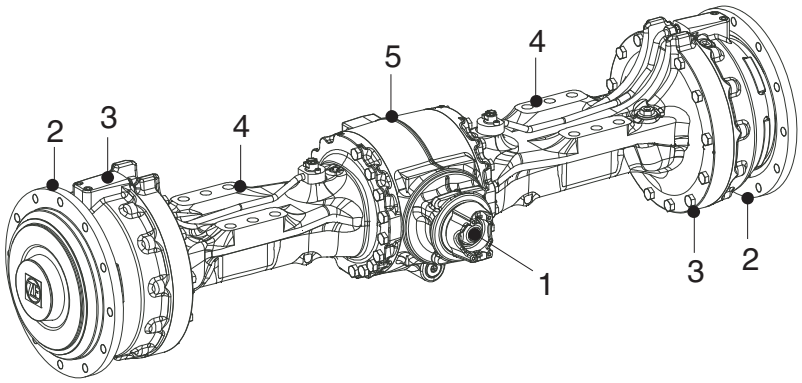
4. AXLE (ZF, machine serial No.: #0080-)

1) DISASSEMBLY

(1) Output and brake disassembly

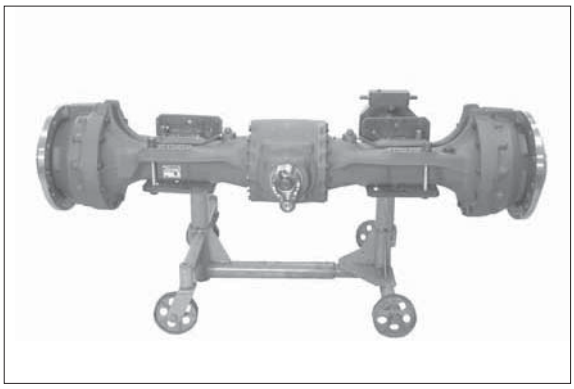


7409AAX001

1	Input	3	Brake	5	Axle drive housing
2	Output	4	Axle housing		

① Mount axle on assembly truck.

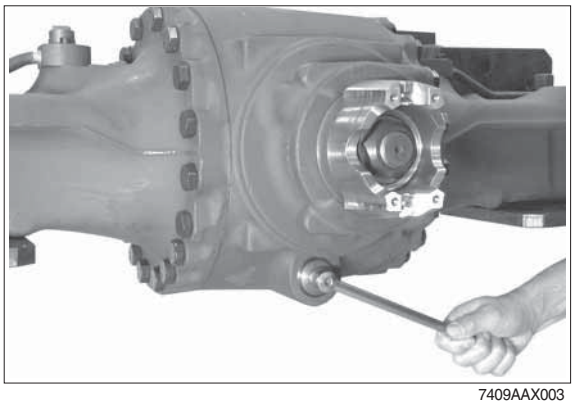
Assembly truck	5870 350 000
Supporting bracket (2EA)	5870 350 106



7409AAX002

② Drain oil from axle.

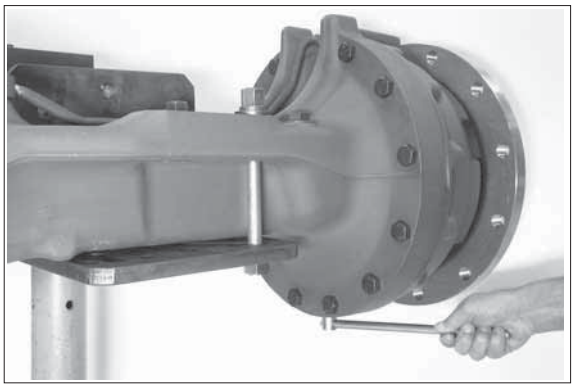
※ Use suitable reservoir-environmental protection.



7409AAX003

③ Drain oil from both outputs.

※ Use suitable reservoir-environmental protection.

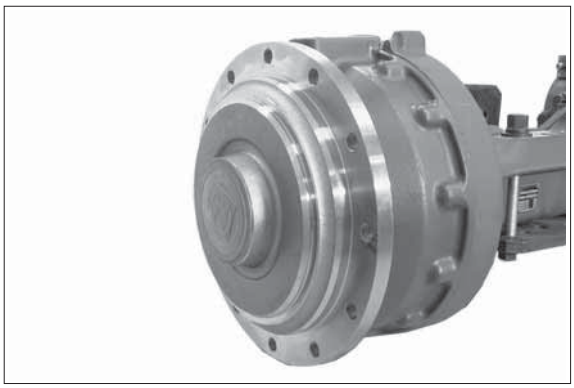


7409AAX004

Disassembly output assy /brake

For any replacement of components you can remove the output assy (with brake) as one unit.
In this context refer to work steps on page 3-292~193, figure AX007~AX009 and assembly steps page 3-332~337.

※ Please consider, however, that multi discs of the brake must be replaced on both outputs each.



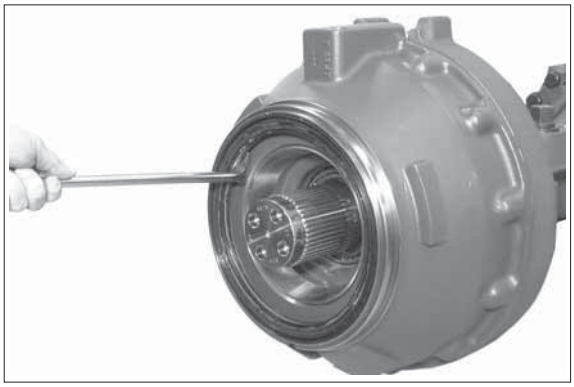
7409AAX005

Replacement combi seal ring (output)

※ The combi seal ring (output) can also be replaced on the installed axle for this purpose remove output shaft.

For the installation of the combi seal ring, refer to work steps page 3-325~326 (AX303 ~AX305).

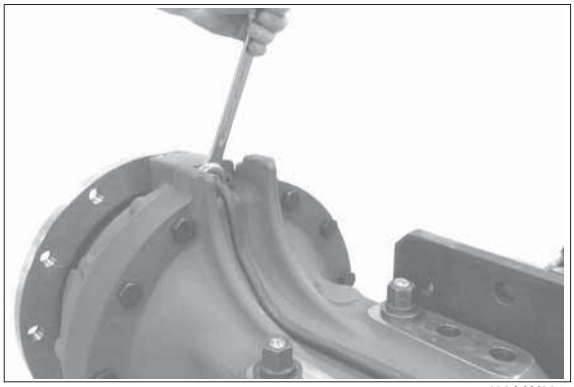
Pry bar 5870 345 071



7409AAX006

Output /brake

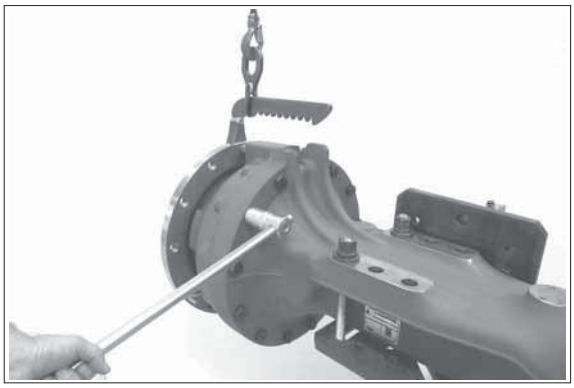
① Disassemble brake tube.



7409AAX007

② Take up output by means of a lifting bracket.
Loosen bolted connection (output /axle housing) and separate output from axle housing.
Pay attention to releasing end plate and multi discs.

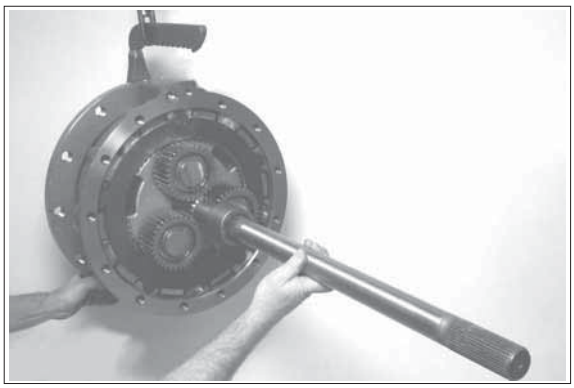
Lifting bracket	5870 281 043


7409AAX008

③ Remove stub shaft and sun gear shaft.

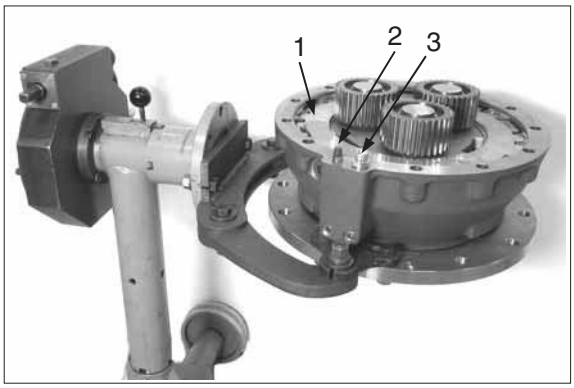
※ Pay attention to shim (placed in sun gear shaft) and mark allocation of shim to sun gear shaft and output side assembly aid.

In certain cases the stub shaft /sun gear shaft could get stuck in the axle housing (gearing of axle bevel gear /differential).


7409AAX009

④ Mount output assy on assembly truck.
Remove end plate (1), brake breather valve (2) and screw neck (3).

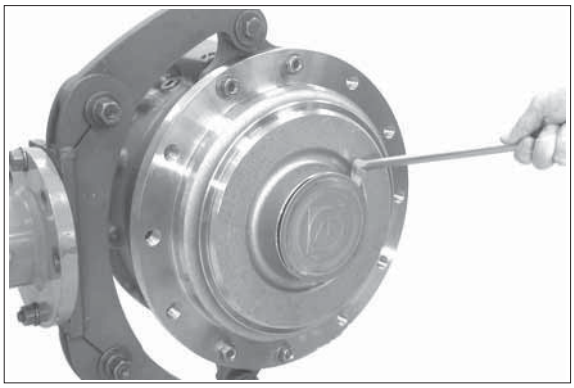
Assembly truck	5870 350 000
Fixture	5870 350 112



7409AAX010

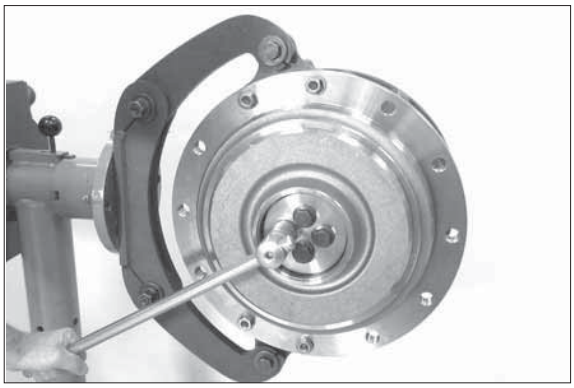
⑤ Remove lid (with O-ring).

Pry bar	5870 345 071


7409AAX011

⑥ Loosen locking screws and remove lid.

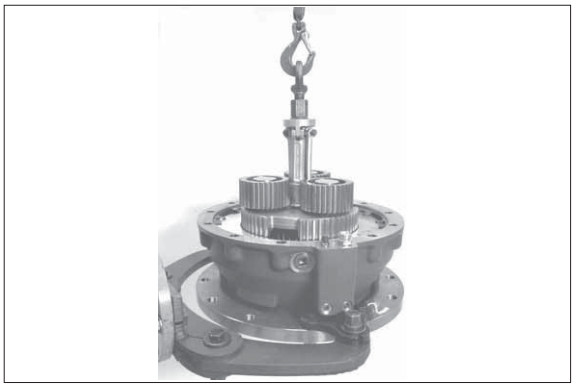
※ Pay attention to releasing planetary carrier, risk of accident.



7409AAX012

⑦ Lift compl. planetary carrier out of brake housing.

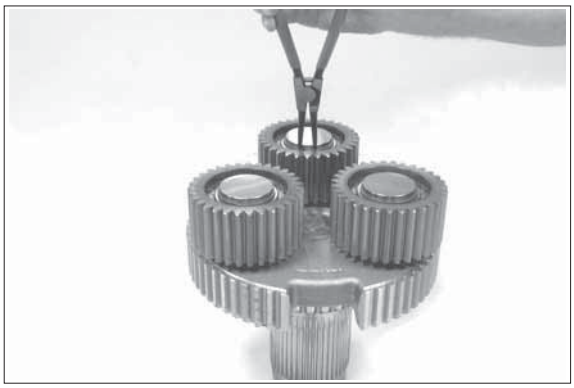
Inner extractor	5870 300 019
Eye nut	5870 204 073



7409AAX013

⑧ Snap out retaining ring.

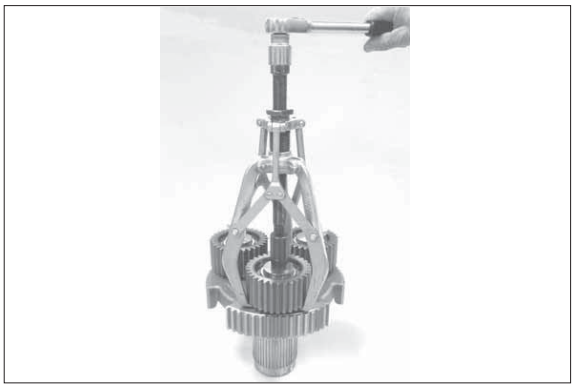
Set of external pliers	5870 900 015



7409AAX014

⑨ Pull off planetary gear.
Disassemble the remaining planetary gears in the same way.

Three armed puller	5870 971 002



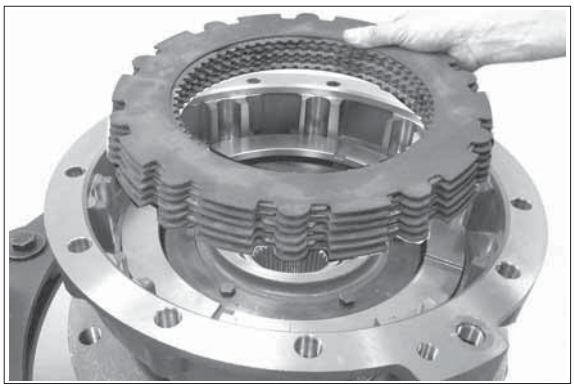
7409AAX015

⑩ Pull bearing inner ring off the planetary carrier.

Grab sleeve	5873 003 033
Basic tool	5873 003 001

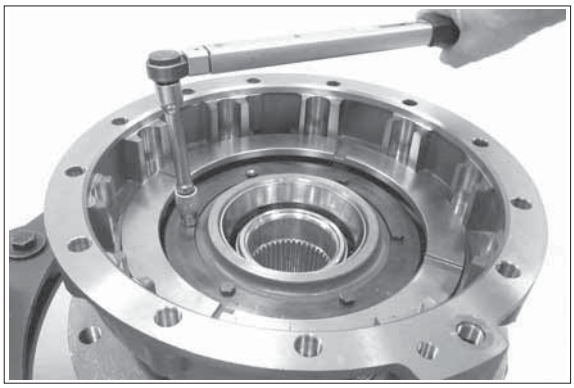
7409AAX016

⑪ Take disc package out of brake housing.



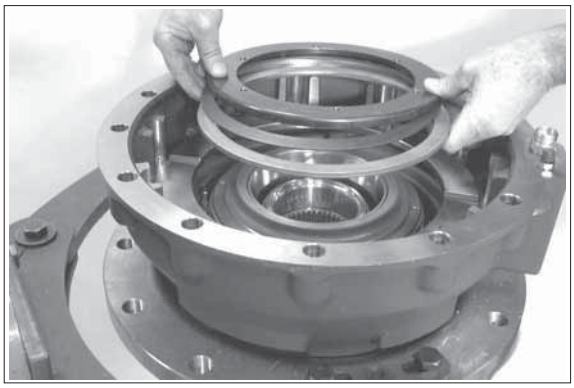
7409AAX017

⑫ Loosen threaded joint.



7409AAX018

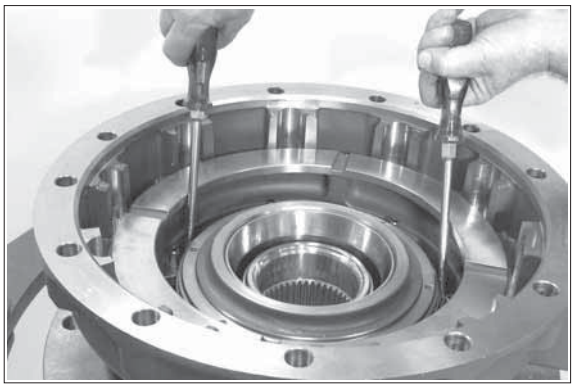
⑬ Remove lid, cup spring and disk.



7409AAX019

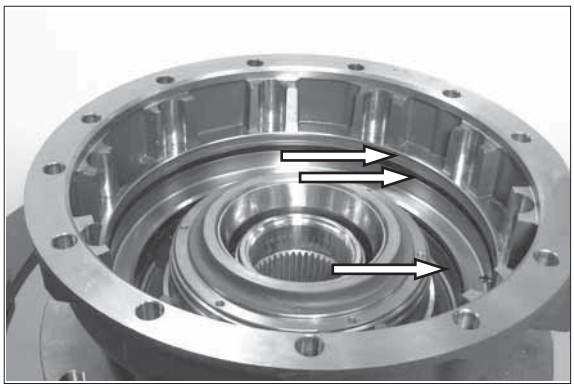
⑭ Lift piston off with lever.

Adjusting device 5870 400 001



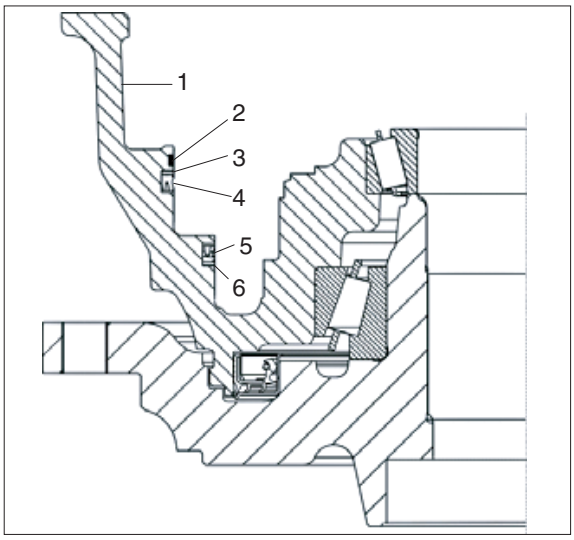
7409AAX020

⑮ Remove sealing elements (arrows also refer to AX022) from annular grooves of brake housing.



7409AAX021

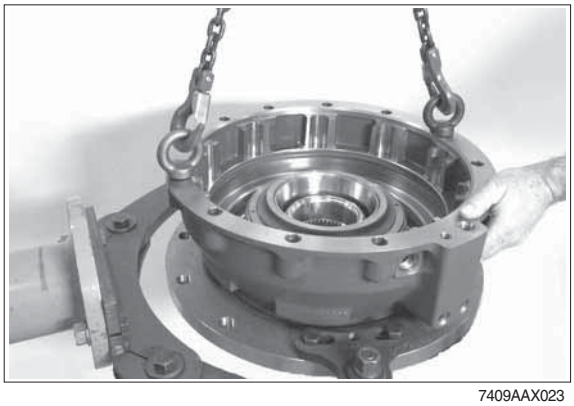
1 Brake housing
2 Guide ring
3 Support ring
4 Grooved ring
5 Grooved ring
6 Support ring



7409AAX022

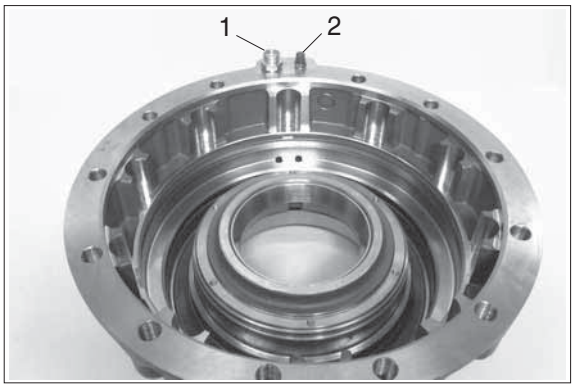
⑯ Lift brake housing off the output shaft by means of lifting device.

Lifting chain 5870 281 047
Eyebolts 5870 204 071



7409AAX023

⑰ Remove screw neck (1) and breather valve (2).



7409AAX024

⑱ Lift off shaft seal by lever and remove both bearing outer rings from brake housing, if required.

Pry bar	5870 345 071

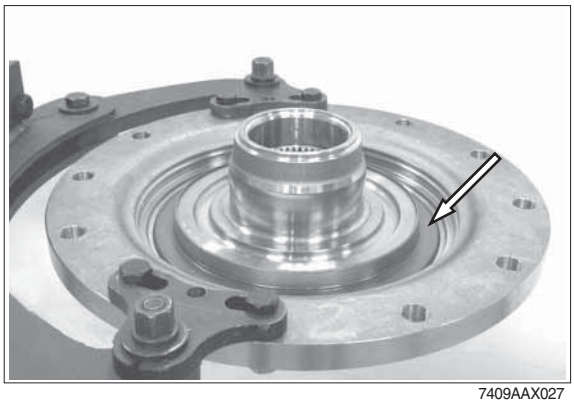

7409AAX025

⑲ Pull bearing inner ring from output shaft.

Rapid grip	5873 014 016
Basic tool	5873 004 001


7409AAX026

⑳ If required, disassemble wear sleeve (arrow) of combi seal ring.

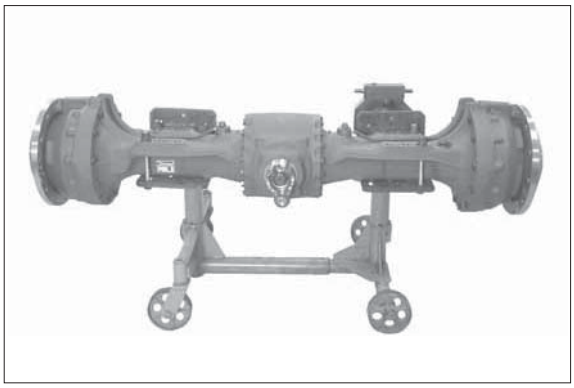

7409AAX027

(2) Differential and input disassembly

■ Differential

① Mount axle on assembly truck.

Assembly truck	5870 350 000
Supporting bracket (2EA)	5870 350 106



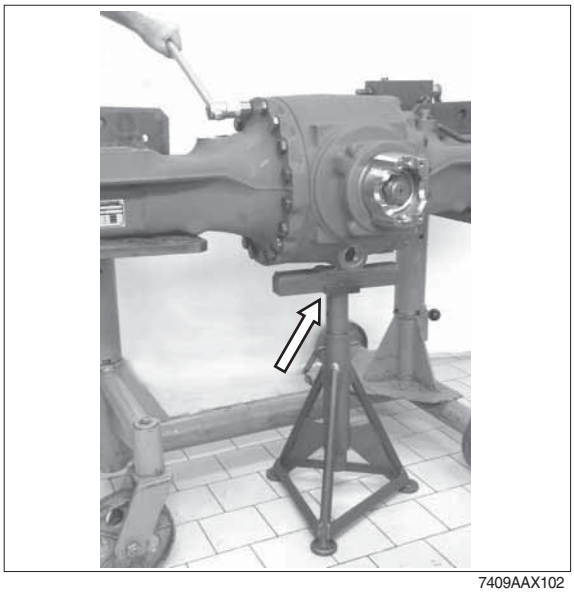
7409AAX101

※ The following illustration shows the removal of the differential in the course of a complete disassembly of the axle.
To remove the differential, however, it is possible to separate the axle half assy (axle housing with output) from the axle drive housing.

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

② Take up axle housing half on crown wheel side with lifting chain (see AX103) and loosen bolted connection (axle housing /axle drive housing).

Lifting chain	5870 281 047
Eyebolts	5870 204 071

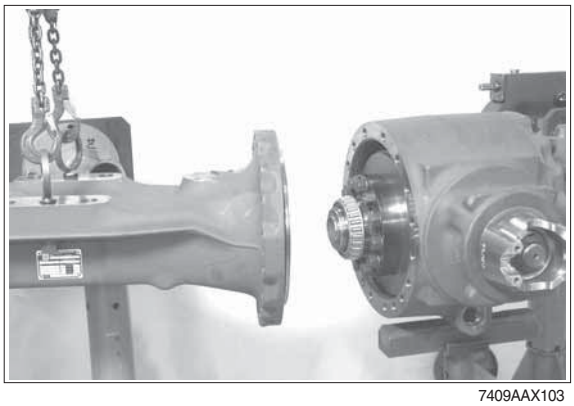


7409AAX102

③ Separate axle housing from axle drive housing.

※ Pay attention to releasing axial roller ring and differential.

※ Pay attention to releasing stub shaft and sun gear shaft with inserted shim (sun gear shaft clearance).
Mark allocation of shim versus sun gear shaft /stub shaft and output side, assembly aid.



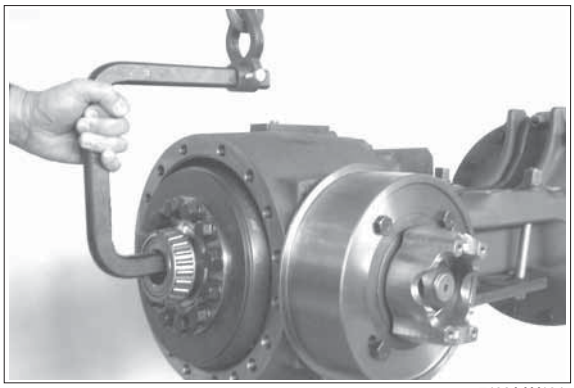
7409AAX103

Conventional differential (STD)

※ Description of disassembly and reassembly of the limited slip differential from page 3-301.

① Lift differential assy out of axle drive housing.

Lifting bracket	5870 281 033



7409AAX104

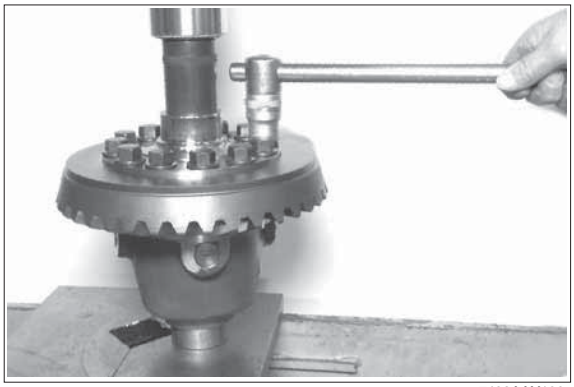
② Pull both taper roller bearings off the differential carrier.

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

7409AAX105

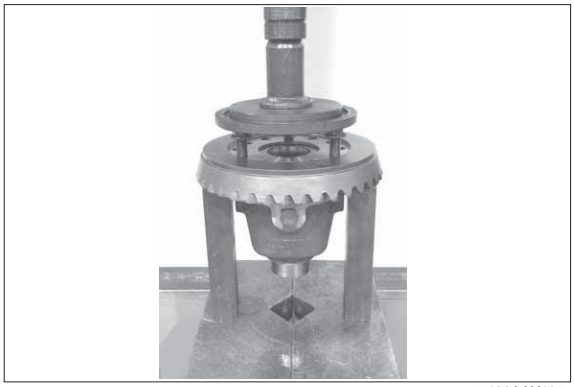
③ Hold differential by means of a press. Loosen locking screws and remove lid.

※ Locking screws permitted for one time use only.



7409AAX106

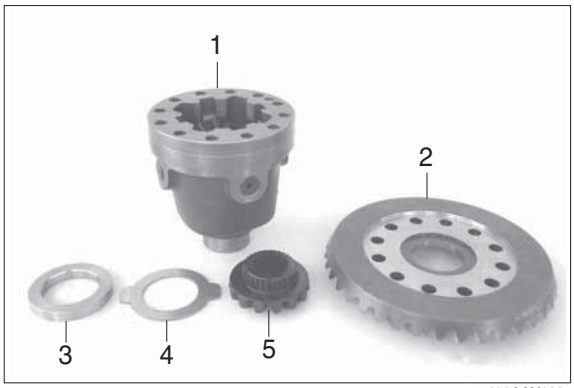
④ Insert some locking screws, position pressure plate and press differential carrier off the crown wheel.



7409AAX107

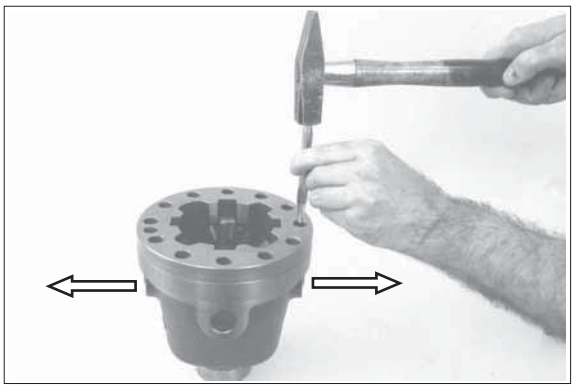
⑤ Remove axle bevel gear, thrust washer and constant spacer.

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

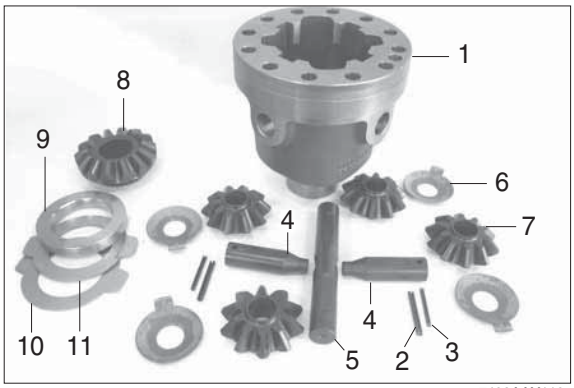


7409AAX108

⑥ 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

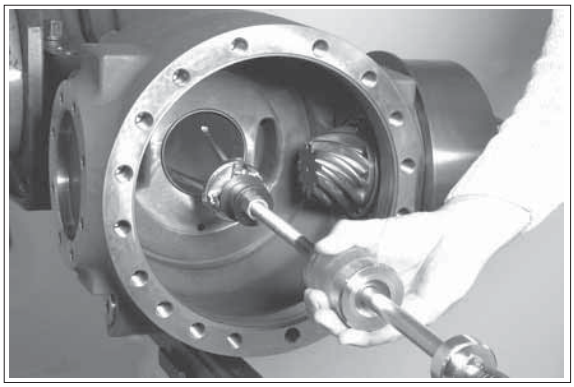


7409AAX110

⑦ Pull bearing outer ring out of hole by means of the striker and remove shim behind (backlash).

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

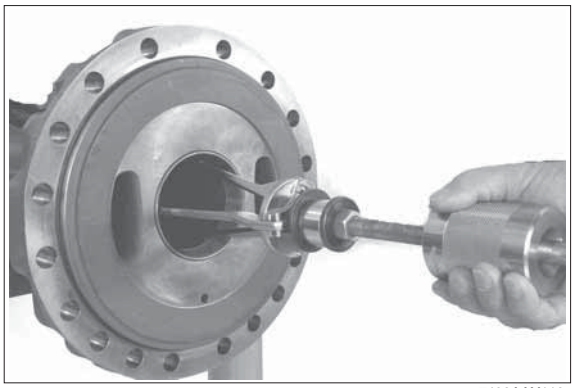
Striker 5870 650 004


7409AAX111

⑧ Remove O-ring (arrow).
Remove bearing outer ring and shim behind (rolling torque differential bearing) from axle housing.

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

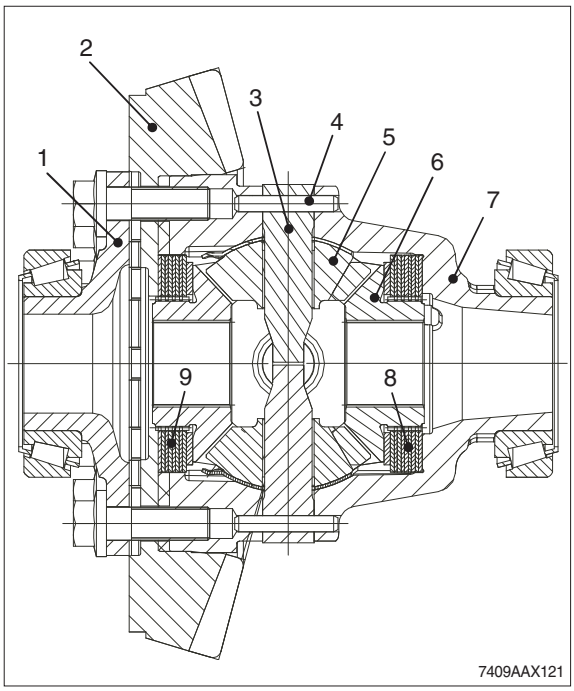
Striker 5870 650 004



7409AAX112

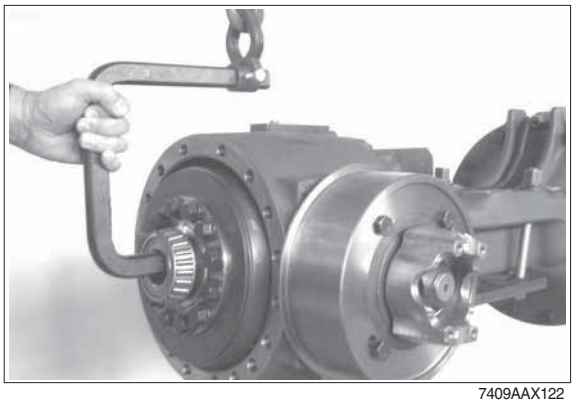
Limited slip differential (option)

1 Housing cover
2 Crown wheel
3 Spider shaft (split version) (2EA)
4 Double slotted pins
(5 × 50 and 8 × 50 ㎜)
5 Spider gear
6 Axle bevel gear
7 Differential carrier
8 Disk package "A"
9 Disk package "B"



7409AAX121

① Use the lifting device to lift the differential out of the axle drive housing.



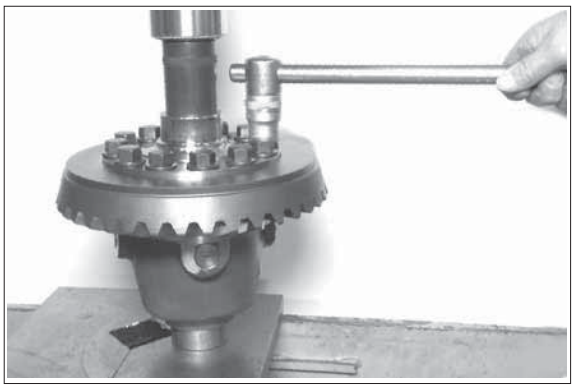
7409AAX122

② Pull the tapered roller bearing from the housing cover /differential carrier.

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

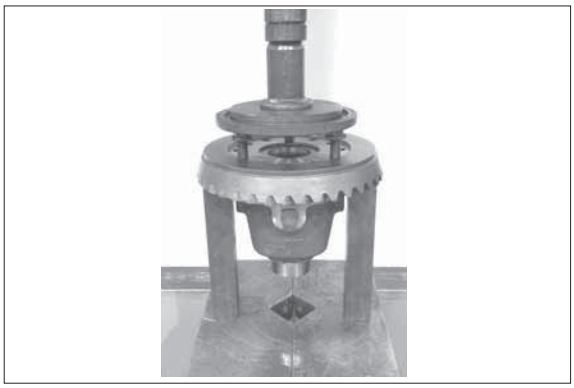
7409AAX123

③ Use the press to fix the differential ; loosen the locking screws and remove the cover.



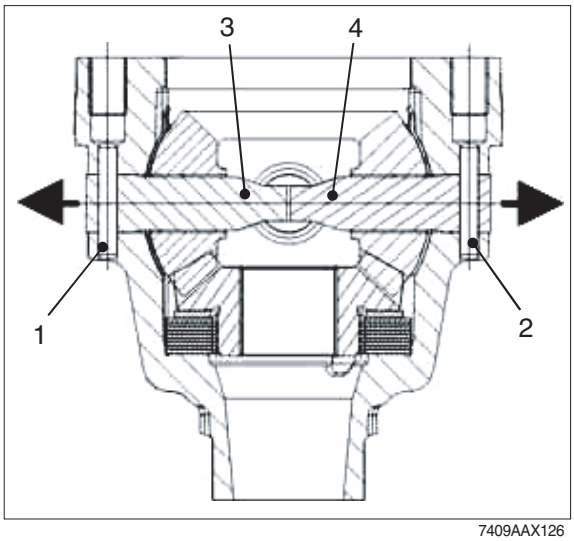
7409AAX124

④ Mount some locking screws, position the pressure plate and press the differential carrier from the crown wheel.
Remove the releasing disk package, thrust washer and axle bevel gear.



7409AAX125

⑤ Force the double slotted pins out (position 1 and 2) and pull the spider shafts (position 3 and 4) in direction of arrow out of the holes. Then remove the remaining single parts.

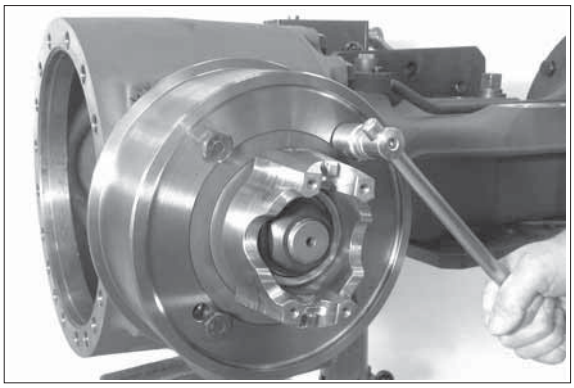


7409AAX126

■ Input

For axle version with pivot bearing only
(see AX128)

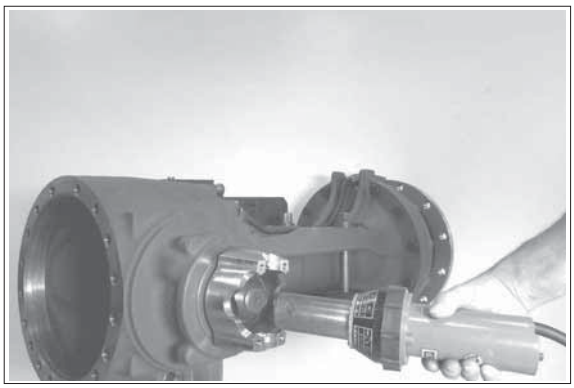
① Loosen bolted connection and pull off bearing flange.



7409AAX128

② Heat up hex nut (loctite locking compound) by means of hot air blower disassembly aid.

Hot air blower 230 V	5870 221500
Hot air blower 115 V	5870 221501

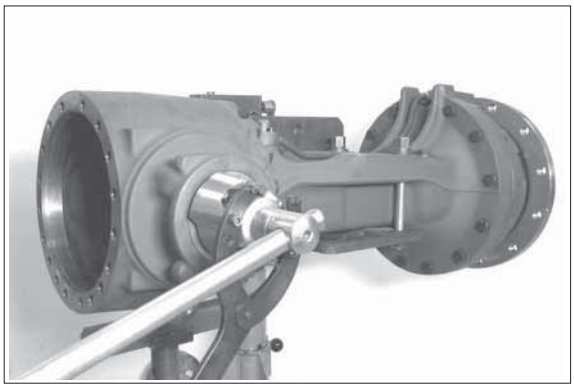


7409AAX129

③ Fix input flange by means of a clamping fork, loosen hex nut.

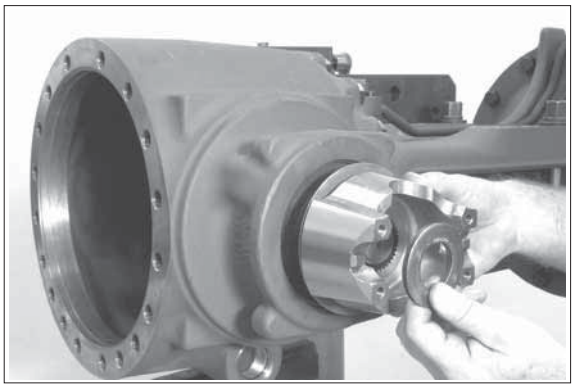
⚠ Secure axle by means of a support, risk of accident.

Clamping fork	5870 240 025



7409AAX130

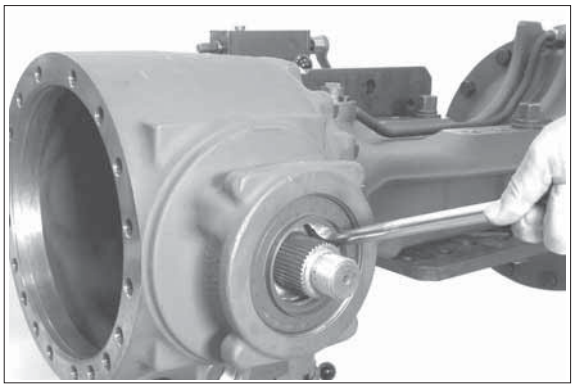
④ Remove disc and pull off flange.
Remove screen sheet from output flange, if required.



7409AAX131

⑤ Lift shaft seal off.

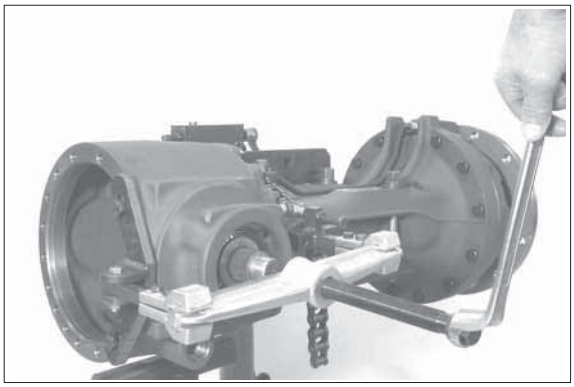
Pry bar	5870 345 071



7409AAX132

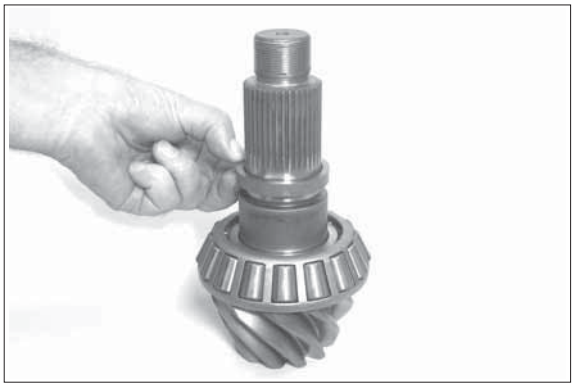
⑥ Press input pinion out by means of press off tool and remove releasing bearing inner ring.

Press-off tool	5870 280 044



7409AAX133

⑦ Remove spacer ring from pinion.



7409AAX134

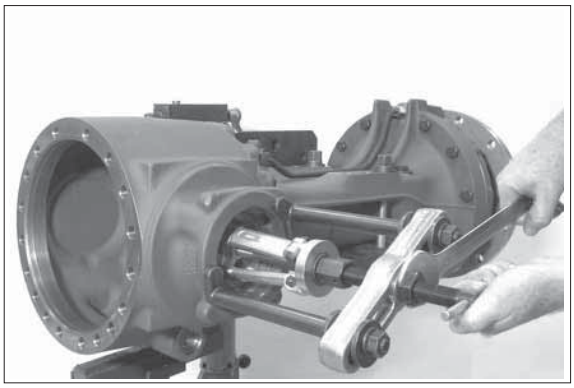
⑧ Pull bearing inner ring off the pinion.

Grab sleeve	5873 012 013
Basic tool	5873 002 001

7409AAX135

⑨ Pull-off outside bearing outer ring.

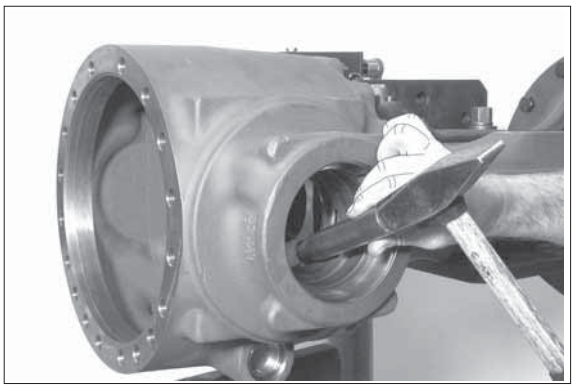
Internal extractor	5870 300 019
Counter support	5870 300 020



7409AAX136

⑩ Force bearing outer ring out of inner bearing hole, pay attention to shim behind (contact pattern/bevel gear set).

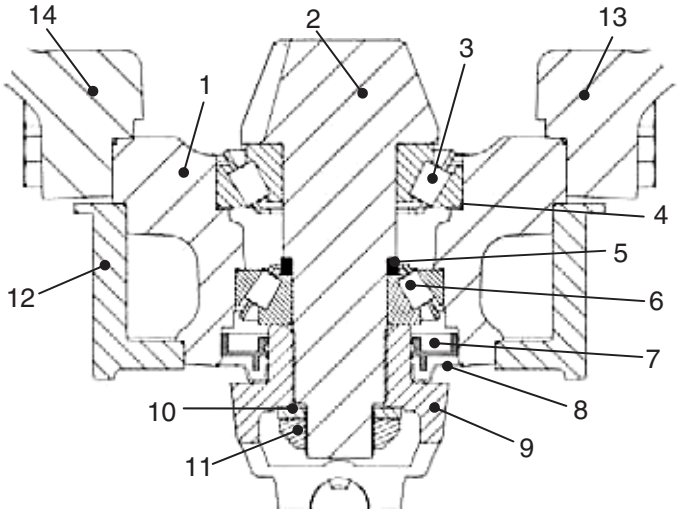
※ Mark shim (thickness/position and bearing allocation), assembly aid.



7409AAX137

2) ASSEMBLY

(1) Input assembly



7409AA201

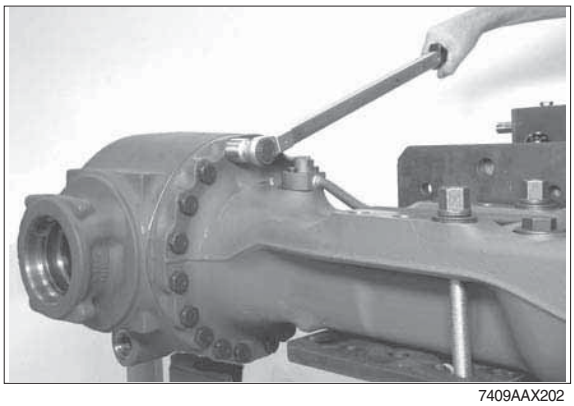
1	Axle drive housing	8	Protection plate
2	Input pinion	9	Input flange
3	Tapered roller bearing	10	Disc
4	Shim for contact pattern (bevel gear set)	11	Hexagon nut
5	Spacer ring (bearing roller torque/ pinion bearing)	12	Bearing flange (only for axle version with pivot bearing)
6	Tapered roller bearing	13	Axle housing/ part I
7	Shaft seal	14	Axle housing/ part II (crown-wheel side)

※ Depending on the version, crown wheel and bevel pinion may be mounted as a bevel gear set (for production reasons, crown wheel and pinion are paired and show an identical pairing number see AX204) or as single parts, the respective version has to be taken from the specification of the corresponding spare parts list.
If a bevel gear set is specified, the crown wheel must only be replaced together with the pinion.

Only for assembly of new parts or if disassembled :

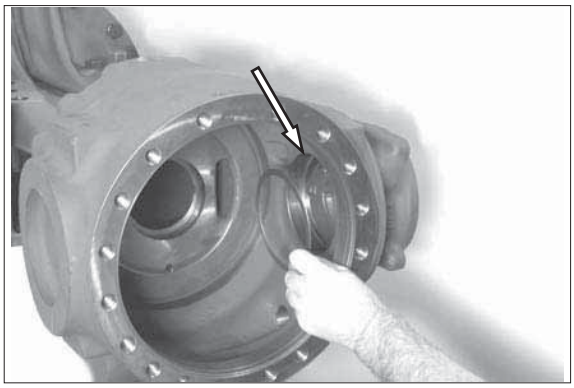
Mount O-ring on axle housing /part I and install axle drive housing, pay attention to radial installation position.

· Tightening torque (M18 × 1.5/10.9) :
39.8 kgf · m (288 lbf · ft)



7409AAX202

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



7409AAX203

※ We recommend to reinstall the shim found during disassembly (e.g. "S" = 1.20 mm, see disassembly instructions, page 3-305, AX137) into the inner bearing hole /pinion bearing.

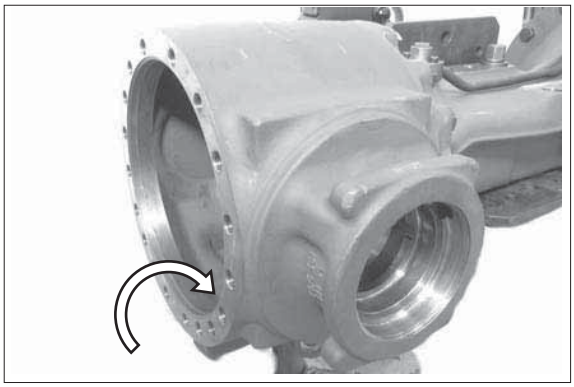
※ The contact pattern required on the bevel gear set, however, is decisive. If this is not achieved, see contact pattern check on page 3-317, AX237, correct the pinion position with a corresponding shim.

※ As an alternative, a basic setting of the required pinion position can be made, e.g. when assembling a new part, as shown below (see AX204~AX206).

Basic setting of pinion position :

① Read dimension "l" = production dimension /axle drive housing (from axle center to bearing contact /inner bearing hole) from the axle drive housing (position, see arrow).

Dimension l e.g. ..... 182.81 mm



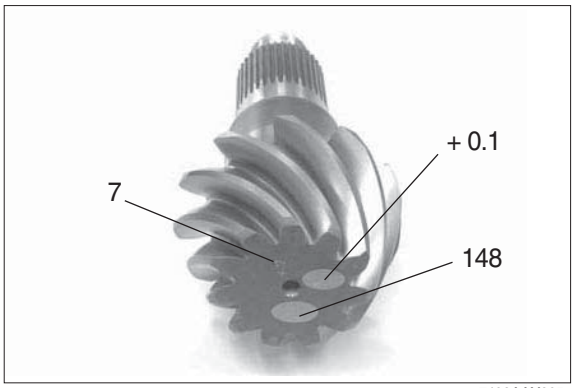
7409AAX204

② Read pinion dimension "X" (pinion basic dimension e.g. = 148) from pinion, or determine it in case of a + or - deviation from pinion dimension due to production (value concerned is marked by hand on the pinion, e.g.+ 0.1).

Pinion dimension "X" (without + or - deviation value) = 148.0 mm
Pinion dimension "X" with indication of + 0.1 deviation = 148.1 mm
Pinion dimension "X" with indication of - 0.1 deviation = 147.9 mm

Dimension II (pinion dimension X)
e.g. ..... 148.00 mm

※ Pairing number e.g. 7 - only for version with bevel gear set, see note AX201.



7409AAX205

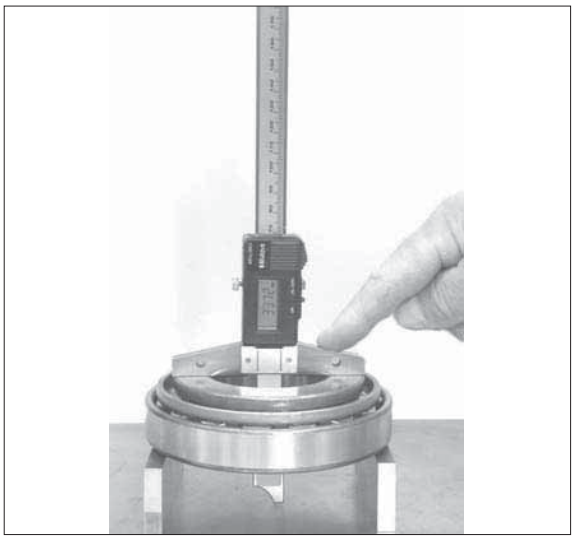
③ Determine dimension "III" bearing width, ensure here that the rollers are located without any play (rotate bearing inner ring in both directions several times, roller setting).
Since the installed roller bearing is subject to a pre-load in installation position, deduct an experience value of -0.05 mm.

Dimension III = e.g. .....
33.67 mm - 0.05 mm → 33.62 mm

CALCULATION EXAMPLE :
Dimension I ..... 182.81 mm
Dimension II + III (148.00 + 33.62) .....
-181.62 mm
Result ..... = 1.19 mm
Required shim "S" → 1.20 mm

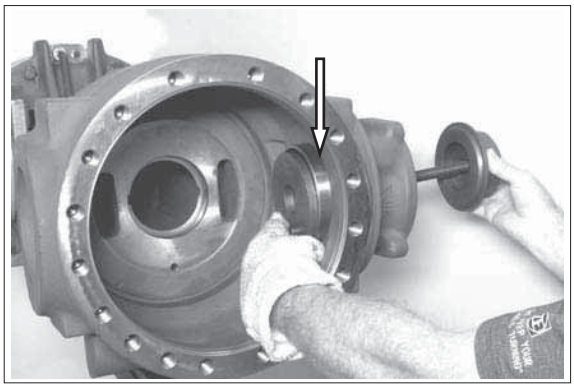
Insert determined shim into the hole of the axle drive housing, see AX203.

Digital depth gauge	5870 200 072
Gauge blocks	5870 200 066


7409AAX205

④ Undercool bearing outer ring (see arrow) and bring it into contact position in the inner bearing hole /pinion bearing by means of the fixture.

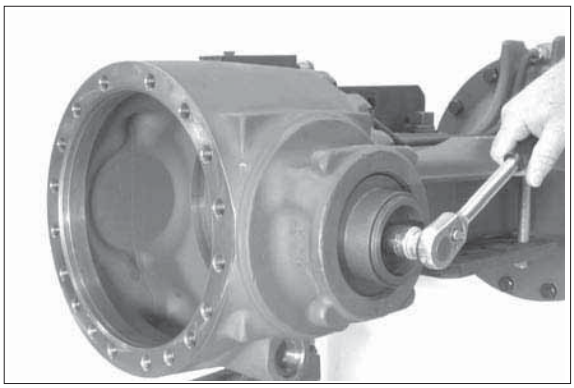
Assembly fixture 5870 345 049



7409AAX207

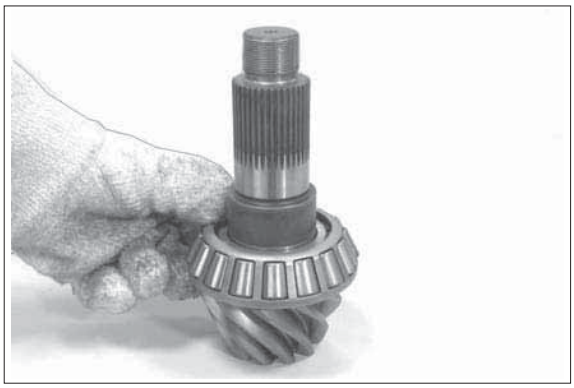
⑤ Install outside bearing outer ring /pinion bearing.

Assembly fixture 5870 345 049



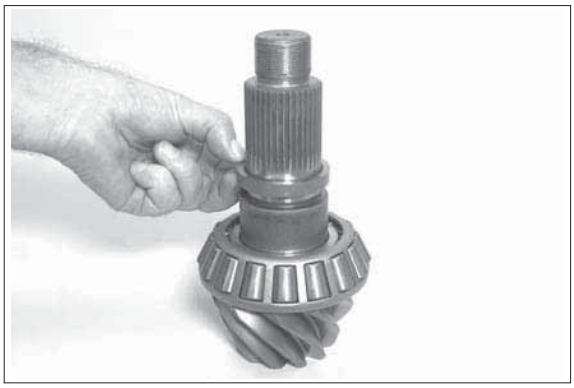
7409AAX208

⑥ Mount heated bearing inner ring until contact position and adjust after cooling down.



7409AAX209

Set rolling torque of input pinion bearing 0.11~0.23 kgf · m (0.81~1.70 lbf · ft) (without shaft seal) :



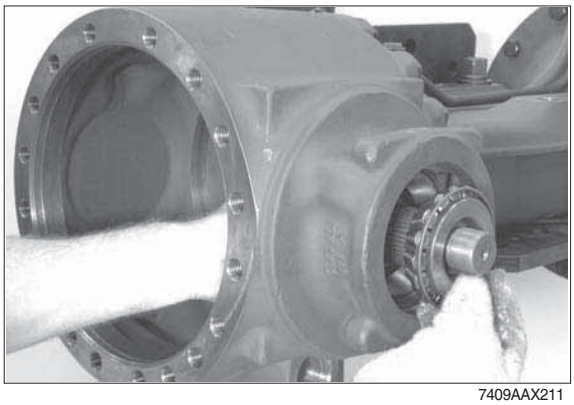
7409AAX210

⑦ Mount spacer ring (s = optional).

※ We recommend to reinstall the spacer ring found during disassembly (e.g. s = 8.7 mm).
If the originally installed shim was replaced (contact pattern /bevel gear set), see page 3-307, AX203, also install a spacer ring adjusted by the same correction value.

※ The required bearing rolling torque of 0.11~0.23 kgf · m (0.81~1.70 lbf · ft) (without shaft seal), however, is decisive, in case it is not achieved, see bearing rolling torque check (see AX213), correct the bearing rolling torque with a corresponding shim.

⑧ Insert preassembled input pinion, mount heated bearing inner ring until contact is obtained.



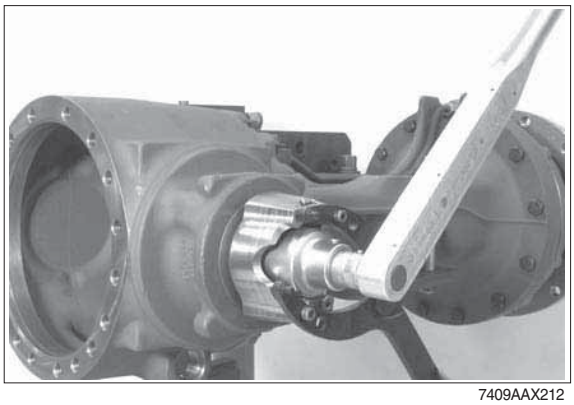
7409AAX211

⑨ Mount flange, fix with disc and hex. nut.

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

· Tightening torque (M36 × 1.5) :
71.4 kgf · m (516 lbf · ft)

Clamping fork 5870 240 025



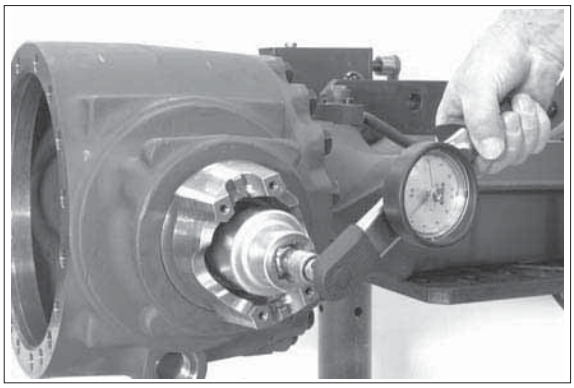
7409AAX212

⑩ Check rolling torque of the pinion bearing.
Bearing rolling torque (without shaft seal) : 0.11~0.23 kgf · m (0.81~1.70 lbf · ft).
Try to achieve upper value.

※ In case of a deviation from the required rolling torque correct it with a corresponding spacer ring (see AX210, page 3-310).

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

For assembly of shaft seal stick to description in page 3-322 (after completed differential assembly and positive contact pattern check).

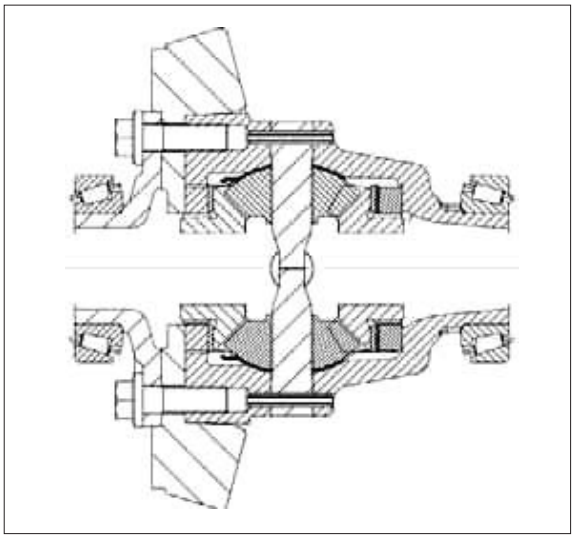

7409AAX213

(2) Differential assembly

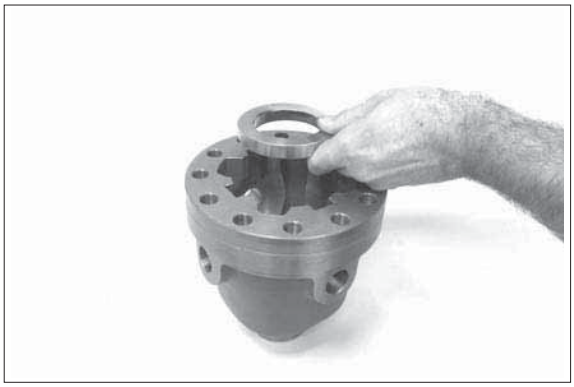
Conventinaol differential (STD)

① Illustration in figure AX214 shows conventional differential.

※ Description of the reassembly of the limited slip differential from page 3-319.

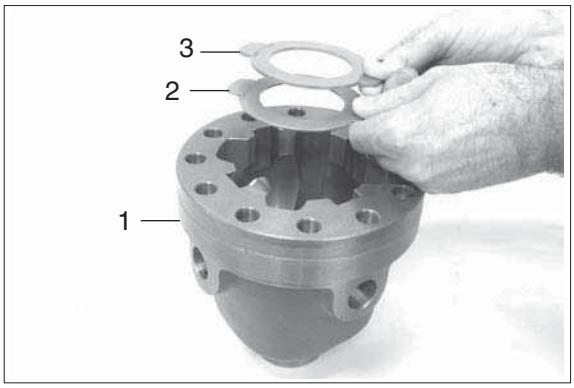

7409AAX214

② Insert constant spacer into differential carrier.


7409AAX215

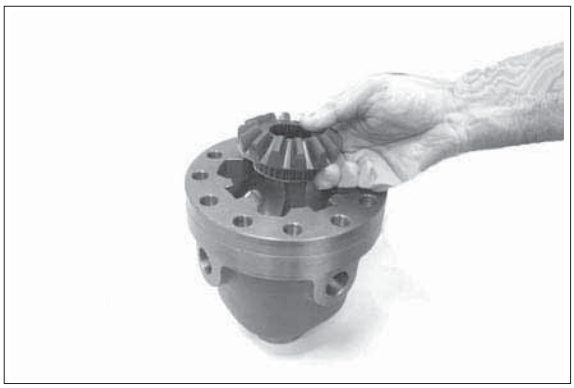
③ Insert steel outer disc (2) and thrust washer (3) into the differential carrier (1)

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



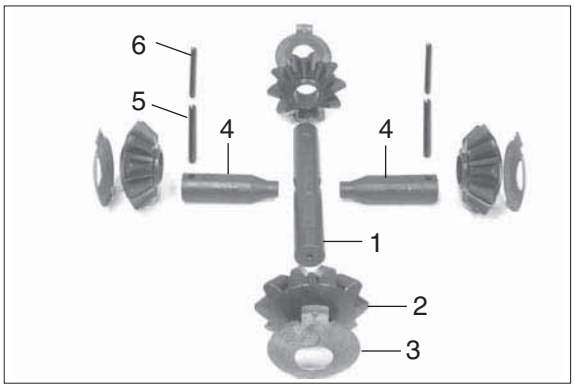
7409AAX216

④ Insert axle bevel gear.


7409AAX217

⑤ Differential spider single parts :

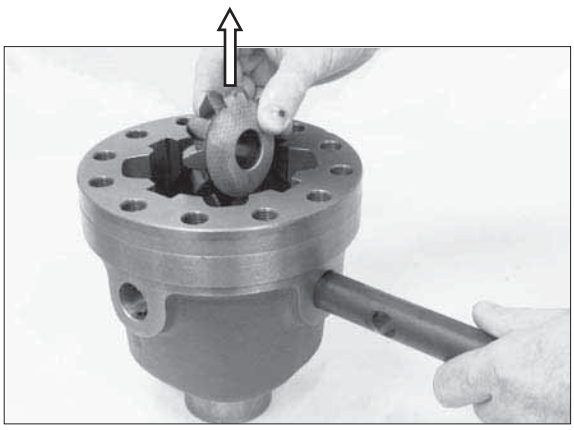
1 Spider shaft (one part)
2 Spider gear (4EA)
3 Thrust washer (4EA)
4 Spider shaft (split version)
5 Slotted pin (2EA)
6 Slotted pin (2EA)



7409AAX218

⑥ Insert one part spider shaft (1) into hole / differential (without slotted pin location hole) thereby mounting two spider gears (2) with thrust washers (3).

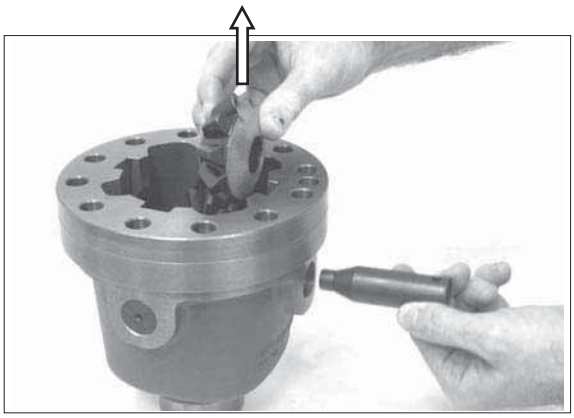
※ Insert thrust washers with tabs showing upwards (see arrow) and being located in recess.


7409AAX219

⑦ Install split spider shaft (4) with spider gears (2) and thrust washers (3).

※ Insert thrust washers with tabs showing upwards (see arrow) and being located in recess.

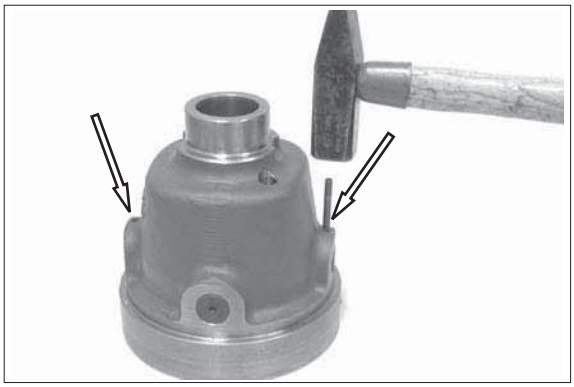
※ Pay attention to installation position of spider shaft/ halves-slotted pin/location holes of spider shaft towards differential carrier.



7409AAX220

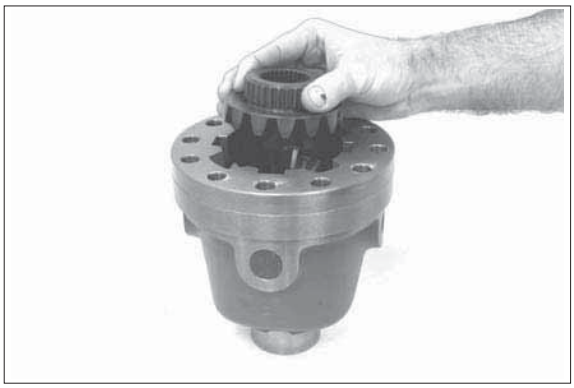
⑧ Fix spider shaft half (arrows) with double slotted pins.

※ Install double slotted pins, always with slots in a 180° offset position to each other.



7409AAX221

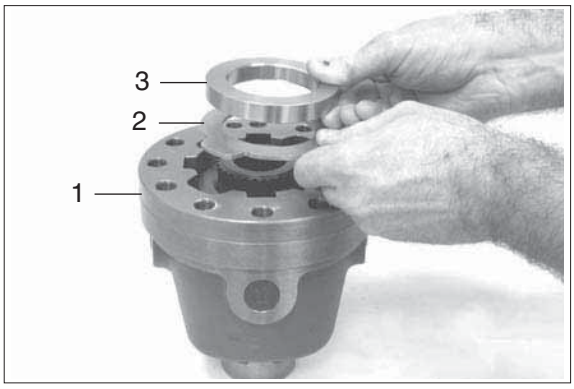
⑨ Insert second axle bevel gear into differential carrier.



7409AAX222

⑩ Insert thrust washer (2) and constant spacer (3) into differential carrier (1).

※ Pay attention to installation position of thrust washer and constant spacer, see position /figure.

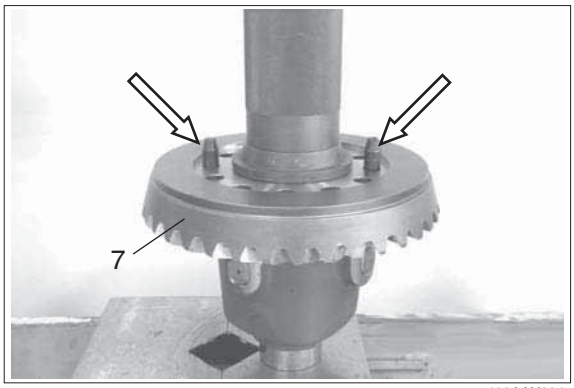


7409AAX223

⑪ Install two adjusting screws (M16) (see arrows) and press crown wheel to contact position.

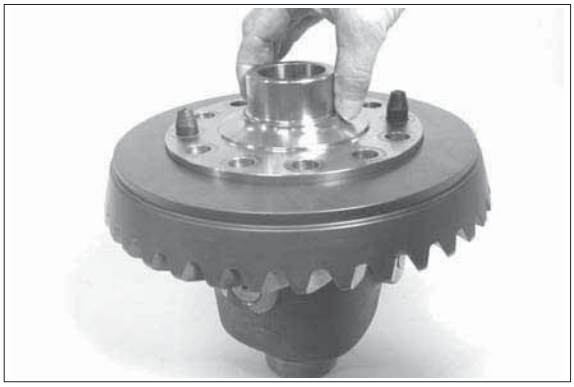
For input version with bevel gear set only, see specification in the corresponding spare parts list :
If a bevel gear set is specified, the pairing number/crown wheel (e.g. "7") must be identical with pairing number/ input pinion (also refer to note on page 3-308, AX205).

Adjusting screws (M16 × 1.5)
5870 204 040



7409AAX224

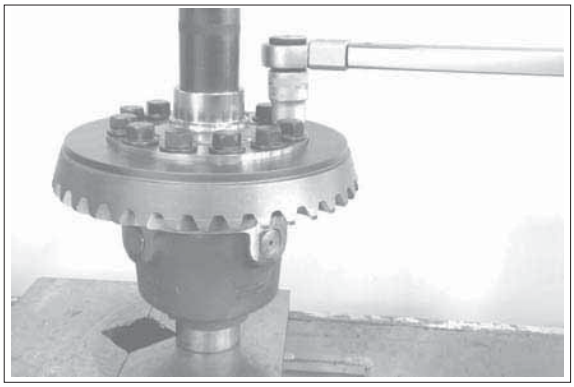
⑫ Mount housing lid.


7409AAX225

⑬ Fix differential by means of a press and fix lid with new locking screws.

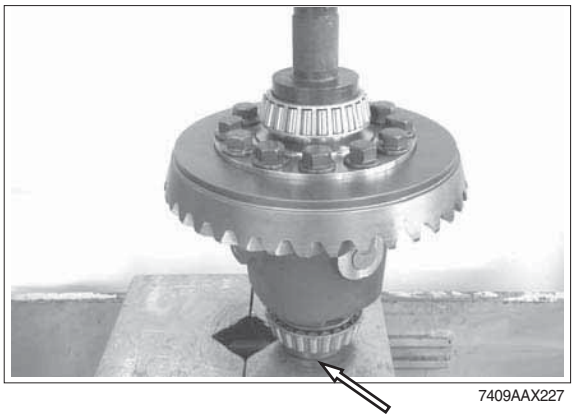
※ Locking screws permitted for one time use only.

· Tightening torque (M16 × 1.5/12.9) :
42.8 kgf · m (302 lbf · ft)


7409AAX226

⑭ Press both bearing inner rings to contact position.

※ Use suitable support (arrow) for provisionally mounted bearing ring, roller bearing cage, risk of damage.

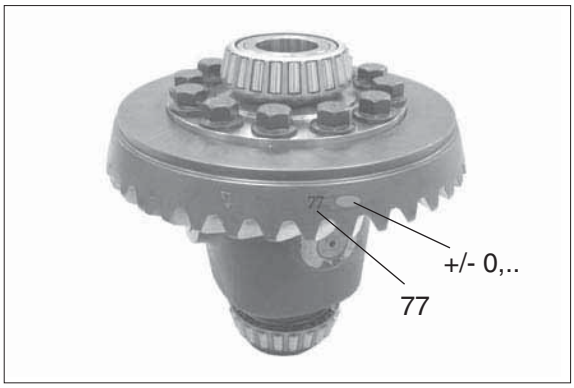

7409AAX227

Determine shims for bearing rolling torque /differential bearing and backlash /bevel gear set

⑮ Read crown wheel labeling (test dimension) from crown wheel rear side.

Determine required shims by means of the read value (crown wheel) and the relating specifications of the following table :

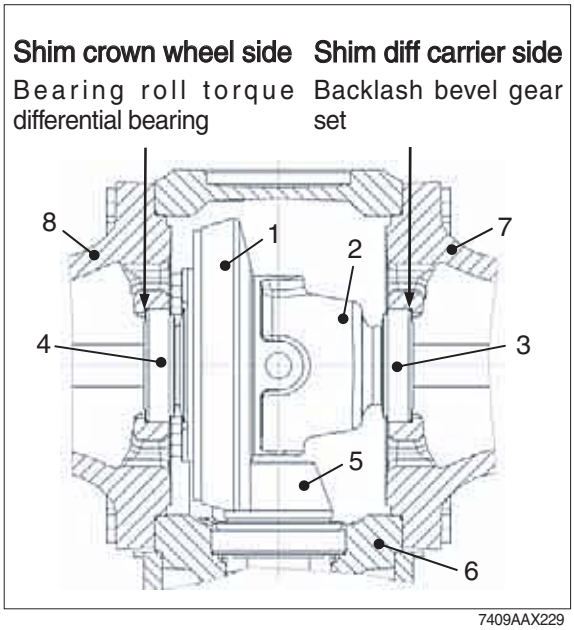
Test dimension, e.g. "77" mm is stamped on the crownwheel rear side, without + or - deviation, which corresponds to the real value/test dimension "77" in the following table. The required shims according to this real value /test dimension are allocated in the following table.



7409AAX228

⑯ Any + or - deviation from the test dimension due to production is manually applied on the crown wheel rear side (e.g. - 20 or - 10 or 10).
The required shims according to this real value /test dimension are allocated in the following table.

1 Crown wheel
2 Differential carrier
3 Tapered roller bearing (crown wheel side)
4 Tapered roller bearing (differential carrier side)
5 Input pinion
6 Axle drive housing
7 Axle housing
8 Axle housing



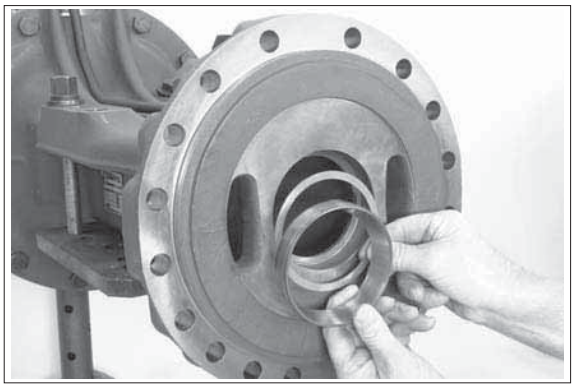
7409AAX229

Shims for differential				
Crown wheel marking	- 20	- 10	-	10
Deviation	- 0.2	- 0.1	0	0.1
Shim / Differential cage side Shim thickness	**0.8**	**0.9**	**1.0**	**1.1**
Shim	ZGAQ-02566	ZGAQ-02567	ZGAQ-02568	ZGAQ-02569
Shim / Crown wheel side Shim thickness	**1.2**	**1.1**	**1.0**	**0.9**
Shim Conventional, Limited slip	ZGAQ-02570	ZGAQ-02569	ZGAQ-02568	ZGAQ-02567

⑰ Insert determined shim (e.g. s = 1.00 mm) and bearing outer ring into hole of axle housing on crown wheel side.

※ Observe allocation of shim regarding installation position.

Driver tool	5870 058 021
Handle	5870 260 002

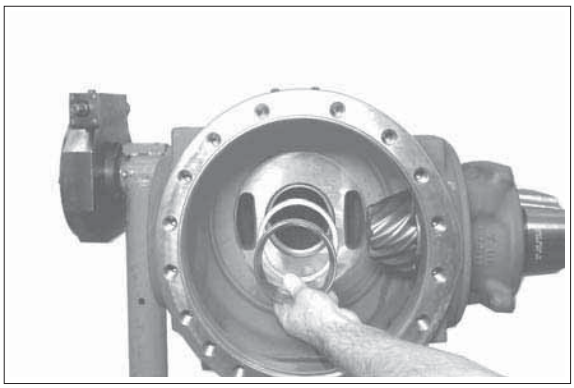


7409AAX230

⑱ Insert determined shim (e.g. s = 1.00 mm) and bearing outer ring into hole of axle housing on differential carrier side.

※ Observe allocation of shim regarding installation position.

Driver tool	5870 058 021
Handle	5870 260 002



7409AAX231

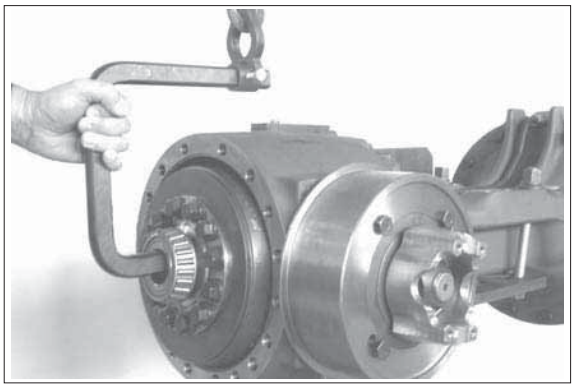
Contact pattern check of bevel gear set :

⑲ Cover some tooth flanks of crown wheel with marking ink (contact pattern check).

7409AAX232

⑳ Insert preassembled differential.

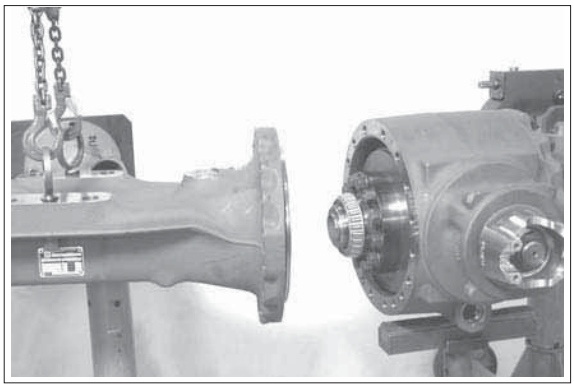
Lifting bracket	5870 281 033



7409AAX233

㉑ Position axle housing of crown wheel side (without O-ring) on axle drive housing, pay attention to radial installation position.

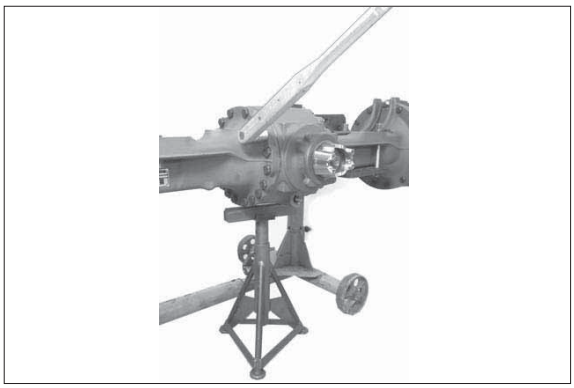
Lifting chain	5870 281 047
Eyebolts	5870 204 071



7409AAX234

㉒ Bring axle housing to contact position with hexagon screw and fix temporarily. Rotate differential several times in both directions, roller setting (also see AX236).

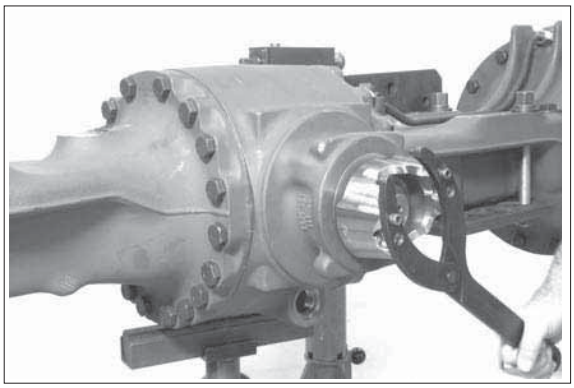
· Tightening torque (M18/10.9) :
39.8 kgf · m (288 lbf · ft)



7409AAX235

㉓ Roll input pinion over crown wheel in both directions (coast-drive flank meshing-contact pattern).

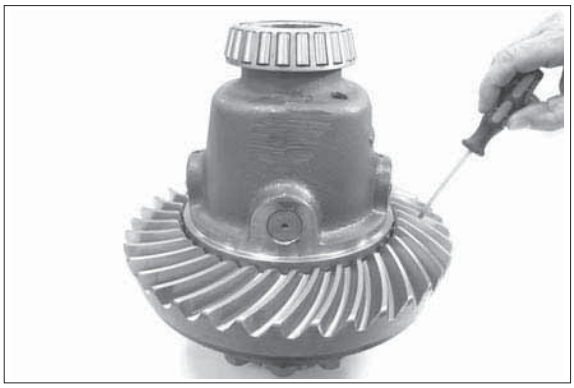
Clamping fork	5870 240 025



7409AAX236

㉔ Disassemble differential.
Compare contact pattern.

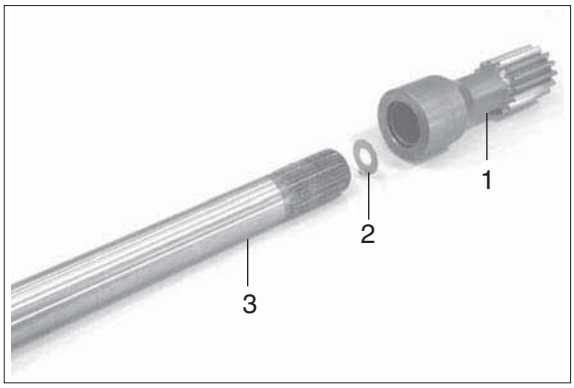
※ If contact pattern differs considerably, use a suitable shim for correction (see AX203, page 3-307).



7409AAX237

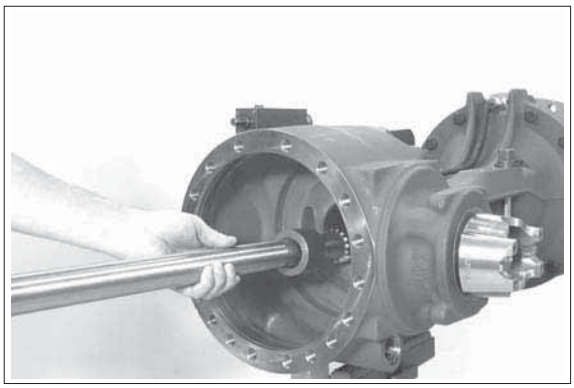
㉕ If disassembled :
Insert shim(s) (2) into sun gear shaft (1) and mount stub shaft (3).

※ If position was not allocated, as specified in disassembly instructions on page 3-198, AX103, sun gear shaft clearance (see page 3-333~334, AX330~AX334) must be set on both output sides.



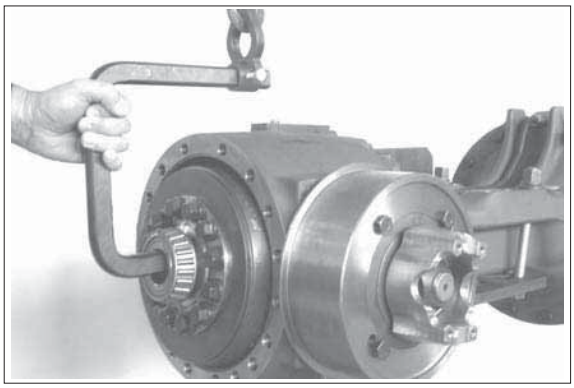
7409AAX238

㉖ Insert preassembled stub shafts into both outputs (considering allocation to the correct output side).


7409AAX239

㉗ Remount differential by mounting stub shaft into gearing of axle bevel gear (differential).

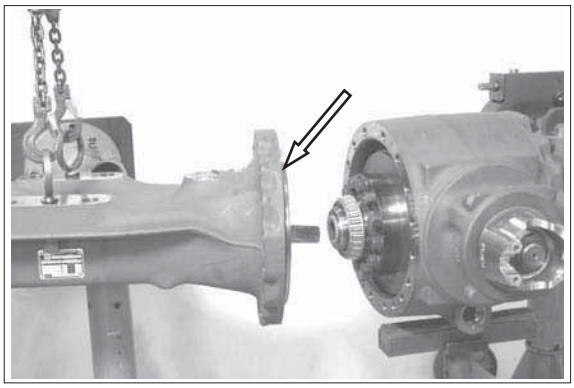
Lifting bracket	5870 281 033


7409AAX240

㉘ Oil O-ring (arrow) and mount it.
Position complete axle half on the axle drive housing by mounting the stub shaft into the gearing of the axle bevel gear (differential).

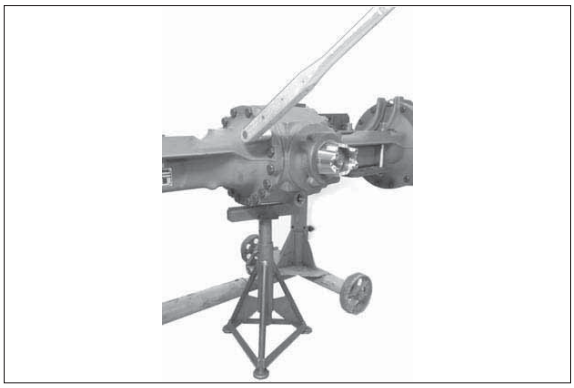
※ Pay attention to radial installation position of output towards axle drive housing.

Lifting chain	5870 281 047
Eyebolts	5870 204 071


7409AAX241

㉙ Fix axle housing finally by means of hexagon screws.
Rotate differential several times in both directions roller setting.

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

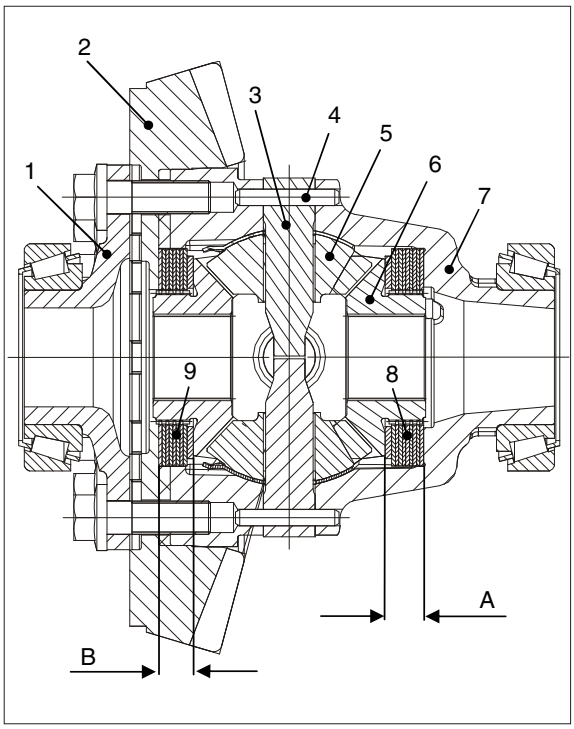


7409AAX242

(3) Limited slip differential (OPT) assembly

1 Housing cover
2 Crown wheel
3 Spider shaft (split version) (2EA)
4 Double slotted pins
(5 × 50 and 8 × 50 mm)
5 Spider gear
6 Axle bevel gear
7 Differential carrier
8 Disk package "A"
9 Disk package "B"

A Installation dimension = 18.6 - 0.2 mm
B Installation dimension = 16.7 - 0.2mm

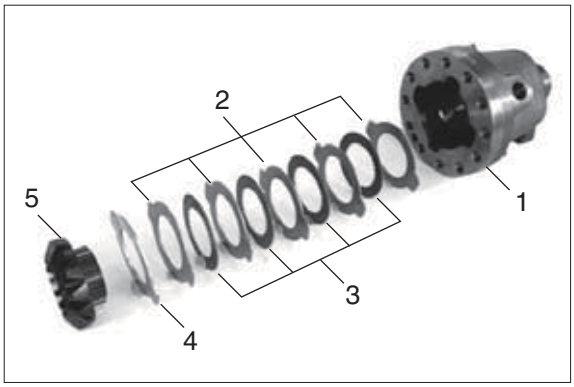


7409AAX247

① Mount the single parts as indicated on the figure right.

1 Differential carrier
2 5 outer disks (optional)
3 4 inner disks
4 Thrust washer (brass)
5 Axle bevel gear

※ Determine the installation dimension "A"= 18.6 - 0.2mm with the different outer disks (s =1.8~2.0 mm), see also AX247. Pay attention to the disk arrangement, AX248.
Oil the single parts.

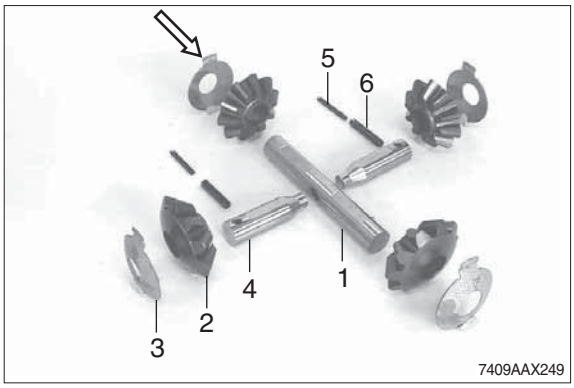


7409AAX248

② Mount the single parts, see AX249 and AX250.

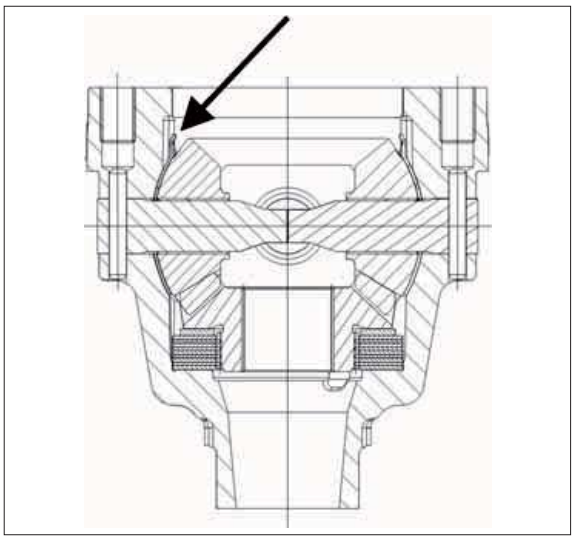
Single parts differential spider :

1 Spider shaft (one piece)
2 Spider gear (4EA)
3 Thrust washer (4EA)
4 Spider shaft (two pieces)
5 Slotted pins (2 pieces, 5 × 50 mm)
6 Slotted pins (2 pieces, 8 × 50 mm)



③ Pay attention to the radial installation position of the thrust washers (3). The torsional stop must show upwards, see arrow /AX250.

The two spider shafts (4) are fixed by means of double slotted pins (5 and 6). Thereby mount the slots of the slotted pins 180° offset to each other.



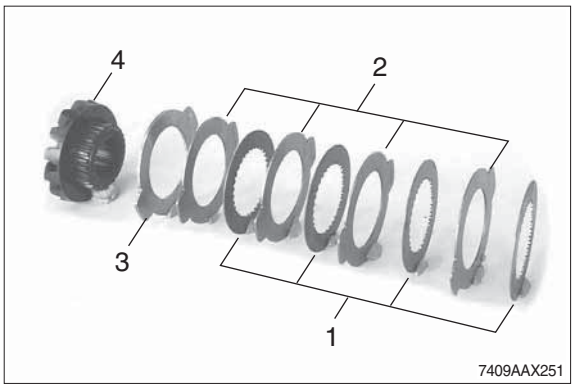
④ Mount the single parts as indicated on the figure right.

1 4 inner disks
2 4 outer disks (optional)
3 Thrust washer (brass)
4 Axle bevel gear

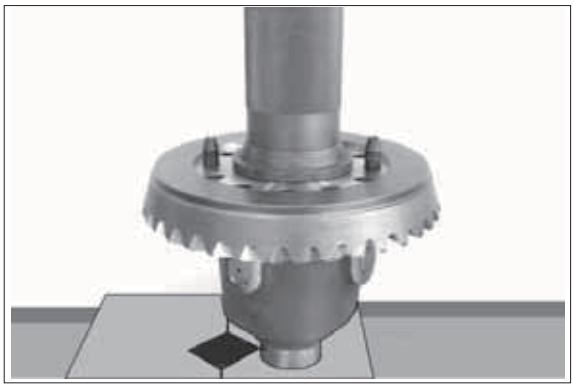
※ Determine the installation dimension ("B" = 16.7 - 0.2 mm) with the different outer disks =1.8~2.0 mm), see also AX247.

Pay attention to the disk arrangement, see AX251.

Oil the single parts.



⑤ Mount two adjusting screws and press the crown wheel until contact is obtained.



7409AAX252

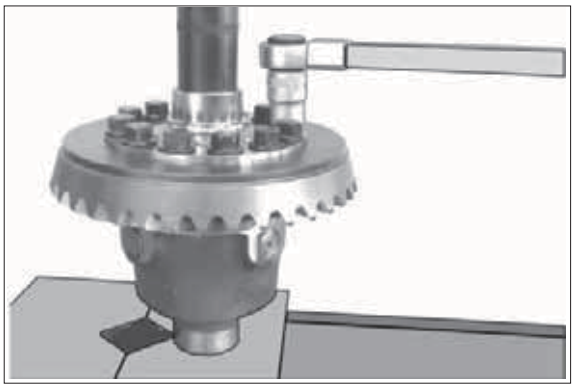
⑥ Mount the housing cover.

7409AAX253

⑦ Bolt housing cover, crown wheel and differential housing.

· Tightening torque (M16 × 1.5/12.9) :
42.8 kgf · m (302 lbf · ft)

※ It is only permitted to use new locking screws.

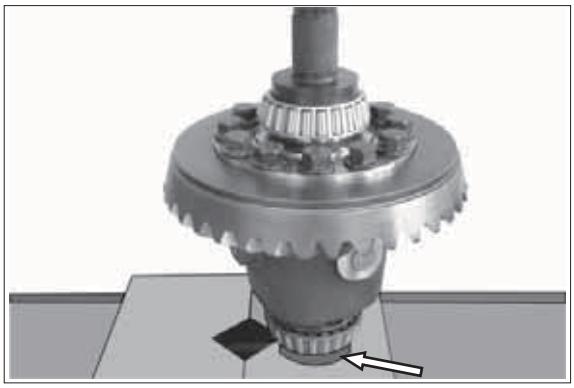


7409AAX254

⑧ Press both bearing inner rings until contact position is obtained.

※ Support the lower tapered roller bearing appropriately (arrow), pay attention that the roller cage is not damaged.

※ Description of differential reassembly from page 3-315.

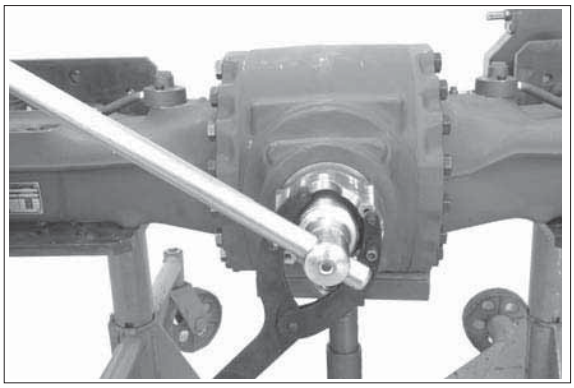


7409AAX255

(4) Shaft seal /input flange assembly

① Remove flange.

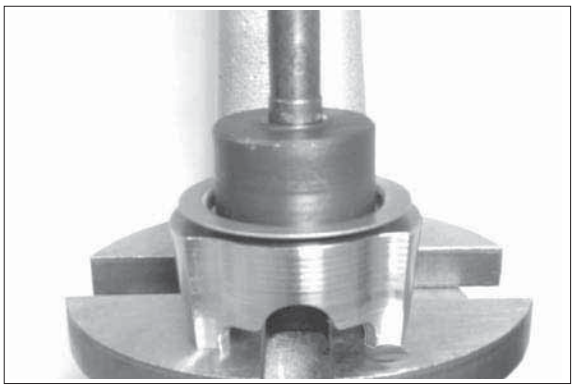
Clamping fork 5870 240 025



7409AAX289

② For new parts assembly only :
Mount protection plate on screen sheet on input flange and bring to contact position.

※ Pay attention to installation position of screen sheet also see AX292.



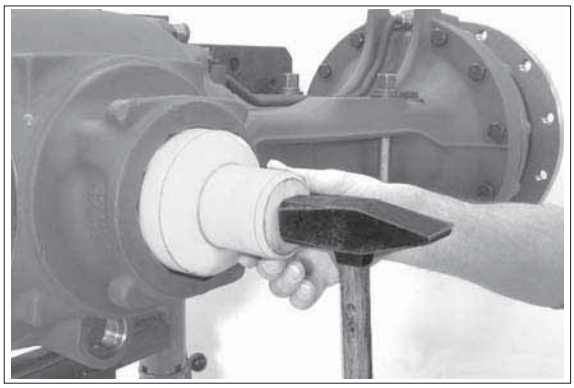
7409AAX290

③ Insert shaft seal (1), considering the required installation position (dimension "X") see detailed AX292.
Contact face (outer diameter) of shaft seal :
- if rubber - coated :
  wet with spirit (assembly aid)
- if made of metal :
  apply sealing agent (loctite no. 574)

Grease the shaft seal around the sealing and dust lip.

※ Ensure plane installation position of shaft seal use the specified driver tool to obtain an exact installation position of the shaft seal.

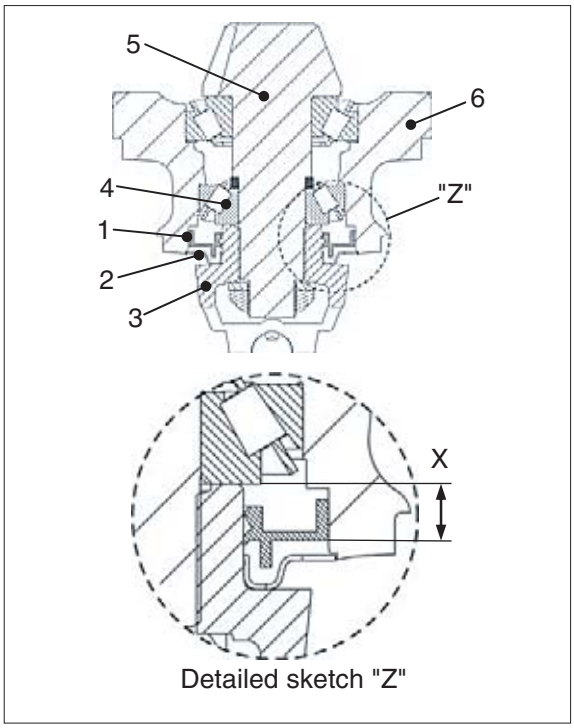
Driver tool 5870 048 225



7409AAX291

1 Shaft seal
2 Protection plate
3 Input flange
4 Tapered roller bearing
5 Input pinion
6 Axle drive housing

X = Install. dimension 16.6 ± 0.2 mm



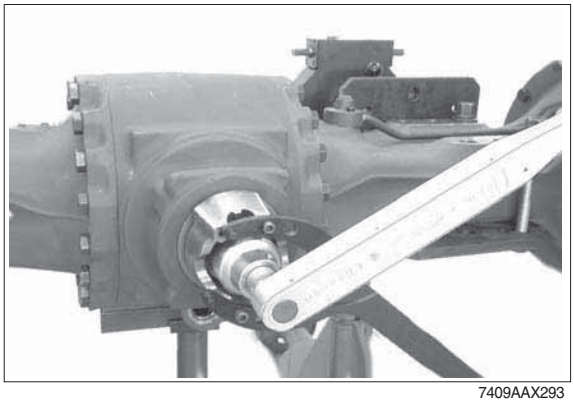
7409AAX292

④ Mount flange, fix with washer and hexagon nut.
During tightening, rotate pinion several times in both directions (roller setting).

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

· Tightening torque (M36 × 1.5) :
71.4 kgf · m (516 lbf · ft)

Clamping fork 5870 240 025

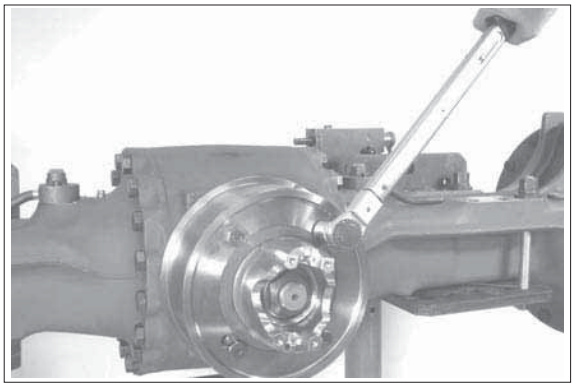


7409AAX293

(5) Pivot bearing assembly

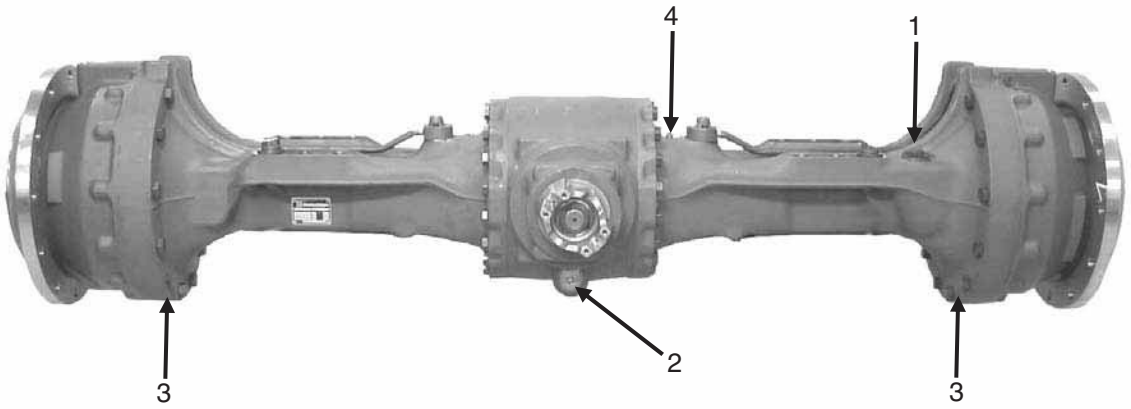
For version with pivot bearing only (AX294) :
Mount bearing flange and fix with hexagon screws.

· Tightening torque (M14/10.9) :
18.7 kgf · m (136 lbf · ft)



7409AAX294

(6) Oil dipstick, drain plugs and breather valve assembly



7409AAX295

1 Oil dipstick
2 Drain plug /axle drive housing
(Axle version with pivot bearing is fitted with another drain plug)
3 Drain plug/output
4 Depending on version
Breather valve or screw plug

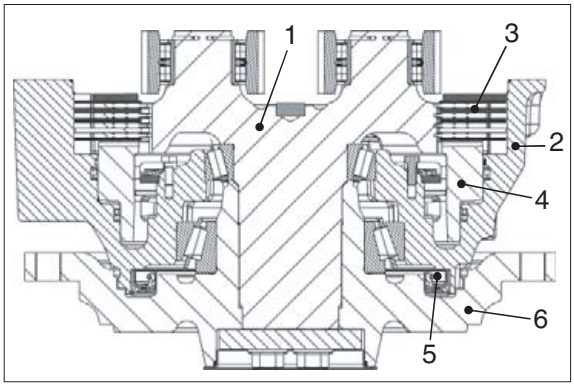
Provide oil dipstick and drain plugs with new O-ring and install them.
Mount breather valve or screw plug, depending on version.

· Tightening torque
Oil dipstick (M36 × 1.5) : 5.1 kgf · m (36.9 lbf · ft)
Drain plug (M36 × 1.5) : 5.1 kgf · m (36.9 lbf · ft)
Drain plug (M24 × 1.5) : 5.1 kgf · m (36.9 lbf · ft)
Breather valve /screw plug (M10 × 1) : 0.6 kgf · m (4.4 lbf · ft)

(7) Output and brake assembly

1 Planetary carrier
2 Brake housing
3 Disc package
4 Piston
5 Combi seal ring
6 Output shaft

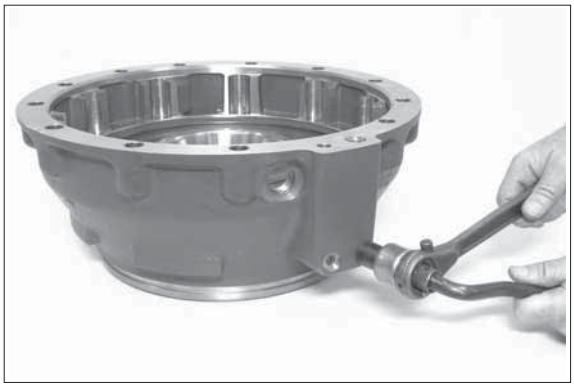
Assembly truck	5870 350 000
Fixture	5870 350 112



7409AAX301

Close apertures of oil supply holes with plugs.

Hand tool	5870 320 014
Ratchet wrench	5870 320 018


7409AAX302

Installation combi seal ring

① Mount shaft seal (part I /combi seal ring) considering installation dimension "X", see detailed sketch AX304.

※ Wet contact faces of shaft seal /brake housing with spirit right before assembly, assembly aid.

※ Grease shaft seal around the dust and sealing lips.

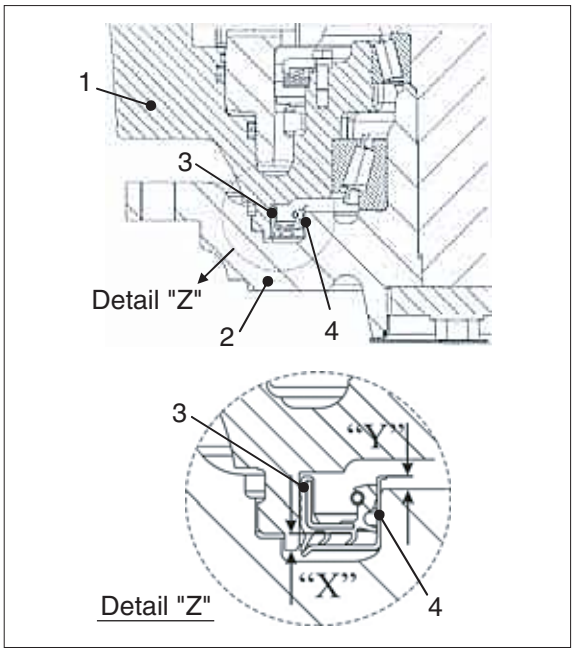
※ Observe plane installation position of shaft seal, use the specified driver to ensure an exact shaft seal installation position.

Driver tool	5870 051 065


7409AAX303

1 Brake housing
2 Output shaft
3 Shaft seal (part I) ┐ combi
4 Wear sleeve (part II) ┘ seal ring

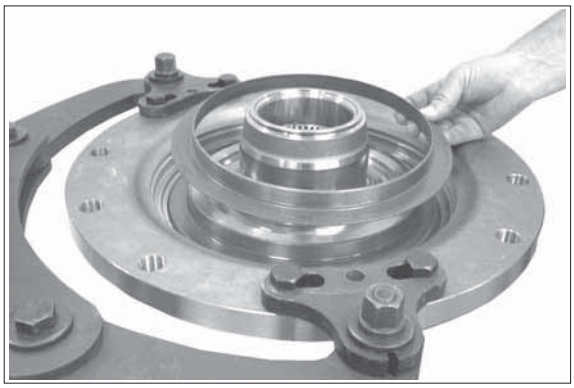
"X" = installation dimension /shaft seal
4.1 $^{+0.2}$ mm
"Y" = installation dimension /wear sleeve
2.6 $^{+0.2}$ mm



7409AAX304

② Apply sealing agent (loctite #574) on contact faces of wear sleeve /output shaft and mount wear sleeve (part I / combi seal ring) considering installation dimension "Y" see detailed AX304.

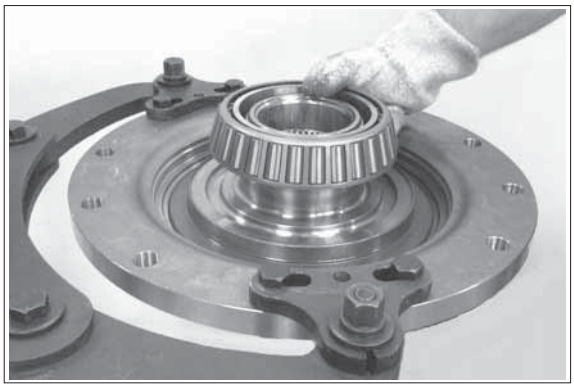
Pressing device 5870 506 172


7409AAX305

Output shaft /brake housing

① Mount heated bearing inner ring until contact.

※ Adjust bearing inner ring after cooling down.



7409AAX306

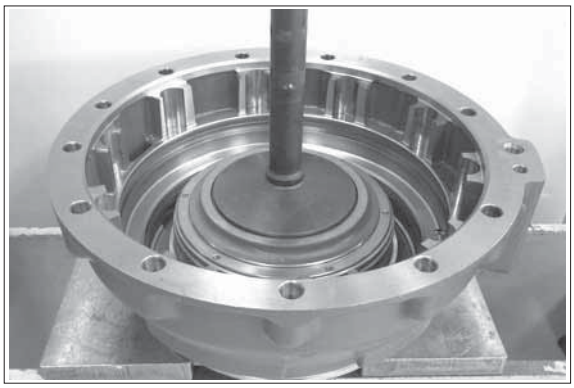
② Press outside bearing outer ring into brake housing until contact.

Driver tool 5870 050 010

7409AAX307

③ Press inside bearing outer ring into brake housing until contact.

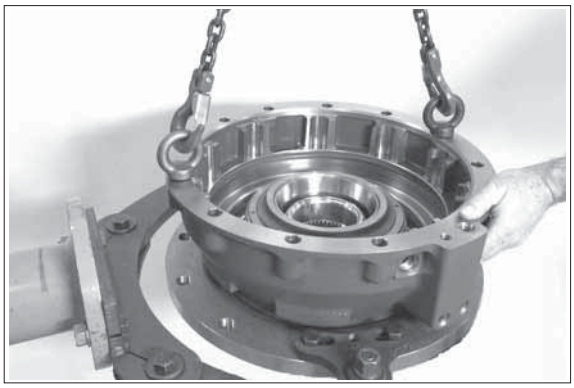
Driver tool 5870 050 003



7409AAX308

④ Position preassembled brake housing on the output shaft.

Lifting chain 5870 281 047
Eyebolts 5870 204 071

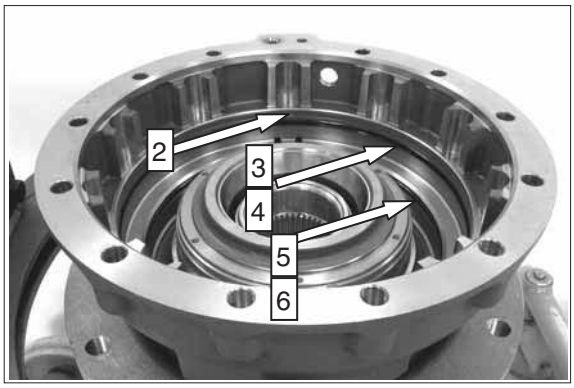


7409AAX309

⑤ Insert sealing elements (arrows) into annular grooves of brake housing paying attention to installation position and arrangement, in this context refer to AX311.

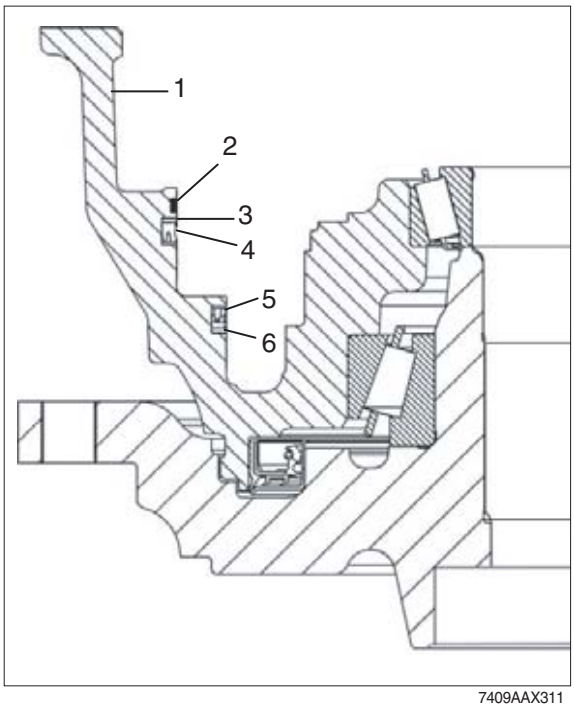
※ Guide ring installation :
Clean annular groove of brake housing with spirit. Then insert guide ring into annular groove - Ensure an exact contact position of the whole guide ring circumference - afterwards stick guide ring with glue (loctite #415) on its endpoints.

※ Ensure a correct installation position of the guide ring - Endpoints of guide ring to be in 12 o'clock position in the axle installed in the vehicle (radial position in brake housing - area of brake oil supply and vent hole).



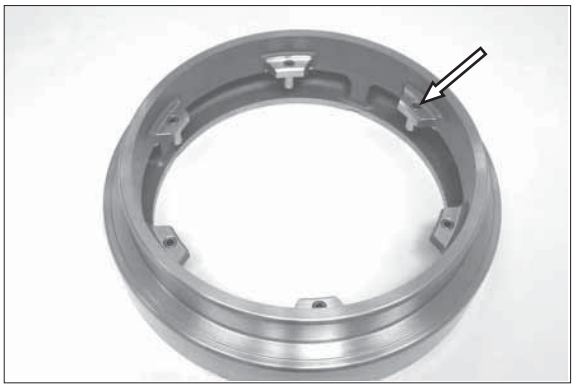
7409AAX310

1 Brake housing
2 Guide ring
3 Support ring
4 Grooved ring
5 Grooved ring
6 Support ring



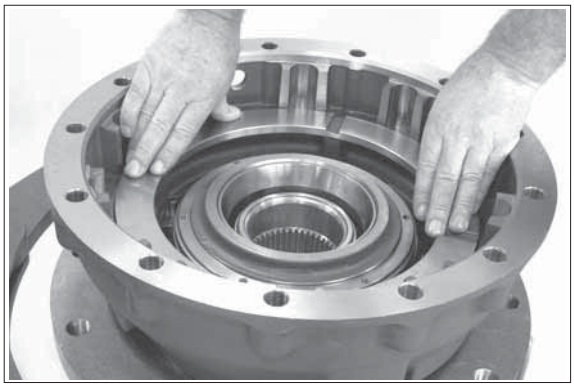
7409AAX311

⑥ Flush-mount slotted pins (for installation position refer to arrow) into the piston, if not disassembled, adjust adequately (flushfitting).



7409AAX312

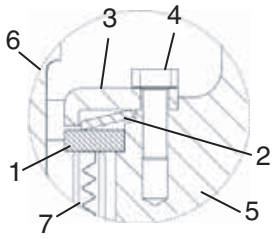
⑦ Oil sealing/sliding surface of piston and sealing elements (W-10 oil).
Carefully bring piston in contact position.

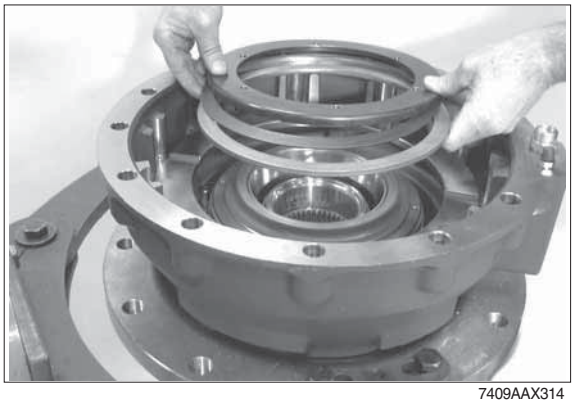


7409AAX313

⑧ Insert disc, cup spring and lid considering the installation position, see detail sketch.

1 Disc
2 Cup spring
3 Lid
4 Hexagon screw
5 Brake housing
6 Piston
7 Slotted pin

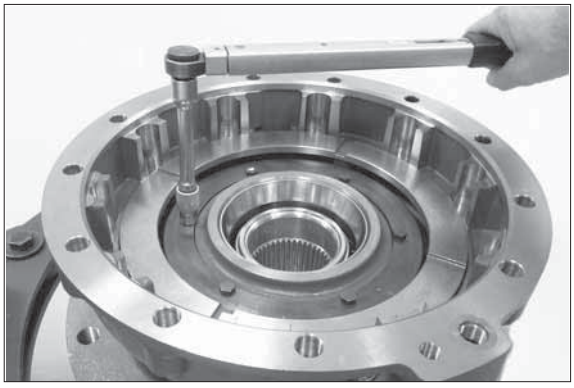




7409AAX314

⑨ Fix lid with hexagon screws evenly until contact is obtained (cup spring pre load). Finally tighten hexagon screws.

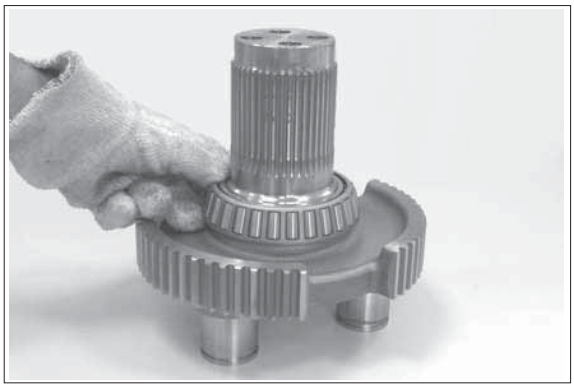
· Tightening torque (M8/10.9) :
3.47 kgf · m (25 lbf · ft)



7409AAX315

⑩ Mount heated bearing inner ring until contact.

※ Adjust bearing inner ring after cooling down.

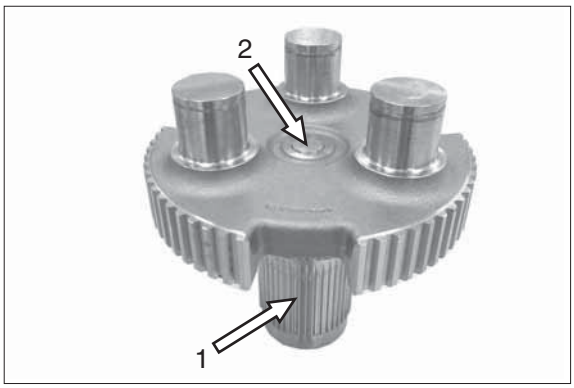


7409AAX316

⑪ Apply anti-corrosive agent on spline (arrow 1).

Only for assembly of a new planetary carrier or if disassembled :

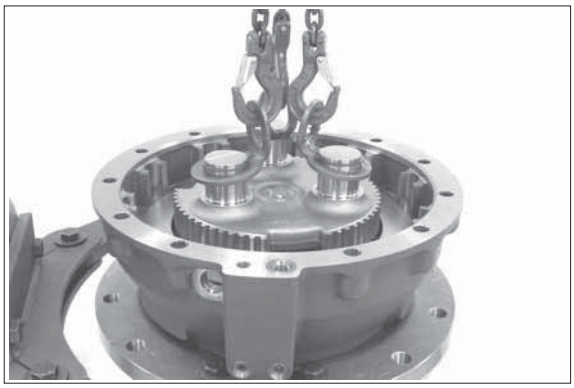
Insert shim (arrow 2) into planetary carrier until contact.



7409AAX317

⑫ Insert pre assembled planetary carrier.

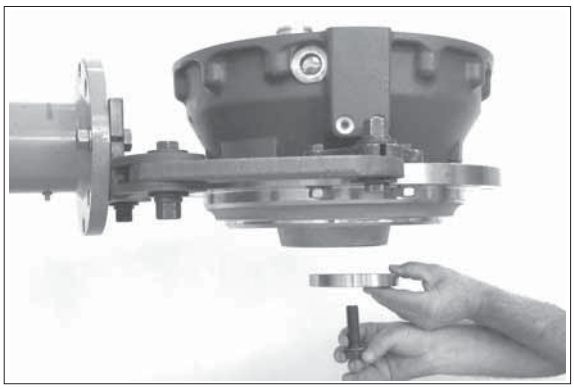
Lifting chain	5870 281 047
Lifting device	5870 281 082



7409AAX318

⑬ Fix planetary carrier with disc and new locking screws.

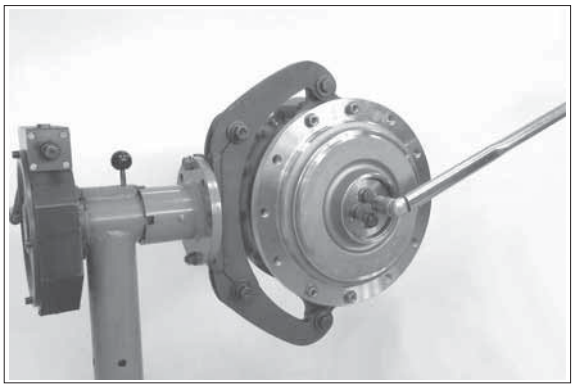
※ Do not reuse locking screws, just one time installation is permitted.



7409AAX319

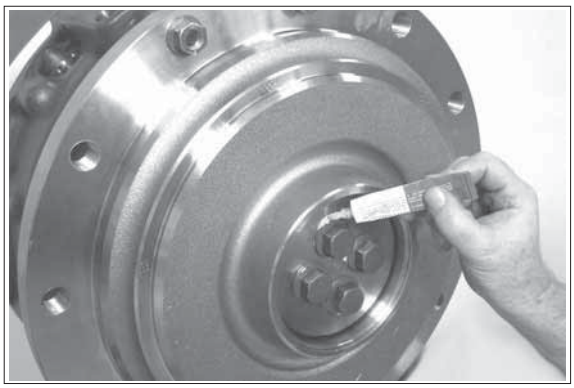
⑭ Evenly tighten locking screws crosswise while rotating the brake housing in both directions several times (roller setting).

· Tightening torque (M8/12.9) :
51.0 kgf · m (369 lbf · ft)



7409AAX320

⑮ Apply a screw safety marking paint on correctly installed locking screws.



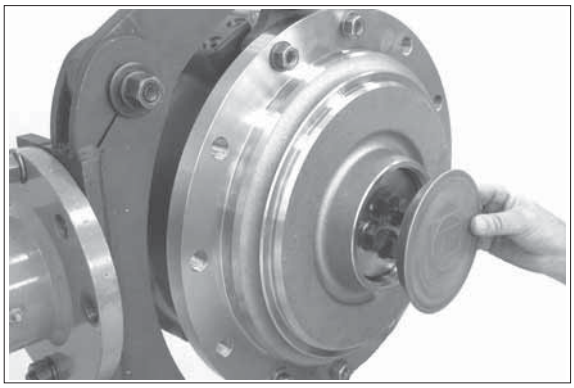
7409AAX321

⑯ Mount O-ring (arrow) on lid.

7409AAX322

⑰ Insert pre-assembled lid into output shaft.

Plastic hammer 5870 280 004

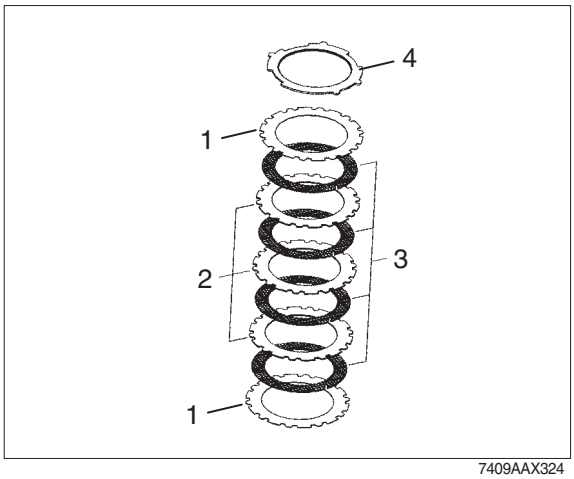


7409AAX323

Brake

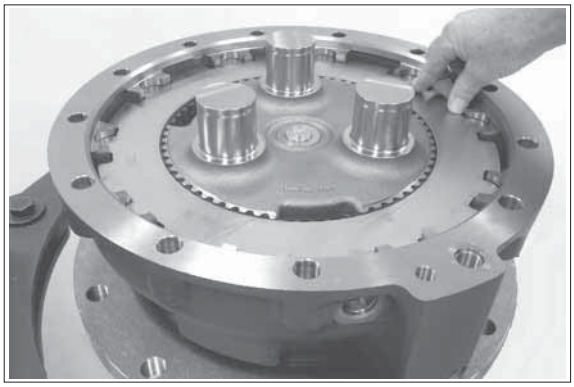
※ Possible other versions could have a deviating equipment (number and arrangement of single discs), the illustration in the relating spare parts list forms the basis for the required equipment.

1 Outer disc s = 2.0 mm
2 Outer disc s = 4.0 mm
3 Inner disc (lined disc)
4 End plate



7409AAX324

① Insert disc package, considering disc arrangement and installation position of outer discs, see AX324.

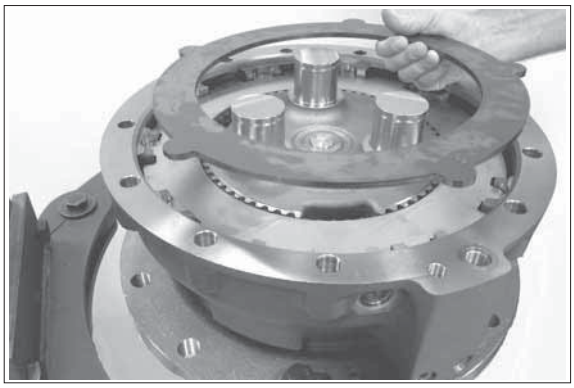

7409AAX325

② Insert end plate (item 4, see AX324) fix by means of grease assembly aid.

※ Ensure radial installation position driving tabs of end plate must be positioned in recessed grooves of the brake housing.

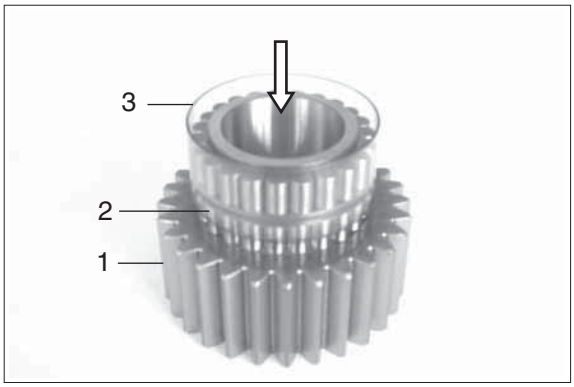
Locating screw 5870 204 078

※ Make leakage test on brake hydraulics see page 3-188.


7409AAX326

③ Only for assembly of new parts :
Install cylindrical roller bearing into planetary gear by pressing roller bearing into planetary gear by means of assembly sleeve (arrow) until snap ring engages into annular groove of planetary gear.

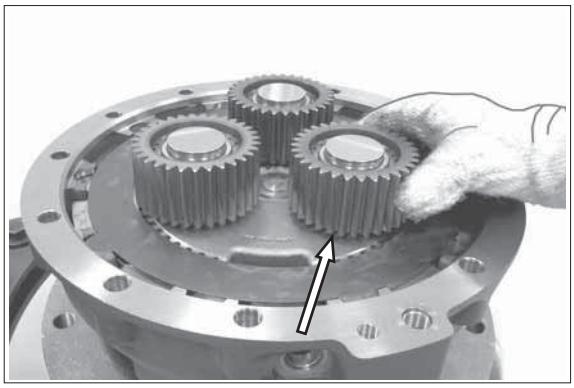
1 Planetary gear
2 Roller bearing
(with bearing inner ring /cylindical rollers /axial discs and snap ring)
3 Assembly sleeve



7409AAX327

④ Heat up planetary gears and mount to the pin of the planetary carrier until contact is obtained, with the large radius /bearing inner ring showing downwards (arrow).

※ Adjust bearing after cooling down.

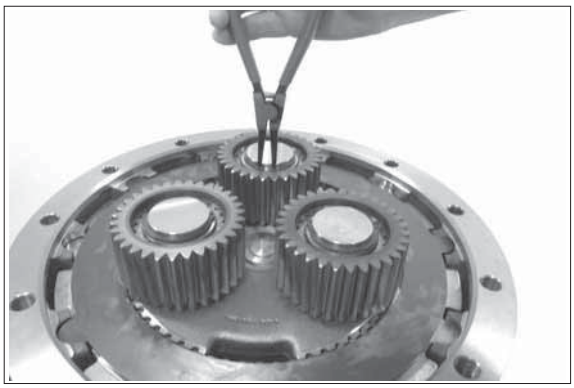


7409AAX328

⑤ Fix planetary gears with retaining ring.

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

Set of external pliers 5870 900 015

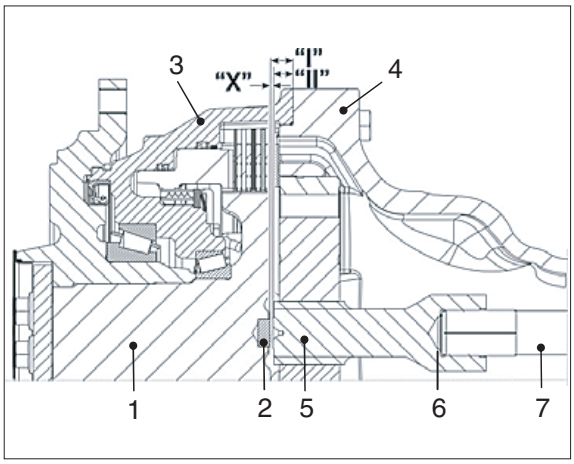


7409AAX329

Axial play setting of sun gear shaft :

1 Planetary carrier
2 Stop pin
3 Brake housing
4 Axle housing
5 Sun gear shaft
6 Shim (s = optional)
7 Stub shaft

"X" = axial play - sun gear shaft 0.5~2.0 mm

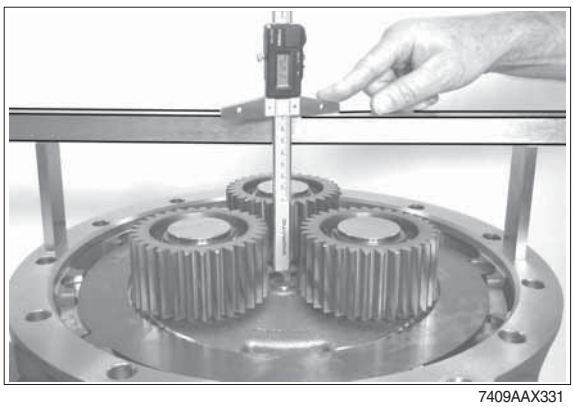


7409AAX330

① Determine dimension "I" from mounting face (brake housing/axle housing) to stop pin.

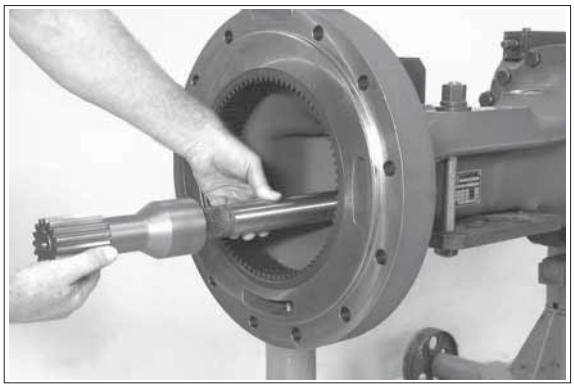
Dimension I e. g. ..... 21.25 mm

Digital-depth gauge 5870 200 072
Gauge blocks 5870 200 066
Straightedge 5870 200 022



7409AAX331

② Mount stub shaft with fitted sun gear shaft (without shim) into differential /axle bevel gear until contact.



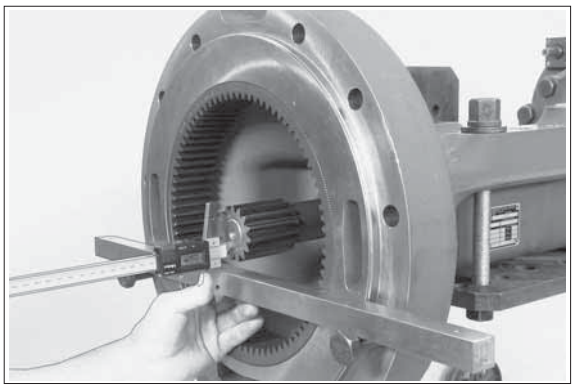
7409AAX332

③ Determine dimension "II" from mounting face (brake housing /axle housing) to front face /sun gear shaft.

Dimension II e. g. ..... 19.00 mm

CALCULATION EXAMPLE:

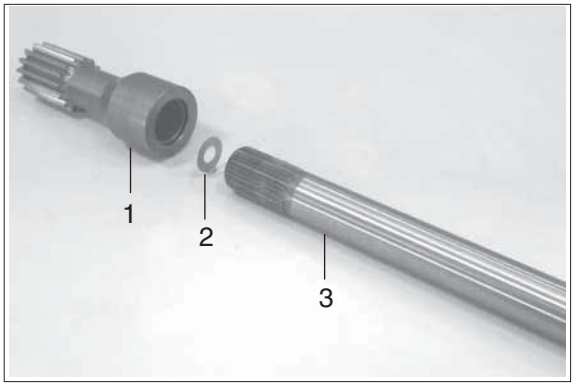
Dimension I ..... 21.25 mm
Dimension II ..... - 19.00 mm
Difference ..... 2.25 mm
Required axial play e.g. (average)
- 1.25 mm
Result = shim required e.g. s = 1.00 mm



7409AAX333

④ Pull stub shaft with sun gear shaft out of axle housing.

Insert determined shim(s) (2) into sun gear shaft (1) and mount stub shaft (3).

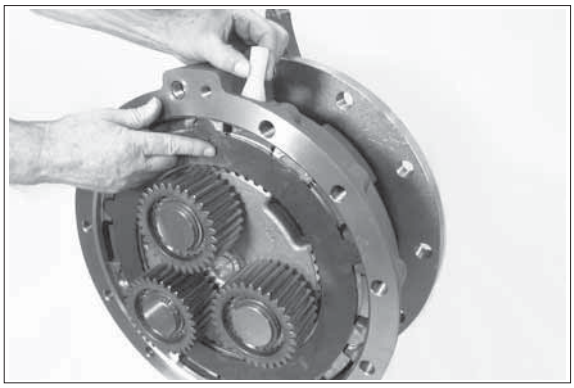


7409AAX334

Assemble output assy

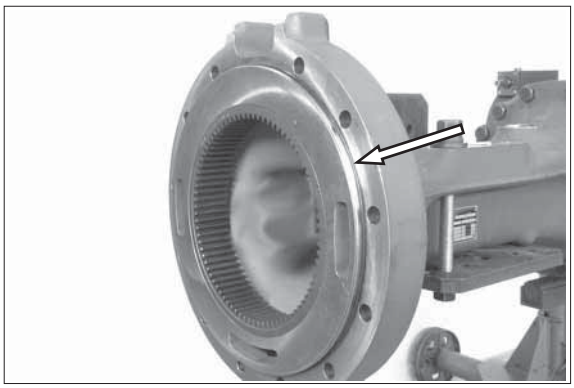
① Fix disc package by means of locating screw, assembly aid.

Locating screw 5870 204 078



7409AAX335

② Oil O-ring and mount on collar of axle housing.

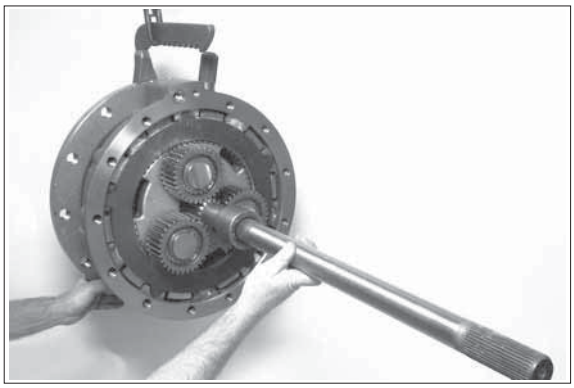


7409AAX336

③ Take up output by means of lifting bracket.

Mount pre-assembled sun gear /stub shaft into teeth of planetary gears.

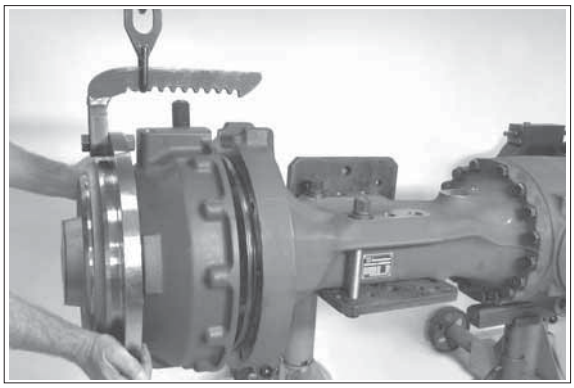
Lifting bracket 5870 281 043



7409AAX337

④ Bring output assy into contact position with axle housing by mounting the stub shaft into the gearing of the axle bevel gear /differential.

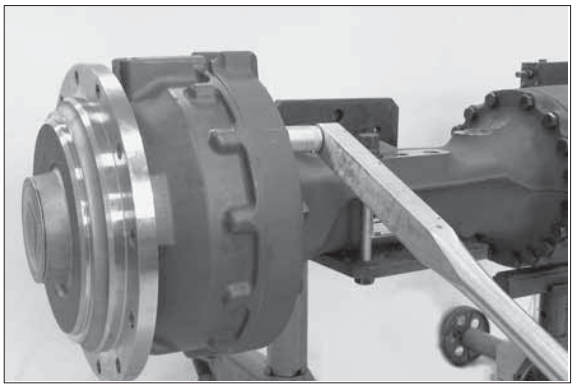
※ Pay attention to end plate see AX326, page 3-332.



7409AAX338

⑤ Connect output with axle housing evenly by means of hex. screws.

· Tightening torque (M18 × 1.5/10.9) :
39.8 kgf · m (288 lbf · ft)



7409AAX339

⑥ Install screw plug (1) with new O-ring.

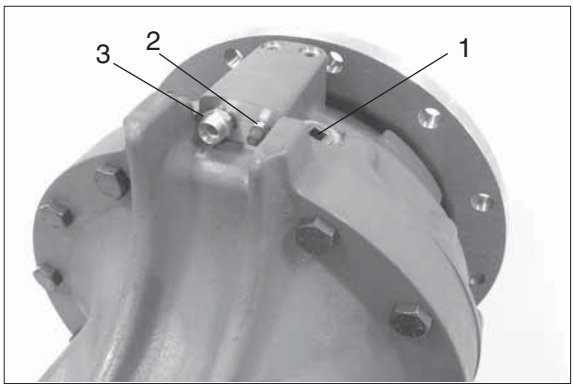
· Tightening torque (M24 × 1.5) :
5.1 kgf · m (36.9 lbf · ft)

Mount breather valve (2).

· Tightening torque :
0.6 kgf · m (4.4 lbf · ft)

Install screw neck (3) with new O-ring.

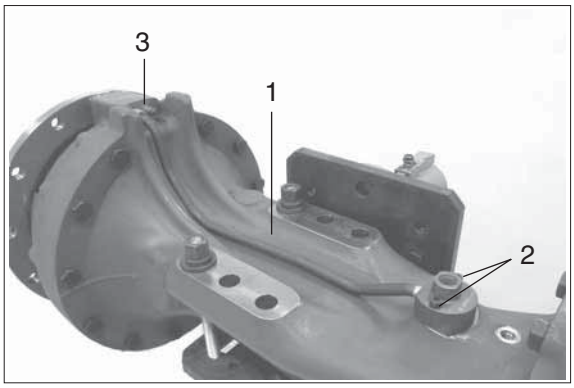
· Tightening torque :
3.7 kgf · m (26.6 lbf · ft)



7409AAX340

⑦ Install brake tube (1).

· Tightening torque:
Screw nut (2)
10.2 kgf · m (73.8 lbf · ft)
Cylindrical screw (3) (M8 /8.8)
2.35 kgf · m (17.0 lbf · ft)



7409AAX341

Make leakage test on brake hydraulics

※ Prior to starting the test, completely breathe brake hydraulics.

High pressure test :

Build up testing pressure p = 100 - 10 bar maximum and close connection to HP pump by means of a shutoff valve A pressure drop by maximum 3% (3 bar) is permissible during a 5 minute test duration.

Low pressure test :

Reduce testing pressure to p = 5 bar and close shut off valve again.

No pressure drop is permitted during a 5-minute test duration.

Test medium : SAE 15W-40

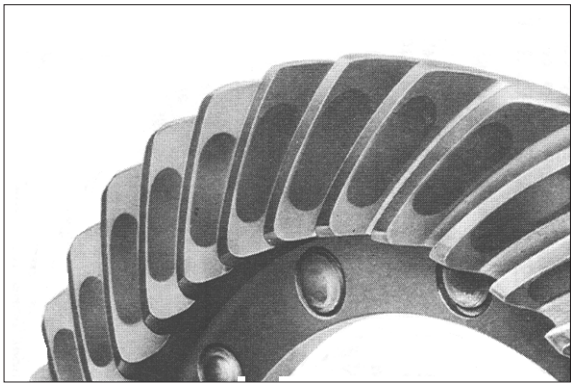
HP-pump	5870 287 007
Straight screw-in connection	0637 842 518
Measuring fitting (M18 × 1.5)	5870 950 139
Oil collector bottle	5870 286 072

7409AAX342

※ 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

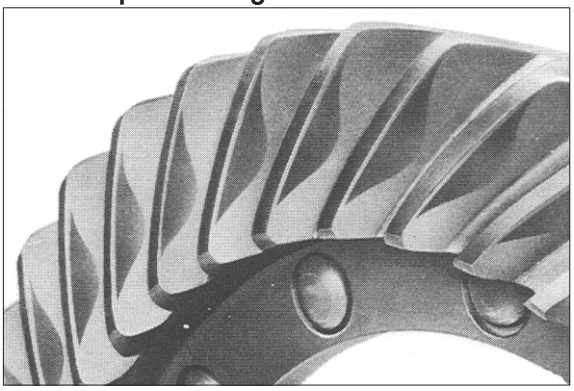
Concave side

WTHAX17

Convex side

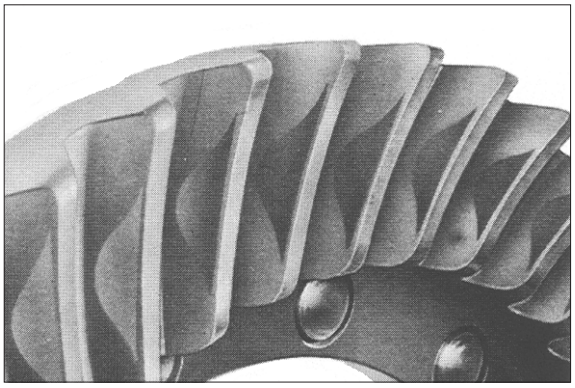
※ ADJUSTMENT

Incorrect pattern : high contact



WTHAX18

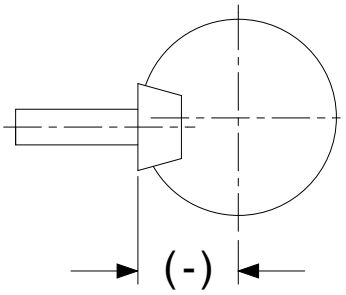
Concave side



WTHAX19

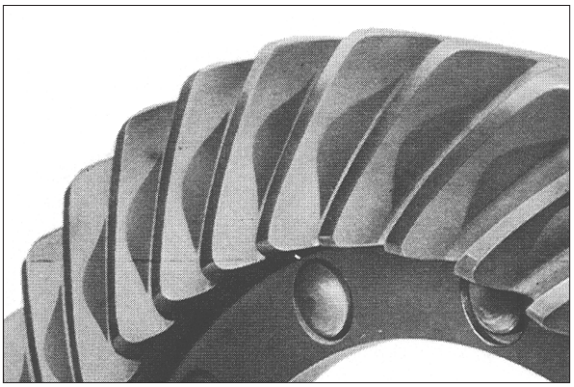
Convex side

- Reduce the distance (-)



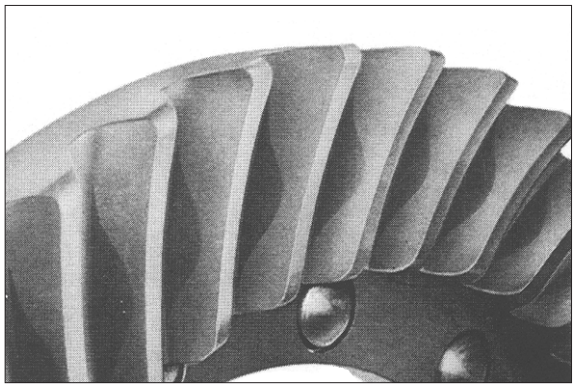
WTHAX20

Incorrect pattern, low contact



WTHAX21

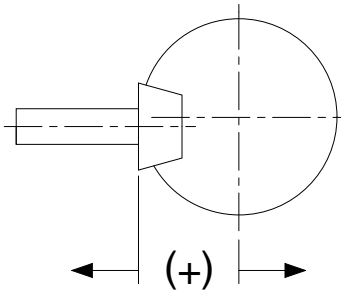
Concave side



WTHAX22

Convex side

- Add the distance (+)



WTHAX23