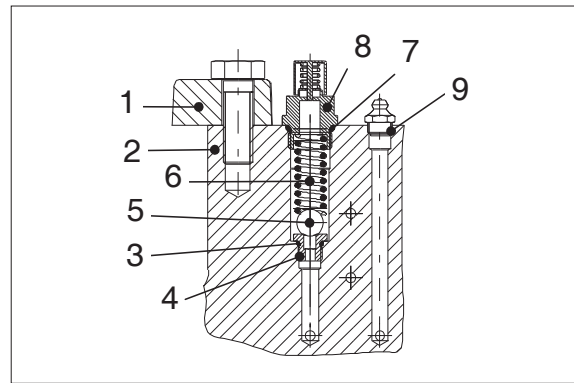
Tightening torque (M 12/8.8) $M_A = 80 \text{ Nm}$



14WF8TM255

Emergency release (parking brake)

- 65) 1 = Input housing
2 = Housing
3 = O-ring
4 = Threaded element (orifice)
5 = Ball
6 = Compression spring
7 = O-ring
8 = Breather
9 = Position of lubrication nipple for version
Transmission installation position Vertical

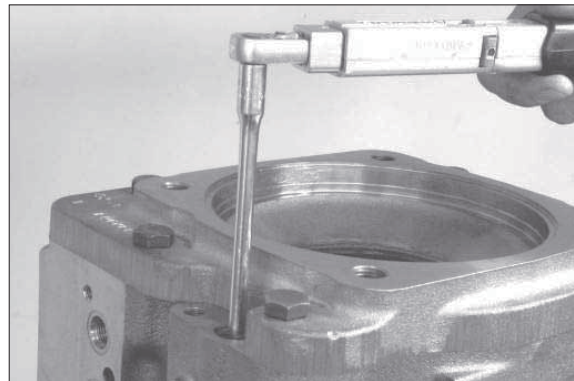


14WF8TM256

- ※ Position of lubrication nipple for version transmission installation position Horizontal, see 14WF8TM261.
- ※ Remove protective cap of lubrication nipple only if emergency release is required.

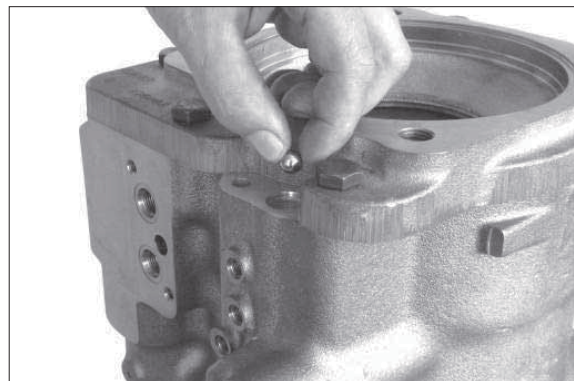
- 66) Install threaded element (4) with new O-ring (3).

Tightening torque (M 10×1) $M_A = 15 \text{ Nm}$



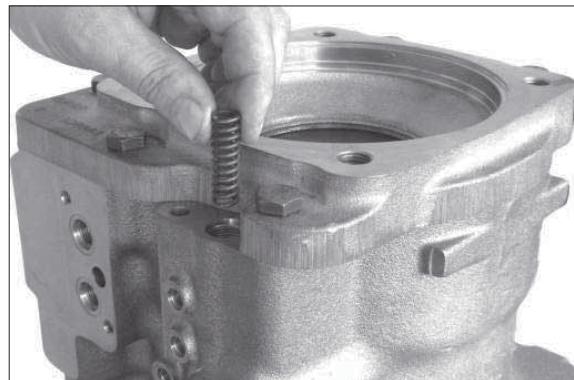
14WF8TM257

- 67) Insert ball (5).



14WF8TM258

- 68) Insert compression spring (6).



14WF8TM259

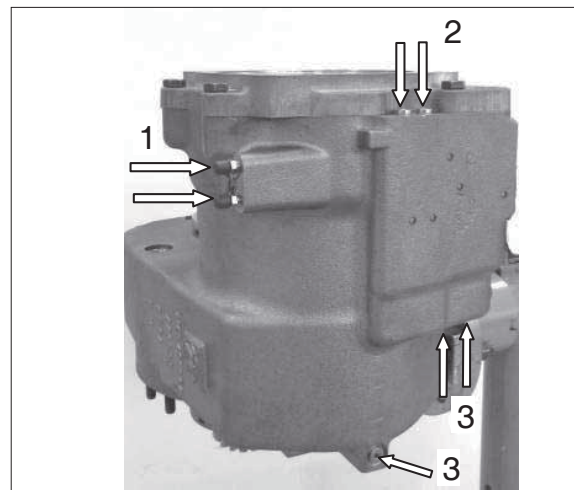
Check emergency release for leak tightness

69) Illustration shows version transmission installation position Vertical.

※ For version transmission installation position Horizontal connections and positions of breather valves/lubrication nipple etc. must be considered as shown on illustration of 14WF8TM261.

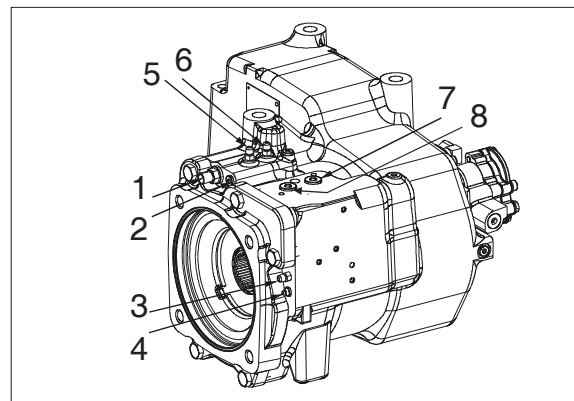
Install both breather valves (1), screw plugs (2) with new seal rings and screw plugs (3) with new O-rings.

Breather valve (M 10×1) MA = 15 Nm
 Screw plug (M 10×1 with seal ring) MA = 20 Nm
 Screw plug (M 10×1 with O-ring) MA = 20 Nm



14WF8TM260

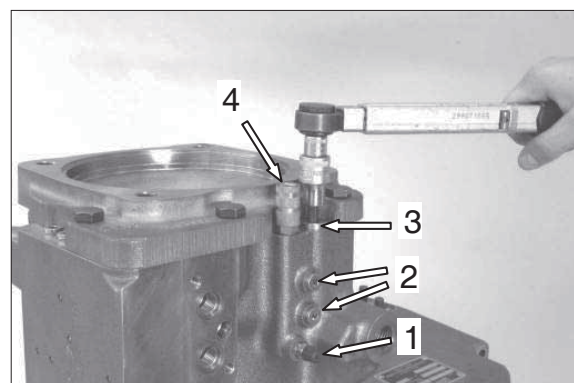
- 70) 1 = Breather/Pressure relief-valve (emergency release – parking brake)
- 2 = Screw plug
- 3 = Breather valve (emergency release – parking brake)
- 4 = Lubrication nipple (emergency release – parking brake)
- 5 = Breather valve (multi-disk clutch)
- 6 = Breather valve (multit-disk brake)
- 7 = Pressure oil connection – multi-disk brake
- 8 = Pressure oil connection – multi-disk clutch



14WF8TM261

71) Install breather valve (1), screw plugs (2), screw plug (3) with new O-ring and compressed air connection piece (4).

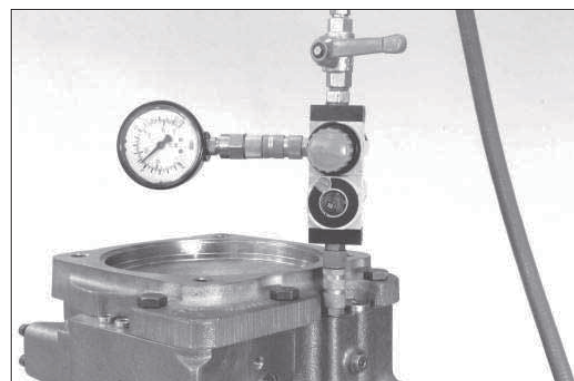
Breather valve (M 10×1) MA = 15 Nm
 Screw plug (M 10×1 with O-ring) MA = 20 Nm
 Screw plug (M 18×1.5 with O-ring) MA = 35 Nm
 Compressed air connect. piece (M 10×1) with seal ring MA = 20 Nm



14WF8TM262

72) Pressurize emergency release with compressed air $p = 5 + 1$ bar and close shut-off valve. During a test duration of 3 minutes no pressure drop is allowed.

(S) Air connection 5870 505 012



14WF8TM263

- 73) Remove screw plug and compressed air connection piece (see 14WF8TM262).
Install breather (3) with new O-ring and lubrication nipple (4).

Lubrication nipple (M 10×1) MA = 15 Nm
Breather (M 18×1.5) MA = 22 Nm

Check multi-disk brake and clutch for leak tightness as well as closing pressure

- 74) 1 = Transmission housing
2 = Input housing

AB = Pressure oil connection – multi-disk brake

AK = Pressure oil connection – multi-disk clutch

EB = Breather valve – multi-disk brake

EK = Breather valve – multi-disk clutch

※ Illustration shows version transmission installation position Vertical.

※ For version Transmission installation position Horizontal, connections and positions of breather valves/lubrication nipple etc. according to illustration in 14WF8TM261 must be considered.

Multi-disk brake

- 75) Connect HP pump (AB – see 14WF8TM265 and 14WF8TM261) and build up pressure of $p = 30$ (max. 35 bar).

- Bleed pressure chamber several times.
Close shut-off valve.

During a test duration of 3 minutes no measurable pressure drop is allowed.

(S) HP pump 5870 287 007

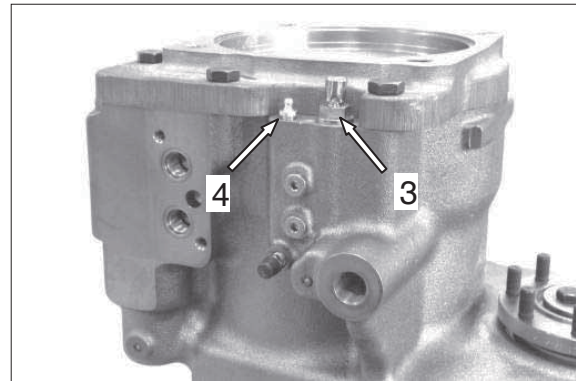
Closing pressure test (Cup spring preloading force)

- 76) When measuring closing pressure, valve block may not be attached to transmission due to by-pass function between brake and clutch.

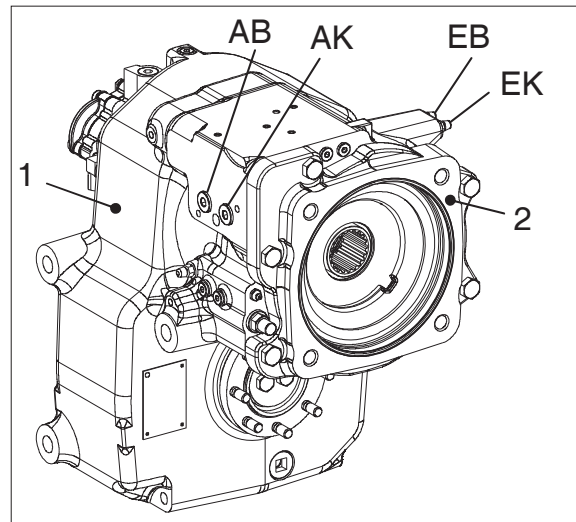
Connection AK (see 14WF8TM265 and 14WF8TM261) open (not closed and tank connection).

Reduce pressure slowly, when pressure range 12~9 bar (closing pressure) is reached, input shaft must be locked at a tightening torque of 35 Nm.

(S) Spline mandrel 5870 510 039



14WF8TM264



14WF8TM265



14WF8TM266

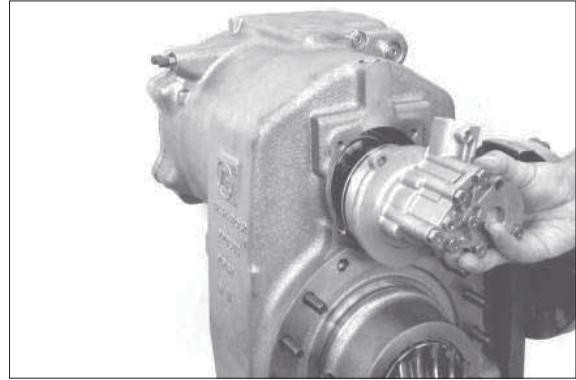


14WF8TM267

10. DISASSEMBLY - LUBRICATION PUMP/ SHIFT INTERLOCK and VALVE BLOCK

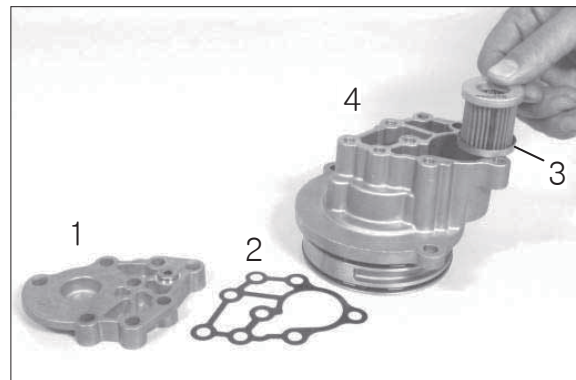
Lubrication pump version

- 1) Loosen threaded joint and pull off cpl. lubrication pump.



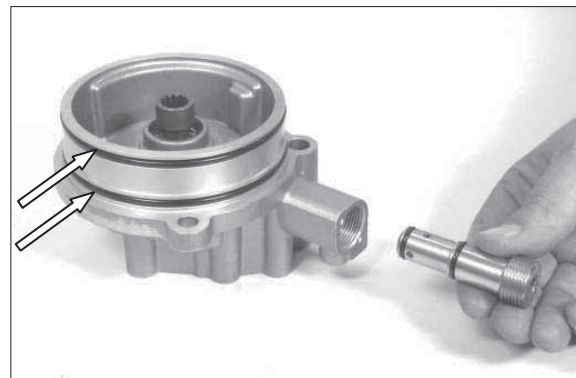
14WF8TM272

- 2) Loosen cover screws, remove cover (1) with seal (2) and filter (3) from housing (4).



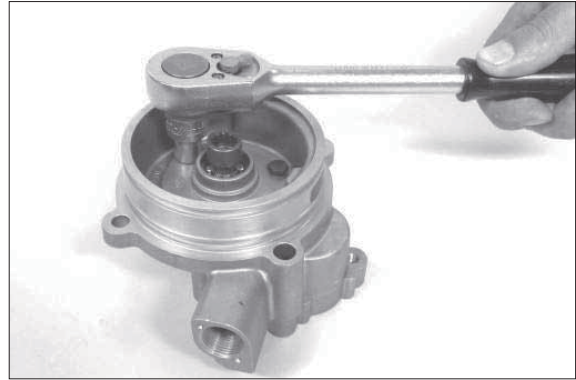
14WF8TM273

- 3) Remove cpl. pressure limiting valve and both O-rings (arrows).



14WF8TM274

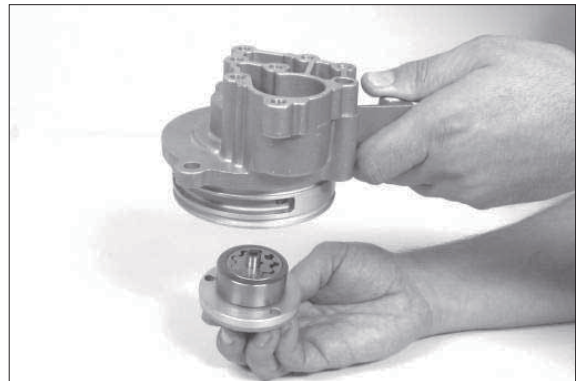
- 4) Keep housing in vertical position, while loosening pump cover screws.



14WF8TM275

- ※ Maintain contact position of pump and rotate by 180° - disassembly aid.

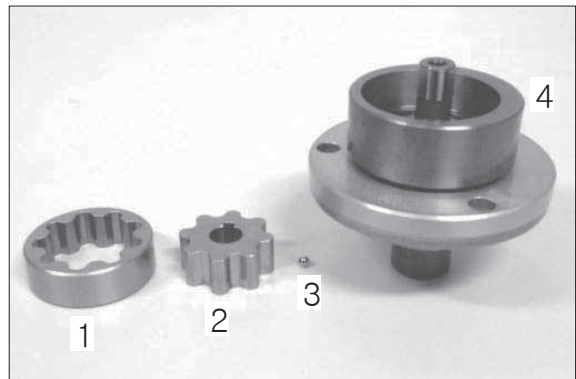
- 5) Then pull pump in vertical position out of housing – pay attention to possibly releasing balls and compression springs.



14WF8TM276

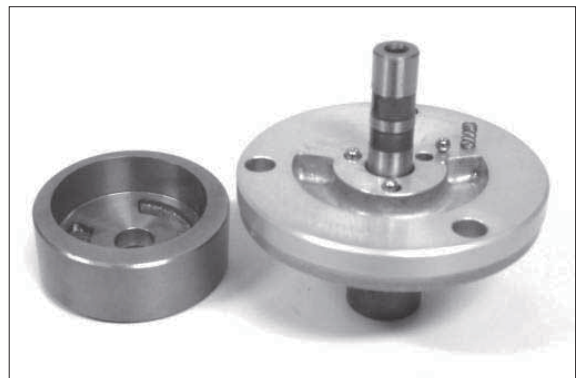
- 6) Remove outer (1) and inner rotor (2) and take releasing ball [(3) driver] out of control housing (4).

- ※ Outer, inner rotor and control housing = rotor set



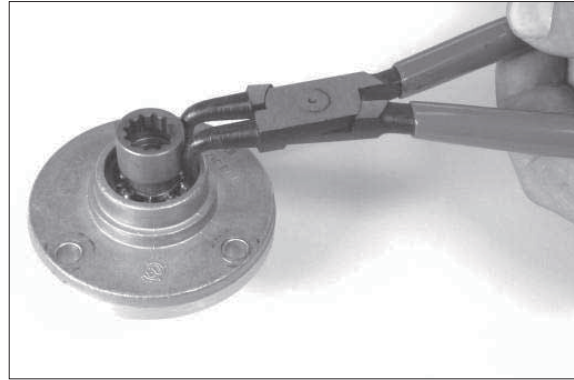
14WF8TM277

- 7) Remove control housing and releasing balls and compression springs (3 pcs. each).



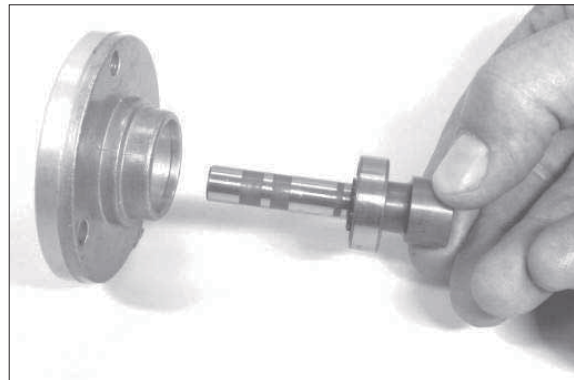
14WF8TM278

8) Unsnap retaining ring.



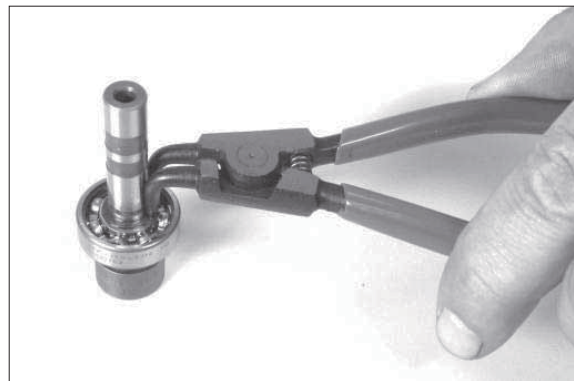
14WF8TM279

9) Pull cpl. pump shaft out of pump cover.



14WF8TM280

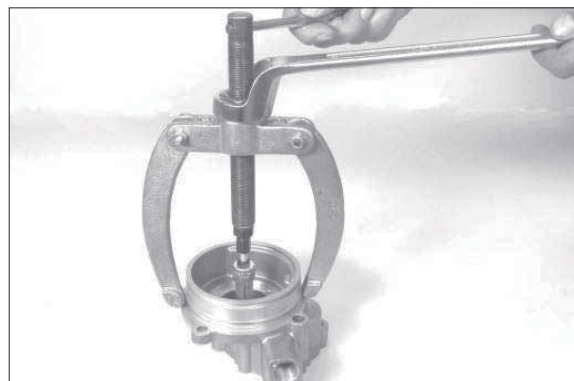
10) Unsnap retaining ring and press ball bearing from shaft.



14WF8TM281

11) Pull needle sleeve out of housing hole.

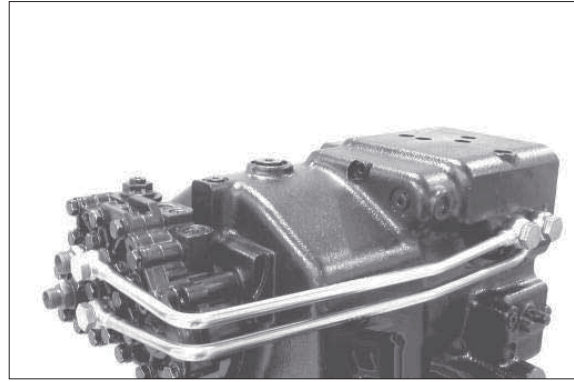
(S) Inner extractor 5870 300 012
(S) Counter support 5870 300 011



14WF8TM282

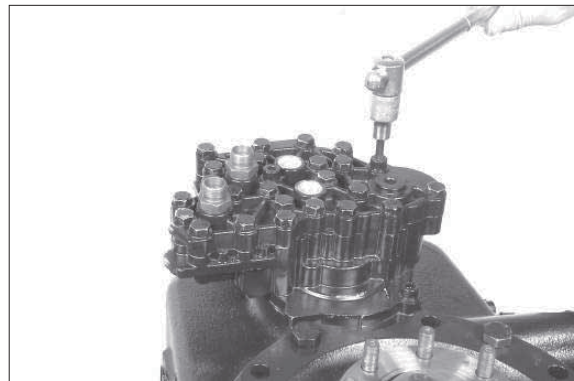
Shift interlock version

12) Disassemble both oil tubes.



14WF8TM283

13) Loosen threaded joint of shift interlock (3 x cylindrical screws) and remove cpl. shift interlock.



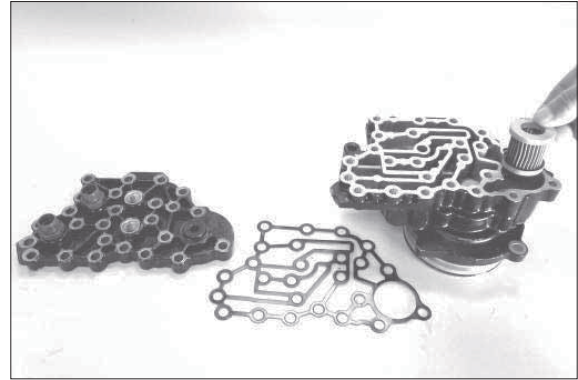
14WF8TM284

14) Loosen cover screws, remove cover and gasket (see also 14WF8TM286).



14WF8TM285

15) Take filter out of housing.



14WF8TM286

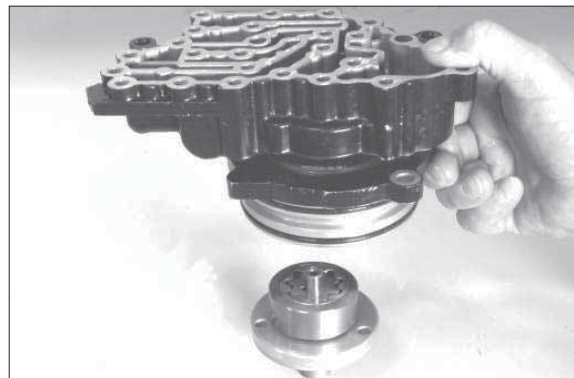
16) Loosen cover screws of pump.



14WF8TM287

※ Maintain contact position of pump and rotate it by 180° – disassembly aid.

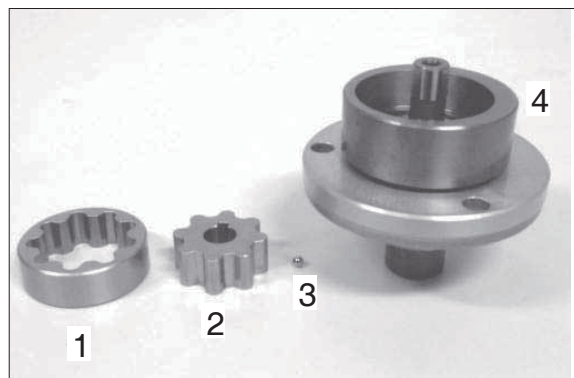
17) Then pull pump in vertical position out of housing – pay attention to possibly releasing balls and compression springs (see 14WF8TM289 and 14WF8TM290).



14WF8TM288

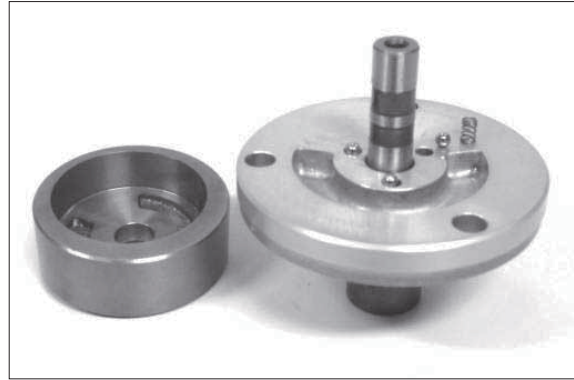
18) Remove outer (1) and inner rotor (2) and take releasing ball [(3) driver] out of control housing (4).

※ Outer, inner rotor and control housing = rotor set



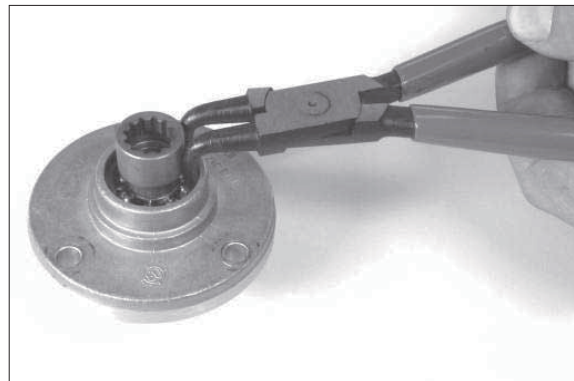
14WF8TM289

19) Remove control housing and releasing balls and compression springs (3 pcs. each).



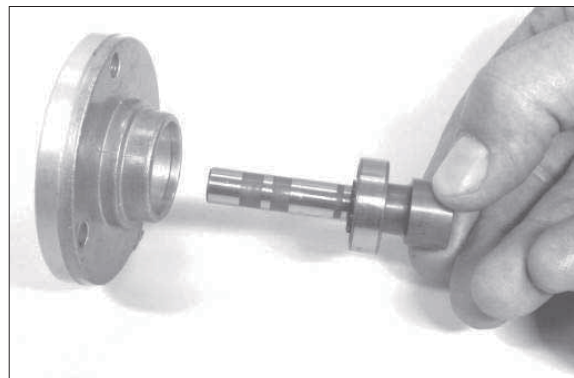
14WF8TM290

20) Unsnap retaining ring.



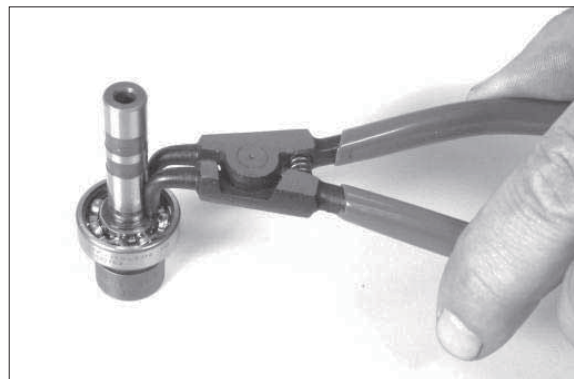
14WF8TM291

21) Pull cpl. pump shaft out of pump cover.



14WF8TM292

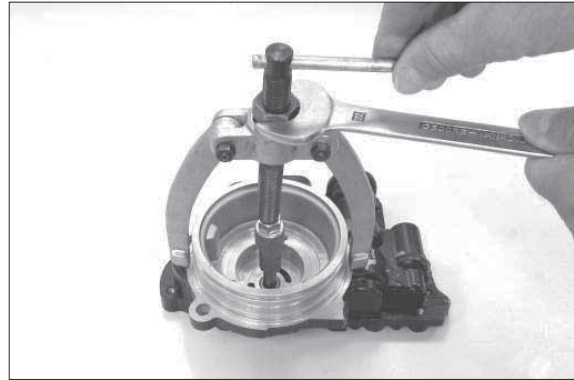
22) Unsnap retaining ring and press ball bearing from shaft.



14WF8TM293

23) Pull needle sleeve out of housing hole.

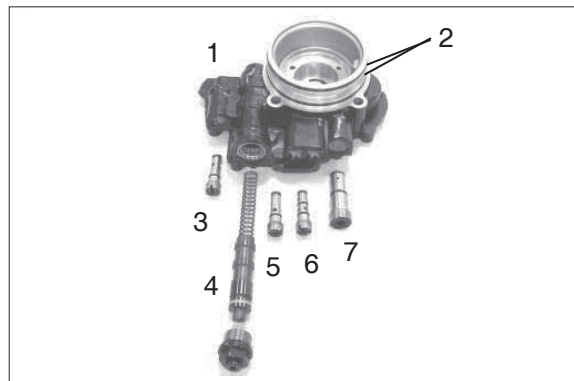
- (S) Inner extractor 5870 300 012
- (S) Counter support 5870 300 011



14WF8TM294

24) Remove O-rings and all single parts, remove valves.

- 1 = Housing
- 2 = O-rings
- 3 = Check valve (010)
- 4 = Shift piston
- 5 = Check valve (009)
- 6 = Check valve (008)
- 7 = Pressure relief valve

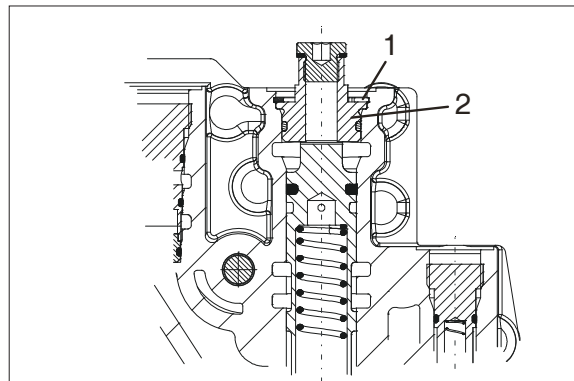


14WF8TM295

Position 4 (shift piston) shows version with screw plug.

25) In sketch 14WF8TM296 version II is shown with plug (2) and retaining ring (1).

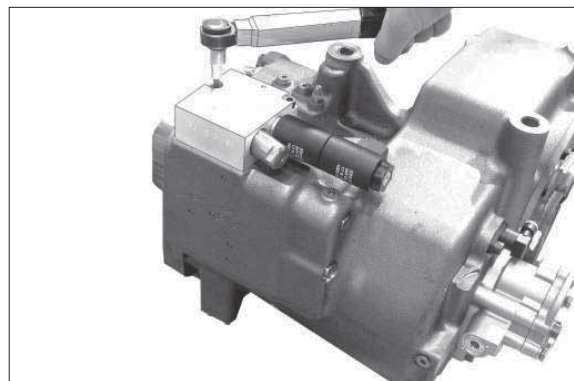
⚠ When disengaging retaining ring – Pay attention to spring preload. Protect against movement.



14WF8TM296

Disassemble valve block

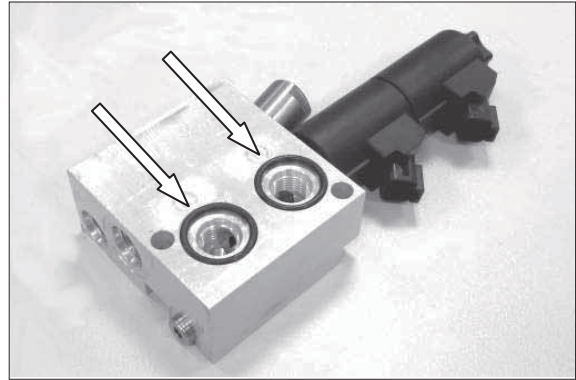
26) Loosen fixing screws and remove cpl. valve block.



14WF8TM297

27) Remove both O-rings (see arrows).

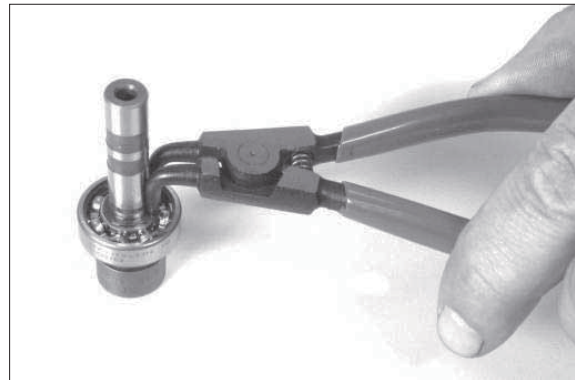
※ Do not further disassemble. Valve block may only be replaced as component.



14WF8TM298

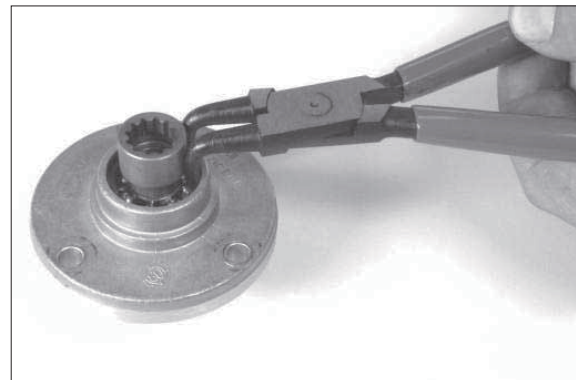
11. REASSEMBLY LUBRICATION PUMP

- 1) Mount ball bearing onto pump shaft and fix it by engaging retaining ring into annular groove of pump shaft.



14WF8TM299

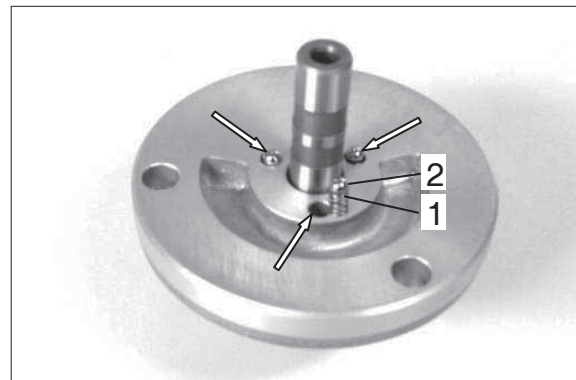
- 2) Press preassembled pump shaft into pump cover and fix it by engaging retaining ring into annular groove of pump cover.



14WF8TM300

- 3) Insert compression springs (1) and ball (2) into holes (see arrows - 3x).

※ Keep preassembled single parts in vertical position—pay attention to position of inserted balls and compression springs (see work steps 14WF8TM301~14WF8TM307).



14WF8TM301

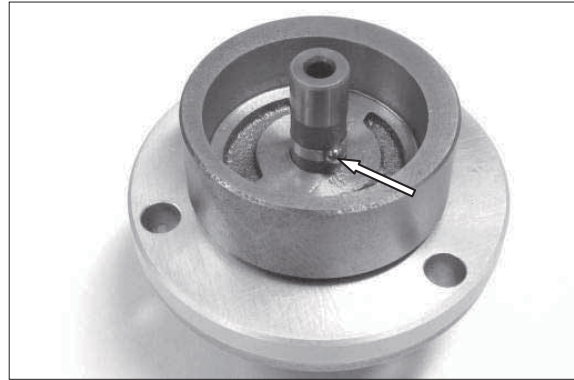
- 4) Mount control housing.

※ Control housing, inner and outer rotor = rotor set



14WF8TM302

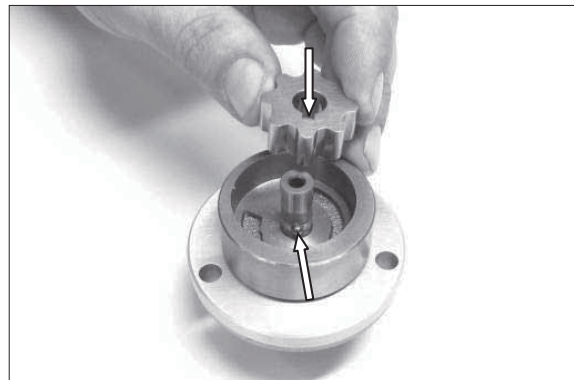
- 5) Position ball – (see arrow, engagement for inner rotor) with grease into countersink of pump shaft.



14WF8TM303

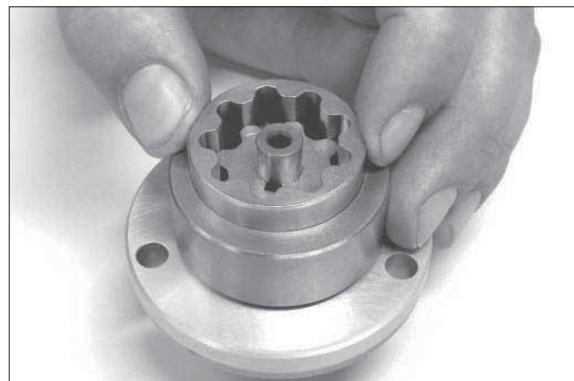
- 6) Mount inner rotor.

- ※ Place groove of inner rotor over ball (see arrows).



14WF8TM304

- 7) Mount outer rotor



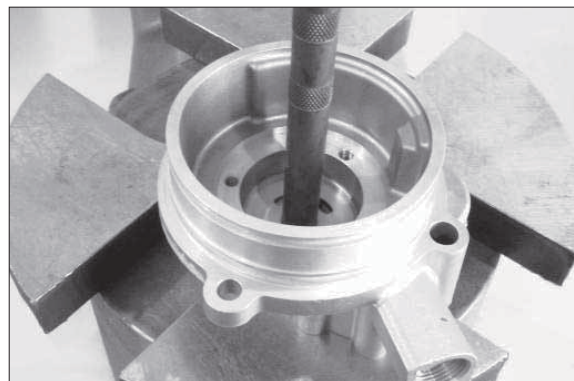
14WF8TM305

- 8) Insert needle sleeve to installation dimension X into housing.

X = 0.2~0.7 mm below plane face / housing

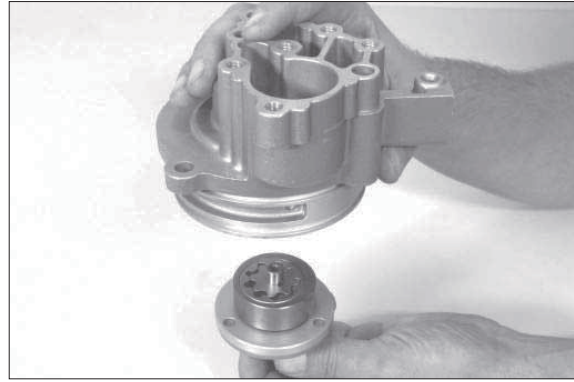
(S) Driver tool 5870 705 003

- ※ Use of specified driver tool ensures exact installation position.
※ Insert needle sleeve with marked front face showing upwards.
※ Check opening of orifice / oil hole in housing bottom.



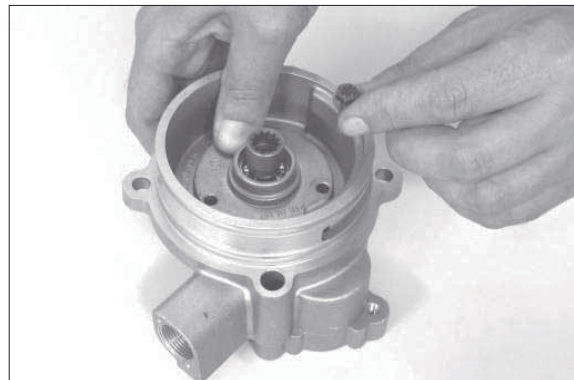
14WF8TM306

- 9) Maintain pump in vertical position while inserting housing with mounted needle sleeve onto preassembled pump.



14WF8TM307

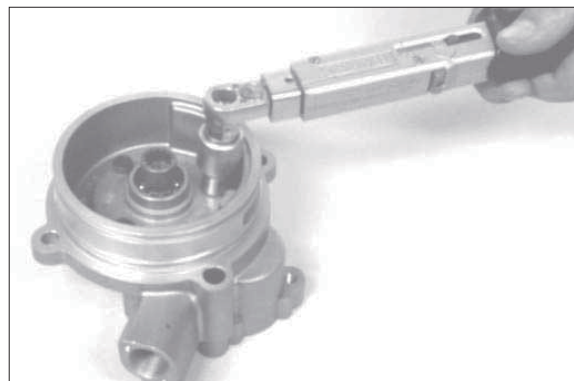
- 10) Rotate housing by 180° and fix pump with hexagon screws.
※ Maintain contact position of inserted pump.



14WF8TM308

- 11) Fix pump.

Tightening torque (M6/8.8) $M_A = 9.5 \text{ Nm}$



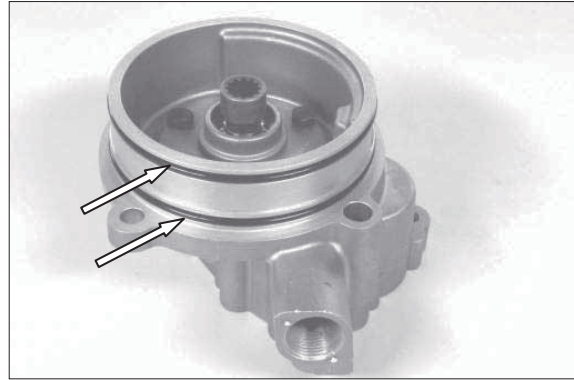
14WF8TM309

- 12) With counter-turning motions on pump shaft, swiveling of control housing (stop LH/RH in pump cover) is audible.



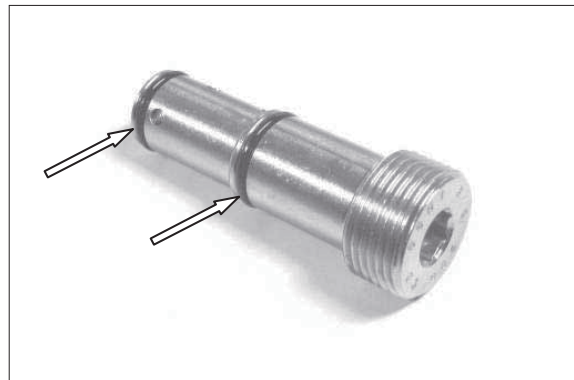
14WF8TM310

13) Oil both O-rings (arrows) and put them into annular groove of housing.



14WF8TM311

14) Insert O-rings (see arrows) into annular grooves of pressure relief valve.

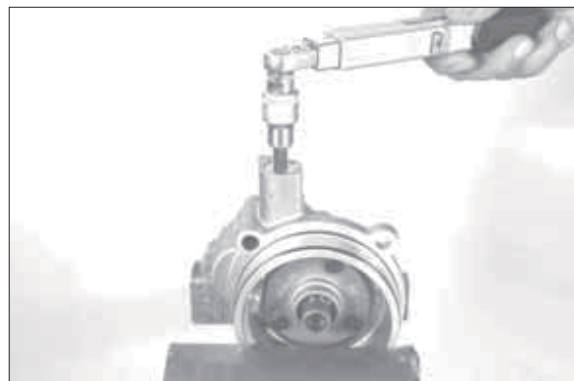


14WF8TM312

15) Mount pressure relief valve.

Tightening torque

$M_A = 10 \text{ Nm}$



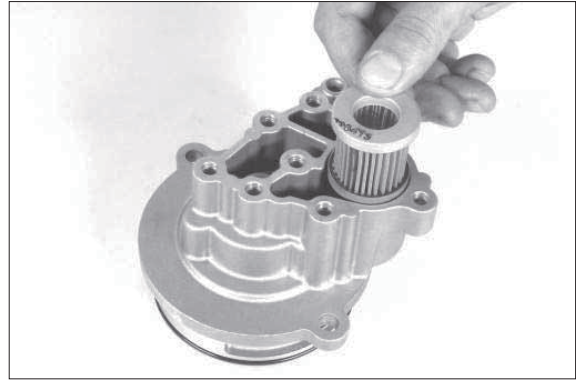
14WF8TM313

16) Secure pressure relief valve by center punch marks (2x).



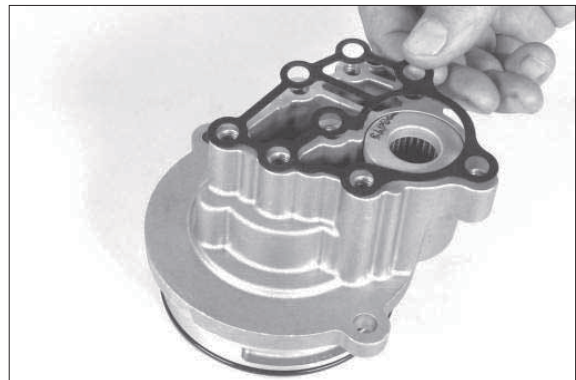
14WF8TM314

17) Insert filter.



14WF8TM315

18) Place gasket.



14WF8TM316

19) Place cover and fix it with hexagon screws and disks.

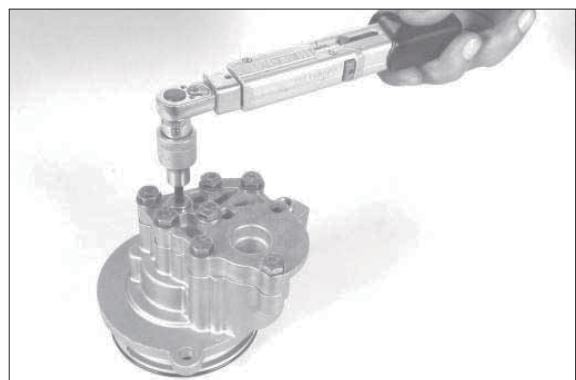
Tightening torque (M8/8.8) $M_A = 23 \text{ Nm}$



14WF8TM317

20) Insert screw plug with new O-ring.

Tightening torque (M10 × 1) $M_A = 15 \text{ Nm}$

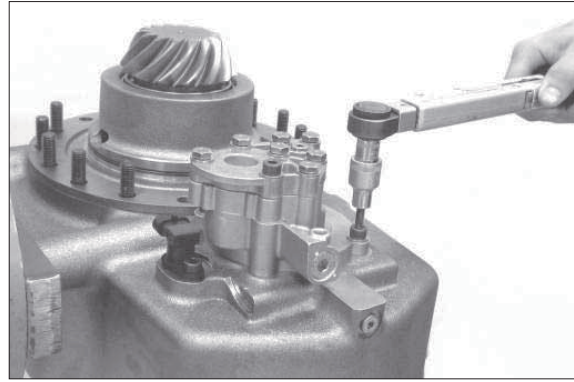


14WF8TM318

21) Mount cpl. lubrication pump and fasten it with cylindrical screws and disks.

Tightening torque (M8/10.9) $M_A = 23 \text{ Nm}$

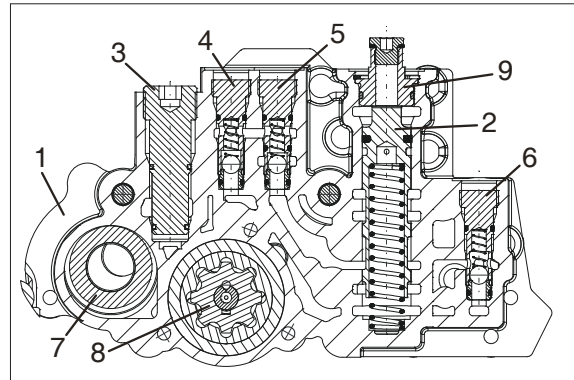
※ Prior to putting the unit into operation, observe the specifications and regulations.



14WF8TM319

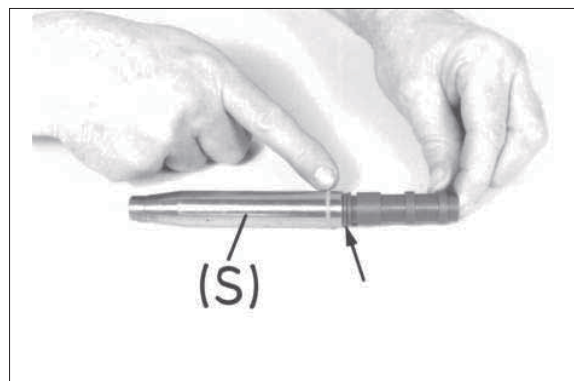
12. REASSEMBLY SHIFT INTERLOCK

- 1) 1 = Housing
- 2 = Shift piston
- 3 = Pressure relief valve
- 4 = Check valve (008)
- 5 = Check valve (009)
- 6 = Check valve (010)
- 7 = Filter
- 8 = Lubrication pump
- 9 = Plug



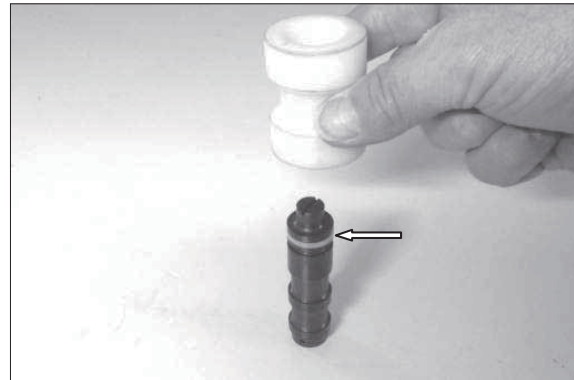
14WF8TM320

- 2) Put O-ring (see arrow) into annular groove of piston.
Lead plastic ring by means of inner installer (S) over piston and position it at O-ring.
(S) Inner installer 5870 651 055
- ※ Seal consists of plastic ring and O-ring (see 14WF8TM321~14WF8TM322).



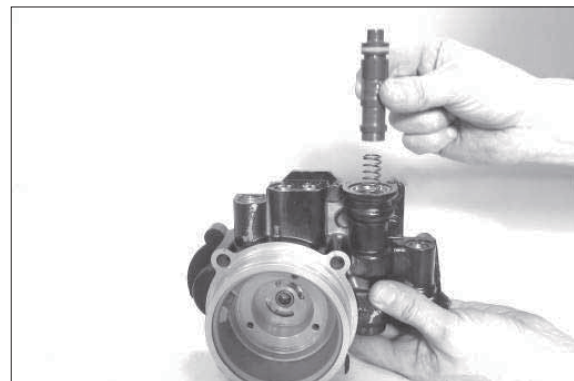
14WF8TM321

- 3) Center plastic ring (see arrow) with calibrating mandrel.
(S) Calibrating mandrel 5870 651 056



14WF8TM322

- 4) Insert compression spring, oil preassembled piston and install.



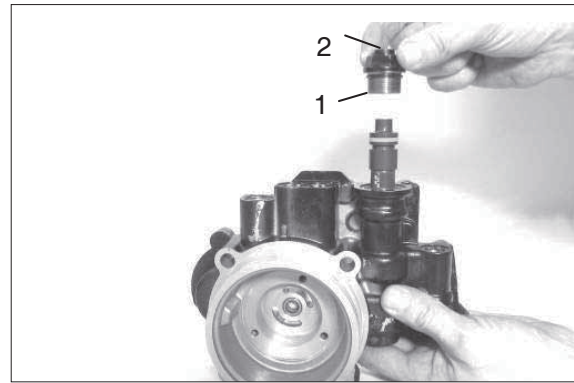
14WF8TM323

Version I :

- 5) Fix piston with screw plug (1- with O-ring).
Install screw plug (2 – with seal ring).

Screw plug (M24×1.5) $M_A = 50 \text{ Nm}$

Screw plug (M10×1) $M_A = 15 \text{ Nm}$



14WF8TM324

Version II (14WF8TM325 ~ 14WF8TM327) :

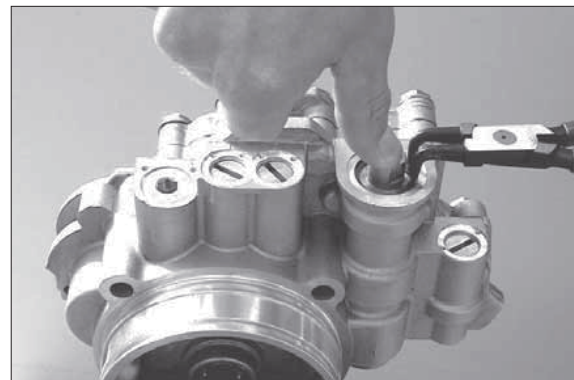
- 6) Oil O-ring and insert it into annular groove of plug.



14WF8TM325

- 7) Fix plug by engaging retaining ring into annular groove of housing.

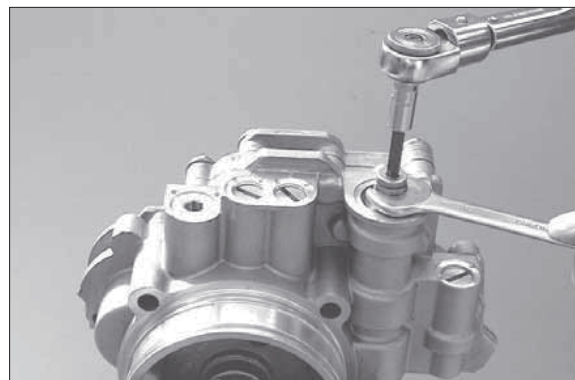
※ Pay attention to spring preload – protect against movement.



14WF8TM326

- 8) Mount screw plug with seal.

Tightening torque (M10×1) $M_A = 15 \text{ Nm}$

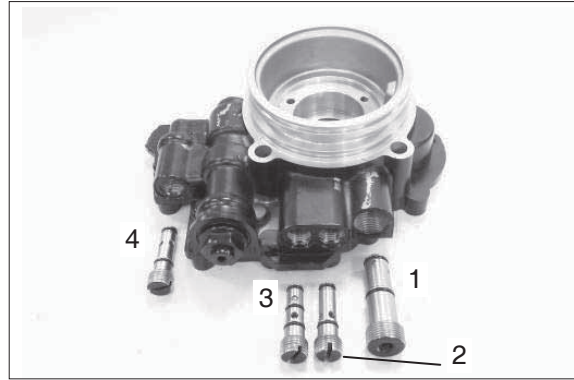


14WF8TM327

9) Install single parts according to adjacent illustration.

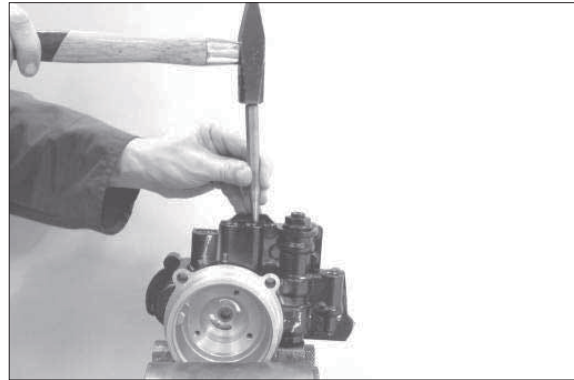
- 1 = Pressure relief valve cpl. $M_A = 10 \text{ Nm}$
- 2 = Check valve cpl. $M_A = 10 \text{ Nm}$
- 3 = Check valve cpl. $M_A = 10 \text{ Nm}$
- 4 = Check valve cpl. $M_A = 10 \text{ Nm}$

※ Observe installation position of the different check valves (see also 14WF8TM320).



14WF8TM328

10) Secure check valves and pressure relief valves with two center punch marks each.



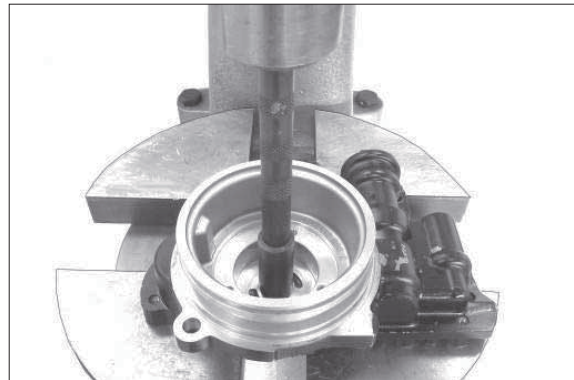
14WF8TM329

11) Insert needle sleeve to installation dimension X into housing.

$X = 0.2 \sim 0.7 \text{ mm}$ below plane face/housing

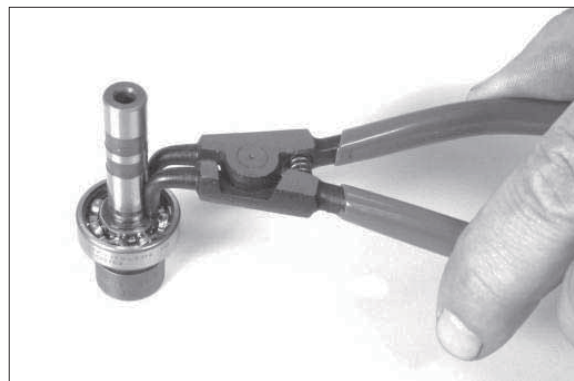
(S) Driver tool 5870 705 003

- ※ Use of specified driver ensures exact installation position.
- ※ Insert needle sleeve with marked front face showing upwards.
- ※ Check opening of orifice / oil hole in housing bottom.



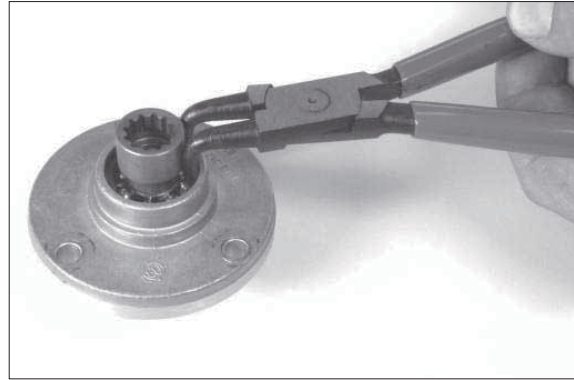
14WF8TM330

12) Insert ball bearing onto pump shaft and fix it by engaging retaining ring into annular groove of pump shaft.



14WF8TM331

- 13) Press preassembled pump shaft into pump cover and fix it by engaging retaining ring into annular groove of pump cover.

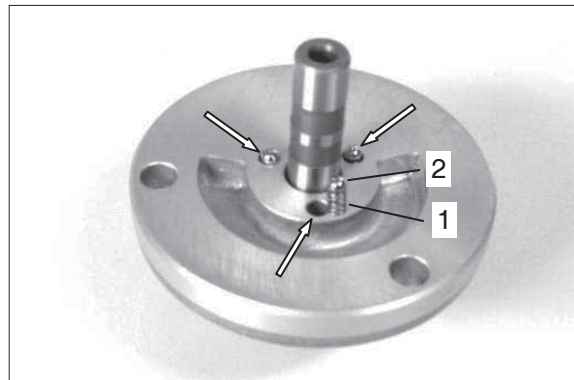


14WF8TM332

- 14) Insert compression springs (1) and ball (2) into holes (see arrows - 3x).

▲ Prior to installation, oil single parts of pump/rotor set (control housing, inner and outer rotor) – use oil (lubrication)

- ※ Keep preassembled single parts in vertical position – pay attention to position of inserted balls and compression springs (see work steps 14WF8TM333 ~14WF8TM338).



14WF8TM333

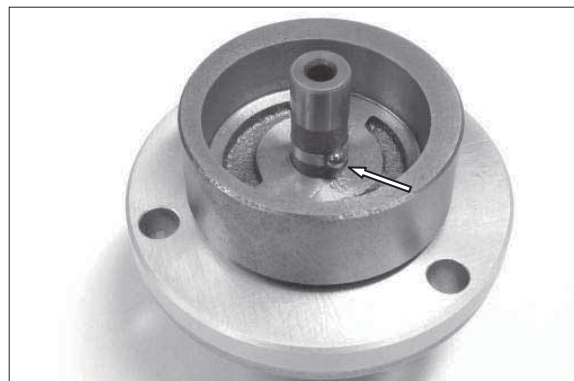
- 15) Mount control housing.

- ※ Control housing, inner and outer rotor = rotor set



14WF8TM334

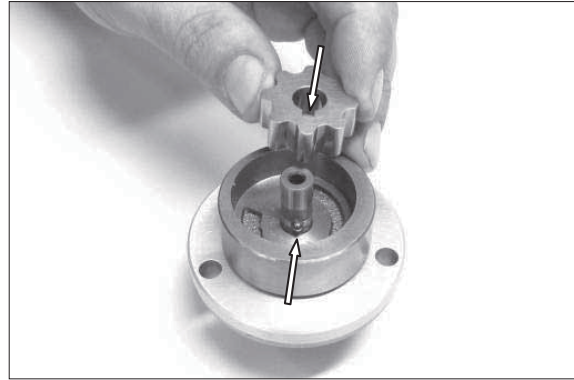
- 16) Position ball – (see arrow –engagement for inner rotor) with grease into countersink of pump shaft



14WF8TM335

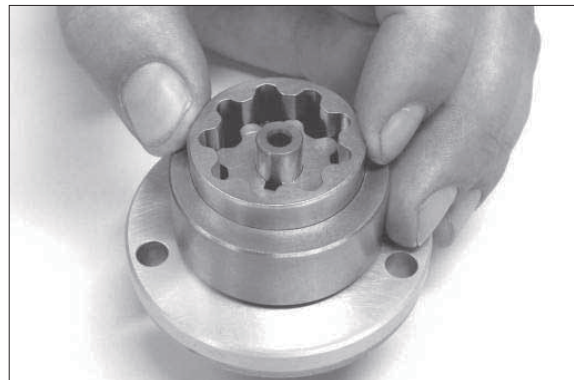
17) Mount inner rotor.

- ※ Place groove of inner rotor over ball (see arrows).



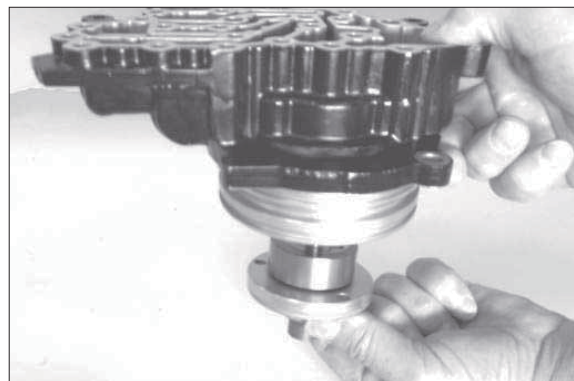
14WF8TM336

18) Mount outer rotor.



14WF8TM337

19) Maintain pump in vertical position while inserting housing with mounted needle sleeve onto preassembled pump.



14WF8TM338

20) Rotate housing by 180° and fix pump with hexagon screws.

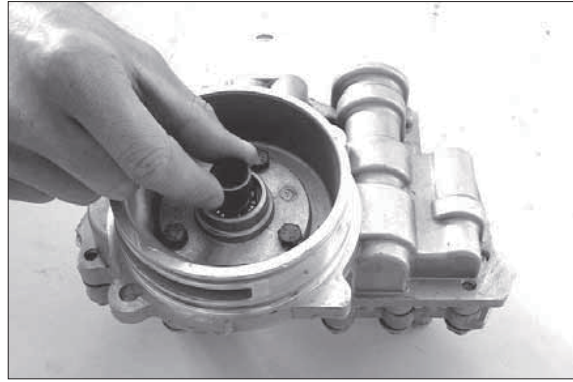
Tightening torque (M6/8.8) $M_A = 9.5 \text{ Nm}$

- ※ Maintain contact position of inserted pump.



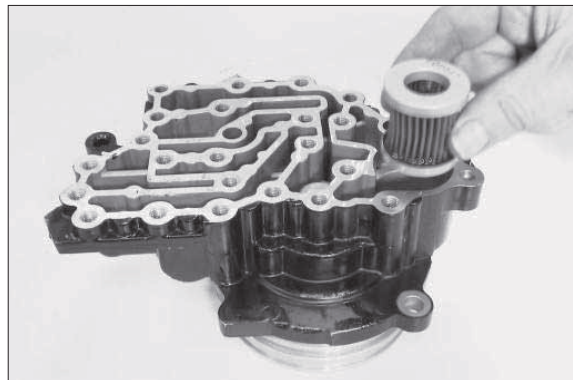
14WF8TM339

21) With counter-turning motions on pump shaft, swiveling of control housing (stop LH/ RH in pump cover) is audible.



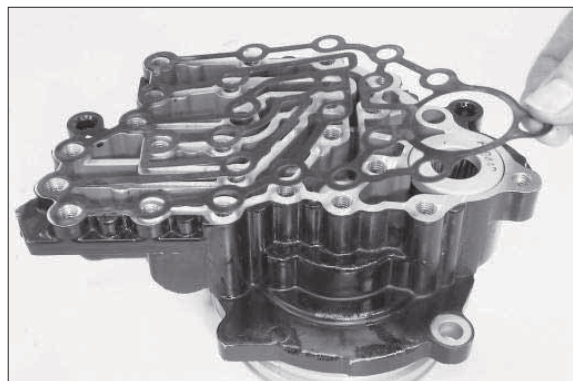
14WF8TM340

22) Insert screen filter.



14WF8TM341

23) Place gasket.



14WF8TM342

24) Place cover and fix with hexagon screws and disks.

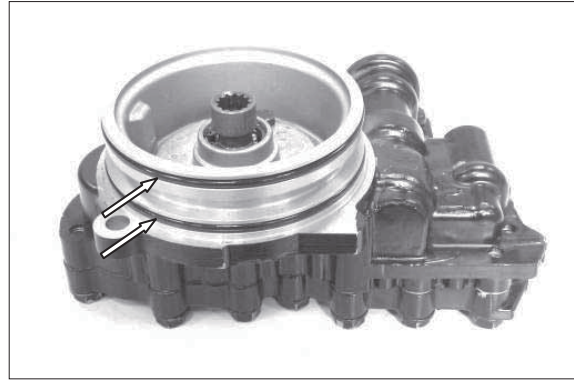
Tightening torque (M8/8.8) $MA = 23 \text{ Nm}$

※ Pay attention to different screw length.



14WF8TM343

25) Oil both O-rings (arrows) and put them into annular groove of housing.

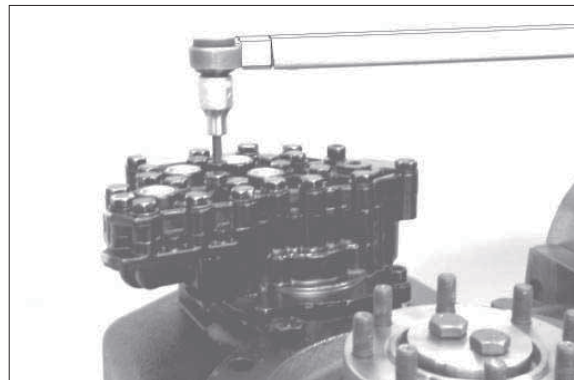


14WF8TM344

26) Insert cpl. shift interlock and fix with cylindrical screws with disks.

Tightening torque (M8/10.9) $M_A = 23 \text{ Nm}$

※ Pay attention to different screw length.

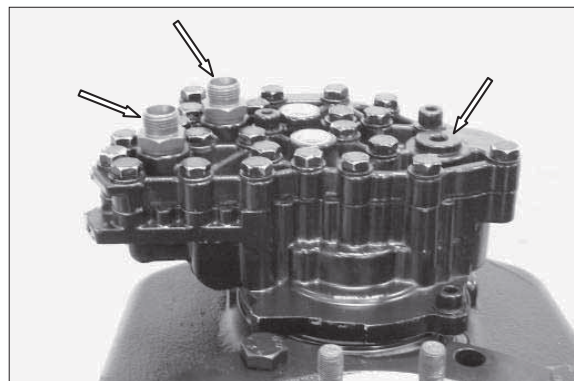


14WF8TM345

27) Install both screw-in sleeves and screw plug (see arrow) with O-rings.

Screw-in sleeve (M 16 × 1.5) $M_A = 30 \text{ Nm}$

Screw plug (M 18 × 1.5) $M_A = 35 \text{ Nm}$



14WF8TM346

28) 1 = Oil tube

2 = Hollow screw (M16 × 1.5)

3 = Seal ring

4 = Hollow screw (M14 × 1.5)

5 = Seal ring



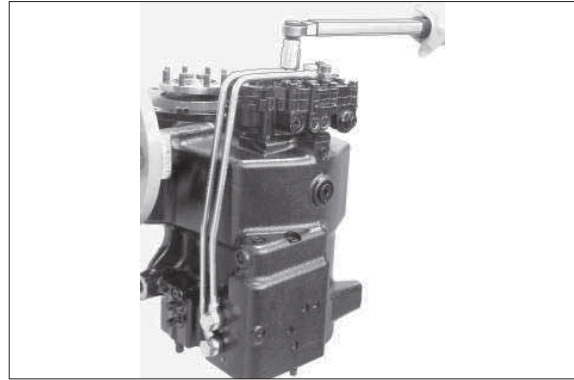
14WF8TM347

29) Mount oil tubes.

Hollow screw (M14×1.5) $M_A = 40 \text{ Nm}$

Hollow screw (M16×1.5) $M_A = 40 \text{ Nm}$

※ Prior to putting the unit into operation,
observe the specifications and regulations.

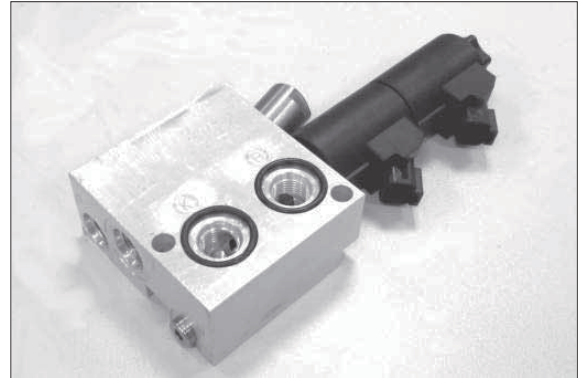


14WF8TM3428

13. VALVE BLOCK (shifting low gear – high gear)

1) Insert O-rings (see arrows) into countersinks of valve block.

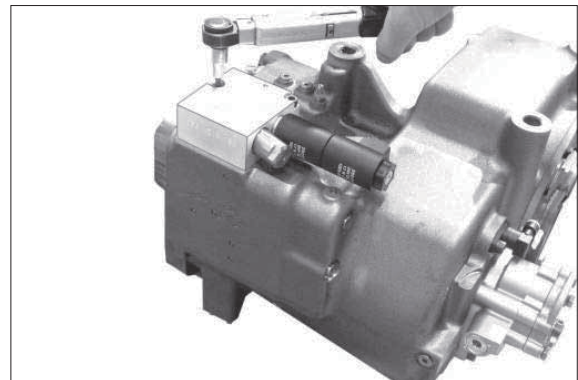
※ Use grease as assembly aid.



14WF8TM349

2) Fix cpl. valve block with cylindrical screws.

Tightening torque (M8/10.9) $M_A = 23 \text{ Nm}$

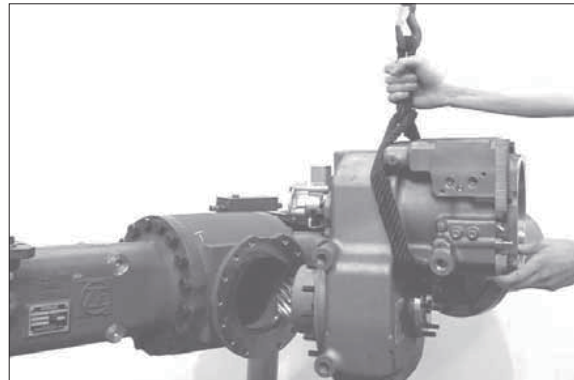


14WF8TM350

14. Mount TRANSMISSION to AXLE (only for version axle attachment)

1) Position complete transmission to axle.

(S) Lifting strap 5870 281 026

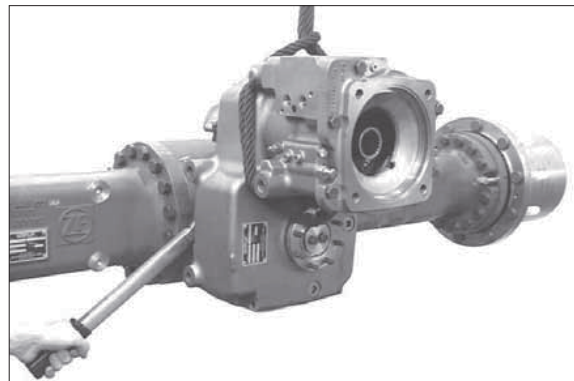


14WF8TM351

2) Fix transmission to axle with hexagon screws and nuts.

Tightening torque (M12/8.8) $M_A = 79 \text{ Nm}$

※ Prior to putting the unit into operation,
observe the specifications and regulations.



14WF8TM352

GROUP 8 STEERING VALVE

1. REMOVAL AND INSTALL

1) REMOVAL

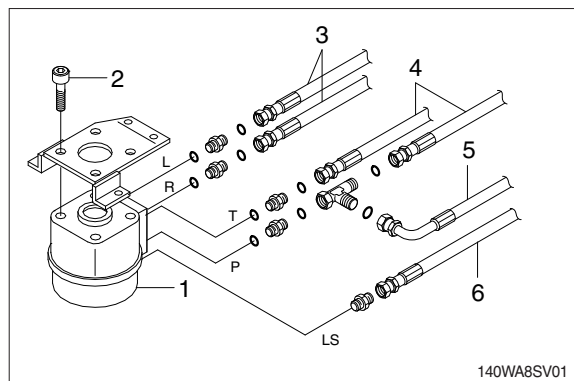
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- (4) Disconnect steering line hoses (3, 4, 5, 6).
- (5) Loosen the socket bolt (2) and remove the steering valve assembly (1).
 - Tightening torque : $8.3 \pm 1.7 \text{ kgf} \cdot \text{m}$
($60.0 \pm 12.3 \text{ lbf} \cdot \text{ft}$)

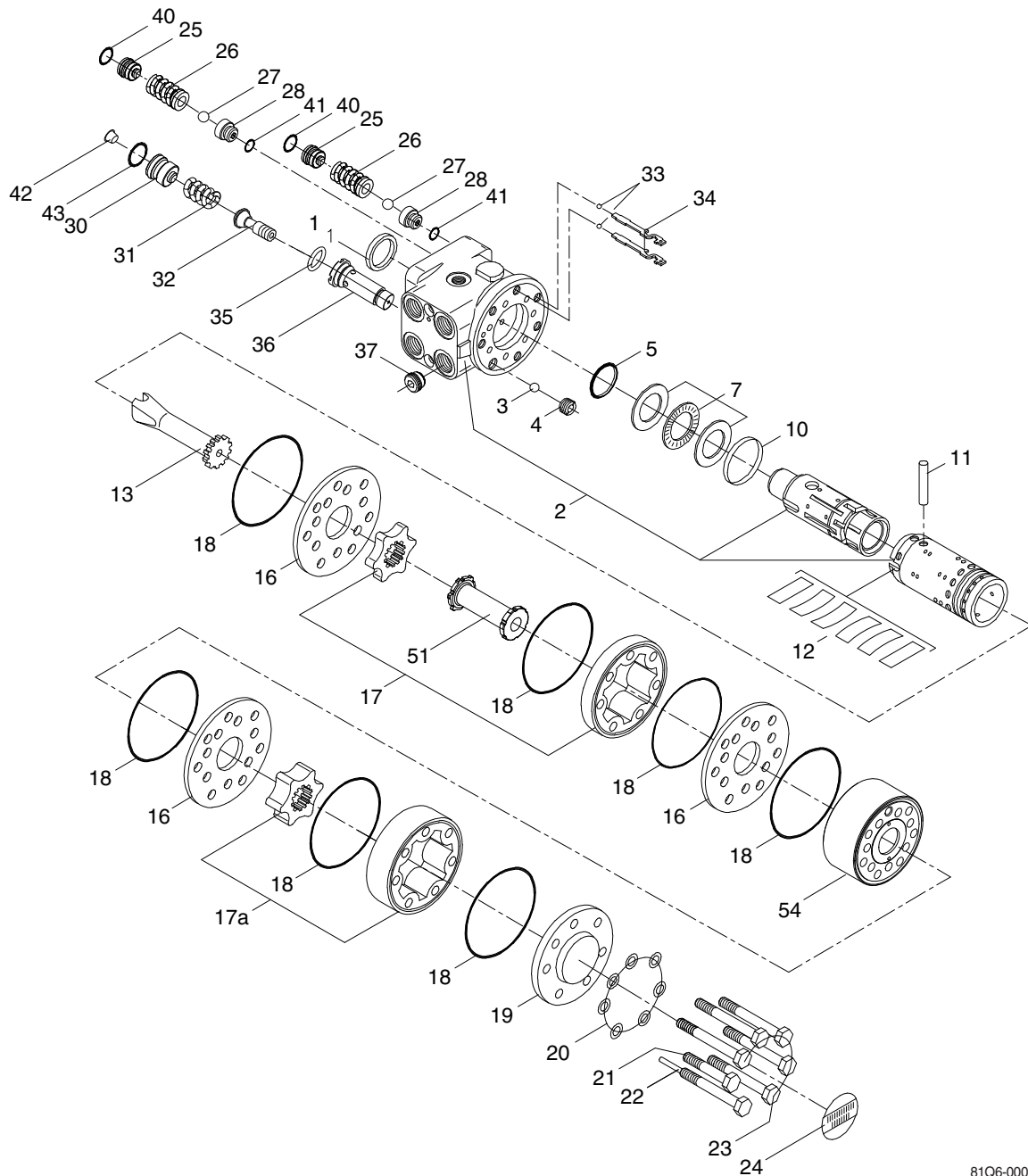
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - (2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.
- ※ When removing the steering valve assembly, check that all the hoses have been disconnected.



2. STEERING VALVE

1) STRUCTURE



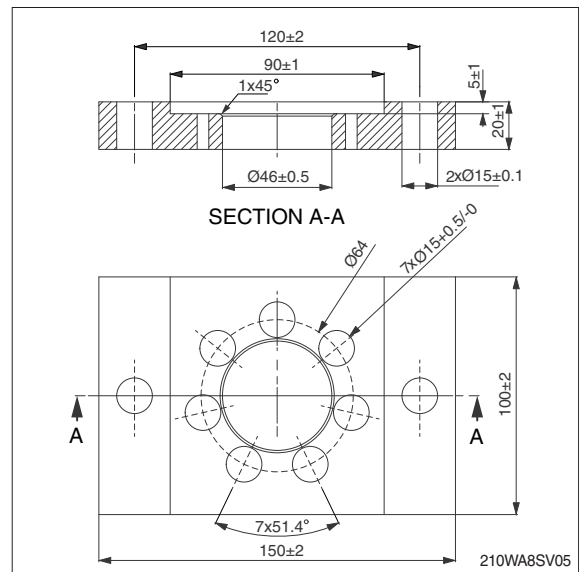
- | | | | | | |
|-----|------------------------|----|------------------|----|-------------------|
| 1 | Dust seal ring | 18 | O-ring | 33 | Ball |
| 2 | Housing, spool, sleeve | 19 | End cover | 34 | Bushing |
| 3 | Ball | 20 | Washer | 35 | Ball stop |
| 4 | Threaded bushing | 22 | Pin bushing | 36 | Ball |
| 5 | Shaft seal | 23 | Screw | 37 | Check valve |
| 7 | Bearing assy | 24 | Model/code label | 40 | O-ring |
| 10 | Ring | 25 | Adjusting screw | 41 | O-ring |
| 11 | Cross pin | 26 | Spring | 42 | Plug |
| 12 | Spring set | 27 | Ball | 43 | O-ring |
| 13 | Cardan shaft | 28 | Seat | 51 | Cardan shaft |
| 16 | Distributor plate | 30 | Adjusting screw | 54 | Valve and housing |
| 17 | Gear wheel set | 31 | Spring | 56 | Spacer |
| 17a | Gear wheel set | 32 | piston | | |

81Q6-00030-PA

2) TOOLS

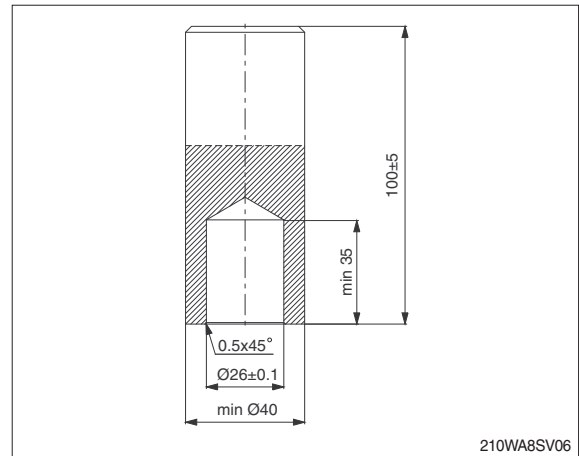
(1) Holding tool for the entire steering unit.

※ Appropriate metal or hard plastic.



(2) Assembly tool for dust seal.

※ Material : Free cutting steel.



(3) Assembly tool for shaft seal, O-ring.



(4) Common tool

Torque wrench : 0~7.1 kgf · m
(0~54.4 lbf · ft)

13 mm socket spanner.

2.75, 5 and 6 mm hex sockets.

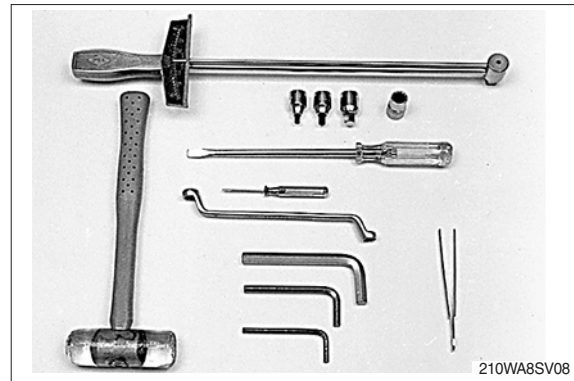
12 mm screwdriver.

2 mm screwdriver.

13 mm ring spanner.

Plastic hammer.

Tweezers.

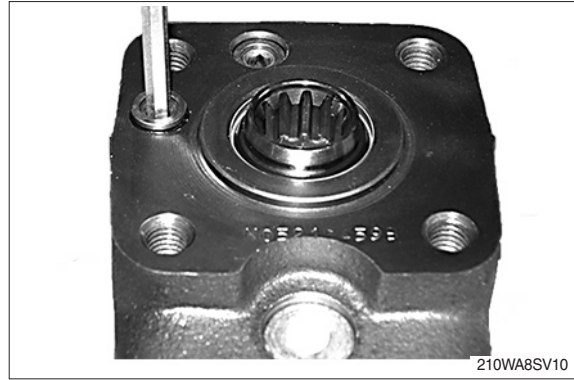


3) TIGHTENING TORQUE

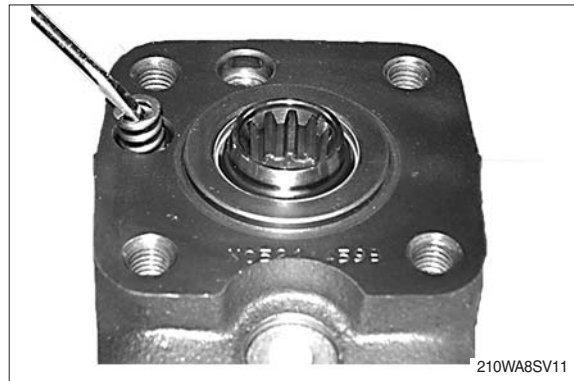
Screwed connection	Max. tightening torque kgf · m (lbf · ft)			
	With cutting edge	With copper washer	With aluminum washer	O-ring
PF 1/4	3.6 (25.8)	3.6 (25.8)	3.6 (25.8)	-
PF 3/8	7.1 (51.6)	4.6 (33.2)	5.1 (36.9)	-
PF 1/2	10.2 (73.6)	5.6 (40.6)	8.2 (59.0)	-
PF 3/4	18.4 (133)	9.2 (66.4)	13.3 (95.9)	-
7/16-20 UNF	-	-	-	2.0 (14.8)
3/4-16 UNF	-	-	-	6.1 (44.3)
7/8-14 UNF	-	-	-	9.2 (66.4)
1 1/16-12 UNF	-	-	-	12.2 (88.5)
M12 × 1.5	3.1 (22.1)	2.0 (14.8)	3.1 (22.1)	2.5 (18.4)
M18 × 1.5	8.2 (59.0)	5.6 (40.6)	7.1 (51.6)	5.1 (36.9)
M22 × 1.5	10.2 (73.6)	6.6 (47.9)	8.2 (59.0)	6.1 (44.3)
9/16-18 UNF, ORFS	-	-	-	2.5 (18.4)
1 1/16-16 UN, ORFS	-	-	-	2.8 (19.9)

4) DISASSEMBLY

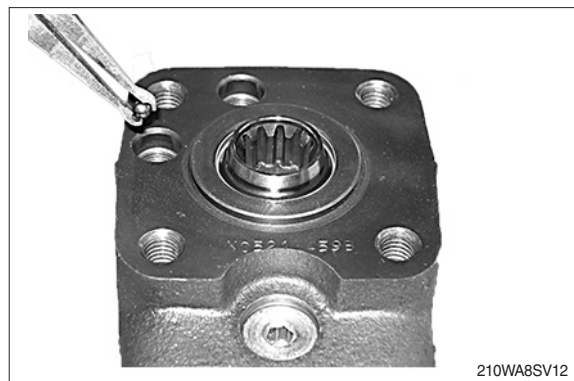
- (1) Place the unit in the holding tool on gear set end.
Screw out the adjusting screws for shock valves (25).
O-ring (40) is fitted on adjusting screw (25).



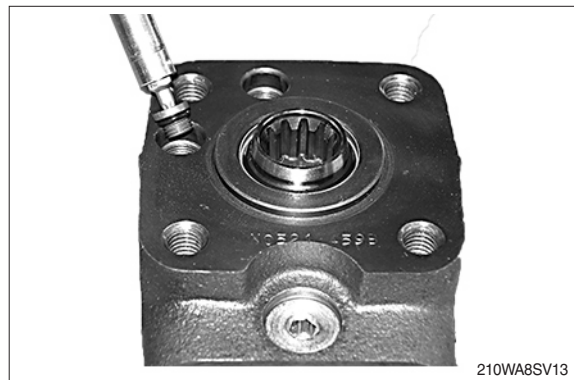
- (2) Remove the springs with trust pads for shock valves (26).



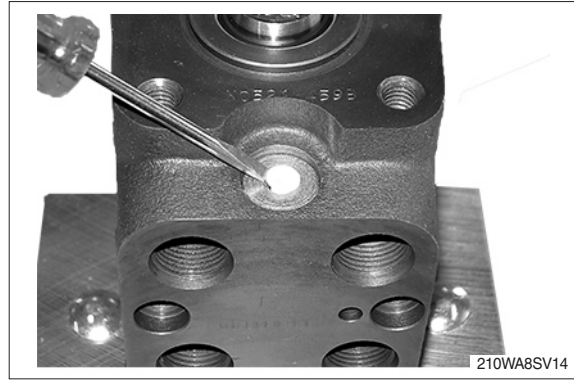
- (3) Remove the balls for shock valves (27).



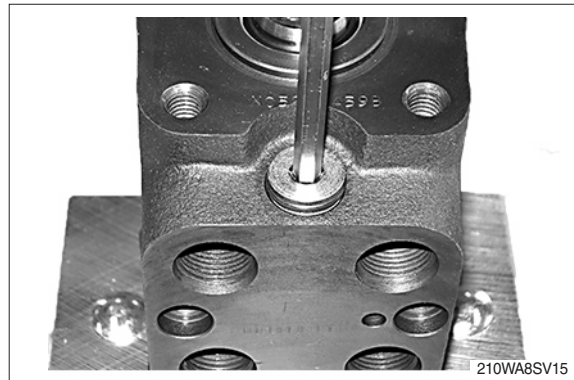
- (4) Screw out the seats for shock valves (28).
O-ring (41) is fitted on seat (28).



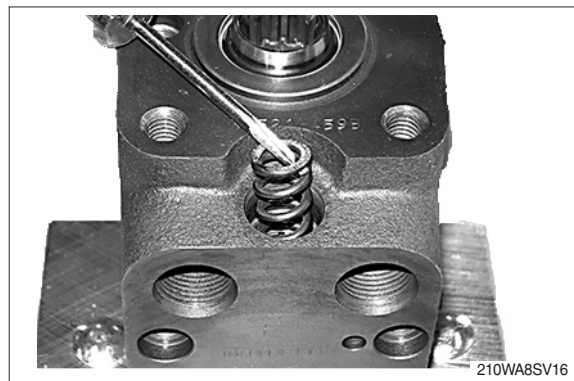
(5) Remove the plastic plug (42).



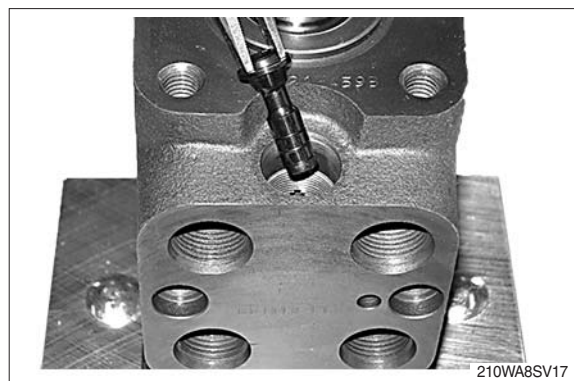
(6) Screw out the adjusting screw for relief valve (30).
O-ring (43) is fitted on adjusting screw (30).



(7) Remove the spring for relief valve (31).



(8) Remove the piston for relief valve (32).



(9) Replace the unit in the holding tool on steering column end.

- ① Remove the screws (21, 22 and 23) with washers (20).
- ② Some versions have pin bolt screw (22), threaded bushing (4) and 5 pieces standard screws (23) as shown page 8-178. Other versions (like this taken apart) has threaded bushing with ball stop (4) and 6 pieces standard screws (23).
- ③ All versions have one piece short standard screw (21).
- ④ Screw (21) is threaded in valve housing (54).



(10) Remove the end cover (19), sideways.



(11) Lift the gearwheel set (17a) off the unit.
Remove the two O-rings (18).



(12) Remove the rear distributor plate (16).



- (13) Remove valve housing assembly (54).
Remove the two O-rings (18).
※ Do not disassemble the entire valve (54)



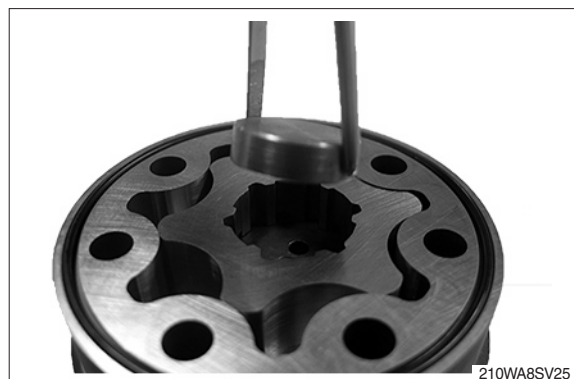
- (14) Remove the middle distributor plate (16).



- (15) Remove the cardan shaft (51).



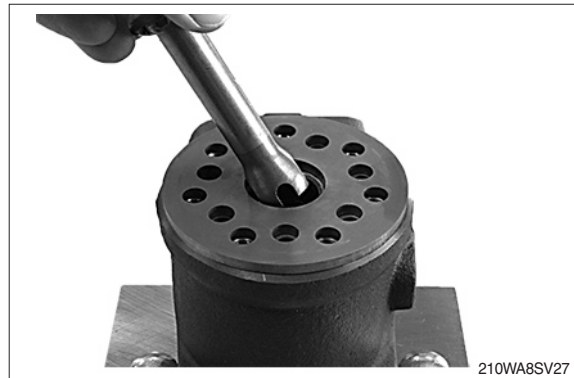
- (16) Remove spacer (56) if present.
※ Spacer is only present in OSPD with GSW1 (17) equal to 100 cm³/rev or larger/
height 13.0 mm or larger.



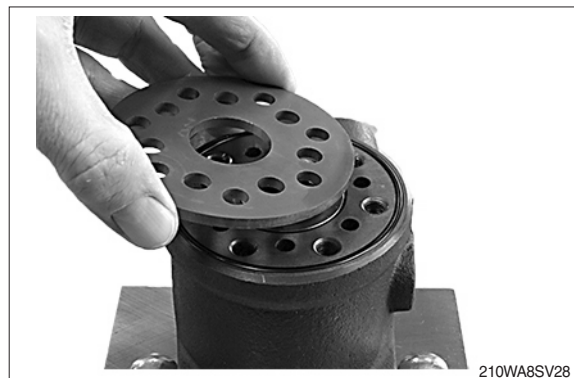
- (17) Lift the gearwheel set (17) off the unit.
Remove the two O-rings (18).



- (18) Remove the cardan shaft (13).



- (19) Remove the distributor plate (16) from the housing.



- (20) Remove the threaded bushing/ball stop (4) from housing.



- (21) Remove the ball stop (35) from housing.
Ball stop (35), and belonging ball (36) is only present in OSPD LS with check valve in LS line.



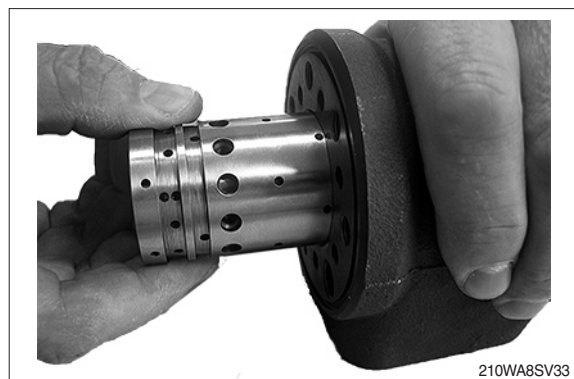
- (22) Remove the O-ring (18) from housing.



- (23) Shake out the check valve ball (3), suction valve pins (34), balls (33) and ball (36).



- (24) Place the housing with the ports facing down on the work bench. Ensure that the cross pin (11) in the spool and sleeve set (2) is in the horizontal position. The pin (11) can be observed through the open end of the spool. Press the spool (2) inwards (from the housing mounting face end) and the sleeve (2), ring (7) and bearing assembly (6) will be pushed out of the housing together.



(25) Take the ring (10), bearing races and needle bearing (7) from the spool and sleeve set (2).

The outer bearing (7) race can sometimes “stick” in the housing, therefore check that it has come out.



(26) Press out the cross pin (11).



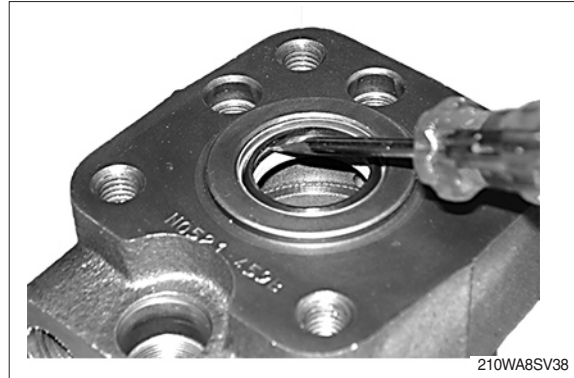
(27) Carefully press the spool out of the sleeve.



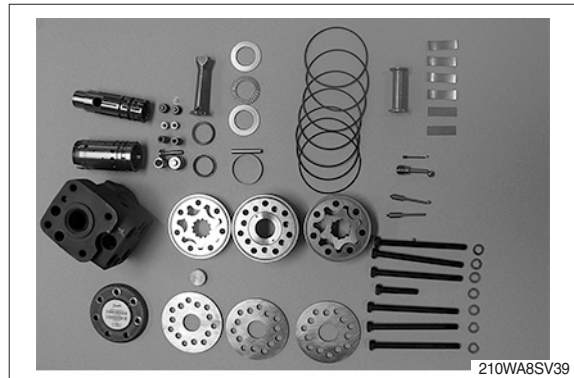
(28) Press the neutral position springs (12) out of the slot of the spool.



- (29) Remove dust seal (1) and shaft seal (Roto Glyd) (5) carefully with a screw driver or similar tool.



- (30) The steering unit OSPD is now completely dismantled



※ **Cleaning**

Clean all parts carefully in Shellsol K or similar cleaner fluid.

※ **Inspection and Replacement**

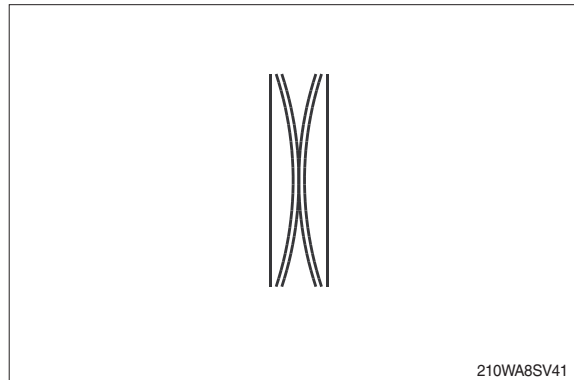
Replace all seals and washers. Check all parts carefully and make any replacements as is necessary.

5) ASSEMBLY

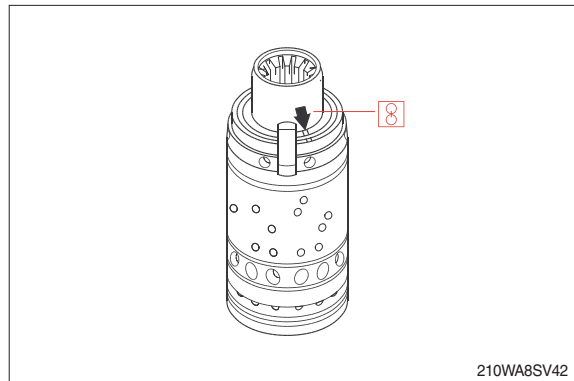
- (1) Place the two flat neutral position springs in the slot.
Place the curved springs between the flat ones and press them into place.



- (2) Configuration of spring set (12).
There can be different numbers of curved springs depending on configuration of spring set. There can be 2, 4 or 6 curved springs.



- (3) Spool and sleeve must be positioned correctly relatively to each other. Small marks are present on both spool and sleeve close to one of the slots for the spring set.



- (4) Guide the spool into the sleeve (2).
If the spool and sleeve has marks as shown above, these must be placed on same side. Make sure the centering springs (12) are placed into the slot.



(5) Line up the spring set (12).



(6) Guide the ring (10) down over the sleeve.
The ring should be able to move free of the springs.



(7) Fit the cross pin (11) into the spool/sleeve.



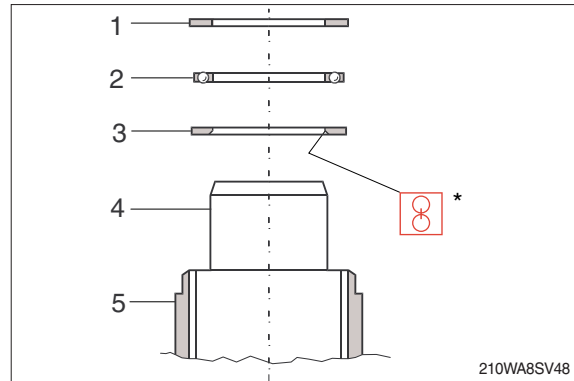
(8) Fit bearing races and needle bearing (7)
as shown on the next drawing.



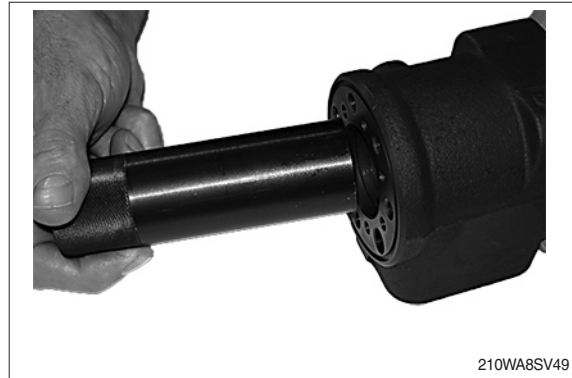
(9) Assembly pattern for standard bearing

- 1 Outer bearing race
- 2 Needle bearing
- 3 Inner bearing race
- 4 Spool
- 5 Sleeve

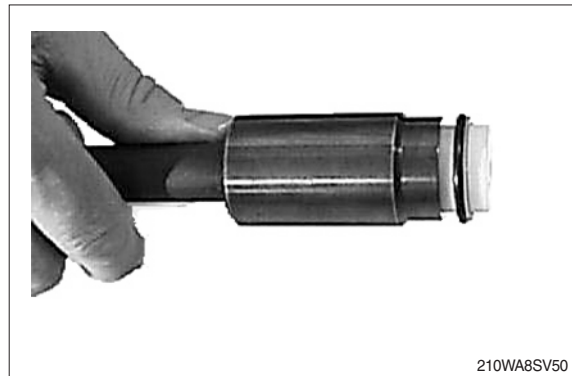
※ * The inside chamfer on the inner bearing race must face the chest of the inner spool.



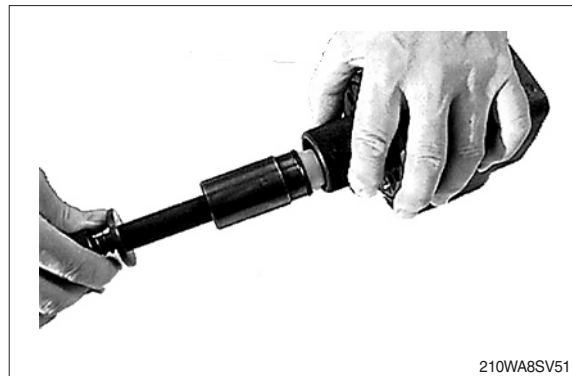
(10) Place the steering unit housing with the port face down on the work bench. Guide the outer part of the assembly tool into the bore for the spool/sleeve set (2).



(11) Grease the shaft seal (Roto Glyd, 5) with hydraulic oil and place them on the tool. Ensure that the Roto Glyd seal is placed on the insertion tool as per the photograph.



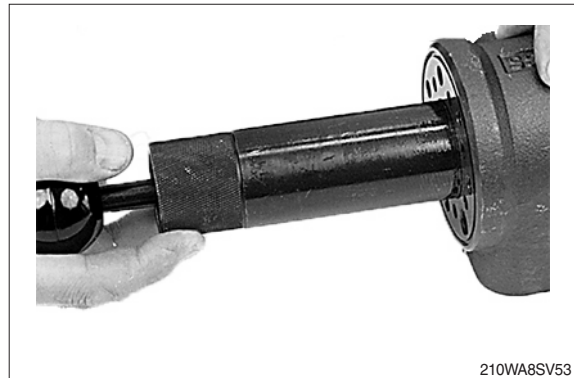
(12) Hold the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.



(13) Press and turn the shaft seal (5) into position in the housing.



(14) Draw the inner and outer parts of the assembly tool out of the steering unit bore, leaving the guide from the inner part in the bore.



(15) With a light turning movement, guide the spool and sleeve into the bore. Fit the spool set holding the cross pin (11) horizontal.



(16) The spool set will push out the assembly tool guide. The shaft seal (5) is now installed.



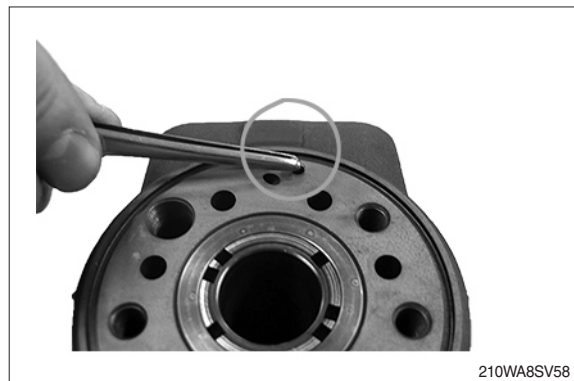
- (17) Place the steering unit housing on the holding tool on the steering column end. Put the check valve ball (3) into the hole indicated by the circle.



- (18) Screw the threaded bushing/ball stop (4) lightly into the check valve bore. The top of the bush must lie just below the surface of the housing.



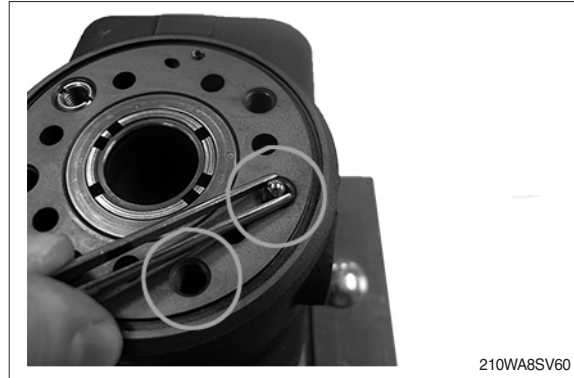
- (19) Put the check valve ball (36) into the hole indicated by the circle. Ball (36) is only present in OSPD LS with check valve in LS line.



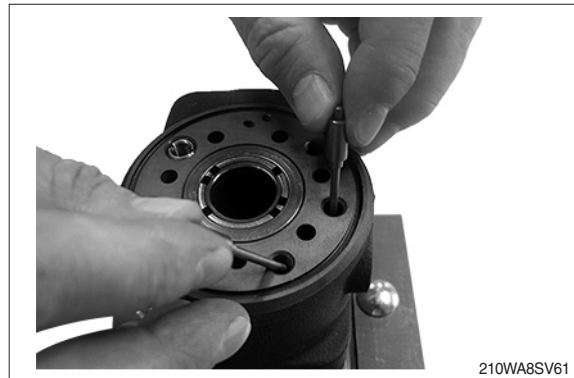
- (20) Screw the ball stop (35) into the LS check valve bore.
 $1 \pm 0.1 \text{ N}\cdot\text{m}$ [$8.85 \pm 0.885 \text{ lbf}\cdot\text{in}$].



(21) Place a ball (33) in the two bolt holes indicated by the circles.



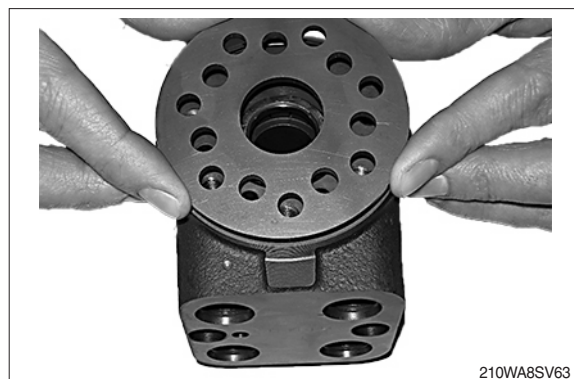
(22) Place the pins (34) in the same two bolt holes.



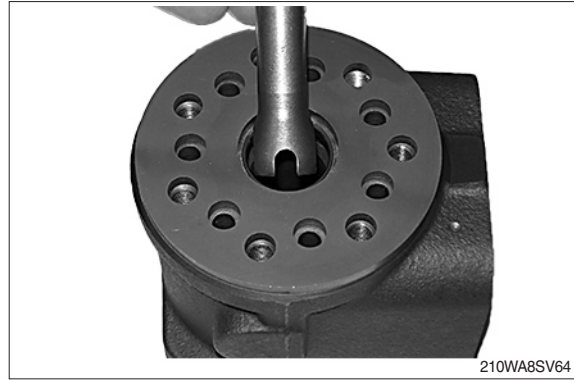
(23) Insert the O-ring (18) in the groove on the housing.



(24) Place the distributor plate (16) so that the channel holes match the holes in the housing.



- (25) Guide the cardan shaft (13) down into the bore so that the slot is parallel with the connection flange ports and lines up with the cross pin (11).



- (26) Place the 2 O-rings (18) in the two grooves in the gear rim.
Fit the gearwheel and rim (17) on the cardan shaft (13).

- ※ Place the gear wheel side with all the deeper splines facing downwards. Only this side will fit on the cardan shaft due to all gear sets used in OSPD V2 has timing securing: splines of gear wheel and cardan shaft can only be assembled with correct timing.



- (27) Place the spacer (56) if present.
Spacer is only present in OSPD with GSW1 (17) equal to or larger than 100 cm³.



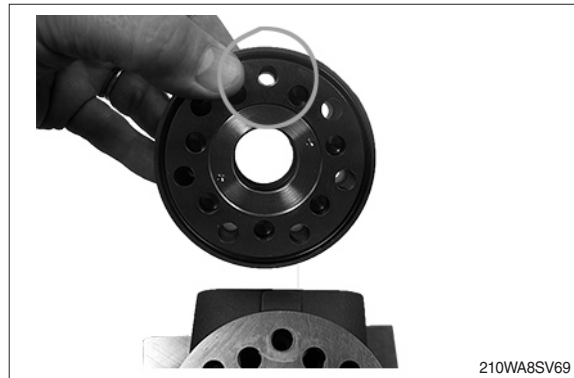
- (28) Place and rotate the cardan shaft (51) with the big diameter end until it moves in gear with gear wheel of gear set (17).



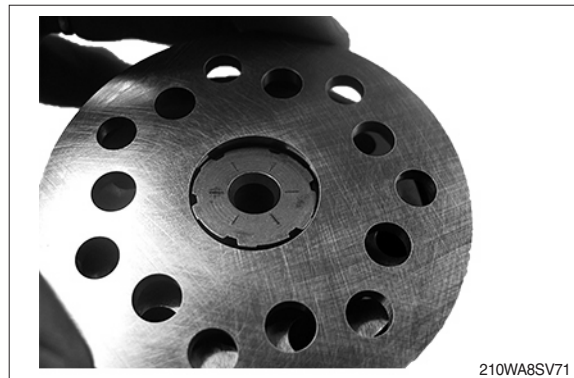
(29) Place the middle distributor plate (16) so that the channel holes match the holes in the gear set.



(30) Place the 2 O-rings (18) in the two grooves in the valve housing assembly (54). Place the valve housing assembly so that the one and only M8 thread whole points upwards and direction port face. Make sure that channel holes match the holes in the distributor plate (16).



(31) Place the rear distributor plate (16) so that the channel holes match the holes in valve housing assembly (54).



(32) Place the 2 O-rings (18) in the two grooves in the gear rim.

Fit the gearwheel and rim (17a) on the cardan shaft (51).

Place the gear wheel side with all the deeper splines facing downwards. Only this side will fit on the cardan shaft due to all gear sets used in OSPD V2 has timing securing: splines of gear wheel and cardan shaft can only be assembled with correct timing.



(33) Place the end cover (19) in position.

Ensure that the bar codes and writing are parallel with port face.



(34) Fit the short screw (22) with new washer (20) and place it in the hole shown.



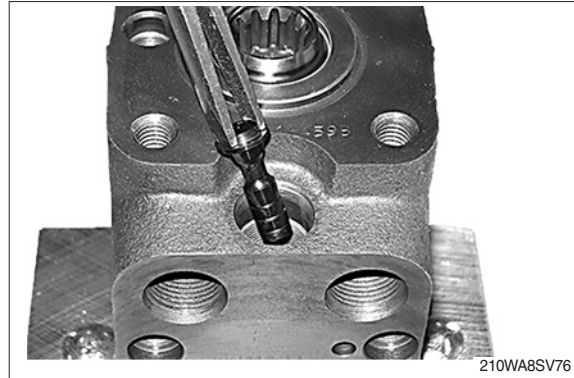
(35) Fit the six screws (23) with new washers (20) and insert them. In case the unit has pin bolt screw, this must be inserted where the circle is marked: Cross-tighten all the screws (22 and 23) with a torque of 30 ± 6 N·m [265.5 ± 53 lbf·in].

Replace the unit in the holding tool on gear set end.

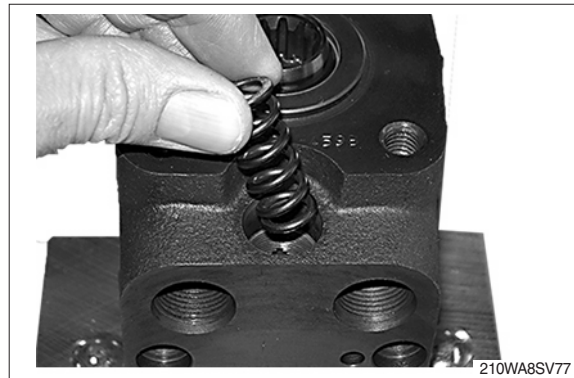
The OSPD V2 can now be function tested manually: it must be possible to rotate input shaft with torque < 3.5 N·m [31.0 lbf·in].



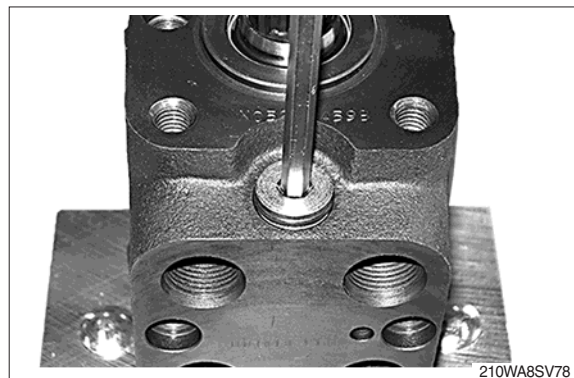
(36) Install the piston (32) to housing.



(37) Install the spring (31) on top of the piston (32).



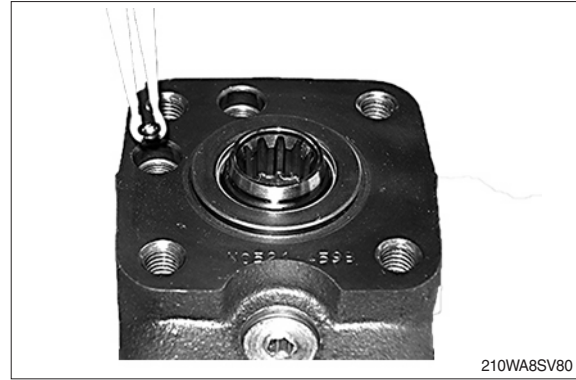
(38) Place O-ring (43) on adjusting screw (30).
Screw in the adjustment screw (30) with a 6 mm Allan key. Make the pressure setting on a test panel according to valve setting specification.
Insert plastic protection plug (42) to the adjustment screw (30).



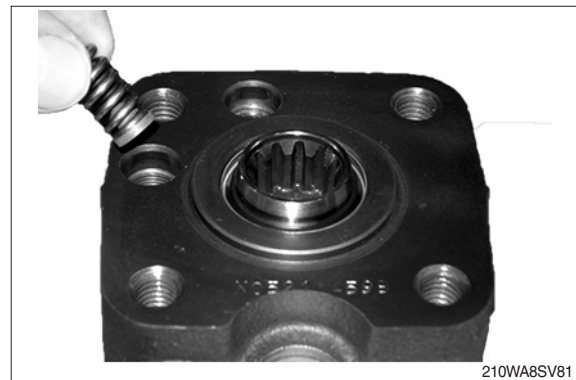
(39) Place O-ring (41) on the shock valve seats (28). Screw in the seats (28) with a 2.75 mm allen key into the cavities indicated by the circles.
Torque $6 \pm N \cdot m$ [53.1 ± 8.85 lbf·in].



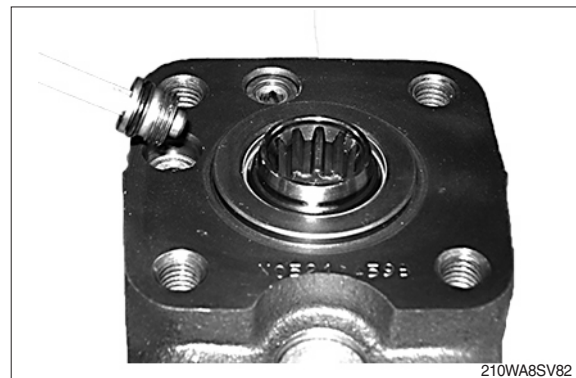
(40) Place one ball (27) in each of the shock valve cavities.



(41) Place springs with trust pads (26) over the two balls.



(42) Place O-rings (40) on adjusting screws (25).
Screw in the two adjusting screws (25) using a 5 mm allen key.
Make the pressure setting on a test panel according to valve setting specification.



※ Plug all ports, established 35 bar, hydraulic pressure on T and check the unit is completely leak free.
(43) Place the dust seal ring (1) in the housing.



(44) Fit the dust seal ring in the housing using special tool for dust seal assembly and a plastic hammer.



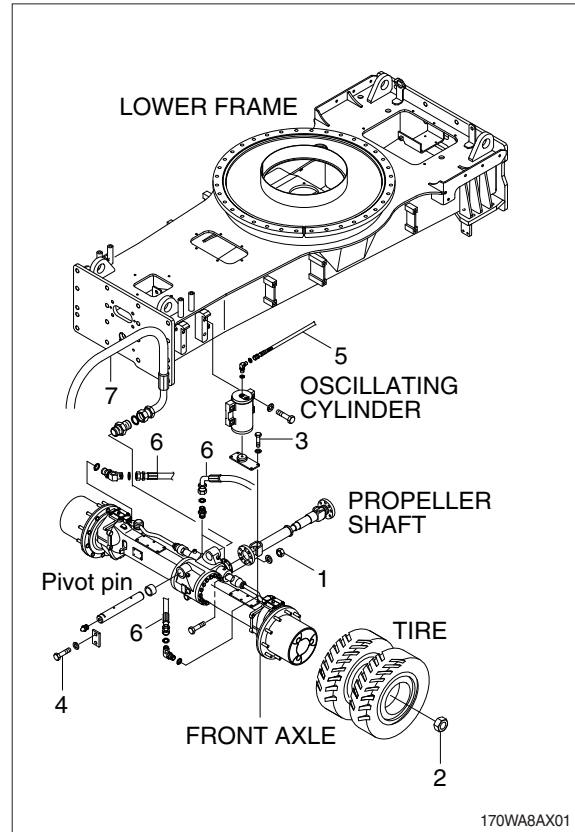
(45) Screw in the plastic plugs into the connection ports to keep the ports clean during storage and transportation.



GROUP 9 FRONT AXLE

1. REMOVAL FRONT AXLE

- 1) Propeller shaft mounting nut (1, M10)
 - Tightening torque : 5.9 ± 0.6 kgf · m
(42.7 ± 4.3 lbf · ft)
- 2) Wheel nut (2, M22)
 - Tightening torque : 60 ± 5.0 kgf · m
(433 ± 36.2 lbf · ft)
- 3) Oscillating cylinder supporting mounting bolt (3, M16)
 - Tightening torque : 29.7 ± 4.5 kgf · m
(215 ± 32.5 lbf · ft)
- 4) Pivot pin lock plate mounting bolt (4, M12)
 - Tightening torque : 12.8 ± 3.0 kgf · m
(92.6 ± 25.7 lbf · ft)
- 5) Pipe assy (5)
- 6) Hose assy (6, 7)
- 7) Front axle weight : 637 kg (1400 lb)



2. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

- (1) This manual has been developed for the skilled serviceman, trained by the ZF-Passau.
- (2) During all operations, pay attention to cleanliness and skilled working.
Therefore, axle removed from the machine, must be cleaned prior to open them.
- (3) We assume that the special tools, specified by ZF, will be used.
The special tools are available from ZF-Passau.
- (4) After the disassembly, all components must be cleansed, especially corners, cavities and recesses of housing and covers.
- (5) The old sealing compound must be carefully removed.
- (6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.
- (7) The latter refers especially to new parts.
- (8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..
- (9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.
- (10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.
- (11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.
- (12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100°C.
- (13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.
- (14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.
- (15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.
- (16) After the repair, units are filled up with oil.
- (17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

- (1) In principle, repairers are themselves responsible for the labour safety.
- (2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.
- (3) Before starting the work, the repairers have to make themselves familiar with these regulations.
- (4) The proper repair of these products requires especially trained personnel.
- (5) The repairer himself is obliged to provide for the training.

3) LUBRICANT SPECIFICATIONS

- (1) Gear oils with limited - slip additives.
- (2) API GL-5
- (3) MIL-L-2105D (SAE 85W-90 LSD or UTTO)

4) BRAKE LINING WEARING TEST

(1) The measurement of wear on the multi-disc brake only gives limited information on the total state of the plate pack without disassembling the output.

Make measurement of lining wear at least once per year, in particular, however, in case of a different braking behaviour, like :

- Braking noises
- Reduced braking power
- Different deceleration
- Different brake oil level
- Different braking pressure

※ To avoid injury when opening the oil drain/ oil filler plug (1), due to a possible pressure build-up in the planetary carrier bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and filler plug (1).

(2) Then turn output until oil filler / oil drain hole (2) is on 9 o'clock position.

1 = Oil filler-/oil drain hole

2 = Gauge hole ($\varnothing=10$ mm) in ring gear
9 o'clock position

3 = Dial indicator with solenoid support

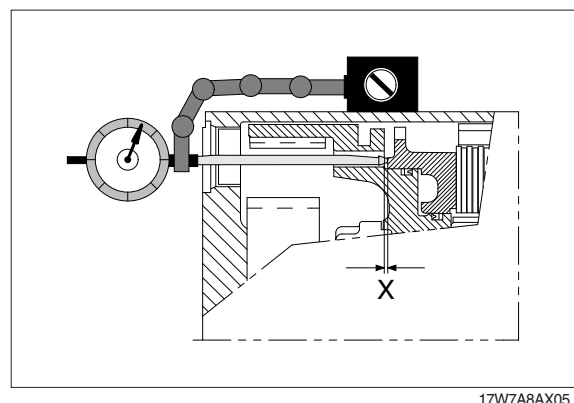
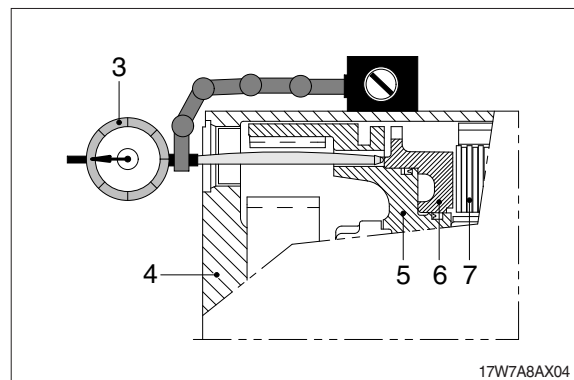
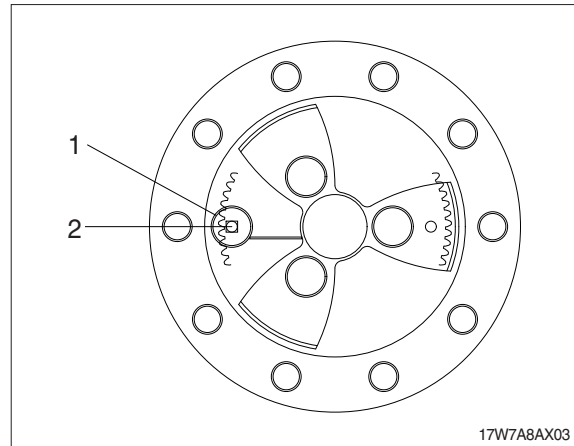
4 = Planetary carrier

5 = Ring gear

6 = Piston

7 = Plate pack

X = Piston stroke



3. DISASSEMBLY

1) STEERING

(1) Fix the axle to the assembly truck.

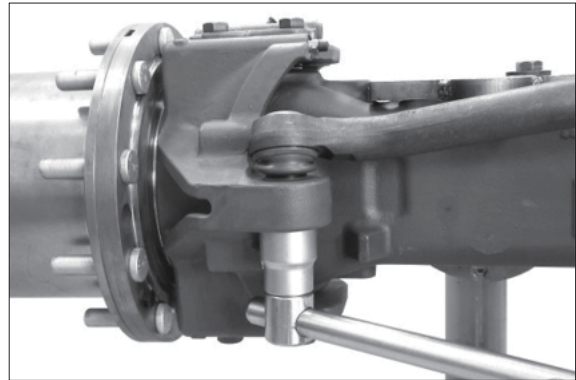
(S) Assembly truck 5870 350 000

(S) Support 5870 350 106



17W98FA001

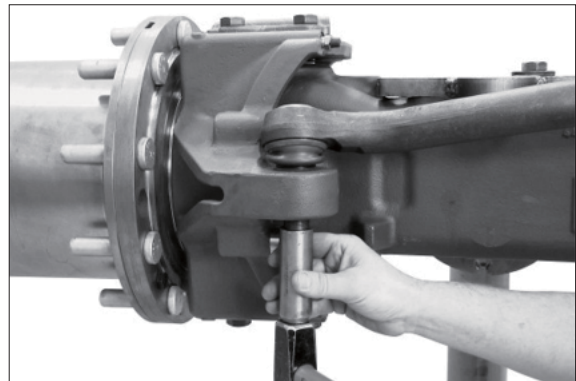
(2) Loosen locknut.



17W98FA002

(3) Force out tie rod from bevel seat.

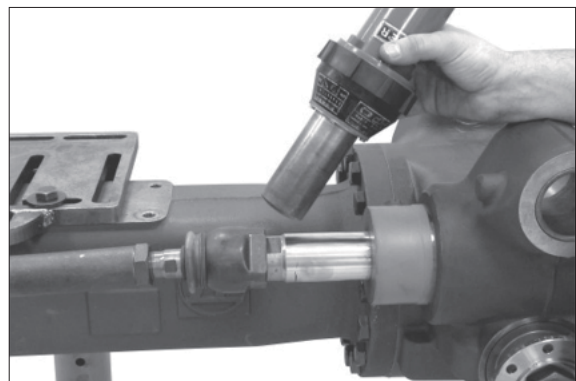
※ Use suitable mandrel (brass or aluminum).



17W98FA003

(4) Warm up piston rod by means of hot air blower.

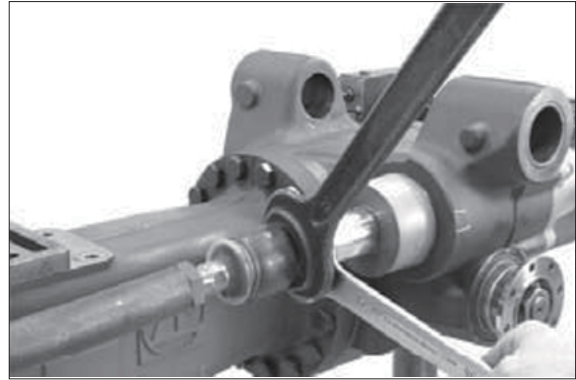
※ Axial joint is installed with Loctite no. 243.



17W98FA004

(5) Separate both tie rods from piston rod.

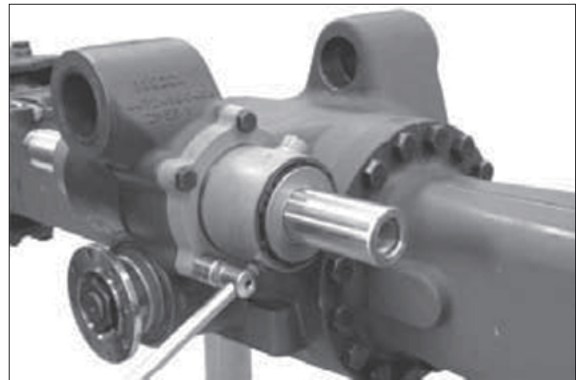
- ※ If work is just to be done on piston rod, guide or sealing elements, no disassembly of the steering cylinder assy is required.



17W98FA005

(6) Loosen hexagon screws.

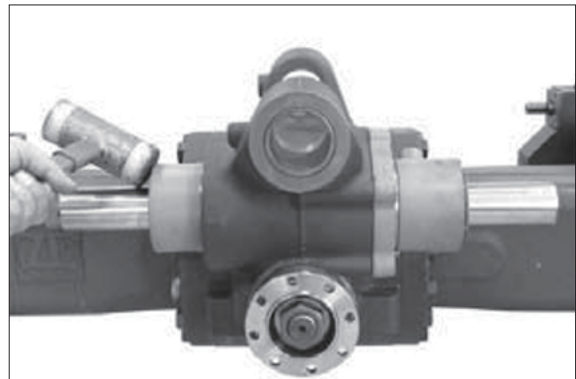
- ※ Mark radial installation position of steering cylinder to axle housing – assembly aid.



17W98FA006

(7) Drive out steering cylinder assy from axle housing hole.

- ※ Use a plastic hammer.



17W98FA007

(8) Unsnap the retaining ring and remove the releasing flange.



17W98FA008

(9) Unsnap retaining ring.



17W98FA009

(10) Push/force the brake head into the cylinder tube, until the retaining ring (see figure FA011) can be removed.



17W98FA010

(11) Unsnap retaining ring.

Then drive out piston rod together with brake head from cylinder tube.



17W98FA011

(12) Pull off brake head from the piston rod.

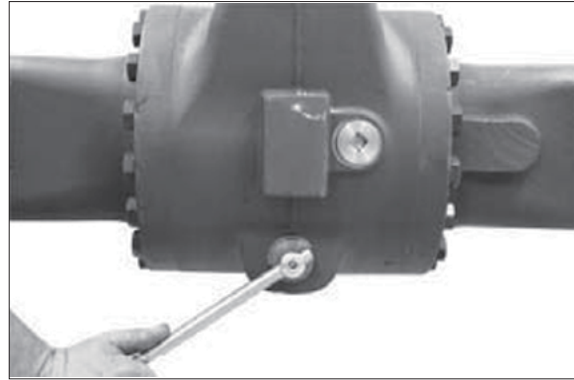
Then remove all sealing elements from piston rod, brake head and cylinder tube.



17W98FA012

2) OUTPUT

- (1) Loosen screw plug and drain oil from the axle.



17W98FA013

- (2) Loosen screw plug and drain oil from the planetary carrier.

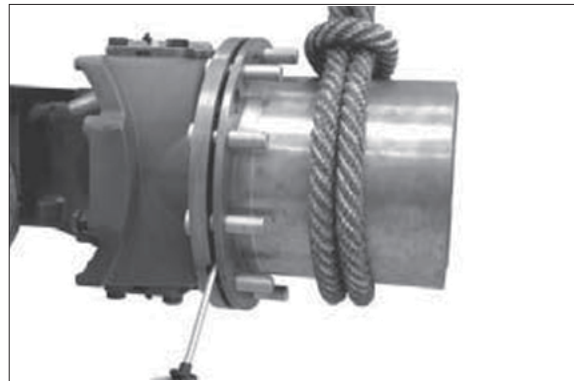
- ※ To avoid injury due to a possible pressure build-up in the oil system of the planetary carrier, bring oil filler and control plug to 12 o'clock position and carefully unscrew. Then bring drain hole to 6 o'clock position and drain oil.
- ※ Use suitable collecting basin environmental protection.



17W98FA014

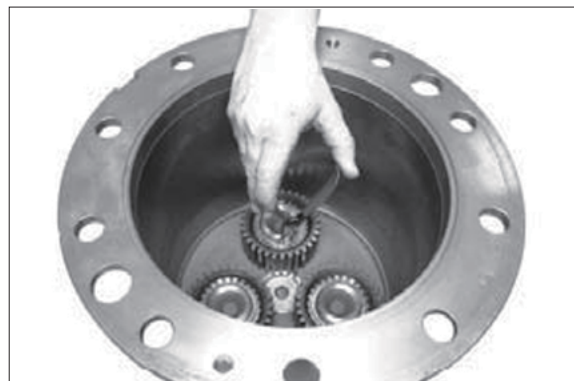
(3) Planetary carrier

Loosen both hexagon screws and separate planetary carrier from hub.



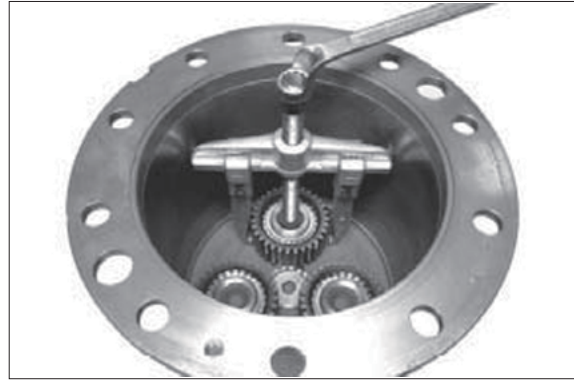
17W98FA015

- (4) Unsnap retaining ring.



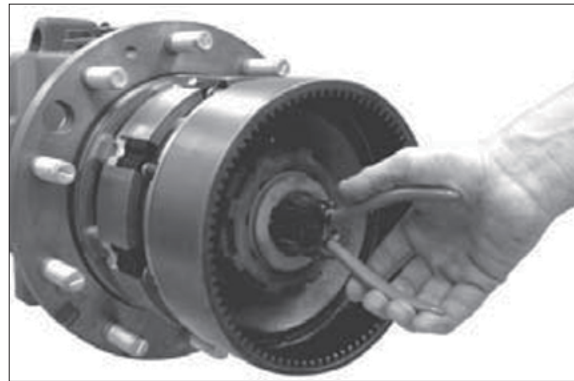
17W98FA016

- (5) Pull off planetary gear together with cylindrical roller bearing.



17W98FA017

- (6) **Brake**
Unsnap retaining ring and remove both thrust washers.



17W98FA018

- (7) Loosen cylindrical screw (slotted nut fixing).



17W98FA019

- (8) Loosen slotted nut.
(S) Socket wrench 5870 656 097

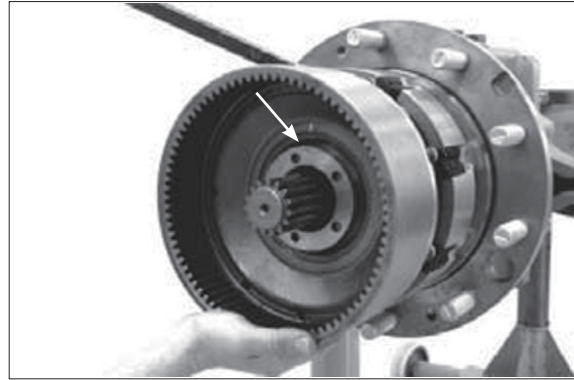


17W98FA020

(9) Press off ring gear together with piston from joint housing.

(S) Assembly lever 5870 345 036

※ Pay attention to releasing O-ring (arrow).



17W98FA021

(10) Loosen hexagon screws and remove releasing spring sleeves and compression springs.



17W98FA022

(11) Press off piston from ring gear.



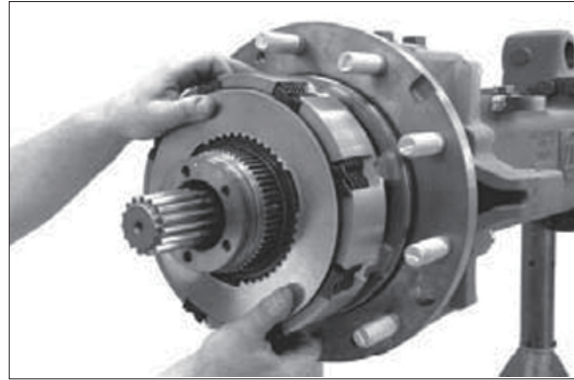
17W98FA023

(12) Remove sealing elements from the annular grooves (see arrows) of the ring gear.



17W98FA024

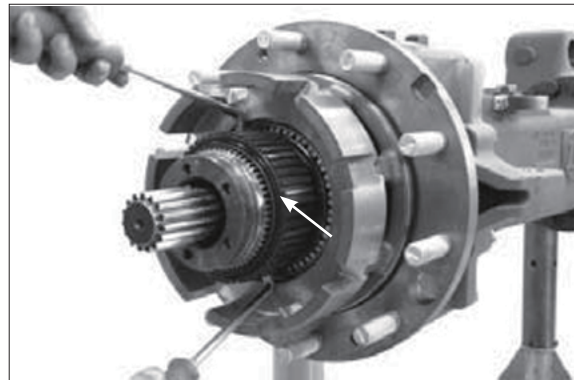
(13) Remove disk package.



17W98FA025

(14) Remove O-ring (see arrow) and lift off disk carrier from the joint housing.

(S) Adjusting device 5870 400 001



17W98FA026

(15) Hub

Remove O-ring (see arrow).

Secure hub with lifting bracket (S) and pull from joint housing by means of a two armed puller.

(S) Lifting bracket 5870 281 043

(S) Pressure piece 5870 100 067

※ Pay attention to releasing bearing inner ring.



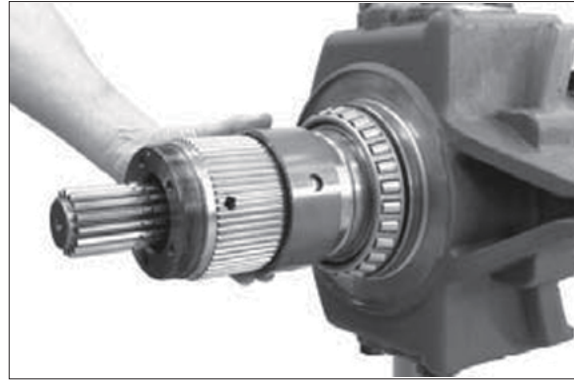
17W98FA027

(16) Use a lever to lift-off shaft seal ring (see arrow) from hub hole and force both bearing outer rings out of the hub.



17W98FA028

(17) Remove spacer bushing.



17W98FA029

(18) Pull tapered roller bearing from joint housing.

- (S) Grab sleeve 5873 003 022
- (S) Pressure piece 5870 100 067



17W98FA030

(19) Knuckle housing

Loosen threaded joint and remove upper bearing pin.

- ※ Pay attention to releasing O-ring.
- ※ Remove lower bearing pin only after securing the knuckle housing (see figure FA032).



17W98FA031

(20) Secure knuckle housing by means of lifting tackle.

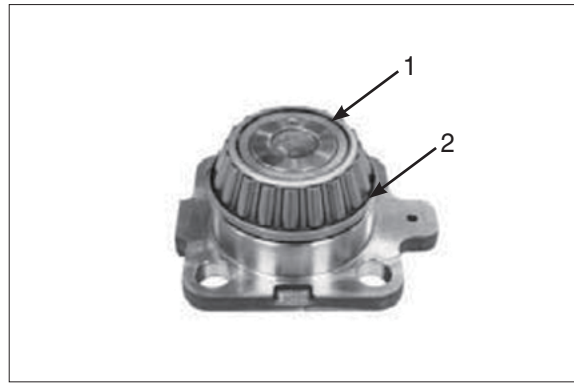
Then loosen threaded joint and remove lower bearing pin.

- (S) Eyebolts (M 16) 5870 804 001



17W98FA032

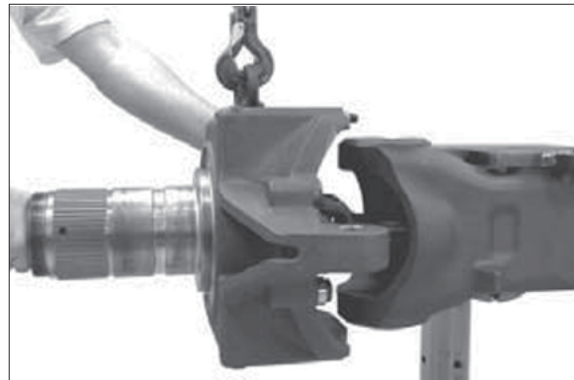
- (21) Use lever to remove tapered roller bearing (1) from bearing pin, remove releasing sealing cap (2) and the O-ring lying behind.



17W98FA033

- (22) Separate knuckle housing with double u-joint shaft from the axle housing.

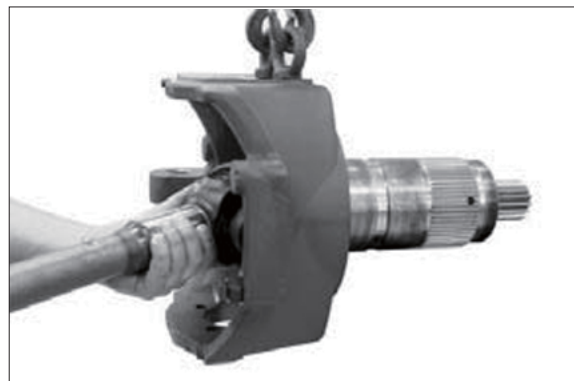
※ Pay attention to shaft seal ring in the axle housing risk of damage.



17W98FA034

- (23) Pull out double u-joint shaft from knuckle housing.

※ Pay attention to shaft seal ring in the knuckle housing risk of damage.



17W98FA035

- (24) Pull out shaft seal ring and afterwards the bushing behind from the axle housing.

(S) Internal extractor 5870 300 007

(S) Counter support 5870 300 020

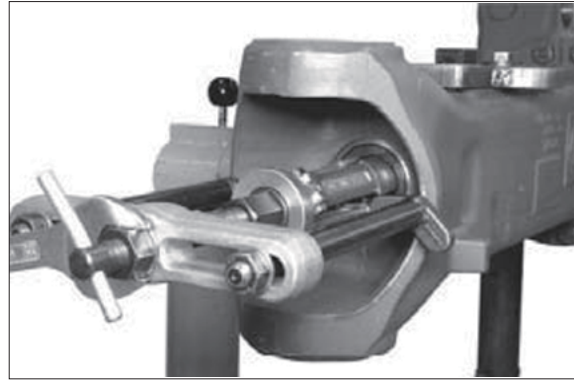


17W98FA036

(25) Pull out shaft seal ring and afterwards the bushing behind from the axle housing.

(S) Internal extractor 5870 300 017

(S) Counter support 5870 300 020



17W98FA037

(26) Pull out both bearing outer rings from the pivot bearing holes.

(S) Internal extractor 5870 300 019

(S) Counter support 5870 300 020



17W98FA038

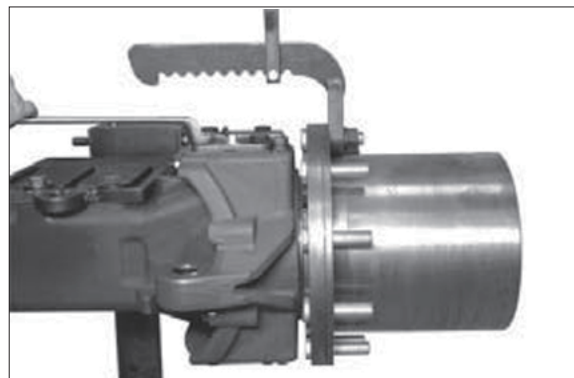
(27) Output assy

※ If work is required on the differential or pinion, you may disassembly the output as complete unit (operation FA039 and FA040).

Secure output assy by means of lifting tackle (S).

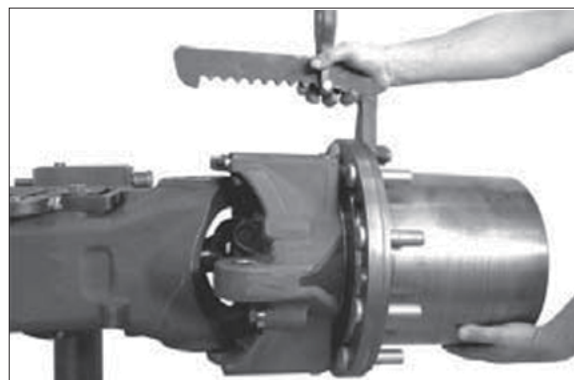
(S) Lifting bracket 5870 281 043

Then loosen threaded joints of both bearing pins.



17W98FA039

(28) Remove both bearing pins and separate the output assy from the axle housing.



17W98FA040

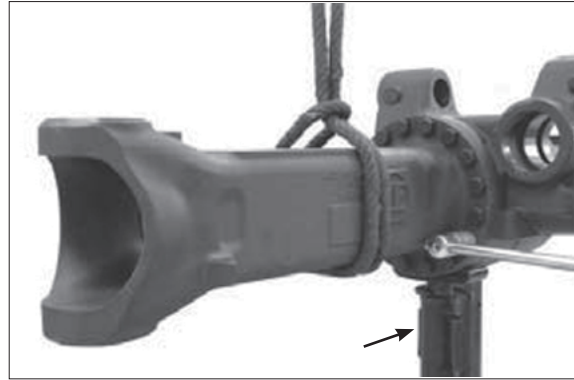
3) INPUT

- (1) Support axle to axle drive housing (see arrow).

Then secure axle housing (crown wheel side) by means of lifting tackle and loosen threaded joint.

Then separate axle housing from axle drive housing.

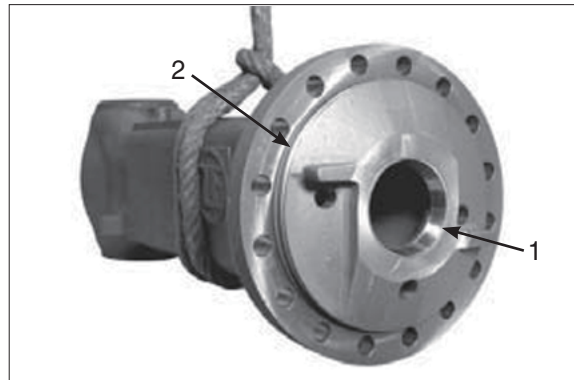
- ※ Pay attention to possibly releasing differential.



17W98FA041

- (2) Pull bearing outer ring (arrow 1) from the bearing hole and remove releasing shim.
Then remove O-ring (arrow 2).

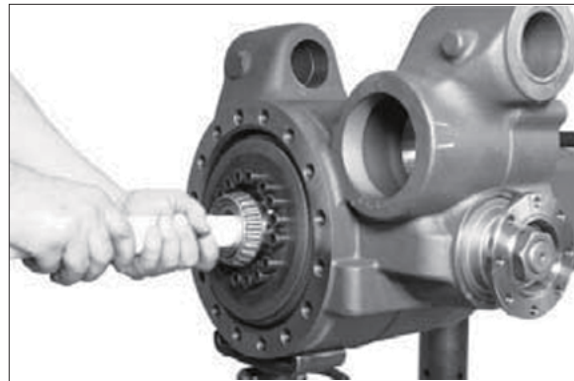
(S) Striker 5870 650 004



17W98FA042

- (3) Lift differential out of the axle drive housing.

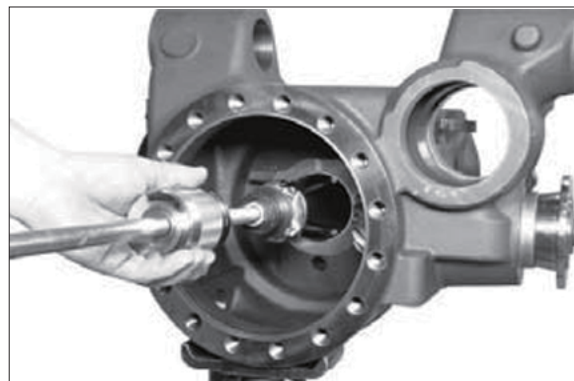
- ※ Disassembly of the differential is described as of page 8-230.



17W98FA043

- (4) Use striker (S) to pull bearing outer ring out of the bearing hole (axle housing) and remove releasing shim.

(S) Striker 5870 650 004



17W98FA044

- (5) Warm up hexagon nut by means of hot air blower.
Then loosen hexagon nut and remove the releasing shim.

(S) Clamping fork 5870 240 025

- ※ Hexagon nut is installed with Loctite no. 262.



17W98FA045

- (6) Pull input flange from pinion.
If necessary, remove screen sheet from flange.



17W98FA046

- (7) Use a lever to remove the shaft seal ring from the housing hole.



17W98FA047

- (8) Force out input pinion and remove releasing roller bearing.

- ※ Use plastic hammer.
※ If tapered roller bearings should not be replaced, pay attention that the outer bearing inner ring with all its rolls is in contact with bearing outer ring when forcing out the input pinion.



17W98FA048

(9) Remove spacer ring.



17W98FA049

(10) Press roller bearing from input pinion.

(S) Grab sleeve 5873 001 037

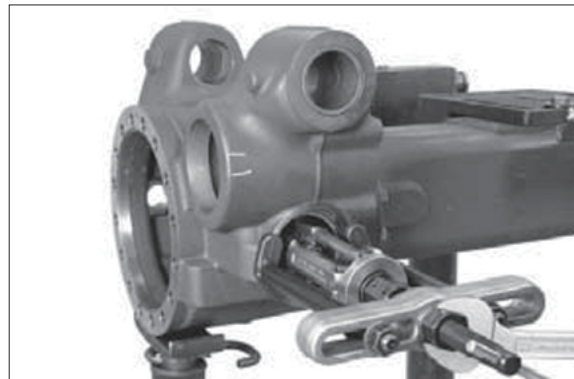


17W98FA050

(11) Pull off outer bearing outer ring from bearing hole.

(S) Internal extractor 5870 300 019

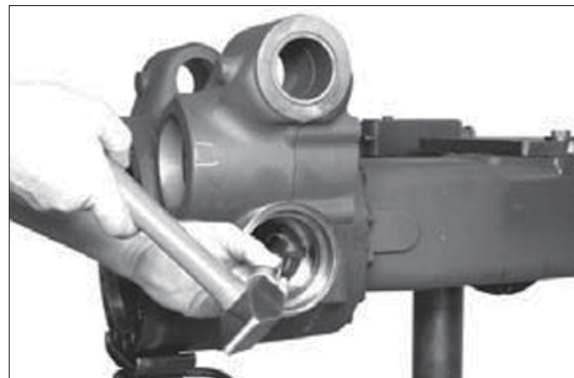
(S) Counter support 5870 300 020



17W98FA051

(12) Force out bearing outer ring from the inner bearing hole pay attention to the shim behind.

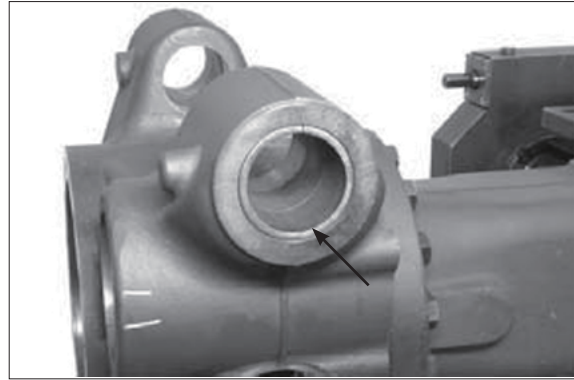
※ Mark shim (with regard to position/bearing allocation) assembly aid.



17W98FA052

(13) If necessary, provide bushings with a separating slot (see arrow) and remove from holes.

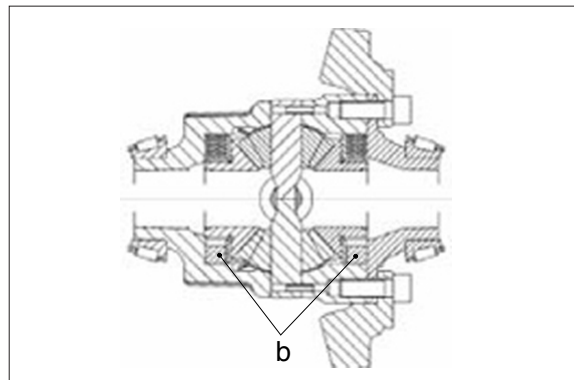
※ Bushings are destroyed by this.



17W98FA053

4) DIFFERENTIAL

(1) Differential - versions:
b = Constant spacers



17W98FA054

(2) Pull both tapered roller bearings from differential carrier.

(S) Grab sleeve	5873 011 019
(S) Basic tool	5873 001 000
(S) Pressure piece	5870 100 009



17W98FA055

(3) Use press to fix differential and loosen threaded joint crown wheel / differential carrier.



17W98FA056

(4) Press crown wheel from differential.



17W98FA057

(5) Remove single parts.
Remove axle bevel gear together with thrust washer and constant spacer from the differential carrier.



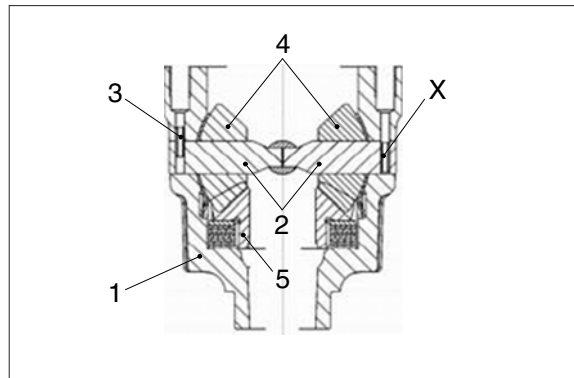
17W98FA058

(6) Force slotted pins (considering position "X", see subsequent sketch FA060) into the spider shafts.



17W98FA059

(7) Comment on sketch:
1 = Differential carrier
2 = Spider shafts (short)
3 = Slotted pins
4 = Differential bevel gears
5 = Axle bevel gear
X = Position of the slotted pin to force out the spider shafts



17W98FA060

(8) Force out both spider shafts (short).



17W98FA061

(9) Remove all single parts.

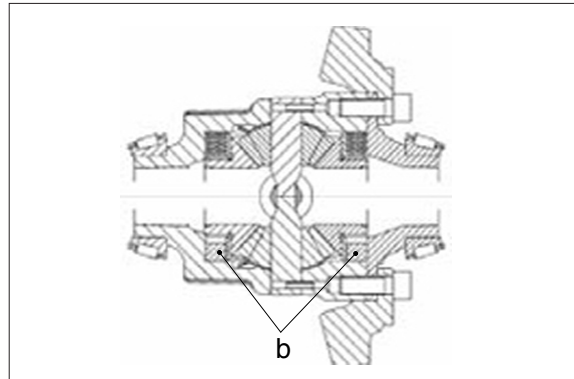


17W98FA062

4. REASSEMBLY

1) DIFFERENTIAL

(1) b = Constant spacers



17W98FA054

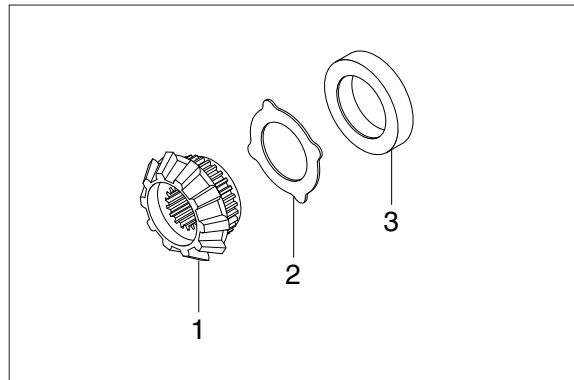
(2) All outer and inner disks are replaced by a constant spacer (see figure FA066).

1 = Axle bevel gear

2 = Pressure disk

3 = Constant ring

※ No measuring / setting of the axial play of the two axle bevel gears is required, therefore single parts can be immediately oiled.



17W98FA065

(3) Insert premounted axle bevel gear into the differential carrier.



17W98FA066

(4) Insert differential bevel gears (1) with thrust washers (2) and fix with spider shafts (3 and 4).

※ Pay attention to radial installation position of the thrust washers.



17W98FA067

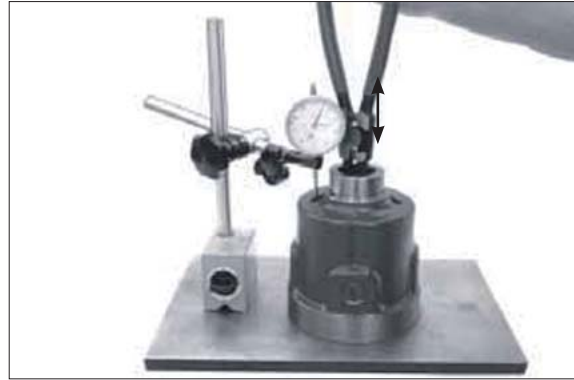
(5) Check axial play of the axle bevel gear $0.0 \sim 0.15$ mm.

※ If the axial play is not within the specified tolerance, correct with the corresponding outer disks.

After the setting procedure separate the single parts again.

Then oil and reassemble all single parts again.

※ Make sure that thickness and arrangement of the second disk package are identical (figure FA071).



17W98FA068

(6) Fix both spider shafts (short) by means of slotted pins (considering installation dimension, see sketch FA070).



17W98FA069

(7) Comment on sketch:

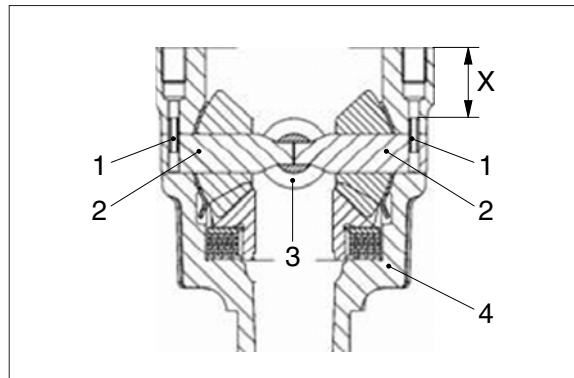
1 = Slotted pin

2 = Spider shaft (short)

3 = Spider shaft

4 = Differential carrier

X = Installation dimension 34 ± 0.5 mm



17W98FA070

(8) Mount second axle bevel gear with thrust washer and constant spacer (see also figure FA065).

※ Mount the pressure disk with the coated surface showing to the outer disk.

※ Thickness and arrangement of the disk package must be identical on both sides of the differential gear.



17W98FA071

(9) Check axial play of the second axle bevel gear 0.0~0.15 mm.

※ If the axial play is not within the specified tolerance, correct with the corresponding outer disks.

After the resetting procedure remove the second axle bevel gear together with the disk package from the differential carrier.

Then oil and reassemble all single parts.



17W98FA072

(10) Mount two adjusting screws (S) and insert cover.

(S) Adjusting screws (M12×1.5)

5870 204 027



17W98FA073

(11) Press crown wheel onto the cover / differential carrier until contact position is obtained.



17W98FA074

(12) Fix differential with press and tighten crown wheel with cylindrical screws.

Tightening torque (M12×1,5/12.9)

. MA = 145

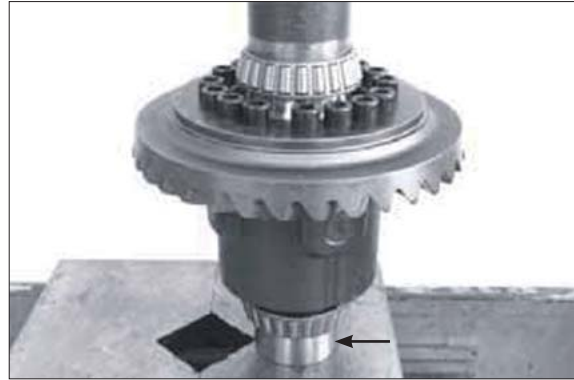
Nm



17W98FA075

(13) Press on both bearing inner rings until contact is obtained.

- ※ Use an appropriate support (arrow differential may not be supported on the bearing cage).



17W98FA076

2) INPUT

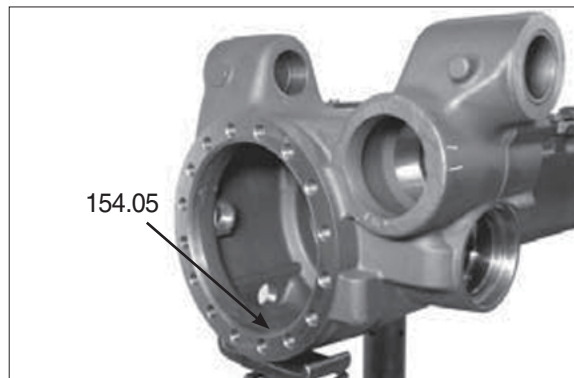
(1) Input pinion

- ※ The following measuring procedures must be carried out with utmost accuracy. Inaccurate measurements lead to an incorrect contact pattern and another disassembly and reassembly of the input pinion is required.

(2) Determine thickness of the shim to obtain a correct contact pattern

Read dimension I from the axle drive housing.

Dimension I e.g. 154.05 mm



17W98FA077

(3) Read dimension II (pinion dimension).

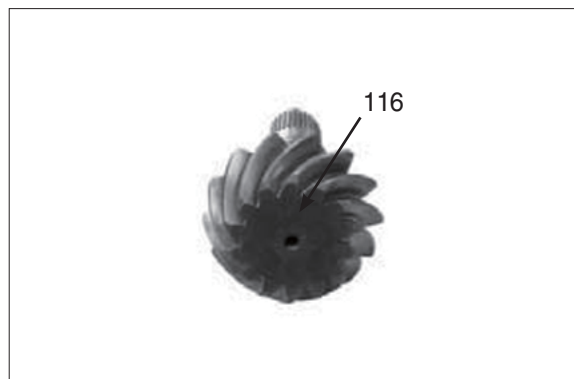
Dimension II e.g. 116.00 mm

In case of a + or - deviation of the pinion dimension for production reasons the relevant value is marked by hand on the pinion.

Pinion dimension (without + or - deviation) = 116.0 mm

Pinion dimension with an indicated + 0.1 deviation = 116.1 mm

Pinion dimension with an indicated - 0.1 deviation = 115.9 mm



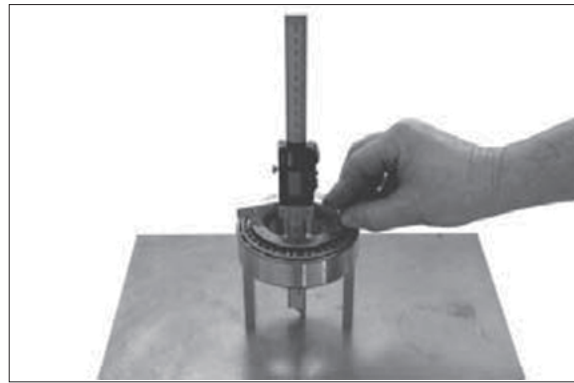
17W98FA078

(4) Determine dimension III (bearing width).

- ※ Make sure that the rollers are located without any play (rotate bearing g inner ring several times in both directions roller setting).

Since the installed roller bearing is subject to a pre-load in installation position, consider an experience deduction of 0.1 mm.

Dimension III, e.g. 36.60 mm – 0.1 mm
..... = 36.50 mm

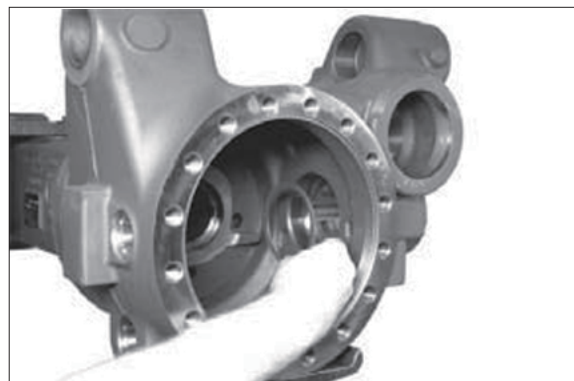


17W98FA079

(5) Calculation example "B" :

Dimension I 154.05 mm
Dimension X - 152.50 mm
Difference = shim s = 1.55 mm

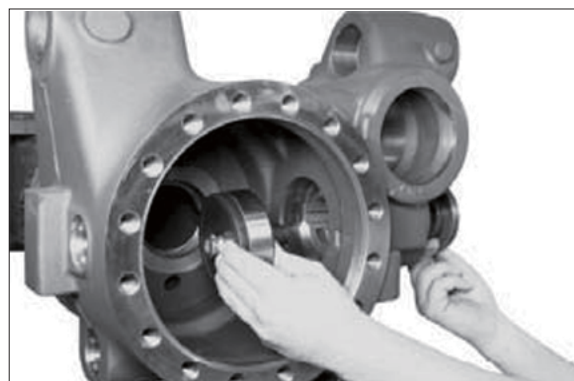
Insert the determined shim (e.g. s = 1.55 mm) into the inner bearing hole.



17W98FA080

(6) Undercool bearing outer ring (see arrow) and bring into contact position in the bearing hole by using the assembly fixture (S).

(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98FA081

(7) Undercool outer bearing outer ring and insert into bearing hole until contact is obtained.

(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98FA082

(8) Setting of rolling torque of the input pinion bearing 1.0 ... 3.0 Nm (without shaft seal ring)

Warm up roller bearing and insert until contact is obtained.

※ Adjust bearing after cooling down.



17W98FA083

(9) Insert spacer ring (e.g. $s = 16.96$ mm).

※ According to our experience, the necessary rolling torque is obtained when reusing the spacer ring which has been removed during disassembly (e.g. $s = 16.96$ mm).

A later check of the rolling torque, however, is absolutely necessary.



17W98FA084

(10) Insert the preassembled input pinion into the axle housing and mount the heated roller bearing until contact is obtained.



17W98FA085

(11) Press screen sheet (see arrow) onto the input flange until contact is obtained.

※ The shaft seal ring is mounted only after contact pattern check.



17W98FA086

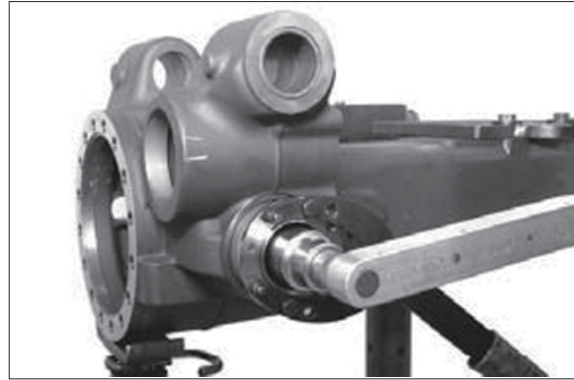
(12) Mount input flange, fix with disk and hexagon nut.

Tightening torque (M30 x 1,5)

..... MA = 600 Nm

(S) Clamping fork 5870 240 025

- ※ During the tightening process rotate the input pinion several times in both directions.



17W98FA087

(13) Check rolling torque (1.0 ... 3.0 Nm without shaft seal ring).

- ※ When installing new bearings try to achieve the upper value of the rolling torque.
- ※ In case of deviations from the necessary rolling torque correct with a corresponding spacer ring (figure FA084) as specified below.

Insufficient rolling torque

install thinner spacer ring

Excessive rolling torque

install thicker spacer ring.



17W98FA088

(14) Determine shim for setting the bearing rolling torque (differential bearing) and backlash (bevel gear set).

- ※ The required shims must be determined on the basis of the read value (test dimension / crown wheel) and the corresponding specifications of the table next page : (KRS – SET – RIGHT) :
Read test dimension from crown wheel rear.



17W98FA089

- ※ Test dimension "70" is stamped into the crown wheel rear. Without + or deviation specification, this corresponds to test dimension / Actual value "70" in the table below.

According to this value the necessary shims are allocated in the table next page.

※ In case of + or – deviation of the test dimension for production reasons, it is additionally signed on the crown wheel rear (e.g. - 20 or - 10 . 10 or 20) .

※ In accordance with this deviation the necessary shims are allocated in the below table.

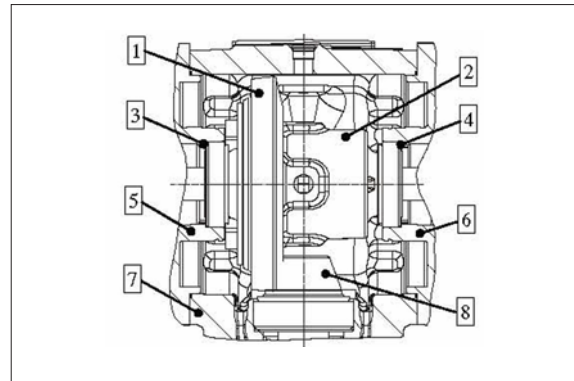
(15) Comment on sketch:

1 = Crown wheel 2 = Differential carrier

3 = Shim 4 = Shim
(crown wheel side) (diff. carrier side)

5 = Axle housing 6 = Axle housing

7 = Axle drive housing 8 = Input pinion

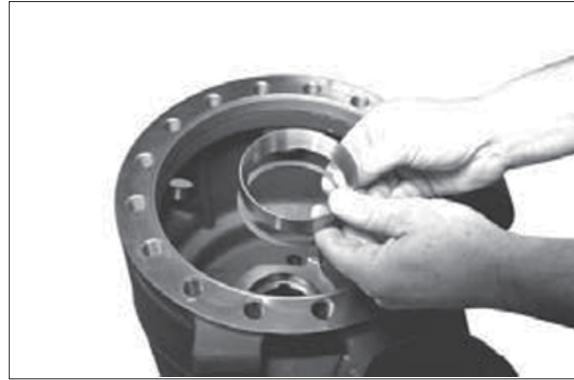


17W98FA090

Setting disks for differential					
Test dimension/Marking of crown wheel 70 and deviation	-20	-10	0	10	20
Result → Test dimension / Act. value	69.80	69.90	70.0	70.10	70.20
Shim/Diff. carrier side Required disk thickness	0.95	1.05	1.15	1.25	1.35
Shim no.	ZGAQ-00545	ZGAQ-00547	ZGAQ-00549	ZGAQ-00552	ZGAQ-00554
Shim/Crown wheel side Required disk thickness	1.35	1.25	1.15	1.05	0.95
Shim no.	ZGAQ-00554	ZGAQ-00552	ZGAQ-00549	ZGAQ-00547	ZGAQ-00545

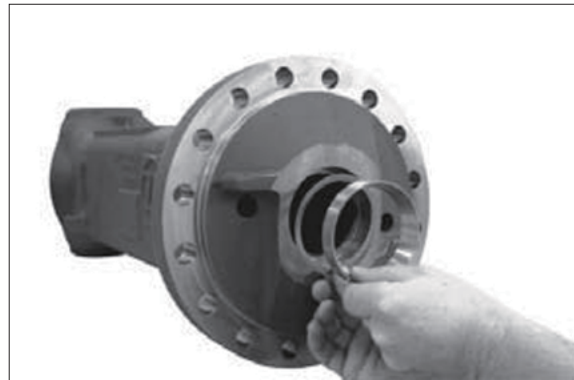
(16) Insert the determined shim (e.g. $s = 1.15$ mm) and the bearing outer ring into the hole of the axle housing on the differential carrier side.

※ Pivot axle housing 90° .



17W98FA091

(17) Insert the determined shim (e.g. $s = 1.15$ mm) and the bearing outer ring into the hole of the axle housing on the crown wheel side.



17W98FA092

(18) Check the contact pattern of the bevel gear set

Wet some drive and coast flanks of the crown wheel with marking ink.



17W98FA093

(19) Insert the preassembled differential into the axle drive housing.

(S) Internal extractor 5870 300 005



17W98FA094

(20) Use lifting tackle to mount the axle housing (crown wheel side) and preliminarily fix with hexagon screws.

Tightening torque (M18/10.9)
..... MA = 390 Nm

※ Preliminarily fix axle housing without O-ring.

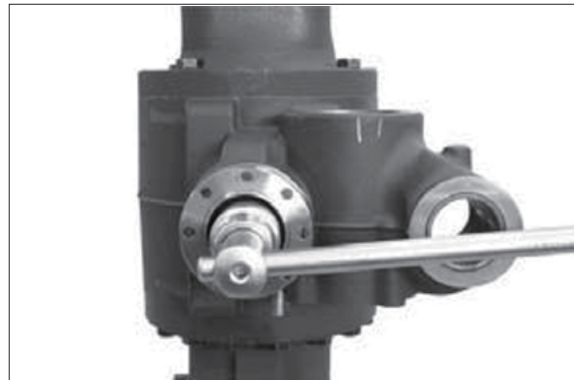


17W98FA095

(21) Roll the crown wheel by rotation on the input flange several times in both directions over the input pinion.

Then remove axle housing again and lift differential out of the axle drive housing. Compare the obtained contact pattern with contact pattern example page 0/4 and 0/5.

※ In case of a contact pattern deviation a measuring mistake was made when determining the shim (figure FA080), which must be absolutely corrected.



17W98FA096

(22) Grease O-ring (see arrow) and mount to axle housing.



17W98FA097

(23) Use lifting tackle to mount the axle housing (part II), finally tighten with hexagon screws.

Tightening torque (M18/10.9)
..... MA = 390 Nm

Then bring axle into horizontal position and reassemble the second clamping angle (S) (see also figure FA001).

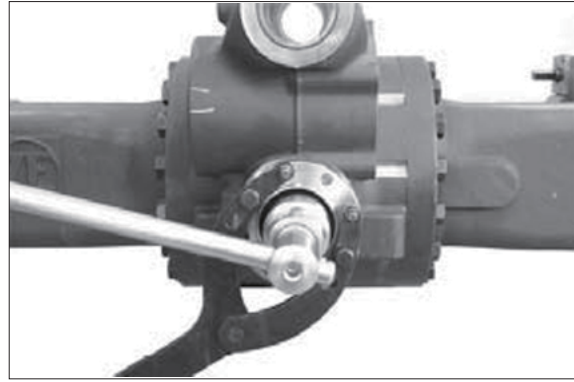


17W98FA098

(24) Mount shaft seal ring (input flange)

Loosen hexagon nut and pull the input flange from the input pinion.

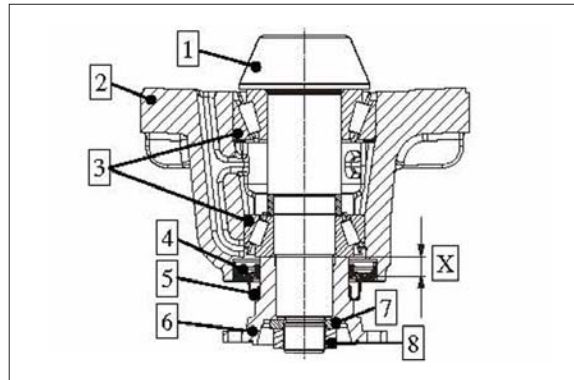
(S) Clamping fork 5870 240 025



17W98FA099

(25) Comment on sketch:

- 1 = Input pinion
- 2 = Axle drive housing
- 3 = Tapered roller bearing
- 4 = Shaft seal ring
- 5 = Screen sheet
- 6 = Input flange
- 7 = Disk
- 8 = Hexagon nut
- X = Installation dimension → 13.5 +0, 2 mm

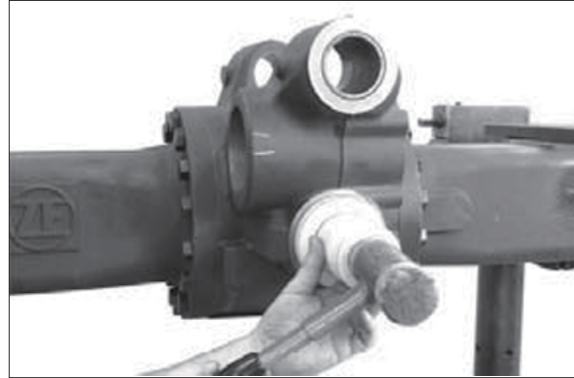


17W98FA100

(26) Mount shaft seal ring with the seal lip showing to the oil chamber.

(S) Driver tool 5870 048 286

- ※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.
- ※ Just before fitting, wet contact face shaft seal ring/axle drive housing with lubricant. Apply grease on seal and dust lip of the shaft seal ring.



17W98FA101

(27) Mount input flange, finally tighten with disk and hexagon nut.

Tightening torque (M30x1.5)
..... MA = 600 Nm

(S) Clamping fork 5870 240 025

- ※ Wet thread of the hexagon nut with Loctite no. 262.



17W98FA102

3) OUTPUT

(1) Preassembly axle housing

Insert bushing into hole of axle housing considering installation dimension "B" and installation position "Y" (see also sketch FA104 and FA106).

(S) Driver tool 5870 055 081

(S) Handle 5870 260 002



17W98FA103

(2) Comment on sketch:

1 = Axle housing

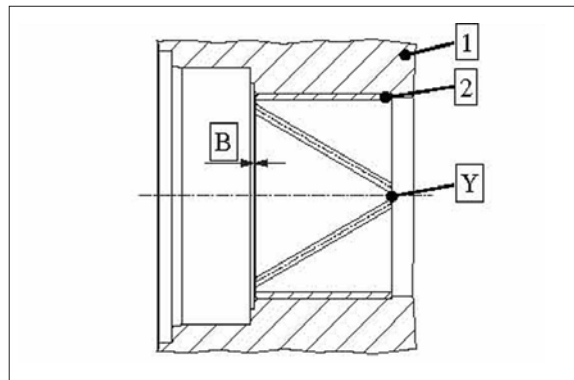
2 = Bushing

B = Installation dimension 1.0 ± 0.3 mm

Y = Installation position / lubrication groove outlet of bushing (top view)

※ Lubrication groove outlet (V-point) must be mounted in 6 o'clock position (bottom) and showing to the oil chamber side.

※ Use of the specified driver tool (S) ensures the exact installation depth of the bushing.



17W98FA104

(3) Flush-mount seal ring with the seal lip showing to the oil chamber (see sketch FA106) into the axle housing hole.

(S) Driver tool 5870 055 081

(S) Handle 5870 260 002

※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.



17W98FA105

※ Just before fitting wet the contact face shaft seal ring/axle drive housing with lubricant.

Apply grease on seal and dust lip of the shaft seal ring.

(4) Comment on sketch:

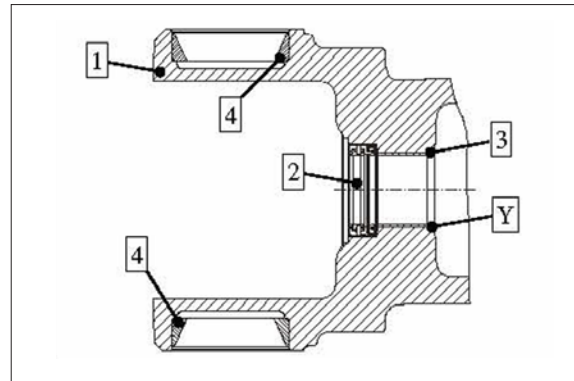
1 = Axle housing

2 = Shaft seal ring

3 = Bushing

4 = Bearing outer rings (pivot bearing)

Y = Lubrication groove outlet (V-point – in 6 o'clock position and on oil chamber side)

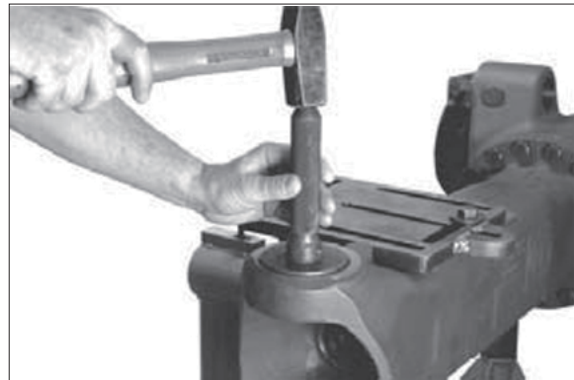


17W98FA106

(5) Insert both bearing outer rings into the pivot bearing holes of the axle housing.

(S) Driver tool 5870 058 058

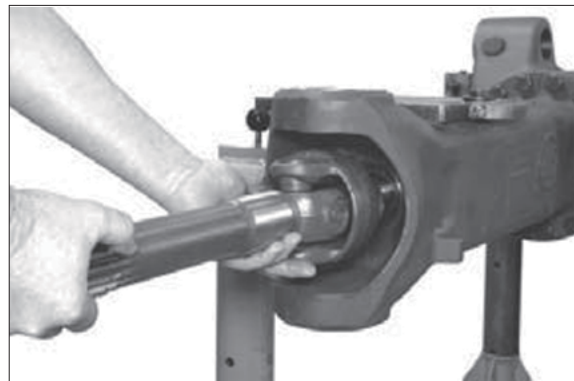
(S) Handle 5870 260 002



17W98FA107

(6) Install the u-joint shaft by inserting the u-joint shaft into the axle bevel gear teeth.

※ Pay attention to shaft seal ring in the axle housing risk of damage.



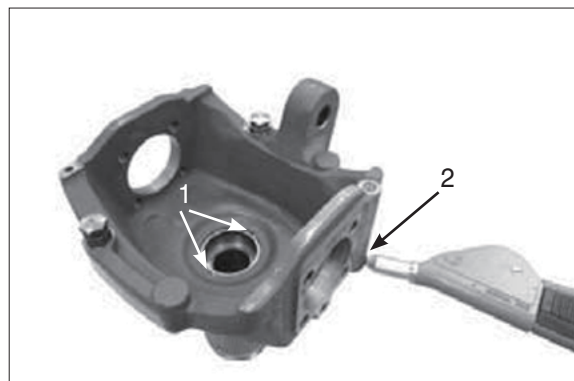
17W98FA108

(7) Knuckle housing (pivot bearing-SET-RIGHT)

Seal machining openings of oil supply holes – position 1 and 2 with plugs.

(S) Lever riveting tongs 5870 320 016

※ Operation is only required when using a new knuckle housing.



17W98FA109

- (8) Insert bushing into the hole of the knuckle housing considering the installation dimension "B" and installation position "Y" (see also sketch FA111 and FA113).

(S) Driver tool 5870 055 090
(S) Handle 5870 260 002



17W98FA110

- (9) Comment on sketch:

1 = Knuckle housing

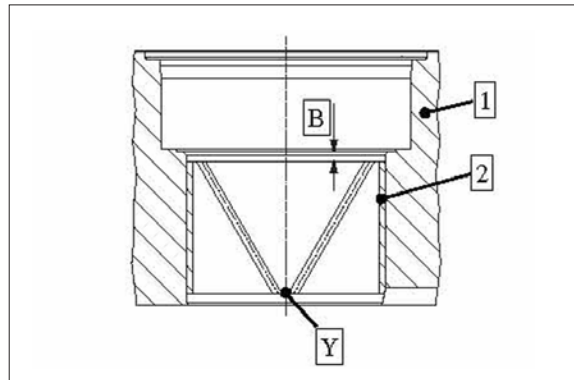
2 = Bushing

B = Installation dimension. . . 2.0 ± 0.2 mm

Y = Installation position / lubrication groove outlet of the bushing

- ※ Lubrication groove outlet (V-point) must be mounted in 6 o'clock position (bottom) and showing to the oil chamber side (referred to the axle fitted into the vehicle).

- ※ Use of the specified driver tool (S) ensures the exact installation depth of the bushing.



17W98FA111

- (10) Insert shaft seal ring into the hole of the knuckle housing with the seal lip showing to the oil chamber – considering the installation dimension "W" (see also sketch below).

(S) Driver tool 5870 055 081
(S) Handle 5870 260 002

- ※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.



17W98FA112

(11) Comment on sketch:

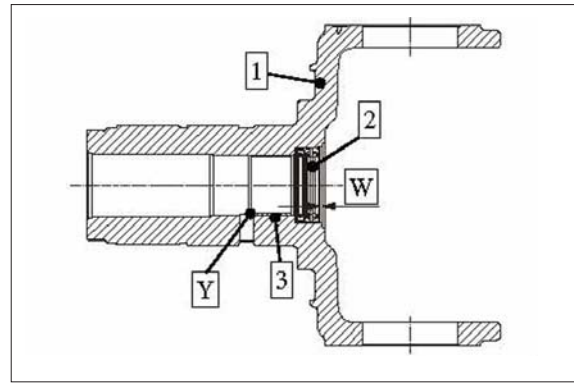
1 = Knuckle housing

2 = Shaft seal ring

3 = Bushing

W = Installation dimension – shaft seal ring 2.0 ± 0.2 mm

Y = Lubrication groove outlet (V-point) must be mounted in 6 o'clock position and showing to the oil chamber side (referred to the axle fitted into the vehicle)



17W98FA113

※ Just before fitting wet contact face shaft seal ring / knuckle housing with sealing agent.

Apply grease on seal and dust lip of the seal ring.

(12) Grease O-ring (see arrow) and insert it into the groove of the bearing pin.



17W98FA114

(13) Place sealing cap (see arrow) and mount the tapered roller bearing until contact position is obtained.

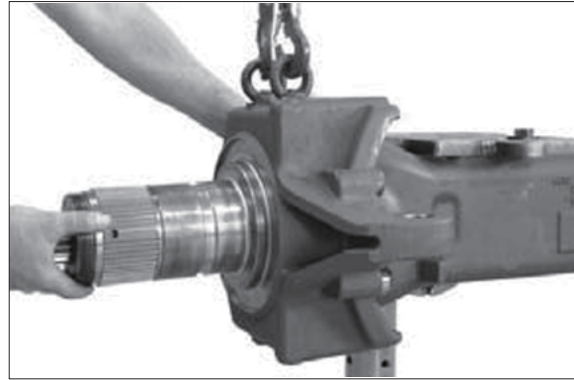


17W98FA115

(14) Locate pre-assembled knuckle housing on axle housing and carefully mount u-joint shaft.

(S) Eyebolts (M 16) 0636 804 001

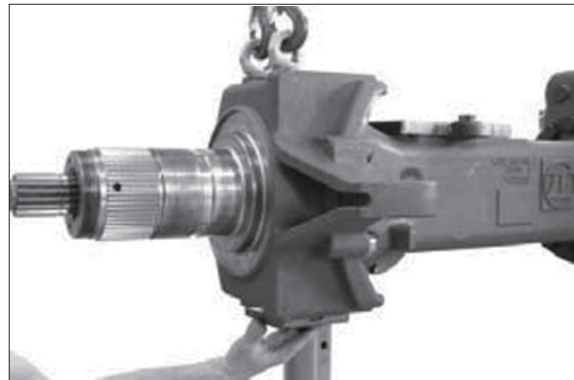
※ Pay attention to shaft seal ring in the knuckle housing risk of danger.



17W98FA116

(15) Insert the pre-assembled lower bearing pin and preliminarily fix with hexagon screws.

※ Pay attention to installation position mount bearing pin with lubrication nipple showing to axle centre.

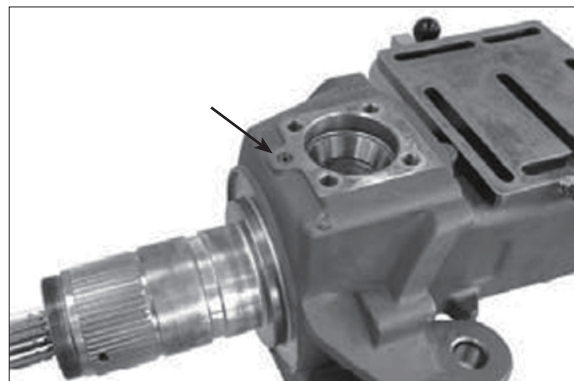


17W98FA117

(16) Insert O-ring (see arrow) or O-rings into countersink of the knuckle housing.

1 pcs for version with breather valve in the knuckle housing

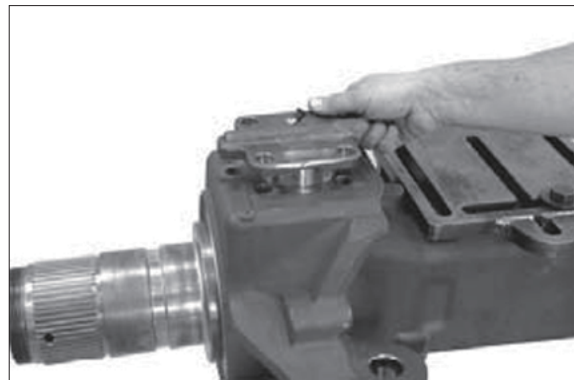
2 pcs for version with breather valve in the bearing pin



17W98FA118

(17) Insert pre-assembled upper bearing pin.

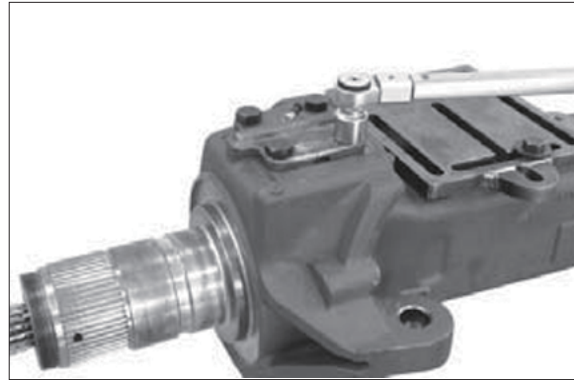
※ Observe installation position mount bearing pin with oil supply holes showing to axle centre.



17W98FA119

(18) Fix both bearing pins definitely.

※ Tightening torque (M 16/10.9)
..... MA = 280 Nm



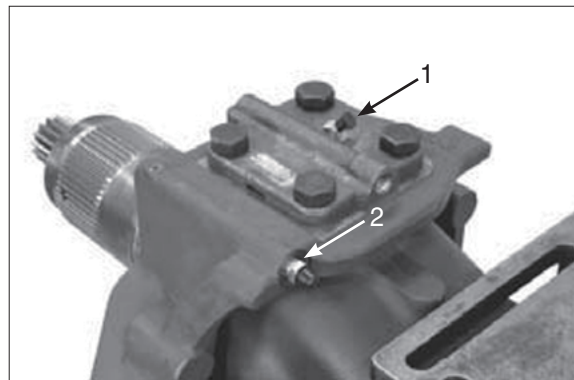
17W98FA120

(19) Mount lubrication nipple in both bearing pins (arrow 1 showing to the axle centre) and apply grease to the pivot bearing.

Tightening torque (M 10×1)
..... MA = 3 Nm

Mount breather valve (arrow 2, position depending on version : integrated in the knuckle housing or in the bearing lid) and provide with dust cap.

Tightening torque (M 14×1,5)
..... MA = 20 Nm



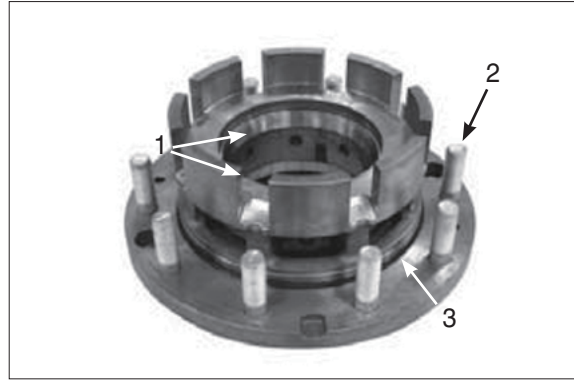
17W98FA121

4) HUB (Hub bearing-SET-RIGHT)

- (1) Insert both bearing outer rings (1) of the hub bearing until contact position is obtained.

Press wheel bolts (2) into the hub until contact position is obtained.

Oil O-ring (3) and locate in annular groove of hub.



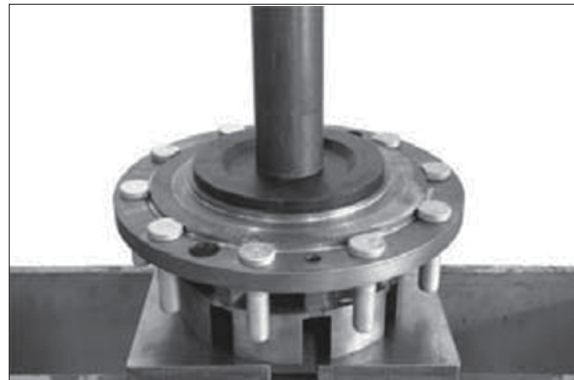
17W98FA122

- (2) Press shaft seal ring with the marking "OUT SIDE" showing outside (upwards) into the hub.

(S) Driver tool 5870 051 035

※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.

※ Wet the outer diameter of the shaft seal ring with Loctite no. 574.



17W98FA123

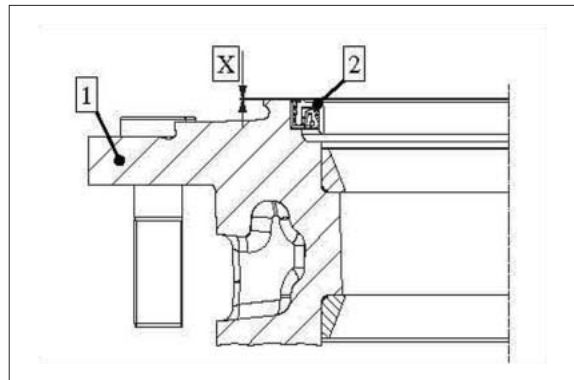
- (3) Comment on sketch:

1 = Hub

2 = Shaft seal ring

X = Installation dimension – Shaft seal ring

..... 0.0~0.3 mm



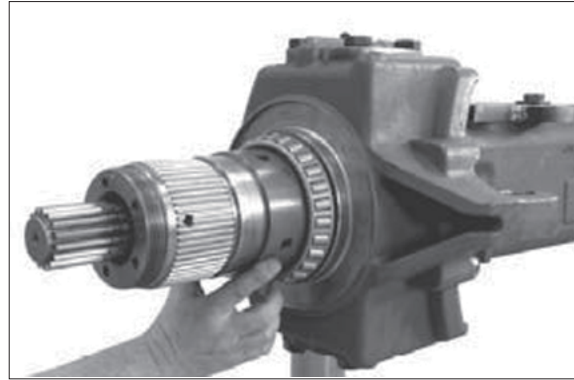
17W98FA124

- (4) Heat the tapered roller bearing and mount until contact position with the knuckle housing is obtained.



17W98FA125

(5) Insert spacer bushing.



17W98FA126

(6) Install preassembled hub until contact is obtained and fix with heated tapered roller bearing.

(S) Lifting bracket 5870 281 043

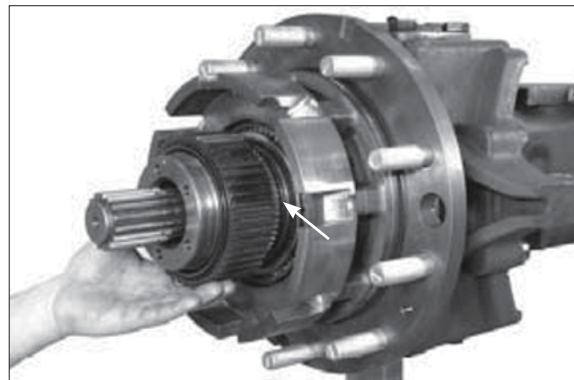
※ Just before fitting wet the seal lips of the shaft seal ring with lubricant.



17W98FA127

(7) Oil O-ring and insert it into the annular groove (see arrow) of the knuckle housing.

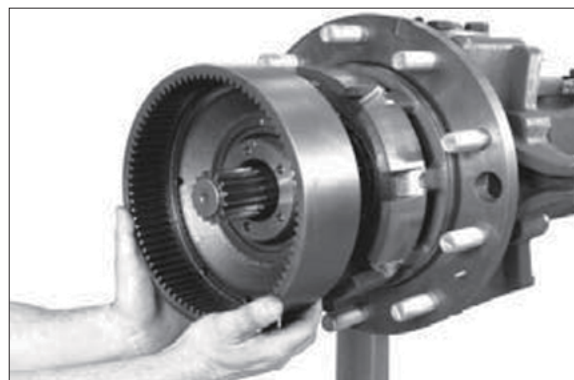
Then install disk carrier.



17W98FA128

(8) Bring disk carrier and hub bearing into contact position (figure FA129 and FA130)

Install ring gear (without sealing elements).



17W98FA129

- (9) Bring hub bearing into contact position for this purpose tighten slotted nut with a tightening torque of max. 1400 Nm.

(S) Socket wrench 5870 656 097

- ※ While tightening the slotted nut rotate hub in both directions several times roller setting.
- ※ Apply lubricant to thread knuckle housing / slotted nut.



17W98FA130

- (10) Loosen slotted nut again and remove ring gear.

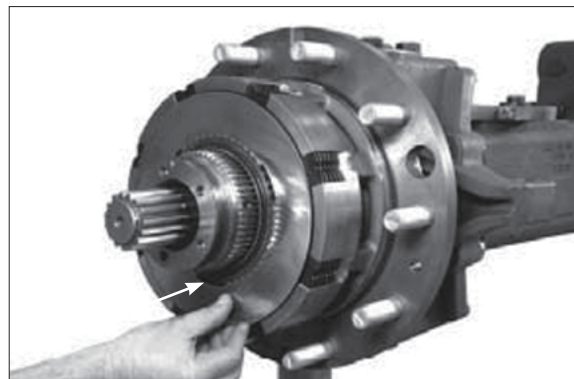


17W98FA131

5) DISK BRAKE

- (1) Install disk package alternately starting with an outer disk.

- ※ Take the actually required disk fitting / arrangement from the corresponding spare parts list.
- ※ Bring inner clutch disks in a position where one of the tooth recesses (see arrow) is in 6 o'clock position with axle being installed in the vehicle.



17W98FA132

- (2) Oil O-ring and locate in annular groove of disk carrier.



17W98FA133

(3) Oil U- and support rings and insert them into the annular grooves of the ring gear.

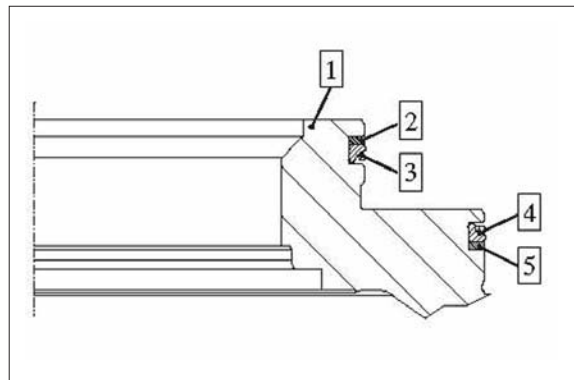
※ Observe installation position, see sketch below.



17W98FA134

(4) Comment on sketch:

- 1 = Ring gear
- 2 = Support ring
- 3 = U-ring
- 4 = U-ring
- 5 = Support ring



17W98FA135

(5) Mount cylindrical pins into piston, considering installation dimension "X".

X = Installation dimension 18.00 mm



17W98FA136

(6) Install piston on ring gear.



17W98FA137

- (7) Fix piston with "new" hexagon screws (1), spring sleeves (2) and compression springs (3 and 4).

Tightening torque (M 6/8.8)
 MA = 8 Nm

※ Use hexagon screws just once.



17W98FA138

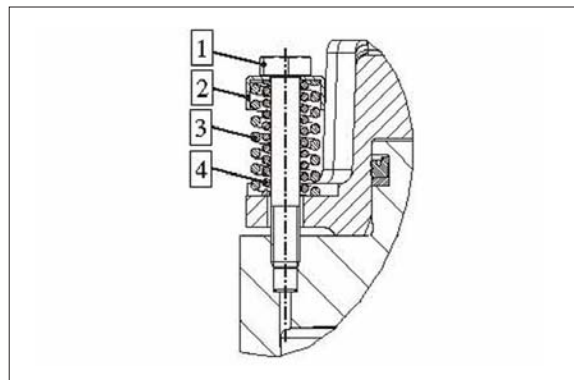
- (8) Comment on sketch:

1 = Hexagon screw (special version)

2 = Spring sleeve

3 = Compression spring

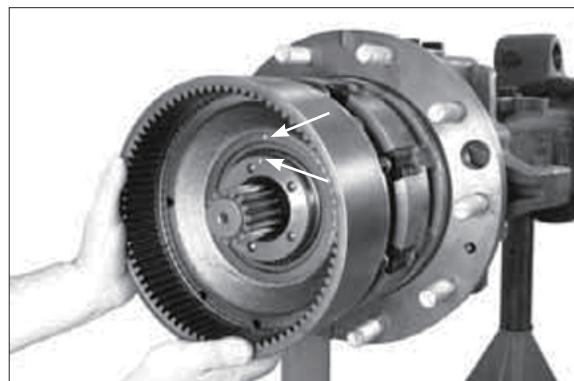
4 = Compression spring



17W98FA139

- (9) Mount preassembled ring gear considering the installation position (markings O in 12 o'clock position - see arrows).

※ Ensure exact tothing position of oil supply holes knuckle housing / ring gear (pressure oil supply to brake piston).



17W98FA140

- (10) Oil O-ring and insert in recess (see arrow).



17W98FA141

(11) Fix ring gear with slotted nut.

Tightening torque:

(M 110 x 1.5) MA = 1400 ⁺²⁰⁰ Nm

(S) Socket wrench 5870 656 097

※ First tighten slotted nut with 1400 Nm, then retighten slotted nut until a fixing hole overlaps a threaded hole in the knuckle housing.

While tightening the slotted nut rotate hub in both directions several times roller setting.

※ Wet thread knuckle housing / slotted nut with lubricant.



17W98FA142

(12) Make leakage test of multi-disk brake

Mount threaded coupling (S) and connect HP pump.

(S) HP pump 5870 287 007

(S) Threaded coupling (M14x1.5) 5870 950 102

(S) Breather bottle 5870 286 072

※ Breathe brake completely before starting the test.

Test media :

Motor oils SAE-10W

High-pressure test:

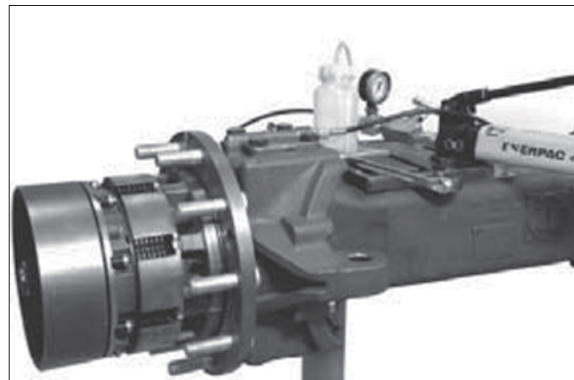
Build up test pressure $p = 100$ bar and close locking valve of HP pump.

A pressure drop by max. 3 bar is permissible during a 5-minute test duration.

Low pressure test:

Reduce test pressure $p = 5$ bar and close locking valve.

No pressure drop is allowed during a 5-minute testing duration.



17W98FA143

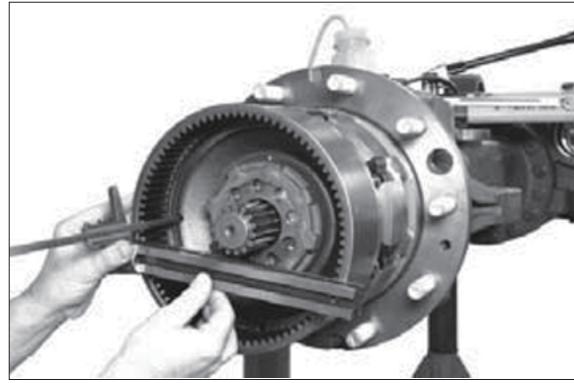
(13) Adjust and check piston stroke

Piston stroke / disk clearance = 0.7 1.3 mm
 Build up braking pressure (100 bar) and close locking valve of the HP pump.

Determine dimension "A", from face of the ring gear (1) through measuring hole (see also sketch FA145) to the face of the piston (3).

Dimension "A" e.g. 83.10 mm

※ Breathe brake completely before starting the measuring operation.

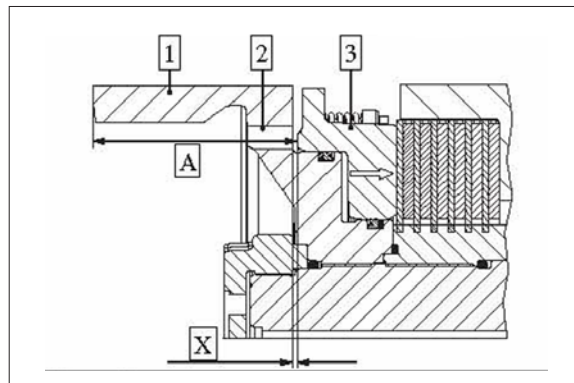


17W98FA144

(14) Then open locking valve of the HP pump and release pressure from brake (reset piston through compression springs).

Determine dimension "B", from the face of the ring gear (1) through the measuring hole (see also sketch FA146) to the face of the piston (3).

Dimension "B" e.g. 82.10 mm



17W98FA145

(15) CALCULATION EXAMPLE:

Dimension "A" e.g. 83.10 mm
 Dimension "B" e.g. - 82.10 mm
 Difference = Piston stroke = 1.00 mm

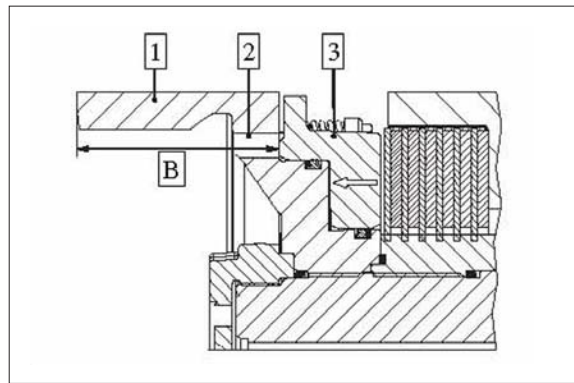
※ If the required piston stroke (0.7 ... 1.3 mm) is not achieved, correct it with the corresponding inner clutch disk (s) – refer to corresponding spare parts list.

Then remove HP pump (S), breather bottle (S) and threaded coupling (S).

Comment on sketch 43 and 44:

- 1 = Ring gear
- 2 = Measuring hole
- 3 = Piston
- X = Piston stroke / disk clearance

(S) Straightedge 5870 200 022



17W98FA146

(16) Secure slotted nut with cylindrical screw
(please also refer to figure FA142)

Tightening torque (M 10/8.8)
..... MA = 32 Nm



17W98FA147

(17) Insert thrust washer.

※ Observe installation position ensure that
both lugs of the thrust washer are
engaged each in a spare fixing hole of the
slotted nut.



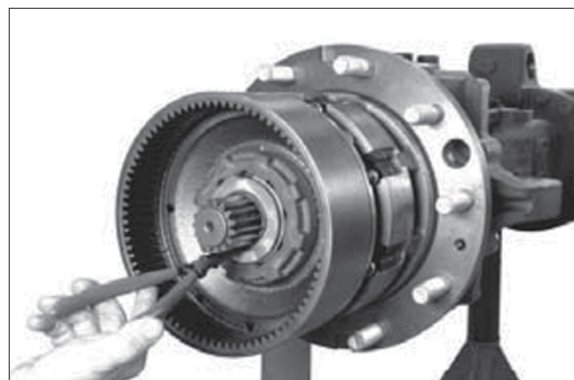
17W98FA148

(18) Mount thrust washer with shoulder
showing to the retaining ring (outwards).



17W98FA149

(19) Fix thrust washers by using a retaining
ring.



17W98FA150

6) PLANETARY CARRIER

- (1) Press thrust washer into the planetary carrier until contact position is obtained.

(S) Driver tool 5870 048 245



17W98FA151

- (2) Insert the cylindrical roller bearing into the planetary gear for this purpose press the cylindrical roller bearing through the packaging sleeve until the snap ring engages into the annular groove of the planetary gear.

※ Use packaging sleeve to facilitate assembly.

1 = Cylindrical roller bearing

2 = Packaging sleeve

3 = Snap ring

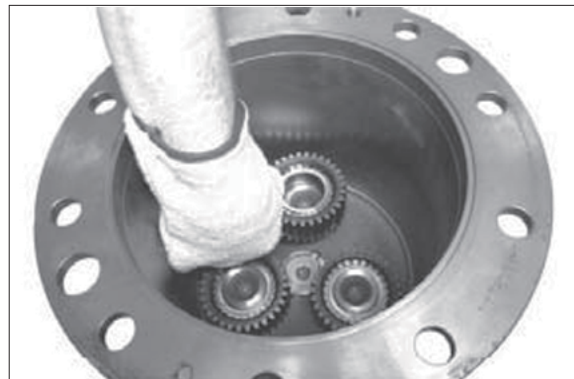
4 = Planetary gear



17W98FA152

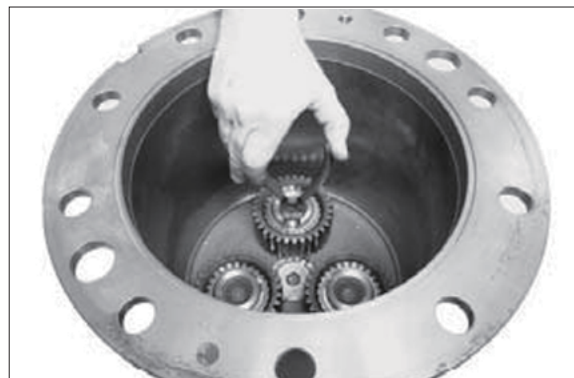
- (3) Warm up bearing inner ring and install pre-assembled planetary gear until contact is obtained.

※ Mount bearing inner ring with large radius, showing to the planetary carrier (downwards).



17W98FA153

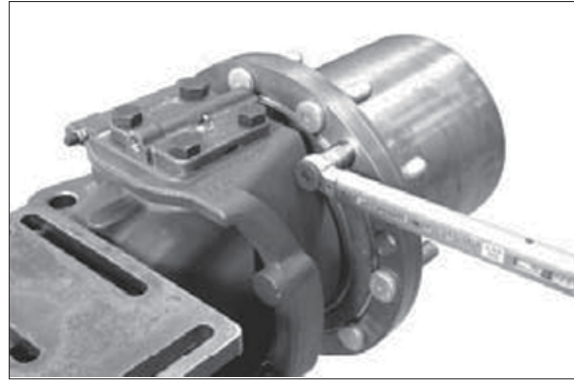
- (4) Fix planetary gear by means of retaining ring.



17W98FA154

- (5) Install preassembled planetary carrier and fix with hexagon screws.

Tightening torque (M12/8.8)
 MA = 55 Nm



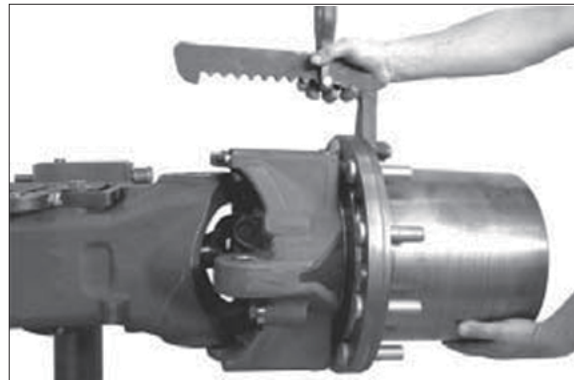
17W98FA155

(6) Output assy

Locate output assy on the axle by means of the lifting bracket (S) by installing the u-joint shaft in the axle bevel gear toothing.

(S) Lifting bracket 5870 281 043

- ※ Pay attention to shaft seal ring in the axle housing risk of damage.

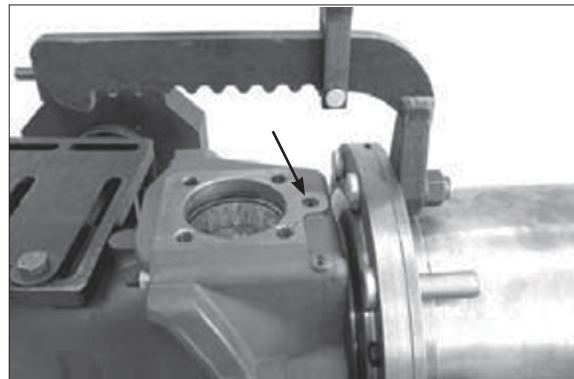


17W98FA156

- (7) Insert O-ring (see arrow) or O-rings into the countersink (s) of the knuckle housing.

1 pc for version with breather valve in knuckle housing.

2 pcs. for version with breather valve in bearing pin.

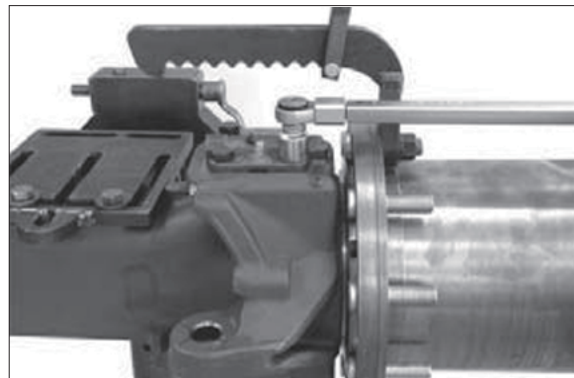


17W98FA157

- (8) Mount both bearing pins and fix with hexagon screws or locking screws.

Tightening torque (M 16/10.9)
 MA = 280 Nm

- ※ Observe installation position, mount upper bearing pin with oil supply holes showing to axle centre.

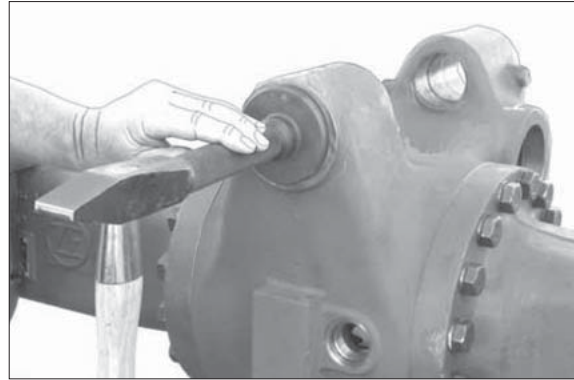


17W98FA158

(9) Pivot bearing

Super-cool bushings and insert into the heated pivot bearing hole until contact is obtained.

- ※ Observe installation position for bushing version with slot, insert bushings with slot in 12 o'clock position.
- ※ Prior to putting the axle into operation, fill in oil.

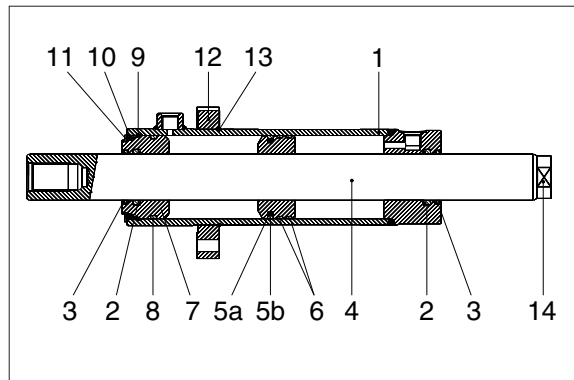


17W98FA159

7) STEERING

(1) Comment on sketch:

- 1 = Steering cylinder
 - 2 = Grooved ring
 - 3 = Scraper
 - 4 = Piston rod
 - 5a = O-ring
 - 5b = Form seal ring
 - 6 = Guide ring
 - 7 = Brake head
 - 8 = Dual ring
 - 9 = Retaining ring
 - 10 = O-Ring (only for version "with" O-ring)
 - 11 = Retaining ring
 - 12 = Flange
 - 13 = Retaining ring
 - 14 = Wrench point of attack (piston rod)
- } Piston sealing



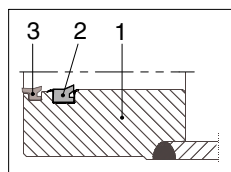
17W98FA160

(2) Preassemble steering

Mount U-ring (2) and scraper (3) in the steering cylinder (1).

- ※ Observe installation position – see detailed sketch.

Detailed sketch:



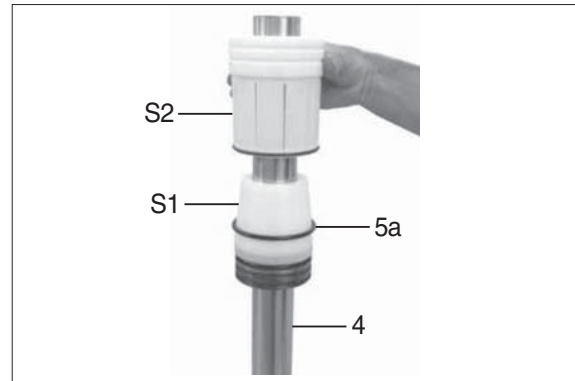
17W98FA161

- (3) Position inner installer (S1) on piston rod (4).

Mount O-ring (5a) and press with inner installer (S2) into annular groove (arrow) of the piston (4).

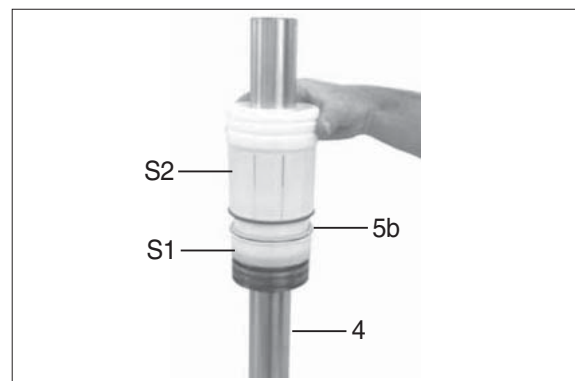
(S) Inner installer (S1) 5870 651 086

(S) Inner installer (S2) 5870 651 087



17W98FA162

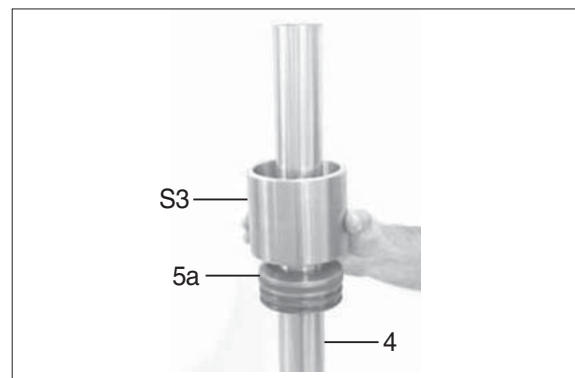
- (4) Install form seal ring (5b) and press with inner installer (S2) into the annular groove of the piston (4).



17W98FA163

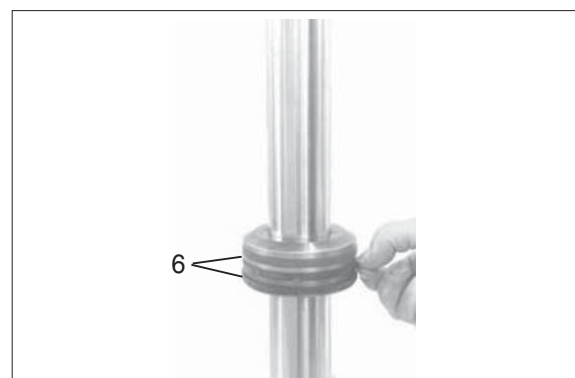
- (5) Calibrate form seal ring (5b) with calibration bushing (S3).

(S) Calibration bushing (S3) 5870 651 090



17W98FA164

- (6) Place both guide rings (6) into the annular grooves of the piston rod.

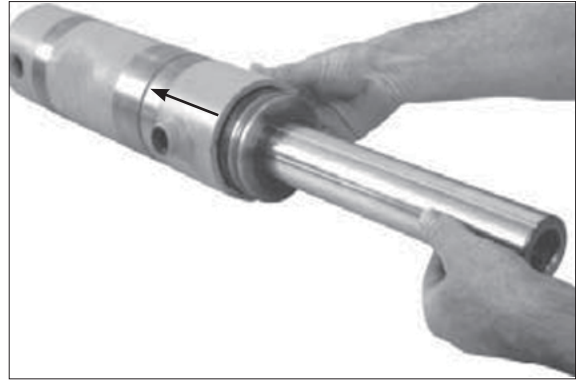


17W98FA165

(7) Insert preassembled piston rod into the steering cylinder.

※ Slightly oil all sealing elements before installing the piston rod.

※ Observe installation position, insert piston rod with wrench point of attack (14, see also sketch FA160) showing in direction of arrow.

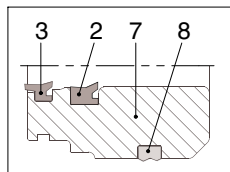


17W98FA166

(8) Insert U-ring (2), scraper (3) and dual ring (8) into the grooves of the brake head (7).

※ Observe installation position in this connection refer to detailed sketch.

Detailed sketch:



17W98FA167

(9) Push preassembled brake head into the steering cylinder so that the retaining ring (see figure FA169) can be mounted.

※ Slightly oil all sealing elements before inserting the brake head.



17W98FA168

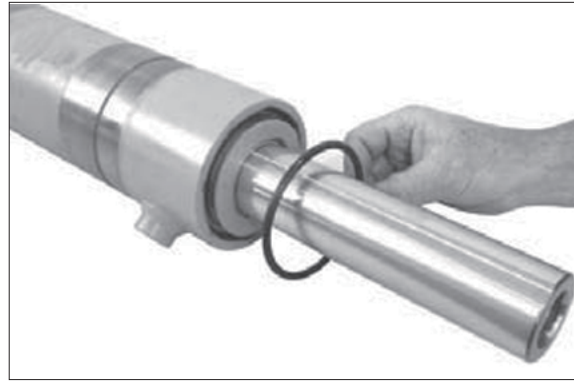
(10) Engage retaining ring (9) into the groove of the cylinder tube.



17W98FA169

(11) Position the inserted brake head (7) on the snap ring (9) until contact is obtained (arrow).

Only for version with O-ring (see corresponding spare parts list) : Oil O-ring (10) and place into the recess.



17W98FA170

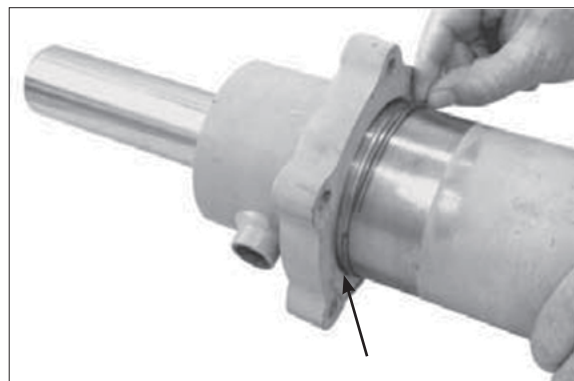
(12) Fix brake head (7) with retaining ring (11).



17W98FA171

(13) Install flange (12) and engage retaining ring (13).

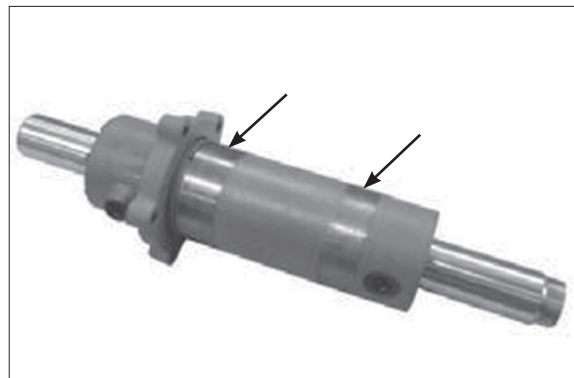
※ Observe installation position of flange mount flange with chamfer (see arrow) showing to the snap ring.



17W98FA172

(14) Mount steering

Apply anti-corrosive agent (Weicon Anti-Seize) on contact faces (cylinder tube / axle housing, see arrow).



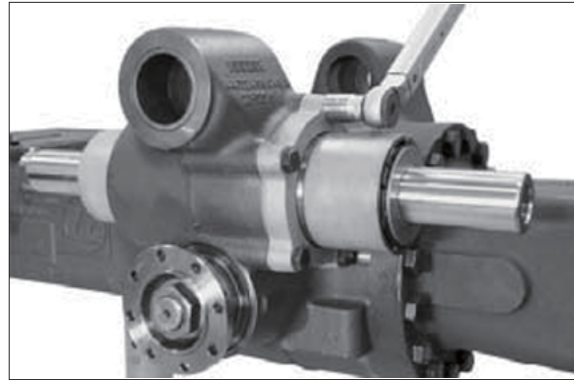
17W98FA173

(15) Insert preassembled steering cylinder into axle housing and fix with hexagon screws.

Tightening torque (M 12/8.8)
..... MA = 79 Nm

※ The radial installation position of the steering cylinder (position of the hydr. connections) is customer specific see also disassembly instructions figure FA018.

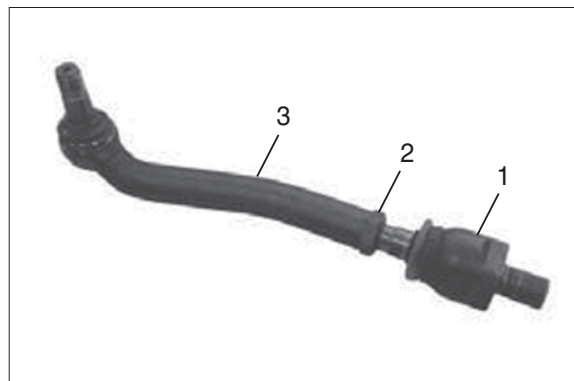
※ Wet the thread of the hexagon screws with Loctite no. 243.



17W98FA174

(16) Bolt hexagon nut (2) and ball joint (3) to axial joint (1).

※ Do not tighten hexagon nut before setting the track.



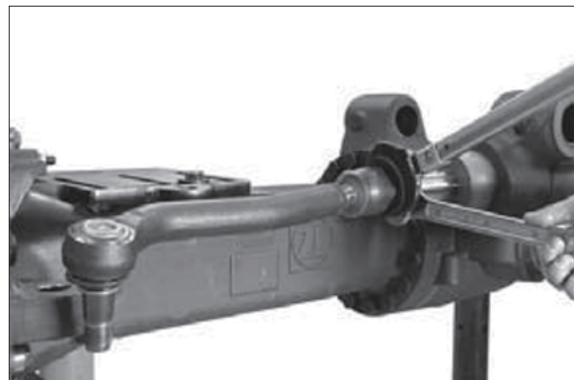
17W98FA175

(17) Fix both tie rods to piston rod (with offset showing to the axle housing).

Tightening torque (M30 × 1.5)
..... MA = 450 Nm

※ (S) Socket wrench (SW 55) 5870 656 100

Wet thread of the axial joint with Loctite no. 243.



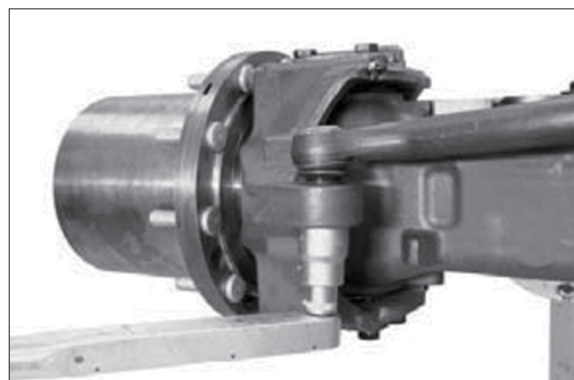
17W98FA176

(18) Install tie rod into knuckle housing and fix with "new" locking nut.

Tightening torque (M 27 × 1.5)
..... MA =

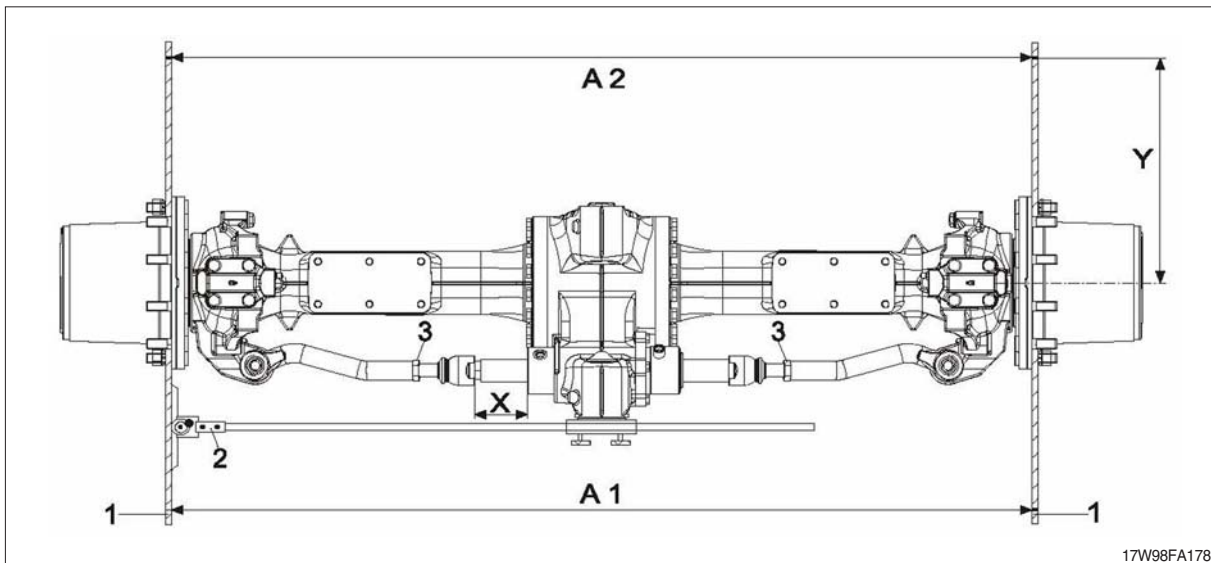
※ 600 Nm

Use locking screws just once.



17W98FA177

(19) Steering setting and checking



17W98FA178

- 1 = (S) Straightedge 5870 200 029
- 2 = (S) Measuring device 5870 200 033
- 3 = Hexagon nut
- X = Installation dimension (central position – piston rod)
- Y = Distance – wheel center to rim flange

(20) Basic track setting

Bring piston rod in central position.

Dimension X = 119 mm (measured from front face/steering cylinder to contact face/axial joint).

- ※ Do not change axial position of piston rod any more during track setting.

Mount straightedge (1) in horizontal and central axis position.

Fix measuring device (2) to yoke.

Loosen hexagon nut (3) and set length of tie rod (axial joint) until the measuring device (2) indicates 0° (corresponds to a track setting of zero mm).

- ※ For a toe-in and toe-out setting, which might be required, stick to the vehicle manufacturer's specification.

- ※ Make setting on both output sides.

Check track setting (0°):

Determine dimension A1.

Rotate both outputs by 180° – dimension A2 must equal dimension A1.

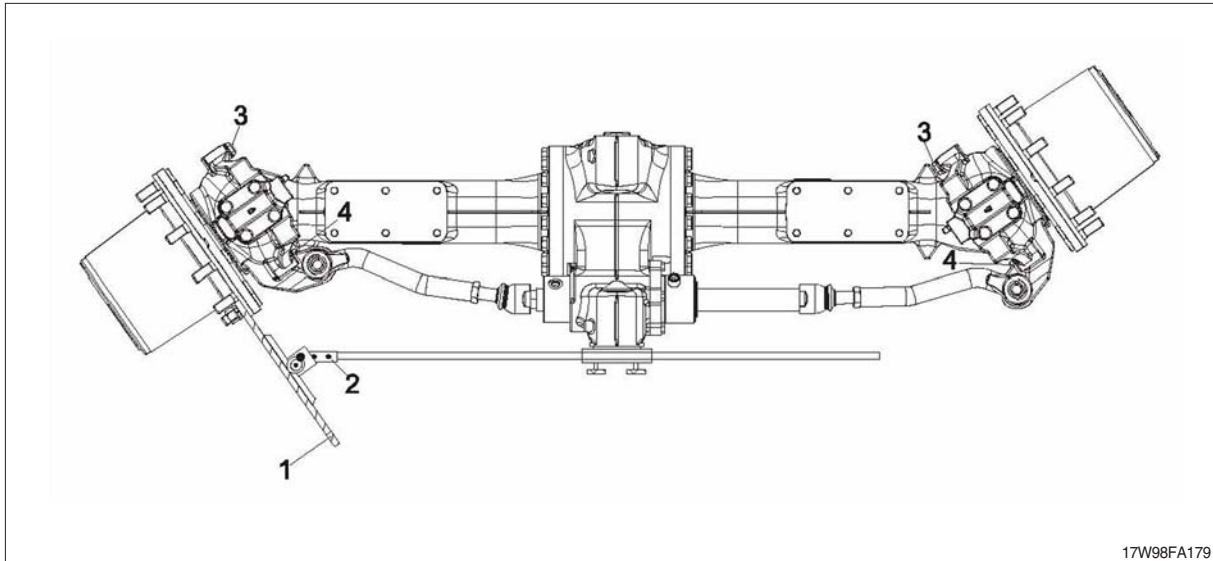
Dimension "Y" = distance between rim center and rim flange.

Then fix both tie rods (axial joint) by means of hexagon nut (3).

Tightening torque MA = 400 - 450 Nm

(21) Steering angle setting

- ※ When track setting is required, steering angle setting may only be carried out after track setting has been completed.



- 1 = (S) Straightedge 5870 200 029
- 2 = (S) Measuring device 5870 200 033
- 3 = Stop screw with stop washer (optional)
- 4 = Stop screw with hexagon nut

Mount straightedge (1) in horizontal and central axis position.

Fix measuring device (2) to yoke.

Pivot output until the required steering angle (e.g. 35°) is indicated on the measuring device (2).

- ※ Take the value of the steering angle to be set from the vehicle manufacturer's specifications.

Bring the stop screw (4) on the axle housing in contact position and lock with hexagon nut.

Tightening torque (M18/10.9) MA = 300 Nm

Then set inner stop by means of stop screw (3) and stop washer (s = optional).

Tightening torque (M18/10) MA = 390 Nm

- ※ Make setting on both output sides.

(22) Check leakage of steering

Make leakage test of steering in both steering directions by means of HP pump.

Test pressure: 200 bar

Test medium: Engine oils SAE 10W

Test pressure p = Build up 200 bar (bleed pressure chamber).

Then close connection to HP pump by means of locking valve.

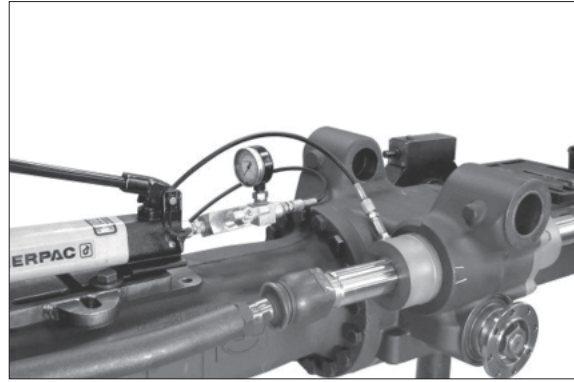
A 5 bar pressure drop is permissible during a test duration of 20 sec.

(S) HP pump 5870 287 007

(S) Reduction 5870 950 161

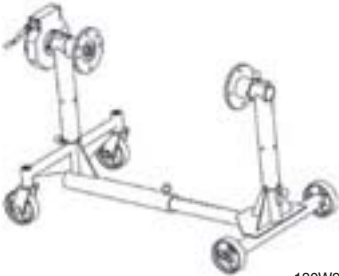
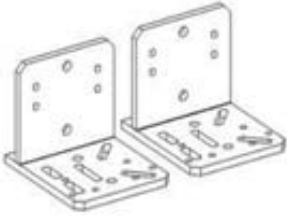



(S) Clutch 0501 207 939

※ Prior to putting the axle into operation fill it with oil.




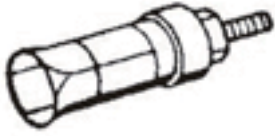
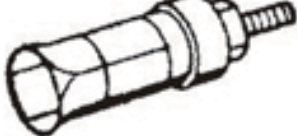



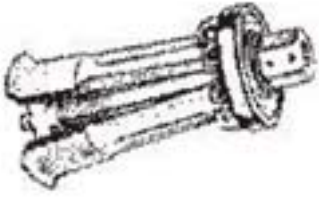

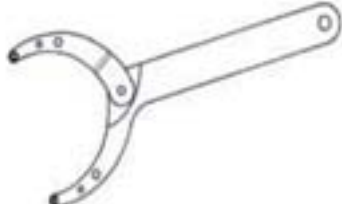

17W98FA180





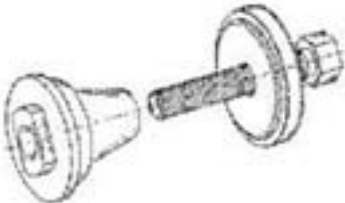
5. SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

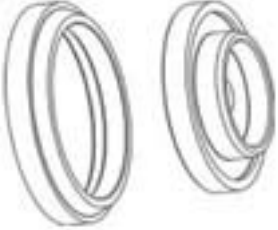
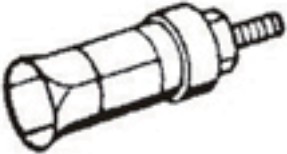
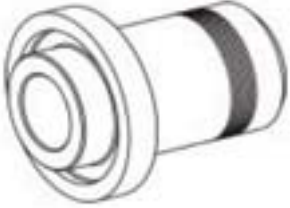

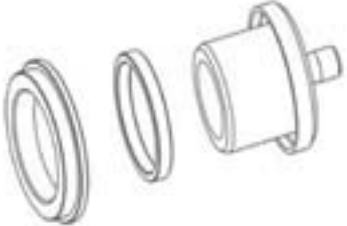
No.	Figure	Designation order no.	Qty	Page
1	 <p style="text-align: right; font-size: small;">180W9A8FA501</p>	Assembly truck assy with tilting device 5870 350 000	1	8-217 8-290
2	 <p style="text-align: right; font-size: small;">180W9A8FA502</p>	Supporting bracket 5870 350 106	1	8-217 8-290
3	 <p style="text-align: right; font-size: small;">180W9A8FA503</p>	Socket wrench 5870 656 097	1	8-221 8-290
4	 <p style="text-align: right; font-size: small;">180W9A8FA504</p>	Assembly lever 5870 345 036	1	8-222 8-291
5	 <p style="text-align: right; font-size: small;">180W9A8FA505</p>	Adjusting device 5870 400 001	2	8-223 8-292






No.	Figure	Designation order no.	Qty	Page		
6	 <p style="text-align: right; font-size: small;">180W9A8FA506</p>	Lifting bracket 5870 281 043	1	8-223, 226, 251, 259 8-292, 294, 318, 326		
7	 <p style="text-align: right; font-size: small;">180W9A8FA507</p>	Pressure piece 5870 100 067 (FR axle) 5870 100 063 (RR axle)	1 1	8-223, 224 8-292, 293		
8	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center; vertical-align: top;"> FR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-1</p> </td> <td style="width: 50%; text-align: center; vertical-align: top;"> RR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-2</p> </td> </tr> </table>	FR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-1</p>	RR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-2</p>	Grab sleeve 5873 003 022 (FR axle) 5873 013 015 (RR axle)	1	8-214 8-293
FR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-1</p>	RR axle  <p style="text-align: right; font-size: x-small;">180W9A8FA508-2</p>					
9	 <p style="text-align: right; font-size: small;">180W9A8FA509</p>	Grab sleeve HW180 / HW210 5873 004 026	1	-		
10	 <p style="text-align: right; font-size: small;">180W9A8FA510</p>	Grab sleeve HW210 5873 004 022	1	-		


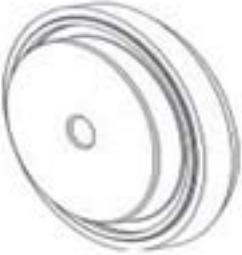
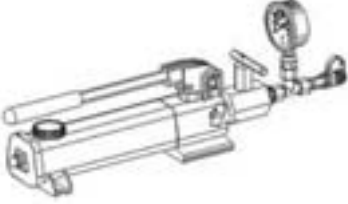


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11	 <p data-bbox="639 555 746 577">180W9A8FA511</p>	<p data-bbox="770 376 970 409">Eyebolts (FR axle)</p> <p data-bbox="770 432 991 465">0636 804 001 (M16)</p>	2	8-248
12	 <p data-bbox="639 898 746 920">180W9A8FA512</p>	<p data-bbox="770 719 970 752">Eyebolts (FR axle)</p> <p data-bbox="770 775 991 808">5870 204 085 (M18)</p>	2	-
13	 <p data-bbox="639 1234 746 1256">180W9A8FA513</p>	<p data-bbox="770 1039 970 1072">Eyebolts (FR axle)</p> <p data-bbox="770 1095 858 1128">HW210</p> <p data-bbox="770 1151 991 1184">0636 804 003 (M20)</p>	2	-
14	 <p data-bbox="639 1576 746 1599">180W9A8FA514</p>	<p data-bbox="770 1397 1027 1431">Inner installer (FR axle)</p> <p data-bbox="770 1453 1086 1487">5870 300 007 (Ø 46 ~ 56 mm)</p>	1	8-225
15	 <p data-bbox="639 1912 746 1935">180W9A8FA515</p>	<p data-bbox="770 1733 1027 1767">Inner installer (FR axle)</p> <p data-bbox="770 1789 1086 1823">5870 300 017 (Ø 56 ~ 70 mm)</p>	1	8-226




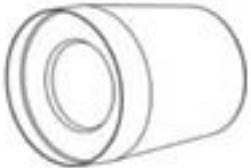
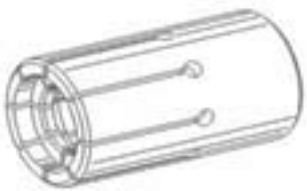
No.	Figure	Designation order no.	Qty	Page
16	 <p data-bbox="638 555 746 577">180W9A8FA516</p>	<p data-bbox="769 376 949 405">Counter support</p> <p data-bbox="769 432 922 461">5870 300 020</p>	1	<p data-bbox="1232 383 1353 412">8-226, 229</p> <p data-bbox="1257 423 1327 452">8-298</p>
17	 <p data-bbox="638 896 746 918">180W9A8FA517</p>	<p data-bbox="769 712 917 741">Inner installer</p> <p data-bbox="769 768 1098 797">5870 300 019 (Ø 56 - 110 mm)</p>	1	<p data-bbox="1232 719 1353 748">8-226, 229</p> <p data-bbox="1257 759 1327 788">8-298</p>
18	 <p data-bbox="638 1232 746 1254">180W9A8FA518</p>	<p data-bbox="769 1052 842 1081">Striker</p> <p data-bbox="769 1108 922 1137">5870 650 004</p>	1	<p data-bbox="1257 1059 1327 1088">8-227</p> <p data-bbox="1203 1099 1378 1128">8-293, 296, 297</p>
19	 <p data-bbox="638 1568 746 1590">180W9A8FA519</p>	<p data-bbox="769 1393 922 1422">Clamping fork</p> <p data-bbox="769 1449 922 1478">5870 240 025</p>	1	<p data-bbox="1203 1400 1378 1429">8-228, 239, 243</p> <p data-bbox="1203 1440 1378 1469">8-303, 312, 316</p>
20	 <p data-bbox="638 1904 746 1926">180W9A8FA520</p>	<p data-bbox="769 1729 901 1758">Grab sleeve</p> <p data-bbox="769 1785 922 1814">5873 001 037</p>	1	<p data-bbox="1257 1736 1327 1765">8-229</p> <p data-bbox="1257 1776 1327 1805">8-298</p>

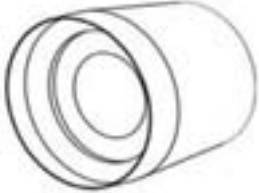


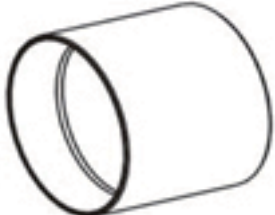

No.	Figure	Designation order no.	Qty	Page
21	 <p data-bbox="639 555 746 577">180W9A8FA521</p>	<p data-bbox="770 376 903 405">Grab sleeve</p> <p data-bbox="770 432 922 461">5873 011 019</p>	1	<p data-bbox="1257 383 1326 412">8-230</p> <p data-bbox="1257 423 1326 452">8-299</p>
22	 <p data-bbox="639 898 746 920">180W9A8FA522</p>	<p data-bbox="770 712 874 741">Basic tool</p> <p data-bbox="770 768 922 797">5873 001 000</p>	1	<p data-bbox="1257 719 1326 748">8-230</p> <p data-bbox="1257 759 1326 788">8-299</p>
23	 <p data-bbox="639 1234 746 1256">180W9A8FA523</p>	<p data-bbox="770 1055 935 1084">Pressure piece</p> <p data-bbox="770 1111 922 1140">5870 100 009</p>	1	<p data-bbox="1257 1061 1326 1090">8-230</p> <p data-bbox="1257 1102 1326 1131">8-299</p>
24	 <p data-bbox="639 1570 746 1592">180W9A8FA524</p>	<p data-bbox="770 1391 954 1420">Adjusting screws</p> <p data-bbox="770 1447 1050 1476">5870 204 027 (M12 × 1.5)</p>	1	<p data-bbox="1257 1397 1326 1426">8-235</p> <p data-bbox="1257 1438 1326 1467">8-304</p>
25	 <p data-bbox="639 1906 746 1928">180W9A8FA525</p>	<p data-bbox="770 1727 951 1756">Assembly fixture</p> <p data-bbox="770 1783 922 1812">5870 345 049</p>	1	<p data-bbox="1257 1733 1326 1762">8-237</p> <p data-bbox="1257 1780 1326 1809">8-311</p>






No.	Figure	Designation order no.	Qty	Page
26	 <p data-bbox="639 555 748 577">180W9A8FA526</p>	<p data-bbox="770 376 916 405">Pressure ring</p> <p data-bbox="770 432 916 461">5870 345 056</p>	1	<p data-bbox="1259 383 1324 412">8-237</p> <p data-bbox="1259 423 1324 452">8-311</p>
27	 <p data-bbox="639 898 748 920">180W9A8FA527</p>	<p data-bbox="770 714 954 743">Internal extractor</p> <p data-bbox="770 770 1086 799">5870 300 005 (Ø 36 ~ 46 mm)</p>	1	<p data-bbox="1259 721 1324 750">8-247</p> <p data-bbox="1259 761 1324 790">8-307</p>
28	 <p data-bbox="639 1234 748 1256">180W9A8FA528</p>	<p data-bbox="770 1055 986 1084">Driver tool (FR axle)</p> <p data-bbox="770 1111 916 1140">5870 048 286</p>	1	<p data-bbox="1259 1077 1324 1106">8-243</p>
29	 <p data-bbox="639 1576 748 1599">180W9A8FA529</p>	<p data-bbox="770 1395 986 1424">Driver tool (FR axle)</p> <p data-bbox="770 1451 916 1480">5870 055 081</p>	1	<p data-bbox="1259 1420 1324 1449">8-246</p>
30	 <p data-bbox="639 1912 748 1935">180W9A8FA530</p>	<p data-bbox="770 1731 986 1760">Driver tool (FR axle)</p> <p data-bbox="770 1787 916 1816">5870 055 090</p>	1	<p data-bbox="1259 1758 1324 1787">8-246</p>

No.	Figure	Designation order no.	Qty	Page
31	 <p style="text-align: right; font-size: small;">180W9A8FA531</p>	Handle (FR axle) 5870 260 002	1	8-244, 245, 246
32	 <p style="text-align: right; font-size: small;">180W9A8FA532</p>	Driver tool 5870 058 058	1	8-245
33	 <p style="text-align: right; font-size: small;">180W9A8FA533</p>	Driver tool 5870 058 022	1	8-245
34	 <p style="text-align: right; font-size: small;">180W9A8FA534</p>	Driver tool (FR axle) HW210 5870 058 078	1	-
35	 <p style="text-align: right; font-size: small;">180W9A8FA535</p>	Lever riveting tongs (RR axle) 5870 320 016	1	8-245, 317



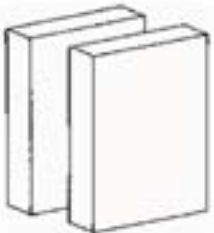


No.	Figure	Designation order no.	Qty	Page
36	 <p data-bbox="639 557 748 577">180W9A8FA536</p>	<p data-bbox="770 376 879 405">Driver tool</p> <p data-bbox="770 432 919 461">5870 051 035</p>	1	<p data-bbox="1259 383 1326 412">8-250</p> <p data-bbox="1259 423 1326 452">8-318</p>
37	 <p data-bbox="639 898 748 918">180W9A8FA537</p>	<p data-bbox="770 696 879 725">Driver tool</p> <p data-bbox="770 736 852 766">HW210</p> <p data-bbox="770 792 919 822">5870 051 068</p>	1	-
38	 <p data-bbox="639 1234 748 1254">180W9A8FA538</p>	<p data-bbox="770 1055 874 1084">HP pump</p> <p data-bbox="770 1111 919 1140">5870 287 007</p>	1	<p data-bbox="1233 1061 1353 1090">8-255, 267</p> <p data-bbox="1259 1102 1326 1131">8-323</p>
39	 <p data-bbox="639 1574 748 1594">180W9A8FA539</p>	<p data-bbox="770 1395 970 1424">Threaded coupling</p> <p data-bbox="770 1451 1038 1480">5870 950 102 (M14x1.5)</p>	1	<p data-bbox="1259 1402 1326 1431">8-257</p> <p data-bbox="1259 1442 1326 1471">8-323</p>
40	 <p data-bbox="639 1910 748 1930">180W9A8FA540</p>	<p data-bbox="770 1731 927 1760">Breather bottle</p> <p data-bbox="770 1787 919 1816">5870 286 072</p>	1	<p data-bbox="1259 1740 1326 1769">8-257</p> <p data-bbox="1259 1780 1326 1809">8-323</p>


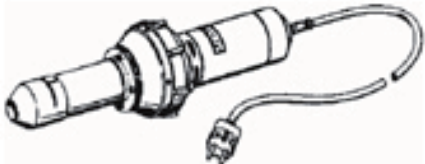


No.	Figure	Designation order no.	Qty	Page
41	 <p style="text-align: right; font-size: small;">180W9A8FA541</p>	Straightedge 5870 200 022	1	8-256 8-324
42	 <p style="text-align: right; font-size: small;">180W9A8FA542</p>	Driver tool 5870 048 245	1	8-258
43	 <p style="text-align: right; font-size: small;">180W9A8FA543</p>	Driver tool HW180 / HW210 5870 048 263	1	-
44	 <p style="text-align: right; font-size: small;">180W9A8FA544</p>	Inner installer (FR axle) 5870 651 086	1	8-241
45	 <p style="text-align: right; font-size: small;">180W9A8FA545</p>	Inner installer (FR axle) 5870 651 087	1	8-261

No.	Figure	Designation order no.	Qty	Page
46	 <p data-bbox="638 555 750 577">180W9A8FA546</p>	<p data-bbox="769 376 1023 405">Inner installer (FR axle)</p> <p data-bbox="769 432 922 461">5870 651 088</p>	1	-
47	 <p data-bbox="638 896 750 918">180W9A8FA547</p>	<p data-bbox="769 719 922 748">Inner installer</p> <p data-bbox="769 775 922 804">5870 651 089</p>	1	-
48	 <p data-bbox="638 1232 750 1254">180W9A8FA548</p>	<p data-bbox="769 1055 979 1084">Calibration bushing</p> <p data-bbox="769 1111 922 1140">5870 651 090</p>	1	8-261
49	 <p data-bbox="638 1579 750 1601">180W9A8FA549</p>	<p data-bbox="769 1391 979 1420">Calibration bushing</p> <p data-bbox="769 1447 922 1476">5870 651 091</p>	1	-
50	 <p data-bbox="638 1915 750 1937">180W9A8FA550</p>	<p data-bbox="769 1715 932 1744">Socket wrench</p> <p data-bbox="769 1771 1018 1800">5870 656 100 (SW 55)</p> <p data-bbox="769 1827 922 1856">5870 656 097</p>	1	<p data-bbox="1201 1738 1382 1809">8-221, 252, 255, 264</p> <p data-bbox="1201 1821 1382 1850">8-280, 319, 323</p>



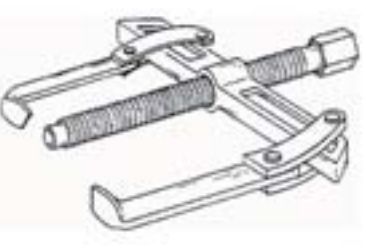
No.	Figure	Designation order no.	Qty	Page
51	 <p data-bbox="639 557 746 577">180W9A8FA551</p>	<p data-bbox="770 353 1034 387">Socket wrench (FR axle)</p> <p data-bbox="770 409 855 443">HW210</p> <p data-bbox="770 454 1015 488">5870 656 099 (SW 75)</p>	1	-
52	 <p data-bbox="639 898 746 918">180W9A8FA552</p>	<p data-bbox="770 712 1026 745">Straightedges (FR axle)</p> <p data-bbox="770 768 919 801">5870 200 029</p>	1	8-265, 266
53	 <p data-bbox="639 1234 746 1254">180W9A8FA553</p>	<p data-bbox="770 1055 1066 1088">Measuring device (FR axle)</p> <p data-bbox="770 1111 919 1144">5870 200 033</p>	1	8-265, 266
54	 <p data-bbox="639 1574 746 1594">180W9A8FA554</p>	<p data-bbox="770 1395 986 1429">Reduction (FR axle)</p> <p data-bbox="770 1451 919 1485">5870 950 161</p>	1	8-267
55	 <p data-bbox="639 1910 746 1930">180W9A8FA555</p>	<p data-bbox="770 1731 946 1765">Clutch (FR axle)</p> <p data-bbox="770 1787 919 1821">0501 207 939</p>	1	8-267

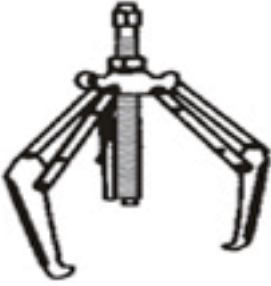
6. COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

No.	Figure	Designation order no.	Qty	Remark
1	 <p style="text-align: right; font-size: small;">180W9A8FA556</p>	Magnetic stand 5870 200 055	1	Universal
2	 <p style="text-align: right; font-size: small;">180W9A8FA557</p>	Dial indicator 5870 200 057	1	Universal
3	 <p style="text-align: right; font-size: small;">180W9A8FA558</p>	Gauge blocks 5870 200 066 (70 mm) 5870 200 067 (100 mm)	1	Universal 8-295
4	 <p style="text-align: right; font-size: small;">180W9A8FA559</p>	Digital depth gauge 5870 200 072 (200 mm) 5870 200 114 (300 mm)	1	Universal
5	 <p style="text-align: right; font-size: small;">180W9A8FA560</p>	Digital caliper gauge 5870 200 109 (150 mm)	1	Universal

No.	Figure	Designation order no.	Qty	Remark
6	 <p style="text-align: right; font-size: small;">180W9A8FA561</p>	<p>Torque wrench</p> <p>5870 203 030 0.6 ~ 6.0 Nm 5870 203 031 1.0 ~ 12 Nm 5870 203 032 3.0 ~ 23 Nm 5870 203 033 5.0 ~ 45 Nm 5870 203 034 10 ~ 90 Nm 5870 203 039 80 ~ 400 Nm 5870 203 016 140 ~ 750 Nm 5870 203 011 750 ~ 2000 Nm</p>	1	Universal
7	 <p style="text-align: right; font-size: small;">180W9A8FA562</p>	<p>Hot air blower</p> <p>5870 221 500 230 V 5870 221 501 115 V</p>	1	Universal
8	 <p style="text-align: right; font-size: small;">180W9A8FA563</p>	<p>Plastic hammer</p> <p>5870 280 004 Ø 60 mm</p> <p>Substitute nylon insert</p> <p>5870 280 006</p>	1	Universal
9	 <p style="text-align: right; font-size: small;">180W9A8FA564</p>	<p>Lifting strap</p> <p>5870 281 026</p>	1	Universal

No.	Figure	Designation order no.	Qty	Remark
10	 <p data-bbox="639 555 746 577">180W9A8FA565</p>	<p data-bbox="767 376 906 405">Lifting chain</p> <p data-bbox="767 432 922 461">5870 281 047</p>	1	Universal
11	 <p data-bbox="639 898 746 920">180W9A8FA566</p>	<p data-bbox="767 712 858 741">Pry bar</p> <p data-bbox="767 768 922 797">5870 345 071</p>	1	Universal
12	 <p data-bbox="639 1234 746 1256">180W9A8FA567</p>	<p data-bbox="767 1055 847 1084">Striker</p> <p data-bbox="767 1111 922 1140">5870 650 004</p>	1	Universal
13	 <p data-bbox="639 1576 746 1599">180W9A8FA568</p>	<p data-bbox="767 1368 986 1397">Set of internal pliers</p> <p data-bbox="767 1413 879 1442">I1-I2-I3-I4</p> <p data-bbox="767 1469 922 1498">5870 900 013</p>	1	Universal
14	 <p data-bbox="639 1912 746 1935">180W9A8FA569</p>	<p data-bbox="767 1715 986 1744">Set of internal pliers</p> <p data-bbox="767 1749 975 1778">I11-I21-I31-I41 90°</p> <p data-bbox="767 1805 922 1834">5870 900 014</p>	1	Universal

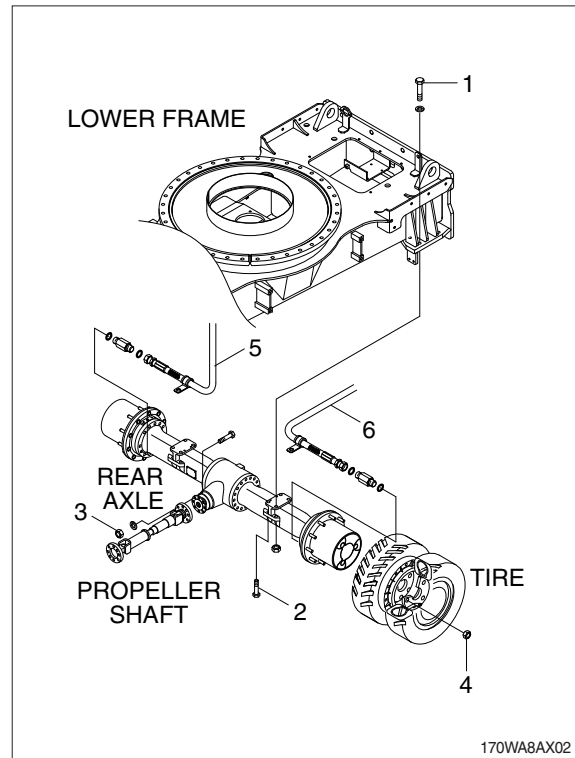
No.	Figure	Designation order no.	Qty	Remark
15	 <p style="text-align: right; font-size: small;">180W9A8FA570</p>	Set of external pliers A1-A2-A3-A4 5870 900 015	1	Universal
16	 <p style="text-align: right; font-size: small;">180W9A8FA571</p>	Set of external pliers A01-A02-A03-A04 90° 5870 900 016	1	Universal
17	 <p style="text-align: right; font-size: small;">180W9A8FA572</p>	Two-armed puller 5870 970 001 Jaw width 80 mm Throat depth 100 mm 5870 970 002 Jaw width 120 mm Throat depth 125 mm 5870 970 003 Jaw width 170 mm Throat depth 125 mm 5870 970 004 Jaw width 200 mm Throat depth 175 mm 5870 970 006 Jaw width 350 mm Throat depth 250 mm 5870 970 007 Jaw width 520 mm Throat depth 300 ~ 500 mm 5870 970 026 Jaw width 250 mm Throat depth 200 mm 5870 970 028 Jaw width 380 mm Throat depth 200 mm	1	Universal

No.	Figure	Designation order no.	Qty	Remark
18	 <p data-bbox="619 808 727 831">180W9A8FA573</p>	<p data-bbox="746 255 935 286">Two-armed puller</p> <p data-bbox="746 313 895 344">5870 971 001</p> <p data-bbox="746 351 1011 383">Jaw width 85 mm</p> <p data-bbox="746 389 1011 421">Throat depth 65 mm</p> <p data-bbox="746 427 895 459">5870 971 002</p> <p data-bbox="746 465 1027 497">Jaw width 130 mm</p> <p data-bbox="746 504 1027 535">Throat depth 105 mm</p> <p data-bbox="746 542 895 573">5870 971 003</p> <p data-bbox="746 580 1027 611">Jaw width 230 mm</p> <p data-bbox="746 618 1027 649">Throat depth 150 mm</p> <p data-bbox="746 656 895 687">5870 971 004</p> <p data-bbox="746 694 1027 725">Jaw width 295 mm</p> <p data-bbox="746 732 1027 763">Throat depth 235 mm</p> <p data-bbox="746 770 895 801">5870 971 005</p> <p data-bbox="746 808 1027 840">Jaw width 390 mm</p> <p data-bbox="746 846 1027 878">Throat depth 270 mm</p> <p data-bbox="746 884 895 916">5870 971 006</p> <p data-bbox="746 922 1027 954">Jaw width 640 mm</p> <p data-bbox="746 960 1027 992">Throat depth 300 mm</p>	1	Universal

GROUP 10 REAR AXLE

1. REMOVAL FRONT AXLE

- 1) Rear axle mounting nut (1, M20)
 - Tightening torque : 58.0 ± 6.3 kgf · m
(420 ± 45.6 lbf · ft)
- Rear axle mounting nut (2, M20)
 - Tightening torque : 62.8 ± 9.4 kgf · m
(454 ± 68 lbf · ft)
- 2) Propeller shaft mounting bolt (3, M10)
 - Tightening torque : 5.9 ± 0.6 kgf · m
(42.7 ± 4.3 lbf · ft)
- 3) Wheel nut (4, M22)
 - Tightening torque : 60 ± 5.0 kgf · m
(433 ± 36.2 lbf · ft)
- 4) Hose assy (5, 6)
- 5) Axle weight : 534 kg (1180 lb)



2. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

- (1) This manual has been developed for the skilled serviceman, trained by the ZF-Passau.
- (2) During all operations, pay attention to cleanliness and skilled working.
Therefore, axle removed from the machine, must be cleaned prior to open them.
- (3) We assume that the special tools, specified by ZF, will be used.
The special tools are available from ZF-Passau.
- (4) After the disassembly, all components must be cleansed, especially corners, cavities and recesses of housing and covers.
- (5) The old sealing compound must be carefully removed.
- (6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.
- (7) The latter refers especially to new parts.
- (8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..
- (9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.
- (10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.
- (11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.
- (12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100°C.
- (13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.
- (14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.
- (15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.
- (16) After the repair, units are filled up with oil.
- (17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

- (1) In principle, repairers are themselves responsible for the labour safety.
- (2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.
- (3) Before starting the work, the repairers have to make themselves familiar with these regulations.
- (4) The proper repair of these products requires especially trained personnel.
- (5) The repairer himself is obliged to provide for the training.

3) LUBRICANT SPECIFICATIONS

- (1) Gear oils with limited - slip additives.
- (2) API GL-5
- (3) MIL-L-2105D (SAE 85W-90 LSD or UTTO)

4) BRAKE LINING WEARING TEST

(1) The measurement of wear on the multi-disc brake only gives limited information on the total state of the plate pack without disassembling the output.

Make measurement of lining wear at least once per year, in particular, however, in case of a different braking behaviour, like :

- Braking noises
- Reduced braking power
- Different deceleration
- Different brake oil level
- Different braking pressure

※ To avoid injury when opening the oil drain/ oil filler plug (1), due to a possible pressure build-up in the planetary carrier bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and filler plug (1).

(2) Then turn output until oil filler / oil drain hole (2) is on 9 o'clock position.

1 = Oil filler-/oil drain hole

2 = Gauge hole ($\varnothing=10$ mm) in ring gear
9 o'clock position

3 = Dial indicator with solenoid support

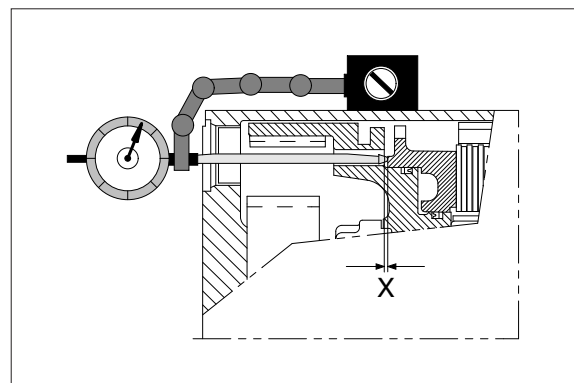
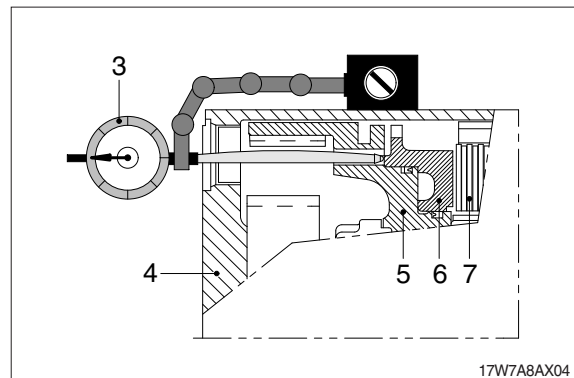
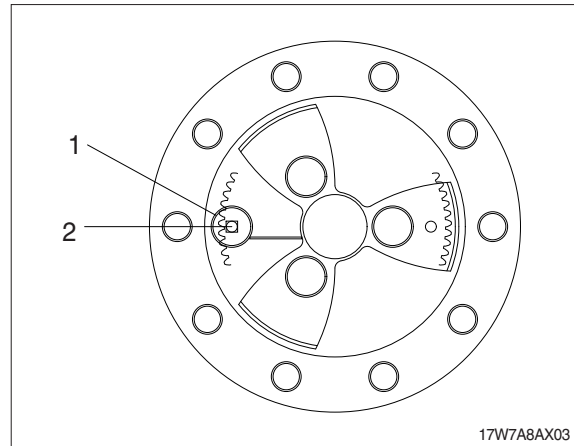
4 = Planetary carrier

5 = Ring gear

6 = Piston

7 = Plate pack

X = Piston stroke



3. DISASSEMBLY

1) OUTPUT

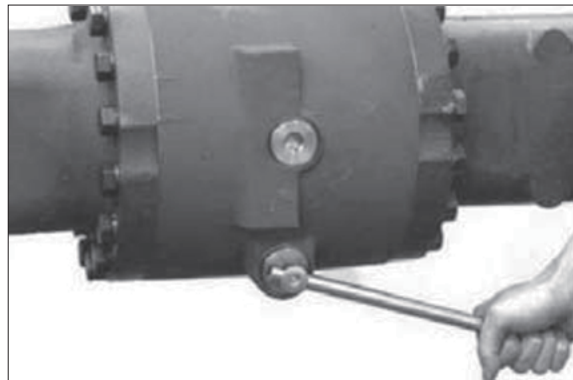
(1) Attach axle to the assembly truck.

- (S) Assembly truck 5870 350 000
- (S) Supporting bracket 5870 350 106



17W98RA001

(2) Loosen screw plug and drain oil from the axle.



17W98RA002

(3) Loosen screw plug and drain oil from the planetary carrier.

- ※ To avoid any risk of injury due to a possible pressure buildup in the oil system of the planetary carrier, bring oil filler / level check plug to the uppermost position (12 o'clock) and turn it out carefully. Then bring drain hole to 6 o'clock position and drain oil.

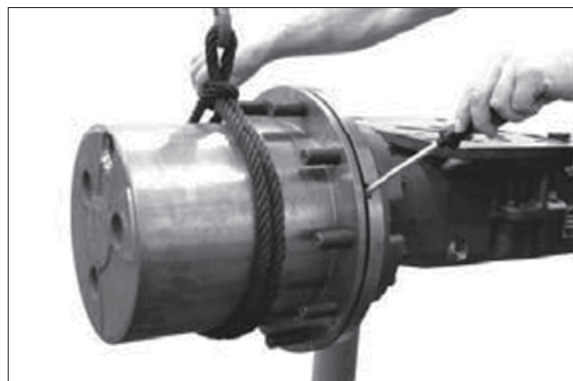


17W98RA003

- ※ Use suitable oil reservoir environmental protection.

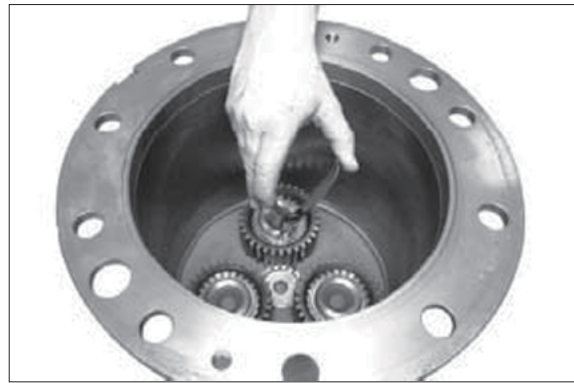
(4) Planetary carrier

Loosen both hexagon screws and separate planetary carrier from the hub.



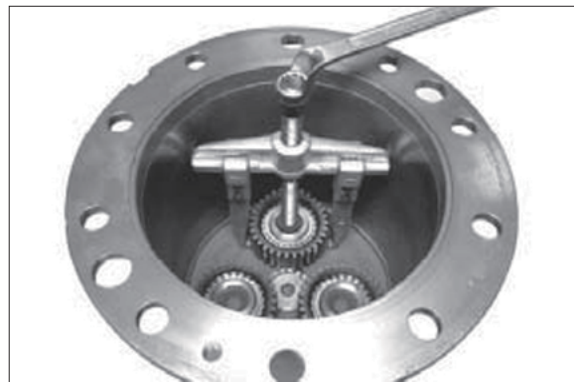
17W98RA004

(5) Snap out retaining ring.



17W98RA005

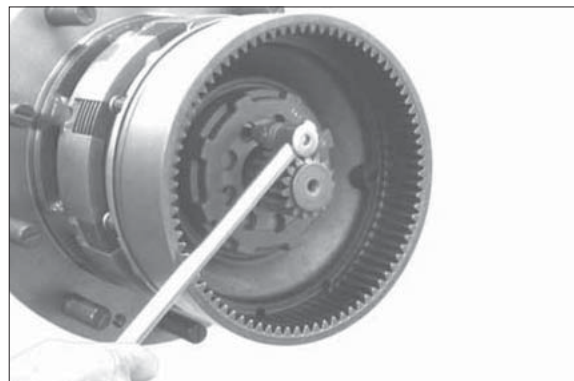
(6) Pull off planetary gear together with cylindrical roller bearing.



17W98RA006

(7) Brake

Loosen cylindrical screw (slotted nut fixing).

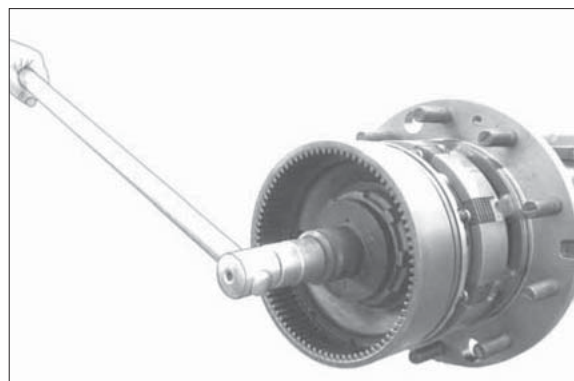


17W98RA007

(8) Loosen slotted nut.

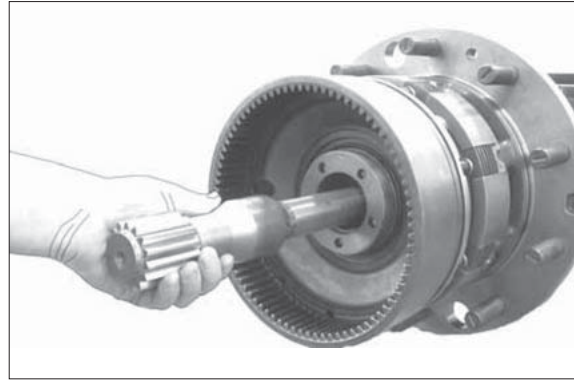
(S) Socket wrench

5870 656 097



17W98RA008

- (9) Pull sun gear together with stub shaft out of the axle housing.

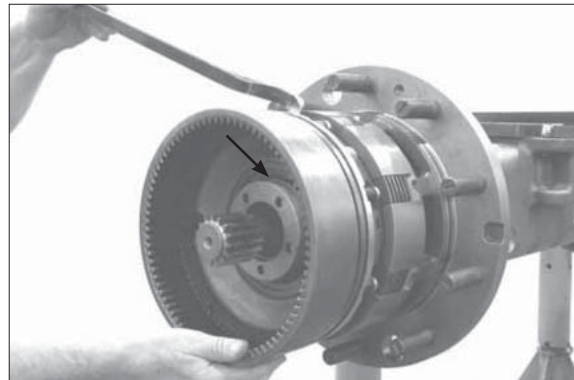


17W98RA009

- (10) Press ring gear together with piston off the hub carrier.

(S) Assembly lever 5870 345 036

- ※ Pay attention so that the O-ring (arrow) does not drop.



17W98RA010

- (11) Loosen hexagon screws and remove releasing spring sleeves and compression springs.



17W98RA011

- (12) Press piston off the ring gear.



17W98RA012

(13) Remove sealing elements from the annular grooves (see arrows) of the ring gear.



17W98RA013

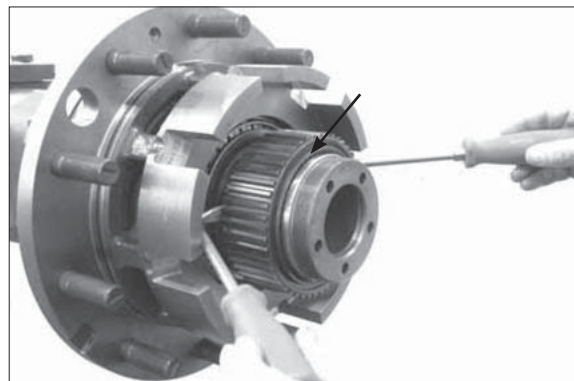
(14) Remove disk package.



17W98RA014

(15) Remove O-ring (see arrow) and use a lever to remove disk carrier from hub carrier.

(S) Resetting device 5870 400 001



17W98RA015

(16) Hub

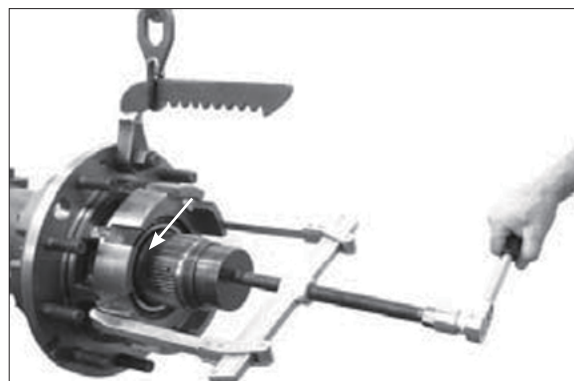
Remove O-ring (see arrow).

Secure hub with lifting bracket (S) and pull it off the hub carrier by means of a two armed puller.

(S) Lifting bracket 5870 281 043

(S) Pressure piece 5870 100 063

※ Pay attention that the releasing bearing inner ring does not drop.



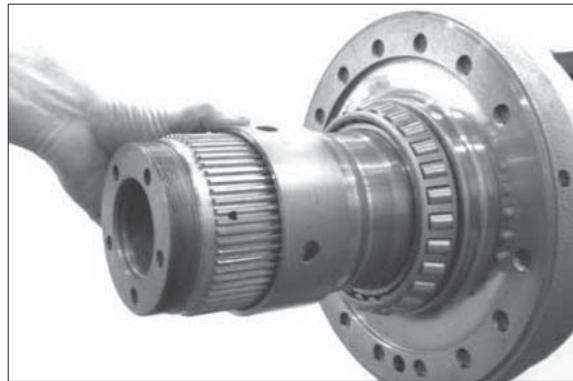
17W98RA016

(17) Use a lever to remove the shaft seal ring (see arrow) from the hub hole and force both bearing outer rings out of the hub.



17W98RA017

(18) Remove spacer bushing.



17W98RA018

(19) Pull tapered roller bearing off the hub.

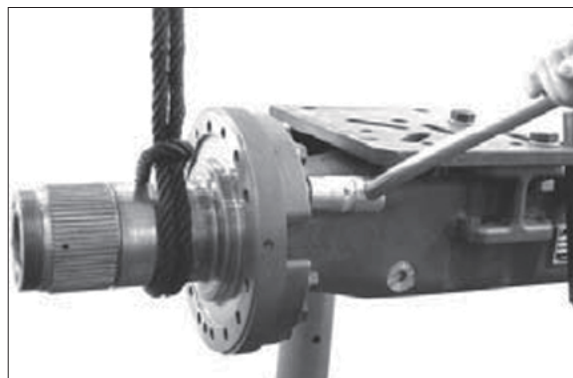
- (S) Grab sleeve 5873 013 015
- (S) Pressure piece 5870 100 063



17W98RA019

(20) Secure hub carrier with lifting tackle, loosen threaded joint and separate hub carrier from the axle housing.

Then remove single parts such as screw neck, breather valve and O-ring from the hub carrier.



17W98RA020

(21) Output assy

※ If work is to be done on the differential or pinion, you may remove the output as a complete unit (operations figure RA021 and RA022).

Secure output by means of lifting tackle (S) and loosen threaded joint.

(S) Lifting bracket 5870 281 043



17W98RA021

(22) Separate output assy from the axle housing and pull out stub shaft.



17W98RA022

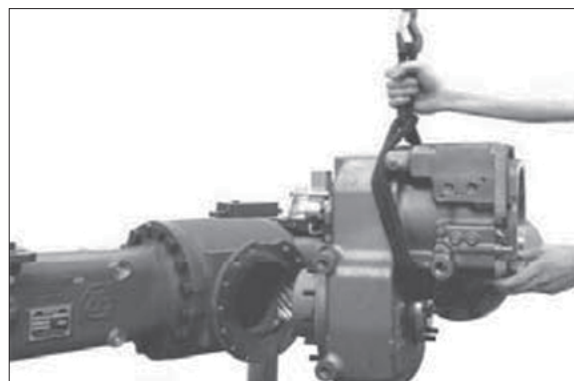
2) INTPUT

(1) Secure transmission with lifting tackle and loosen threaded joint (transmission/axle drive housing).



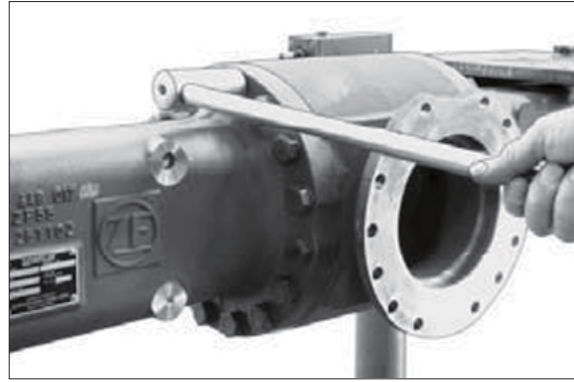
17W98RA023

(2) Separate transmission from the axle.



17W98RA024

- (3) Secure axle housing (on crown wheel side) by means of lifting tackle and loosen threaded joint.

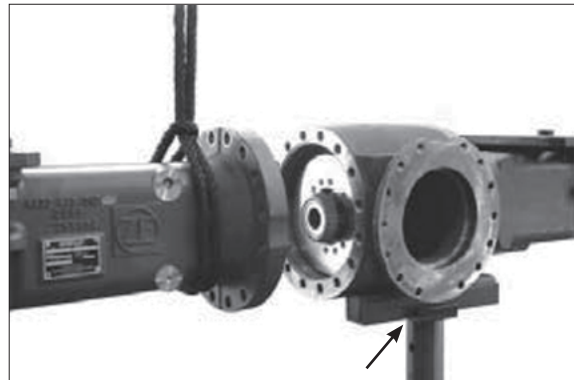


17W98RA025

- (4) Support axle at the axle drive housing (see arrow).

Then separate axle housing from the axle drive housing.

- ※ Pay attention that the differential does not drop.

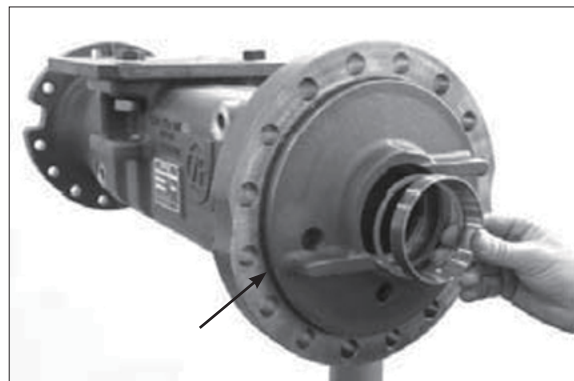


17W98RA026

- (5) Pull bearing outer ring out of the bearing hole and remove the releasing shim.

Then remove O-ring (see arrow).

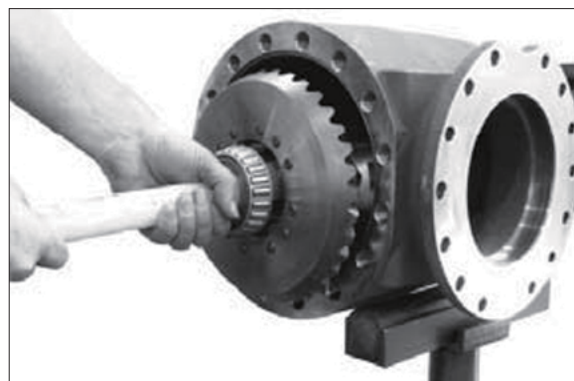
(S) Striker 5870 650 004



17W98RA027

- (6) Lift differential out of the axle drive housing.

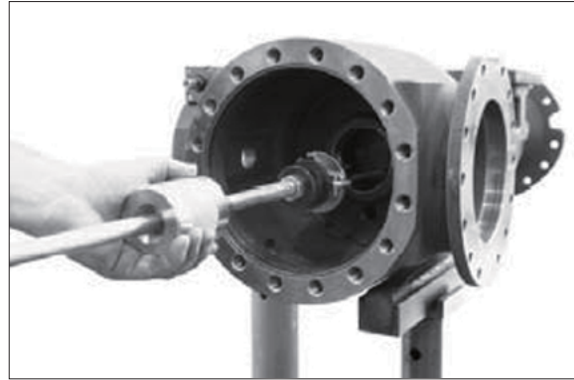
- ※ Disassembly of the differential see description on page 8-299 and following.



17W98RA028

- (7) Use striker (S) to pull bearing outer ring out of the bearing hole (axle housing) and remove the releasing shim.

(S) Striker 5870 650 004

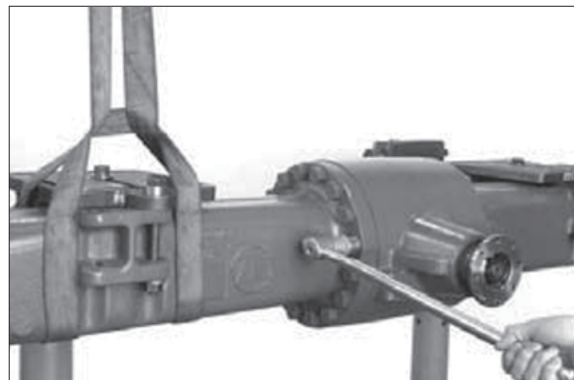


17W98RA029

- (8) Secure axle housing (on crown wheel side, part II) by means of lifting tackle and loosen threaded joint.

Then separate axle housing (part II) from the axle drive housing.

- ※ Pay attention that the differential does not drop.

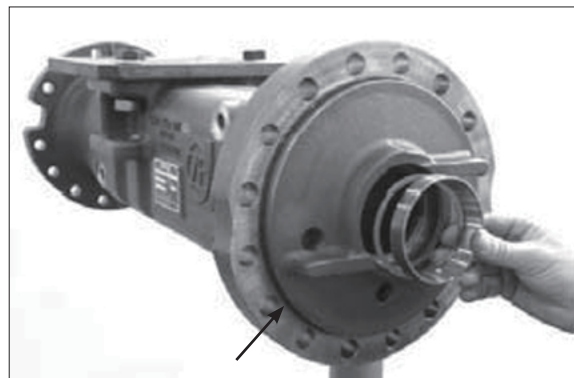


17W98RA030

- (9) Pull bearing outer ring out of the bearing hole and remove the releasing shim.

Then remove O-ring (see arrow).

(S) Striker 5870 650 004

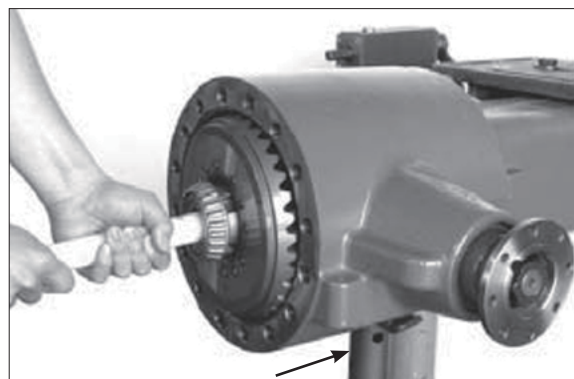


17W98RA031

- (10) Support axle at the axle drive housing (see arrow).

Then lift differential out of the axle drive housing.

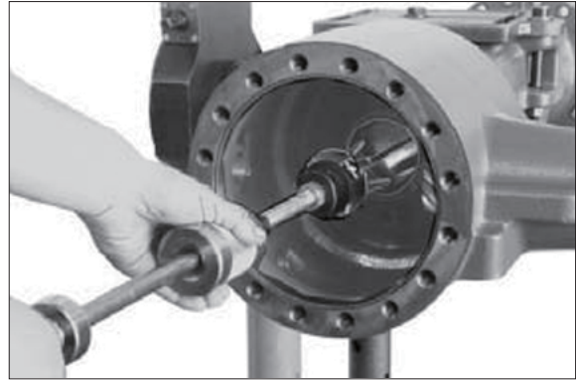
- ※ Disassembly of the differential see description on page 8-299 and following.



17W98RA032

(11) Use striker (S) to pull bearing outer ring out of the bearing hole (axle housing) and remove the releasing shim.

(S) Striker 5870 650 004



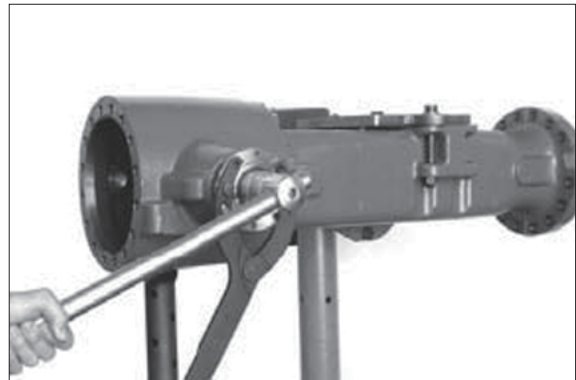
17W98RA033

(12) Heat up hexagon nut with hot-air blower.

Then loosen hexagon nut and remove the releasing washer.

(S) Clamping fork 5870 240 025

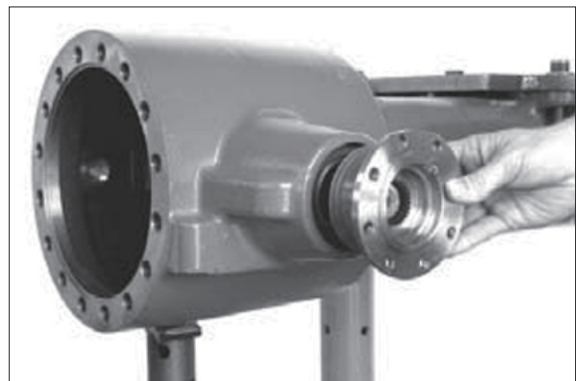
※ Hexagon nut is secured with Loctite no. 262.



17W98RA034

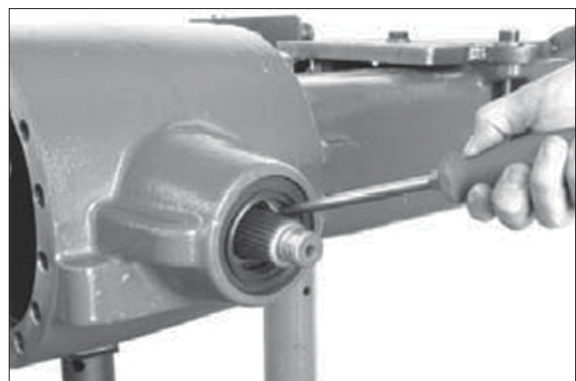
(13) Pull input flange off the pinion.

If required, remove screen sheet from the flange.



17W98RA035

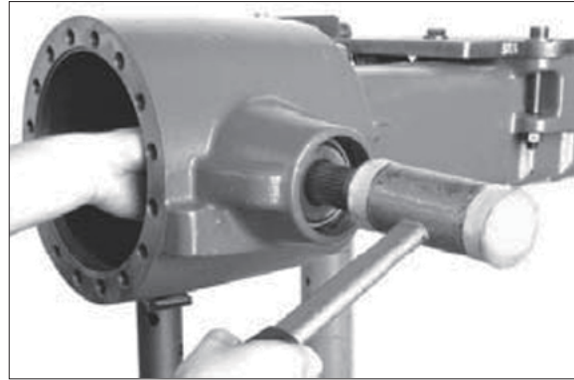
(14) Use a lever to remove the shaft seal ring out of the housing hole.



17W98RA036

(15) Force out input pinon and remove the releasing roller bearing.

- ※ Use a plastic hammer.
- ※ If the tapered roller bearings are not replaced, pay attention that all the rollers of the outer bearing inner ring are always in contact with the bearing outer ring when forcing out the input pinon.



17W98RA037

(16) Remove spacer ring.



17W98RA038

(17) Press roller bearing off the input pinion.

(S) Grab sleeve 5873 001 037



17W98RA039

(18) Pull external bearing outer ring out of the bearing hole.

(S) Internal extractor 5870 300 019

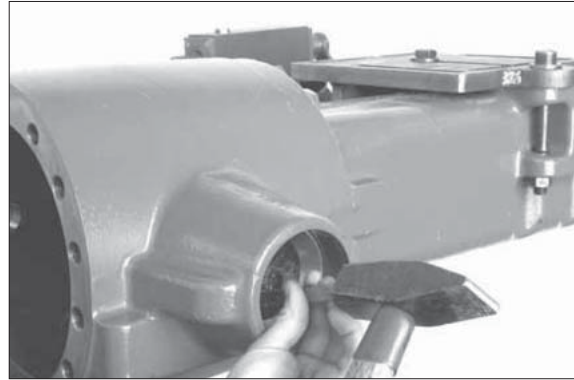
(S) Counter support 5870 300 020



17W98RA040

(19) Force bearing outer ring off the inner bearing hole pay attention to the shim behind.

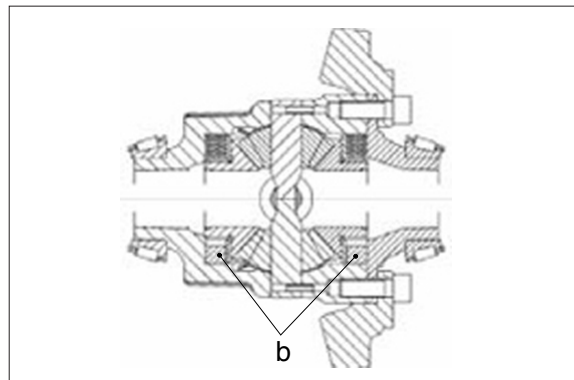
※ Mark shim regarding position/bearing allocation reassembly aid.



17W98RA041

3) DIFFERENTIAL

(1) b = Constant spacers



17W98RA042

(2) Pull both tapered roller bearings from differential carrier.

(S) Grab sleeve	5873 011 019
(S) Basic tool	5873 001 000
(S) Pressure piece	5870 100 009



17W98RA043

(3) Use press to fix differential and loosen threaded joint crown wheel / differential carrier.



17W98RA044

(4) Press crown wheel from differential.



17W98RA045

(5) Remove single parts.

Remove axle bevel gear together with thrust washer and constant spacer from the differential carrier.



17W98RA046

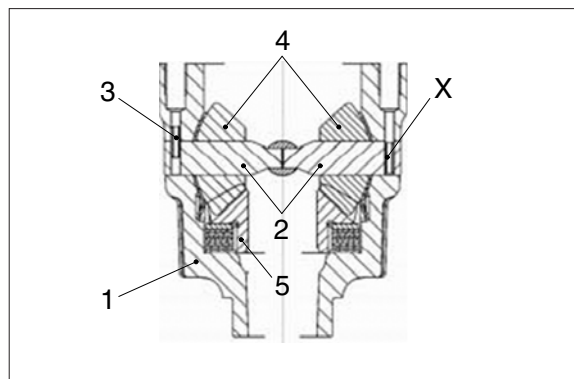
(6) Force slotted pins (considering position "X", see subsequent sketch) into the spider shafts.



17W98RA047

(7) Comment on sketch:

- 1 = Differential carrier
- 2 = Spider shafts (short)
- 3 = Slotted pins
- 4 = Differential bevel gears
- 5 = Axle bevel gear
- X = Position of the slotted pin to force out the spider shafts



17W98RA048

(8) Force out both spider shafts (short).



17W98RA049

(9) Remove all single parts.

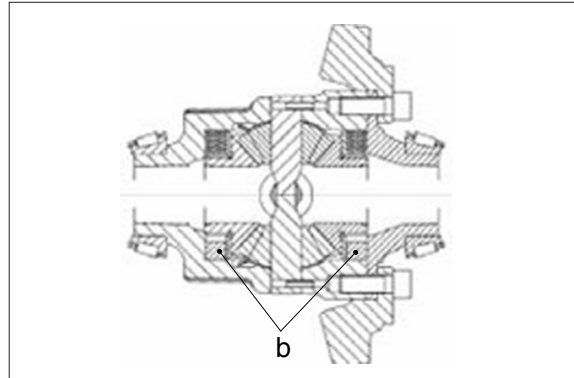


17W98RA050

4. REASSEMBLY

1) DIFFERENTIAL

(1) b = Constant spacers



17W98RA042

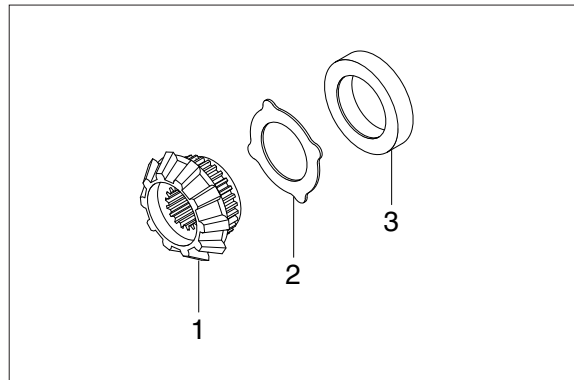
(2) All outer and inner disks are replaced by a constant spacer (see figure RA054).

1 = Axle bevel gear

2 = Pressure disk

3 = Constant ring

※ No measuring / setting of the axial play of the two axle bevel gears is required, therefore single parts can be immediately oiled.



17W98RA053

(3) Insert premounted axle bevel gear into the differential carrier.



17W98RA054

(4) Insert differential bevel gears (1) with thrust washers (2) and fix with spider shafts (3 and 4).

※ Pay attention to radial installation position of the thrust washers.



17W98RA055

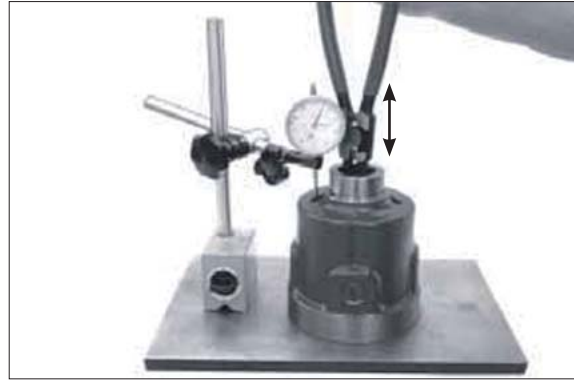
(5) Check axial play of the axle bevel gear 0.0 ... 0.15 mm.

※ If the axial play is not within the specified tolerance, correct with the corresponding outer disks.

After the setting procedure separate the single parts again.

Then oil and reassemble all single parts again.

※ Make sure that thickness and arrangement of the second disk package are identical (figure RA059).



17W98RA056

(6) Fix both spider shafts (short) by means of slotted pins (considering installation dimension, see sketch RA058).



17W98RA057

(7) Comment on sketch:

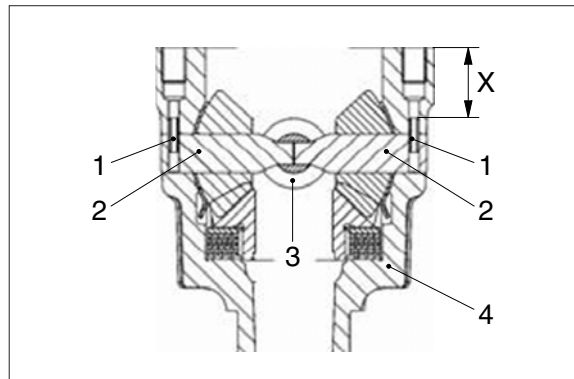
1 = Slotted pin

2 = Spider shaft (short)

3 = Spider shaft

4 = Differential carrier

X = Installation dimension 34 ± 0.5 mm



17W98RA058

(8) Mount second axle bevel gear with thrust washer and constant spacer (see also figure RA053).

※ Mount the pressure disk with the coated surface showing to the outer disk.

※ Thickness and arrangement of the disk package must be identical on both sides of the differential gear.



17W98RA059

(9) Check axial play of the second axle bevel gear 0.0 ... 0.15 mm.

※ If the axial play is not within the specified tolerance, correct with the corresponding outer disks.

After the resetting procedure remove the second axle bevel gear together with the disk package from the differential carrier.

Then oil and reassemble all single parts.



17W98RA060

(10) Mount two adjusting screws (S) and insert cover.

(S) Adjusting screws (M12×1.5)

5870 204 027



17W98RA061

(11) Press crown wheel onto the cover / differential carrier until contact position is obtained.



17W98RA062

(12) Fix differential with press and tighten crown wheel with cylindrical screws.

Tightening torque (M12×1.5/12.9)
..... MA =
145 Nm



17W98RA063

(13) Press on both bearing inner rings until contact is obtained.

※ Use an appropriate support (arrow) differential may not be supported on the bearing cage.

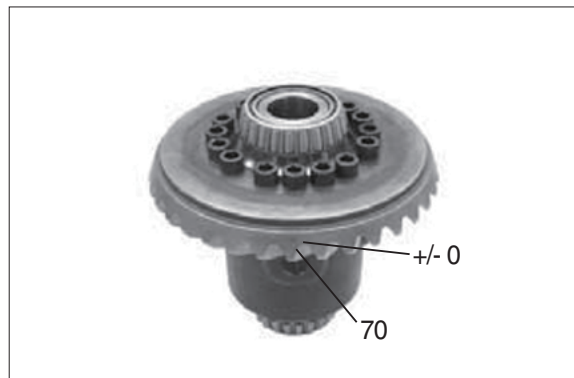


17W98RA064

2) INPUT

(1) Determination of shims for setting the bearing rolling torque (differential bearing) and the backlash (bevel gear set).

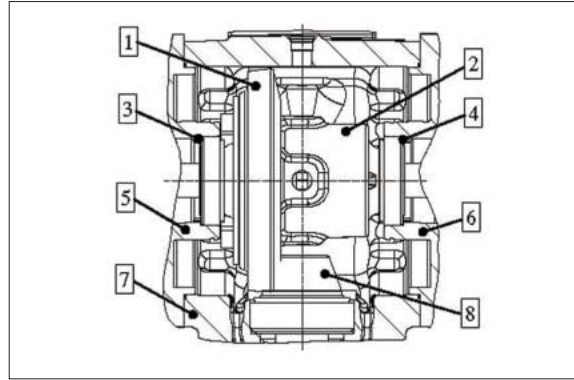
※ Determine the required shims on basis of the read value (test dimension/ crown wheel) and the corresponding specifications of the table next page :
(KRS – SET – RIGHT) (KRS = bevel gear set)



17W98RA065

(2) Test dimension see crown wheel rear side.

※ The test dimension "70" is stamped into the crown wheel rear side. If no + or deviation is indicated, this value corresponds with the test dimension/ actual value "70" in the table below. According to this value, the required shims are allocated in the table below.



17W98RA066

Any + or - deviation of the test dimension caused by production is also marked on the crown wheel rear side (e.g. 20 or – 10 / 10 or 20) . In accordance with this deviation, the required shims are allocated in the table below.

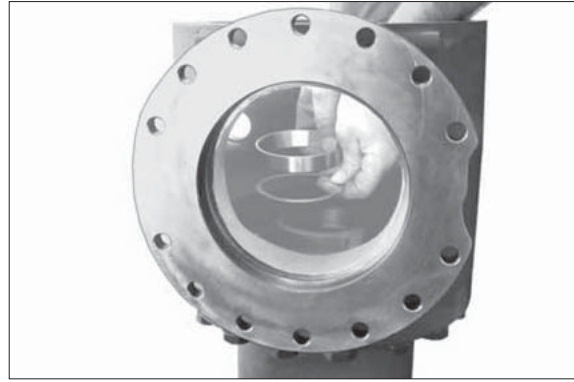
· Legend to sketch:

- 1 = Crown wheel
- 2 = Differential carrier
- 3 = Shim (crown wheel side)
- 4 = Shim (diff. carrier side)
- 5 = Axle housing
- 6 = Axle housing
- 7 = Axle drive housing
- 8 = Input pinion

Setting disks for differential					
Test dimension/crown wheel marking 70 and deviation	-20	-10	0	10	20
results in → test dim. / actual value	69.80	69.90	70.0	70.10	70.20
Shim/ diff. carrier side Required shim thickness	0.95	1.05	1.15	1.25	1.35
Shim No.	ZGAQ-00545	ZGAQ-00547	ZGAQ-00549	ZGAQ-00552	ZGAQ-00554
Shim/crown wheel side Required shim thickness	1.35	1.25	1.15	1.05	0.95
Shim No.	ZGAQ-00554	ZGAQ-00552	ZGAQ-00549	ZGAQ-00547	ZGAQ-00545

- (3) Place determined shim (e.g. thickness = 1.15 mm) and bearing outer ring into the hole of the axle housing on differential carrier side.

※ Rotate axle housing by 90°.



17W98RA067

- (4) Place determined shim (e.g. thickness = 1.15 mm) and bearing outer ring into the hole of the axle housing on crown wheel side.



17W98RA068

- (5) **Contact pattern check of bevel gear set**
Cover some drive and coast flanks of the crown wheel with marking ink.



17W98RA069

- (6) Place preassembled differential into the axle drive housing.

(S) Internal extractor 5870 300 005



17W98RA070

- (7) Use lifting tackle to mount the axle housing (crown wheel side) and preliminarily fix it with hexagon screws.

Tightening torque (M18/10.9)
. MA = 390 Nm

- ※ Preliminarily fix axle housing without O-ring.

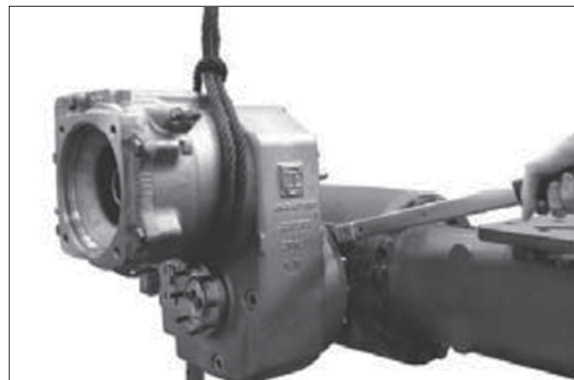


17W98RA071

- (8) Rotate axle by 90° and support it.

Use lifting tackle to bring HL transmission into contact position with the axle housing and fix it.

Tightening torque MA = 79 Nm



17W98RA072

- (9) By rotating the input flange, roll crown wheel over the input pinion in both directions several times.

Then remove transmission and axle housing and lift differential out of the axle drive housing.

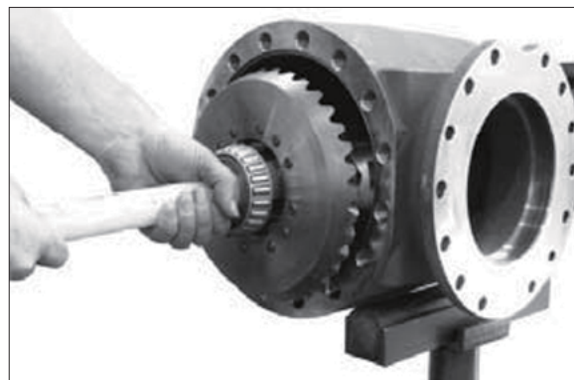
Compare the obtained contact pattern.

- ※ In case of a contact pattern deviation, check the pinion shimming of the transmission.



17W98RA073

- (10) After contact pattern check, place differential into the axle drive housing.



17W98RA074

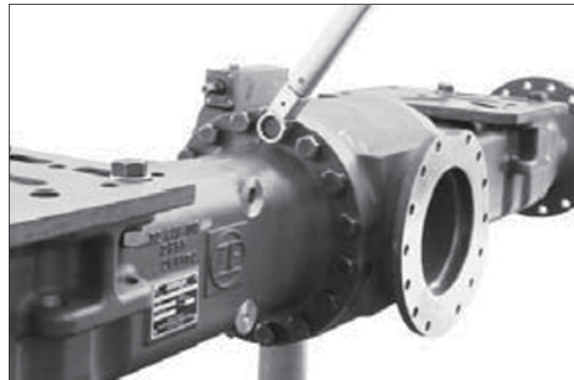
(11) Grease O-ring (see arrow) and mount it to axle housing.



17W98RA075

(12) Use lifting tackle to mount the axle housing and finally tighten it with hexagon screws.

Tightening torque (M18/10.9)
..... MA = 390 Nm



17W98RA076

3) INPUT PINION

The following measuring operations must be carried out with utmost accuracy. Inaccurate measurements lead to an incorrect contact pattern and require an additional disassembly and reassembly of the input pinion.

(1) Determination of shim thickness to obtain a correct contact pattern

Read dimension I from the axle drive housing.

Dim. I e.g. 154.05 mm



17W98RA077

(2) Read dimension II (pinion dimension).

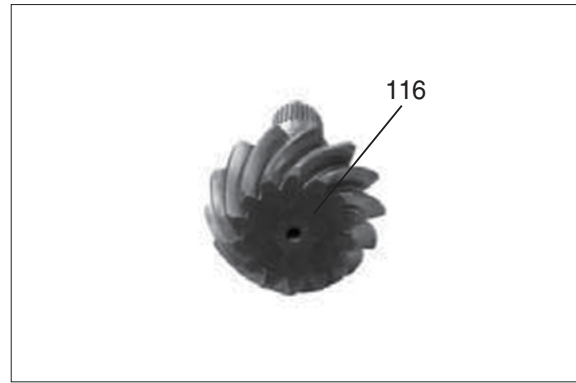
Dim. II e.g. 116.00 mm

In case of a + or - deviation of the pinion dimension for production reasons, the respective value is marked by hand on the pinion.

Pinion dim. (without + or - deviation) =
116.0 mm

Pinion dim. with + 0.1 deviation value =
116.1 mm

Pinion dim. with - 0.1 deviation value =
115.9 mm



17W98RA078

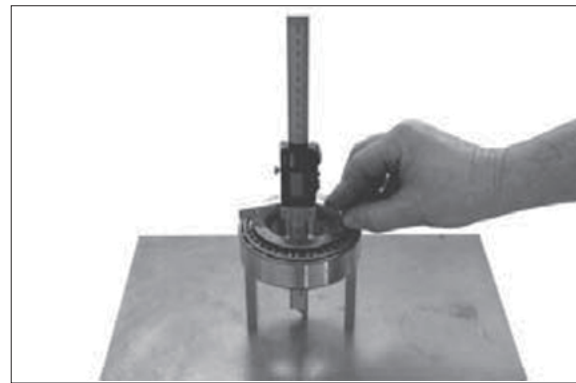
(3) Determine dimension III (bearing width).

※ Make sure that the rollers are located without any play (rotate bearing inner ring several times in both directions roller setting).

Since the installed roller bearing is subject to a preload in installation position, deduct an experience value of 0.1 mm.

Dimension III, e.g. 36.60 mm - 0.1 mm =
36.50 mm

(S) Gage blocks 5870 200 066



17W98RA079

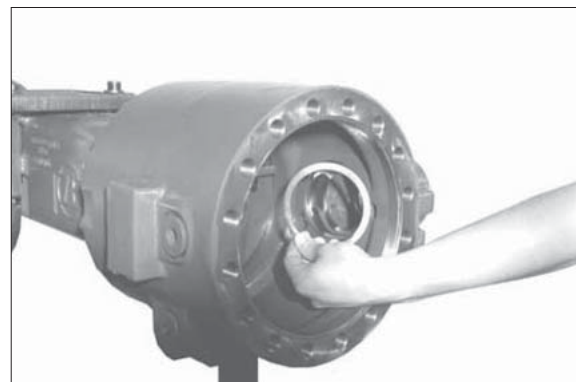
(4) Calculation example :

Dimension I 154.05 mm

Dimension X - 152.50 mm

Difference = shim s = 1.55 mm

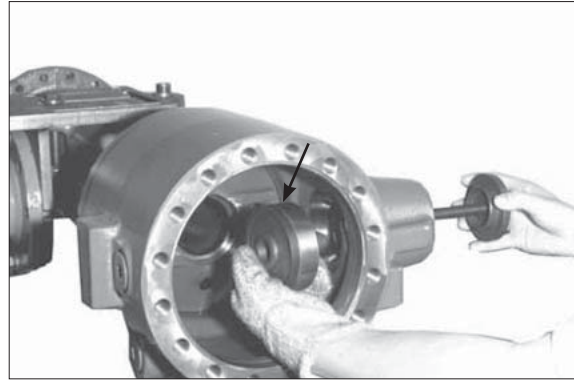
Place the determined shim (e.g. thickness = 1.55 mm) into the inner bearing hole.



17W98RA080

- (5) Undercool bearing outer ring (see arrow) and bring it into contact position in the bearing hole by using the assembly fixture (S).

(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98RA081

- (6) Undercool external bearing outer ring and insert it into the bearing hole until contact is obtained.

(S) Assembly fixture 5870 345 049
(S) Pressure ring 5870 345 056



17W98RA082

- (7) Adjustment of the rolling torque of input pinion bearing 1.0 ... 3.0 Nm (without shaft seal ring)**

Heat up roller bearing and install it until contact is obtained.

※ Adjust bearing after cooling-down.



17W98RA083

- (8) Mount spacer ring (e.g. thickness = 16.96 mm).

※ According to our experience, the necessary rolling torque is obtained when reusing the spacer ring which has been removed during disassembly (e.g. thickness = 16.96 mm).

A later check of the rolling torque, however, is absolutely necessary.



17W98RA084

- (9) Place the preassembled input pinion into the axle housing and mount the heated roller bearing until contact is obtained.



17W98RA085

- (10) Press screen sheet (see arrow) onto the input flange until contact is obtained.
- ※ Do not fit the shaft seal ring until the contact pattern has been checked.



17W98RA086

- (11) Mount input flange and fix it with washer and hexagon nut.

Tightening torque (M30 x 1.5)
 MA = 600 Nm

(S) Clamping fork 5870 240 025

- ※ While tightening, rotate the input pinion in both directions several times.

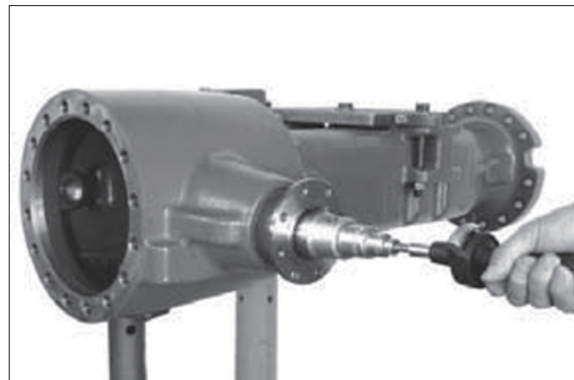


17W98RA087

- (12) Check rolling torque (1.0 ... 3.0 Nm without shaft seal ring).

- ※ When installing new bearings, try to achieve the upper value of the rolling torque.
- ※ Any deviation from the required rolling torque must be corrected with an appropriate spacer ring (figure RA110) as specified below.

Insufficient rolling torque - install thinner spacer ring.
 Excessive rolling torque - install thicker spacer ring.



17W98RA088

(13) Determination of shims for setting the bearing rolling torque (differential bearing) and the backlash (bevel gear set)

※ Determine the required shims on basis of the read value (test dimension/crown wheel) and the corresponding specifications of the table below:
(KRS – SET – RIGHT) (KRS = bevel gear set) : Test dimension see crown wheel rear side.

※ The test dimension "70" is stamped into the crown wheel rear side. If no + or deviation is indicated, this value corresponds with the test dimension/actual value "70" in the table below. According to this value, the required shims are allocated in the table below.

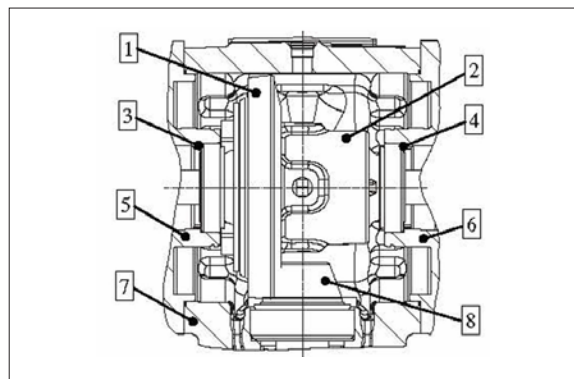
※ Any + or – deviation of the test dimension caused by production is also marked on the crown wheel rear side (e.g. – 20 or – 10 / 10 or 20) . In accordance with this deviation, the required shims are allocated in the table below.



17W98RA089

(14) Legend to sketch:

- 1 = Crown wheel
- 2 = Differential carrier
- 3 = Shim (crown wheel side)
- 4 = Shim (diff. carrier side)
- 5 = Axle housing
- 6 = Axle housing
- 7 = Axle drive housing
- 8 = Input pinion



17W98RA090

Shims for differential					
Test dimension/crown wheel marking 70 and deviation	-20	-10	0	10	20
results in → test dim. / actual value	69.80	69.90	70.0	70.10	70.20
Shim/ diff. carrier side Required shim thickness	0.95	1.05	1.15	1.25	1.35
Shim No.	ZGAQ-00545	ZGAQ-00547	ZGAQ-00549	ZGAQ-00552	ZGAQ-00554
Shim/crown wheel side Required shim thickness	1.35	1.25	1.15	1.05	0.95
Shim No.	ZGAQ-00554	ZGAQ-00552	ZGAQ-00549	ZGAQ-00547	ZGAQ-00545

(15) Place determined shim (e.g. thickness = 1.15 mm) and bearing outer ring into the hole of the axle housing on differential carrier side (part I).

※ Rotate axle housing by 90°.



17W98RA091

(16) Place determined shim (e.g. thickness = 1.15 mm) and bearing outer ring into the hole of the axle housing on crown wheel side (part II).



17W98RA092

(17) Contact pattern check of bevel gear set

Cover some drive and coast flanks of the crown wheel with marking ink.



17W98RA093

(18) Place preassembled differential into the axle drive housing.



17W98RA094

(19) Use lifting tackle to mount the axle housing (crown wheel side, part II) and preliminarily fix it with hexagon screws.

Tightening torque (M18/10.9)
. MA = 390 Nm

※ Preliminarily fix axle housing without O-ring.



17W98RA095

(20) By rotating the input flange, roll crown wheel over the input pinion in both directions several times.

Then remove axle housing and lift differential out of the axle drive housing. Compare the obtained contact pattern with contact pattern.

※ In case of a contact pattern deviation it is imperative to correct the measuring error which was made when determining the shim (figure RA080).



17W98RA096

(21) After contact pattern check, place differential into the axle drive housing.

Grease O-ring (see arrow) and mount it to the axle housing.



17W98RA097

(22) Use lifting tackle to mount the axle housing and finally fix it with hexagon screws.

Tightening torque (M18/10.9)
. MA = 390 Nm

Then bring axle into horizontal position and reassemble the second supporting bracket (S) (see also figure RA001).

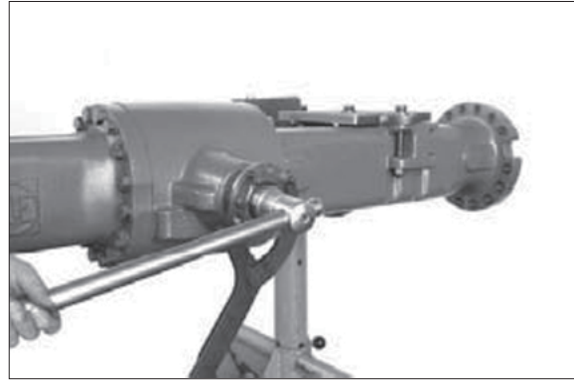


17W98RA098

(23) Fitting of shaft seal ring (input flange)

Loosen hexagon nut and pull input flange off the input pinion.

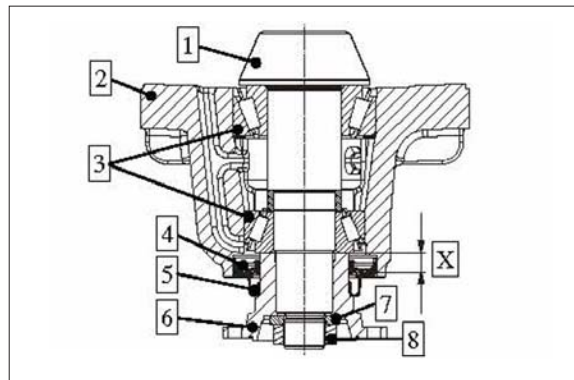
(S) Clamping fork 5870 240 025



17W98RA099

(24) Legend to sketch:

- 1 = Input pinion
- 2 = Axle drive housing
- 3 = Tapered roller bearing
- 4 = Shaft seal ring
- 5 = Screen sheet
- 6 = Input flange
- 7 = Washer
- 8 = Hexagon nut
- X = Installation dimension → 13.5 +0.2 mm

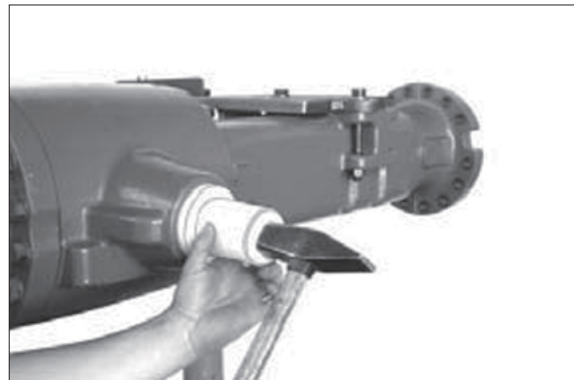


17W98RA100

(25) Mount shaft seal ring with the sealing lip facing the oil chamber.

(S) Driver tool 5870 048 286

- ※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.
- ※ Just before fitting, apply lubricant to the contact face of shaft seal ring/axle drive housing.
Apply grease to seal and dust lip of the shaft seal ring.



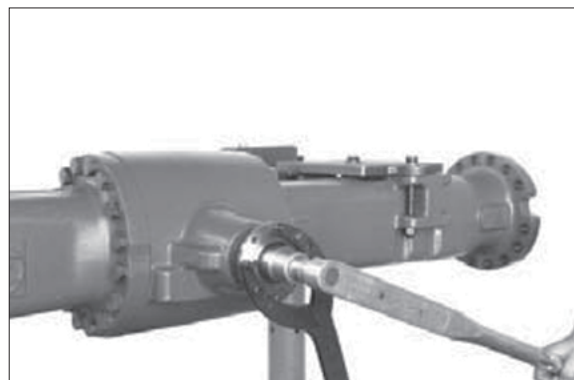
17W98RA101

(26) Mount input flange and finally fix it with washer and hexagon nut.

Tightening torque (M30 x 1.5)
..... MA = 600 Nm

(S) Clamping fork 5870 240 025

- ※ Wet thread of hexagon nut with Loctite no. 262.



17W98RA102

4) OUTPUT

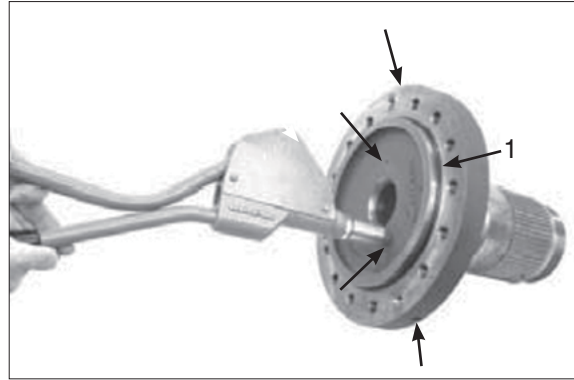
(1) Hub carrier

Grease O-ring (1) and mount it to hub carrier.

The following operation is only required when fitting a new hub carrier :

Seal machining openings (arrows) of oil supply holes with plugs.

(S) Lever riveting tongs 5870 320 016

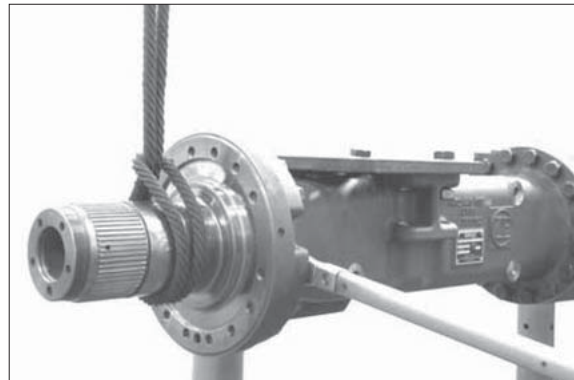


17W98RA103

(2) Mount preassembled hub carrier to the axle housing, considering the installation position, and fix it with hexagon screws.

Tightening torque (M 16/10.9)
..... MA = 280 Nm

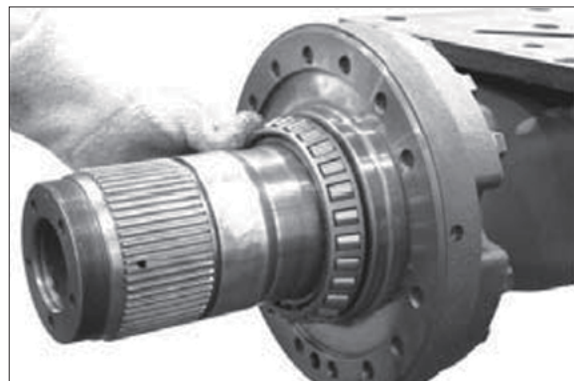
※ Ensure radial installation position.
Stamped circle (see arrow) must be in uppermost (12 o'clock) position.



17W98RA104

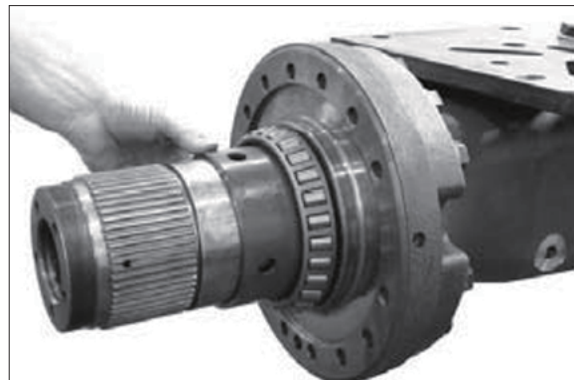
(3) Hub (Hub bearing SET-RIGHT)

Heat up tapered roller bearing and mount it to hub carrier until contact is obtained.



17W98RA105

(4) Mount spacer bushing.

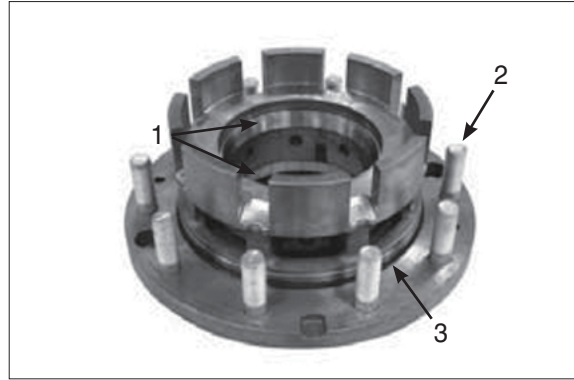


17W98RA106

- (5) Insert both bearing outer rings (1) of the hub bearing until contact position is obtained.

Press wheel bolts (2) into the hub until contact position is obtained.

Grease O-ring (3) and place it into the annular groove of the hub.

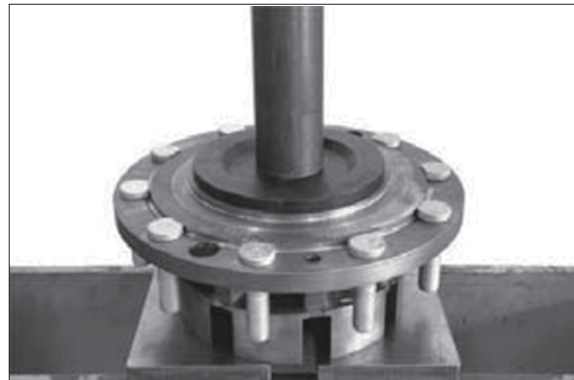


17W98RA107

- (6) Press shaft seal ring into the hub, with the marking "OUT SIDE" showing outwards (facing up):

(S) Driver tool 5870 051 035

- ※ Use of the specified driver tool (S) ensures the exact installation position of the shaft seal ring.
- ※ Wet outer diameter of the shaft seal ring with Loctite no. 574.



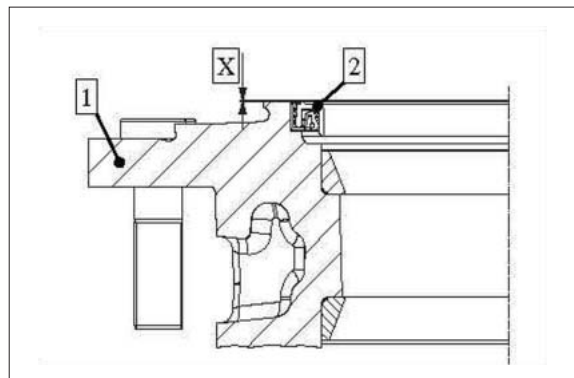
17W98RA108

- (7) Legend to sketch:

1 = Hub

2 = Shaft seal ring

X = Installation dimension – shaft seal ring
 0.0~0.3 mm

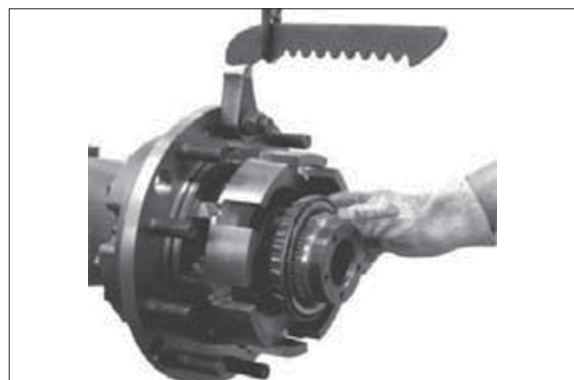


17W98RA109

- (8) Mount preassembled hub until contact is obtained and fix it with heated tapered roller bearing.

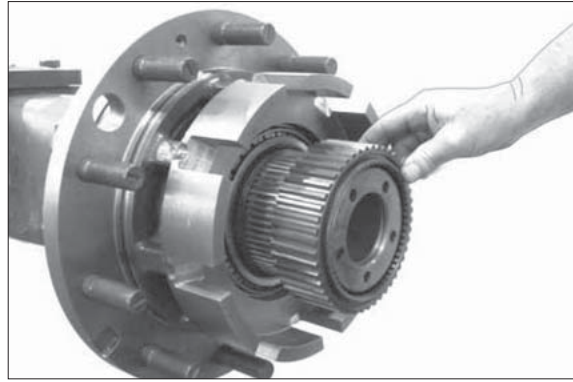
(S) Lifting bracket 5870 281 043

- ※ Just before fitting, wet sealing lips of shaft seal ring with lubricant.



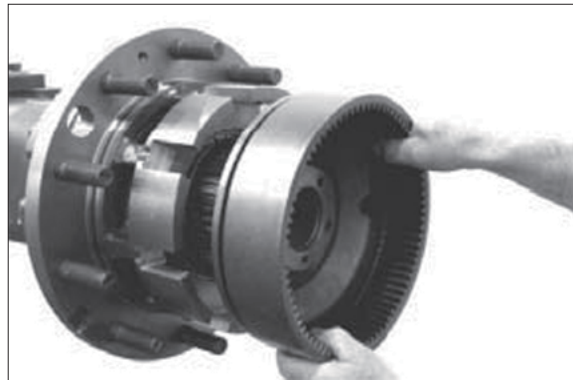
17W98RA110

- (9) Oil O-ring and insert it into the annular groove (see arrow) of the hub carrier.
Then mount disk carrier.



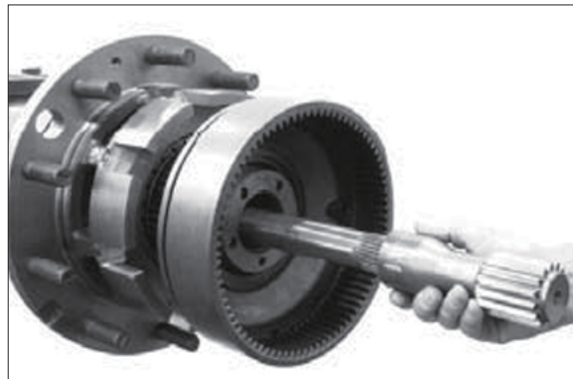
17W98RA111

- (10) Bring disk carrier and hub bearing into contact position (figure no. RA112 ... RA115) :
Mount ring gear (without sealing elements).



17W98RA112

- (11) Insert stub shaft and sun gear shaft for supporting the socket wrench (see following figure).



17W98RA113

- (12) Bring hub bearing into contact position for this purpose tighten slotted nut with a tightening torque of 1400 Nm max.

(S) Socket wrench 5870 656 097

- ※ While tightening the slotted nut rotate hub in both directions several times roller setting.
- ※ Apply lubricant to thread of knuckle housing/slotted nut.



17W98RA114

(13) Loosen slotted nut and remove ring gear.



17W98RA115

(14) Multi-disk brake

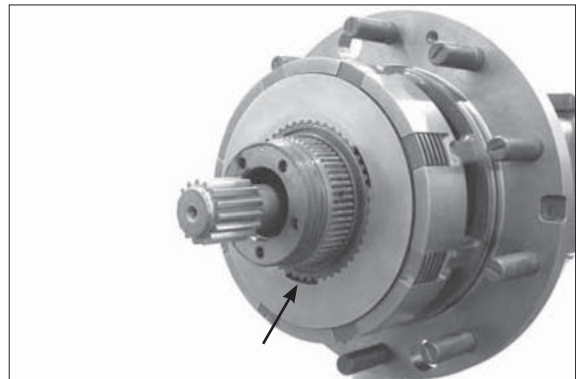
Mount outer and inner disks of the disk package alternately, starting with an outer disk.

※ For the actually required disk fitting/ arrangement please refer to the corresponding spare parts list.



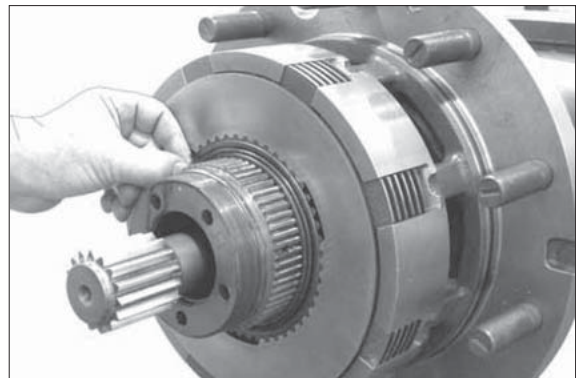
17W98RA116

(15) Bring inner clutch disks into a position where one of the tooth recesses is in 6 o'clock position after installation of the axle into the vehicle.



17W98RA117

(16) Oil O-ring and place it into the annular groove of the disk carrier.



17W98RA118

(17) Oil grooved and back-up rings and insert them into the annular grooves of the ring gear.

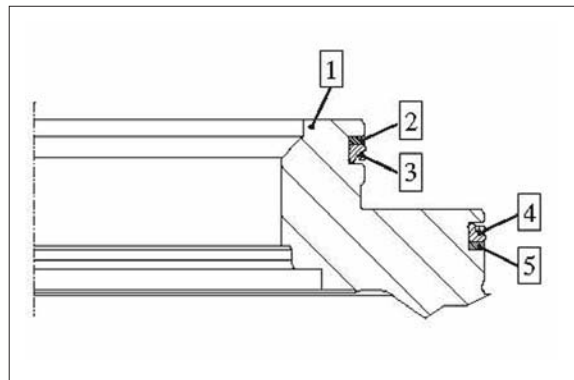
※ Observe installation position, see sketch below.



17W98RA119

(18) Legend to sketch:

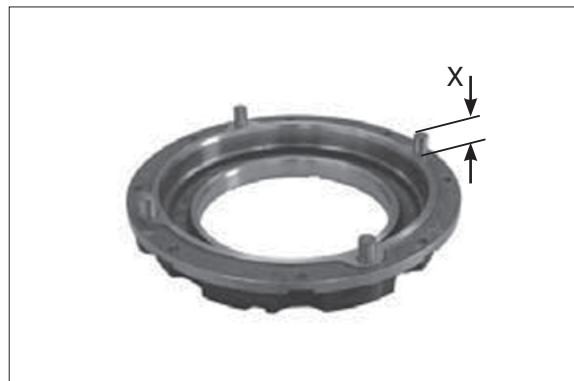
- 1 = Ring gear
- 2 = Back-up ring
- 3 = Grooved ring
- 4 = Grooved ring
- 5 = Back-up ring



17W98RA120

(19) Fit cylindrical pins into the piston, considering the installation dimension "X".

X = Installation dimension18.00 mm



17W98RA121

(20) Mount piston onto ring gear.



17W98RA122

(21) Fix piston with "new" hexagon screws (1), spring sleeves (2) and compression springs (3 and 4).

Tightening torque (M 6/8.8)
 MA = 8 Nm

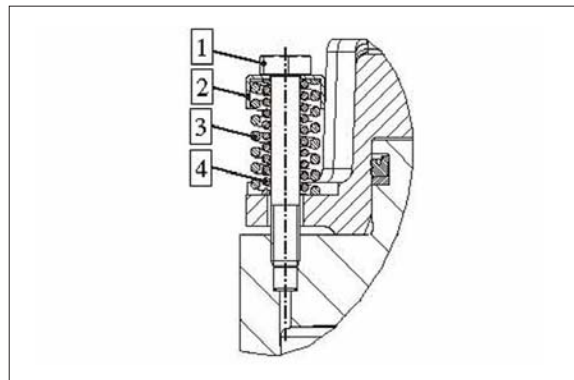
※ Use hexagon screws just once.



17W98RA123

(22) Legend to sketch:

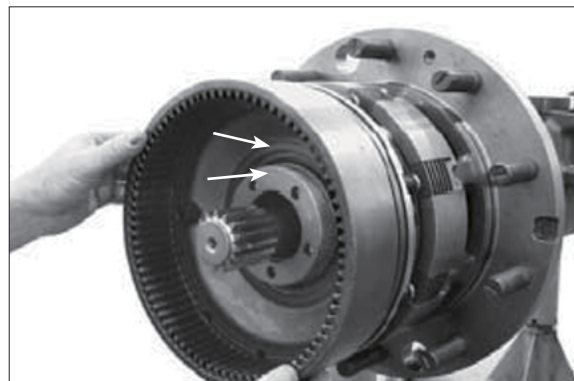
- 1 = Hexagon screw (special version)
- 2 = Spring sleeve
- 3 = Compression spring
- 4 = Compression spring



17W98RA124

(23) Mount preassembled ring gear, considering the installation position (markings O in 12 o'clock position – see arrows).

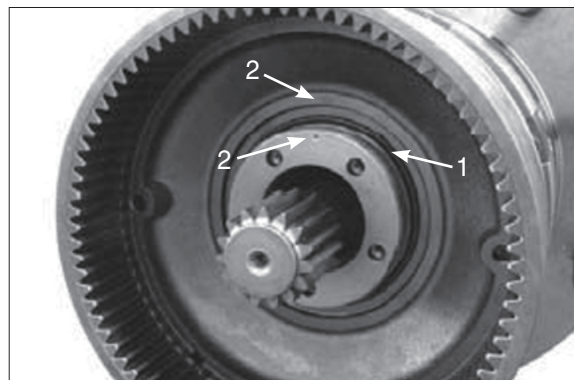
※ Ensure exact tothing position of oil supply holes – hub carrier/ring gear (pressure oil supply to brake piston).



17W98RA125

(24) Oil O-ring and insert it into the recess (see arrow 1).

※ Arrows (2) show once more the markings O and the installation position of hub carrier and ring gear.



17W98RA126

(25) Fix ring gear with slotted nut.

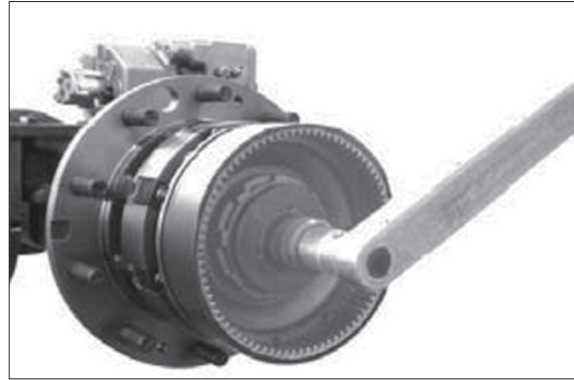
Tightening torque (M85×1.5)
. MA = 1400 + 200 Nm

(S) Socket wrench 5870 656 097

※ Pretighten slotted nut with 1400 Nm, then continue tightening the slotted nut until a fixing hole overlaps a threaded hole in the knuckle housing.

While tightening the slotted nut rotate hub in both directions several times – roller setting.

※ Apply lubricant to thread of knuckle housing/slotted nut.



17W98RA127

(26) Leakage test of multi-disk brake

Fit breather (arrow) and threaded coupling (S), then connect HP pump.

(S) HP pump 5870 287 007

(S) Threaded coupling (M14×1.5) 5870 950 102

※ (S) Breather bottle 5870 286 072

Breathe brake completely before starting the test.



17W98RA128

Test media :

Motor oils SAE-10W

High-pressure test:

Build up test pressure $p = 100$ bar and close shut-off valve of HP pump.

A maximum pressure drop of 3 bar is permissible during a 5-minute test.

Low-pressure test:

Reduce test pressure to $p = 5$ bar and close shut-off valve.

No pressure drop is allowed during a 5-minute test.

(27) Adjustment and check of piston stroke

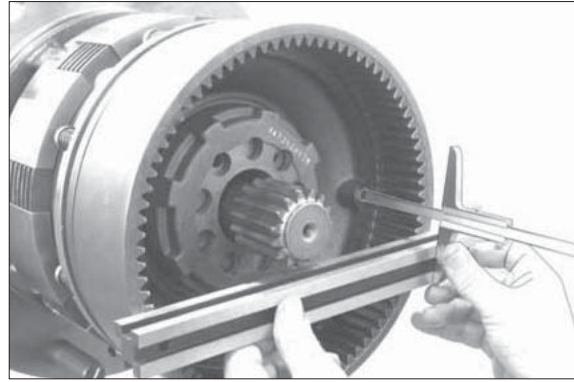
Piston stroke / disk clearance =
0.7 ... 1.3 mm

Build up brake pressure (100 bar) and close shut-off valve of HP pump.

Determine dimension "A", from face of the ring gear (1) through the measuring hole (see also sketch 43) to the face of the piston (3).

Dim. "A" e.g. 83.10 mm

※ Breathe brake completely before starting the measuring operation.

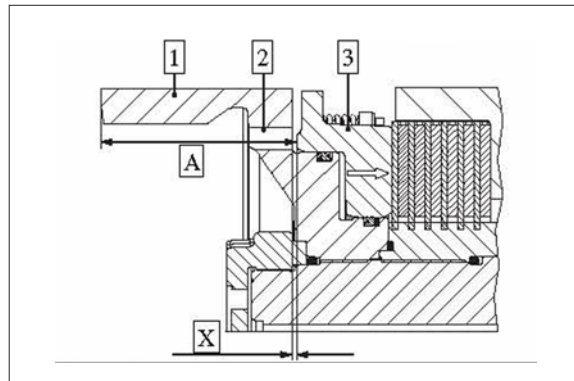


17W98RA129

(28) Then open shut-off valve of HP pump and release pressure from brake (piston return via compression springs).

Determine dimension "B", from the face of the ring gear (1) through the measuring hole (see also sketch RA131) to the face of the piston (3).

Dimension "B" e.g. 82.10 mm



17W98RA130

(29) Calculation example :

Dimension „A“ e.g. 83.10 mm

Dimension „B“ e.g. - 82.10 mm

Difference = piston stroke = 1.00 mm

※ If the required piston stroke (0.7 ... 1.3 mm) is not achieved, correct it with (a) corresponding inner clutch disk(s) – see respective spare parts list.

Then remove HP pump (S), breather bottle (S) and threaded coupling (S).

Legend to sketches RA130 and RA131:

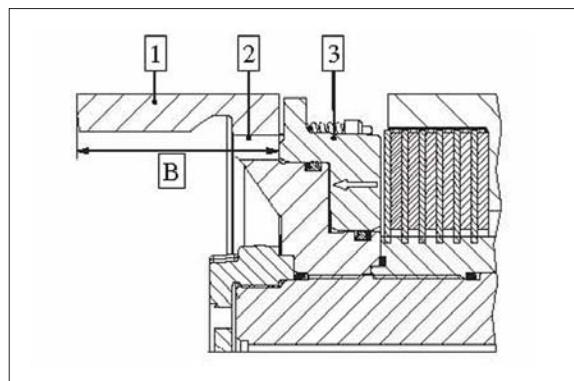
1 = Ring gear

2 = Measuring hole

3 = Piston

X = Piston stroke/disk clearance

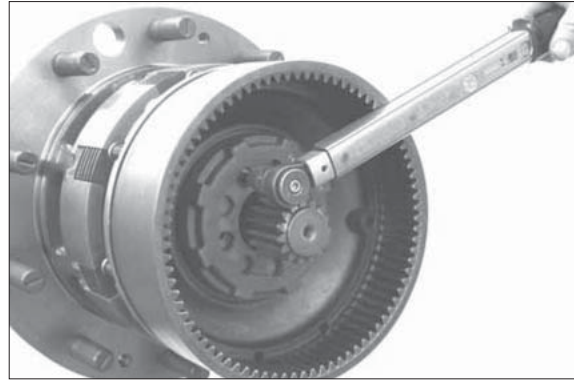
(S) Straightedge 5870 200 022



17W98RA131

(30) Secure slotted nut with cylindrical screw
(see also figure RA127).

Tightening torque (M 10/8.8)
. MA = 32 Nm



17W98RA132

(31) Planetary carrier

Press thrust washer into the planetary carrier until contact is obtained.

(S) Driver tool 5870 048 245



17W98RA133

(32) Insert the cylindrical roller bearing into the planetary gear – for this purpose press the cylindrical roller bearing through the packaging sleeve until the snap ring engages into the annular groove of the planetary gear.

※ Use packaging sleeve to facilitate assembly.

- 1 = Cylindrical roller bearing
- 2 = Packaging sleeve
- 3 = Snap ring
- 4 = Planetary gear



17W98RA134

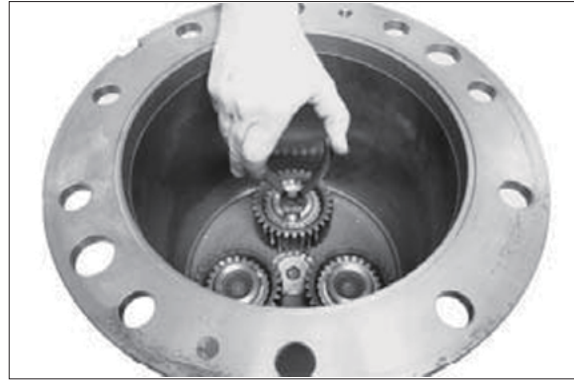
(33) Heat up bearing inner ring and mount preassembled planetary gear until contact is obtained.

※ Mount bearing inner ring with the large radius facing the planetary carrier (downwards).



17W98RA135

(34) Fix planetary gear by means of retaining ring.



17W98RA136

(35) Mount preassembled planetary carrier and fix it with hexagon screws.

Tightening torque (M12/8.8)
..... MA = 55 Nm



17W98RA137

(36) Output assy

Use lifting tackle (S) to locate the output assy at the axle, mount stub shaft into the teeth of the axle bevel gear and fix output assy with hexagon screws.

Tightening torque (M16/10.9)
..... MA = 280 Nm

(S) Lifting bracket 5870 281 043



17W98RA138

- ※ Prior to putting the axle into operation, fill in oil.
- Observe the vehicle manufacturer's instructions and specifications for the installation and commissioning of the unit.

GROUP 11 RCV LEVER

1. REMOVAL AND INSTALL

1) REMOVAL

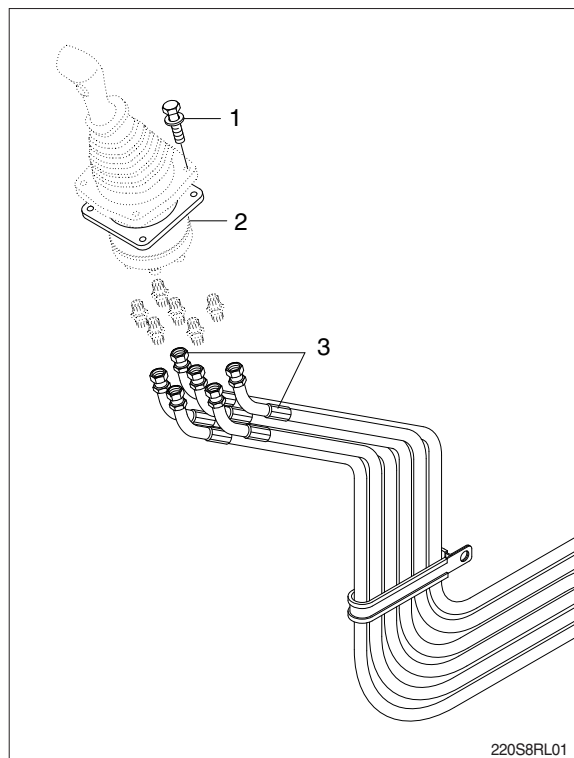
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- (4) Loosen the socket bolt (1).
Tightening torque : $1.05 \pm 0.2 \text{ kgf} \cdot \text{m}$
($7.6 \pm 1.45 \text{ lbf} \cdot \text{ft}$)
- (5) Remove the cover of the console box.
- (6) Disconnect pilot line hoses (3).
- (7) Remove the pilot valve assembly (2).
※ When removing the pilot valve assembly, check that all the hoses have been disconnected.

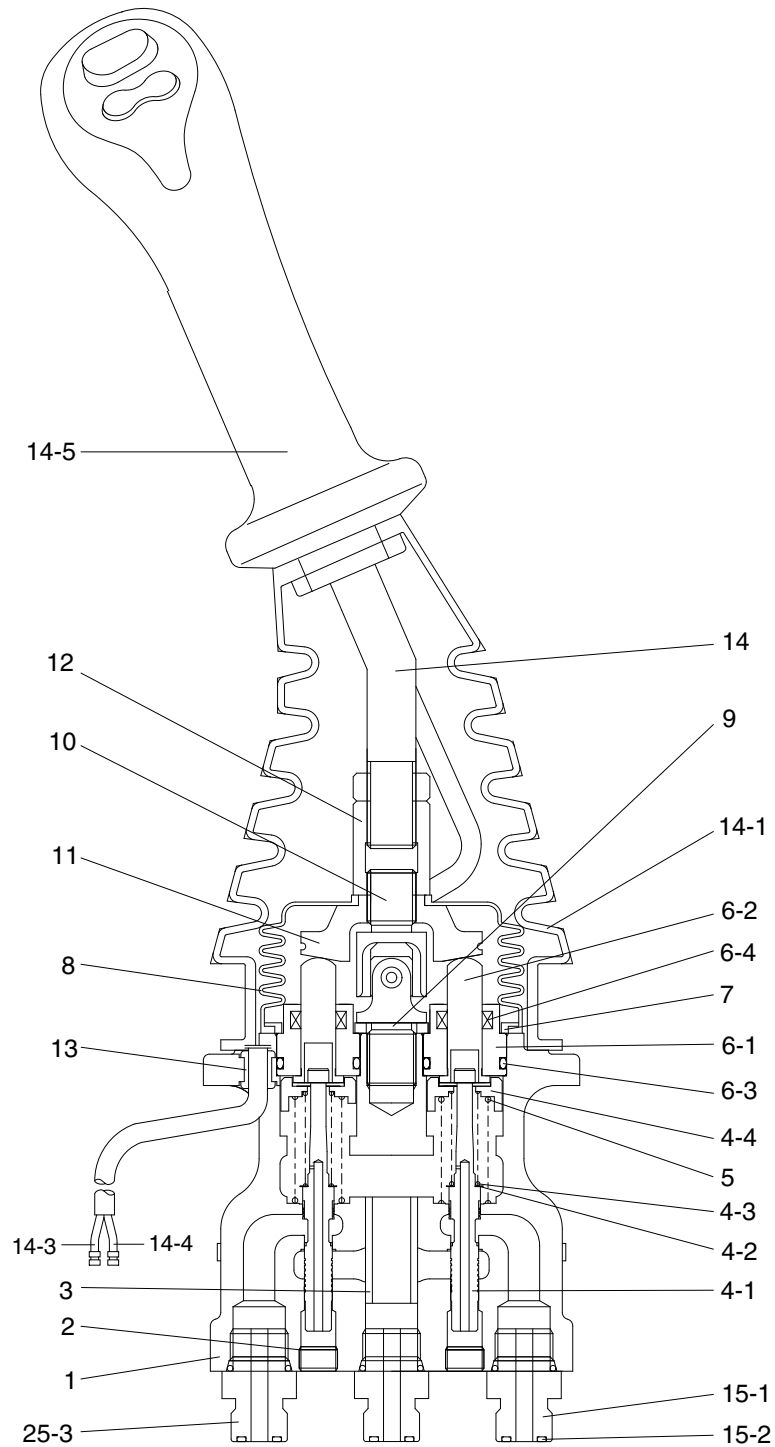
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

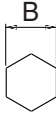


140WA2RL06

1 Case	5 Spring	9 Spacer	14-3 Housing
2 Plug	6-1 Plug	10 Joint Assy	14-4 Housing
3 Bushing	6-2 Push rod	11 Swash plate	14-5 Handle
4-1 Spool	6-3 O-ring	12 Adjusting nut	14-6 Lock nut
4-2 Shim	6-4 Rod seal	13 Bushing	15-1 Filter
4-3 Spring	7 Spacer	14-1 Boot	15-2 Connector
4-4 Spring seat	8 Boot	14-2 Spring pin	15-3 Connector

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	6	
Spanne	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Joint	10	M14	3.5	25.3
Swash plate	11	M14	5.0±0.35	36.2±2.5
Adjusting nut	12	M14	5.0±0.35	36.2±2.5
Lock nut	14-6	M14	5.0±0.35	36.2±2.5

3) DISASSEMBLY

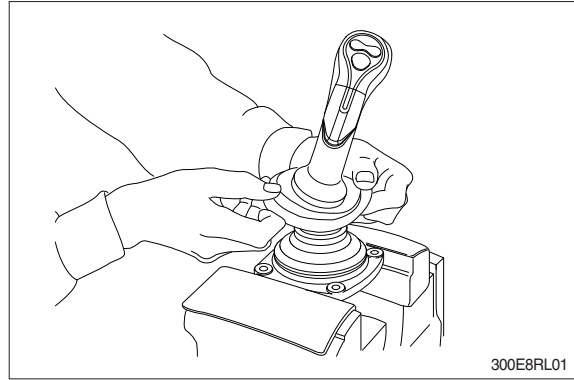
※ Procedures are based on the type M25.

(1) Clean pilot valve with kerosene.

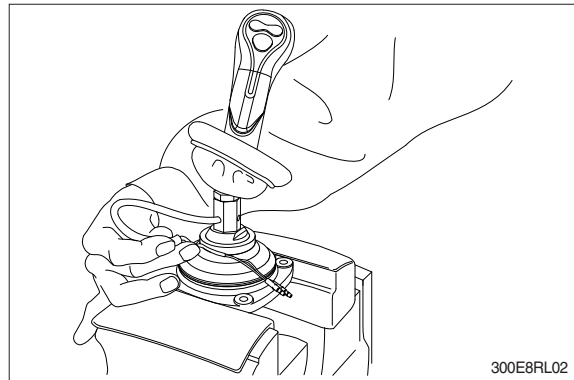
※ Put blind plugs into all ports

(2) Fix pilot valve in a vise with copper (or lead) sheets.

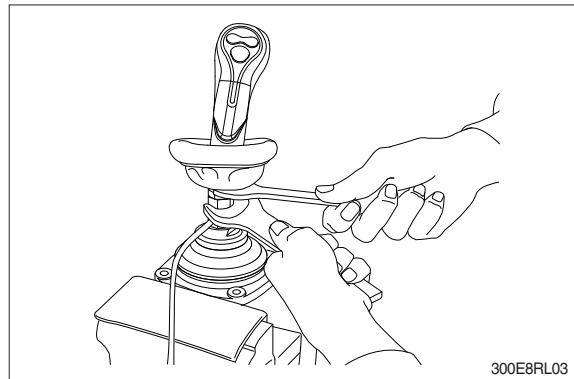
(3) Remove end of boot (14-1) from case (1) and take it out upwards.



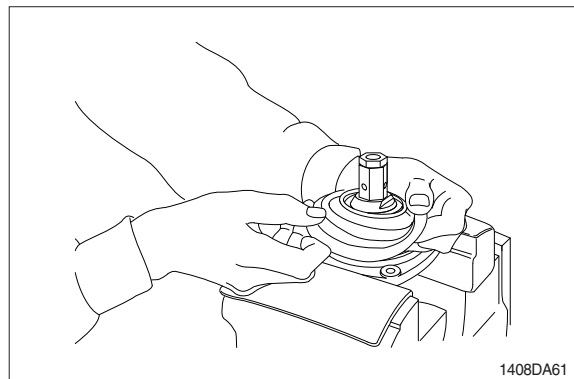
※ For valve with switch, remove cord also through hole of casing.



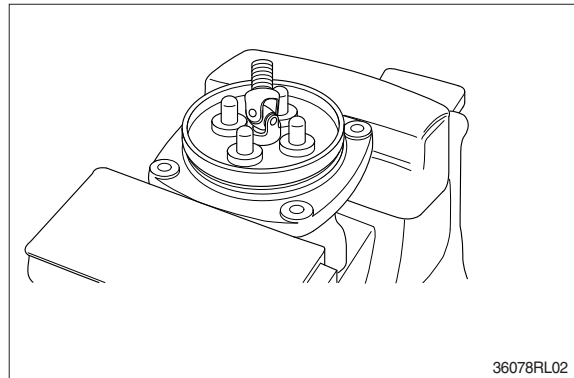
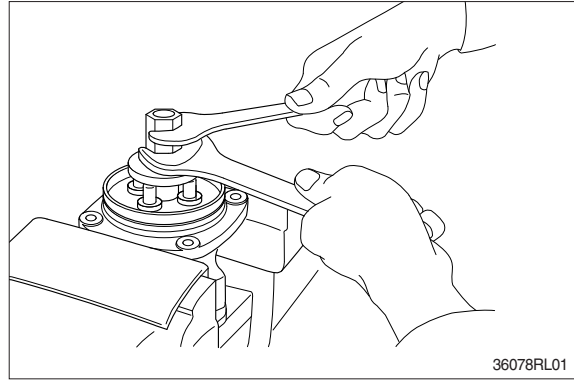
(4) Loosen lock nut (14-6) and adjusting nut (12) with spanners on them respectively, and take out handle section as one body.



(5) Remove the boot (8).

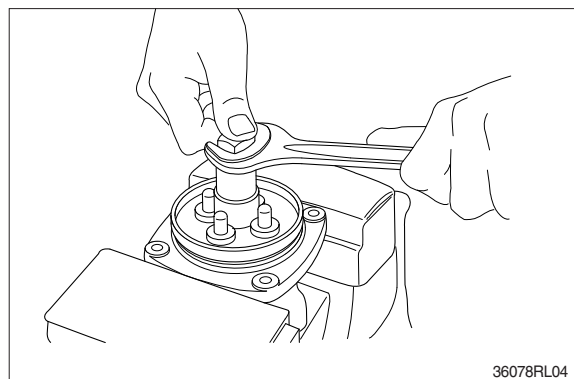
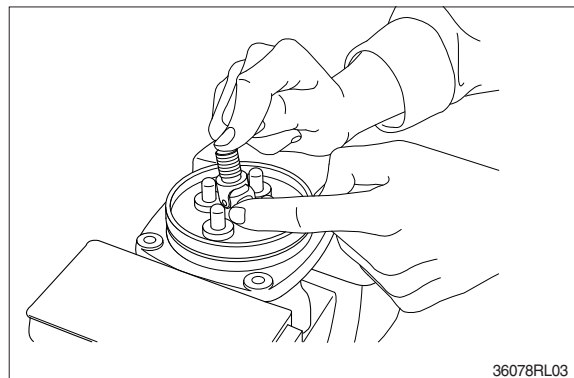


- (6) Loosen adjusting nut (12) and swash plate (11) with spanners on them respectively, and remove them.

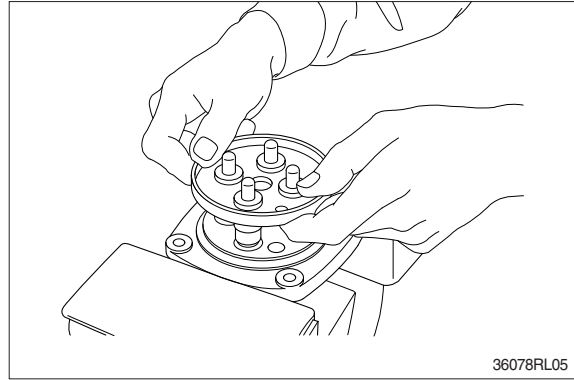


- (7) Turn joint anticlockwise to loosen it, utilizing jig (Special tool).

- ※ When return spring (5) is strong in force, plate (7), plug (6-1) and push rod (6-2) will come up on loosening joint. Pay attention to this.

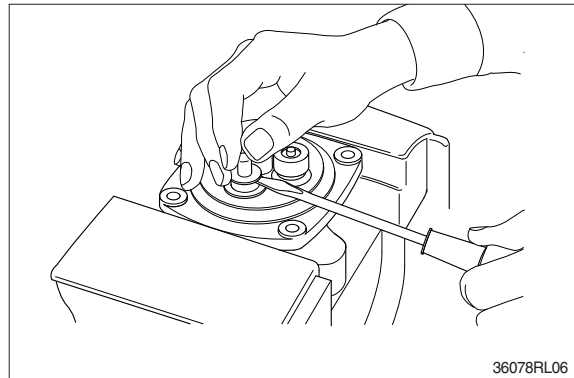


(8) Remove plate (7-1).



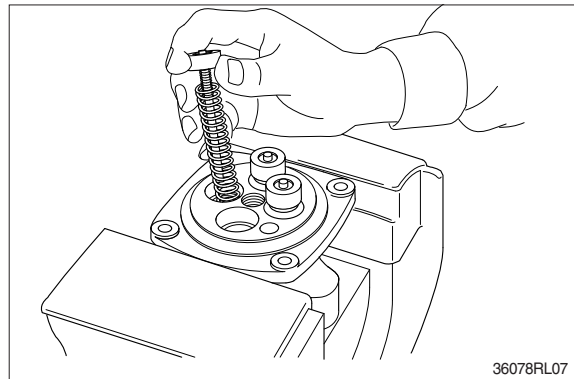
(9) When return spring (5) is weak in force, plug (6-1) stays in casing because of sliding resistance of O-ring.

- ※ Take it out with minus screwdriver. Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.
- ※ During taking out, plug may jump up due to return spring (5) force. Pay attention to this.



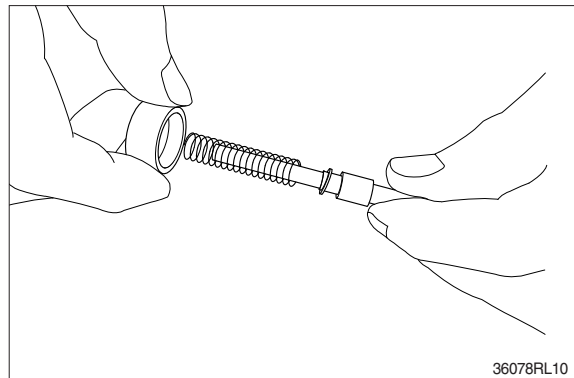
(10) Remove reducing valve subassembly and return spring (5) out of casing.

- ※ Record relative position of reducing valve subassembly and return springs.

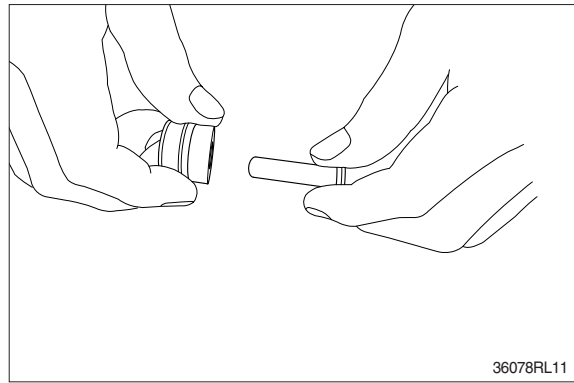


(11) Separate spool (4-1), spring seat (4-4), spring (4-3) and shim (4-2) individually.

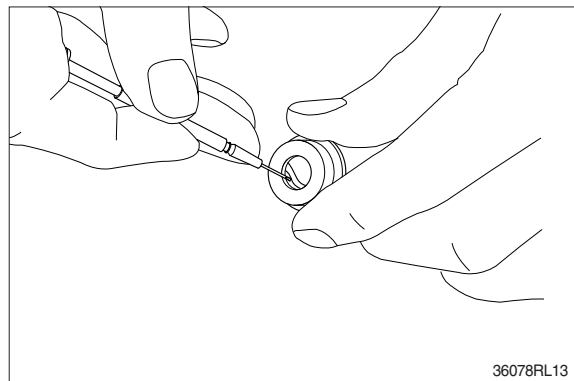
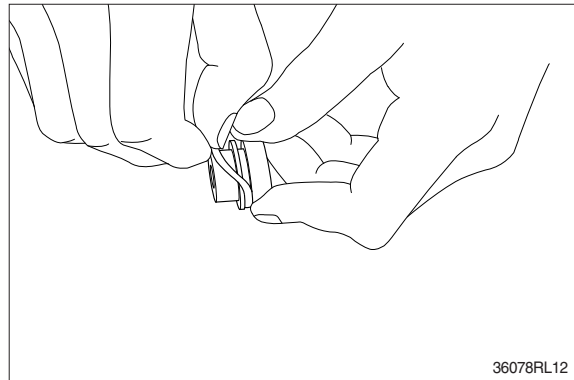
- ※ Pay attention not to damage spool surface.
- ※ Record original position of spring seat (4-4).
- ※ Until being assembled, they should be handled as one subassembly group.



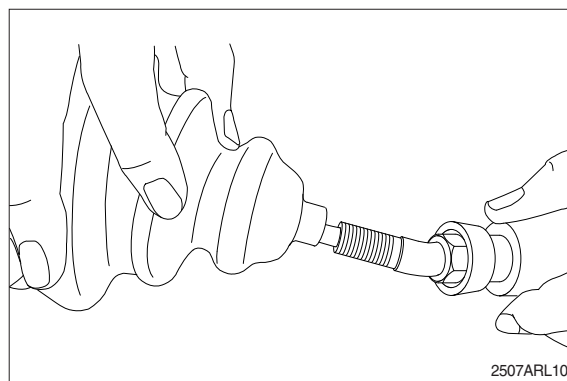
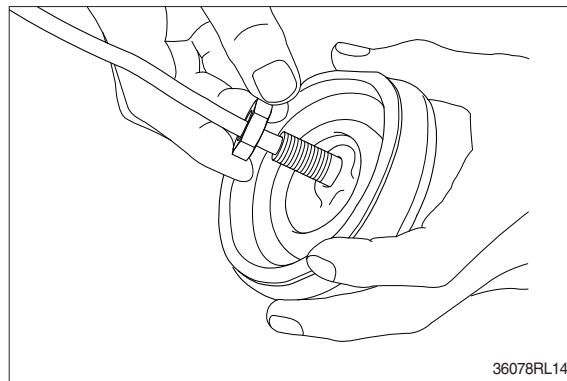
(12) Take push rod (6-2) out of plug (6-1).



(13) Remove O-ring (8-3) and seal (6-4) from plug (6-1).
Use small minus screwdriver or so on to remove this seal.



(14) Remove lock nut (14-6) and then boot (14-1).



(15) Cleaning of parts

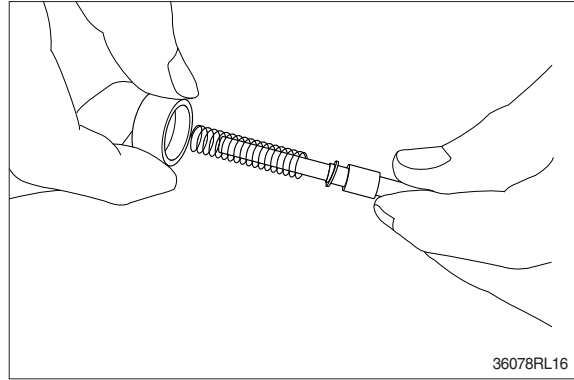
- ① Put all parts in rough cleaning vessel filled with kerosene and clean them (rough cleaning).
 - ※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.
 - ※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.
Therefore, control cleanliness of kerosene fully.
- ② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides (finish cleaning).
 - ※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

(16) Rust prevention of parts

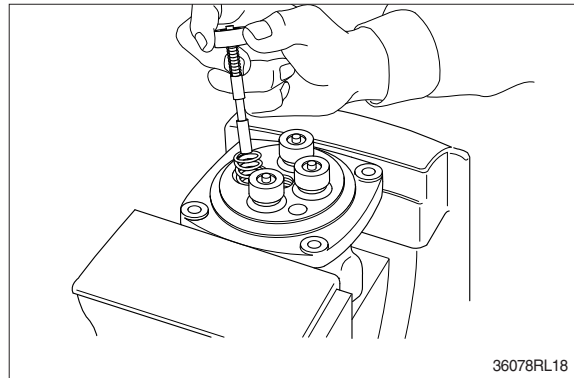
- Apply rust-preventives to all parts.
- ※ If left as they are after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

4) ASSEMBLY

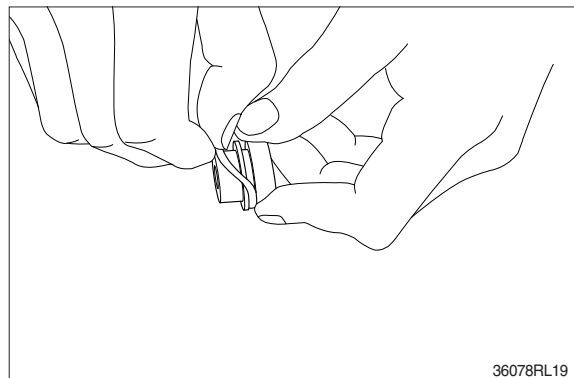
- (1) Put shim (4-2), springs (4-3) and spring seat (4-4) onto spool (3) in this order.



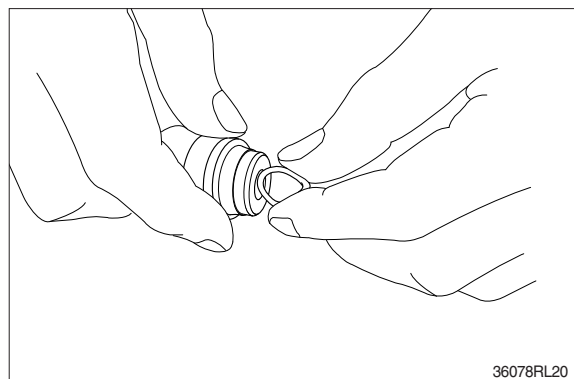
- (2) Assemble spring (5) into casing (1).
Assemble reducing valve subassembly into casing.
※ Assemble them to their original positions.



- (3) Assemble O-ring (8-3) onto plug (6-1).

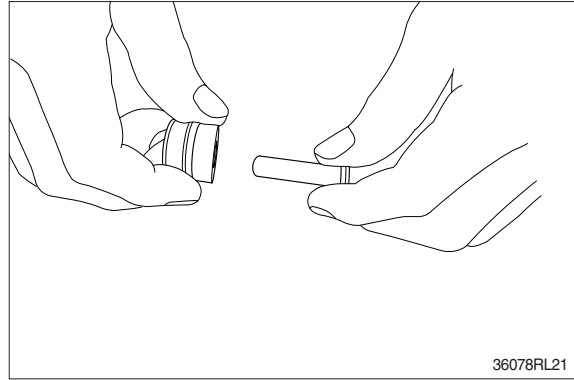


- (4) Assemble seal (6-4) to plug (6-1).
※ Assemble seal in such lip direction as shown below.



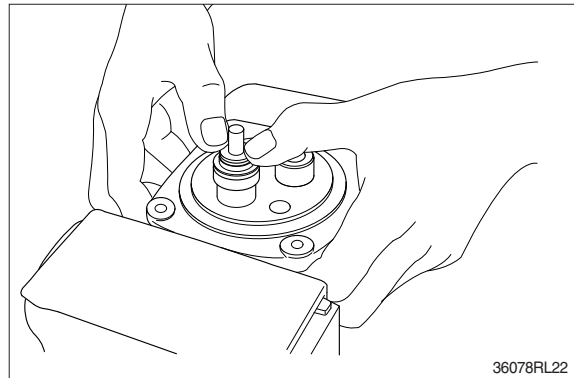
(5) Assemble push rod (6-2) to plug (6-1).

※ Apply working oil on push-rod surface.

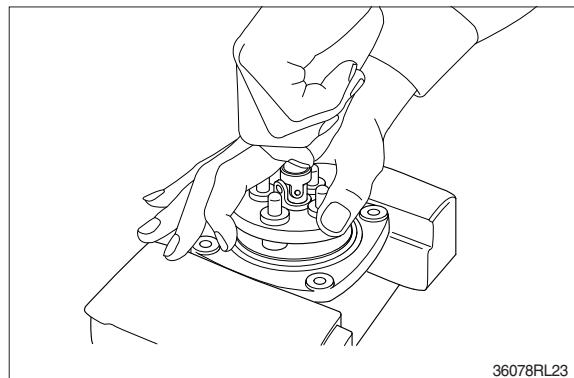


(6) Assemble plug subassembly to casing.

※ When return spring is weak in force, subassembly stops due to resistance of O-ring.

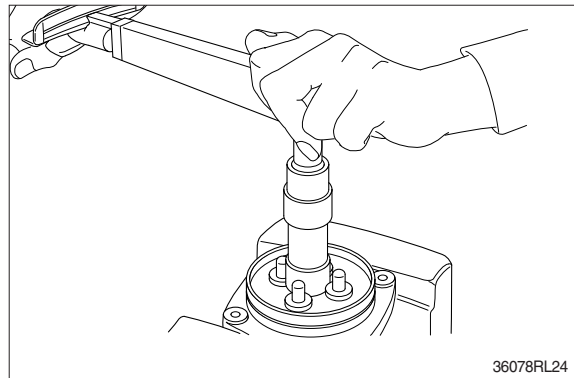


(7) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (7), and tighten joint (10) temporarily.

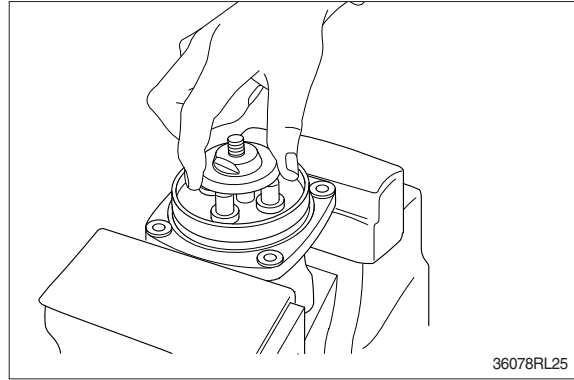


(8) Fit plate (7).

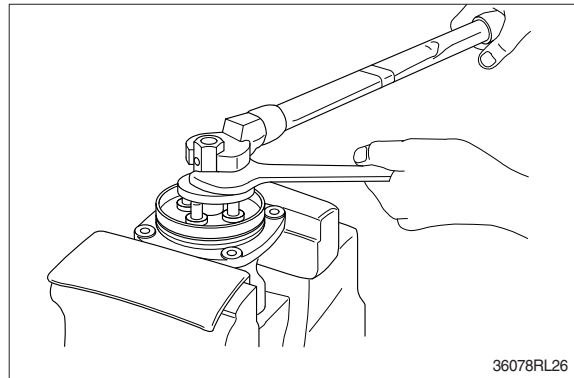
(9) Tighten joint (10) with the specified torque to casing, utilizing jig.



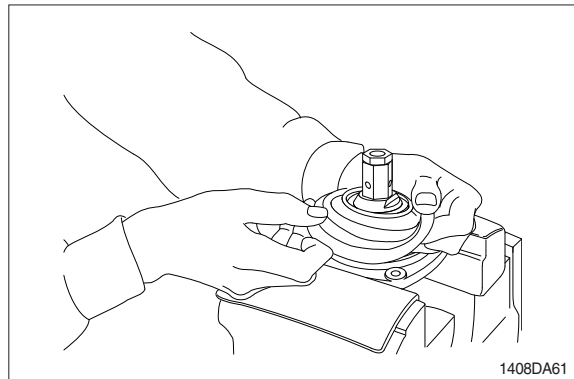
- (10) Assemble swash plate (11) to joint (10).
- ※ Screw it to position that it contacts with 4 push rods evenly.
 - ※ Do not screw it over.



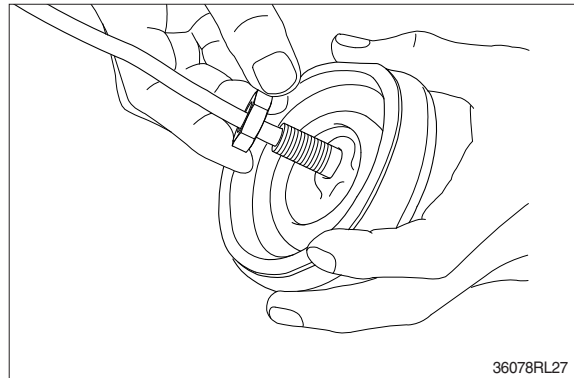
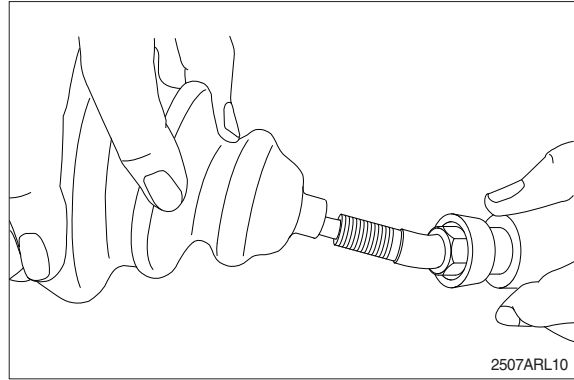
- (11) Assemble adjusting nut (12), apply spanner to width across flat of plate (11) to fix it, and tighten adjusting nut to the specified torque.
- ※ During tightening, do not change position of disk.



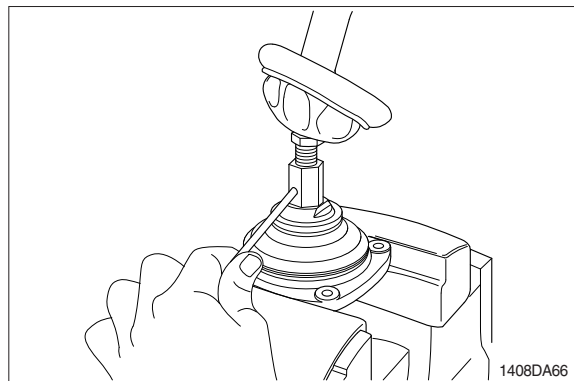
- (12) Fit boot (8) to plate.



(13) Fit boot (14-1) and lock nut (14-6), and handle subassembly is assembled completely.

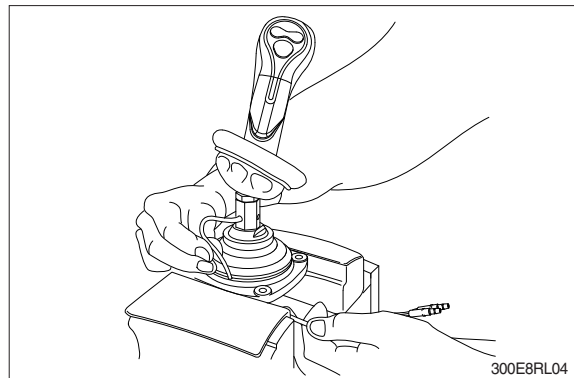


(14) Pull out cord and tube through adjusting nut hole provided in direction 60 ° to 120 ° from casing hole.

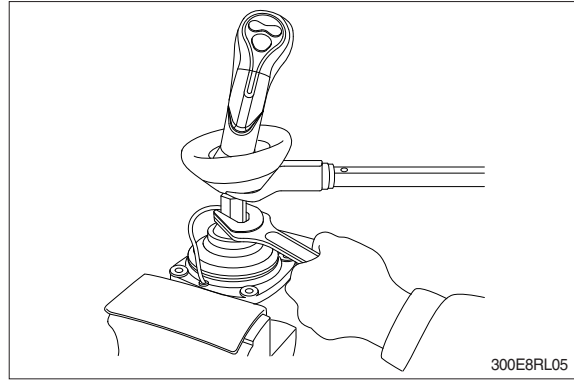


(15) Assemble bushing (13) to plate and pass cord and tube through it.

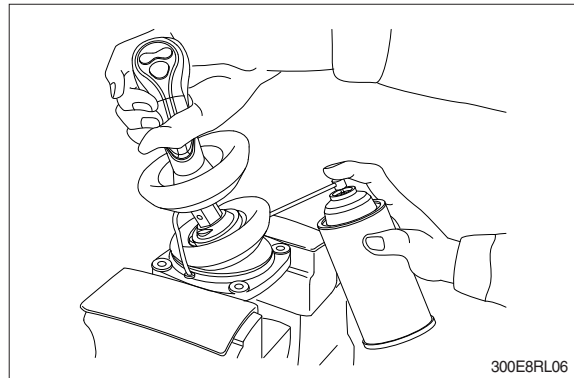
※ Provide margin necessary to operation.



(16) Determine handle direction, tighten lock nut (14-6) to specified torque to fix handle.

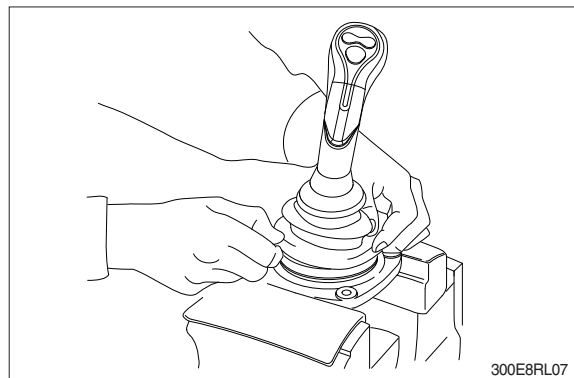


(17) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(18) Assemble lower end of bellows to casing.

(19) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



GROUP 12 TURNING JOINT

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

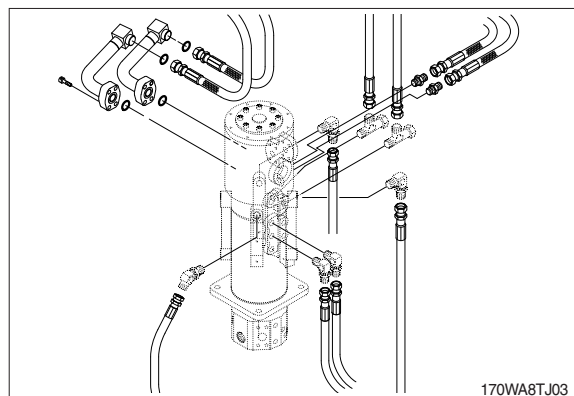
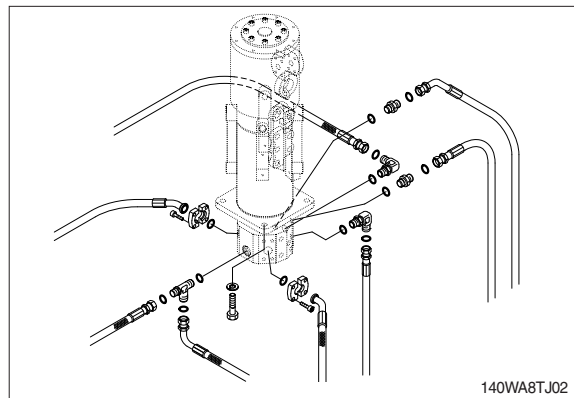
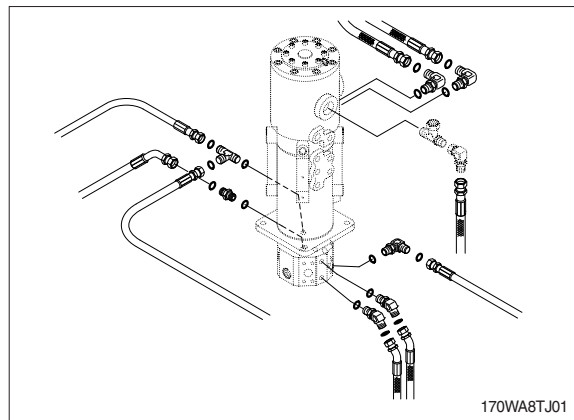
▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Disconnect all hoses.
- (5) Sling the turning joint assembly (1) and remove the mounting bolt (2).
 - Weight : 117 kg (260 lb)
 - Tightening torque : $12.8 \pm 3.0 \text{ kgf} \cdot \text{m}$
($92.6 \pm 21.7 \text{ lbf} \cdot \text{ft}$)
- (6) Remove the turning joint (1) assembly.
 - ※ When removing the turning joint, check that all the hoses have been disconnected.

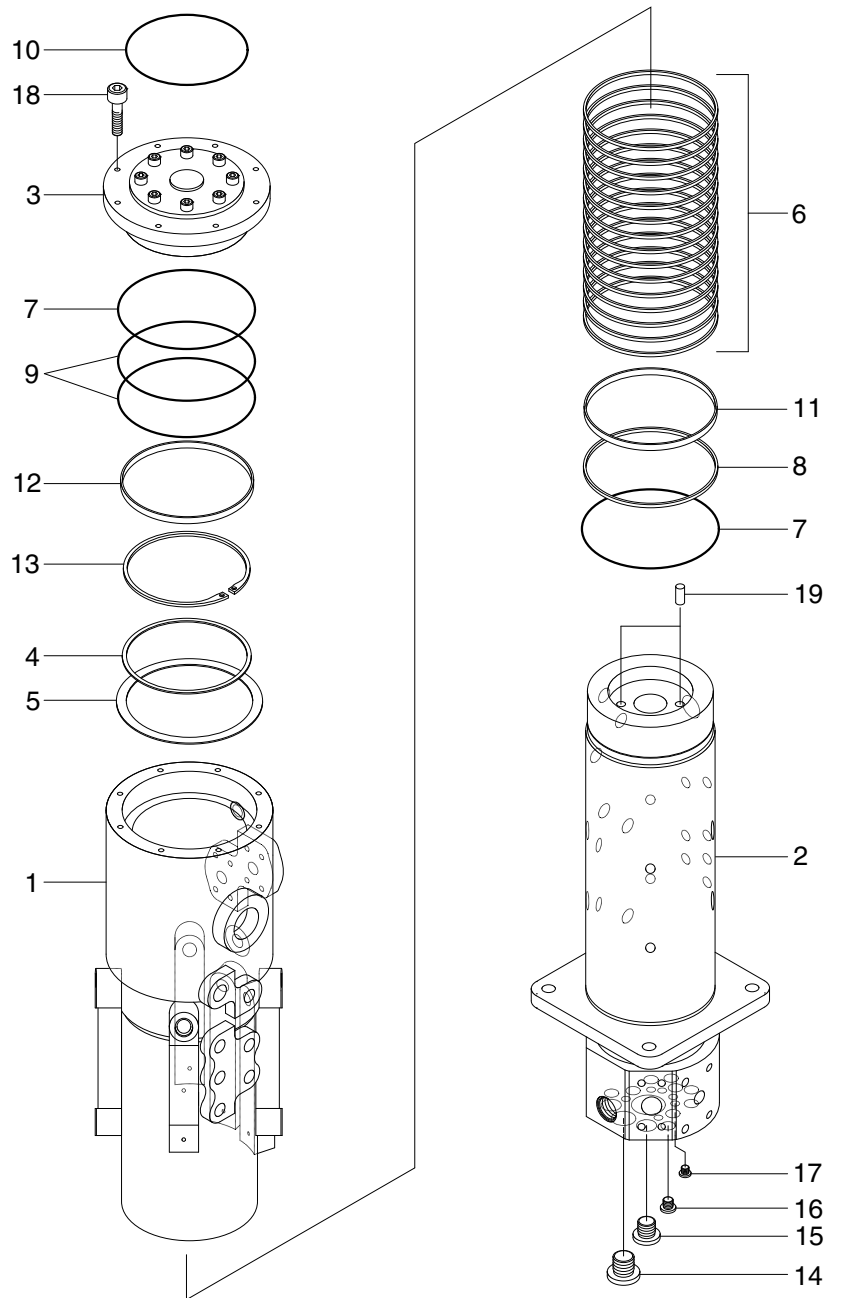
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - ※ Take care of turning joint direction.
 - ※ Assemble hoses to their original positions.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



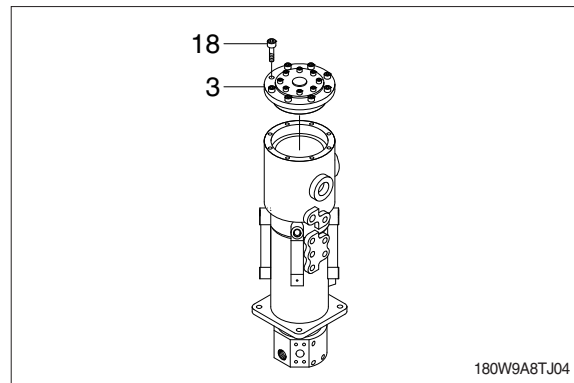
- | | | | | | |
|---|--------------|----|---------------|----|-------------|
| 1 | Hub | 8 | O-ring | 15 | Plug |
| 2 | Shaft | 9 | O-ring | 16 | Plug |
| 3 | Cover | 10 | O-ring | 17 | Plug |
| 4 | Spacer | 11 | Wear ring | 18 | Socket bolt |
| 5 | Shim | 12 | Wear ring | 19 | Spring pin |
| 6 | Slipper seal | 13 | Retainer ring | | |
| 7 | O-ring | 14 | Plug | | |

180W9A8TJ03

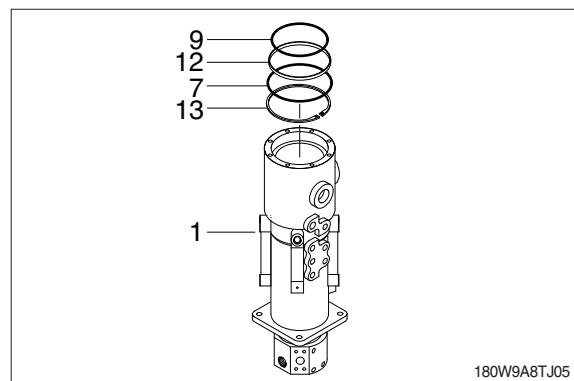
2) DISASSEMBLY

※ Before the disassembly, clean the turning joint.

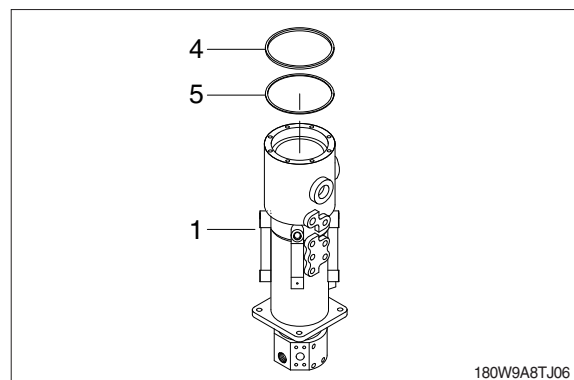
(1) Loosen the socket bolt (18) and remove cover (3).



(2) Remove O-ring (9), wear ring (12), O-ring (7) and retainer ring (13) from hub (1).



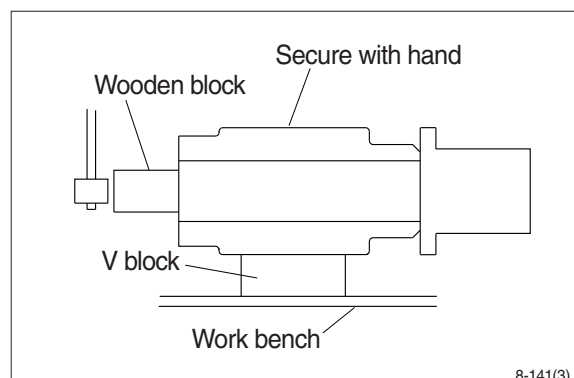
(3) Remove spacer (4) and shim (5) from hub (1).



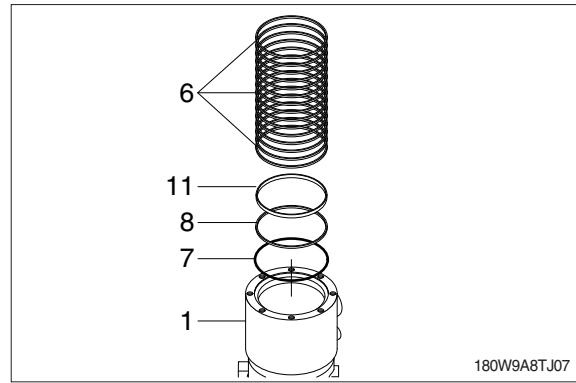
(4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the hub with a hammer.

※ Take care not to damage the shaft (2) when remove hub (1) or rest it sideways.

※ Put a fitting mark on hub (1) and shaft (2).



(5) Remove seventeen slipper seal (6), O-ring (7, 8) and wear ring (11) from hub (1).

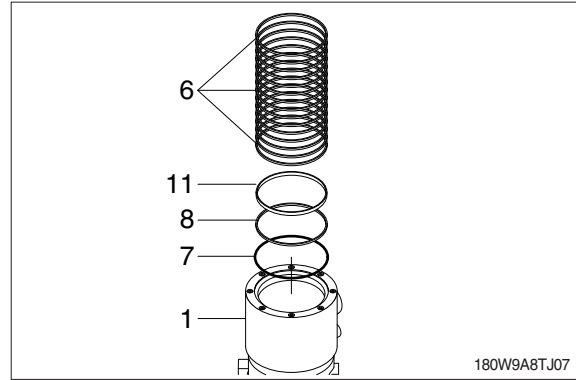


3) ASSEMBLY

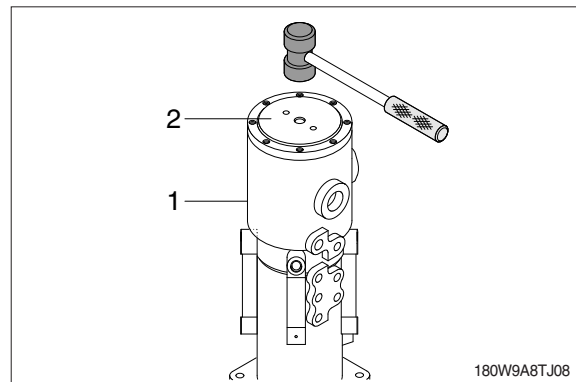
- ※ Clean all parts.
- ※ As a general rule, replace oil seals and O-ring.
- ※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fit O-ring (8), seventeen slipper seal (6), and wear ring (11).

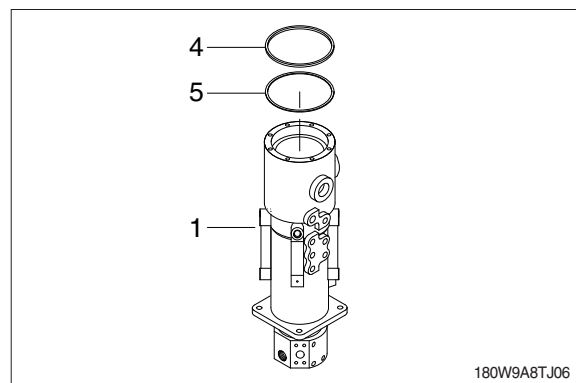
(2) Fit O-ring (7) to shaft (2).



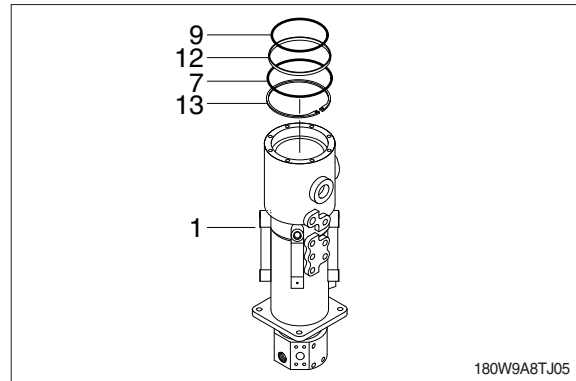
(3) Set shaft (2) on block, tap hub (1) with a plastic hammer to install.



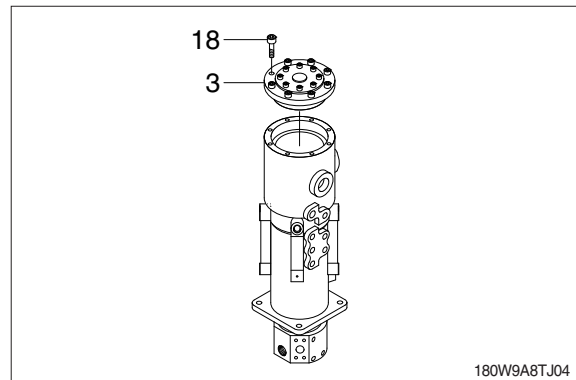
(4) Fit shim (5), and spacer (4) to hub (1) of turning joint upside.



- (5) Fit retainer ring (13), O-ring (7) and wear ring (12) to shaft (2).
- (6) Fit O-ring (9) to hub (1).



- (7) Install cover (3) to hub and tighten bolts (18).
- Torque : $2.35 \pm 0.35 \text{ kgf} \cdot \text{m}$
($17.0 \pm 2.5 \text{ lbf} \cdot \text{ft}$)



GROUP 13 BOOM, ARM, BUCKET, DOZER AND OUTRIGGER CYLINDER

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

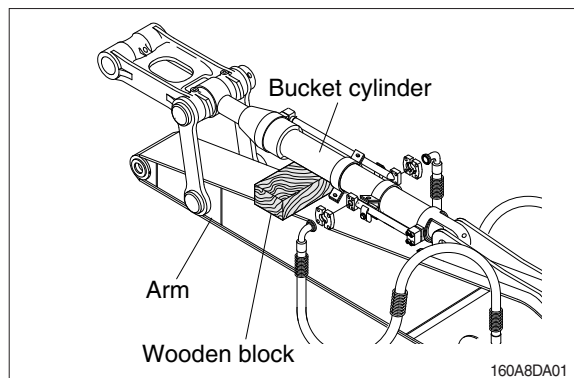
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

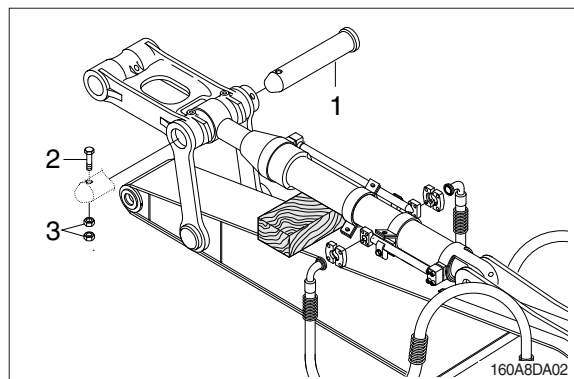
① Set block between bucket cylinder and arm.



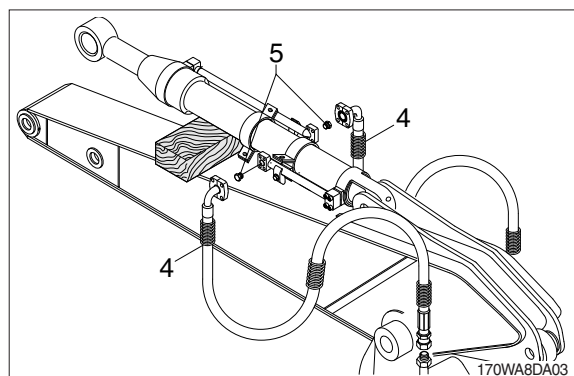
② Remove bolt (2), nut (3) and pull out pin (1).

- ※ Tie the rod with wire to prevent it from coming out.

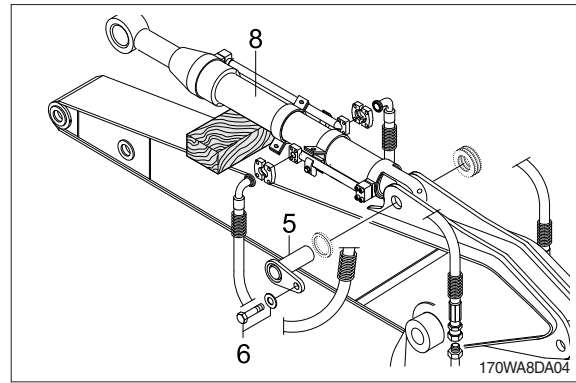
· Tightening torque (2) : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)



③ Disconnect bucket cylinder hoses (4), and put plugs (5) on cylinder pipe.



- ④ Sling bucket cylinder assembly (8) and remove bolt (6) then pull out pin (5).
- ⑤ Remove bucket cylinder assembly (8).
 - Weight : 123 kg (270 lb)
 - Tightening torque (6) : 29.7 ± 4.5 kgf · m
(215 ± 32.5 lbf · ft)



(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the bucket cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2) ARM CYLINDER

(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

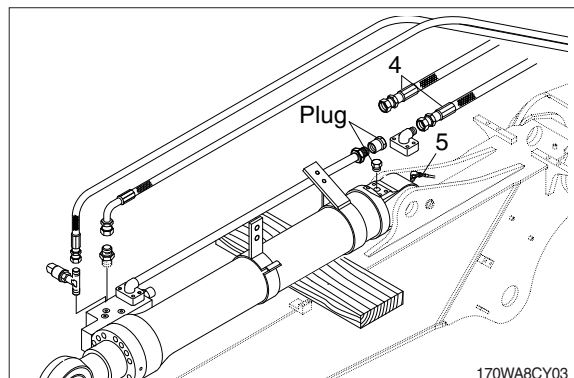
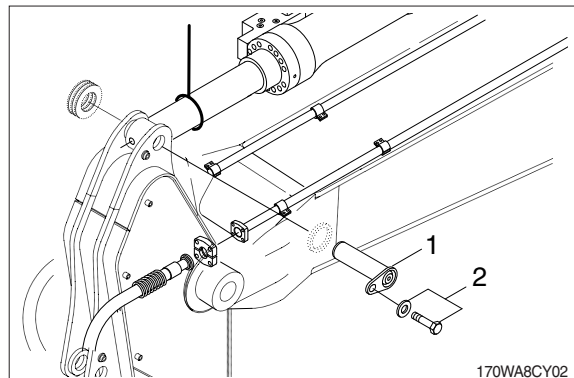
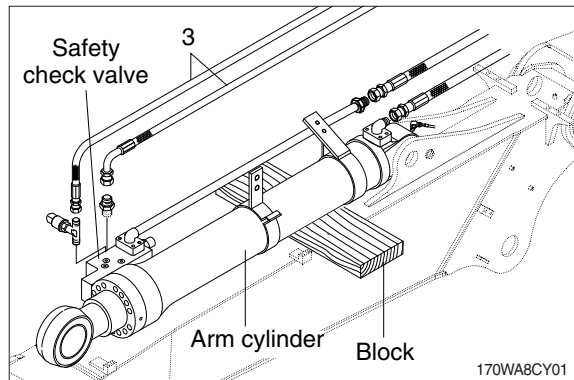
▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Set block between arm cylinder and boom.
 - ② Disconnect arm cylinder hoses (3) and put plugs on safety check valve.

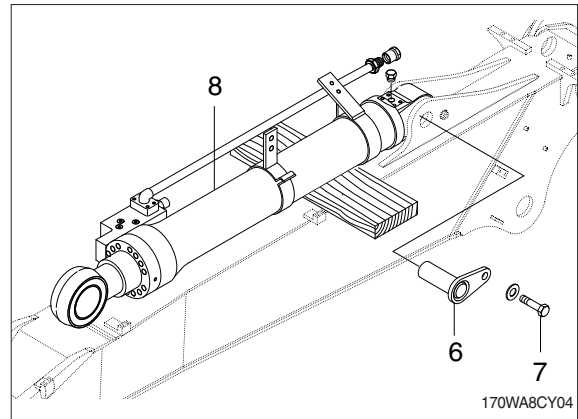
- ③ Remove bolt (2) and pull out pin (1).

- ※ Tie the rod with wire to prevent it from coming out.
 - Tightening torque (2) : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)

- ④ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.
- ⑤ Disconnect greasing pipings (5).



- ⑥ Sling arm cylinder assembly(8) and remove bolt (7) then pull out pin (6).
 - Tightening torque (7) : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)
- ⑦ Remove arm cylinder assembly (8).
 - Weight : 169 kg (370 lb)



(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the arm cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) DOZER CYLINDER

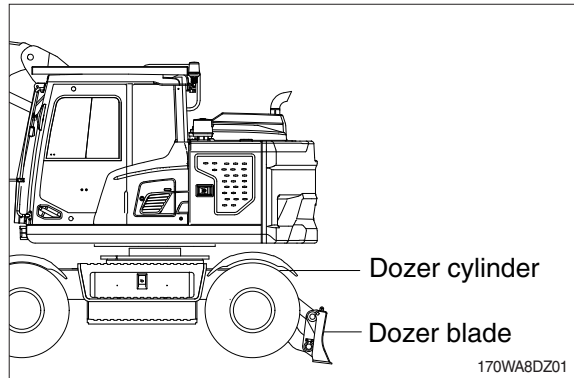
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

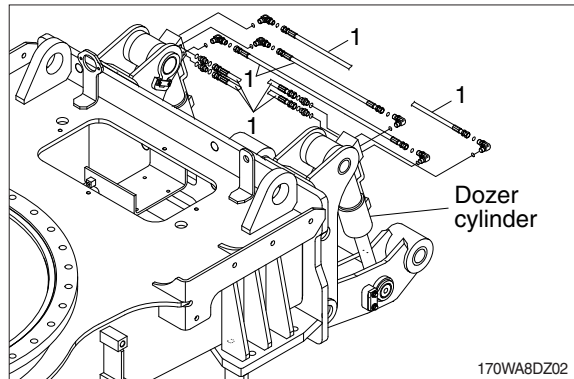
▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Lower the dozer blade to the ground.



② Disconnect dozer cylinder hoses (1), and put plugs on cylinder pipe.

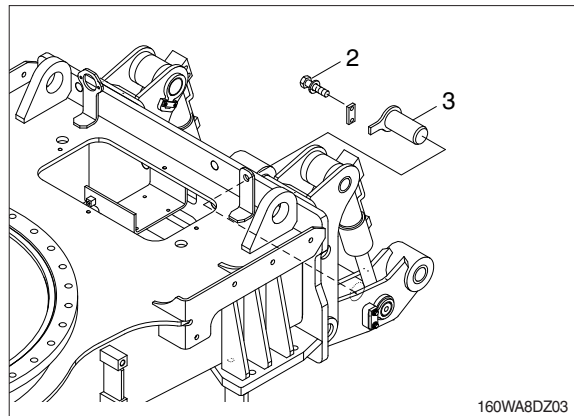


③ Sling dozer cylinder assembly.

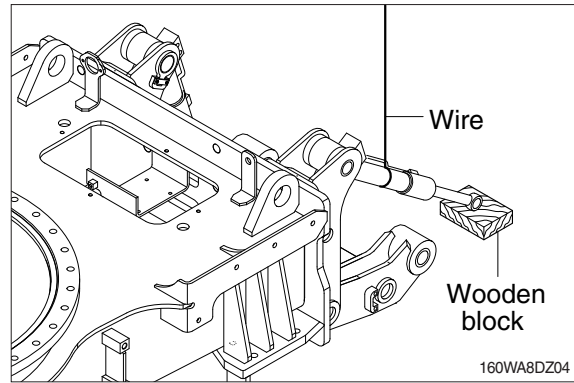
④ Remove bolt (2) and pull out pin (3).

- Tightening torque (2) : 12.8 ± 3.0 kgf · m
(92.6 ± 21.7 lbf · ft)

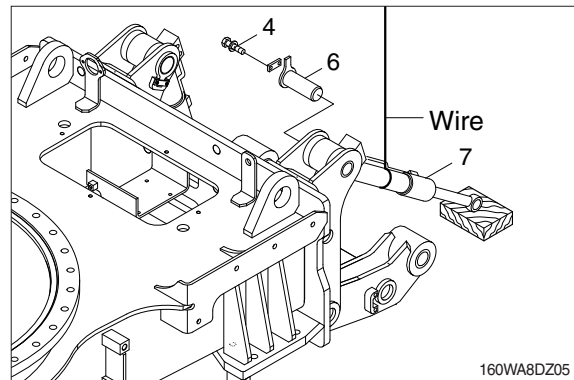
- ※ Tie the rod with wire to prevent it from coming out.



- ⑤ Lower the dozer cylinder rod side on a wooden block.



- ⑥ Loosen the bolt (4) and nut (5), and pull out pin (6).
· Tightening torque (4) : 12.8 ± 3.0 kgf · m
(92.6 ± 21.7 lbf · ft)
- ⑦ Remove the dozer cylinder assy (7).
· Weight : 43 kg (95 lb)



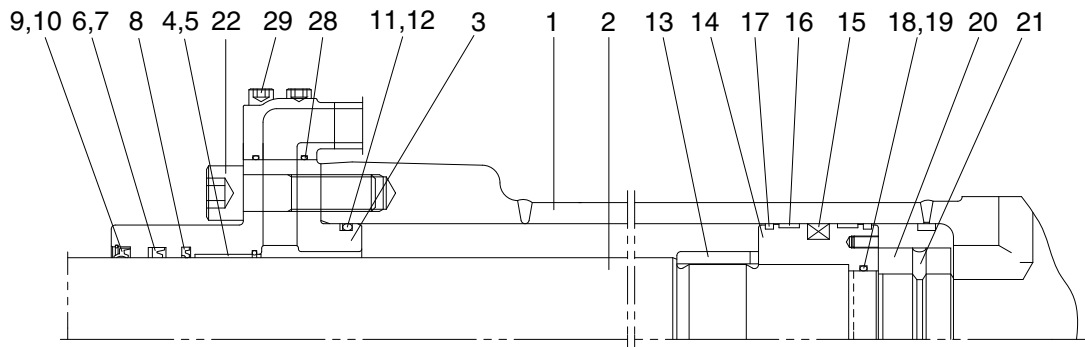
(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the dozer cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

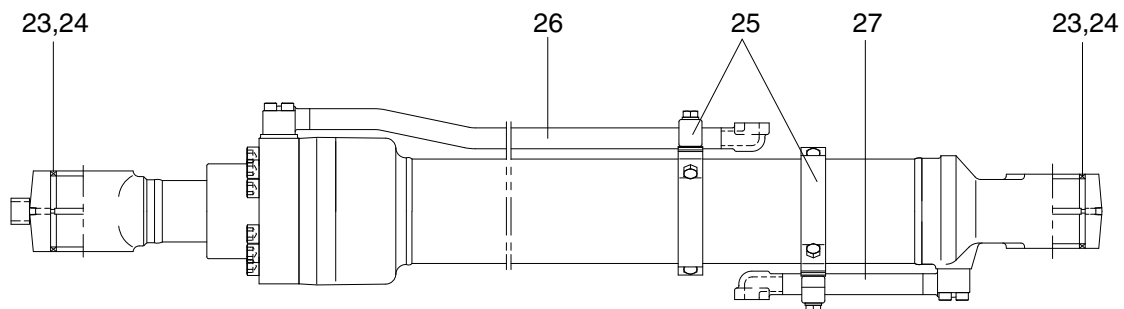
2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder



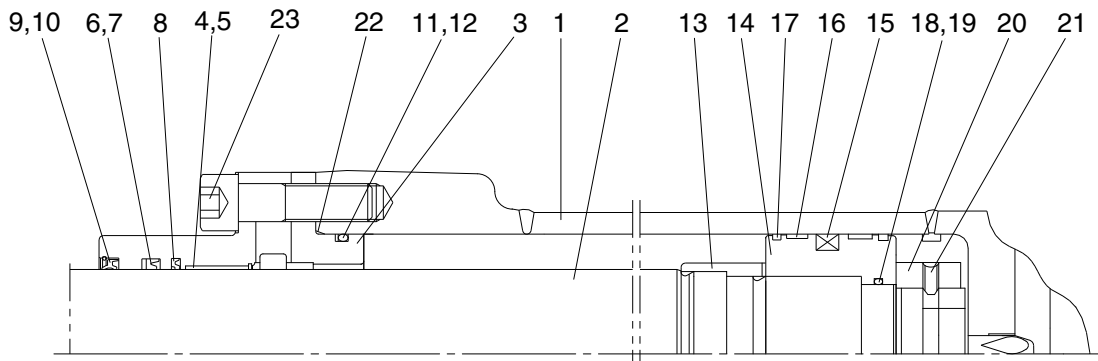
Internal detail



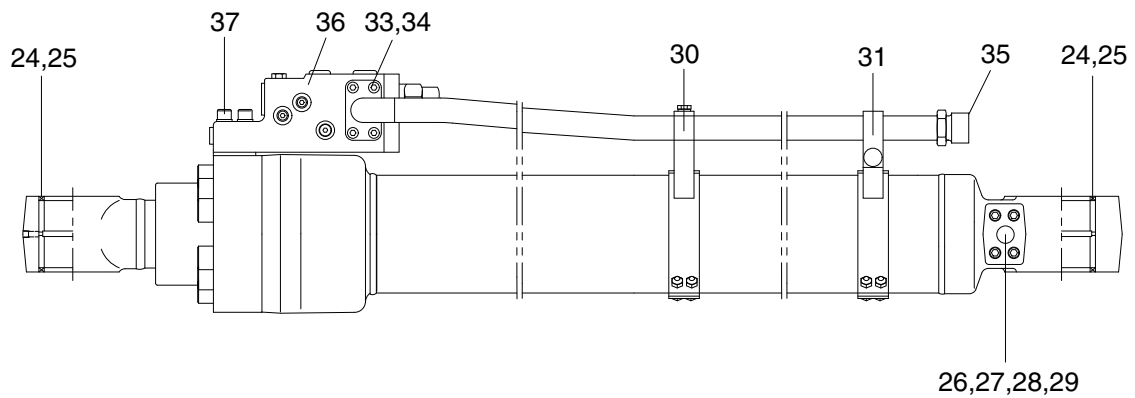
32Q5-60110CGG

1	Tube assembly	11	O-ring	21	Hex socket headless set screw
2	Rod assembly	12	Back up ring	22	Hexagon socket head bolt
3	Gland	13	Cushion ring	23	Dimple bushing
4	DD2 bushing	14	Piston	24	Dust seal
5	Snap ring	15	Piston seal	25	Band assembly
6	Rod seal	16	Wear ring	26	Pipe assembly-R
7	Back up ring	17	Dust ring	27	Pipe assembly-B
8	Buffer ring	18	O-ring	28	O-ring
9	Dust wiper	19	Back up ring	29	Hexagon socket head bolt
10	Snap ring	20	Lock nut		

(2) Arm cylinder



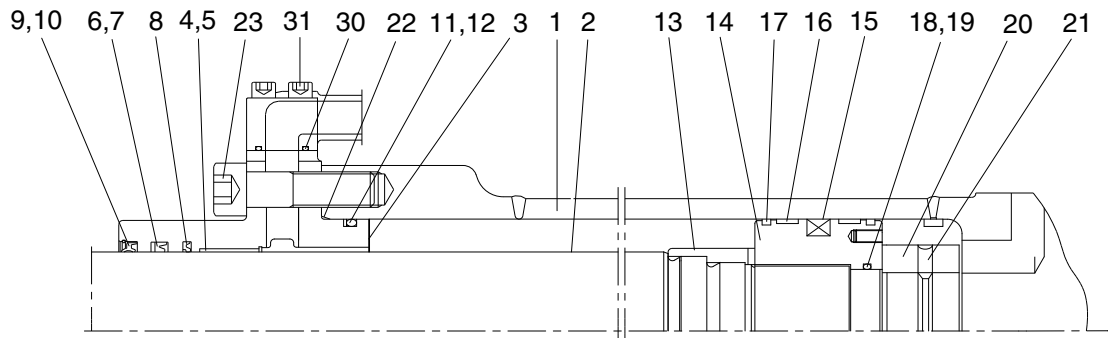
Internal detail



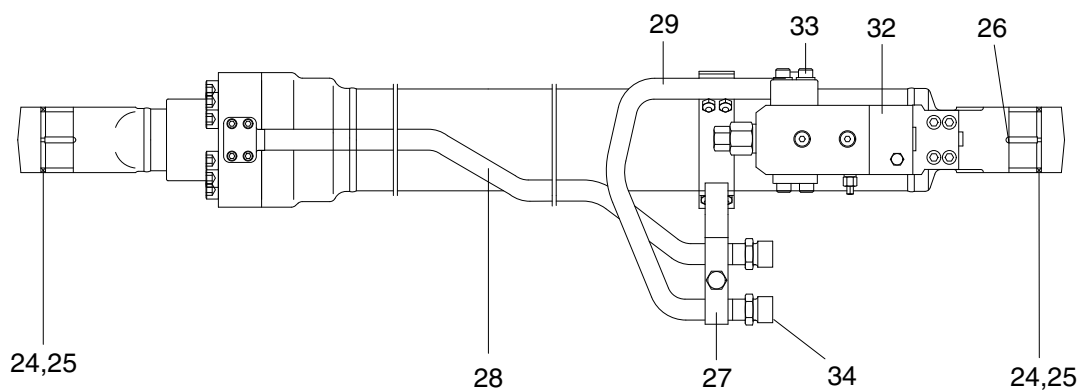
HCK5-53130GG

1	Tube assembly	14	Piston	27	Coil spring
2	Rod assembly	15	Piston seal	28	O-ring
3	Gland	16	Wear ring	29	Check valve
4	DU bushing	17	Dust ring	30	Band assembly-R
5	Snap ring	18	O-ring	31	Band assembly-B
6	Rod seal	19	Back up ring	32	Pipe assembly-R
7	Back up ring	20	Lock nut	33	O-ring
8	Buffer ring	21	Hex socket headless set screw	34	Hexagon socket head bolt
9	Dust wiper	22	O-ring	35	O-ring
10	Snap ring	23	Hexagon socket head bolt	36	Safety lock valve
11	O-ring	24	Dimple bushing	37	Hexagon socket head bolt
12	Back up ring	25	Dust seal		
13	Cushion ring	26	Plug		

(3) Boom cylinder (2 piece)



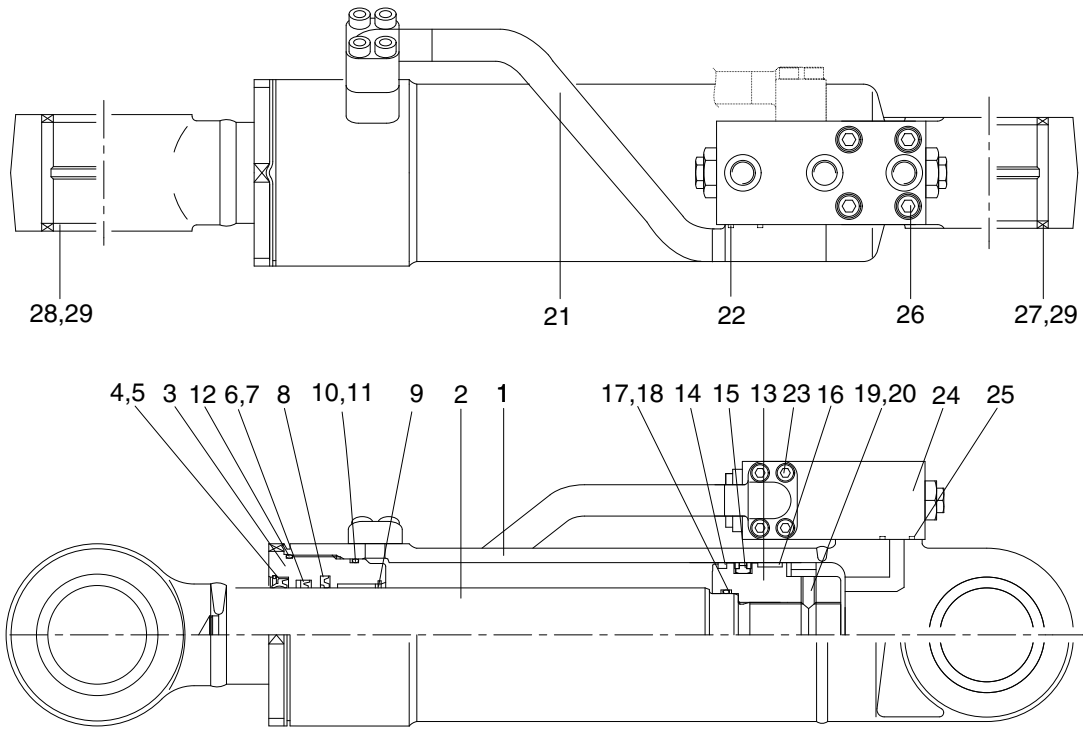
Internal detail



HCK5-52911GG

- | | | | | | |
|----|---------------|----|-------------------------------|----|--------------------------|
| 1 | Tube assembly | 13 | Cushion ring | 25 | Dust seal |
| 2 | Rod assembly | 14 | Piston | 26 | Plug |
| 3 | Gland | 15 | Piston seal | 27 | Band assembly |
| 4 | DU bushing | 16 | Wear ring | 28 | Pipe assembly-R |
| 5 | Snap ring | 17 | Dust ring | 29 | Pipe assembly-B |
| 6 | Rod seal | 18 | O-ring | 30 | O-ring |
| 7 | Back up ring | 19 | Back up ring | 31 | Hexagon socket head bolt |
| 8 | Buffer ring | 20 | Lock nut | 32 | Safety lock valve |
| 9 | Dust wiper | 21 | Hex socket headless set screw | 33 | Hexagon socket head bolt |
| 10 | Snap ring | 22 | O-ring | 34 | O-ring |
| 11 | O-ring | 23 | Hexagon socket head bolt | | |
| 12 | Back up ring | 24 | Dimple bushing | | |

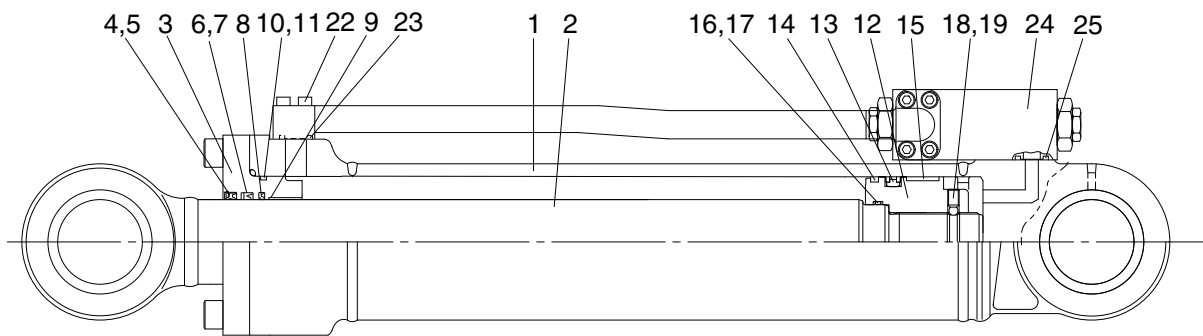
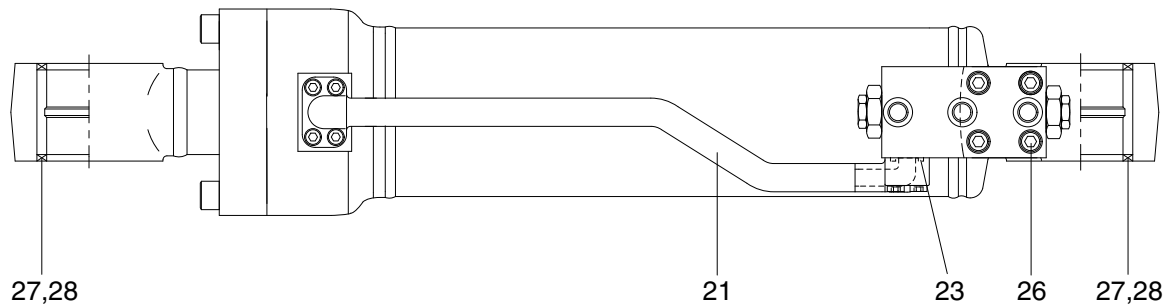
(4) Dozer cylinder



31K5-70110

- | | | | | | |
|----|----------------|----|----------------|----|--------------------------|
| 1 | Tube assembly | 11 | Retaining ring | 21 | Pipe assy |
| 2 | Rod assembly | 12 | O-ring | 22 | O-ring |
| 3 | Gland | 13 | Piston | 23 | Hexagon socket head bolt |
| 4 | Dust wiper | 14 | Piston seal | 24 | Pilot check valve |
| 5 | Retaining ring | 15 | Dust ring | 25 | O-ring |
| 6 | Rod seal | 16 | Wear ring | 26 | Hexagon socket head bolt |
| 7 | Back up ring | 17 | O-ring | 27 | Pin bushing |
| 8 | Buffer ring | 18 | Backup ring | 28 | Pin bushing |
| 9 | Dry bearing | 19 | Steel ball | 29 | Dust seal |
| 10 | O-ring | 20 | Set screw | | |

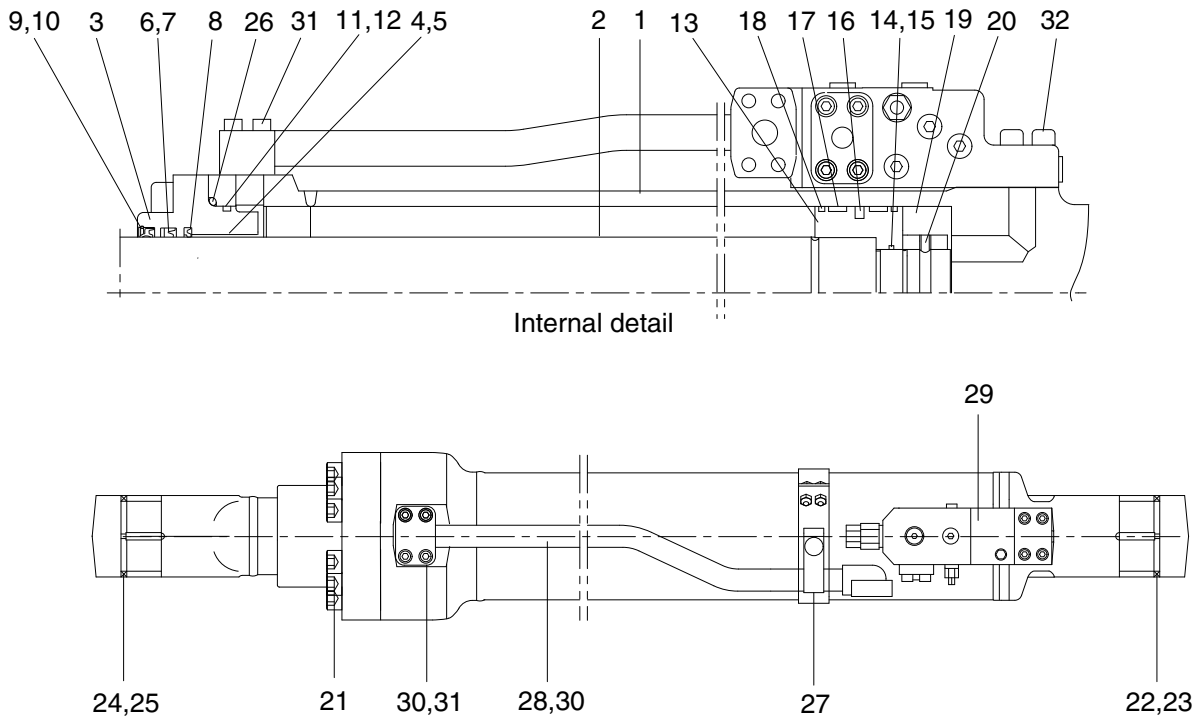
(5) Outrigger cylinder



31Q5-70211

- | | | | | | |
|---|---------------|----|--------------|----|--------------------------|
| 1 | Tube assembly | 10 | O-ring | 19 | Set screw |
| 2 | Rod assembly | 11 | Back up ring | 20 | Hexagon socket head bolt |
| 3 | Gland | 12 | Piston | 21 | Pipe assembly |
| 4 | Dust wiper | 13 | Piston seal | 23 | O-ring |
| 5 | Retainer ring | 14 | Dust ring | 24 | Check valve assembly |
| 6 | Rod seal | 15 | Wear ring | 25 | O-ring |
| 7 | Back up ring | 16 | O-ring | 26 | Hexagon socket head bolt |
| 8 | Buffer ring | 17 | Back up ring | 27 | Pin bushing |
| 9 | Dry bushing | 18 | Steel ball | 28 | Dust seal |

(6) Adjust cylinder

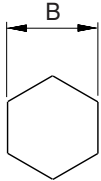


HCK5-52951GG

1	Tube assembly	12	Retaining ring	23	Dust seal
2	Rod assembly	13	Piston	24	Dimple bushing
3	Gland	14	O-ring	25	Dust seal
4	DU bushing	15	Back up ring	26	O-ring
5	Snap ring	16	Piston seal	27	Band assy
6	Rod seal	17	Wear ring	28	Pipe assy
7	Back up ring	18	Dust ring	29	Safety lock valve
8	Buffer ring	19	Lock nut	30	O-ring
9	Dust wiper	20	Hex socket headless set screw	31	Hexagon socket head bolt
10	Snap ring	21	Hexagon socket head bolt	32	Hexagon socket head bolt
11	O-ring	22	Dimple bushing		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark		
Allen wrench	6		
	8		
	14		
	17		
Spanner	7		
	8		
(-) Driver	Small and large sizes		
Torque wrench	Capable of tightening with the specified torques		

(2) Tightening torque

Part name	Item	Size	Torque			
			kgf · m	lbf · ft		
Socket head bolt	Bucket cylinder	22★1★3	M14	15.0±2.0	108±14.5	
		29★3	M10	5.4±0.5	39.1±3.6	
	Boom cylinder	23★1★3★5	M14	15.0±2.0	108±14.5	
		31★3★5	M10	5.4±0.5	39.1±3.6	
		33★3★5	M10	5.4±0.5	39.1±3.6	
	Arm cylinder	23★1★3	M16	23±2.0	166±14.5	
		34★3	M10	5.4±0.5	39.1±3.6	
		37★3	M10	5.4±0.5	39.1±3.6	
	Adjustment cylinder	21★1★3	M22	63.0±6.0	456±43.4	
		31★3	M10	5.4±0.5	39.1±3.6	
		32★3	M10	5.4±0.5	39.1±3.6	
	Dozer cylinder	23★3	M8	3.3±0.3	23.9±2.2	
		Outrigger cylinder	20★7	M16	23±2.3	166±16.6
			22★7	M8	2.7±0.3	19.5±2.2
26★7	M10		5.4±0.5	39.1±3.6		
Lock nut	Bucket cylinder	20★3	-	100±10.0	723±72.3	
	Boom cylinder	31★3★5	M52	100±10.0	723±72.3	
	Arm cylinder	20★3	M56	100±10.0	723±72.3	
	Adjustment cylinder	19★3	M76	100±10.0	723±72.3	

★1 : Apply loctite #243 on the thread of bolt.

★3 : CHANGZHOU

★5 : 2-piece boom

★7 : SH PAC

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Piston	Bucket cylinder	14★3★5	-	125 ± 12.0	904 ± 86.8
	Boom cylinder	14★3★5	M65	125 ± 12.0	904 ± 86.8
	Arm cylinder	14★3	M70	150 ± 15.0	1085 ± 108
	Adjustment cylinder	13★3	M90	150 ± 15.0	1085 ± 108
	Dozer cylinder	13★3	M45	112 ± 11.2	810 ± 81.0
	Outrigger cylinder	12★7	M56	140 ± 14	1013 ± 101
Set screw	Bucket cylinder	21★3	M8	2.7 ± 0.3	19.5 ± 2.2
	Boom cylinder	21★3★5	M8	2.7 ± 0.3	19.5 ± 2.2
	Arm cylinder	21★3	M8	2.7 ± 0.3	19.5 ± 2.2
	Dozer cylinder	20★3	M8	1.7 ± 0.2	12.3 ± 1.4
	Adjustment cylinder	20★3	M10	5.4 ± 0.5	39.1 ± 3.6
	Outrigger cylinder	19★7	M8	2.7 ± 0.3	19.5 ± 2.2
Gland	Dozer cylinder	3★3	M115	92 ± 9.2	665 ± 66.5

★1 : Apply loctite #243 on the thread of bolt.

★3 : CHANGZHOU

★5 : 2-piece boom

★7 : SH PAC

3) DISASSEMBLY

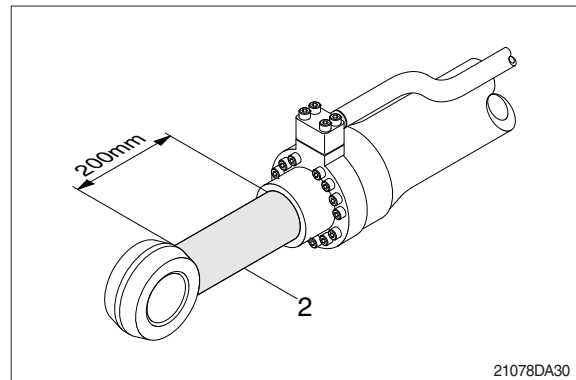
(1) Remove cylinder head and piston rod

※ Procedures are based on the bucket cylinder. (CHANGZHOU type)

① Hold the clevis section of the tube in a vise.

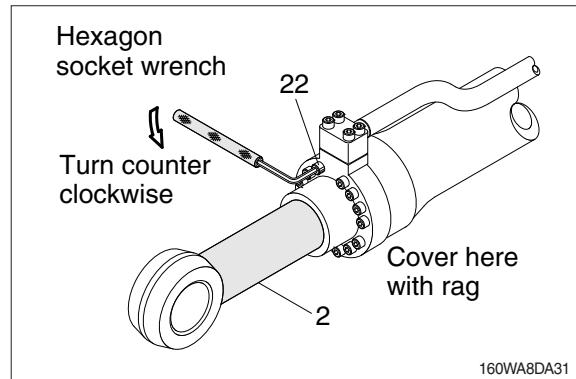
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

② Pull out rod assembly (2) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



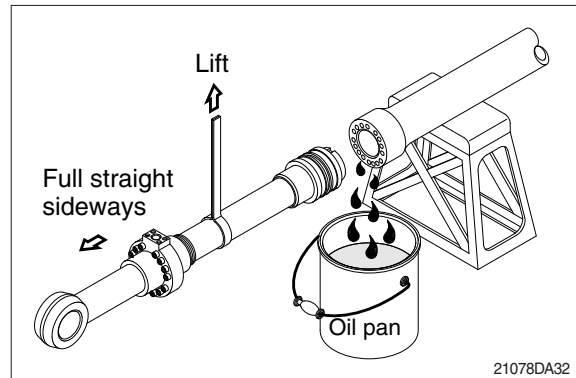
③ Loosen and remove socket bolts (22) of the gland in sequence.

※ Cover the extracted rod assembly (2) with rag to prevent it from being accidentally damaged during operation.



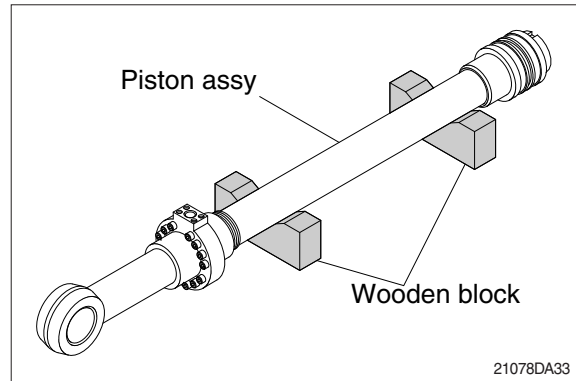
④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



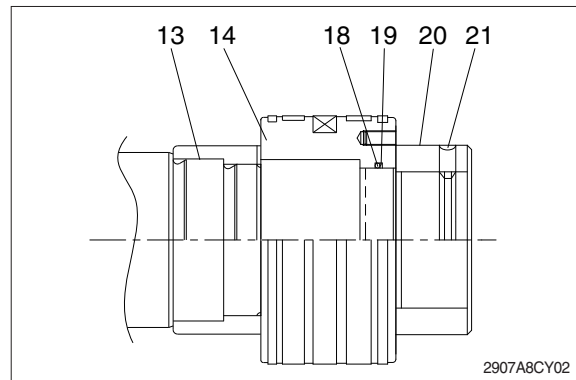
Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.



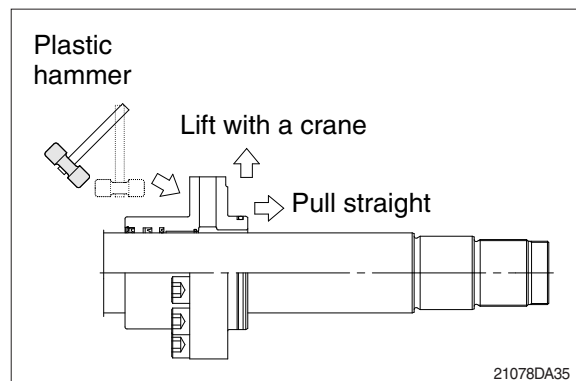
(2) Remove piston and cylinder head

- ① Remove set screw (21).
- ② Remove lock nut (20).
- ※ Since piston (14) and lock nut (20) are tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the piston (14) and lock nut (20).
- ③ Remove piston assembly (14), back up ring (19), and O-ring (18).
- ④ Remove cushion ring (13).



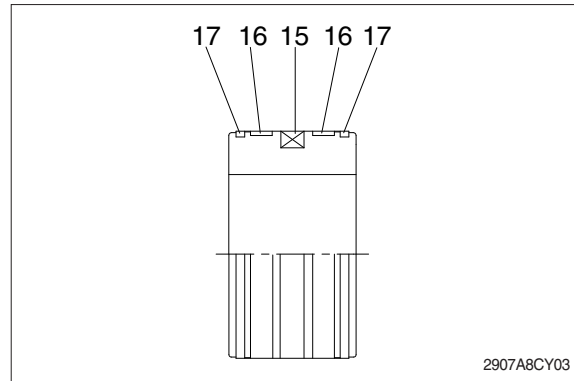
- ⑤ Remove the cylinder head assembly from rod assembly (2).
- ※ If it is too heavy to move, move it by striking the flanged part of cylinder head with a plastic hammer.
- ※ Pull it straight with cylinder head assembly lifted with a crane.

Exercise care so as not to damage the lip of rod bushing (4) and packing (5,6,7,8,9,10) by the threads of rod assembly (2).



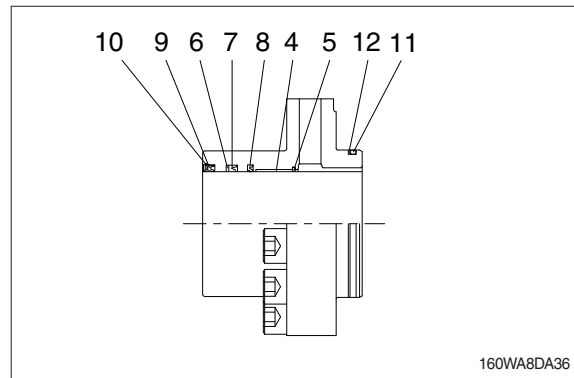
(3) Disassemble the piston assembly

- ① Remove wear ring (16).
 - ② Remove dust ring (17) and piston seal (15).
- ※ Exercise care in this operation not to damage the grooves.



(4) Disassemble cylinder head assembly

- ① Remove back up ring (12), and O-ring (11).
 - ② Remove snap ring (10), dust wiper (9).
 - ③ Remove back up ring (7), rod seal (6) and buffer ring (8).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.
- ※ Do not remove bushing (4).

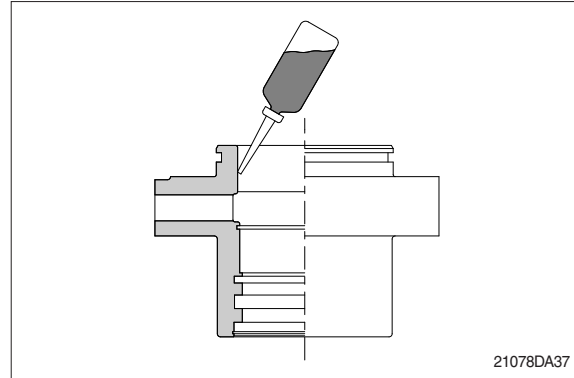


4) ASSEMBLY

(1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

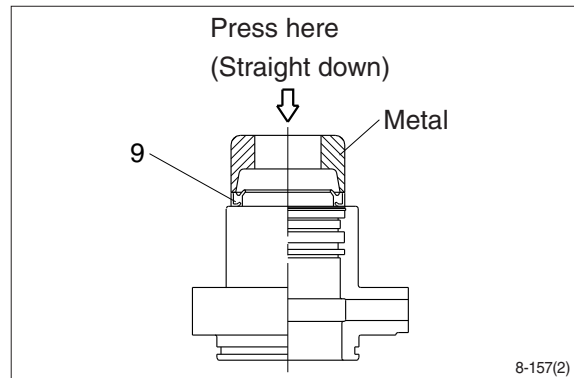
① Coat the inner face of gland (3) with hydraulic oil.



② Coat dust wiper (9) with grease and fit dust wiper (9) to the bottom of the hole of dust seal.

At this time, press a pad metal to the metal ring of dust seal.

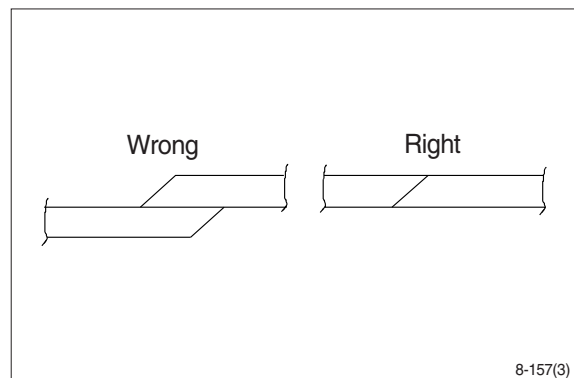
③ Fit snap ring (10) to the stop face.



④ Fit back up ring (7), rod seal (6) and buffer ring (8) to corresponding grooves, in that order.

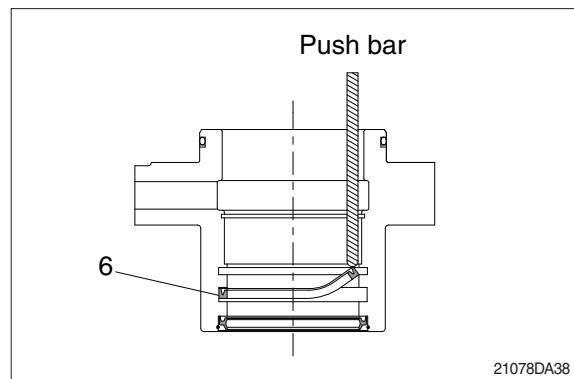
※ Coat each packing with hydraulic oil before fitting it.

※ Insert the backup ring until one side of it is inserted into groove.

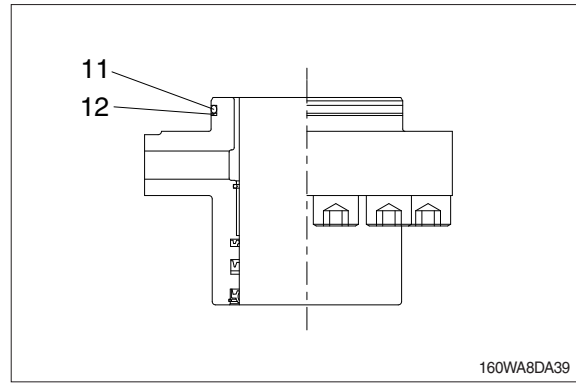


※ Rod seal (6) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

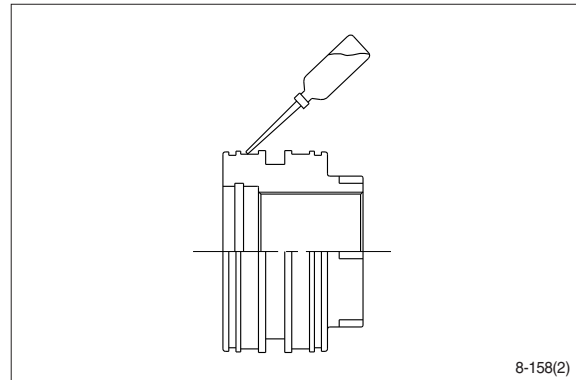


- ⑤ Fit back up ring (12) to gland (3).
- ※ Put the backup ring in the warm water of 30~50°C.
- ⑥ Fit O-ring (11) to gland (3).

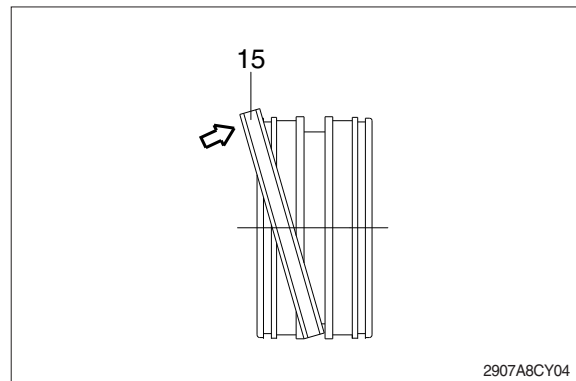


(2) Assemble piston assembly

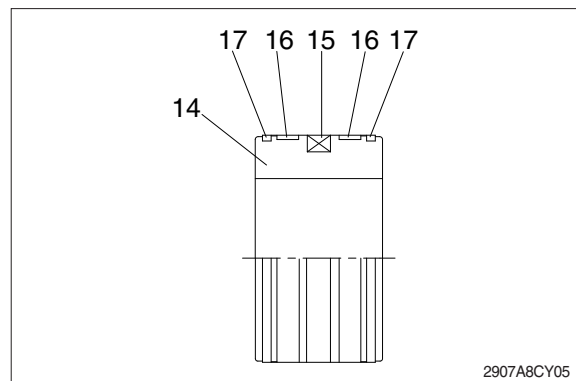
- ※ Check for scratches or rough surfaces. If found smooth with an oil stone.
- ① Coat the outer face of piston (14) with hydraulic oil.



- ② Fit piston seal (15) to piston.
- ※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
- ※ After assembling the piston seal, press its outer diameter to fit in.

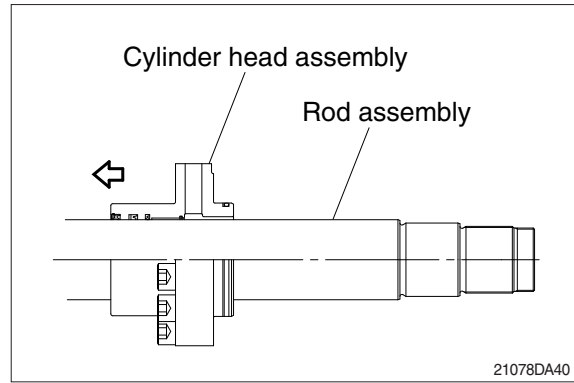


- ③ Fit wear ring (16) and dust ring (17) to piston (14).

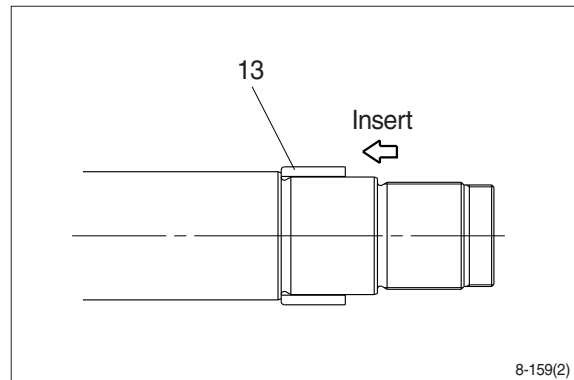


(3) Install piston and cylinder head

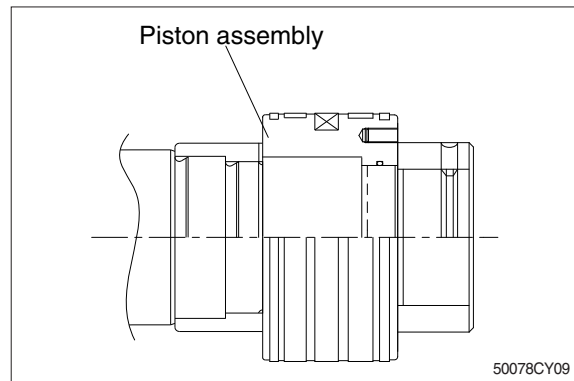
- ① Fix the rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to rod assembly.



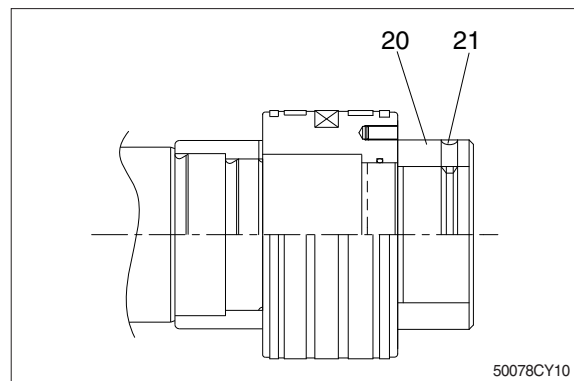
- ④ Insert cushion ring (13) to rod assembly.
- ※ Note that cushion ring (13) has a direction in which it should be fitted.



- ⑤ Fit piston assembly to rod assembly.
- Tightening torque : 125 ± 12.0 kgf · m
(904 ± 86.8 lbf · ft)
- ※ Refer to page 8-349.



- ⑥ Fit lock nut (20) and tighten the screw (21).
- Tightening torque :
- Item 20 : 100 ± 10.0 kgf · m (723 ± 72.3 lbf · ft)
- Item 21 : 2.7 ± 0.3 kgf · m (19.5 ± 2.2 lbf · ft)
- ※ Refer to page 8-349.



(4) Overall assemble

- ① Place a V-block on a rigid work bench.
Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
- ② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.
 - ※ Be careful not to damage piston seal by thread of tube assembly.
- ③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.
 - ※ Refer to the table of tightening torque.

