

Service Manual

3T WHEEL LOADER DRIVING AXLE

Applicable Scope: LG938、 LG936、 LG933

Series Wheel Loader Driving Axle

**SHANDONG LINGONG CONSTRUCTION
MACHINERY CO., LTD**

Driving Axle Service Manual

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Service Manual

Concise Guide

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PREFRACE

This service manual, which shows the structure, principle and the maintenance technology of the driving axle, will help the maintenance workers understand the disassemble and assemble method of driving axle more deeply and bring the maintenance workers solid technology basis of locating faults and maintaining correctly.

Main content of the Service Manual:

1. Structure and working principle of the driving axle

This chapter shows the structures and functions of each kind of part, which establish the basis of assembling and disassembling driving axle. Furthermore, it also could be used as the reference of locating faults.

2. Disassembling of the driving axle

The steps how to disassembling the parts correctly and the points for attention in disassembling driving axle are shown in this chapter.

3. Assembling of the driving axle

The steps how to assembling the parts correctly and the points for attention in assembling driving axle are shown in this chapter.

4. Standard of criterion of the driving axle for repairing and replacement of parts

The identification methods and standards of criterion of vulnerable parts are formulated in this chapter.

Especially declaration:

This service manual narrates the LG938 Driving Axle as an example. Other series Driving Axle are similar with it except some small differences in connection types and structures. They will not be narrated again here and could be executed as the method described in this manual.



ATTENTION

Forgiving without further notice about the specification's changing of the parts in this manual, which are caused by the complete appliance development. The latest information could be get from Shandong Lingong Construction Machinery CD., LTD.

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CHAPTER I EXORDIUM

1.1 Safety Considerations



Important Safety Considerations

It's very important to operate the loader safely in the process of maintenance and repairing. The related technologies about how to assemble and disassemble the driving axle correctly are described in this manual.

The safety considerations, marked with  as the security label, should be pay more attention when operate it for avoiding hurting workers. When coming across this kind of marker, workers should operate carefully. Workers should keep themselves safe first and take some necessary measures when the potential dangers coming.



Security Attentions

In the process of assembling and disassembling, unsafe factors and parts wear, life losing, properties failure would be caused by the incorrect operation method. Please read the contents carefully when the transmission's parts would be assembled or disassembled.

1. The parameters, graphs and contents in this manual are suitable to the standard configuration products. Please consult our company and search data about the information of deformed products.
2. In repair shop, the region for assembling or disassembling and placing disassembled parts should be marked obviously. Mark sure the tools and parts are placed in the right region. The clean of operation region must be kept and make sure no oil or pollution in the operation region. Fire extinguishing equipments are necessary and smoking is forbidden in the region except the smoking room.
3. When welding operation is needed, it should be done by expert workers who were trained by professional welding training. Welding gloves, baffles, goggles, hats and other work clothes suitable for welding are essential during welding operation.
4. Before the driving axle assembly been disassembled, the appearance of which must been cleared up to avoid the parts been polluted in the disassembling progress.
5. Work clothes not coincide with requirements are forbidden. In the progress of

operation, safety shoes and safety helmets must be worn and the buttons must be attached. Goggles should be worn when workers knock the parts with copper rod.

6. The disassembled parts could be cleaned by petrol, gasoline and water-base oil cleaner.

7. Check the spreaders whether were broken before operate the cranes and other hoisting equipments. The quantity of the spreader must be big enough. For avoiding collisions between parts, spreaders should be operated slowly and located in the correct region. Make sure no one work under the part lifted.

8. When two or more workers will work together, the operation procedure abided by all of who should be made before work for avoiding the accident caused by out of steps.

9. All tools should be been familiar with and kept carefully.

10. When align two holes, the workers make sure their hands and figures are not in the holes. Pay attention to whether the hands would be extruded when assemble parts with hands directly.

11. The disassembled parts must be checked. The parts which have poor properties should be changed, and the standard of criterion could be found in chapter 5--Standard of criterion for repairing and replacing the parts of the driving axle.

12. There should be no interference after assembling each part.

13. Protection measures must be operated, when the oil seal and seal ring across key seats, screw holes and steps, to protect the oil seal and seal ring.

14. To protect screw fasteners, all the tools must be suitable to the screw fasteners when assemble the parts.

15. The gas trigger is forbidden when tighten the screws. Tighten them with hands first, and then tighten them with some specification wrest wrenches to reach the torque demanded.

16. When release the oil in the driving axle, releasing-screw should be loosen off slowly to avoid the oil blowout. The oil drained out should be get with special vessel to prevent the environment pollution.

1.2 Oil and Coating Materials



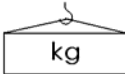




Domestic oil brands	Kinematic Viscosity (100°C) mm ² /s	The similar foreign oil brands (Be classified by the U.A. API, GL-5)			
		MOBIL	CALTEX	ESSO	SHELL
Heavyduty motor Auto-oil 85w-90 GL-5 GB13895-1992	13.5~24.0	Mobilube 1 SHC synthetic oil MOBIL Auto-gear oil HD80W-90 (-20~40°C) MOBIL Auto-gear oil HD85W-140 (-10~50°C)	Multi Purpose Thuban EP	Gear oil GX 85W-90	Spirax EP Heavyduty HD90 HD80W-90

Domestic oil brands	The similar foreign oil brands					
	MOBIL	CALTEX	CASTROL	ESSO	BP	SHELL
2# or 3# lithium grease GB7324-1994	MOBIL grease XHP222	Marfak multi Purpose	LM grease	Ronex MP; Beacon EP 2	Energrease L	Retinax A; Alvania

Name	Code	Application scope and function
Sealant	1545 oxygen-weary type pipe-thread sealant	It's suitable to be used to seal the pipe-thread of Hydraulic system and pneumatic system or be used on the surface with little oil.
	1262 pipe-thread fixed sealant	It's used to fix and seal the M10~M20 screws and the ones be endured intense vibration and impact.
	1596 silicone rubber surface sealant	It's used to seal the joint face on the parts of reductor、water pump、valve and gas engine。
Grease	2# or 3# lithium grease GB 7324-1994	It's suitable to be used to lubricate the fiction position, rolling bearing and sliding bearing of any kinds of engineering machinery between -20~120°C.
Cleaning agent	1755 cleaning agent	It's used to clean the surface of metals and enhance the adhesion strength between repair agent, pope-thread fixed sealant and substrate.

1.3 Marker

To make this manual to be more useful, these markers following are used to mark the important safety and quality.

Marker	Item	Remark
	Safety	Take care in the operation.
	Attention	Pay attention to the technical requirements and make sure the operations reach the requirements in operation.
	Heavy	Choose the appropriate spreader by the parts and their heavy. And choose the right assembly way by the spreader's conditions in operation.
	Tighten torque	Pay more attention to the parts' tighten torque in assembly operation.
	Coating	The location where need to be coated with adhesive and grease.
	Oil and water	Inject required volume of lubricating oil, water or fuel oil.
	Outpour	Outpour required volume of oil or water or.

1.4 Hoisting Explanation

1. When it is not easy to assemble the parts from driving axle assembly, check the following items:

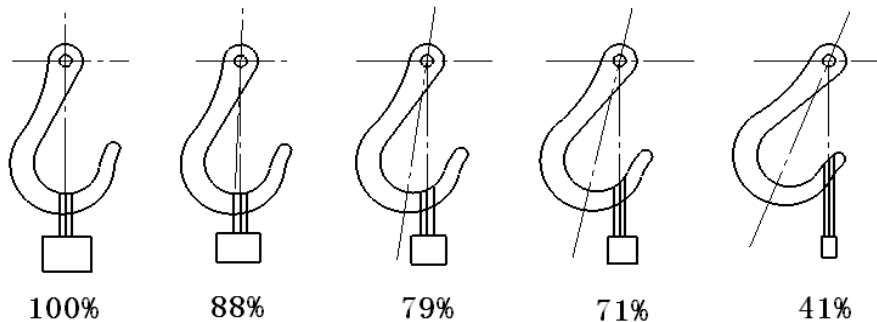
- Check that whether all of tightening bolts of the part have been assembled.
- Check whether the parts being disassembled are hindered by some other parts.

2. Wire Rope

1) Wire rope should be in the middle of the hook. If be in one end of the hook, the wire rope may drop from the hook and that may cause serious accident. The biggest

strength is in the middle of the hook. As shown in graphic 1-1.

2) One single wire rope is forbidden. Make sure that two or more ropes are used in hoisting the heavy.

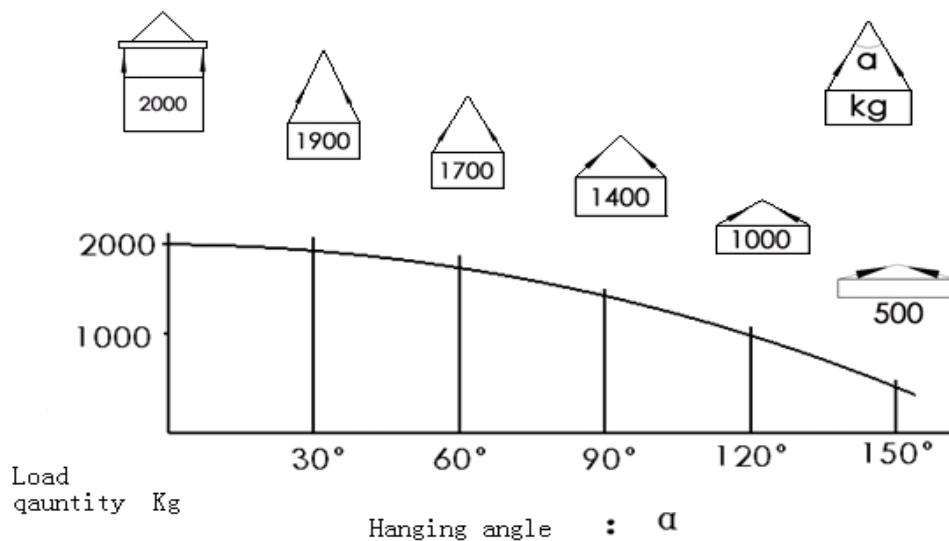


Gr.1-1

! Hoisting with one wire rope may cause the heavy rotates, and then the wire rope looses or the heavy slides from the fixed location which will cause serious accident.

3) The hoisting angle between wire rope and hook should not be oversize when hoist the extremely heavy loading.

When the hook hoists heavy loading with two or more ropes, the bigger of angle between wire rope and hook is, the heavier of each rope loads. The graphic 1-2 shows the changes of allowed loading (kg) in different angles when hoisting with two ropes (The limited vertical hoist loading of each rope is 1000 kg). It can hoist 2000kg when two ropes in the vertical location. But when the angle reaches to 120°, the ropes can only hoist 1000kg. Another hand, the force of the ropes would be 4000kg when the angle reaches 150°, although the loading is only 2000kg.



Gr.1-2

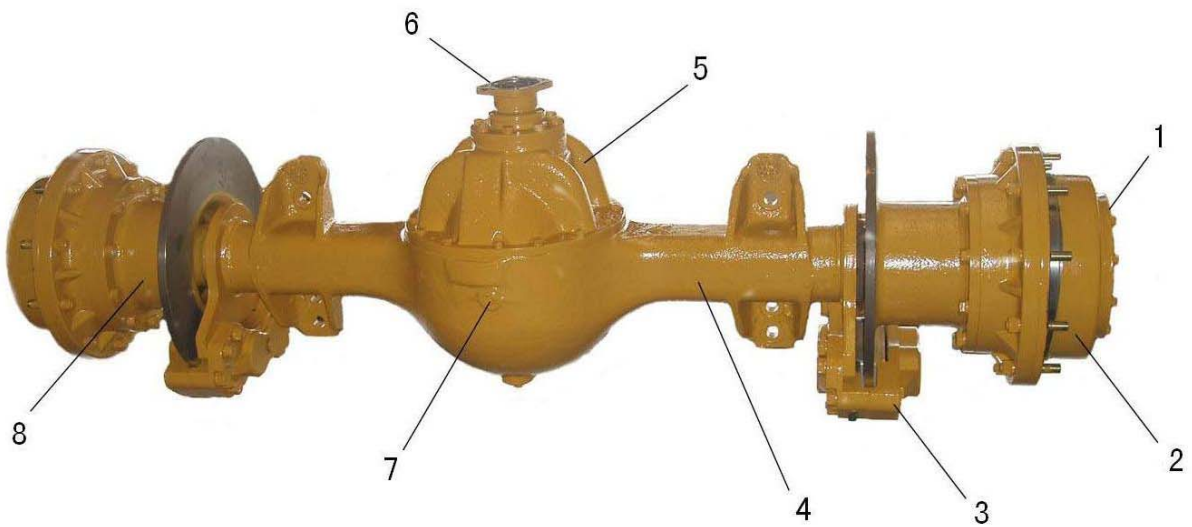
1.5 Table of Common Screw Tighten Torque

Screw Strength Grades	Yield Strength N/mm ²	Screw Nominal Diameter mm				
		6	8	10	12	14
		Tighten Torque N·m				
4.6	240	4~5	10~12	20~25	36~45	55~70
5.6	300	5~7	12~15	25~32	45~55	70~90
6.8	480	7~9	17~23	33~45	58~78	93~124
8.8	640	9~12	22~30	45~59	78~104	124~165
10.9	900	13~16	30~36	65~78	110~130	180~210
12.9	1080	16~21	38~51	75~100	131~175	209~278
Screw Strength Grades	Yield Strength N/mm ²	Screw Nominal Diameter mm				
		16	18	20	22	24
		Tighten Torque N·m				
4.6	240	90~110	120~150	170~210	230~290	300~377
5.6	300	110~140	150~190	210~270	290~350	370~450
6.8	480	145~193	199~264	282~376	384~512	488~650
8.8	640	193~257	264~354	376~502	521~683	651~868
10.9	900	280~330	380~450	540~650	740~880	940~1120
12.9	1080	326~434	448~597	635~847	864~1152	1098~1464
Screw Strength Grades	Yield Strength N/mm ²	Screw Nominal Diameter mm				
		27	30	33	36	39
		Tighten Torque N·m				
4.6	240	450~530	540~680	670~880	900~1100	928~1237
5.6	300	550~700	680~850	825~1100	1120~1400	1160~1546
6.8	480	714~952	969~1293	1319~1759	1694~2259	1559~2079
8.8	640	952~1269	1293~1723	1759~2345	2259~3012	2923~3898
10.9	900	1400~1650	1700~2000	2473~3298	2800~3350	4111~5481
12.9	1080	1606~2142	2181~2908	2968~3958	3812~5082	4933~6577

Remark: In the process of assembling, the tightening torque of the connection bolts could be referred to the above table. When the tightening torques in chapter 4 are not the same as in this table, just follow the torque in chapter 4.

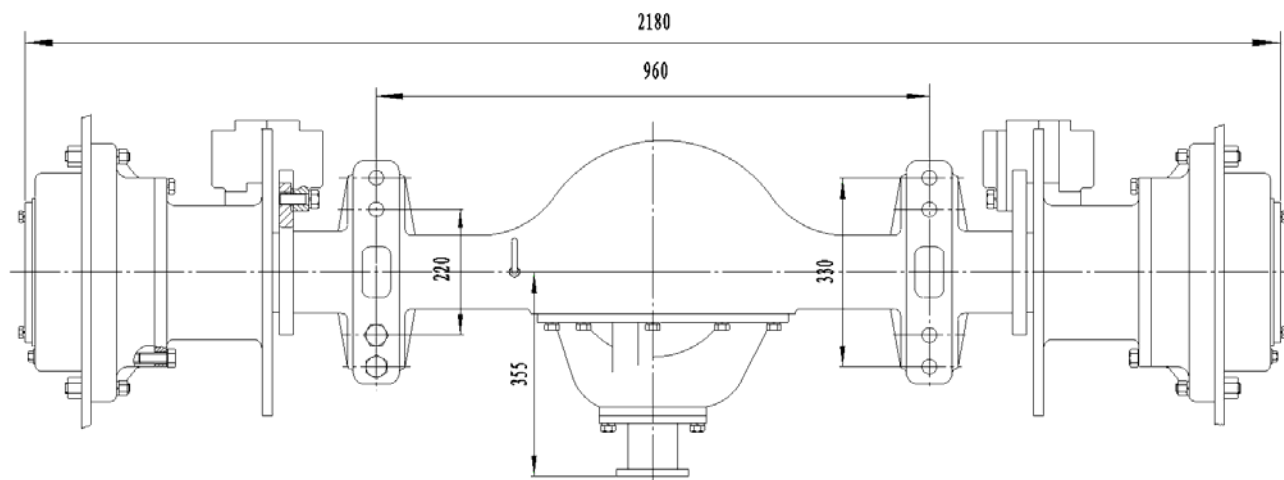
CHAPTER II CONSTRUCTION AND WORKING PRINCIPLE OF THE DRIVING AXLE

2.1 Outside Graphic



1. End cover 2. Wheel-side reducer assembly 3. Brake clip assembly 4. Axle shell
5. Main transmission 6. Input flange 7. Oil-draining plug 8. Wheel hub assembly

2.2 General Graphic



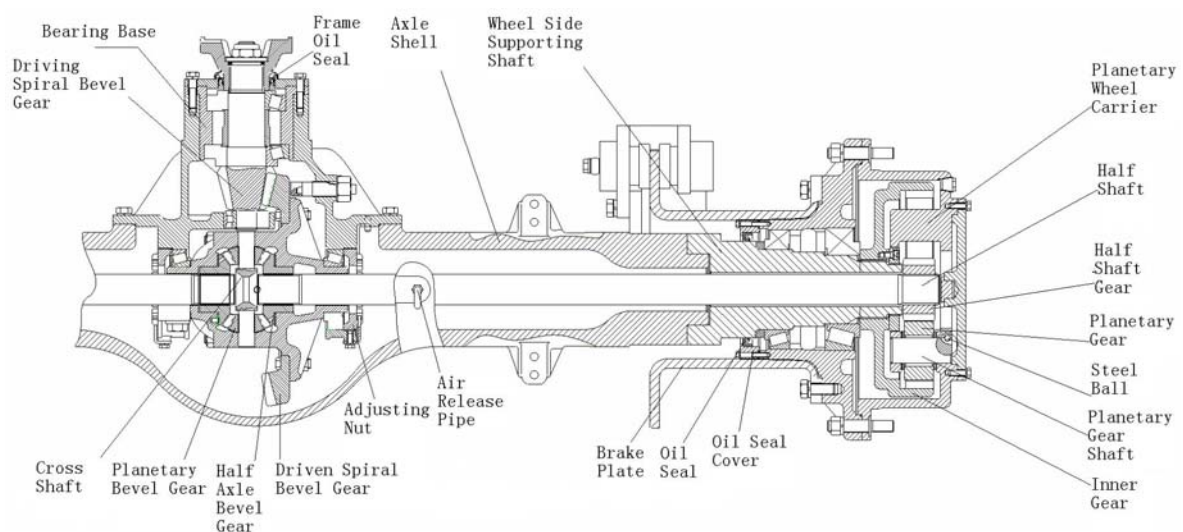
Base parameters of driving axle:

Main Transmission	Type	Spiral Bevel Gear First-order Deceleration
	Reduction Ratio	6.167
Wheel-side Reducer	Type	First-order Planetary Deceleration
	Reduction Ratio	3.12
Oil for Axle	SAE85W-90 GL-5 Gear Oil	13 L

2.3 The Internal Construction of Driving Axle

Driving axle assembly is one of the most important parts in transmission system. The main function of driving axle are turning the rotation speed slower and increasing torque from transmission. The axle brings differential speed function to the two-side wheels. Bearing load and transmitting power are also the functions of driving axle. Driving axle of loader is made up of axle shell, main transmission driver (including differential mechanism), half-axis, wheel-side reducer and brake clip assemblies. The parts with the function of reducing or differencing speed are main transmission driver and wheel-side reducer. Main transmission driver is made up of input flange, oil seal cover, bearing sleeve, driving spiral bevel gear, driven spiral bevel gear, bracket, differential mechanism (planetary wheels, cross shaft, half-axis gear, left shell of differential mechanism, right shell of differential mechanism, gasket), bearings, adjusting shim, stop-pushing bolts and framework oil seal. Wheel-side reducer is made up of internal gear ring, planetary wheel carrier, planetary wheel, solar wheel and shims. The main internal structures are shown in Graphic 2-1.

The power transmission between main transmission driver and wheel-side reducer is realized by half axle. The splines on the two end of half axle mesh with the half axle gears in differential mechanism and the solar gear in wheel-side reducer, and it connect the power between main transmission driver and wheel-side reducer.



Graphic 2-1

2.4 Working Principle of the Driving Axle

Driving axle assembly function of increasing torque, reducing speed and differencing speed are realized by differential mechanism and wheel-side reducer.

Working principle will be introduced as followed:

1. Working principle of differential mechanism—Motion Characteristic:

The symmetrical bevel gear differential mechanism used in driving axle assembly is a kind of planetary gear mechanism. Planetary is composed with differential gear shell and cross shaft, both of which are connected together. At the same time, differential gear shell is driving part because it connects with driven spiral bevel gear. We assume that the angle speeds of differential gear shell and two-side half axle gears are ω_0 (revolution per minute is n_0), ω_1 and ω_2 (revolutions per minute are n_1 and n_2), then the following equations will be right:

$$2\omega_0 = \omega_1 + \omega_2 \qquad 2n_0 = n_1 + n_2$$

These equations are the motion characteristic equations of symmetrical bevel gear differential mechanism with two same diameter half axle gears. They show that the sum speed of left and right half axle gears is same as two times of the speed of differential gear shell but isn't relation with the speed of planetary gears. So, when the loader turns or drives on other condition roads, the planetary gears can rotate on their own speed to make the wheels on two sides rotate in different speed but not slide. The up equations show that:

①When one side half axle speed is zero, the other speed is two times of the differential gear shell.

②In the condition that the speed of differential-gear shell is zero, when one side half axle is rotated by external power, the other side will reverse rotate in the same speed.

2. Working principle of differential mechanism—Torque Distribution:

Assume: The torque from main reducer to symmetrical bevel gear differential mechanism is M_0 ; inside and outside of half axle torques, which are distributed by the differential gear are M_1 and M_2 ; internal friction torque of differential gear is M_r :

$$M_2 + M_1 = M_0 \qquad M_2 - M_1 = M_r$$

The followed conclusions will be get from the equations:

①When the torques from left and right half axle are different, the difference value of them works on the planetary gears and overcome the internal friction torque of

differential gear to drive the planetary gears. This makes the differential action.

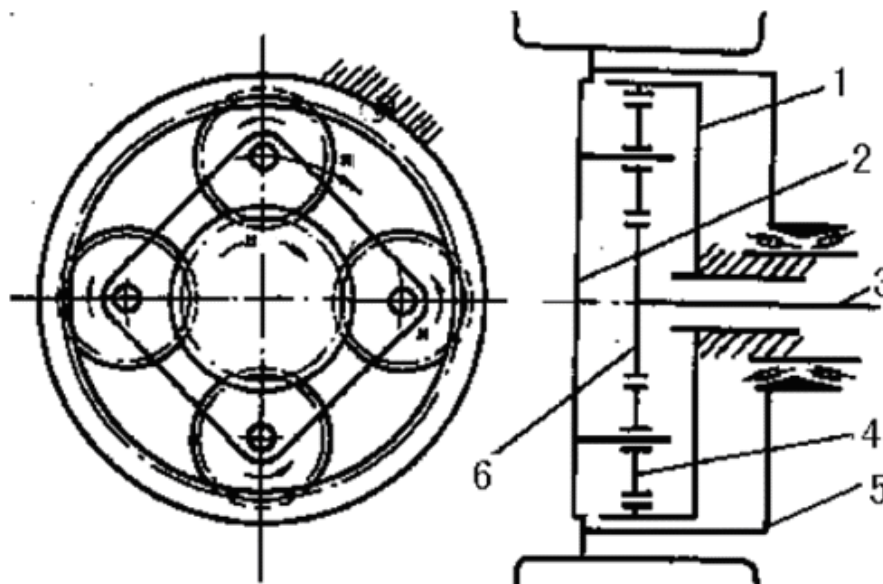
②When the speeds of left and right half axle are different, torques on them are different too. Torque on the slower axle is bigger and that on the faster axle is smaller.

③The sum torque on two half axles is the same as the one on differential gear.

Because the friction torque of the popular symmetrical bevel gear differential mechanism is very small, it could be thought the torque is distributed equally whether the speeds of left and right wheel are same. This is the transmission characteristic—the same torque, but the different speed of common differential mechanism. This characteristic is suitable for loader when works and drives on the general condition. But in the wicked condition, the passing capacity will be affected seriously.

3. Working principle of the wheel-side reducer

Wheel-side reducer is the last increasing torque and reducing speed mechanism. It is a kind of planetary transmission mechanism. It is made up of solar gear, fixed gear ring, driven planetary carrier and planetary gears. Working principle is shown as Graphic 2-30. (This graphic is not complete the same as the actual structure and here is just the principle introduction)



Graphic 2-30 Working principle of wheel-side reducer

1. Internal gear ring 2. Planetary carrier 3. Half axle 4. Planetary gears
5. Wheel hub 6. Solar gear

Solar gear is connected with half axle by spline. Internal gear ring is fixed on the wheel-side supporting axis which on two ends of driving axle shell. Planetary gears mesh with solar gear and internal gear ring. The planetary gears are installed on the

planetary gear carrier by steel balls and planetary gear axis. Planetary gear carriers are fixed with hub as one system by the bolts. So, planetary gear carriers and hub rotate together.

For improving the meshing condition between solar gear and planetary gears and contributing the meshing load equally, half axle is in condition of floating state but not fixed.

4. Transmission principle of driving axle

As shown in the graphic 2-1, the main internal structure of driving axle shown: The left and right shells of the differential mechanism are connected by bolts. The driven spiral bevel gear of the main transmission is fixed on the flange edge of the differential right shell. Journals of the cross axis inlay in the holes which are formed by the relevant groove which on the joint face between left and right shells. One planetary gear incases on the journal of cross axis without fixed. Both of the gear and cross axis mesh with the two straight tooth conical half axle gears. The journals of the two half axle gears install on the left and right base holes on the differential shell and connect with half axle by splines.

Half axle is solid shaft between differential mechanism and wheel side reducer. Its inside end connects with half axle gear by spline and its outside end connects with shield ring and solar gear of wheel side reducer by splines. The left and right half axles of loader are full floating structure. Two ends of half axle bear torque mainly because of the kind of structure. For avoiding half axle motions along axis, the end which connects with wheel side reducer solar gear is limited by steel balls. The torque and speed are transmitted to half axle by differential mechanism. And then, they will be transmitted to wheel side reducer by half axle.

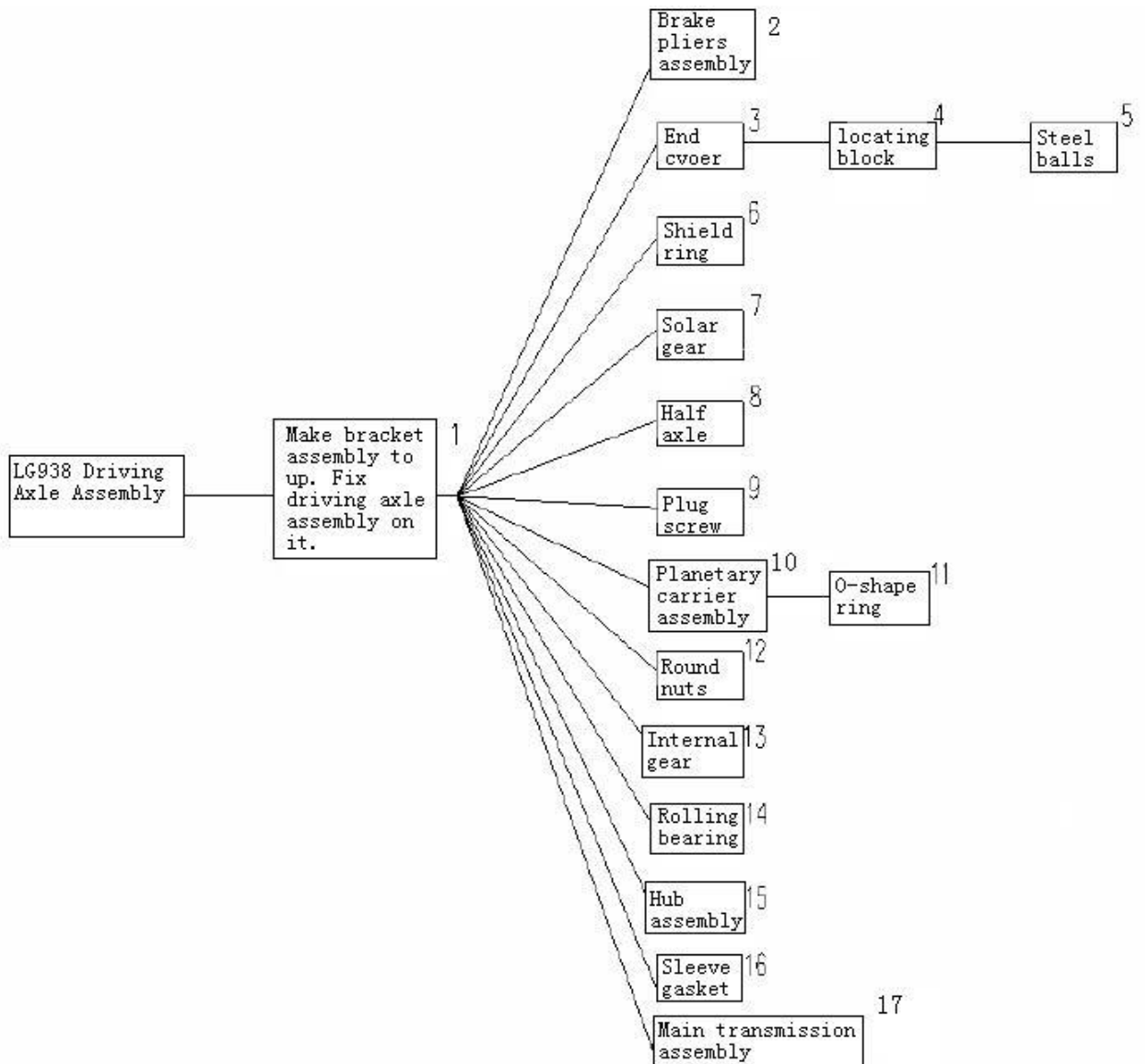
Solar gear connects with half axle by spline. Internal gear ring is fixed on the two ends wheel side bearing shafts of driving axle shell by splines. They are fixed. The planetary gears, which mesh with solar gear and internal gear ring, are installed on the planetary carrier by steel balls and planetary gear axis. Planetary carrier and hub are connected by hub bolts. So, planetary carrier and hub will rotate together.

Transmission way will be get from the above structure:

Transmission (power) → Transmission shaft → Input flange → Driving spiral bevel gear → Driven spiral bevel gear → Left and right shells of differential mechanism → Half axle gear → Half axle → Solar gear → Planetary gears → Planetary carrier → Hub assembly → Driving wheels.

CHAPTER III DISASSEMBLY OF DRIVING AXLE

3.1 Transmission Net Graphic (corresponding to disassembly of driving axle)



Tools and Equipments of Disassembling

Name of general tools	Specification	Number	Application position (corresponding to net graphic number or assembly name)
Gas trigger	LB10, LB16A, LB20A, M1-20P	1 group	Choose different specification by size of screws
Sleeve	13, 16, 17, 18, 21, 24, 27, 30, 34, 41, 50	1 group	Choose different specification by size of screws
Copper bar		1	In the process of hanging, flick the firm parts by it; Flick bearings when disassembly them
Hexagonal wrench	6	1	12
Name of special tools	Specification	Number	Application position (corresponding to net graphic number or assembly name)
Assembly carrier of driving axle	Prepare assembly platform when no one with transmission	1	
Shield ring pliers for axis (hole)		Each with 1	Disassemble the shield ring
Round nuts special tools		1	12
Screw pusher	Replace it by common bolts according to size of screw holes		3、10、17

Explanation about Disassembling—Part

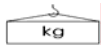
1. Do not reuse the disassembled parts, and replace them with the new;
2. Magnitude of reference of part bearings are relatively large because they were assembled by heated and pressed assembling in factory, which will bring injury to bearings. The bearings, whose faces are damaged in disassembling, could be reused in condition of being repaired and achieving the standard. Otherwise, scrap the bearings.
3. When the copper bar is used, knock the parts as lightly as possible to avoid the debris splashing into the assembly. Or you can choose rubber hammer, plastic hammer or other press-assembly method.

Preparative work

1. Clean the soil and fouling on the duplex-transmission assembly completely.
2. Prepare firmly driving axle assembling carrier.

3.2 Disassembly of transmission

1. Place the driving axle assembly on carrier horizontally. Make the main transmission assembly up.



Driving Axle Assembly



2. Disassemble the brake clip assembly
Use relevant tools (Such as sleeve and open end wrench; the following conditions are similar and won't be explain again)

Loose off the bolts connect the brake clip assembly and carrier. Disassemble the brake clip assembly.



3. Disassemble end cover

Loose off bolts connect the planetary carrier and cover by relevant tools. Push end cover away from wheel side assembly with M10 pusher screw. Disassemble end cover.



4. Disassemble the limit-block.

Take off the limit-block and steel balls together with hands.

★ Relevant tools could be used when the parts are a little tight.



5. Disassemble the steel balls

Remove the locating point of steel balls with tools and make them out.



6. Disassemble shield ring

Take out the shield ring from half axle ring groove by axis shield ring clip.

★ Before disassemble shield ring, draw the half axle out certain distance along the shell first.

⚠ Make sure that the pliers be clamped firmly to avoid it bouncing off to bring potential safety hazard.



7. Disassemble the solar gear

Take off the solar gear from half axle slightly by hands.



8. Disassemble half axle.

Draw out the half axle from axle shell slightly by hands.



9. Plug screw

Loosen the plugs on the wheel side and the axle shell. Unscrew it with hands carefully and avoid the oil splashing.

★ Prepare a clean vessel under it to get oil.



10. Wheel side reducer

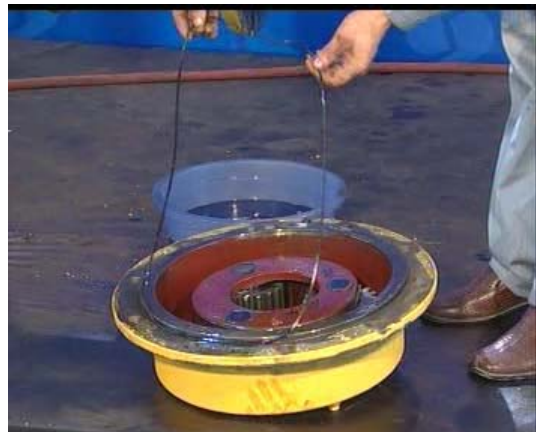
Loose off the hub bolts with relevant tools first. And then, Push planetary carrier away from hub with M16 pusher screw. Disassemble planetary wheel carrier assembly.

⚠ When pushing planetary carrier with pusher screw, the carrier must be pushed carefully for avoiding too fast to fall it down bringing potential safety hazard.



11. O-shape ting

Take off the O-shape ring from planetary wheel carrier by hands.



12. Disassemble round screws.

Loosen off the looseness-proof bolts of the circle nut. And then, disassemble the circle nut with hands.



13. Disassemble internal gear ring

Take off the internal gear ring.



14. Disassemble rolling bearing

Rock the hub assembly slowly. Separate the internal ring of 32221 away from wheel side supporting and get off the internal ring.



15. Disassemble hub assembly

Take down the hub assembly from wheel side support axis.



Hub assembly

★ In the process of hanging-disassembling, keep the axis of hub assembly and the axis of wheel side support axis being in the same line approximately to avoid hurting the oil sealing face and the internal parts.



16. Disassemble the sleeve gasket

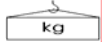
Take down the sleeve gasket.

Remark: Disassemble all the parts on the other side of driving axle in the same way.



17. Disassemble main transmission assembly

Loose off the bolts connecting the main transmission and axle shell assembly. Hang transmission assembly off..



Main transmission assembly

★ In the process of hanging main transmission assembly, the hanging tool should be kept above the transmission assembly to avoid hurting internal parts in the process.



3.3 Disassembling of assemblies

3.3.1 Disassemble planetary wheel carrier assembly

1. Put planetary carrier on working plate horizontally.



2. Knock the planetary wheel carrier out with the copper bar



3. Take out the steel balls.



4. Take down the planetary gears and gasket.



5. Disassemble the shield ring first. And then take down the noodle roller on the internal wall of planetary gears.



3.3.2 Disassemble the hub assembly

1. Put hub assembly on working plate horizontally.



2. Loose off the bolts connect brake plate and hub with relevant tool.



3. Take down the brake plate



4. Loosen the bolts connecting the oil seal end cover and the hub. Take down the oil seal end cover.



5. Take down the gasket



6. Take down the frame oil seal



7. Get the bearing out



3.3.3 Disassemble main transmission assembly

1. Fixed the main transmission (face the input flange up) on the carrier horizontally.



2. Loosen the locking nuts off with relevant tool. Take down input flange, gasket, O-sharp ring and the shield ring.



3. Loose off the bolts connect seal cover and bearing sleeve and take the seal cover down.



4. Take down frame oil seal from seal cover with specific tool.



5. Take down the gasket by hands.

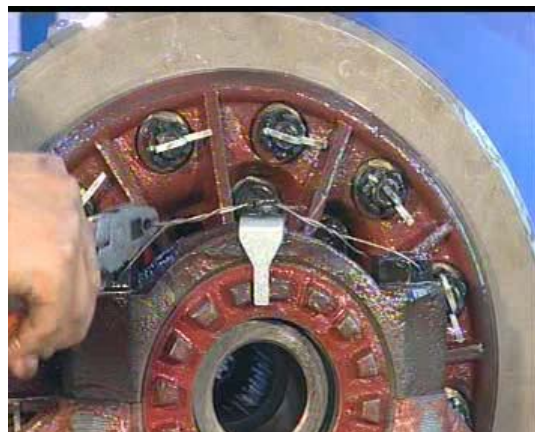


6. Turn the main transmission 180°



7. Disassemble locking iron wire

★ Some machine type structure may be not the same as this graphic. Adjust the operation content in actual work in the disassembling process.



8. Loose off the bolts fix locking plate and take down locking plate.



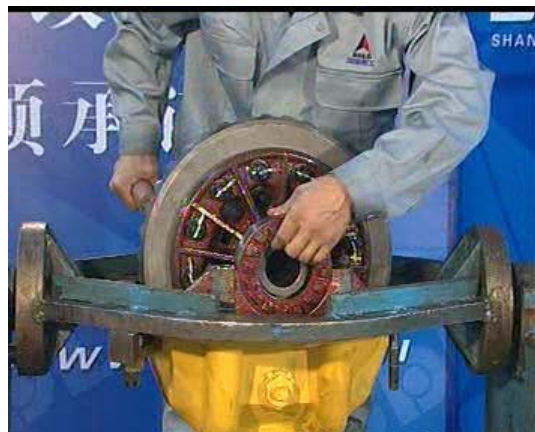
9. Mark the part for reinstalling it to the original position.



10. Loose off the bolts connect the bearing base and dismount the bearing base.



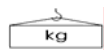
11. Dismount adjusting nuts with hands.



12. Knock down the locking plate of stop-pushing bolt and dismount the nuts. Take down locking plate and disassemble stop-pushing bolt.



13. Hang out the differential mechanism assembly



Differential mechanism assembly

⚠ Keep balance in the hanging progress to avoid bringing potential safety hazard.



14. Separate driving spiral bevel gear assembly and bracket with copper bar.

⚠ Don't knock the spiral bevel gear assembly too abruptly to avoid it falling down to scratch parts or bring potential safety hazard.



3.3.4 Disassemble the differential mechanism assembly

1. Put differential mechanism assembly on the working plate vertically and firmly.



2. Loosen the nuts connecting the driven spiral bevel gear and the right shell of the differential mechanism and disassemble the driven spiral bevel gear.

★ Before taking down the driven spiral bevel gear, check or mark the assembly label first to reinstall the part to its initial position.



3. Dismount the bearings on the left and right shells of the differential mechanism.



4. Loosen the nuts connecting the left and right shells and separate the left and right shells of the differential mechanism.

★ Before separating the left and right shells, check or mark the assembly label first to reinstall the part to its initial position.



5. Take down the half axle gear gasket and half axle gear.



6. Take down the cross and differential gear together, then take down the differential gear gasket and differential gear from the cross.



7. Take down the axle shaft gear gasket and axle shaft gear.



3.3.5 Disassemble the spiral bevel driving gear assembly

1. Put the spiral bevel driving gear assembly on the proper worktable, and put up the flange of bearing sleeve, and then exert pressure on the thread end of spiral bevel driving gear.

★ During exerting pressure, the pressure should not be so high to prevent destroying the flange. If so, the spiral bevel driving gear will be pulled off by the bearing sleeve.

2. Remove the bearing.



3. Remove the bearing sleeve.



4. Remove the adjusted gasket.

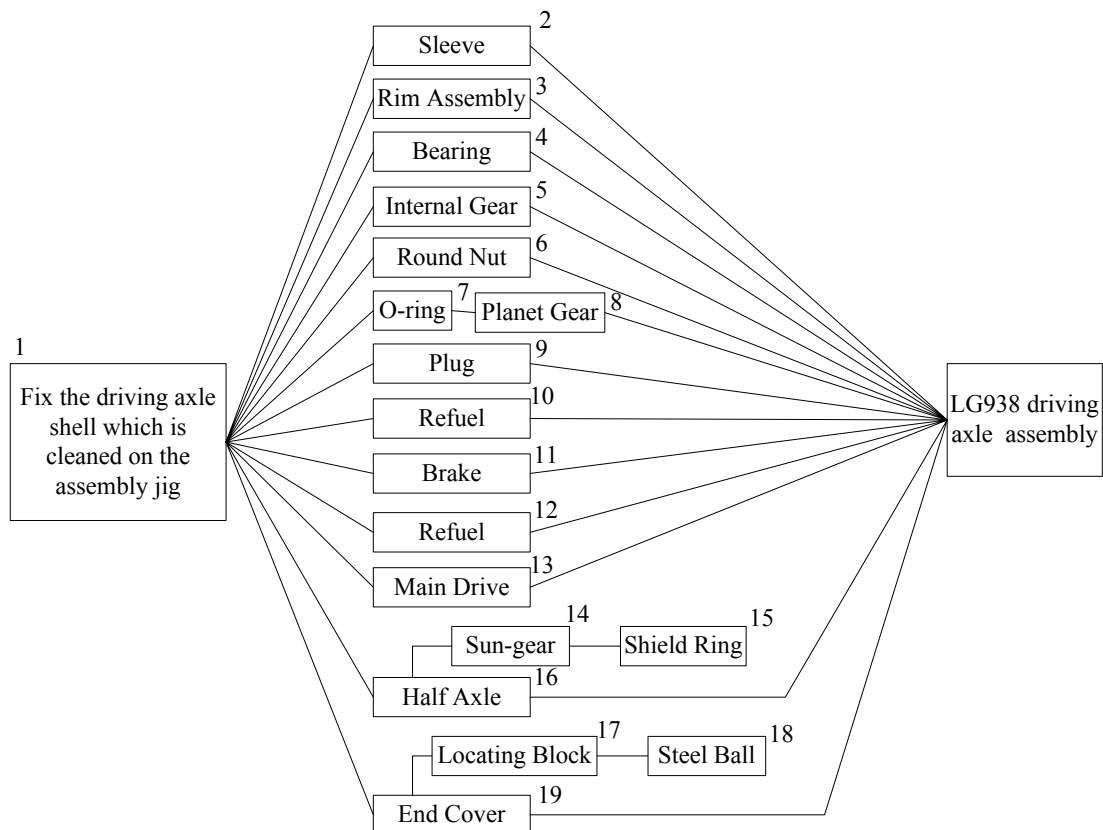


5. Remove the sleeve.



CHAPTER IV THE ASSEMBLY OF DRIVING AXLE

4.1 The Network Chart of Final Assembly



Assembly Tools and Equipments

General tool name	Specification	Number	Using Position(corresponding to the serial number of network chart or assembly parts name)
Gas trigger	LB10, LB16A, LB20A, M1-20P	1 group	Select different specification according to the size of the assembly bolts
Sleeve	13, 16, 17, 18, 21, 24, 27,30, 34, 41, 50	1 group	Select different specification according to the size of the assembly bolts
Dial Indicator	0.01/0~10	1	Partial assemble the main driver assembly and install the input flange
Copper Rod		1	Lightly beat the parts with assembly magnitude of interference
Heating Machine	Please use another method without it	1	4
Cleaning Machine	Please use another method without it	1	Clean every part
Press	Please use another method without it	1	Partial assemble the spiral bevel driving gear assembly
Depth Vernier Caliper	0.02/0~200	1	Install the fixed pin of half axle gear gasket and the spiral bevel driving gear
Inter hexagonal wrench	6	1	6
Wrest wrench	0~140Nm, 0~350Nm, 0~800Nm	1 group	Select different specification according to the size of the assembly bolts
Side swing instrument		1	Install the input flange
Pull-tensile dynamometer	0~300, 0~100N	1 group	6, partial assemble the spiral bevel driving gear assembly
Special Tools Name	Specification	Number	Using Position(corresponding to the serial number of network chart or assembly parts name)
Driving axle assembly jig	Prepare assembly support yourself without it	1	
Circlip Plier for Axis (Hole)		one for each	Assemble the shield ring
Special tool for round nut		1	6
Bearing press mounting sleeve		1 group	Install the bearing
Oil seal press mounting sleeve		1 group	Install the oil seal

4.2 Assembly specification and points for attention of axle

4.2.1 Classification and tightening method of axle screw fastener

According to the analysis of the request of assembly performance, assembly process, and assembly operation and assembly quality of axle serial product, as well as factors such as prevention for oil leakage and the importance of quality characteristic in

assembling the box, classify the axle screw fastener into three grades: A, B, C.

Table for axle screw fastener of grade A

Serial number	Position
1	End cover bolts at the side of wheel
2	Connecting bolts and nuts on left and right shell of the differential mechanism
3	bolts and nuts of spiral bevel driven gear
4	Bolts of sealing cover for main driver
5	Bolts connecting bracket and axle housing
6	End cover bolts connecting wheel-side oil seal

Table for axle screw fastener of grade B

Serial number	Position
1	Bolts connecting the rim and brake disc
2	Bolts of brake clip
3	Bolts and nuts connecting planet carrier and rim
4	Bolts for fastening flanges
5	Bolts connecting bracket and bearing seat

Table for axle screw fastener of grade C

Serial number	Position
1	Bolts for bracket locking tablets
2	Plug for the center of axle
3	Plug at both sides of wheel

Assembling methods of A-grade screw fastener

1.1.1 Firstly, screw the bolts for more than 2-3 pitches manually.

1.1.2 Then preload with gas trigger of low velocity and small torque on the principle of symmetry and cross.

1.1.3 Finally, turn 30° at least with a proper torsion wrench to reach the median of regular moment.

1.1.4 An intelligent tightening machine could instead of step 1.1.3, so long as the median of regular moment can be reached and the accuracy of the machine is ensured.

Principle for tightening B/C-grade screw fasteners:

1.2.1 Firstly, screw the bolts for more than 2-3 pitches manually.

1.2.2 Secondly, preload diagonally with gas trigger of same specification or one-grade

smaller specification.

1.2.3 At last, tighten the screw to reach the median of regular moment with gas trigger of appropriate specification.

4.2.2 Points for attention in assembling the axle

1. Before assembling, the scrap iron, burrs, oil contaminant, sediment on the component must be cleaned out. There must be no corrosion, scratch or damage on the mating surface and friction surface. The oil holes and groove should be clean and unobstructed.

2. During assembling, do not damage the thread on the screws.

3. The end face of screw and nut should be in uniform contact with the fastened parts; neither inclination nor hammering the faces into contact is allowed. No bending deformation occurs to the screws.

4. The connected parts should be under uniform compression, closely jointed and connected firmly.

5. It is forbidden to use inappropriate wrench or sleeve when tightening the screws and nuts.

6. Assemble strictly with the fastener of right grade according to the above regulation. It's not allow to use low performance fastener instead of high performance ones or use high performance fastener instead of low performance ones in principle.

7. Coat proper amount of sealant for locking screws on the external thread of screw fastener cycle by cycle. Don't coat onto the first two pitches of the thread, and the width of sealant coated would be 3 to 5 pitches, then screw into internal thread to the regular moment. When the internal hole is a blind hole, coat proper amount of sealant onto the bottom, and then tighten.

8. In the assembly of screws and bolts, insert them for more than 2-3 pitches, then preload with tools, and finally tighten to regular moment with proper specification torque wrench.

9. In the assembly of screws bolts and nuts, pay attention to protecting the paint film, coating and etc of the connected components, as well as the end of screws and bolts, and grooving of the screws. Make sure there is no damage.

10. Use proper tap when threaded holes need rethreading, and make sure the axis of threaded hole is vertical with the surface of connectors.

11. After being tightened, the bolts and screws should sprout 2-3 pitches out of the end face of the nuts.

12. When preload group of screws and bolts, preload in order according to the figure of connected components and the distribution of bolts.

12.1 In case of group of screws and bolts arranged in rectangle, tighten them from the middle to both sides symmetrically. The order is showed in Figure (1).

12.2 In case of screws and bolts arranged in square or cycle, tighten symmetrically. The order is showed in Figure (2).

12.3 If exist a locating pin, tighten from the screws which are near the pin. The order is showed in Figure (3).

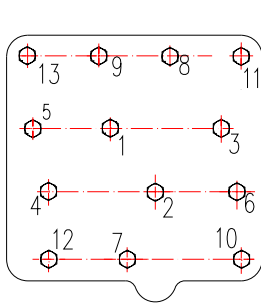


Figure (1)

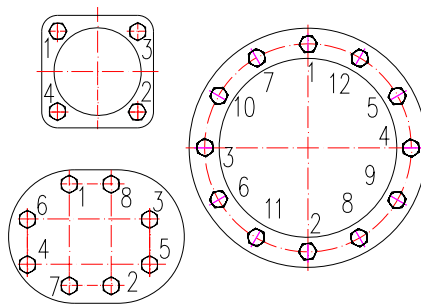
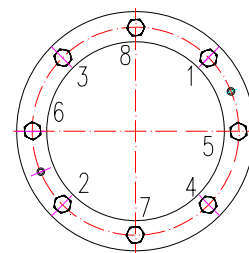


Figure (2)



Figure(3)

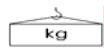
13. When installing the heated bearings, heat insulation gloves must be used in order not to be hurt.

14. When using copper rods, knock slightly to avoid debris splashing into the cavity of the components. Also can use rubber hammer, plastic hammer, or in the method of press mounting.

4.3 Assemble the driving axle

1. Axle shell

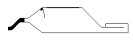
Hang the cleaned axle shell on the special support. Wring the plug with glue on the oil-letting and fuel-deliverer of the axle belly.



Driving axle shell



Tightening torque of plug:
70~100Nm



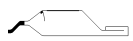
1545 oxygen-wear type
pipe-thread sealant

2. Sleeve

Turn over the axle shell to make the end surface of axle shell horizontal and upward, then install the gear sleeve on the wheel-side supporting shaft of axle shell assembly.

3. Hub assembly

Coat the lubricating oil on the wheel-side supporting shaft of axle shell assembly, then install the hub assembly on the supporting shafts at both ends of axle shell assembly.



Lubricating oil

4. Bearing

Heat the inner ring of rolling bearing 32220 to 50~80°C, then install it on the wheel-side supporting shaft.



5. Internal gear

Install the driving axle internal gear on the spline at the end of supporting shaft.



6. Round nut


Install and fasten the round nut. Beat the internal gear with copper rod slightly to assemble it in place.


★ 1. Hook the $\text{Ø}22.5$ hole with pull-tensile dynamometer which is pulled along the tangential direction. The reading is 24~56N. If the reading is not between the 24~56N, adjust the degree of tightness of the round nut according to the reading. Repeat the above processes until the reading is 24~56N. Finally, coat 1262 thread lock-fix sealant on the thread hole of internal gear from the second tooth to the fifth or sixth tooth (form a liquid level on the 1/3 circle of screw), then tighten the screw and fix the round nut.



2. Before measuring the pressure, rotate the hub forward and backward for more than five times.

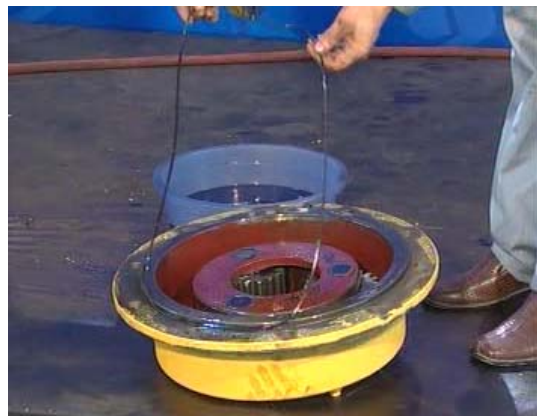


 1262 thread lock-fix sealant

 Tightening torque of screw:
22~30Nm


7. Install the O-shape sealing ring

Install the O-shape sealing ring on the planet gear assembly.



8. Install the planet gear assembly

Install the planet gear assembly and O-shape sealing ring on the hub with the rim bolt, washer and nut.

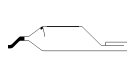
 kgm Tightening torque: 264~354Nm


 kg The planet gear assembly



9. Install the plug

Insert the plug with glue in the oil holes at both sides of wheel.


 1545 oxygen-wear type pipe-thread sealant

 kgm Tightening torque: 70~100Nm



10. Refuel


Load both about 1.5L SAE85W-90 GL-5 gear oil (GB13895-1992) in two wheel-side reducers (Base on the overflow of planet gear).

 SAE85W-90 GL-5 gear oil



11. Install the brake

Install the disk brake on the braking clamp support, and then fix it with bolt and washer.

 kgm Tightening torque: 370~470Nm

 kg Brake

★Warning: When installing the bolt, coat proper amount of 1262 screw lock-fix sealant on length of 20mm along the end of screw.



12. Refuel

Load 10L SAE85W-90 GL-5 gear oil (GB13895-1992) in the axle packet of axle shell.

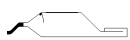


SAE85W-90 GL-5 gear oil



13 Install the main driver assembly

13.1 Coat 1596 silicone rubber surface sealant on the joint surface between axle shell and the bracket. Coat the sealant to form $\text{Ø}3 \sim \text{Ø}6$ circumference closed ring in the internal side of thread hole at the bigger end surface of axle shell, and coat this sealant on the thread hole circumference at both sides of R50 arc. Don't place the coating sealant in the air for more than 10 minutes.



1596 silicone rubber surface sealant

13.2 Install the main driver

Hoist the main driver assembly with joist barrow. Drop the main driver in the main driver shell of axle, and then install the locating pin.



Main driver assembly

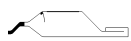


13.3 Install the bolt

Coat proper amount of 1262 screw lock-fix sealant on the bolt, and the position of coating sealant is the length of 15mm along the end of the screw. Then fasten main driver assembly and axle shell assembly with bolt and washer.



Tightening torque: 110~130Nm



1262 screw lock-fix sealant

★ Warning: Fasten every bolt on principle of symmetric and cross.



14. Install the sun-gear

Install sun-gear on the end with shield ring groove of the half shaft.



15. Install the shield ring

Install the shield ring with axial circlip plier.

⚠ Make sure the circlip plier is clamped firmly during using to avoid bouncing off during assembling to form hidden danger.



16. Install the half shaft assembly

After installing sun-gear on the half shaft, install the half shaft assembly in the hub (pay attention to assembling the half shaft spline and gear).



17. Install the locating block

Rivet the steel ball on locating block. The steel ball can rotate flexibly after riveting.



18. Install the steel ball

Install the locating block which has been riveted steel ball on the end cover.

★ If the locating block doesn't install to the desired position, beat it lightly with proper tool until the steel ball can rotate flexibly.



19. Install the end cover

Install O-ring on the end cover, and coat 1262 screw lock-fix sealant in the screw M10*30 in which install the washer. The position of coating sealant is 15mm along the end of screw. Then tighten the cover with the bolt and washer.

★ Warning: Fasten every bolt on principle of symmetric and cross.



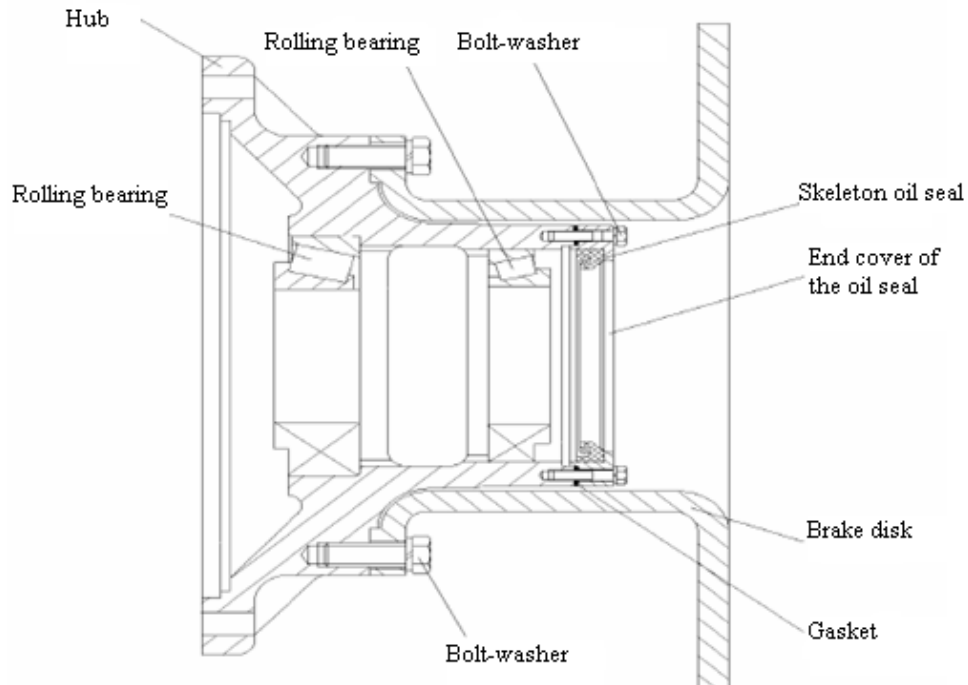
kgm

Tightening torque: $45 \pm 5 \text{ Nm}$ 

1262 screw lock-fix sealant

4.4 Partial assemble the assembly

1. Install the hub assembly




1.1 Put the hub with bigger end upward and install the external ring of bearing 32220. Then turnover, let the smaller end upward and install the external ring of bearing 32021, and then install the internal ring of bearing 32021.



1.2 Coat lubricating oil on the end cover of oil-seal, and check the integrity of oil-seal. Then coat lubricating oil in the groove of skeleton oil-seal uniformly, and then install the skeleton oil-seal in the end cover of oil-seal.




1.3 Install gasket on the smaller end surface of hub, then install the end cover of oil-seal on the smaller end of hub, and tighten with bolt M8*45 and washer.

 kgm Tightening torque: 22~25Nm

★ Warning: Fasten every bolt on principle of symmetric and cross.



1.4 Install brake disc on the hub, then tighten with bolt M8*1.5*50 and washer.

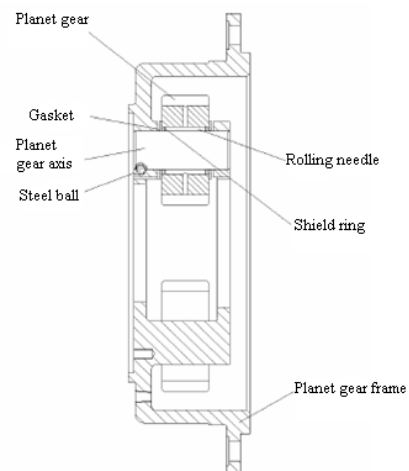
 kgm Tightening torque: 200~250Nm

 kg Brake disc

★ Warning: Fasten every bolt on principle of symmetric and cross.



2. Install the planet gear frame assembly.



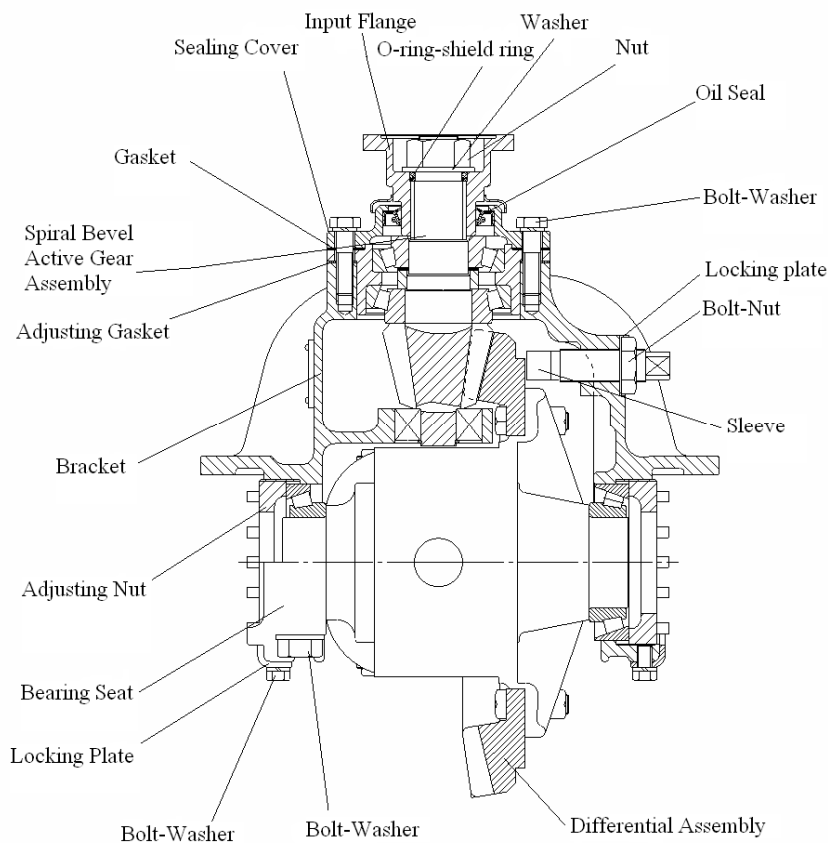
2.1 Glue needle rollers (28 for each) on the internal holes wall of planet gear with lubricating grease. Install shield ring on both ends of needle roller and install gaskets on both ends of planet gear hole. Finally install the whole in the seat hole of planet gear frame.



2.2 Install steel ball which aligns to the semicircular cavity of planet gear frame in the hole of planet gear axis. Then install them and planet gear axis passing through the inner hole of planet gear and gasket on the planet gear frame. After assembling completely, the planet gear should rotate flexibly and has no jamming phenomenon.



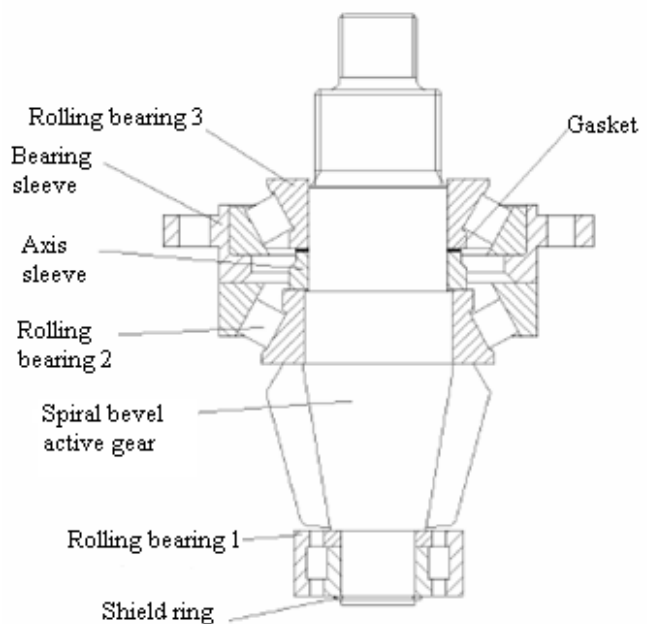
3. Install the main drive assembly



3.1.1 Press the external ring of rolling bearing 3 in the seat hole at the big end of bearing sleeve. Press the external ring of rolling bearing 2 in the hole at the small end of bearing sleeve.

3.1.2 Install the rolling bearing 1 in the end journal of the spiral bevel active gear (front axle is left lateral and rear axle is right lateral) with mechanical press, and then install the shield ring in order.

3.1.3 Turnover, press the internal ring of rolling bearing 2 in the other end of spiral bevel active gear with mechanical press.



Install the axis sleeve in order.



Install the gasket.



Then install the bearing sleeve.



Finally, press the inner ring of rolling bearing 31310.



★ Warning: When assemble the main reducer, the tapered roller bearing should have certain assembly preloading degree, that is to say, after eliminating clearance between the bearings, load certain pre-tightening force, in order to reduce axial displacement caused by the axial force produced during the



transmission and increase the brace stiffness of the axis to assure the normal mesh of bevel gear pair. However, if too tight the tapered roller bearing's wear will speed up. Load and keep the pressure $P=5420\text{kg}$ on the inner ring at up end of rolling bearing 31310, then hook the hole $\phi 14.5$ on the bearing sleeve with pull-tensile dynamometer which is pulled along the tangential direction. The reading is $5\sim 35\text{N}$. If the reading is not between the $5\sim 35\text{N}$, increase and reduce the thickness of adjusting gasket. Repeat the above processes until the reading is $5\sim 35\text{N}$.

3.2.1 Install the half shaft gear

Install two fixed pins and half shaft gear gaskets in the left shell of in order.

★ Warning: Beat lightly when install the fixed pin to prevent exceeding the range 1.5 ± 0.1 (measure with caliper while beating)

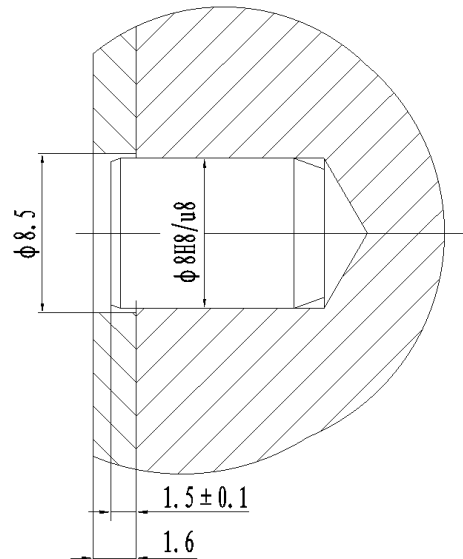


Install the half shaft gear.



It is necessary to coat lubricating oil when install half shaft gear gasket and half shaft gear. The surface with oil groove of half shaft gear gasket combines with the back surface of semi-axis gear.

 Lubricating oil



3.2.2 Install the half shaft gear

Install two fixed pins, half shaft gear gaskets and half shaft gears in the right shell of differential in order.


★ Warning: Beat lightly when install the fixed pin to prevent exceeding the range 1.5 ± 0.1 (measure with the caliper while beating)



3.2.3 Assemble the cross assembly

Install the bevel gear (smaller end is inward) and bevel gear gasket on the four axis ends of cross.

★ Warning: Coat lubricating oil when install bevel gear and bevel gear gasket.

 Lubricating oil




3.2.4 Install the differential shell

Install cross assembly in the right shell of differential and let bevel gear mesh with the half shaft gear.

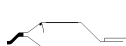
Turnover the differential left shell assembly and install it with the differential right shell assembly, then joint the left and right shell of differential with bolt, and tighten with washer and nut.



 Tightening torque of nut: 180~210Nm

★Warning: 1. Make sure the assembly mark on the right shell of the differential mechanism aligns to the left shell of the differential mechanism.

2. Coat proper amount of 1262 screw lock-fix sealant on length of 10mm along the screw bottom of bolt.

 1262 screw lock-fix sealant

3. After assembling, the half shaft gear and bevel gear can rotate by hand flexibly and have no jam.

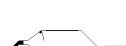


3.2.5 Install the spiral bevel driven gear

Align the assembly mark, fasten the spiral bevel driven gear (rear axle is left lateral and front axle is right lateral) on the right shell of differential mechanism with bolt, washer and nut, then tighten the nut.

 Tightening torque of nut: 305±25Nm

★1. Coat certain 1262 screw locking sealant on the bolt. And the length is about 12mm from screw bottom of bolt.

 1262 screw lock-fix sealant

2. The judgment method of left and right lateral: Face to the front of gear, the helical teeth extend from smaller end to bigger end according to clockwise named right lateral; conversely, extend from smaller end to bigger end according to anticlockwise



named left lateral.

3.2.6 Install the bearing

Install rolling bearing on the external end bearing of differential right shell.

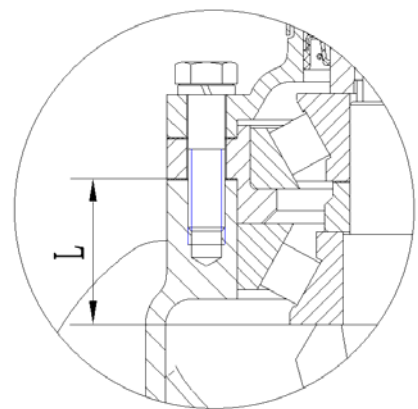
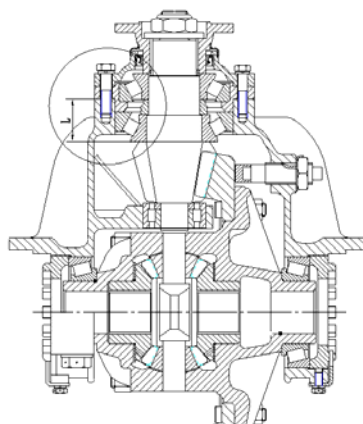


Install rolling bearing on the external end bearing of differential left shell.

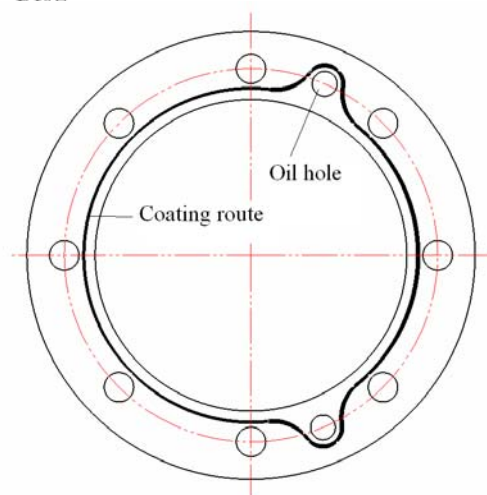


3.3.1 Install the spiral bevel active gear

Measure the size L as the graphic. The recommended primary selecting thickness of adjusting gasket is the measured value subtracts 50.9. Fix the bracket on the assembly frame with the smaller end upward. Coat sealant on the smaller end surface, and install the adjusting gasket.



★Coat sealant line with diameter 2~4mm on the smaller end uniformly. The coating route is showed in the graphic; The coating route of bearing sleeve (the other end of gasket) also according to the above requirement.



Install the spiral bevel active gear assembly after assembling in the bracket.



3.3.2 Assemble the seal cover

Press the oil-seal in the seal cover.

★ Warning: Coat proper lubricating oil on the external diameter when install the oil-seal.



Lubricating oil



3.3.3 Install the input flange

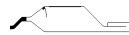
Put the gasket on the end surface of bracket, then install the seal cover assembly (coat lubricating grease according to the general requirement of driving axle), and joint to the bracket with bolt and washer (preload the bolt M14*55 and M12*55),

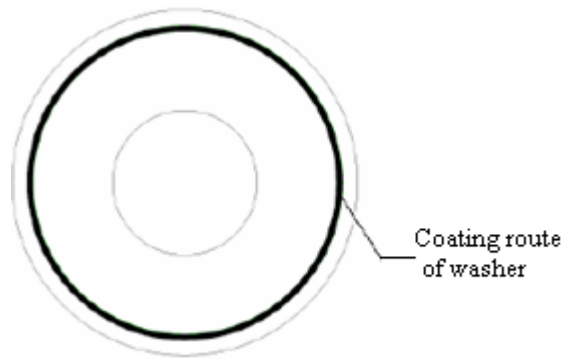


Install the input flange.




Install the shield ring and O-shape seal ring. Coat sealant on one end surface of gasket, and then install the gasket with coating surface downward.

 609 sealant



Install the nut M33*1.5 and tighten.

 Tightening torque of nut:
320~400Nm

★ Warning: 1. Before installing the flange, install the flange on the spline of spiral bevel active gear, and measure the radial pulsation of flange to assure not more than 0.08, and make matching and assembling mark. If more than 0.08, rotate the flange to a certain angle and install it, then measure again until satisfy the requirement. Otherwise, replace the flange.

2. Coat a glue line whose coarseness is $\phi 2 \sim \phi 3$ on the washer as close to external circular as possible according to the line showed in the graphic.



3.3.4 Assemble the differential assembly

Turnover the bracket, install the differential assembly in the bracket.

 Differential assembly

Install the bearing seat with washer and bolt (the bolt is tight lightly), then install the adjusting nut.



★ Warning: 1. The two bearing seats could not be exchanged.

2. Coat proper amount of 1262 screw lock-fix sealant on the length of 15~25mm along the screw end surface of bolts.

 1262 screw lock-fix sealant

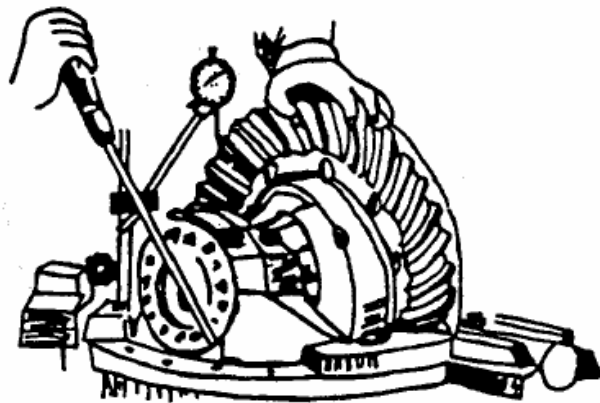
3.3.5 Adjust the spiral bevel gear.

Engagement status adjustment of spiral

bevel gear is to adjust the area of engagement and engagement clearance. When adjusting the engagement clearance of spiral bevel gear, press the contacts of percent meter on the bigger end edge of driven spiral bevel gear, then turn the driven spiral bevel gear to measure the clearance directly. The clearance should be 0.1~0.35mm.


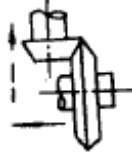
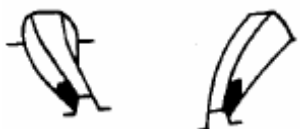


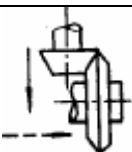
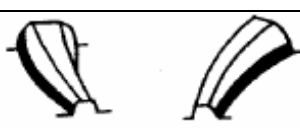
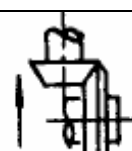
The way to adjust engagement clearance is: turn the adjusting nuts to change the position of driven spiral bevel gear (move the driving spiral bevel gear assembly for adjustment if necessary). If the clearance is greater than the regular value, move the driven spiral bevel gear to the active spiral bevel gear; Otherwise, far away. To keep the pretightening of differential tapered roller bearing which has been adjusted, the number of inserting the adjusting nuts on one end should be equal to the cycle number of wringing adjusting nuts out on the other end.

When adjusting the contacting area of spiral bevel gear engagement pair, firstly coat red pigment (red lead powder and etc.) on the teeth of driven spiral bevel gear (3 teeth should be coated generally), then turn the driven spiral bevel gear reciprocating by hand, and check the touching imprint. The right position of the spiral bevel gear imprint is: no less than 50% along the direction of tooth depth and tooth length; the imprint of spiral bevel gear is near to the centre and locates on the middle of tooth depth along the direction of length; deviate to smaller end slightly along the direction of tooth length. The way to improve the preload of the differential bearing: after adjusting the engagement clearance of spiral bevel gear, guarantee the clearance between the tapered roller bearing at both ends of differential to zero. The method of



adjusting is in the following table.

Adjustment of contacting area and clearance when install the spiral bevel gear

Tooth flank contacting area of driven bevel gear	Way to adjust	The moving direction of gear
	Move the driven gear to the driving gear; if the clearance is too small, move the driving gear outward.	
	Move the driven gear away from the driving gear; if the clearance is too big, move the driving gear inward.	
	Move the driving gear to the driven gear; if the clearance is too small, move the driven gear outward.	
	Move the driving gear away from the driven gear; if the clearance is too big, move the driven gear inward.	


The way to adjust the engagement generally is to increasing or decreasing the adjusting gaskets and turning the adjusting nuts. The adjustment of contacting area affects the service performance and service life greatly, which should be carried out seriously.

★ Warning: After adjusting completely, clean up the red lead powder.

3.3.6 Install the locking plate

Tighten the fixing bolt of bearing seat, the tightening torque is 450~550Nm. Place the locking plate rightly, then fix the locking plate on the bearing seat with locking plate fixed bolt and washer, and tighten the locking plate fixed bolt.




 Tightening torque: 40~50Nm
 450~550Nm


★ Warning: Coat proper amount of 1262 screw lock-fix sealant on length of 5~10mm along screw end of locking plate fixed bolt.


 1262 screw lock-fix sealant

3.3.7 Install the stop-push bolt

Turnover the bracket, press the copper sleeve in the end of the stop-push bolt, then screw them in the bracket, let the copper sleeve contact with the back of driven spiral bevel gear in the differential assembly. Then overturn 1/6-1/4 circle, and tighten with nut and locking plate.



 1567F sealant

Fold bending one tooth of locking plate to avoid the nut's loosening.



Then tighten the fixed bolt of seal cover.



Tightening torque of bolt:

M14*55—124~165Nm

M12*55—78~104Nm

★ Warning: Tighten the fixed bolt of the seal cover should according to the principle of symmetric and cross successive.



CHAPTER V JUDGEMENT STANDARDS OF MAINTENANCE AND CHANGING PARTS IN SERVICE MANUL FOR DRIVING AXLE

I . After disassembling, identify the parts whether write-off. The basis for identifying is whether the parts are lose their function completely (service performance) and whether could not be repaired.

II . There are two ways to identify the parts which are disassembled:

1. watch & touch
2. measure

III. Judge the parts which are disassembled by watching and touching firstly; the part in the following condition must be replaced:

1. Never further use the components which are seriously knocked, have fracture and crack, or lose function.
2. Never further use the oil seals, dust ring, O-ring and seal gasket which are disassembled because of leakage. If use again, low reliability and short service life will occur.
3. Never further use the bolts, nuts, washers, plug screws, pipe joints which have the following condition: serious corrosion; the thread doesn't work well in tightening operation; the thread is damaged, worn out or slipping.
4. Never further use the looseness-proof wire which is disassembled form the connection of bolt.
5. Never further use the bearings if they could not be turned by hand smoothly; crack exists on each component; the race way is seriously worn or the balls are broken.
6. Never further use the gears and splines which have crack, fatigue delamination, collision or over worn on the teeth.
7. Never further use the parts in the following conditions: boxes or shells with crack; shell bearing with crack, wear, elliptic or fatigue delamination in the installing holes; and shell screw which does not work well in tightening operation.
8. Never further use the bearing seats and oil seal seats which have crack, wear,

- elliptic, collision or fatigue delamination on the mating surface or spigot.
9. Never further use the gaskets for planet gears and bevel gears which have serious wear, crack, and collision or fatigue delamination.
 10. Never further use pins with serious wear, collision or crack.
 11. Never further use the parts in the following conditions: wheel-side supporting shafts, half shafts and flanges have collision, serious wear, and crack on the spline or teeth; the working surfaces of oil seal and bearing for assembling have crack.
 12. Never further use the parts with large bending moment, such as axle shell, supporting shaft, and half shaft, which have crack or mini crack on the arc, chamfer, transition area of spline and the area nearby.

IV. If it is hard to judge by watching or touching, check by measuring. The common easily wear parts are listed in the following table.

Unit: mm

Parts category	Items to check	Judgment Standard		Oversize Measurement
		Size (Tolerance)	Allowable Limits	
Bearings	Inner diameter tolerance	About 0~ -0.02	+0.02	Replaced
	Outer diameter tolerance	About 0~ -0.02	-0.04	
Gear	Wear of tooth thickness	About 0~0.10	12% of tooth thickness of reference circle (1.2~1.4 generally, 2.0 for spiral bevel gear)	Replaced
Bevel gear gasket	Thickness	1.6±0.06	1.3	Replaced
Half shaft gear gasket	Thickness	1.6±0.06	1.3	Replaced
Cross shaft	Outer diameter Φ25	0~-0.021	Φ24.93	Replaced
Bevel gear	Inner diameter Φ25	+0.117~+0.065	Φ25.17	Replaced
Common parts	Outer diameter of common mating	Mark tolerance as T	Recommend: 0.3T less than lower limit	Replaced
	Inner diameter of common mating	Mark tolerance as T	Recommend: 0.3T more than upper limit	