4. AXLE (machine serial No.:#0089-, ZF)

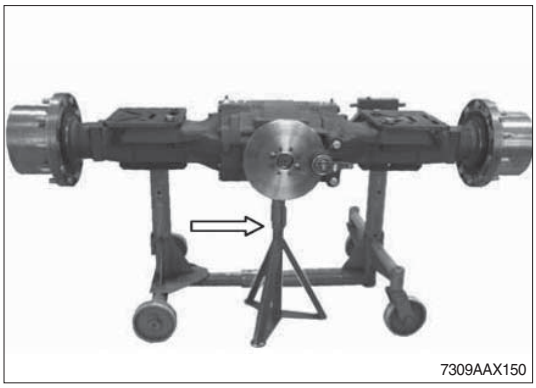
1) DISASSEMBLY

(1) General

① Mount axle on assembly truck.

⚠ Secure axle by means of support (arrow).

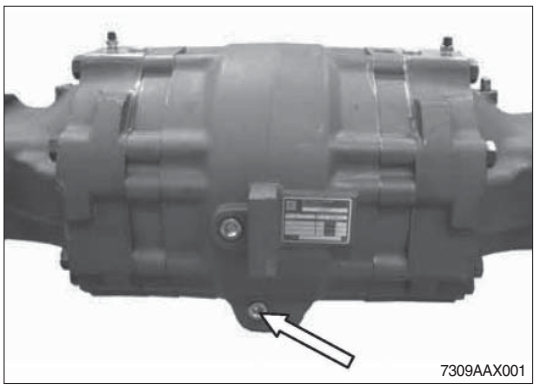
Assembly truck	5870 350 000
Fixtures	5870 350 106



(2) Oil drain

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

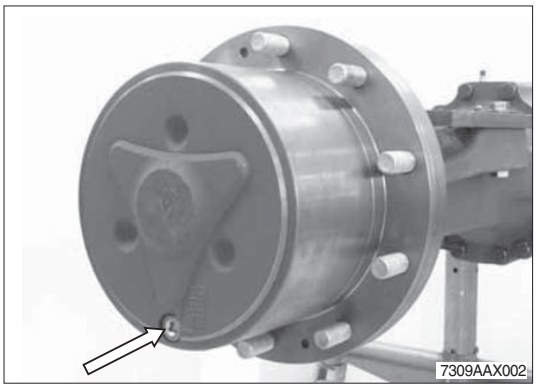
※ Use suitable oil reservoir-environmental protection.



※ To avoid any risk of injury due to a possible pressure build up in the oil system of the planetary carrier, bring oil filler/level check plug in 12 o'clock position and turn it out carefully.

② Then bring drain hole to 6 o'clock position and drain the oil.

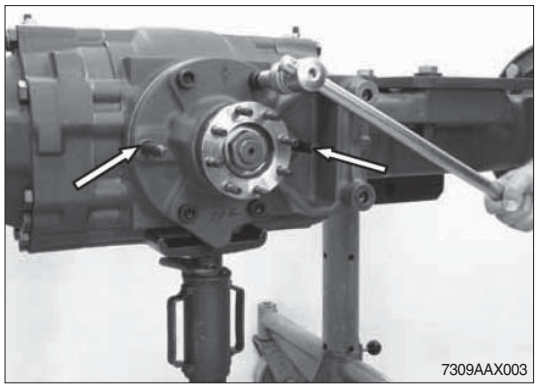
※ Use suitable oil reservoir-environmental protection.



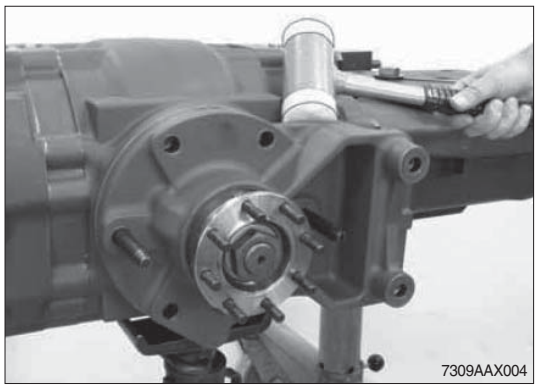
(3) Input

① Replace two cylindrical screws of the bolted connection (input housing/axle drive housing) by two adjusting screws (arrows) and loosen the remaining screws.

Adjusting screws (M16) 5870 204 023



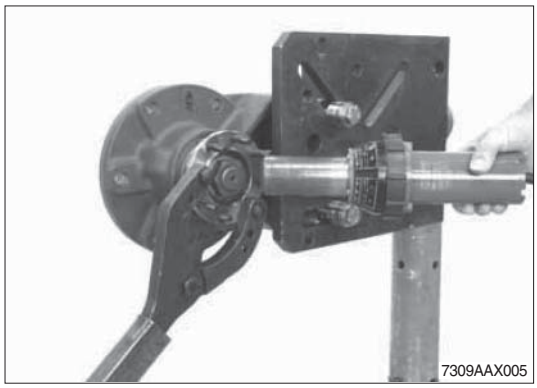
② Separate input housing by means of slight hits with a plastic hammer (difficult disassembly-sealing compound/loctite).



③ Fix input on assembly truck.

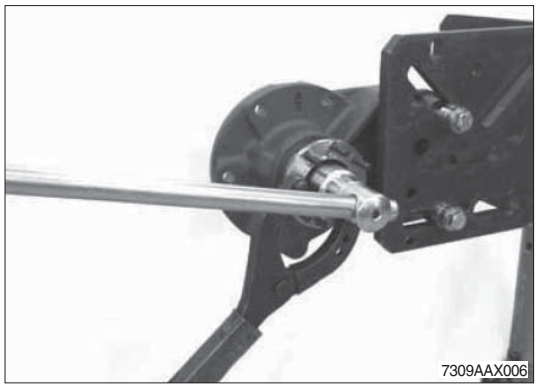
Hexagon nut is fixed with locking agent (loctite)-more difficult disassembly.
Heat up hexagon nut with hot air blower.

Assembly truck 5870 350 000
Fixtures 5870 350 065

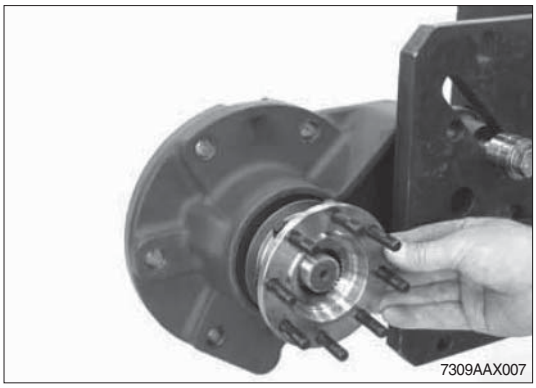


④ Fix input flange by means of clamping fork, loosen hexagon nut.

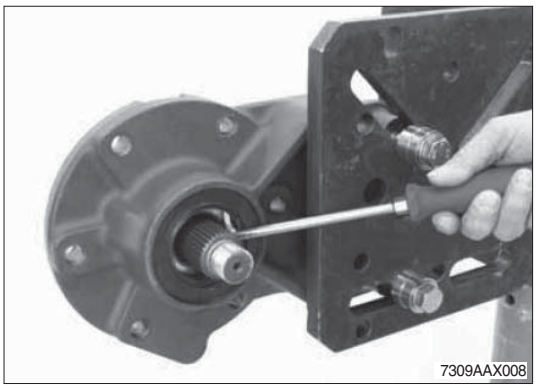
Clamping fork 5870 240 025



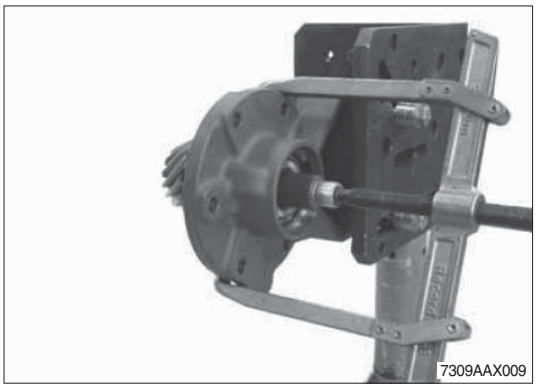
⑤ Pull-off input flange.



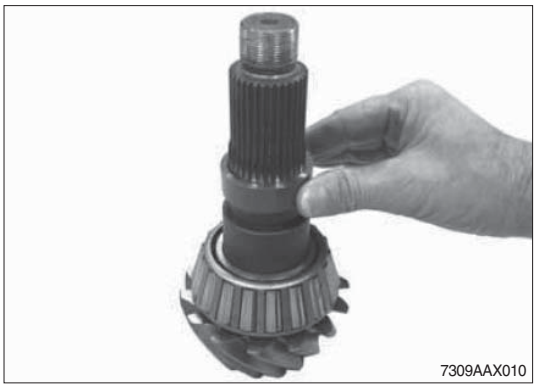
⑥ Use lever to lift off shaft seal.



⑦ Force out input pinion using the two-armed puller, pay attention that the input pinion and the bearing inner ring do not drop.



⑧ Remove spacer ring from input pinion.



⑨ Pull-off bearing inner ring.

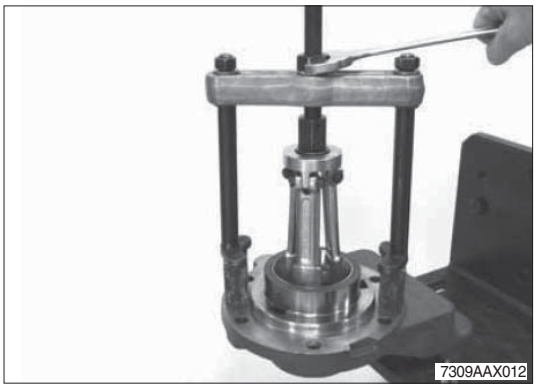
Grab sleeve	5873 001 037
Basic tool	5873 001 000

⑩ Pull internal bearing outer ring out of housing hole, pay attention that the adjusting shim (contact pattern/bevel gear set) does not drop.

※ Mark adjusting shim (thickness/position and bearing allocation).

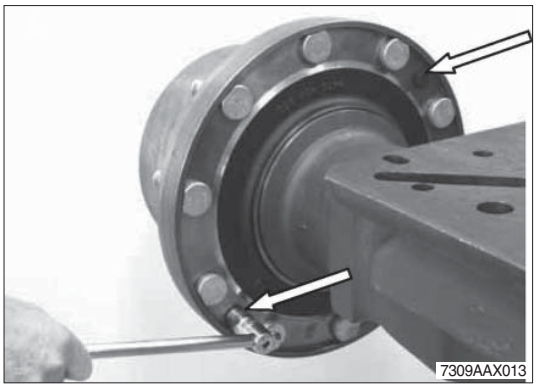
Pull second bearing outer ring out of housing hole.

Inner extractor	5870 300 019
Counter support	5870 300 020

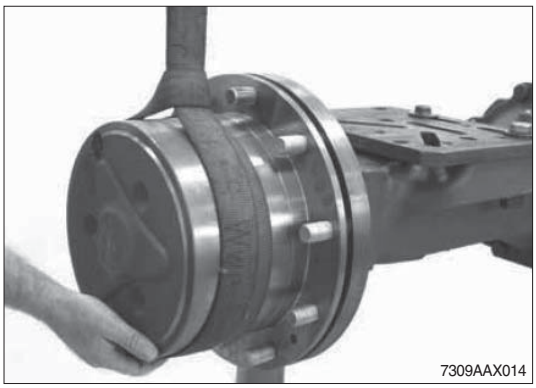


(4) Output

① Loosen both hexagon screws (arrows) of planetary carrier fixing.

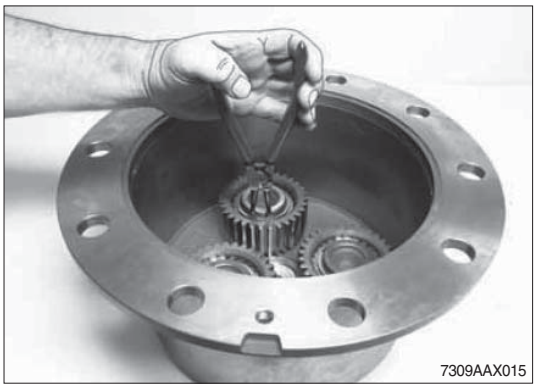


② Take up the planetary carrier by the lifting strap and pull it off the hub.



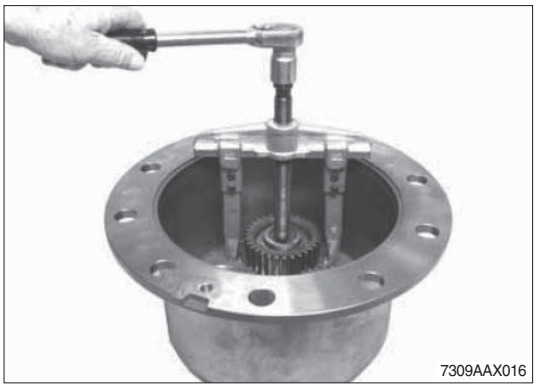
③ Snap out retaining ring.

※ Depending on the axle version, the planetary carrier is fitted with 3 or 4 planetary gears.
The figure shows the planetary carrier version with 3 planetary gears.

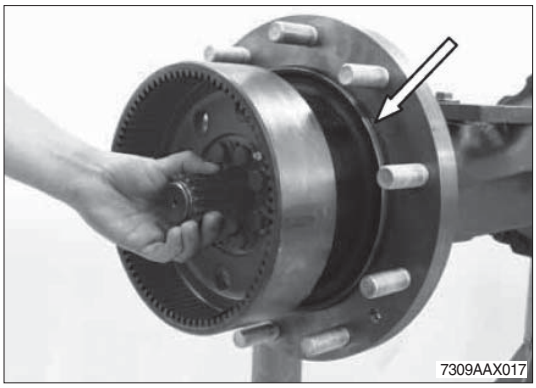


④ Pull-off planetary gear.

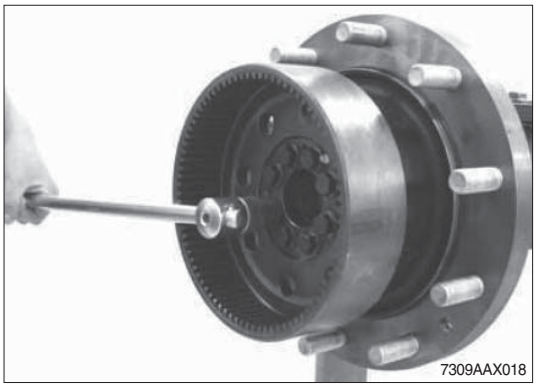
Remove the remaining planetary gears in the same way.



⑤ Pull out sun gear shaft and remove O-ring (arrow).

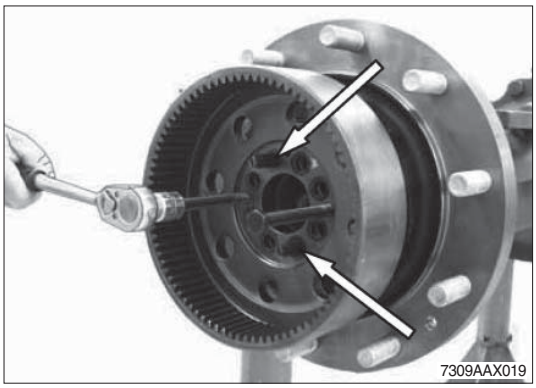


⑥ Loosen locking screws of the ring gear threaded connection.



⑦ Insert two adjusting screws (M14, see arrows) and press the ring gear evenly off the axle housing using puller screws (M12).

Adjusting screws (M14) 5870 204 022



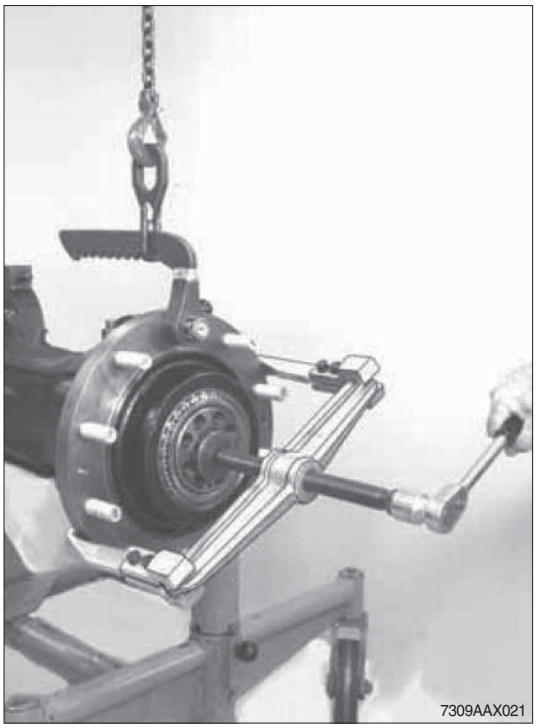
⑧ If required-remove bushes from the ring gear.
For this purpose provide bushes with a thread and pull them out by means of a striker.

※ To ensure a correct functioning, replace the shaft seal (cassette-type seal) after every disassembly of hub, see figure AX022.

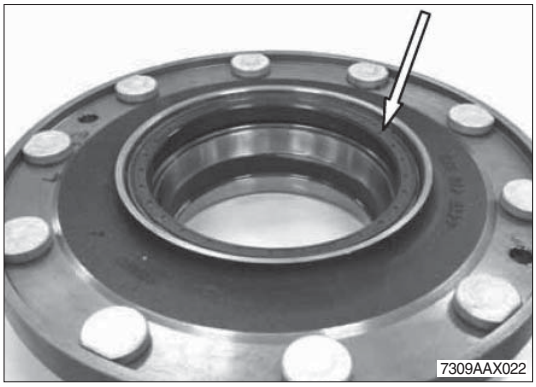
⑨ Pull hub off the axle housing using a pressure piece and a two-armed puller.

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

Lifting bracket 5870 281 043

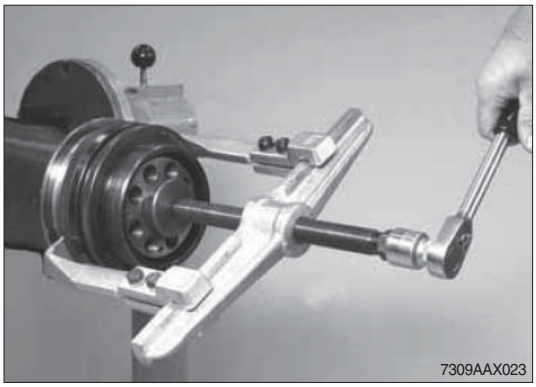


⑩ Use a lever to lift off shaft seal (arrow), and remove both bearing outer rings from hub.

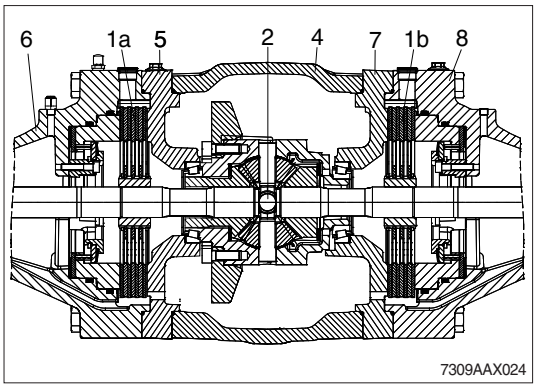


⑪ Pull bearing inner ring off the axle housing.

Grab sleeve 5873 004 026

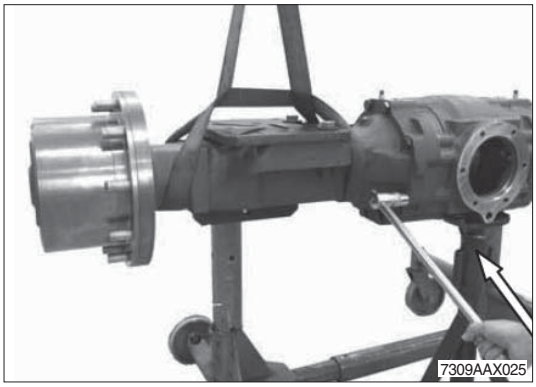


(5) Service brake (multi disk brake)



1 Service brake (multi disk brake)
1a Crown wheel side
1b Opposite side of crown wheel
2 Differential
4 Axle drive housing
5 Bearing housing (crown wheel side)
6 Axle housing (crown wheel side)
7 Bearing housing
(opposite side of crown wheel)
8 Axle housing
(opposite side of crown wheel)

① Disassembly of the service brake on the axle housing (crown wheel side) is described below. For disassembly of the service brake on the other axle housing (opposite side of crown wheel) proceed in the same way.

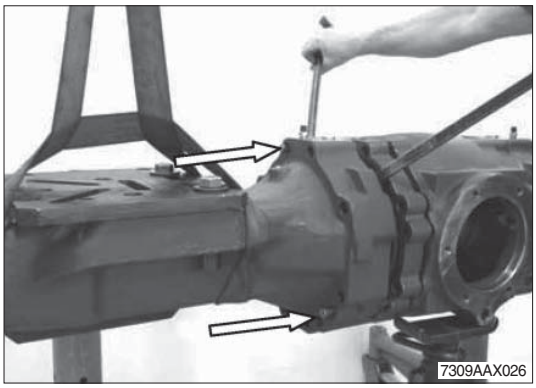


⚠ Secure axle by means of a support, see arrow.

Take up axle housing with a lifting strap and loosen threaded connection (crown wheel side-axle housing/bearing housing/axle drive housing).

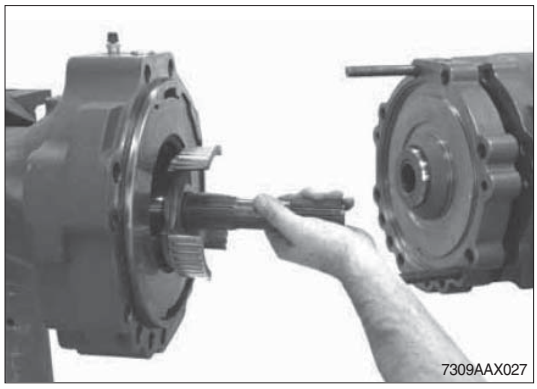
② Insert two adjusting screws (M16) (see arrows) and separate axle housing from bearing housing.

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

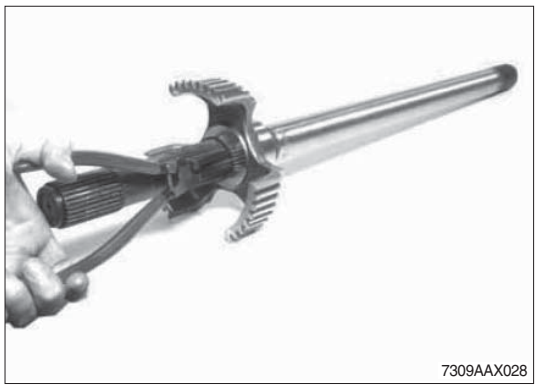


Adjusting screws (M18)	5870 204 026
Assembly lever	5870 345 065

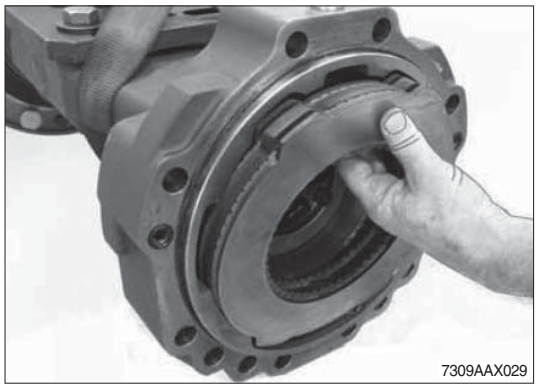
③ Remove complete stub shaft (with inner disk carrier) from axle tube.



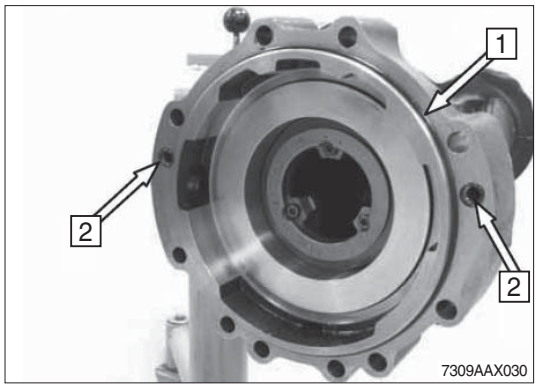
④ Snap out retaining ring and pull inner disk carrier from stub shaft.



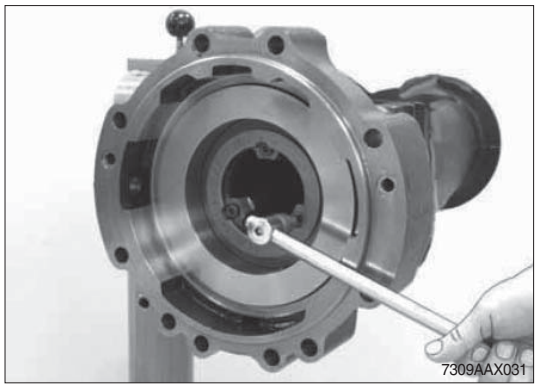
⑤ Remove disks from axle housing.



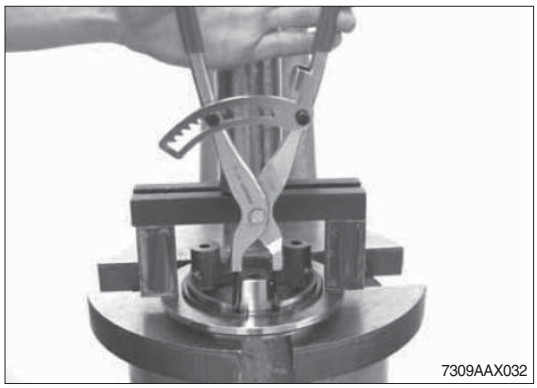
⑥ Remove O-rings (arrows 1+2).



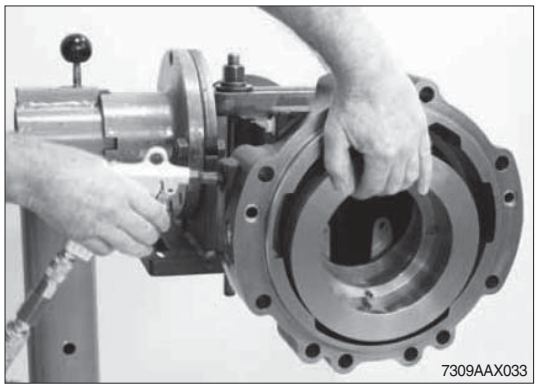
⑦ Loosen threaded connection and remove complete ring.



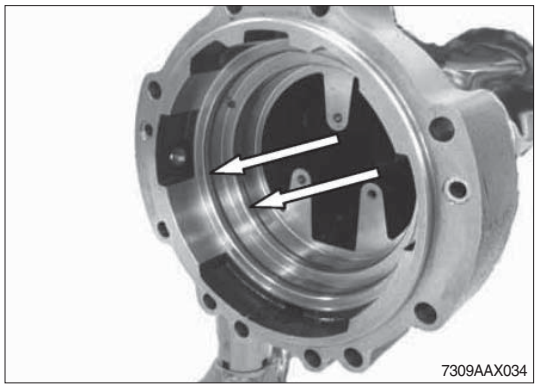
⑧ Compensate cup spring preload using a press, snap out retaining ring and remove disk.



⑨ Force out piston by compressed air, remove shim and cup spring behind.

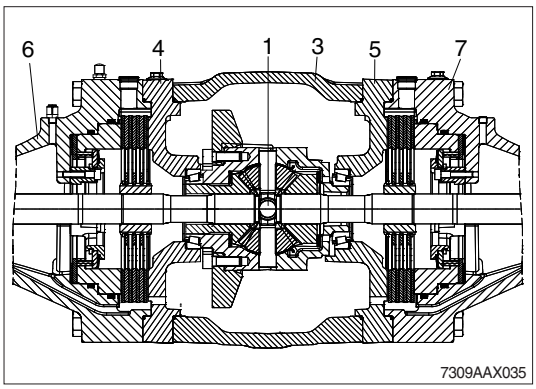


⑩ Remove sealing elements from axle tube, see arrows.



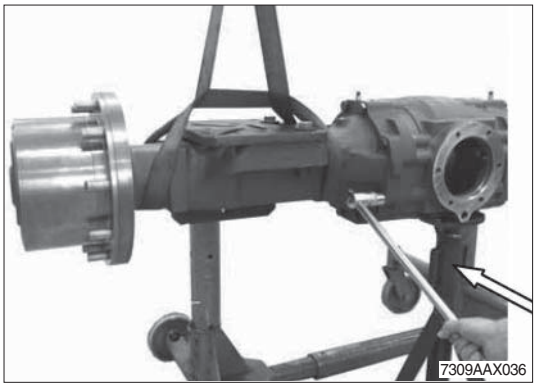
(6) Differential

1 Differential
3 Axle drive housing
4 Bearing housing (crown wheel side)
5 Bearing housing
(opposite side of crown wheel)
6 Axle housing
(crown wheel side)
7 Axle housing
(opposite side of crown wheel)



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

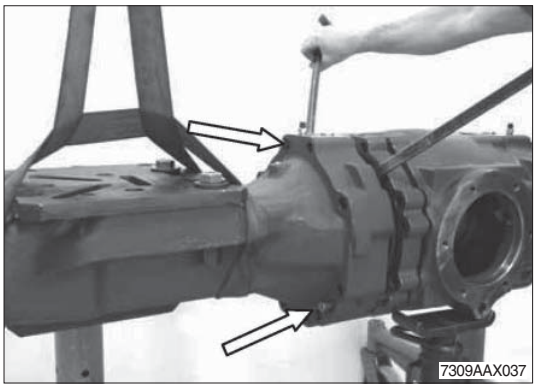
① Take up axle housing with a lifting strap and loosen threaded connection (crown wheel side-axle housing/bearing housing /axle drive housing).



② Insert two adjusting screws (M 18) (see arrows) and separate axle housing from bearing housing.

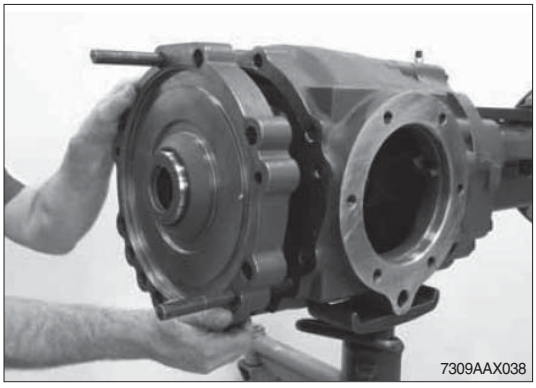
※ Pay attention that the releasing O-rings do not drop.

Adjusting screws (M18)	5870 204 026
Assembly lever	5870 345 065

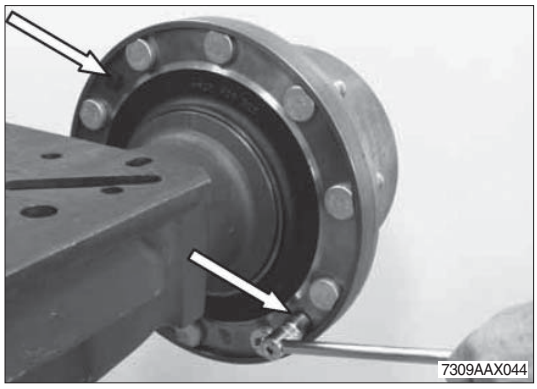


③ Remove bearing housing.

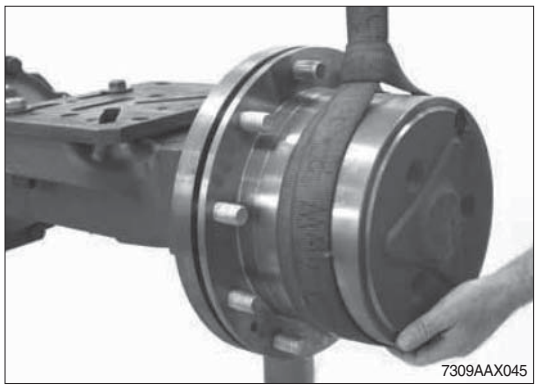
※ Pay attention that the releasing O-rings do not drop.



④ Loosen both hexagon screws (arrows) of the planetary carrier fixing - output opposite to crown wheel.

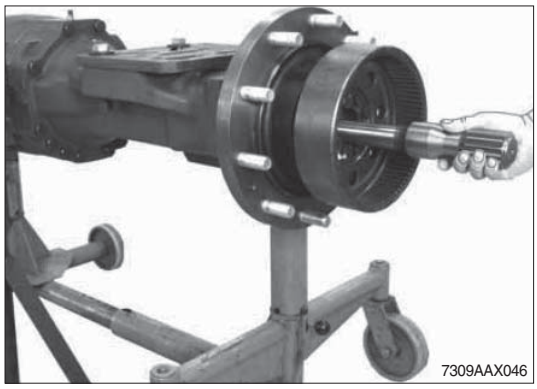


⑤ Take up planetary carrier by means of the lifting strap and pull it off the hub.



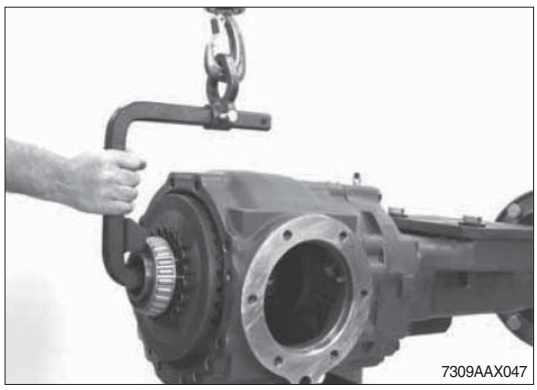
⑥ Pull off sun gear shaft and stub shaft.

※ Pay attention that releasing differential does not drop.



⑦ Lift axle out of differential.

Lifting bracket 5870 281 033

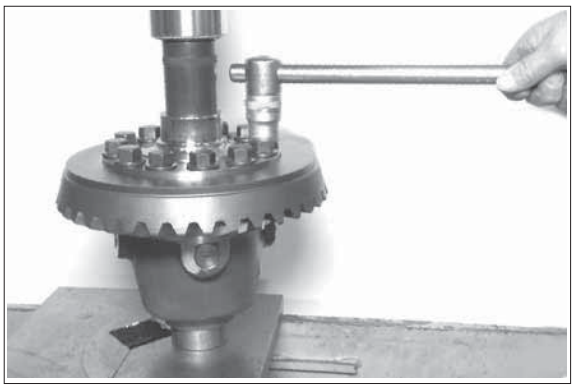


⑧ Pull both tapered roller bearings from the differential.

Grab sleeve	5873 002 035
Basic tool	5873 002 001
Pressure piece	5873 100 047

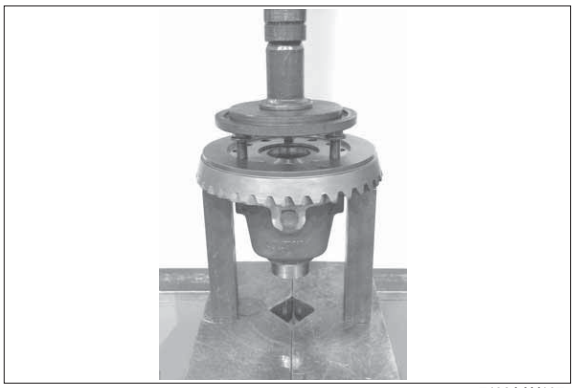
7409AAX105

⑨ Preload the differential by means of a press, loosen locking screws and housing cover.



7409AAX106

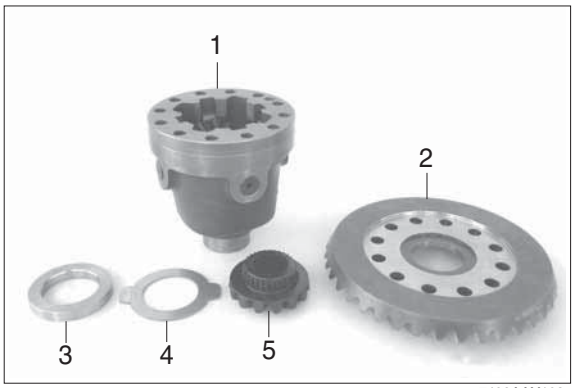
⑩ Insert some locking screws, position pressure plate and press differential carrier off the crown wheel.



7409AAX107

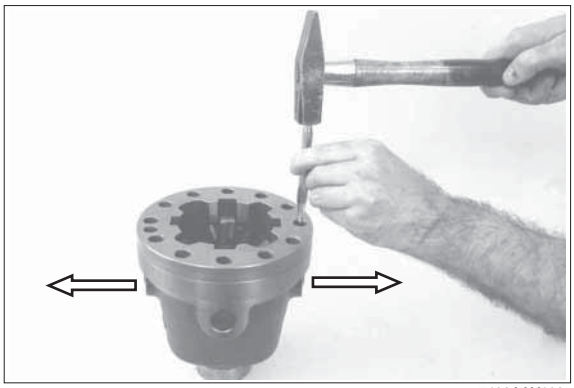
⑪ Remove axle bevel gear, thrust washer and constant spacer.

1 Differential carrier
2 Crown wheel
3 Constant spacer
4 Thrust washer
5 Axle bevel gear



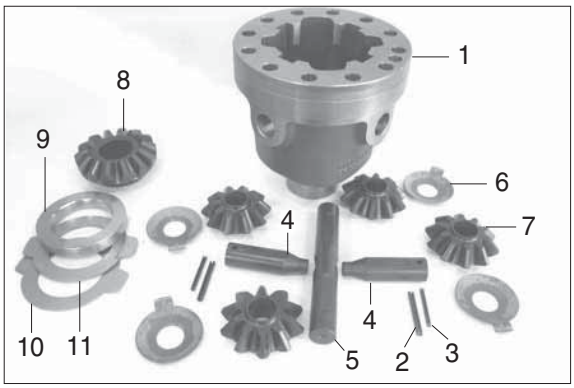
7409AAX108

⑫ Force slotted pin (fixing) out of both spider shaft halves (split version), then remove both spider shaft halves in arrow direction and take components (see AX110) out of differential carrier.



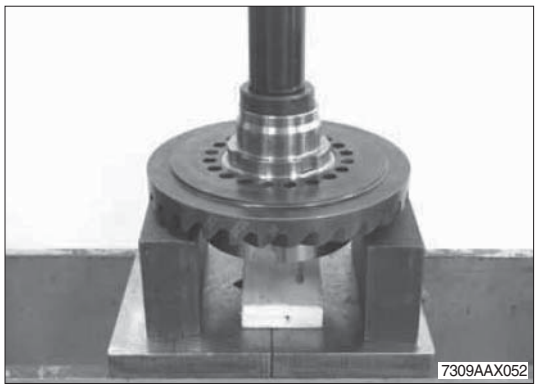
7409AAX109

1 Differential carrier
2 Slotted pin (2EA)
3 Slotted pin (2EA)
4 Spider shaft (split version)
5 Spider shaft (one piece)
6 Spider gear (4EA)
7 Thrust washer (4EA)
8 Axle bevel gear
9 Constant spacer
10 Outer disc
11 Thrust washer



7409AAX110

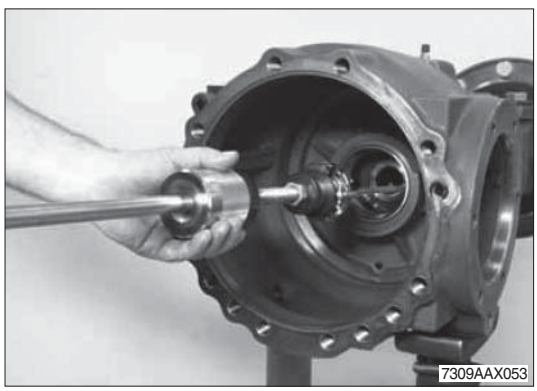
⑬ Separate crown wheel from differential carrier.



7309AAX052

⑭ Remove bearing outer ring and shim behind (backlash).

※ Mark shim (position/bearing allocation), assembly aid.

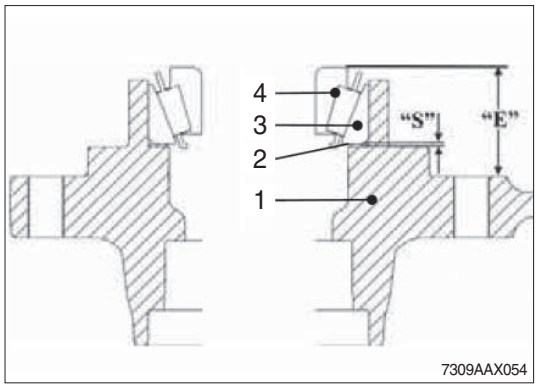


7309AAX053

2) ASSEMBLY

(1) Input

Determination of shim for an optimum contact pattern (crown wheel/pinion) and the required pinion position :

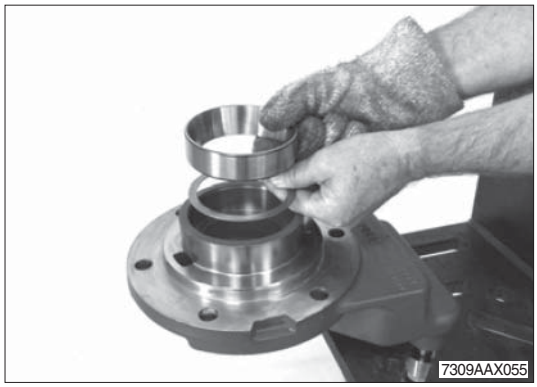


1 Input housing
2 Shim
3 Bearing outer ring
4 Bearing inner ring

S = required shim (e.g. s = 1.20 mm)
E = Setting/reference dimension-required pinion position to obtain an optimum contact pattern (crown wheel/pinion)

① Insert shim (e.g. S = 1.20 mm) and undercooled bearing outer ring into hole of input housing until contact is obtained.

※ We would recommend to reinstall the shim found during disassembly (e.g. S = 1.20 mm -see disassembly instructions, page 3-207, figure AX012) into the bearing hole of the input housing.



Driver tool	5870 058 078
Handle	5870 260 002

② **Check setting/reference dimension E :**
Read pinion dimension (standard distance dimension = 127) from pinion, in case of a + or - deviation of the standard distance dimension caused by production, the actual value is marked on the pinion e.g. :

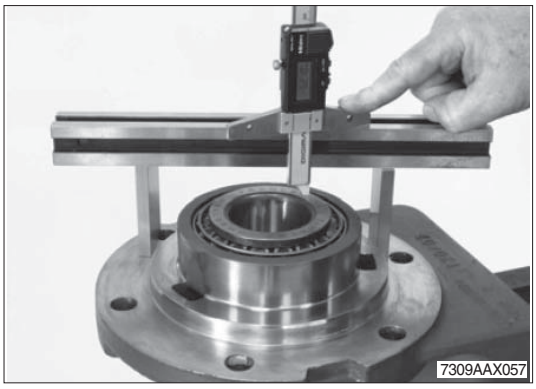
Pinion dimension =
without + or - deviation → 127.0 mm
Pinion dimension =
with a + 0.1 deviation → 127.1 mm
Pinion dimension =
with a - 0.1 deviation → 126.9 mm

③ Determine setting/reference dimension from the face/bearing inner ring (pinion contact position) to mounting face/input housing (also refer to figure AX054).

If a pinion dimension of 127.0 mm (without specified +/- deviation - also see figure AX056) is indicated, a setting/reference dimension of E = 52.0 ± 0.05 mm must be achieved.
Any + or - deviation of the pinion dimension, must be considered accordingly when taking the setting/reference dimension E.
e.g. :
Deviation$^{+0.1}$ → setting/reference dimension = 51.90 mm
Deviation$^{-0.1}$ → setting/reference dimension = 52.10 mm

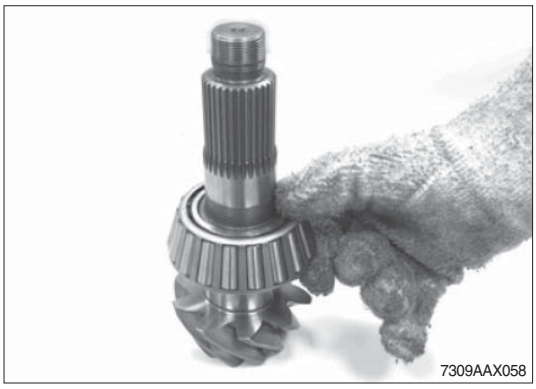
※ If the required setting/reference dimension is not achieved use a corresponding shim for correction, see figure AX055.

Straightedge	5870 200 022



④ Take inserted bearing inner ring (figure AX056) out of the input housing.
Heat up bearing inner ring and mount it until contact position with pinion is obtained.

※ Readjust bearing inner ring after cooling-down.

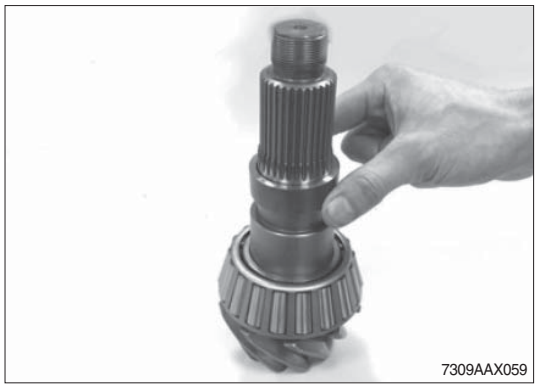


Setting of rolling torque of the input pinion bearing

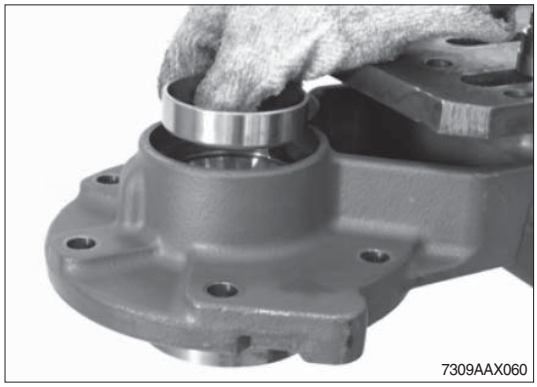
① Install spacer ring (s = optional).

We would recommend to reinstall the spacer ring found during disassembly (e.g. s = 16.8 mm).

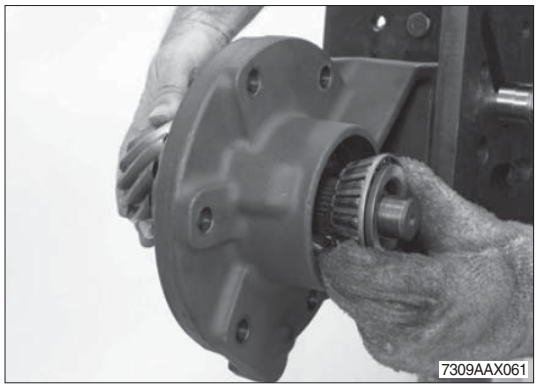
※ The required bearing rolling torque of 0.1 ~0.31 kgf · m (0.72~2.24 lbf · ft) (without shaft seal), however, is decisive.
See bearing rolling torque check, figure AX066, see page 3-222.



② Undercool external bearing outer ring and install into hole of input housing until contact is obtained.

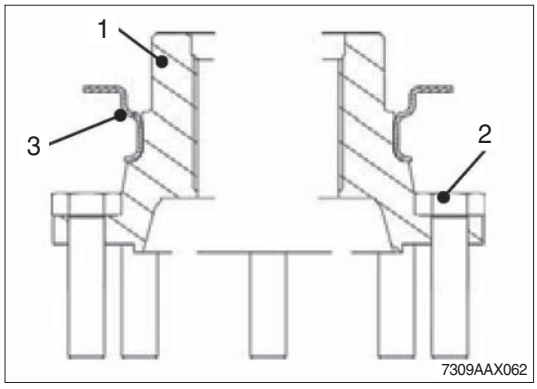


③ Insert pre-assembled input pinion, mount heated bearing inner ring until contact.



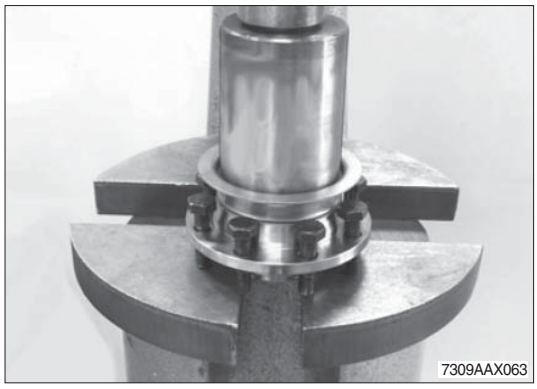
Only applicable for assembly of new parts or if disassembled :

1 Input flange
2 Hexagon screws
3 Screen sheet



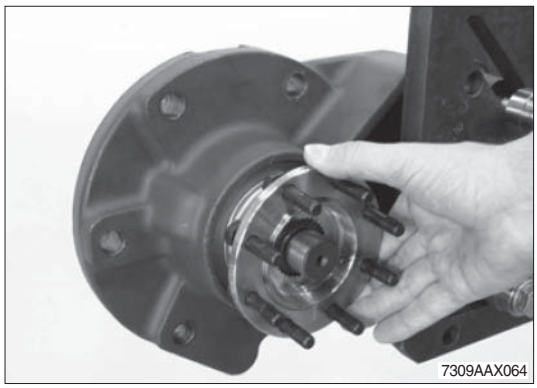
④ Insert hexagon screws (2) into input flange (1). Mount screen sheet (3) and bring to contact position.

※ Observe installation position of screen sheet. Screen sheet must not be deformed during reassembly, use suitable driver tool.



⑤ Install flange.

※ Do not mount the shaft seal before achieving a positive result of the contact pattern check, see page 3-229.

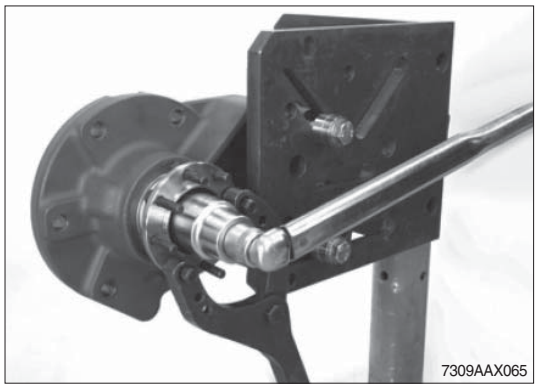


⑥ Fix flange with washer and hexagon nut.

※ While tightening - rotate the 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



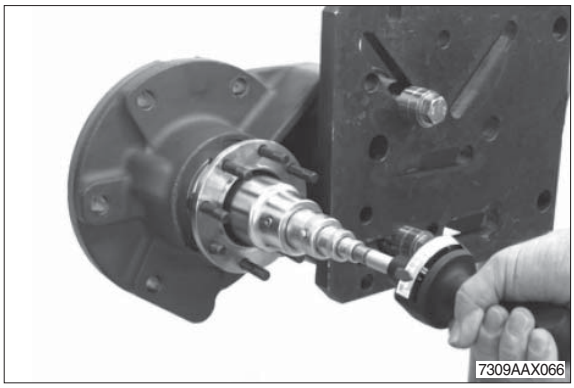
⑦ Check rolling torque of pinion bearing.

Required rolling torque for use of :
New roller bearing → 0.1~0.31 kgf · m
(without shaft seal)
Old roller bearing → 0.1~0.31 kgf · m
(without shaft seal)
(try to achieve upper value)

※ If the required rolling torque is not achieved, use a suitable spacer ring (see figure AX059, see page 3-220) and correct it.

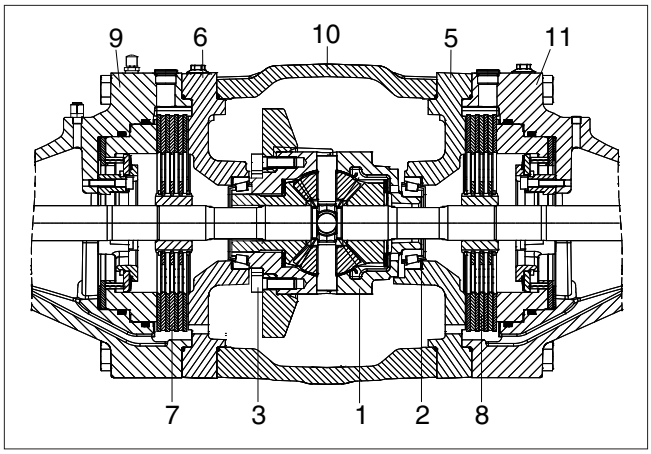
Torque wrench	5870 203 031
Reducing adapter ¼" to ½"	5870 656 056
Reducing adapter ½" to ¾"	5870 656 057

Installation of the input to the axle is described in page 3-244.



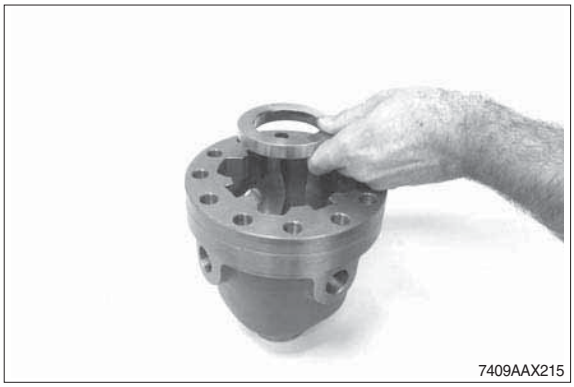
(2) Differential

1 Differential
2 Shim (backlash)
3 Shim (diff bearing rolling torque)
5 Bearing housing
(side opposite to crown wheel)
6 Bearing housing (crown wheel side)
7 Multi-disk service brake
(crown wheel side)
8 Multi-disk service brake
(side opposite to crown wheel)
9 Axle housing
10 Axle drive housing
11 Axle housing



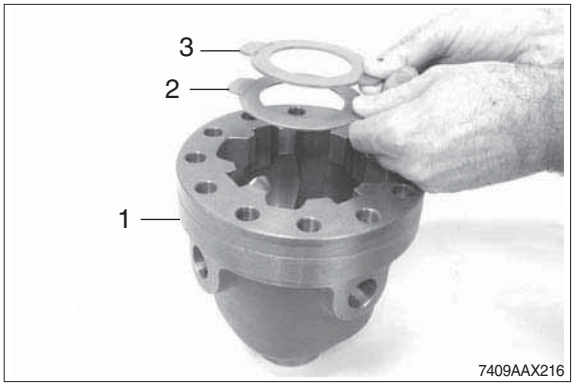
7309AAX067

① Insert constant spacer into differential carrier.


7409AAX215

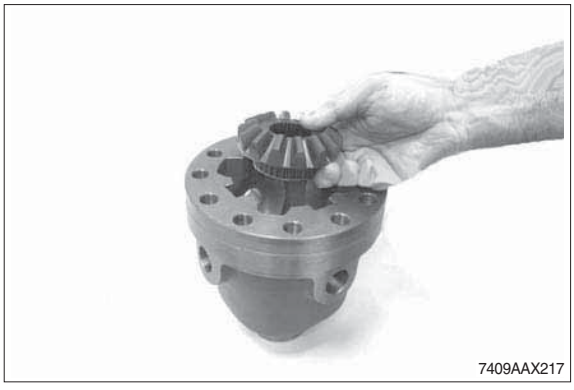
② Insert steel outer disc (2) and thrust washer (3) into the differential carrier (1)

※ Pay attention to installation position of outer disc and thrust washer see position/figure.



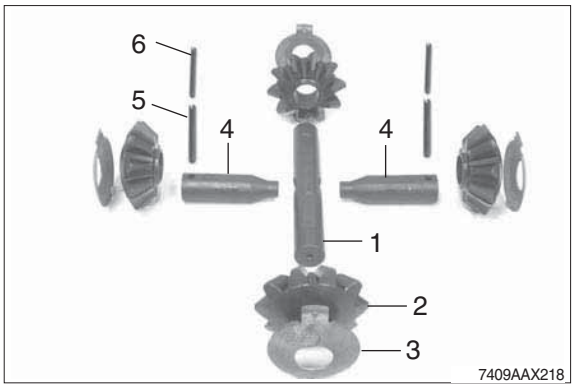
7409AAX216

③ Insert axle bevel gear.


7409AAX217

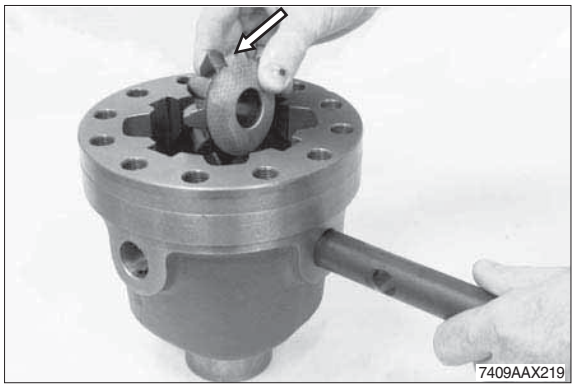
Differential spider single parts :

1 Spider shaft (one part)
2 Spider gear (4EA)
3 Thrust washer (4EA)
4 Spider shaft (split version)
5 Slotted pin (2EA)
6 Slotted pin (2EA)



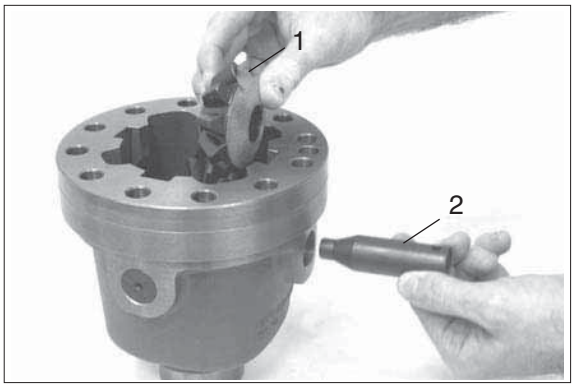
④ Insert spider gears with thrust washers into the differential huosing and fix them with the spider shaft (long).

Thrust washers must be positioned with the tabs (see arrow) being located in recesses of the differential housing.



⑤ Insert spider gears with thrust washers into the differential huosing and fix them with the spider shaft (short).

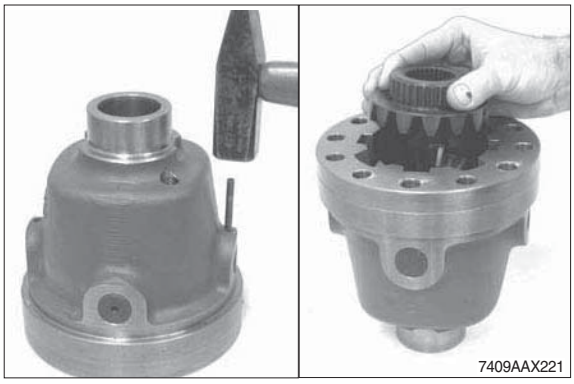
Thrust washers must be positioned with the tabs (see arrow 1) being located in recesses of the differential housing.
Pay attention to radial installation position of the spider shafts (fixing holes, aeeow 2).



⑥ Fix spider shafts (short) with slotted pins.

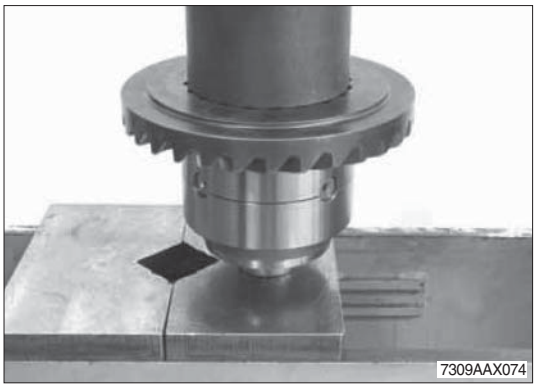
Flush mount slotted pins.
Install openings of the slotted pins ts in a 180° offset to each other.

Mount second axle bevel gear.



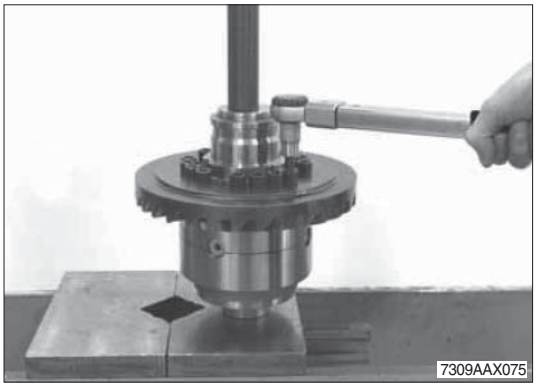
⑦ Install two adjusting screws and press crown wheel onto differential carrier until contact is obtained.

Adjusting screws (M12) 5870 204 021



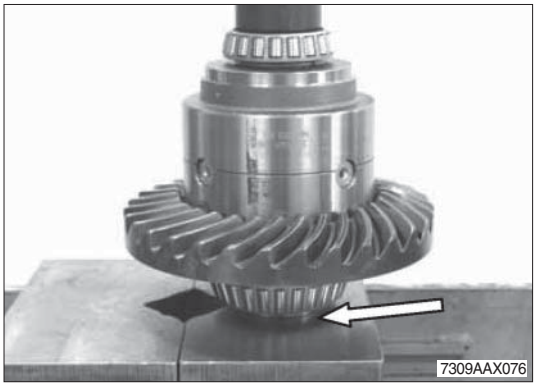
⑧ Fix differential by means of a press and connect differential carrier halves with cylindrical screws.

· Tightening torque (M12/12.9) :
13.8 kgf · m (99.6 lbf · ft)



⑨ Install both bearing inner rings.

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



⑩ Cover some tooth flanks of crown wheel with marking ink (for contact pattern check, see figure AX090, page 3-230).

Determination of shim for backlash (crown wheel/input pinion) and of shim for the differential bearing rolling torque :

Setting of backlash 0.15~0.27 mm :

① Bring axle into vertical position.
Insert shim (backlash) into hole of bearing housing and locate bearing outer ring until contact is obtained.
We would recommend to reinstall the shim found during disassembly (e.g. s = 1.60 mm), refer to disassembly instructions page 3-217, figure AX053.

※ The required backlash, however, is decisive for the shim(s) to be used.
Backlash check - see figure AX089, page 3-229.

② Read distance dimension (e.g. D = 70.0) indicated on crown wheel, see arrow and legend of figure AX080)

Insert preassembled differential.

Inner extractor	5870 300 019
Eye nut	5870 204 073

※ Exactly position the inserted differential by rotating the differential in both directions several times (rolling in).

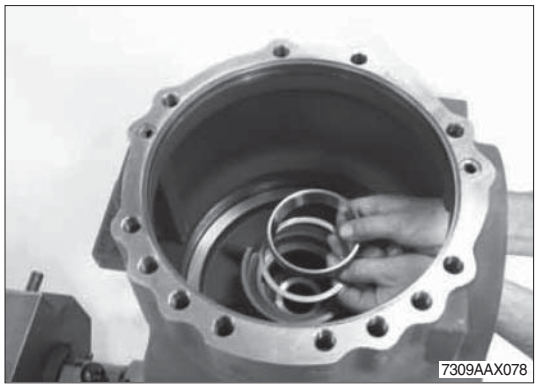
③ The test/reference dimension depends on the specified distance dimension.

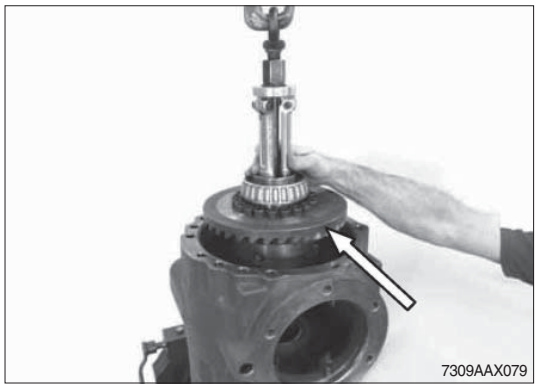
Test/reference dimension required if :
Distance dimension D = 70.0 mm →
test/reference dim. K = 50.0 mm
Distance dimension D = 70.1 mm →
test/reference dim. K = 49.9 mm
Distance dimension D = 69.9 mm →
test/reference dimension K = 50.1 mm

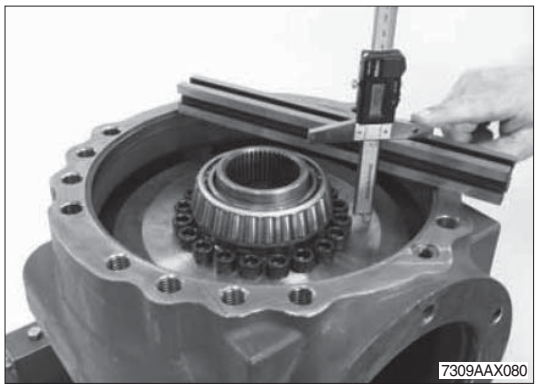
※ Check test/reference dimension e.g. :
K = 50.0 ± 0.05 mm.
Take measurement on crown wheel within Ø = maximum 180 mm.

④ Take measurements at different points and determine average.

Straightedge	5870 200 022

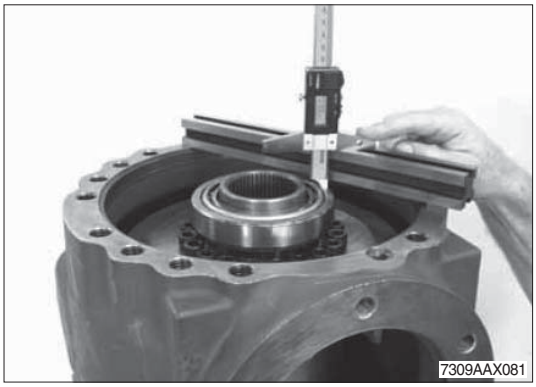






※ If the required test/reference dimension is not achieved, use a suitable shim for correction, see figure AX078.

Setting of differential bearing rolling torque 0.1~0.41 kgf · m (0.72~3.0 lbf · ft) :


7309AAX081

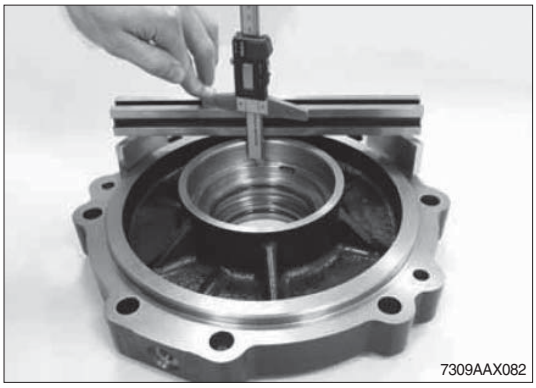
※ For the following determination of dimension ensure an exact contact of the bearing outer ring and a correct position of the differential.

※ Position bearing outer ring on bearing inner ring, until all rollers are located without any play.

① Determine dimension I - from mounting face/axle drive housing to front face/bearing outer ring.
Take measurements at different points and determine average.

Dimension I e.g. ..... 6.62 mm

Straightedge 5870 200 022

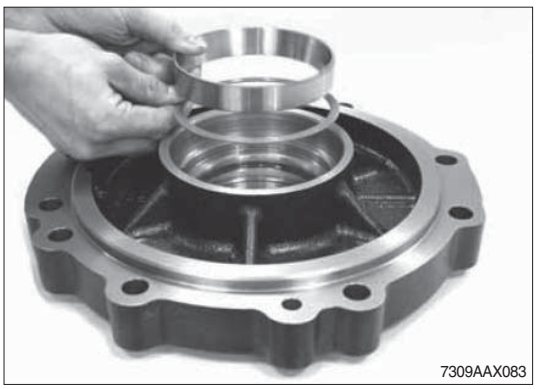

7309AAX082

② Determine dimension II - from mounting face/bearing housing to bearing hole/ bearing outer ring contact.

Dimension II e.g. ..... 5.35 mm

Calculation example :

Dimension I e.g.	6.62 mm
Dimension II e.g.	- 5.35 mm
Difference	1.27 mm
Bearing preload	+ 0.15 mm
Result	= 1.42 mm
Required shim (s)	= 1.40 mm


7309AAX083

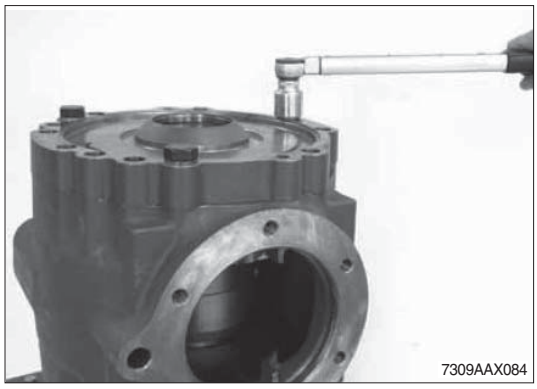
※ A bearing preload of 0.15 mm corresponds to a bearing rolling torque of approximately 0.1~0.41 kgf · m, when using new bevel roller bearings.

③ Insert determined shim (e.g. s=1.40 mm) into hole of bearing housing and locate bearing outer ring until contact is obtained.

Mount preassembled bearing housing (without O-rings). Bring it to contact position and fix provisionally with hexagon screws (3EA) and washer.

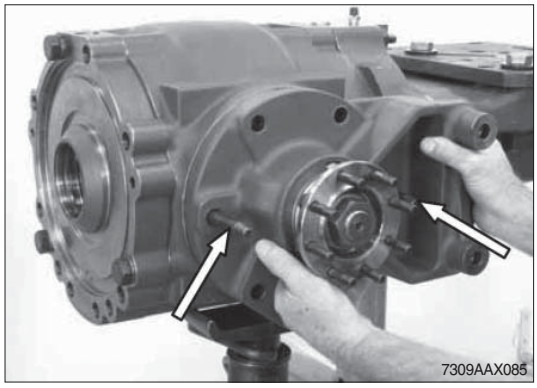
· Tightening torque (M18/10.9) :
39.8 kgf · m (288 lbf · ft)

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



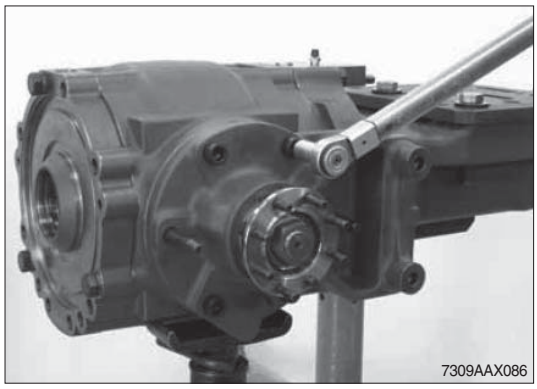
④ Insert two adjusting screws (arrows) and mount preassembled input housing.

Adjusting screws (M16) 5870 204 023



⑤ Fix input housing with cylindrical screws.

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

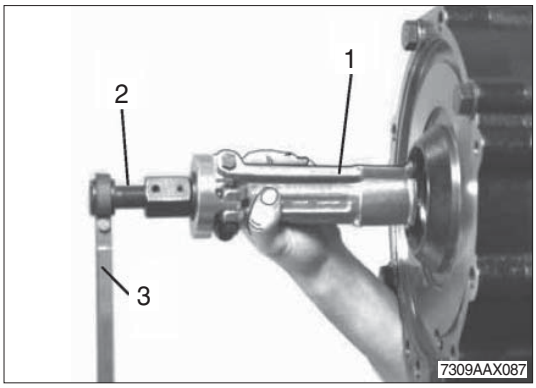


Check of backlash and contact pattern of bevel gear set :

① Insert cylindrical screw (2) into inner extractor (1), fix straightedge (3) and fasten inner extractor into hole of differential carrier.

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

Inner extractor	5870 300 019
Cylindrical screw (M20)	0636 101 468
Straightedge	5870 200 087

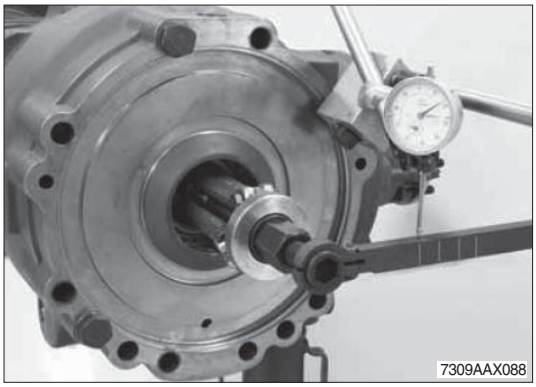


② Place dial indicator at right angles to the straightedge within a distance corresponding to the outer diameter of the crown wheel (r = approximately 125 mm) and check backlash.

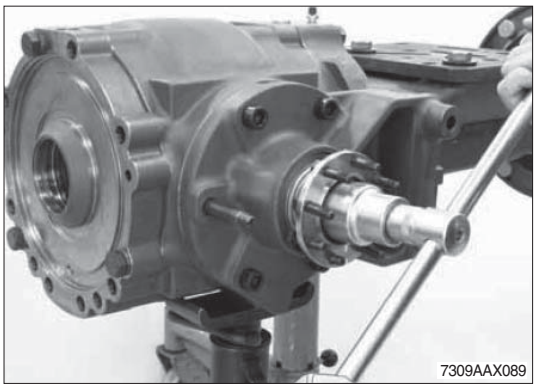
- **Backlash : 0.15~0.27 mm**

※ Any deviation from the required backlash must be corrected with the corresponding shim(s), see figure AX078, page 3-226.

※ A correction of the shim/backlash also requires a counter-correction of shim / differential bearing rolling torque, see figure AX083.



③ For contact pattern, roll input pinion against crown wheel in both directions (drive and coast side engagement).
Remove bearing cover and take differential out of axle drive housing.



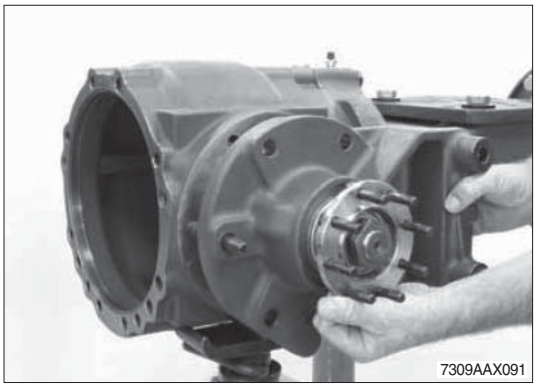
④ Compare contact pattern with contact pattern examples on page 3-246.

※ If contact pattern differs considerably, use a suitable shim for correction (see figure AX055, page 3-218).

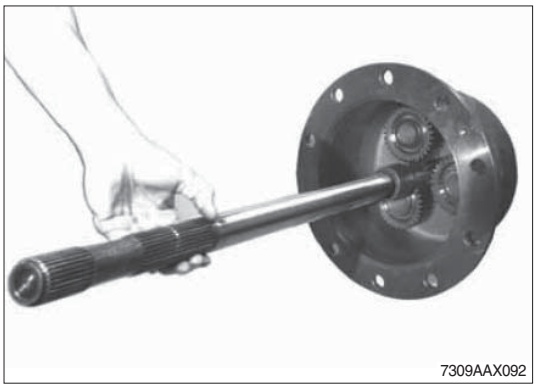
※ A correction of the shim/contact pattern also influences the backlash, check once again (see figure AX088).


7309AAX090

⑤ Remove input housing assy.

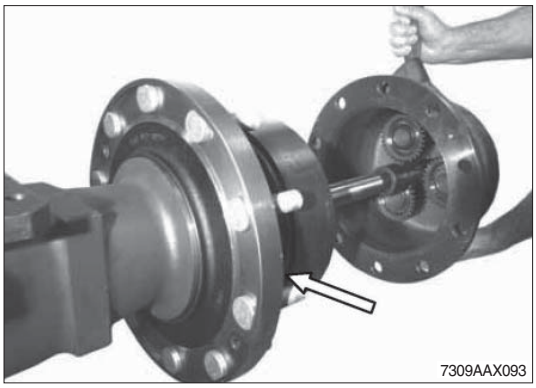

7309AAX091

⑥ Insert sun gear shaft and stub shaft into the planetary carrier (output opposite to crown wheel).


7309AAX092

⑦ Mount planetary carrier by inserting stub shaft into the planetary carrier (service brake).

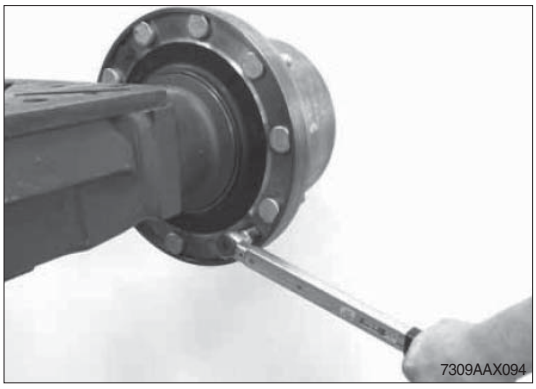
※ Pay attention to O-ring (arrow) mounted to the hub.


7309AAX093

⑧ Fix planetary carrier with hexagon screws.

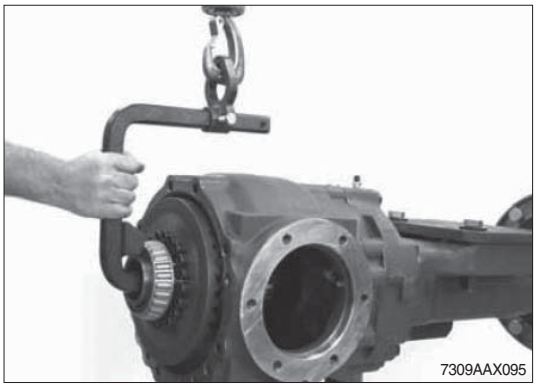
· Tightening torque (M12/8.8) :
5.61 kgf · m (40.6 lbf · ft)

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



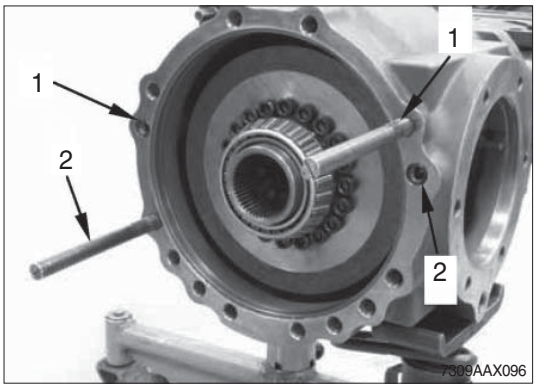
⑨ Relocate differential and insert stub shaft into the axle bevel gear.

Lifting bracket 5870 281 033

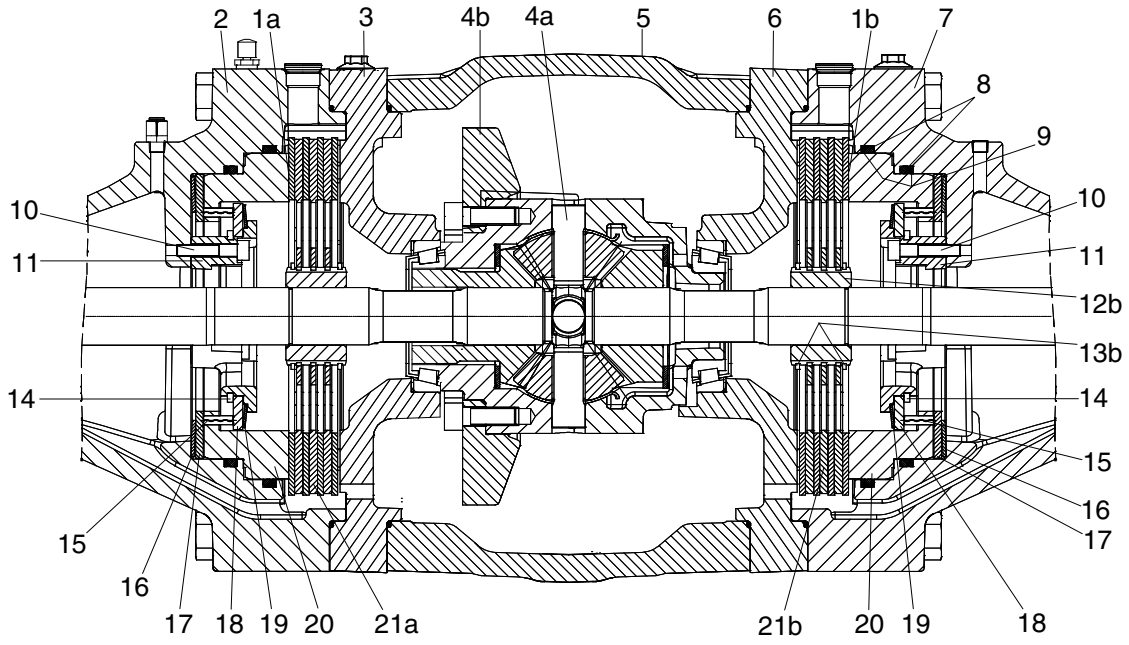


⑩ Install adjusting screws (1) and fix both O-rings (2) with grease (assembly aid) into the countersinks of the axle drive housing.

Adjusting screws (M18) 5870 204 026



(3) Service brake (multi disk brake)

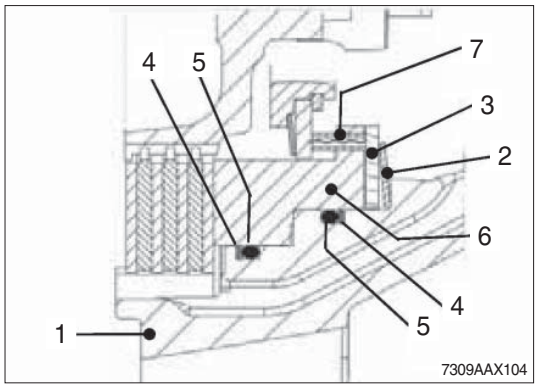


7309AAX103

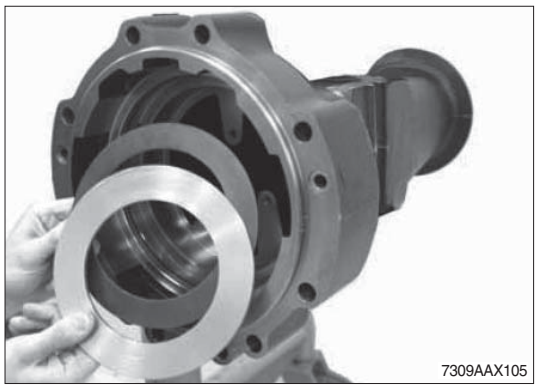
1	Service brake (multi-disk brake)	7	Axle housing (SOC)	15	Slotted pin
1a	crown wheel side (CS)	8	O-ring	16	Cup spring
1b	side opposite of crown wheel (SOC)	9	Back-up ring	17	Washer
2	Axle housing (CS)	10	Cylinder screw	18	Washer
3	Bearing housing (CS)	11	Ring	19	Cup spring
4	Differential assy	12	Disk carrier	20	Piston
4a	differential	13	Retaining ring	21	Disk package
4b	crown wheel	13a	retaining ring (CS)	21a	disk package (CS)
5	Axle drive housing	13b	retaining ring (SOC)	21b	disk package (SOC)
6	Bearing housing (SOC)	14	Retaining ring		

※ The following description refers to the reassembly of the service brake on the axle housing (CS = crown wheel side). For reassembly of the service brake on the second axle housing (SOC = side opposite of crown wheel) largely proceed in the same way.

1 Axle housing
2 Cup spring
3 Washer
4 Back-up ring
5 O-ring
6 Piston
7 Slotted pins

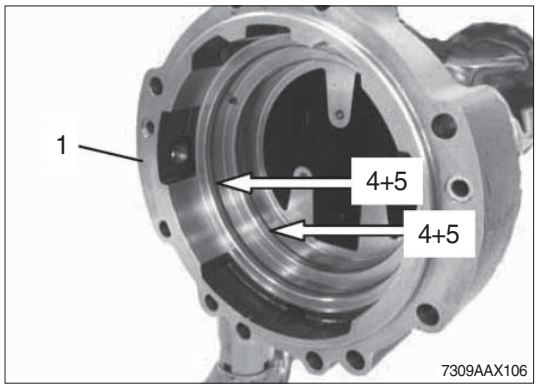


※ Locate cup spring (2), paying attention to correct installation position (see figure AX104) and washer (3) into axle housing (1).

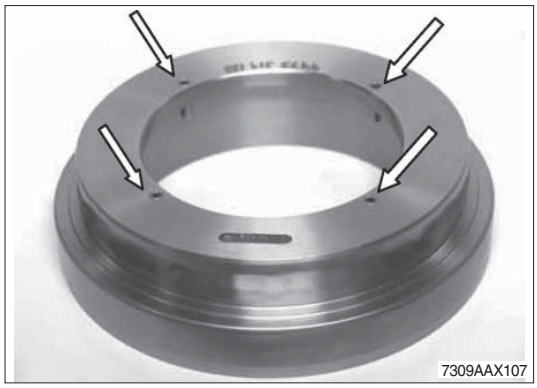


① Insert sealing elements (4+5, see figure AX104) into annular grooves (arrows) of the axle housing.

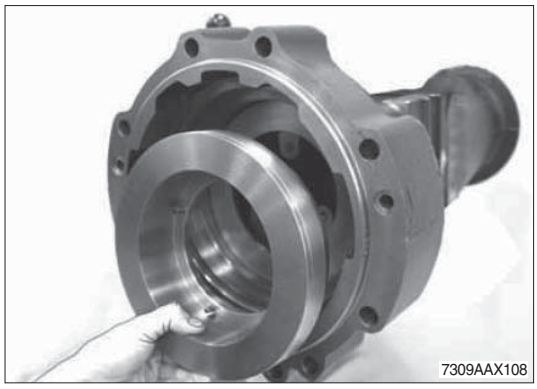
※ Pay attention to installation position of the individual sealing elements.



② Flush-mount slotted pins (7, see arrows) (front face) into piston (6), or relocate to be flush, if not dismantled.

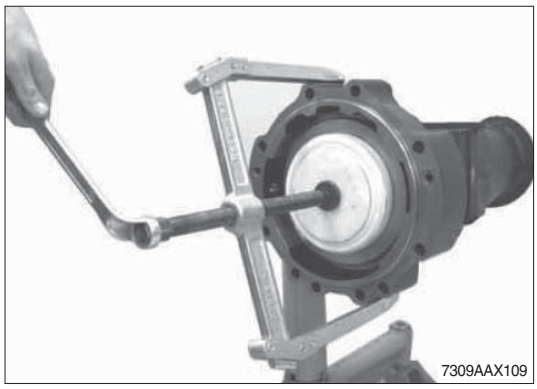


③ Oil O-rings and sealing surfaces of axle housing as well as piston.
Mount piston (4).

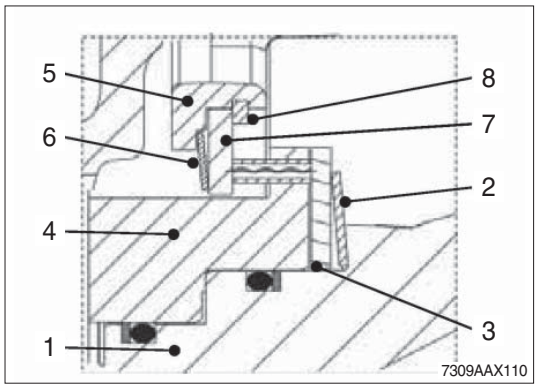


④ Push piston to contact position using a two-armed puller and a pressure plate.

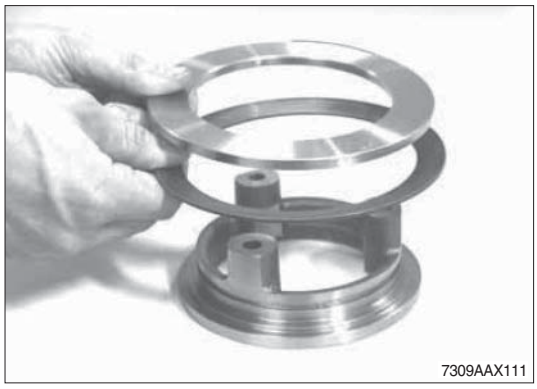
※ Pay attention to the slotted pins placed in the piston.
Ensure that the position of the inserted slotted pins does not change, pressure plate may only be in touch with piston front face.



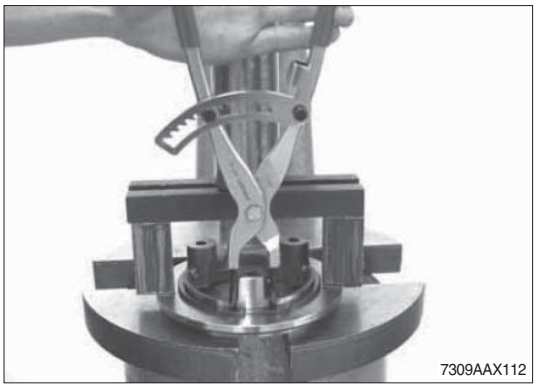
1 Axle housing
2 Cup spring
3 Washer
4 Piston
5 Ring
6 Cup spring
7 Washer
8 Retaining ring



※ Locate cup spring (6), paying attention to correct installation position (see figure AX110) and washer (7) on the ring (5).



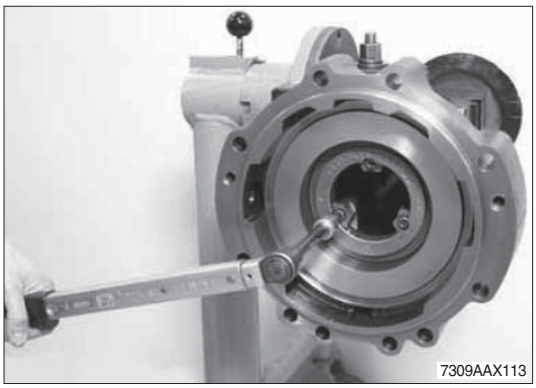
⑤ Press down cup spring preload using a press, and snap in retaining ring (8).



⑥ Insert preassembled ring and fix it with cylinder screws.

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

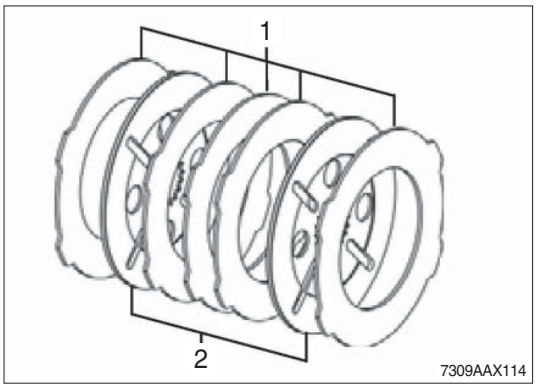
· Tightening torque (M 8/8.8) :
2.35 kgf · m (17.0 lbf · ft)



※ For the required fitting of the service brake (number and arrangement of the single disks), please stick to the parts list specifications, for this purpose refer to the corresponding spare parts list (text and perspective view).

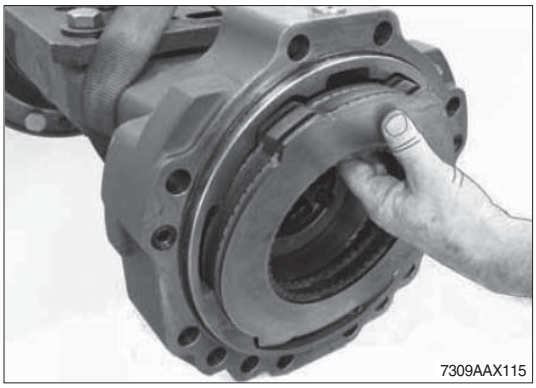
1 Outer disks
2 Inner disks (lined disks)

※ The right figure shows the service brake (version with 2 lined disks).

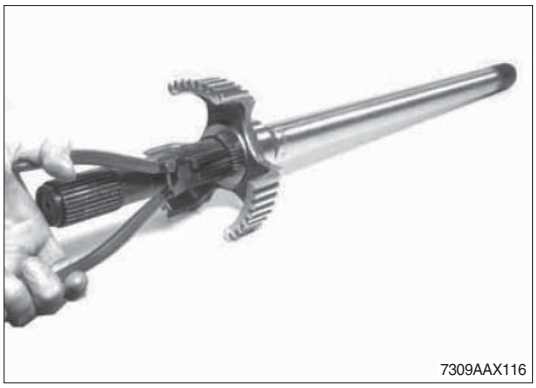


⑦ Locate disk package, taking the disk arrangement into consideration (see figure AX114).

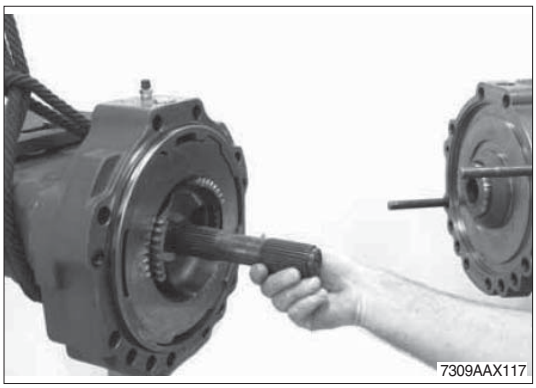
※ Fix outside disk with grease, assembly aid.



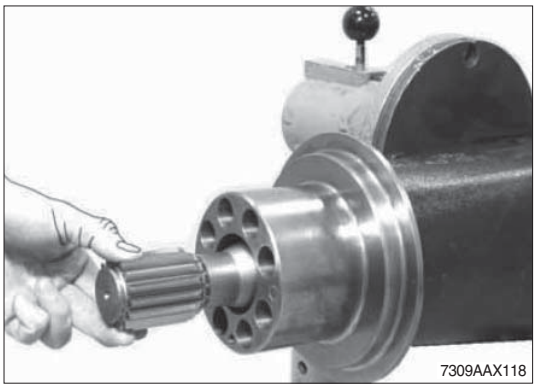
⑧ Mount disk carrier paying attention to correct installation position (see figure AX116) and snap in retaining ring.



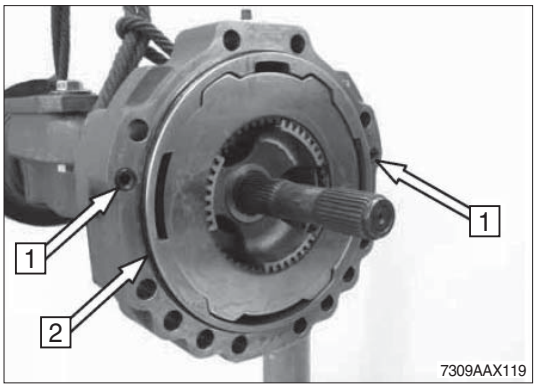
⑨ Insert pre-assembled stub shaft until all inner disks are mounted.



⑩ Mount sun gear shaft to the inserted stub shaft, assembly aid (for central position of stub shaft).

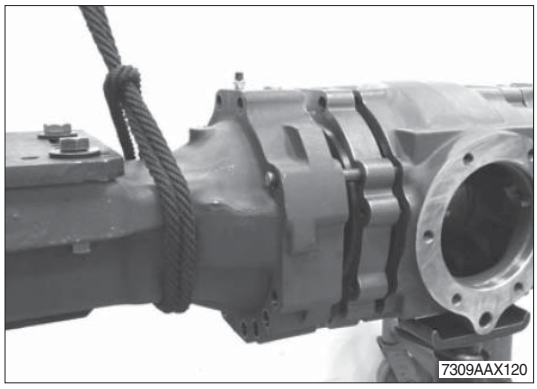


⑪ Fix both O-rings (1) with grease (assembly aid) into countersinks of the axle housing.
Oil O-ring (2) and install on the axle housing.



⑫ 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).

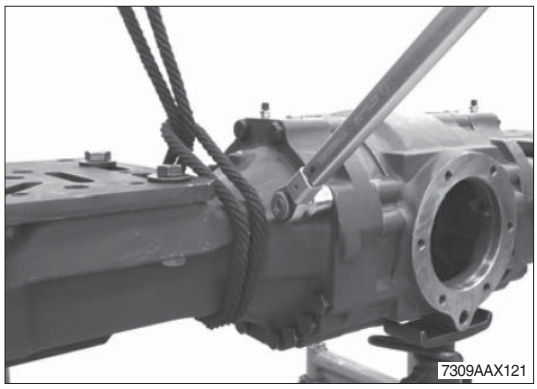
※ Pay attention to O-rings installed in the axle drive housing (see page 3-231, figure AX096) and in the axle housing (page 3-236, figure AX119).



⑬ Use hexagon screws to bring the axle housing equally to contact position and to fix it.

※ Rotate the differential in both directions several times, roller setting.

· Tightening torque (M18/10.9) :
39.7 kgf · m (288 lbf · ft)



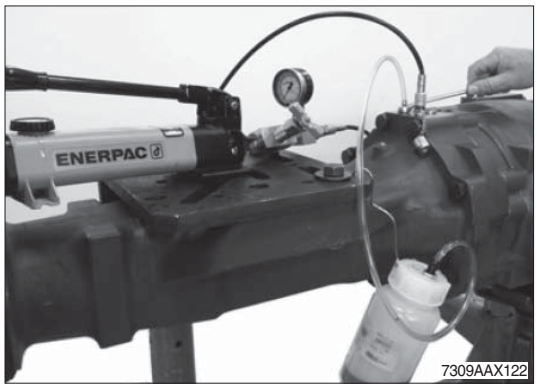
Leakage test of multi-disk brake:

① Mount breather valve 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 = 20 bar +10 bar and close shut-off valve of HP pump (maintain pressure).
A pressure drop of maximum 1.5 bar is allowed during a 5 minute testing time.
Test media : SAE15W-40



Disk clearance check of service brake:

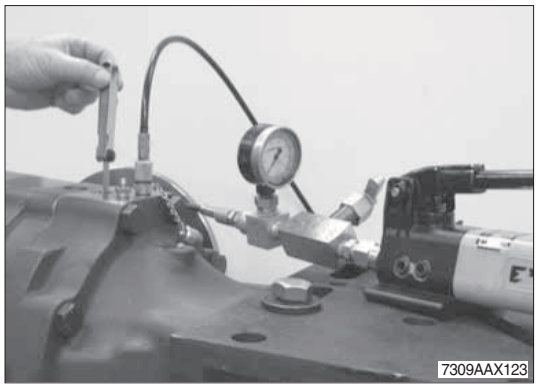
※ The brake must be fully breathed for obtaining an objective test result of the disk clearance.

② Pressurize brake by HP pump with p = 60 bar-10 bar, release brake and check disk clearance X using a feeler gauge, also refer to figure AX124.

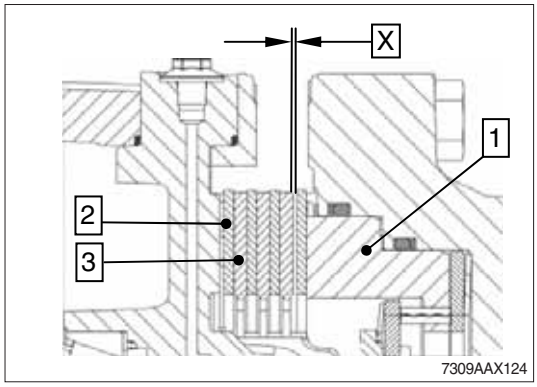
Specified disk clearance X = 0.4~0.85 mm

※ If the required disk 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 disk
3 Inner disk (lined disk)
X Disk clearance (0.4~0.75 ㎜)



Leakage test of differential:

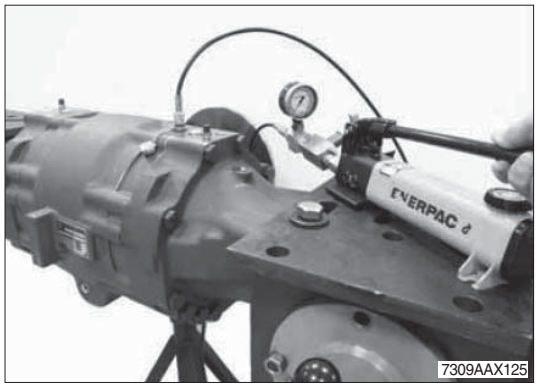
③ Prior to starting the test, bleed pressure chamber and then check differential (function of connection / disconnection).

Leakage 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.

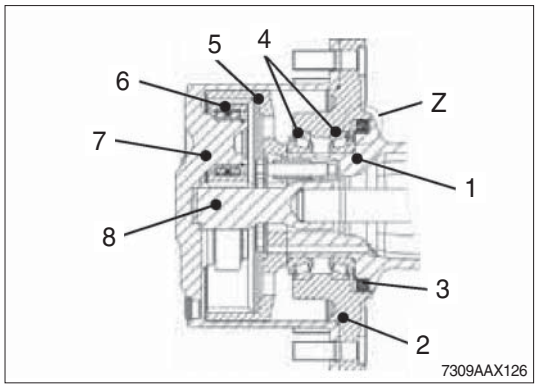
HP pump	5870 287 007
Threaded coupling (7/16-20 UNF)	5870 950 135

Test media : SAE15W-40

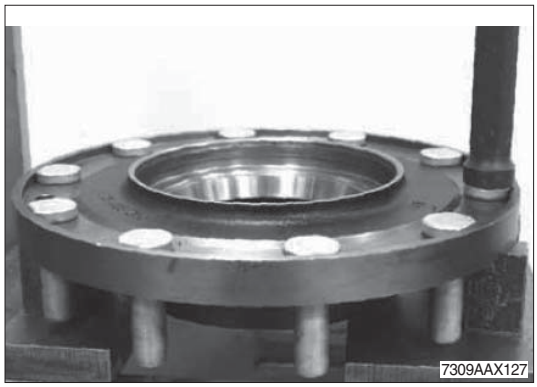


(4) Output

1 Axle housing
2 Hub
3 Shaft seal
4 Roller bearing (hub bearing)
5 Ring gear
6 Planetary gears
7 Planetary carrier
8 Sun gear shaft
Z Detailed sketch (see figure AX130)



① Mount wheel bolt.

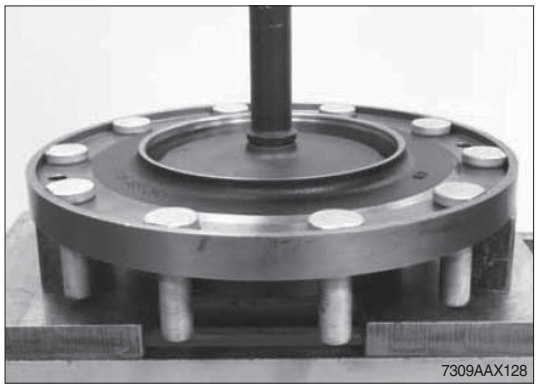


② Install both bearing outer rings of hub bearing until contact is obtained.

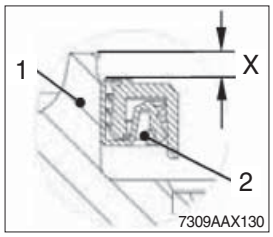
※ Hub must not be supported on wheel bolts.

Driver tool	5870 051 012
Handle	5870 260 004

※ To ensure correct functioning, always use a **new** shaft seal when installing the hub, also refer to disassembly instructions page 3-210, figure AX021.

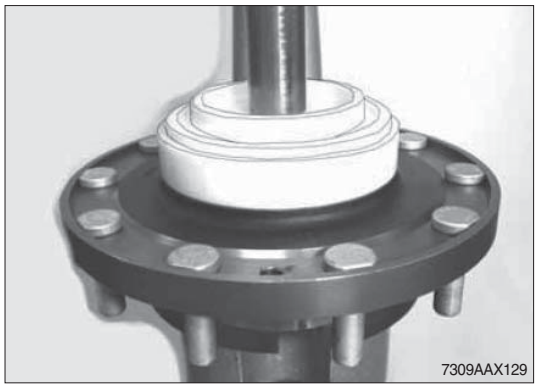


※ Apply sealing agent (loctite #574) to contact face shaft seal/hub.
Mount shaft seal paying attention to the correct installation position (labeling OUTSIDE showing upwards / outwards) and to the correct offset X, see below detailed sketch.

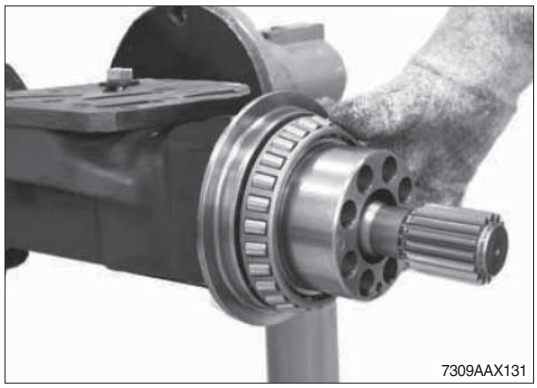


1 Hub
2 Shaft seal
X Installation dimension $5.5^{+0.2}$ mm

Driver tool 5870 051 057



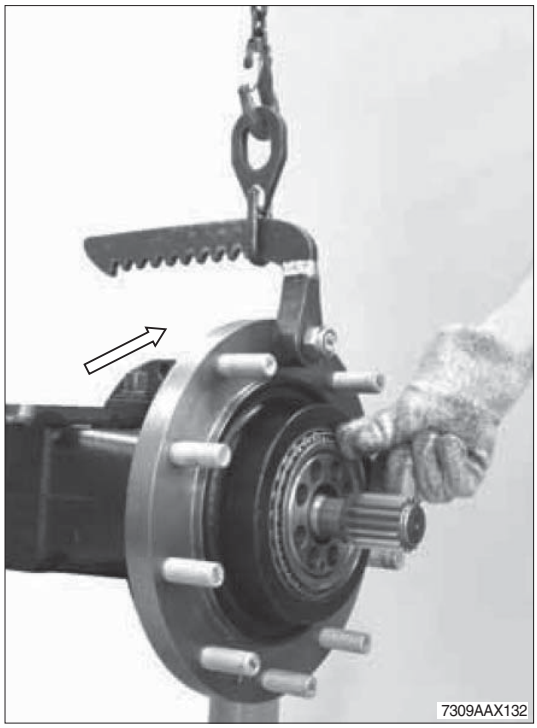
③ Mount heated bearing inner ring until contact.



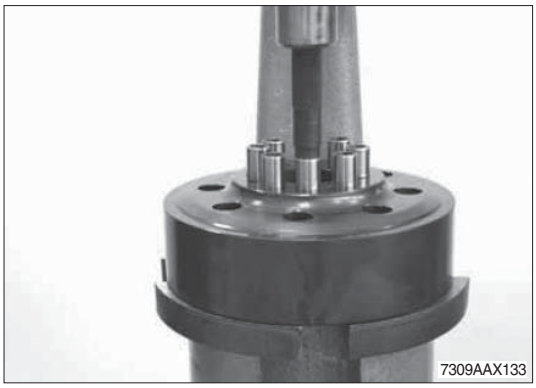
※ Just before fitting, wet the contact face shaft seal/axle housing with spirit, assembly aid.

④ Mount preassembled hub until contact and fix it with heated external bearing inner ring.

Lifting bracket 5870 281 043

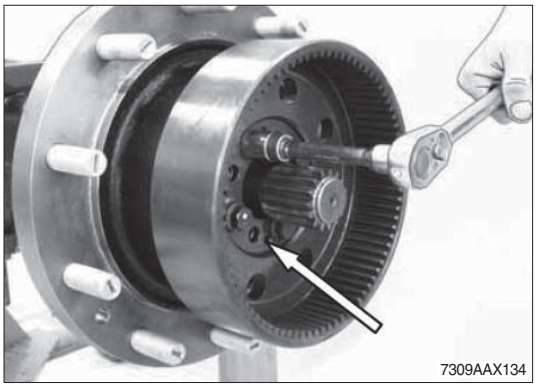


⑤ If diassembled, insert bushings into the ring gear until contact is obtained.



※ Mount preassembled ring gear paying attention to the correct installation position (oil through hole position of axle housing/ring gear must match, see arrow) and equally bring it to contact position using the **old** locking screws (from disassembly).

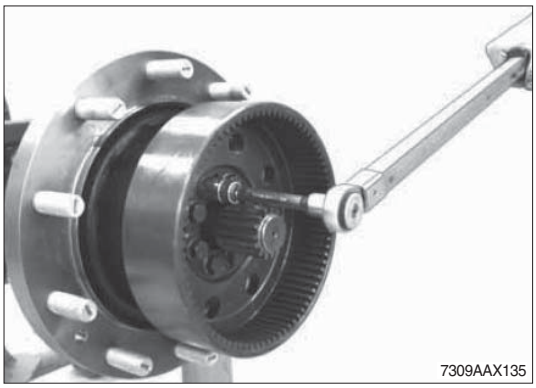
※ Rotate hub in both directions several times, roller setting.



⑥ Finally fix ring gear with new locking screws.

※ Evenly tighten locking screws - crosswise. Locking screws are permitted for one-time use only.

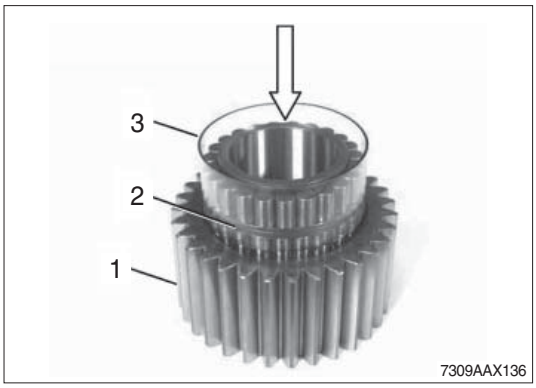
· Tightening torque (M14/12.9) :
2.55 kgf · m (18.4 lbf · ft)



Just for new parts assembly :

⑦ Insert cylinder roller bearing into the planetary gear by pressing the roller bearing into the planetary gear with assembly sleeve (arrow) until the snap ring engages in the annular groove of the planetary gear.

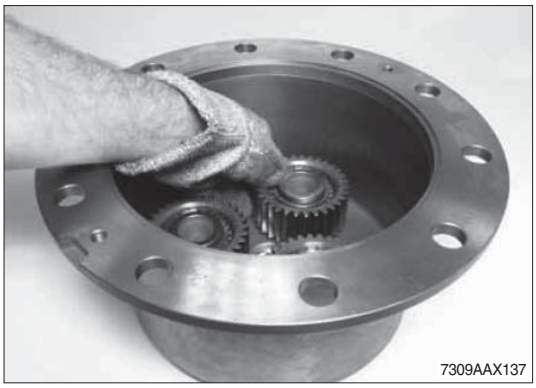
1 Planetary gear
2 Roller bearing with bearing inner ring/ cylinder rollers/axial washers and snap ring
3 Assembly sleeve



⑧ Heat up preassembled planetary gear (bearing inner ring) and install until contact is obtained, with large radius/bearing inner ring showing downwards.

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

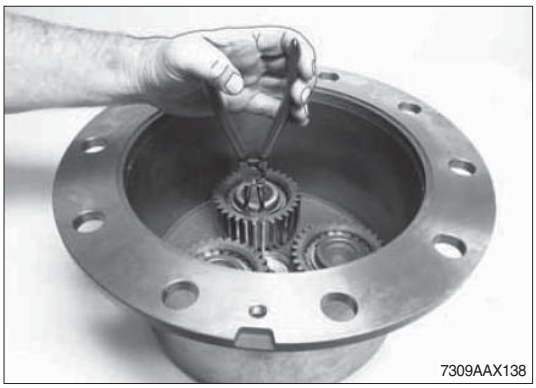
※ Depending on the version, the planetary carrier is fitted with 3 or 4 planetary gears. The figure shows the version with 3 planetary gears.



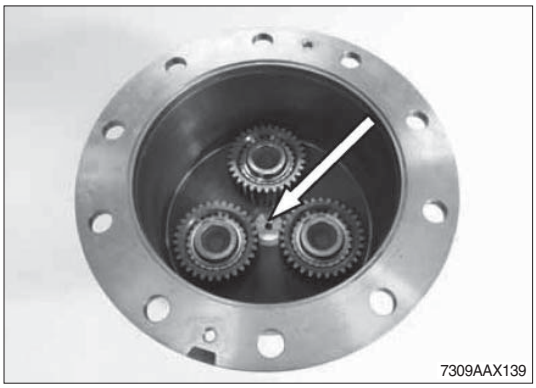
⑨ Snap in retaining ring.

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

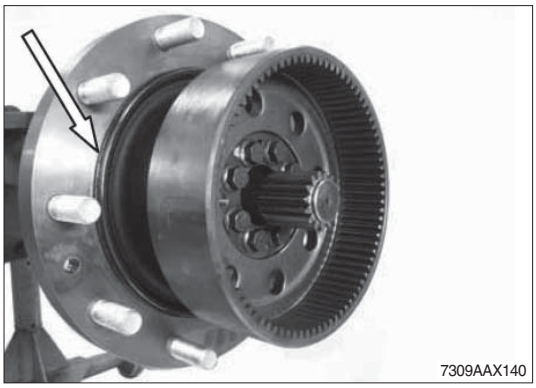
※ For reassembly of all other planetary gears proceed in the same way.



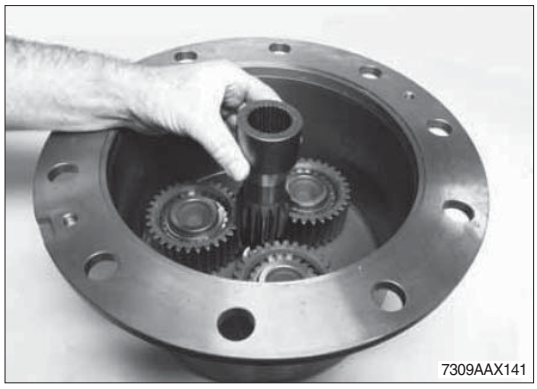
⑩ If disassembled, install stop pin (arrow).



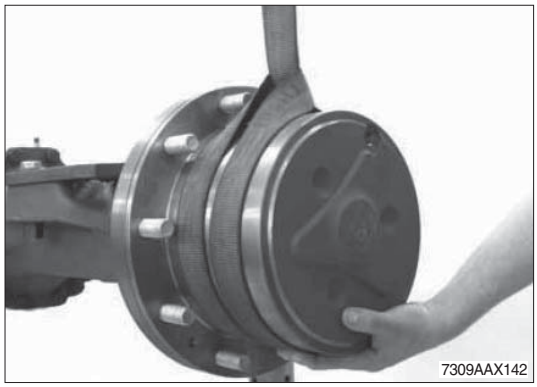
⑪ Oil O-ring (arrow) and install it on collar of hub.



⑫ Insert sun gear shaft into the preassembled planetary carrier, assembly aid.



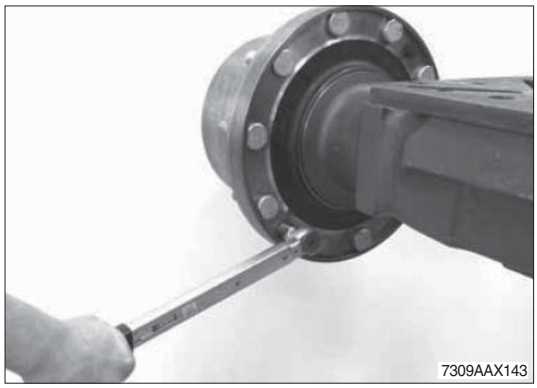
⑬ Take up preassembled planetary carrier by means of lifting strap and mount it on the hub by mounting the stub shaft into sun gear shaft.



⑭ Fix planetary carrier with hexagon screws.

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

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

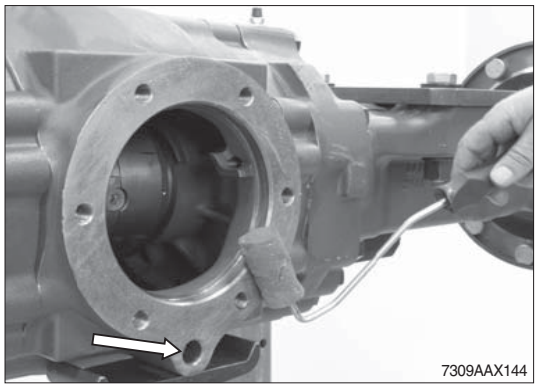


※ Prior to putting the axle into operation fill it with oil.

(5) Completion of the axle

① Apply sealing agent (loctite #574) on contact face of axle drive housing/input housing.

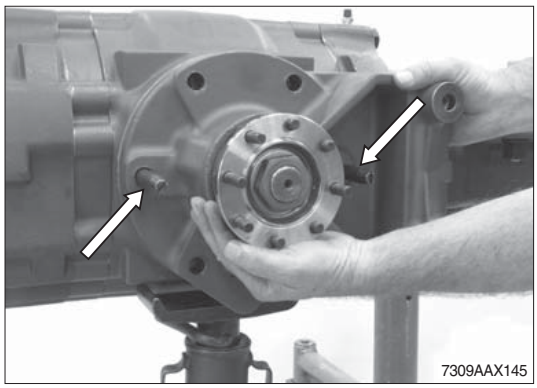
※ Ensure that area around the oil return hole (arrow) is completely wetted.



※ For preassembly of input, refer to page 3-218~222.

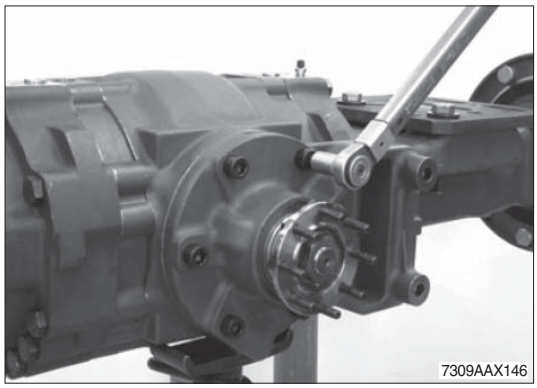
② Insert two adjusting screws (arrows) and mount preassembled input housing.

Adjusting screws (M16) 5870 204 023



③ Fix input housing with cylindrical screws.

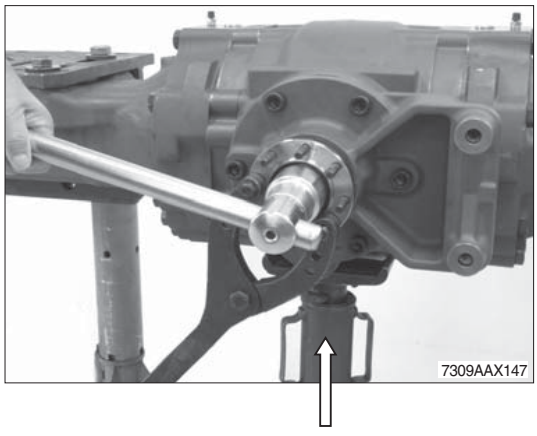
· Tightening torque (M16/8.8) :
19.9 kgf · m (144 lbf · ft)



⚠ Secure axle by means of support (arrow), risk of accident.

④ Remove the flange which has been provisionally installed (for the purpose of setting the pinion bearing rolling torque)

Clamping fork 5870 240 025



※ Insert shaft seal, paying attention to installation dimension X (also refer to figure AX148-1).

X = Installation dimension $13.5^{+0.2}$ mm

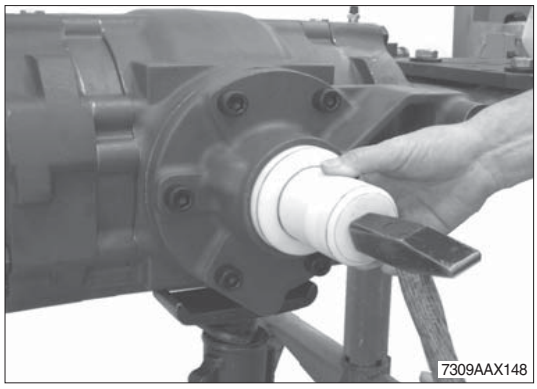
⑤ Contact face of input housing / shaft seal, (outer diameter of shaft seal) :

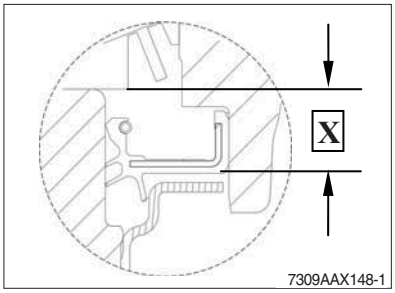
- if rubber-coated, wet with spirit (assembly aid)
- if made of metal, apply sealing agent (loctite #574)

Grease the shaft seal around the sealing and dust lip.

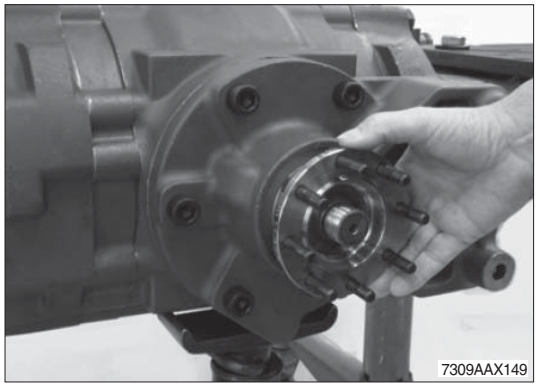
※ Ensure a plane installation position of the shaft seal using the specified driver ensures an exact installation position of the shaft seal.

Driver tool 5870 048 286





⑥ Mount preassembled input flange (with installed hexagon screws and screen sheet), fix it with washer and hexagon nut.

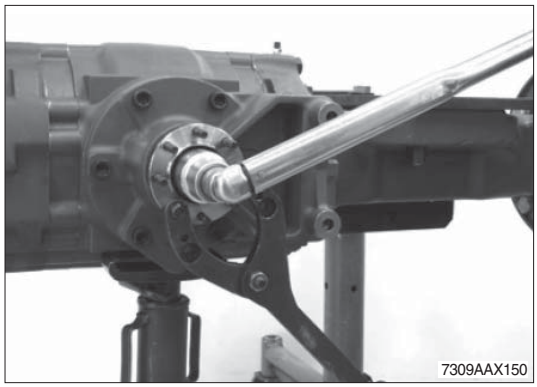


⑦ Fix input flange by means of clamping fork, and rotate it in both directions several times while tightening the hexagon nut (roller setting/pinion bearing).

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

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

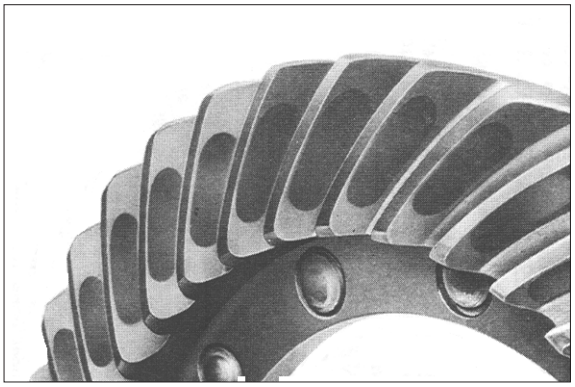
Clamping fork 5870 240 025



BACKLASH CHECK

- 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

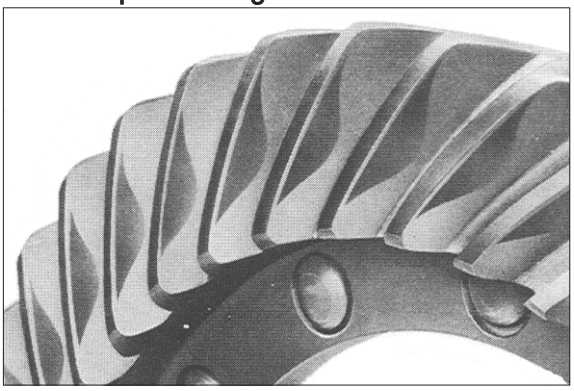
Concave side

WTHAX17

Convex side

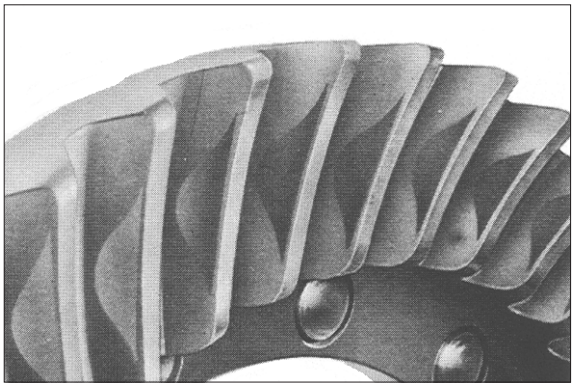
ADJUSTMENT

Incorrect pattern : high contact



WTHAX18

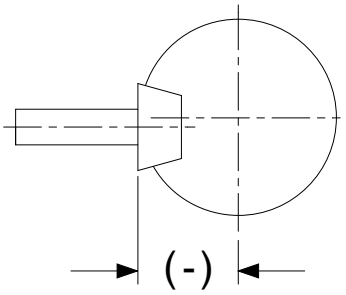
Concave side



WTHAX19

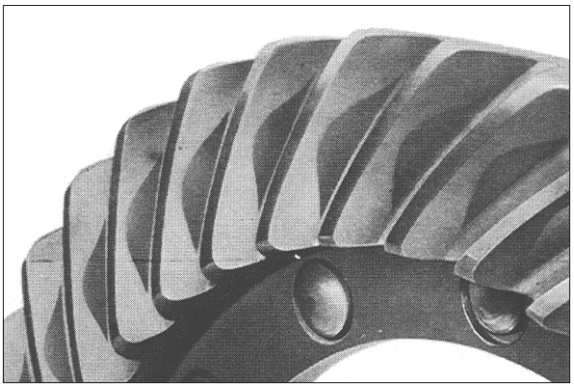
Convex side

- Reduce the distance (-)



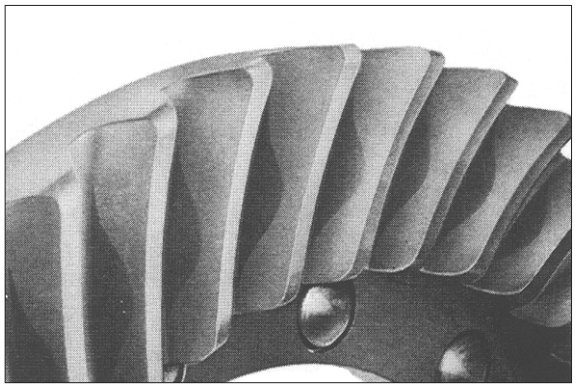
WTHAX20

Incorrect pattern, low contact



WTHAX21

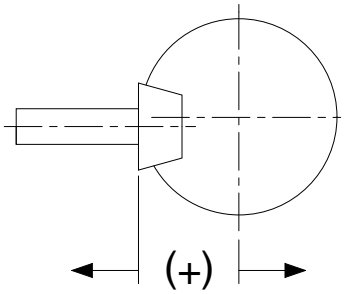
Concave side



WTHAX22

Convex side

- Add the distance (+)



WTHAX23