

SECTION 4 BRAKE SYSTEM

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SECTION 4 BRAKE SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. OUTLINE

There are two brake systems, the foot brake system and the parking brake system.

The foot brake adopts the brake system of oil type at drive axle.

Oil pressure is generated in maximum 60 kgf/cm² through brake oil input path of the left and right drive axle housing, this pressure allows the piston brake to advance and compresses a friction plate and a plate.

So when the transportation travels, it is possible to brake.

The parking brake works by the switch installed on steering column.

2. SPECIFICATION

1) DISK BRAKE

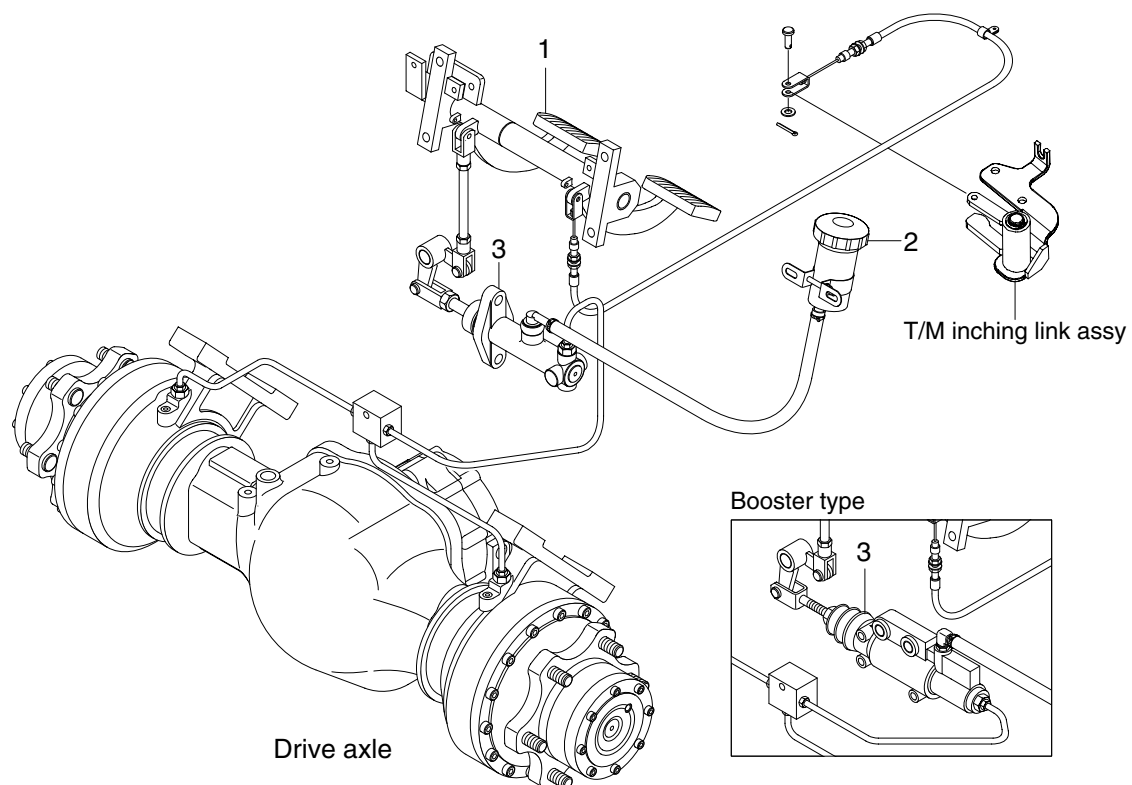
Item			Specification
Type			Wet disk brake
Piston bore diameter		Non-booster (std) Booster (opt)	33 mm (1.3 in) 22.23 mm (0.9 in)
Pedal adjustment	Height	Non-booster (std) Booster (opt)	118 mm (4.6 in) 119 mm (4.7 in)
	Play		2~4 mm
Brake oil			Azolla ZS32 (ISO VG32 hydraulic oil)

2) PARKING BRAKE

Item		Specification
Type		Wet disk brake (Negative)
Switch location		Steering column
Disc location		Axle carrier sub assy

3. BRAKE PEDAL AND PIPING

1) STRUCTURE



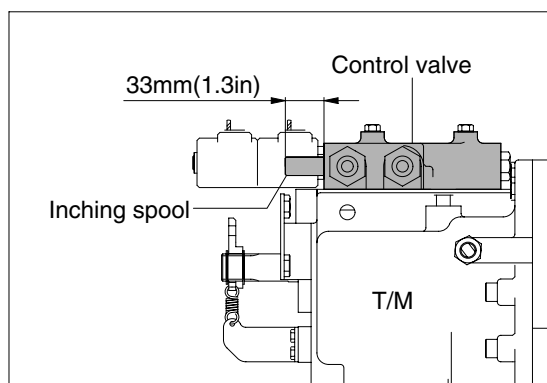
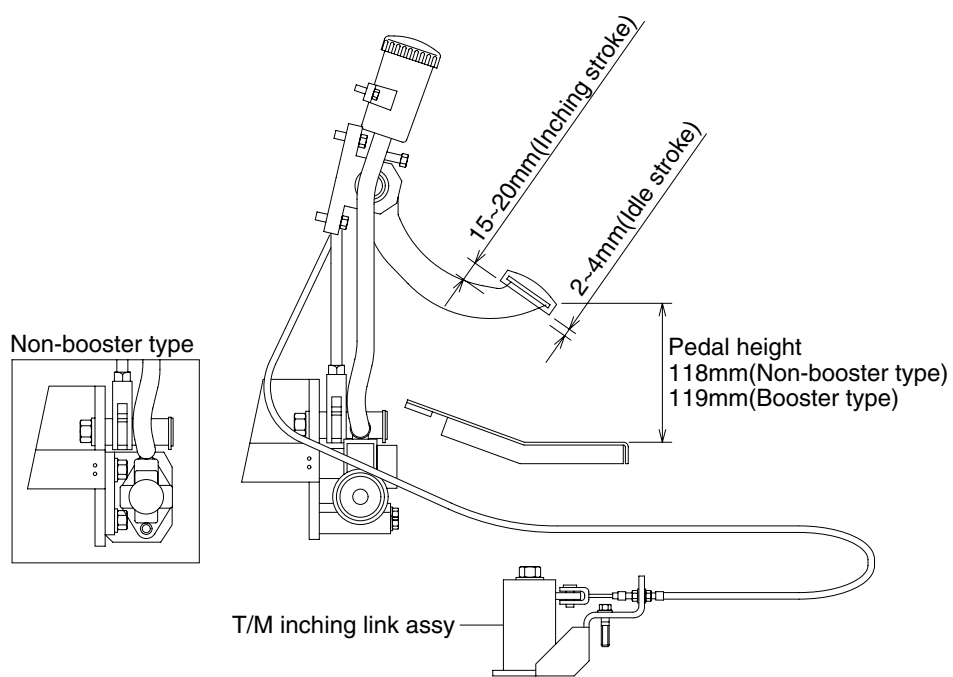
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- 1 Brake pedal
- 2 Reservoir tank assembly

- 3 Brake valve Assy

4. INCHING PEDAL AND LINKAGE

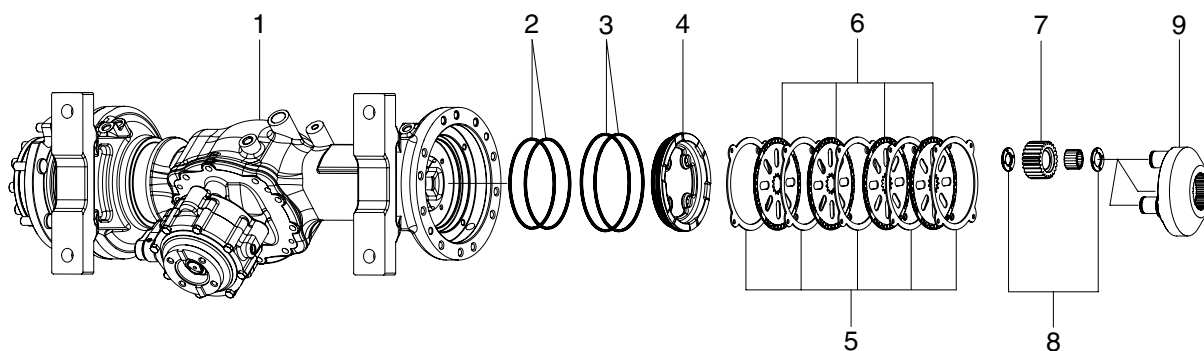
The brake pedal serves to actuate the hydraulic brakes on the drive axle. At the beginning of the pedal stroke, the inching spool of the transmission control valve is actuated to shift the hydraulic clutch to neutral and turn off the driving force. By treading the pedal further, the brake is applied.



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5. WET DISK BRAKE (SERVICE)

1) STRUCTURE



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1	Drive axle housing	4	Piston brake	7	Planet gear
2	Square ring	5	Plate	8	Snap ring
3	Square ring	6	Friction plate	9	Planet shaft

2) OPERATION

Sealed up structure of hydraulic disk brake system secures good brake performance even in the high humid or dusty area.

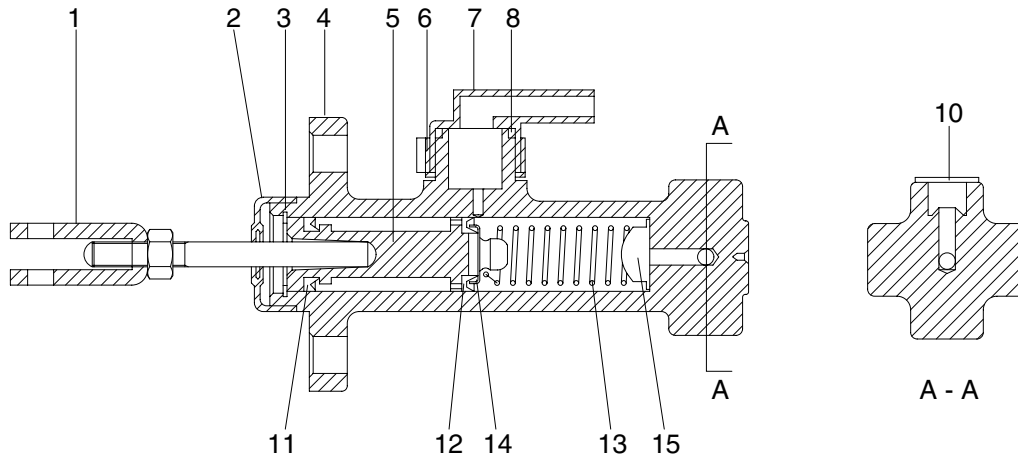
Because it is possible to use the brake semi-permanently, there is no need to replace or change the lining as drum type brake do.

Major components are 6 plates (5), 5 friction plates (6), piston brake (4), and brake housing.

Braking force is applied by restricting the drive force from drive shaft and spline collar.

6. BRAKE VALVE (NON-BOOSTER BRAKE, STD)

1) STRUCTURE



22D9BS04

1	Rod assy	6	Union	13	Spring
2	Boot	7	Elbow	14	Spring seat
3	Snap ring	8	O-ring	15	Spring seat
4	Body	11	Secondary cup		
5	Piston	12	Primary cup		

2) DISASSEMBLY

- (1) Remove the master cylinder boot (2) and remove the rod assy (1).
- (2) Remove the snap ring (3) and take out the piston (5), the secondary cup (11), primary cup (12), spring (13) and spring seat (14, 15).
- (3) Specification of master cylinder.
 - Piston bore diameter : 22.23 mm (0.88")
 - Piston stroke : 28 mm (1.1")
 - Max operating pressure : 150 kgf/cm² (2130 psi)

3) INSPECTION

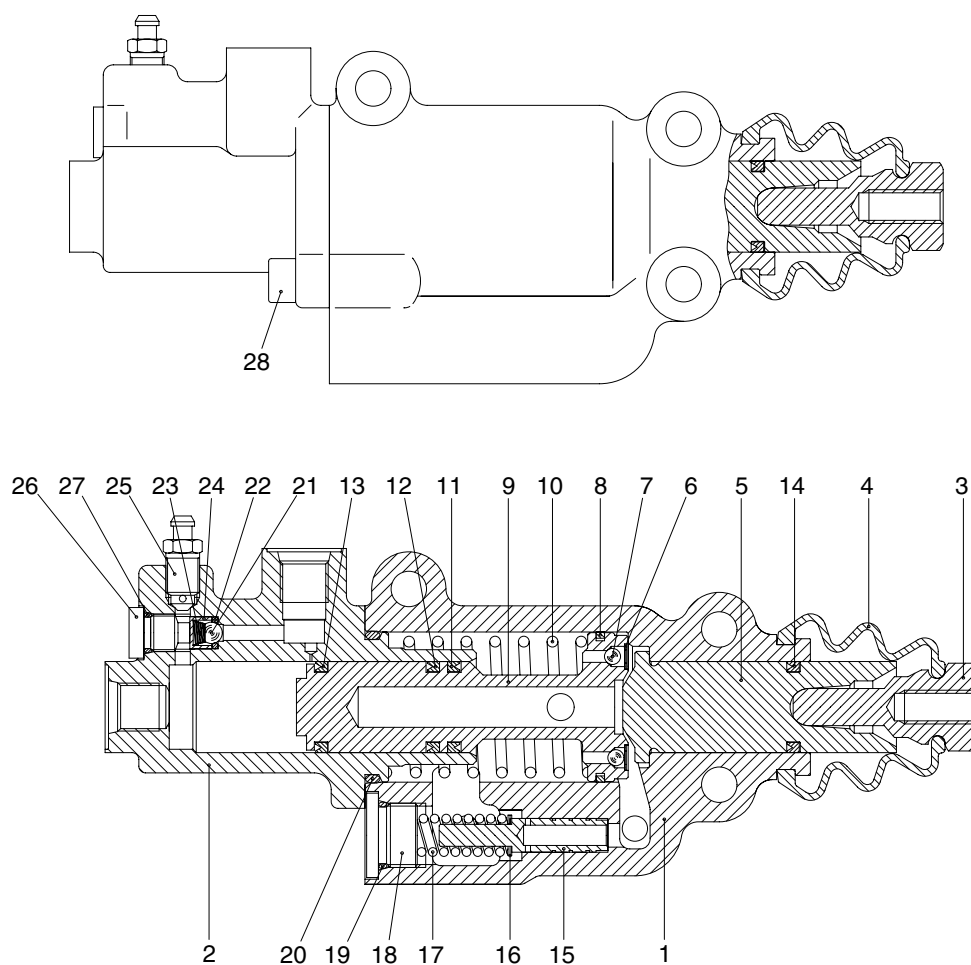
- (1) Clean and check these components.
 - ※ Use Isopropyl alcohol or brake fluid for washing the components. Do not use gasoline, kerosene or any other mineral oils. When using alcohol, do not leave urbber parts in the liquid for more than 30 seconds.
- (2) Inspect the inside wall of the master cylinder, and if any faults are found, replace the cylinder assembly.
- (3) Replace the boot (2), the secondary cup (11), primary cup (12) and piston (5), if deformation or any other defect is found.

4) ASSEMBLY

- ※ Prior to assembly make sure again of no contaminant of the components. Apply a thin coat of brake oil to the components.
- ※ Assembly is in opposite order to disassembly.

7. BRAKE VALVE (BOOSTER BRAKE, OPT)

1) STRUCTURE

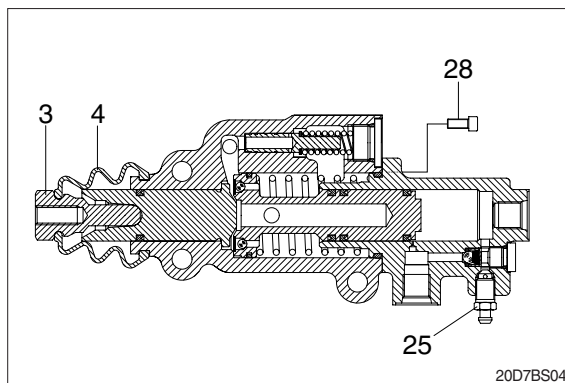


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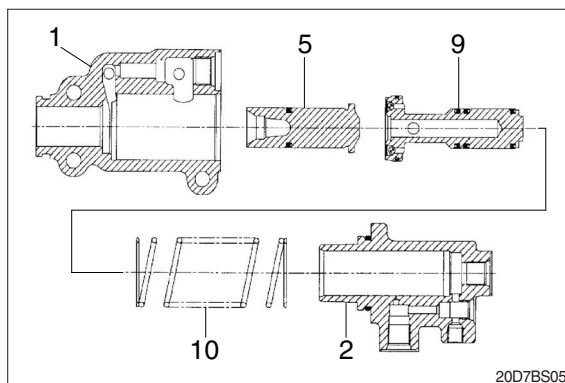
1	Front housing	11	Seal	21	Check ball
2	Rear housing	12	Seal	22	O-ring
3	Push rod	13	Seal	23	Check spring
4	Bellows	14	Seal	24	Cage
5	Master piston	15	Relief piston	25	Air bent
6	Lock washer	16	Shim	26	Check plug
7	Piston ball	17	Relief spring	27	O-ring
8	Piston ring	18	Relief plug	28	Bolt
9	Servo piston	19	O-ring		
10	Servo spring	20	O-ring		

2) DISASSEMBLY

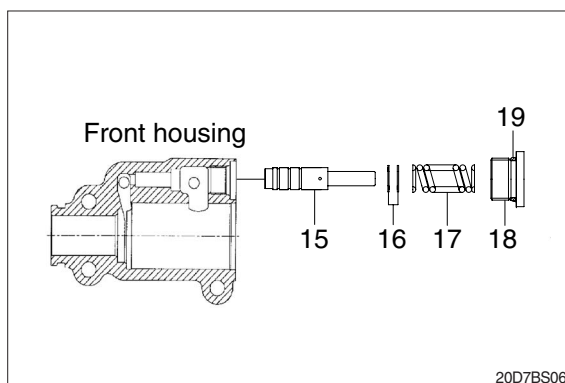
- (1) Remove push rod (3), bellows (4), air vent (25) and bolt (28).



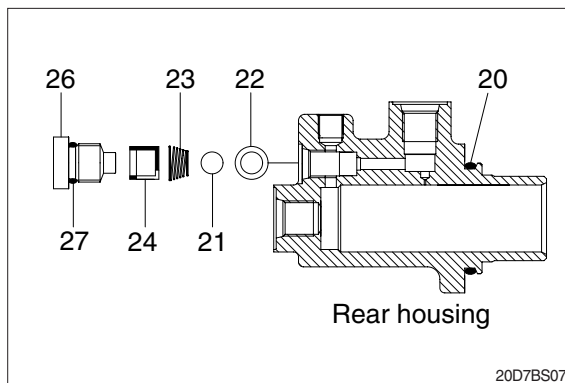
- (2) Remove front housing (1), rear housing (2), servo spring (10), servo piston (9) and master piston (5).



- (3) Remove relief plug (18) with O-ring (19), relief spring (17), shim (16) and relief piston (15).



- (4) Remove O-ring (20), check plug (26) with O-ring (27), cage (24), check spring (23), check ball (21) and O-ring (22).



3) INSPECTION AND ASSEMBLY

- (1) Clean all parts thoroughly and lubricate the parts either with mineral or with hydraulic oil, according to their use destination.
 - (2) All single parts are to be checked for damage and replaced, if required.
 - (3) Assembly is in opposite order to disassembly.
 - (4) Seal kit : XKAU-00176
- ▲ Use only brake fluid (ZS 32, ISO VG 32) into the compensation reservoirs.

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

1) GENERAL INFORMATION

Brake system generate small metal wear particles at a fairly steady rate, especially during the break-in period.

If these fine, but hard particles are allowed to circulate in the lubricant, along with external moisture and dirt, internal components will wear at a much faster rate than normal.

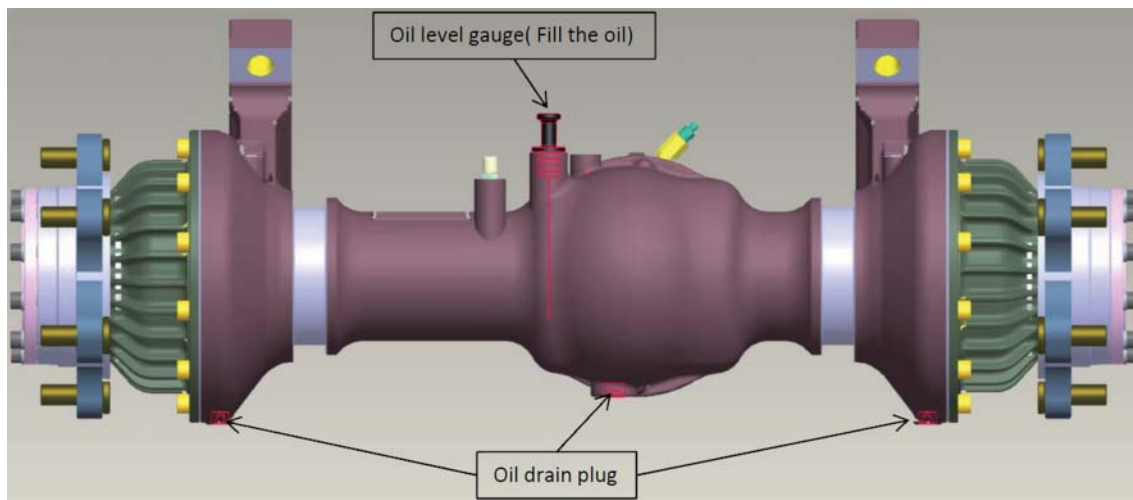
2) BRAKE PIPING

- (1) Check pipes, hoses and joints for damage, oil leakage or interference.
- (2) Operate brake pedal and check operating force when pedal is depressed. Check also change in operating force, and change in position of pedal when pedal is kept depressed.

3) OIL LEVEL

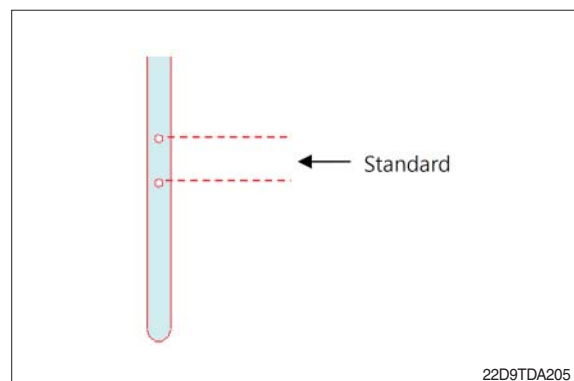
(1) Check and adjust oil

Axle housing has oil level gauge and drain plug.



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- ① Make sure the vehicle is on a level surface.
- ② Pull out oil level gauge from axle, then check the height of oil.
- ③ If the height of oil of level gauge is higher than the upper limit, take oil out by loosening drain plug and keep the standard refer to (2), page 4-9, if the height of oil is lower than the lowest limit, pour oil in to level gauge and keep the standard.



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(2) Oil change

▲ Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only jacks. Jacks can slip and fall over. Serious personal injury can result.

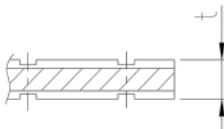

- ① Make sure the vehicle is on level surface.
- ② Raise lift of vehicle and drain oil by loosening drain plug.
- ③ After drain all oil, faster the plug cleaned.
- ④ Fill oil with checking the height of oil by level gauge at the front of vehicle.

(3) Oil capacity and using oil

- ① Oil volume is approximately 5.6 liters. Actual volume will vary by axle model and configuration.
- ② Using Hyundai Genuine axle oil (If use incorrect axle oil, the product has noise and burn-out at component).

4) MAINTENANCE

- (1) Period of check drive axle : 1,000 hrs
- (2) O-ring, oil seal, rubber, gasket : Change all parts at every disassembling, if as necessary.
- (3) Check internal leakage of brake system (Brake seal) : Replace as necessary or every 1,000 hrs
- (4) Friction plate (disk), reaction (steel) plate : Change the part that exceeds the wear limits.

Item		Part no.	Standard	Limit
Friction plate (Disk)		XKCF-01168 (parking)	t=3.5	t=3.05
		XKCF-00591 (service)	t=2.2	t=1.80
Plate (Steel plate)		XKCF-01167 (parking)	t=2.5	t=2.35
		XKCF-00590 (service)	t=1.5	t=1.40

- (5) Bearing : If in doubt about the wear or lack of lubrication, replace the bearing and oil
Check the release bearing the see if it rotates unfreely, use matel cleaner and then recheck.
If it is unfreely again, replace the part
- (6) Spring : Measure free length of spring, If it has deform $\pm 10\%$ over then free length, replace the part
- (7) Gear, shaft : If it is abnormal or change the cross sectional area, you have to change.
- (8) Axle oil change

Recommended initial oil change	100 hrs
Check oil level	Every 250 operating hours
Periodic oil change	Evey 1,000 operating hours

2. TROUBLESHOOTING

1) BRAKE SYSTEM

Problem	Cause	Remedy
1. Insufficient braking force	<ul style="list-style-type: none">• Hydraulic system leaks oil.• Hydraulic system leaks air.• Disk worn.• Brake valve malfunctioning.• Hydraulic system clogged.	<ul style="list-style-type: none">• Repair and add oil.• Bleed air.• Replace.• Repair or replace.• Clean.
2. Brake acting unevenly. (Machine is turned to one side during braking.)	<ul style="list-style-type: none">• Tires unequally inflated.• Brake out of adjustment.• Disk surface roughened.• Wheel bearing out of adjustment.• Hydraulic system clogged.	<ul style="list-style-type: none">• Adjust tire pressure.• Adjust.• Repair by polishing or replace.• Adjust or replace.• Clean.
3. Brake trailing.	<ul style="list-style-type: none">• Pedal has no play.• Piston cup faulty.• Brake valve return port clogged.• Hydraulic system clogged.• Wheel bearing out of adjustment.	<ul style="list-style-type: none">• Adjust.• Replace.• Clean.• Clean.• Adjust or replace.
4. Brake chirps	<ul style="list-style-type: none">• Brake trailing.• Piston fails to return.• Disk worn.• Disk surface roughened.	<ul style="list-style-type: none">• See above. Brake trailing.• Replace.• Replace.• Repair by polishing or replace.
5. Brake squeaks	<ul style="list-style-type: none">• Disk surface roughened.• Disk worn.• Excessively large friction between disk plate.	<ul style="list-style-type: none">• Repair by polishing or replace.• Replace.• Clean and apply brake grease.
6. Large pedal stroke	<ul style="list-style-type: none">• Brake out of adjustment.• Hydraulic line sucking air.• Oil leaks from hydraulic line, or lack of oil.• Disk worn.	<ul style="list-style-type: none">• Adjust.• Bleed air.• Check and repair or add oil.• Replace.
7. Pedal dragging.	<ul style="list-style-type: none">• Twisted push rod caused by improperly fitted brake valve.• Brake valve seal faulty.	<ul style="list-style-type: none">• Adjust.• Replace.

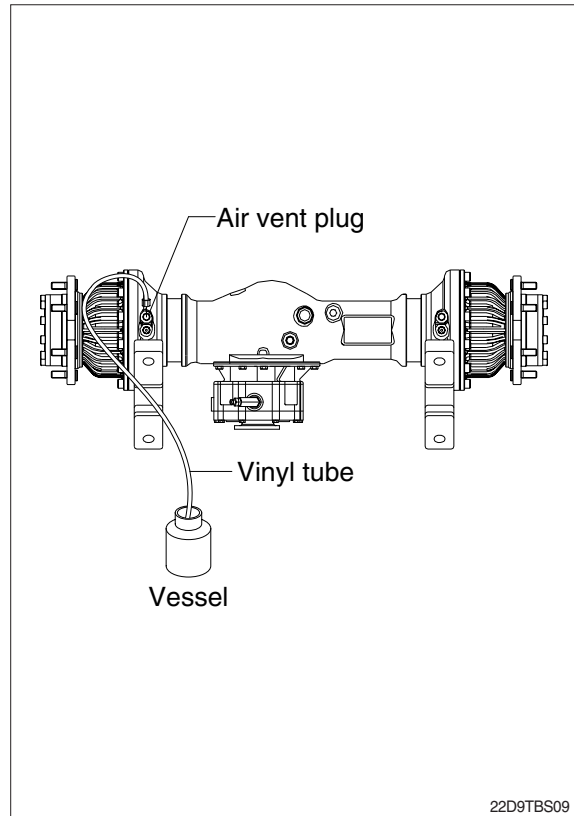
2) BRAKE SYSTEM OF THE DRIVE AXLE

Trouble symptom	Probable cause	Remedy
1. Inoperation of brake 1) Service brake	<ul style="list-style-type: none"> · Non-inject or lack of brake oil · Damage of brake seal · Wrong assemble brake seal · Detect of slide on seal (Axle housing, piston) · Mix particle of slide on seal · Damage of friction plate and plate · Defect of material (or oil line) 	<ul style="list-style-type: none"> · Check oil level, set correct oil volume · Replace piston seal. · After disassembly and adjust or replace part · Replace related part · Wash slide part or replace piston seal · After disassembly and adjust or replace part · After disassembly and replace the part
2) Parking brake	<ul style="list-style-type: none"> · Damage of parking spring · Wrong assembly of parkgin spring · Damage of friction plate and plate 	<ul style="list-style-type: none"> · After disassembly and replace the part · After disassembly and adjust or replace part · After disassembly and adjust or replace part
2. Impossible release of brake 1) Service brake	<ul style="list-style-type: none"> · Failure of return at service brake piston · Damage of friction plate and plate 	<ul style="list-style-type: none"> · After disassembly and adjust or replace part · After disassembly and adjust or replace part
2) Leakage of parking brake	<ul style="list-style-type: none"> · Damage of brake seal · Wrong assemble brake seal · Detect of slide on seal (Axle housing, Pistion) · Mix particle of slide on seal · Defect of material (or oil line) 	<ul style="list-style-type: none"> · After disassembly and replace the part · After disassembly and adjust or replace part · Replace related part · Wash slide part or replace piston seal · After disassembly and replace the part
3. Deterioration of brake	<ul style="list-style-type: none"> · Inadequate actuation fluid supply to brake · Inadequate pressure to apply brakes · Worn or damaged discs · Air enter into brake system · Deform parking spring 	<ul style="list-style-type: none"> · Supply standard oil, replace seal of brake system · Check or replace of brake seal and brake oil line · After disassembly and adjust or replace part · Remove air by air breather · After disassembly and replace the part

GROUP 3 TESTS AND ADJUSTMENTS

1. AIR BLEEDING OF BRAKE SYSTEM

- 1) Air bleeding should be performed by two persons :
One rides on truck for depressing and releasing brake pedal : the other person is on the ground and removes cap from air vent plug on wheel cylinder.
- 2) Block the front wheel securely and apply parking brake.
- 3) Start the engine.
- 4) Attach a vinyl tube to air vent plug and immerse other end of tube into a vessel filled with hydraulic oil.
- 5) Loosen air vent plug by turning it 3/4 with a wrench. Depress brake pedal to drain oil mixed with air bubbles from plug hole.
- 6) Depress brake pedal until no air bubbles come out of air vent plug hole.
- 7) After completion of air bleeding, securely tighten air vent plug. Install cap on plug.



2. ADJUSTMENT OF PEDAL

1) BRAKE PEDAL

(1) Pedal height from floor plate

Adjust with stopper bolt.

· Pedal height

Non booster : 118 mm (4.6 in)

Booster : 119 mm (4.7 in)

(2) Idle stroke

Adjust with rod of master cylinder

· Play : 2~4 mm

2) INCHING PEDAL

(1) Pedal height from floor plate

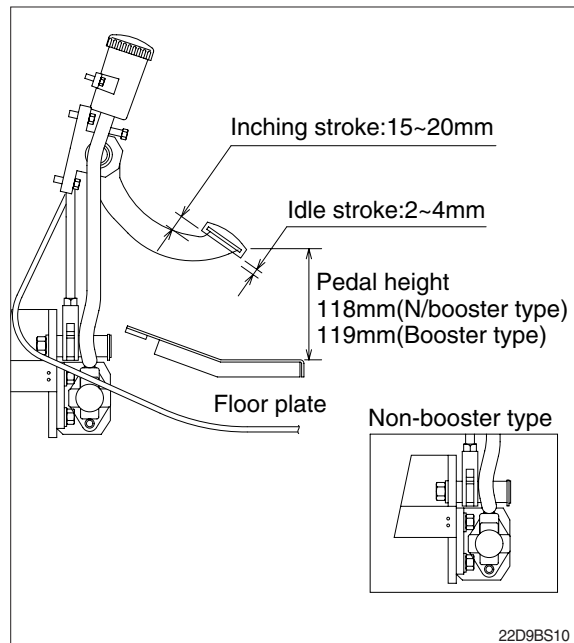
Adjust with stopper bolt.

· Pedal height

Non booster : 118 mm (4.6 in)

Booster : 119 mm (4.7 in)

- (2) Adjust bolt so that brake pedal interconnects with inching pedal at inching pedal stroke 15~20 mm (0.6~0.8 in).



3. PARKING BRAKE RELEASE

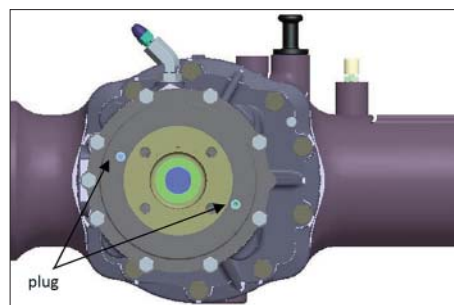
In case of malfunction of transmission, it's hard to supply pressure at parking brake.

Using function of parking force release at carrier sub assembly of drive axle, it is possible to tow the truck.

1) DISASSEMBLE PLUG

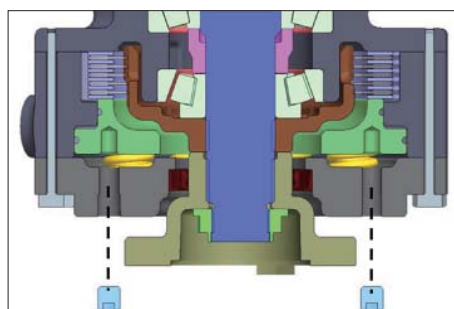
Must wash surrounding plug before disassembly

Tool : Use 5 mm six-angular lenth or bitsocket



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※ Correspond with hole of assembly and tap hole of piston by guide pin.



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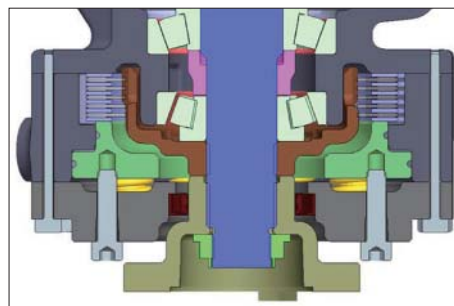
2) ASSEMBLE BOLT OF RELEASED PARKING

(1) Assemble bolt for released parking at hole of plug by disassemble.

Bolt spec : M8x1.25P × 30L

Socket-bolt, S109-080304

(2) Assemble bolt by hand to reach axle housing.



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(3) Tighten two bolt like clockwise rotation.

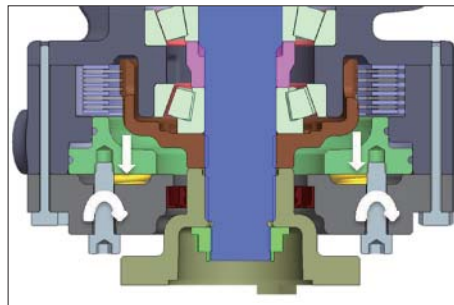
According to the force of tighten bolt, pull piston and release parking brake.

Tool : Use 6 mm six-angular lenth or bitsocket

(4) Rotate 1.5~2 times by clockwise direction, and then release parking brake.

Do not exceed tightening torque 400 kgf-cm

(5) Check parking to rotate flange shaft by hand.



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