

# Service Manual

## Steering Drive Axle for KODIAK AMERICA

**AXLE No.: HDZ13T341526009 (K06262)**

**HDZ13T341526010 (K06263)**

Shaanxi HANDE Axle Co., Ltd was jointly invested and built up by Weichai Power Co., Ltd. & Shaanxi Automobile Group Co., Ltd on March 23rd, 2003, with its predecessor as axle plant of Shaanxi Automobile Manufacturing Factory. The company is classified as high-tech enterprise, consisting of two plants in Xi'an and Baoji, which totally covers 32 hectares for workshop area. It has over 3,800 staff members, including more than 650 engineers and intermediate level technicians. The company registered capital is 53 million USD and annual sales revenue is over 833 million USD.

HANDE has been awarded as Top 500 China Machinery Enterprises and China 100 Best Auto Parts Enterprises for many years. In 2007, HANDE axle was honored as China Top Brand Product. In 2009, HANDE trademark was honored as the China Well-known Trademark. In the year of 1984, 1999 , 2009 and 2015, 5T SX2150 and 7T SX2190 military off-road vehicles with HANDE axle assembly participated in the parade celebrations of 35th, 50th and 60th National Day Anniversary, which got commendation by the State Council and Central Military Committee.

HANDE is a large & technology leading enterprise integrated with R&D, manufacturing and marketing system in China. A number of series of axle assembly have been in batches assembled onto China military heavy duty off-road vehicles and numerous famous China heavy duty trucks and buses.

Presently, HANDE main products include: 4.5T-25T steering front axles, 10T-45T hub reduction axles, 7T-13T single reduction axles, 5T-18T steering drive front axles and 5T-16T tag axles. The products have 101 types, covering four series as heavy & medium truck axles, construction axles, bus axles, off-road axles. Among which, the hub reduction axles and single reduction axles are in the leading position in China domestic market relying on the unique technical advantage, excellent loading capability and transmission torque.

<http://www.hdcq.com/>

## Foreword

This manual is intended to provide assistance in performing repairs correctly on the axles.

This publication assumes that persons who use it possess the requisite technical knowledge in handling driven axles.

Pictures and the corresponding descriptions are typical one-time representations; they do not always correspond to the axle in question, but this does not necessarily mean they are incorrect.

In such cases, plan and carry out the repair work in accordance with the sense of the Instructions.

Welcome to use HanDe products, we'll try the best to serve you well.

Shaanxi HanDe Axle Co., Ltd. keeps the right to change on technical in future for the development.

## How to Order

Email: [gurukirpa2129@gmail.com](mailto:gurukirpa2129@gmail.com)

Email: [sales@bei-feng.com](mailto:sales@bei-feng.com)

***Always use genuine HanDe replacement parts.***

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## Part II Drive carrier of axle

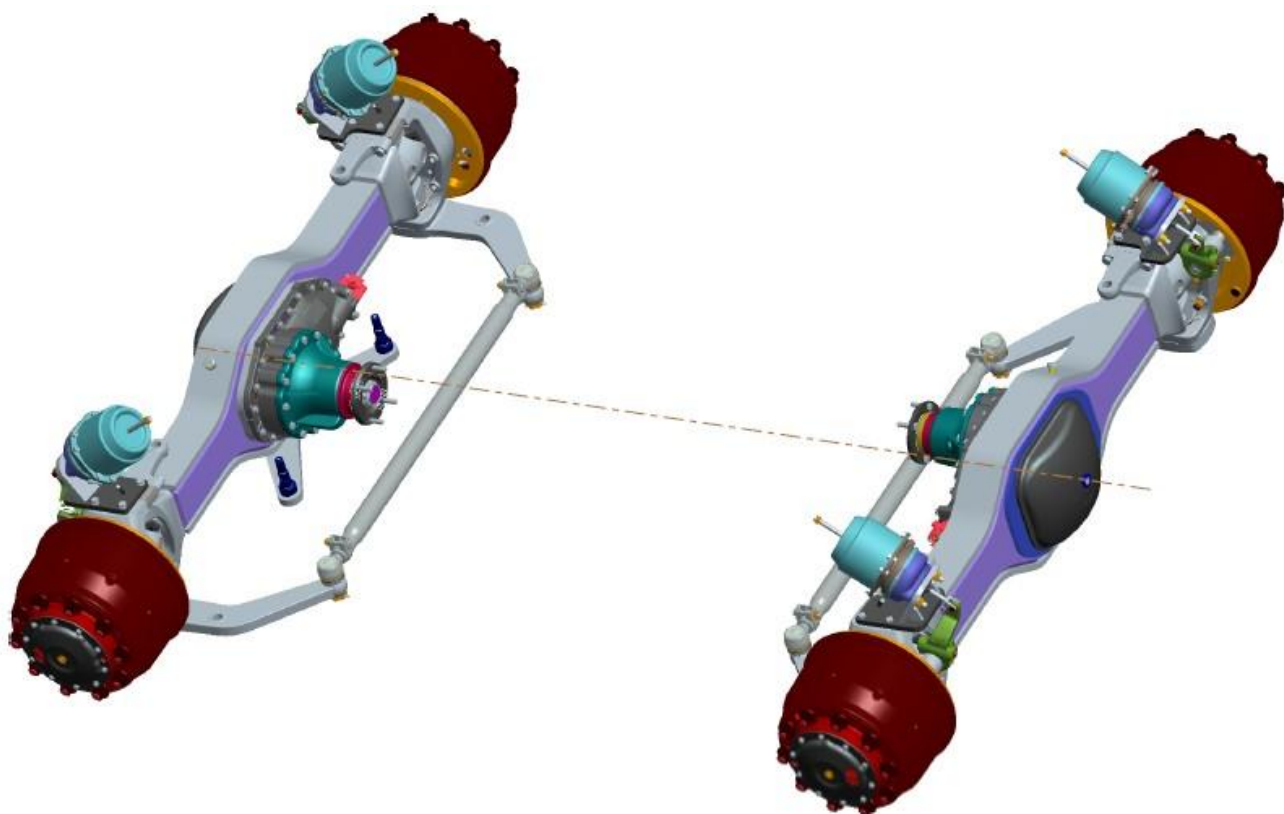
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The following axles are summarized in this manual:

1. **Front steering drive axle with pneumatic cam brake (Axle No.: K06262).**
2. **Rear steering drive axle with pneumatic cam brake (Axle No.: K06263).**

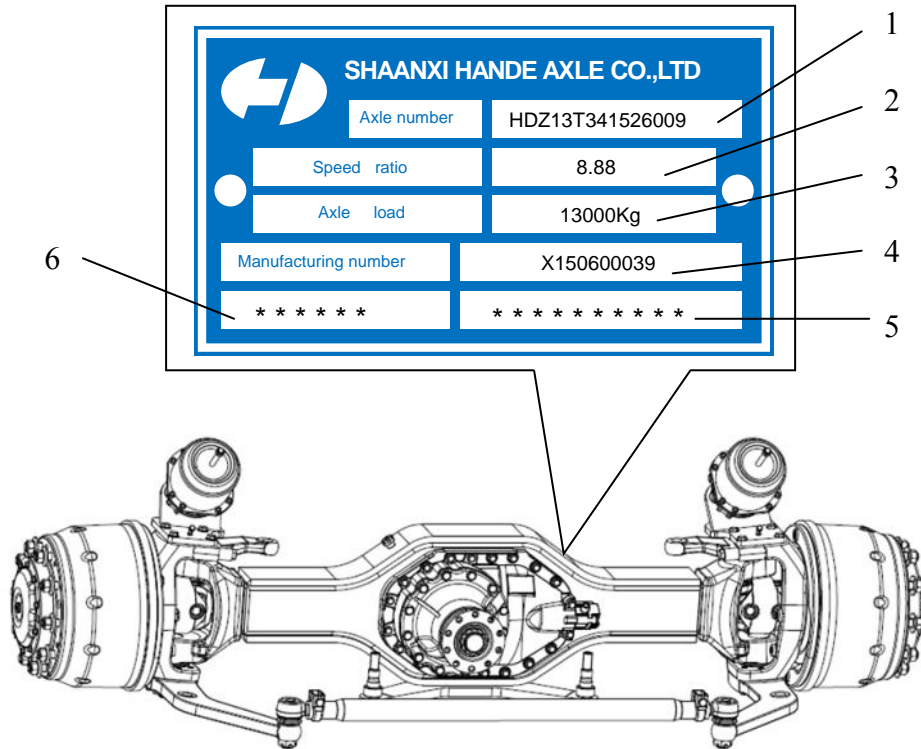
**CAUTION**

The front axle is only assembled in the front of chassis, rear axle is only for rear of chassis as well.


**Axle Parameter**

No.	Item	Parameter
1	Capacity	13,000 kg
2	Kingpin inclination	5°
3	Wheel camber	1°
4	Max. steering angle	27°/19.9°
5	Axle ratio	8.88:1
6	Max. input torque	9,810 Nm
7	Drive carrier ratio	2.25:1
8	Wheel end ratio	3.947:1
9	Brake specification	φ410×180 mm
10	P.C.D/thread type	φ335/10×M22×1.5
11	Wheel bolt length	48 mm
12	Lube volume	drive carrier 13L, 1.2L each hub

Identification



1. **Axle number:** a special number in our system, include all technical information of this axle.

HDZ 13 T 3 41 5 2 6009

- Sequence number (S/N)
- Type of housing, “2” means tailor-welding
- “5” means non-tandem & hub reduction
- “41” means steering drive axle
- Diameter of ring gear, “3” means rang from 300 to 380 mm
- Brake type, “T” means s-cam drum brake
- Capacity, “13” means rated load 13 ton
- Technology platform of HANDE AXLE

2. **Speed ratio:** This is axle speed ( wheel end ratio times with carrier ratio)

3. **Axle load:** This axle`s rated load is 13,000kg

4. **Manufacturing S/N:** for example,X150600039

X 1506 00039

- This is the 39<sup>th</sup> axle assembled in “X” assembly line
- Manufactured year and month
- Code of assembly line

5. **Vehicle manufacture part number for this axle**

6. **Vehicle manufacture name**

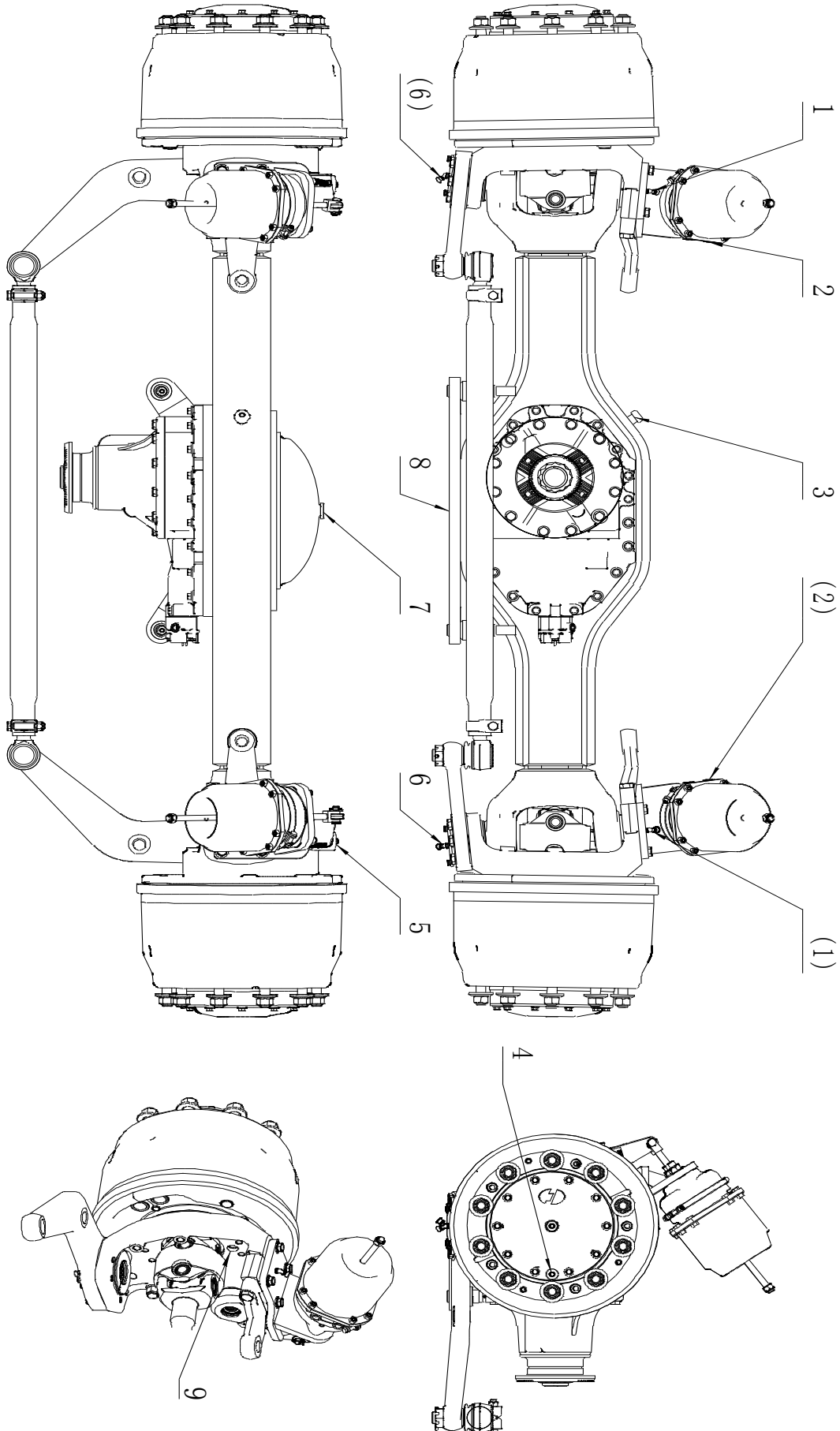


Fig. 1 Key points

Key points		
S/N	Item	Remark
1	Grease nipple	upper king pin bush
2	Brake chamber	interface inner thread M16×1.5
3	Breather	breather of drive carrier
4	Plug	wheel end plug for refuel and drain, M22×1.5, inner hexagon subtense 10 mm
5	Grease nipple	automatic slack adjuster
6	Grease nipple	lower king pin bush
7	Refuel plug	drive carrier, M24×1.5, inner hexagon subtense 14mm
8	Drain plug	drive carrier, M24×1.5, inner hexagon subtense 14mm
9	Breather	wheel end



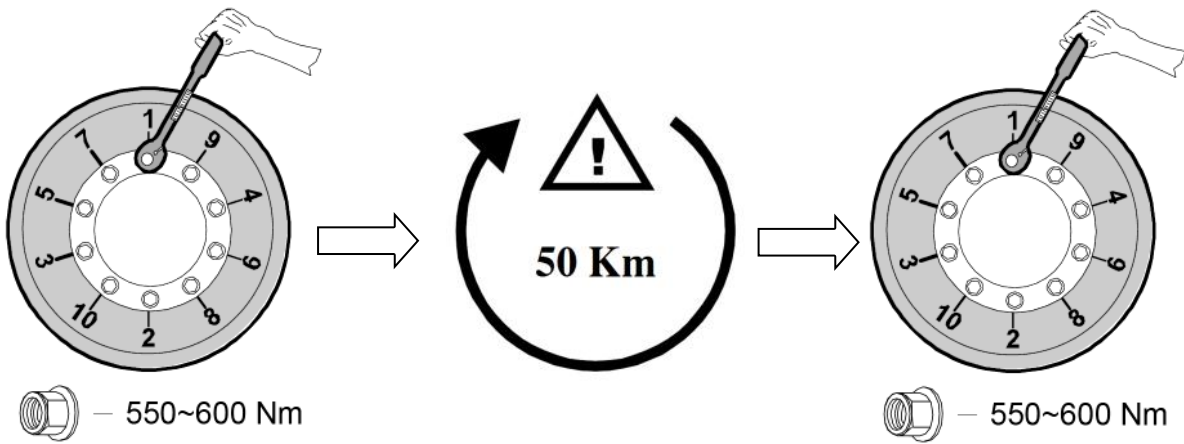
# WARNING

**1. The axle does not fill lube when leave the plant**

Please fill the right volume & reasonable type of lube before use the axle (see the maintenance of axle below).

**2. Tighten the wheel nut**

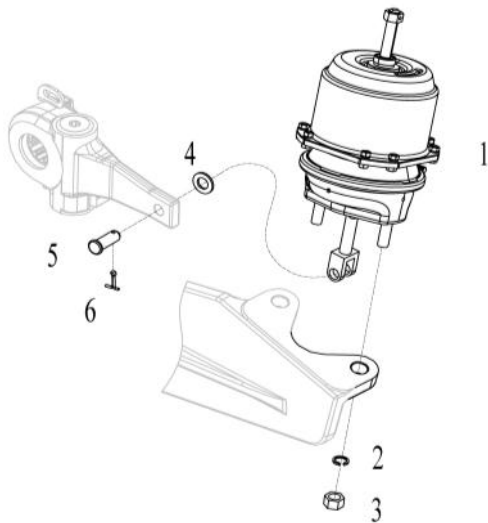
Please tighten the wheel nut with procedure below, and re-tighten again after 50 km.



### 3. Assemble brake chamber with A.S.A

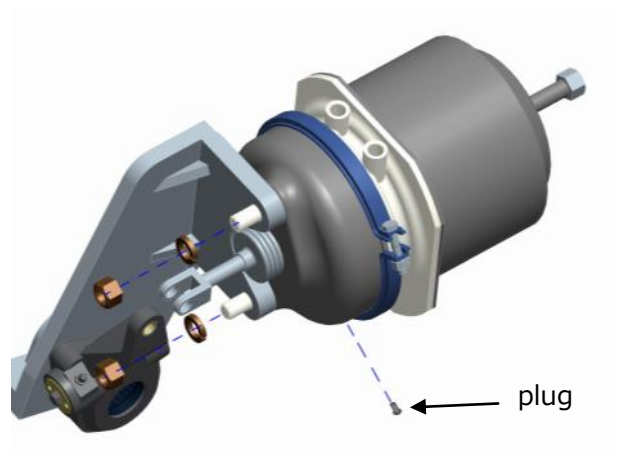
In case to avoid collision of brake chamber when delivering, the brake chamber is not assembled in the axle sometimes. The brake chamber and other parts are delivered with axle. Please assemble the brake chamber in the axle before use.

Please follow procedure below.

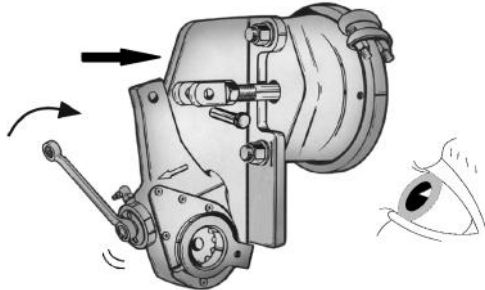


S/N	Remark
1	Brake chamber
2	Spring washer
3	Nut
4	Washer
5	Pin
6	Cotter

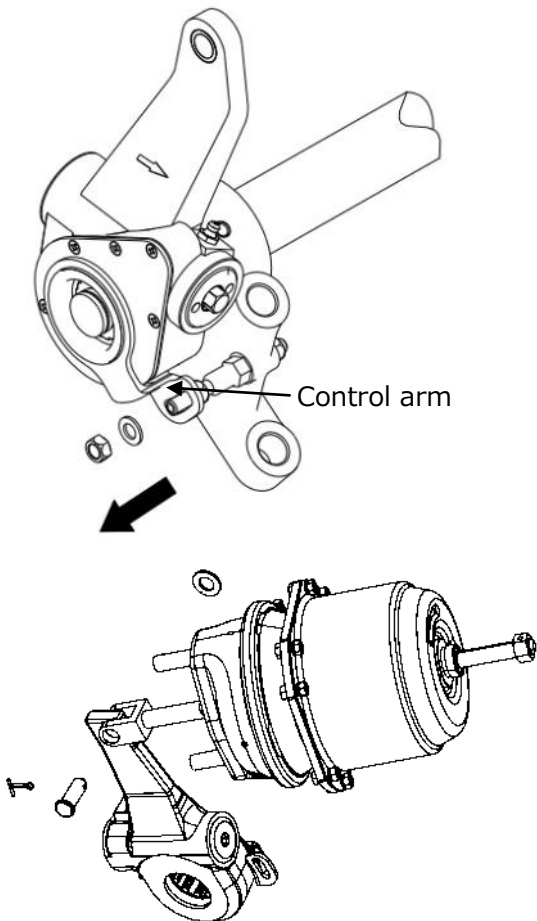
(1) Assemble brake chamber with torque 200Nm, remove the lowest plug of chamber.



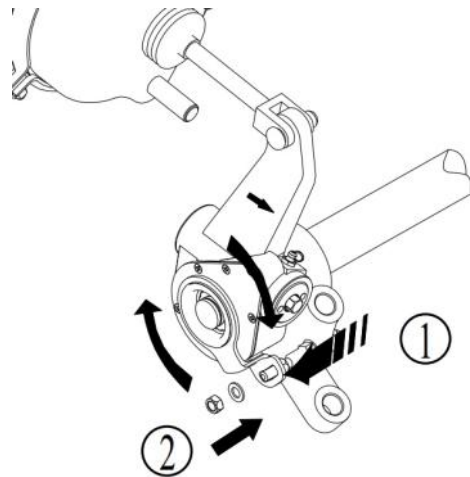
(2) Clockwise rotate adjust nut to make sure the A.S.A assembly hole align with hole of pushrod of chamber.



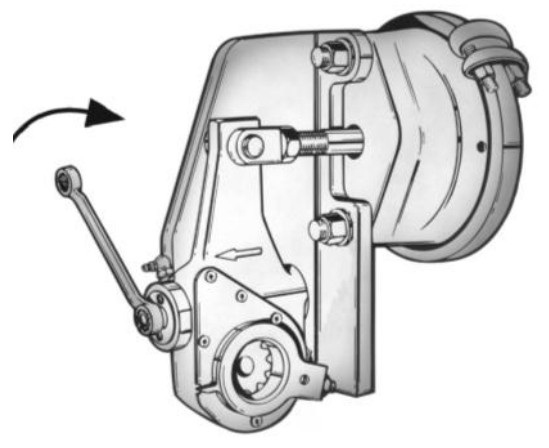
(3) Loosen nut of control arm, then assemble pin, washer, and lock with cotter.



(4) Clockwise rotate control arm into the pre-set position (you will meet an extreme resistance, it is hardly rotate with hand). Then tighten the nut.

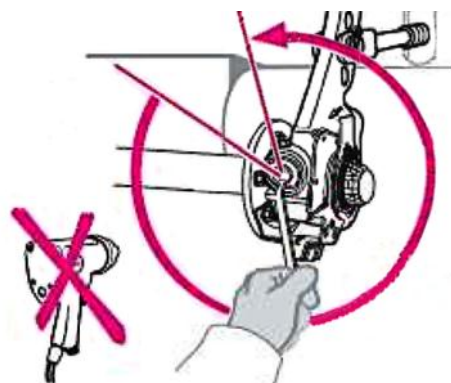


(5) Clockwise rotate adjust nut to make brake lining contact with inner face of brake drum.

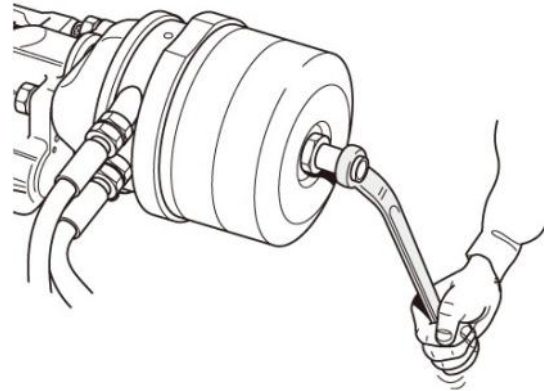


(6) Counter-clockwise rotate adjust nut 270° ~360° to enlarge the clearance between brake lining and brake drum.

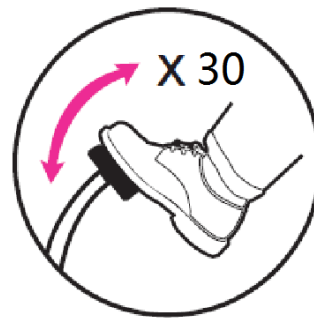
**Note: It is not allowed to use power driven spanner to rotate adjust nut, in case to break automatic adjust function of ASA.**



(7) Clockwise rotate pull rod blot of chamber till nut contact with chamber. Then chamber is at the parking brake status right now.



(8) It is strongly recommend that brake 30 times after assemble axle into the vehicle to running-in the brakes, then brakes work well.



## **⚠ CAUTION**

## Instructions of Axle

### 1. Warning of axle

- (1) It is not allowed to use axle when breakdown
- (2) It is not allowed to self-disassemble axle, you should contact with trained person.
- (3) It is not allowed to self-change the structure of axle.

### 2. Instructions

- (1) It is strongly recommend that apply genuine spare of HANDE AXLE.
- (2) Please inspect and maintain axle timely.

### 3. Note of engaging differential

- (1) To avoid break gears, it is recommend to engage differential at low speed (less than 10km/h).
- (2) It is not allowed turning when engaging differential, it must disengage differential timely when out of trouble road, if not, it will cause axle part break or tyre abnormal wear.

### 4. Note of changing wheel

- (1) Don't scratch thread of wheel bolt. It must not have oil, grease and other dirt on the contact face of brake drum, rim and wheel nut. Paint moderate oil or anti-seize mixture on the thread of wheel bolt and wheel nut when assemble.
- (2) Clean the pilot circular surface of rim and hub reduction case, and paint some grease before assemble wheel.
- (3) Tighten wheel nut diagonally. It must re-tighten wheel nut after 50km when re-install wheel.

## 5. Note of brake lining

- (1) After originally drive 5000km, please inspect thickness of brake lining, it should not less than 8mm, then check again periodically per working condition in case to severe break down due to over-wear.
- (2) The clearance between brake lining and drum ranges from 0.5~1.5mm, the gap between linings should be less than 0.3mm.
- (3) It must apply the same supplier, same model and same batch.

## ⚠ CAUTION

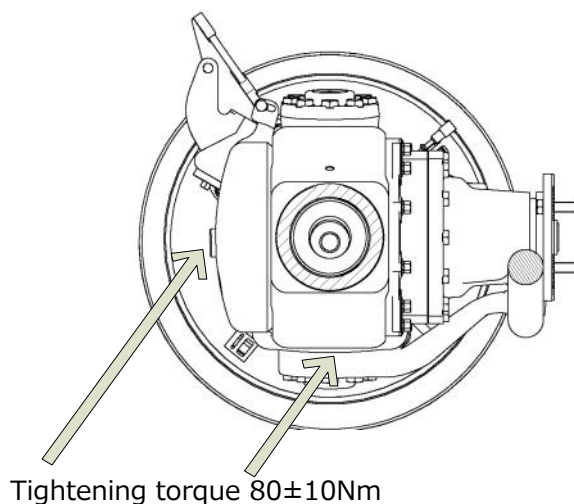
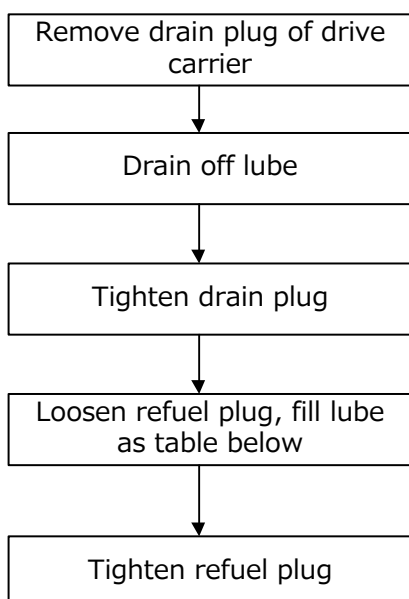
## Maintenance of Axle

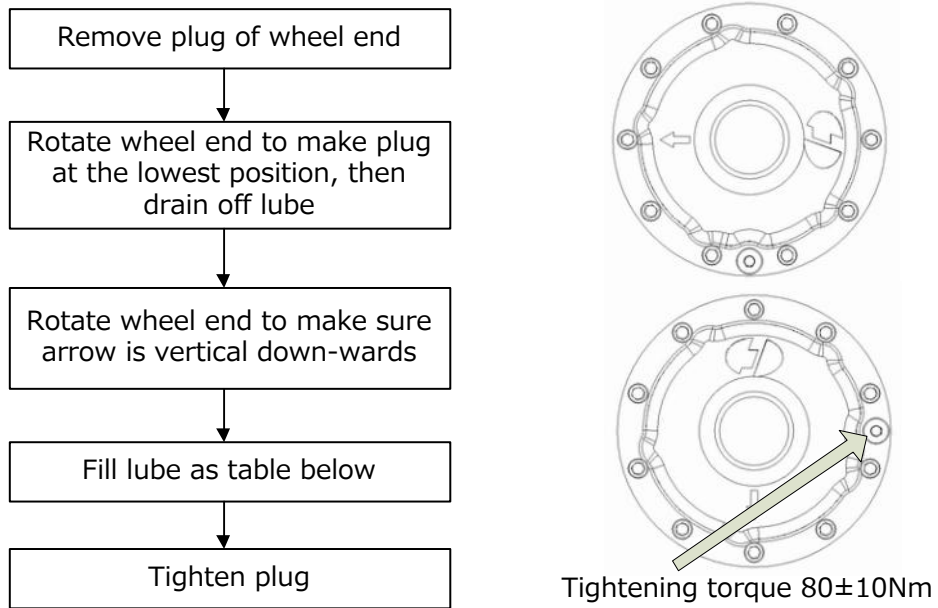
### 1. Daily maintenance

- (1) Inspect wheel nut and refuel / drain plug before start vehicle, please re-tighten timely if loose.
- (2) Inspect lube, please maintain timely if leak.
- (3) Inspect brake performance and returning status, the clearance between brake lining and drum must range form 0.5~1.5mm, please adjust and maintain timely if clearance beyond range or abnormal returning.
- (4) Inspect ASA and brake s-cam works well or not, please refuel grease to make sure rotate smoothly.
- (5) Please refuel grease into grease nipple of ASA, s-cam and brake anchor every 200 hours, if can't refuel smoothly please check and maintain timely.

### 2. Please change original lube at mileage between 4,000~5,000km, follow procedure below.

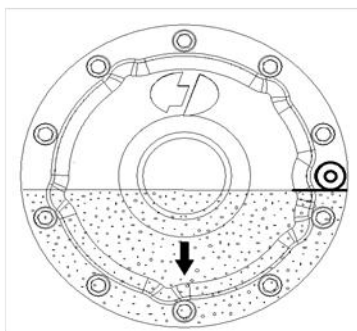
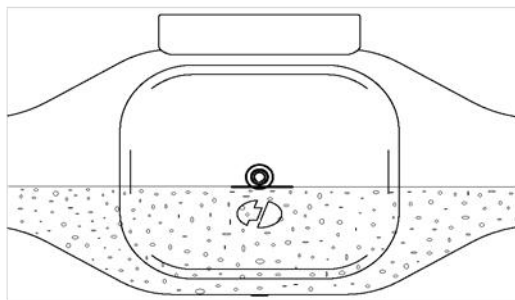
Drive Carrier Fill Lube Procedure



**Wheel End Fill Lube Procedure**


Lubrication part	Lubrication	Lube type	Nominal volume
drive carrier	gear lube	≥-12℃,85W-90	*13L
wheel end		≥-26℃,80W-90	*1.2L each
grease nipple	grease	≥-40℃,75W-90	full
		Lithium grease 2#	

Note: \* actual volume of lube will be subject to spill(as below).



Arrow is vertical down-wards

(1) Change lube of axle.

(2) Fill grease into nipple of ASA, s-cam and brake anchor as table above.

- (3) Inspect bolts of outer parts, please tighten if loose.
- (4) Inspect clearance between brake lining and brake drum ranges from 0.5~1.5mm.
- (5) Inspect breather of drive carrier and wheel end, and make sure it works well.

### **3. Periodical maintenance**

Periodically maintain every 15,000~20,000km (petroleum lube) or 40,000km (synthetic lube)/1 year. Procedures as below,

- (1) Repeat steps as original maintenance.
- (2) Paint grease into brake pin and brake roller.
- (3) Inspect thickness of brake lining, please change brake lining if it not less than 8mm.

Note:

- (1) Inspect lube level every 5,000km or 2 months, please refuel timely.
- (2) It is not allowed to use different lube when maintain.
- (3) Please shut down engine of vehicle and stop at flat road with parking brake, and put wedge block into tow sides of axle to avoid accident.



## Troubleshooting

### 1. Brake overheat

No.	Possible failure cause	Solution
1	Air leakage for chamber or chamber pushrod can't return	Change chamber
2	Small brake clearance	Adjust brake clearance between brake lining and brake drum
3	Brake cam shaft jam or can't return	Fill grease to nipple of cam shaft
4	Brake shoes return spring loose or break	Change return spring
5	Improper installation of ASA	Re-install and adjust
6	Improper adjust the clearance after change brake friction lining and brake drum	Adjust brake clearance
7	Brake frequently	Engine exhaust brake for long downgrade
8	Air circuit failure	Check air circuit

### 2. Lube leakage

No.	Possible failure cause	Solution
1	Air vent/breather block	Unchoke air vent or change breathor
2	Shaft seal and O ring seal ageing and damage	Change seal ring
3	Connection bolt in joint surface loose	Fasten joint bolt

### 3. Axle overheat

According to national standard and axle structure, HanDe defines axle temperature as below:

Temperature for carrier shall not be higher than 120°C and for wheel end shall not be higher than 90°C. Infrared thermometer is available from housing shell 10-15mm to measure. Drive carrier is measured in the input end or rear cover of housing; hub is measured in the wheel end cover.

No.	Possible Failure Reason	Solution
1	Lack of lube	Fill lube
2	Excessively fill of lube	Drain excessive lubrication
3	Improper preload of carrier bearing	Readjust preload as mentioned in the Part II
4	Improperly adjust preload of hub bearing	Readjust preload as mentioned in the Part I

**4. Abnormal noise**

There are so many reasons to cause the axle abnormal noise. Usually the failure cause can be traced after disassemble the axle. The typical situations as below:

No.	Failure Phenomenon	Failure Cause
1	Abnormal noise when vehicle turning	Diff. failure
2	Continuous noise when vehicle running and high noise with speed increasing.	Bearing pitting, gear damage
3	Abnormal noise when vehicle accelerating	Large clearance of backlash
4	Noise when vehicle slowing down and reversing	Back side of gear damage

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**Part I**

**Planetary Wheel End**

**&**

**Wheel End Brakes**

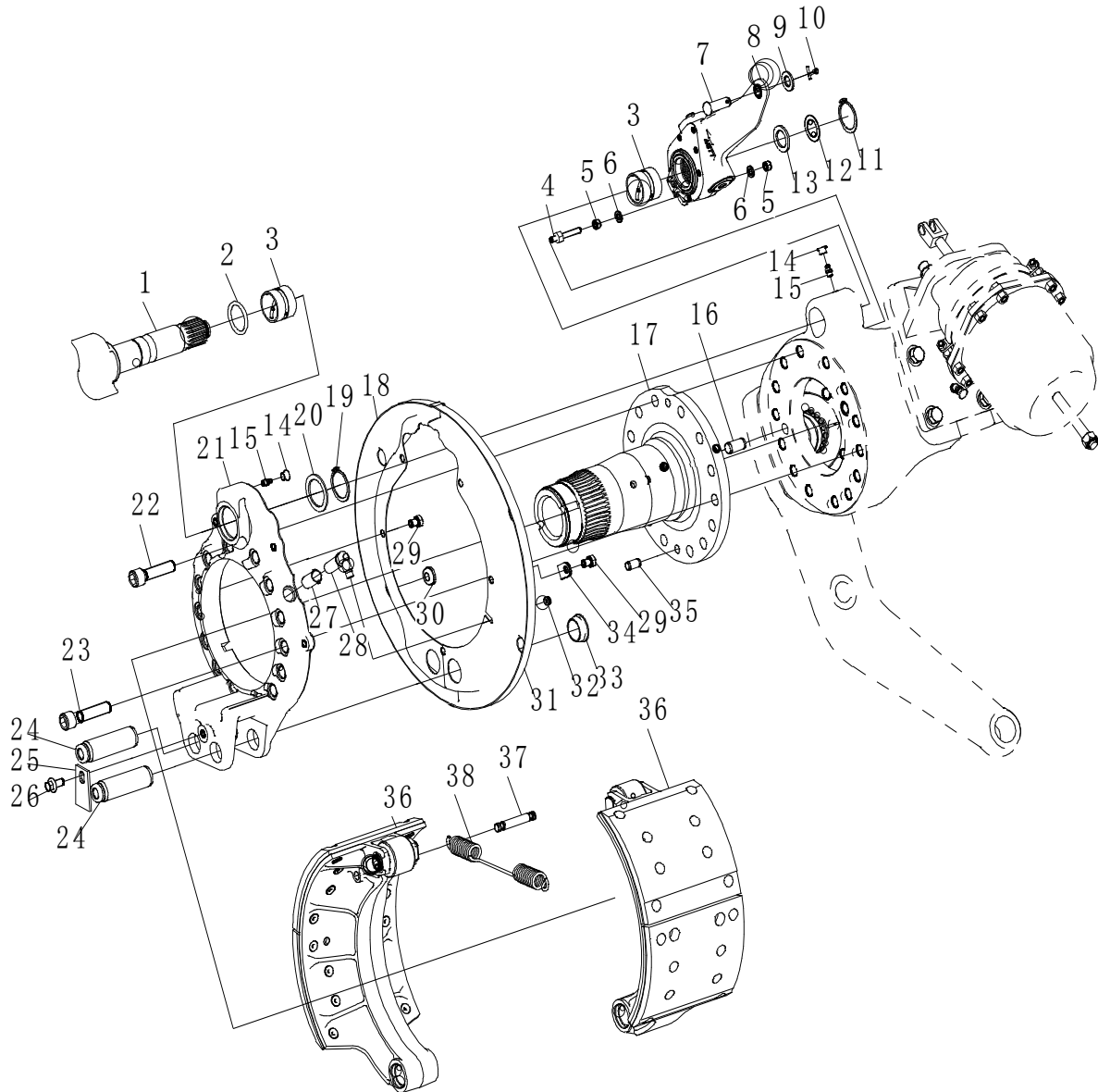


Fig. 1-1 wheel end—brake parts

- |                      |                          |                         |
|----------------------|--------------------------|-------------------------|
| 1 Cam                | 14 Dust shield           | 27 ABS sensor sleeve    |
| 2 O ring             | 15 Grease nipple         | 28 ABS sensor           |
| 3 Bush               | 16 Pin                   | 29 Bolt                 |
| 4 Studs              | 17 Spindle assembly      | 30 Seal stopper         |
| 5 Nut                | 18 Dust shield           | 31 Dust shield          |
| 6 Flat washer        | 19 Circlip               | 32 Button hole          |
| 7 Pin                | 20 Auxiliary washer      | 33 Stopper              |
| 8 ASA                | 21 Brake anchor          | 34 Clip                 |
| 9 Flat washer        | 22 Inside-hexagonal bolt | 35 Pin                  |
| 10 Cotter pin        | 23 Bolt                  | 36 Brake shoe assembly  |
| 11 Circlip           | 24 Pin                   | 37 Returning spring pin |
| 12 Adjustable washer | 25 Snap-gauge            | 38 Returning spring     |
| 13 Washer            | 26 Flange bolt           |                         |

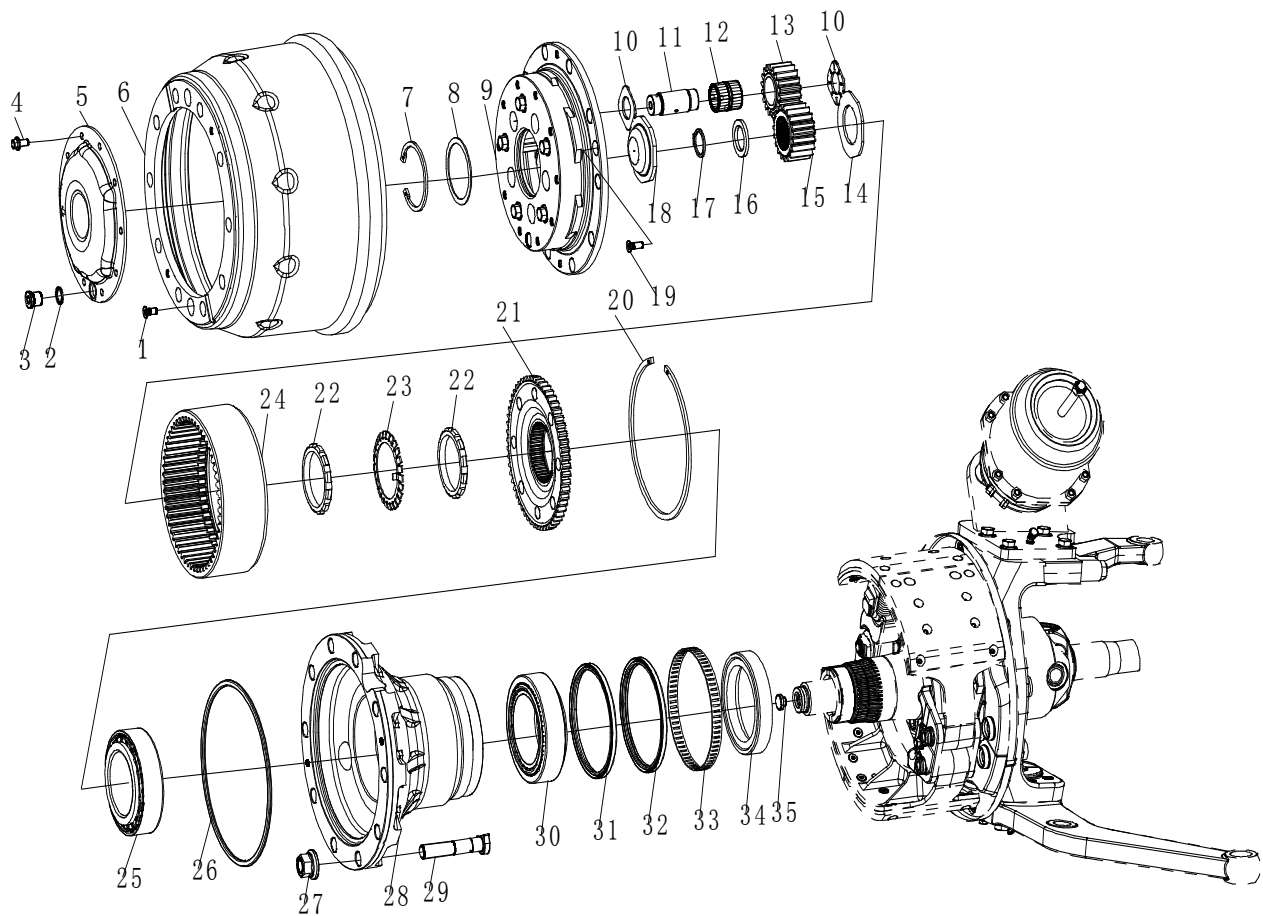


Fig. 1-2 wheel end—drive parts

- |                         |                           |                     |
|-------------------------|---------------------------|---------------------|
| 1 Sunk screw            | 13 Planetary gear         | 25 Tapper bearing   |
| 2 Seal washer           | 14 Thrust washer          | 26 O ring           |
| 3 Refuel plug           | 15 Sun gear               | 27 Wheel nut        |
| 4 Flange bolt           | 16 Washer                 | 28 Hub              |
| 5 End cap               | 17 Circlip                | 29 Wheel bolt       |
| 6 Brake drum            | 18 Thrust disc            | 30 Tapper bearing   |
| 7 Circlip               | 19 Sunk screw             | 31 Seal             |
| 8 Adjustable washer     | 20 Circlip                | 32 Seal             |
| 9 Planetary carrier as- | 21 Inner gear ring        | 33 ABS impulse ring |
| 10 Thrust washer        | 22 Slotted nut            | 34 Spacer ring      |
| 11 Planetary gear pin   | 23 Loose-proof lock plate | 35 End cap pin      |
| 12 Needle               | 24 Ring gear              |                     |

## 1 Disassemble and assemble brake drum

### 1.1 Disassemble brake drum

Take down sunk screw, then pull brake drum out.

Note: Check crack and wear of brake drum.



### 1.2 Assemble brake drum

1) After cleaning contact-face between hub and brake drum, justify the hole site of sunk screw, push brake drum along the wheel end reduction, then tighten the sunk screw.



2) Disassemble seal stopper on dust shield, measure the gap between brake friction lining and brake drum with feeler gauge.

Note: The difference between the maximum clearance and the minimum clearance should be less than 0.3mm.

## 2 Disassemble and assemble end cap

### 2.1 Disassemble end cap

1) Rotate the wheel end to make the drain plug

at the lowest position, then take drain plug down and drain the lube.



2) Disassemble bolt, then take down the end cap.



### 2.2 Assemble end cap

1) Clean the contact face of end cap, the paint sealant [a] the face.

Note: the painting should be uniform and closed.



2) Clean end cap face and thread holes, drop screw lock adhesive [b] into thread holes.

3) Tighten the end cap with flange bolt.

Note: tighten torque:  $80 \pm 10$  Nm.



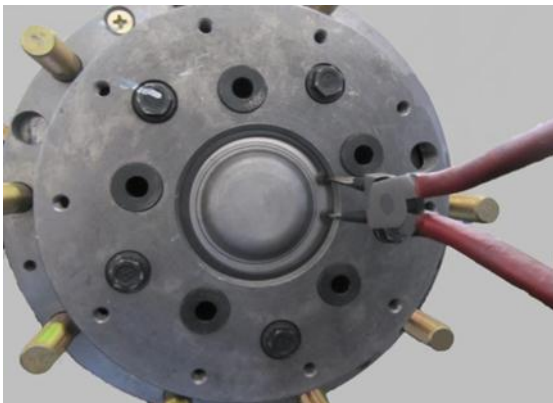
4) Put drain plug and seal washer into drain hole, tighten torque  $80 \pm 10$  Nm.



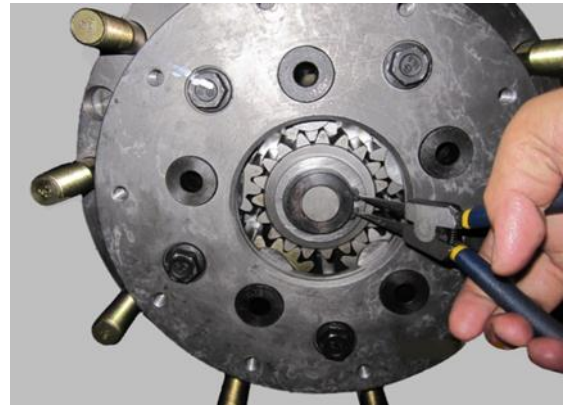
### 3 Disassemble and assemble sun gear

#### 3.1 Disassemble sun gear

1) Take down circlip, take out adjust washer and thrust disc.

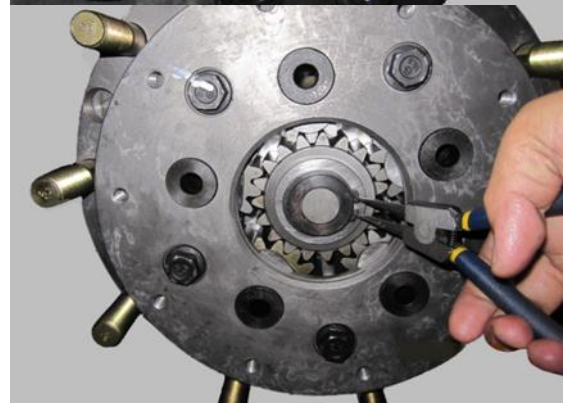
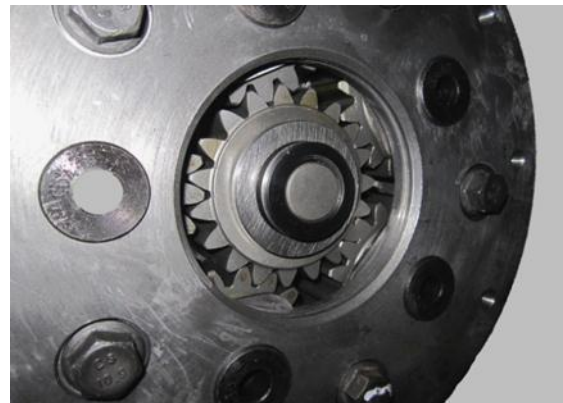


2) Take down circlip, take out washer, sun gear and end cap pin.

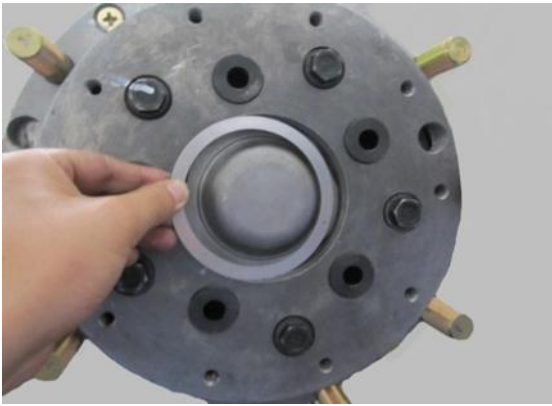


#### 3.2 Assemble sun gear

1) Put in sun gear, washer & end cap pin, then assemble circlip.

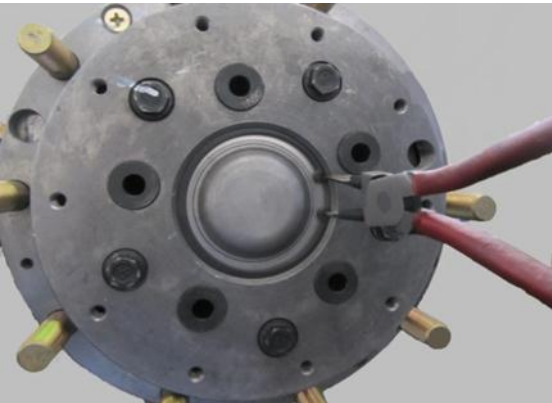


2) Assemble thrust disc, then put in suitable adjust washer.



3) Assemble circlip

Note: Change adjust washer to make sure clearance is 0.3 to 0.5 mm between end cap pin and thrust disc.



#### 4 Disassemble and assemble hub reduction assembly

##### 4.1 Disassemble hub reduction assembly

1) Take down sunk screw, push out hub reduction with bolt(M10).



2) Draw a line in the hub reduction inner face and planetary carrier to make them align.



3) Untighten bolt of planetary carrier.



4) Disassemble planetary carrier assembly.



5) Disassemble planetary gear pin, planetary gear and needle bearing.



## 4.2 Assemble hub reduction assembly

1) Put planetary pin into holes, then pass thrust washer through planetary pin.

Note: the lube groove side of planetary pin is at the up direction.



2) Assemble planetary gear, push needle bearing between planetary gear and pin with tool [1].



3) Assemble washer on the planetary gear and sun gear.

Note: lube groove side of washers contact with gears, washers should align with rotating-proof pilot.



4) Apply tool [2] to align planetary carrier with planetary gear pin, then push planetary carrier into position.

Note: Planetary carrier should be at the suitable position that aligned with the draw line when disassembled it.



5) Tighten bolt

Note: Painting 3~4 drops of screw lock adhesive [c] into bolt thread, tighten torque  $240 \pm 20$  Nm, the planetary gear should rotate flexibly.

6) Paint sealant around O ring uniformly and closed after assemble the O ring.



7) Apply sunk screw to tighten hub reduction.



## 5 Disassemble and assemble inner gear ring and hub assembly

### 5.1 Disassemble inner gear ring and hub assembly

1) Apply screw driver to force loosen lock plate open.



2) Apply tool [3] to disassemble outer slotted nut, take down loosen lock plate ,then Disas-

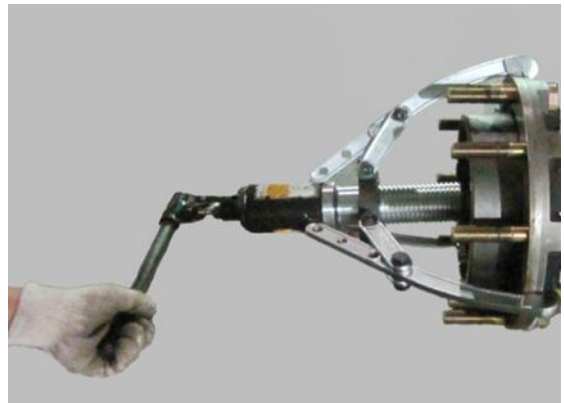
semble inner slotted nut with tool [3].



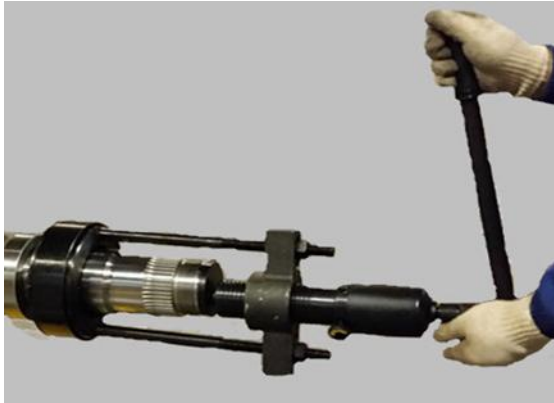
3) Disassemble gear ring bracket assembly.



4) Apply puller [4] & [5] to disassemble hub.



5) Apply puller [5]&[6] to disassemble inner taper bearing cone.



6) Take down circlip ,then Disassemble inner gear ring.



### 5.2 Assemble inner gear ring and hub assembly

1) Paint lube in the bearing area of spindle, heat cone reach to 70~80 °C, then assemble cone to position, if not, apply tool [7].



2) Assemble hub assembly to spindle, apply tool [7] to assemble outer bearing cone into position.

Note: Assemble the hub slowly and carefully to

avoid the seal scratch.



3) Put gear ring bracket into inner gear ring, then assemble circlip.



4) Tighten inner slotted nut with tool [3], tightening torque  $550 \pm 50$  Nm, re-tighten it after rotate the hub 2~3 circles.



5) Loosen outer slotted nut  $60^\circ \sim 90^\circ$ .

6) Put in loose lock plate, apply tool [3] to tighten outer slotted nut with torque  $550 \pm 50$  Nm.



7) Measure hub start force range 70~90N with spring scale, if beyond the range, loosen outer slotted nut, loosen and tighten the inner slotted nut to make sure hub start force match the range.



2) Disassemble hub outer bearing cup with tool [5] & [8].

3) Disassemble hub inner bearing cup with tool [5] & [9].



8) Lock tooth of plate into groove of slotted nuts.



4) Disassemble wheel bolt.



## 6.2 Assemble hub

1) Assemble hub inner and outer bearing cup with tool [10] and [11] respectively.

## 6 Disassemble and assemble hub

### 6.1 Disassemble hub

1) Apply screw to disassemble hub seal and ABS impulse ring.

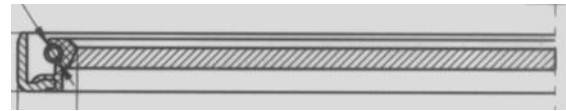
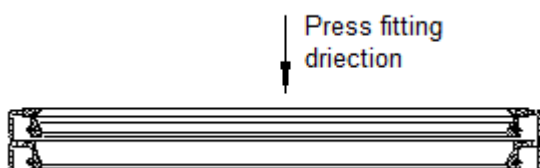


2) Push seal into hub with tool [12], and paint grease [e] in the lip of seal.

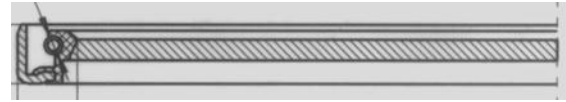


Note:

- ① Must change a new seal.
- ② Push into the seal with single lip firstly, then the seal with double lips.
- ③ Single lip seal differentiate the left use and right use which depends on the drive direction. Left use—oil return line: right-hand rotation. Right use—oil return line: left-hand rotation.
- ④ Double lips seal locates outside of single lip seal.



Oil return line: right-hand rotation



Oil return line: left-hand rotation

3) Press impulse ring with tool [20].



4) Press wheel bolt into hub.

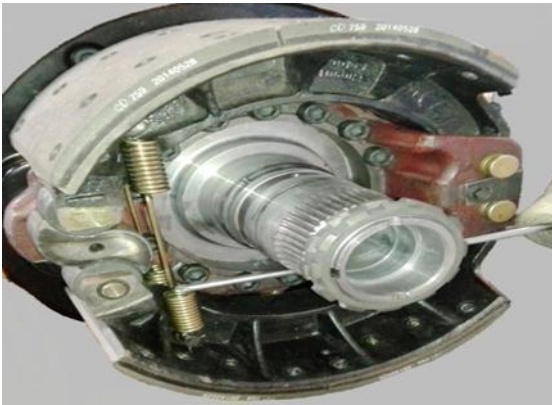


## 7 Disassemble and assemble brake shoe

### 7.1 Disassemble brake shoe

1) Disassemble return spring

Note: Please glove to avoid clamping hand, take down dust shield to check if necessary.



2) Take down bolt from brake shoe, then pull snap-gauge out.

Note:

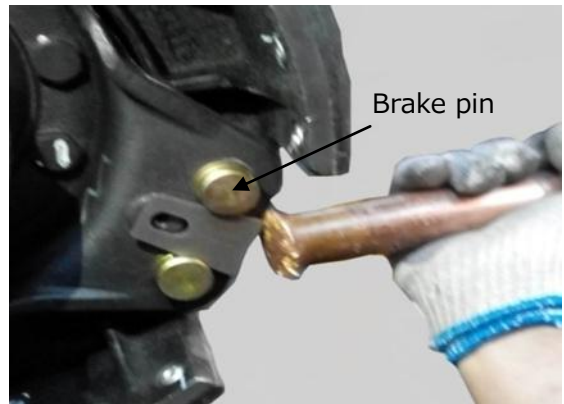
①lining without crack, riveting firm, no oil stain in the surface of lining, brake shoe assemble with pair.

②lining should the same batch, material & supplier.

2) Press snap-gauge between groove of brake pins.

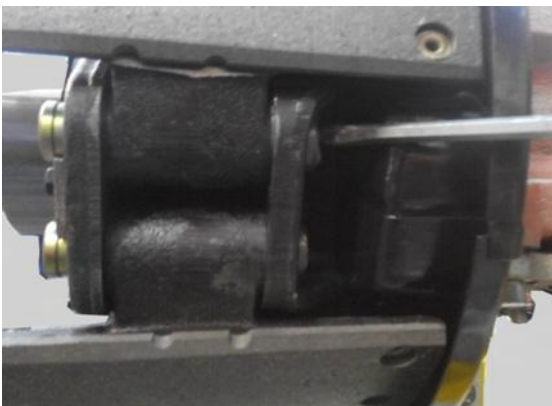


3) Push out brake pin form holes brake shoe and brake anchor, then take down brake shoe.



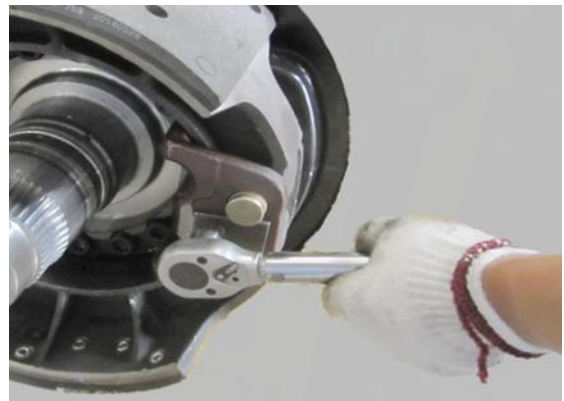
3) Tighten flange bolt with painting moderate screw lock adhesive [c].

Note: tightening torque:  $85 \pm 5$  Nm.



## 7.2 Assemble brake shoe

1) Paint some sliver base anti-seize mixture [d] into bush hole of brake shoe, fit brake pin with groove outside.



4) Painting moderate sliver base anti-seize mixture [d] in the contact surface of brake cam, then assemble return spring in position.



Note: return spring must assemble in position, brake cam should rotate flexibly.

## 8 Disassemble and assemble brake chamber and brake slack adjuster

### 8.1 Disassemble brake chamber and brake slack adjuster

1) Loosen bolt of chamber, take down cotter, then pin and chamber.



2) Counter clockwise rotate hexagon bolt of

ASA, till U-folk apart from ASA arm.



3) Apply plier to take down circlip, then washers.

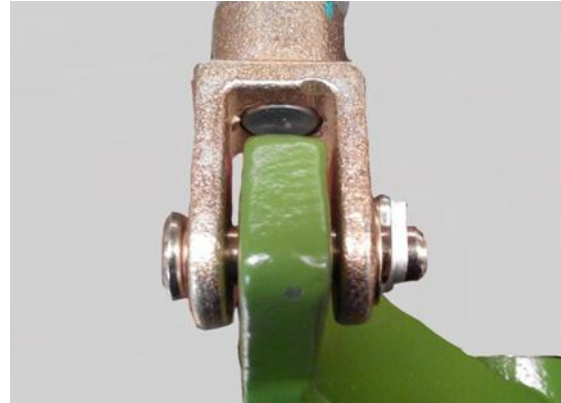


4) Disassemble bolt of control arm of ASA, then ASA.



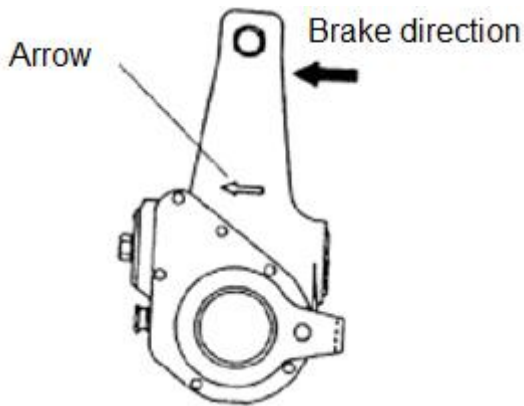
### 8.2 Assemble brake chamber and slack adjuster

1) Paint moderate grease [e] at spline of brake cam, then assemble ASA, washer, suitable adjust washer and circlip.



Note:

- ① Axial gap of ASA 0.5-2mm.
- ② The arrow of housing and brake direction should be coincident.

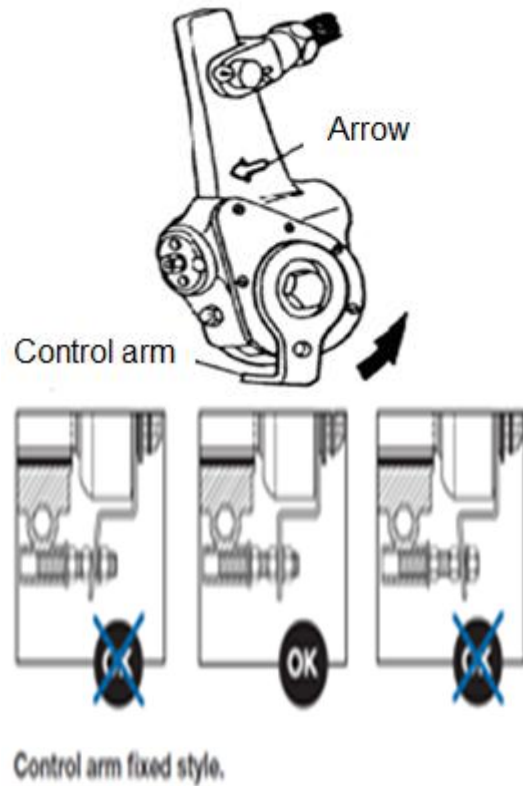


- 2) Clockwise rotate hexagon of ASA, until U-fork hole align with hole of ASA arm, pass pin through hole of pin, then assemble cotter.



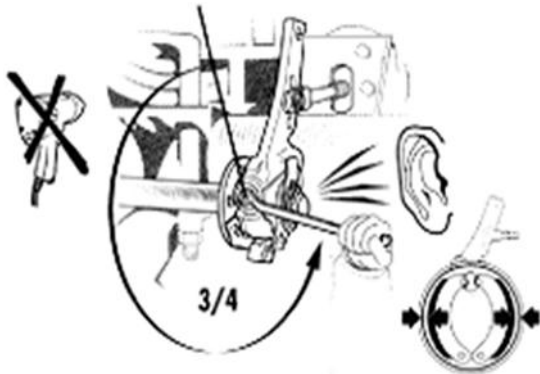
- 3) Rotate ASA arm along with brake direction (same as arrow mark of ASA arm) till cannot rotate again. Axial move ASA left and right, make sure both sides of ASA have clearance with cam. Tighten control arm on the bracket with bolt.

Note: Control arm should tight without additional force.



- 4) Clockwise rotate hexagon of ASA till brake lining contact with brake drum inner surface, then counter clockwise rotate hexagon 3/4

circle to gain a moderate clearance between brake lining and brake drum inner surface.



Note: Do not use power-driven spanner to rotate hexagon of ASA. Please follow steps 1~4 when changing brake lining, brake drum and ASA.

5) Assemble brake chamber, spring washer, tighten nut with torque  $200 \pm 20 \text{Nm}$ .



## 9 Disassemble and assemble brake anchor and ABS sensor

### 9.1 Disassemble brake anchor and ABS sensor

1) Take down bolt of brake anchor, then pull brake cam out.



2) Apply plier to disassemble circlip, then take down additional washer, pull brake out from brake anchor, then O ring seal.



3) Disassemble ABS wire.



4) Loosen bolt of dust shield.



5) Apply tool [14] to disassemble brake anchor bush.



Note:

① Do not use hammer or solid part to hammer ABS sensor.

② ABS sensor do not come out from face of brake anchor, press ABS sensor to make it contact with impulse ring after assembled hub.

3) Tighten bolt of dust shield, tie the ABS wire.

Tightening torque  $40 \pm 5 \text{Nm}$ .



## 9.2 Assemble brake anchor and ABS sensor

1) Apply tool [15] to push bush into hole of brake anchor.



2) Assemble ABS sensor sleeve and ABS sensor.



4) Assemble O ring seal into brake cam after paint moderate grease on bush, then additional washer, circlip.



5) Tighten bolt of brake anchor after paint moderate screw lock adhesive [b] on the thread of bolt.



Note: Diagonally tighten with torque of  $300 \pm 30$  Nm.

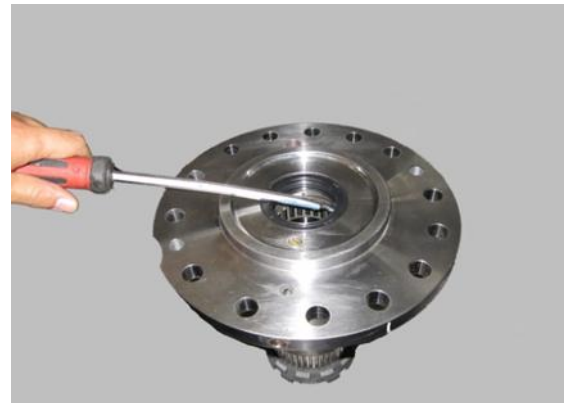
## 10 Disassemble and assemble spindle assembly

### 10.1 Disassemble spindle assembly

1) Take down spindle.



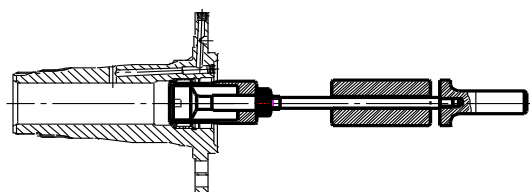
2) Take down O ring seal.



3) Take down spring elastic ring.



4) Disassemble needle bearing with tool [16].



## 10.2 Assemble spindle assembly

1) Push needle bearing with tool [17].



2) Assemble circlip.



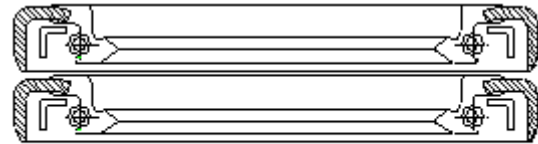
3) Apply tool [18] & [19] to push seal into spindle (paint a round of sealant [a] in the seal area).



Note:

- ① seal should not scratch
- ② Paint moderate grease [e] into the lip of seal.

fitting direction  
↓



4) Stack steering knuckle upon spindle, make the holes coincident.



**11 Disassemble and assemble steering lever**

**11.1 Disassemble steering lever**

1) Take down cotter



2) Loosen slotted nut, take down steering lever.



### 11.2 Assemble steering lever

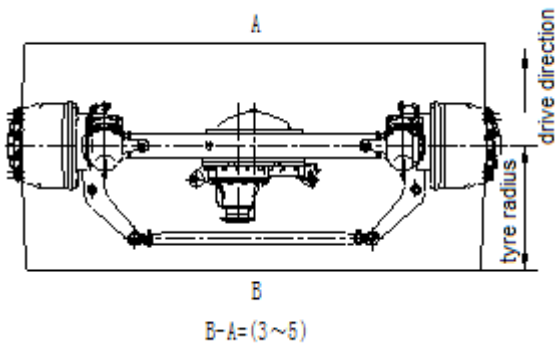
1) Assemble steering lever, then tighten slotted nut.

Note: tightening torque  $300 \pm 30$  Nm.

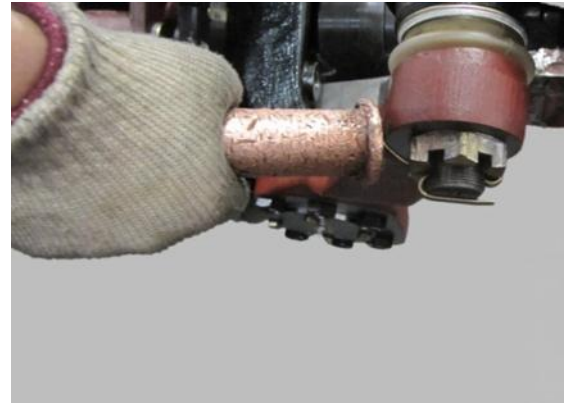


2) Adjust toe-in through rotate lever.

Note:  $B-A=3 \sim 5$ mm, A means front of drive direction, B means rear of drive direction.



3) Assemble cotter.



4) Tighten hoop bolt with tightening torque  $165 \pm 15$  Nm.



## 12 Disassemble and assemble steering knuckle

### 12.1 Disassemble steering knuckle

1) Loosen bolts of brake chamber, take down chamber bracket, adjust washer.



2) Disassemble upper cap bolt of steering lever.



3) Disassemble bolts of steering lever arm, then steering lever, thrust roller bearing.



4) Disassemble steering arm and bolt of upper cap, then steering upper cap, steering knuckle assembly.



## 12.2 Assemble steering knuckle

1) Assemble shaft sleeve

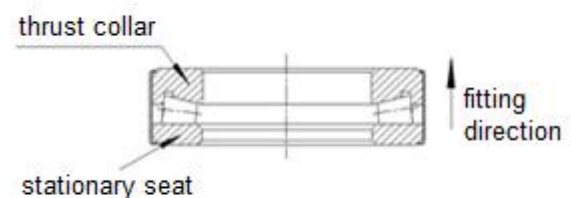


2) Steering knuckle assembly pass through universal joint , then stack with shaft fork, tighten the bolts of steering knuckle arm and upper cap.

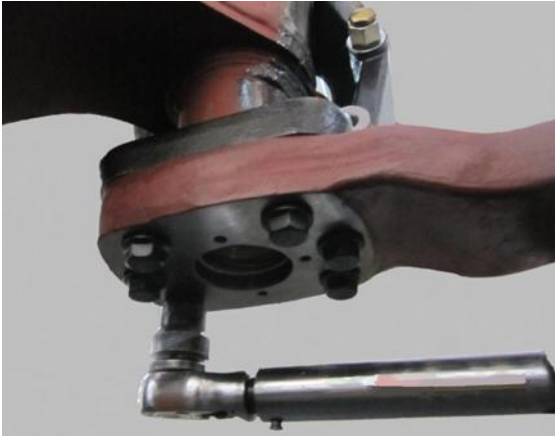


Note: paint moderate screw lock adhesive [b] into thread, tightening torque  $430 \pm 30$  Nm.

3) Pass thrust bearing through lower king pin.



4) Align steering lever arm with holes, then tighten bolts.



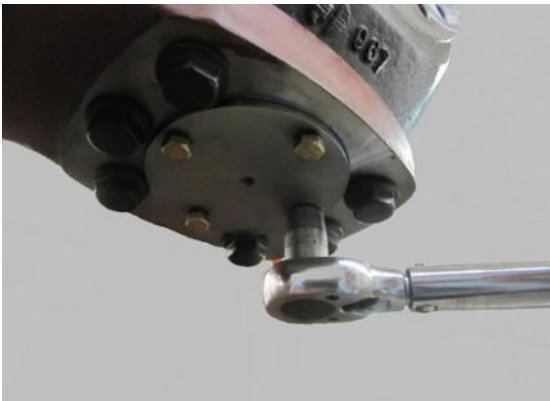
Note: Paint some screw lock adhesive [b] in the thread of bolt, tighten diagonally with torque of  $300 \pm 30$  Nm.

5) Clean the contact face of upper cap, paint a circle of sealant [a].



Note: painting uniformly and closed.

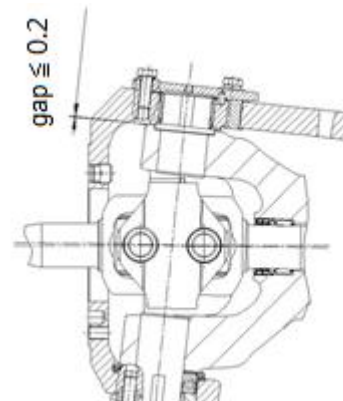
6) Apply bolt and spring washer to tighten the upper cap into steering lever arm.



7) Assemble suitable adjust washer above shaft sleeve.



8) Apply bolt and spring washer to pre-tighten brake chamber bracket, adjust gap between lower face of shaft sleeve and upper face of shaft fork less than 0.2 mm through increase and decrease adjust washer, make sure steering knuckle rotate flexibly, no catching.



Note: tightening torque  $250 \pm 20$  Nm.

9) Tighten bolts of brake chamber bracket diagonally with torque of  $140 \pm 15$  Nm.



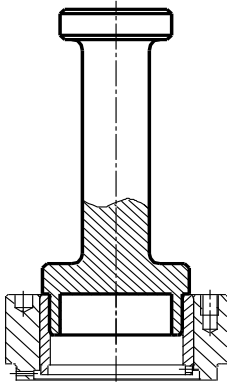
### 13 Disassemble and assemble steering knuckle and steering lever arm

#### 13.1 Disassemble steering knuckle and steering lever arm

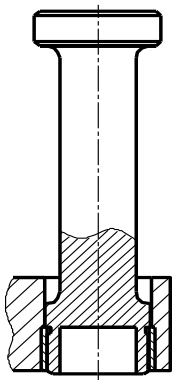
1) Take down protection plate with seal ring.



2) Apply tool [20] to disassemble steering lever and bush.



3) Apply tool [21] to disassemble cam bush of steering knuckle.



#### 13.2 Assemble steering knuckle and steering lever arm.

1) Press the protection plate with seal ring.



2) Press the bush in steering tie rod arm.



3) Press the bush in shaft sleeve with tool [23].



4) Press the bush in knuckle with tool [24].



## 14 Disassemble universal shaft

### 14.1 Disassemble universal shaft

1) Remove universal shaft.



2) Remove the oil seal.



3) Remove criclip

4) Remove the needle bearing from housing with tool [16].



### 14.2 Install universal shaft

1) Press the needle bearing in to housing with tool I [16].

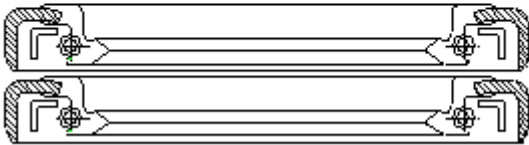
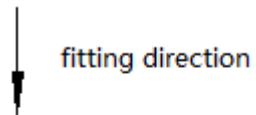


2) Install criclip in to groove.

3) Press the seal into housing with tool [17]& [18] after paint sealant [a] into the hole.



Note: paint grease in the seal lip.



4) Install universal shaft, do not damage the oil seal.



### Accessories List

No.	Model	Remark
[a]	Tianshan 1598F	Plane sealant
[b]	Tianshan 1243	Thread locking adhesive
[c]	Tianshan 1262	Thread locking adhesive

### Special Tools List

No.	Drawing	Tool No.	Remark
[1]		BZ-783-150125	Push tool for needle bearing
[2]		BZ-783-150081	Push tool for needle planetary carrier
[3]		BZ-783-150069	Sleeve for hub adjust nut
[4]		BM-783-150230	Hub puller
[5]		XZ-783-160654	Puller labor-saving device
[6]		BZ-783-150370	Puller for hub inner bearing
[7]		BZ-783-150137	Push for inner ring of hub bearing

No.	Drawing	Tool No.	Remark
[8]		BZ-783-150357	Puller for hub inner bearing
[9]		BZ-783-150356	Puller for hub outer bearing
[10]		BZ-783-150142	Puller for hub outer bearing
[11]		BZ-783-150136	Puller for hub outer bearing
[12]		BZ-783-150083	Push tool for Hub seal
[13]		BZ-783-150056	Push tool for Hub ABS ring
[14]		BS-783-150301	Remove tool for bush of brake anchor
[15]		BS-783-150300	Push tool for brake anchor

No.	Drawing	Tool No.	Remark
[17]		BZ-783-150133	Push tool for needle of housing
[18]		BZ-783-150134	Push tool for seal of housing
[19]		BZ-783-150135	Push tool for seal of housing
[20]		BZ-783-150369	Remove tool for axle sleeve bush
[21]		BZ-783-150371	Remove tool for cam shaft bush
[22]		BM-783-150202	Push tool for bush of steering tie rod arm
[23]		BM-783-150193	Push tool for shaft sleeve bush
[24]		BZ-783-150147	Push tool for cam shaft bush

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# Part II

## Drive Carrier of Axle

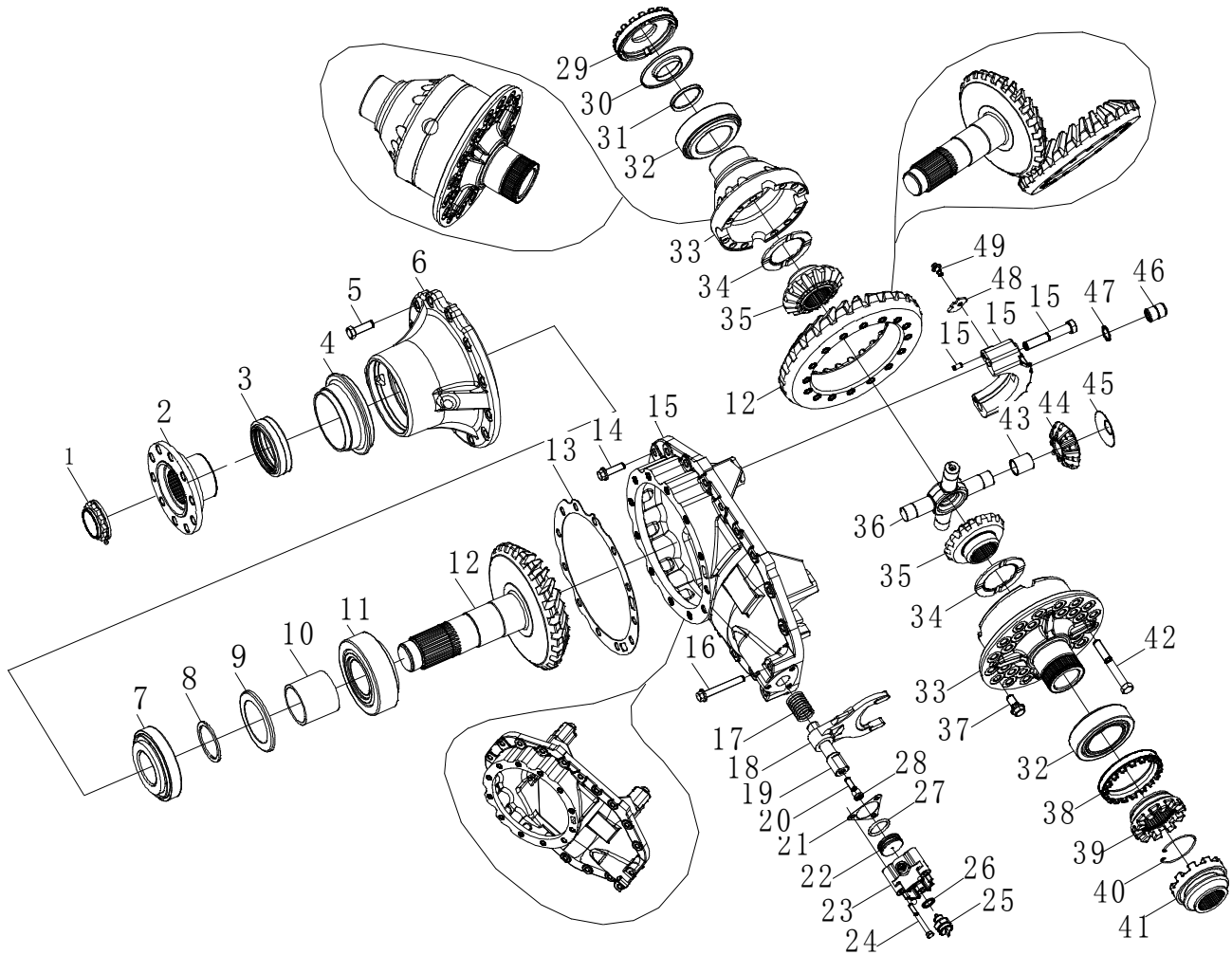


Fig.2 Drive Carrier

- |                           |                               |                           |
|---------------------------|-------------------------------|---------------------------|
| 1 Flange nut              | 18 Criclip                    | 35 Bush of planetary gear |
| 2 Flange                  | 19 Pin                        | 36 Baffle                 |
| 3 Hex bolt                | 20 Lock plate                 | 37 Adjusting nut          |
| 4 Dust cover              | 21 Hex bolt                   | 38 Switch assembly        |
| 5 Oil seal                | 22 Sliding joggle sleeve      | 39 Gasket                 |
| 6 Oil seal seat           | 23 Criclip                    | 40 Bolt                   |
| 7 Hex bolt                | 24 Fixed joggle sleeve        | 41 Cylinder               |
| 8 Bearing seat            | 25 Differential adjusting nut | 42 Piston                 |
| 9 Conical roller bearing  | 26 Tapered roller bearing     | 43 O ring seal            |
| 10 Adjusting washer       | 27 Hex bolt                   | 44 Bolt                   |
| 11 Oil baffle             | 28 Hex bolt                   | 45 Gasket                 |
| 12 Spacer                 | 29 Differential case- left    | 46 Screw                  |
| 13 Conical roller bearing | 30 Differential case- right   | 47 Operation bar          |
| 14 Pinion gear            | 31 Planetary gear washer      | 48 Shifting fork          |
| 15 Adjusting washer       | 32 Spider                     | 49 Spring                 |
| 16 Ring gear              | 33 Bush                       | 50 Hex bolt               |
| 17 Carrier case           | 34 Side gear                  |                           |

## 1 Disassemble and assemble carrier assembly

### 1.1 Disassemble carrier assembly

1) Disassemble bolts that connect carrier and axle housing.

Note: Before disassemble carrier assembly, be sure that lube drained off, and pull the two sides of axle shaft out, then disassemble DCDL switch.

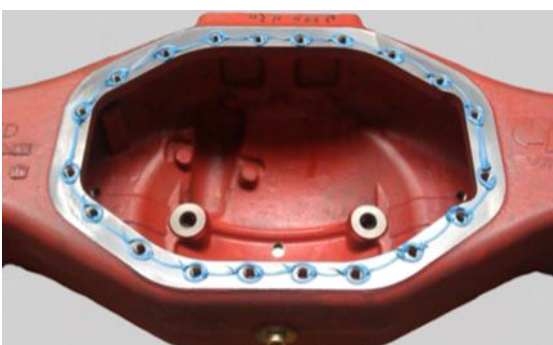


2) Hang out carrier assembly, and place it smoothly;



### 1.2 Assemble carrier assembly

1) Paint a circle of sealant on the contact surface of housing.



Note: sealant should be uniform and closed.

2) Put carrier assembly into housing (align with holes ), then tighten bolts with torque of  $250 \pm 25 \text{Nm}$ .



Note:

- ① Paint thread locking adhesive on the thread of bolts.
- ② Diagonally tighten the bolts.

## 2 Disassemble and assemble inter-wheel differential lock

### 2.1 Disassemble inter-wheel differential lock

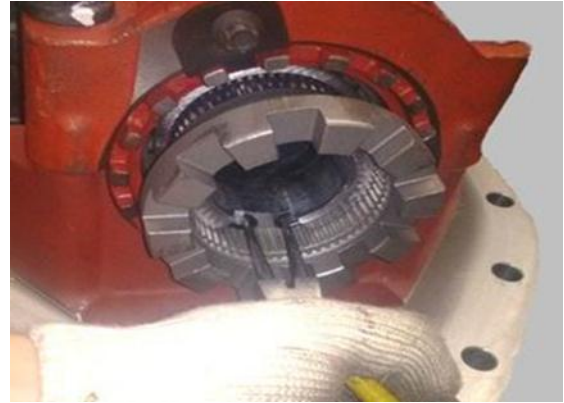
1) Remove the process bolt(M18×1.5), disengage sliding sleeve.



2) Loosen hex nut, remove cylinder.



3) Take out operation bar, shifting fork, springs.



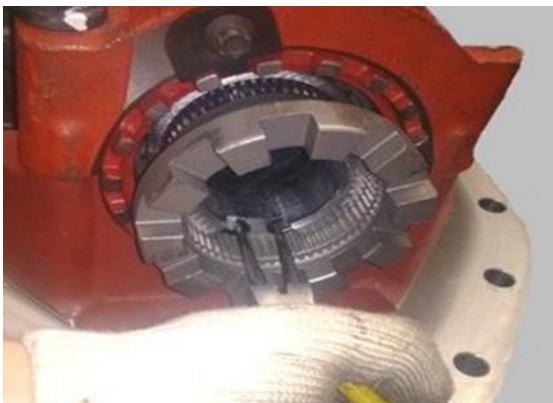
2) Assemble operation bar, nut and screw together.



4) Remove criclip and fixed joggle sleeve.



3) Fix the operation bar in to carrier, and Install shifting fork and sliding sleeve in position.



## 2.2 Assemble inter-wheel differential lock

1) Install the fixed joggle sleeve and lock with criclip.



4) Install o ring and piston in to cylinder, and grease it.



5) Install the gasket and cylinder.



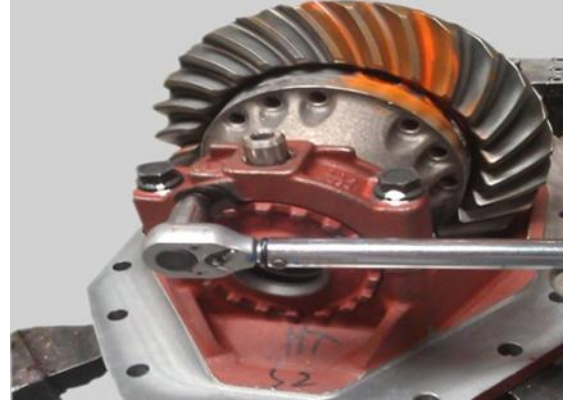
6) Screwing in the process bolt to make solid tooth sleeve joggle with slide tooth sleeve, and clearances between fork faces and groove faces of slide tooth sleeve should be  $0.5 \pm 0.2$  mm. Please rotate screw to make if clearance is out of range.



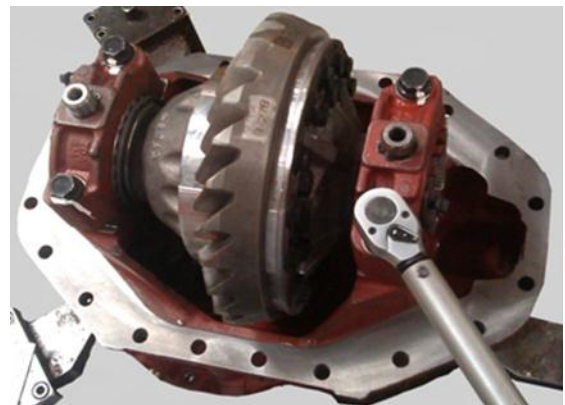
### 3 Disassemble and assemble diff assembly

#### 3.1 Disassemble diff assembly

1) Remove hex. bolts and take off stop plate;



2) Remove the connection bolts of bearing cap with wrench and take bearing caps out.

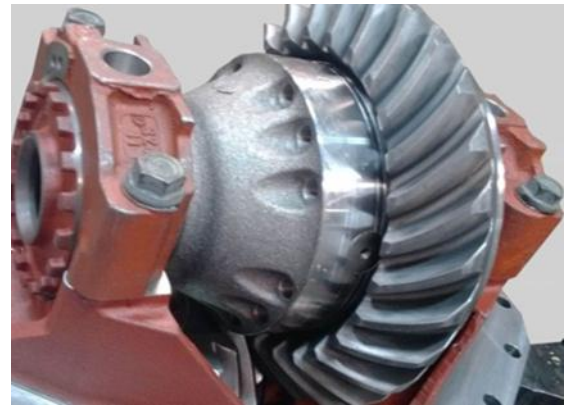
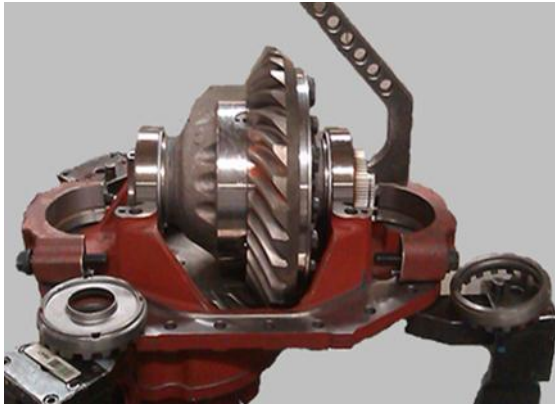


Note: Make a matching mark on bearing caps in both sides to prevent installation mixing.

3) Remove the adjusting nut (if need, remove the oil baffle) .



4) Place diff assembly smoothly after hang it out and remove the cup of tapered roller bear-



### 3.2 Assemble diff assembly

- 1) Press the baffle in to adjusting nut.



- 2) Hoist diff assembly with the outer ring on the diff. case.



Note: Apply a circle of lubricating oil on the installation position of the tapered roller bearing cup.

- 3) Mount adjusting nut and bearing cap in turn, paint thread locking adhesive [c] on the thread of bolts, then screw them into bearing hole.

Note: assemble bearing cap and case in pair.

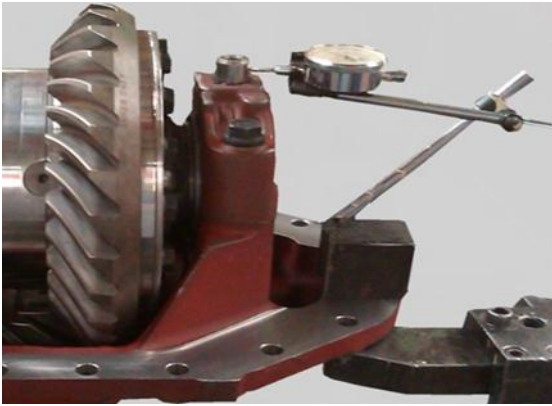
### 3.3 Diff. bearing preload adjustment

- 1) Tighten the bolt at crown gear side. Tightening torque of bearing cap bolt should be  $290 \pm 20$  Nm.



- 2) Attach a dial indicator to the crown gear side, make pointer rest against the hollow pin at the backside of the crown wheel and preload the pointer.

- 3) Tighten the adjusting nut that is opposite the crown wheel with tool [1], till 0.05 amount of end play was shown on the dial indicator. Then Rotate crown gear 2~3 circles and loosen adjuster by turning anti-clockwise until indicator shows no sign of moving.



- 4) Set dial indicator "0", then tighten the adjusting nut with tool [1] until 0.05mm reading achieved.
- 5) Tighten bearing cap bolts at the opposite side with torque of  $290 \pm 20$  Nm.



### 3.4 Backlash adjustment

- 1) Attach a dial indicator to carrier case, make sure pointer vertically at the convexity of ring gear, hold the pinion, rotate ring gear, measure the clearance at three points of ring gear.



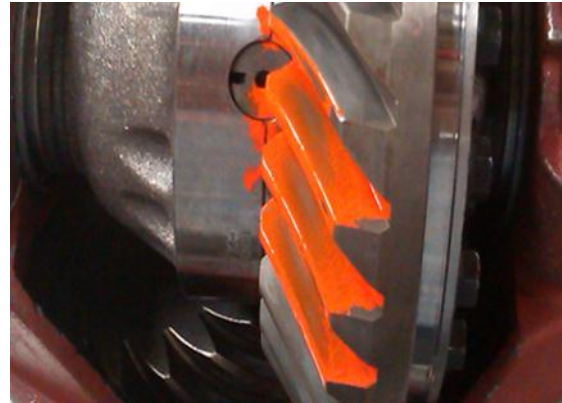
- 2) Clearance should be  $0.2 \sim 0.4$ , the difference

should be less than 0.15. Adjust clearance through tightening or loosening differential adjusting nuts with tool [1] if it is not qualified.

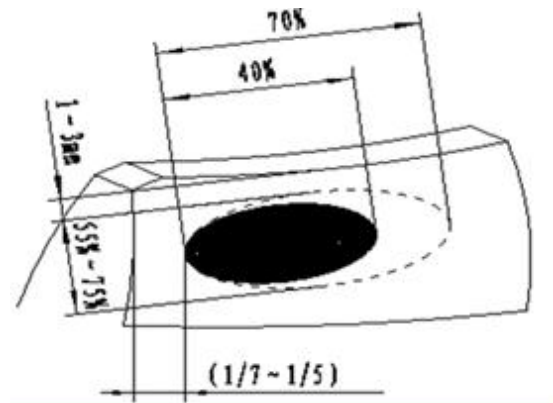
Note: The two adjusting nuts must have same angle of the tightening and loosening.

### 3.5 Contact pattern adjustment

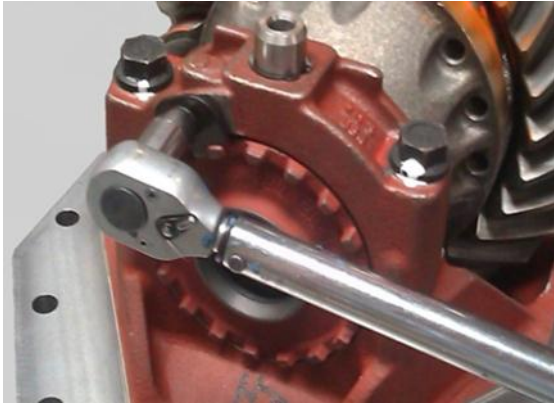
- 1) Evenly apply red lead powder on the continuous 3~5 surface of ring gear, then rotate ring gear back and forth, check the contact pattern.



Note: contact pattern position shall be a little more in small end of the tooth, take up 40%~70% of tooth length and take up 55%~75% of tooth height. The tooth contact pattern cannot cross the tooth top, bottom and small end. Adjust through changing adjusting washers and tightening or loosening differential adjusting nuts if it is not qualified.



2) Tighten stop plate with hex bolts and lock adjusting nut.



Note: Tightening torque should be  $45 \pm 5$  Nm.

#### 4 Disassemble and assemble bearing seat assembly

##### 4.1 Disassemble bearing seat assembly

1) Remove the connecting bolts between bearing seat and carrier.



2) Hang out pinion gear with bearing seat assembly and place it steadily. Remove adjusting washer and seal.



Note: Clean up junction surface of diff. case, bearing seat, adjusting washer, check if the seal has damaged for subsequent assembling.

##### 4.2 Install bearing seat assembly

1) Place the shim packs on carrier case, paint with less sealant [a] on the oil passage to avoid block in oil passage, and put in locating pin.



2) Apply plane sealant [a] on the edge of the bearing seat.



Note: Paint with less sealant on the oil passage to avoid block in oil passage;

3) Align pinion gear assembly to the position of hole and steadily hang it to carrier case. Apply thread locking adhesive [c] in the carrier case. Diagonally fasten hex bolt with torque of  $200 \pm 10$  Nm.



## 5 Disassemble and assemble diff sub-assembly

### 5.1 Disassemble diff sub-assembly

1) Remove bearing inner ring of the diff assembly by tool [2] and tool [3].



2) Remove connection bolts of the diff case.



3) Remove the crown gear, side gear, spider and washers.

Note : Clean all of parts, and check whether tooth surface fracture or wear.



### 5.2 Assemble diff sub-assembly

1) Put side gear washer and side gear into the diff case.



Note: Apply a round of lubricating oil [f] in diff case, side gear and side gear washer fitting surface before assemble.

2) Install planet gear, planet gear washer and spider into the diff case.



Note: Apply a round of lubricating oil [f] on planet gear and planet gear washer after assemble.

3) Mount the other side gear and side gear washer.



Note: side gear shall be rotate flexibly.

4) Align the two matching marks of the half diff case and mount the other diff case in place. Apply thread locking adhesive [c] on the bolt thread, then diagonally fasten the two diff cases bolts with torque of  $210 \pm 20 \text{Nm}$ .



5) Assemble ring gear, paint thread locking adhesive [c], diagonally fasten the two diff cases bolts with torque of  $270 \pm 10 \text{Nm}$ .



6) Apply a circle of lubricating oil [f] on the bearing installation position; then press the two bearing inner rings in position with tool [4].



## 6 Disassemble and assemble pinion assembly

### 6.1 Disassemble pinion assembly

1) Unlock flange nut with screw driver.



2) Remove the flange nut with tool [5] (socket S55), then take down flange.



3) Remove the pinion gear with bearing.



4) Take out adjusting washer and spacer. Check if the conical roller bearing was damaged.



5) Remove the bearing cone with suitable tool [6] & tool [2].



6) Remove the outside bearing cup in the bearing seat with tool [7] & tool [2].



7) Remove the other outside bearing cup in the bearing seat with tool [8] & tool [2].



## 6.2 Assemble pinion assembly

1) Apply a circle of lubricating oil [f] in the bearing installation holes of bearing seat, then press the bearing cup in place with tool [10] and tool [9].



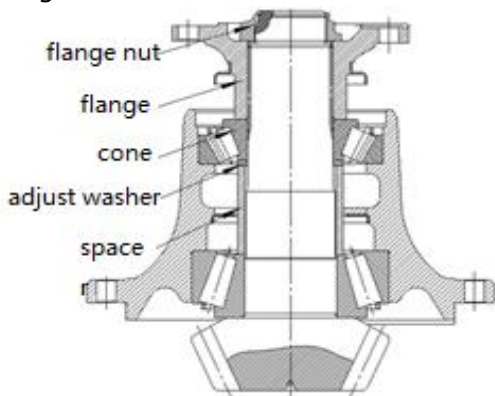
2) Press the other bearing cup in position with tool [11] and tool [10].



3) Apply a circle of lubricating oil [f] on the bearing installation area of pinion gear, then press the bearing cone in position with tool [12].



4) Put pinion gear into the bearing installation hole of bearing seat, then take the suitable adjusting washer, bush, press them onto the bearing inner race.



5) Fasten flange nut with tool [5] (socket S50) after installing flange assembly

Note: tightening torque  $1050 \pm 50 \text{ Nm}$ .

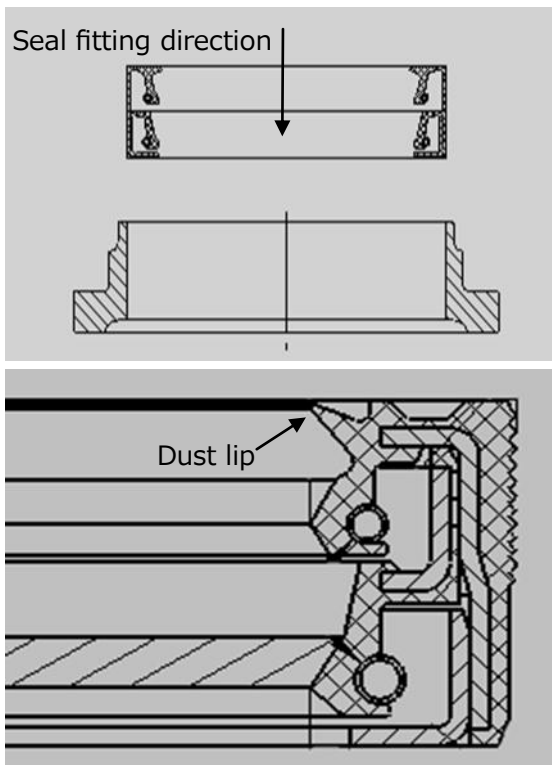


6) Use a torque scale to measure the bearing rolling torque. The range of the torque should be among  $1 \sim 2 \text{ Nm}$ . If not satisfied, adjust by changing the washer's thickness after dismantling flange nut, flange, pinion gear.



7) Press oil seal into cover by tool [13], and coat lubricating oil [f] on seal lip.





8) If preload force is qualified, remove the flange nut and flange assembly, then apply a circle of sealant [a] in the spigot of the bearing seat which matches with the seal seat, finally press the seal into the bearing seat in place with tool [13].

Note: paint some grease in the lip of seal in case to scratch the lip.


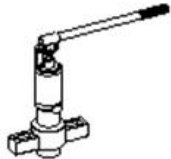
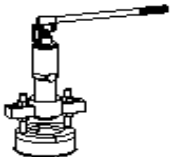






9) Re-mount flange assembly and tighten flange nut, then lock the flange nut with screw driver.

### Accessories List

No.	Model	Remark
[a]	Tianshan 1598F	Plane sealant
[b]	Tianshan 1243	Thread locking adhesive
[c]	Tianshan 1262	Thread locking adhesive

### Special Tools List

No.	Drawing	Tool No.	Remark
[1]		XM-783-160118	Sleeve for diff adjusting nut
[2]		XZ-783-160654	Puller labor-saving device
[3]		XM-783-210002	Puller for cone of diff. bearing
[4]		XM-783-210010	Push tool for cone of diff. bearing
[5]		XM-783-160106	Socket
[6]		XM-783-210001	Puller for cone of pinion bearing
[7]		XM-783-210004	Puller for cone of pinion bearing

No.	Drawing	Tool No.	Remark
[8]		XM-783-210005	Puller for cup of pinion bearing
[9]		XZ-783-210012	Press tool for cup of pinion bearing
[10]		XZ-783-210017	Handle
[11]		XM-783-210007	Press tool for cup of pinion bearing
[12]		XM-783-210009	Socket
[13]		XM-783-160306	Press tool for oil seal



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