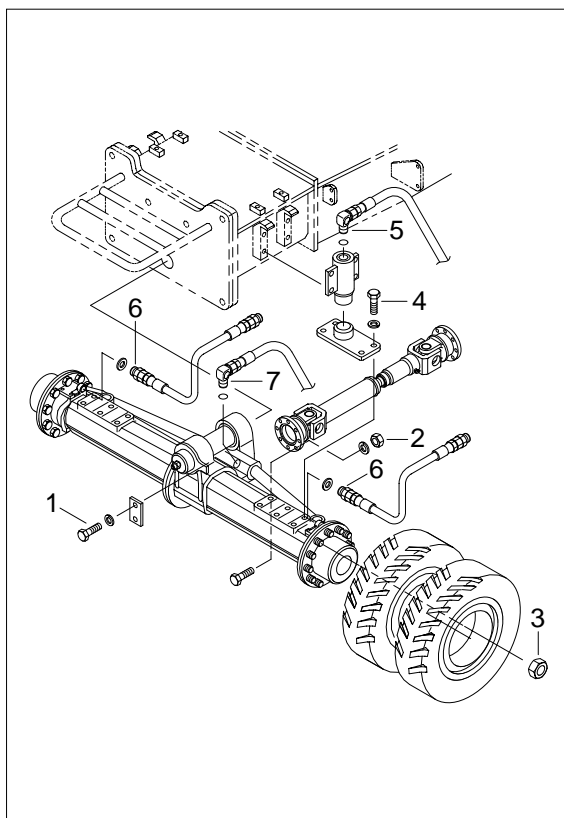


GROUP 11 FRONT AXLE

1. REMOVAL FRONT AXLE

- 1) Propeller mounting nut(2, M10)
 - Tightening torque : $5.9 \pm 0.6 \text{ kgf} \cdot \text{m}$
($42.7 \pm 4.3 \text{ lbf} \cdot \text{ft}$)
- 2) Wheel nut(3, M20)
 - Tightening torque : $50^{+0}_{-5} \text{ kgf} \cdot \text{m}$
($362^{+0}_{-36} \text{ lbf} \cdot \text{ft}$)
- 3) Oscillating cylinder supporting mounting bolt(4, M16)
 - Tightening torque : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214 \pm 23.1 \text{ lbf} \cdot \text{ft}$)
- 4) Hose assy(5, PF 3/8)
 - Tightening torque : $5.0 \text{ kgf} \cdot \text{m}$ ($36.2 \text{ lbf} \cdot \text{ft}$)
- 5) Hose assy(6, PF 1/4)
 - Tightening torque : $4.0 \text{ kgf} \cdot \text{m}$ ($28.9 \text{ lbf} \cdot \text{ft}$)
- 6) Hose assy(7, PF 1/2)
 - Tightening torque : $6.0 \text{ kgf} \cdot \text{m}$ ($43.4 \text{ lbf} \cdot \text{ft}$)
- 7) Front axle weight : 470kg(1036lb)



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 AND MAINTENANCE SPECIFICATIONS

(1) Lubricant

- ① Gear oils with limited - slip additives.
- ② API GL-5
- ③ MIL-L-2105D(SAE 85W-90, 85W-140 with LS-Additive)

(2) Maintenance

- ① Oil change interval
 - 1st : 500hr
 - Every 1000hr or at least once a year.
- ② Grease
 - Monthly

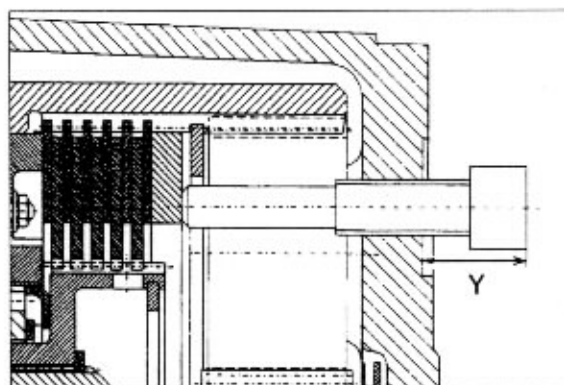
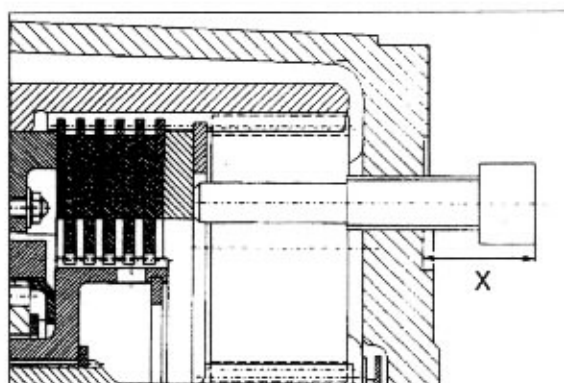
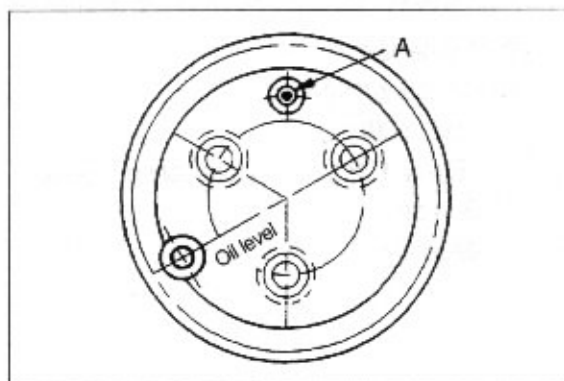
4) BRAKE LINING WEARING TEST

(1) General

- ① The brake lining wearing test gives a limited information about the overall condition of the brake plate pack - without disassembly of the planetary carrier, resp. of the plates.
- ② The wearing test has to be carried out in case of the following criteria :
 - In the course of the oil change intervals(min. once a year)
 - Braking noises
 - Reduced braking power
 - Change of deceleration, of the brake fluid level as well as of the brake pressure
 - In case of a general change of the brake performance.
- ③ Carry out the wearing test on both final drive sides.
 - Permitted piston stroke max. : 5.2mm
 - Piston stroke in new condition of the plate pack : 2.5-2.9mm

(2) Carry out the wearing test

- ① Turn the planetary carrier until screw plug A(M16 × 1.5) is in the upper position(12 o'clock position).
Now, remove the screw plug.
- ② Apply the brake(required brake pressure min. 40bar).
- ③ Screw measuring screw(M16 × 1.5) in until contact is obtained and tighten it with a torque of 1kgf · m.
- ④ Determine dimension X according to the figure on the right.
- ⑤ Release the brake and equalize the plate clearance by resetting the measuring screw.
 - Tightening torque : 1kg · m.
- ⑥ Determine dimension Y according to the figure on the right.
- ⑦ The difference of the two dimensions (X-Y) corresponds to the piston stroke (Actual state).



(3) Result

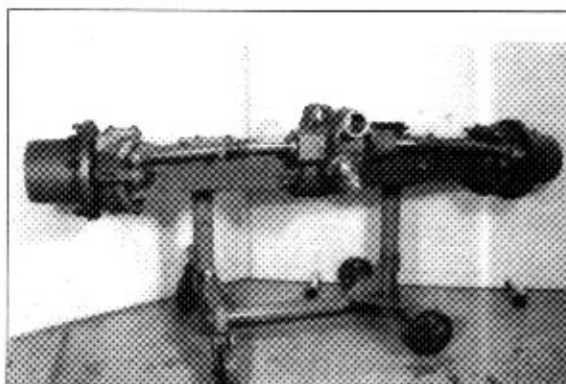
If the max. permitted piston stroke(5.0mm) is exceeded, the lining plates must be renewed on both final drive sides.

3. FINAL DRIVE DISASSEMBLY AND ASSEMBLY

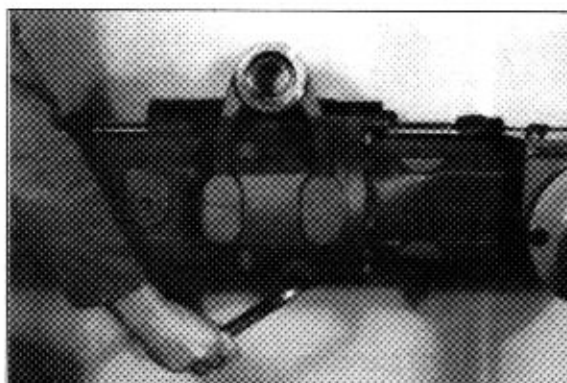
1) DISASSEMBLY

The illustration on the right shows the complete axle on the assembly car.

- * Special tool
- Assembly car 5870 350 000
- Support 5870 350 055

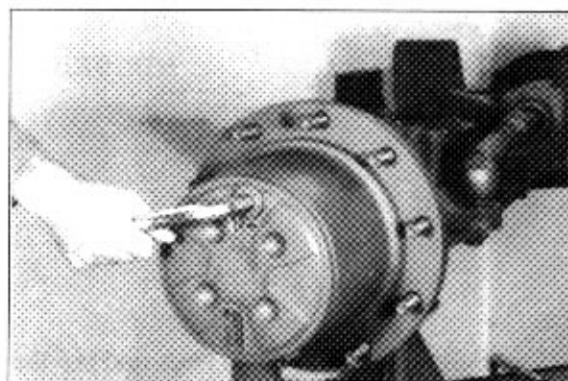


Drain oil from the axle housing.

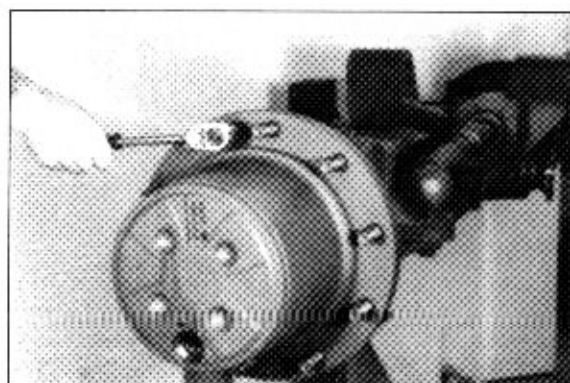


(1) Planetary carrier

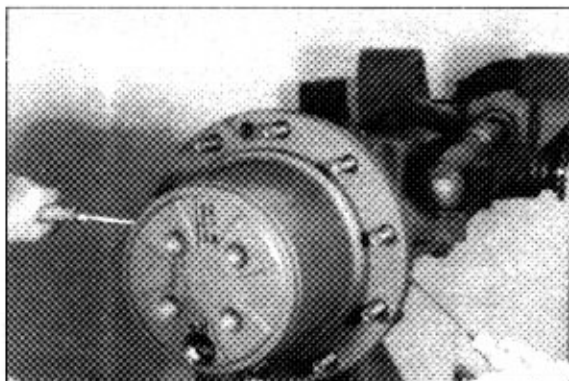
- ① Screw out the screw plug carefully.
Swivel planetary carrier through 180° and drain oil.
- * Pay attention to the position of the screw plug -12 o'clock position- during the opening.



- ② Loosen the two socket head screws.



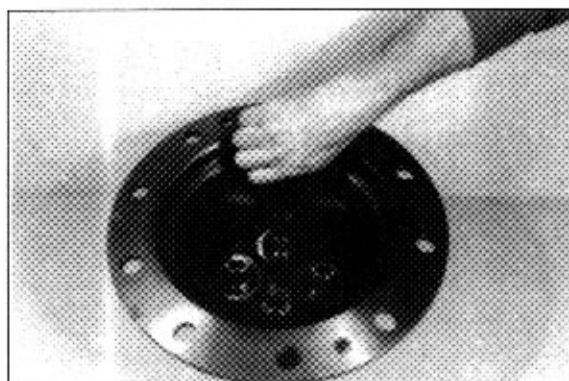
- ③ Separate planetary carrier from the hub.



- ④ Squeeze out circlip.

※ Special tool

External snap ring pliers 5870 900 015

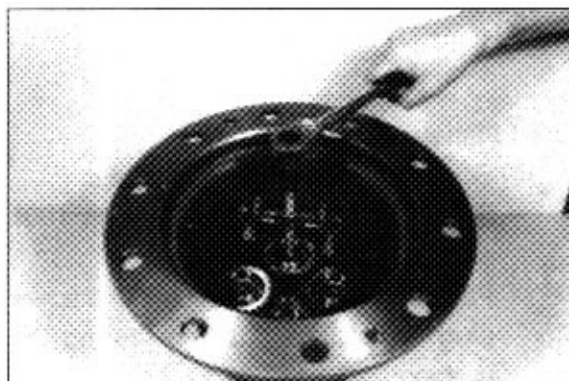


- ⑤ Pull off planetary gears.

If required, remove the thrust washer (For the sun gear shaft).

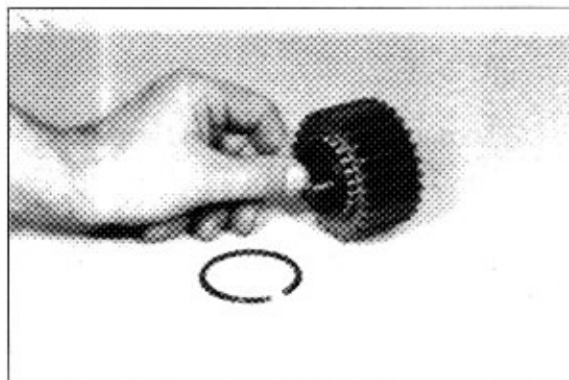
※ Special tool

Two-leg puller 5870 970 002



- ⑥ Squeeze out the angle rings and pull the complete bearing inner race out of the planetary gear.

※ Pay attention to the released rollers.



(2) Internal gear

① Squeeze out circlip.

※ Special tool

External snap ring pliers 5870 900 015



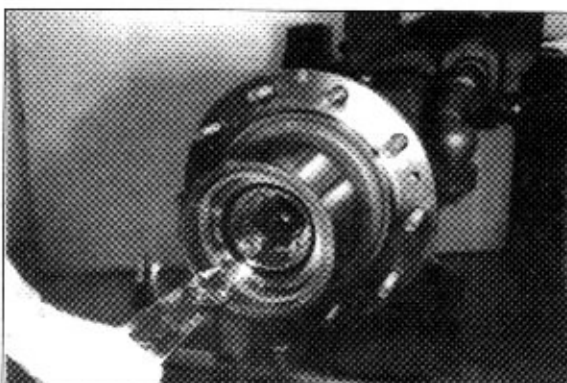
② Remove the plate carrier and the thrust washer installed behind it.



③ Squeeze out circlip.

※ Special tool

Clamping pliers 5870 900 021



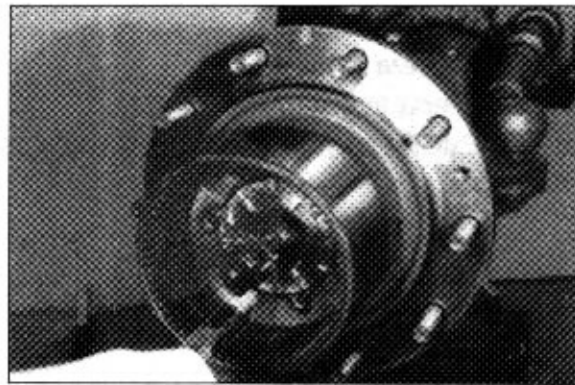
④ Take backing plate and plate pack out of the internal gear.



⑤ Squeeze out circlip(Slotted nut).

※ Special tool

Set of snap ring pliers 5870 900 013



⑥ Assemble centering disk(2) and upon hook spanner(4), position and fix them by means of circlip(1).

※ Pay attention to the exact engagement of the circlip.

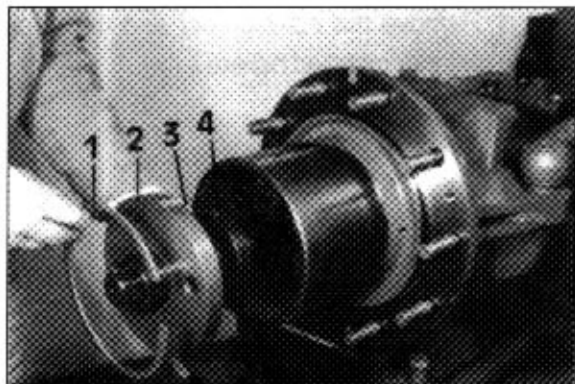
※ Danger of injury

※ Special tool

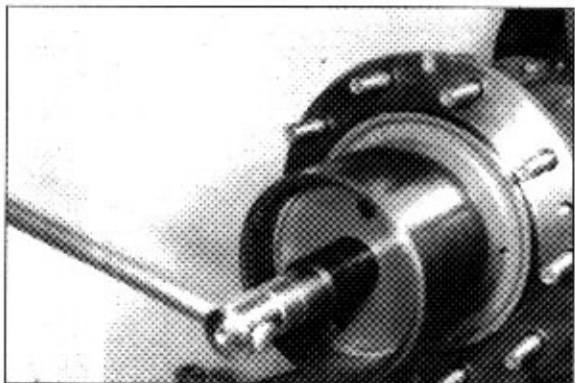
Hook spanner(4EA) 5870 401 085

Centering disk(2EA) 5870 912 009

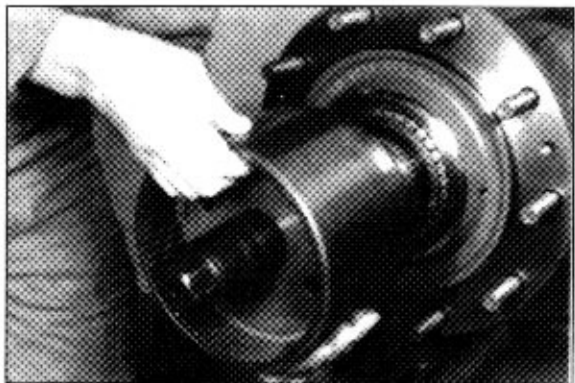
Centering ring(3EA) 5870 912 017



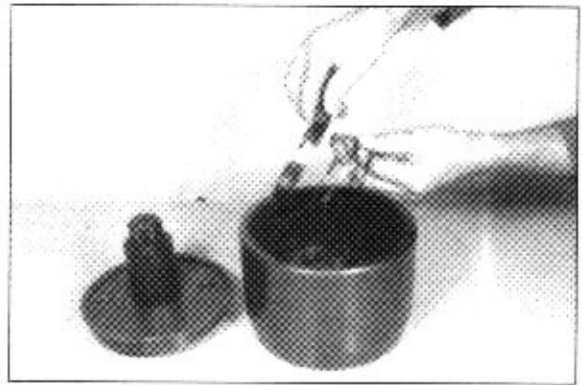
⑦ Loosen slotted nut.



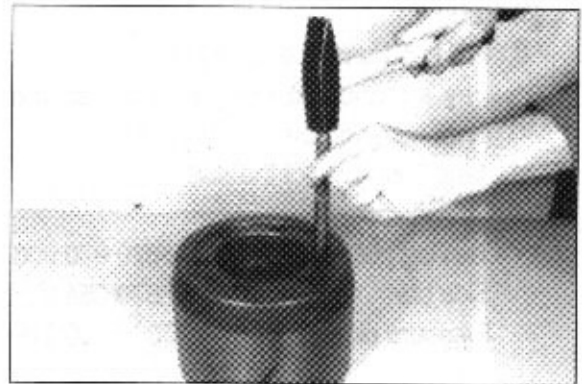
⑧ Screw off slotted nut and separate complete internal gear from hub carrier.



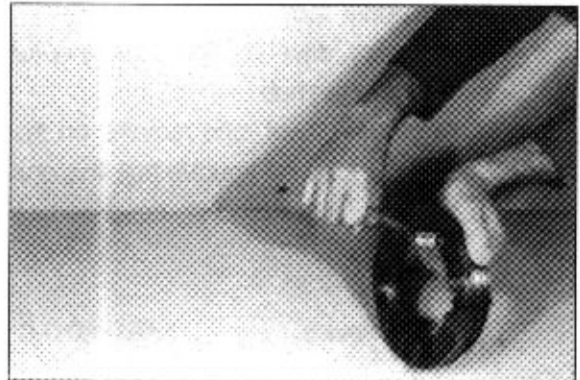
- ⑨ Remove hook spanner.
Lift slotted nut, angle ring and O-ring out of the internal gear.



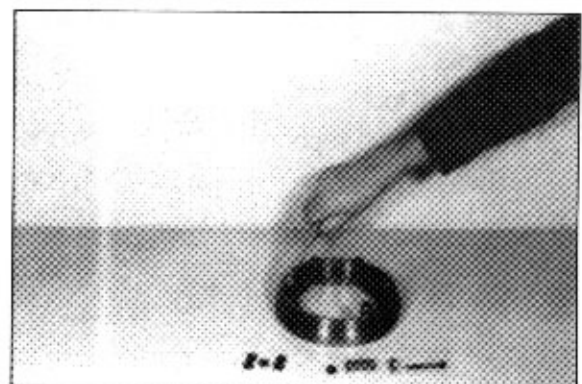
- ⑩ Tap piston loose and drive it out of the internal gear.
※ Grooved rings and back up rings will be damaged in course of the piston removal. Use new grooved rings and back up rings.



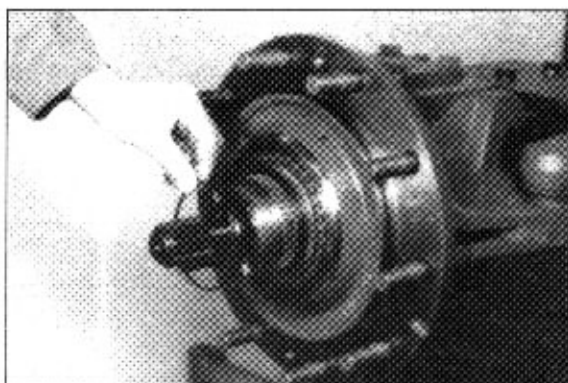
- ⑪ Loosen lock nuts.



- ⑫ Loosen all hex head screws, resp. socket head screws.
Remove compression springs, spring cages and the released supporting disk.



⑬ Remove O-ring.

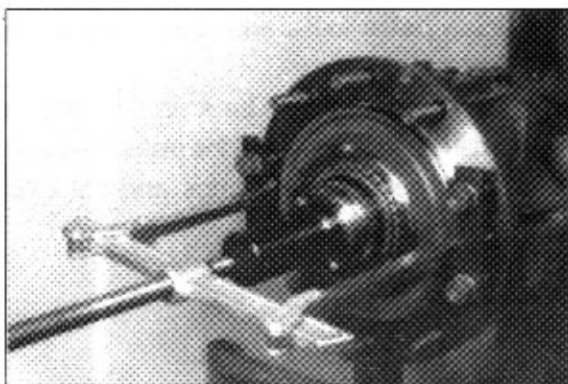


(3) Hub

- ① Pull hub from steering knuckle hull.
Pay attention to the released bearing inner race and the spacing ring.
Take O-ring out of the hub.

※ Special tool

Two leg puller	5870 970 006
Side bar	5870 654 025
Pressure piece	5870 100 019

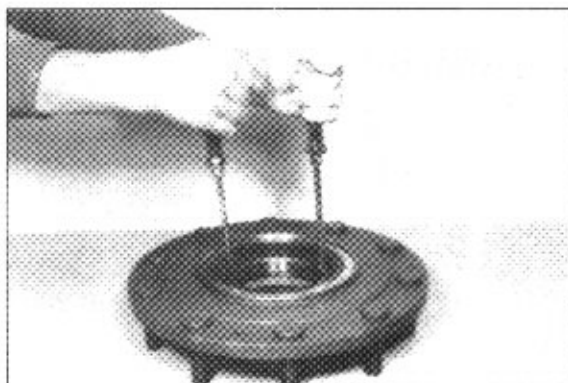


- ② Pry out sealing ring and remove the bearing inner race.
If necessary, drive the two bearing outer races out of the hub.

- ※ If the bearing inner race remains on the neck of the steering knuckle hull, this one must be disassembled as described as below figure(③).

※ Special tool

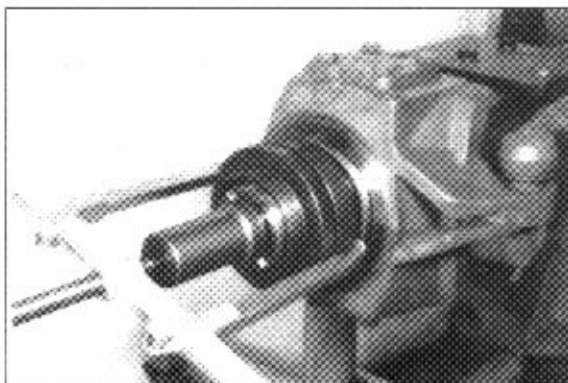
Adjusting device	5870 400 001
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- ③ Pull bearing inner race from the neck of the steering knuckle hull and pry off shaft seal.

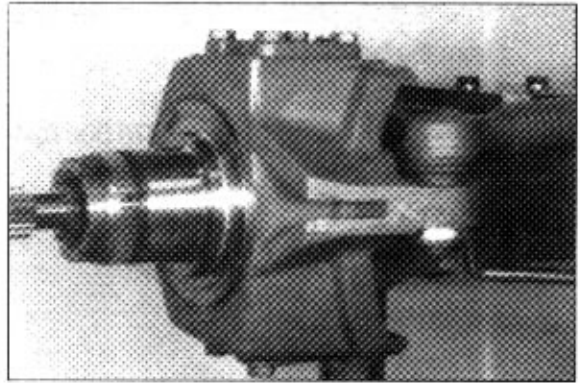
※ Special tool

Grab sleeve super	5870 029 005
Two leg puller	5870 970 006



(4) Steering knuckle hull

- ① Remove cotter pin.
Loosen castle nut for some threads only.

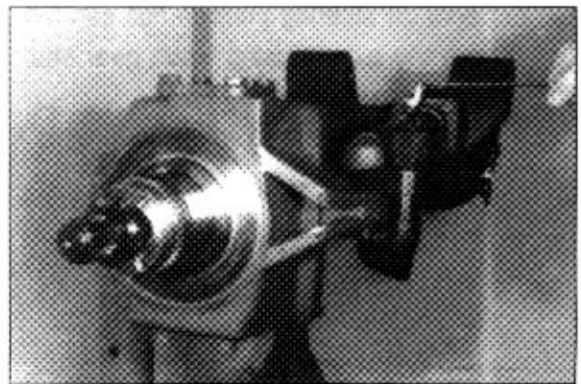


- ② Loosen tie rod from the steering knuckle hull, using ejection tool.
Now, screw off castle nut and unhook tie rod.

※ Special tool

Ejection tool 5870 000 077

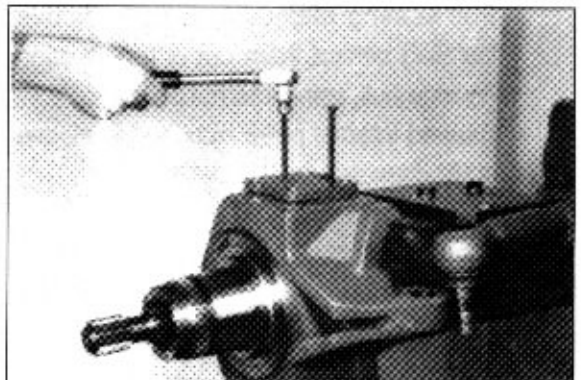
Yoke 5870 000 079



- ③ Loosen hex head screws and screw back-off screws in.

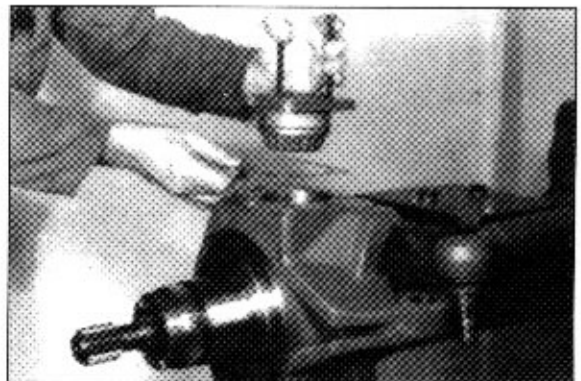
※ Special tool

Back off screw(M8) 5870 204 008



Steering knuckle bearing

- ④ Remove the two bearing pins.
※ Pay attention to the released shim on the upper bearing pin.

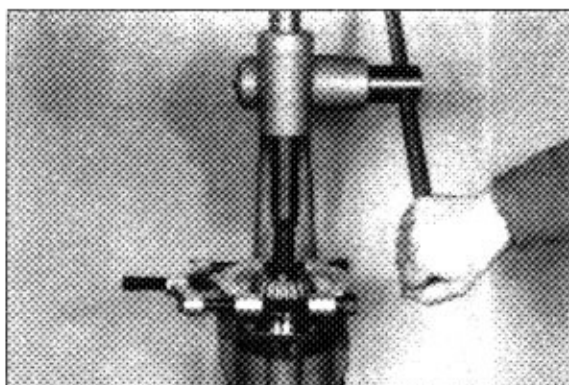


- ⑤ If necessary, press the bearing inner race from the bearing pin, using parting tool.

※ Special tool

Parting tool

5870 300 024



- ⑥ Separate steering knuckle hull carefully from the axle housing - sun gear shaft could damage the shaft seal.

※ Pay attention to the released double - joint shaft.



- ⑦ Pull sealing elements and the sleeve installed behind them out of the steering knuckle hull, using internal puller.

※ Expand internal puller max. to the sleeve outer diameter.

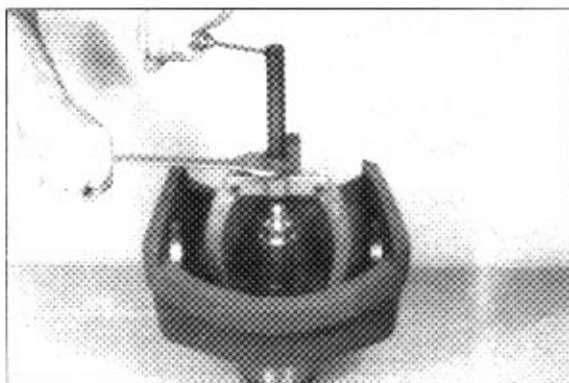
※ Special tool

Internal puller

5870 300 007

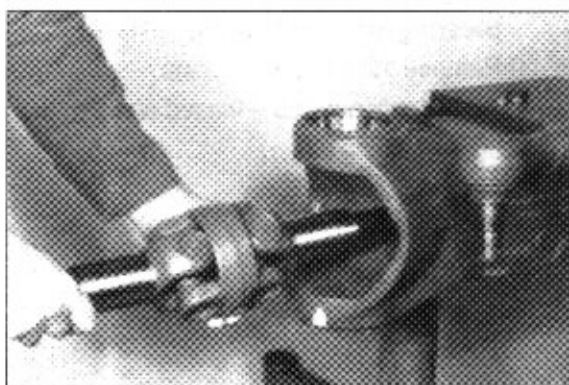
Back up tool

5870 300 003

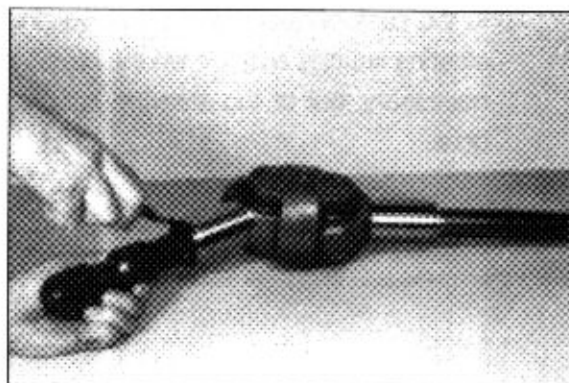


(5) Double-joint shaft

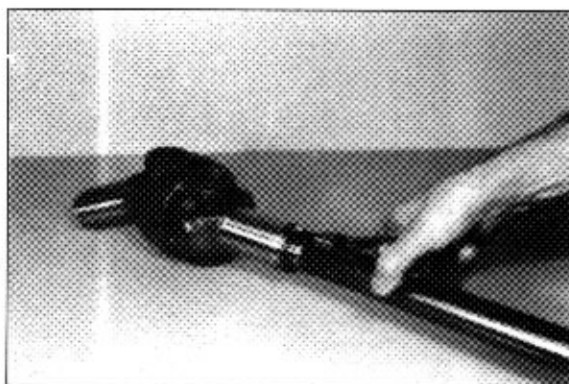
- ① Take the double-joint shaft out of the axle housing.



- ② Expand circlip and pull sun-gear shaft out of the double-joint shaft.



- ③ Expand circlip and remove stub shaft.



(6) Axle housing

- ① Pull bearing outer race out of the steering knuckle bores.

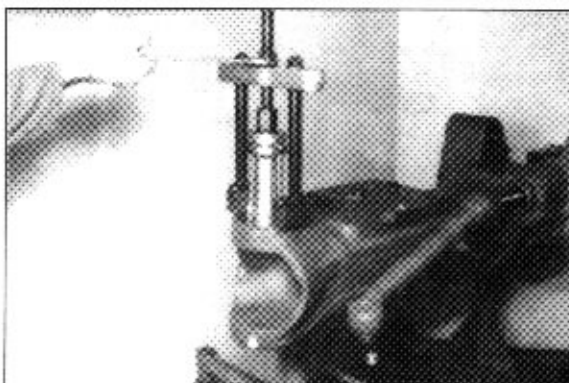
* Special tool

Internal puller

5870 300 019

Back up tool

5870 300 020



- ② Pull the shaft seal and the sleeve installed behind it out of the bore.

* Special tool

Internal puller

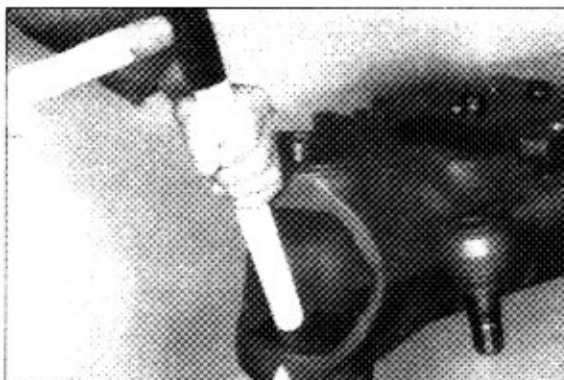
5870 300 019

Back up tool

5870 300 020



- ③ In the case of versions - with traversing steering knuckle bore - drive the cover, if necessary, out of the steering knuckle bore.



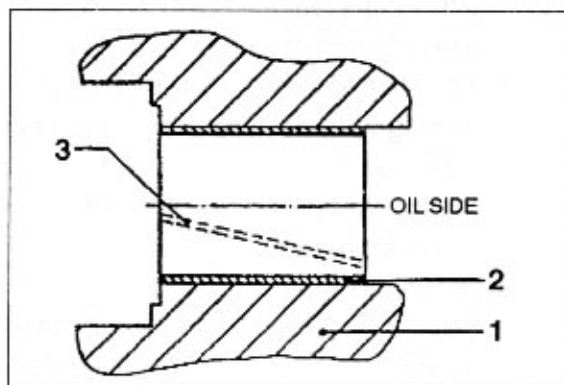
2) REASSEMBLY

(1) Axle housing and double-joint shaft

① Reference Draft

(Sectional position vertical)

- 1 Axle housing
- 2 Sleeve
- 3 Lubricating groove

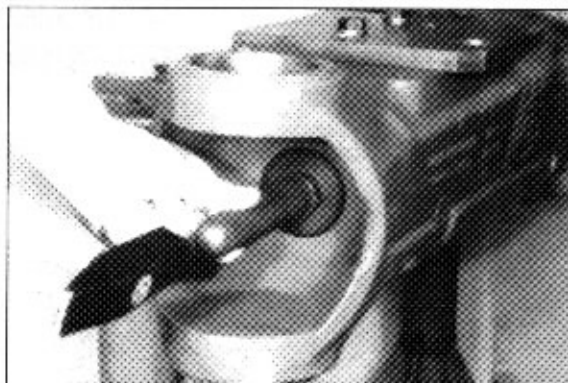


- ② Drive in the sleeve - inner lubricating groove(3) showing downward towards the axle center - until it is flush(See also Draft ①).

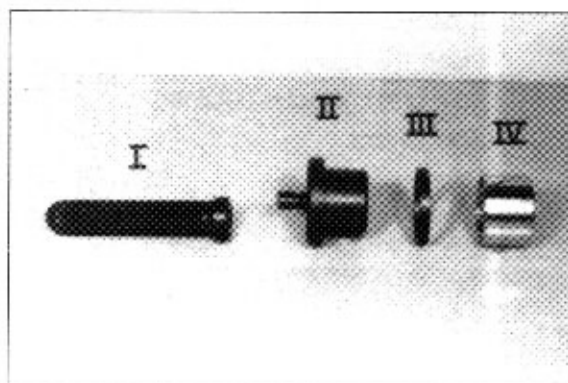
* Special tool

Driver(II) with ring(III) 5870 055 090

Handle(I), see below.

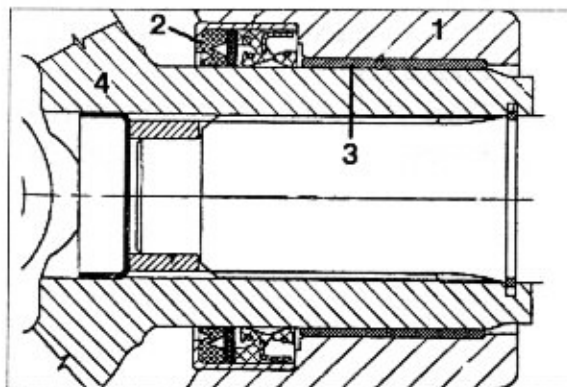


- I Handle 5870 260 002
- II Driver 5870 055 090
- III Ring
- IV Sleeve



③ Reference Draft

- 1 Axle housing
- 2 Shaft seal
- 3 Sleeve
- 4 Double-joint shaft



- ④ Cover shaft seal on the outer diameter with loctite(Type-No. 574) and insert it until contact is obtained.

* Pay attention to the installation position.
Sealing lip must face the oil chamber
(See Draft ③).

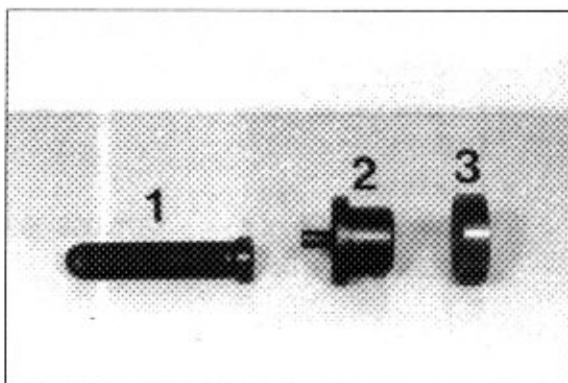
Grease shaft seal in the zone of the dust lip and sealing lip.

* Special tool

Driver	5870 055 090
Handle	5870 260 002



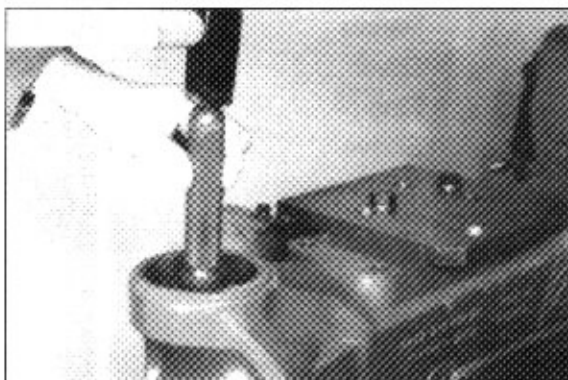
1	Handle	5870 260 002
2	Driver	5870 055 090
3	Shaft seal	



- ⑤ If necessary, according to the version, insert the cover in the steering knuckle bore until contact is obtained.

* Special tool

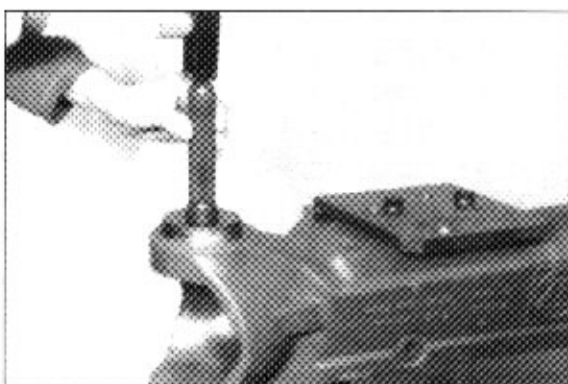
Driver	5870 057 010
Handle	5870 260 002



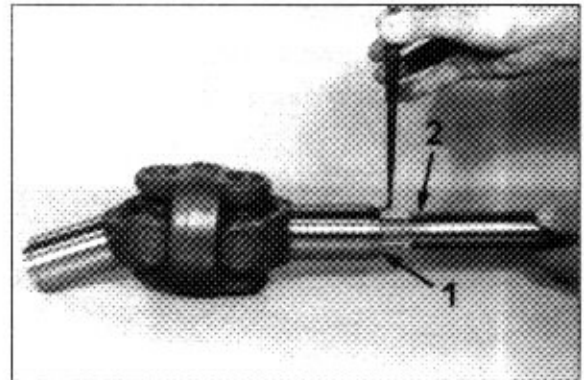
- ⑥ Place undercooled bearing outer races against shoulder until contact is obtained.

* Special tool

Driver	5870 058 058
Handle	5870 260 002



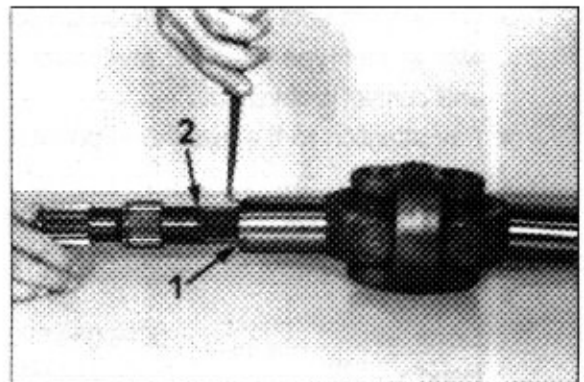
- ⑦ Insert circlip(Arrow 1), assemble stub shaft into the double-joint until the circlip engages in the annular groove(2).



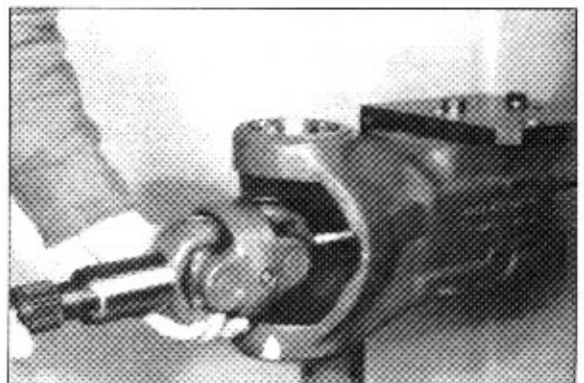
- ⑧ Insert circlip(Arrow 1).
Assemble the sun-gear shaft until the circlip engages in the annular groove (Arrow 2).

※ Special tool

External snap ring 5870 900 015



- ⑨ Introduce the complete double-joint shaft into the axle housing until the stub shaft splines are received in the differential.
※ Pay attention to the sealing elements.



(2) Steering knuckle hull

- ① Drive the sleeve in until it is flush(See also Draft ②).

※ Pay attention to the installation position of the sleeve.

The inner lubricating groove(3) must show, in the installed steering knuckle hull, downward and towards the oil chamber.

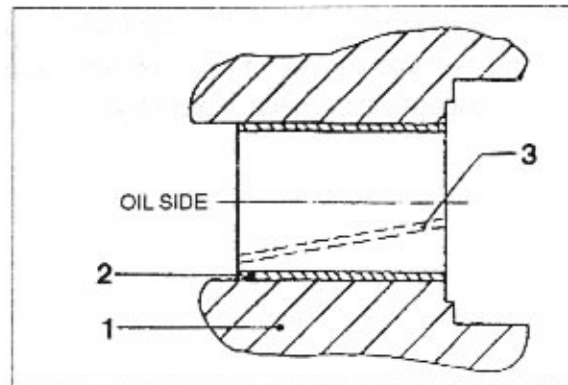
※ Special tool

Driver 5870 055 090

Handle 5870 260 002



- ② Reference Draft
(Sectional position vertical)
- 1 Steering knuckle hull
 - 2 Liner
 - 3 Lubricating groove



- ③ Cover shaft seal on the outer diameter with loctite(Type-No. 574) and install it until contact is obtained.

※ Pay attention to the installation position, see Draft ④.

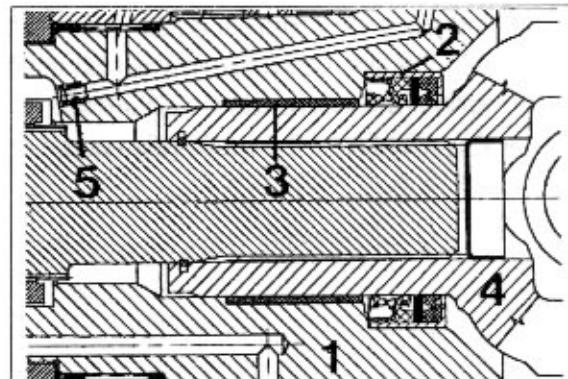
Grease the shaft seal in the zone of the dust lip and sealing lip.

※ Special tool

Driver	5870 055 090
Handle	5870 260 002



- ④ Reference Draft
- 1 Steering knuckle hull
 - 2 Shaft seal
 - 3 Sleeve
 - 4 Double-joint shaft
 - 5 Screw plug



- ⑤ Close the two bores(See Arrows) in the steering knuckle hull by means of screw plugs(5), (See also Draft ④).

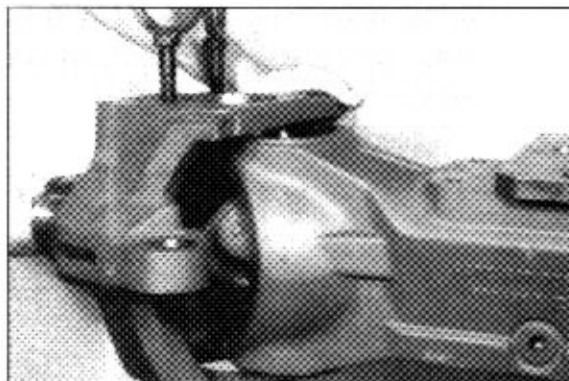
※ Special tool

Lever riveting tongs	5870 320 016
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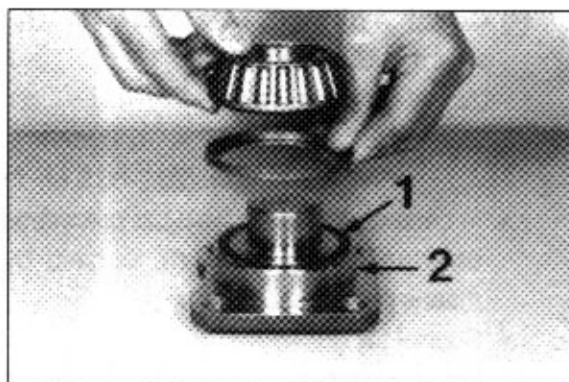


(3) Adjust steering knuckle bearing

- ① Position the steering knuckle hull on the axle housing.



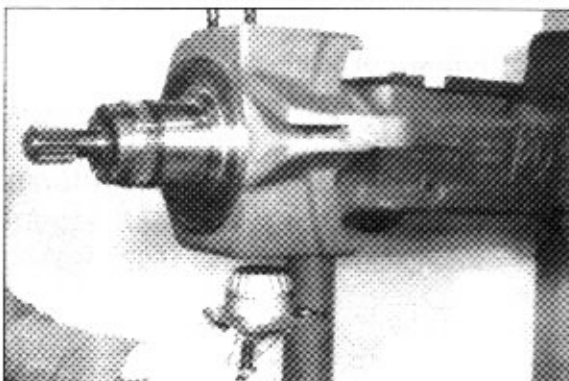
- ② Grease the O-ring and insert it in the annular groove of the bearing pin (Arrow 1). Assemble sealing cap and install subsequently bearing inner race until contact is obtained. Cover the collar of the bearing pin (Arrow 2) with anti-corrosive agent (Never Seez).



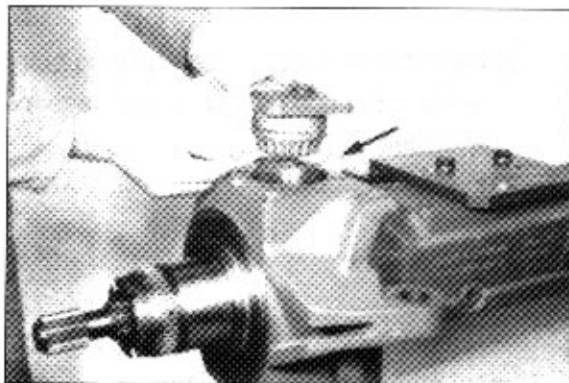
- ③ Grease the bearing outer and inner races. Fix the steering knuckle hull by means of pre-assembled bearing pin and hexagon head screws.

* Pay attention to the installation position of the bearing pins.

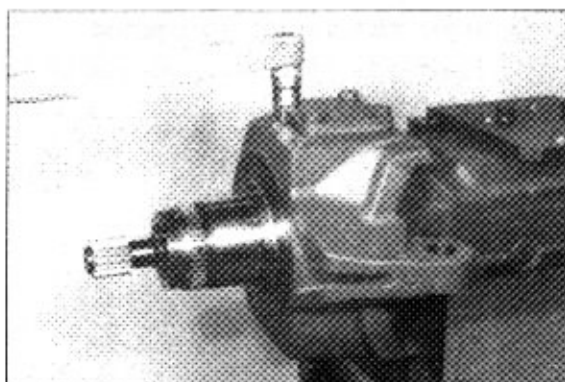
Grease nipple is facing the axle center.
Use grease according to the list of lubricants TE-ML 05.



- ④ Insert shim (e.g. $s = 0.80\text{mm}$) on the upper bearing pin.



- ⑤ Tighten hexagon head screw(M16/10.9).
At the same time, tilt the steering knuckle
hull several times.
- Tightening torque : 28.5kgf · m
(206lbf · ft)



(4) Check rolling resistance of the steering knuckle bearing
(Aim at the upper value)

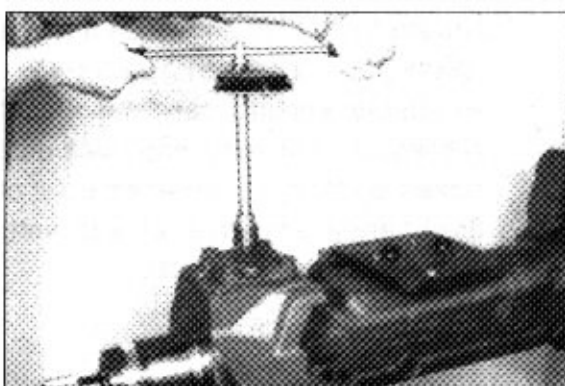
- ① Bearing rolling moment : 4.1-5.1kgf · m
(29.7-36.9 lbf · ft)

※ In case of deviations from the prescribed bearing rolling moment, correct by means of corresponding shim.

※ Special tool

Torque spanner 5870 203 014

Spanner 5870 656 004



(5) Hub-wheel bearing

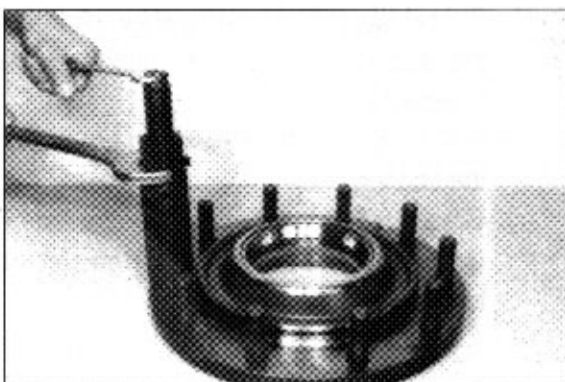
- ① Pull in wheel studs.

※ Special tool

Wheel stud puller basic set 5870 610 001

Insert(M22 × 1.5) 5870 610 002

Insert(M20 × 1.5) 5870 610 003



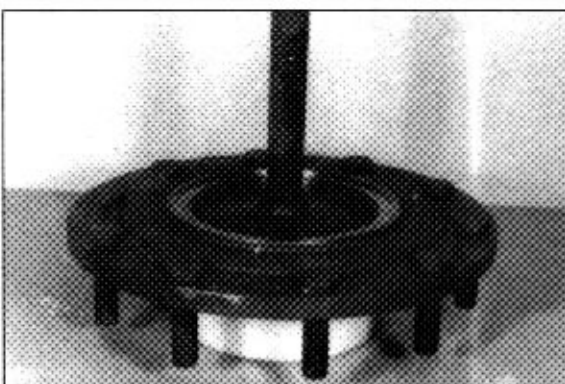
- ② Insert the two undercooled bearing outer races in the hub and place them against shoulder.

※ Do not support the hub on the wheel studs.

※ Special tool

Driver 5870 050 007

Handle 5870 260 004



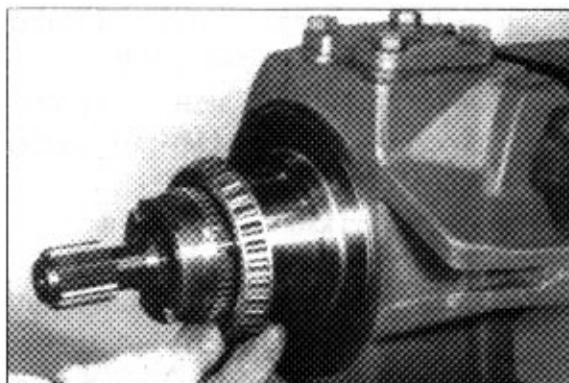
(6) Adjust and check the rolling moment of the wheel bearing

Determination of the spacing ring

- ① Place heated bearing inner against the steering knuckle hull until contact is obtained.

Reset after the cooling down.

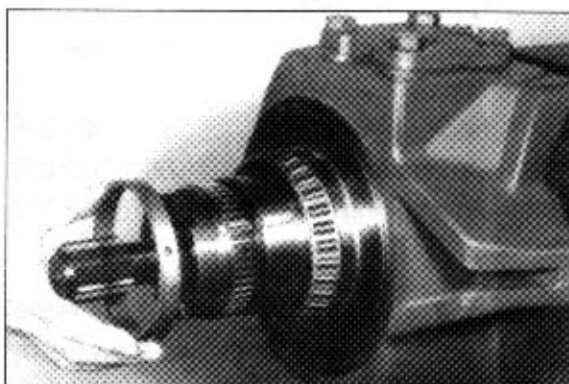
- ※ Pay attention to the different sizes of the two bearing inner races.



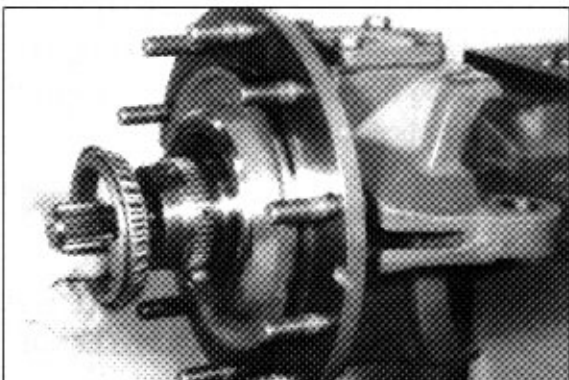
- ② Assemble spacing ring(e.g. $s = 14.50\text{mm}$ - empirical value).

- ※ If the hub as well as the two wheel bearings have not been renewed, we recommend to reuse the actual spacing ring again.

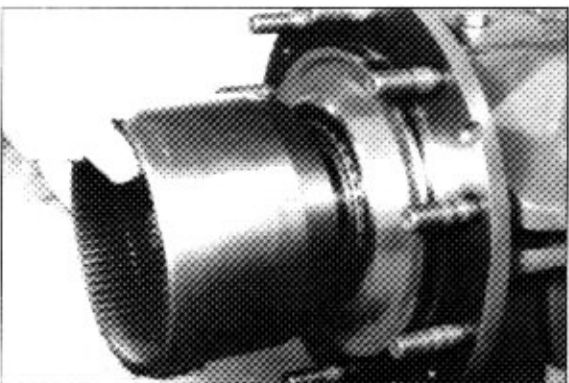
Binding, however is the prescribed rolling resistance of the wheel bearing(Figure ⑥).



- ③ Assemble the hub(Without shaft seal) and fix it by means of heated bearing inner race.



- ④ Assemble the internal gear(Without sealing elements).



- ⑤ Fix hook spanner by means of circlip
(See also Figure ⑥, page 8-196).

Cover threads of slotted nut with lubricant (Type Molykote M11) and tighten slotted nut.

• Tightening torque : $158^{+51}_{-30} \text{ kgf} \cdot \text{m}$
($1143^{+368}_{-100} \text{ lbf} \cdot \text{ft}$)

- ※ Aim at the conformity of slotted nut/pocket of steering knuckle hull, starting with the lower tightening torque $158 \text{ kgf} \cdot \text{m}$ ($1143 \text{ lbf} \cdot \text{ft}$).

During the tightening, mark several full revolutions of the hub in both senses.

- ※ Special tool

Hook spanner	5870 401 085
Centering disk	5870 912 009
Spacing ring	5870 912 017

- ⑥ Check the rolling moment of the wheel bearing, resp. the traction force (F) by means of a spring scale.

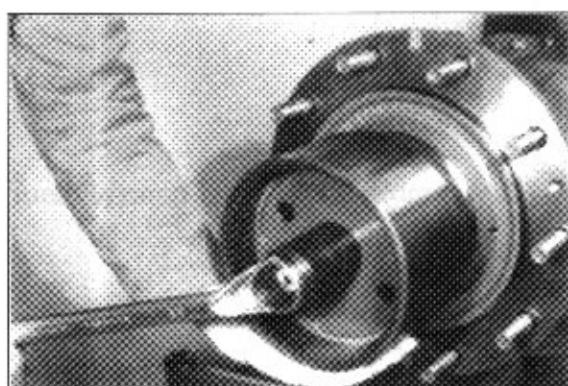
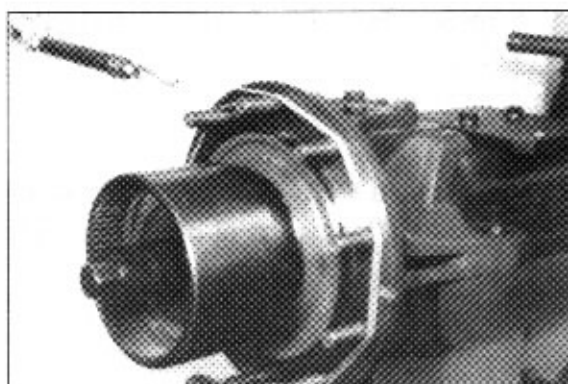
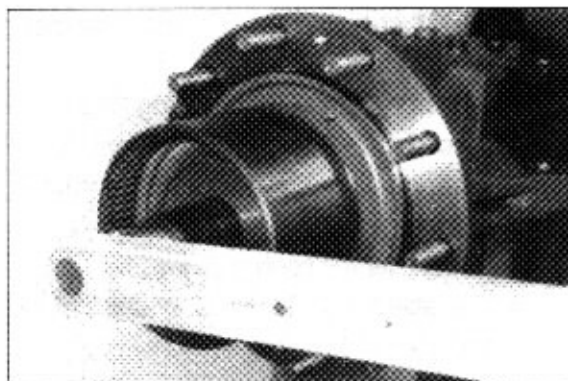
• Rolling moment : $0.8 \sim 1.2 \text{ kgf} \cdot \text{m}$
($5.9 \sim 8.8 \text{ lbf} \cdot \text{ft}$)

- ※ In case of deviations from the required rolling moment, correct by means of corresponding spacing ring.

- ※ Special tool

Spring scale	5870 230 006
--------------	--------------

- ⑦ Now, loosen slotted nut again and remove internal gear, hub and bearing inner races.



(7) Mount hub

① Insert heated bearing inner race.

※ Pay attention to the different bearing inner ring sizes.

To avoid an excessive cooling down of the bearing inner race, the reassembly of the shaft seal, resp. the assembling of the hub must be carried out immediately after the insertion of the bearing inner race.



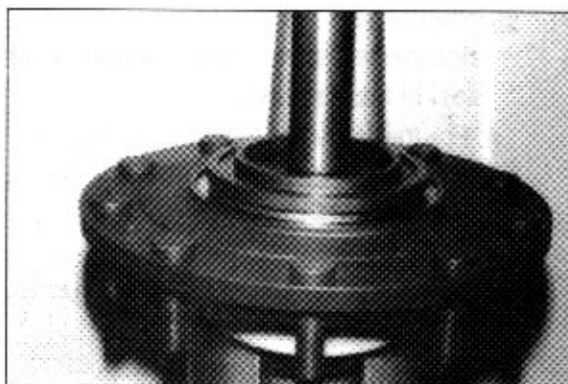
② Cover shaft seal on the outer diameter with loctite(Type-No. 574) and install it (See Draft ③).

※ Wet shaft seal in the zone of the inner diameter, immediately prior to the reassembly of the hub(Figure ④) with spirit.

※ Special tool

Driver 5870 051 022

Handle 5870 260 004



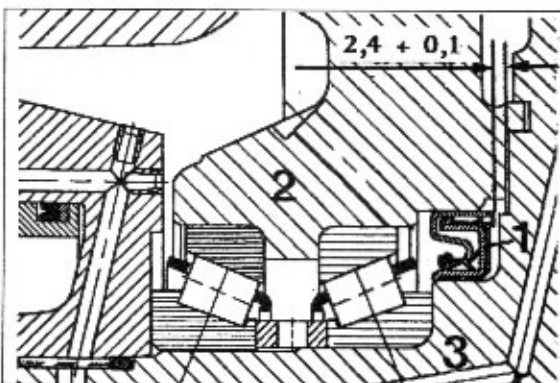
※ By using the prescribed driver, the exact installation depth is obtained(See Draft on the right).

③ Reference Draft

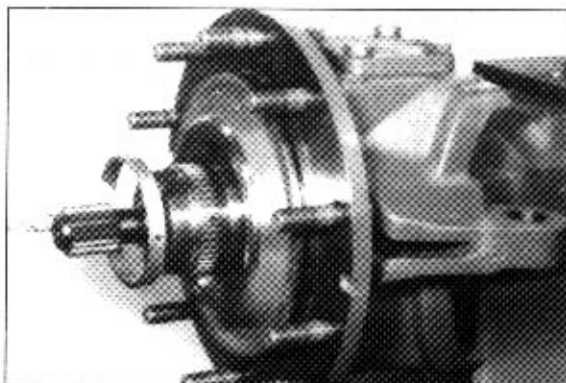
1 Shaft seal

2 Hub

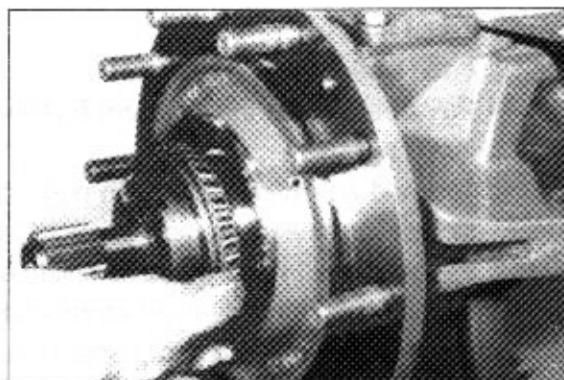
3 Steering knuckle hull



④ Assemble pre-assembled hub and determined spacing ring (e.g. s = 14.50mm).



- ⑤ Fix the hub by means of the heated bearing inner race.



(8) Internal gear

One-piece internal gear, piston reset / socket head screws

- ※ For the following reassembly, the use of the assembly help special tool is recommended.

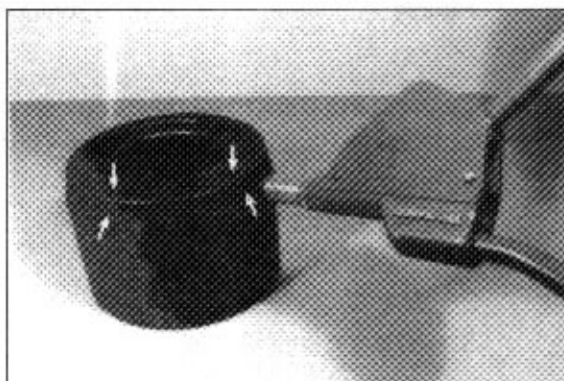
- ※ Special tool

Assembly ring 5870 347 013

- ① Close bores(See Arrows) by means of screw plugs.

- ※ Special tool

Lever riveting tongs 5870 320 016

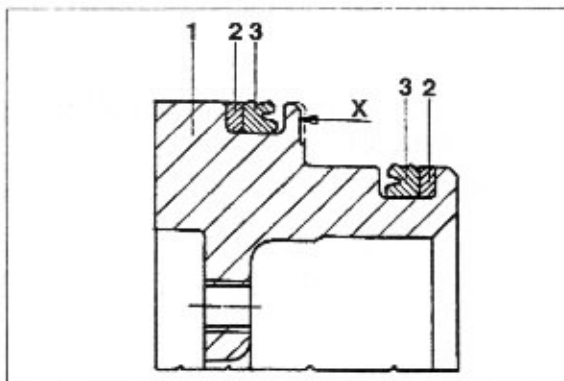


- ② Heat the two back-up rings in an oil bath and insert them in the piston recesses. Install grooved rings.

- ※ Pay attention to the installation position, see draft on the right.

• Reference Draft

- 1 Piston
- 2 Back-up rings
- 3 Grooved rings
- X Pressure chamber

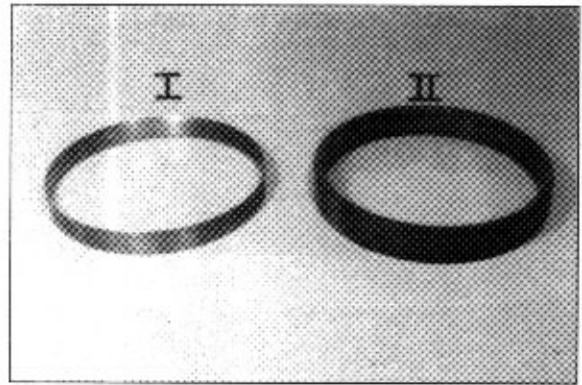


- ③ The illustrated assembly help special tool facilitates, resp. assures a correct reassembly of the prescribed piston.

※ Special tool(Assembly ring)

Part I Centering ring 5870 347 013

Part II Installer



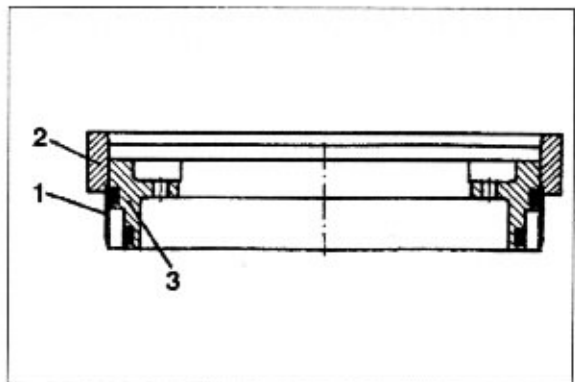
- ④ After the cooling down, oil the back-up ring and the grooved ring(Use W-10 oils).

• Reference Draft

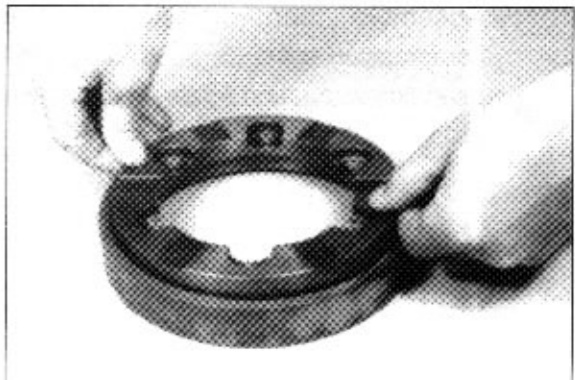
1 Assembly help / part I

2 Assembly help / part II

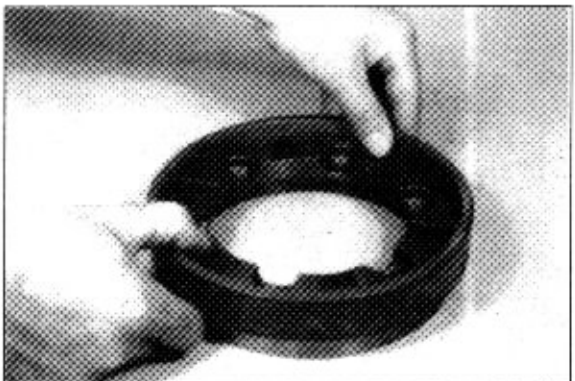
3 Piston



- ⑤ Insert piston(3) in the assembly help / part II .



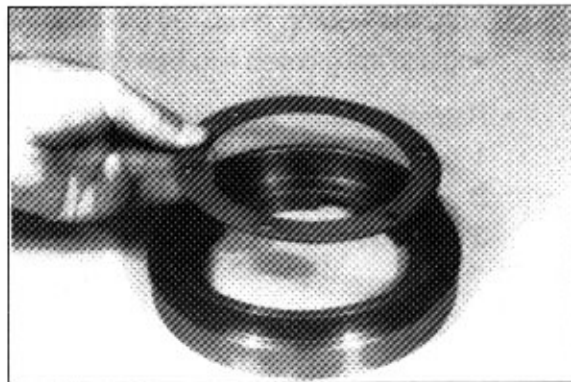
- ⑥ Place assembly help / part II upon part I and press piston through.



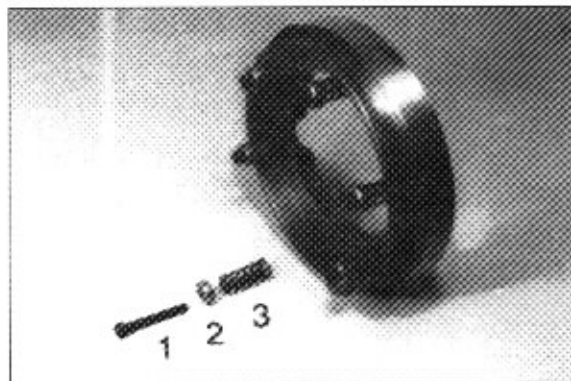
⑦ Take off assembly help / part II.



⑧ Insert the supporting disk into the piston.

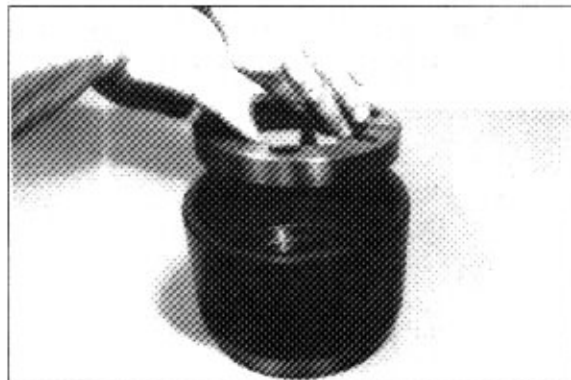


⑨ Assemble spring cage(2) and compression spring(3) upon the socket head screws(1), and screw them into the piston.



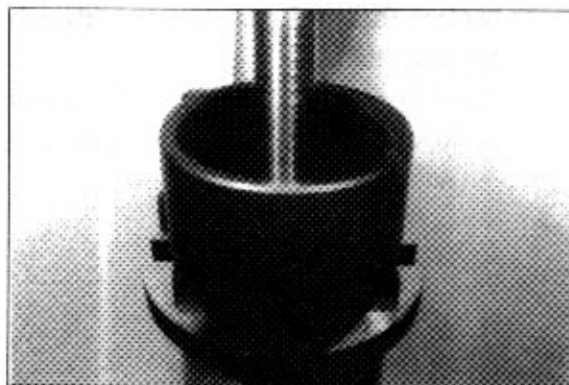
⑩ Assemble the assembly help / part I (With the inserted piston) in the internal gear.

※ Pay attention to the radial installation position of the piston.



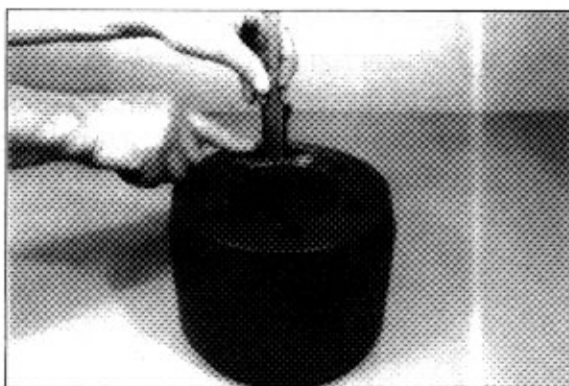
- ⑪ Press piston carefully against shoulder.
Now, take the assembly help / part I out of the internal gear.

※ To avoid the shearing off, resp. tipping of the grooved rings, install the piston with utmost care (By means of a hand press).



- ⑫ Adjust dimension "X" = 3.75 - 4.25mm, bearing contact / internal gear to the screw head. (See Draft ⑬).

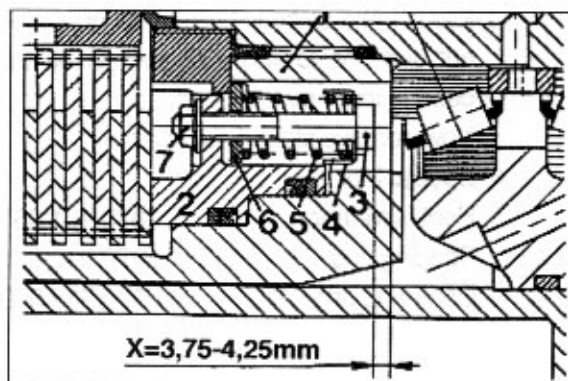
※ Pay attention to the exact piston contact in the internal gear.



⑬ Reference Draft

• Dimension "X" = 3.75 - 4.25mm.

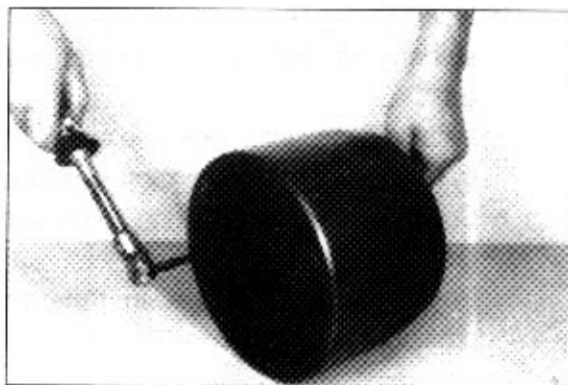
- 1 Internal gear
- 2 Piston
- 3 Socket head screw
- 4 Spring cage
- 5 Compression spring
- 6 Supporting disk
- 7 Lock nut



- ⑭ Check socket head screws by means of lock nut.

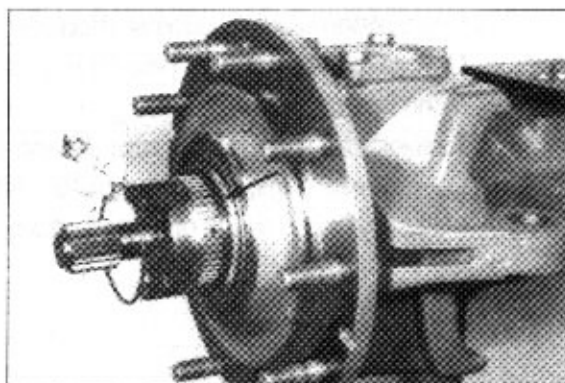
• Tightening torque : 1.1kgf · m (8.0 lbf · ft)

※ Secure lock nut additionally with loctite (Type-No. 242).



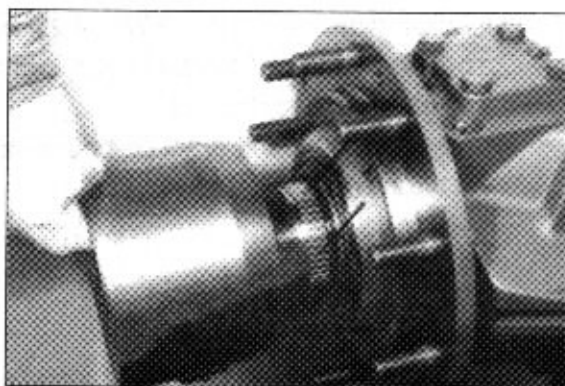
Mount Internal gear on the steering knuckle hull

- ⑮ Oil O-ring and insert it in the annular groove of the steering knuckle hull (Arrow).



- ⑯ Assemble internal gear.

※ Pay attention to the exact overlapping of the oil supply holes (See Arrows) of the steering knuckle hull, resp. internal gear splines.



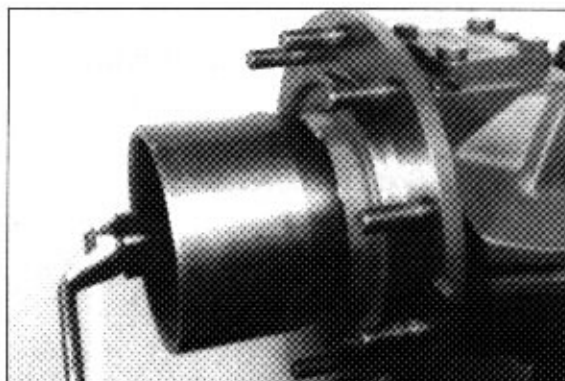
- ⑰ Place internal gear by means of slotted nut over the O-ring until contact on the bearing inner race is obtained. Now, remove slotted nut again.

※ Special tool

Hook spanner 5870 401 085

Spacing ring 5870 912 017

Centering ring 5870 912 009

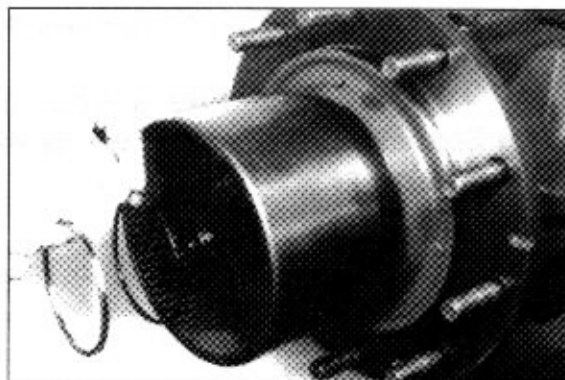


- ⑱ Insert O-ring evenly in the gap of the steering knuckle hull and the internal gear.

Install subsequently angle ring and pull it by means of slotted nut against shoulder.

※ Cover O-ring and angle ring amply with grease.

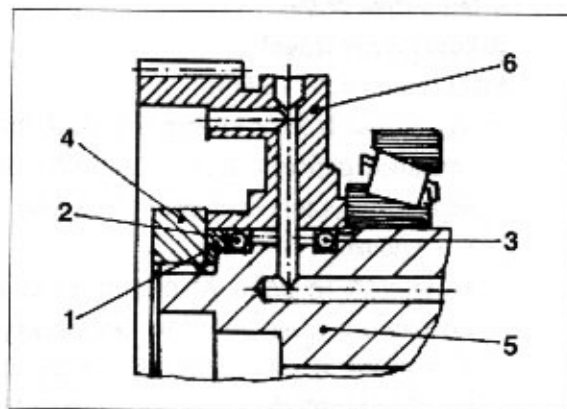
Pay attention to the installation position (See Draft ⑲).



- ①⑨ Unscrew slotted nut again and check O-ring(if damaged), resp. angle ring seat.

• Reference Draft

- 1 Angle ring
- 2 O-ring
- 3 O-ring
- 4 Slotted nut
- 5 Steering knuckle hull
- 6 Internal gear



- ②⑩ Cover threads of slotted nut with lubricant(Type Molykote M11) and tighten slotted nut finally.

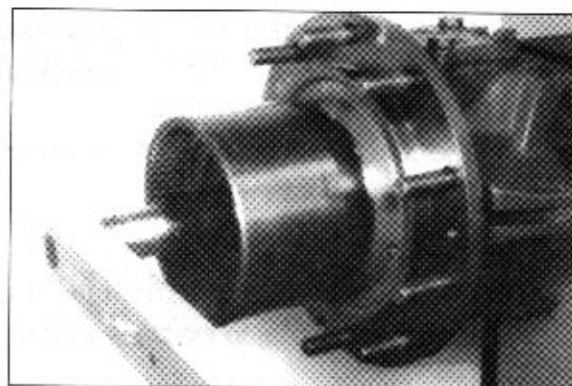
• Tightening torque : $158^{+51}_{-36} \text{ kgf} \cdot \text{m}$
 $(1143^{+368}_{-260} \text{ lbf} \cdot \text{ft})$

- ※ Aim at the conformity of slotted nut / Pocket of the steering knuckle hull, starting with the lower tightening torque $158 \text{ kgf} \cdot \text{m}$ ($1143 \text{ lbf} \cdot \text{ft}$).

During the tightening, make several full revolutions of the hub in both senses.

※ Special tool

Hook spanner	5870 401 085
Spacing ring	5870 912 017
Centering ring	5870 912 009

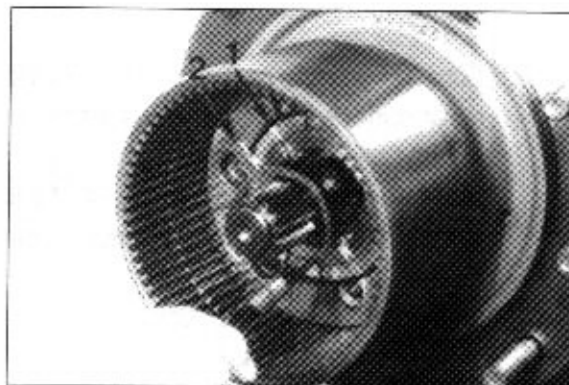


- ②⑪ Fix slotted nut by means of circlip (Tongue).

The tolerance range of the tightening torque has been selected in such a way that a matching position of the recesses of slotted nut and steering knuckle hull(Arrow 1) can be obtained.

- ※ Pay attention to the installation position of the circlip.

The tongue(Arrow 2) must be positioned in one of the upper recesses(Arrow 1).



(9) Multi-disk brake

Adjust piston travel

Piston travel = 2.5 - 3.5mm

- ※ We know from experience that the required piston travel is obtained by installing 5 outer plates of the thickness $s = 2.50\text{mm}$

However, in case of exceptions, a correction may become necessary. Therefore, a measuring of the piston travel(**Example B**, page 8-219) must be absolutely carried out.

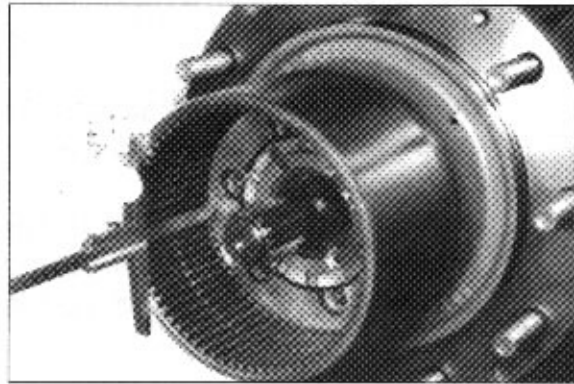
In case of deviations from the prescribed piston travel, correct by means of corresponding outer plate(s).

The correct performance of the multi-disk brake is assured.

- ① Determine dimension I from the end face / internal gear to the plane surface / piston.

- Dimension I e.g. : 81.00mm

- ※ Pay attention to a correct piston contact in the internal gear.

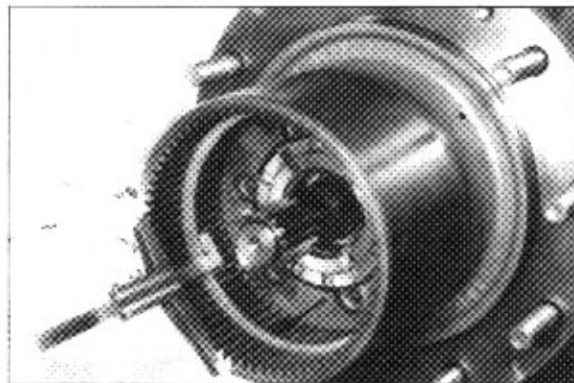


- ② Squeeze in circlip and place it against the outer surface of the recess(Direction of Arrow) until contact is obtained.

Measure dimension II from the end face/ internal gear to the inner surface of the circlip.

- Dimension II e.g. : 42.70mm

Now, remove circlip again.



- ③ Determine dimension III (Thickness of the backing plate).

Dimension III e.g. 9.00mm

Example A

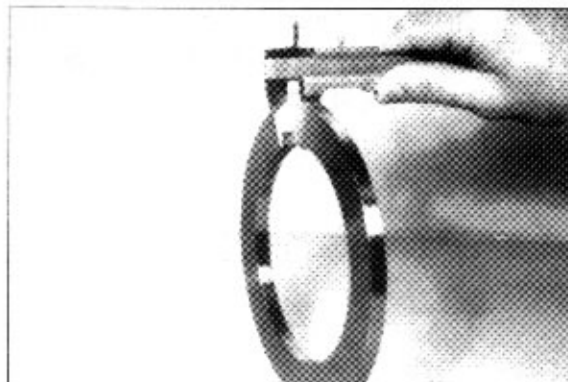
Dimension I 81.00mm

Dimension II - 42.70mm

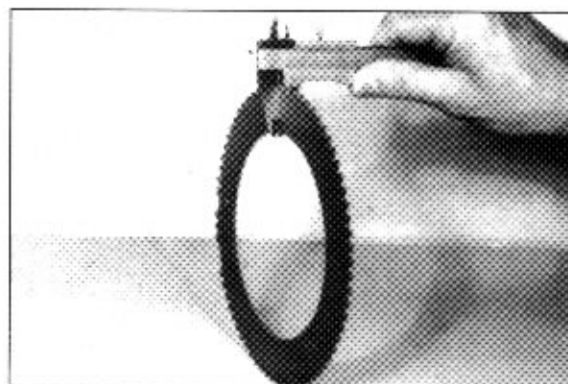
Difference 38.30mm

Dimension III - 9.00mm

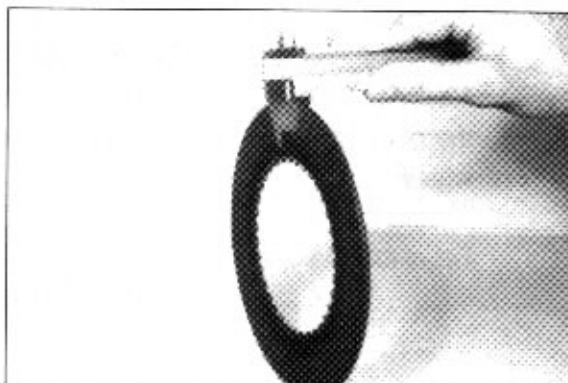
Gives Dimension X 29.30mm



- ④ Determine total height of the plate pack.
 * The plate thickness has to be measured on the single plate-not on the total plate pack.
 The undulation of the outer plate may not affect the measuring result.



- ⑤ The inner plates have a constant thickness of $s = 3.50\text{mm}$.
 5 Outer plates $s = 2.50\text{mm}$ = 12.50mm
 4 Inner plates $s = 3.50\text{mm}$ = 14.00mm
 Gives the total height = Dimension Y = 26.50mm



Example B

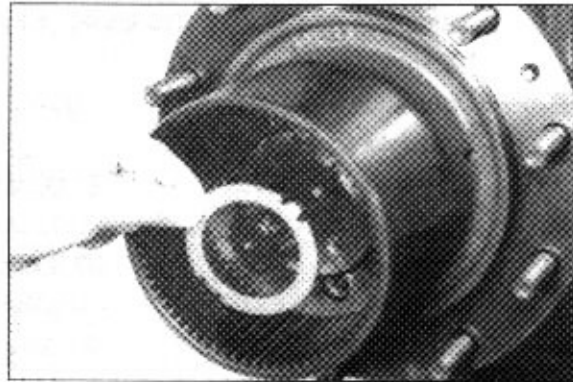
Dimension X 29.30mm

Dimension Y - 26.50mm

Difference = Piston travel = 2.80mm

- * If the required piston travel is not obtained, correct by means of corresponding outer plate(s) ($s = 2.00\text{mm}$, $s = 2.50\text{mm}$, $s = 3.00\text{mm}$).

- ⑥ Make thrust washer(With the two tongues in the free grooves / steering knuckle hull) adhere with grease.

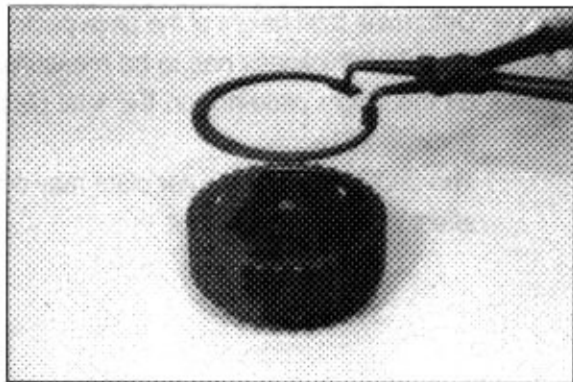


- ⑦ Engage circlip in the plate carrier.

※ Special tool

Set of internal snap ring pliers

5870 900 013



- ⑧ Assemble the plate carrier upon the sun-gear shaft and fix it by means of circlip. Now, place the sun-gear shaft along with the plate carrier against shoulder(Thrust washer).

※ Special tool

Set of external snap ring pliers

5870 900 015

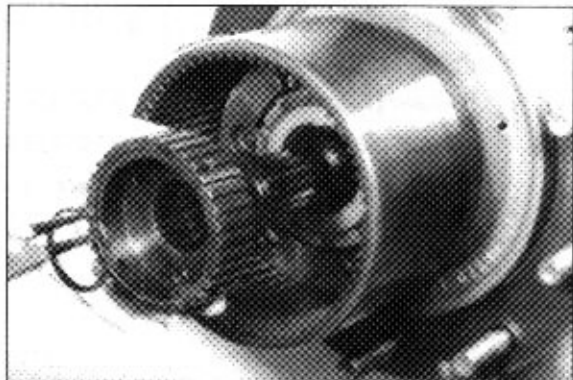


Plate arrangement

To assure a correct plate arrangement, the undulated outer plates are marked by suppression of several teeth.

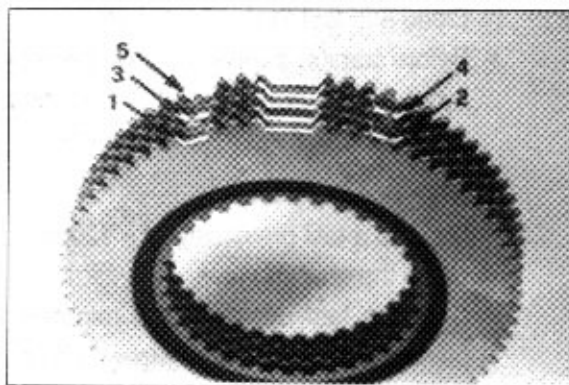
Figure ⑨ show the correct arrangement of the outer plates.

Great tooth spaces(2 teeth missing) must be central in line.

Small tooth space (1 tooth missing, see Arrows) lies alternating to the left(Outer plate 1, 3 and 5), resp. to the right(Outer plate 2, 4).

Between two outer plates, there must be always one coated(Inner) plate installed.

⑨ Plate arrangement 4 Coated plates.



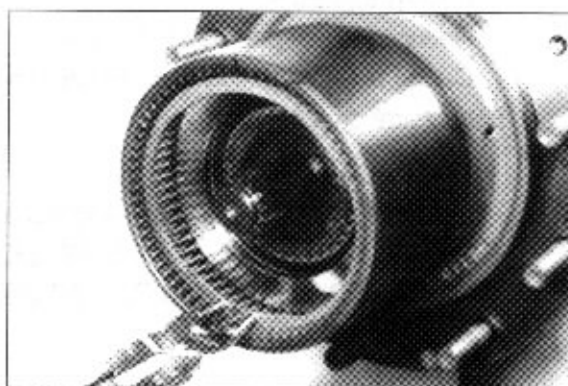
⑩ Install the plate pack according to the prescribed arrangement and fix it by means of backing plate and circlip.

* If outer plates of different thickness are assembled, install the thinner plates externally in the pack.

* Special tool

Clamping pliers

5870 900 021



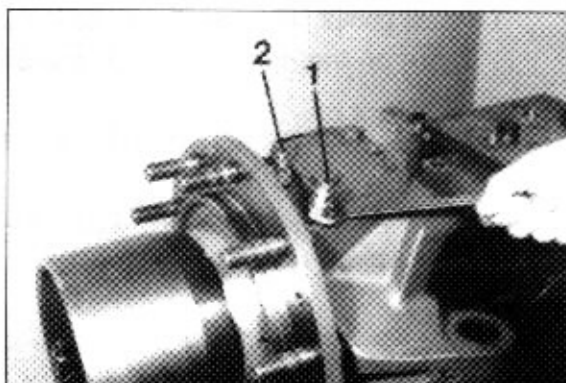
Check tightness of the brake hydraulic system

⑪ Install pressure port(1) and breather(2)
(Use new sealing rings).

* Special tool

HP pump compl.

5870 287 007



⑫ Bleed and test the brake system.

- ※ Before starting the test, actuate the brake hydraulic system several times(10 times at least), and bleed it at the same time.

• **High-pressure test :**

Build up a test pressure of $p = 120\text{bar}$.

Close the shut-off valve.

During a test duration of 5 minutes, a pressure drop of max. 2%($p = 117\text{bar}$) is permitted.

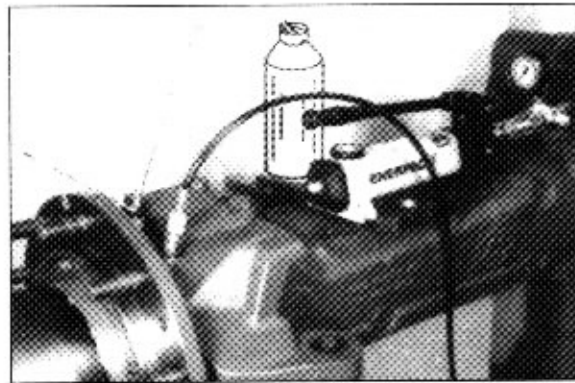
• **Low -pressure test :**

Reduce the test pressure to $p = 5\text{bar}$.

During a test duration of 5 minutes, no pressure drop may occur.

• **Test media :**

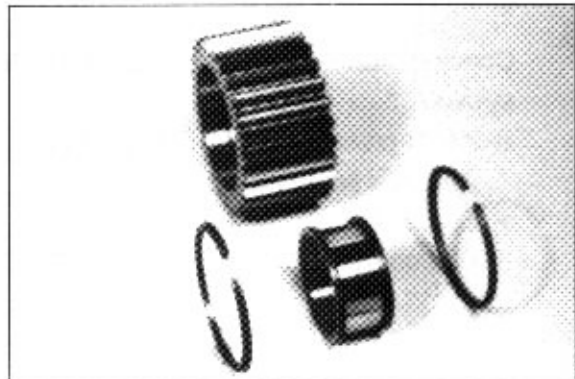
Motor Oils SAE 10-W, corresponds to MIL-L2104 C, MIL-L 45 152, API-CC, CD, SC, SD, SE, AFT-Oils Type A-Suffic A Dexron of II D.



(10) Planetary gears

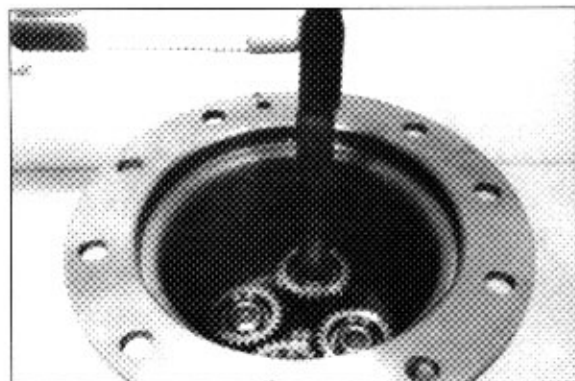
① Install components, as illustrated in the figure on the right, into the planetary gear.

- ※ Make cylindrical rollers adhere with grease on the bearing inner race. Offset side(Small diameter) of the angle rings is always facing the outside.

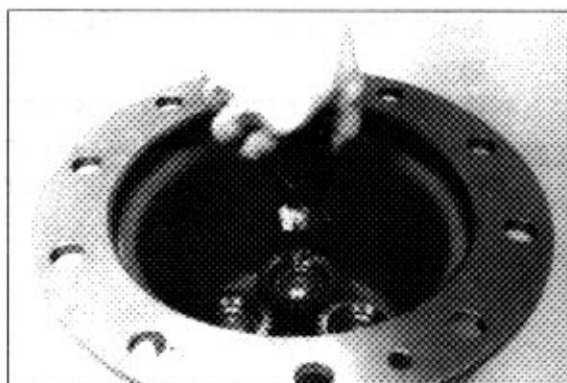


② Heat the bearing inner race of the pre-assembled planetary gear and place it against shoulder.

- ※ Large radius on the bearing inner race is facing the planetary carrier(Downward).



- ③ Fix planetary gears by means of circlips.



**Adjust end play of the Sun-gear shaft
0.3-0.6mm (Figure ④ - ⑦)**

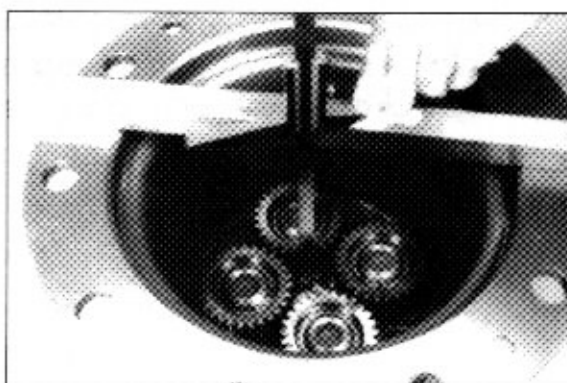
- ④ Determine dimension I from the flange-mounted surface / planetary carrier to the locating face / thrust washer.

• Dimension I e.g. : 199.10mm

※ Special tool

Depth gauge 5870 200 052

Straightedge 5870 200 022



- ⑤ Slide sun-gear shaft, resp. plate carrier in until contact is obtained.

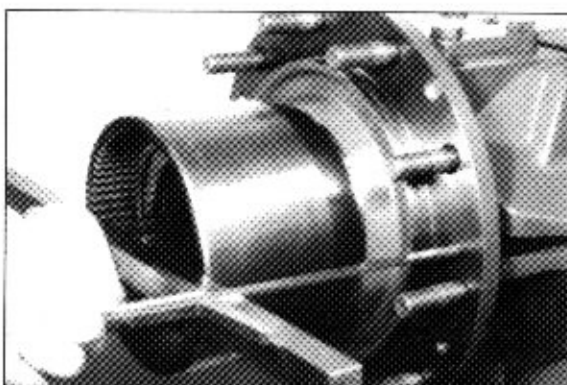
※ Measure dimension II from the end face / sun-gear shaft to the flange-mounted surface / hub

• Dimension II e.g. : 196.60mm

※ Special tool

Depth gauge 5870 200 052

Straightedge 5870 200 022



Example

Dimension I 199.10mm

Dimension II -199.60mm

Difference 2.50mm

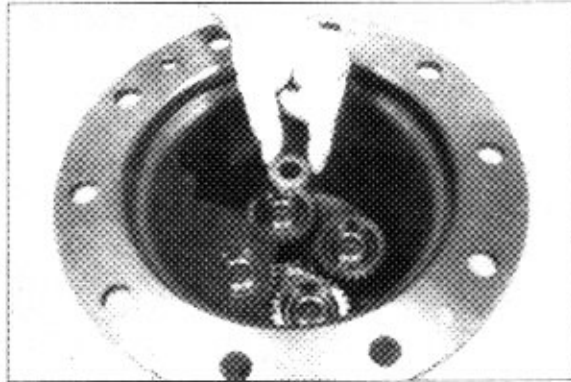
Required end play e.g. - 0.50mm

Difference = Thickness of

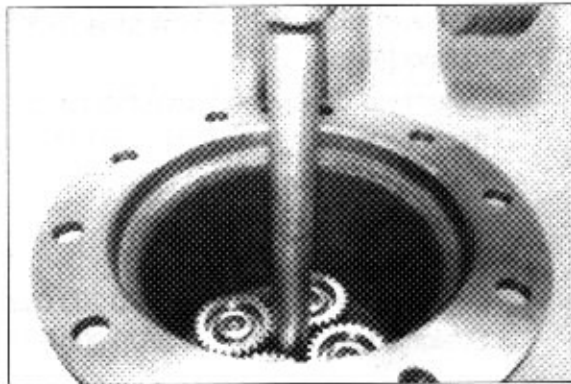
Thrust washer e.g. s = 2.00mm

- ⑥ Insert thrust washer in the planetary carrier.

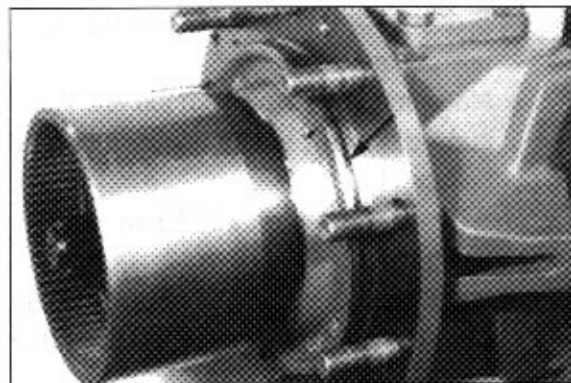
※ If the thrust washer has only one phosphatized surface, it must be installed with this surface facing the sun-gear shaft.



- ⑦ According to the version - press in thrust washer - resp. in case of an unfavorable tolerance disposition, caulk(4 points).



- ⑧ Grease the O-ring and insert it in the annular groove of the hub.

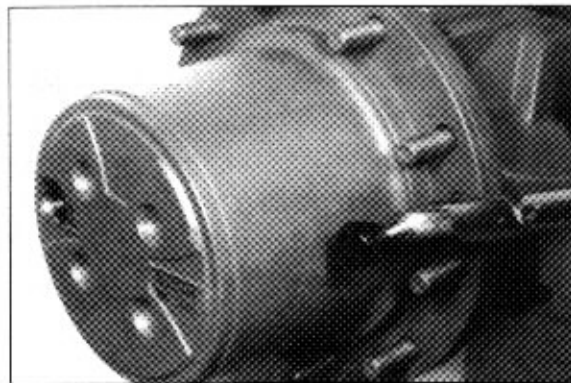


- ⑨ Assemble the planetary carrier and fasten it by means of socket head screws.

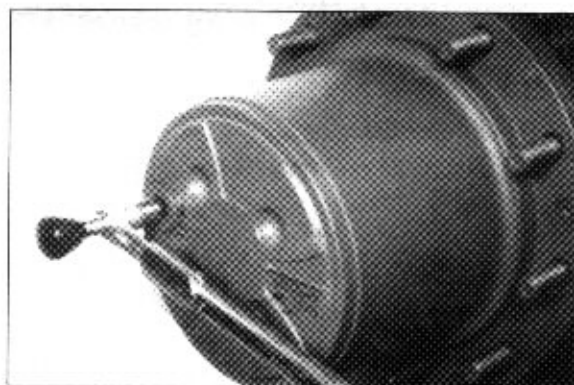
• Tightening torque :

M10 / 8.8 - 3.3kgf · m (23.9 lbf · ft)

M12 / 8.8 - 5.6kgf · m (40.5 lbf · ft)



- ⑩ Employ new O-ring for the screw plug and screw it in.
- * Before the axle is put into service, pay attention to the lubrication and maintenance instructions, page 8-191.

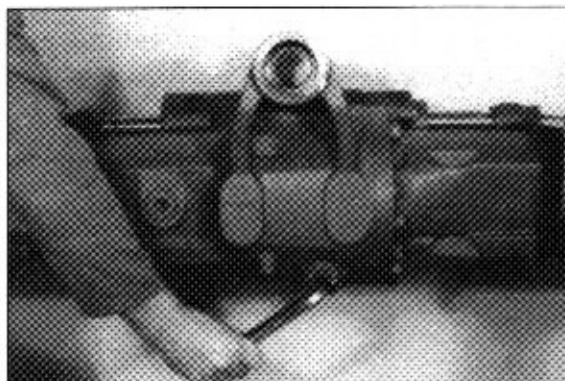


4. DRIVE UNIT / DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

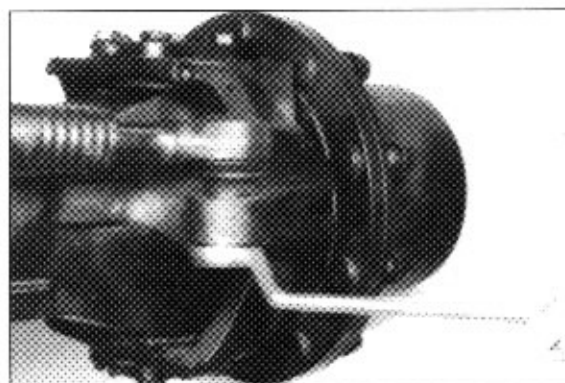
1) DISASSEMBLY

(1) Differential

- ① Drain oil from the axle housing.



- ② Remove cotter pin, loosen castle nut for some threads.



- ③ Loosen tie rod by means of ejection tool.
Now, screw off castle nut and unhook tie rod.

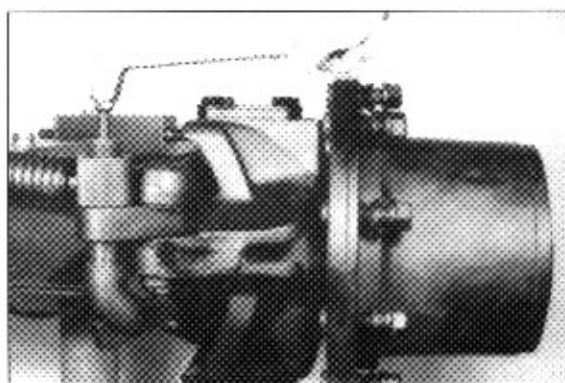
※ Special tool

Ejection tool

5870 000 077

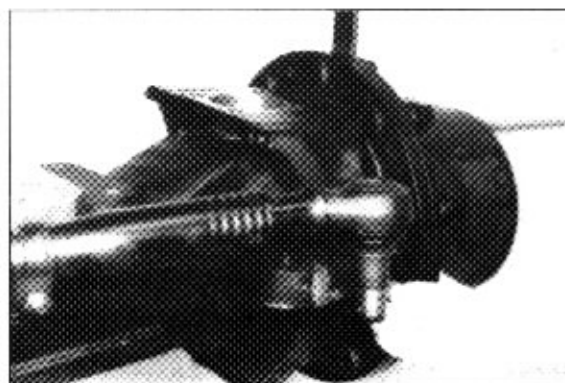
Yoke

5870 000 097

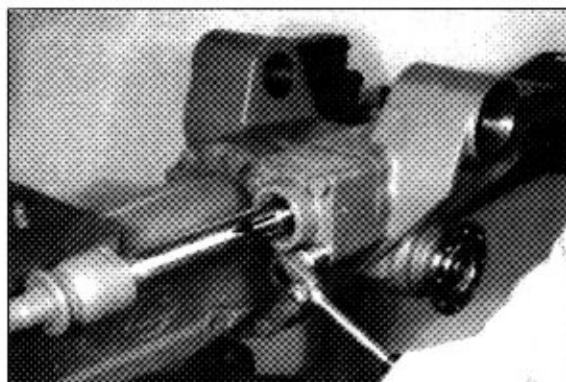


- ④ Remove bearing pin and separate the two final drives from the axle housing.

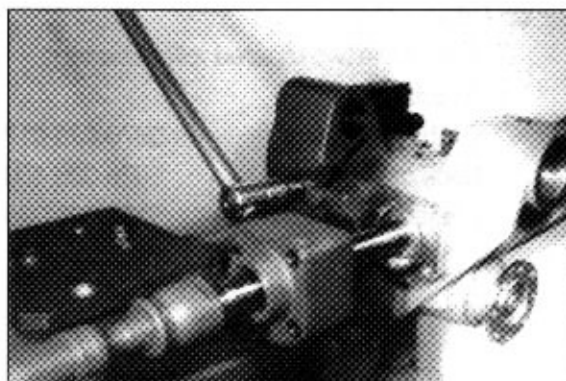
※ Pay attention, on the upper bearing pin, to the released shim.



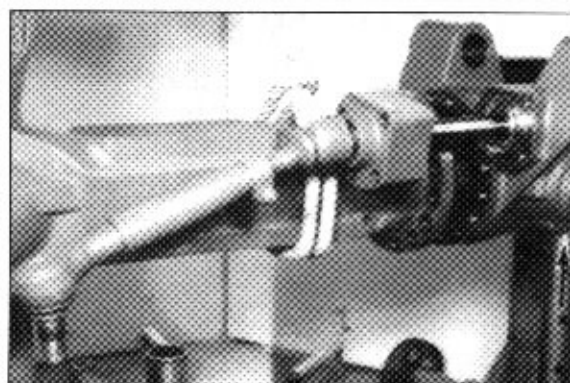
- ⑤ Loosen hex head screws of the guide.
Displace guide on the piston rod(See Arrows).



- ⑥ Loosen hex head screws and reamed bolt(See Arrow).
※ If a ground anchoring of the assembly car is not possible, the axle housing part I must be secured by means of a support(See Figure ⑦ -Arrow).



- ⑦ Separate axle housing part II from part I .

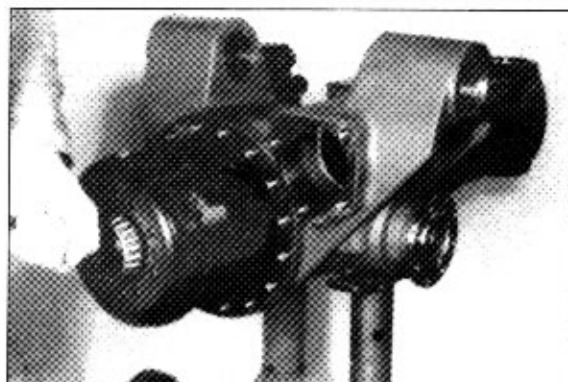


- ⑧ Remove O-ring and drive the bearing outer race(See Arrow) out of the axle housing bore.
※ Pay attention to the released shim.
※ Special tool
Striker

5870 650 004



- ⑨ Lift the complete differential case out of the axle housing.



(2) Differential

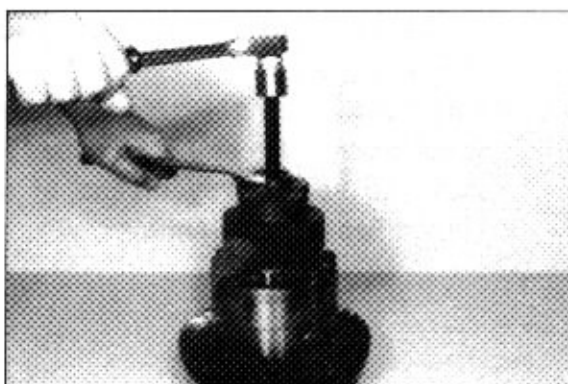
- ① Pull off the two tapered roller bearings.

* Special tool

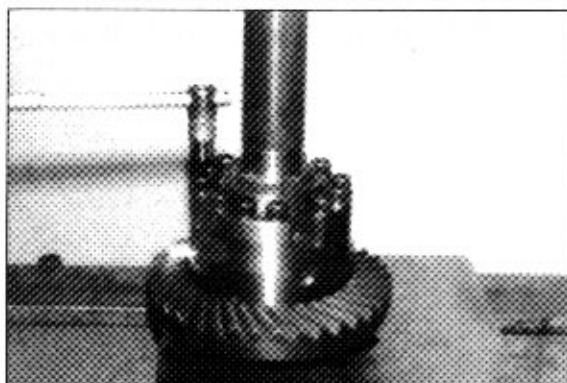
Grab sleeve super 5870 026 017

Back off insert 5870 026 100

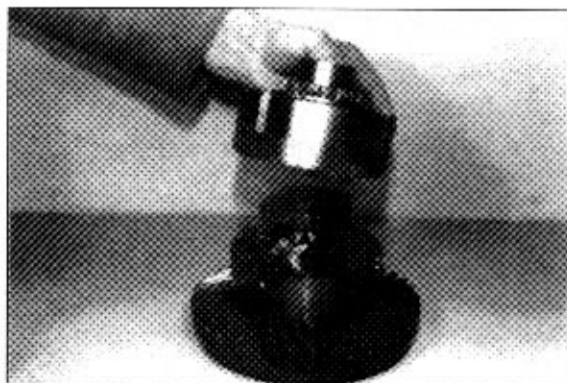
Pressure piece 5870 100 009



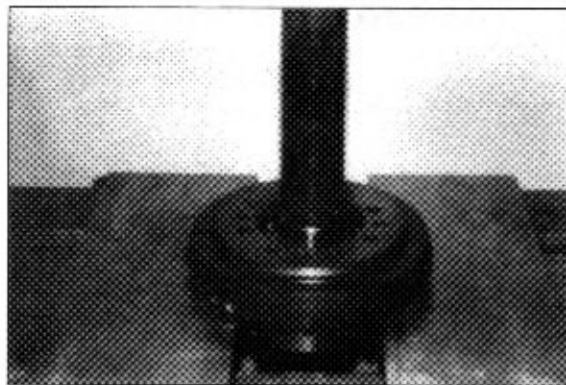
- ② Loosen socket head screws.



- ③ Take off differential case half / part II and remove the released components.



- ④ Press crown wheel from differential case half part I .



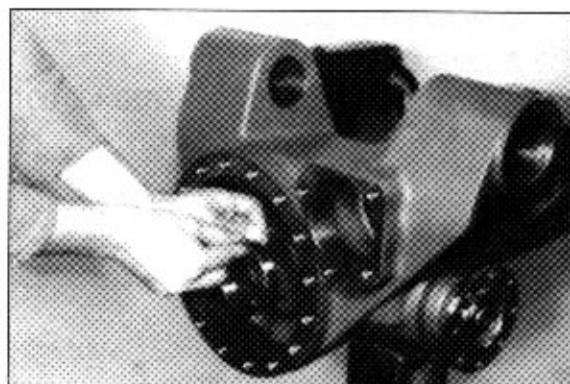
- ⑤ Remove bearing outer race from axle housing / part I .

※ Pay attention to the released shim.

※ Special tool

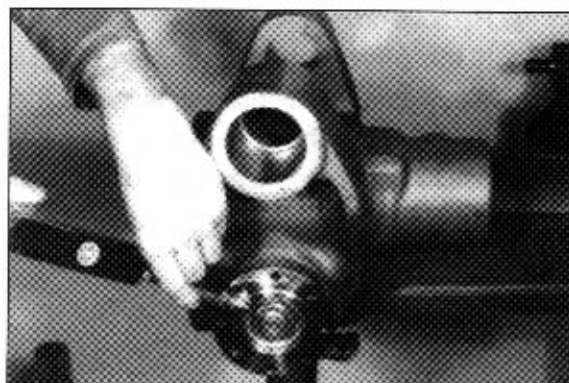
Striker

5870 650 004



(3) Remove drive pinion

- ① Remove lock plate.

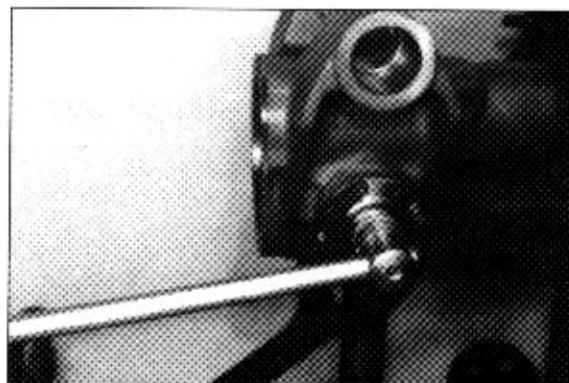


- ② Loosen hex nut.

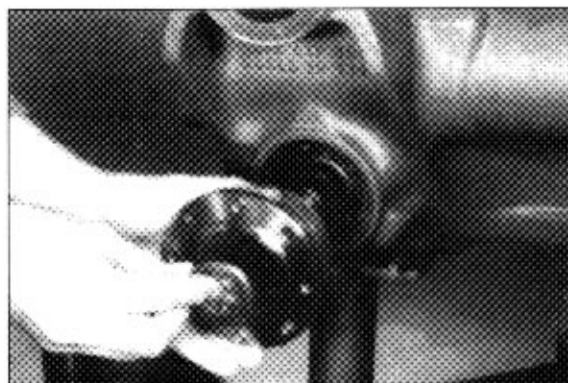
※ Special tool

Clamping yoke

5870 240 025



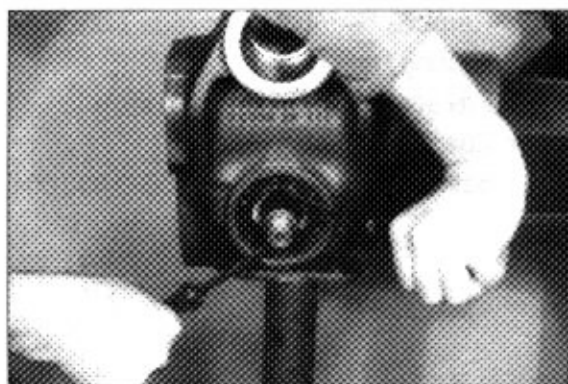
- ③ Pull off disk and drive flange.



- ④ Pry out shaft seal.

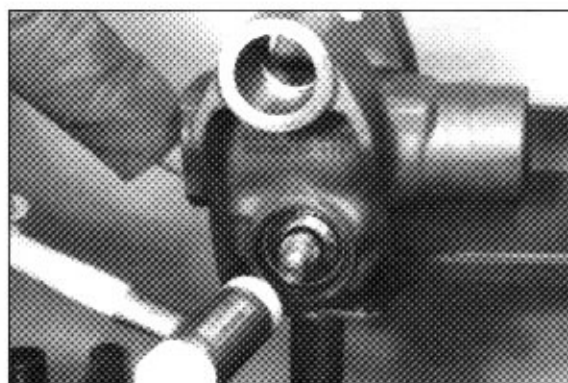
※ Special tool

Adjusting device(2EA) 5870 400 001



- ⑤ Remove drive pinion.

※ If the pinion bearing should not be renewed, pay attention that during the driving out of the drive pinion, the outer bearing inner race is always held against shoulder to avoid this damage of the bearing.



- ⑥ Remove spacing ring.

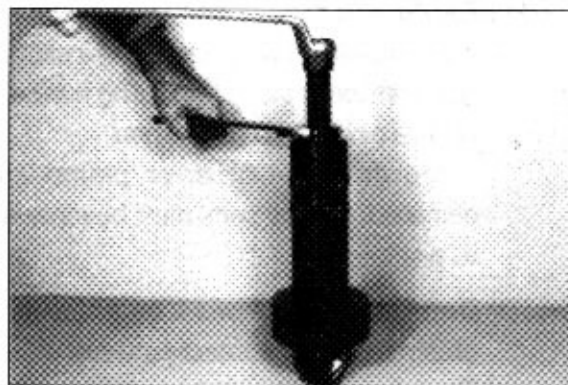


⑦ Pull bearing inner race from drive pinion.

※ Special tool

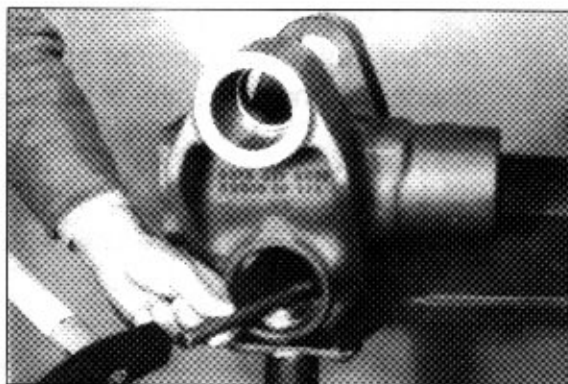
Grab sleeve super 5870 026 001

Basic set 5870 026 000



⑧ Drive the bearing outer race out of the inner bearing bore.

※ Pay attention to the released spacing washer.

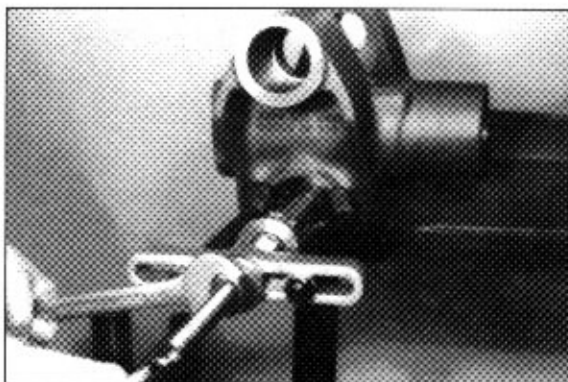


⑨ Pull the bearing outer race out of the outer bearing bore.

※ Special tool

Internal puller 5870 300 019

Back up tool 5870 300 020



2) REASSEMBLY

- ※ If a complete crown wheel set is installed, pay attention to the same mating numbers of drive pinion and crown wheel.

If crown wheel or drive pinion are damaged, the two parts must be renewed as a set.

(1) Determine thickness of shim - to obtain a correct contact pattern

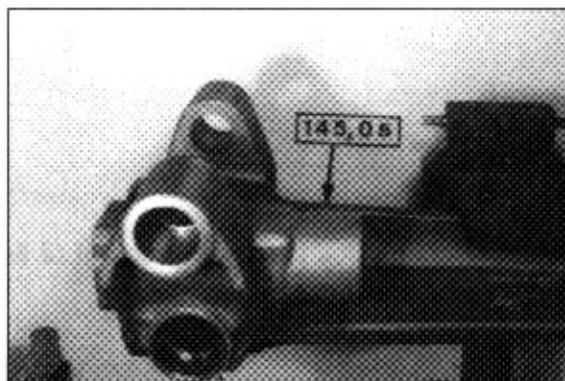
- ※ The following measuring operations have to be carried out with utmost precision. Inexact measurements bring along a faulty contact pattern and require another disassembly and reassembly of the drive pinion.

Determination of shim thickness "with" given dimension I

(on the axle housing / part I)

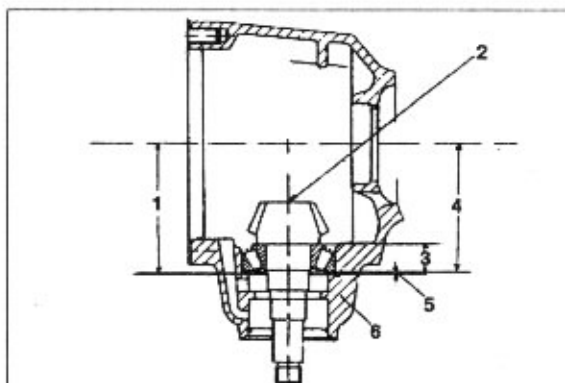
- ① Read dimension I from the axle housing / part I .

Dimension I e.g. : 145.05mm

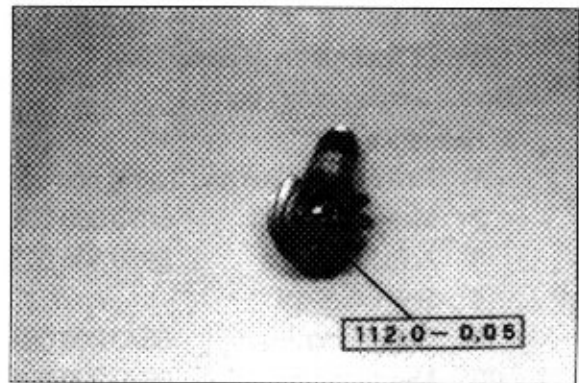


② Reference Draft

- 1 Dimension I
- 2 Dimension II (Pinion dimension)
- 3 Dimension III (Bearing width)
- 4 Dimension X
- 5 Shim
- 6 Axle housing

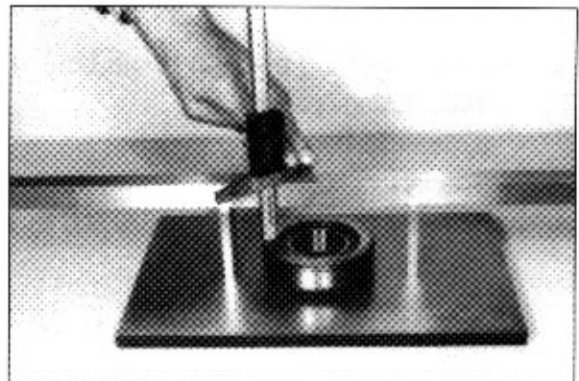


- ③ Read dimension II (Pinion dimension).
Dimension II e.g. $(112.0_{-0.05}) = 111.95\text{mm}$



- ④ Determine dimension III (Bearing width).
Dimension III e.g. : 32.05mm

- ※ Special tool
- | | |
|---------------------|--------------|
| Straightedge | 5870 200 022 |
| Gauge blocks | 5870 200 066 |
| Digital depth gauge | 5870 200 072 |



Example A

Dimension II	111.95mm
Dimension III	+ 32.05mm
Gives Dimension X	<u>144.00mm</u>

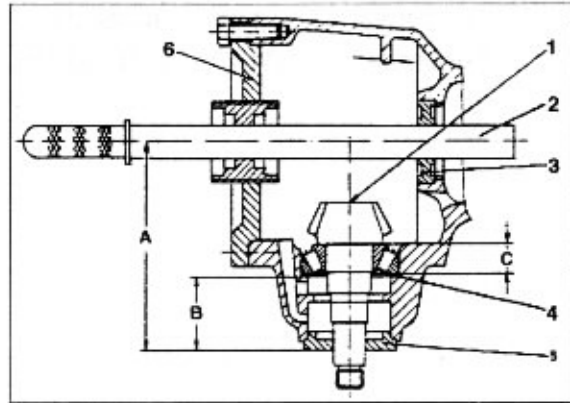
Example B

Dimension I	145.05mm
Dimension II	- 144.00mm
Difference = Thickness of shims =	<u>1.05mm</u>

Determination of shim thickness
"Without" definition of dimension I ,
(On the axle housing / part I)

⑤ Reference Draft

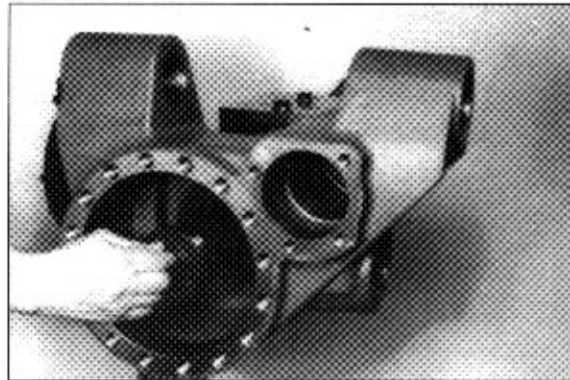
- | | | |
|---|------------------------------------|--------------|
| 1 | Pinion dimension and mating number | |
| 2 | Measuring shaft | 5870 500 001 |
| 3 | Adjusting piece | 5870 500 013 |
| 4 | Shim | |
| 5 | Gauge ring | 5870 200 064 |
| 6 | Measuring cover | 5870 200 034 |
| | Centering ring | 5870 200 042 |



- ⑥ Insert adjusting piece(3) in the bore of axle housing / part I (Differential bearing).

※ Special tool

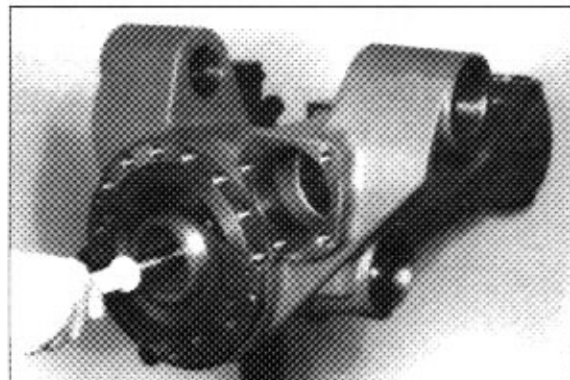
- | | |
|-----------------|--------------|
| Adjusting piece | 5870 500 013 |
|-----------------|--------------|



- ⑦ Push centering ring upon measuring cover(6), place it against shoulder and fasten it by means of hex head screws. introduce measuring shaft(2) into the bore of the adjusting piece(3) until the location is obtained.

※ Special tool

- | | |
|-----------------|--------------|
| Measuring shaft | 5870 500 001 |
| Measuring cover | 5870 200 034 |
| Centering ring | 5870 200 042 |



- ⑧ Position gauge ring(5) on the locating face of the outer bearing inner race against shoulder.

Determine dimension A from the plane surface of the gauge ring(5) to the center/measuring shaft(2) (See Draft ⑤).

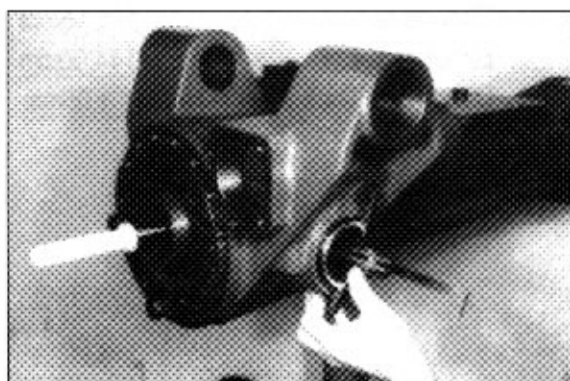
Determined dimension e.g. 208.85mm

1/2 \varnothing measuring shaft +15.00mm

Gives dimension "A" e.g. 223.85mm

※ Special tool

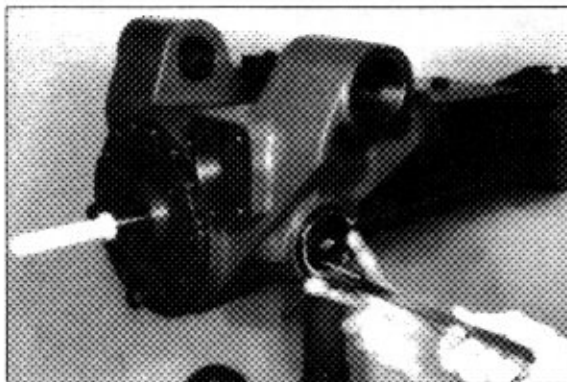
- | | |
|------------|--------------|
| Gauge ring | 5870 200 064 |
|------------|--------------|



- ⑨ Measure dimension B from the plane surface / gauge ring(5) to the locating face of the inner bearing outer race(See Draft ⑤).

• Dimension B e.g. : 78.80mm

Now, remove measuring device.



- ⑩ Determine dimension C(Bearing width).

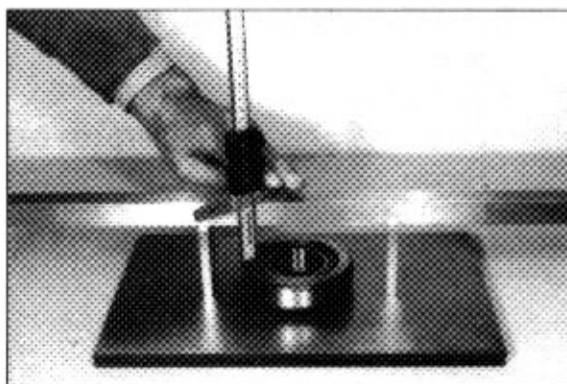
• Dimension C e.g. : 32.05mm

※ Special tool

Straightedge 5870 200 022

Gauge blocks 5870 200 066

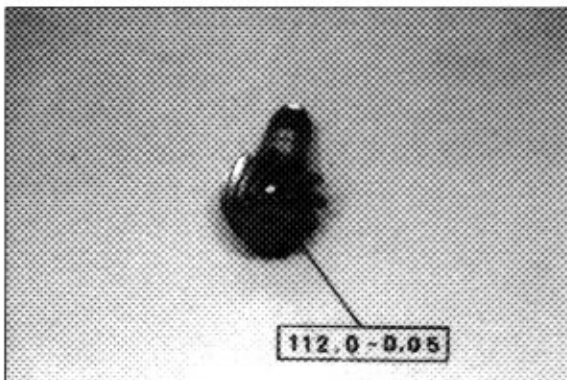
Digital depth gauge 5870 200 072



- ⑪ Read pinion dimension(1).

Pinion dimension e.g.

$(112.0_{-0.5}) = 111.95\text{mm}$



Example

Dimension A 223.85mm

Dimension B + Dimension C

$(78.80 + 32.05) - 110.85\text{mm}$

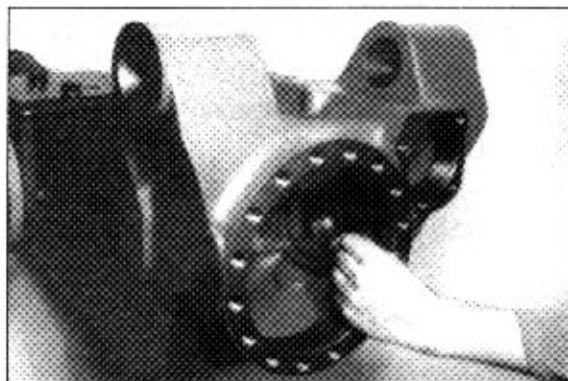
Gives 113.00mm

Pinion dimension - 111.95mm

Difference = Shim thickness $s = 1.05\text{mm}$

(2) Install drive pinion

- ① Insert determined shim e.g. $s = 1.05\text{mm}$.



- ② Undercool and insert outer bearing outer race.

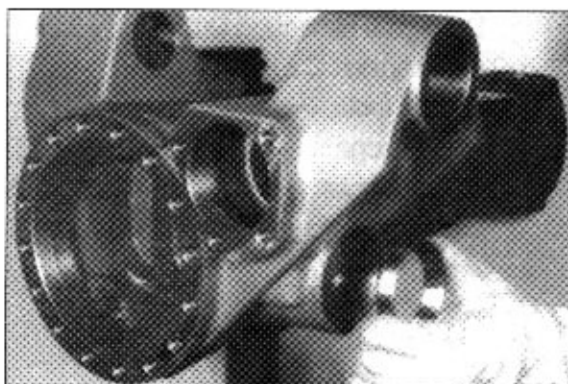
※ Special tool

Driver

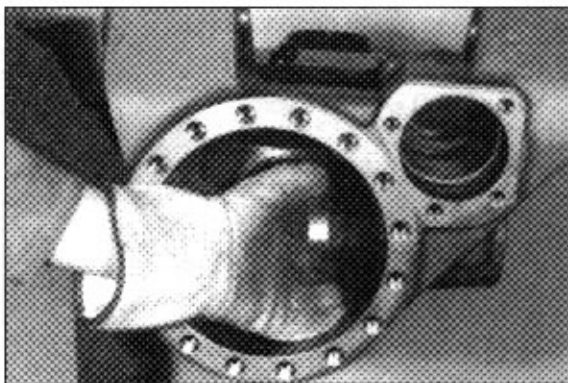
5870 058 062

Handle

5870 260 002



- ③ Undercool and insert inner bearing outer race.

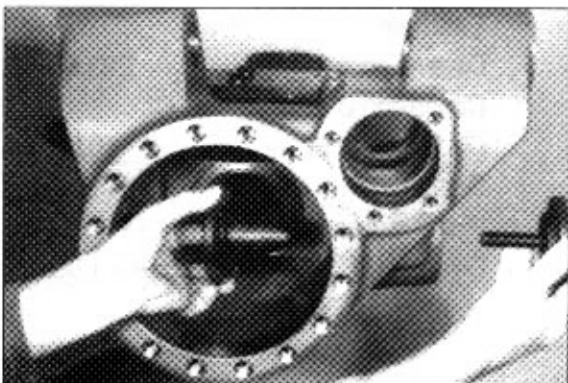


- ④ Position the two bearing outer races against shoulder, using special device.

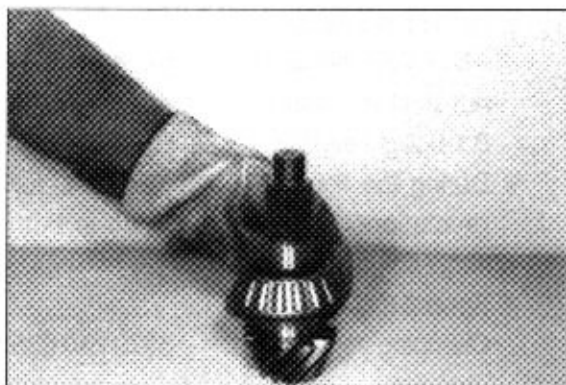
※ Special tool

Assembly jig

5870 345 049

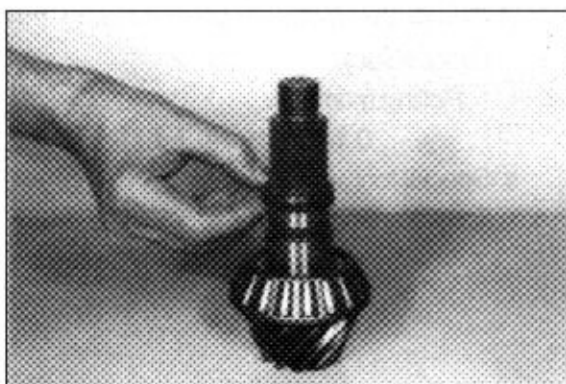


- ⑤ Heat tapered roller bearing and replace it firmly against shoulder.
- ※ Reset the bearing after the cooling down.

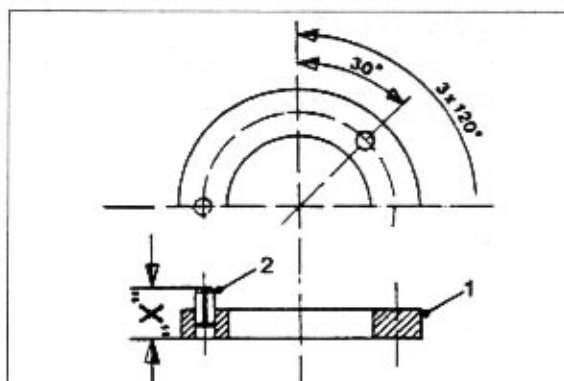


Adjust rolling moment of the drive pinion bearing 0.1- 0.2kgf · m(0.7-1.4 lbf · ft)

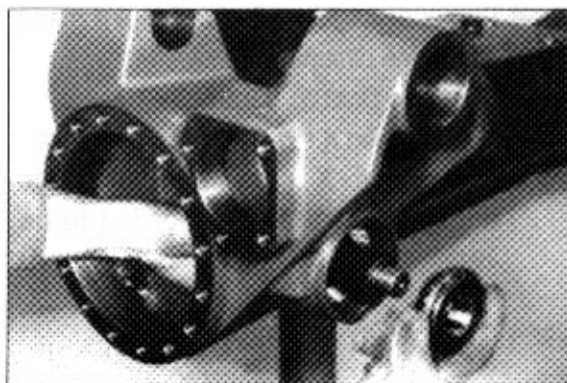
- ⑥ Assemble gauge ring.
- Shape and description of the gauge ring, see Draft ⑦.



- ⑦ Reference Draft
- 1 Gauge ring
- 2 Roll pins(3EA)
- ※ Dimension **X** = Thickness of the spacing ring.



- ⑧ Insert pre-assembled drive pinion and assemble the heated bearing inner race until contact is obtained.



⑨ Install drive flange.

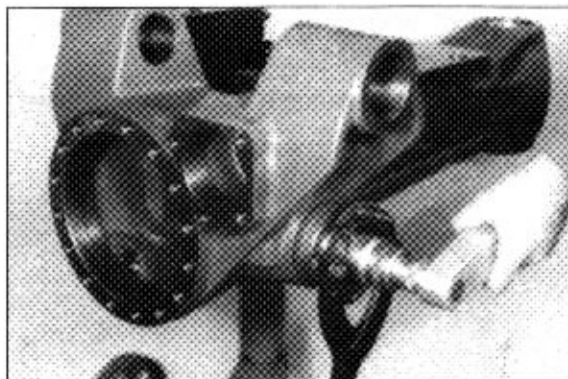
Assemble the disk and tighten the hex nut until the required rolling moment of $0.1-0.2\text{kgf} \cdot \text{m}$ ($0.7-1.4\text{bf} \cdot \text{ft}$) is obtained.

- ※ During the tightening, make several full revolutions of the drive pinion in both senses.

※ Special tool

Clamping yoke

5870 240 025



⑩ Check the rolling moment (Aim at the upper value).

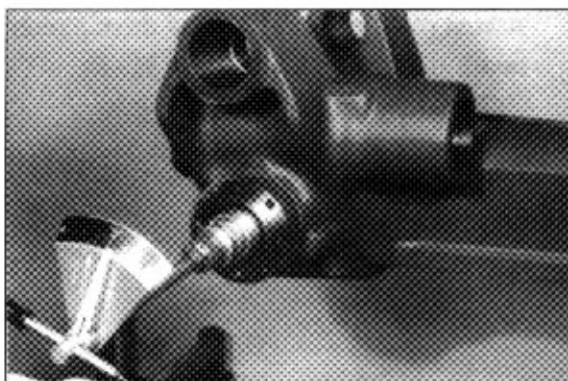
- Rolling moment :

$0.1-0.2\text{kgf} \cdot \text{m}$ ($0.7-1.4\text{bf} \cdot \text{ft}$)

※ Special tool

Torque spanner

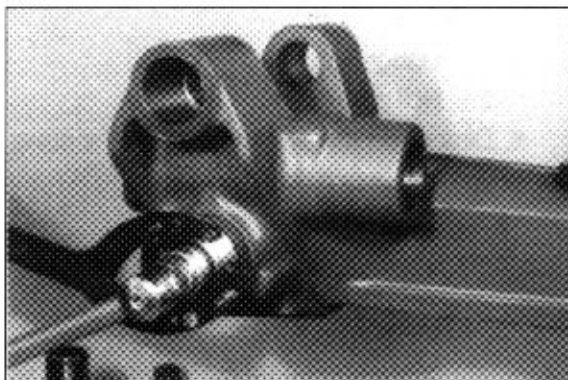
5870 203 019



⑪ Loosen hex nut.

Pull off disk and drive flange.

Remove drive pinion again.

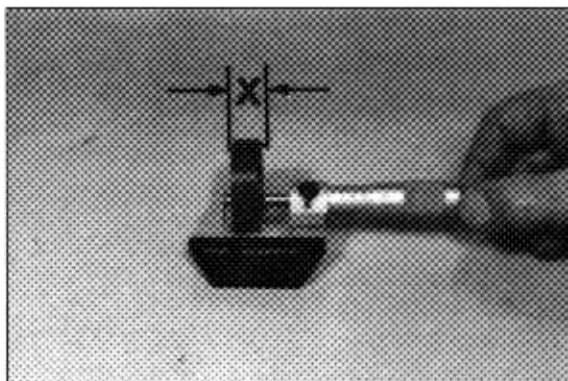


⑫ Remove gauge ring from drive pinion and determine dimension X

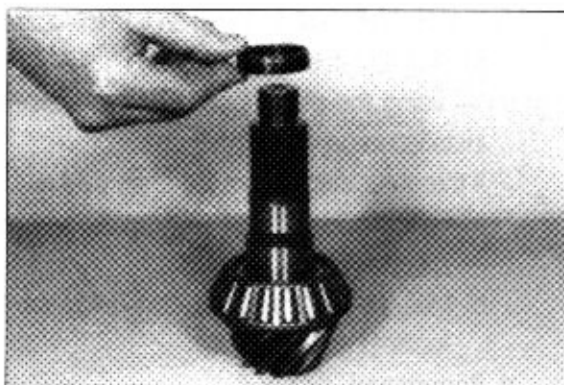
(See also Draft ⑦, page 8-237).

- Dimension X e.g. $s = 11.45\text{mm}$

- ※ Dimension X corresponds to the thickness of the spacing ring to be installed.



- ⑬ Assemble instead of the gauge ring the determined spacing ring
(e.g. $s = 11.45\text{mm}$).



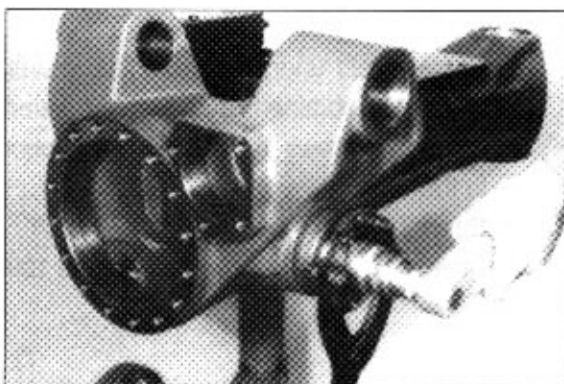
- ⑭ Install pinion again.
Assemble drive flange and disk and tighten hex nut.

• Tightening torque : $43.8\text{kgf} \cdot \text{m}$
($317\text{lbf} \cdot \text{ft}$)

- ※ During the tightening, make several full revolutions of the drive pinion in both senses.

- ※ Special tool

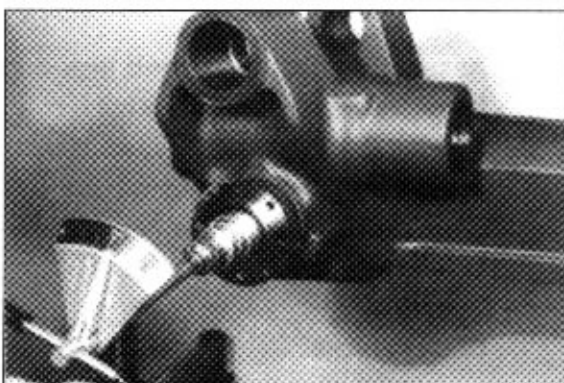
Clamping yoke 5870 240 025



- ※ Check rolling moment again.
If the required rolling moment
($0.1 - 0.2\text{kgf} \cdot \text{m}$) is not obtained, correct by
means of a corresponding spacing ring.

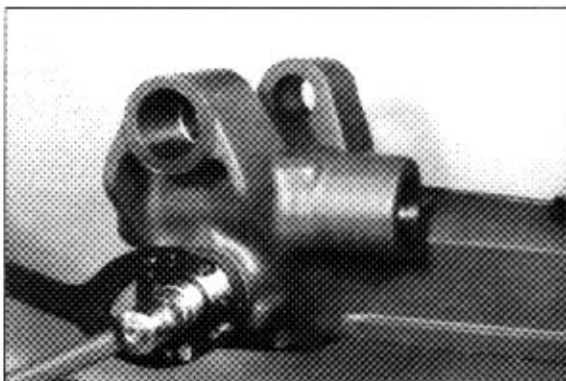
- ※ Special tool

Torque spanner 5870 203 019



- ⑮ Loosen hex nut.

Pull off disk and drive flange.



- ⑩ Install shaft seal and grease it in the zone sealing lip / dust lip.

※ By using the prescribed driver, the exact installation depth is obtained.

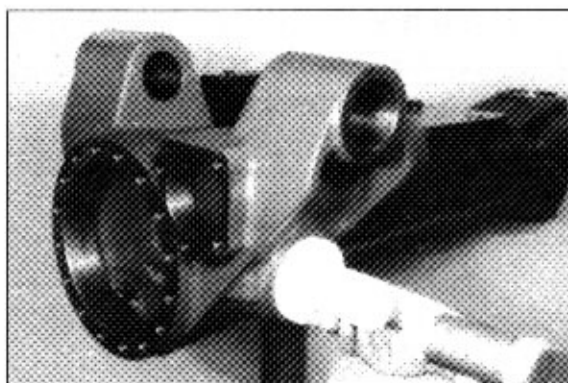
If the outer diameter of the shaft seal is

- a) Rubber-coated-wet with spirit / water mixture(1:1)
- b) Metallic-cover with sealing compound loctite(Type-No. 574).

※ Special tool

Driver

5870 048 120

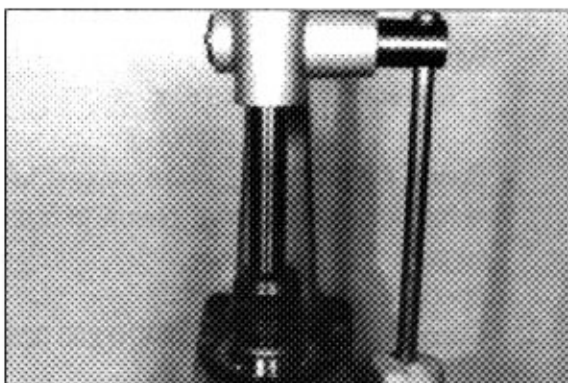


- ⑪ Press shield upon the drive flange until contact is obtained, if necessary, insert hex head screws in the drive flange prior to this step.

※ Special tool

Driver

5870 048 109



- ⑫ Assemble drive flange and disk and fasten finally by means of hex nut.

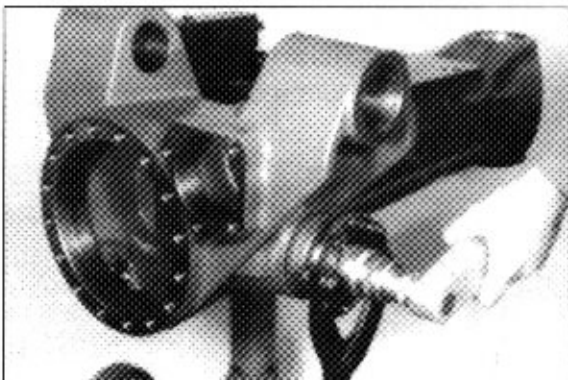
- Tightening torque : 43.8kgf · m
(317lbf · ft)

※ Carry out securing of the hex nut-after the contact pattern has been taken.

※ Special tool

Clamping yoke

5870 240 025

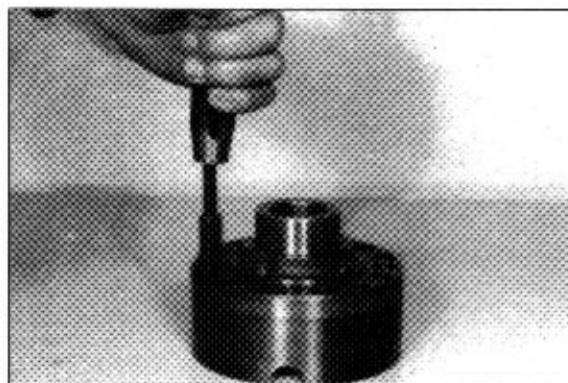


(3) Complete and install differential

※ Oil all components of the differential prior to the reassembly.(Use oil according to the list of lubricants TE-ML 05)

① Drive roll pins(2 pieces/each bore) into the blind holes(4EA) of differential case half I .

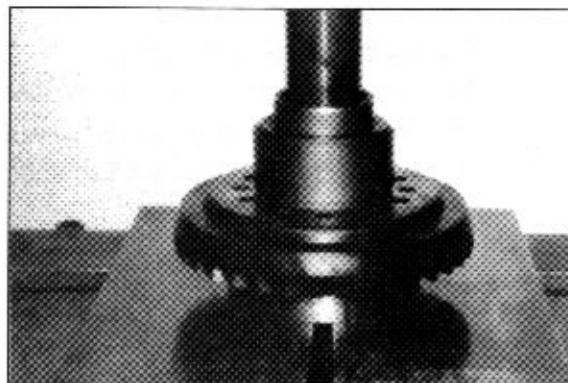
※ Install the roll pins, with the opening, in the load direction, resp. circumferential direction of the differential case, spaced for 180° .



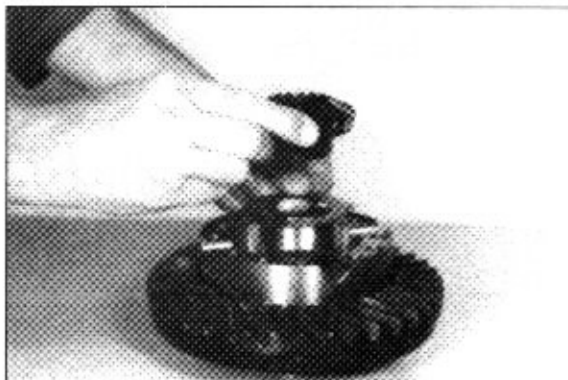
② Position heated crown wheel by means of adjusting screws(M12 × 1.5) and press it against shoulder.

※ Special tool

Adjusting screw(M12 × 1.5) 5870 204 027



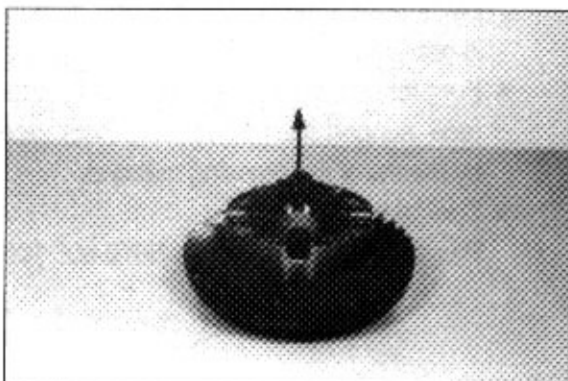
③ Insert thrust washer and side gear.



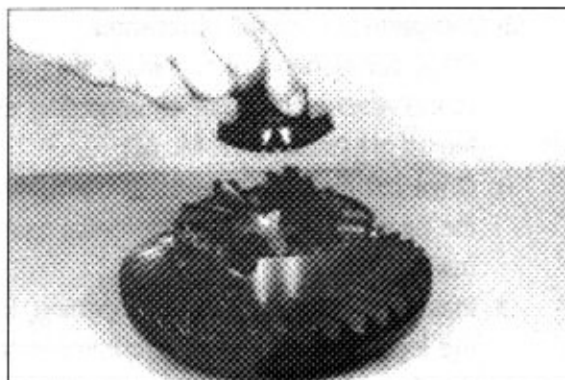
④ Assemble side gears and shims on the differential spider.

Insert the complete differential spider in the differential case half I .

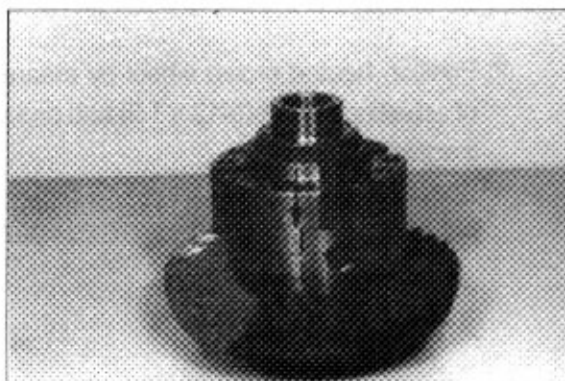
※ Pay attention to the radial installation position of the thrust washers - tongue shows upward(See Arrow).



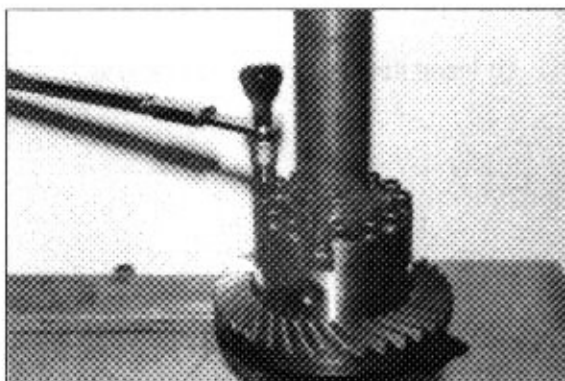
- ⑤ Replace second side gear.



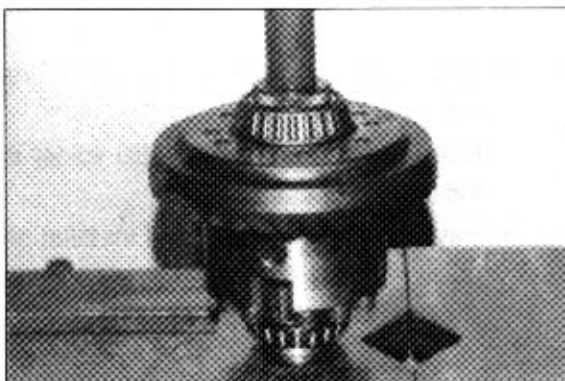
- ⑥ Make thrust washer adhere with grease in the differential case half II.
Replace differential case half II.
※ Pay attention to the radial installation position of the two differential case halves. ZP-No.(See Arrow) signifies assembly marking at the same time.



- ⑦ Mount flat washers and tighten socket head screws(M12 × 1.5/12.9).
- Tightening torque : 14.8kgf · m
(107lbf · ft)



- ⑧ Heat the two bearing inner races and press them against shoulder until contact is obtained.
※ For pressing on the second bearing inner race, support the first bearing inner race by means of the pressing mandrel.
※ Special tool
Pressing mandrel 5870 506 103



(4) Determine and adjust backlash of the crown wheel set and bearing preload of the differential

① Backlash : 0.15-0.25mm

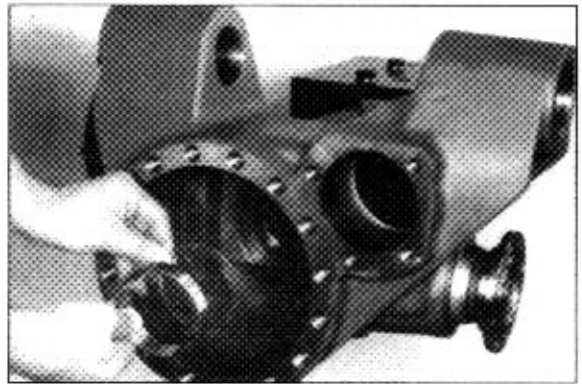
Bearing rolling moment : 0.1- 0.2kgf · m
(0.7-1.4lbf · ft)

② Insert shim e.g. $s = 170\text{mm}$ (Empirical value) in the bearing bore (Axle housing / part I) and install subsequently bearing outer race.

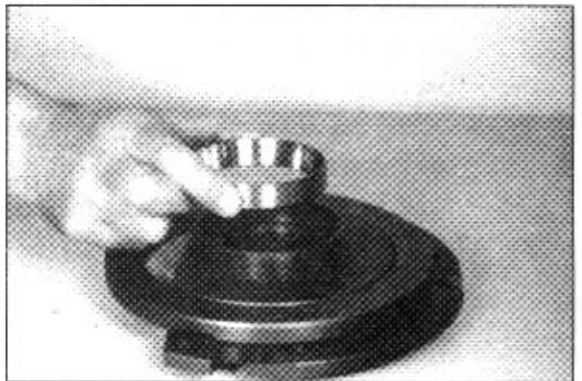
※ Special tool

Driver 5870 058 061

Handle 5870 260 002



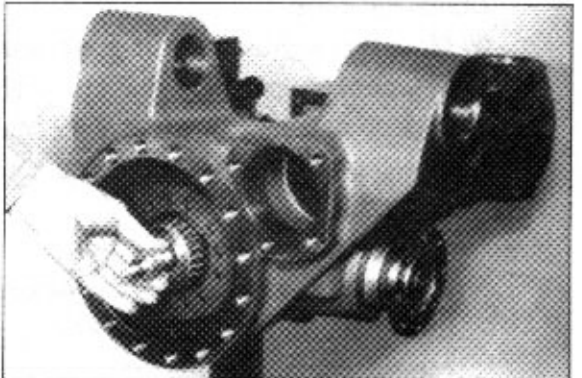
③ Insert crown-wheel side bearing outer race in the measuring device.



④ Insert differential in the axle housing and install clamping segment into the stub shaft bore of the differential.

※ Special tool

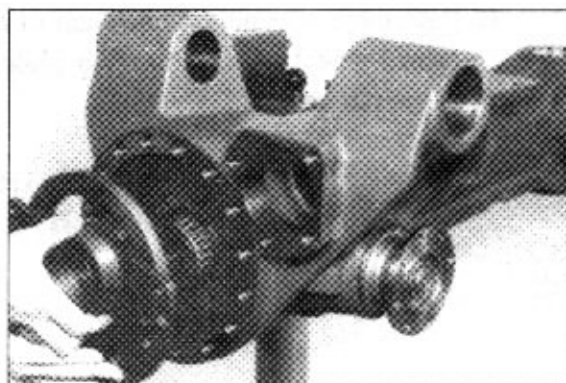
Clamping segment 5870 654 026



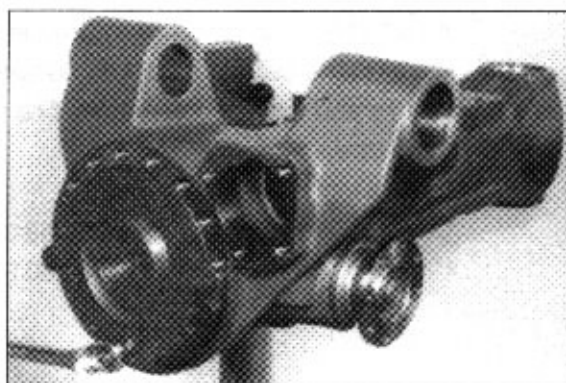
- ⑤ Fix the differential by means of measuring cover.

※ Special tool

Measuring cover	5870 200 034
Centering ring	5870 200 042
Magnetic base	5870 200 055
Dial indicator	5870 200 057



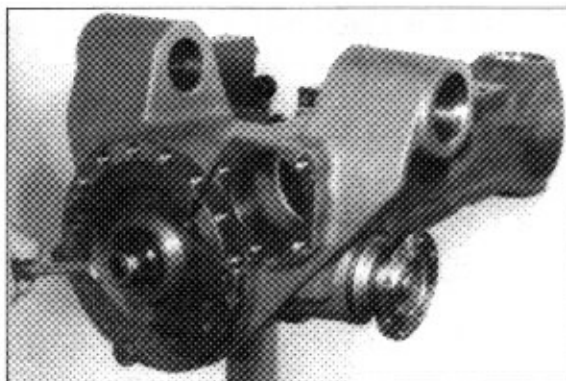
- ⑥ Fasten special device by means of hex head screws.



- ⑦ Adjust the differential by application of the threaded spindle free of play and pressure.

※ During the adjustment, make several full revolutions of the drive pinion.

Now, fix the threaded spindle by means of locking screw(See Arrow).

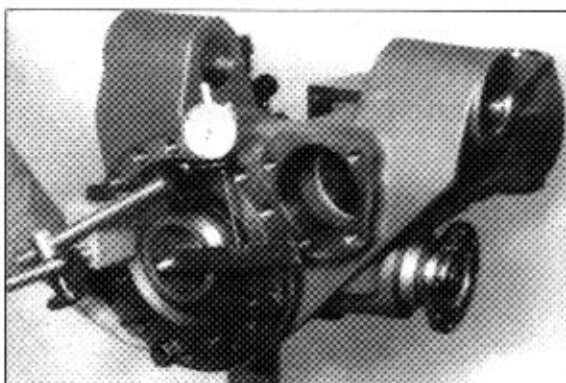


Check Backlash

- ⑧ Mount straightedge on the clamping segment. Apply dial indicator right-angled(Position = outer diameter / crown wheel) on the straight edge and check backlash.

· Backlash : 0.15-0.25mm

※ In case of deviations from the required backlash, correct by means of a corresponding shim(See Figure ②, page 8-243).



- ⑨ After termination of the backlash adjustment, remove the measuring device again.

Determine dimension I from the flange-mounted surface to the locating face / bearing outer race.

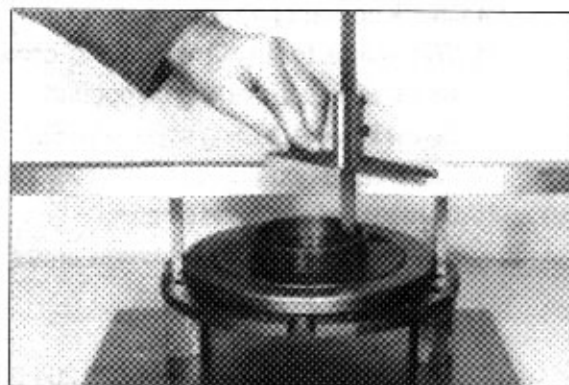
• Dimension I e.g. : 16.55mm

※ Special tool

Straightedge 5870 200 022

Gauge blocks 5870 200 066

Digital depth gauge 5870 200 072



- ⑩ Measure dimension II from the flange-mounted surface of the axle housing / part II to the locating face/ bearing outer race.

• Dimension II e.g. : 13.90mm

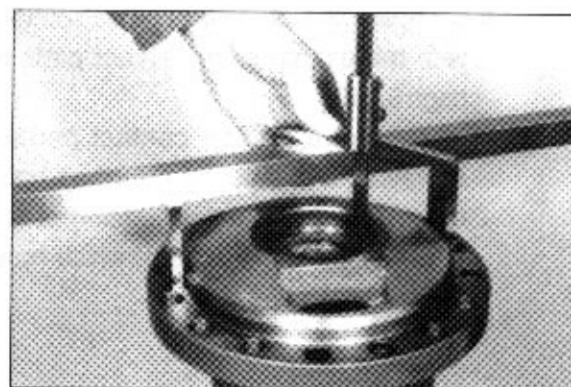
- ※ With various axle types, the dimension II can be greater than dimension I .
Change the example accordingly.

※ Special tool

Straightedge 5870 200 022

Gauge blocks 5870 200 066

Digital depth gauge 5870 200 072



Example

Dimension I 16.55mm

Dimension II -13.90mm

Difference 2.65mm

Required bearing preload +0.10mm

Gives shim thickness $s = 2.75\text{mm}$

- ※ With a bearing preload of 0.10mm, the required rolling moment of 0.1-0.4kgf · m is obtained.

- ⑪ Insert the determined shim(s) e.g. $s = 2.75\text{mm}$ into the axle housing / part II and install subsequently the bearing outer race until contact is obtained.

※ Special tool

Driver 5870 058 061

Handle 5870 260 002

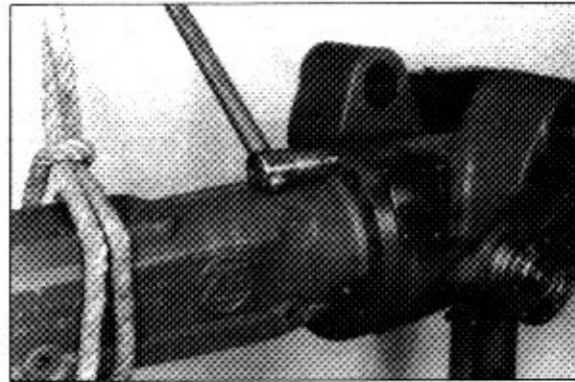


(5) Check contact pattern

- ① Wet some tooth flanks of the crown wheel with gear-marking compound. Screw in two adjusting screws(M18). Fasten axle housing/ part II provisionally by means of hex head screws. Roll the crown wheel several times to and fro over the drive pinion.

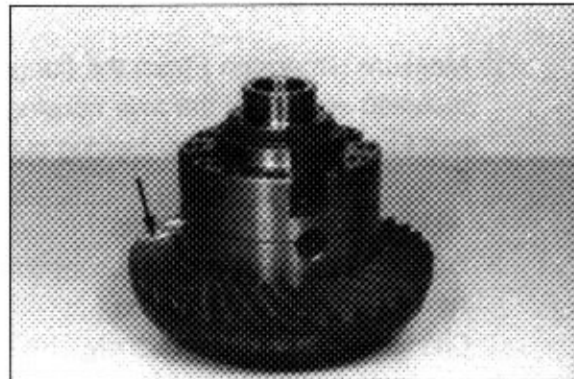
※ Special tool

Adjusting screw(M18) 5870 204 026

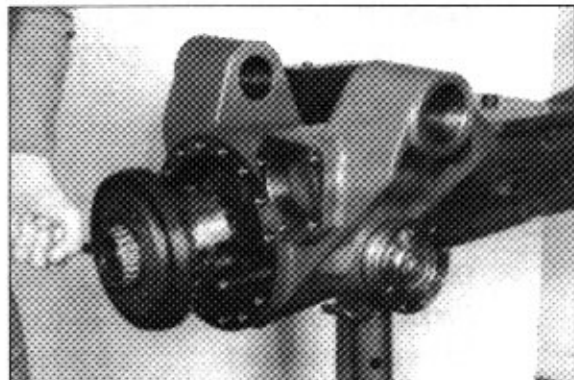


- ② Remove differential.

- ※ Compare the obtained contact pattern with the examples of contact pattern, page 8-249.
- ※ In case of a greater contact pattern deviation, a measuring error has been made during the determination of the shim(Figure ④, page 236), which must be absolutely corrected.



- ③ Install differential again.



(6) Axle bolting

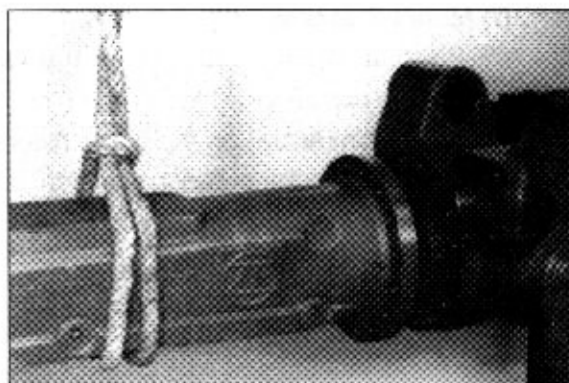
- ① Insert new O-ring in the annular groove (Arrow).



- ② Combine the axle housing / part II with part I .

※ Special tool

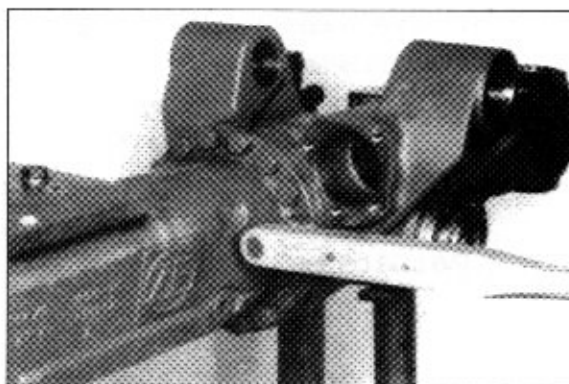
Adjusting screws(M18) 5870 204 026



- ③ Fasten axle housing / part II by means of hex head screws(With washers).

※ Pay attention to the installation position of the reamed bolt(1EA), see Arrow.

• Tightening torque : 41.8kgf · m
(302lbf · ft)



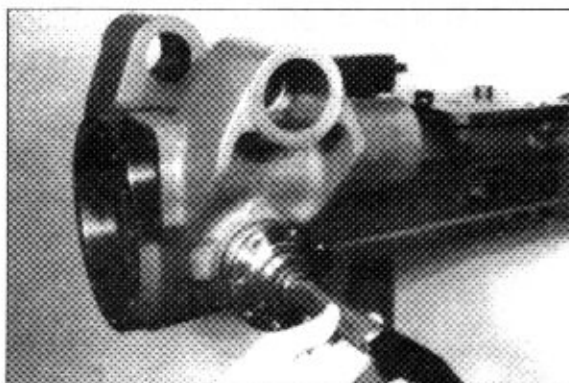
Secure drive pinion bolting

- ④ Drive lock plate upon the hex nut.

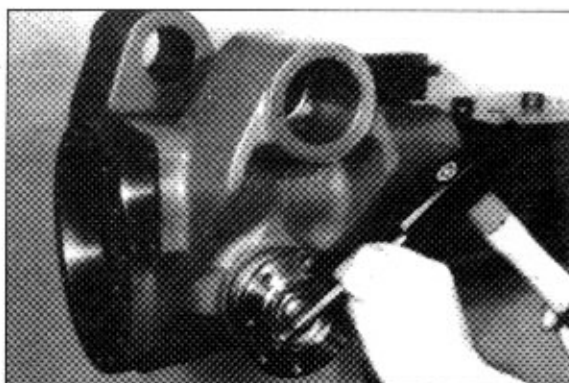
※ Special tool

Driver 5870 057 021

Handle 5870 260 002



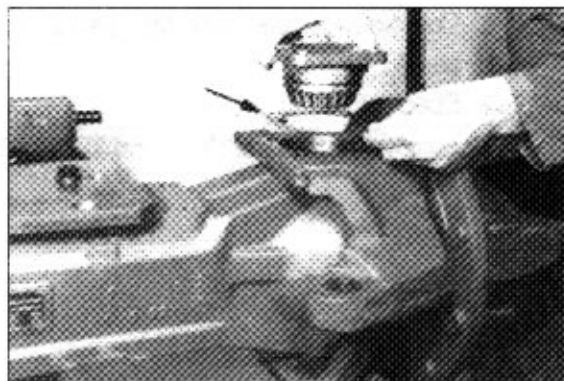
- ⑤ Caulk lock plate.



(7) Mount final drive

- ① Fix final drive by means of the two bearing pins.

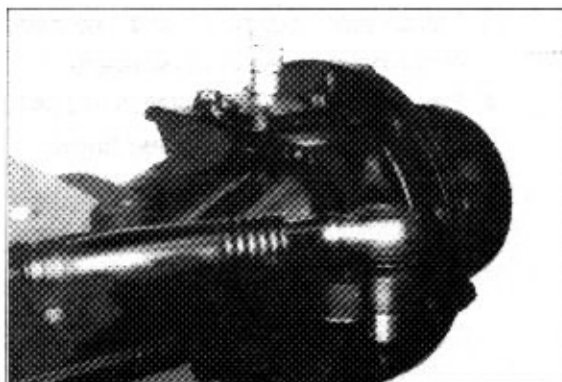
※ Insert shim(Arrow) on the upper bearing pin. Cover collar of bearing pin with anti-corrosive agent(Never-Seez).



- ② Fasten bearing pins by means of hexagon head screws.

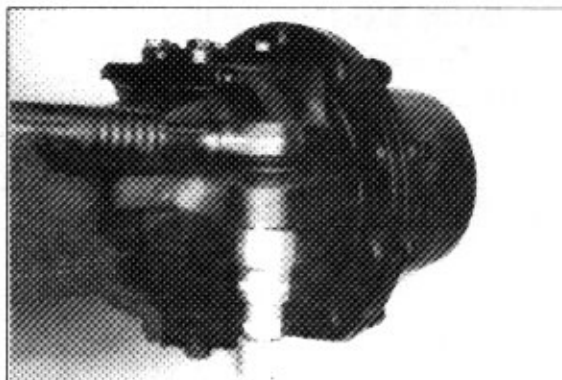
• Tightening torque : 28.5kgf · m
(206lbf · ft)

※ Pay attention to the installation position of the bearing pins. Grease nipple is facing the axle center.



- ③ Engage tie rod in the steering knuckle hull. Tighten castle nut and secure it by means of cotter pin.

• Tightening torque : 30.6kgf · m
(221lbf · ft)

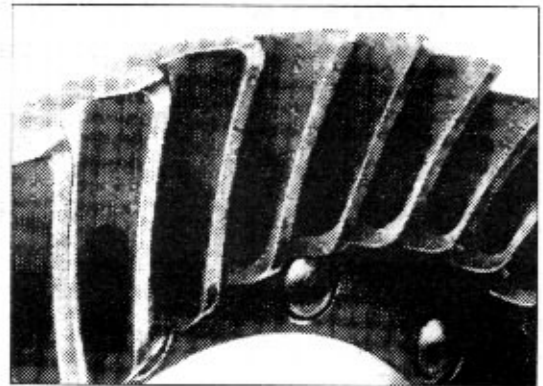


3) CONTACT PATTERNS

(1) Ideal tooth contact pattern(Pinion distance is correct)

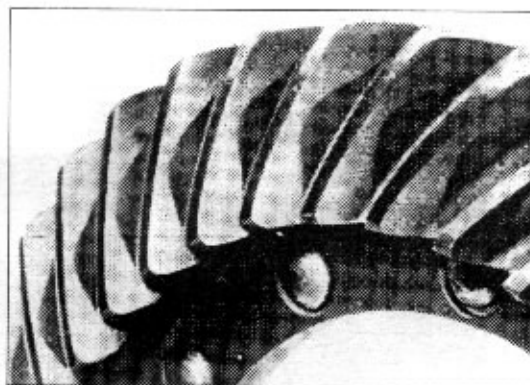
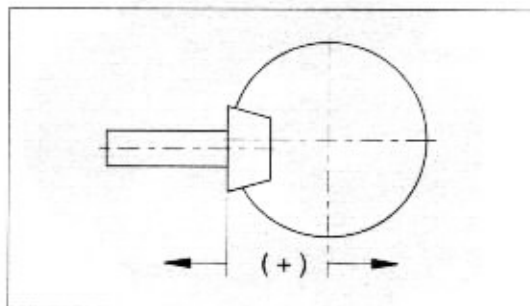


Coast side(Concave)



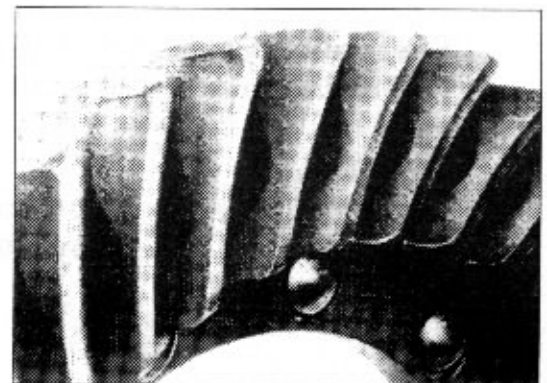
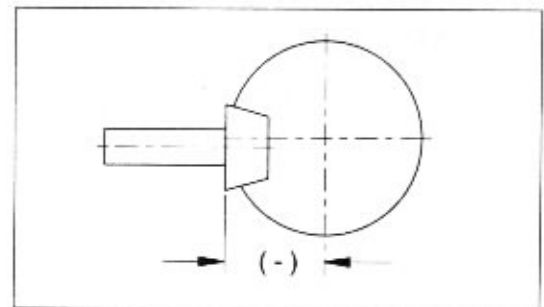
Drive side(Convex)

(2) Pinion distance must be increased



Coast side(Concave)

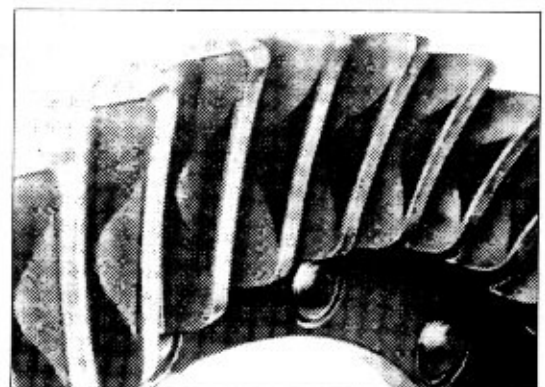
(3) Pinion distance must be decreased



Coast side(Concave)



Drive side(Convex)



Drive side(Convex)

5. STEERING ASSEMBLY

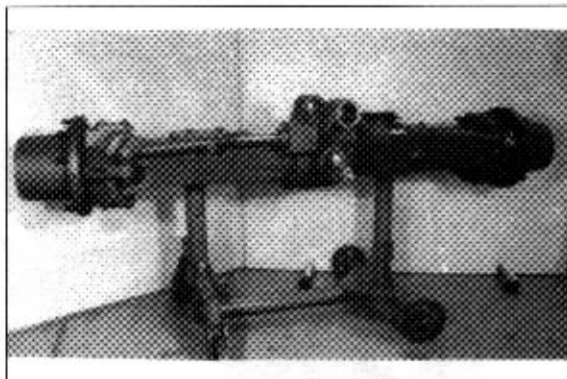
1) DISASSEMBLY

The illustration on the right shows the total view of the axle with integrated hydraulic steering assembly.

※ Special tool

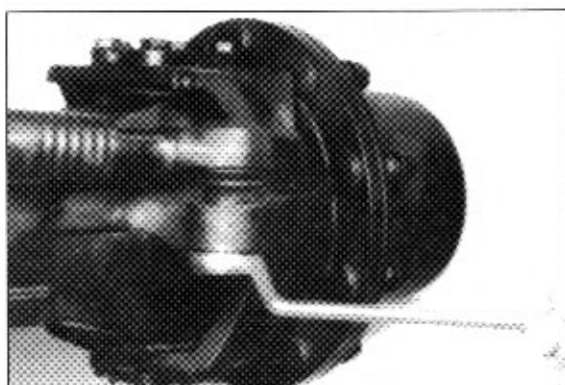
Assembly car 5870 350 000

Support 5870 350 055



(1) Remove tie rod

- ① Remove cotter pin, loosen castle nut for some threads.

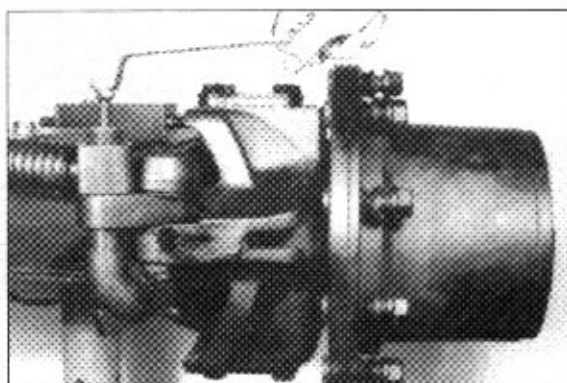


- ② Loosen tie rod by means of ejection tool. Now, unscrew castle nut and unhook tie rod.

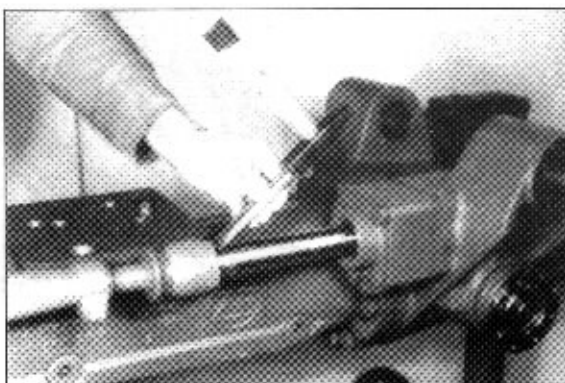
※ Special tool

Ejection tool 5870 000 077

Yoke 5870 000 079

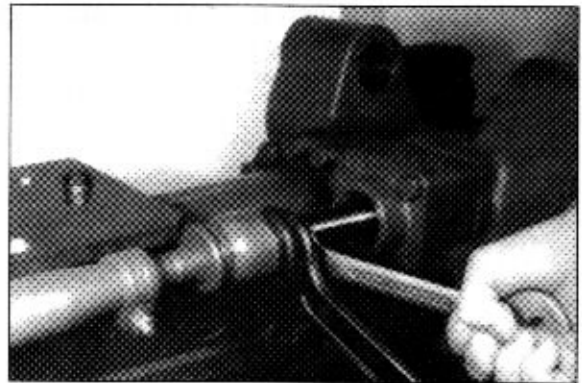


- ③ If necessary (According to the version), unlock the bolting piston rod / tie rod.



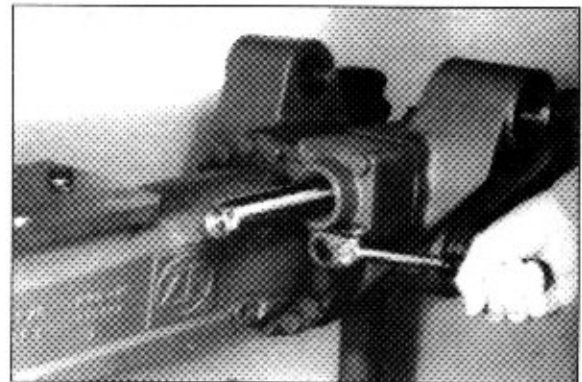
Version-tie rod "without" stop ring for the steering lock

- ⑧ Heat bolting piston rod / axial joint.
Loosen bolting and remove complete tie rod.
- * Disassemble second tie rod accordingly.
- * Special tool
Hot-air blower(220V) 5870 221 500
Hot-air blower(110V) 5870 221 501

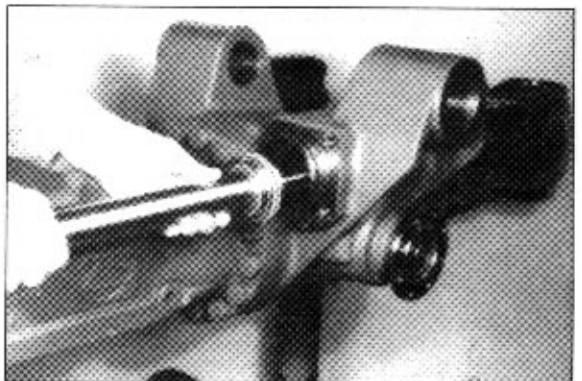


(2) Remove piston and cylinder

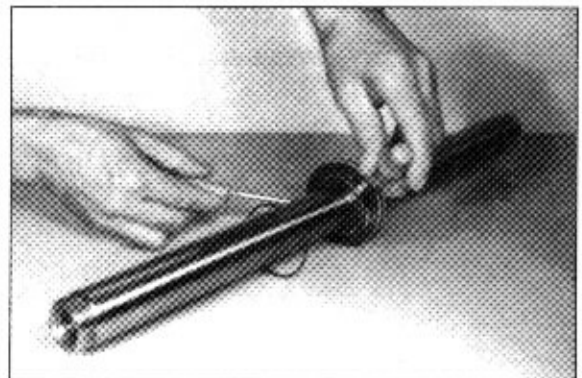
- ① Loosen hex head screws and pull off guide I .
If necessary, remove sealing elements.
- * Pay attention to the released shim.



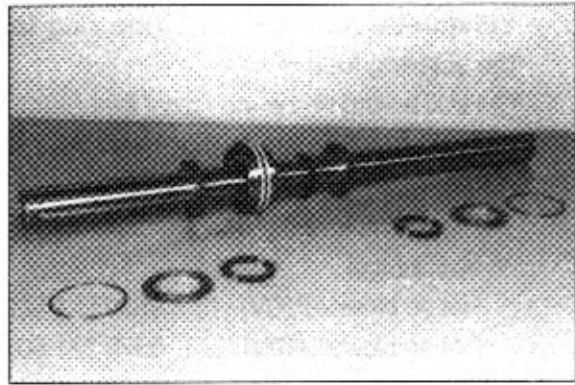
- ② Pull piston rod out of the cylinder.



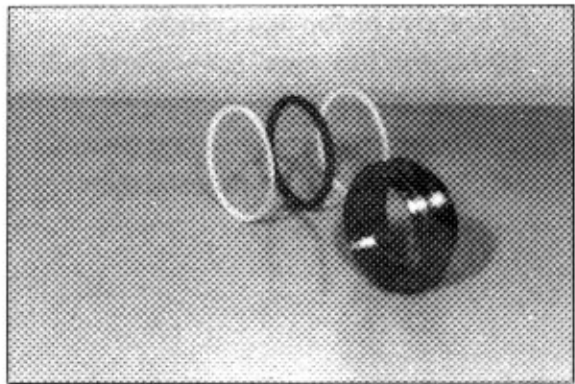
- ③ Remove snap ring, circlip and split ring.



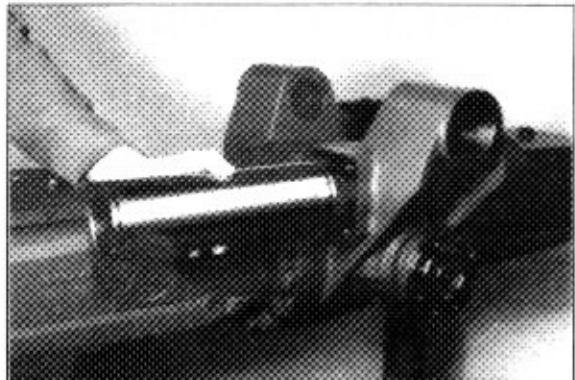
- ④ Remove piston and remaining components.



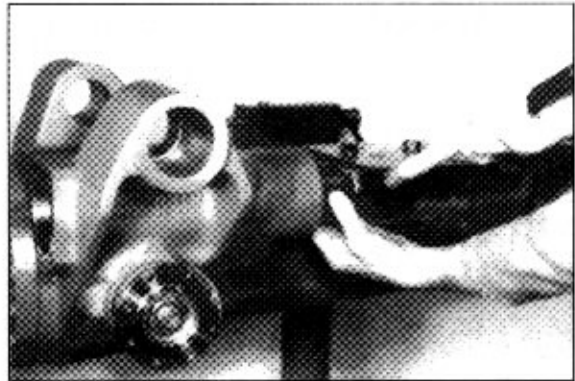
- ⑤ Take scraper rings and sealing ring from the piston.



- ⑥ Pull cylinder out of the housing.
Remove O-rings.



- ⑦ Drive guide [] out of the housing.
If necessary, remove sealing elements.



2) REASSEMBLY

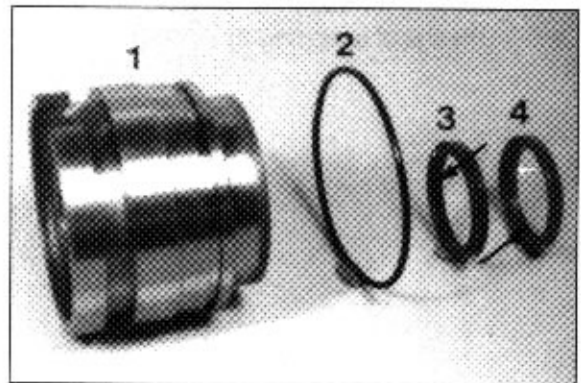
(1) Install guide, cylinder and piston

① Pre-assemble guide [.

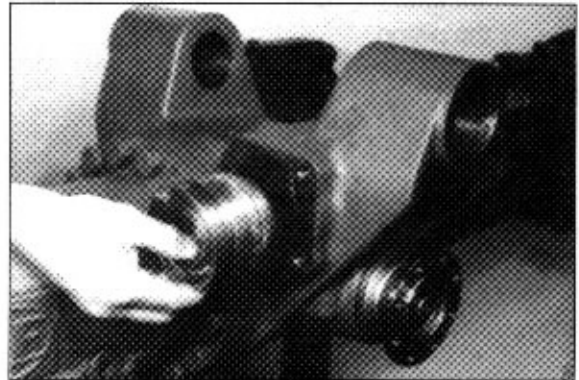
- 1 Guide
- 2 O-ring
- 3 Grooved ring
- 4 Scraper ring

※ Grooved ring(3)-sealing lip shows inward (See Arrow).

Scraper ring(4)-dust lip shows outward (see Arrow).



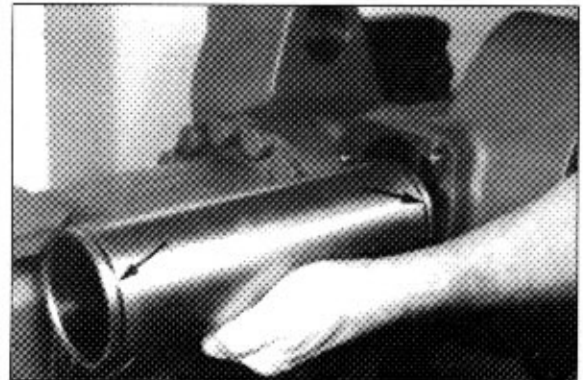
② Grease O-ring and sealing elements and insert the pre-assembled guide in the steering box until contact is obtained,



③ Grease O-ring (See Arrow) and insert it in the annular groove.

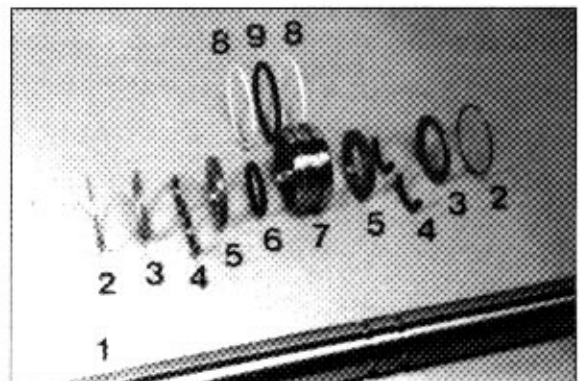
Introduce cylinder and reset it until contact is obtained.

※ Pay attention to the different diameters of the O-rings.



④ Sealing and locking elements of piston / piston rod.

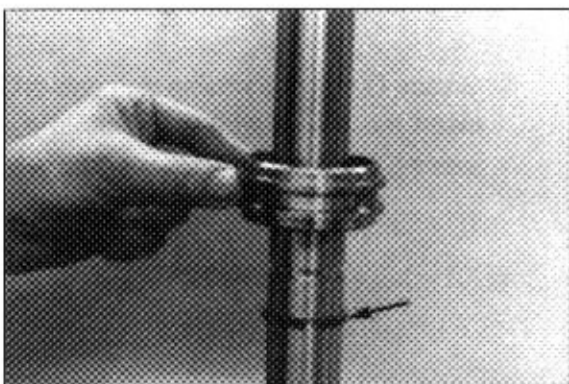
- 1 Piston rod
- 2 Snap ring
- 3 Circlip
- 4 Split ring
- 5 Disk
- 6 O-ring
- 7 Piston
- 8 Scraper ring
- 9 Sealing ring



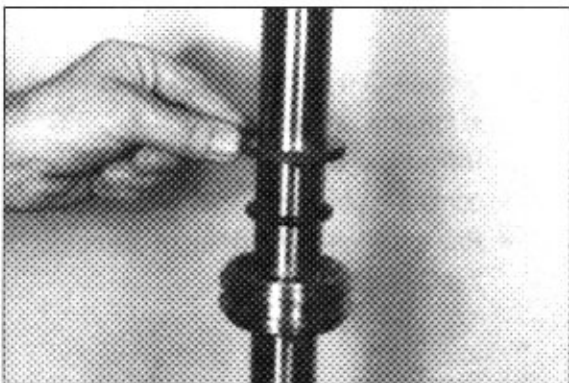
- ⑤ Lay disk(5) into the piston.
Install subsequently circlip(3) and fix it by means of snap ring(2).



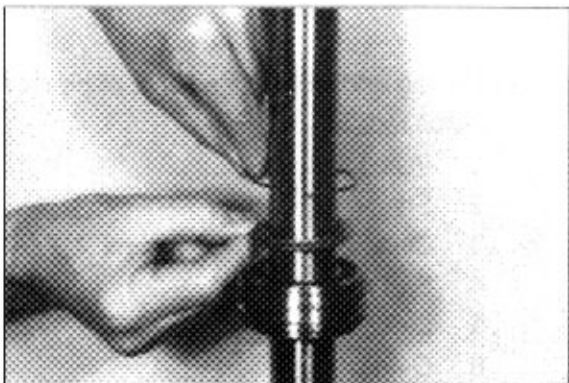
- ⑥ Insert split ring(4) in the annular groove of the piston rod(See Arrow) and assemble the piston.



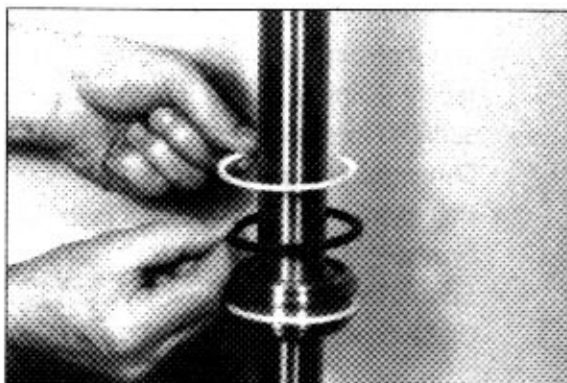
- ⑦ Grease O-ring(6), mount it along with disk(5) carefully over the second annular groove into the piston.



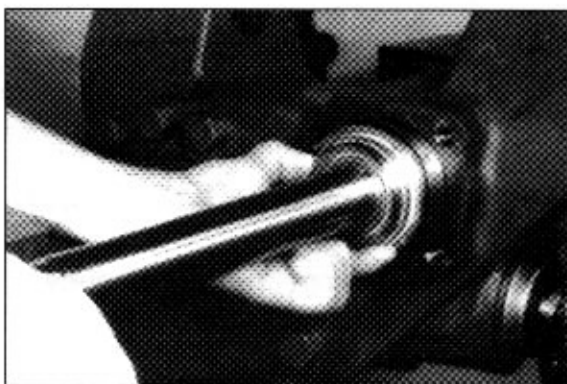
- ⑧ Insert split ring(4), fix it by means of circlip(3) and snap ring(2).



- ⑨ Assemble scraper ring(8) and sealing ring(9) upon the piston.
Grease sealing elements.



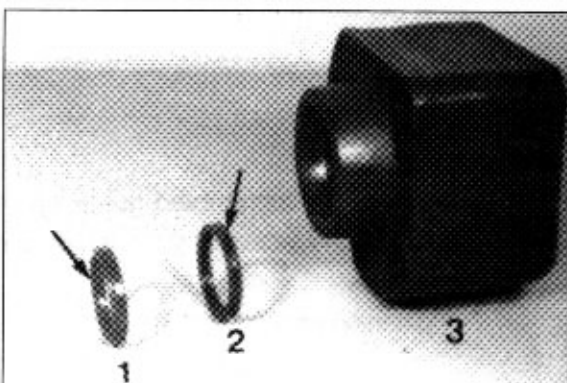
- ⑩ Introduce complete piston rod into the cylinder.



- ⑪ Pre-assemble guide II .

- 1 Scraper ring
- 2 Grooved ring
- 3 guide

- * Scraper ring(1)-dust lip shows outward (See Arrow).
- Grooved ring(2)-sealing lip shows inward(See Arrow).

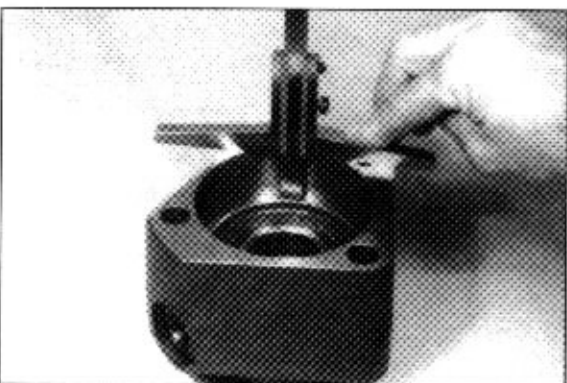


Determination of the spacing washer / steering cylinder

- ⑫ Dimension "A" e.g. : 32.05mm

- * Special tool

Digital depth gauge 5870 200 072



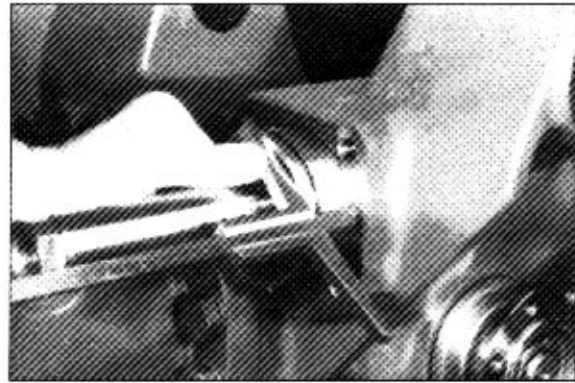
- ⑬ Slide cylinder in until contact is obtained and measure dimension **B** from the end face / cylinder to the flange-mounted surface / axle housing.

Dimension **B** e.g. : 30.90mm

- ※ Pay attention to the contact of guide and cylinder.

- ※ Special tool

Digital depth gauge 5870 200 072



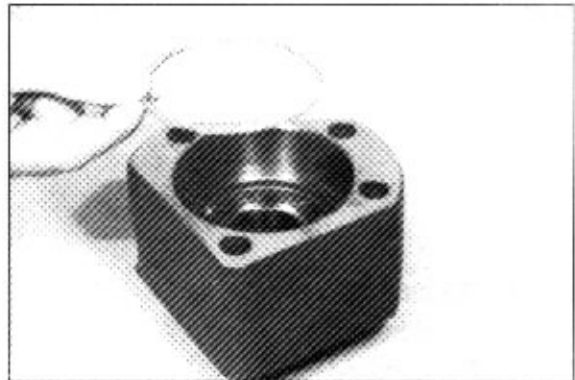
Dimension **A** 32.05mm

Dimension **B** -30.90mm

Difference = Shim thickness s = 1.15mm

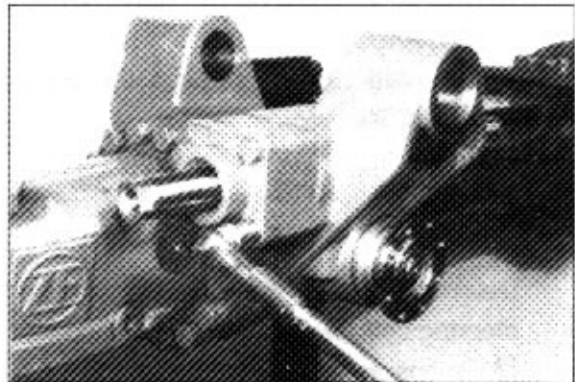
- ⑭ Make determined shim(e.g. s = 1.15mm) adhere with grease.

Grease sealing elements of the guide.



- ⑮ Assemble pre-assembled guide upon piston rod and fasten it by means of hex head screws.

- Tightening torque(M14/10.9) :
18.9kgf · m(137lbf · ft)



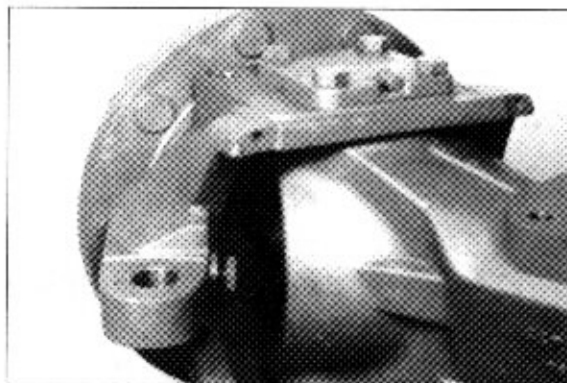
(2) Adjust track and steering lock

(Without stop ring)

- ① The max. steering lock is 35°.

Adjust steering lock

- ② Screw stop screw into the steering knuckle hull (Without shim).

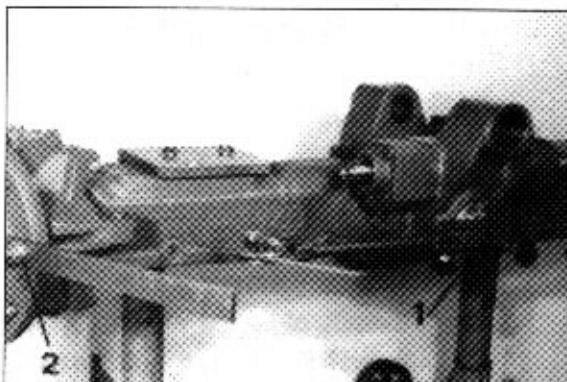


- ③ Fasten measuring device(1) on the drive flange and the straightedge(2) on the hub / wheel stud.

※ Special tool

Measuring device 5870 200 033

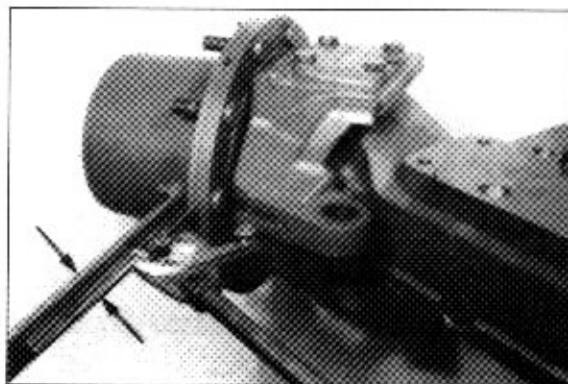
Straightedge 5870 200 029



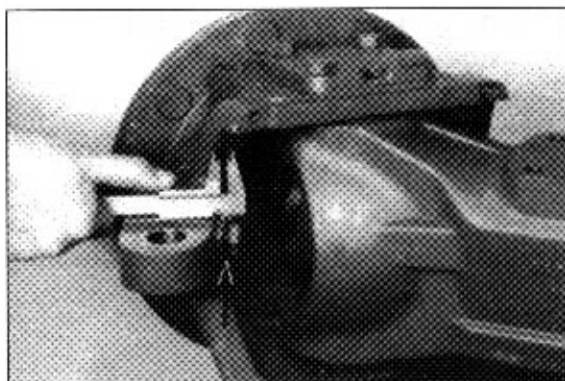
- ④ Adjust required steering lock, e.g. 31°, on the measuring device(1).

Tilt the drive unit until the straightedge(2) is parallel to the measuring device (See Arrows).

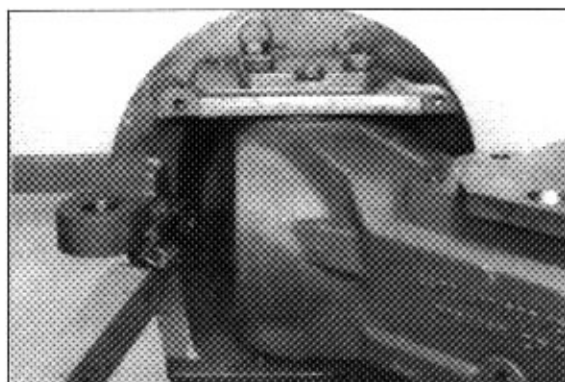
Place stop screw (See Figure ②) against the axle housing until contact is obtained.



- ⑤ Determine dimension **X**.
Dimension **X** = Shim thickness.

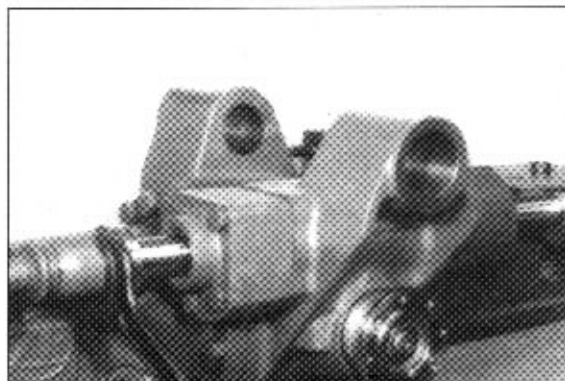


- ⑥ Assemble determined shim(S) and tighten stop screw.
• Tightening torque : 39.8kgf · m
(288lbf · ft)
※ Adjust steering lock on the opposite steering knuckle hull accordingly.

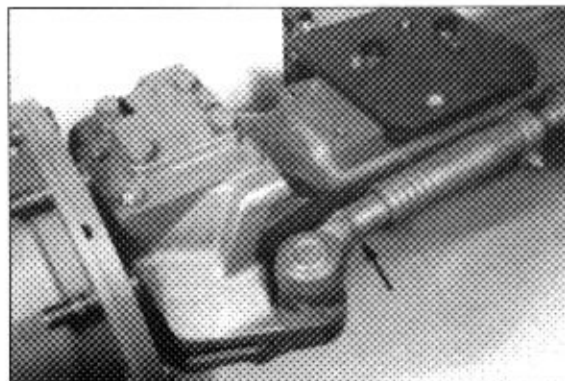


Track basic adjustment

- ⑦ Cover threads of tie rod with loctie(Type No.242) and screw it into the piston rod. Tighten tie rod.
• Tightening torque : 35.7kgf · m
(258lbf · ft)

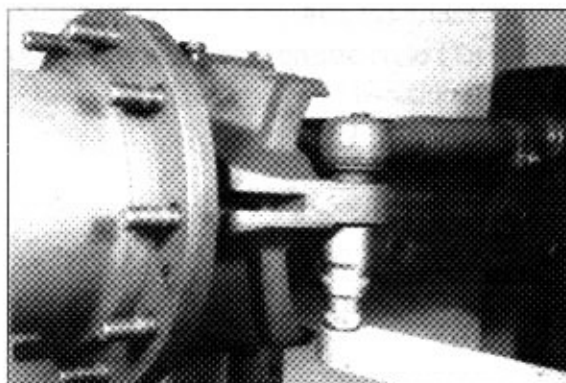


- ⑧ Engage tie rod.
※ Pay attention to the installation position of the tie rod.
Standard version - Shoulder(See Arrow) is facing the axle housing.
Different version are possible.



- ⑨ Tighten castle nut and secure it by means of cotter pin.

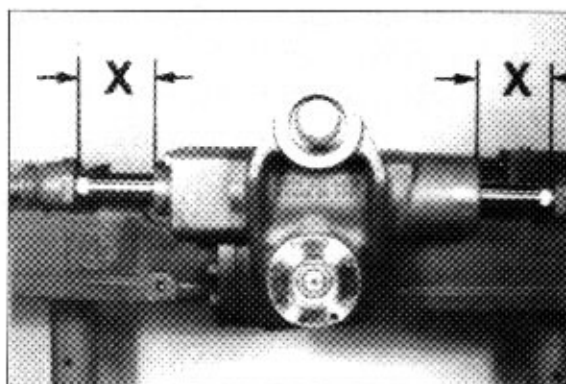
• Tightening torque : 30.9kgf · m
(221lbf · ft)



- ⑩ Locate piston rod in the central position.

X = Equal distance

- ※ To obtain a correct track adjustment, it is for the following step(Figure⑩...⑭) absolutely necessary to respect the central position of the piston rod.



- ⑪ Check track position 0°.

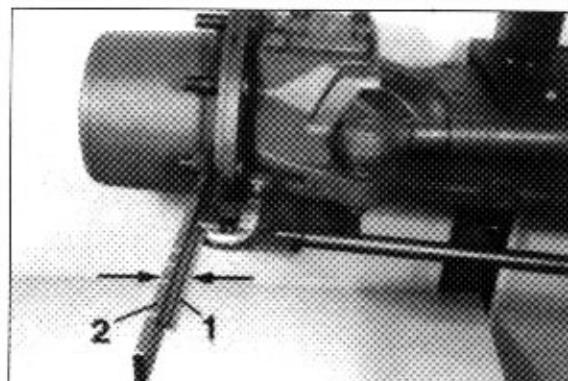
Locate measuring device(1) to the 0°-Position.

Measuring device(1) must be parallel to the straightedge(2).

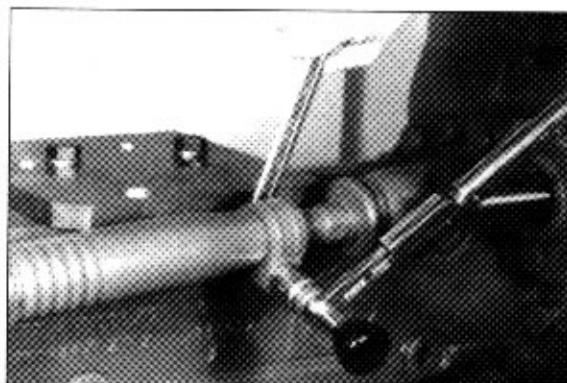
- ※ Special tool

Measuring device 5870 200 033

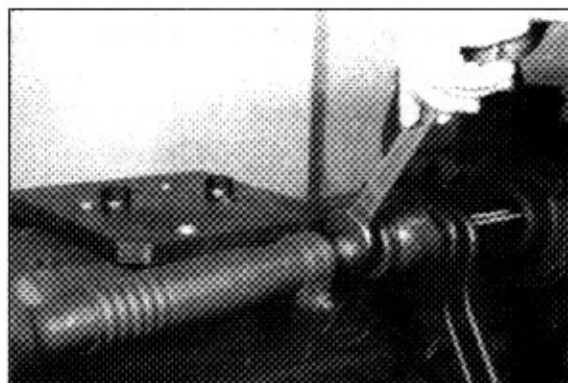
Straightedge 5870 200 029



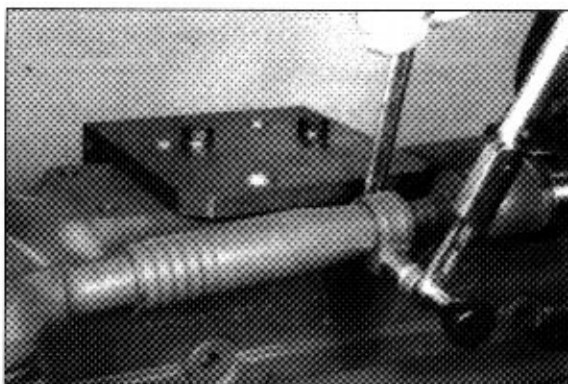
- ⑫ Loosen the clamp of the tie rod.



- ⑬ Turn axial joint until the parallel position (0°) of measuring device and straightedge is obtained.



- ⑭ After termination of the adjustment, tighten the clamp again.
• Tightening torque : $7.1 \sim 8.2 \text{ kgf} \cdot \text{m}$
($51.6 \sim 59 \text{ lbf} \cdot \text{ft}$)



A technical drawing of a mechanical assembly, likely a pump or motor, shown in a side view. The drawing includes several dimension lines and callouts. Dimension A is a horizontal line at the bottom, spanning the width of the main body. Dimension B is a horizontal line at the top, also spanning the width of the main body. Dimension X is a vertical line on the left, indicating the height of the main body. Dimension Y is a vertical line on the left, indicating the height of the top flange. Callout 1 points to the main body, and callout 2 points to the top flange. The drawing shows a central vertical shaft with a motor or pump head at the top and a base at the bottom. The main body is a horizontal cylinder with various fittings and a flange on the left. The top flange is a circular plate with a central hole and several bolts. The base is a horizontal plate with a central hole and several bolts. The drawing is a black and white line drawing with no shading.

Y = Steering lock

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