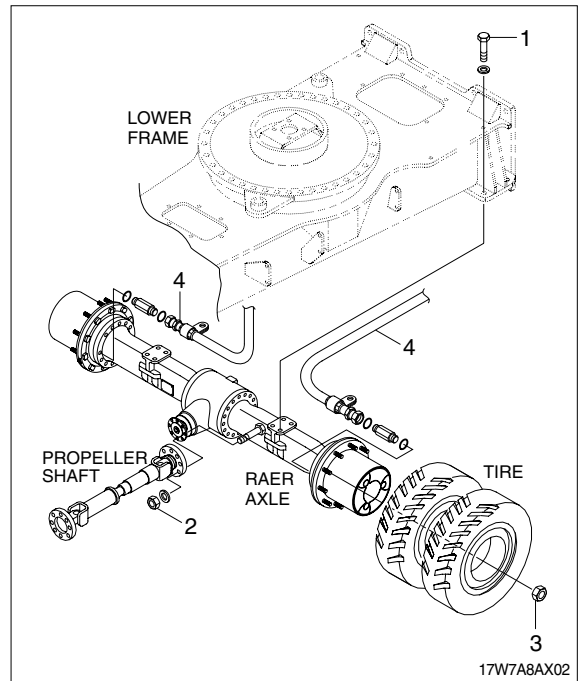


GROUP 10 REAR AXLE

1. REMOVAL REAR AXLE

- 1) Rear axle mounting bolt (1, M20)
 - Tightening torque : 58 ± 6.3 (kgf · m)
 - (419 ± 45.5 lbf · ft)
- 2) Propeller shaft mounting bolt (2, M10)
 - Tightening torque : 5.9 ± 0.6 kgf · m
 - (42.7 ± 4.3 lbf · ft)
- 3) Wheel nut (3, M20)
 - Tightening torque : $60 \begin{smallmatrix} 0 \\ -5 \end{smallmatrix}$ kgf · m
 - ($434 \begin{smallmatrix} 0 \\ -36 \end{smallmatrix}$ lbf · ft)
- 4) Hose assy (4)
- 5) Axle weight : 540kg (1190lb)



2. GENERAL INSTRUCTIONS

1) GENERAL WORKING INSTRUCTIONS

- (1) This manual has been developed for the skilled serviceman, trained by the ZF-Passau.
- (2) During all operations, pay attention to cleanliness and skilled working.
Therefore, axle removed from the machine, must be cleaned prior to open them.
- (3) We assume that the special tools, specified by ZF, will be used.
The special tools are available from ZF-Passau.
- (4) After the disassembly, all components must be cleansed, especially corners, cavities and recesses of housing and covers.
- (5) The old sealing compound must be carefully removed.
- (6) Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.
- (7) The latter refers especially to new parts.
- (8) Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. rotary seal rings, O-rings, U-section rings, cap boots, protective caps etc..
- (9) Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.
- (10) For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.
- (11) Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.
- (12) Ball bearings, covers, flanges and parts like that must be heated to about 90 to 100° C.
- (13) Hot-mounted parts must be reset after cooling in order to assure a proper contact.
- (14) Before pressing shafts, bearings etc. in position, both parts must be lubricated.
- (15) During to reassembly, all specified adjustment values, testing specifications and tightening torque must be respected.
- (16) After the repair, units are filled up with oil.
- (17) After the oil filling, the oil level plugs and oil drain plugs must be tightened to the specified tightening torque.

2) IMPORTANT INSTRUCTIONS CONCERNING THE LABOUR SAFETY

- (1) In principle, repairers are themselves responsible for the labour safety.
- (2) The observance of all valid safety regulations and legal rules is a precondition to prevent damage to individuals and products during the maintenance and repair operations.
- (3) Before starting the work, the repairers have to make themselves familiar with these regulations.
- (4) The proper repair of these products requires especially trained personnel.
- (5) The repairer himself is obliged to provide for the training.

3) LUBRICANT SPECIFICATIONS

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

4) BRAKE WEAR MEASUREMENT

(1) The measurement of wear on the multi-disc brake only gives limited information on the total state of the plate pack without disassembling the output.

Make measurement of lining wear at least once per year, in particular, however, in case of a different braking behaviour, like :

- Brake noises
- Reduced braking power
- Different deceleration
- Different brake oil level
- Different braking pressure

※ To avoid injury when opening the oil drain/oil filler plug (1), due to a possible pressure build-up in the planetary carrier bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and filler plug (1).

(2) Then turn output until oil filler / oil drain hole (2) is on 9 o'clock position.

1 = Oil filler-/oil drain hole

2 = Gauge hole ($\varnothing = 10\text{mm}$) in ring gear
9 o'clock position

3 = Dial indicator with solenoid support

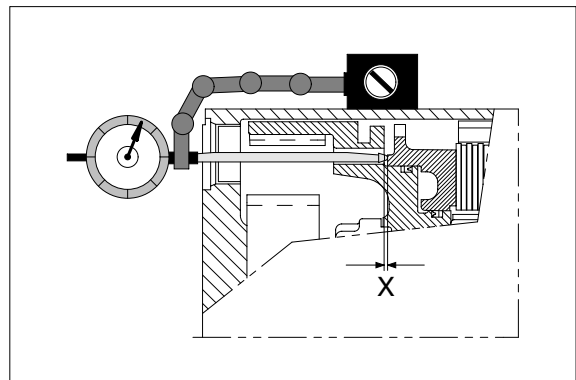
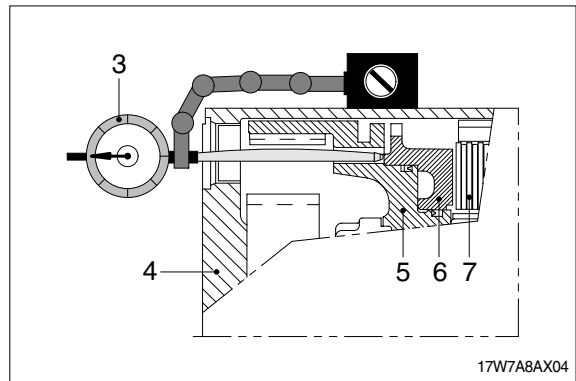
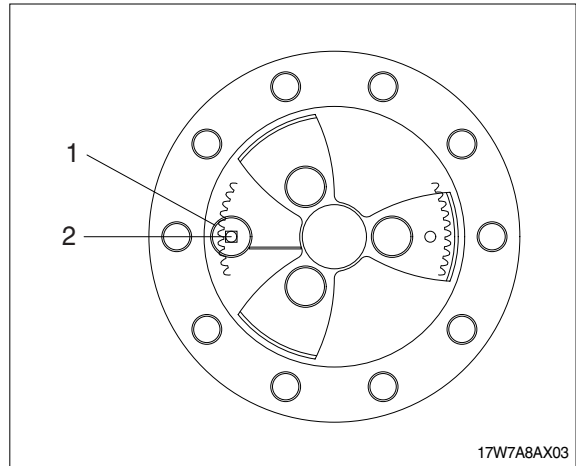
4 = Planetary carrier

5 = Ring gear

6 = Piston

7 = Plate pack

X = Piston stroke

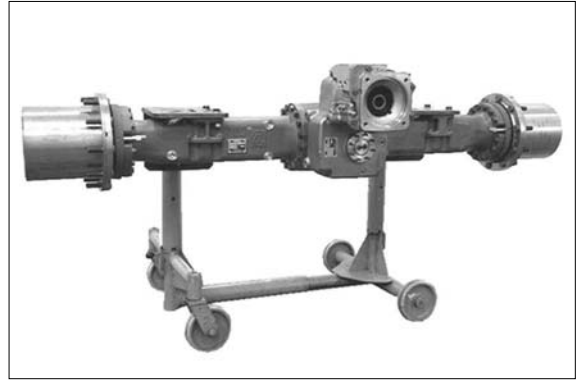


3. DISASSEMBLY - OUTPUT

1) Mount the axle to the assembly truck.

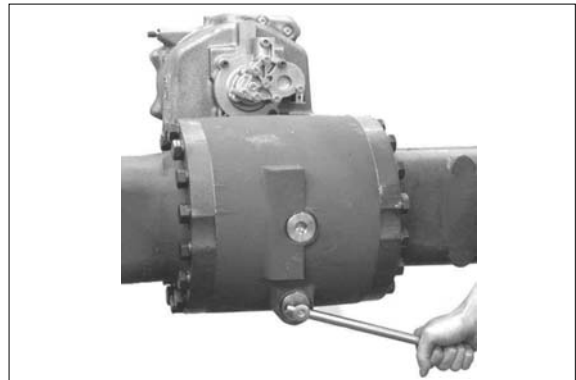
(S) Assembly truck 5870 350 000

(S) Supporting bracket (x2) 5870 350 106



17W7A8RA001

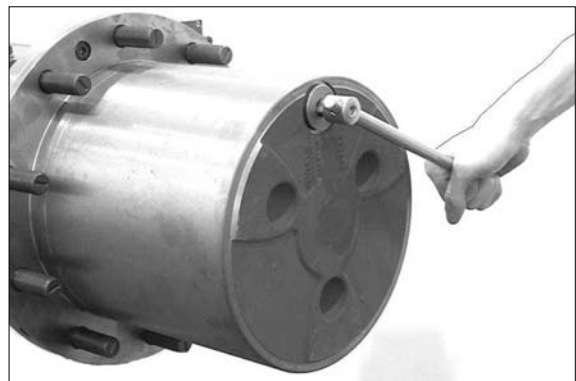
2) Loosen oil drain plug and drain oil from the axle - use suitable collecting basin.



17W7A8RA002

3) To avoid injury when opening the oil drain and oil filler plug, due to a possible pressure build-up in the oil system of the planetary carrier - bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and oil filler plug.

Then bring drain hole to lowermost position (6 o'clock) and drain oil from outputs - use suitable collecting basin.

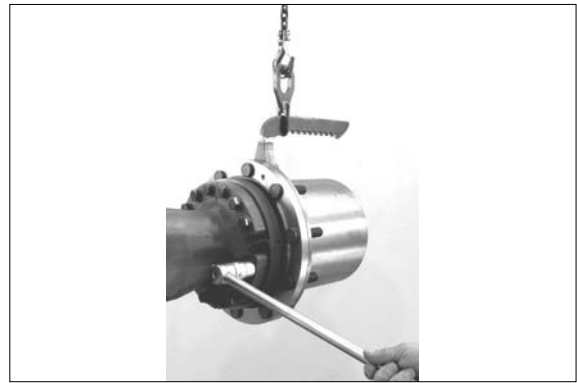


17W7A8RA003

- 4) When working on the differential / input, you can disassemble the output as a cpl. unit (see fig. RA004) and no complete disassembly is required as illustrated in fig. RA005 ~ RA022.

For this purpose secure output assy by means of lifting bracket, loosen threaded connections and separate output assy from axle housing.

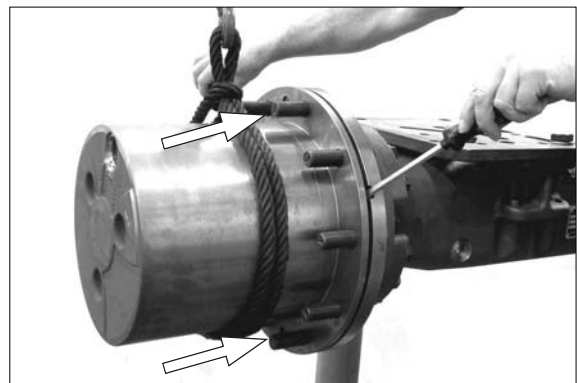
(S) Lifting bracket 5870 281 043



17W7A8RA004

- 5) Secure planetary carrier by means of lifting strap, loosen both cylinder screws (arrows) and separate planetary carrier from hub.

(S) Lifting strap 5870 281 026



17W7A8RA005

- 6) Unsnap retaining ring.

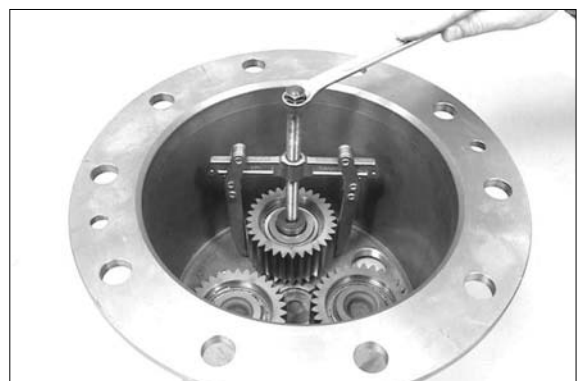
(S) Set of external pliers 5870 900 015



17W7A8RA006

- 7) Pull off planetary gear by means of two-armed puller.

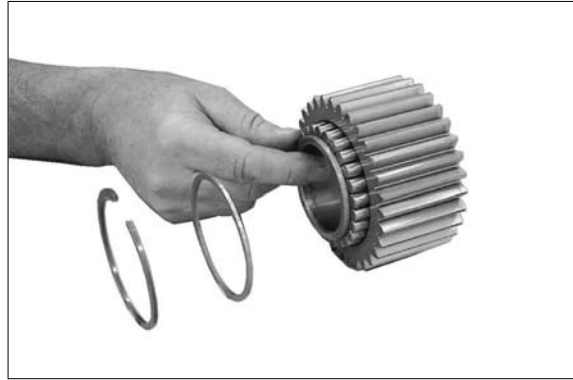
(S) Two-armed puller 5870 970 002



17W7A8RA007

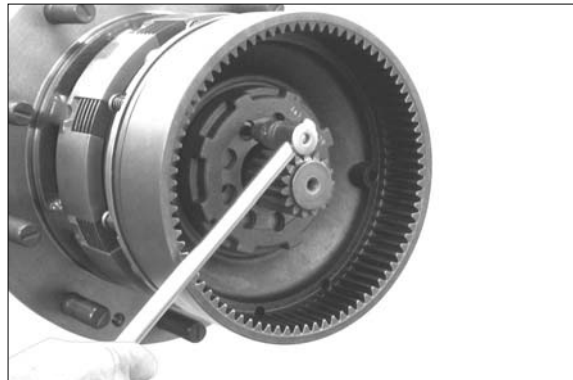
8) Unsnap circlip and remove the washer behind.

Then remove roller bearing, second circlip and washer from planetary gear.



17W7A8RA008

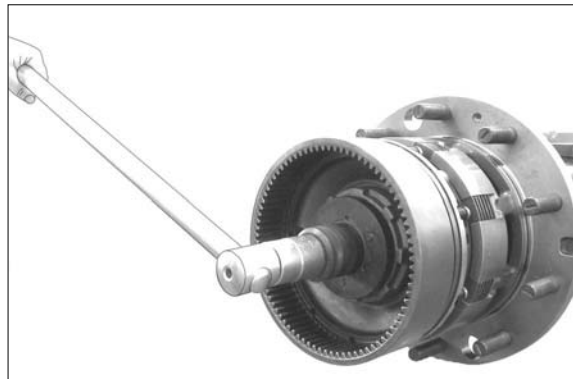
9) Remove slotted nut mount (cylinder screw).



17W7A8RA009

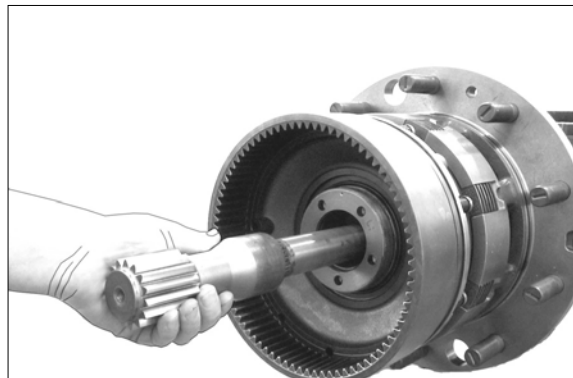
10) Loosen slotted nut.

(S) Slotted nut wrench 5870 656 097



17W7A8RA010

11) Remove sun gear shaft and stub shaft.

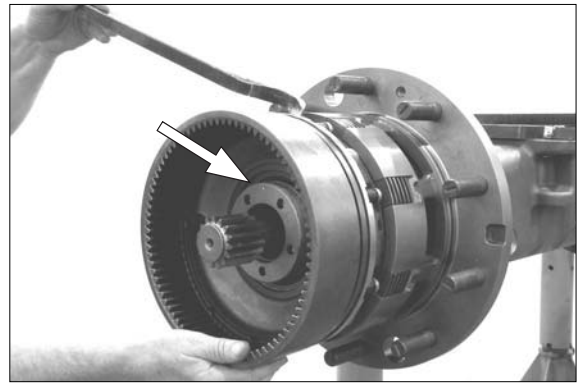


17W7A8RA011

12) Press off ring gear with piston.

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

(S) Assembly lever 5870 345 065



17W7A8RA012

13) Loosen hex screws, remove spring sleeves and compression springs.



17W7A8RA013

14) Press piston from ring gear.



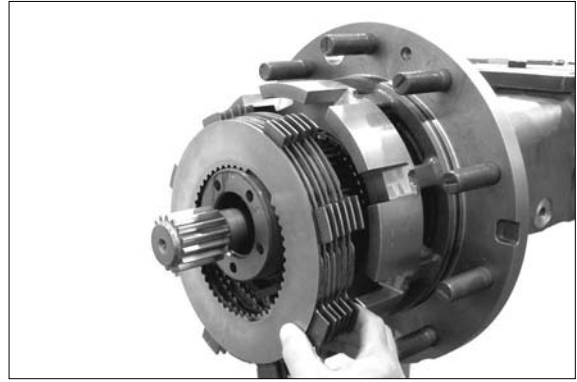
17W7A8RA014

15) Remove sealing elements (arrows) from ring gear.



17W7A8RA015

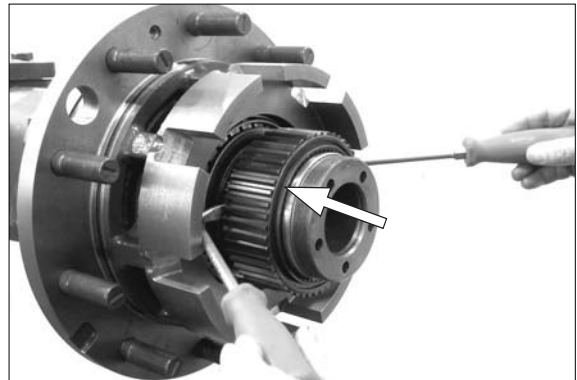
16) Remove plate pack.



17W7A8RA016

17) Remove O-ring (arrow) and lift-off disc carrier with lever, then remove releasing O-ring.

(S) Adjusting device 5870 400 001
(2 pcs. required)

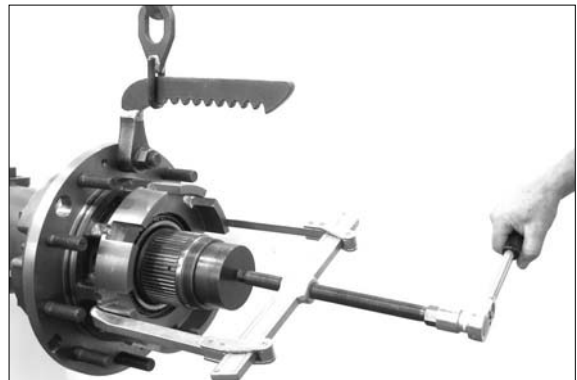


17W7A8RA017

18) Secure hub by means of lifting bracket, pull hub from hub carrier by means of pressure piece and two-armed puller.

※ Pay attention to the releasing bearing inner ring.

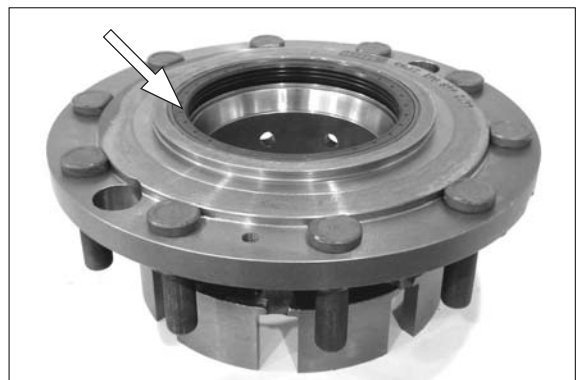
(S) Lifting bracket 5870 281 043
(S) Two-armed puller 5870 970 006
 Pressure piece 5870 100 063



17W7A8RA018

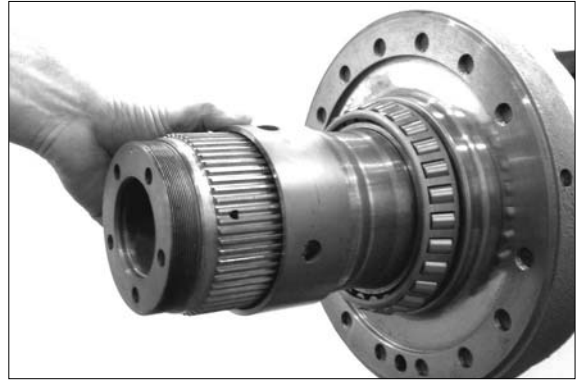
19) Lift-off shaft seal (arrow) with lever and remove both bearing outer rings from hub.

(S) Pry bar 5870 345 071



17W7A8RA019

20) Remove spacer bushing.



17W7A8RA020

21) Pull bearing inner ring from hub.

- (S) Gripping insert 5873 004 026
- (S) Two-armed puller 5870 970 006
- (S) Pressure piece 5870 281 026

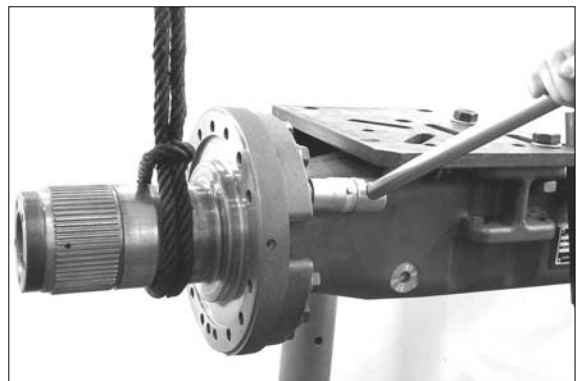


17W7A8RA021

22) Fix hub carrier by means of a strap, loosen threaded connection and separate hub carrier from axle housing.

Then remove single components such as screw neck, breather valve and O-ring from hub carrier.

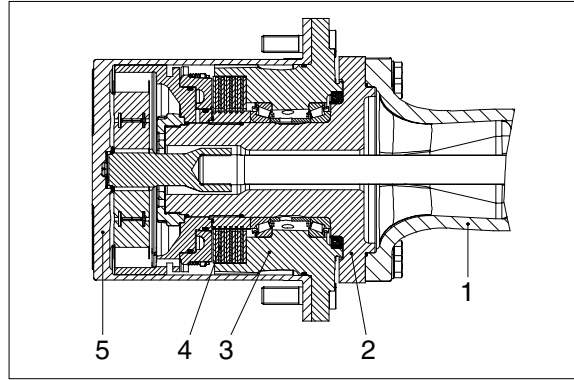
- (S) Lifting strap 5870 281 026



17W7A8RA022

4. REASSEMBLY - OUTPUT

- 1 = Axle housing
- 2 = Hub carrier
- 3 = Hub carrier
- 4 = Multi - disc brake
- 5 = Planetary carrier



17W7A8RA023

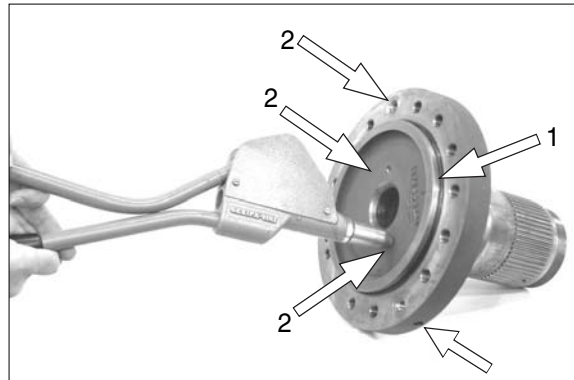
1) HUB CARRIER/HUB

- (1) Oil the O-ring (1) and install on hub carrier.

Only applicable for assembly of a new hub carrier :

Close machining apertures (2) of the oil supply holes with blanking plug.

(S) Lever rivet pliers 5870 320 016

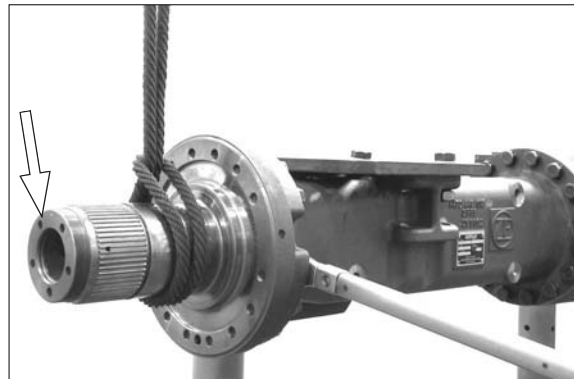


17W7A8RA024

- (2) Install pre-assembled hub carrier to axle housing, considering the installation position - stamped circle in 12 o'clock position (see arrow) - fix with hex screws and washers

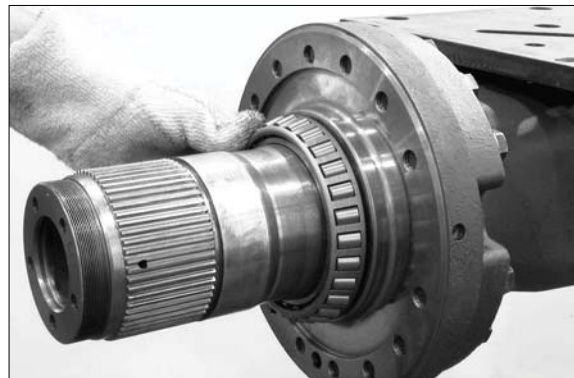
Tightening torque (M16 / 10.9)
 $M_A = 280\text{Nm}$

(S) Lifting strap 5870 281 026



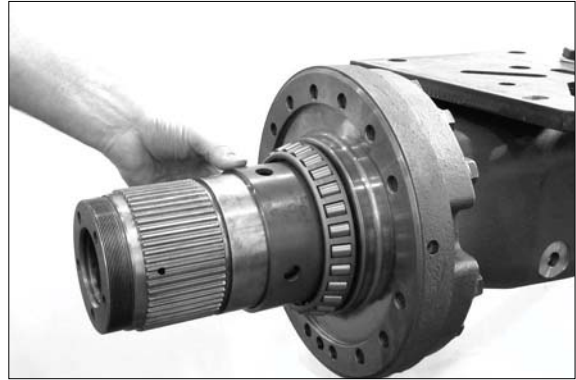
17W7A8RA025

- (3) Install heated bearing inner ring until contact.



17W7A8RA026

(4) Install spacer bushing.



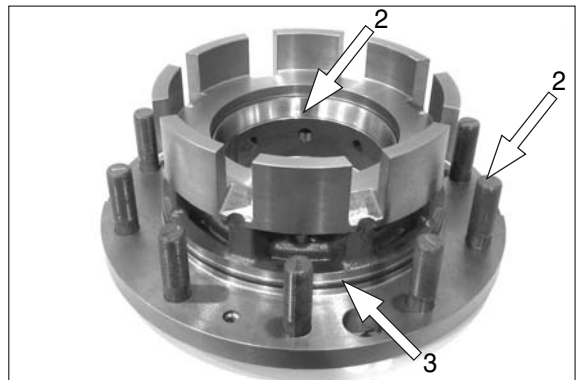
17W7A8RA027

(5) Mount wheel bolts (1).

Insert both bearing outer rings (2) of the hub bearing until contact.

Oil the O-ring (3) and locate in annular groove of hub.

Mount shaft seal, considering installation position (marking OUT - SIDE looking upward / outward) and rim offset **X** - see detailed sketch.



17W7A8RA028

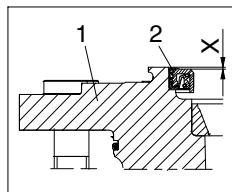
(6) Legend to figure RA029 and detail sketch :

1 = Hub

2 = Shaft seal

X = Rim offset

X..... 0.0~0.3mm



17W7A8RA029

(7) Apply sealing agent (Loctite - No. 574) to contact face of shaft seal /hub.

※ Wet contact face of shaft seal / hub carrier with spirit at the very beginning of the assembly - assembly aid.

(S) Driver 5870 051 035

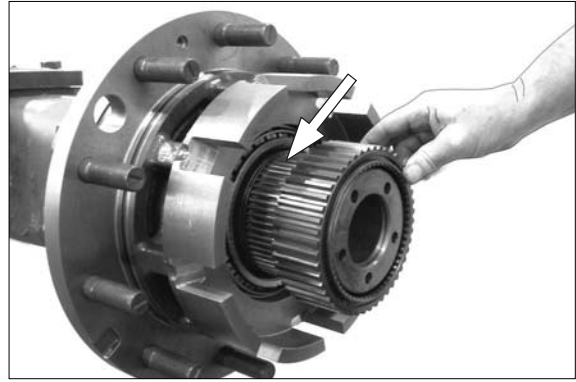
Install preassembled hub until contact and fix with heated outer bearing inner ring.

(S) Lifting bracket 5870 281 043



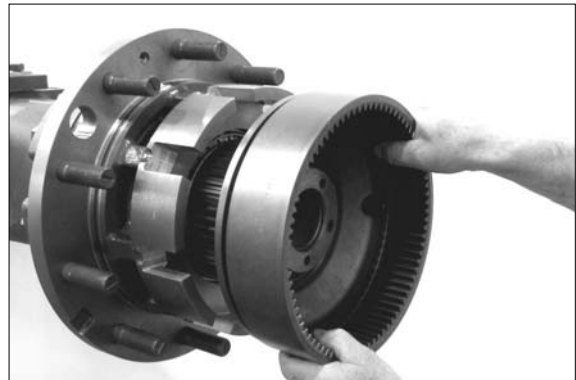
17W7A8RA030

- (8) Oil the O-ring and locate in annular groove (arrow) of disc carrier. Then install disc carrier.



17W7A8RA031

- (9) Bring hub bearing into contact position (figure RA032~RA035) : Install ring gear (without sealing elements).



17W7A8RA032

- (10) Insert stub shaft and sun gear shaft (support for slotted nut wrench - see figure RA034).

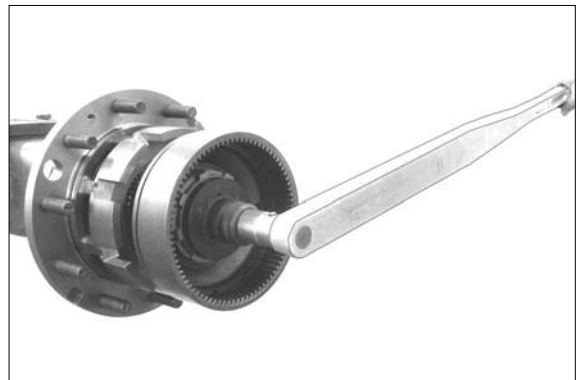


17W7A8RA033

- (11) Bring hub bearing into contact position - for this purpose tighten slotted nut with a tightening torque of max. 1400 Nm.

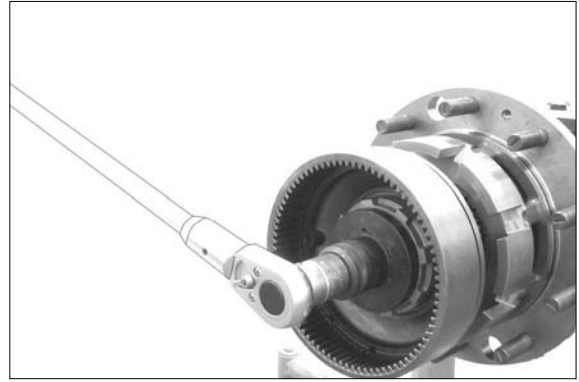
- ※ Apply thread-hub carrier/slotted nut-with lubricant.
- ※ While tightening the slotted nut rotate hub in both directions several times - roller setting.

(S) Slotted nut wrench 5870 656 097



17W7A8RA034

- (12) Loosen slotted nut again and remove ring gear.



17W7A8RA035

2) MULTI DISC BRAKE

- (1) Install disc pack alternately starting with an outer disc.

- ※ Pay attention to installation position of inner discs - see RA037.
- ※ Take the actual necessary plate arrangement from the corresponding spare parts list.



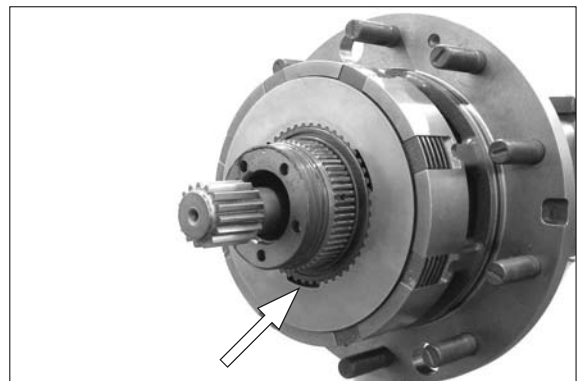
17W7A8RA036

- (2) Installation position of inner discs :

- ※ Position inner discs in such a way that one of the tooth recesses (arrow) is in 6 o'clock position - when axle is installed in vehicle.

Inner clutch discs $s = 2.5\text{mm}$ (standard)

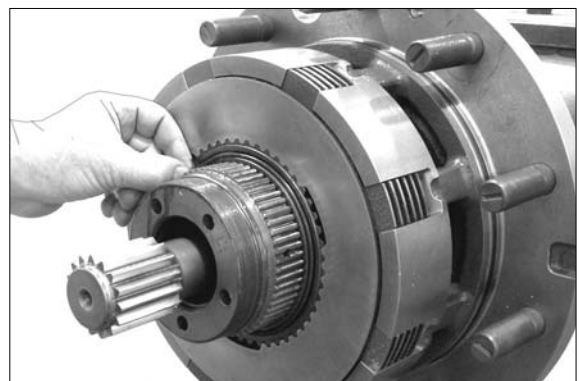
- ※ Install inner discs with $s =$ alternatively (2.0 - 2.5 - 3.0mm) - required to set the disc clearance - on outside position in disc pack.



17W7A8RA037

- (3) Oil the O-ring and locate in annular groove of disc carrier.

- ※ Stick O-ring by means of grease - assembly aid.



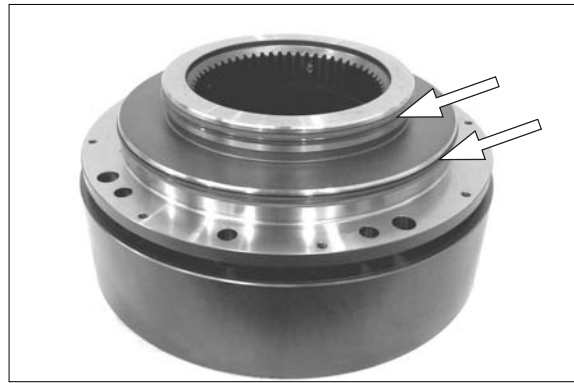
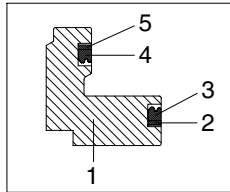
17W7A8RA038

(4) Oil sealing elements and locate in annular grooves (arrows) of ring gear as shown in the detailed sketch.

※ Pay attention to installation position and arrangement of sealing elements.

Legend to figure RA039 and detail :

- 1 = Ring gear
- 2 = Support ring
- 3 = U-ring
- 4 = U-ring
- 5 = Support ring



17W7A8RA039

(5) Just for assembly of new parts or if disassembled :

Mount all cylindrical pins into piston considering installation dimension **X**.

X..... =16.00mm



17W7A8RA040

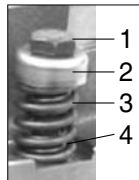
(6) Install piston on preassembled ring gear.



17W7A8RA041

(7) Legend to detail A :

- 1 = Hex. Screw
- 2 = Spring sleeve
- 3 = Compression springs (outer)
- 4 = Compression springs (inner)



Fix piston with spring sleeve (2), compression springs (3 and 4) and new hex. screws (1).

※ Use hex. screws just once for assembly.

Tightening torque (M 6 / 8.8)

..... $M_A = 11Nm$

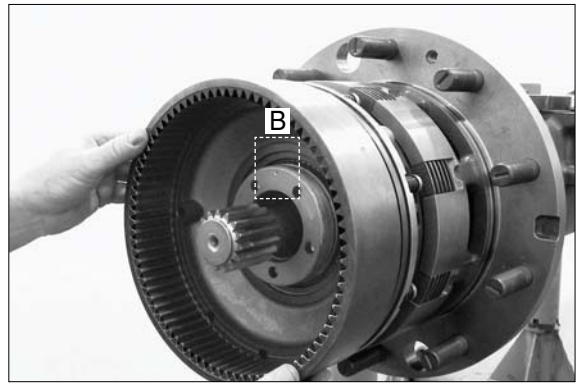


17W7A8RA042

(8) Mount preassembled ring gear, considering installation position (markings **O** in 12 o'clock position - see arrows, detail **B**).



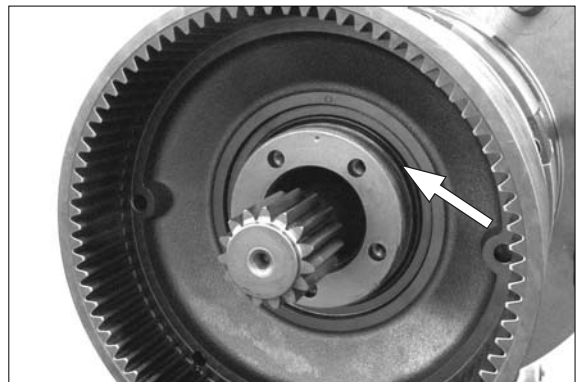
- ※ Ensure exact position of tothing of oil supply holes - hub carrier/ring gear (pressure oil supply to brake piston).



17W7A8RA043

(9) Oil the O-ring and insert it in recess (arrow).

- ※ Apply thread - hub carrier/slotted nut - with lubricant



17W7A8RA044

(10) Fix ring gear with slotted nut.

- ※ First tighten slotted nut with 1400Nm, then retighten slotted nut until a fixing hole overlaps a threaded hole in the hub carrier - In this connection also refer to fig. RA051.
- ※ While tightening the slotted nut rotate hub in both directions several times - roller setting.



17W7A8RA045

Tightening torque (M110 × 1.5)

..... $M_A = 1400^{+200}$ Nm

(S) Slotted nut wrench 5870 656 097

(11) Make leakage test of multi - disc brake :

Mount breather valve (arrow) and connect HP - pump (to connection hole on input side / hub carrier).

(S) HP - pump 5870 287 007

(S) Threaded coupling (M14 × 1.5)

5870 950 102

(S) Breather bottle 5870 286 072

Breathe brake completely before starting the test.



17W7A8RA046

Test media :

Motor oils SAE-10W correspond,
SAE 85W-90 with LS-ADDITIVE

High pressure test :

Build up testing pressure $p = 100$ bar and close locking valve of HP - pump.

The pressure is allowed to fall by max. 3 bar during a 5-minute test duration.

Low pressure test :

Reduce testing pressure to $p = 5$ bar and close locking valve.

The pressure is not allowed to fall during a 5-minute testing duration.

(12) Adjust and check disc clearance/piston stroke :

Disc clearance/piston travel $X=1.2\sim 1.8$ mm

Legend to figure RA047 and sketches RA048+RA049 :

1 = Ring gear

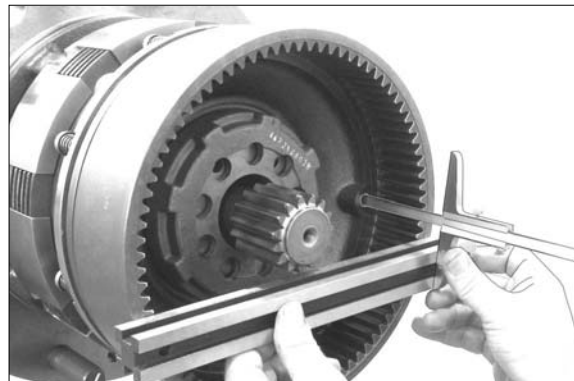
2 = Measuring hole

3 = Piston

X = Disc clearance / piston stroke

(S) Straightedge 5870 200 022

(S) Digital - depth gauge 5870 200 114



17W7A8RA047

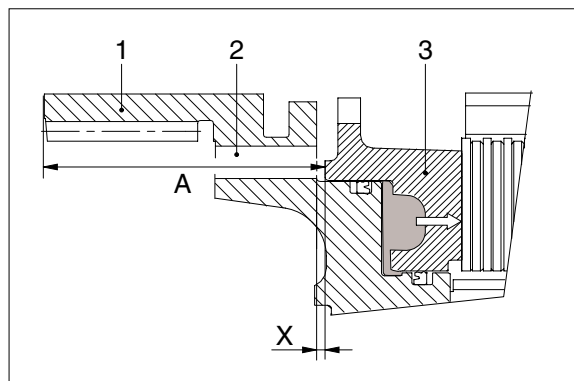
(13) Breathe brake completely before starting the test.

Build up braking pressure (100bar) and find dimension **A**, from front face / ring gear (1) through measuring hole (2) - see fig. RA047 and sketch RA048 - to front face / piston (3).

Dimension **A** e.g. = 83.50mm

Release pressure from brake - i.e. no pressure applied on brake, piston is in contact with ring gear (reset piston through compression springs) - and find dimension **B** from front face / ring gear (1) through measuring hole (2) - see fig. RA047 and sketch RA049 - to front face / piston (3).

Dimension **B** e.g. = 82.10mm



17W7A8RA048

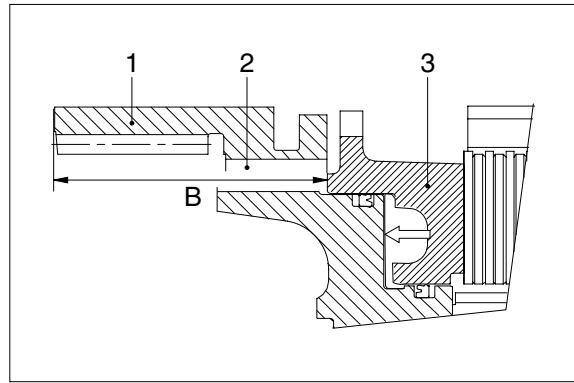
(14) CALCULATION EXAMPLE :

Dimension A e.g. 83.50mm

Dimension B e.g. - 82.10mm

Result → disc clearance = 1.40mm

- ※ If the required disc clearance / piston stroke ($X = 1.2 \sim 1.8\text{mm}$) is not achieved, correct it with corresponding inner clutch disc(s) - see figure RA037.



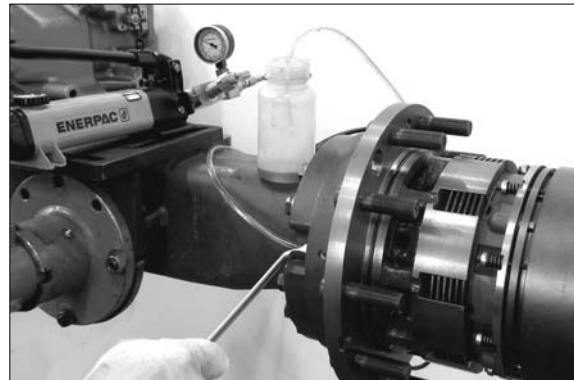
17W7A8RA049

(15) Dismantle HP-pump and mount screw neck with O-ring.

(Just for transport protection - mount protection cap with O-ring on screw neck).

Tightening torque (M14 × 1.5)

..... $M_A = 23\text{Nm}$

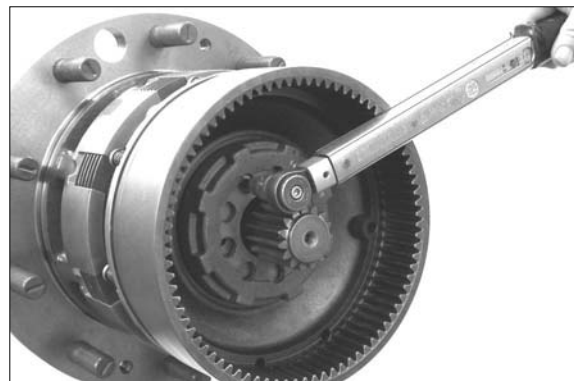


17W7A8RA050

(16) Secure slotted nut with cylinder screw - in this connection refer to note on fig. RA045.

Tightening torque (M10 / 8.8)

..... $M_A = 32\text{Nm}$



17W7A8RA051

3) PLANETARY CARRIER :

Adjust axial play of sun gear shaft 0.3~1.0mm, fig. RA052~RA054.

- (1) Determine dimension I, from mounting face of planetary carrier to contact face of thrust washer.

Dimension I, e.g. 260.65mm

(S) Straightedge 5870 200 022

(S) Digital-depth gauge 5870 200 114



17W7A8RA052

- (2) Determine dimension II, from front face (arrow) of sun gear to mounting face of hub.

Dimension II, e.g. 255.70mm

CALCULATION EXAMPLE :

Dimension I eg. 260.65mm

Dimension II eg. - 255.70mm

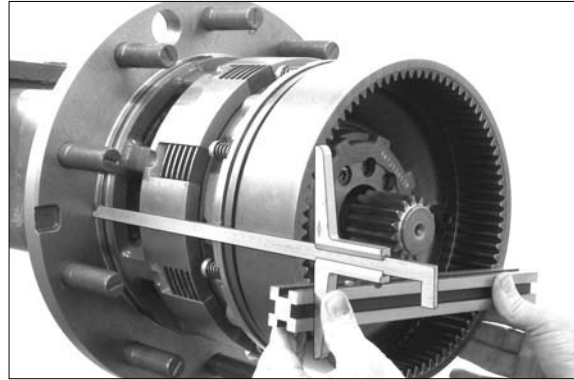
Difference = 4.95mm

Required axial play(average) e.g.

..... - 0.75mm

Result = requ. thrust washer(s) e.g.

..... s = 4.20mm



17W7A8RA053

- (3) Insert thrust washer(s) (e.g. s = 4.20mm) into planetary carrier and press into contact position.

(S) Driver 5870 048 263



17W7A8RA054

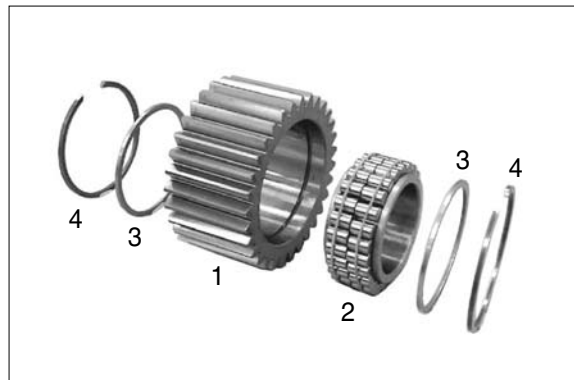
- (4) Preassemble planetary gear, as shown in the figure.

1 = Planetary gear

2 = Roller bearing

3 = Washer

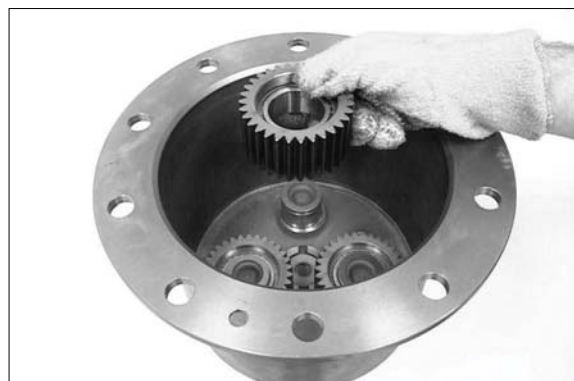
4 = Circlip



17W7A8RA055

- (5) Warm up bearing inner ring and install pre-assembled planetary gear until contact.

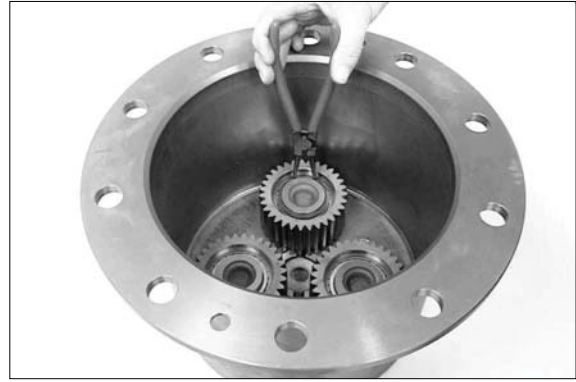
- ※ Mount planetary gear or bearing inner ring with large radius looking to planetary carrier (downward).



17W7A8RA056

(6) Fix planetary gear by means of retaining ring.

(S) Set of external pliers 5870 900 015



17W7A8RA057

(7) Install planetary carrier and fix with cylindrical screws.

Tightening torque (M12 / 8.8)

..... $M_A = 55\text{Nm}$



17W7A8RA058

4) ASSEMBLY OF AN OUTPUT ASSY

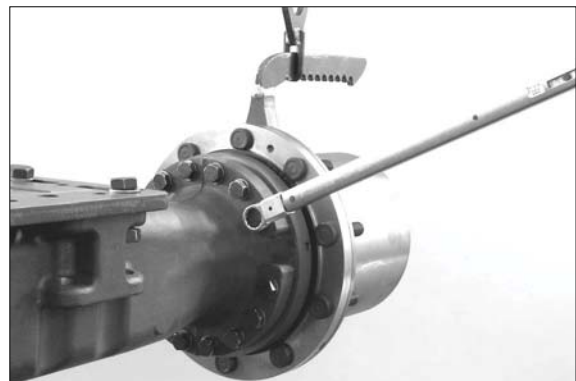
Bring output assy into position on axle housing by installing stub shaft into differential (axle bevel gear) - and fix with hex. screws and washers.

Tightening torque (M16 / 10.9)

..... $M_A = 280\text{Nm}$

(S) Lifting bracket 5870 281 043

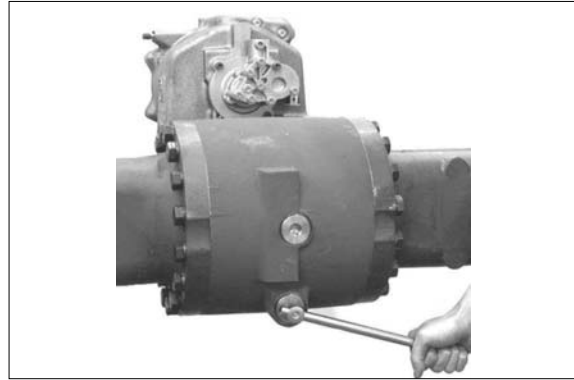
※ Prior to putting the axle into operation fill it with oil.



17W7A8RA059

5. DISASSEMBLY-DIFFERENTIAL / INPUT

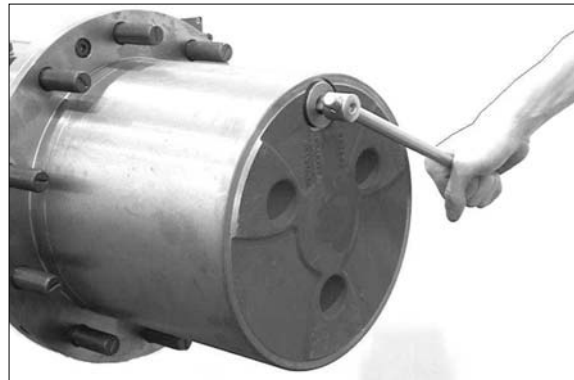
- 1) Loosen oil drain plug and drain oil from the axle
 - Use suitable collecting basin.



17W7A8RA060

- 2) To avoid injury when opening the oil drain and oil filler plug due to a possible pressure build-up in the oil system of the planetary carrier.
 - Bring drain hole to topmost position (12 o'clock) and carefully unscrew oil drain and oil filler plug.

Then bring drain hole to lowermost position (6 o'clock) and drain oil from outputs - use suitable collecting basin.

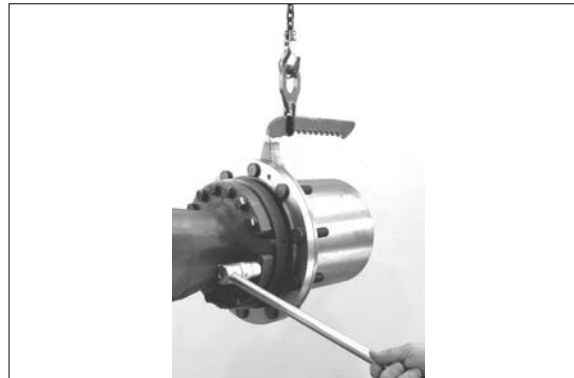


17W7A8RA061

- 3) When carrying out works on differential and/or input pinion, the output/s can be dismantled as complete unit (see figure RA062 and RA063).

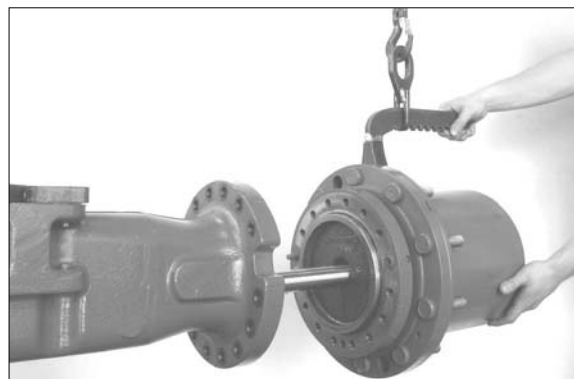
Secure output assy by means of lifting bracket, loosen threaded joint.

(S) Lifting bracket 5870 281 043



17W7A8RA062

- 4) Separate the output assy from the axle housing and pull the stub shaft.



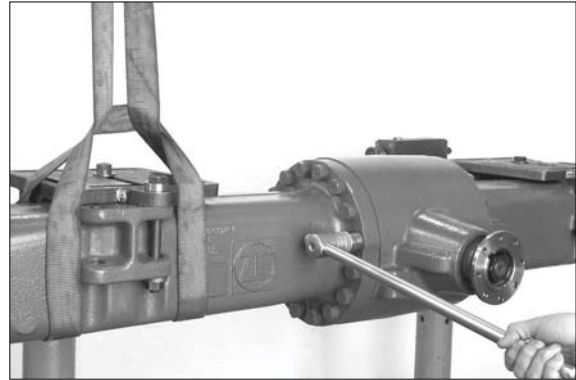
17W7A8RA063

5) INPUT

- (1) Loosen the threaded joint of the axle housing half on the crown wheel side. Carefully separate the axle housing half.

※ Pay attention to releasing differential.

(S)Lifting strap 5870 281 026



17W7A8RA071

- (2) Move the differential assembly out of the axle drive housing.

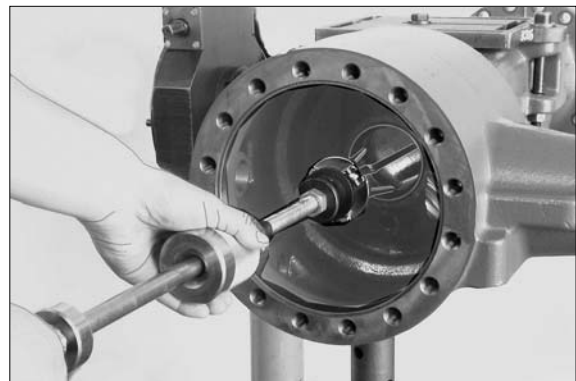


17W7A8RA072

- (3) Use a striker to pull the bearing outer ring out of the hole and remove the shim behind (backlash).

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

(S) Striker 5870 650 004

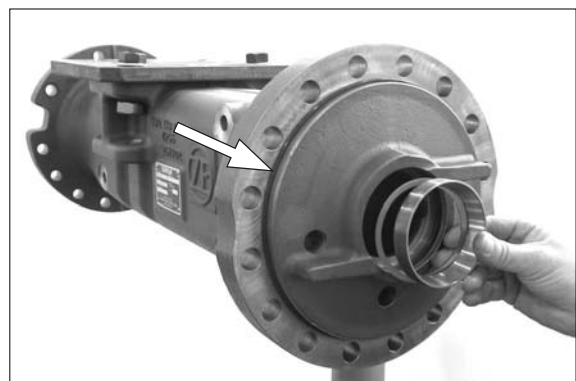


17W7A8RA073

- (4) Remove the bearing outer ring and the shim behind (rolling torque differential bearing) from the second axle housing half.

※ Mark the shim (installation position / bearing allocation) - assembly aid!

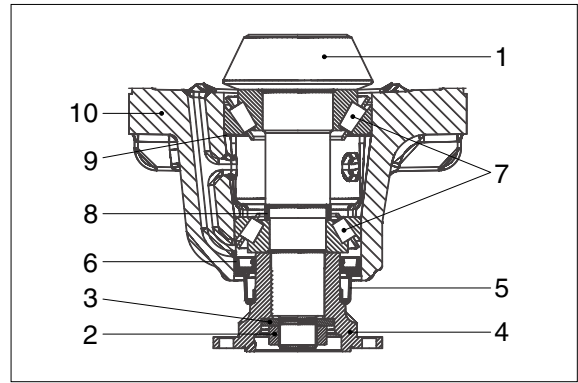
Remove the O-ring (arrow).



17W7A8RA074

(5) Legend to sketch RA075 :

- 1 = Input pinion
- 2 = Hexagon nut
- 3 = Disk
- 4 = Input flange
- 5 = Screen sheet
- 6 = Shaft seal
- 7 = Taper roller bearing
- 8 = Spacer ring (bearing rolling torque)
- 9 = Shim (contact pattern)
- 10 = Input housing

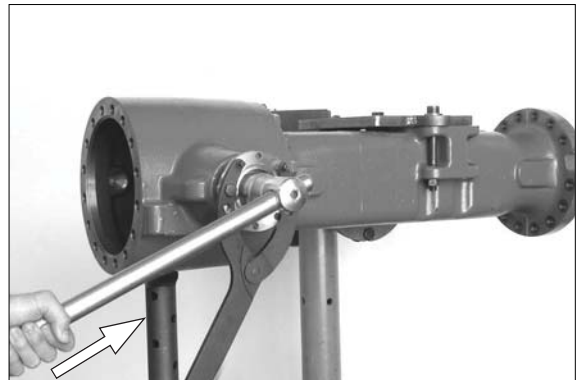


17W7A8RA075

(6) Fix the input flange with a clamping fork, loosen the hexagon nut and remove the shim behind.

※ Secure the axle housing with a support (arrow).

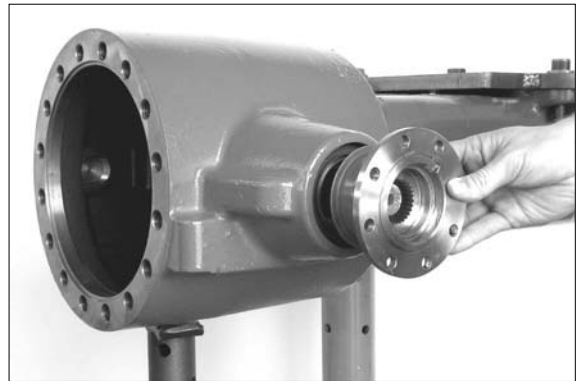
(S) Clamping fork 5870 240 025



17W7A8RA076

(7) Remove the flange.

If necessary, remove the screen sheet from the output flange.



17W7A8RA077

(8) Remove the shaft seal with a lever.

(S) Pry bar 5870 345 071

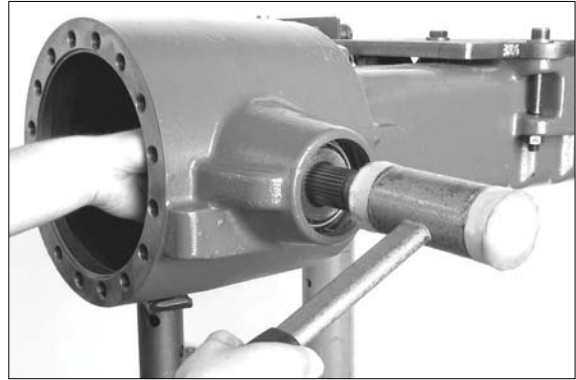


17W7A8RA078

(9) Drive the input pinion out.

- ※ If the taper roller bearings should be reused, ensure that the outer bearing inner ring is always in contact with the bearing outer ring with all rollers, when driving the input pinion out.

(S) Plastic hammer 5870 280 004



17W7A8RA079

(10) Remove the spacer ring.



17W7A8RA080

(11) Press the bearing inner ring off from the input pinion.

(S) Gripping insert 5873 001 037

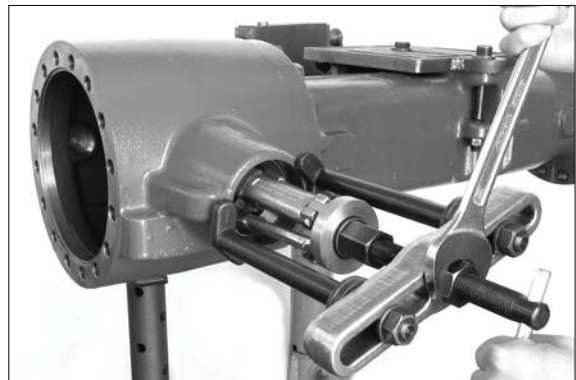


17W7A8RA081

(12) Pull the outer bearing outer ring off.

(S) Internal extractor 5870 300 019

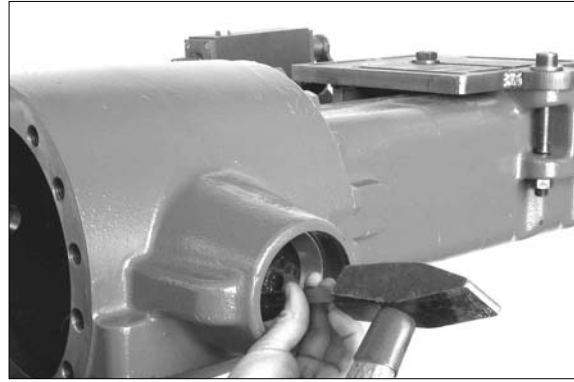
(S) Counter support 5870 300 020



17W7A8RA082

(13) Drive the bearing outer ring out of the inner bearing hole - pay attention to the shim behind (contact pattern / bevel gear set).

※ Mark the shim (with regard to position / bearing allocation) - assembly aid.



17W7A8RA083

6) DIFFERENTIAL

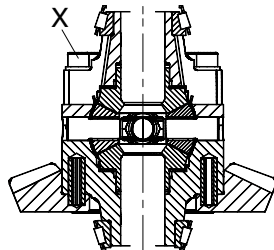
(1) Pull both taper roller bearings from the differential carrier.

(S) Gripping insert - Super	5873 001 020
Back off insert	5870 026 100
Pressure piece	5870 100 009



17W7A8RA084

(2) Loosen the threaded joint (see position X).



※ The hexagon screws are mounted with locking compound (Loctite) - disassembly is more difficult - if necessary, heat the threaded joint section (disassembly aid).



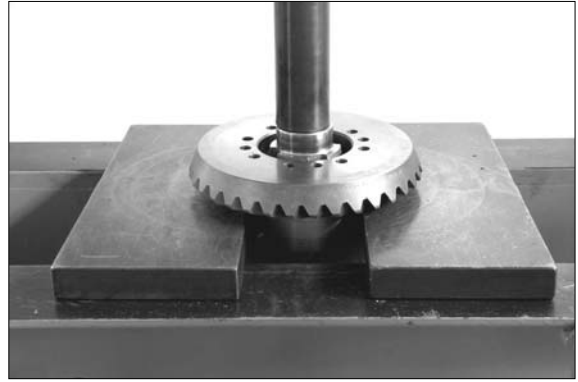
17W7A8RA085

(3) Separate the differential carrier halves and remove the releasing individual parts.



17W7A8RA086

(4) Press the crown wheel off from the differential carrier half.

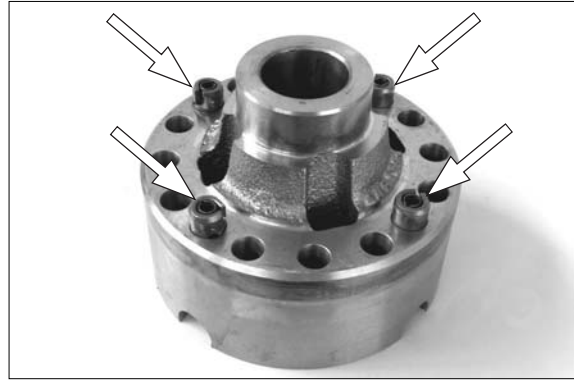


17W7A8RA087

6. REASSEMBLY - DIFFERENTIAL / INPUT

1) DIFFERENTIAL

- (1) Mount slotted pins (arrows) - as specified in the assembly instructions, see sketch No. 2 - into differential carrier half.



17W7A8RA088

- (2) Assembly instructions :

Position slotted pin (s) in such a way that the slot is looking into the direction of force (arrow).

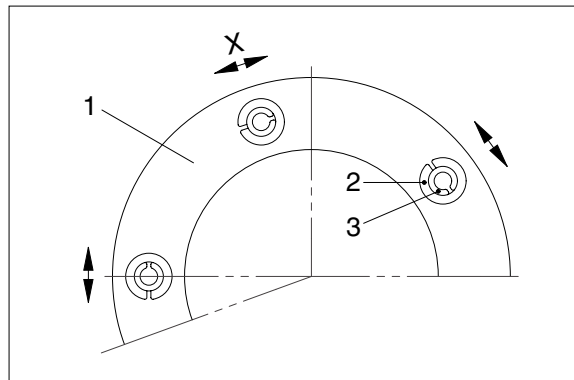
In case of double slotted pins - bring the slots in a 180° offset position to each other.

1 = Differential carrier

2 = Slotted pin

3 = Slotted pin (only for double slotted pin version)

X = Force direction



17W7A8RA089

- (3) Insert two adjusting screws into crown wheel and press differential carrier until contact.

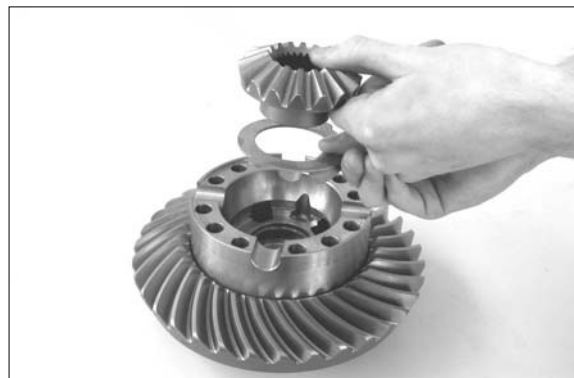
(S) Adjusting screw 5870 204 027
(M12 × 1.5)



17W7A8RA090

- (4) Insert thrust washer and axle bevel gear.

- ※ Put driving lugs of thrust washer into driving holes / differential carrier - do not position in oil supply recesses.



17W7A8RA091

(5) Install differential bevel gears and thrust washer on differential spider and insert in differential carrier half I.

- ※ Ensure radial installation position of thrust washer.
Lug is looking vertically upward (see arrows).



17W7A8RA092

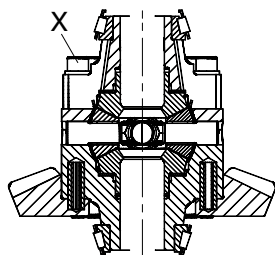
(6) Insert second axle bevel gear.



17W7A8RA093

(7) Glue thrust washer with grease (assembly aid) into differential carrier half II. Position the preassembled differential carrier half II to differential carrier half I.

- ※ Put driving lugs of thrust washer into driving holes / differential carrier - do not position in oil supply recesses.



17W7A8RA094

(8) Fasten differential carrier halves with cylinder screws and washers (pos. X).

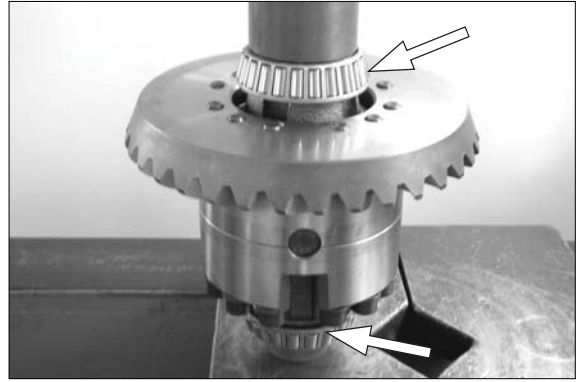
- ※ Ensure radial installation position - designation corresponds to radial position marking.

Tightening torque (M12 × 1.5 / 12.9)
..... M_A = 145Nm



17W7A8RA095

(9) Install both bearing inner rings (arrows).



17W7A8RA096

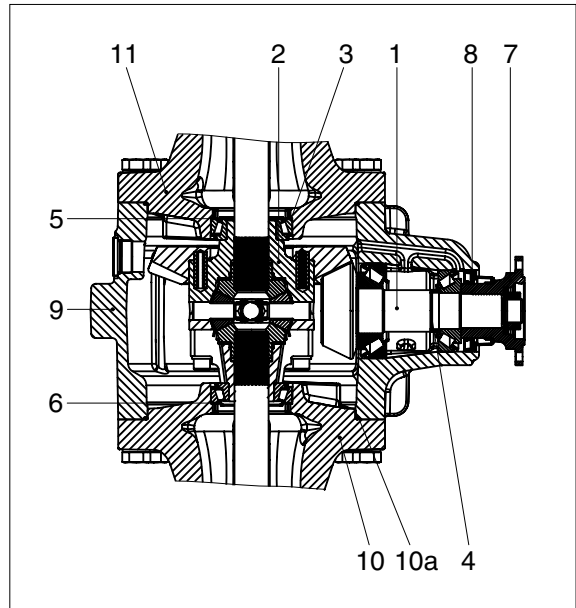
(10) Wet some tooth flanks of the crown wheel with marking ink (for contact pattern acceptance - see figure RA119, page 8-261).



17W7A8RA097

2) Input

- 1 = Drive pinion
- 2 = Differential (with crown wheel)
- 3 = Shim for contact pattern
(bevel gear set)
- 4 = Spacer ring
(bearing rolling torque / pinion bearing)
- 5 = Shim for backlash
- 6 = Shim
(bearing rolling torque / differential bearing)
- 7 = Input flange
- 8 = Shaft seal
- 9 = Axle drive housing
- 10 = Axle housing / part I
- 10a = O-ring
- 11 = Axle housing / part II
(crown wheel side)



17W7A8RA098

Only for assembly of new parts or if disassembled :

Install O-ring (10a) on axle housing / part I (10) and mount axle drive housing (9) observe installation position.

Tightening torque (M18 / 10.9) $M_A = 390\text{Nm}$

- (1) Determine shim for pinion positioning to obtain an optimum contact pattern of crown wheel / pinion.

Read dimension I (Position - see arrow) from axle drive housing.

Dimension I e.g. 149.15mm



17W7A8RA099

- (2) Read pinion dimension (basic distance) **X** from pinion (see arrow) or determine it in case of a + or - deviation of the pinion dimension caused by the production (value concerned is marked by hand on the pinion, e.g.+ 0.1).

Pinion dimen. **X** (without + or - deviation) = 116.0mm
 Pinion dimen. **X** with an indicated^{+0.1} deviation = 116.1mm
 Pinion dimen. **X** with an indicated^{-0.1} deviation = 115.9mm
 Dimension II (Pinion basic distance) e.g. ...
 116.00mm



17W7A8RA100

- (3) Determine dimension **III** bearing width, observing that the rollers are located without any play (rotate bearing inner ring several times in both directions - roller setting).

Since the installed roller bearing is subject to a pre-load in installation position, deduct an experience value of - 0.1mm.

Dimension **III** = e.g. 32.00mm - 0.1mm →
 31.90mm

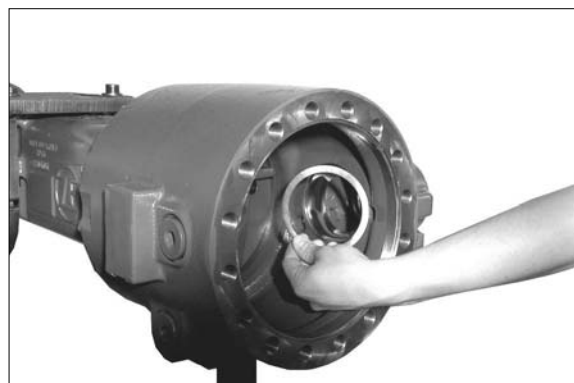
(S) Digital depth gauge 5870 200 072
 (S) Gauge blocks 5870 200 066

CALCULATION EXAMPLE :

Dimension I 149.09mm
 Dimension II + III - 148.10mm
 (116.00 + 31.90)
 Result = 1.01mm
 Shim required S = 1.00mm



17W7A8RA101

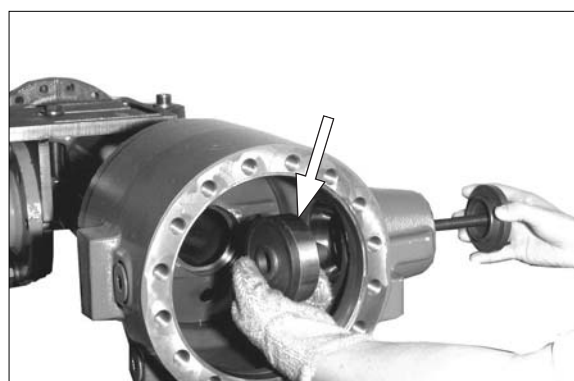


17W7A8RA102

- (4) Insert the determined shim(e.g. S = 1.00mm) into the inner bearing hole / pinion bearing.

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

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



17W7A8RA103

- (6) Install outer bearing outer ring / pinion bearing.

(S) Driver 5870 058 083
(S) Grip 5870 260 002



17W7A8RA104

- (7) Mount heated bearing inner ring until contact is obtained and readjust after cooling-down.



17W7A8RA105

- (8) **Adjust rolling torque of drive pinion bearing 1.0 ~ 3.0Nm (without shaft seal) :**

Mount spacer ring (s = optional).

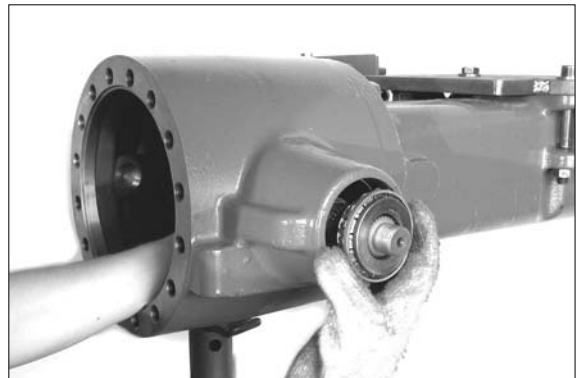
We would recommend to reinstall the spacer ring found during disassembly.

If, however, the required rolling torque of 1.0~3.0Nm (without shaft seal) is not achieved - see bearing rolling torque test - correct the bearing rolling torque by means of a corresponding spacer ring.



17W7A8RA106

- (9) Insert the preassembled drive pinion, mount the heated bearing inner ring until contact is obtained.



17W7A8RA107

(10) Mount flange, fix with washer and hex nut.

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

Tightening torque (M27 × 1.5)
 $M_A = 480\text{Nm}$

(S) Clamping fork 5870 240 025



17W7A8RA108

(11) Check rolling torque of pinion bearing.

Bearing rolling torque (without shaft seal)
 1.0 ~ 3.0Nm

Try to achieve upper value.

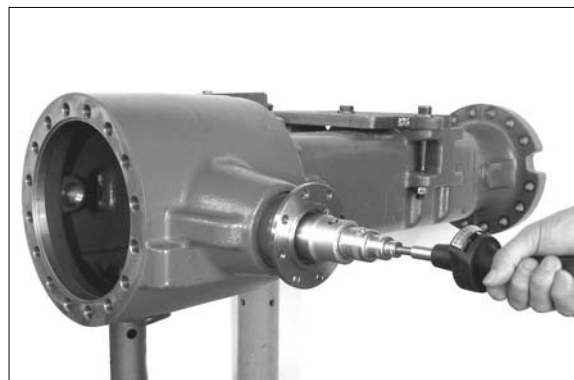
※ If the rolling torque differs from the required value, correct it with a suitable spacer ring (see figure RA106 / page 8-257).

(S) Torque wrench 5870 203 031

(S) Reduction 1/4 to 1/2 5870 656 056

(S) Reduction 1/2 to 3/4 5870 656 057

※ Reassemble shaft seal - as shown page 8-262 and 8-263 (after completion of differential assembly and positive contact pattern check).



17W7A8RA109

(12) Adjust backlash of bevel gear set and bearing rolling torque of differential bearing :

Backlash (crown wheel / drive pinion)
 = 0.12 ~ 0.24mm

Differential bearing preload
 = 0.10 ~ 0.15mm

(corresponds to a bearing rolling torque of 1 ~ 4Nm)

Bring axle drive housing / axle housing into vertical position.

※ Insert shim (backlash) into hole of axle housing / part I and install bearing outer ring until contact is obtained.

We would recommend to reinstall the shim (experience value = approx. 1.25mm) found during disassembly - also refer to disassembly instructions page 8-247, figure RA 073.



17W7A8RA110

※ However, the required backlash is decisive for the shim(s) to be used.

- (S) Driver 5870 058 061
- (S) Grip 5870 260 002

(11) Insert pre-assembled differential.



17W7A8RA111

(12) Place bearing outer ring.

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

For this purpose rotate differential and bearing outer ring several times in both directions - roller setting.

※ A correct positioning of bearing outer ring and differential is imperative for the following measuring operation.



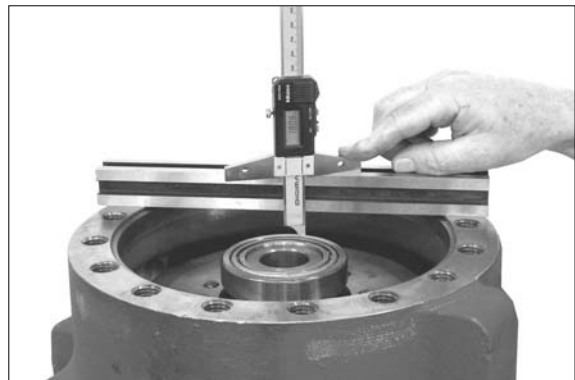
17W7A8RA112

(13) Determine dimension I, from mounting face of axle drive housing to bearing contact.

Dimension I e. g. 18.10mm

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

※ Make measurement on several points and calculate mean value.



17W7A8RA113

(14) Determine dimension II, from mounting face of axle housing / part II to contact face / bearing outer ring.

Dimension II e. g. 17.20mm

CALCULATION EXAMPLE :

Dimension "I" e. g. 18.10mm

Dimension "II" e. g. -17.20mm

Difference = 0.90mm

Requ. bearing preload + 0.13mm

(0.10 ~ 0.15mm)

Result = 1.03mm

Required shim S = 1.05mm



17W7A8RA114

- (15) Insert determined shim (s) e. g. **S** = 1.05mm into bearing hole of axle housing / part II and install bearing outer ring until contact is obtained.

Install (glue) bearing outer ring into hole with grease - assembly aid.

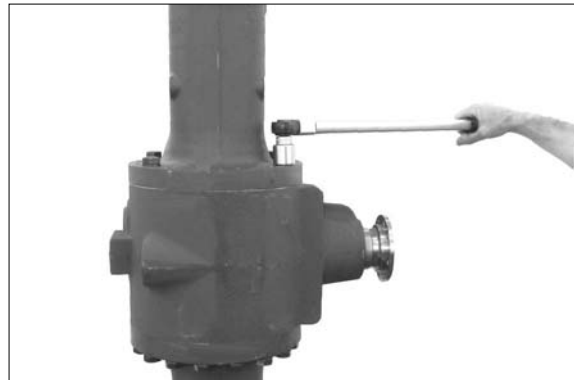
(S) Driver 5870 058 061

(S) Grip 5870 260 002



17W7A8RA115

- (16) Locate preassembled axle housing / part II (without O-ring) (observe radial installation position) and provisionally fix with hex. screws.



17W7A8RA116

- (17) **Check backlash and contact pattern :**

Place dial indicator at right angles to a tooth flank of the crown wheel (within the outer diameter area) through the oil filling hole and check backlash.

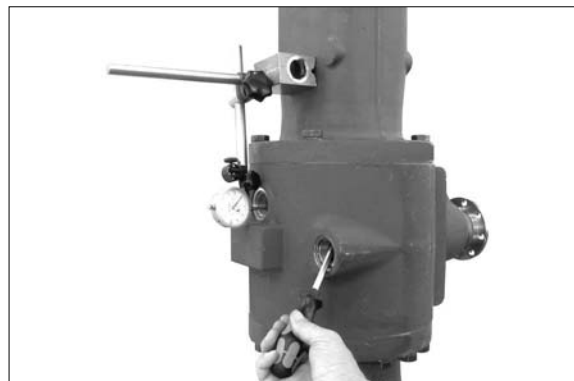
Backlash = 0.12 ~ 0.24mm

- ※ If the backlash is not within the specified tolerance, correct with a suitable shim (see figure RA110).

A correction of shim / backlash also requires a correction of shim/bearing rolling torque to the opposite direction (see figure RA115).

(S) Magnetic stand 5870 200 055

(S) Dial indicator 5870 200 057



17W7A8RA117

- (18) Rotate drive pinion in both directions several times over crown wheel / differential (contact pattern impression - in this connection see figure RA119).



17W7A8RA118

(19) Remove differential again.

Compare contact pattern (see arrow) with contact pattern examples.

- ※ If the contact pattern differs considerably, an error was made when determining the shim (see figure RA102, page 8-256), which needs to be corrected by all means.



17W7A8RA119

(20) Oil O-ring and mount on collar (arrow) of axle housing half / part II.



17W7A8RA120

(21) Reinstall differential.



17W7A8RA121

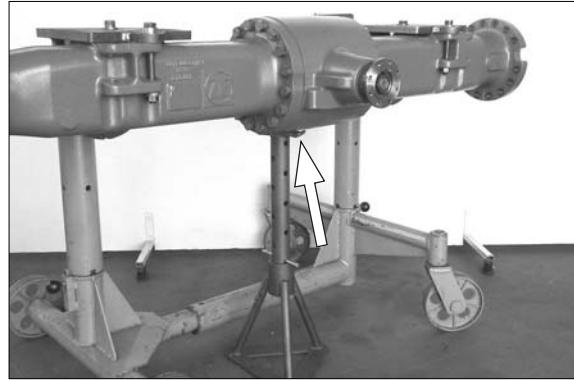
(22) Install pre-assembled axle housing half (observe radial installation position), fix with hex. screws and washer.

Tightening torque (M18/10.9)
..... $M_A = 390\text{Nm}$



17W7A8RA122

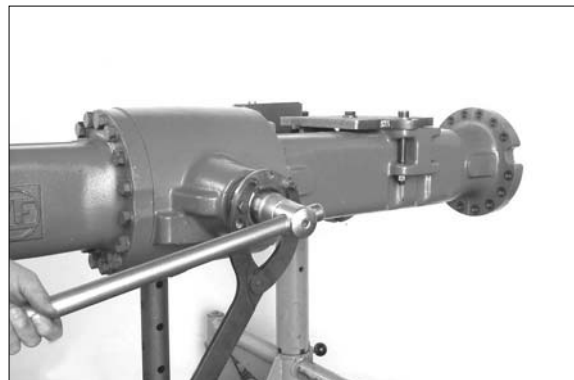
(23) Bring axle into horizontal position and secure with a support (arrow).



17W7A8RA123

(24) Disassemble flange again.

(S) Clamping fork 5870 240 025



17W7A8RA124

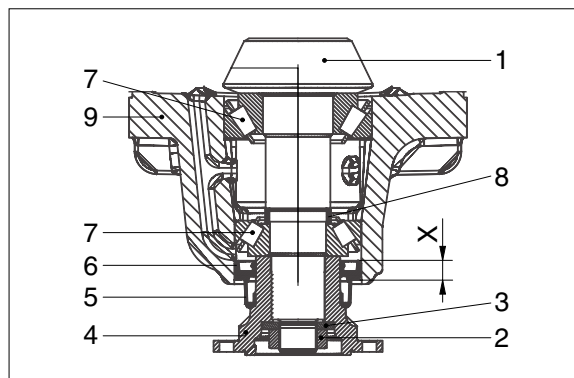
(25) Input flange :

Comment on sketch RA125~figure RA128 :

- 1 = Drive pinion 6 = Shaft seal
- 2 = Hex. nut 7 = Bevel roller bearing
- 3 = Washer 8 = Spacer ring
- 4 = Input flange 9 = Input housing
- 5 = Screen sheet

X = Installation dimension → $13.0^{+0.2}$ mm

Place shaft seal (6), considering the required installation position (dimension X)



17W7A8RA125

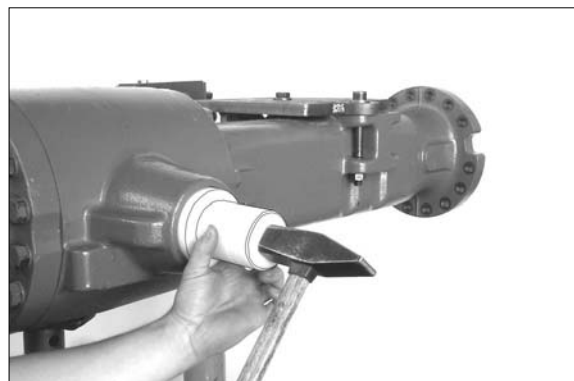
(26) Contact face (outer diameter) of shaft seal :

- wet with spirit (assembly aid) if rubber-coated
- apply sealing agent (Loctite No. 574) if made of metal

Apply grease on seal and dust lip of the shaft seal.

※ Ensure plane installation position of shaft seal - use suitable driver.

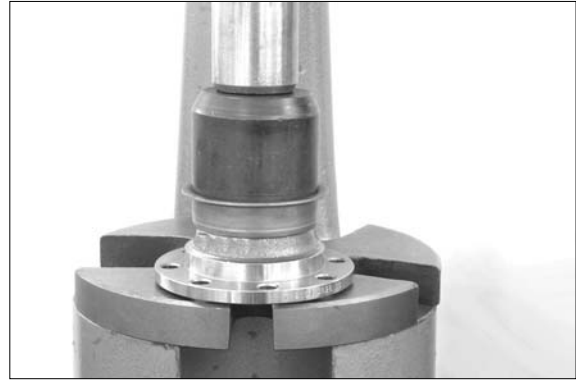
(S) Driver 5870 048 269



17W7A8RA126

(27) Press screen sheet / thrust plate (5) on the input flange until contact is obtained - also see sketch RA125.

- ※ Screen sheet / thrust plate must not be deformed during assembly - use suitable driver.



17W7A8RA127

(28) Install pre-assembled drive flange (4+5) and washer (3), fix with hex. nut (2).

- ※ Secure hex. nut with locking agent (Loctite-no. 262).

Tightening torque (M27 × 1.5)
 $M_A = 480 \text{ Nm}$

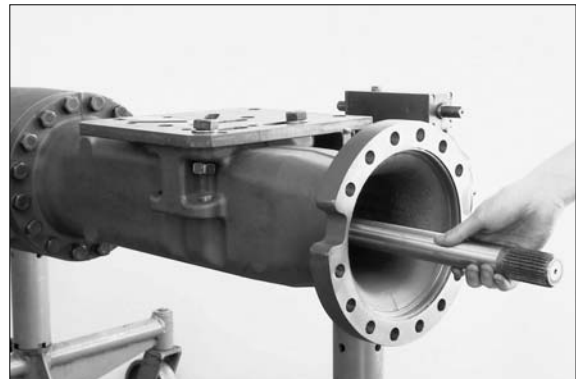
(S) Clamping fork 5870 240 025



17W7A8RA128

3) REASSEMBLE THE OUTPUT ASSY

(1) Install the plug shaft into the gears of the axle bevel gear.

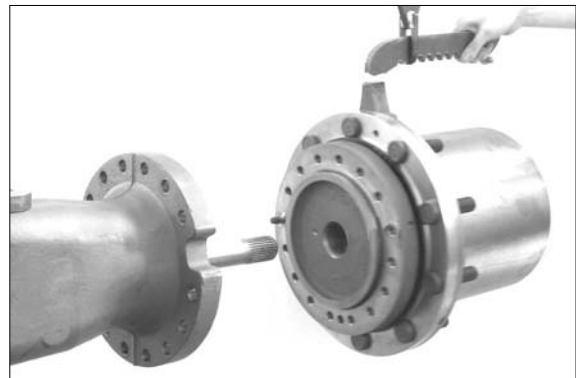


17W7A8RA129

(2) Position the output assy correctly to the axle housing by inserting the plug shaft into the sun gear shaft.

Pay attention to O-ring (arrow).

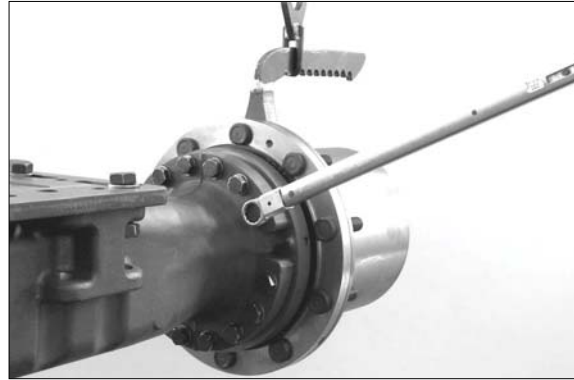
(S) Lifting bracket 5870 281 043



17W7A8RA130

- (3) Fix the output with hexagon screws and washers.

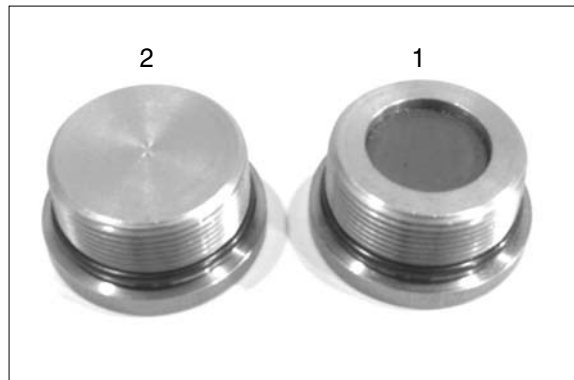
Tightening torque (M16/10.9)
 $M_A = 280\text{Nm}$



17W7A8RA131

4) OIL DRAIN, OIL FILLER AND OIL CONTROL PLUGS

- (1) Legend to Fig. RA132 ~ RA134 :
 1 = Screw plug with solenoid insert
 2 = Screw plug (without solenoid insert)

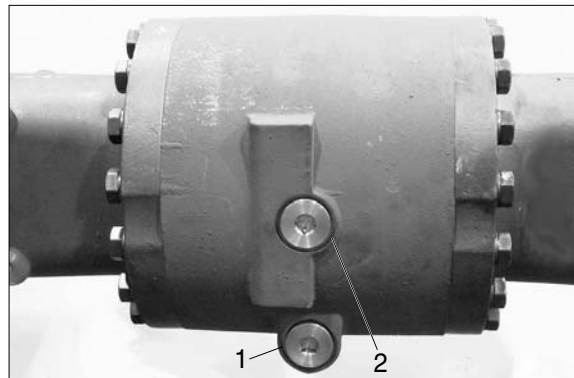


17W7A8RA132

- (2) Mount screw plugs with solenoid insert (1)
 - Equipped with new O-ring.

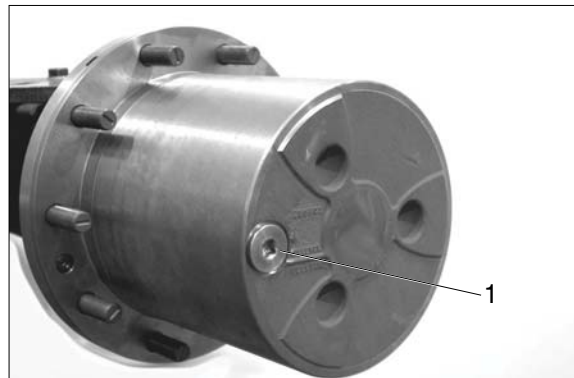
Mount screw plug (2) - equipped with new O-ring.

Tightening torque ($M36 \times 1.5$)
 $M_A = 50\text{Nm}$



17W7A8RA133

- (3) Prior to putting the axle into operation, fill it with oil. In this context observe operator's manual.



17W7A8RA134