

## 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.

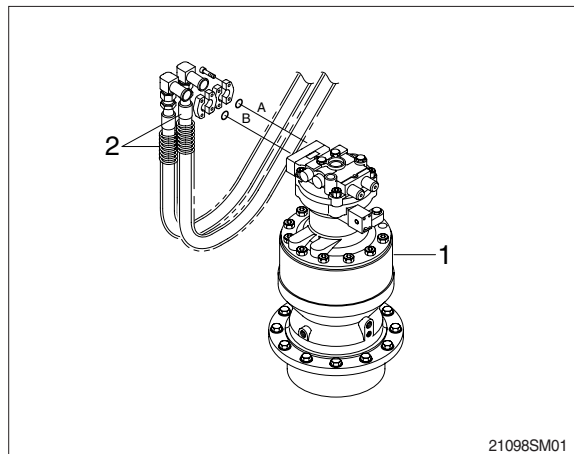
**▲ Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ 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, 7, 8).
- (6) Sling the swing motor assembly (1) and remove the swing motor mounting socket bolts (9).

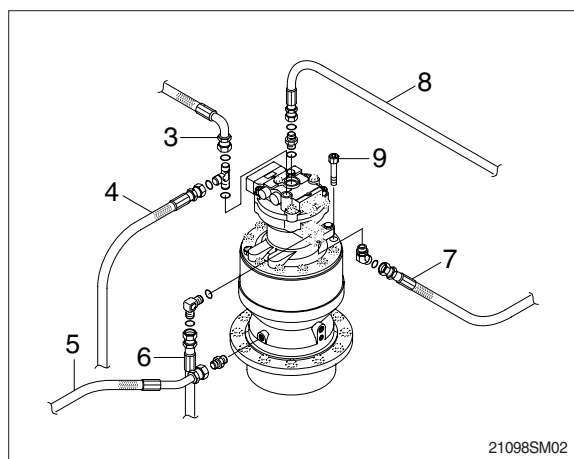
· Motor device weight : 61kg (135lb)

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



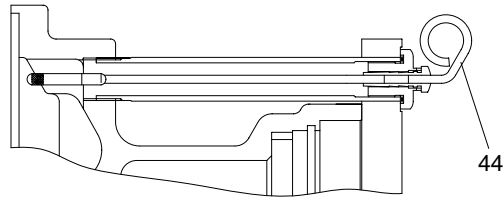
#### 2) INSTALL

- (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.

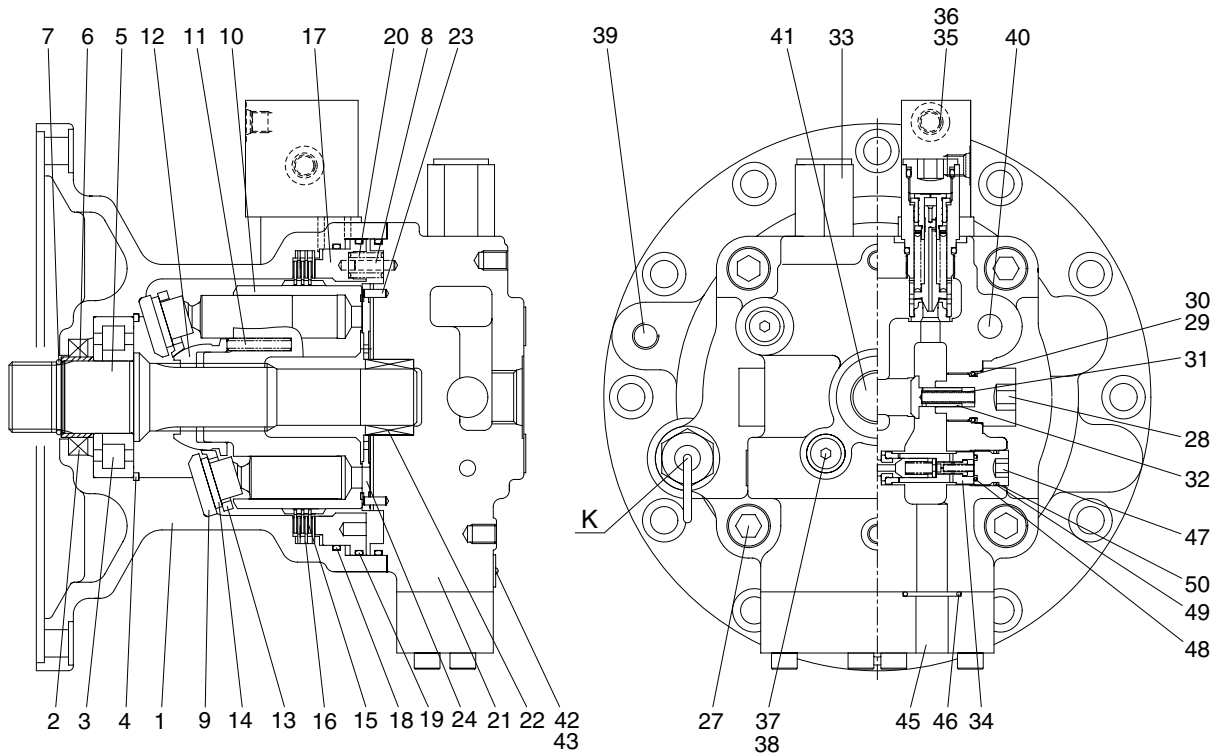


## 2. DISASSEMBLY AND ASSEMBLY OF SWING MOTOR

### 1) STRUCTURE



DETAIL K



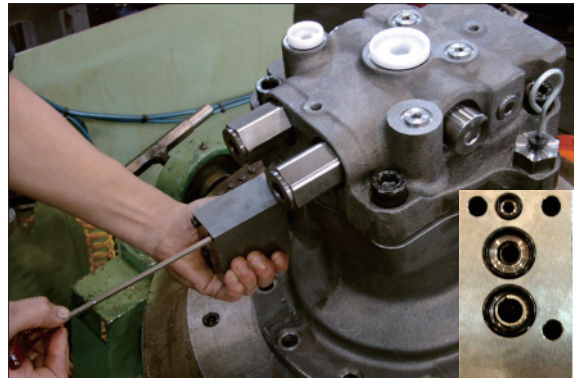
21092SM02

1	Body	17	Brake piston	35	Time delay valve
2	Oil seal	18	O-ring	36	Wrench bolt
3	Roller bearing	19	O-ring	37	Plug
4	Snap ring	20	Brake spring	38	O-ring
5	Shaft	21	Rear cover	39	Plug
6	Bushing	22	Needle bearing	40	Plug
7	Stop ring	23	Pin	41	Plug
8	Pin	24	Valve plate	42	Name plate
9	Shoe plate	27	Wrench bolt	43	Rivet
10	Cylinder block	28	Plug	44	Level gauge
11	Spring	29	Back up ring	45	Flange
12	Ball guide	30	O-ring	46	O-ring
13	Set plate	31	Spring	47	Plug
14	Piston assy	32	Check	48	O-ring
15	Friction plate	33	Relief valve	49	O-ring
16	Separate plate	34	Anti-inversion valve	50	Back up ring

## 2) DISASSEMBLING

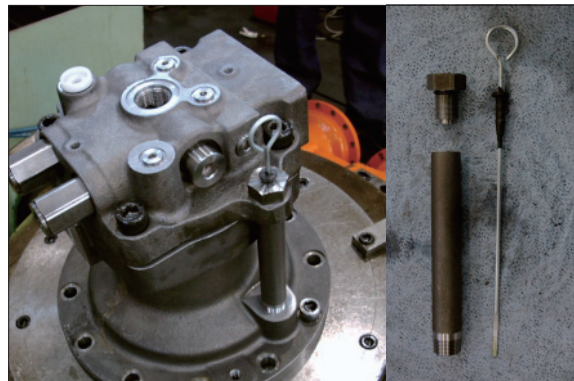
### (1) Disassemble the sub of a TURNING AXIS

- ① Unloosing wrench bolt and disassemble time delay valve assy (35) from rear cover (21)



14078SM201/201A

- ② Disassemble level gauge (44) from body (1).



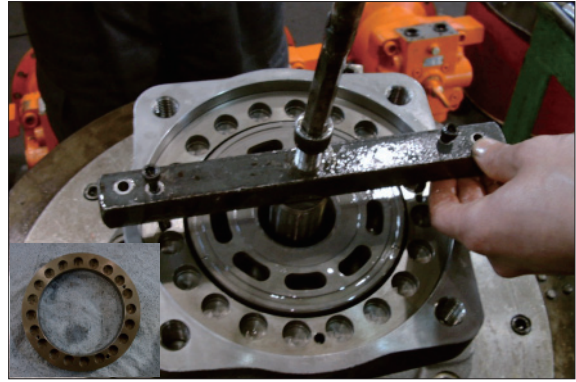
14078SM202/202A

- ③ Hang rear cover (21) on hoist, unloose wrench bolt (27) and disassemble from body (1).



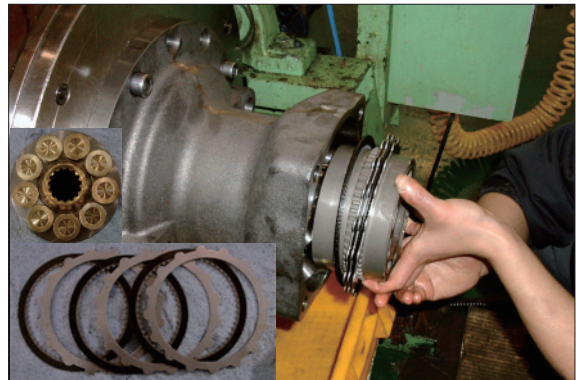
14078SM203/203A

- ④ Using a jig, disassemble break piston (17) from body (1).



14078SM204/204A

- ⑤ Disassemble respectively cylinder block assy, friction plate (15), plate (16) from body (1).



14078SM205/205A/B

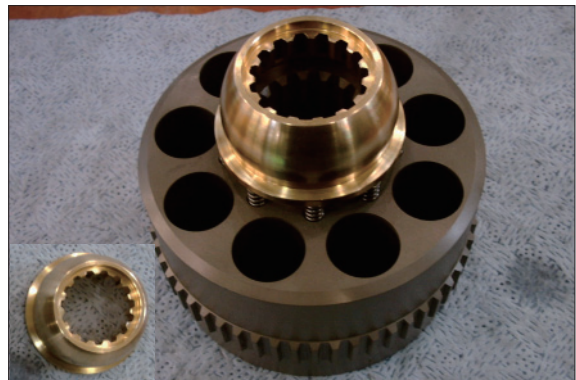
**(2) Disassemble cylinder block assy sub**

- ① Disassemble piston assy (14), set plate (13) from cylinder block assy.



14078SM206/205B

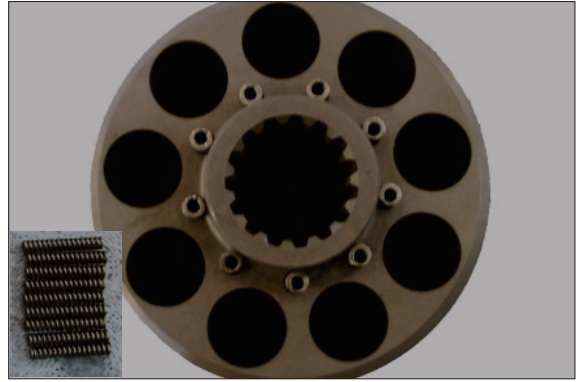
- ② Disassemble ball guide (12) from cylinder block (10).



14078SM207/207A

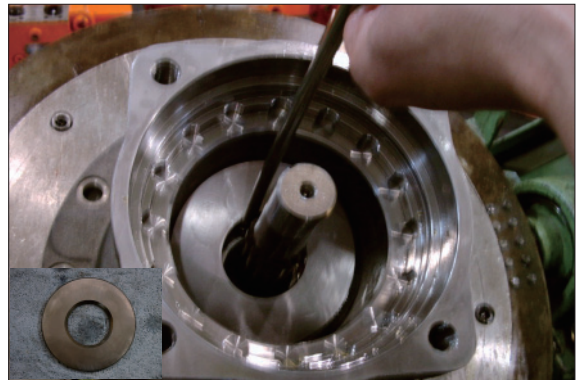


- ③ Disassemble spring (11) from cylinder block (10).



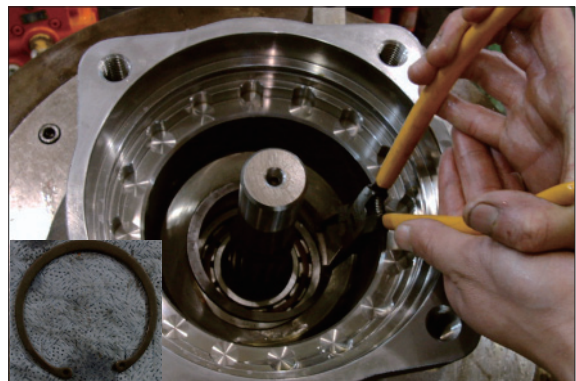
14078SM208/208A

- ④ Disassemble shoe plate (9) from body (1).



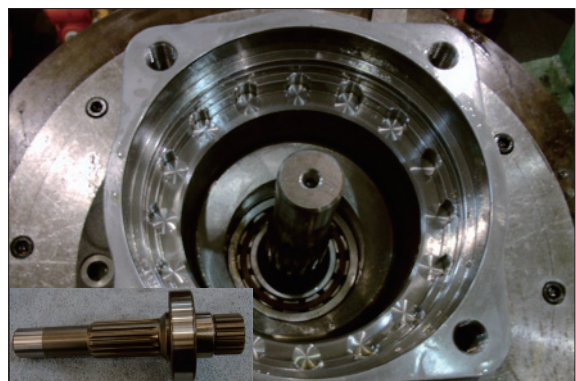
14078SM209/209A

- ⑤ Using a plier jig, disassemble snap ring (4) from shaft (5).



14078SM210/210A

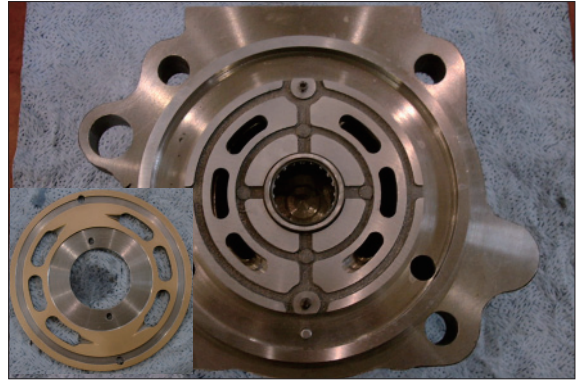
- ⑥ Disassemble shaft assy from body (1).



14078SM211/211A

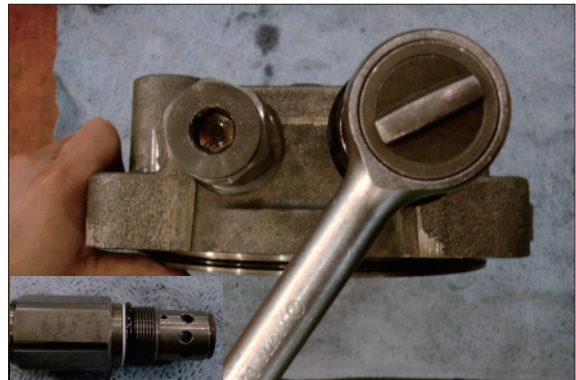
**(3) Disassemble rear cover assy sub**

- ① Disassemble pin (8, 23), valve plate (24) from rear cover (21).



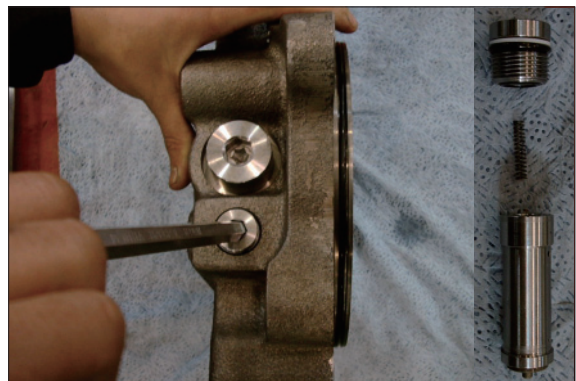
14078SM212/212A

- ② Using a torque wrench, disassemble relief valve assy (33) 2 set from rear cover (21).



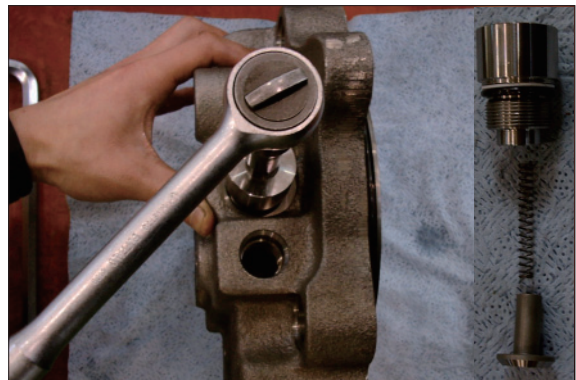
14078SM213/213A

- ③ After disassembling plug with a L-wrench from rear cover (21), disassemble respectively back up ring, O-ring, O-ring, spring, anti-inversion valve assy (34)



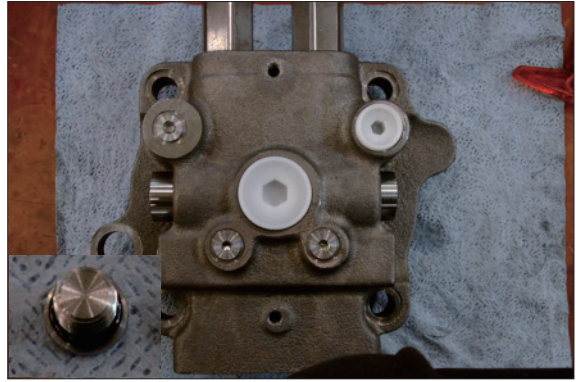
14078SM214/214A

- ④ Disassemble make up check valve assy with a torque wrench from rear cover (21).



14078SM215/215A

- ⑤ Disassemble respectively plug (37, 40, 41), with a L-wrench from rear cover (21).



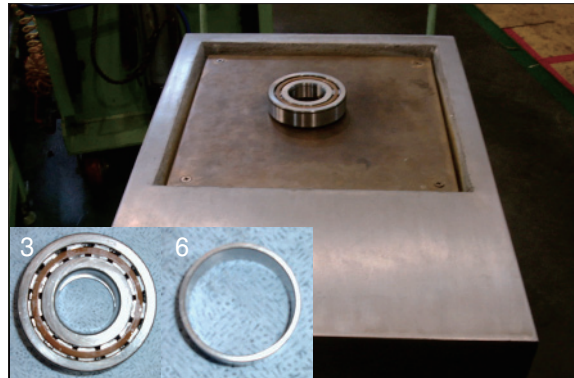
14078SM216/216A



### 3) ASSEMBLING

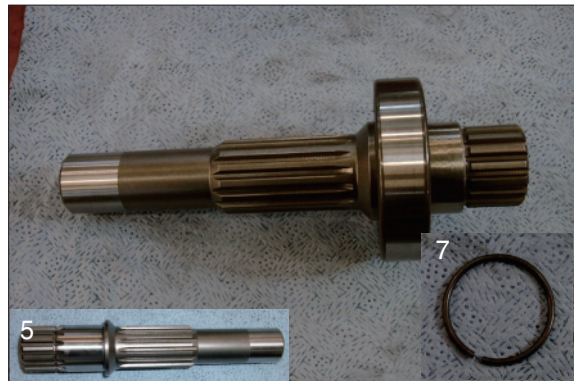
#### (1) Assemble the sub of a turning axls

- ① Put roller bearing (3), bushing (6) on pre-heater and provide heat to inner wheel (compressing temp : 290°C for 2minutes)
  - Roller bearing × 1 EA
  - Bushing × 1 EA



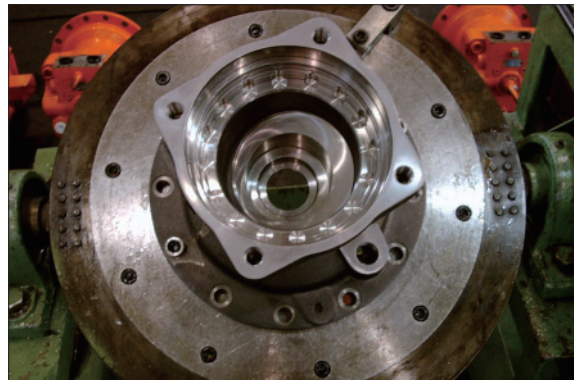
14078SM217/217A/B

- ② After assembling and compressing pre-heated roller bearing (3), bushing (6) into shaft (5).
  - Stop ring × 1 EA
  - Shaft × 1 EA



14078SM218/218A/B

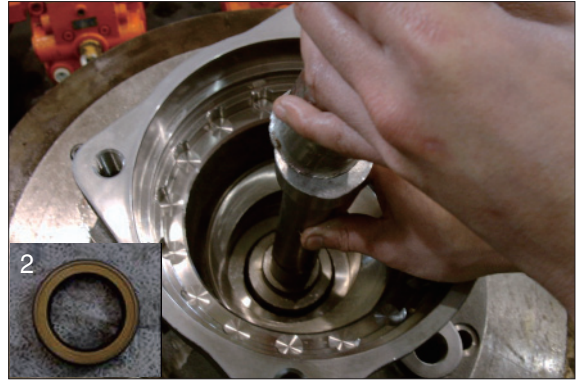
- ③ Put body (1) on a assembling jig, fix it with bolts to prohibit moving.



14078SM219

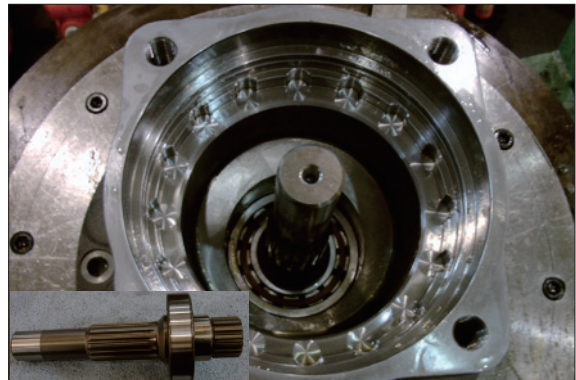


- ④ Using a compressing tool and steel stick, assemble oil seal (2) into body (1).  
· Oil seal × 1 EA



14078SM220/220A

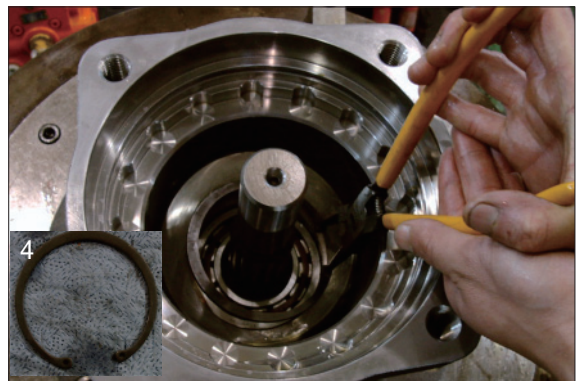
- ⑤ Insert above shaft sub into body (1) and assemble it with a steel stick.



14078SM211/211A

- ⑥ Fix snap ring (4) to shaft with a plier jig.

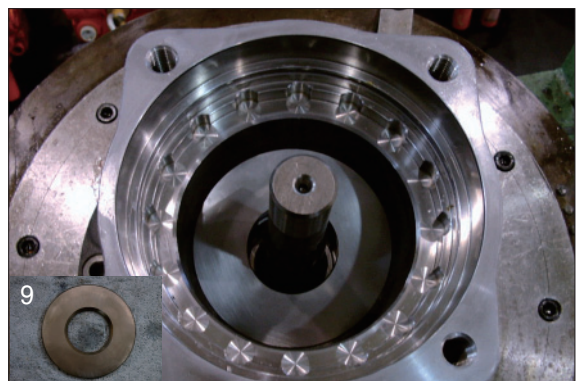
· Snap ring × 1 EA



14078SM210/210A

- ⑦ Spread grease on shoe plate (9) and assemble on the body.

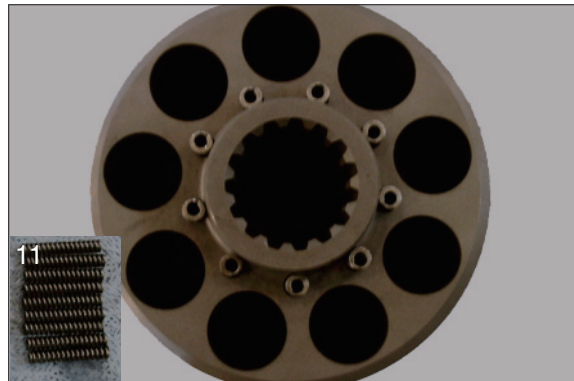
· Shoe plate × 1 EA



14078SM222/209A

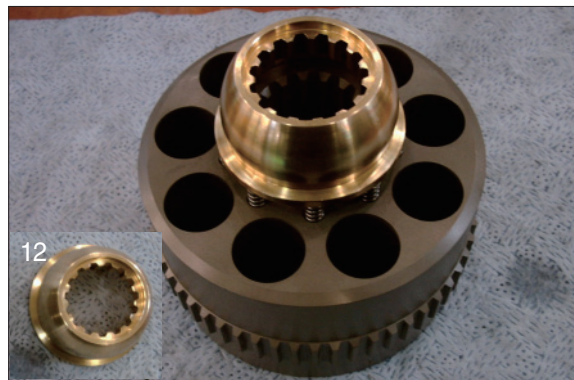
**(2) Assemble the sub of cylinder block assy**

- ① Assemble spring (11) 9 set into cylinder block (10).  
· Spring × 9 EA



14078SM208/208A

- ② Assemble ball guide (12) into cylinder.  
· Ball guide × 1 EA



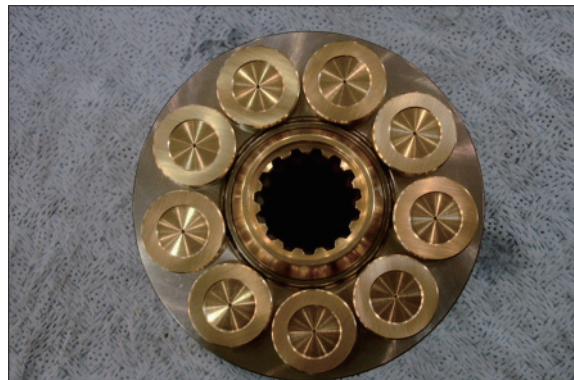
14078SM207/207A

- ③ Assemble piston assy (14) 9 set into set plate (13).  
· Piston assy × 9 EA  
· Set plate × 1 EA



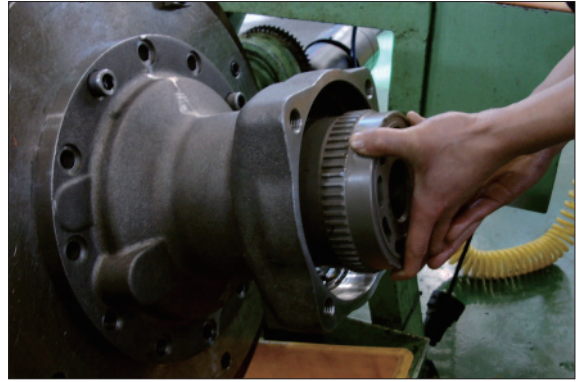
14078SM223/223A

- ④ Assemble above item ② and ③.



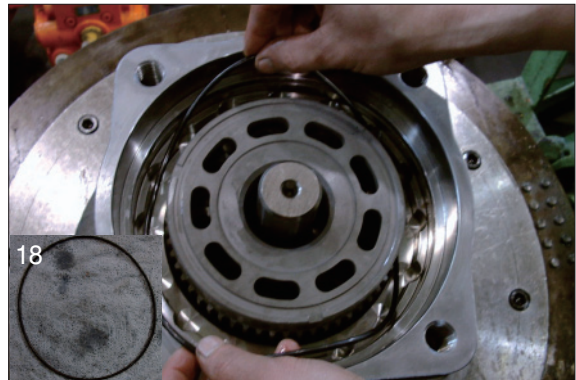
14078SM224

- ⑤ Assemble cylinder block assy into body (1).



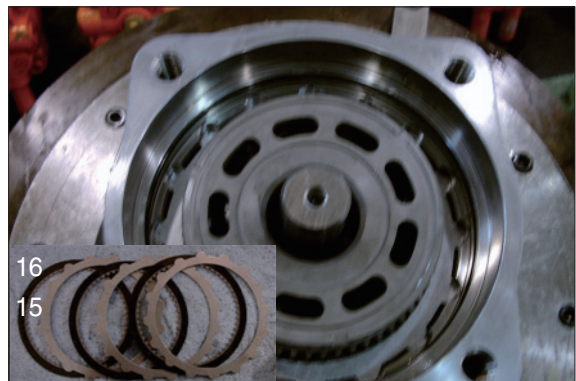
14078SM225

- ⑥ Assemble O-ring (18) into body (1).  
· O-ring × 1 EA



14078SM226/226A

- ⑦ Assemble 3 set of plate (16), friction plate (15) respectively into body.  
· Plate × 3 EA  
· Friction plate × 3 EA



14078SM227/205A

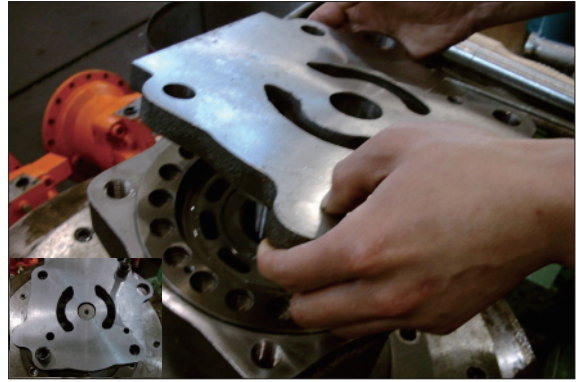
- ⑧ Assemble O-ring (19) into break piston (17).  
· O-ring × 2 EA



14078SM228/226A

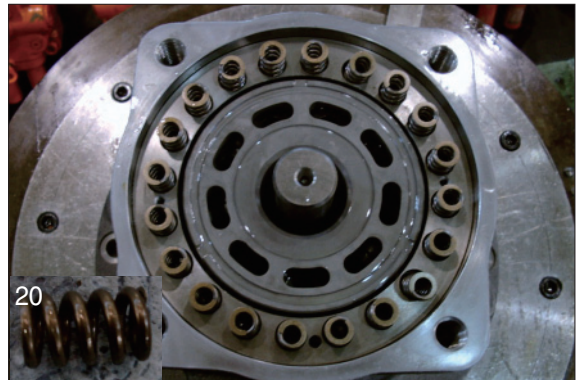


- ⑨ Insert break piston assy into body (1) and compress it with a jig and hammer.



14078SM229/229A

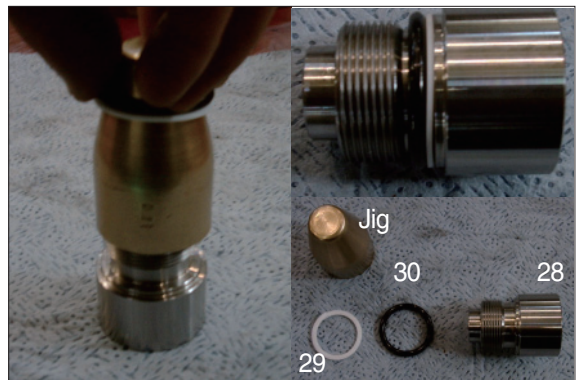
- ⑩ Assemble spring (20) (20 EA) into break piston (17).  
 · Spring × 20 EA



14078SM230/230A

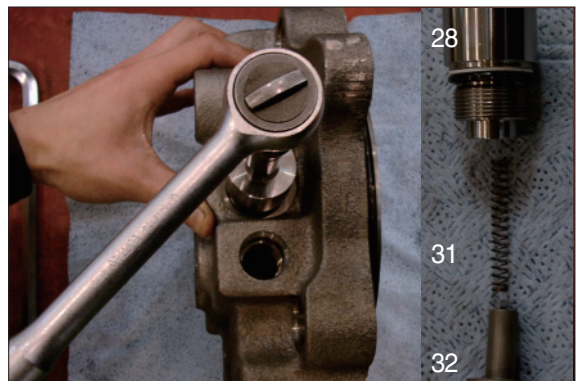
**(3) Assemble the sub of rear cover assy sub**

- ① Assemble the sub of make up check valve assy.  
 Assemble O-ring (30), back up ring (29) into plug (28) with a O-ring assembling jig.  
 · Plug × 1 EA  
 · Back up ring × 1 EA  
 · O-ring × 1 EA



14078SM231/231A/B

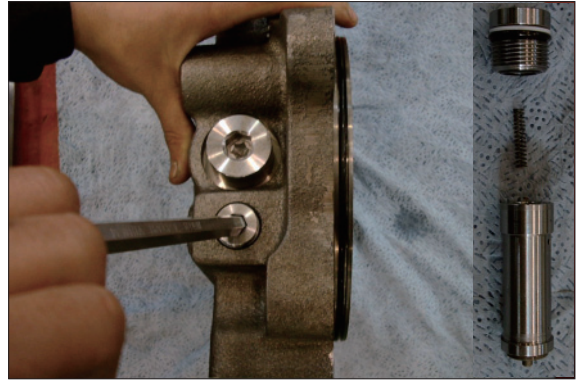
- ② Assemble respectively make up check valve assy spring (31), check (32), plug (28) into rear cover (21) after then screw it torque wrench.  
 · Make up check sub × 2 set  
 · Spring × 2 EA  
 · Check × 3 EA



14078SM215/215A

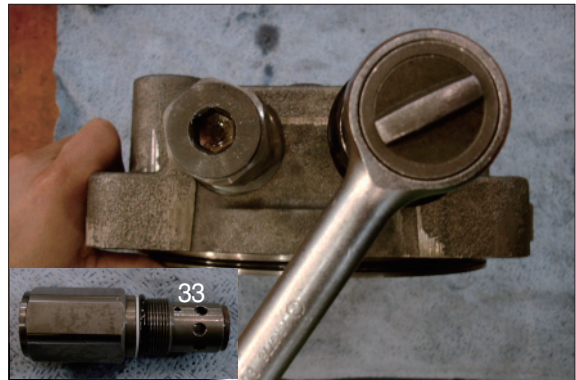


- ③ Assemble respectively plug (47), back up ring, O-ring, O-ring, spring, anti-rotating valve assy (34) into rear cover (21).  
(Bilateral symmetry assembling)
- Anti-Inversion v/v assy × 2 set
  - O-ring (P12) × 2 EA
  - O-ring (P18) × 2 EA
  - Back up ring (P18) × 2 EA



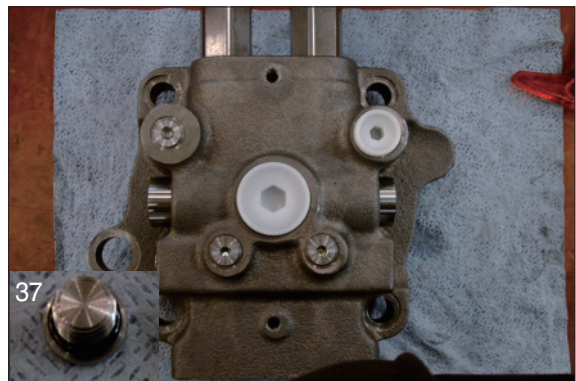
14078SM214/214A

- ④ Assemble relief valve assy (33) 2set into rear cover (21) with a torque wrench.  
(Bilateral symmetry assembling)



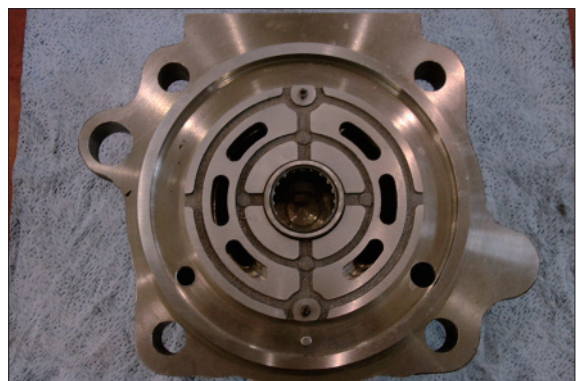
14078SM213/213A

- ⑤ Assemble plug (37), plug (40, 41) into rear cover (21) with a L-wrench.  
\* Plug × 3 EA (PF1/4)



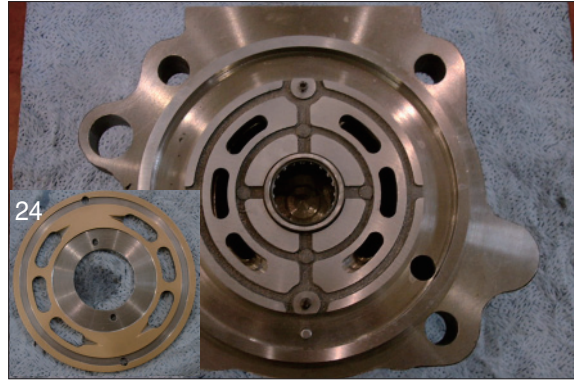
14078SM216/216A

- ⑥ After assembling needle bearing (22) into rear cover (21), with a hammer assemble pin (8, 23).  
\* Pin × 1 EA  
\* Pin × 2 EA



14078SM212

- ⑦ Spreading grease on valve plate (24),  
assemble into rear cover (21).  
· Valve plate × 1 EA



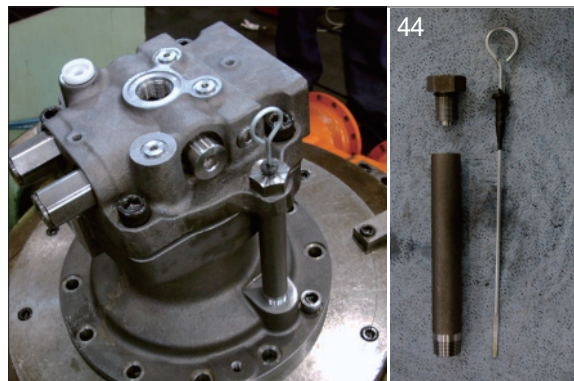
14078SM212/212A

- ⑧ Lift up rear cover assy on body (1) by a crane and assemble it with a wrench bolt (27).



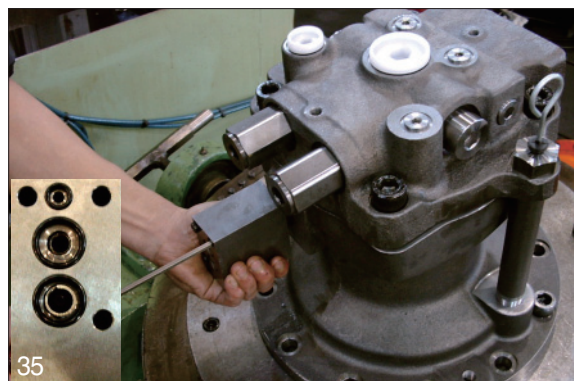
14078SM203/203A

- ⑨ Assemble level gauge (44) into body (1).



14078SM202/202A

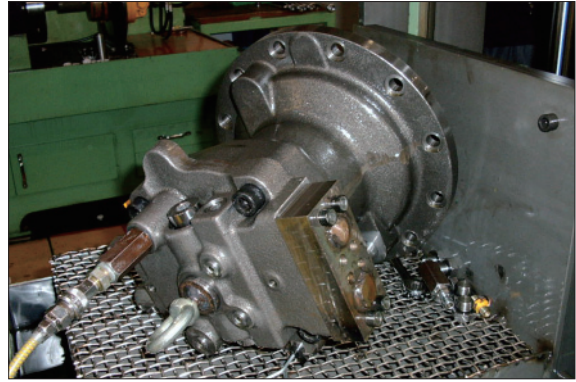
- ⑩ Assemble time delay valve assy (35) into rear cover (21) with a wrench bolt (36).



14078SM01/201A

**(4) Air pressing test**

Be sure of leakage, after press air into assembled motor



14078SM232

**(5) Leakage check**

After cleaning motor by color check No.1, paint No.3 and be sure of leakage.



14078SM233/233A

**(6) Mount test bench**

Mounting motor test bench, test the availability of each part.



220078SM14



### 3. REMOVAL AND INSTALL OF REDUCTION GEAR

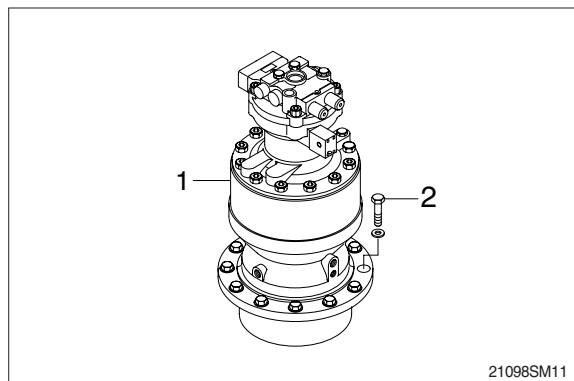
#### 1) REMOVAL

- (1) Remove the swing motor assembly.  
For details, see removal of swing motor assembly.
- (2) Sling reduction gear assembly (1) and remove mounting bolts (2).
- (3) Remove the reduction gear assembly.
  - Reduction gear device weight : 180 kg  
(396 lb)



#### 2) INSTALL

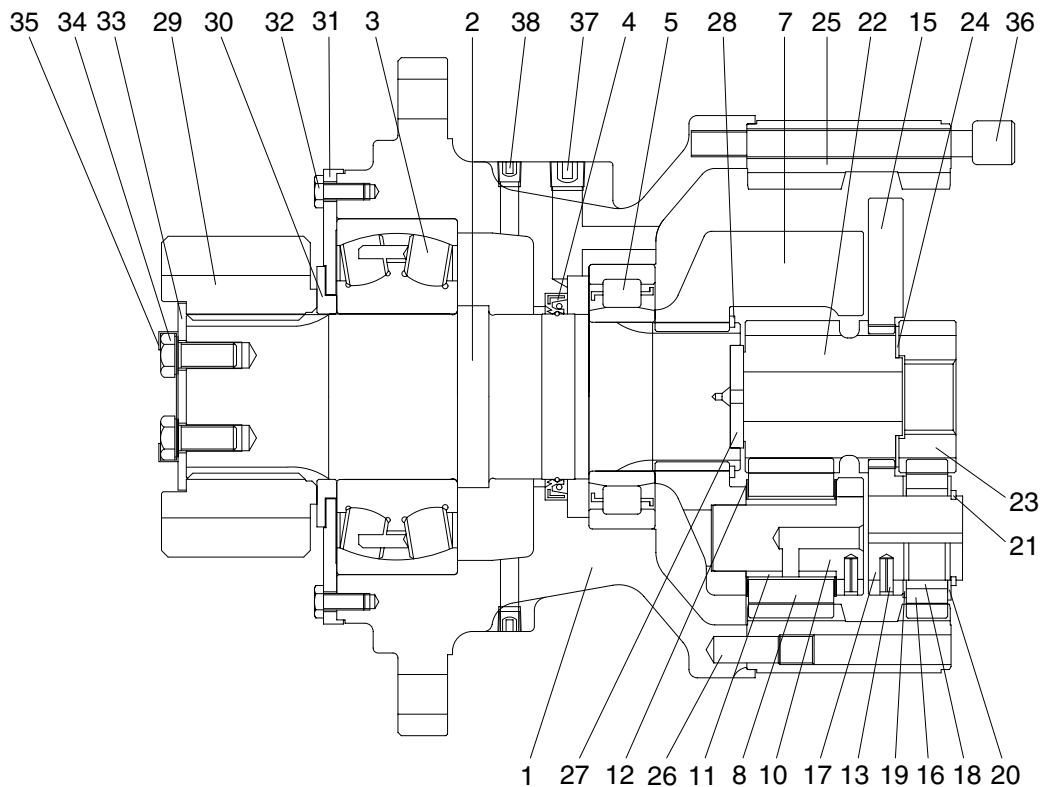
- (1) Carry out installation in the reverse order to removal.
  - Tightening torque :  $58.4 \pm 6.4$  kgf · m  
( $422 \pm 46.3$  lbf · ft)





## 4. DISASSEMBLY AND ASSEMBLY OF REDUCTION GEAR

### 1) STRUCTURE



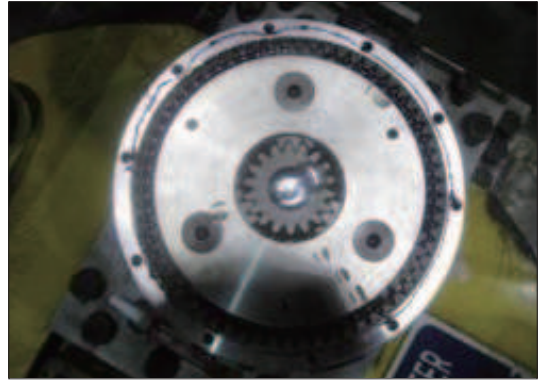
235Z92SM03

1	Casing	16	Planet gear 1	28	Stop ring
2	Drive shaft	17	Pin 1	29	Pinion gear
3	Roller bearing	18	Needle cage	30	Spacer
4	Oil seal	19	Side plate 1	31	Cover plate
5	Roller bearing	20	Side plate 2	32	Hexagon bolt
7	Carrier 2	21	Stop ring	33	Lock plate
8	Planet gear 2	22	Sun gear 2	34	Hexagon bolt
10	Pin & bushing	23	Sun gear 1	35	Lock washer
11	Bushing 2	24	Side plate 3	36	Socket bolt
12	Thrust washer	25	Ring gear	37	Plug
13	Spring pin	26	Knock pin	38	Plug
15	Carrier 1	27	Thrust plate		

## 2) DISASSEMBLY

### (1) Preparation

- ① The reduction gear removed from machine is usually covered with mud.  
Wash out side of reduction gear and dry it.
  - ② Setting reduction gear on work stand for disassembling.
  - ③ Mark for mating  
Put marks on each mating parts when disassembling so as to reassemble correctly as before.
- ▲ Take great care not to pinch your hand between parts while disassembling not let fall parts on your foot while lifting them.



2209A8SM01

### (2) Disassembly

- ① Remove every “socket bolt (M10)” that secure swing motor and reduction gear.
- ② Removing carrier sub assy & sun gear
  - a. Removing No.1 sun gear from No.1 carrier sub assy.  
※ Be sure maintaining it vertical with ground when disassembling No.1 sun gear.



2209A8SM02

- b. Removing No.1 carrier sub assy screwing I-bolt to tab hole (M10) in No.1 carrier.  
Lifting it gradually maintaining it vertical with ground.  
※ It's impossible to disassemble No.1 spring pin. If No.1 spring pin has problem, change whole No.1 carrier sub assy.



2209A8SM03

c. Removing No.2 sun gear from No.2 carrier sub assy.

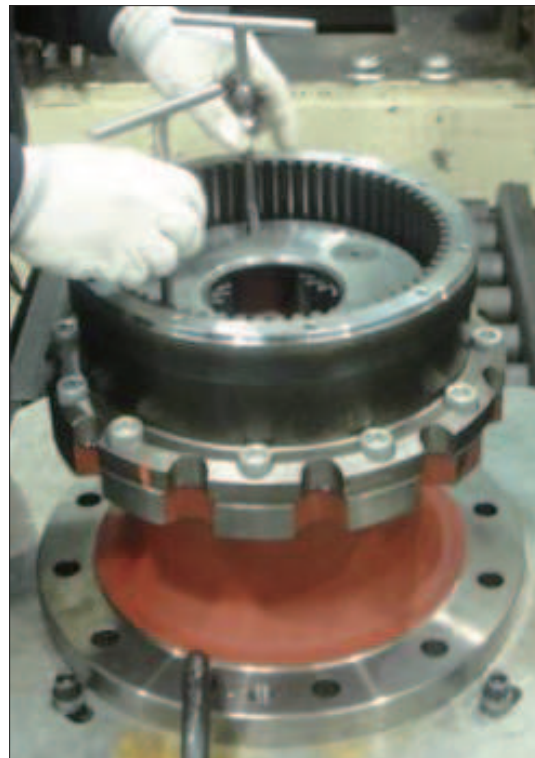
※ Be sure maintaining it vertical with ground when disassembling No.2 sun gear.



2209A8SM04

d. Removing No.2 carrier sub assy screwing I-bolt to tab hole (M10) in No.2 carrier. Lifting it gradually maintaining it vertical with ground.

※ It's impossible to disassemble No.2 spring pin. If No.2 spring pin has problem, change whole No.2 carrier sub assy.



2209A8SM05

### ③ Removing ring gear

After unscrewing every socket bolt (M16), remove ring gear from casing.

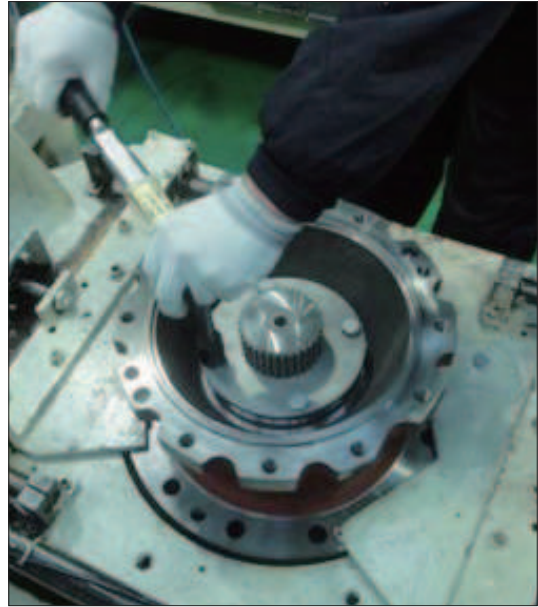
※ Because of liquid gaskets between ring gear and casing, put sharp punch between ring gear and casing and tapping it to remove them.



2209A8SM06

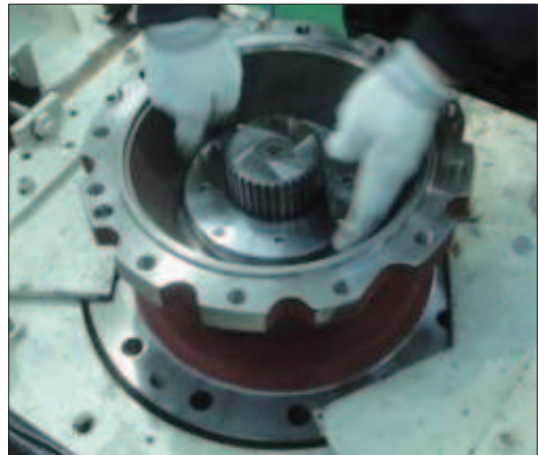
④ Removing drive shaft sub assy

- a. Unscrew every hex head bolt (M12) to remove lock plate.



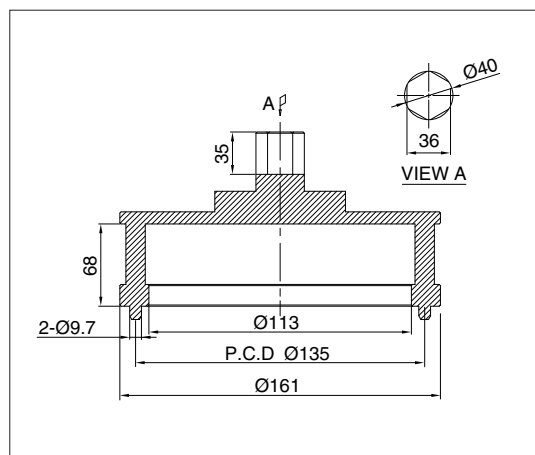
2209A8SM07

- b. Rolling ring nut for removing them from drive shaft sub assy.



2209A8SM08

- ※ Use special tool to roll ring nut to counter clockwise.



220L8SM01



- c. Remove drive shaft sub assy from casing.  
※ Set a rack for flange of casing, and remove drive shaft sub assy from casing by using press.

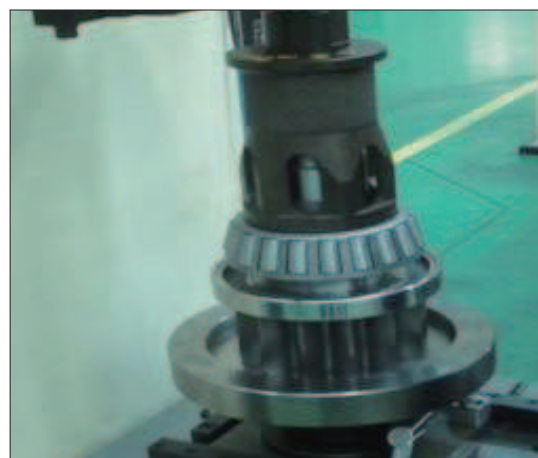


2209A8SM09

- d. Remove oil seal & taper bearing (small) from casing.  
※ Do not re-use oil seal. It is impossible to disassemble drive shaft sub assy.



2209A8SM10



2209A8SM11

## 4. ASSEMBLY REDUCTION UNIT

### 1) GENERAL NOTES

- (1) Clean every part by kerosene and dry them in a cool and dry place.
- (2) Loctite on surface must be removed by solvent.
- (3) Check every part for any abnormal.
- (4) Each hexagon socket head bolt should be used with loctite #242 applied on its threads.
- (5) Apply gear oil slightly on each part before assembling.

▲ Take great care not to pinch your hand between parts or tools while assembling nor let fall parts on your foot while lifting them.

Inspection before assembling.

#### Thrust washer

- Check the seizure, abnormal wear or uneven wear.
- Check the unallowable wear.

#### Gear

- Check the pitting or seizure on tooth surface.
- Check the cracks on the root of tooth.

#### Bearing

- Rotate it by hands to check such noise or uneven rotation.

### 2) ASSEMBLING NO.1 CARRIER SUB ASSY

- (1) Put thrust plate firmly in No.1 carrier.
- (2) After assembling No.1 needle bearing to No.1 planetary gear, put a pair of No.1 thrust washer on both sides of bearing and install them to No.1 carrier.

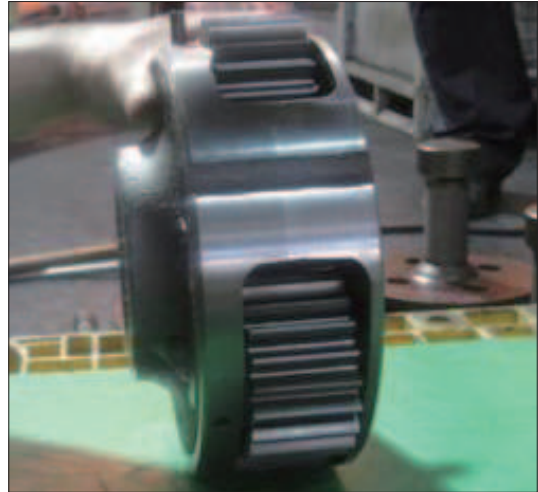


2209A8SM12



2209A8SM13

- (3) Make of spring pin hole No.1 pin and No.1 carrier of spring pin hole in line, press No.1 spring pin into the holes.  
 Make No.1 spring pin hole head for No.1 planetary gear.



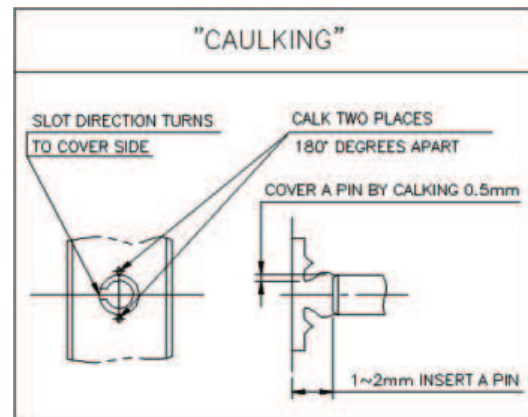
2209A8SM14

- (4) Caulk carrier holes to make No.1 spring pin settle down stably.



2209A8SM15

- ※ Refer to “caulking details”  
 Use paint marker for marking after caulking.



2209A8SM16

## 2) ASSEMBLING NO.2 CARRIER SUB ASSY

(1) Put thrust plate in firmly No.2 carrier.



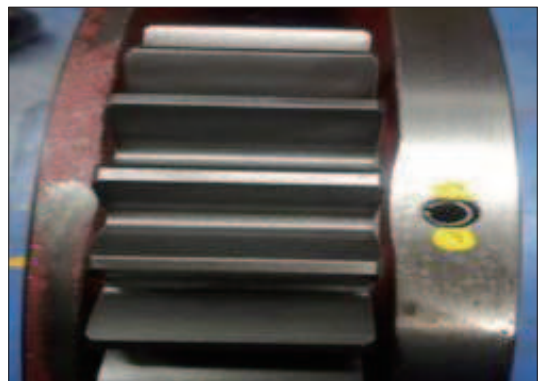
2209A8SM17

(2) After assembling No.2 needle bearing to No.2 planetary gear, put 2 pieces of No.2 thrust washer on both sides of bearing and install them to No.2 carrier.



2209A8SM18

(3) Align No.2 spring pin hole and No.2 carrier spring pin hole, put No.2 spring pin into the holes.  
Make No.2 spring pin cutting line face to No.2 planetary gear.

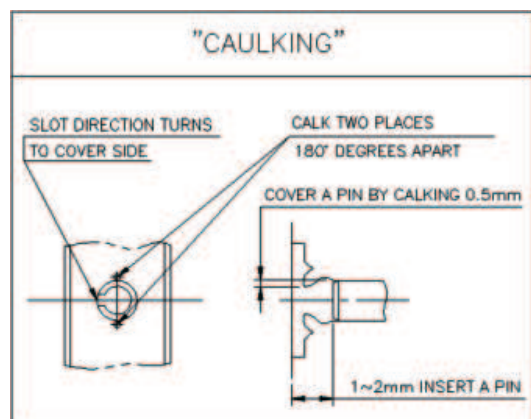


2209A8SM19

(4) Caulk carrier holes to make No.2 spring pin settle down stably.

※ Refer to “caulking details”

Use paint marker for marking after caulking.



2209A8SM20



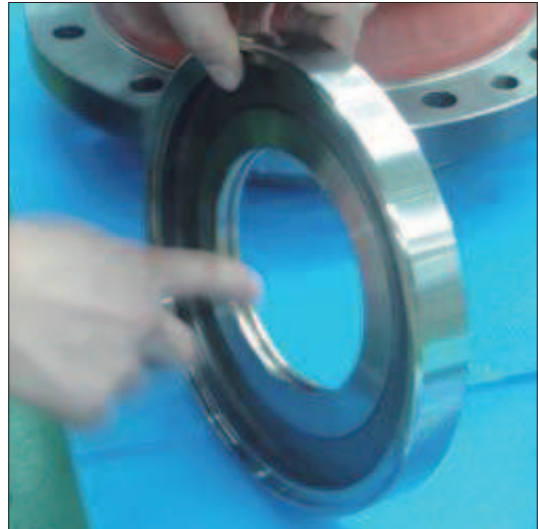
### 3) ASSEMBLING PINION GEAR SUB ASSY

- (1) Prepare drive shaft pinion gear vertical with ground.



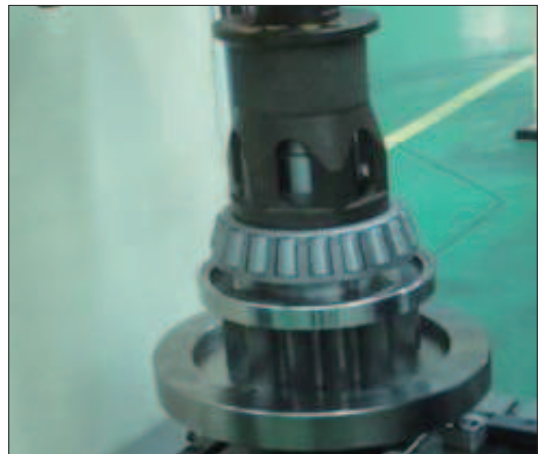
2209A8SM21

- (2) Fully apply grease (albania EP02) to O-ring groove of sleeve.  
※ Be sure to maintain it vertical with ground when assembling it.
- (3) Put O-ring into O-ring groove of sleeve.  
Fully apply grease on O-ring.



2209A8SM22

- (4) Assemble taper bearing and sleeve into drive shaft using press jig.  
Use special jig for pressing. Leave no space between sleeve and taper bearing.



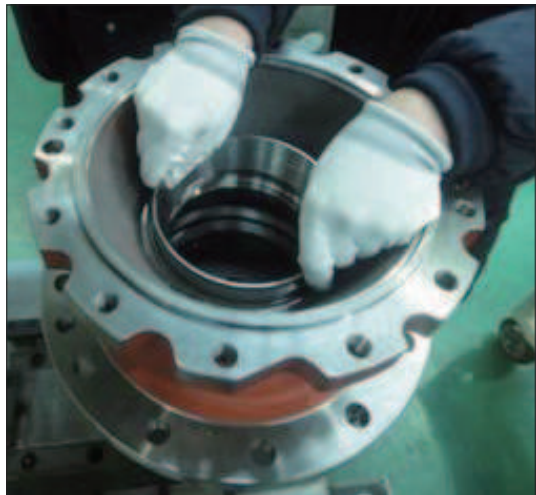
2209A8SM23



2209A8SM24

#### 4) ASSEMBLING BEARING CUP & OIL SEAL (PRESSING)

- (1) Put top, bottom bearing cup into casing.  
Use special jig for pressing. Pay attention to foreign materials while assembling bearing cup.
- ※ Flip over casing to assemble oil seal.

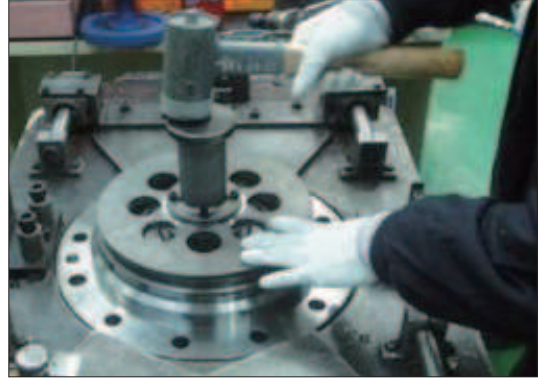


2209A8SM25



2209A8SM26

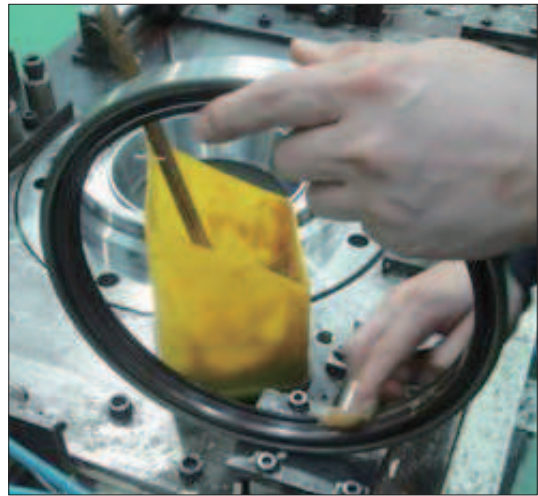
- (2) Assemble oil seal to casing.  
Use special jig for pressing. Pay attention to direction of dust seal and dent.



2209A8SM27

※ WHILE ASSEMBLING OIL SEAL

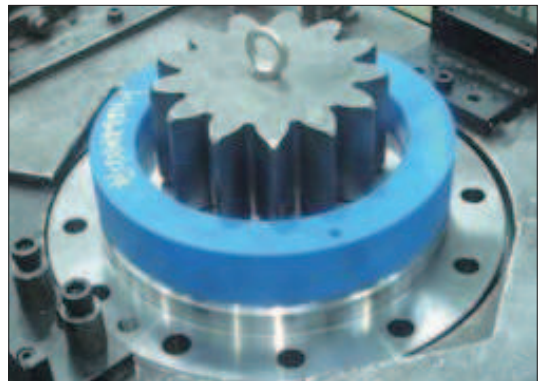
1. Be sure to set dust seal to gear oil.
2. Before assembling, charge enough grease in oil seal.
3. Before assembling, apply enough grease inside and outside of oil seal.



2209A8SM28

**5) ASSEMBLING SHAFT SUB ASSY & RING NUT**

- (1) After assembling casing & drive shaft sub assy, flip it over.



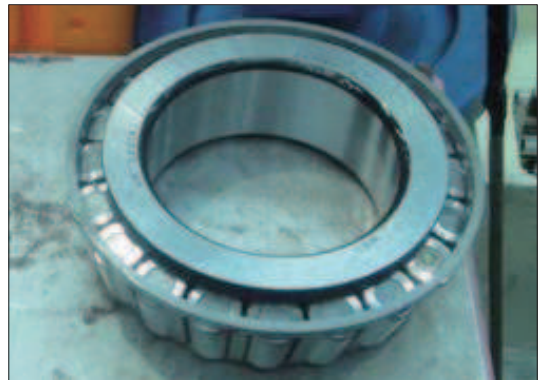
2209A8SM29

- (2) Put drive shaft sub assy into casing.  
※ Be sure to maintain it vertical with ground when assembling it.



2209A8SM30

- (3) Put taper bearing into it.  
Rotate bearing by hands for checking after assembly.



2209A8SM31

- (4) Put ring nut into drive shaft sub assy by using special jig.

The tightening torque (M95) =  $3.5 \pm 0.4$  kgf·m  
( $25.3 \pm 2.9$  lbf·ft)



2209A8SM32

- ※ Apply enough loctite #242 before screwing bolts.



2209A8SM33



- (5) Align bolt screw of ring nut with lock plate's hole.

In case of misalign between bolt screw ring nut and lock plate's hole, put lock plate as near as possible to hole of bolt screw of ring nut and make it in line by increasing tightening torque.



2209A8SM34



2209A8SM35

- (6) Screw 4 bolts (M12×16) to connect ring nut and lock plate by using torque wrench.

Bolt (M12, 4EA) = 10.9T

The tightening torque =  $8.8 \pm 0.9$  kgf·m  
( $63.7 \pm 6.5$  lbf·ft)

- ※ Apply enough loctite #242 before screwing bolts.



2209A8SM36

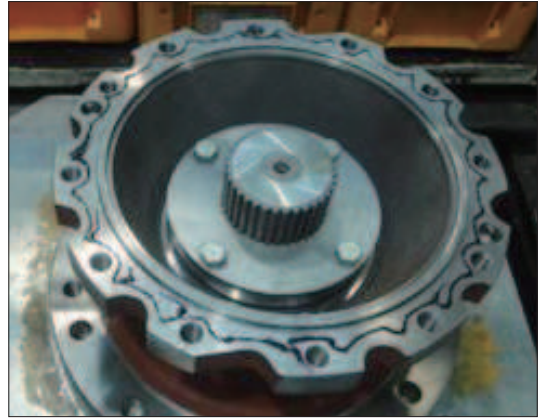
- (7) Use paint marker for checking surplus parts after assembling.



2209A8SM37

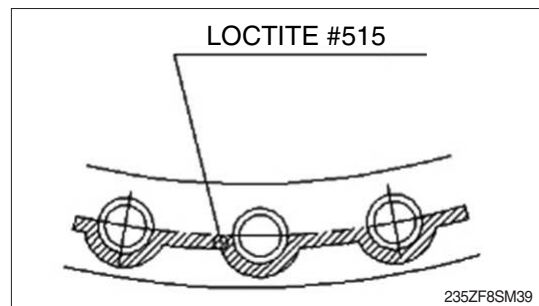
## 6) ASSEMBLING RING GEAR

- (1) Apply loctite #515 bottom of casing sub assy contacting with ring gear without disconnection.



2209A8SM38

Refer to loctite detail.



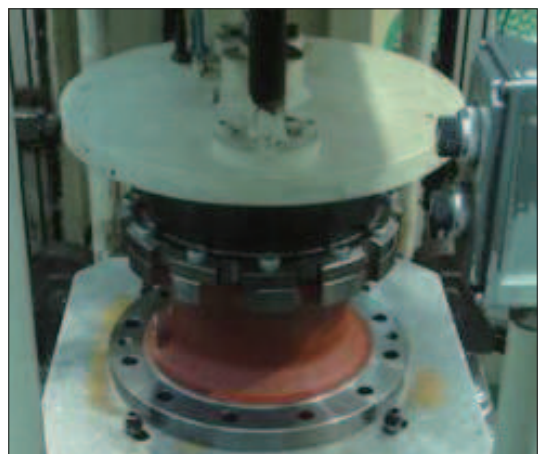
235ZF8SM39

- (2) Put parallel pin into hole of casing sub assy.  
Mark parallel pin position using paint marker.



2209A8SM40

- (3) Align ring gear with parallel pin to put them into casing sub assy.  
※ Be sure to maintain them vertical with ground while using press.



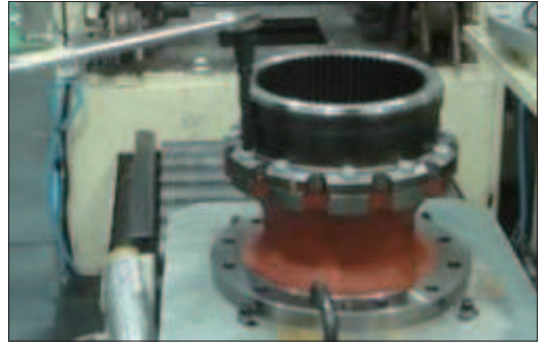
2209A8SM41

- (4) Screw 12 bolts (M16×45) to connect casing sub assy and ring gear (01) by using torque wrench.

Bolt (M16, 12EA) = 12.9T

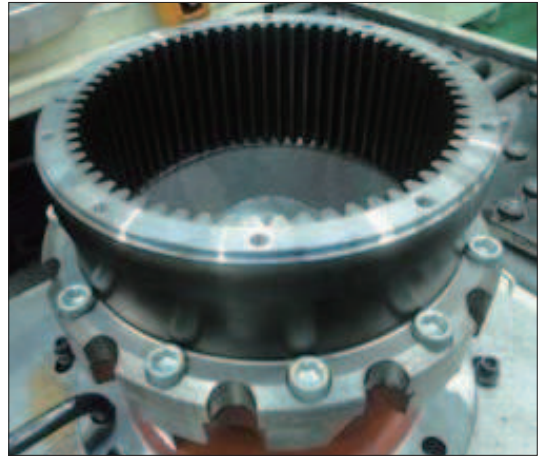
The tightening torque =  $27 \pm 2.7$  kgf·m  
( $195 \pm 19.5$  lbf·ft)

- ※ Apply enough loctite #242 before screwing bolts.



2209A8SM42

- (5) Use paint marker for checking surplus parts after assembling.



2209A8SM43



2209A8SM44

## 7) ASSEMBLING CARRIER SUB ASSY & SUN GEAR

- (1) Put No.2 carrier sub assy along spline of drive shaft spline.
- Screw M10 I-bolt to No.2 carrier sub assy.
  - Lifting up No.2 carrier sub assy and align planetary gear and tooth of ring gear by rotating planetary gear by hands.
  - Rotate No.2 carrier sub assy by hands to fit No.2 carrier sub assy into drive shaft spline.



2209A8SM45

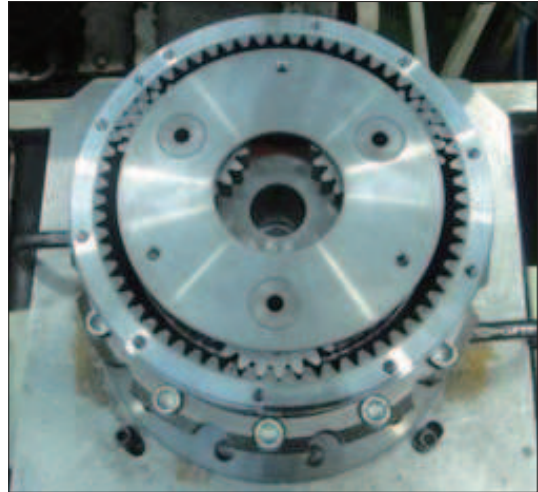
- (2) Put No.2 sun gear into No.2 carrier sub assy.



2209A8SM46

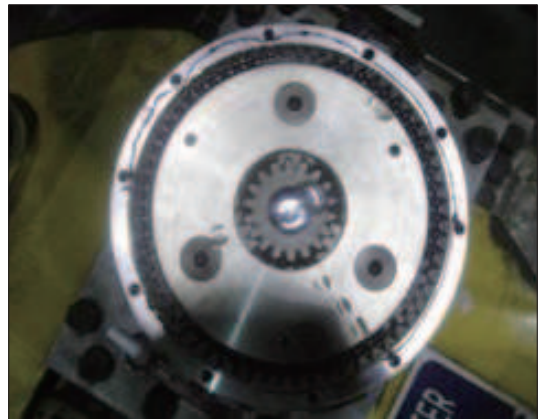


- (3) Put No.1 carrier sub assy into No.2 sun gear along spline.
- Screw M10 I-bolt to No.1 carrier sub assy.
  - Lifting up No.1 carrier sub assy and align planetary gear and tooth of ring gear by rotating planetary gear by hands.
  - Rotate No.1 carrier sub assy by hands to fit No.1 carrier into No.2 sun gear spline.



2209A8SM47

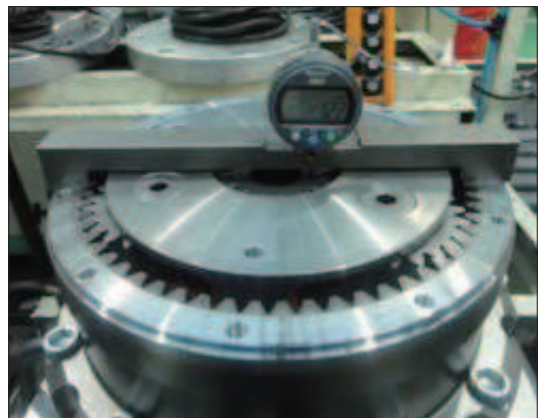
- (4) Put No.1 sun gear into No.1 carrier sub assy. Be sure to maintain it vertical with ground. And align with No.1 planetary gear spline.
- (5) Rotate No.1 carrier sub assy by hands to check noise.



2209A8SM48

## 8) MEASURING CLEARANCE & ASSEMBLING NAME PLATE

- (1) Check the clearance between ring gear and No.1 sun gear using a tool with dial gauge.
- Check the clearance  
Dial gauge = -0.3 ~ +2.95



2209A8SM49