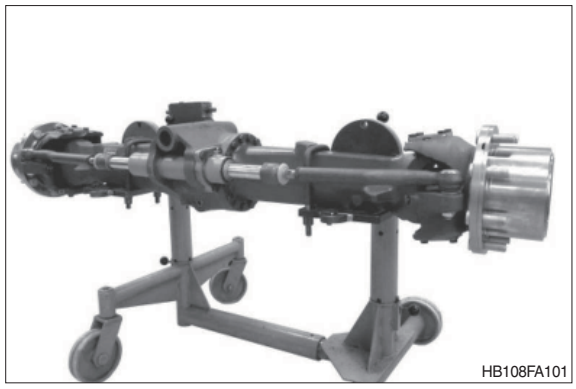
2. FRONT AXLE

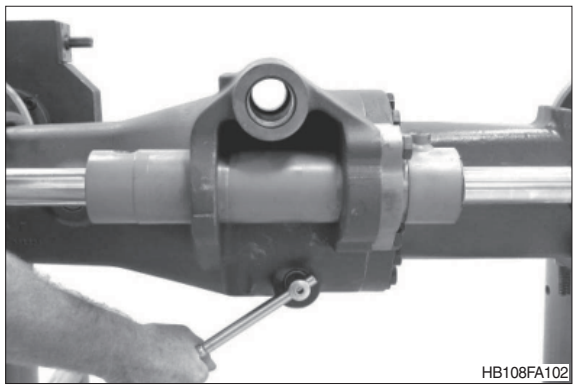
1) DISASSEMBLY OUTPUT

(1) Fix the axle to the assembly truck.

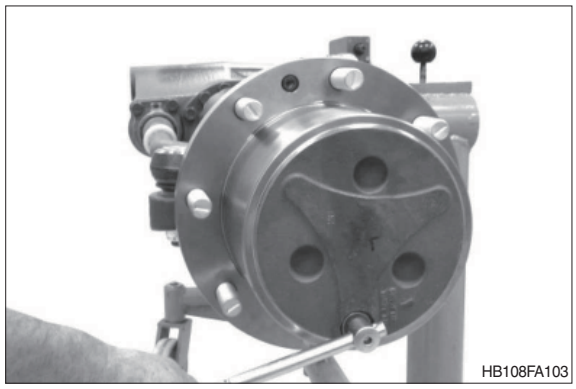
(S) Assembly truck	5870 350 000
(S) Fixtures	5870 350 139
(S) Fixing bracket	5870 350 140


HB108FA101

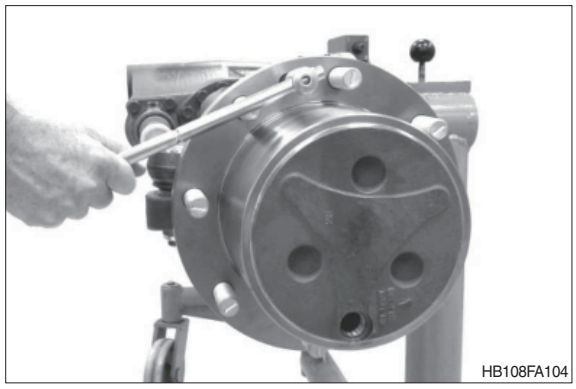
(2) Loosen the screw plug and drain oil from the axle.


HB108FA102

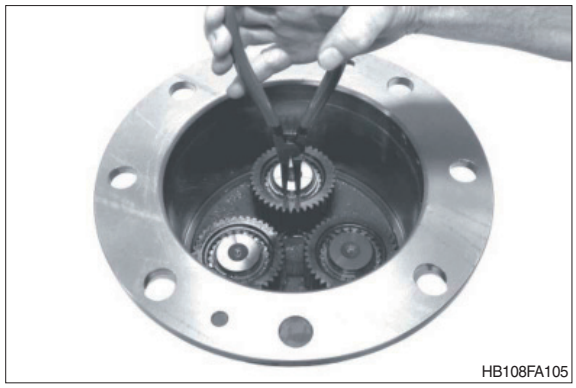
(3) Loosen the screw plug and drain oil from the planetary carrier.


HB108FA103

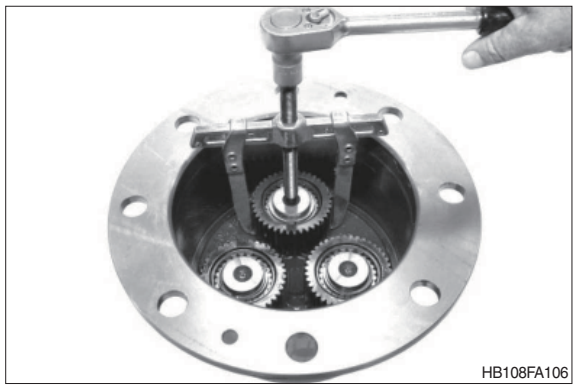
(4) Loosen the cylindrical screws and pull the planetary carrier from the hub.


HB108FA104

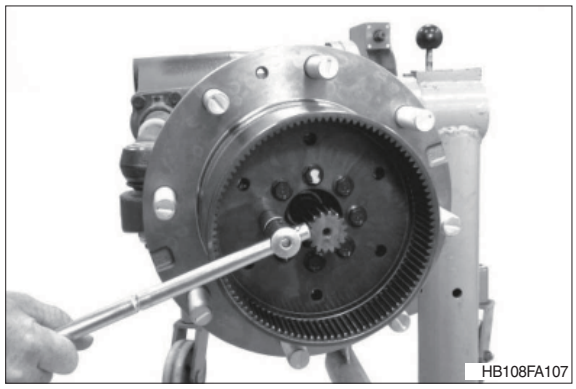
(5) Disengage the retaining ring.


HB108FA105

(6) Pull off the planetary gear with the cylindrical roller bearing.

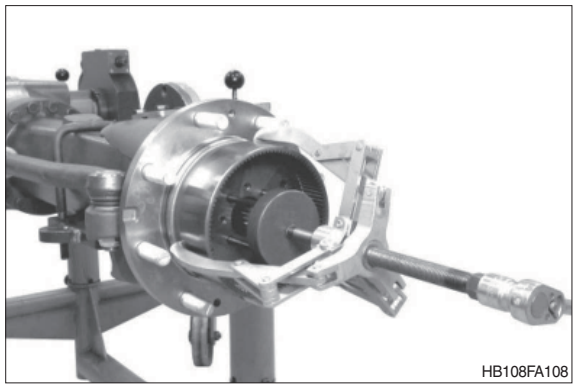

HB108FA106

(7) Loosen the locking screws.


HB108FA107

(8) Pull the ring gear with a three-armed puller from the knuckle housing/from the bushes.

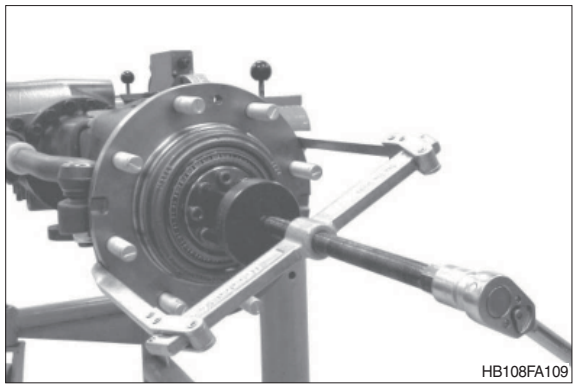
(S) Pressure piece 5870 100 080


HB108FA108

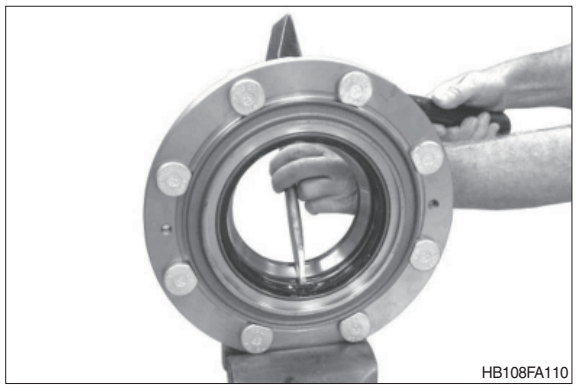
(9) Pull the hub with a two-armed puller from the knuckle housing.

(S) Pressure piece 5870 100 080

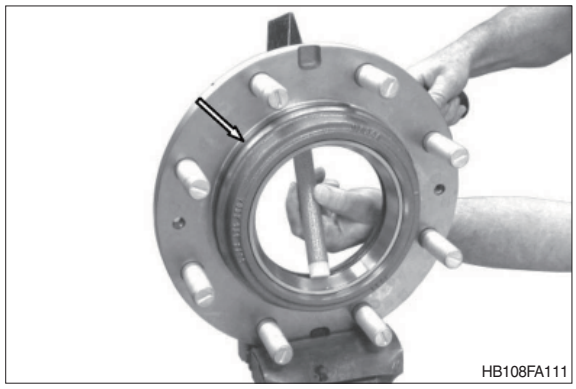
※ Pay attention to the releasing bearing inner ring.


HB108FA109

(10) Force the cassette type sealing out of the hub.

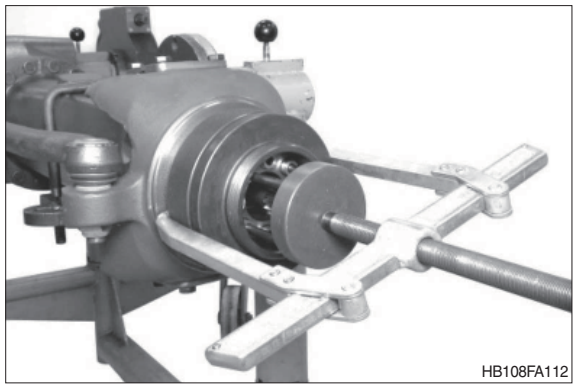

HB108FA110

(11) Force both bearing outer rings out of the hub and remove the O-ring (see arrow).

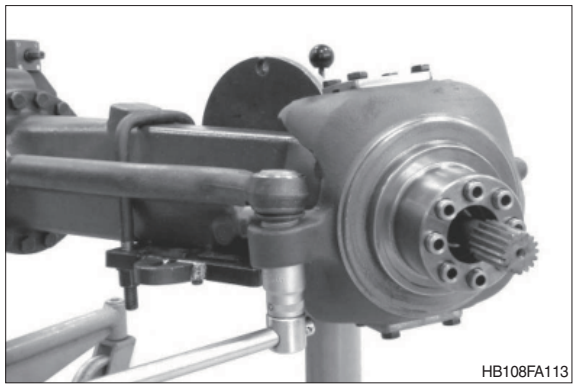

HB108FA111

(12) Pull the bearing inner ring from the knuckle housing.

(S) Rapid grip 5873 013 015
(S) Pressure piece 5870 100 080

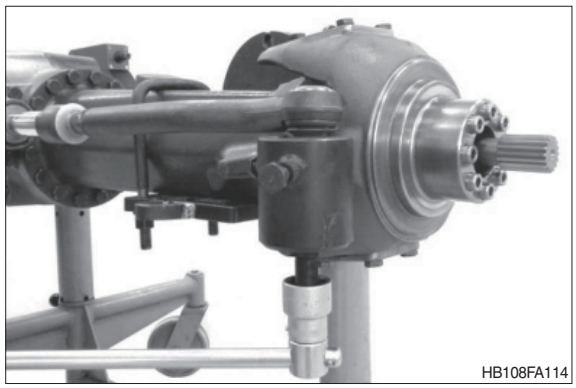

HB108FA112

(13) Loosen the hexagon nut.

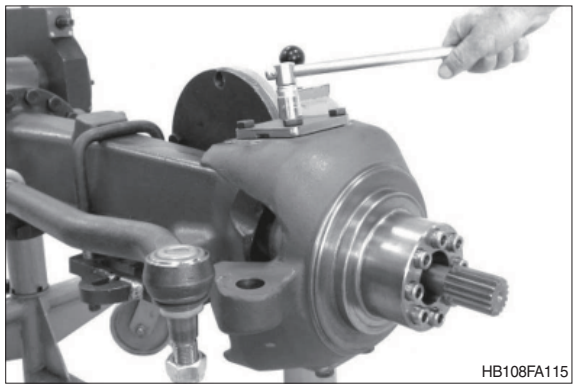


(14) Press the tie rod with a forcing device (S) out of the knuckle housing.

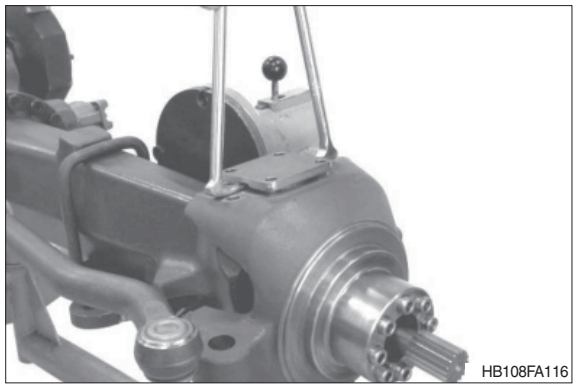
(S) Forcing device 5870 080 041



(15) Loosen the hexagon screws on both bearing bolts.

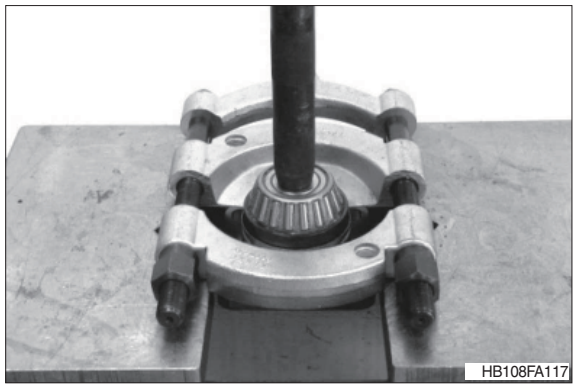


(16) Use a lever to remove both bearing bolts from the knuckle housing.

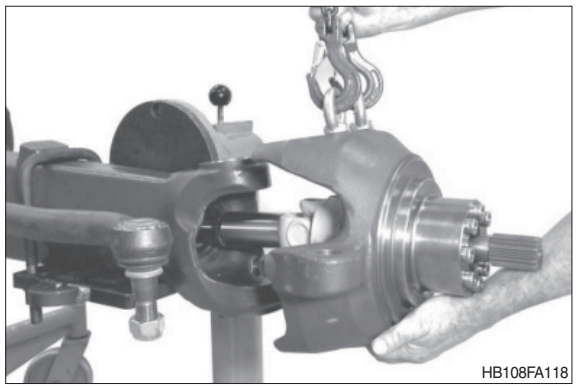


(17) Press the bearing inner ring and the shaft seal ring with the cutoff device (S) from the bearing bolt.

(S) Cut-off device 5870 300 024

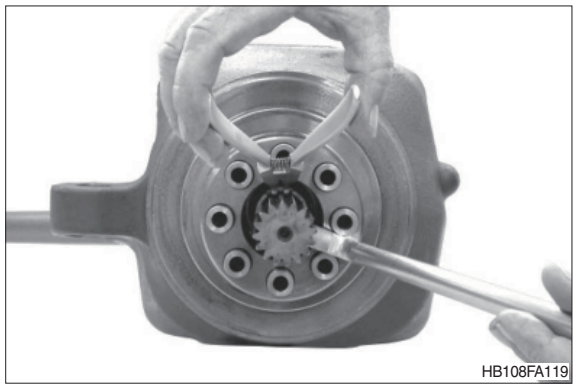


(18) Separate the knuckle housing with the double U-joint shaft from the axle housing.

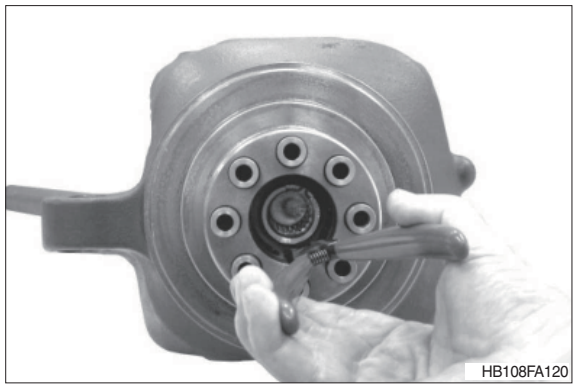


(19) Force the retaining ring apart and pull the sun gear shaft from the double U-joint shaft.

(S) Pliers 5870 900 026

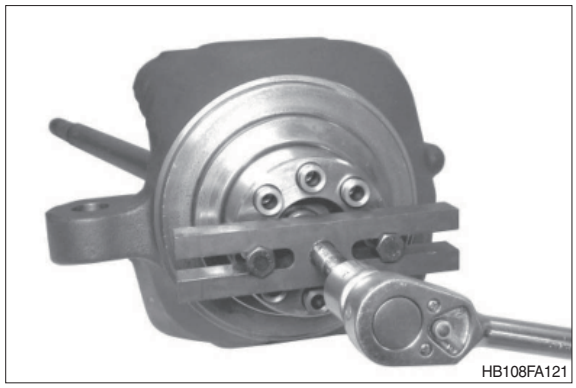


(20) Disengage the retaining ring out of the annular groove of the double U-joint shaft.



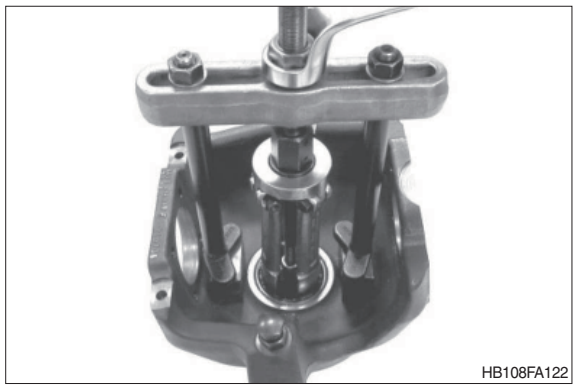
(21) Press the double U-joint shaft out of the knuckle housing.

(S) Extracting tool 5870 000 017

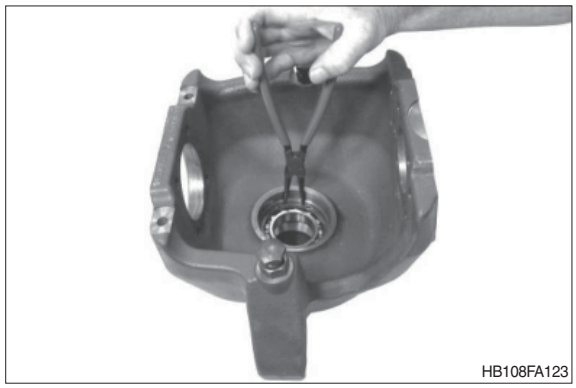


(22) Pull the shaft seal out of the housing hole.

(S) Internal extractor 5870 300 007
(S) Counter support 5870 300 003



(23) Disengage the retaining ring and press the releasing ball bearing out of the knuckle housing.

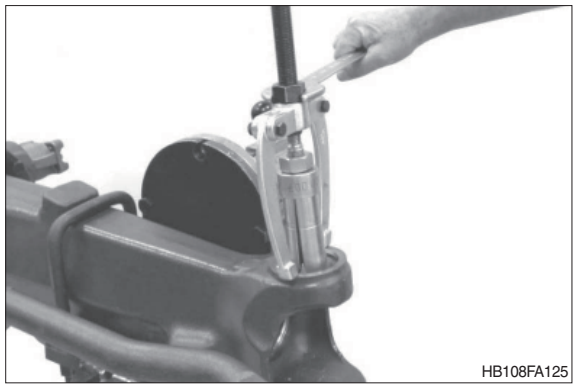


(24) If necessary provide the bushes with threads (M12) and use a striker (S) to pull them out of the housing.

(S) Striker 5870 650 001

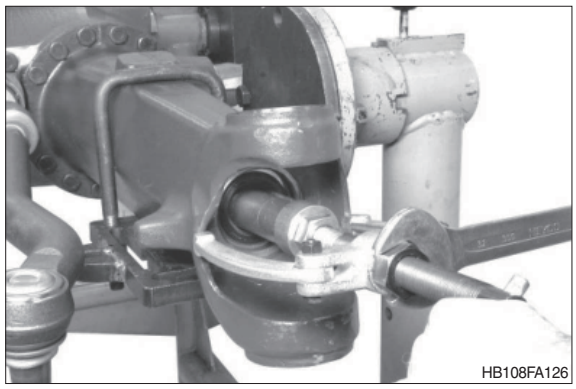
(25) Pull both bearing outer rings out of the pivot bearing holes.

(S) Internal extractor 5870 300 007
(S) Counter support 5870 300 003


HB108FA125

(26) Pull shaft seal and bush out of the axle housing.

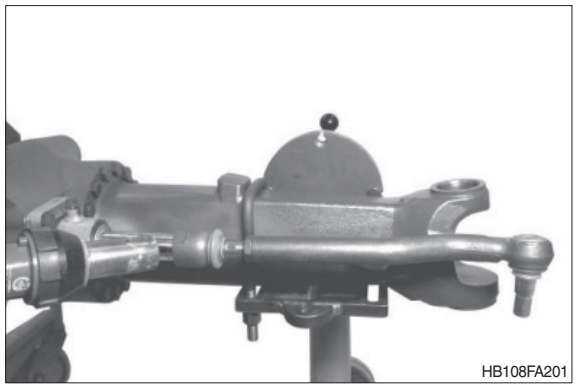
(S) Internal extractor 5870 300 007
(S) Counter support 5870 300 003


HB108FA126

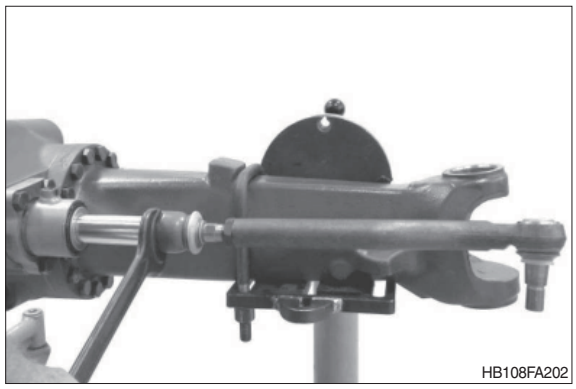
2) DISASSEMBLY STEERING

(1) Heat the piston rod with a hot air blower.

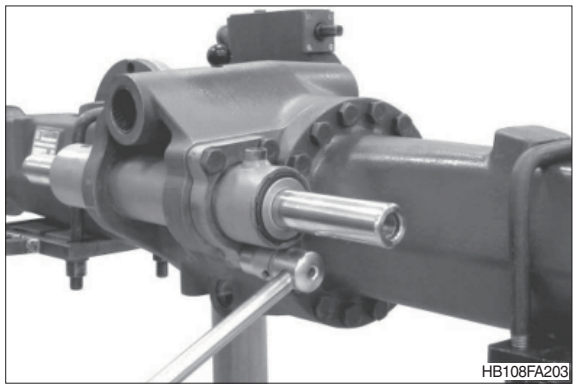
⚠ **The axial joint is mounted with loctite #243.**


HB108FA201

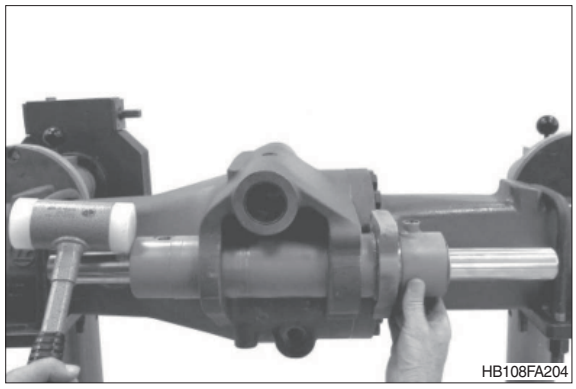
(2) Separate the tie rod from the piston rod.


HB108FA202

(3) Loosen the hexagon screws.

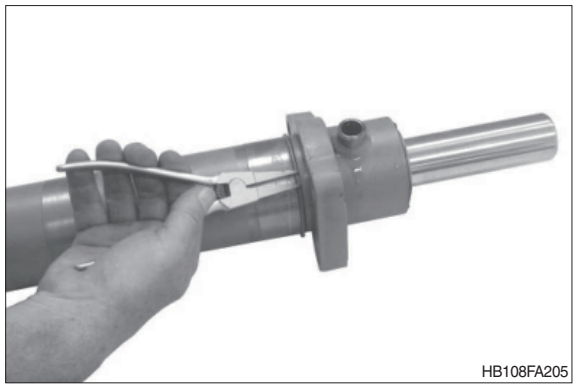

HB108FA203

(4) Force the complete steering cylinder out of the axle housing holes.

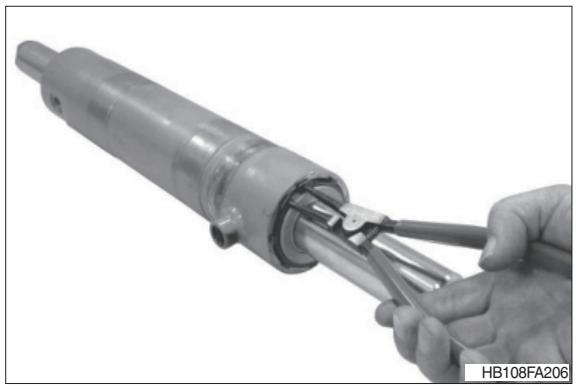

HB108FA204

(5) Unsnap the ring and remove the releasing flange.

(S) Pliers 5870 900 026



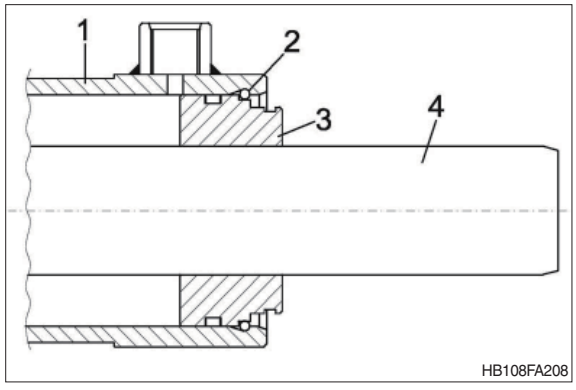
(6) Unsnap the retaining ring.



(7) Push or force the plug into the cylindrical tube, until it is possible to unsnap the retaining ring (see sketch below).

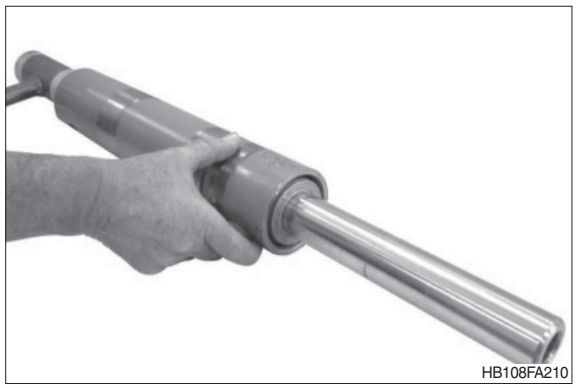
(8) Comment on sketch

1 = Cylindrical tube
2 = Retaining ring
3 = Plug
4 = Piston rod



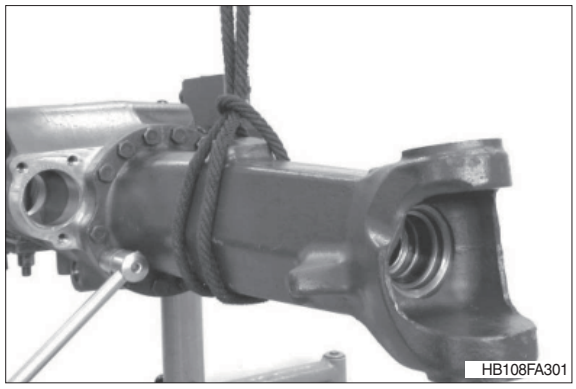
(9) Unsnap the retaining ring.

(10) Force the piston rod with the plug out of the cylindrical tube.
Then remove all sealing elements from piston rod, plug and cylindrical tube.

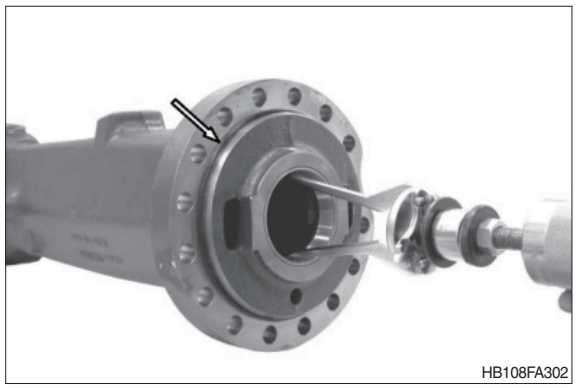


3) DISASSEMBLY INPUT

(1) Secure the axle housing with the lifting device and loosen the screw joint.
Then separate the axle housings.

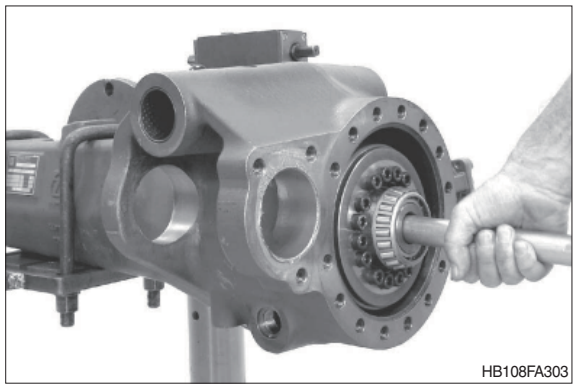


(2) Pull the bearing outer ring with a striker out of the bearing hole and remove the shim lying behind.
Remove the O-ring (see arrow).

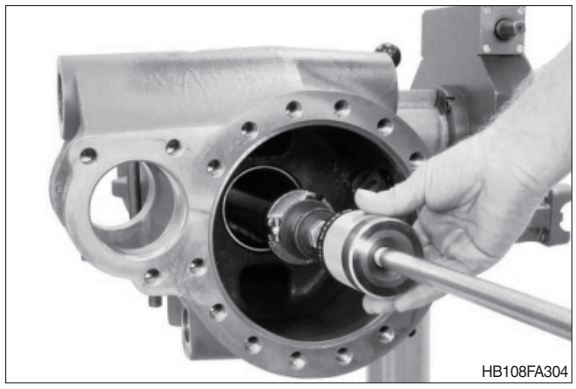


(3) Lift the differential out of the axle housing.

※ The disassembly of the differential is described from page 3-129.

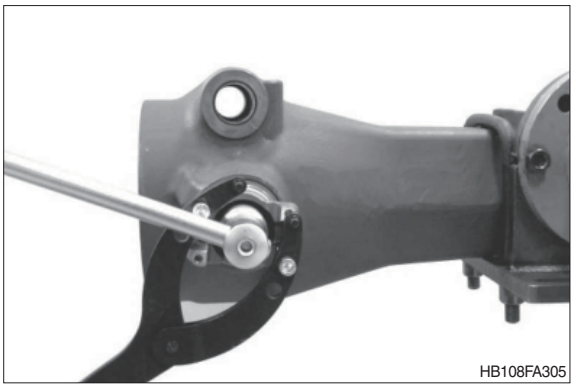


(4) Pull the bearing outer ring with a striker out of the bearing hole and remove the shim lying behind.

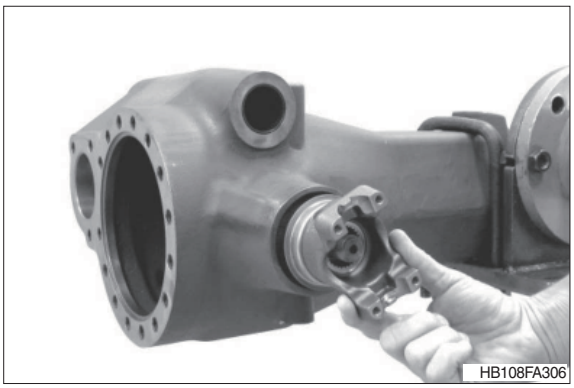


(5) Loosen the hexagon nut and remove the shim lying behind.

(S) Clamping fork 5870 240 025

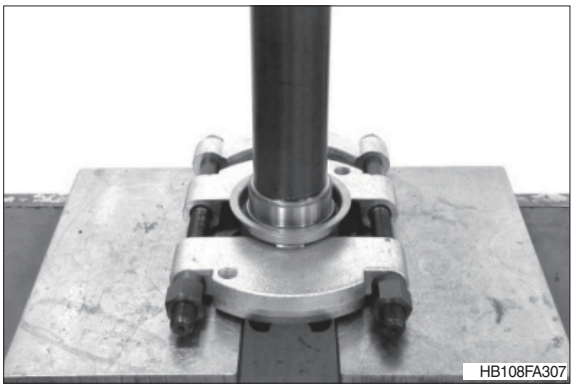


(6) Pull the yoke from the input pinion.



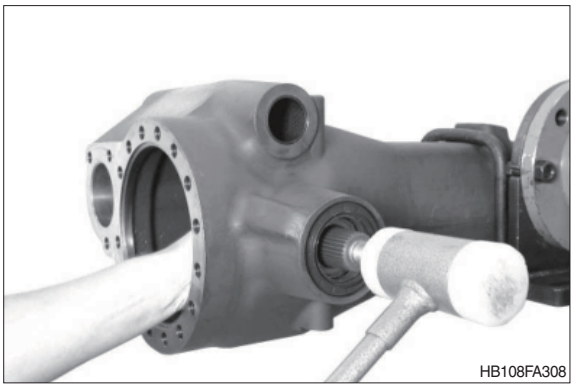
(7) Press the screen sheet with the cut-off device (S) from the yoke.

(S) Cut-off device 5870 300 024

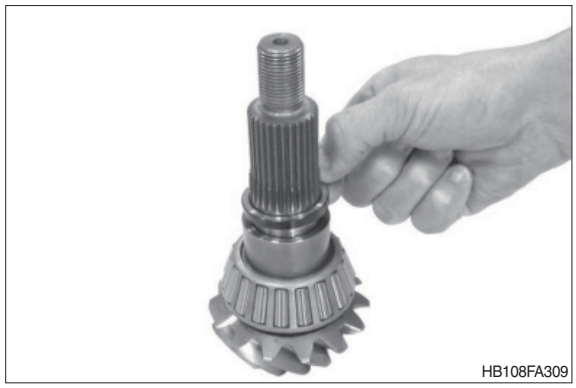


(8) Force the input pinion out of the axle housing.

※ If the pinion bearing should not be replaced, special care must be taken that the outer bearing inner ring is always in contact position with the bearing outer ring when forcing the input pinion out.



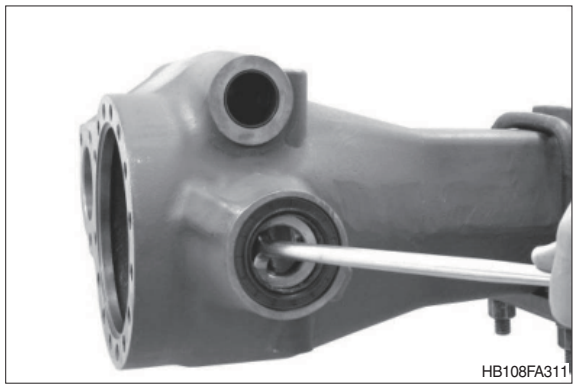
(9) Remove spacer ring and bush.



(10) Pull the roller bearing from the input pinion and remove the releasing shim.

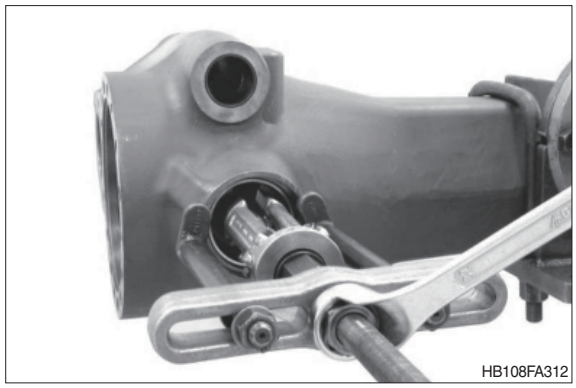
(S) Grab sleeve	5873 001 031
(S) Basic device	5873 001 000

(11) Use a lever to remove the shaft seal ring from the axle housing and remove the releasing roller bearing.

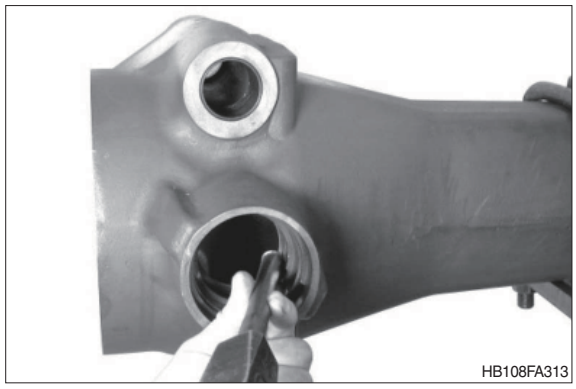


(12) Pull the bearing outer ring out of the outer bearing hole.

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

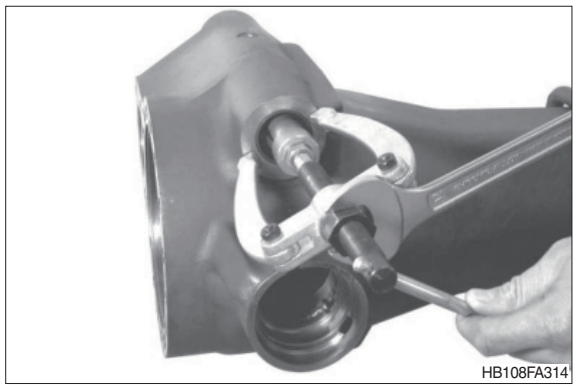


(13) Force the bearing outer ring out of the inner bearing hole.


HB108FA313

(14) If necessary, pull both bushes out of the axle housing.

(S) Internal extractor 5870 300 005
(S) Counter support 5870 300 003


HB108FA314

4) DISASSEMBLY DIFFERENTIAL

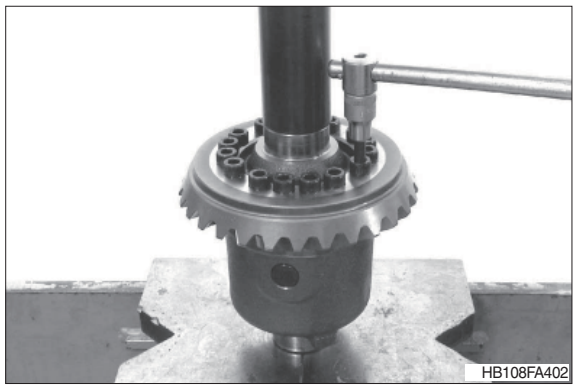
(1) Pull both roller bearings from the differential carrier.

(S) Grab sleeve 5873 001 020
(S) Basic device 5873 001 000

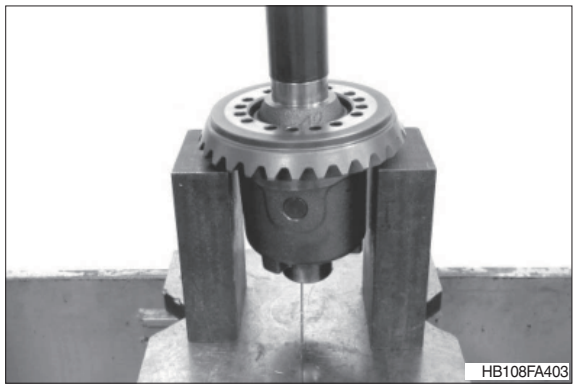

HB108FA401

(2) Use a press to fix the differential and loosen the cylindrical screws.

※ Cylindrical screws are mounted with loctite #243.


HB108FA402

(3) Press crown wheel from differential carrier and cover.


HB108FA403

(4) Lift the axle bevel gear with thrust washer and constant spacer out of the differential carrier.


HB108FA404

(5) Insert the slotted pin into the differential shaft until contact is obtained.


HB108FA405

(6) Pull the differential shaft out of the housing and remove the releasing single parts.
Then force the slotted pin out of the differential shaft.

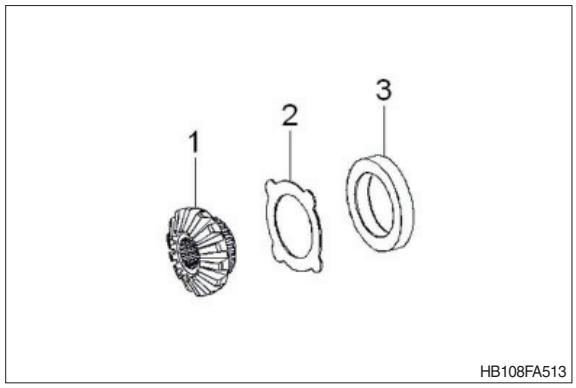

HB108FA406

5) REASSEMBLY OF DIFFERENTIAL

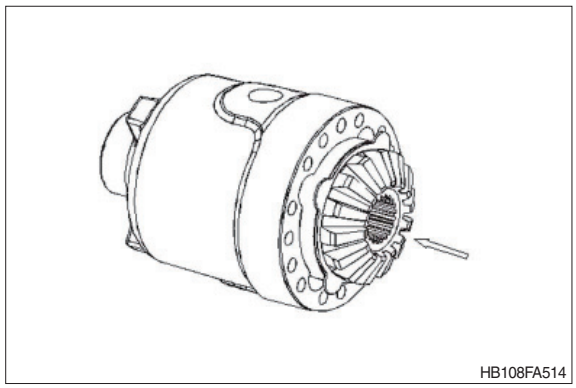
(1) Preassemble the single parts as shown on the right sketch.

1 = Axle bevel gear
2 = Thrust washer
3 = Constant spacer

※ Oil all single parts with axle oil.

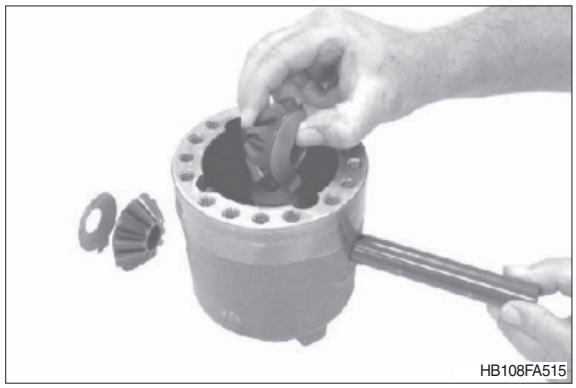


(2) Insert the preassembled axle bevel gear into the differential carrier.



(3) Insert both axle bevel gears with thrust washers into the differential carrier and fix them with the differential shaft.

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

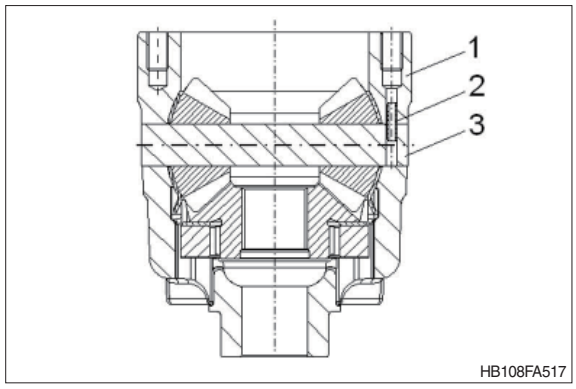


(4) Fix the differential shaft with a slotted pin.

※ Pay attention that the installation depth of differential carrier and differential shaft (see sketch (5)) is the same.

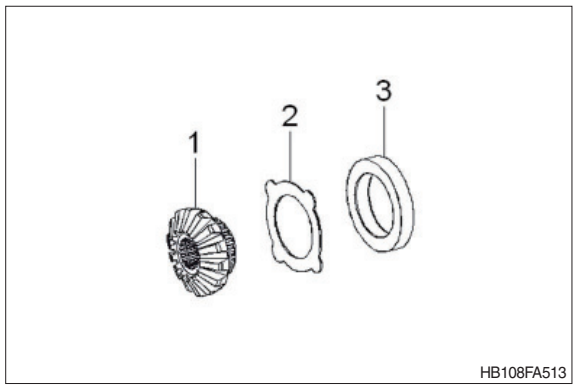
(5) Comment on sketch:

1 = Differential carrier
2 = Slotted pin
3 = Differential shaft

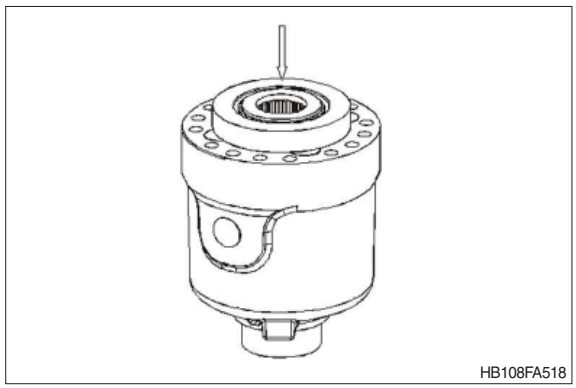


(6) Preassemble the second axle bevel gear.

1 = Axle bevel gear
2 = Thrust washer
3 = Constant spacer



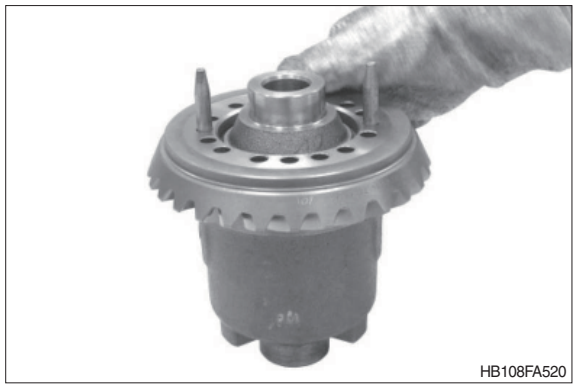
(7) Insert the preassembled axle bevel gear into the differential carrier.



(8) Mount two adjusting screws (S) and install the cover.

(S) Adjusting screws 5870 204 007

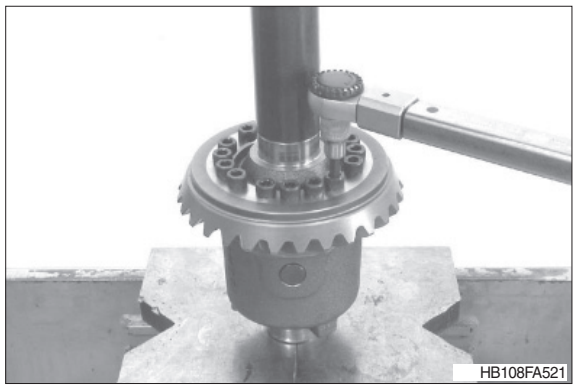
(9) Heat the crown wheel and mount until contact position with the differential carrier is obtained.


HB108FA520

(10) Use a press to fix the differential and fix the crown wheel with cylindrical screws.

· Tightening torque (M10/10.9) :
6.93 kgf · m (50.2 lbf · ft)

※ Wet the thread of the cylindrical screws with loctite #243.


HB108FA521

(11) Heat both roller bearings and mount them until contact is obtained.

※ Adjust the bearing after cooling down.


HB108FA522

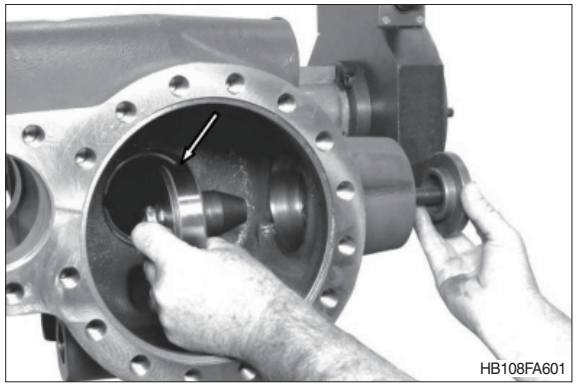
6) REASSEMBLY INPUT

※ If crown wheel or input pinion are damaged, both parts must be replaced together. When reinstalling a complete bevel gear set, pay attention that input pinion and crown wheel have identical mating numbers.

(1) Installation of input pinion

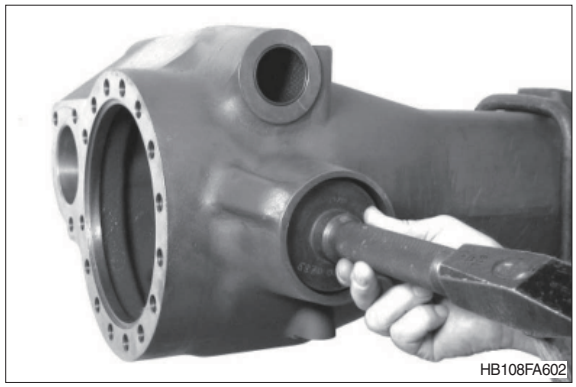
① Undercool the outer bearing outer ring (see arrow) and use the assembly fixture (S) to bring it into contact position with the bearing hole.

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



② Undercool the bearing outer ring and insert until contact position with the bearing hole is obtained.

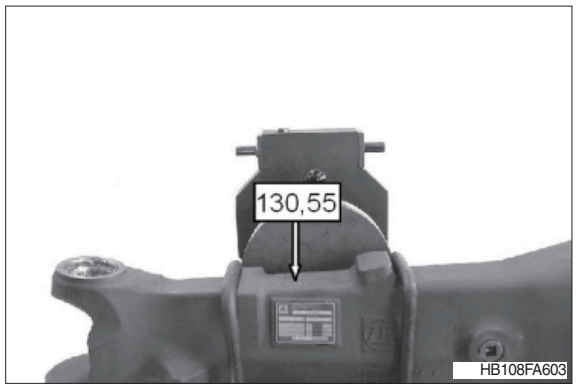
(S) Driver tool	5870 058 062
(S) Handle	5870 260 002



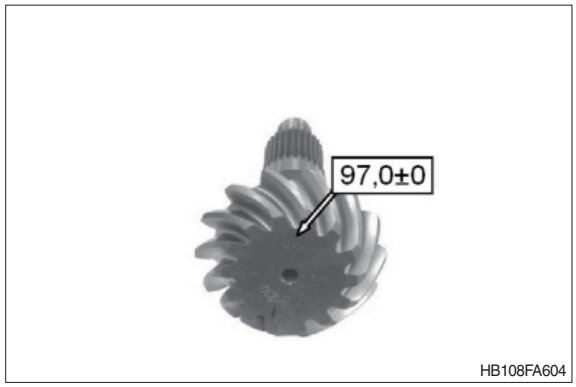
Determine the thickness of the shim to obtain a correct contact pattern

※ Perform the following measuring operations with utmost accuracy. Inaccurate measurements result in a defective contact pattern and require to disassemble and reassemble the input pinion one more time.

① Read dimension I on the axle housing.
Dimension I e.g. ····· 130.55 mm



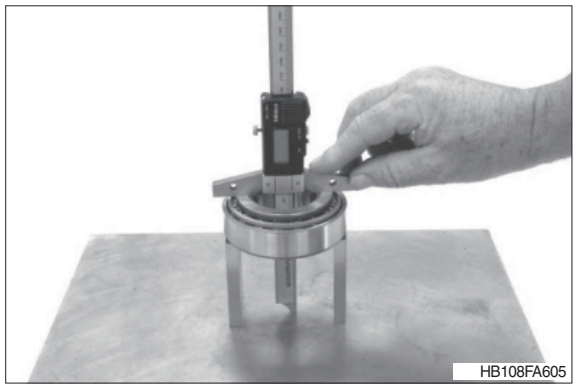
② Read dimension II (pinion dimension)
Dimension II e.g. ····· 97.00 mm



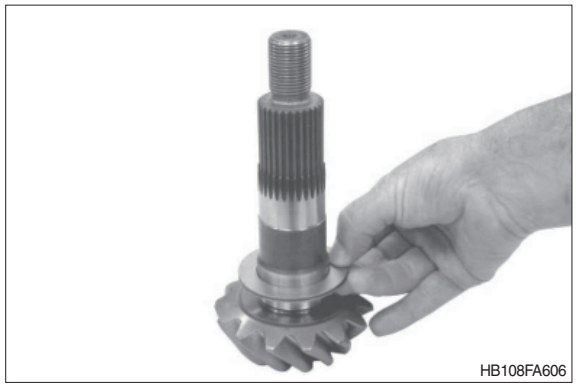
③ Determine dimension III (bearing width).
Dimension III e.g. ····· 30.35 mm

Calculation example A :
Dimension II ····· 97.00 mm
Dimension III ····· + 30.35 mm
Leads to X = 127.35 mm

Calculation example B :
Dimension I ····· 130.55 mm
Dimension X ····· - 127.35 mm
Difference = shim s = 3.20 mm

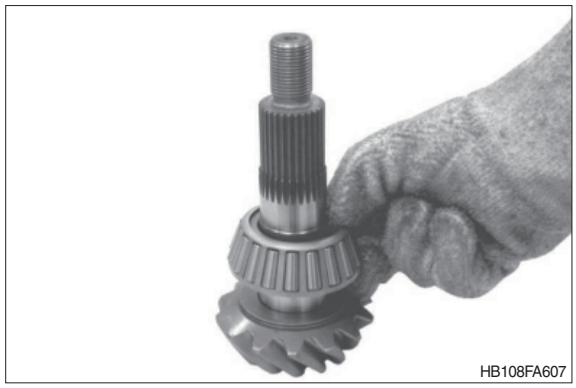


④ Insert the determined shim e.g. s = 3.20 mm.



⑤ Heat the roller bearing and mount until contact is obtained.

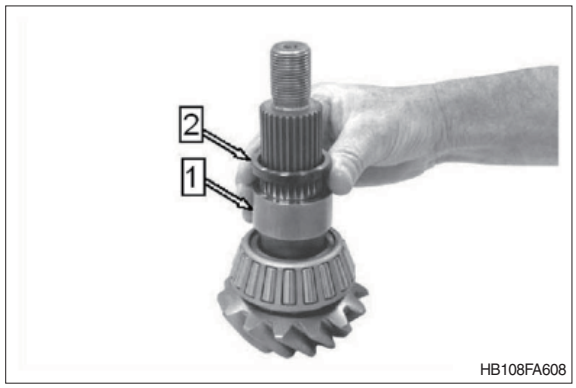
※ Adjust the bearing after cooling down.



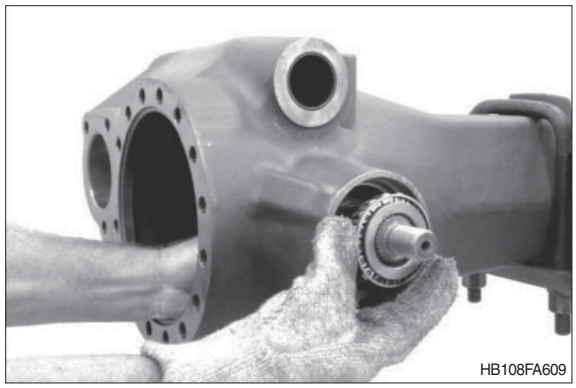
Setting of the rolling torque of the input pinion bearing 0.1~0.31 kgf · m (without shaft seal ring)

① Mount bush (1) and spacer (2), e.g. s = 6.40 mm.

※ Experience has shown that the required rolling torque is reached when reusing the shims being removed during disassembly (e.g. s = 6.40 mm).
A later check of the rolling torque, however, is absolutely necessary.

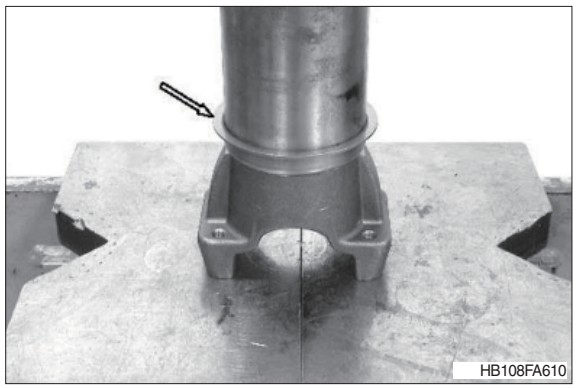


② Insert the preassembled input pinion into the axle housing and mount the heated roller bearing until contact is obtained.



③ Press the screen sheet (see arrow) onto the yoke until contact is obtained.

※ The shaft seal ring is only mounted after acceptance of the contact pattern (see page 3-142).



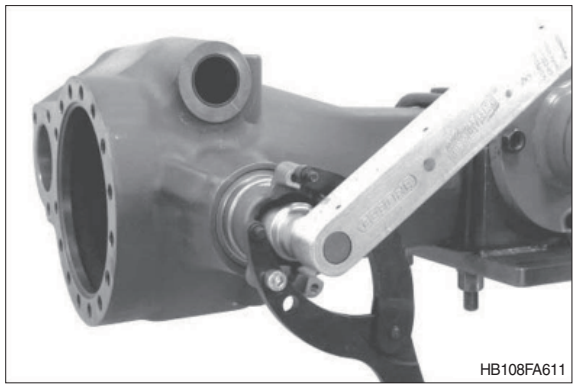
④ Mount the yoke and fix it with disk and hexagon nut.

· Tightening torque :
45.9 kgf · m (332 lbf · ft)

(S) Clamping fork 5870 240 025

※ First use the old hexagon nut (self securing), which has been removed during disassembly.

⚠ **While tightening, rotate the input pinion several times in both directions.**


HB108FA611

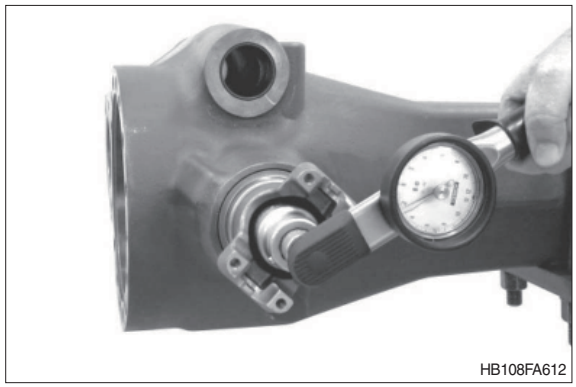
⑤ Check the rolling torque (0.1~0.31 kgf · m without shaft seal ring).

※ With new bearings try to achieve the upper value of the rolling torque.

⚠ **In case of deviations from the necessary rolling torque correct with a corresponding spacer ring (figure FA608, page 3-136), as specified below.**

Insufficient rolling torque - mount a thinner spacer ring.

Excessive rolling torque - mount a thicker spacer ring.

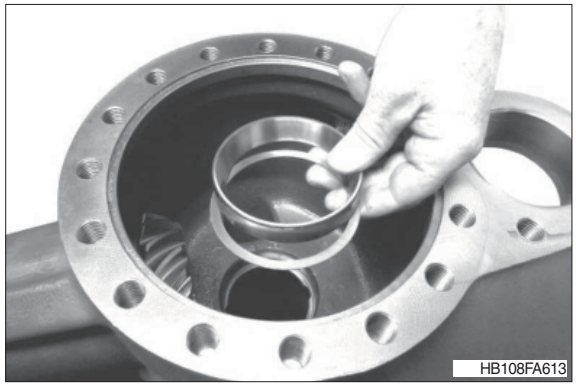

HB108FA612

(2) Setting of the backlash of crown wheel set and bearing preload of the differential

Backlash = 0.12 ··· 0.24 mm
Bearing preload = 0.10 ··· 0.15 mm (corresponds to a bearing rolling torque of 0.31~0.41 kgf · m [2.24~2.97 lbf · ft])

※ Pivot the axle housing 90°.

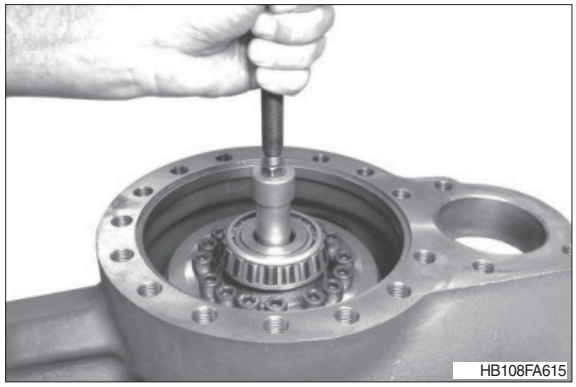
① Insert the shim e.g. s = 0.90 mm (recommended value) into the bearing hole and adjust the bearing outer ring until contact is obtained.


HB108FA613

② Cover some drive and coast flanks with marking ink.

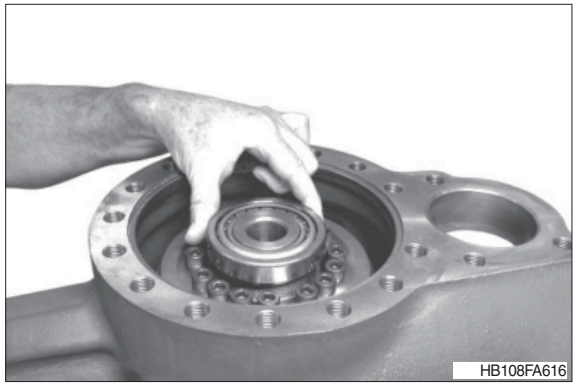

HB108FA614

③ Insert the preassembled differential into the axle housing.


HB108FA615

④ Mount the bearing outer ring.

※ Rotate differential and bearing outer ring in both directions, in order to assure that the rollers are positioned correctly.

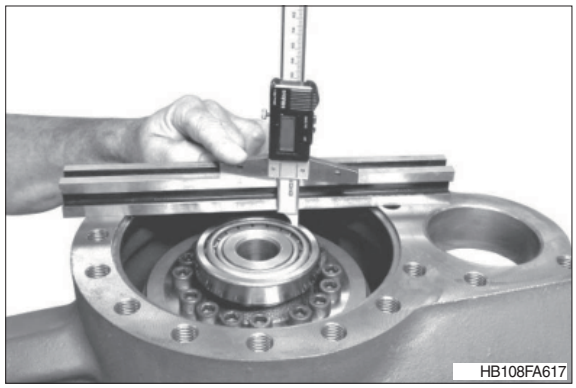

HB108FA616

⑤ Align the differential centrically and determine dimension I, between the mounting face of the axle housing and the front face of the bearing outer ring.

Dimension I e.g. ····· 9.50 mm

(S) Straightedge 5870 200 022

※ Take several measuring points to find the average value.

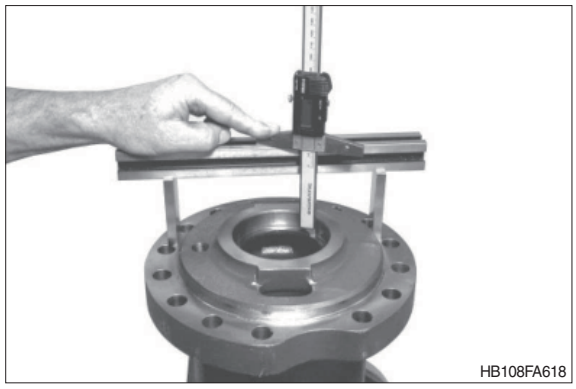

HB108FA617

⑥ Determine dimension II, between the mounting face of the axle housing (part II) and the contact face of the bearing outer ring.

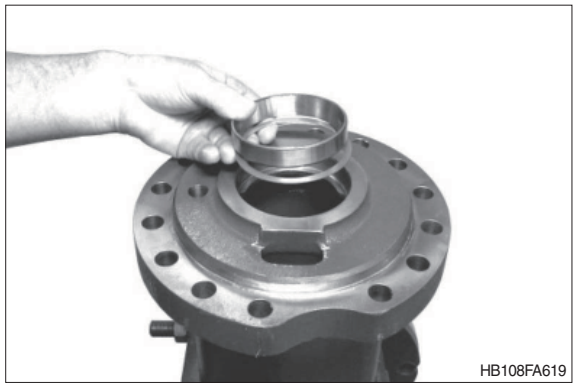
Dimension II e.g. ····· 8.80 mm

Calculation example C :

Dimension I ·····	9.50 mm
Dimension II ·····	- 8.80 mm
Difference =	0.70 mm
Required bearing preload e.g.	+ 0.10 mm
Leads to shim s =	**0.80 mm**

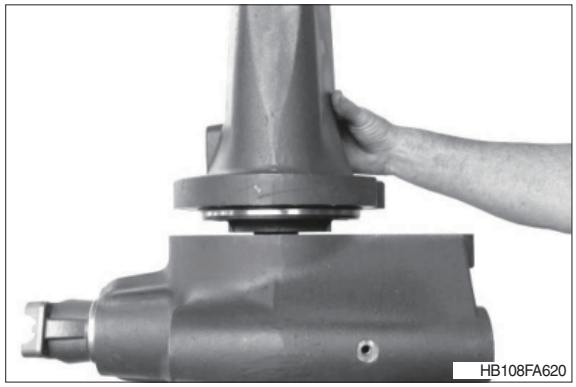

HB108FA618

⑦ Insert the determined shim e.g. s = 0.80 into the bearing hole and adjust the bearing outer ring until contact is obtained.


HB108FA619

⑧ Mount the axle housing (part II) with the lifting device.

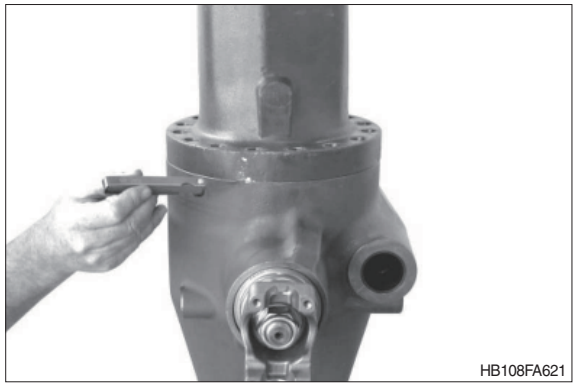
※ Provisionally mount the axle housing without O-ring.


HB108FA620

⑨ Check the gap between the two axle housings with a feeler gauge.

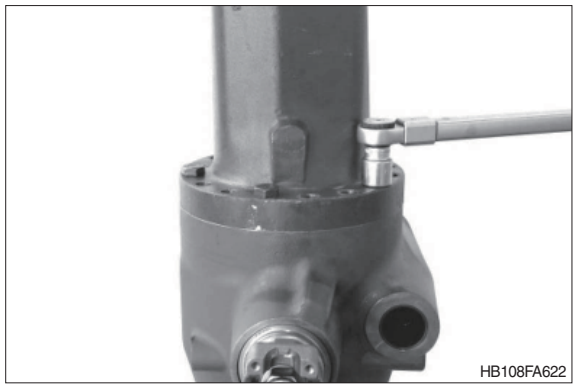
※ If the shim (according to calculation example C, s = 0.80 mm) has been determined correctly, the gap width is approx. 0.10 mm.

⚠ Take several measuring points to find the average value.


HB108FA621

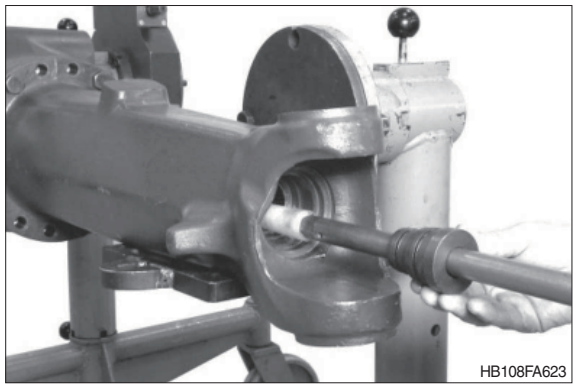
⑩ Tighten the axle housing parts with hexagon screws until contact is obtained.

· Tightening torque (M16/10.9) :
28.6 kgf · m (207 lbf · ft)

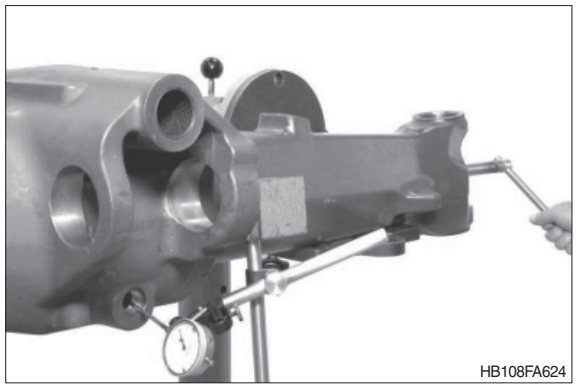


⑪ Pivot the axle housing 90° and fix the torsion bar (S) with the cone connection (S) in the hole of the cover (differential).

(S) Torsion bar 5870 206 001
(S) Cone connection 5870 206 003



⑫ Place the dial indicator right-angled through the oil drain hole at a tooth flank of the crown wheel and check the backlash.


HB108FA624

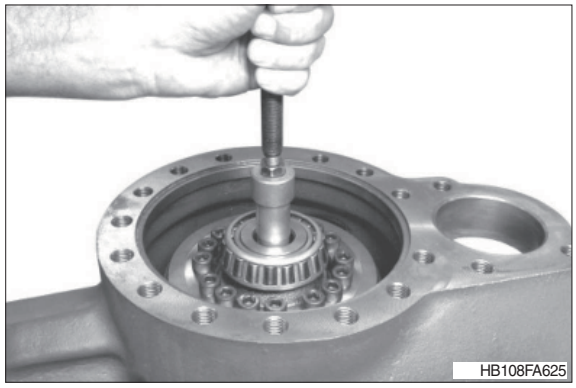
⚠ In case of deviations from the necessary backlash (0.12 ... 0.24 mm) correct with the corresponding shims.

- **Insufficient backlash** – mount a thicker shim (figure FA613).
  The shim to determine the bearing preload (figure FA619), must be accordingly thinner.
- **Excessive backlash** – mount a thinner shim (figure FA613).
  The shim to determine the bearing preload (figure FA619) must be accordingly thicker.

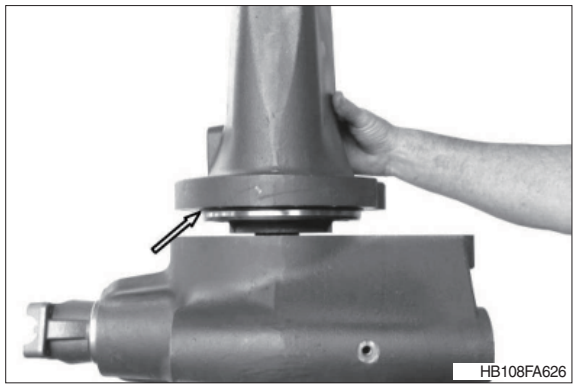
※ **Check the contact pattern:**
Rotate the yoke to roll the crown wheel several times in both directions over the input pinion.
Then separate the axle housings and remove the differential again.
Compare the received contact pattern with contact pattern examples of page 3-213.

⚠ In case of a contact pattern deviation it is imperative to correct the measuring failures which occurred when determin-ing the shim (figure FA606**, page 3-135).**

⑬ Insert the differential again into the axle housing after checking the contact pattern.

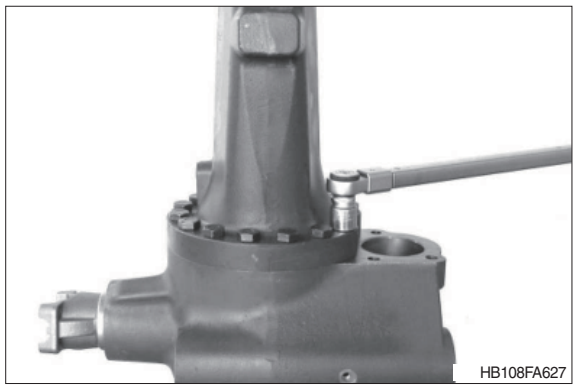

HB108FA625

⑭ Grease the O-ring (see arrow) and mount it to the axle housing (part II). Then mount the axle housing (part II) until contact is obtained.



⑮ Finally tighten the axle housing with hexagon screws.

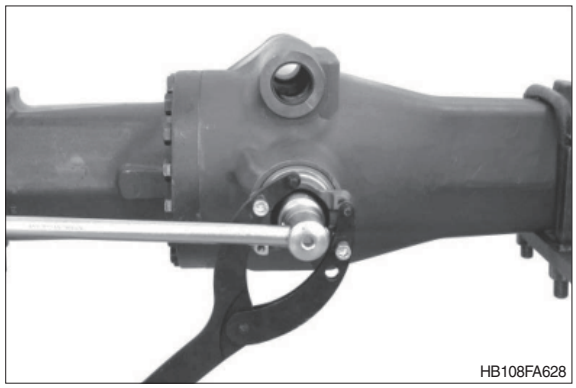
· Tightening torque (M16/10.9) :
28.6 kgf · m (207 lbf · ft)



(3) Mount the shaft seal ring (yoke)

① Loosen the hexagon nut and pull the yoke from the input pinion.

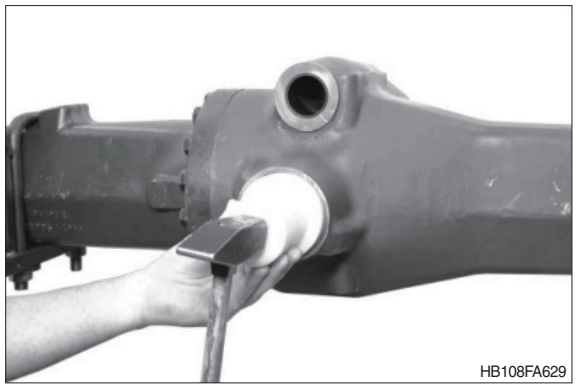
(S) Clamping fork 5870 240 025



② Mount the shaft seal ring with the seal lip showing to the oil chamber.
(S) Driver tool 5870 048 269

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

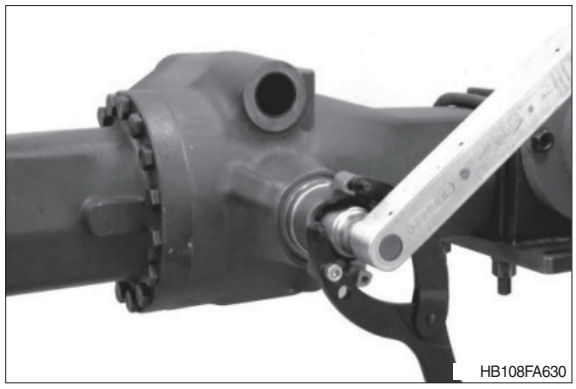
⚠ Just before the assembly wet the outer diameter of the shaft seal ring with spirit and fill the space between seal and dust lip with grease.



③ Mount the yoke and finally tighten with disk and **"new"** hexagon nut (self securing).

· Tightening torque :
45.9 kgf · m (332 lbf · ft)

(S) Clamping fork 5870 240 025



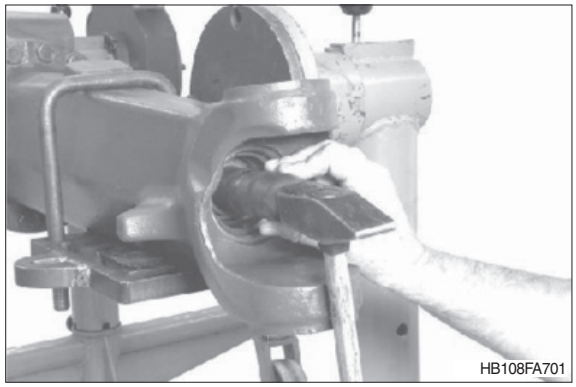
7) REASSEMBLY OUTPUT

(1) Mount the knuckle housing

① Flush-mount the bush into the axle housing.

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

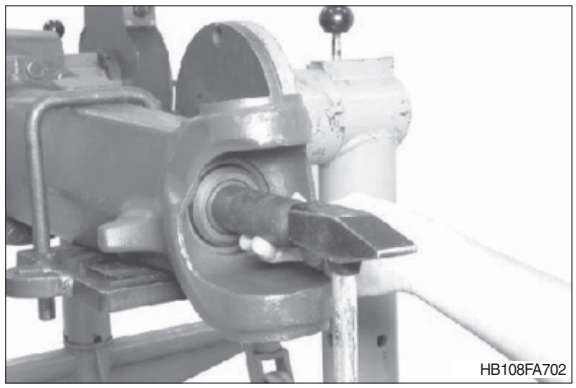
⚠ **Pay attention to the radial installation position, the latching/cross joint of the bush must be showing upwards (12 o'clock) in installed condition.**



② Flush mount the shaft seal ring into the axle housing with the seal lip showing to the oil chamber.

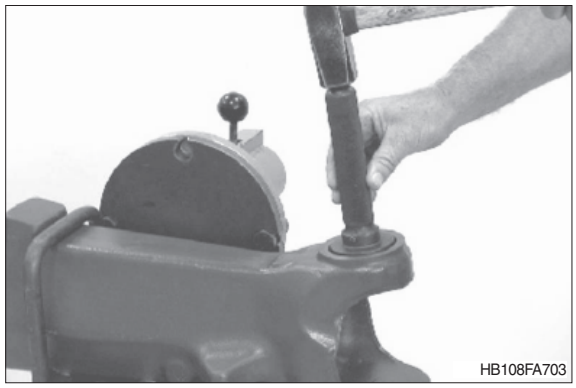
(S) Driver tool	5870 048 156
(S) Driver tool	5870 048 157

⚠ **Right before the assembly wet the outer diameter of the shaft seal ring with spirit and fill the space between the seal lips with grease.**



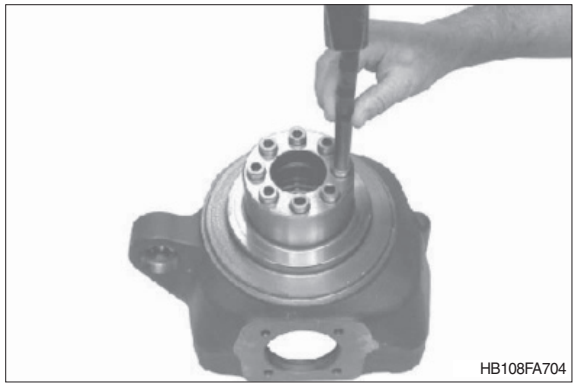
③ Mount both bearing outer rings until contact position with the pivot bearing holes is obtained.

(S) Driver tool	5870 058 047
(S) Driver tool	5870 058 062
(S) Handle	5870 260 002

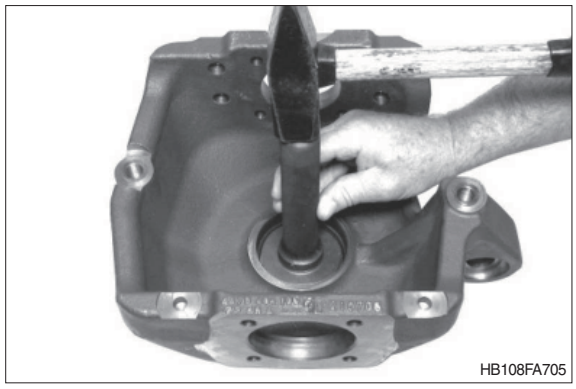


④ Insert the bushes until contact position with the holes of the knuckle housing is obtained.

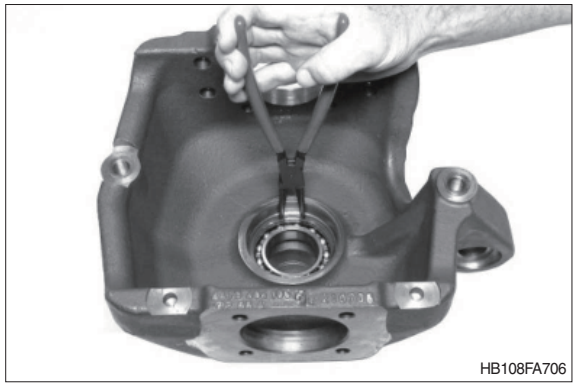
(S) Mandrel	5870 100 011



⑤ Insert the ball bearing into the knuckle housing until contact position is obtained.


HB108FA705

⑥ Fix the ball bearing with a retaining ring.

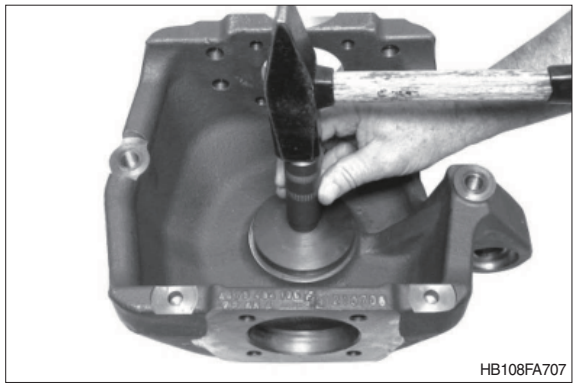

HB108FA706

⑦ Insert the cassette type seal ring into the knuckle housing.

(S) Driver tool 5870 048 307

※ The use of the specified driver tool (S) ensures that the installation position of the cassette type ring is correct.

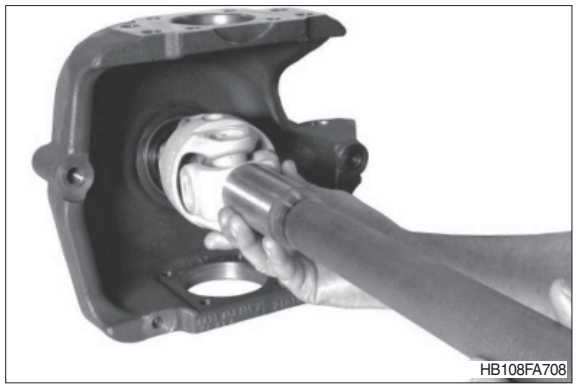
⚠ Right before the assembly wet the outer diameter of the cassette type seal ring with spirit.


HB108FA707

Mount the double U-joint shaft

① Insert the double U-joint shaft into the knuckle housing.

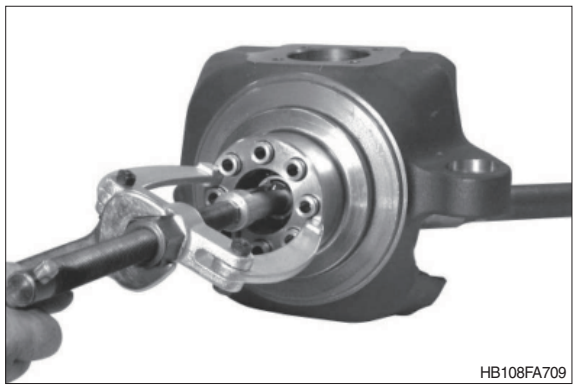
※ Right before the assembly wet the cassette type seal ring with spirit.


HB108FA708

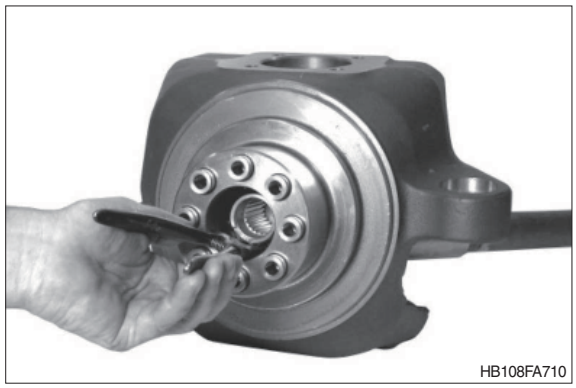
② Pull the double U-joint shaft into the knuckle housing until contact is obtained.

(S) Internal extractor 5870 300 014
(S) Counter support 5870 300 003

※ Place the internal extractor (S) into the groove of the double U-joint shaft.


HB108FA709

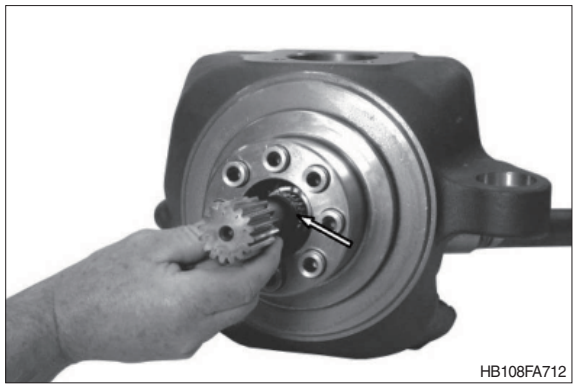
③ Fix the double U-joint shaft with a retaining ring.


HB108FA710

④ Insert the retaining ring into the groove of the double U-joint shaft.


HB108FA711

⑤ Insert the sun gear shaft into the double U-joint shaft, until the retaining ring (figure FA711) engages into the annular groove (see arrow).

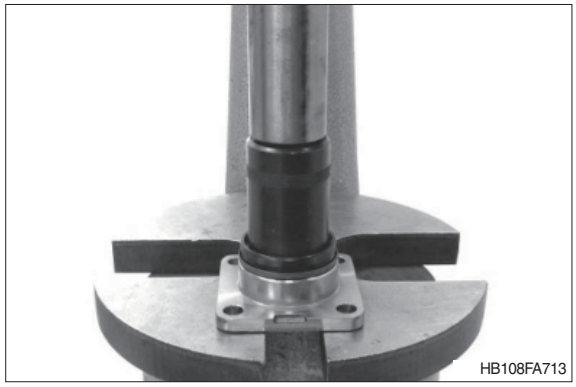

HB108FA712

Mount the pivot bearing

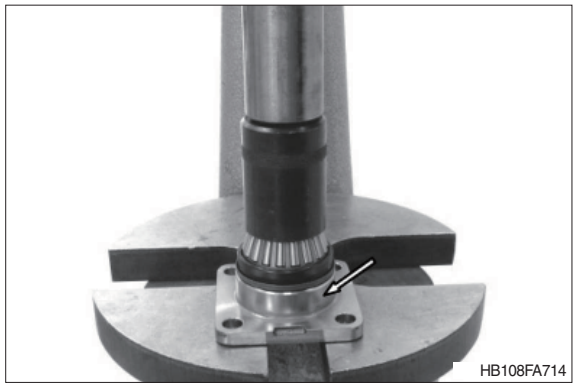
① Press the shaft seal ring over the collar of the bearing bolt.

(S) Driver tool 5870 048 251
(S) Driver tool 5870 048 252

※ The use of the specified driver tool (S) ensures that the installation position of the shaft seal ring is correct.

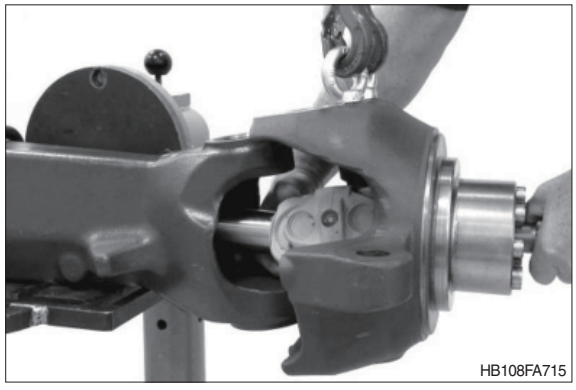

HB108FA713

② Press the roller bearing onto the bearing bolts until contact position is obtained. Then wet the collar of the bearing bolts (see arrow) with anticorrosive agent (Weicon Anti-Seize).


HB108FA714

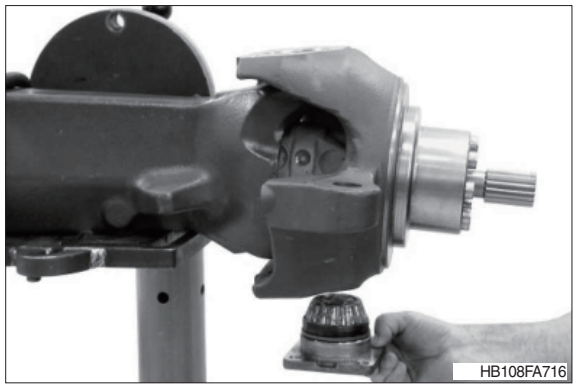
③ Bring the knuckle housing into correct position at the axle housing.

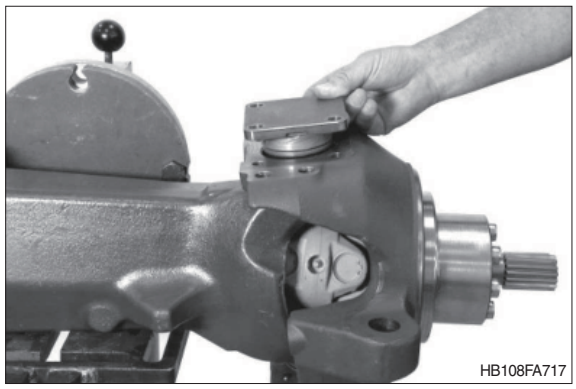
※ Thereby mount the double U-joint shaft into the axle housing until the teeth of the joint fork are mounted to the differential (axle bevel gear).


HB108FA715

④ Fix the knuckle housing with preassembled bearing bolts (figure FA716, 717).

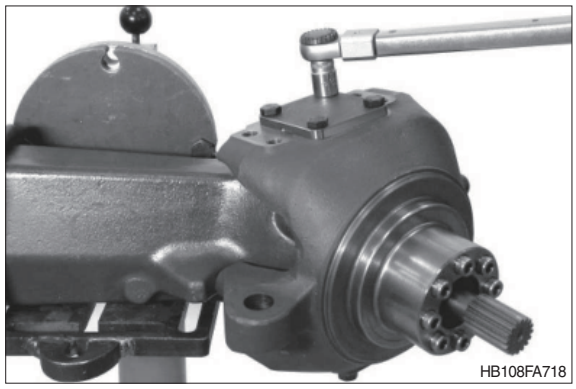
※ Insert the roller bearing with long-term lubricant (e.g. grease Renolit 283 EP 2). Just before the assembly wet the shaft seal ring with spirit.


HB108FA716


HB108FA717

⑤ Fix both bearing bolts with hexagon screws.

· Tightening torque (M12/10.9) :
11.9 kgf · m (86.3 lbf · ft)

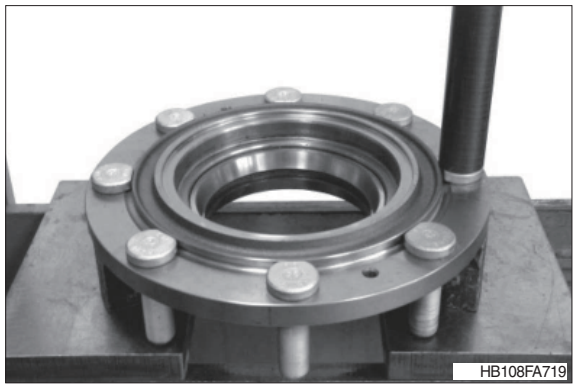

HB108FA718

(2) Mount the hub

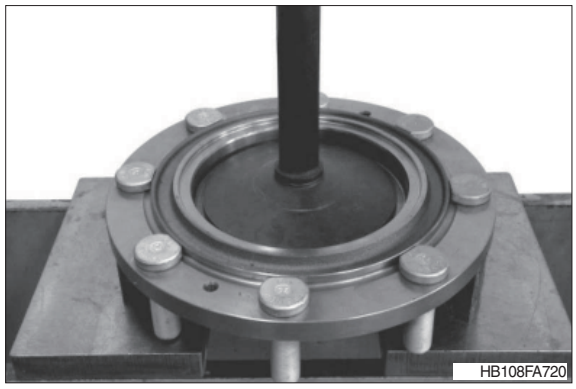
① Press the wheel bolts into the hub until contact position is obtained.

(S) Wheel bolt puller – basic tool
5870 610 010
(S) Insert (M22×1.5) 5870 610 002

※ The special tool (S) is only intended for repair solutions when replacing single wheel bolts with mounted hub.


HB108FA719

② Press both bearing outer rings in until contact position is obtained.

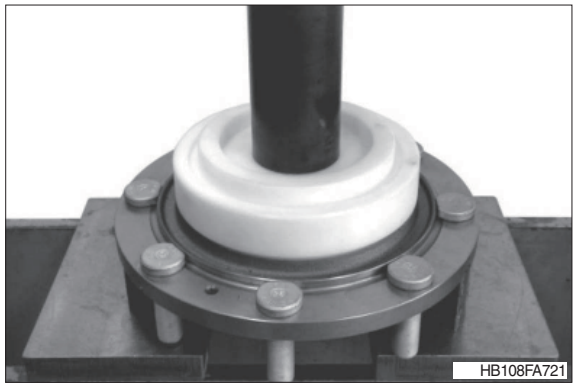


③ Press the cassette type seal with the label OUT SIDE showing outwards (upwards) into flush position with the hub.

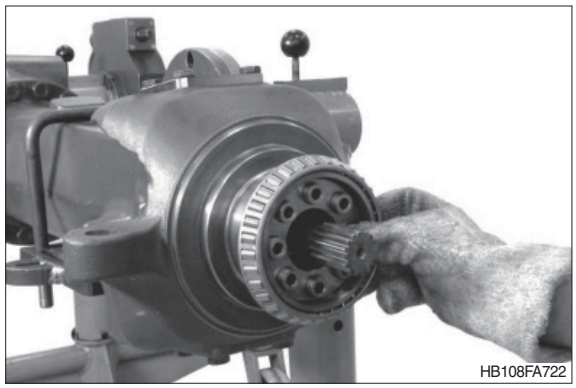
(S) Driver tool 5870 051 035

※ The use of the specified driver tool (S) ensures that the installation position of the cassette type seal ring is correct.

⚠ Just before the assembly wet the outer diameter of the cassette type seal ring with spirit.

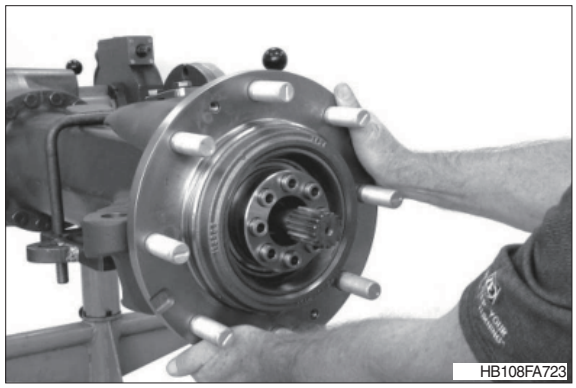


④ Heat the roller bearing and mount until contact position with the knuckle housing is obtained.

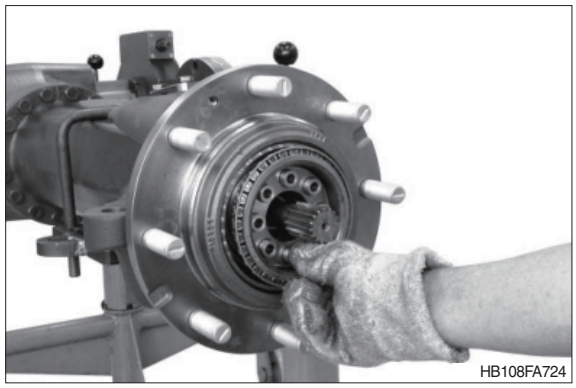


⑤ Mount the preassembled hub.

※ Right before the assembly wet the seal lips of the shaft seal ring with spirit.

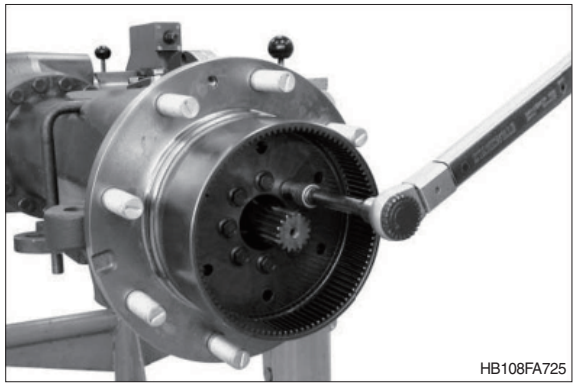


⑥ Heat the roller bearing and mount until contact position is obtained.

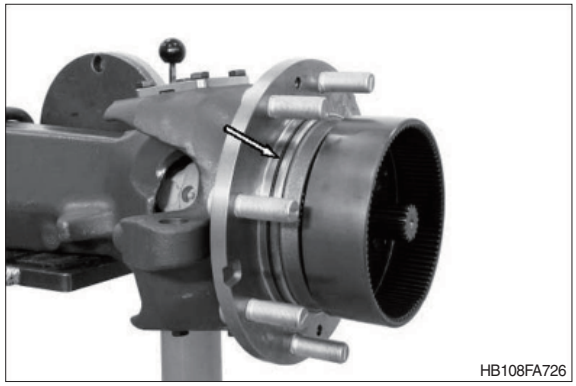


⑦ Mount the ring gear and pre- tighten with the old retaining screws (which have been removed during disassembly) until contact position is obtained.
Then loosen the retaining screws again and finally tighten the ring gear with **new** retaining screws.

· Tightening torque :
9.18 kgf · m (66.4 lbf · ft)



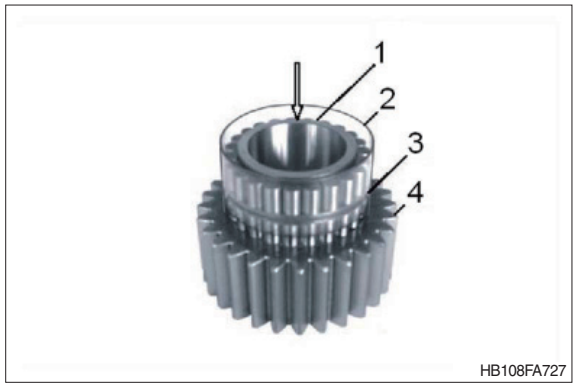
⑧ Insert the O-ring (see arrow) into the annular groove of the hub and grease.



(3) Mount the planetary carrier

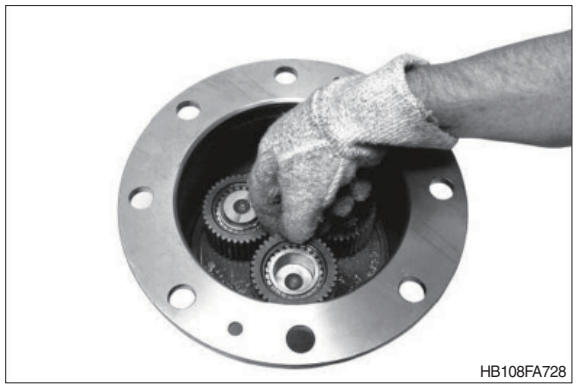
① Insert the cylindrical roller bearing into the planetary gear – for this purpose press the cylindrical roller bearing through the packaging sleeve until the snap ring engages into the annular groove of the planetary gear.

※ The packaging sleeve is used as assembly aid.
1 = Cylindrical roller bearing
2 = Packaging sleeve
3 = Snap ring
4 = Planetary gear

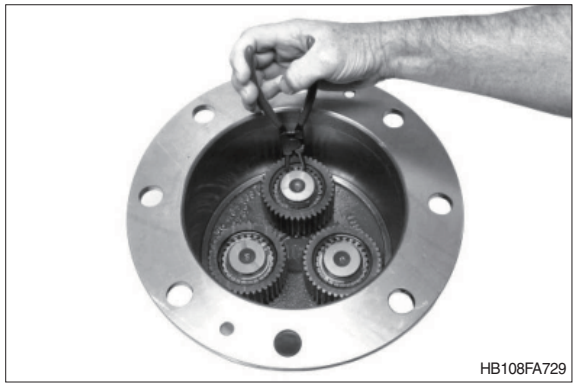


② Heat the bearing inner ring and mount the planetary gear until contact position is obtained.

※ Mount the bearing inner ring with the large radius showing to the planetary carrier (downwards).


HB108FA728

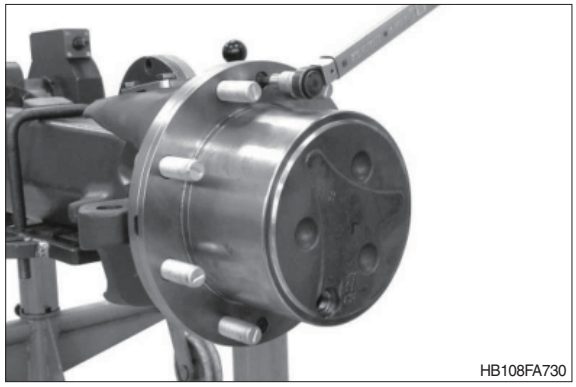
③ Fix the planetary gear with a retaining ring.


HB108FA729

④ Mount the planetary carrier and fix it with cylindrical screws.

· Tightening torque (M10/8.8) :
3.26 kgf · m (23.6 lbf · ft)

※ Prior to putting the axle into operation, fill it with specified oil.

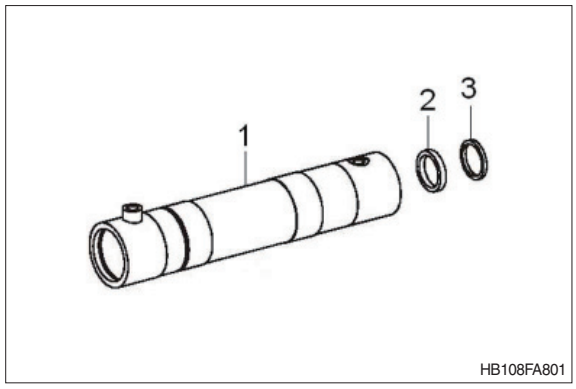

HB108FA730

8) REASSEMBLY STEERING

(1) Preassemble the steering

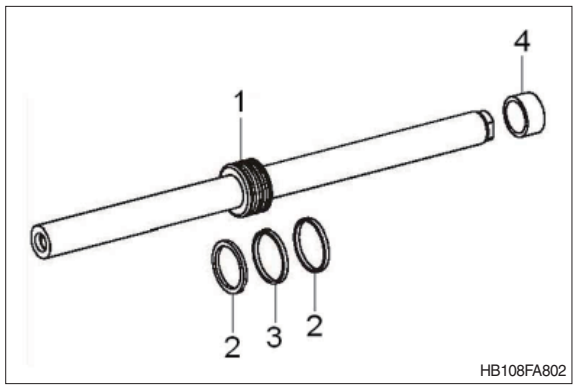
① Pre-assemble the cylindrical tube as shown on the sketch.

1 = Cylindrical tube
2 = Rod seal
3 = Scraper



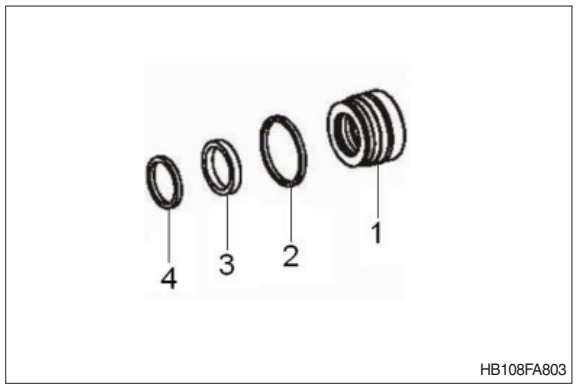
② Pre-assemble the piston rod as shown on the sketch.

1 = Piston rod
2 = Guide ring
3 = Piston seal
4 = Spacer part



③ Pre-assemble the plug as shown on the sketch.

1 = Plug
2 = Dual ring
3 = Rod seal
4 = Scraper

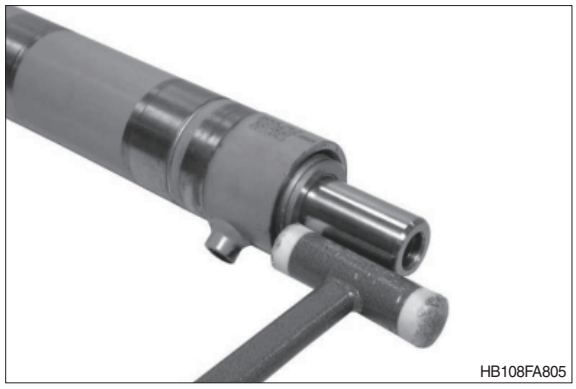


④ Push the preassembled piston rod into the cylindrical tube until contact position is obtained.

※ Slightly oil all seal elements before inserting the piston rod.

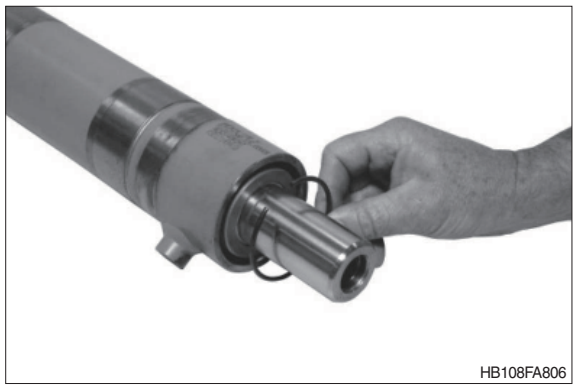
⑤ Push the preassembled plug into the cylindrical tube, until the retaining ring (see sketch below) can be mounted.

※ Slightly oil all seal elements before inserting the plugs.

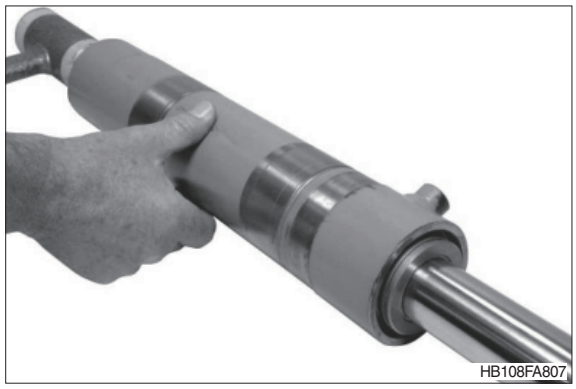


⑥ Engage the retaining ring into the groove of the cylindrical roller.

※ Installation position, see also sketch ⑧.



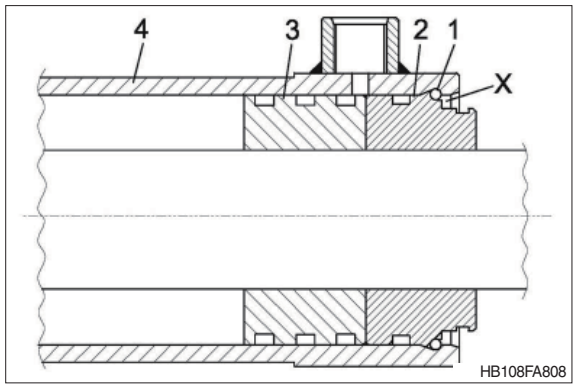
⑦ Use the piston rod to bring the plug in contact position with the retaining ring.



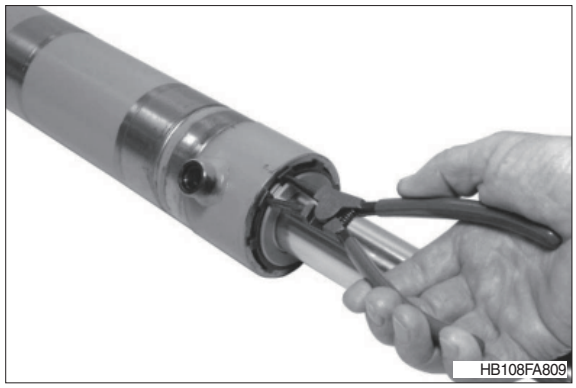
⑧ Fill the space (X) between plug and cylindrical tube with grease.

Comment on sketch:

1 = Retaining ring
2 = Plug
3 = Piston rod
4 = Cylindrical tube
X = Space grease filling

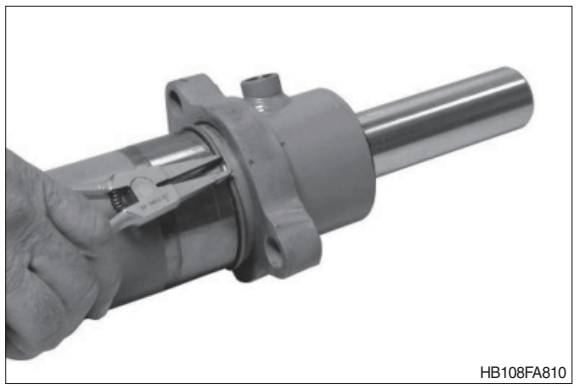


⑨ Use a retaining ring to fix the plug.



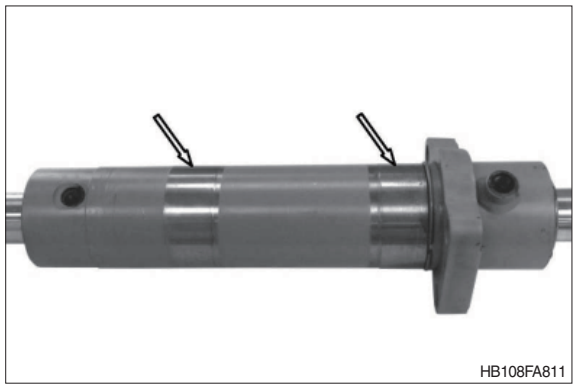
⑩ Mount the flange and fix with a ring.

(S) Pliers 5870 900 026



(2) Mount the steering

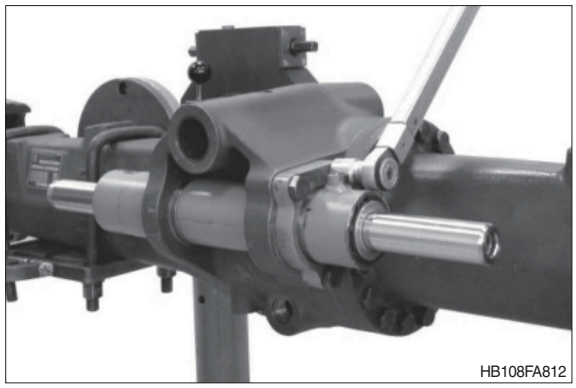
① Wet the contact faces (cylindrical tube/ axle housing, see arrows) with anti-corrosion agent (Weicon Anti-Seize).



② Mount the pre-assembled steering cylinder into the holes of the axle housing.

Then fix the steering cylinder with hexagon screws.

· Tightening torque :
24.5 kgf · m (177 lbf · ft)



③ Screw hexagon nut and ball joint to the axial joint.

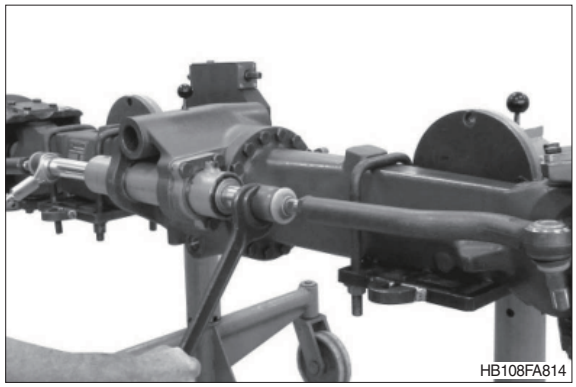
※ Operation (figure FA813~815) must be implemented on both tie rods.


HB108FA813

④ Fix the preassembled tie rod to the piston rod.

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

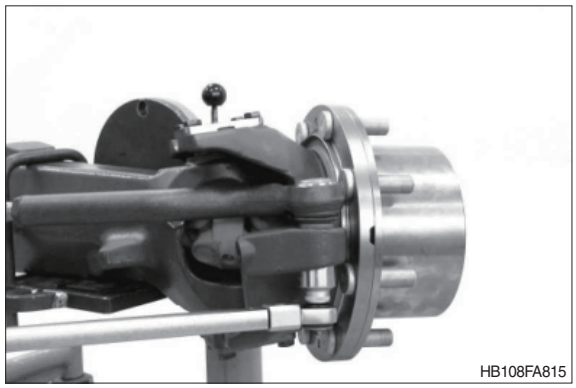
※ Wet the thread of the axial joint with loctite #243.


HB108FA814

⑤ Mount the tie rod to the joint housing and fix with **new** hexagon nut (self-securing).

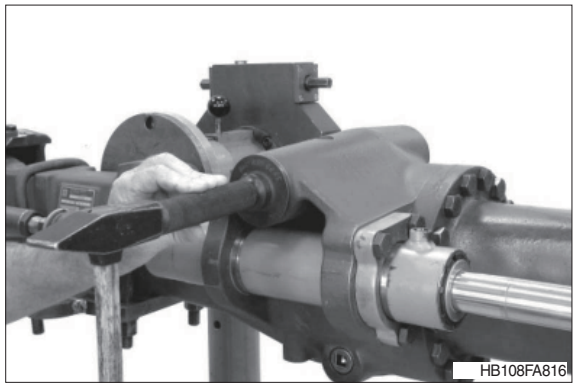
· Output torque : 10.2 kgf · m (73.8 lbf · ft)
· Tightening rotation angle ··· = 180° $^{+45°}$

※ First tighten the hexagon nut with a tightening torque of 10.2 kgf·m (73.8 lbf·ft) ±15%.
Then mark the position of the hexagon nut and retighten with a rotation angle of 180°$^{+45°}$.

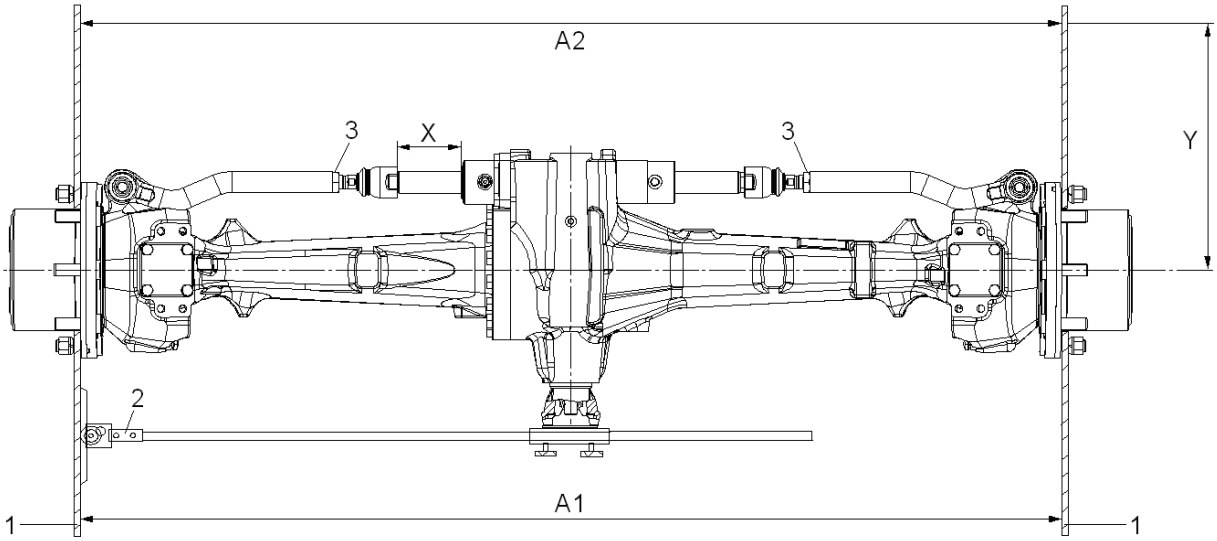

HB108FA815

⑥ Flush mount the bushes on both sides into the axle housing.

(S) Driver tool	5870 058 018
(S) Handle	5870 260 002


HB108FA816

(3) Adjustment and check of track



HB108FA817

Basic track setting

Bring the piston rod into central position.

Setting of dimension X = 121.75 mm (measured between front face/steering cylinder and front face/axial joint).

※ The axial position of the piston rod may no more be changed during track setting.
Mount the straightedges (1) in horizontal and central axis position.
Fix the measuring device (2) to the yoke.
Loosen the hexagon nut (3) and set the length of the tie rod (axial joint), until 0° (= track setting of zero mm) can be read on the measuring device (2).

※ For a toe-in and toe-out setting, which might be required, stick to the vehicle manufacturer's specification.

※ Carry out setting on both output sides.

Comment on sketch:

1 = (S) Straightedges 5870 200 029
2 = (S) Measuring device 5870 200 033
3 = Hexagon nut
X = Setting dimension 121.75 mm

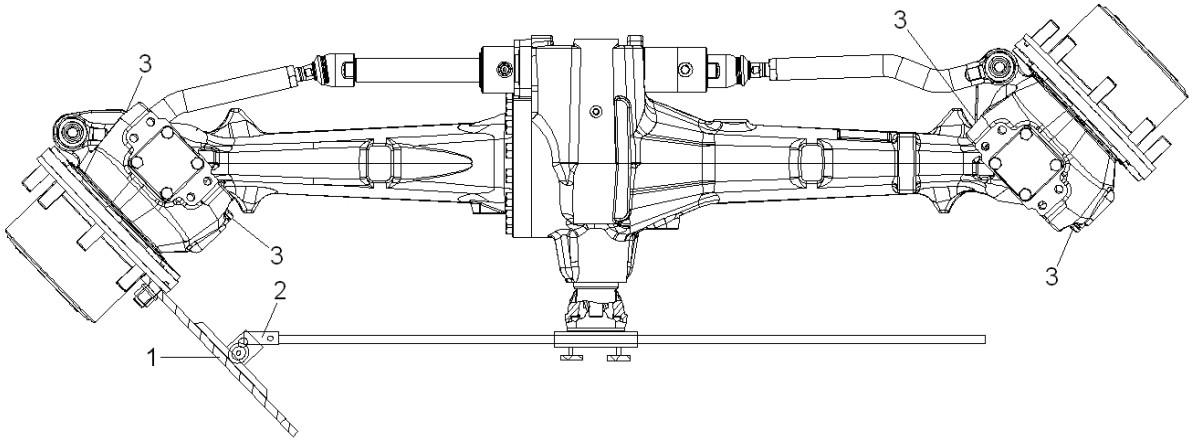
Check track setting (0°) :

Determine dimension A1.
Turn both outputs by 180° – Dimension A2 must be identical with dimension A1.
Dimension Y = distance between wheel center and rim flange.
Then fix both tie rods (axial joint) with hexagon nut (3).

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

(4) Setting of steering angle

※ If track setting should be carried out, the setting of the steering angle should only be carried out after completion of the track setting.



HB108FA818

Mount the straightedge (1) in horizontal and central axis position.
Fix the measuring device (2) to the yoke.
Pivot the output until the steering angle (e.g. 52°) can be read on the measuring device (2).
Then bring the stop screws (3) into contact position with the axle housing and lock them with hexagon nuts.

· Tightening torque (M14×1.5) : 15.3 kgf · m (111 lbf · ft)

※ The value of the required steering value can be taken from the vehicle manufacturer's specifications.

※ Carry out the setting on both output sides.

Comment on sketch:

1 = (S) Straightedge 5870 200 029
2 = (S) Measuring device 5870 200 033
3 = Stop screws

(5) Leakage test of the steering

Use a HP pump to check the steering for leakage in **both** steering directions.
Build up test pressure p = 200 bar (thereby bleed the pressure chamber).
Then close the connection to the HP pump with a shut-off valve.
During a 20 second testing time a pressure decrease of max. 5 bar is permitted.

※ Test medium : Engine oils SAE 10W

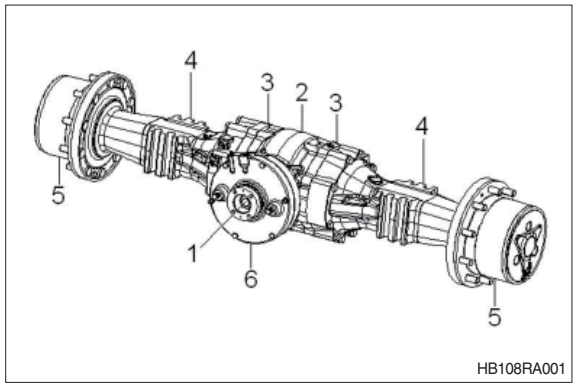
(S) HP pump 5870 287 007
(S) Threaded coupling 5870 950 115

4. REAR AXLE

1) DISASSEMBLY - OUTPUT UNIT

Parking brake (multi-disc brake)

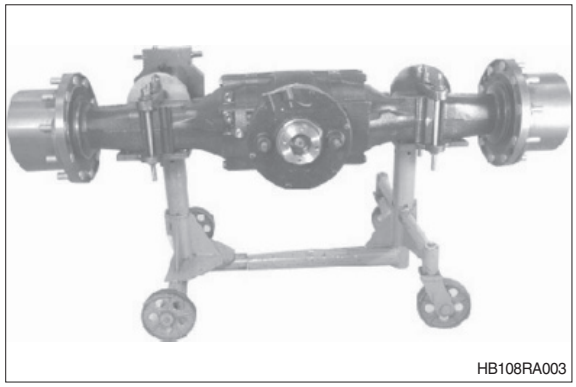
1 = Input
2 = Axle drive housing
3 = Bearing housing
4 = Axle housing
5 = Output unit
6 = Parking brake



HB108RA001

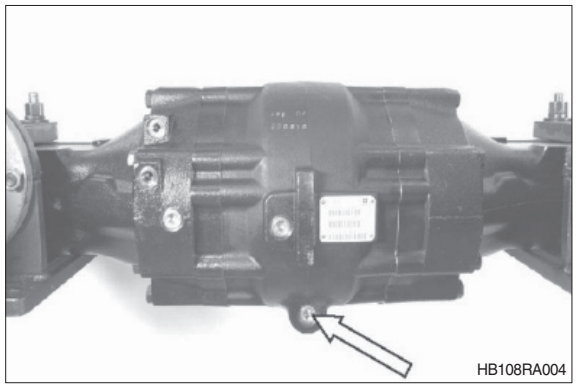
(1) Mount axle on assembly truck.

Assembly truck	5870 350 000
Fixtures	5870 350 139
Fixing bracket	5870 350 140


HB108RA003

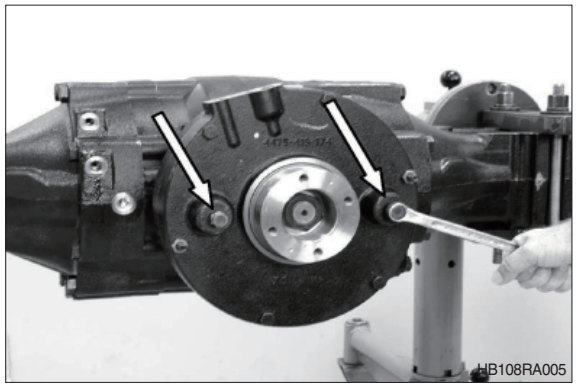
(2) Remove screw plug (arrow) and drain oil from the axle.

※ Use suitable collector-environmental protection.


HB108RA004

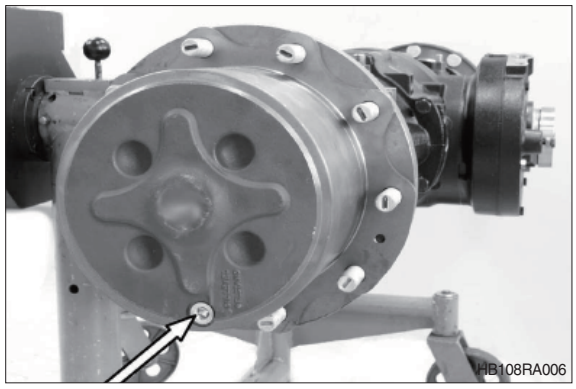
(3) To rotate the output (oil drain hole in 6 o'clock position – see figure RA006) equalize the brake fixing on the axle which was removed from the vehicle by turning in the two emergency breathing screws (arrows).

※ Turn in both emergency breathing screws evenly.

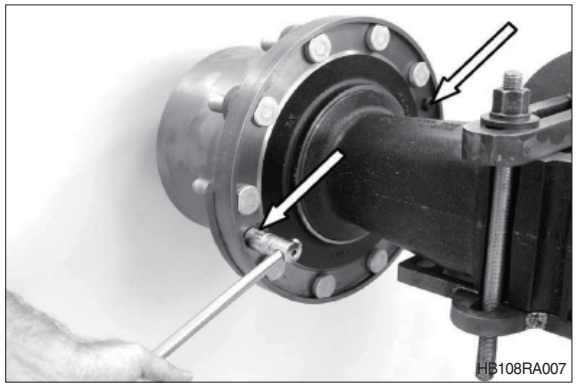

HB108RA005

(4) Remove screw plug (arrow) and drain oil from both output units.

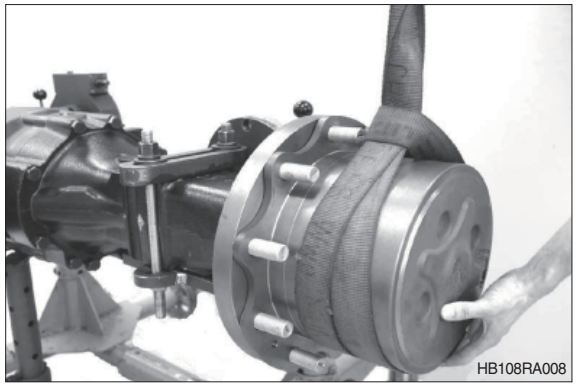
※ Use suitable collector – environmental protection.



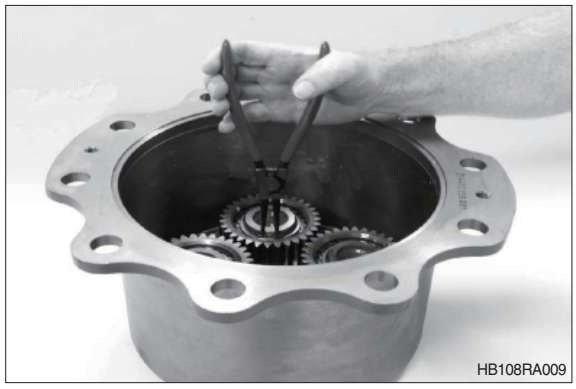
(5) Loosen both hex screws (arrows) of planetary carrier fixing.



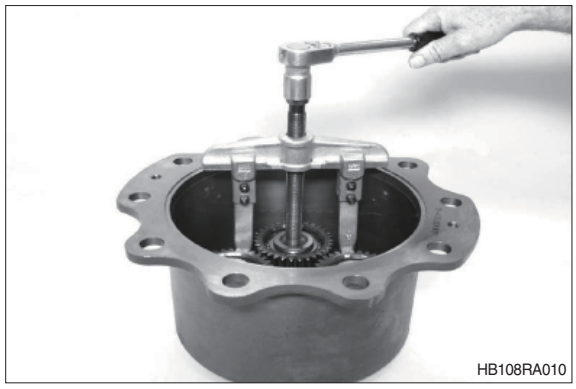
(6) Take up planetary carrier by means of a lifting strap and pull it off the hub.



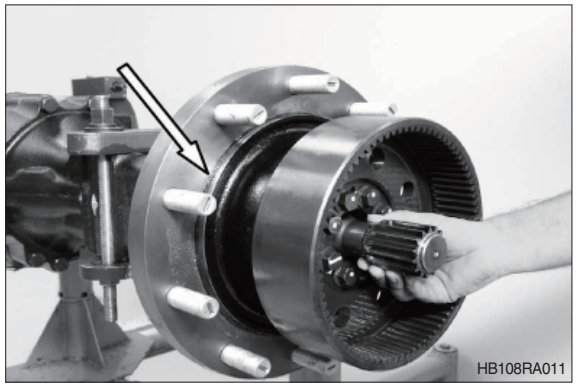
(7) Snap out retaining ring.



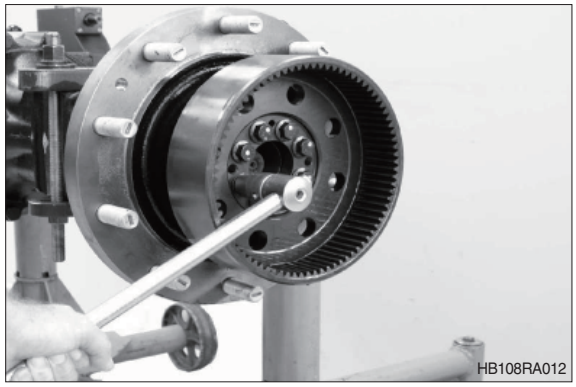
(8) Pull off planetary gear.
Disassemble the remaining planetary gears in the same way.



(9) Pull out sun gear shaft and remove O-ring (arrow).

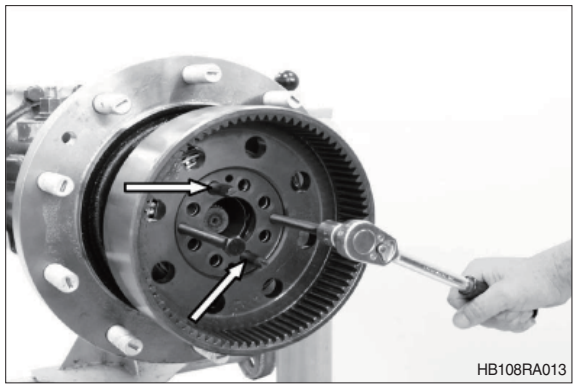


(10) Loosen locking screws of internal gear bolting.

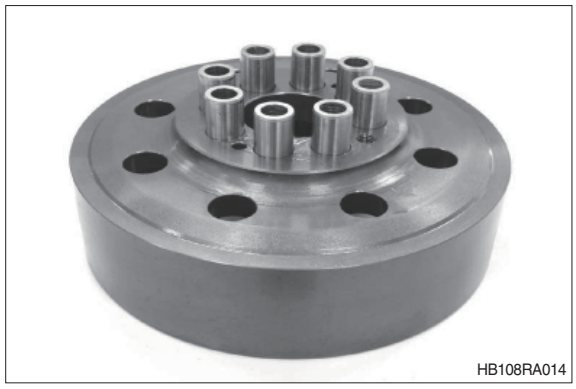


(11) Insert two adjusting screws (M14 – see arrows) and press internal gear evenly off the axle housing by means of puller screws.

Adjusting screws (M14) 5870 204 022



(12) If required – remove bushings from internal gear.
For this purpose fit bushings with thread and pull them out by means of a striker.

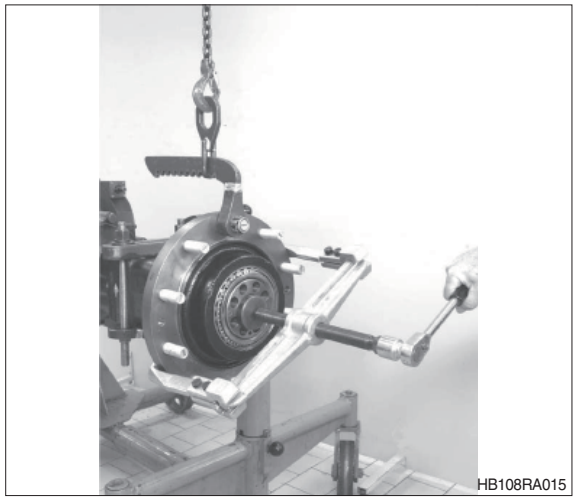

HB108RA014

※ To ensure functioning replace shaft seal (cassette-type sealing) after any disassembly of hub - see figure RA016.

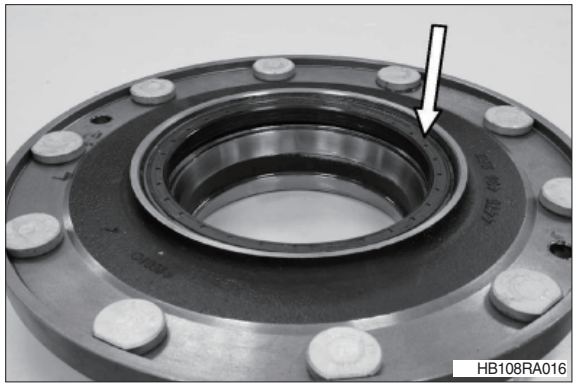
(13) Pull hub off the axle housing using a pressure piece and a two-armed puller.

※ Pay attention that releasing bearing inner ring does not drop.

Lifting bracket 5870 281 043

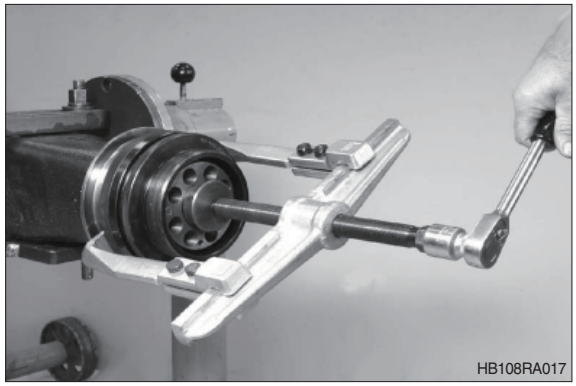

HB108RA015

(14) Lift off shaft seal (arrow) with lever and remove both bearing outer rings from hub.


HB108RA016

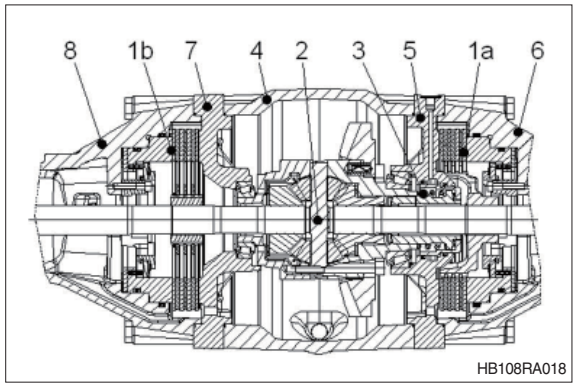
(15) Pull bearing inner ring off the axle housing.

Grab sleeve 5873 004 026


HB108RA017

2) DISASSEMBLY
SERVICE BRAKE (multi disc brake)

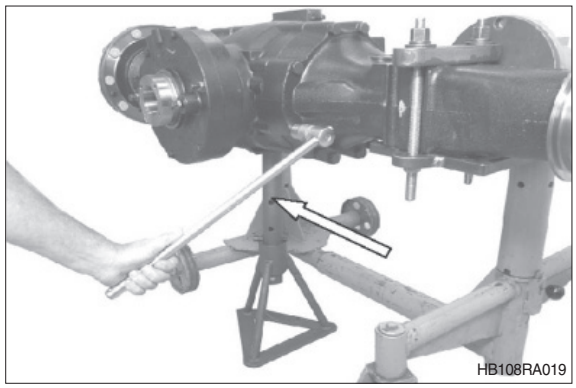
(1) Legend :
- 1 = Service brake (multi disc brake)
- 1a = Crown wheel side
- 1b = Side opposite of crown wheel
- 2 = Differential
- 3 = Differential lock (100% lock)
- 4 = Axle drive housing
- 5 = Bearing housing (crown wheel side)
- 6 = Axle housing (crown wheel side)
- 7 = Bearing housing (side opposite of crown wheel)
- 8 = Axle housing (side opposite of crown wheel)



HB108RA018

※ The description below shows the disassembly of the service brake on the axle housing (crown wheel side). The service brake on the other axle housing (side opposite of crown wheel) must be disassembled in the same way to a large extent.

⚠ **Secure axle by means of a support, see arrow.**

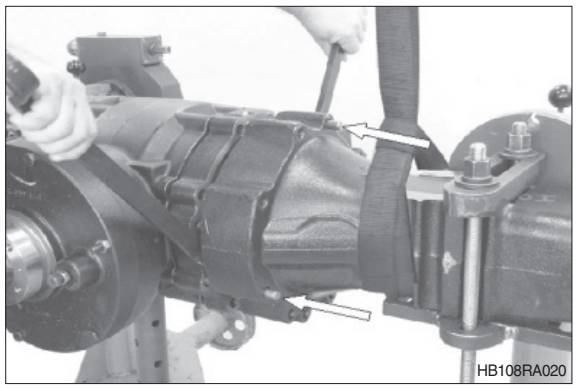

HB108RA019

(2) Loosen screws (axle housing/bearing housing/axle drive housing-crown wheel side).

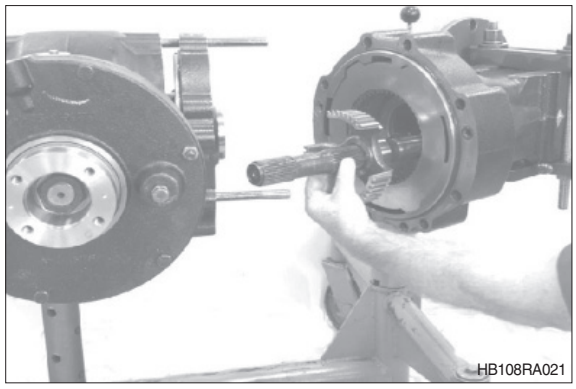
(3) Take up axle housing by means of a lifting strap, insert two adjusting screws (M16) – see arrows – and separate axle housing from bearing housing.

※ Pay attention that releasing O-rings do not drop.

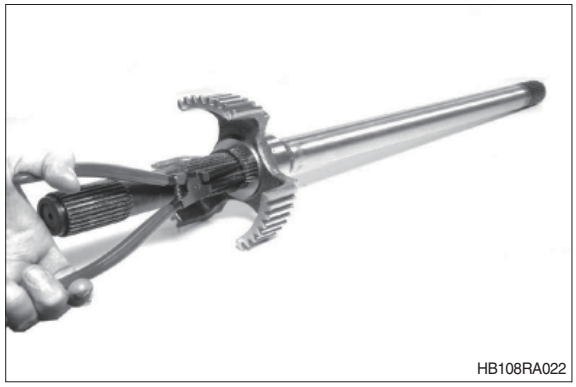
Adjusting screws	5870 204 053
Assembly lever	5870 345 065


HB108RA020

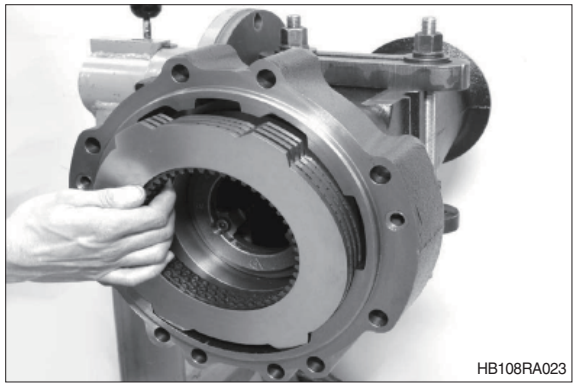
(4) Remove cpl. stub shaft (with inner disc carrier) from axle housing.



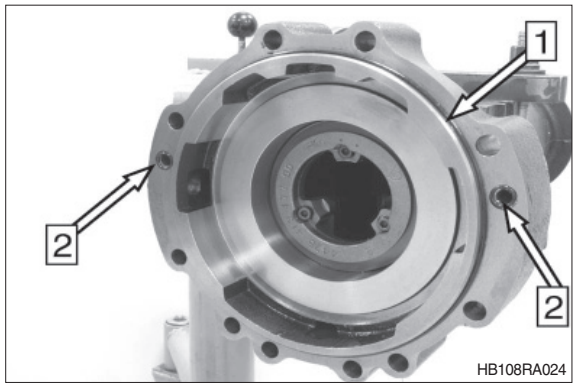
(5) Unsnap retaining ring and pull inner disc carrier from the stub shaft.



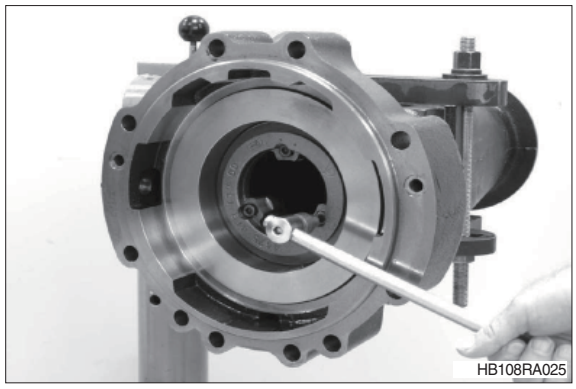
(6) Take disc package out of axle housing.



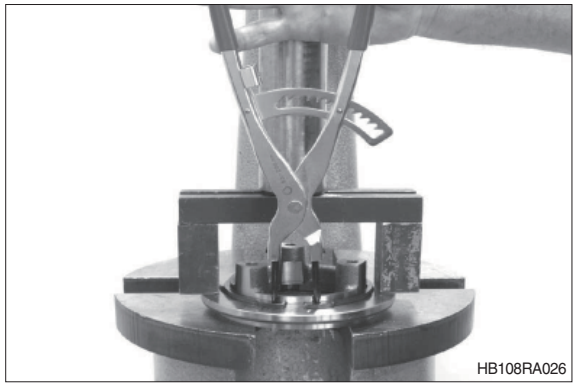
(7) Remove O-rings (arrows 1+2).



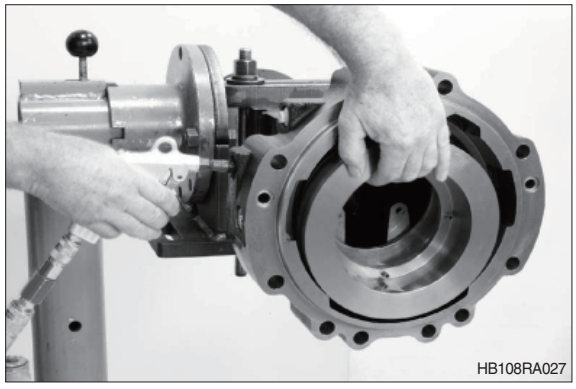
(8) Loosen screws and remove cpl. ring.


HB108RA025

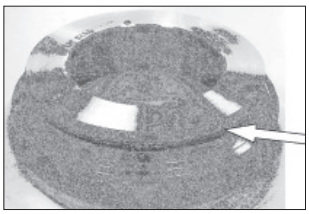
(9) Equalize cup spring preload by a press, unsnap retaining ring and remove washer.

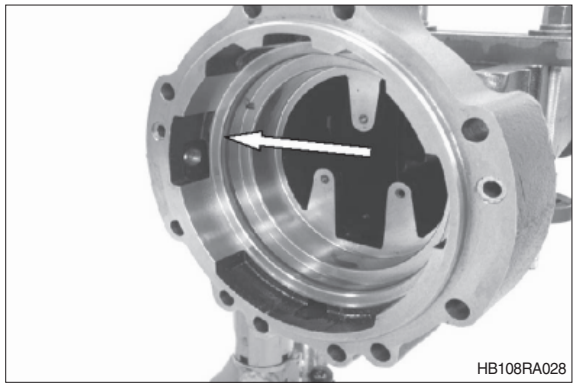

HB108RA026

(10) Press off piston by means of compressed air, remove washer and cup spring behind.


HB108RA027

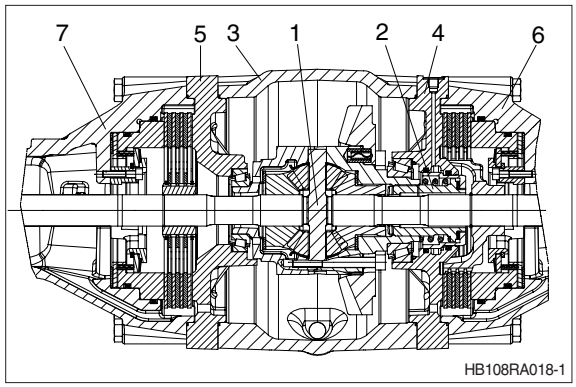
(11) Remove sealing elements from axle housing and piston-see arrows.


HB108RA029


HB108RA028

3) DISASSEMBLY-DIFFERENTIAL WITH 100% LOCK

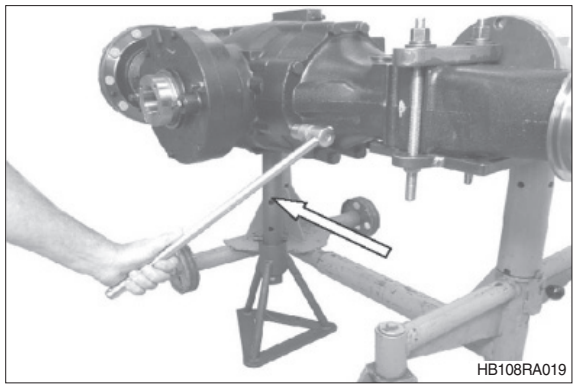
(1) If it is necessary to dismantle the differential and/or the input pinion, separate the axle housing assy (crown wheel side-see item 6) from bearing housing/axle drive housing.



Legend to sketch no. 1:
1 = Differential
2 = Differential lock (100% lock)
3 = Axle drive housing
4 = Bearing housing (crown wheel side)
5 = Bearing housing (side opposite of crown wheel)
6 = Axle housing (crown wheel side)
7 = Axle housing (side opposite of crown wheel)

⚠ **Secure axle by means of a support, see arrow.**

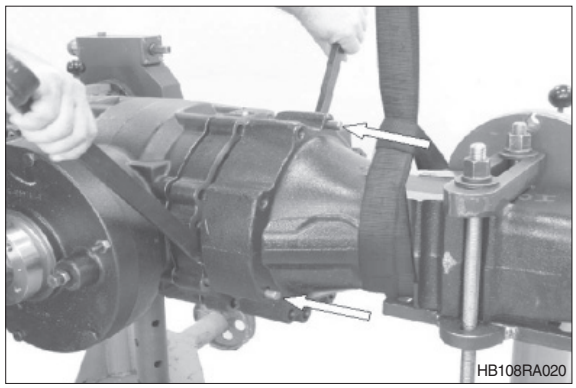
(2) Loosen screws (axle housing/bearing housing/axle drive housing-crown wheel side).



(3) Take up axle housing by means of lifting strap, insert two adjusting screws (M16) – see arrows – and separate axle housing from bearing housing.

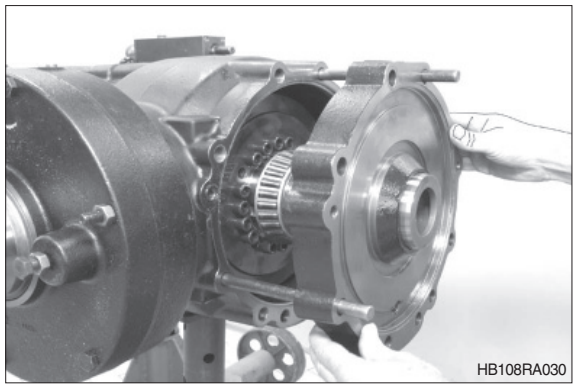
※ Pay attention that releasing O-rings do not drop.

Adjusting screws	5870 204 053
Assembly lever	5870 345 065

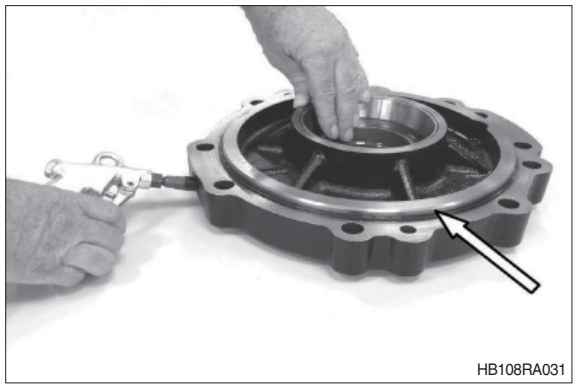


(4) Remove bearing housing.

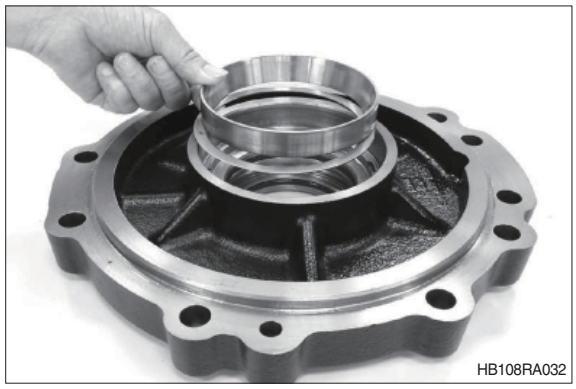
※ Pay attention that releasing O-rings do not drop.



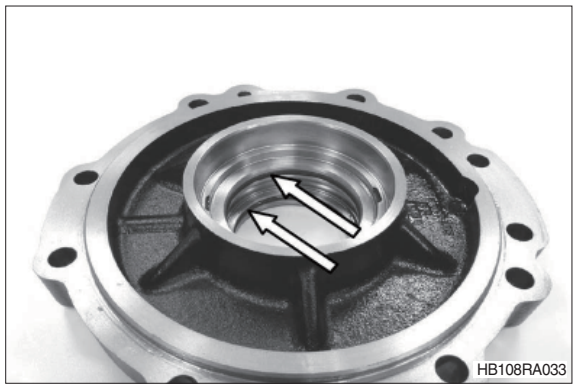
(5) Press off piston by means of compressed air and remove O-ring (arrow).



(6) Remove bearing outer ring and shim (differential bearing preload).

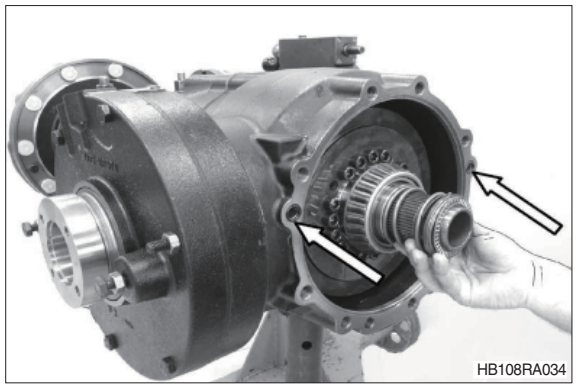


(7) Remove sealing elements (arrows) from bearing housing.

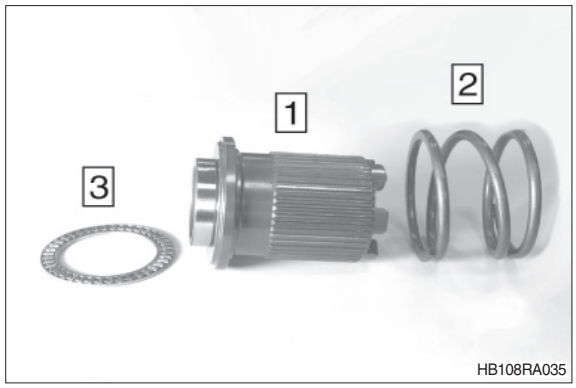


(8) Take cpl. locking slide out of differential.

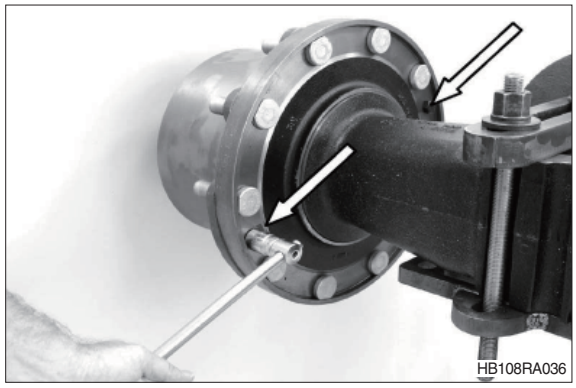
Remove O-rings (arrows).



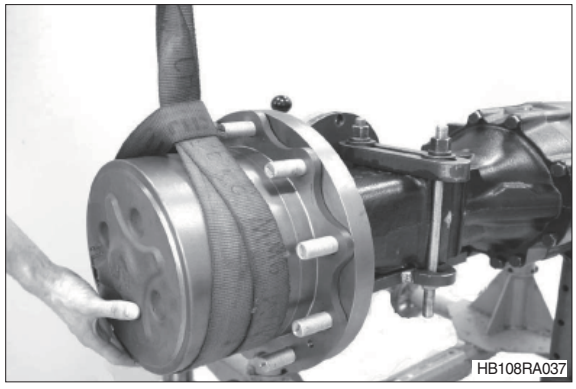
(9) Single parts of locking slide
1 = Locking slide
2 = Compression spring
3 = Axial needle cage



(10) Remove both hexagon screws (arrows) of planetary carrier fixing (output on side opposite of crown wheel).

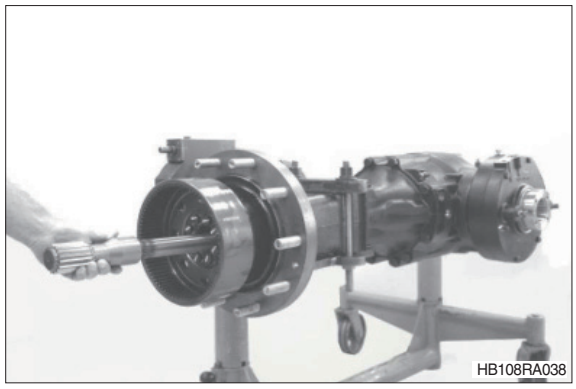


(11) Take up planetary carrier by means of lifting strap and pull it off the hub.



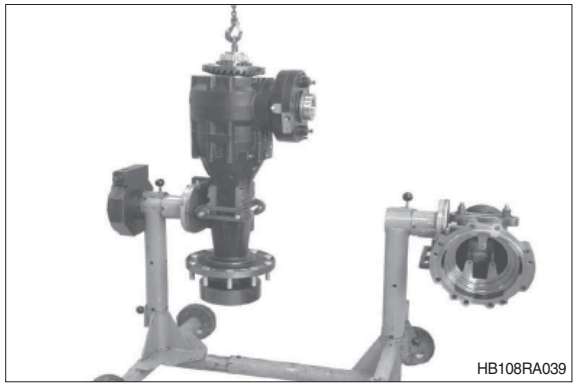
(12) Pull off sun gear shaft and stub shaft.

※ Pay attention that releasing differential does not drop.



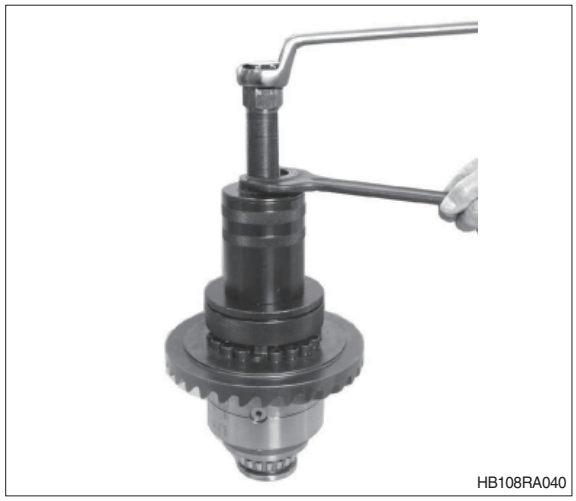
(13) Bring axle in upright position and lift differential out of the axle.

Internal extractor	5870 300 019
Eye nut	5870 204 073



(14) Pull off bearing inner ring.

Grab sleeve	5873 002 027
Basic tool	5873 002 001

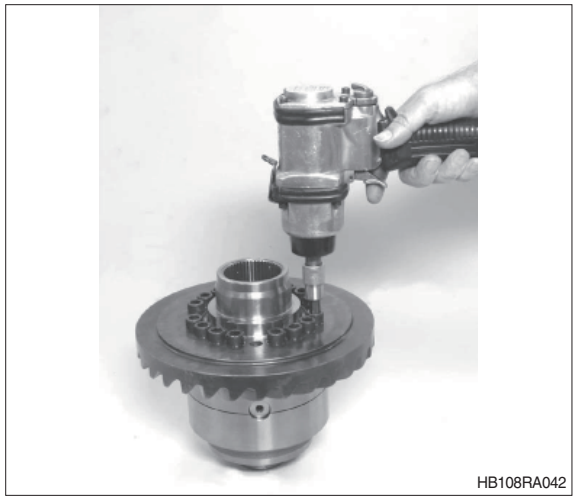


(15) Pull off bearing inner ring.

Grab sleeve	5873 001 059
Basic tool	5873 001 001


HB108RA041

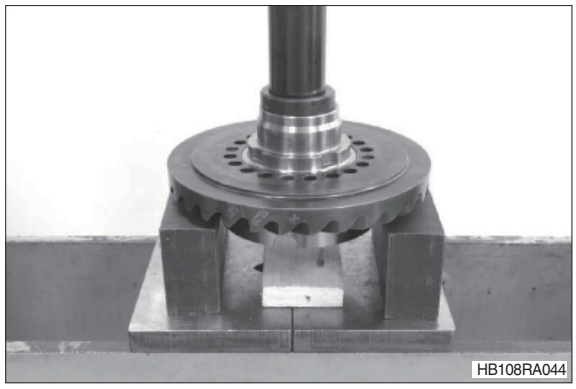
(16) Loosen screws.


HB108RA042

(17) Separate differential carrier halves and remove single parts.

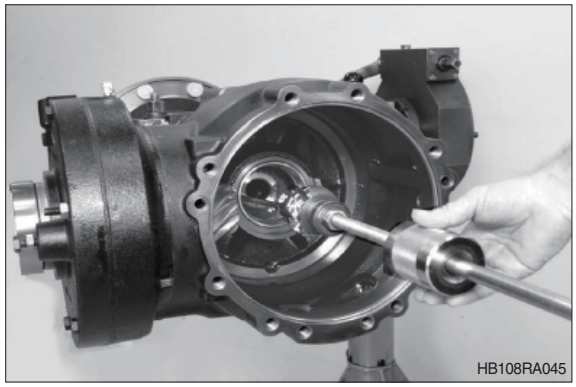

HB108RA043

(18) Separate crown wheel from differential carrier.



(19) Remove bearing outer ring and the shim behind (backlash).

※ Mark shim (position/bearing allocation).



4) DISASSEMBLY - INPUT

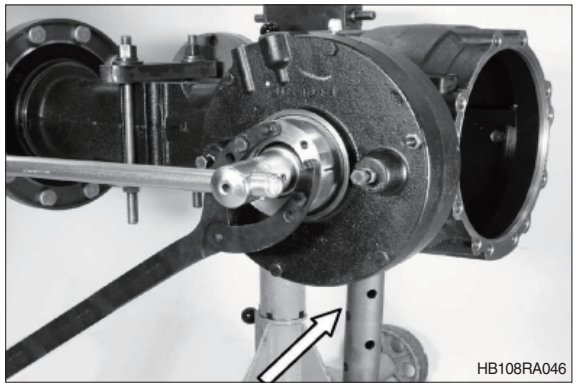
※ The below description shows the disassembly of the input on the axle with parking brake (multi-disc brake).

⚠ **Secure axle by means of a support-see arrow.**

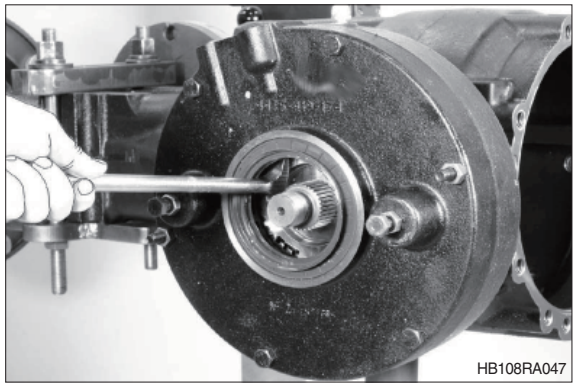
(1) Fix input flange using a clamping fork, loosen hexagon nut and pull off input flange.

Difficult disassembly. Hexagon nut has been located with locking compound (loctite), if required, heat up hexagon nut with hot air blower.

Clamping fork 5870 240 025

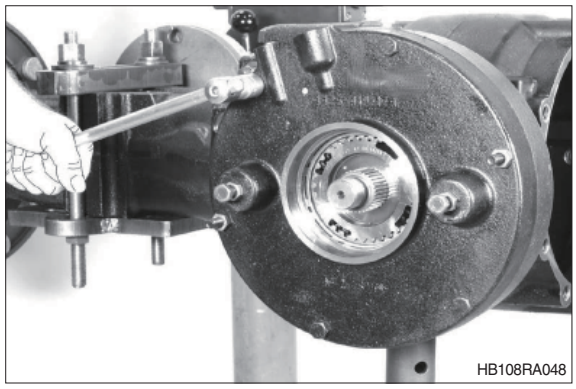


(2) If required – lift off shaft seal with lever.

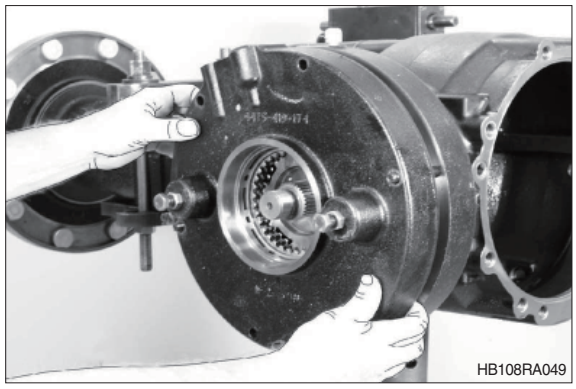


(3) Work steps figure RA048~051.

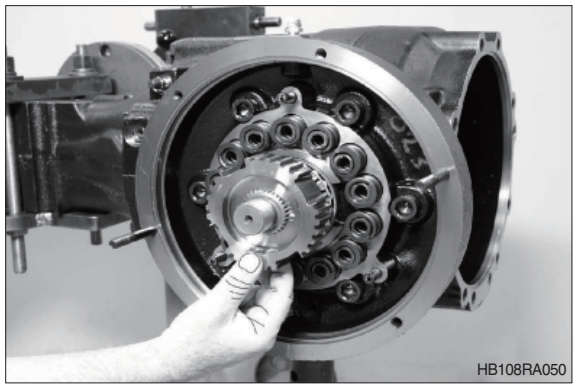
Remove hexagon screws of brake housing bolted connection and loosen the two hexagon nuts evenly (brake housing is subject to compression spring preload).



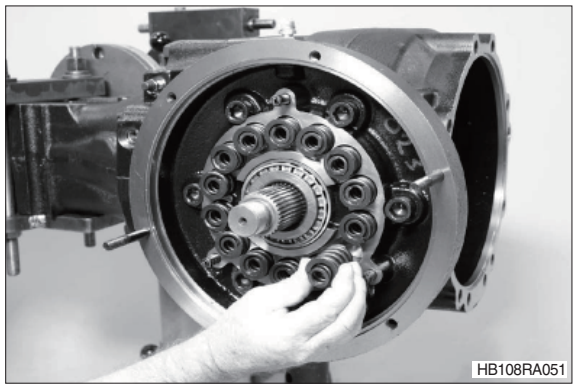
(4) Take off the cpl. brake housing cover.



(5) Remove disc carrier.

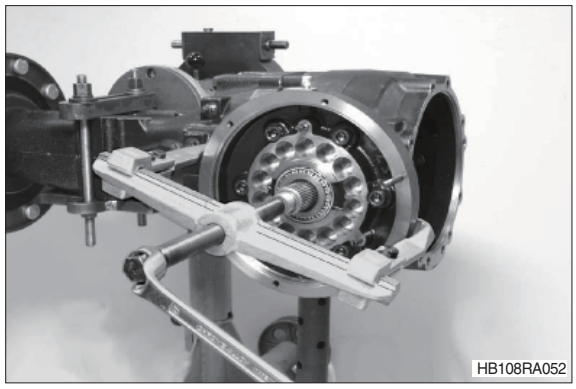


(6) Remove compression springs.



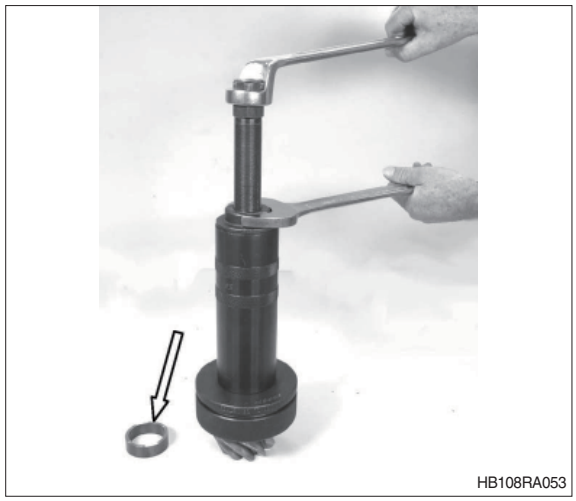
(7) Press off input pinion by means of two-armed puller – pay attention that releasing bearing inner ring does not drop.

※ The input pinion can also be dismantled on the disassembled brake housing.



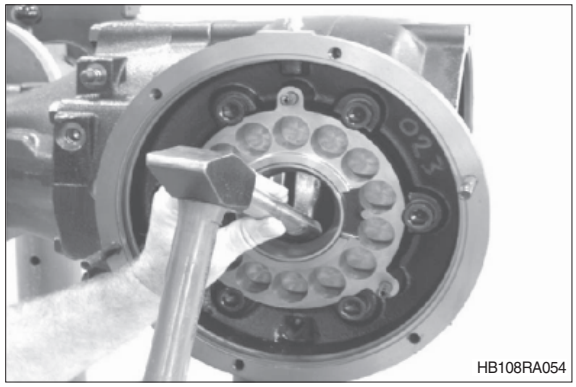
(8) Remove spacer ring (arrow) from input pinion and pull off bearing inner ring.

Grab sleeve	5873 001 037
Basic tool	5873 001 000


HB108RA053

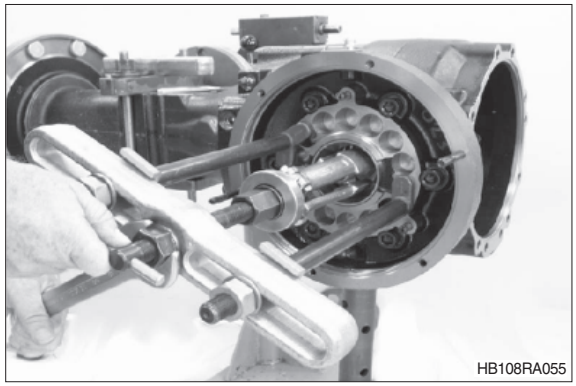
(9) Drive internal bearing outer ring off the housing hole - pay attention that releasing shim (contact pattern/ bevel gear set) does not drop.

※ Mark shim (strength/position and bearing allocation).


HB108RA054

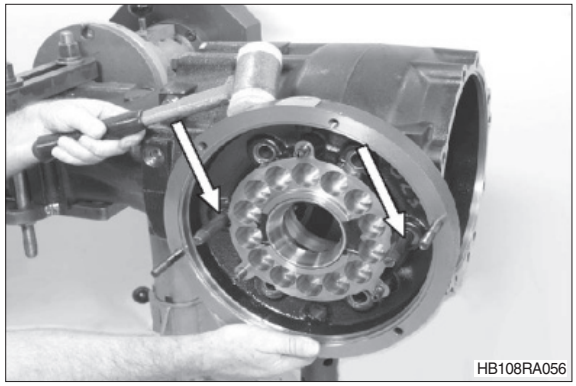
(10) Pull out external bearing outer ring.

Internal extractor	5870 300 019
Counter support	5870 300 020


HB108RA055

(11) Loosen cylinder screws, turn in two adjusting screws (M16)-see arrows-and separate brake housing by means of slight hits with a plastic hammer.

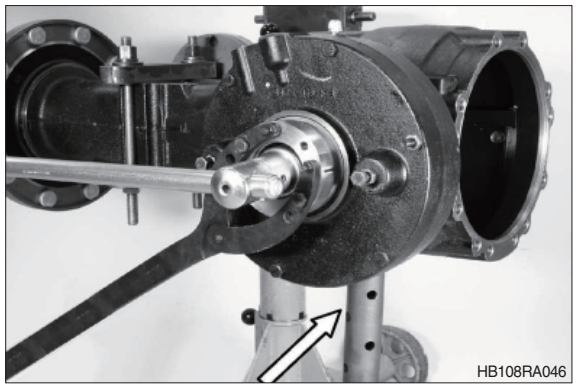
Adjusting screws (M16)	5870 204 023


HB108RA056

5) DISASSEMBLY
PARKING BRAKE (multi disc brake)

※ Disassembly of parking brake (multi-disc brake) was shown as part of the whole disassembly of the axle- disassembly, however, can also be made on the fully mounted axle.

⚠ Secure axle by means of a support - see arrow.

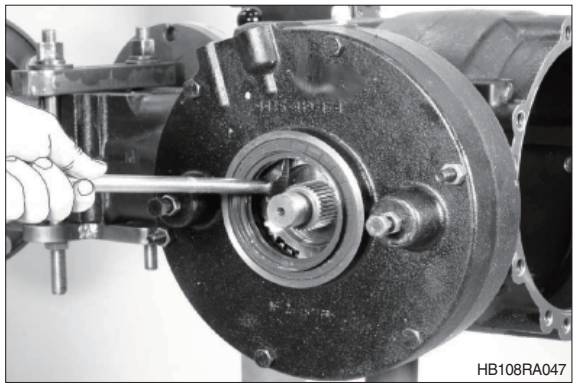

HB108RA046

(1) Fix input flange using a clamping fork, loosen hexagon nut and pull off input flange.

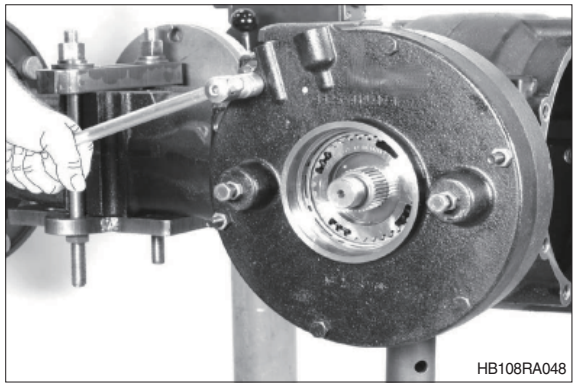
※ Difficult disassembly. Hexagon nut has been located with locking compound (loctite), if required, heat up hexagon nut with hot air blower.

Clamping fork 5870 240 025

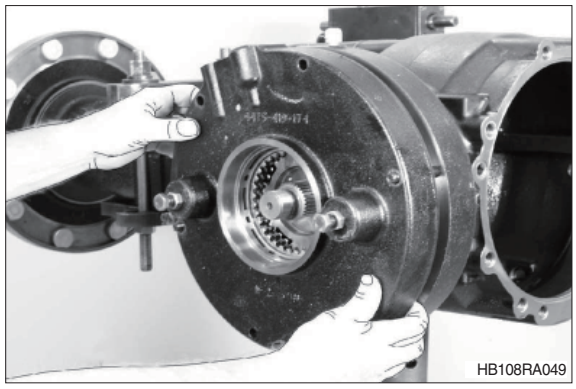
(2) If required – lift off shaft seal with lever.


HB108RA047

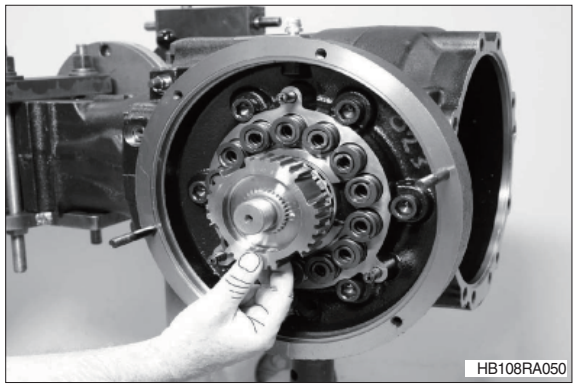
(3) Remove hexagon screws of brake housing bolted connection and loosen the two hexagon nuts evenly (brake housing is subject to compression spring preload).


HB108RA048

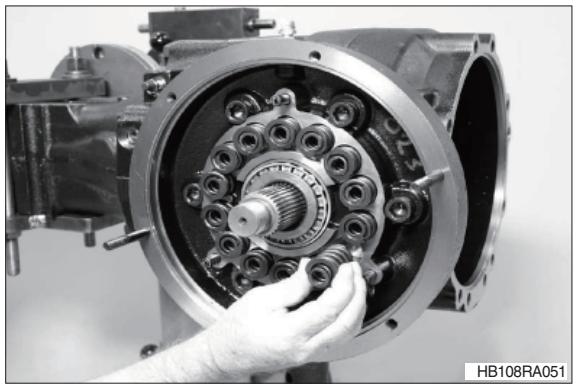
(4) Take off the cpl. brake housing cover.


HB108RA049

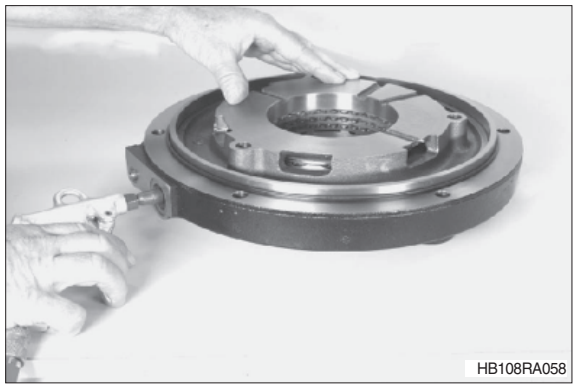
(5) Remove disc carrier.


HB108RA050

(6) Remove compression springs.


HB108RA051

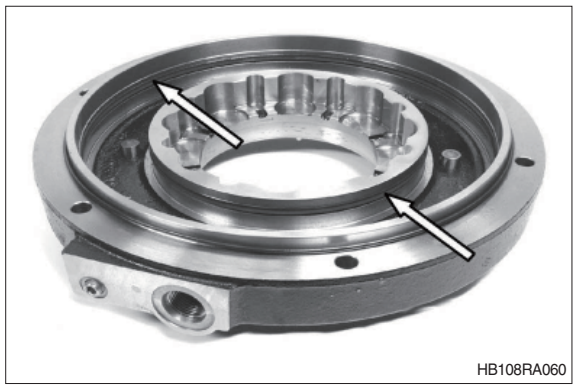
(7) Press piston out of brake housing cover by means of compressed air.


HB108RA058

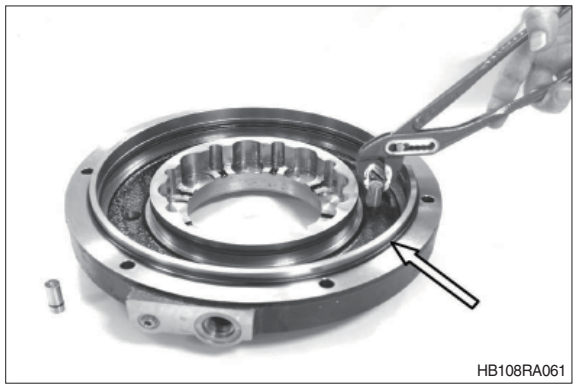
(8) Take disc package out of brake housing cover.


HB108RA059

(9) Remove sealing elements-see arrows- from the grooves of the brake housing cover.

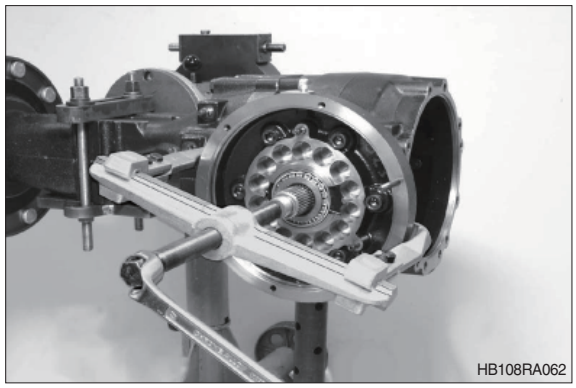

HB108RA060

(10) Pull off both bolts (with O-ring). Remove O-ring (arrow).


HB108RA061

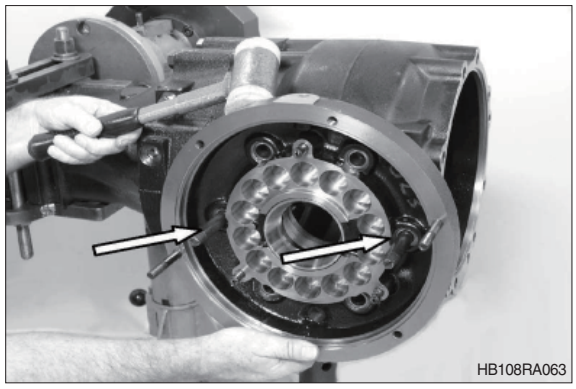
(11) If required, disassemble brake housing (figure RA062+063) : For this purpose, the cpl. differential must be dismounted first-in this connection see parts of section **3) Disassembly differential of page 3-165.**

Press-off input pinion using a two-armed puller-pay attention that releasing bearing inner ring does not drop.


HB108RA062

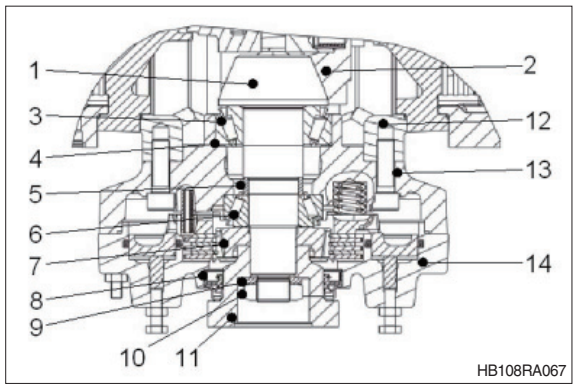
(12) Loosen cylinder screws, turn in two adjusting screws (M16)-see arrows-and separate brake housing by means of slight hits with a plastic hammer.

Adjusting screws (M16) 5870 204 023



6) REASSEMBLY - INPUT

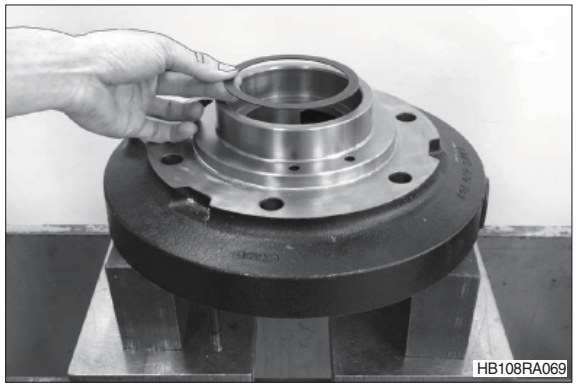
※ The adjacent figure shows the INPUT in the axle with parking brake (multi-disc brake).



Legend :

1 = Input pinion
2 = Crown wheel
3 = Inner roller bearing
4 = Shim (contact pattern)
5 = Adjust ring (rolling torque)
6 = Outer roll bearing
7 = Disc carrier
8 = Shaft seal
9 = Washer
10 = Hexagon nut
11 = Flange
12 = Axle drive housing
13 = Brake housing
14 = Brake housing cover

(1) Determine shim for pinion position required to obtain an optimum contact pattern on the bevel gear set (crown wheel/pinion) :



① Insert shim (e.g. S = 1.60 mm) into hole of brake housing.

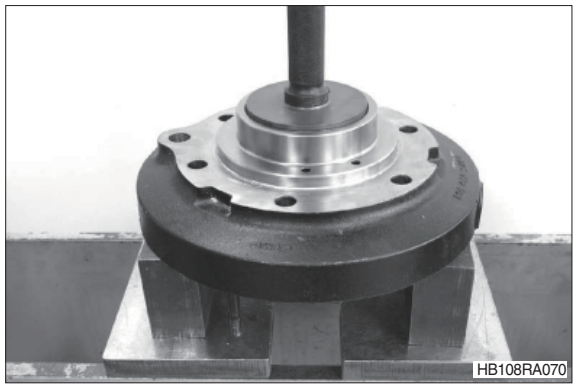
※ We would recommend to reinstall the shim found during disassembly (e.g. S = 1.60 mm – refer to disassembly instructions, page 3-173, figure RA056) into the inner bearing hole /pinion bearing.

※ As an alternative, e.g. when assembl-ing new parts (pinion or roller bearing) – a basic setting of the required pinion position can be made as described below (figure RA075~078).

※ The contact pattern required on the bevel gear set, however, is decisive. Any deviation – see contact pattern check on page 3-190 figure RA106, demands a correction of the pinion position by a corresponding shim.

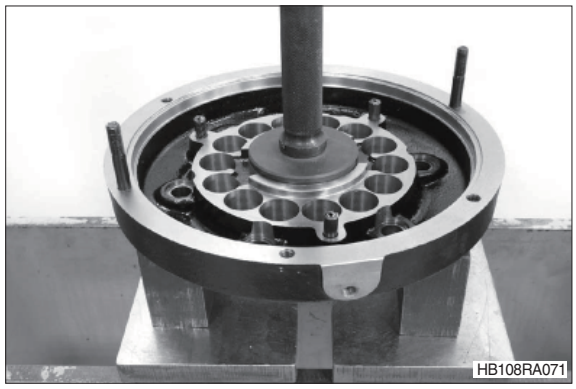
② Insert bearing outer ring until contact is obtained.

Driver	5870 058 078
Grip	5870 260 002


HB108RA070

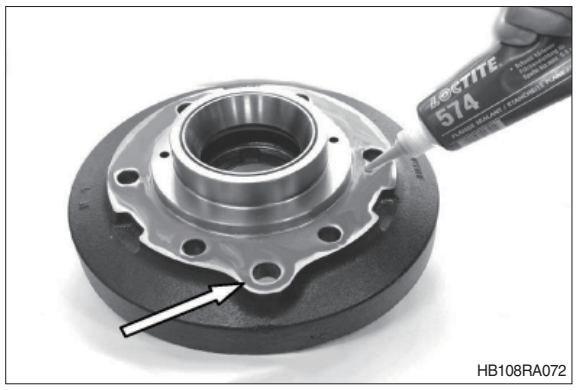
③ Insert bearing outer ring until contact is obtained.

Driver	5870 058 078
Grip	5870 260 002


HB108RA071

④ Apply sealing agent (loctite #574) to contact face of brake housing /axle drive housing.

※ Area around oil return hole (arrow) must fully be wet.

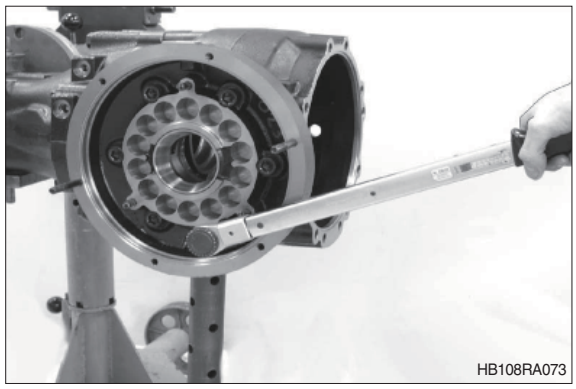


HB108RA072

⑤ Mount pre-assembled brake housing and fix with cylinder screws.

※ Ensure a correct installation position regarding oil return hole location.

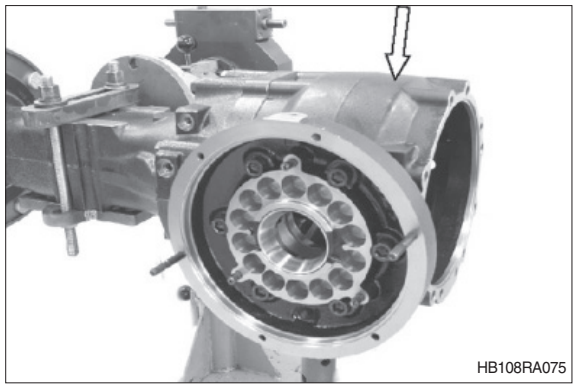
· Tightening torque (M16/8.8) :
19.9 kgf · m (144 lbf · ft)


HB108RA073

Basic setting of pinion position :

① Read dimension I = dimension for production/axle drive housing (from axle center line to bearing contact/inner bearing hole) from brake housing (position-see arrow).

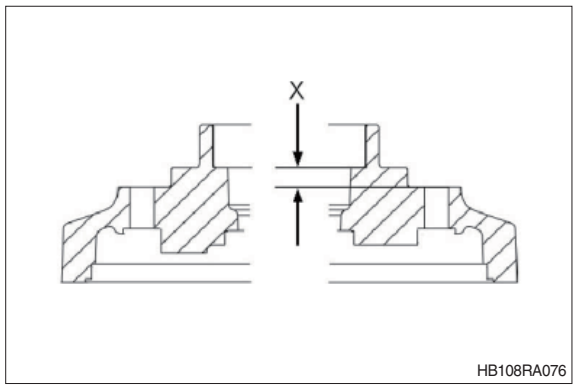
Dimension I e.g. ····· 165.04 mm


HB108RA075

② Just for assembly of a **new** brake housing (figure RA075+076) :

Determine dimension X (contact face/ brake housing to locating face tapered roller bearing) of brake housing OLD and brake housing NEW.

※ Any difference caused by production must be taken into consideration accordingly in dimension I (see figure RA075).



HB108RA076

③ Read pinion dimension (distance standard dimension = 127.0) from pinion, in case of a + or - deviation of the distance standard dimension caused by production, the actual value is indicated on the pinion.
e.g. :
Pinion dimension - without + or - deviation = 127.0 mm
Pinion dimension - with a $^{+0.1}$ deviation = 127.1 mm
Pinion dimension - with a $^{-0.1}$ deviation = 126.9 mm

Dimension II (pinion dimension) e.g.
····· 126.90 mm

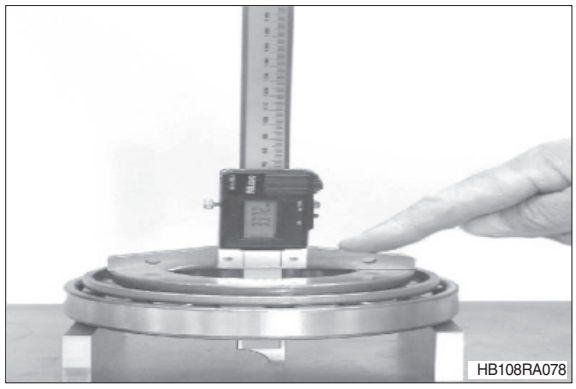

HB108RA077

④ Determine dimension III bearing width, making sure that the rollers are located without clearance (rotate bearing inner ring in both directions several times-roller setting).

Since the installed roller bearing is subject to a preload in installation position, deduct an experience value of $_{-0.05}$ mm.

Dimension III = e.g. ····· 36.60 mm
-0.05 mm → 36.55 mm

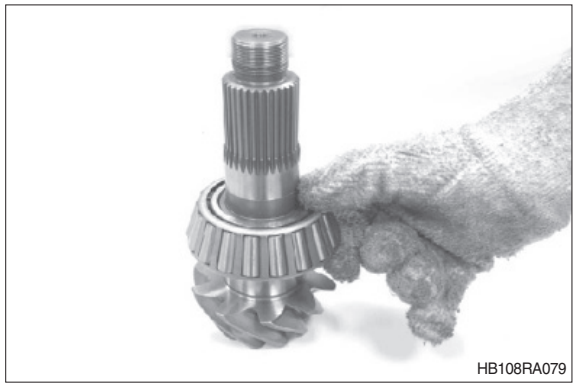
Calculation example e.g. :
Dimension I ····· 165.04 mm
Dimension II + III (126.90+36.55) ·····
····· -163.45 mm
Result ····· = 1.59 mm
Required shim S ····· 1.60 mm


HB108RA078

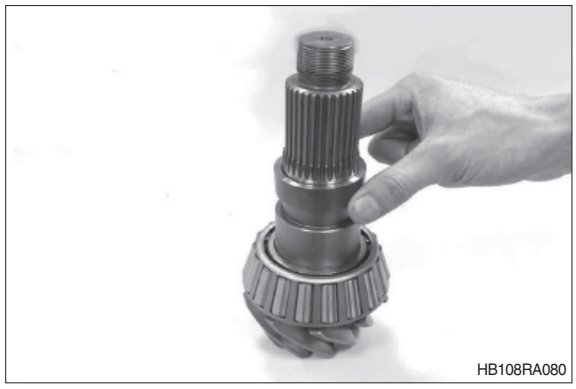
(2) Rolling torque setting of input pinion bearing:

① Mount heated bearing inner ring until contact is obtained and readjust after cooling-down.
Install spacer ring (s = optional).

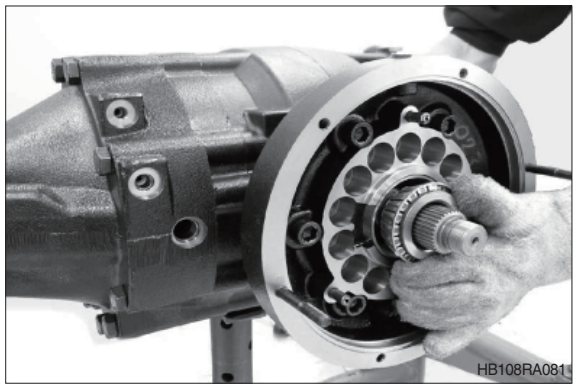
※ We recommend to reinstall the spacer ring found during disassembly (e.g. s = 16.8 mm).
If the originally mounted shim (contact pattern/bevel gear set) – see page 3-178, figure RA069 – was replaced, also install a spacer ring adjusted by the same correction value.


HB108RA079

※ However, the required bearing rolling torque is decisive, for assembly of:
New rolling bearing (without shaft seal) :
0.15~0.31 kgf · m (1.11~2.21lbf · ft)
Old rolling bearing (without shaft seal) :
0.05~0.01 kgf · m (0.36~0.74 lbf · ft)
Try to achieve upper value.
(Old = reinstalled rolling bearing).
Any deviation from the required rolling bearing - see bearing rolling torque check (figure RA084) – demands a correction of the bearing rolling torque by a corresponding spacer ring.

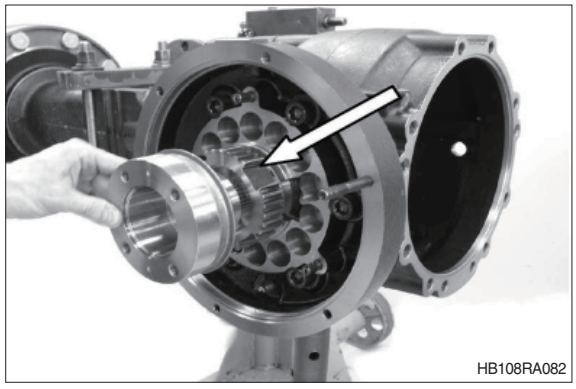

HB108RA080

② Insert pre-assembled input pinion, mount heated bearing inner ring until contact is obtained.


HB108RA081

③ Mount disc carrier (arrow). Pay attention to installation position.

Install flange.

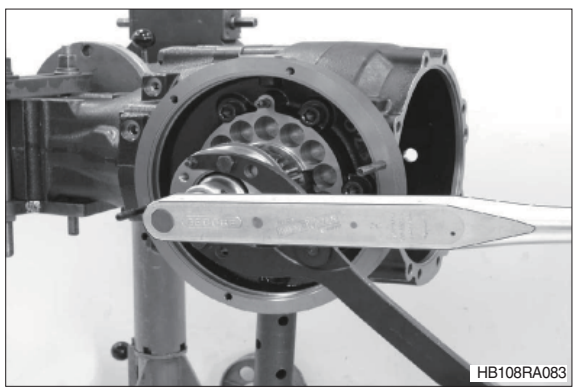

HB108RA082

④ Fix flange with washer and hexagon nut.

※ During tightening rotate pinion in both directions several times (roller setting).

· Tightening torque (M30×1.5) :
61.2 kgf · m (443 lbf · ft)

Clamping fork 5870 240 025


HB108RA083

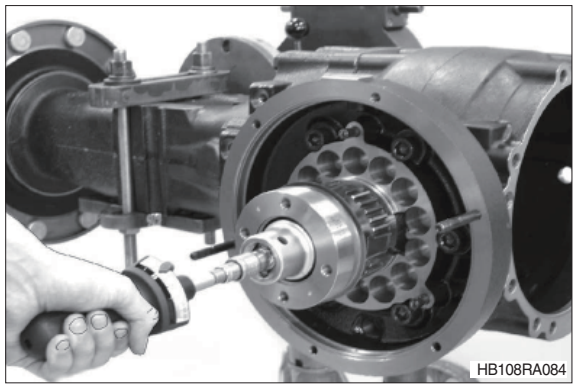
⑤ **Check rolling torque of pinion bearing.**

Required bearing rolling torque when using:

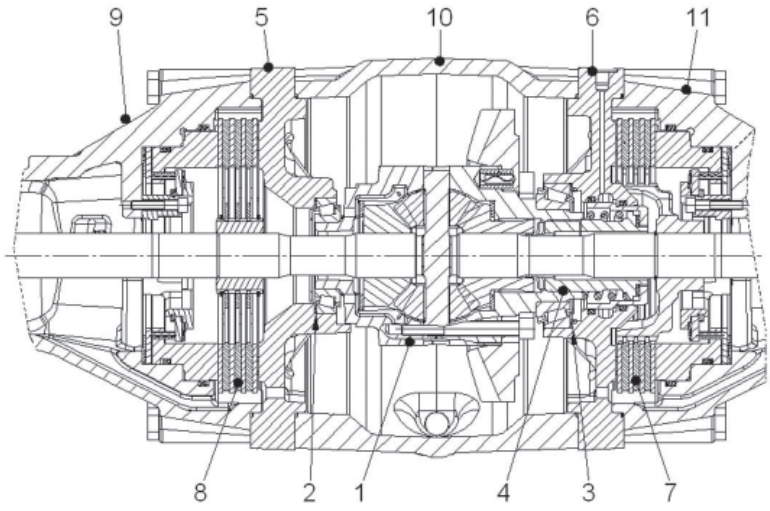
New rolling bearing (without shaft seal) :
0.15~0.31 kgf · m (1.11~2.21 lbf · ft)
Old rolling bearing (without shaft seal) :
0.05~0.01 kgf · m (0.36~0.74 lbf · ft)
Try to achieve upper value.
(Old = reused roller bearing).

※ Any deviation from the required rolling torque requires a correction by a corresponding spacer ring (see figure RA080, page 3-182).

※ If results of contact pattern check are positive, mount shaft seal and input flange according to the descriptions in page 3-208.


HB108RA084

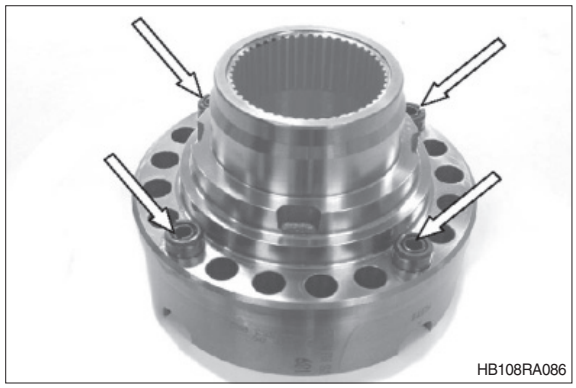
7) REASSEMBLY - DIFFERENTIAL WITH 100% LOCK



HB108RA085

1 Differential
2 Shim (backlash)
3 Shim (diff. bearing rolling torque)
4 Differential lock (100% lock)
5 Bearing housing (side opposite of crown wheel)
6 Bearing housing (crown wheel side)
7 Multi-disc brake - service brake (crown wheel side)
8 Multi-disc brake - service brake (side opposite of crown wheel)
9 Axle housing
10 Axle drive housing
11 Axle housing

(1) Install slotted pins (arrows) into differential carrier half I – observing the assembly instructions, see figure RA087.



HB108RA086

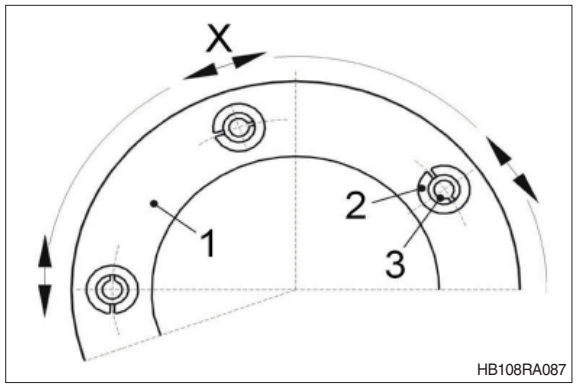
(2) Assembly instructions:

Locate slotted pin (s) with slot in direction of force (arrow).

In case of double slotted pins - bring the slots in a 180 degrees offset position to each other.

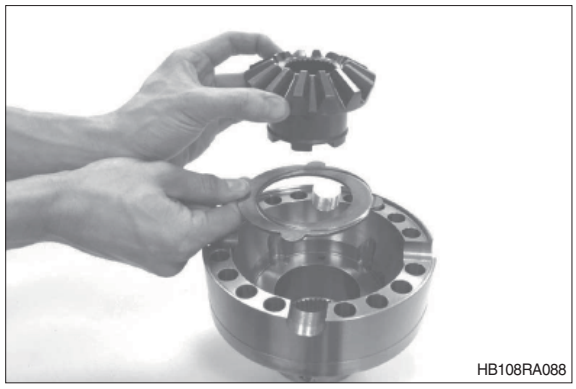
To sketch:

1 = Differential carrier
2 = Slotted pin
3 = Slotted pin (just for version with double slotted pins)
X = Direction of force



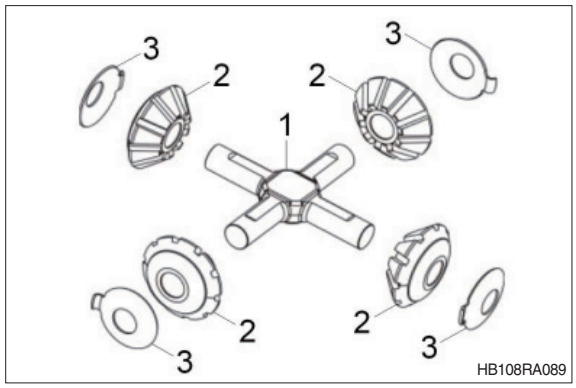
HB108RA087

(3) Insert thrust washer and axle bevel gear into differential carrier half I.



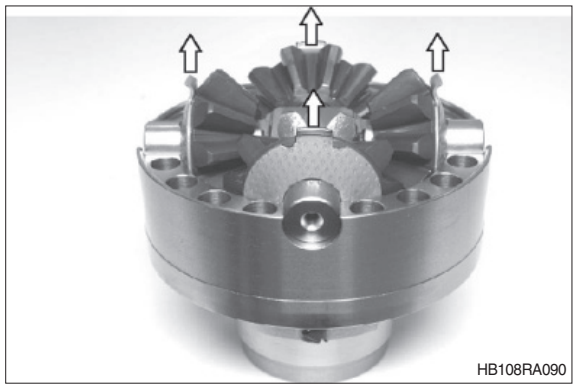
(4) Legend to sketch

1 = Differential spider
2 = Spider gear
3 = Thrust washer

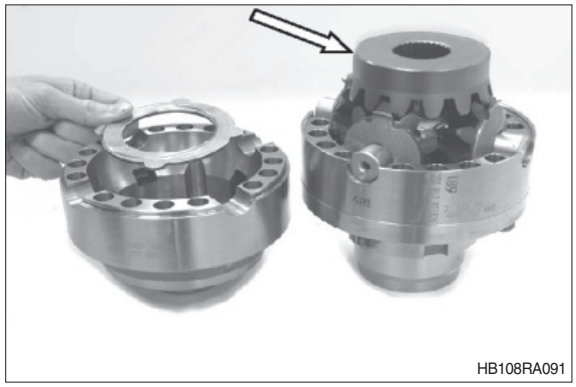


(5) Mount spider gears and thrust washers on differential spider and insert in differential carrier half I.

※ Ensure radial installation position of thrust washers.
Tab to show straight upwards (see arrows).

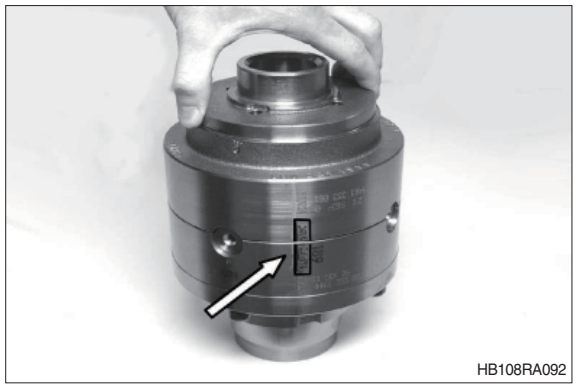


(6) Position axle bevel gear (arrow) on differential spider.
Fix thrust washer with grease (assembly aid), in differential carrier half II.

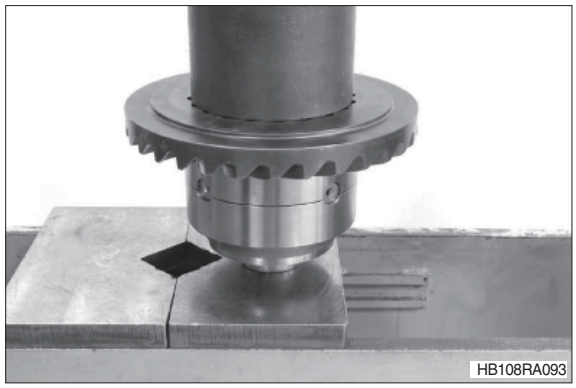


(7) Position pre-assembled differential carrier half II on differential carrier half I.

※ Ensure radial installation of both differential carrier halves – punch-marked no. …. (see arrow) corresponds to radial position marking.

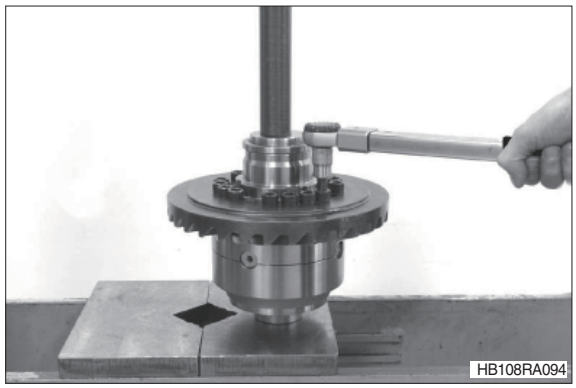

HB108RA092

(8) Position crown wheel on slotted pins and press onto differential carrier until contact is obtained.


HB108RA093

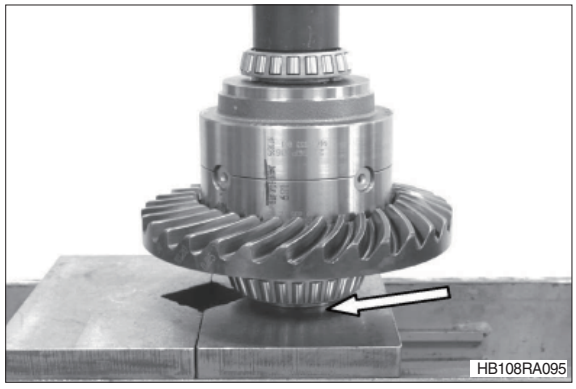
(9) Fix differential by means of a press and connect differential carrier halves with cylinder screws.

· Tightening torque (M 12/12.9) :
13.8 kgf · m (99.6 lbf · ft)


HB108RA094

(10) Install both bearing inner rings.

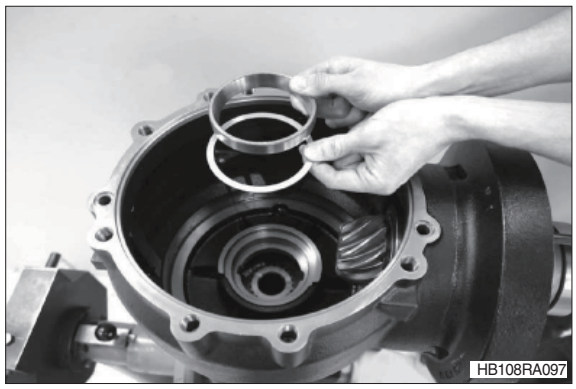
※ Use suitable support (arrow) – differential must not be supported on bearing cage.


HB108RA095

(11) Cover some tooth flanks of crown wheel with marking ink (for contact pattern check – see figure RA106, page 3-190).

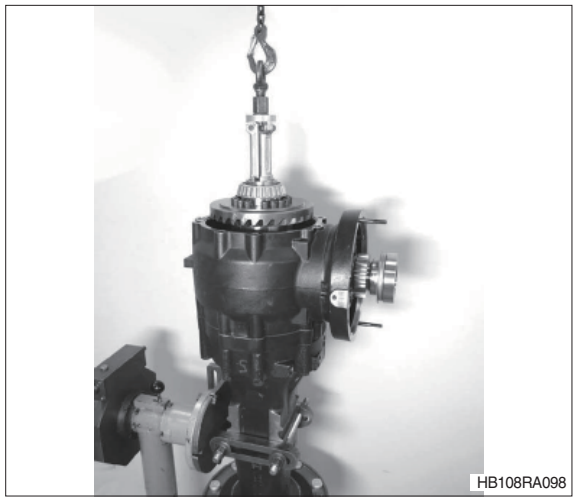
(12) Bring axle into vertical position.
Insert shim (backlash) into hole of axle housing and locate bearing outer ring until contact.
We would recommend to reinstall the shim found during disassembly – refer to disassembly instructions page 3-170, figure RA045 - (e.g. s = 1.70 mm)

※ The required backlash, however, is decisive for the shim (s), to be used – see figure RA103, page 3-189.



(13) Insert preassembled differential.

Internal extractor	5870 300 019
Eye nut	5870 204 027



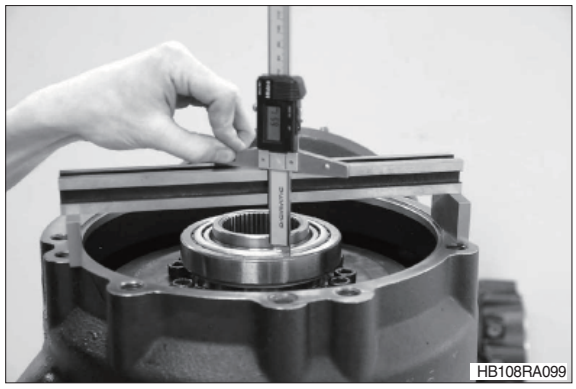
(14) Position bearing outer ring on bearing inner ring, until all rollers are located without clearance.

※ For the following determination of dimension pay attention to an exact contact of the bearing outer ring and a correct positioning of the differential.

Determine dimension A - from mounting face/axle drive housing to front face/bearing outer ring (take measurements at several points and find out mean value).

Dimension I e.g. ····· 6.64 mm

Straightedge 5870 200 022


HB108RA099

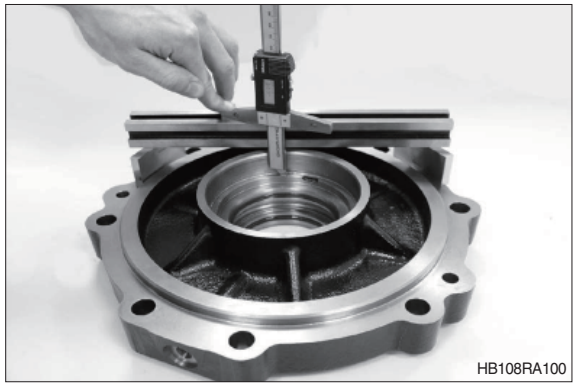
(15) Determine dimension II – from mounting face /bearing housing to bearing hole/ bearing outer ring contact.

Dimension Z e.g. ····· 5.35 mm

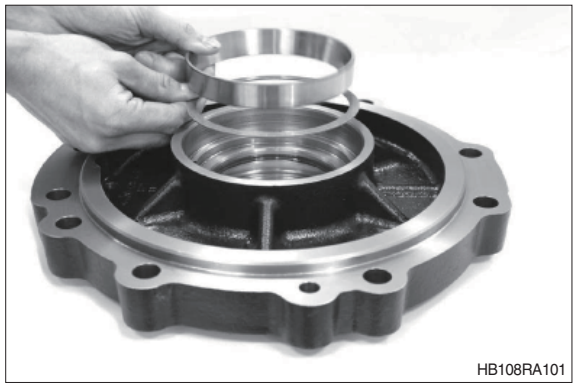
Calculation example :

Dimension I e.g. ····· 6.64 mm
Dimension II e.g. ····· – 5.35 mm
Difference ····· 1.29 mm
Bearing preload ····· + 0.10 mm
Result ····· = 1.39 mm
Required shim (s)····· = 1.40 mm

※ A bearing preload of 0.10 mm corresponds to a bearing rolling torque of approximate 0.10~0.41 kgf · m (0.72~2.95 lbf · ft), if new bevel roller bearings are used.


HB108RA100

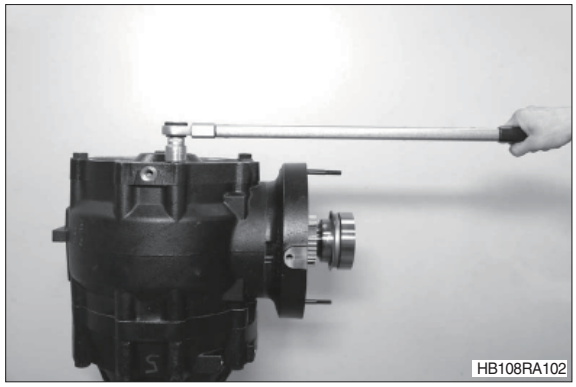
(16) Insert determined shim (e.g. s = 1.40 mm) into hole of bearing housing and locate bearing outer ring until contact.


HB108RA101

(17) Mount preassembled bearing housing (without O-rings). Bring it to contact position and fix provisionally with hexagon screws (3x with washer, L = 70 mm).

※ Rotate differential in both directions several times – roller setting (also see below figure).

· Tightening torque (M16/8.8) :
19.9 kgf · m (144 lbf · ft)

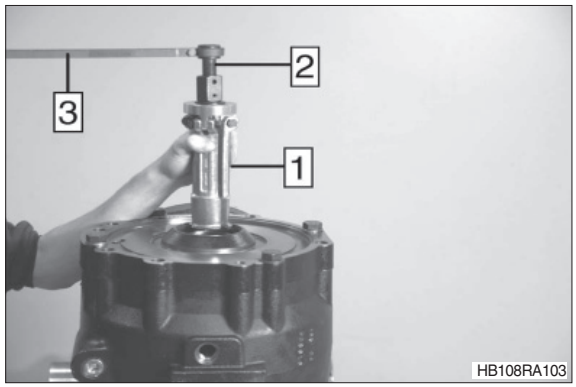

HB108RA102

Check of backlash and of bevel gear set contact pattern:

(18) Insert cylinder screw (2) into internal extractor (1) and fix straightedge (3) and internal extractor in the hole of the differential carrier.

※ Internal extractor must not be positioned in the axle bevel gear.

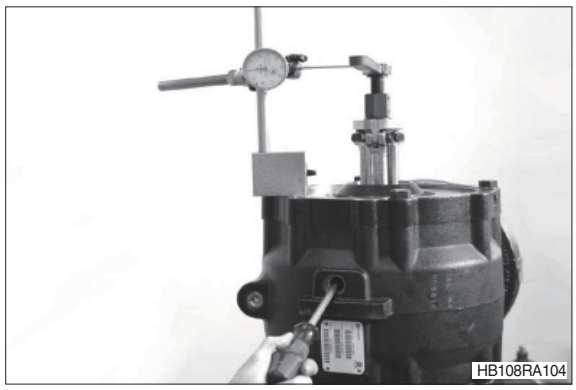
Internal extractor	5870 300 019
Cylinder screw (M20)	0636 101 468
Straightedge	5870 200 087



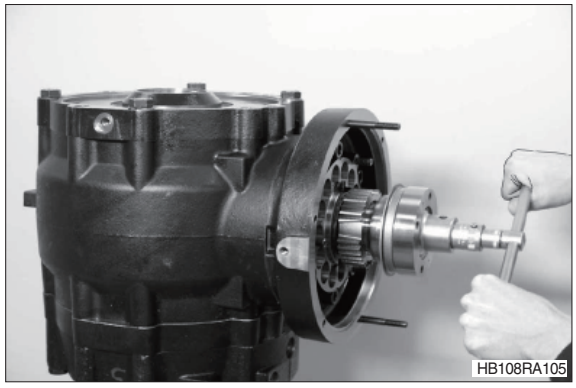
HB108RA103

(19) Place dial indicator (3) at right angles to the straight edge (1) within a distance corresponding to the outer diameter of the crown wheel (r = approx 126 mm) –and check backlash.
Backlash 0.15~0.25

※ Any deviation from the required backlash requires its correction with corresponding shim (s) - see figure RA097, page 3-187.
A correction of the shim/backlash also requires a counter-correction of shim/diff bearing rolling torque - see figure RA101.


HB108RA104

(20) For contact pattern check, roll input pinion against crown wheel in both directions (drive and coast side engagement).


HB108RA105

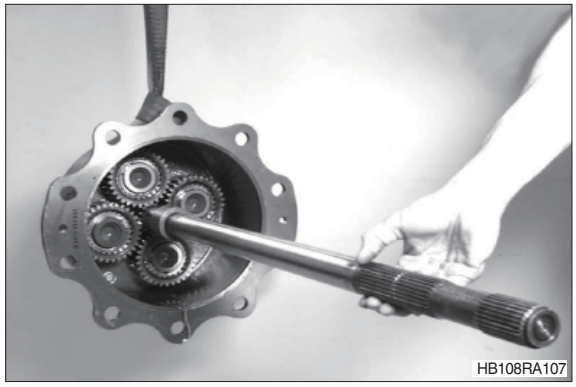
(21) Remove differential again.
Compare contact pattern with contact pattern examples on page 3-213.

※ If contact pattern differs considerably, use a corresponding shim (see figure RA069, page 3-178) for correction.

A correction of the shim/contact pattern also influences the backlash – check once again (see figure RA104).

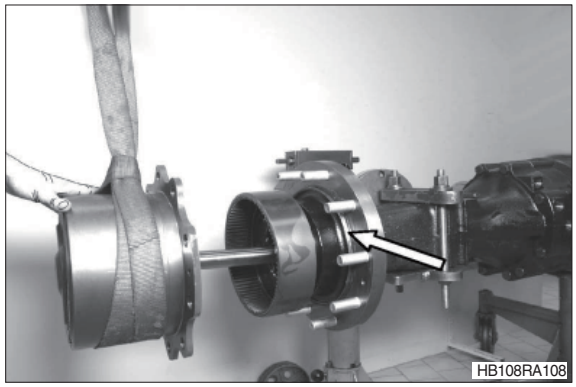

HB108RA106

(22) Place sun gear shaft and stub shaft into the planetary carrier (output opposite to crown wheel).


HB108RA107

(23) Mount planetary carrier, and insert stub shaft into the planetary carrier (service brake).

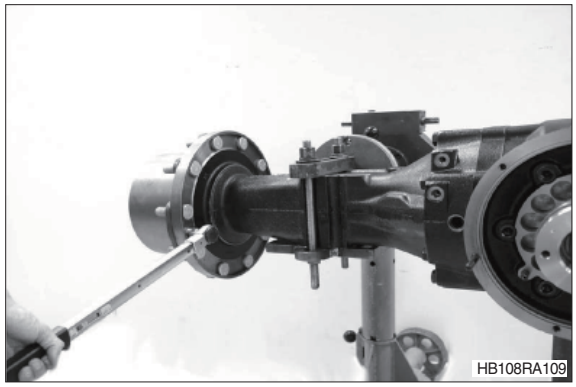
※ Pay attention to mounted O-ring (arrow).


HB108RA108

(24) Fix planetary carrier with hexagon screws.

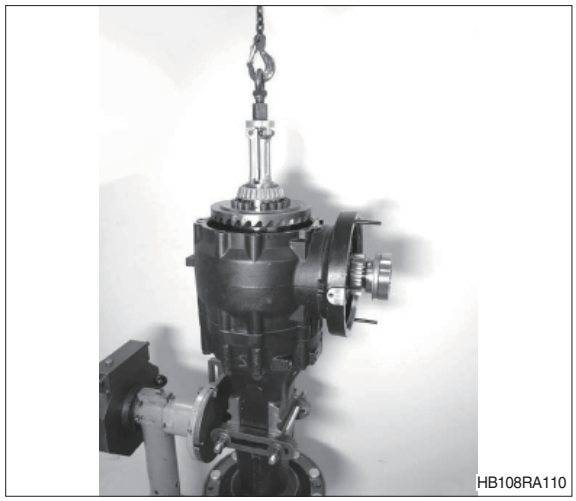
※ Insert hexagon screws with locking compound (loctite #243).

· Tightening torque (M12/8.8) :
5.61 kgf · m (40.6 lbf · ft)


HB108RA109

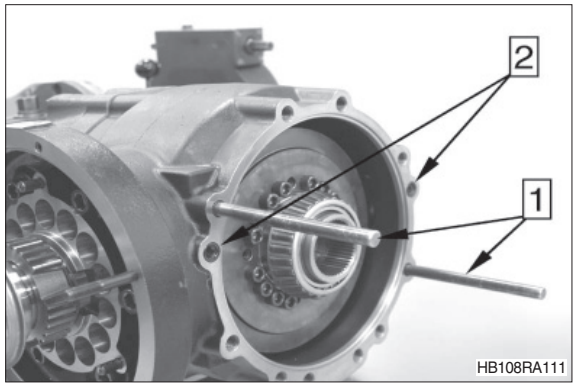
(25) Relocate differential, and insert stub shaft into the axle bevel gear.

Internal extractor	5870 300 019
Eye nut	5870 204 027

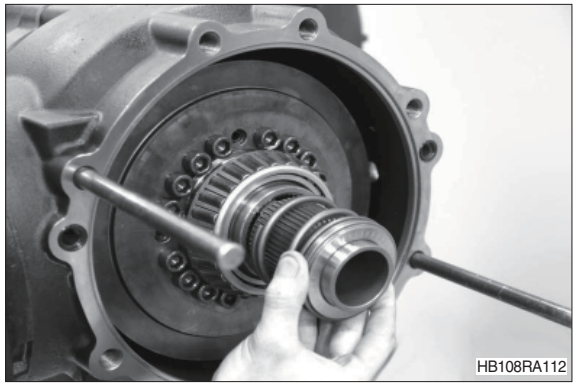


(26) Install adjusting screws (1) and fix both O-rings (2) with grease (assembly aid) into the countersinks of the axle drive housing.

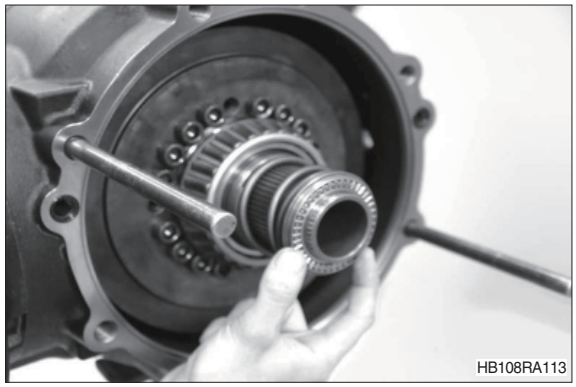
Adjusting screws/M16 (1 set = 2 pcs.)
5870 204 053



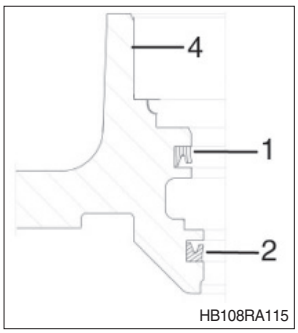
(27) Insert locking slide with mounted compression spring.



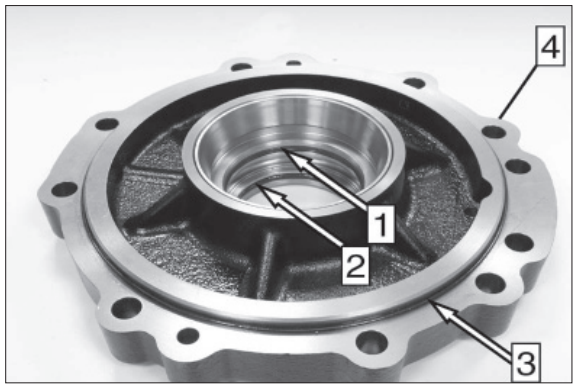
(28) Mount axial needle cage on locking slide. Fix axial needle cage with grease – assembly aid.



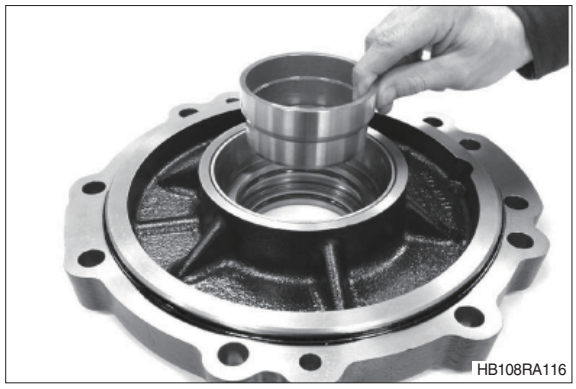
(29) Oil both grooved rings (1 + 2) and place into annular grooves of the bearing housing – paying attention to the installation position (see detailed sketch).
Install O-ring (3).



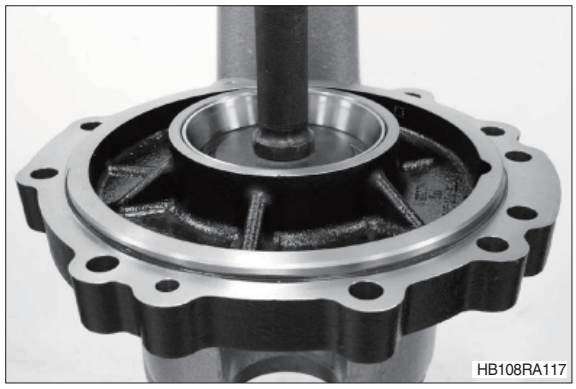
1 = Grooved ring
2 = Grooved ring
3 = O-ring
4 = Bearing housing



(30) Oil sealing surface and insert piston.

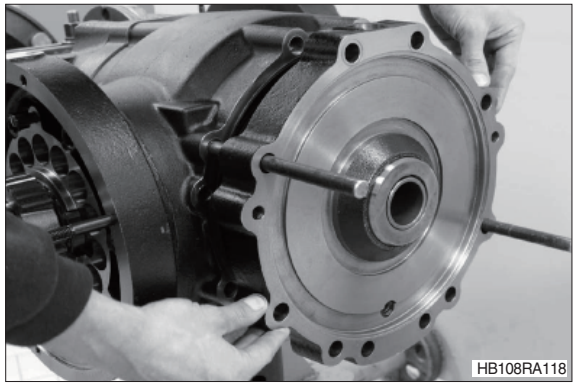


(31) Press piston to contact position.

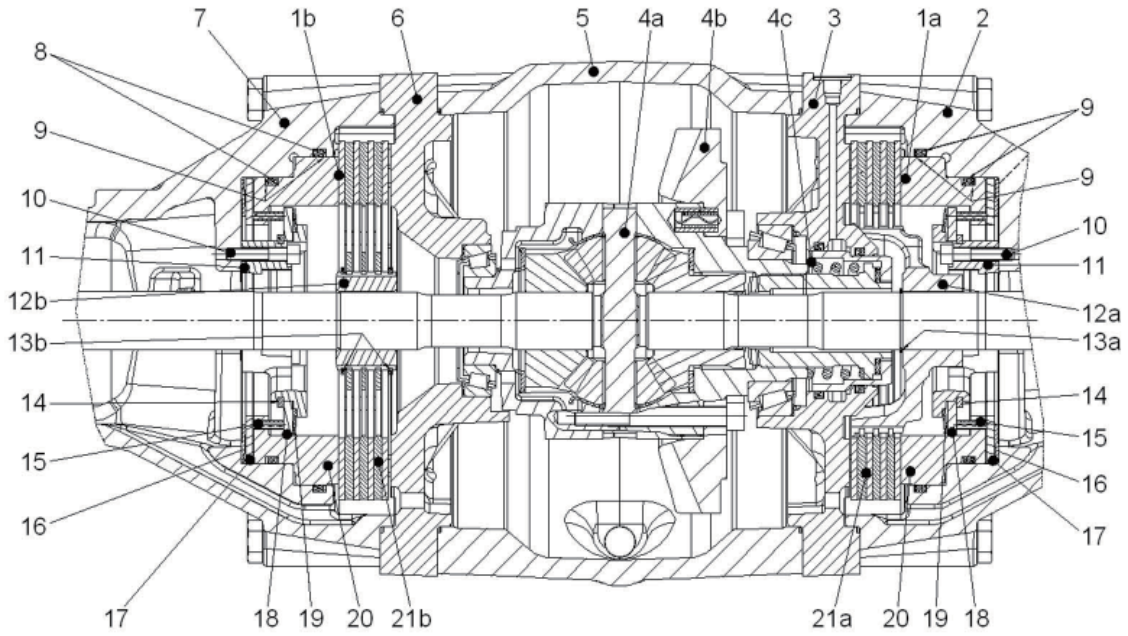


(32) Mount preassembled bearing housing.

※ Check leakage of 100% lock.
- See page 3-199, figure RA141.



8) ASSEMBLY - SERVICE BRAKE (multi-disc brake)



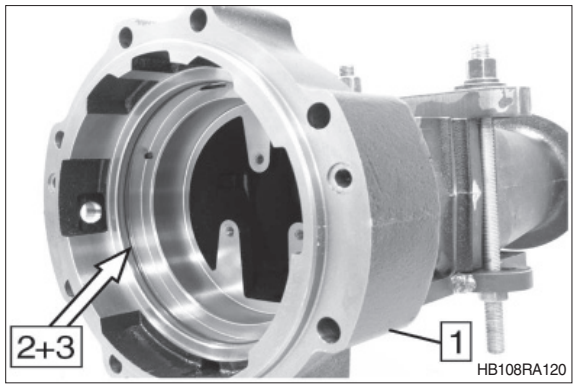
HB108RA119

1	Service brake (multi-disc brake)	12	Disc carrier
1a	Crown wheel side (CS)	12a	Disc carrier (CS)
1b	Side opposite of crown wheel (SOC)	12b	Disc carrier (SOC)
2	Axle housing (CS)	13	Retaining ring
3	Bearing housing (CS)	13a	Retaining ring (CS)
4	Differential assy	13b	Retaining rings (SOC)
4a	Differential	14	Retaining ring
4b	Crown wheel	15	Slotted pin
4c	100% lock	16	Cup spring
5	Axle drive housing	17	Washer
6	Bearing housing (SOC)	18	Washer
7	Axle housing (SOC)	19	Cup spring
8	Grooved ring	20	Piston
9	Back-up ring	21	Disc package
10	Cylinder screw	21a	Disc package (CS)
11	Ring	21b	Disc package (SOC)

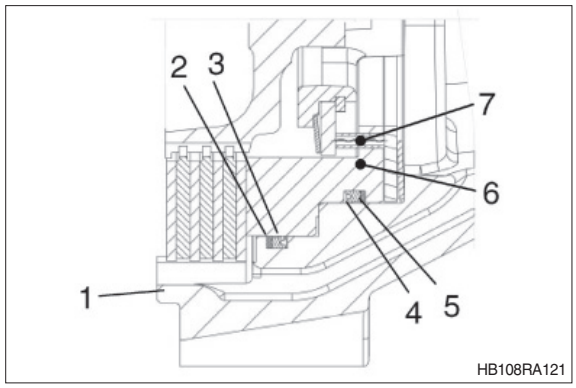
※ Below, the reassembly of the service brake on the axle housing (CS = crown wheel side) is shown. For reassembly of the service brake on the other axle housing (SOC = side opposite of crown wheel) proceed in the same way.

(1) Insert sealing elements (2+3 – see below sketch) into annular groove (arrow) of the axle housing.

※ Pay attention to installation position of the sealing elements.



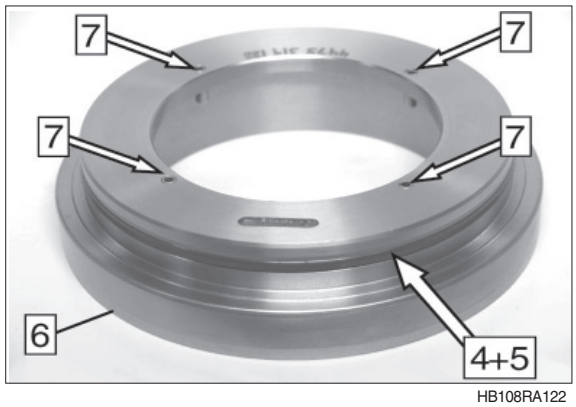
(2) 1 = Axle housing
2 = Back-up ring
3 = Grooved ring
4 = Grooved ring
5 = Back-up ring
6 = Piston
7 = Slotted pins



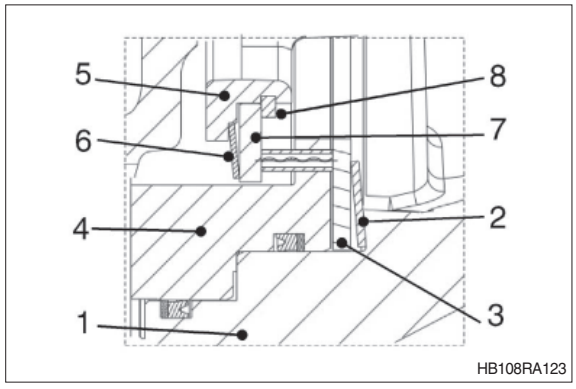
(3) Insert sealing elements (4+5 – see sketch) into annular groove (arrow) of piston (6).

※ Pay attention to installation position of sealing elements.

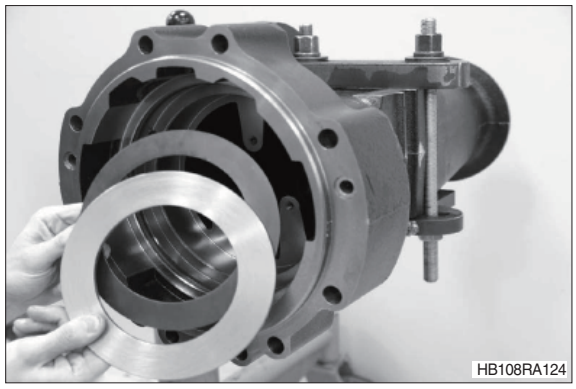
Flush-mount slotted pins (7) (front face) into piston (6), or relocate – if not dismantled.



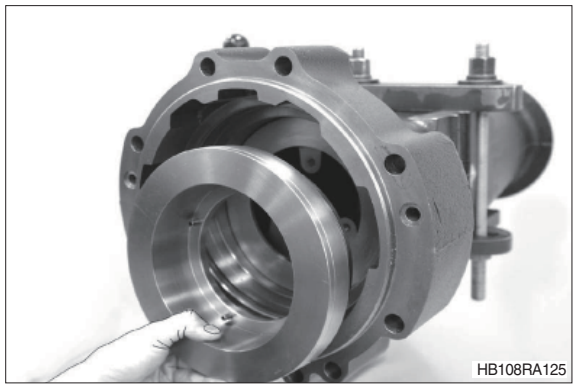
(4) 1 = Axle housing
2 = Cup spring
3 = Washer
4 = Piston
5 = Ring
6 = Cup spring
7 = Washer
8 = Retaining ring



(5) Locate cup spring (2) – **paying attention to correct installation position (see sketch RA123)** - and washer (3) into axle housing (1).

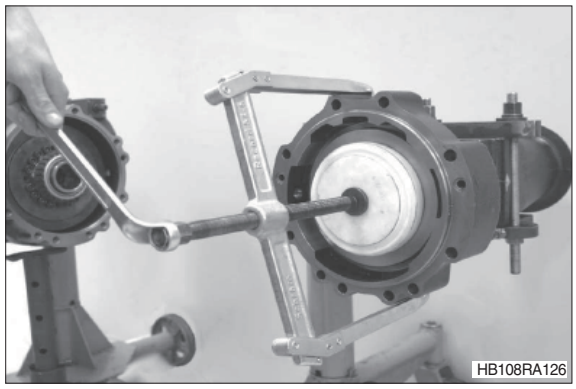

HB108RA124

(6) Oil grooved rings and sealing surfaces of axle housing and piston.
Mount pre-assembled piston (1).


HB108RA125

(7) Push piston to contact position using a two-armed puller and a pressure plate.

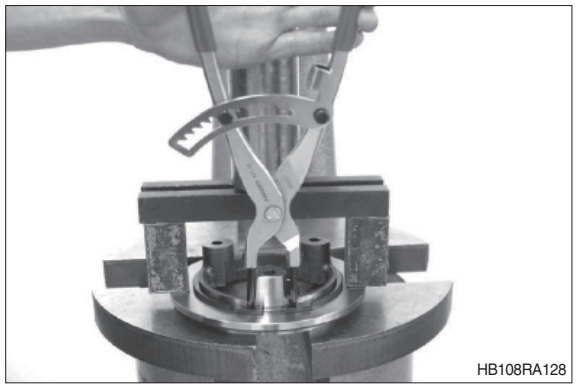
※ Pay attention to the slotted pins placed in the piston.
Ensure that position of located slotted pins does not change – pressure plate may only touch piston front face.


HB108RA126

(8) Mount cup spring (6) – **paying attention to correct installation position (see sketch RA123)** - and washer (7) on ring (5).


HB108RA127

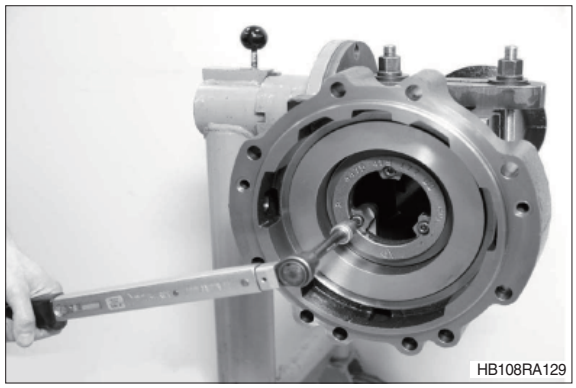
(9) Press down cup spring preload using a press, and snap in retaining ring (8).



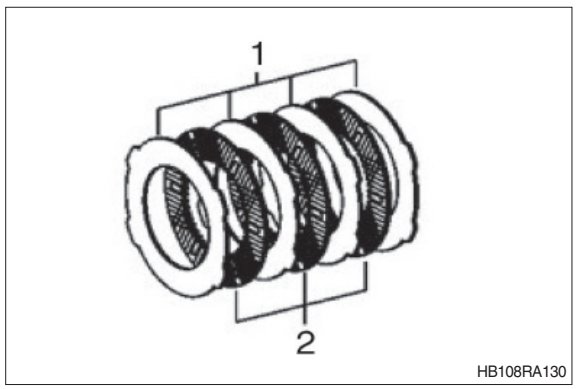
(10) Insert preassembled ring and fix with cylinder screws.

※ Install cylinder screws with locking compound (loctite #262).

· Tightening torque (M8/8.8) :
2.35 kgf · m (17 lbf · ft)

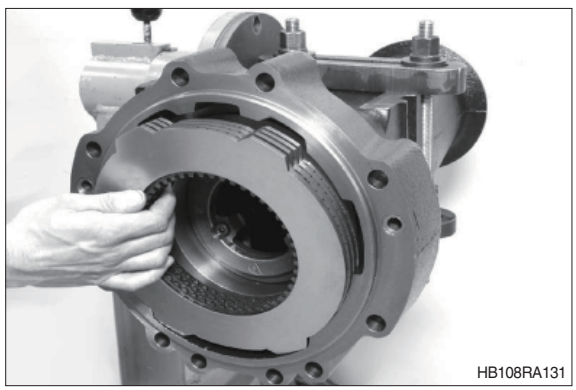


(11) 1 = Outer discs
2 = Inner discs (lined discs)

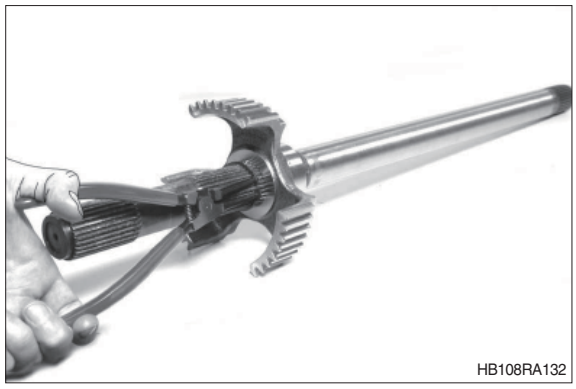


(12) Locate disc package – **taking the disc arrangement into consideration (see sketch above).**

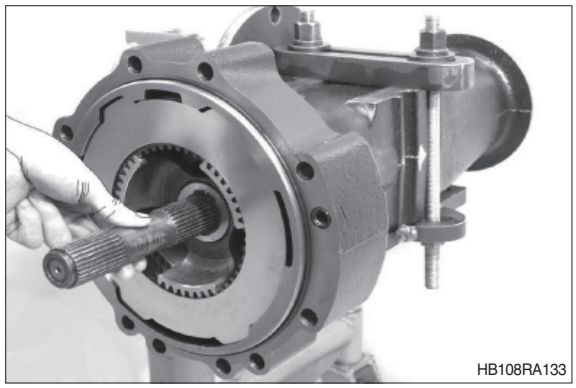
※ Fix outside disc with grease – assembly aid.



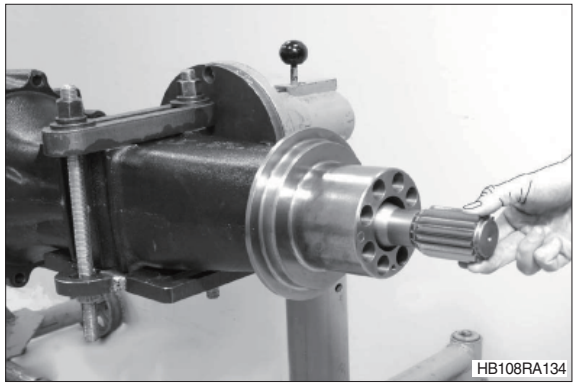
(13) Mount disc carrier – **paying attention to correct installation position (see figure)** –and snap in retaining ring.



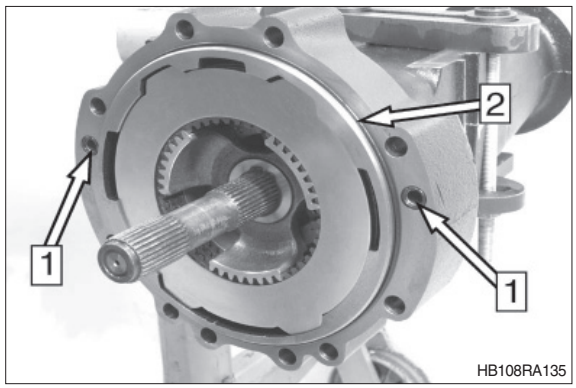
(14) Insert pre-assembled stub shaft until all inner discs are mounted.



(15) Mount sun gear shaft to inserted stub shaft – assembly aid (for central position of stub shaft).

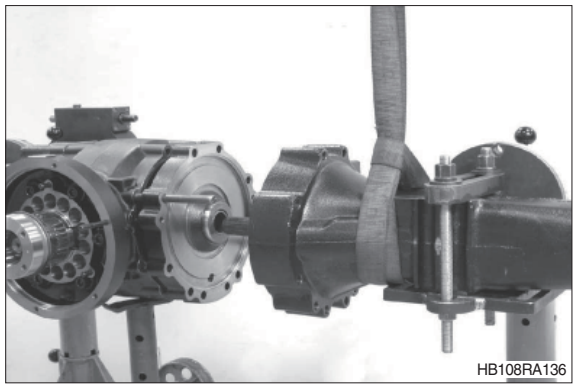


(16) Fix both O-rings (1) with grease (assembly aid) into countersinks of the axle housing.
Oil O-ring (2) and install on the axle housing.



(17) Take up cpl. axle half by means of a lifting strap and position it on bearing housing/ axle drive housing – and insert stub shaft into gearing of the axle bevel gear (differential).

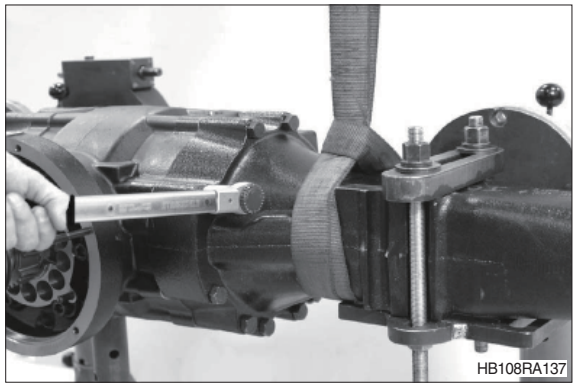
※ Pay attention to O-rings installed in the axle drive housing (see page 3-191, figure RA111) and in the axle housing (page 3-197, figure RA135).



(18) Bring axle housing equally to contact position and fix it by means of hexagon screws.

※ Rotate differential in both directions several times – roller setting.

· Tightening torque (M 16/8.8) :
19.9 kgf · m (144 lbf · ft)



Leakage test of multi-disc brake

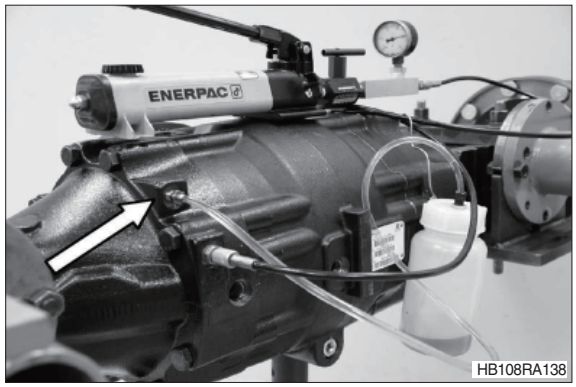
① Mount breather valve (arrow) and connect HP-pump.

HP pump	5870 287 007
Threaded coupling (9/16"-18UNF)	5870 950 115
Oil collector bottle	5870 286 072

※ Completely breathe brake prior to test start.

Leakage test:
Build up test pressure p = 60 bar – 10 bar and close shut-off valve of HP pump (maintain pressure).
A pressure drop of max 3 bar is allowed during a 2 minute testing time.

Test media:
Motor oils SAE-10W ;
API-SE,
ATF-oils : Dexron of II D



Disc clearance test of service brake:

※ The brake must fully be breathed for obtaining an objective test result of the disc clearance.

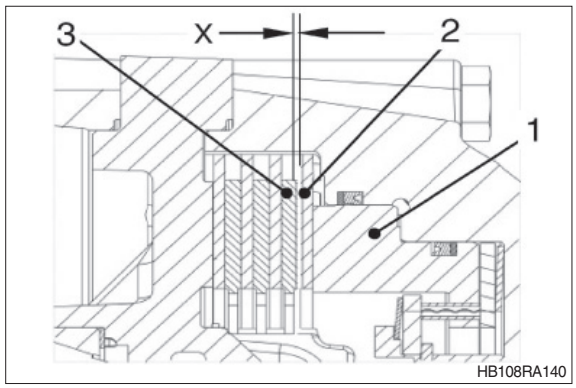
① Pressurize brake by HP pump with p = 60 bar $_{-10\ bar}$, then release brake and check disc clearance X using a feeler gauge – also refer to the next sketch.

Disc clearance X nom. = 0.4 ~ 0.75 mm

※ If the required disc clearance X is not obtained, assembly was not carried out properly, and another disassembly and reassembly is imperative.

HP pump 5870 287 007
Threaded coupling (9/16”-18UNF)
5870 950 115
Feeler gauge 5870 200 113

1 = Piston
2 = Outer disc
3 = Inner disc (lined disc)
X = Disc clearance (0.4 ~ 0.75 mm)



Leakage test of differential look (100% lock) :

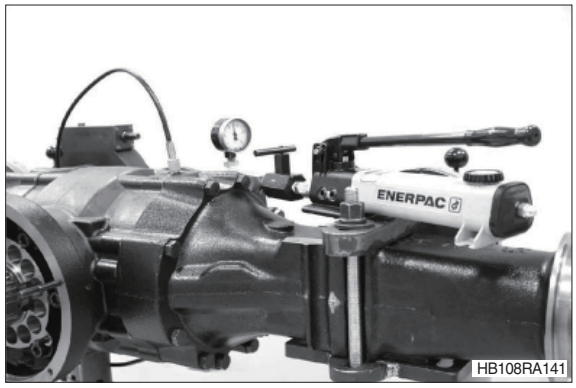
① Prior to starting the test, bleed pressure chamber and then check 100% lock.

Test:
Build up test pressure p = 13 bar and close shut-off valve of HP pump.

※ No pressure drop is allowed during a 2 minute testing time.

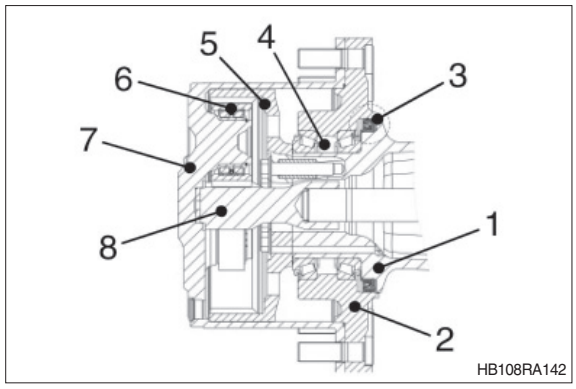
HP pump 5870 287 007
Threaded coupling (7/16-20 UNF)
5870 950 135

Test media:
Motor oils SAE-10W ;
API-SE,
ATF-oils : Dexron of II D



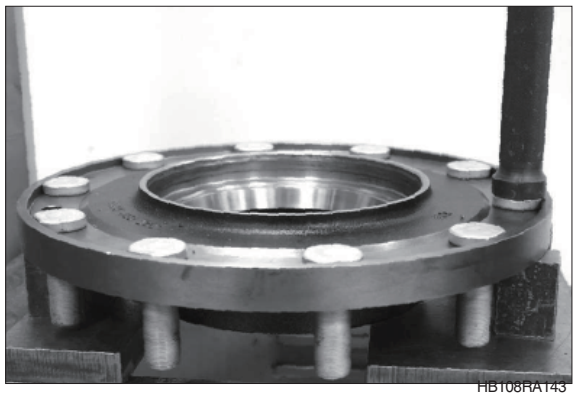
9) DISASSEMBLY - OUTPUT UNIT

1 = Axle housing
2 = Hub
3 = Shaft seal
4 = Roller bearing (hub bearing)
5 = Internal gear
6 = Planetary gears
7 = Planetary carrier
8 = Sun gear shaft



HB108RA142

(1) Mount wheel bolt.

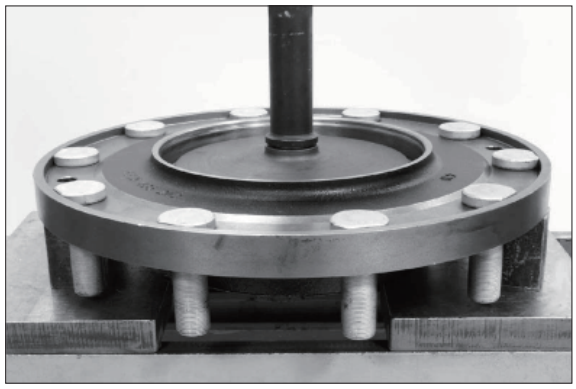

HB108RA143

(2) Install both bearing outer rings of hub bearing until contact is obtained.

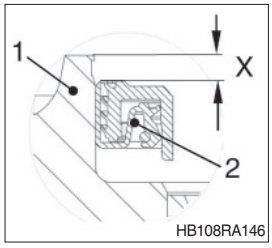
※ Hub must not be supported on wheel bolts.

Driver tool	5870 051 012
Handle	5870 260 004

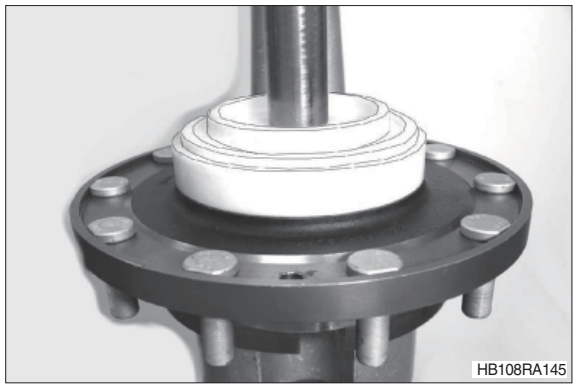
※ To ensure functioning, always use a new shaft seal when reassembling the hub – also refer to disassembly instructions page 3-161, figure RA015.


HB108RA144

(3) Apply sealing agent to contact face shaft seal/hub (loctite #574).
Mount shaft seal observing the correct installation position (labeling OUT-SIDE showing upwards / outwards) and the correct offset X –see detailed sketch.

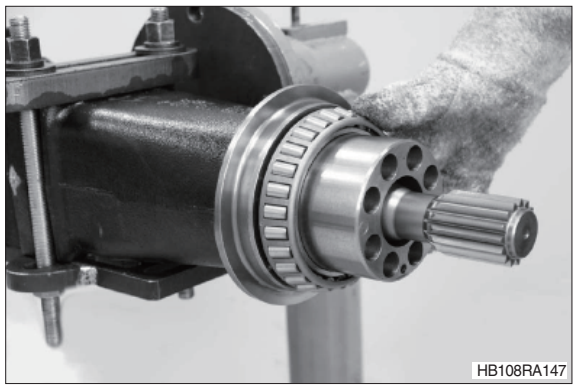


1 = Hub
2 = shaft seal
X = installation dimension 5^{+1} mm



Driver tool 5870 051 057

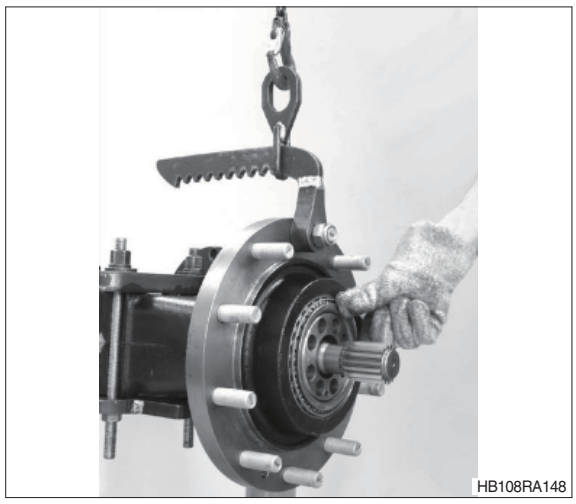
(4) Mount heated bearing inner ring until contact.



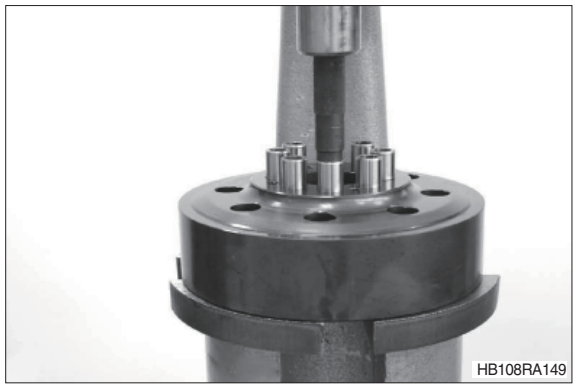
※ Just before fitting, wet the contact face shaft seal/axle housing with spirit – assembly aid.

(5) Mount preassembled hub until contact and fix it with heated external bearing inner ring.

Lifting bracket 5870 281 043

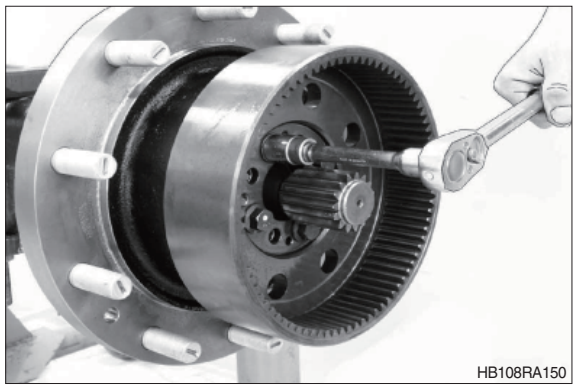


(6) If disassembled – insert bushings into the internal gear until contact is obtained.



(7) Mount preassembled internal gear and equally bring to contact position using the **old** locking screws (from disassembly).

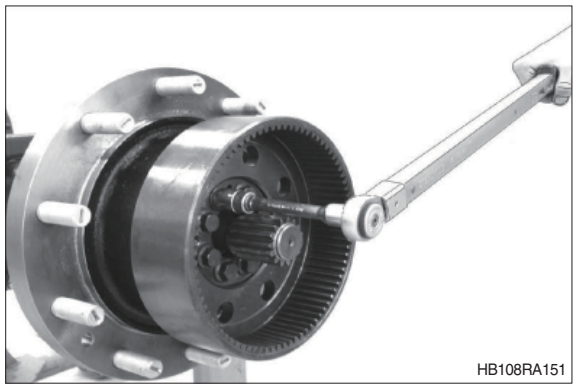
※ Rotate hub in both directions several times – roller setting.



(8) Finally fix internal gear with **new** locking screws.

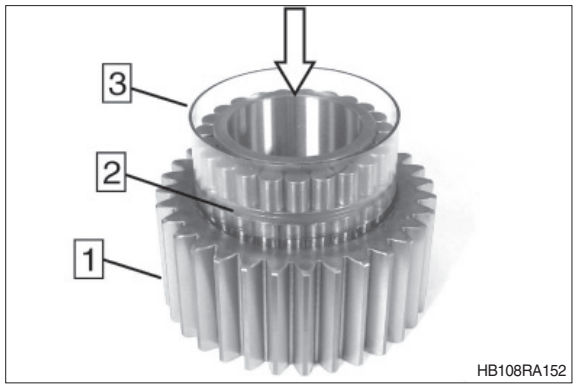
⚠ **Locking screws are permitted for one-time use only.**

· Tightening torque (M14/12.9) :
25.5 kgf · m (184 lbf · ft)



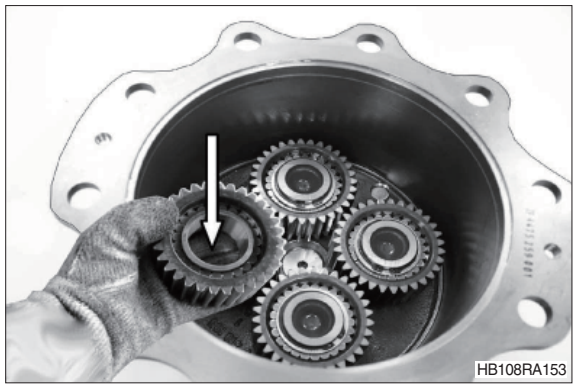
(9) Just for new parts assembly:
Insert cylinder roller bearing into the planetary gear – by pressing the roller bearing into the planetary gear by the assembly sleeve (arrow) until the snap ring engages into the annular groove of the planetary gear.

1 = Planetary gear
2 = Roller bearing (with bearing inner ring /cylinder rollers/axial washers and snap ring)
3 = Assembly sleeve



(10) Heat preassembled planetary gear (bearing inner ring) and install until contact, with large radius /bearing inner ring showing downwards (arrow).

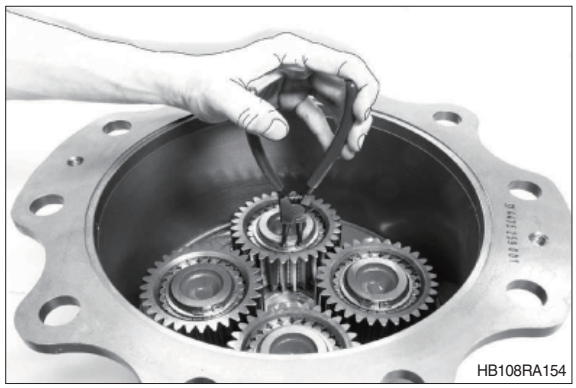
※ Adjust bearing inner ring/planetary gear after cooling down.


HB108RA153

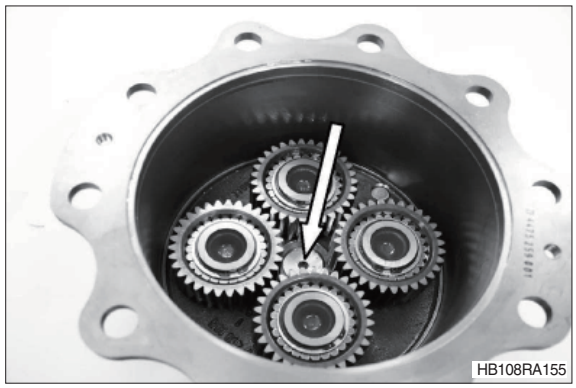
(11) Snap in retaining ring.

⚠ **Check contact position of retaining ring on groove base and readjust.**

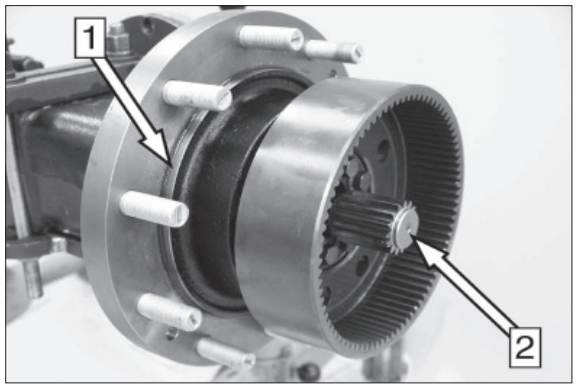
※ For assembly of the other planetary gears proceed in the same way.


HB108RA154

(12) If disassembled – install stop pin (arrow).

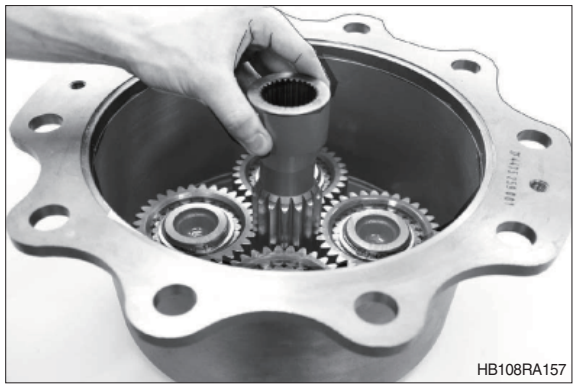

HB108RA155

(13) Oil O-ring (arrow-1) and install on collar of hub.

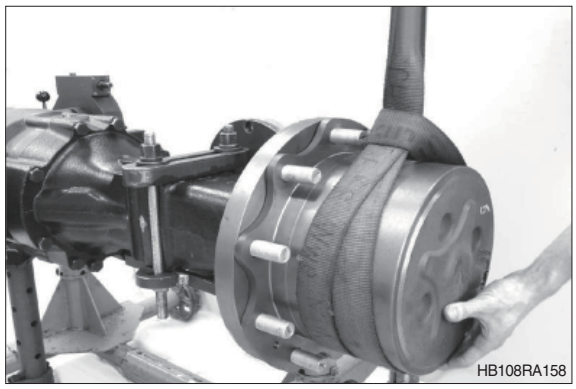


HB108RA156

(14) Take sun gear shaft (see arrow -2 / figure RA156) out of axle housing and insert in the preassembled planetary carrier – assembly aid.


HB108RA157

(15) Take up preassembled planetary carrier by means of lifting strap and mount it on the hub –installing stub shaft into sun gear shaft.

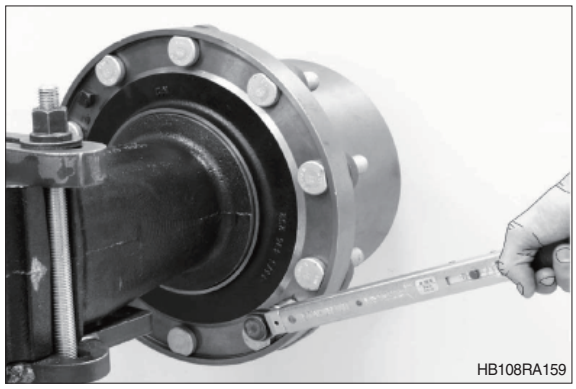

HB108RA158

(16) Fix planetary carrier with hexagon screws.

※ Insert hexagon screws with locking compound (loctite #243).

· Tightening torque (M12/8.8) :
5.61 kgf · m (40.6 lbf · ft)

※ Prior to putting into operation fill the axle with oil.


HB108RA159

10) REASSEMBLY

PARKING BRAKE (multi-disc brake)

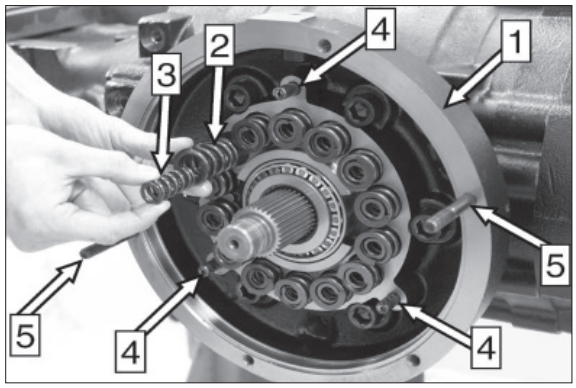
For reassembly of the brake housing (1) see reassembly description of the input pinion – page 3-178~180.

(1) Insert all compression springs (2+3) into the holes of the brake housing (1).

Just for assembly of new parts, or if dismantled:

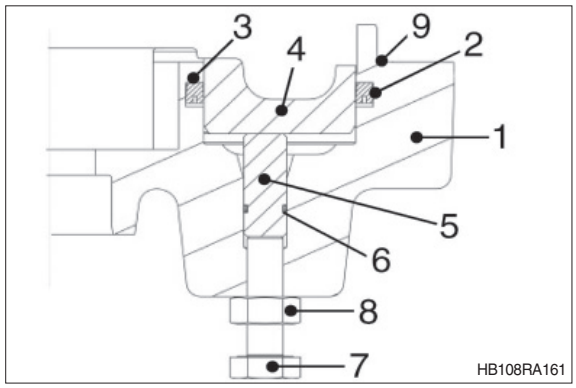
※ Install slotted pins (4) – with slots of slotted pins in a 180° offset position – and stud bolts (5).

※ Insert stud bolts with locking agent (loctite #262).



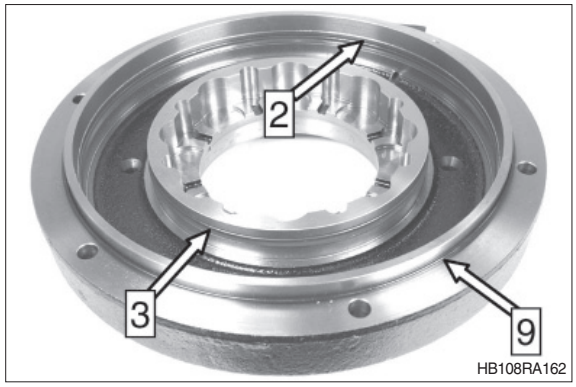
HB108RA160

1 = Brake housing cover
2 = Grooved ring
3 = Grooved ring
4 = Piston
5 = Bolt
6 = O-ring
7 = Hex. screw
8 = Hex. nut
9 = O-ring



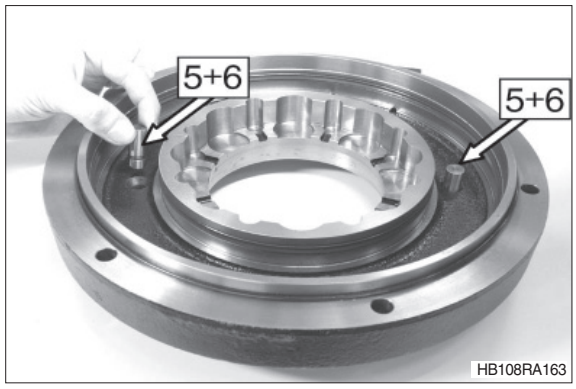
HB108RA161

(2) Oil both grooved rings (arrow) and insert them into the brake housing cover – **observing the installation position, see sketch RA161.**

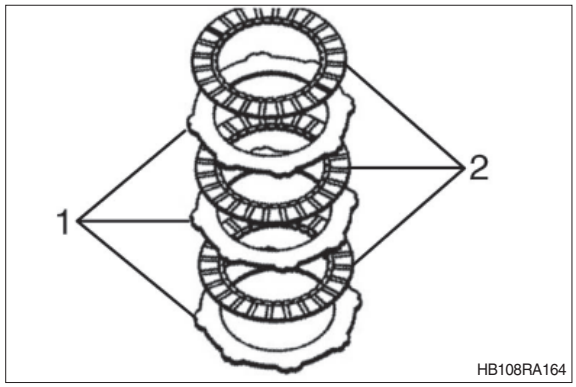


HB108RA162

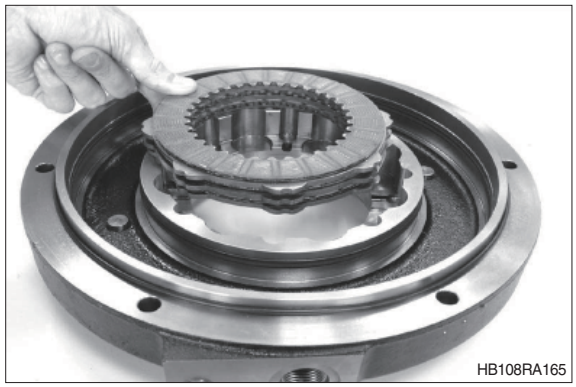
(3) Insert both bolts (arrows) with O-ring into the brake housing cover – **observing the installation position, see sketch RA161.**



(4) 1 = Outer discs (steel discs)
2 = Inner discs (lined discs)

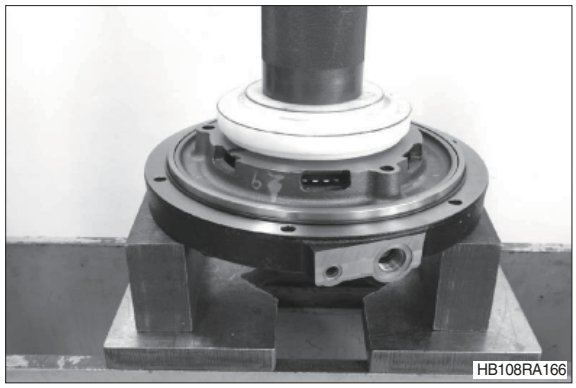


(5) Insert disc package into the brake housing cover – **observing the disc arrangement (see sketch above) starting with an outer disc.**

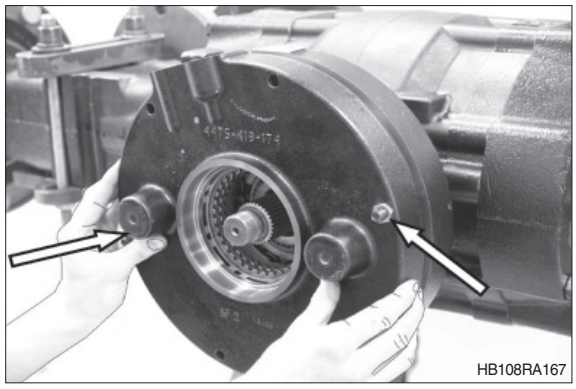


(6) Oil sealing surface of piston and of brake housing cover and press piston into the brake housing cover to contact position.

※ Press in piston without tilting – risk of damage to grooved rings and piston.

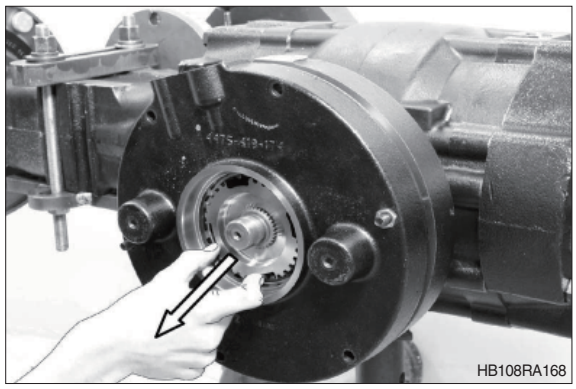


(7) Mount preassembled brake housing cover and fix with hexagon nuts (arrows).



(8) Insert disc carrier so that all discs (inner discs) are mounted.

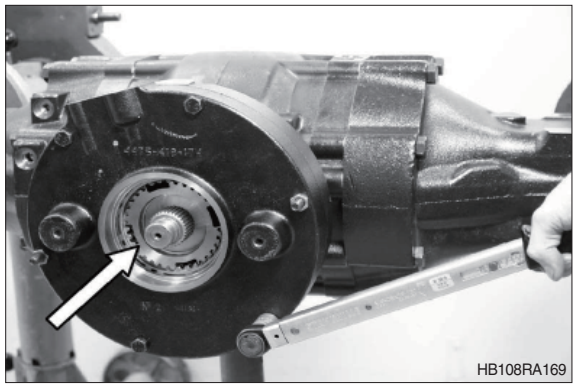
※ Ensure a correct installation position of the disc carrier – countersink/input flange contact to show outwards (arrow).



(9) Bring brake housing cover to contact position **evenly** by hexagon nuts and hexagon screws, then fix it finally.

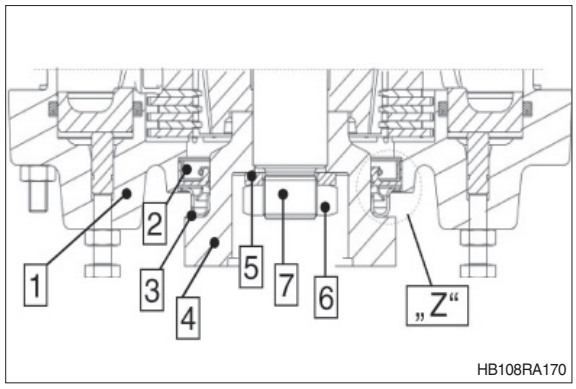
※ Hereby install disc carrier accordingly, to ensure all inner discs remain mounted.

· Tightening torque (M10/8.8) :
4.69 kgf · m (33.9 lbf · ft)

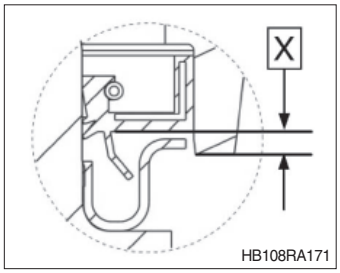


Shaft seal/input flange

1 = Brake housing cover
2 = Shaft seal
3 = Screen sheet
4 = Input flange
5 = Washer
6 = Hex nut
7 = Input pinion
Z = detailed sketch – installation dimension/shaft seal



HB108RA170



HB108RA171

X = installation dimension 3.5 $^{+0.5}$ mm

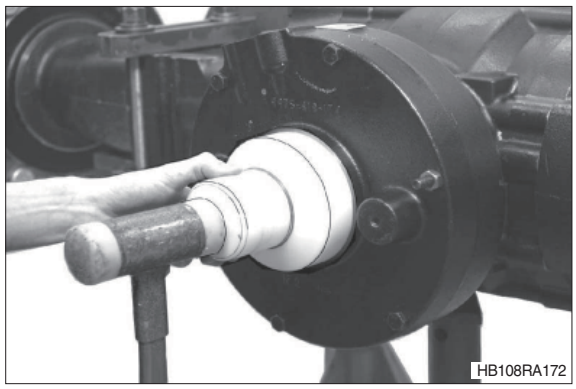
① Insert shaft seal (2) – **observing installation dimension X (see detailed sketch, Z)**.

Contact surface (outer diameter) of shaft seal:
- If rubber-coated, wet with spirit (assembly aid)
- If made of metal, apply sealing agent (loctite #574)

Grease shaft seal around the sealing and dust lip.

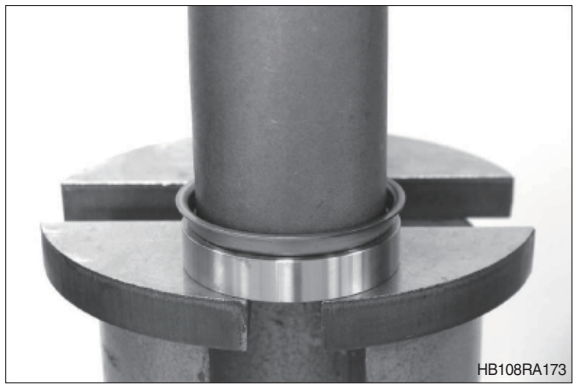
※ Pay attention to a plane installation position of the shaft seal – use the specified driver tool to ensure an exact installation position of the shaft seal.

Driver tool 5870 048 308

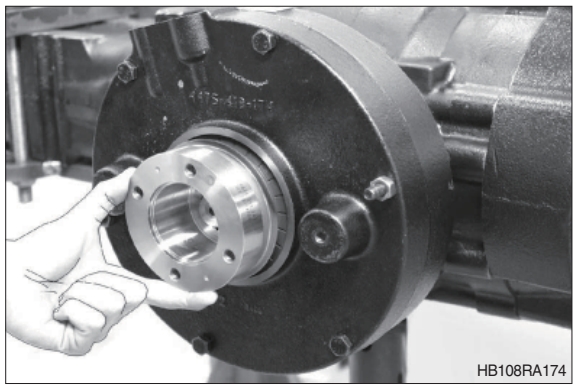

HB108RA172

② Just for new parts assembly:
Mount screen sheet (3)on input flange (4) and bring to contact position.

※ Ensure correct installation position of screen sheet– also see sketch RA170, previous page and detailed sketch, Z.
Install screen sheet without deforming it – use suitable driver tool.


HB108RA173

③ Mount preassembled input flange.

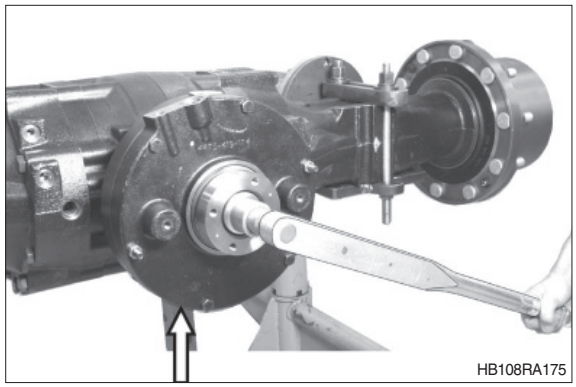

HB108RA174

⚠ Secure axle by using a support (arrow) – risk of accident.

④ Fix flange with washer (5) and hexagon nut (6).
While tightening rotate pinion in both directions several times (roller setting).

※ Install hexagon nut with locking compound (loctite #262).

· Tightening torque (M30 × 1.5) :
61.2 kgf · m (443 lbf · ft)


HB108RA175

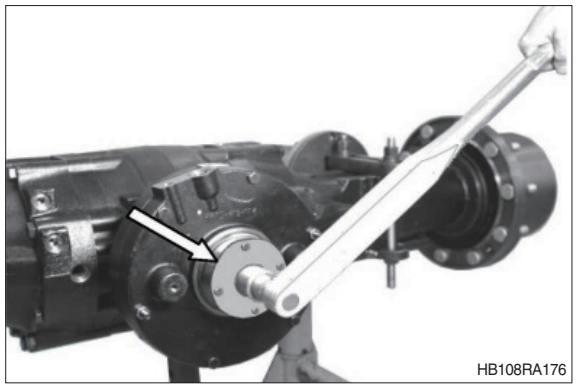
Check break-away torque of multi-disc brake:

⚠ Secure axle by using a support – risk of accident.

① Fix locating piece (arrow) on input flange and check break-away torque of parking brake (do not place torque wrench on hexagon nut of input flange fixing).

※ Break-away torque of parking brake = min 102 kgf · m (738 lbf · ft).

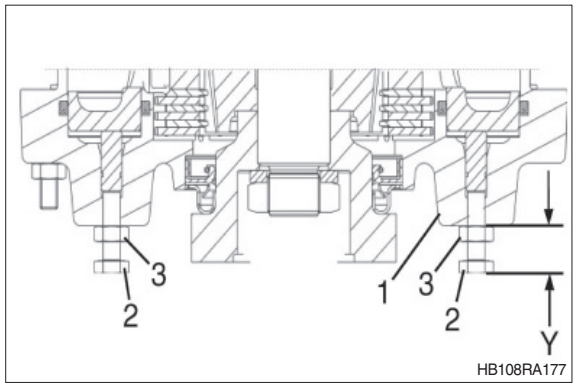
※ In case of a proper parking brake functioning, a break-away (slipping) of < 102 kgf · m is not allowed.



Setting of emergency breathing of multi-disc brake:

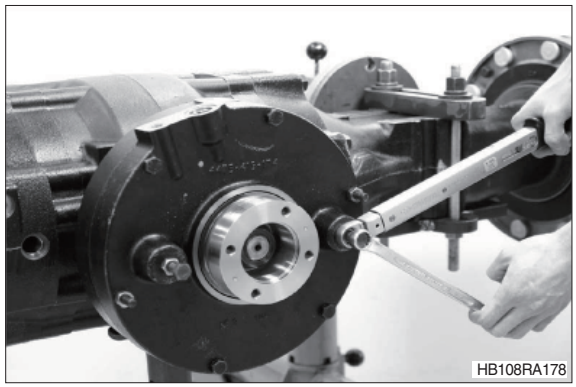
1 = Brake housing cover
2 = Hexagon screw
3 = Hexagon nut

Y = Installation dimension → 29^{+2} mm



① Install both emergency breather screws, observing the installation dimension Y – see sketch.

· Tightening torque (M10 × 1) :
4.69 kgf · m (33.9 lbf · ft)



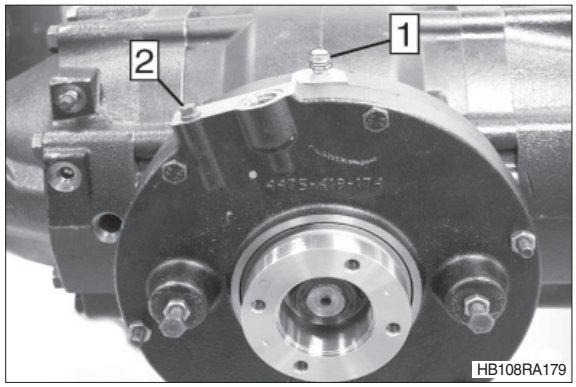
Leakage test of multi disc brake:

① Mount breather (1) and screw plug (2).

※ Install screw plug with sealing agent – (loctite #574).

· Tightening torque (1-breather) :
0.61 kgf · m (4.43 lbf · ft)

· Tightening torque (2-screw plug) :
2.55 kgf · m (18.4 lbf · ft)



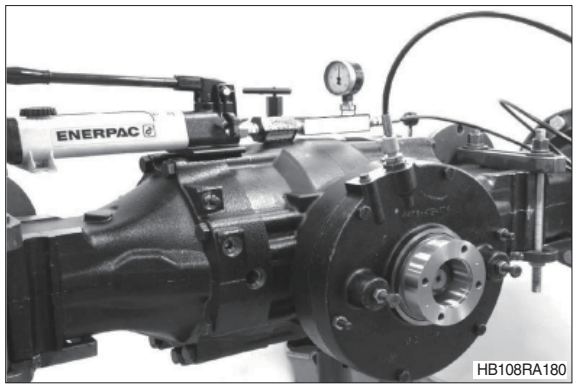
② Check:
Prior to staring the test, bleed pressure chamber and then pressurize multi-disc brake several times.
Build up test pressure p = 13 bar and close shut-off valve of HP pump.

※ A pressure drop of max ≤ 1 bar is permissible during a 4-minute test duration.

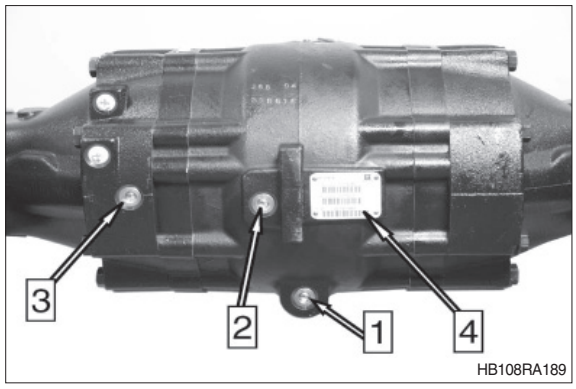
Test media:
Motor oils SAE-10 W corresponds API-SE.
ATF-oils, Dexron of II D.

HP pump 5870 287 007
Reducing adapter (7/8" to G 1/4") 5870 950 159
Threaded coupling (G ¼") 5870 950 104

※ Prior to putting into operation fill the axle with oil.



11) COMPLETION OF AXLE



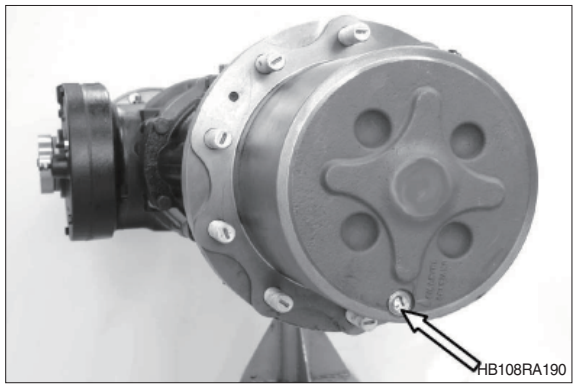
1 = Oil drain plug
2 = Oil filler/level check plug
3 = Brake control plug
4 = Identification plate

① Fit all screw plugs with **new** O-ring and install them.

· Tightening torque (7/8" – 14 UN) :
3.06 kgf · m (22.1 lbf · ft)

Just for assembly of new parts or if disassembled:

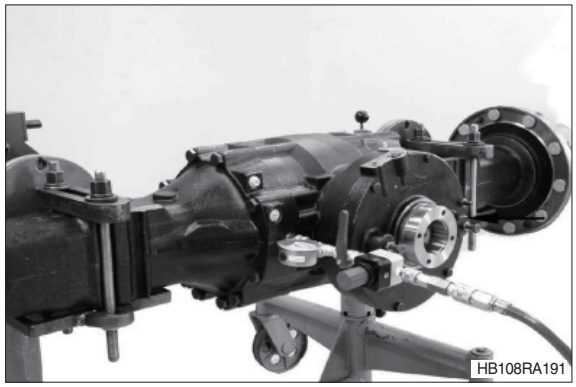
Fix identification plate with grooved pins.



※ Fit screw plugs (arrow) of both output units with new O-ring and mount them.

· Tightening torque (7/8" – 14 UN) :
3.06 kgf · m (22.1 lbf · ft)

Check axle regarding leakage:



※ Max test pressure = 0.5 bar must not be exceeded here – risk of damage.

① Mount air connection into brake control hole of axle housing.
Pressurize axle with a test pressure of = 0.5 bar – and close shutoff valve.

※ No pressure drop is allowed during a 3-minute testing time.

Air connection	5870 286 079
Connection plug	0664 462 467
Reducing adapter (7/8" to G ¼")	5870 950 159

② Remove air connection, then fit screw plug with new O-ring and install it.

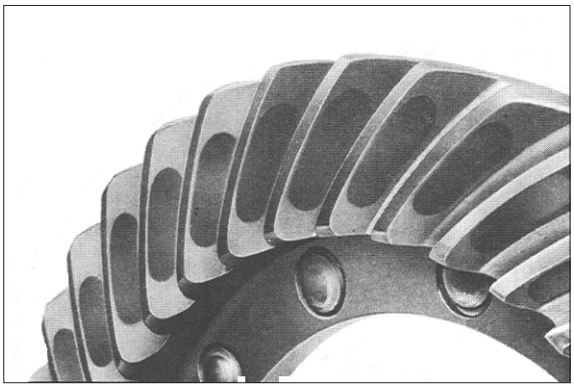
· Tightening torque (7/8" – 14 UN) :
3.06 kgf · m (22.1 lbf · ft)

※ Prior to putting into operation fill the axle with oil.

※ EXAMPLES OF GEAR-TOOTH CONTACT PATTERNS

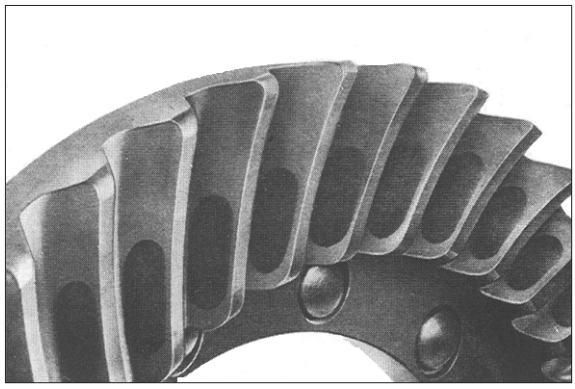
- Applied the paint (or red lead) on the surface of several bevel gear teeth.
- Turn the pinioin gear and check the contact pattern.

Correct pattern



WTHAX16

Concave side

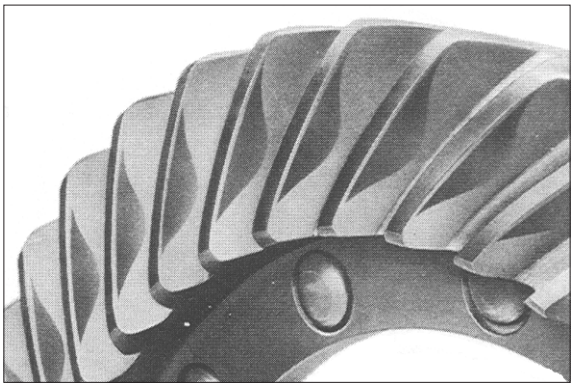


WTHAX17

Convex side

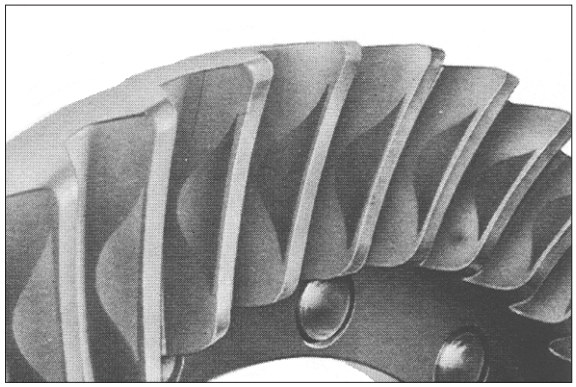
※ ADJUSTMENT

Incorrect pattern : high contact



WTHAX18

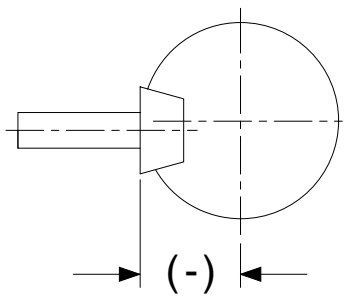
Concave side



WTHAX19

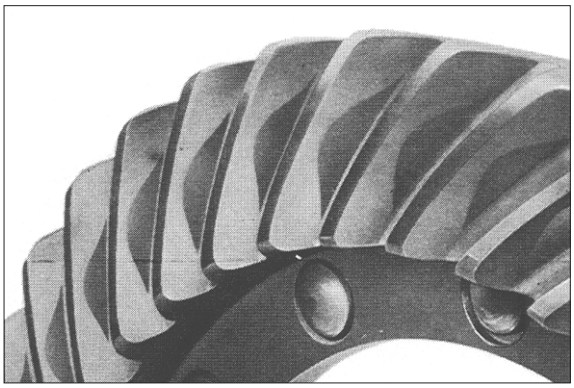
Convex side

- Reduce the distance (-)



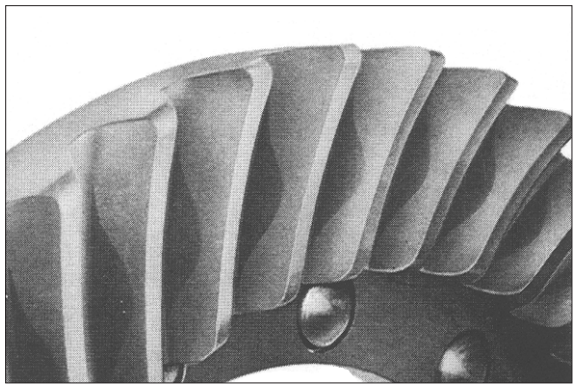
WTHAX20

Incorrect pattern, low contact



WTHAX21

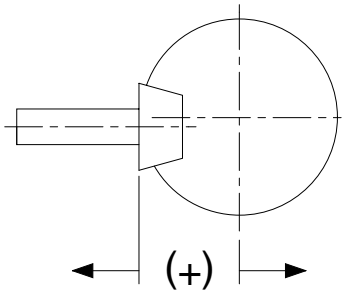
Concave side



WTHAX22

Convex side

- Add the distance (+)



WTHAX23