

## Chapter 5 Steering System

### Section 1 Overview

Toque steering responding to engine speed has been widely used in all types of vehicles. Its major characters are as follows:

Adopting 4-spoke steering wheel, the steering device includes shock absorber and slanting steering device as well as the structure of vane pump steering transmission gears with flow control system of steering oil

| Item     |                                             | Specification                 |
|----------|---------------------------------------------|-------------------------------|
| gear box | steering case type                          | gear bar pinion gear          |
|          | oil pump type                               | vane type                     |
|          | Displacement cm <sup>3</sup> /rev           | 8.5                           |
|          | release set pressure<br>kgf/cm <sup>2</sup> | 90 <sub>0</sub> <sup>+8</sup> |

### Check service specification

| Item                                                               |                                              | Standard value | limit value |
|--------------------------------------------------------------------|----------------------------------------------|----------------|-------------|
| Steering wheel clearance<br>mm                                     | engine off                                   | At 15 or below | —           |
|                                                                    | under hydraulic pressure                     | —              | 30          |
| steering angle                                                     | inside wheels                                | 37° 45' 16"    | —           |
|                                                                    | outside wheels                               | 29° 46' 34"    | —           |
| Start torque of ball joint of steering horizontal linkage end Nm   |                                              | 0.5—2.5        | —           |
| Static steering power N                                            |                                              | Below 34       | —           |
| Fluctuation allowed error N                                        |                                              | Below 5.9      | —           |
| Oil pump pressure Mpa                                              | Pressure leased by oil pump                  | 8.8—9.6        | —           |
|                                                                    | no-load pressure                             | 0.8—1.0        | —           |
|                                                                    | steering gear keeps under hydraulic pressure | 8.8—9.6        | —           |
| Switch operation pressure of power steering oil pressure           | ON→OFF                                       | 1.5—2.0        | —           |
|                                                                    | OFF→ON                                       | 0.7—1.2        | —           |
| Total pre-load of pinion gears Nm                                  |                                              | 0.7—1.4        | —           |
| Rotating resistance of ball joint on steering horizontal linkage N |                                              | 8—20           | —           |
| Rotating torque of ball joint on steering horizontal linkage Nm    |                                              | 2—5            | —           |

|                                                        |   |     |
|--------------------------------------------------------|---|-----|
| Side clearance of belt gear assembly in oil pump<br>mm | — | 0.1 |
|--------------------------------------------------------|---|-----|

## Lubricant

| Recommended brand  | Manufacturer(company) | Trade mark        | Refuel mileage(km) |
|--------------------|-----------------------|-------------------|--------------------|
| power steering oil | Shell Corp.           | Shell steering TA | 2 years/100,000km  |

## Sealant and binder

| Item                |                                                              | Assigned sealant and binder            | Remarks          |
|---------------------|--------------------------------------------------------------|----------------------------------------|------------------|
| power steering case | end plug screw                                               | 3MATD Product No.8663 or equal product | semi-dry sealant |
|                     | Screw for gear bar bearing cover of power steering           |                                        |                  |
|                     | Dust cover for end ball joint of steering horizontal linkage |                                        |                  |

## Special tools

| Tools                                                                               | No.                                | Name                                                   | Usage                                                              |
|-------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------|
|  | MB991113<br>MB990635or<br>MB991406 | Steering horizontal linkage                            | Disjoint from end of steering horizontal linkage                   |
|                                                                                     | MB990685                           | Torque spanner                                         | Measure start torque of ball joint and preload of pinion gear axle |
|  | MB990326                           | Pre-load socket                                        | Measure start torque of ball joint                                 |
|                                                                                     | MB990662                           | Oil pressure gauge assembly                            | Measure oil pressure                                               |
|  | MB990993or<br>MB991217             | Oil pressure gauge joint of power steering (pump side) |                                                                    |

|                                                                                     |          |                                                        |                                                                            |
|-------------------------------------------------------------------------------------|----------|--------------------------------------------------------|----------------------------------------------------------------------------|
|                                                                                     | MB990994 | Oil pressure gauge joint of power steering (tube side) |                                                                            |
|    | MB990830 | steering wheel drawing die                             | disjoint from steering wheel                                               |
|                                                                                     | MB990826 | Torque spanner                                         | Disassemble and install slanting bracket and upper bracket                 |
|    | MB991006 | Pre-load socket                                        | measure pre-load of pinion gear                                            |
|                                                                                     | MB991204 | Torque spanner socket                                  | adjust bearing of gear bar , disassemble gear bar bearing cover            |
|   | MB990925 | installation tool kit for bearing and oil filling up   | install oil seal and bearing                                               |
|                                                                                     | MB991120 | needle bearing drawing die                             | disassemble needle of bar case                                             |
|  | MB991197 | handle (long shape)                                    | pressing installation of oil seal of gear bar                              |
|                                                                                     | MB991199 | installation tool for oil seal                         | pressing installation oil seal of gear bar                                 |
|  | MB991202 | installation tool for oil seal and bearing             | pressing installation of gear bar bearing                                  |
|                                                                                     | MB991213 | installation tool of gear bar                          | installation of gear bar                                                   |
|  | MB991203 | installation tool for oil seal and bearing             | pressing installation of oil seal and bearing of valve case                |
|                                                                                     | MB991317 | installation tool for sealing washer                   | compress sealing washer after replacement of sealing washer of pinion gear |

|                                                                                   |                     |                                      |                                                                                   |
|-----------------------------------------------------------------------------------|---------------------|--------------------------------------|-----------------------------------------------------------------------------------|
|  | MB990776            | front bridge seat                    | install dust cover of end ball joint of steering horizontal linkage               |
|                                                                                   | MB990628            | flexible check ring pincers          | disassemble and install flexible check ring pincers of belt gear and vehicle axle |
|  | MB990767            | Y-shape end bearing seat             | fix transmission belt gear                                                        |
|                                                                                   | MK998719or MD998754 | bearing pin for crankshaft belt gear |                                                                                   |
|  | MB990956            | installation tool for needle bearing | disassemble driving axle assembly                                                 |
|                                                                                   | MB991172            | adaptive socket                      |                                                                                   |

## Section 2 Adjustment sequence of check service

### I. Check on the clearance of steering wheel

- (1) When the engine is on, keep the front wheels straightly forward (under hydraulic pressure).
- (2) Slightly turn the steering wheel in the left and the right direction but before it starts to turn, measure the clearance on the circumference of steering wheel. Limit value: 40mm.
- (3) If the clearance exceeds the limit, it is needed to check the clearance between the joint of steering axle and steering transmission linkage and adjust and replace relative spare parts.
- (4) If the clearance still exceeds the limit, locate the steering wheel in the direction of straight front when the engine is off. Bring 5N load in the circumference and check the clearance. Standard value (the clearance of steering wheel when engine is off): below 15mm.

If the clearance exceeds the limit, it is needed to disassemble the steering case and check the total torque of pinion gears.

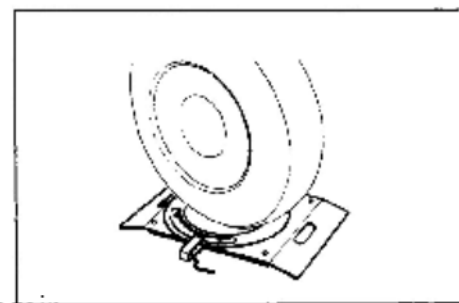
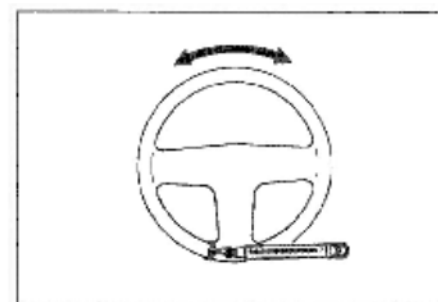
### II. Check on the steering angle

- (1) Place the front wheels on the test device of turning radius and measure the steering angle.

Standard value: inside wheels  $37^{\circ} 45' 16''$

outside wheels  $29^{\circ} 46' 34''$

- (2) If the steering angle is not within the standard range, it may be caused by incorrect toe-in. Adjust toe-in and check steering angle again.

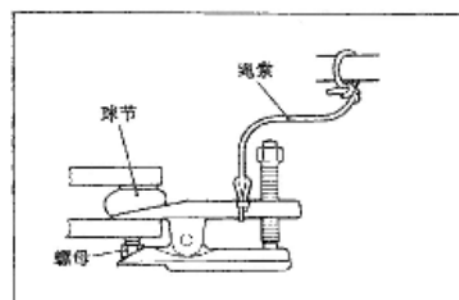


### III. Check on the start torque of end ball joint of steering horizontal linkage

- (1) Disjoint of steering horizontal linkage and steering knuckles with special tools.

#### Caution:

- ① Loosen the screw nut on the ball joint but not to dismantle it, using special



tool during operation.

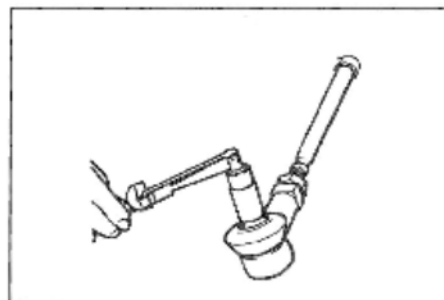
②A rope is required to suspend the special tool in case of its dropping.

(2) Turn the twin-end screw on the ball joint for several times and fix a screw nut on the twin-end screw, using special tool to measure start torque of ball joint.

(3) If the start torque of ball joint exceeds the standard value, a replacement of steering horizontal linkage is needed.

(4) If the start torque is below the standard value, check whether there is any axial clearance or error of engagement.

If nothing abnormal, the ball joint may be kept for further use.



#### IV. Check on the static steering power

(1) Park the vehicle on the plain road and turn the steering wheel to the position of facing front straightly. Start the engine and adjust the engine speed to  $1000 \pm 100$  r/min.

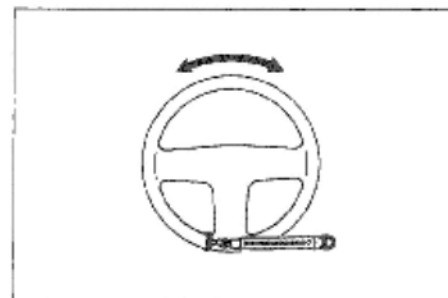
Caution: After checking the engine speed, do have it return to the standard idling speed.

(2) Connecting a spring balance to the outside circumference of steering wheel for measurement.

(3) With the steering wheel facing straightly forward, turn it to the left and to the right (within the range of 1.5 circles) and measure the power of steering needed. In addition, it is necessary to check whether there is no obvious fluctuation of steering power needed.

Standard value: steering power: below 34N allowed fluctuation: below 5.9N

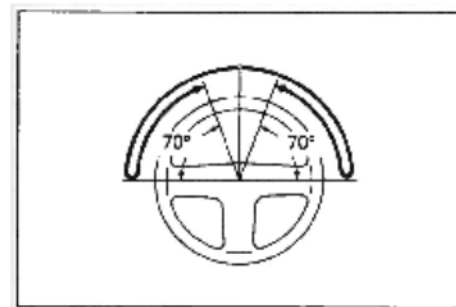
(4) If the measured power exceeds standard value, please check and adjust in accordance with troubleshooting.



#### V. Check on the return-to center ability of steering wheel

This test should be taken in the road tracking test and inspect the following:

- (1) Make a gentle and rapid turn, checking the driving “feeling” to ensure that there is no difference between the needed power turning left / right and the power steering wheel returning to center.



- (2) Turn the steering wheel for an angle of  $90^\circ$  at the vehicle speed of 20—30KM/H. Let go the steering wheel for one or two seconds. If the steering wheel return over  $70^\circ$ , the return ability may be deemed as good.

Remarks: When rapidly turning the steering wheel, a short “heavy” feeling does not mean abnormal (This may be caused by the insufficient supply of fuel by oil pump during idling).

## VI. Check on the Fluid level

Park the vehicle

on plain road and start the engine. Then turn the steering wheel for several times to raise the oil temperature to about  $50^\circ - 60^\circ\text{C}$ .

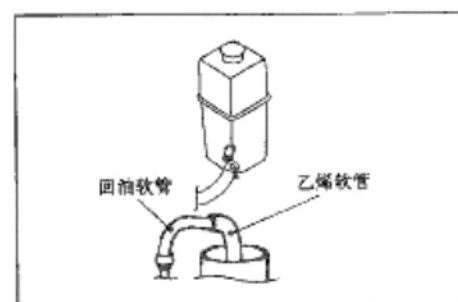
- (1) With the engine on, turn the steering wheel to the left and to the right completely and repeat for several times.
- (2) Check the oil to see whether there are any bubbles or it appears milk-like. Inspect the difference of fluid level in the condition of engine off and on. If the fluid variation is over 5mm, the air must be removed.



## VII. Replacement of steering oil

- (1) Hoist the front wheels with the jack and support them with rigid bracket.

- (2) Disconnect from the joint of the fuel return tube.



- (3) Connect the ethylene tube to the fuel return tube and exhaust the oil to a certain container.
- (4) Disconnect from the high-tension cable. During the interval operation on the starting of engine, turn the steering wheel to the left and to the right completely. Repeat this several times to exhaust all the steering oil.

Notice; Do not place the high-tension cable near the gasification or the oil exhaust tube.

(5) Firmly connect to the oil return tube and fix it with clip knot.

(6) Pour the specified steering oil to the oil tank until it reach the lowest level of the cleaner and then remove the air. The specified steering oil: automatic transmission oil ATF III.

### VIII. Venting

(1) Hoist the front wheels with the jack and then support them with rigid stand.

(2) Rotate the transmission belt of the oil pump manually repeatedly.

(3) Turn the steering to the left and to the right completely and repeatedly for 5-6 times.

(4) Disconnect the high-tension cable. Then in the mean time of regular operation of starting the engine, rotate the steering fully to the left and to the right and repeat this for 5-6 times (for about 15-20seconds)

Notice;

①When venting off the air, remember to supply steering oil in case of the decrease of oil lever to the lowest level of cleaner.

②If venting in the mean time of engine operation, the air may be interrupted and be absorbed to the oil, the way to be done is rotating the crankshaft while venting.

(5) Connect to the ignition cable and start the engine(idle speed).

(6) Turn the steering to the left and to the right until there are no bubbles in the oil tank.

(7) Ensure that the steering oil appears as not milk-like and raise to the level specified by the dipstick.

(8) Ensure a small change of liquid level when the steering is turned to the left and to the right.

(9) Check when the engine is off and on to see whether the liquid level change is within 5MM.

③If the liquid level change is over 5MM, it means that the air has not been vented off from the system. It should be completely removed.

④If the liquid level suddenly arises after the engine off, it means that the air has not been vented off.

⑤If the air has not been vented off, there may be abnormal noise of oil pump and flow control valve which



may cause a shorter life of them.

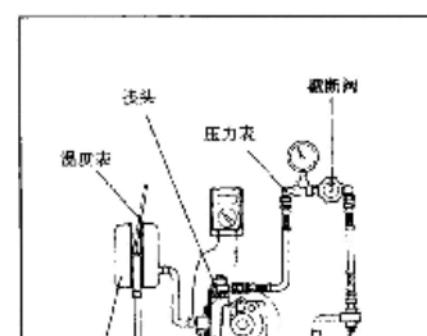
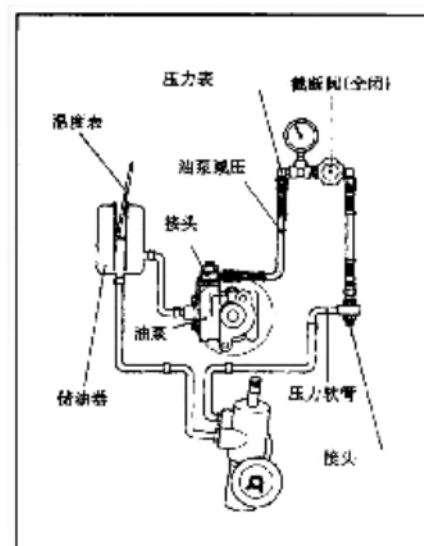
### IX. Test of oil pump pressure

- (1) Disconnect the oil pump from the oil tube and connect it to specified tools.
- (2) After venting the air, turn the steering for several times when the vehicle stay unmoved and keep the oil temperature up to about 50-60℃.
- (3) Start the engine and keep it racing at  $1000 \pm 100$  r/min. Switch off the block valve and test the release pressure of oil pump and confirm whether the pressure is within the standard value.

Standard value; 8.8-9.6Mpa.

- (4) If the release pressure is not within the range of standard value, the oil pump should be repaired fully.
- (5) Check whether the liquid pressure is standard on the condition that block valve of the pressure gauge is switched on. Standard value: 0.8-1.0Mpa.
- (6) If it not within the standard, the steering case should be repaired fully and there should be a repeated measurement on the liquid pressure.
- (7) Turn the steering completely to the left and to the right and repeat for several times. Then check whether the liquid level keeps standard. Standard value: 8.8-9.6Mpa.
- (8) If it not within the standard, it may be caused by the malfunction of oil track and steering case which should be checked and repaired when necessary.
- (9) Disassemble the special tools, tighten up the oil pipe 1 to the assigned torque. Tighten torque: 45-65Nm
- (10) Vent off the air in the system.

### X. Check on the oil pressure switch of power steering





- (1) Disconnect oil pipe 1 from the oil pump and connect to the specified tool.
- (2) Venting off the air, turn the steering several times while keeping the vehicle unmoved and keep the oil temperature up to about 50-60°C.
- (3) Ensure to keep the engine idling.
  - (4) Disconnect the joint to the switch connector of oil pressure and connect to the Ohmmeter in a suitable position.
- (5) Gradually switch off the block valve and increase the hydraulic pressure. Then check whether the hydraulic pressure conformed to standard value when the switch works. Standard value: 1.5-2.0Mpa.
- (6) Gradually switch on the block valve and decrease the hydraulic pressure. Then check whether the hydraulic pressure conformed to standard value when the switch works. Standard value: 0.7-1.2Mpa.
- (7) Disassemble the special tools, tighten up the oil pipe 1 to the assigned torque. Tighten torque: 45-65Nm
- (8) Vent off the air in the system.

### Section 3 Steering wheel and axle

#### I. The assembling and adjustment of steering wheel and steering column

##### 1、 Illustration of steering wheel and steering column

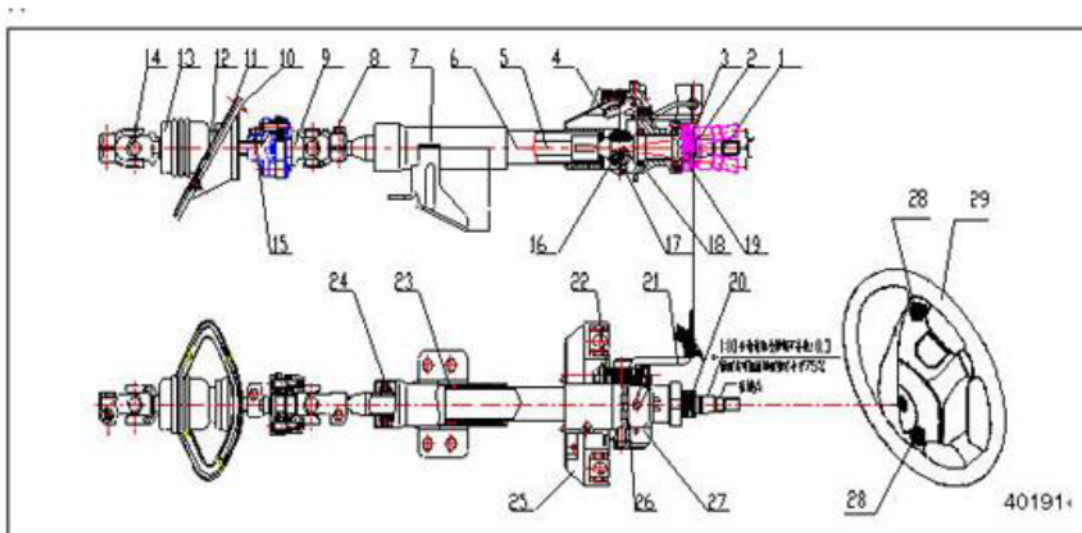
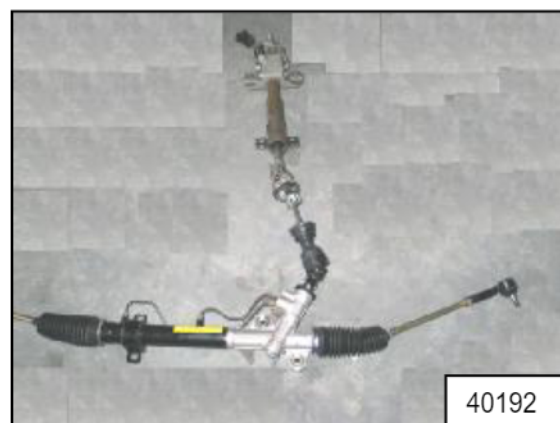


Illustration of steering wheel and steering column

1—upper steering axle 2-retaining ring 3-spacer 4-gear bar 5—steering axle assembly  
6-assembly of upper post 7-assembly of lower post and its stand 8- screw blot 9- upper welding  
Y-end of universal joint 10-frame of dust cover 11-dust cover 12-case of dust cover 13-lower dust  
cover 14—lower welding Y-end 15-screw bolt 16-plastic ball end 17— plastic pin 18- lower bearing  
19-lower retaining ring 20—upper spring on the steering axle 21—adjustable handle 22—bump block  
23—plastic bearing 24—plastic bearing 25—stand for upper post 26—gear bar 27—upper lock seat 28—  
horn button 29—steering wheel

2、 Sequence of assembly: The steering system includes steering assembly, steering column-axle mandrel assembly and steering universal joint assembly. During the assembling, the relative assembly only has to be assembled into an integrity

①Connect the steering universal joint assembly and steering



column-axle mandrel assembly through screw blot 8. Then joint lower welding Y-end 14 of the universal joint to the input axle of steering.

- ② Fix the steering column to the vehicle body through the upper and lower post.
- ③ Keep the two front wheels on the track of straight forward, put the steering 29 in the upper end of centered axle and adjust to the right position. Twist the screw nut and tighten up with the assigned power.
- ④ Fix the case of steering lock to the post. Remember to adjust the relative height of key case and post according to the suitable height of ignition lock center and combined switch cover as the pre-assembled try.
- ⑤ Keep a firm connection of the horn wire /air bag inserting chip and the contacting board, and also a firm connection of horn cover and the body proper, with an even clearance.

### 3、The disassembling and assembling of steering column:

- ① disassemble the steering
- ② disassemble the decorating cover of the combined switch
- ③ disassemble the combined switch
- ④ disassemble the decorating board under the left instrument panel
- ⑤ loosen the mounting bolt in the cross knot and the steering



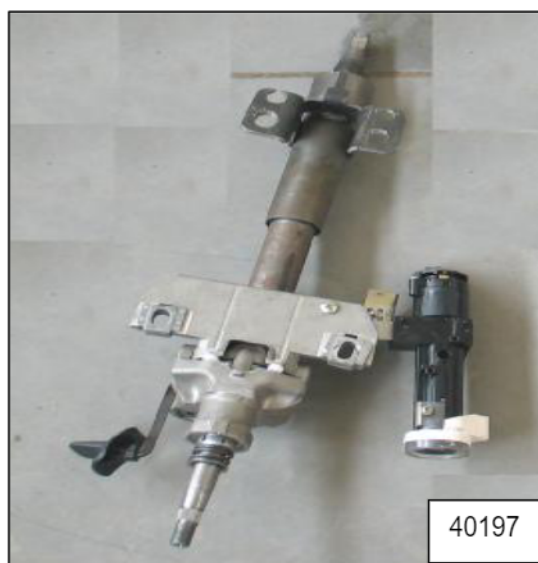
⑥loosen the four mounting bolts in the steering column and the vehicle body with the 13CM socket.



⑦loosen the mounting bolts in the steering column and the frame in the instrument panel with the 13CM socket.



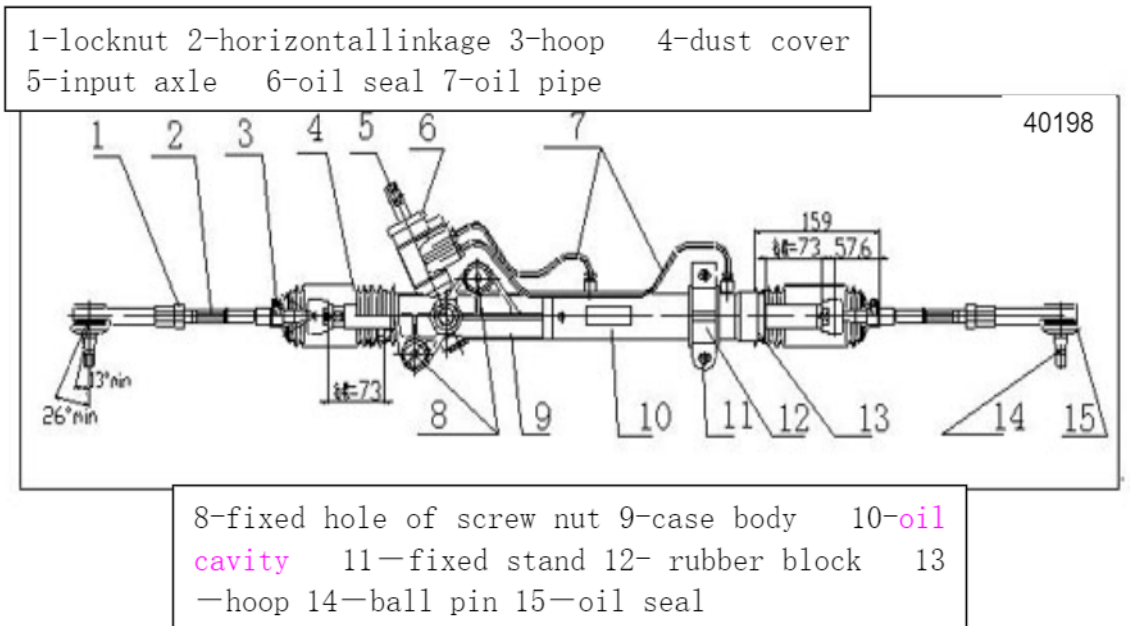
⑧put down the steering column and pull it out from the rear





## II. The assembling of steering

### 1、 The disassemble of steering is resolved as the illustration

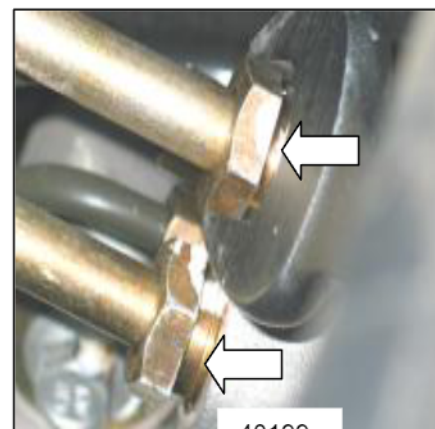


Disassemble of the steering

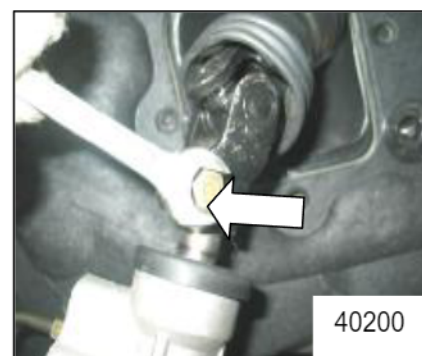
### 2、 The disassembling of steering on the vehicle

Disassemble the air cleaner

Loosen the screw bolt of transmission oil pipe  
on the steering



Loosen the mounting bolt of the direction  
device and the universal joint



Loosen the ball-ended screw bolt of the horizontal left/right linkage in the direction device



Disassemble the mounting bolt of the front venting pipe and the venting manifold of engine



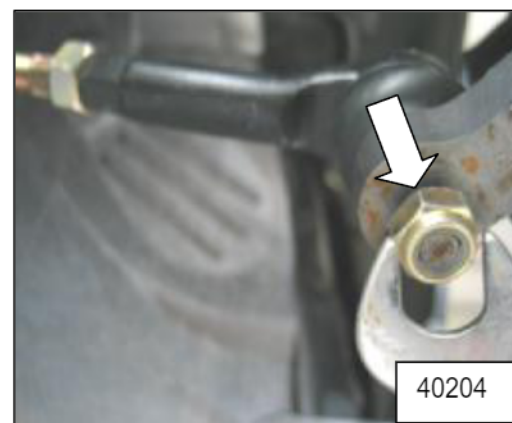
Loosen the mounting bolt of the front venting pipe and the three-way catalytic converter, as well as loosen the socket of the front oxygen sensor and then take off the venting pipe



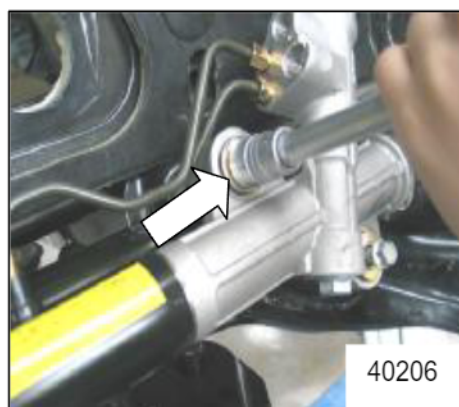
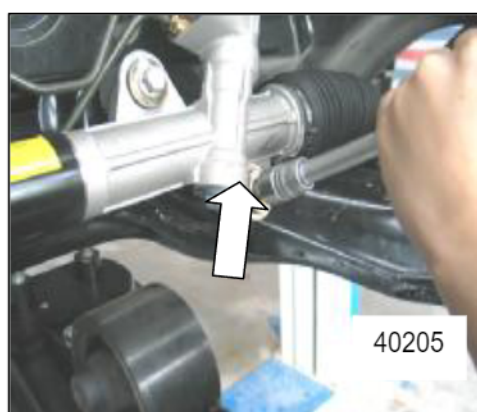
Loosen the screw bolt  
for the stand of front/rear shock absorber

Loosen the mounting bolt of the engine bracket

Loosen the mounting bolts of the left/right  
rocker arms and the sheep-horn

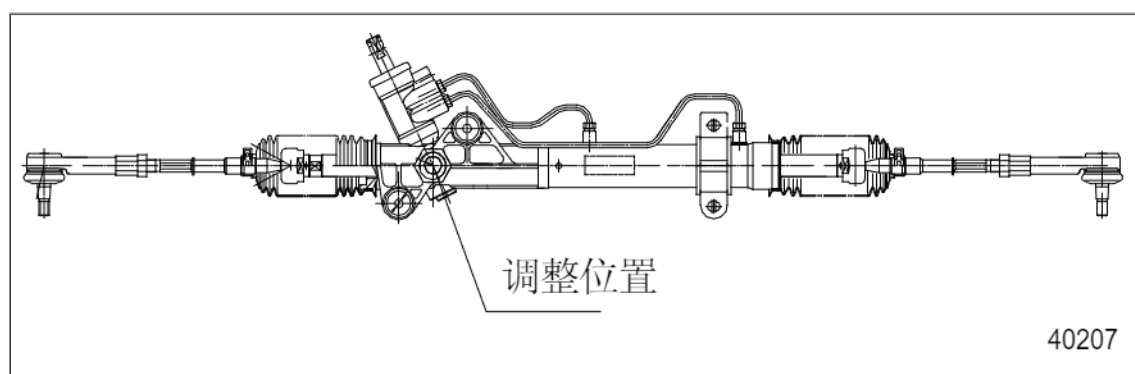


Loosen the three mounting bolts and a fixity nut in the steering and take the steering down



### Sequence of assembling:

① Adjust the gear bar of mechanic steering and make the equal length of left and right reach (size  $a=28.5\text{mm}$ ,  $b=28.5\text{mm}$ ). Presentation as Figure 2-4, measure the distance from the flange of the case to the end surface of gear bar.



① Adjust the steering gear.

- ② Twist the fixing screw nut to the end of gear bar and maintain the above value adjusted;
- ③ Tighten up the screw nut of steering with the torque of 30Nm;
- ④ Put the horizontal linkage into the steering arm;
- ⑤ Put on dust cover on the two sides of steering
- ⑥ Tighten up the screw nut in the two sides of horizontal linkage with the torque of 32Nm;

### III. Disassemble the steering wheel and install a new one

1、Disassemble the air bag unit. Move the steering wheel/wheels to the position of straight forward. Loosen the screw bolt and dismantle the steering wheel.

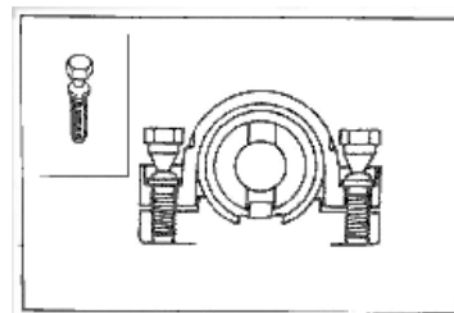


2、Move the wheels to the position of straight forward and install the steering wheel, with an aligned marks of steering wheel and steering axle. Tighten up the torque.

### IV. Steering lock stand/steering lock core

#### Disassembling of steering lock stand/steering lock core

If there is necessity to dismantle the steering lock core, saw the special screw bolt with a steel saw by the sides of steering lock stand.





### Installation of steering lock core/steering lock stand/special screw bolt

(1) When installing the steering lock and lock stand onto the post, keep the lock and the post flange in a line and install the steering lock for the time being.

(2) After confirming the normal work of locking, tighten up the special screw bolt until the bolt end is twisted apart.

Notice; While installation of steering lock, replace the steering lock stand and screw bolt with new ones.

## Section 4 Power steering

### I. Disassembling and installation

#### 1、Pre-operation before disassembling

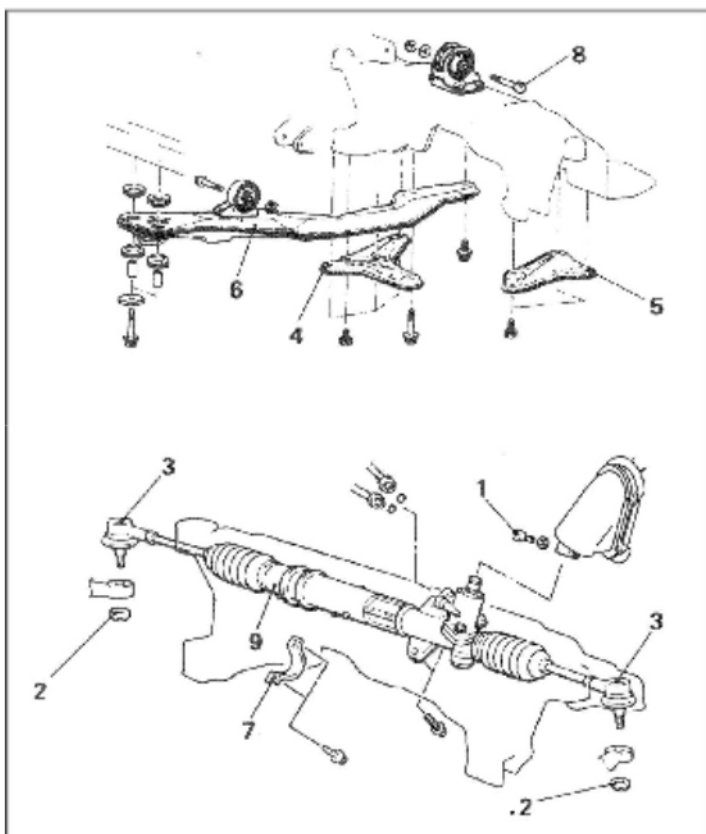
Drain the power steering oil.

Pull off the fixing rod.

#### 2、Disassembling steps

- (1) screw bolt for connecting muff coupling assembly and steering case
- (2) screw nut
- (2) joint of steering horizontal linkage and steering knuckles
- (4) supporting(left)
- (5) supporting(right)
- (6) engine bracket
- (7) block clip
- (8) screw bolt

### (9) power steering assembly



### 3. Operation after installation

Install the stabilization rod

Inject power steering oil.

Check the steering wheel in the condition that the wheels keep straightly forward.

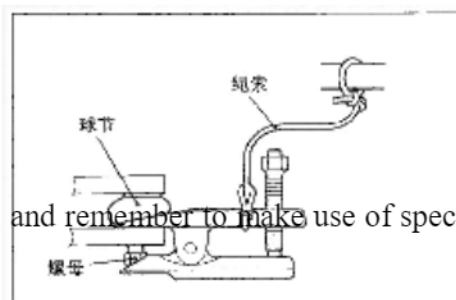
Adjust the front wheels alignment.

## II. Disassembling operation points

### 1. Disjoint of steering horizontal linkage

Caution:

- ① Loosen the screw nut on the ball joint but not take it down, and remember to make use of special tools during



the operation.

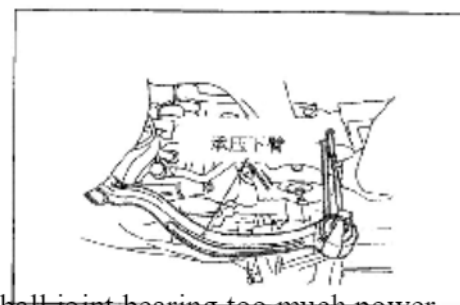
- ②Ropes should be used in case of drop of special tools.

## 2. Disjoint of screw bolts

After removing the screw bolts in the rear horizontal rocker limiting bracket assembly, disassemble the rear of engine and form clearance between engine assembly and horizontal bar so as to disassemble the gear case assembly.

## 3. Disassembling of gear case assembly

- ①Disassemble the lower bearing arm(usually in the left side when the driving seat locates on the left) installation part.



- ②Pay attention to the suspension of the bearing arm and not to have the ball joint bearing too much power.
- ③Disassemble the joint between the gear case assembly and shaft coupling assembly, and then disassemble the gear case assembly from the left-sided horizontal bar.

Caution: When disassembling the gear case assembly, do not damage the rippling pipe and dust cover on the end of horizontal linkage.

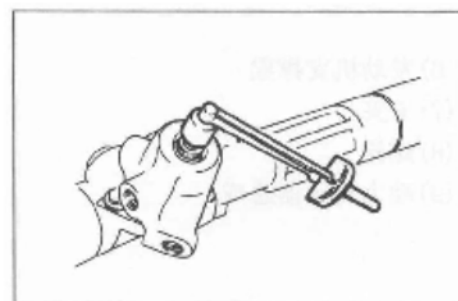
## III. Check

### 1、 Total torque of pinion gears in the gear case

Check the total torque of pinion gears with special tools, turning them at a speed of 4-6 seconds per circle.

Standard value: 0.7-1.4Nm torque variation:0.4Nm

Remarks: Disassemble the rippling pipe from the gear bar case during measurement. Measure the torque of pinion gear along the track of gear bar.

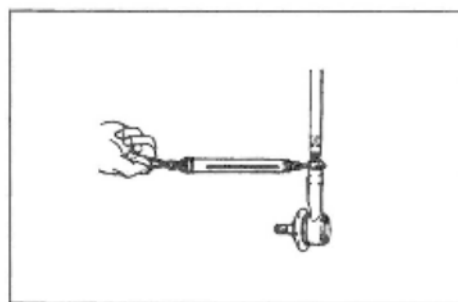


If the measurement value is not within the standard value, first adjust the bearing casing and check again the total torque of pinion gears.

If the total torque of pinion gears could not be adjusted within the range of standard value by adjusting gear bar bearing casing, a check on the gear bar bearing casing, gear bar bearing spring, and gear bar bearing is needed. If necessary, replace the spare parts.

## 2、 Check the waving resistance of steering horizontal linkage

- ① Make the horizontal linkage wave violently for ten times.
- ② Measure the waving resistance of the steering horizontal linkage with a spring balance.

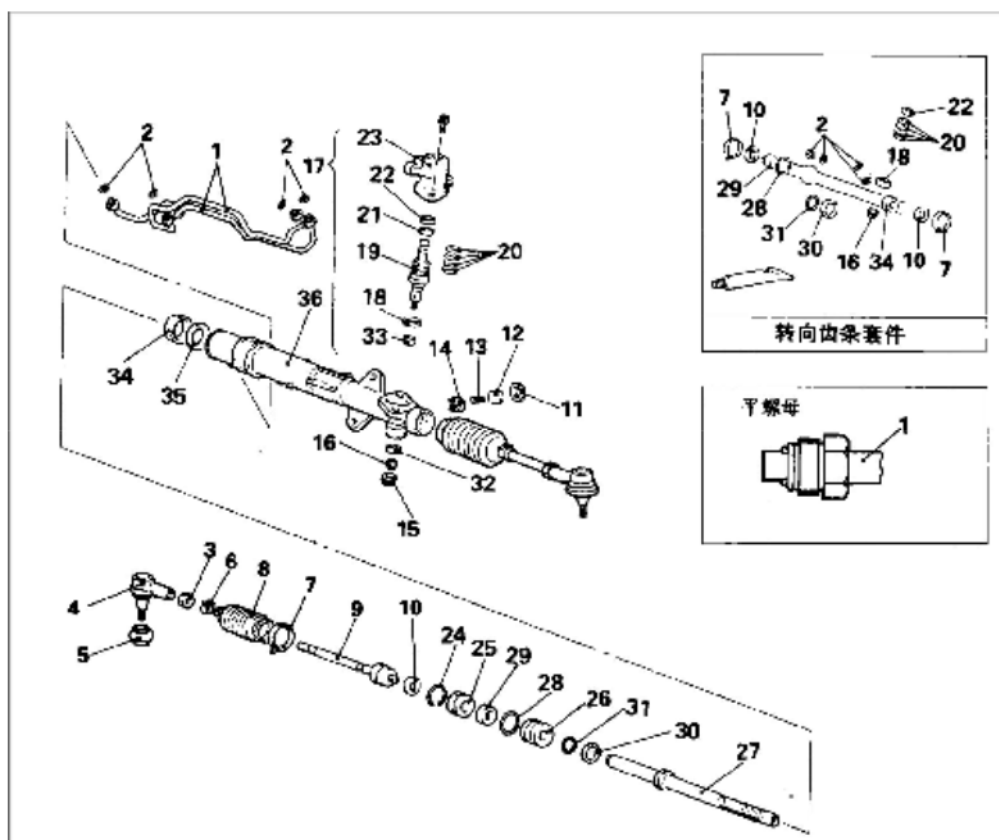


Standard value:8-20N[2-5Nm]

③If the measurement value exceeds the standard value, replacement of steering horizontal linkage assembly is needed.

④Even when the measurement value is below the standard value, the steering horizontal linkage may be kept for further use if there is no much clearance and waves stably.

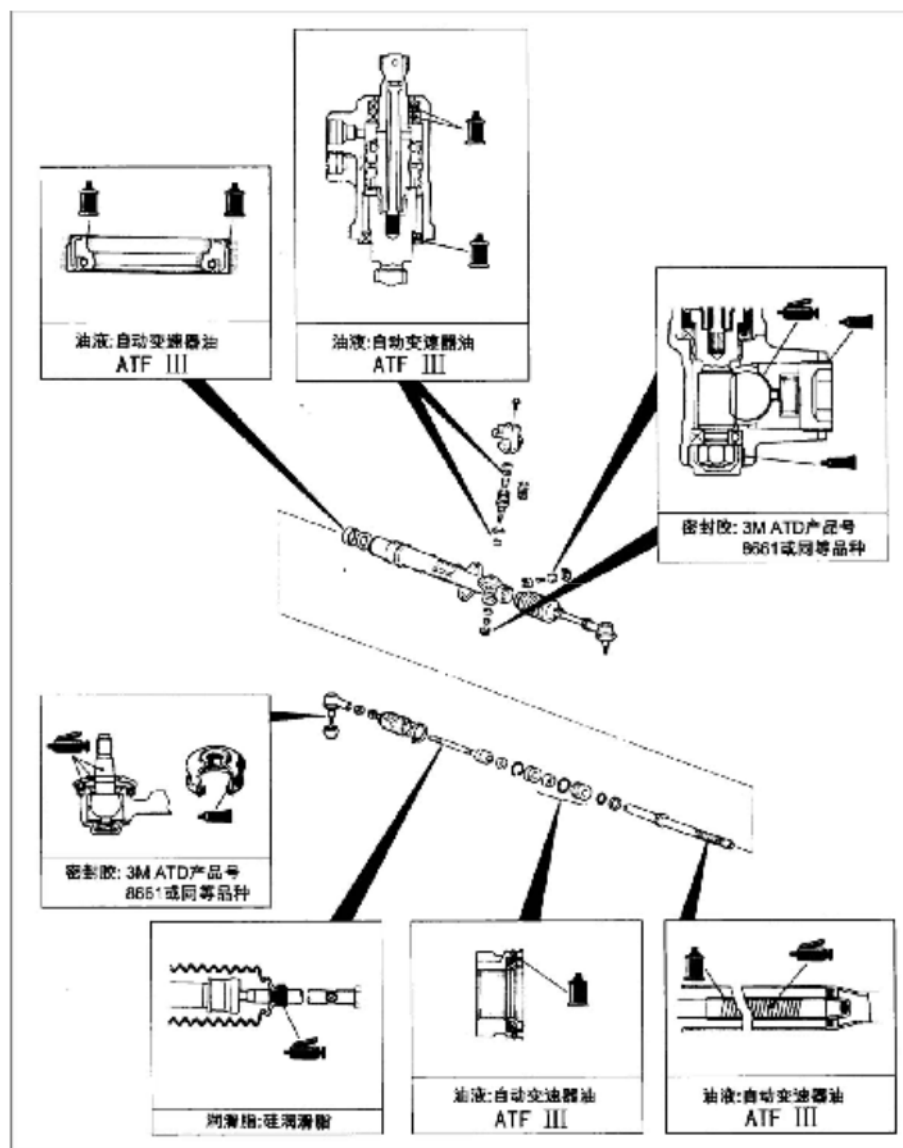
#### IV. Disassemble and reassembling



##### 1、Disassemble steps

- |                                                                    |                                     |                                      |
|--------------------------------------------------------------------|-------------------------------------|--------------------------------------|
| (1) oil supply pipe                                                | (13) gear bar bearing cover         | (25) locating screw case of gear bar |
| (2) O-shape ring                                                   | (14) gear bar bearing               | (26) gear bar bushing                |
| (3) locking bolt on the steering horizontal linkage                | (15) end plug                       | (27) gear bar                        |
| (4) end of steering horizontal linkage                             | (16) self-locking screw nut         | (28) O-shape ring                    |
| (5) dust cover                                                     | (17) valve case assembly            | (29) oil sealing                     |
| (6) block clip of rippling pipe                                    | (18) oil sealing                    | (30) sealing washer                  |
| (7) hoop of rippling pipe                                          | (19) pinion gear and valve assembly | (31) O-shape ring                    |
| (8) rippling pipe                                                  | (20) sealing washer                 | (32) ball bearing                    |
| (9) steering horizontal linkage                                    | (21) ball bearing                   | (33) needle bearing                  |
| (10) adjustment of total torque of pinion gears with winged washer | (22) oil sealing                    | (34) oil sealing                     |
| (11) locking screw nut                                             | (23) valve case                     | (35) bearing washer                  |
| (12) gear bar bearing cover                                        | (24) spring ring                    | (36) gear bar cover                  |

## 2、Lubrication and airtight parts

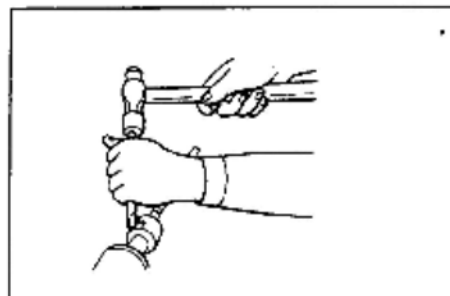


## **V. Disassemble of operation points**

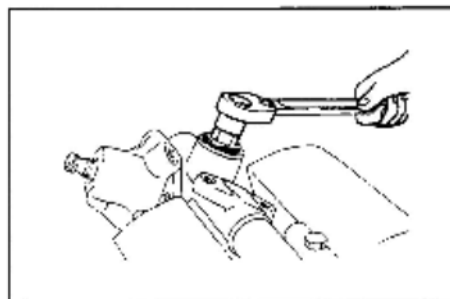
### **1、 Disassembling of steering**

#### **horizontal linkage/winged washer**

Loosen the winged washer fixing the steering horizontal linkage and gear bar with a chisel.



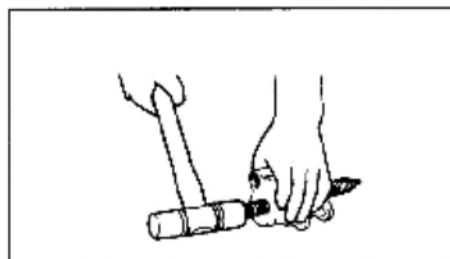
### **2、 Disassembling of gear bar bearing cover**



### **3、 Disassembling of oil**

#### **sealing/pinion gear and valve assembly**

**Knock slightly at the pinion gear with plastic and disassemble it.**

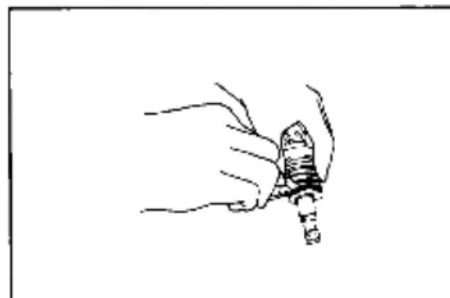


### **4、 Disassembling of sealing washer**

Cut the sealing washer and remove it from pinion gear, valve assembly and gear bar.

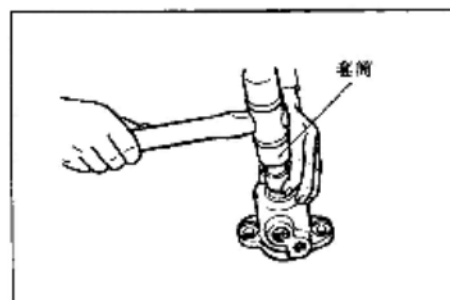
Caution;

Take a notice of cutting sealing washer and not to damage the pinion gear and valve assembly or gear bar.



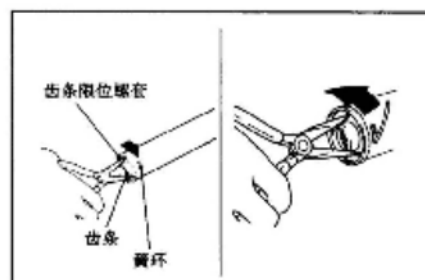
### **5、 Disassembling of bearing and oil seal**

Disassemble oil seal and ball axle in the same time from the valve case with a socket.



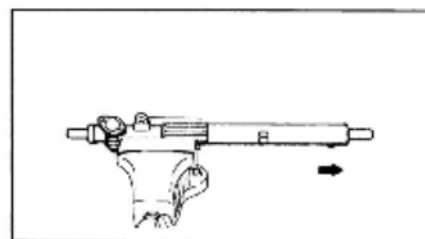
## 6、Disassembling of spring ring

- ① Turn clockwise the steering screw case of gear bar for locating until the end of spring ring stretches out from the slot of gear bar cover.
- ② Turn counterclockwise the screw case of gear bar for locating and disassemble the spring ring.



## 7、Disassembling of gear bar

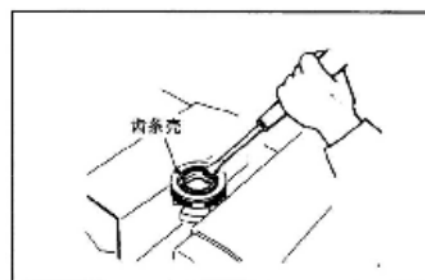
Slowly drag out the gear bar and take out gear bar screw casing and gear bar bushing.



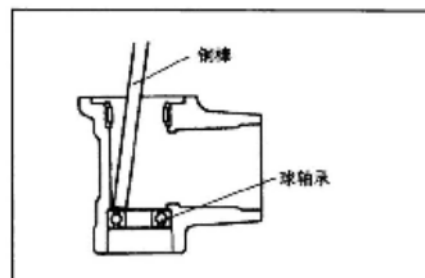
## 8、Disassembling of oil sealing

Bend the oil sealing partly and disassemble it from the gear bar bushing.

Caution: Do not damage the fitting surface of oil seal pressure.

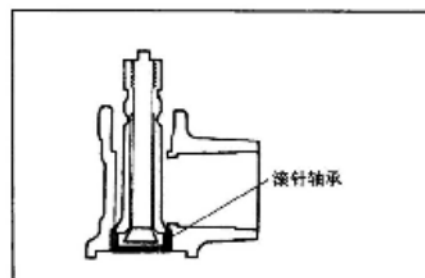


## 9、Disassembling of ball bearing



## 10、Disassembling of needle bearing

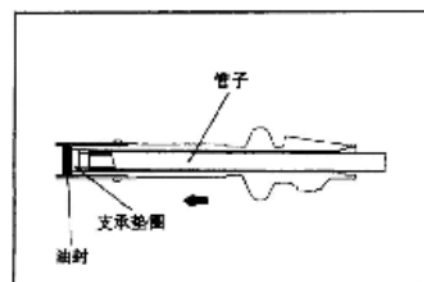
Caution: Do not stretch special tools out too much in case of damage of the inside of casing.



## 11、Disassembling of oil seal/bearing washer

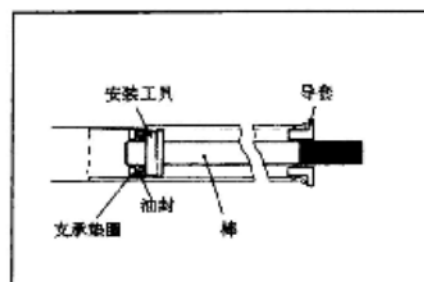
Disassemble the bearing washer and oil seal with a tube or similar tools.

Caution: Take care not to damage the inside surface of gear bar in the gear case.

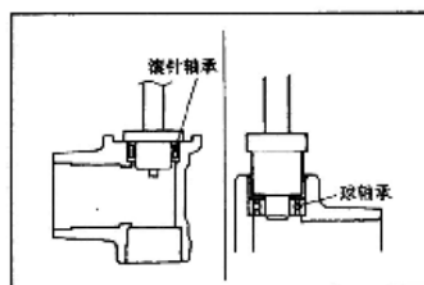


## VI. Reassembling operation points

### 1、 Installation of bearing washer/oil seal



### 2、 Installation of needle bearing/ball bearing

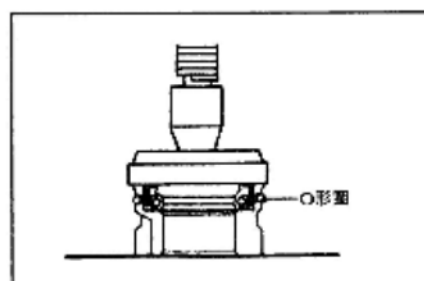


### 3、 Installation of oil seal/O-shape ring

① Apply a coat of oil on the outsides of oil seal and O-shape ring.

Assigned oil: automatic transmission oil ATFIII

③ Press the oil seal with special tools until its touch to the end of gear bar bushing.



### 4、 Installation of gear bar

① Apply a coat of general lubricating grease on the gear surface of gear bar.

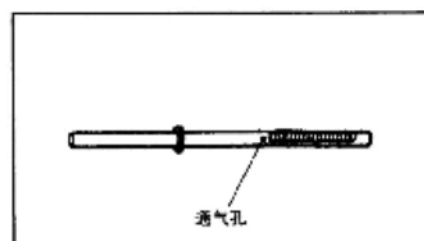
Caution: Do not have the lubricating grease block the venting hole of gear bar.

② Cover the gear surface of gear bar with special tools.

③ Apply assigned oil on the special tools.

Assigned oil: automatic transmission oil ATFIII

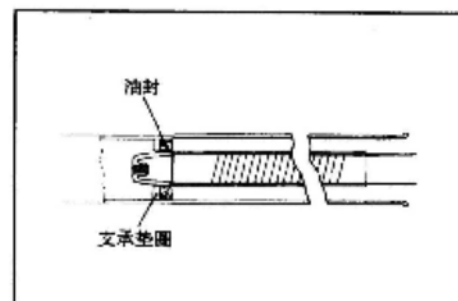
④ Align the center of oil seal and gear bar incase of slide of protecting washer spring and slowly insert the gear bar from the side of power cylinder.



### 5、Installation of gear bar bushing

Twist ethylene tape around the end of gear bar and apply a coat of oil and then put on gear bar bushing and gear bar screw case for locating.

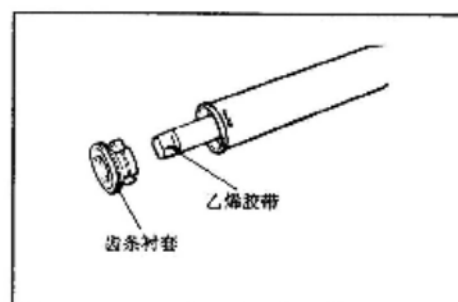
Assigned oil: automatic transmission oil ATFIII



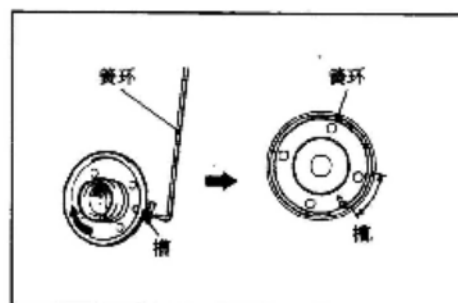
### 6、Installation of spring ring

Insert the spring ring into the gear bar screw case for locating through power cylinder and turn clockwise the gear bar screw case for locating, making sure that the spring ring has been inserted.

Caution: While turning clockwise the gear bar screw case for locating, insert the spring ring into the gear bar screw case for locating.

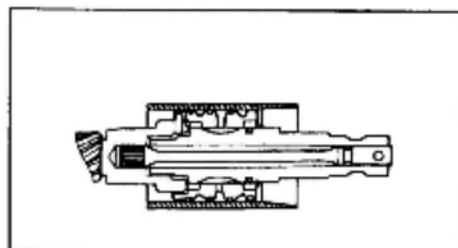
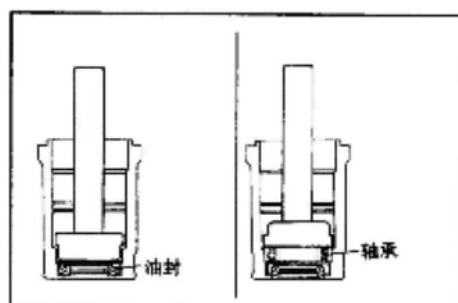


### 7、Installation of oil seal and ball bearing



### 8、Installation of sealing washer

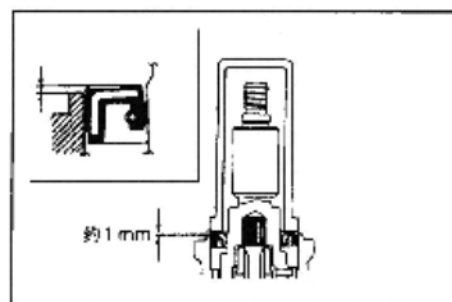
As the sealing washer may open during installation, press the spring ring with special tool or press with hands to fasten it.



### 9、Installation of oil seal

Press the oil seal into the valve case with special tool.

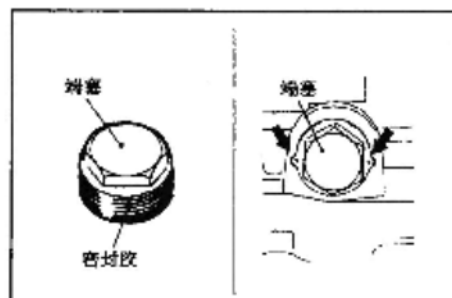
Caution: In case of the sealing out of order in the fitting surface of sliding valve case, the upper surface of oil seal should stretch out 1mm from the fringe of sliding valve case.



### 10、Installation of end plug

Apply a coat of assigned sealant in the threading part of end plug.

Assigned sealant: 3MATD Product No.8661 or the similar type of product. Fix the threading part of end plug in the two ends with punch .



### 11、Adjustment of total torque of pinion gears

- ①Place the gear bar in the middle and tighten the gear bar bearing cover to 15Nm.
- ②Turn clockwise the pinion gear at the speed of 4-6 seconds per circle in the middle position with special tool and turn a counterclockwise angle of 30-60 degrees until the torque being adjusted to standard value.
- ③Check the total torque of pinion gears with the turning of them with special tool at the speed of about 4-6 seconds per circle.

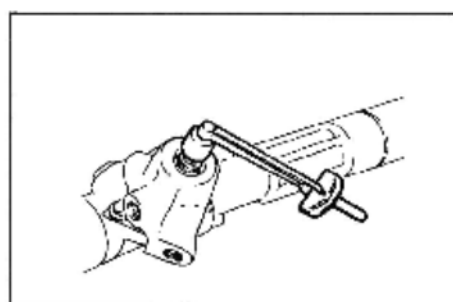
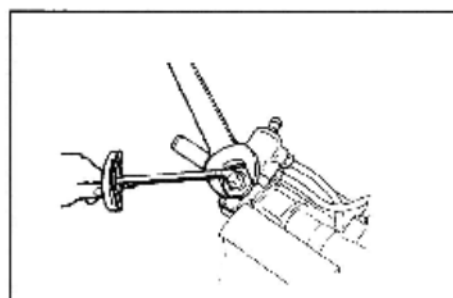
Standard value: 0.7-1.4Nm [Variation of torque:0.4Nm]

Caution:

- a、Set the standard value at its maximum in the adjustment.
- b、Ensure that it would not grip or be blocked during operation of gear bar in the axle.

Remarks: When the adjustment in the assigned corner is not allowed, check or replace the parts of gear bar bearing.

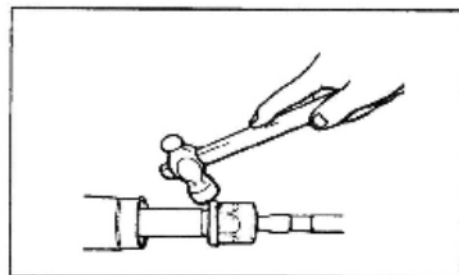
- ④After adjustment, lock the gear bar bearing cover with locking screw nut.



## 12、Installation of

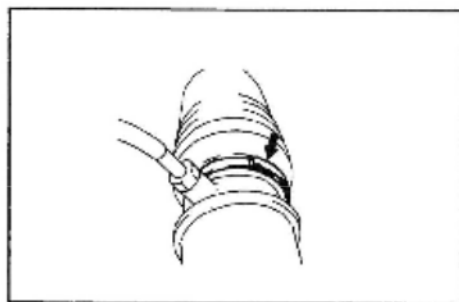
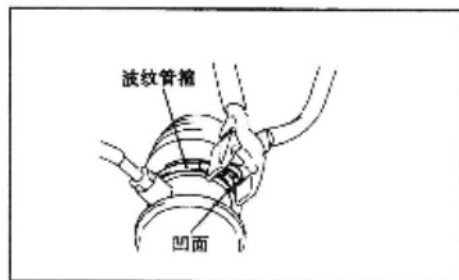
### winged washer/steering horizontal linkage

After installing the steering horizontal linkage to the gear bar, bend the winged washer end into the cutting(position 2) of steering horizontal linkage.

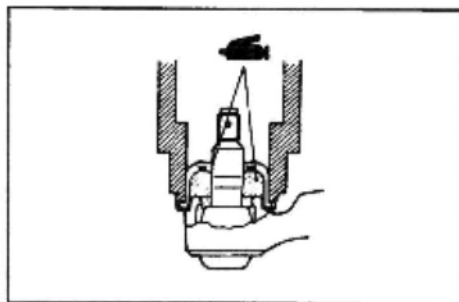


## 13、Installation of rippling pipe hoop

- ①Clip the rippling pipe hoop tightly by holding pincer pliers against the hollow part of rippling pipe.
- ②Bend the hollow part of rippling pipe hoop with a plastic hammer or similar tool as shown.

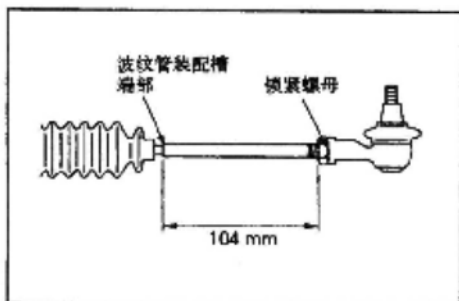


## 14、Installation of dust cover



## 15、Installation of steering horizontal linkage

Twist in the steering horizontal linkage and make the left and right length as shown, fixed by locking screw nut.

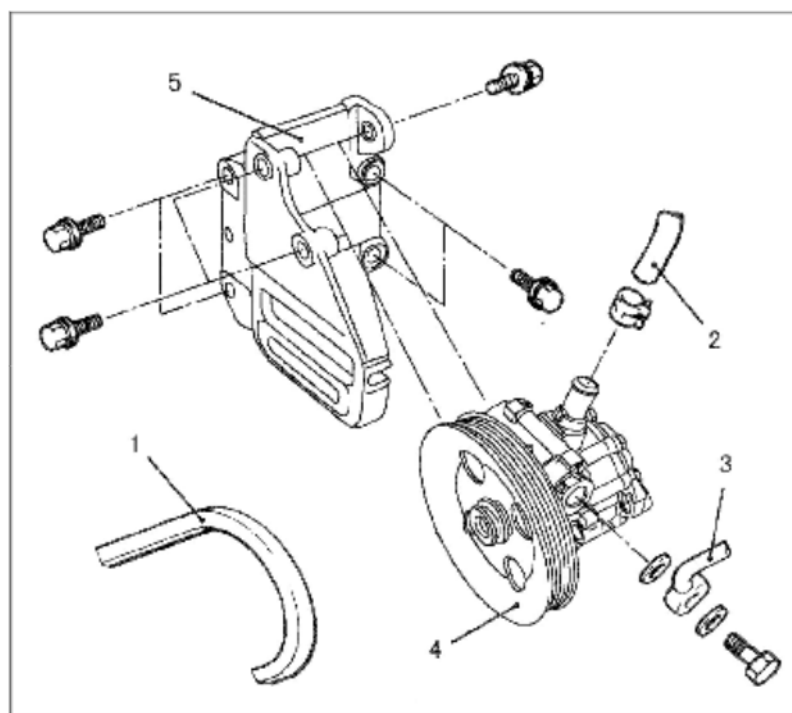


## Section 5 Power steering oil pump

### I. Disassembling and installation

#### 1、Pre-operation before disassembling

Exhaust power steering oil.



#### 2、Disassembling steps

- |                         |                                     |
|-------------------------|-------------------------------------|
| (1) power steering belt | (4) oil pump                        |
| (2) fuel inlet tube     | (5) bracket for power steering pump |
| (3) oil tube 1          |                                     |

#### 3、Operation after installation

Fill power steering oil;

Adjust the tension of power steering belt;

Displacement of power steering line;

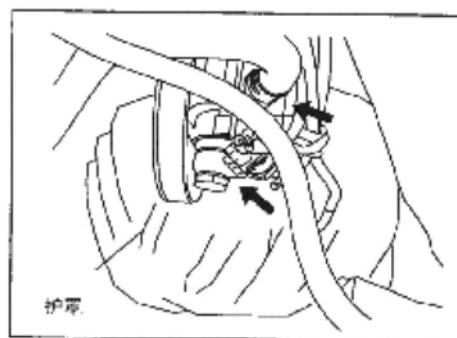
Check on oil pump pressure.

## II. Disassembling operation points

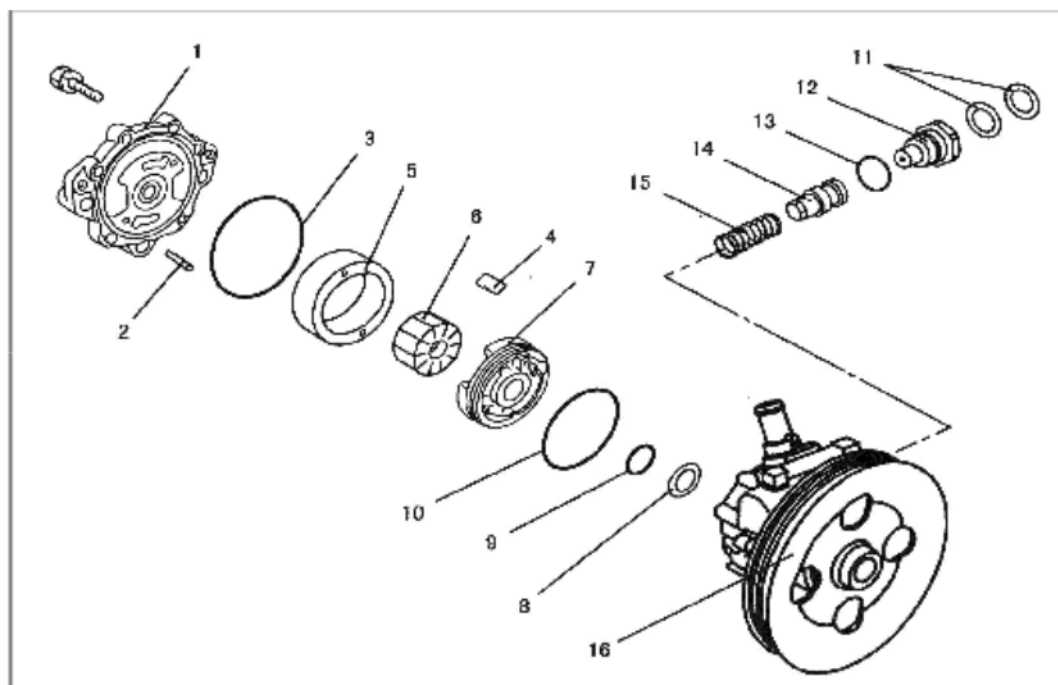
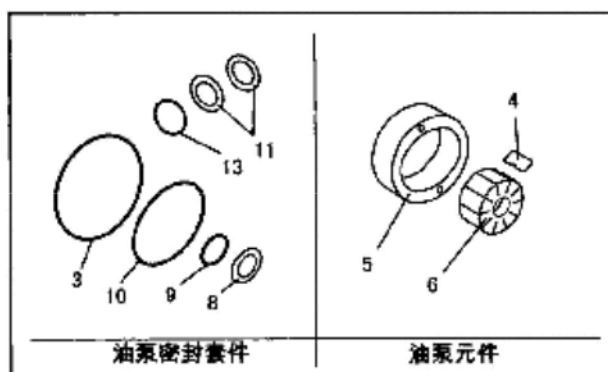
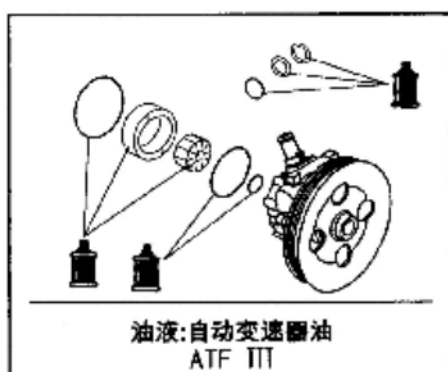
### 1、disassembling of oil inflow tube/oil tube 1

Caution:

As the air-conditioned compressor under the oil pump, before disassembling the oil tube, cover the air-conditioned compressor with a piece of cloth.



## III. Disassemble and reassembling



**1、 Disassemble steps**

- |                  |                     |                          |
|------------------|---------------------|--------------------------|
| (1) pump cover   | (7) side board      | (13) O-shape ring        |
| (2) lock pin     | (8) oil seal        | (14) flow control valve  |
| (3) O-shape ring | (9) O-shape ring    | (15) flow control spring |
| (4) vane         | (10) O-shape ring   | (16) oil pump body       |
| (5) cam ring     | (11) sealing washer |                          |
| (6) rotor        | (12) joint          |                          |

**Caution:**

Do not separate the flow control valve from the oil pump body.

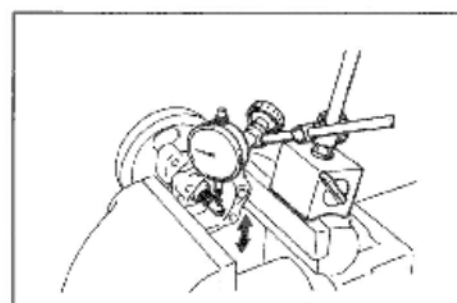
**IV. Check**

The clearance between axle and the pump

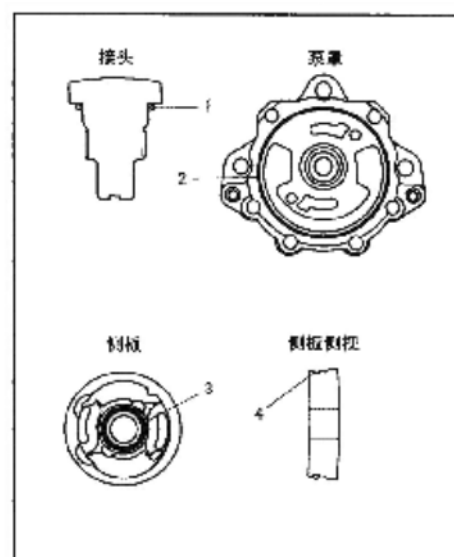
Put the dial gauge against the axle end of belt gear assembly.

Measure the clearance by moving belt gear assembly up and down.

Limit value:0.1mm.

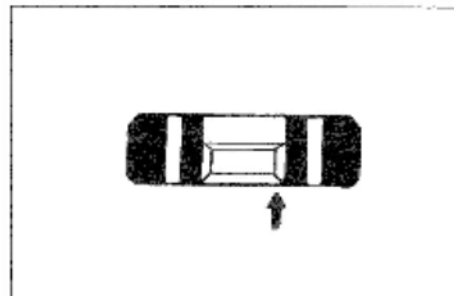
**V. Reassembling operation points****1、 Installation of O-shape ring**

| No. | internal diameter*width |
|-----|-------------------------|
| 1   | 20.5×1.5                |
| 2   | 63×2.3                  |
| 3   | 42×2                    |
| 4   | 15.3×2                  |



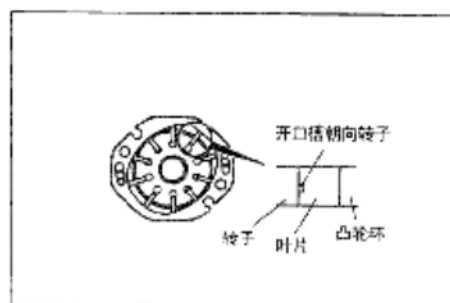
## 2、Installation of rotor

Fix the rotor to the belt gear assembly  
and keep the rotor hub lie in the side of pump cover.



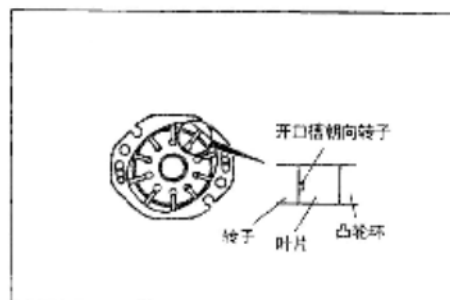
## 3、Installation of cam ring

Install the cam ring with the side logo slot  
facing side board.



## 4、Installation of vane

Install the vane to the rotor, noticing the  
installation direction.



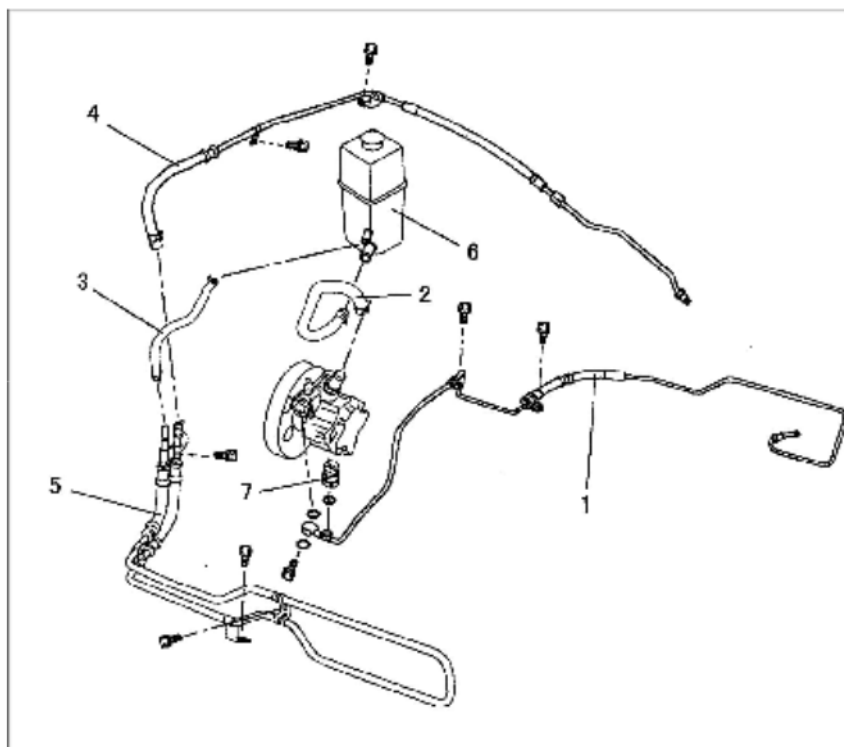
## Section 6 Power steering device line

### Disassembling and installation

#### 1、Pre-operation before disassembling

Exhaust power steering oil.

Disassemble the front protecting bumper.



## 2、Disassembling steps

- |                         |                               |
|-------------------------|-------------------------------|
| (1) oil tube 1 assembly | (5) cooling oil tube assembly |
| (2) oil inflow tube     | (6) power steering oil tank   |
| (3) oil return tube     | (7) pressure switch           |
| (4) oil tube 2 assembly |                               |

## 3、Operation after installation

Install the front protecting bumper.

Fill power steering oil.

Displace the air from the power steering line.

## Section 7 Summary of assembling and adjustment of power steering system

Connect power steering oil tube correctly and be careful to keep the torque stay at  $30 \pm 3\text{Nm}$  of oil return tube, high-tension oil tube and steering device joint, and keep the torque of the hollow bolt connecting high-tension tube and power steering pump stay at  $45 \pm 3\text{Nm}$ . Special vacuum fluid for machines is suggested to serve as power steering oil. The filling of power steering hydraulic oil and displacement of air (e.g. in the service check and maintenance) are suggested to be undertaken as follows: First fill power steering hydraulic oil to the oil storage tank assembly until its maximum limit. Start the engine idling to start the steering pump and the hydraulic oil will soon fill up the steering system. Be careful to keep the engine idling to turn the vane pump and continuously refill hydraulic oil in time in case the vane draw in air due to the decrease of oil level.

Air must be exhausted when the hydraulic oil in the oil storage tank appears milk-like or the noise of pump is too loud (normally the maximum is 80 decibel). The procedures are as follows: Hoist the front of the vehicle to have the two front wheels suspend in the midair. Start the engine. Turn the steering wheel to the left and to the right to the limit position (Note not to pause at the limit position, even if you have to pause, the period had better not to exceed 2 seconds). Repeat this several times to gradually exhaust the air in the system from the oil storage tank. With the decrease of fluid level in the oil tank, refill the hydraulic oil until to the assigned level.

Inspect and adjust the tension of power steering belt regularly: Put 100N power vertically on the middle of belt. The maximum deflection of belt should be less than 5mm, or you have to adjust the tension of bolts or belt to the above requirements. The solid pollution grade of power steering oil should be above 19 / 16 GB / T14093. To those vehicles sold to very cold areas (with temperature lower than  $-35^{\circ}\text{C}$ ), we suggest PENTONSIN III manufactured in Germany to serve as power steering oil which will keep of good performance under such environment( the oil shares life long maintenance free of charge).

It is not allowed to turn the steering wheel to the limit position. Even if necessary, the pause in the position should not exceed 10 seconds. In the test of minimum turning radius in the assembly skid pad, it is also not permitted to keep the steering wheel pause for more than 10 seconds while testing inference. Turn the steering wheel nearly to the limit position and if a loud noise of steering oil pump has been heard, the steering wheel should be returned gradually until the noise disappeared.



Do not keep the power steering pump work without oil. When a sudden heavy steering is found, the vehicle must be stopped to have a check service.