

Introduction

This manual main introduces the items in the aspects of performance, structure, and operation, as well as maintenance and service, etc of the rough-terrain forklift trucks, so that the operators are able for a correct use and maintenance.

During the user operating process, the operators and equipment management personal involved shall carefully follow the relevant regulations of this manual, for the forklift truck to maintain its good technical conditions.

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I. Forklift Truck Main Technical Parameters

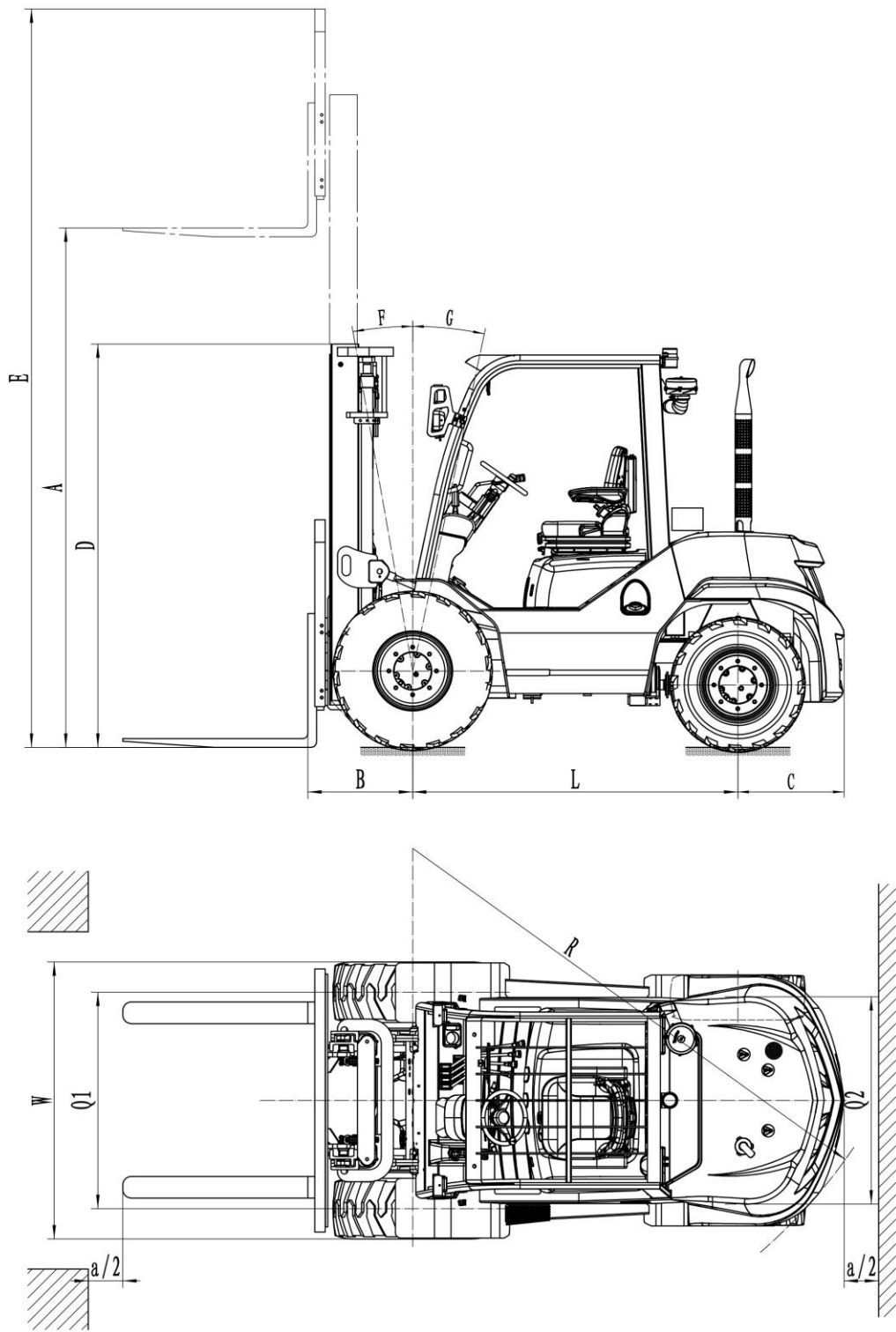


Table 1

Model			R4D25	R4D35
Parameter				
Performance Parameter	Rated Load kg		2500	3500
	Load Center mm		500	
	Lifting Height mm		3000	
	Free Lifting Height mm		165	170
	Mast Tilt Angle Front/Rear		10/12 °	
	Lifting Speed mm/s	Full-Load	600	480
	Running Speed km/h	Hydraulic Truck	Full-Load	19
			No-Load	20
	Max Traction Force	Full-Load N	38000	
	Gradeability	Full-Load %	50	45
	Efficiency of differential lock %		45	45
	Min Turning Radius R mm		3080	

Table 2

Parameter		Model	R4D25	R4D35
Size Parameter	Whole Length L (Without Fork) mm		3070	3085
	Whole Width W mm		1450	1600
	Whole Height D (Mast Retracted) mm		2230	2325
	Whole Height E (Mast Extended with rack) mm		4170	4300
	Wheelbase L mm		1880	
	Wheelbase	Front Q1 mm	1125	1250
		Rear Q2 mm	1198	
	Front Clearance B mm		580	595
	Rear Clearance C mm		605	
	Fork Dimension	Length mm	1070	1220
		Width mm	122	122
		Height mm	40	45
	Fork Horizontal Adjustment Quantity mm		250-1310	250-1500
	Ground Clearance (in the Place of Mast) mm		270	270
	Self weight kg		4850	5460

II. Description about Forklift Truck Main Parts

Power System ——— Gearbox ——— Drive Axle ——— Steering system ——— Braking
system ——— Hydraulic System ——— Lifting System ——— Electrical System

III. Structure, Principle, Adjustment, and Maintenance of Forklift Truck

In order for operators to use, service, and maintain the forklift truck in a better way, the items of such aspects as the structure, principle, adjustment, disassembly and assembly, maintenance, and failure removal, etc related to the forklift truck are now introduced one by one, respectively.

1. Power System

1.1 Engine Overview

At present, the diesel engine used by 1.8-3.5t ordinary rough-terrain forklift is shown in Table 3

Table 3

Model		4TNE98	
Parameter			
Type		4-Stroke, Water-Cooling, Straight-Line, and Valve in Head	
Cylinder	Number of Cylinders – Cylinder Diameter × Stroke	4-98×110	
	Total Displacement	3.319	
	Compression Ratio	21.3	
Rated Power/Speed		42.1kw/2300rpm	
Max Torque/Speed		206N.m/1700rpm	
No-Load Min Speed		750rpm	
Min Fuel Specific Consumption		265 g/kw.h	
Movement Direction		In Clockwise Direction Looking from the End of Fan	
Whole Length × Whole Width × Whole Height		728×526×707	
Weight		225kg	
Working Sequence of Cylinder		1-3-4-2	
Cooling System		Forced Circulation Water Cooling	
Lubricating System		Forced Lubrication	
Main Part	Injection pump	Distributed Type	
	Oil atomizer	Throttling Type	
	Air filter	Paper Filtration	
	Oil pump	Cycloid Pump	
	Water pump	Eddy Current Type	
	Thermostat	Wax Pellet Type	
	Generator	Voltage	12V
		Current	40A
		Method of power generation	AC Generation, and Silicon Rectification
	Starter	Voltage	12
		Output Power	2.3kw
	Battery		12V 90Ah

Refer to their respective engine operation and maintenance manuals for the introduction about homemade engines used for 1.8-3.5t forklift trucks.

The power of engine is mainly transmitted to the transmission system from flywheel through clutch or torque converter, and as engine itself carries working oil pump, it is relatively convenient for engine to replace fan belt.

1.2 Engine Adjustment

It is required to adjust the rotating speed of engine as it produces influence over operating efficiency with both running speed and lifting speed of forklift truck, and the rotating speed of engine shall be adjusted according to the undermentioned methods, if it fails to reach the specified value.

(1) Adjusting idle speed (used for diesel engine)

The speed of diesel engine is controlled by speed limiter of fuel injection pump, and the latter has been properly adjusted on test bed in general, while it can no longer be adjusted after engine is mounted. The steps for adjustment using test bed are given as follows (for reference):



Fig 1-1

a) Control the zero adjustment of gear rack, mount the control rack for measurement device onto the end face of control rack for oil injection pump, and align the zero position of control rack for measurement device with the zero position of graduated scale.

b) Fully tilt the control rod in the direction for fuel to be increased, and ensure that the control rack extends by more than 15mm. Then fully tilt the control rod in the direction for fuel to be stopped, and ensure that the control rack on the graduated scale is less than 1mm.

c) Adjust the oil injection timing and injection speed.

d) Adjust the pressure from the minimum negative pressure.

(2) Examining whether or not air leak exists, by making use of adjusting rack to adjust the negative pressure of oil injection pump in reference to Fig 1-2.

(3) Adjusting the limit of smoke by making use of adjusting screw for limit of smoke, while the operators shall pay attention that please never adjust it for imported engines, when they are basically under normal operating conditions.

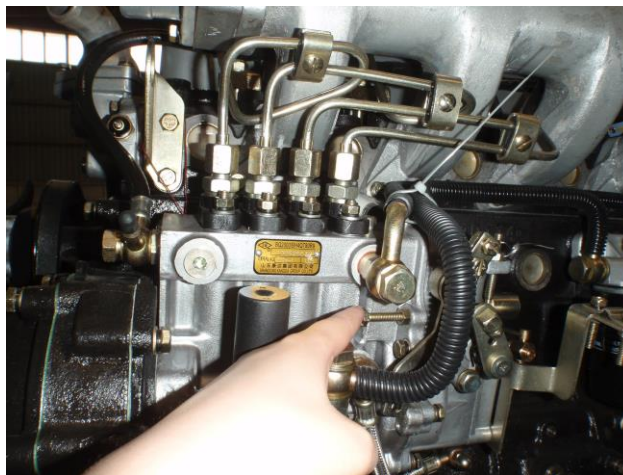


Fig 1-2

1.3 Fuel System

Fuel system is composed of fuel tank, oil quantity sensor, and oil quantity indicator (Fig 1-3 and Fig 1-4).

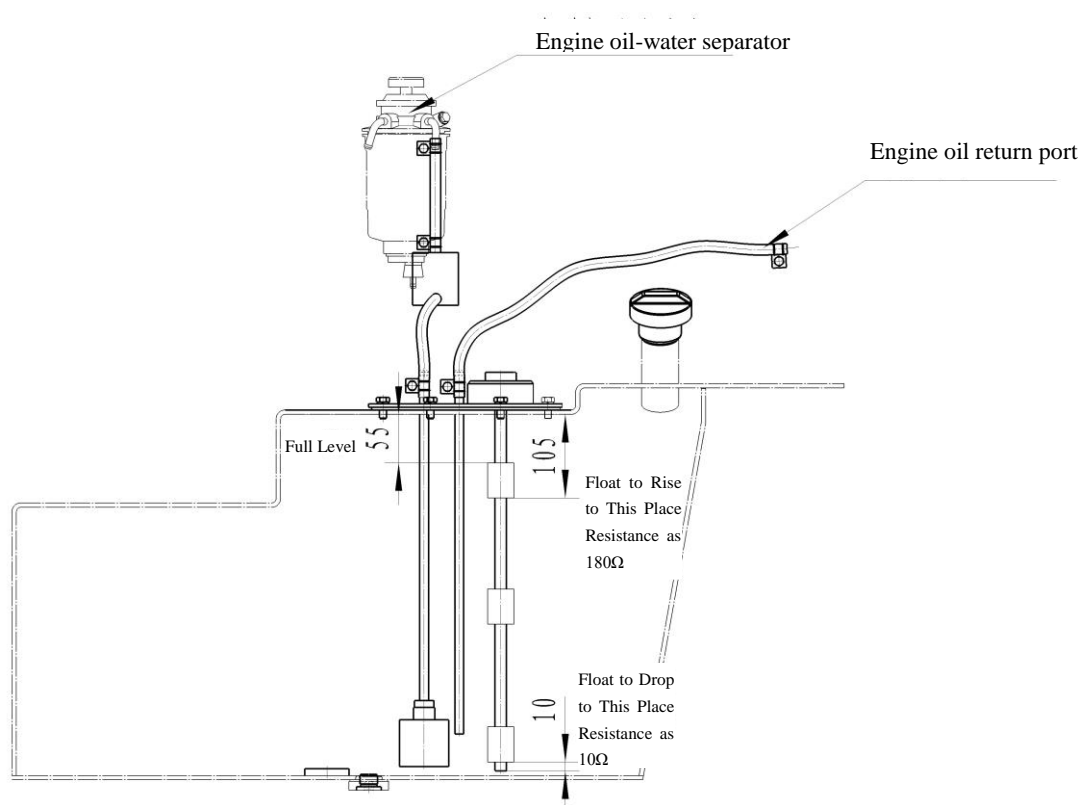


Fig 1-3 Fuel Tank (Diesel Forklift Truck)

1.3.1 Fuel Tank

Fuel tank is an integrated welded structure connected with vehicle chassis into a whole, located on the left side of vehicle chassis. The capacity of 1.8-3.5t ordinary rough-terrain forklift is 55.5L and the fuel quantity sensor is fitted on the tank cover of fuel tank to detect the fuel level.

1.3.2 Fuel Quantity Sensor

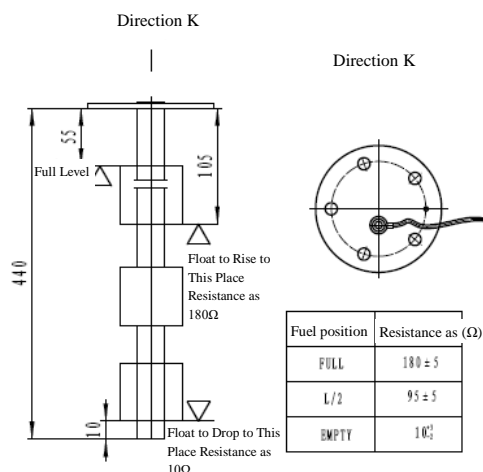


Fig 1-5 Fuel Quantity Sensor

The fuel quantity sensor is used to convert the remaining fuel quantity in fuel tank into voltage, and refer to Fig 1-5. The value of resistance will change, when float moves upward and downward, by making use of alloy steel wire to be fabricated into slide resistance connected with float, and the storage fuel quantity inside fuel tank can be read out from the instrument panel through electromagnetic fuel gauge.

1.3.3 Maintenance of Fuel System

The fuel system is to be maintained and serviced once for every work of 100 hours, with the following method, and the fuel tank shall be cleaned once for every work of 600 hours.

(1) Fuel Filter

Fuel filter is used for remove dust and impurity in fuel, and this fuel filter is located between the fuel tank and the gasoline pump (gasoline engine) or oil delivery pump and oil injection pump (diesel engine).

(2) Service of Diesel Engine Fuel Filter

This filter is in cylindrical type (Refer to Fig 1-6), not detachable generally, and it shall be replaced in complete set if required.

- For every work of 100 hours, dismount the cylindrical shell using special tools, and take out the filter core.
- For every work of 600 hours, the entire filter shall be replaced.
- It is required to pay attention to examining as to whether or not fuel leak exists after reassembly.
- Pay attention to examining the working status of Part 1 overflow valve.

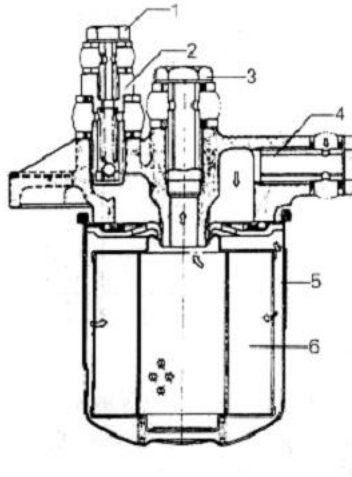


Fig 1-6

(3) Fuel-Water Separator (Sediment Bowl)

As VE oil injection pump is lubricated with fuel internally, water content in fuel must be separated, and therefore sediment bowl is used. If indicator light of fuel-water separator turns on, water shall be drained. (Fig 1-7)

A) Water Drain

Loosen off the fuel drain plug and allow fuel drain plug to drain water manually. Then tighten the fuel drain pump and start the pump for multiple times. It shall be ensured that no fuel leak exists, engine is started, and warning light is turned off. Firmly tighten the fuel drain plug.

B) Air Exhaust

Loosen off the air exhaust plug (overflow valve) of oil injection pump, and press the main pump until no air emits. It shall be ensured that no fuel leak exists.

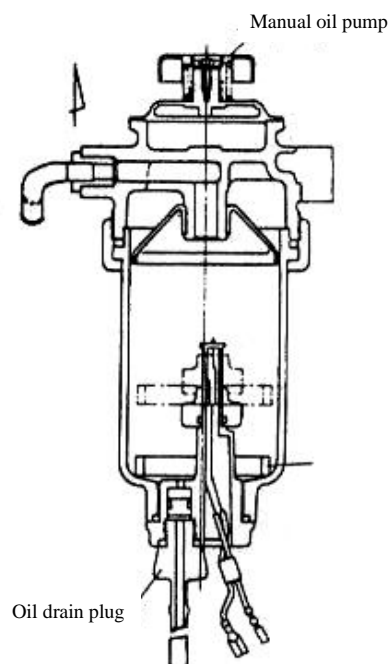


Fig. 1-7

2. Gear box

2.1 Overview

FSDT25/35 rough-terrain forklift truck power transmission system belongs to a new four-wheel drive rough-terrain forklift truck power transmission system, and is mainly composed of FSDT35Igearbox (25/35 universal), FSDT25/35 II transmission box, FSDT25/35 III front main reduction box, and FSDT25/35 IV rear main reduction box, with 2 front and 1 rear gears; the time-sharing four-wheel drive can be realized according to actual needs. The torque converter for FSDT35Igearbox is a single stage, two phase, three work wheels integrated hydraulic torque converter, so that the gearbox is provided with automatic adaptability to hydraulic transmission output, and the output torque and rotational speed can be changed with the change in external load correspondingly; also, it can absorb and eliminate impact vibration onto the transmission system from the engine and external load; an electro-hydraulic shift with inching valve and buffer valve is adopted to make the manipulation simple, convenient and stable while starting, significantly reducing the fatigue strength of operation. The off-axle mechanism is controlled by solenoid valve, and the transformation between two-wheel drive and four-wheel drive is achieved through the hydraulic clutch. FSDT25/35 III front main reduction box and FSDT25/35 IV rear speed reduction box are equipped with differential lock, and can be under automatic control according to the road conditions, greatly improving the off-road capability of the forklift.

2.2 Main technical parameters

Model		FSDT25	FSDT35
Rated power of matching engine Kw		33~40	40~48
Rated speed of matching engine r/min		2000~2650	
Input direction of rotation (for input end)		Clockwise	
Front axle end	F1 gear	8.2011	9.0212
	F2 gear	3.1278	3.4405
	R gear	6.3951	7.0346
Rear axle end	F1 gear	7.7040	7.6543
	F2 gear	2.9382	2.9193
	R gear	6.0075	5.9688
Model of torque converter		YJH265	
Gearbox working oil		L-TSA32GB11120 steam turbine oil /No.6 or 8 hydraulic transmission oil	
Transmission box and main reducer box lubricating oil		85W/90 heavy load gear oil	

2.3 Notes to installation and use

2.3.1 The main oil pressure of the gearbox is 1.1 ~ 1.4 MPa, the oil inlet pressure of the torque converter is 0.4 ~ 0.6 MPa, and the return oil pressure is 0.1 ~ 0.3 MPa.

2.3.2 The working oil temperature of normal oil is 70°C ~ 90°C, the highest working oil temperature does not exceed 120°C, and the duration is not more than 5 minutes.

2.3.3 The working oil should be kept clean, and can not contain impurities; the working oil should be changed after 100 hours of initial work at the normal oil temperature; then, new oil should be changed every 1000 hours or when using after a long time of being discontinued.

2.3.4 The gearbox's working oil level height is checked after 3 minutes since the engine is started, and the oil level height should be within the scope of the oil dipstick; the lubrication oil level height of the transmission case is based on the oil plug in the case; the lubricating oil level height of the front and rear main reduction box will be subject to the axle oil plug.

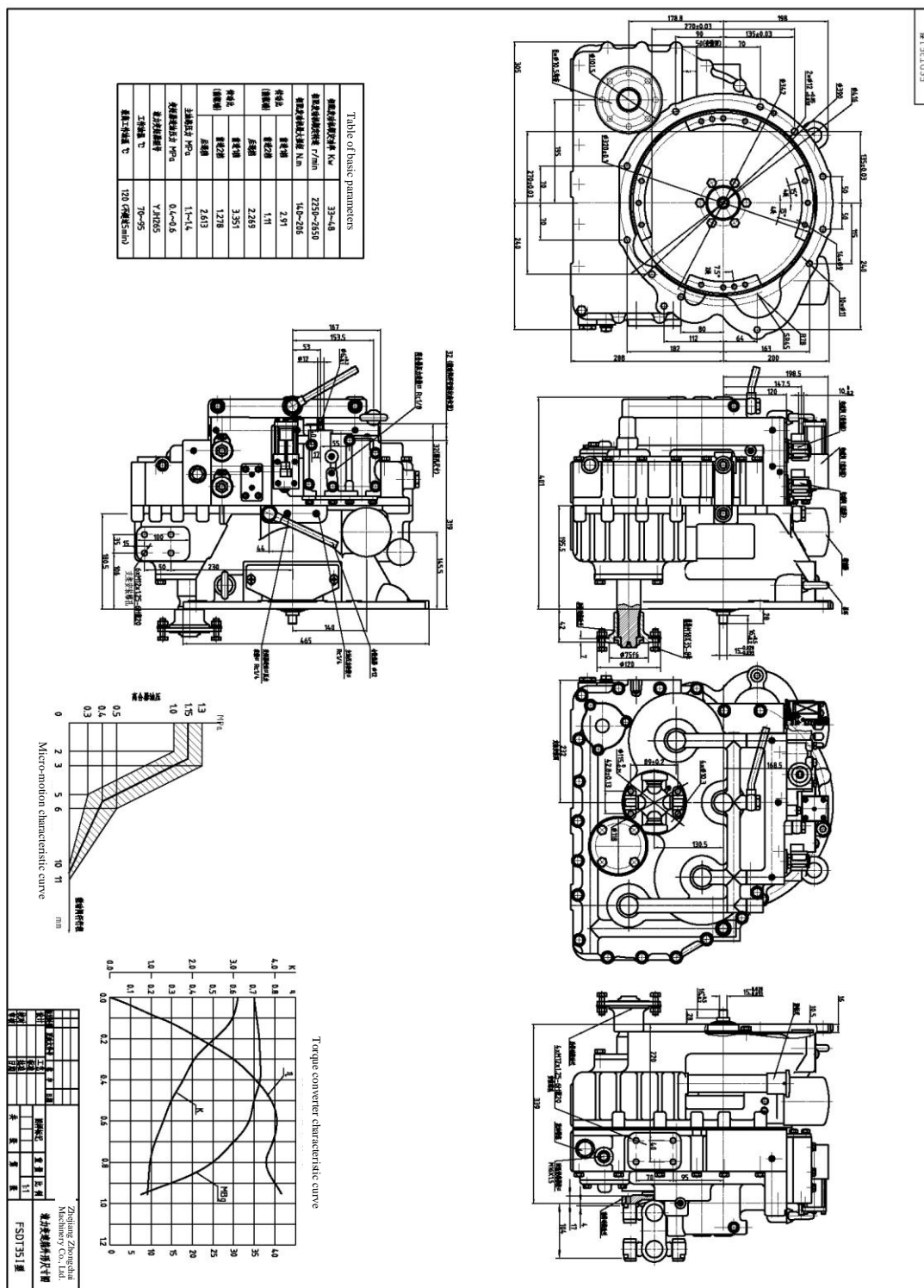
2.3.5 Before the vehicle is shifted, the inching valve should be shut down; before braking, the inching valve must be shut down at first, in order to prevent damage to the clutch or causing brake failure.

2.4 Fault and elimination

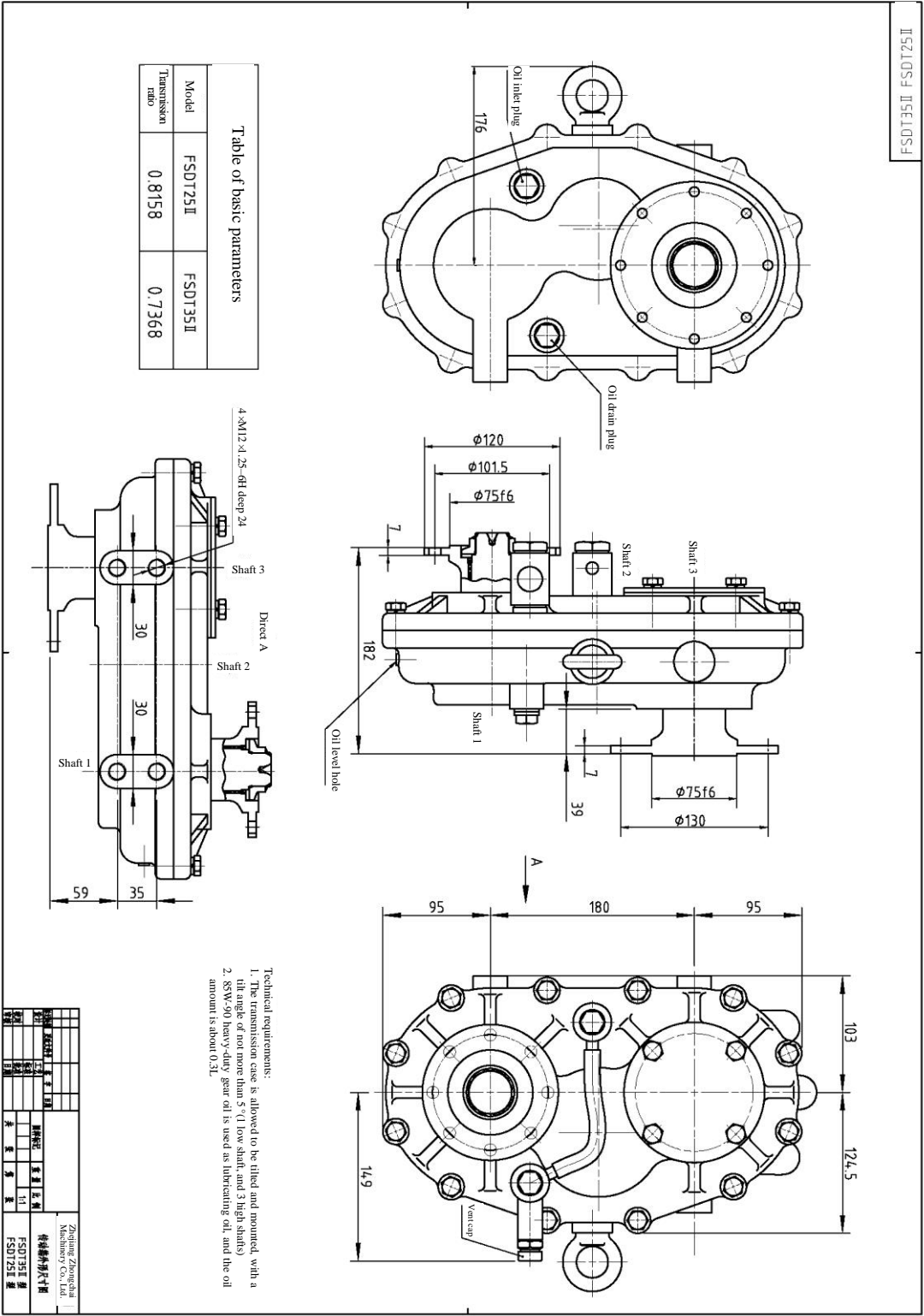
Fault item	Reason for fault and elimination method
Efficiency decreases and oil temperature is too high	1 The friction plate is jammed or worn. Check whether the friction plate is glued, with non-uniform contact or warp. 2 The torque converter is short of oil supply. Check whether the oil pump is worn and whether the oil level is on the normal position. 3 The bearing is damaged. Replace the bearing. 4 Check whether the lubricating oil pipe is blocked. 5 The torque converter's one-way wheel is jammed.
Oil leakage	1 The sealing gasket is broken. Replace the sealing gasket. 2 Rubber parts are aged or damaged. Replace the parts. 3 Some parts are damaged and crack. Replace.
Clutch pressure is low and the swing is too big	1 The oil level is low. Check the oil level and add oil to normal oil level. 2 The sealing ring of input shaft assembly and piston are worn or the wedge is tight at the time of inlet assembly. Attention should be paid to when replacing the sealing ring and assembling. 3. The oil pump is worn. Replace the oil pump. 4 Check whether the inching valve rod is reset.

2.5 Dimensional drawing of shape connection

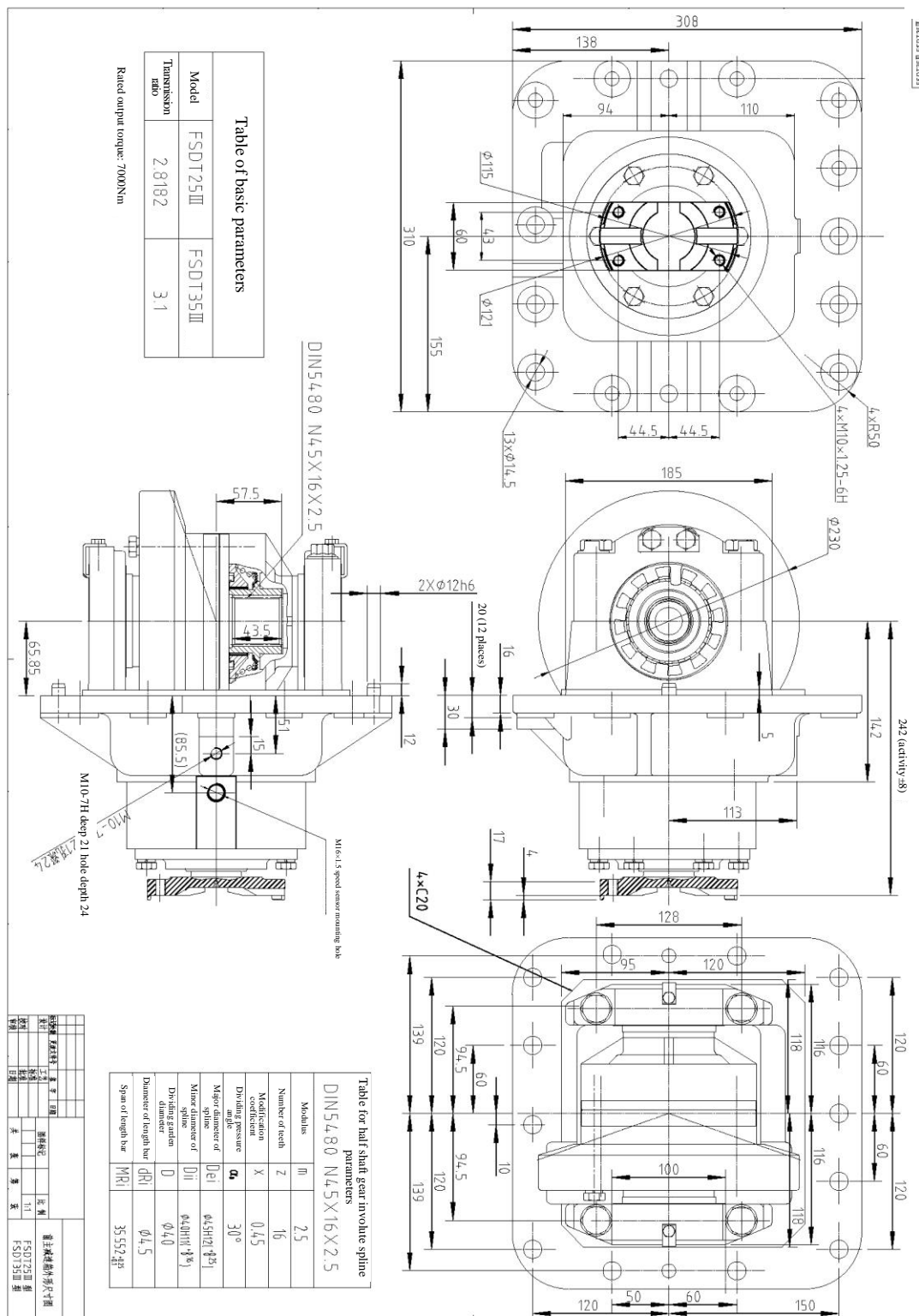
2.5.1 Power transmission system box of FSDT35 rough-terrain forklift truck



2.5.2 Power transmission system gearbox of FSDT35 rough-terrain forklift truck



2.5.3 Power transmission system front main reducer of FSDT35 rough-terrain forklift truck

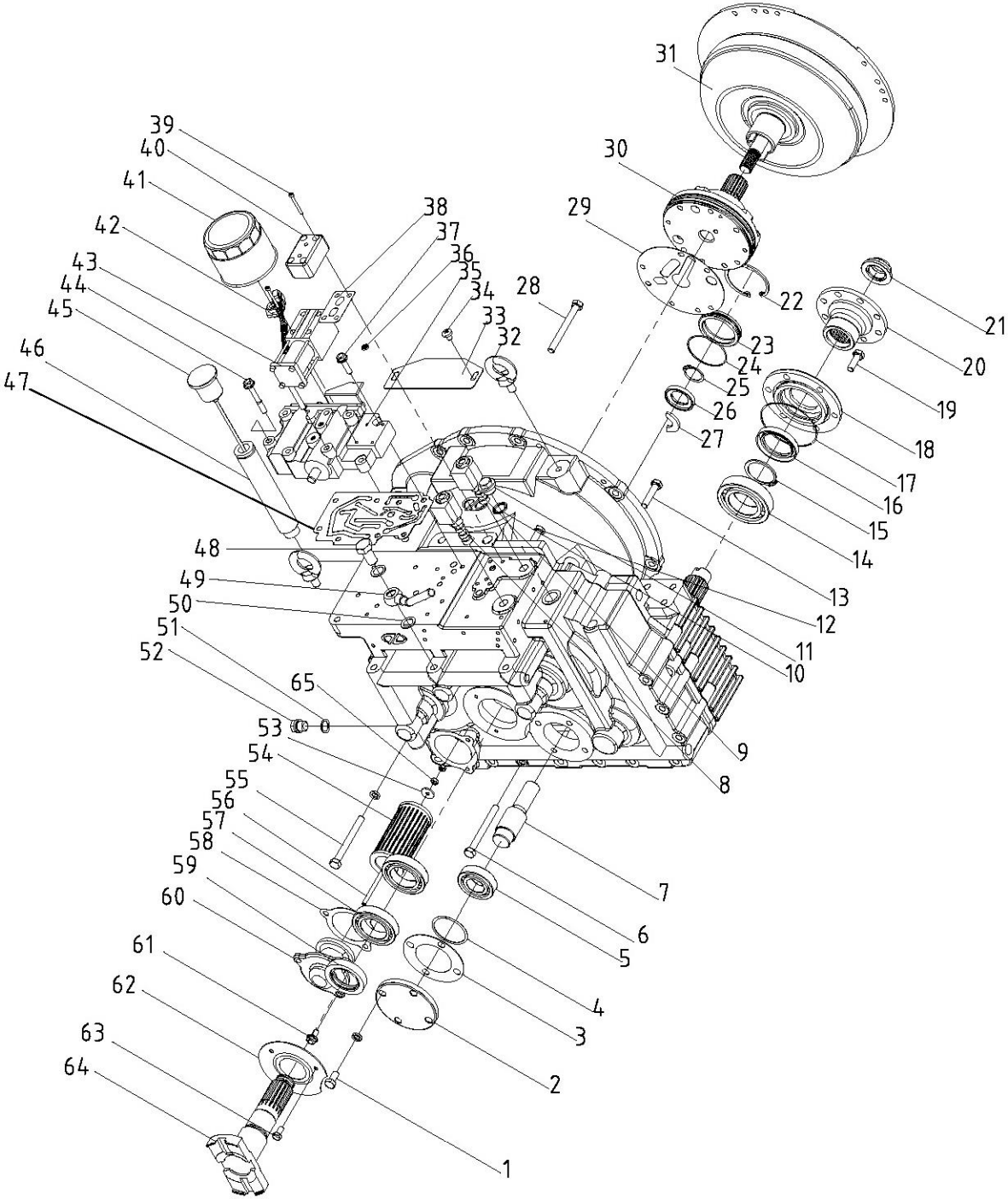


2.6 Parts catalog

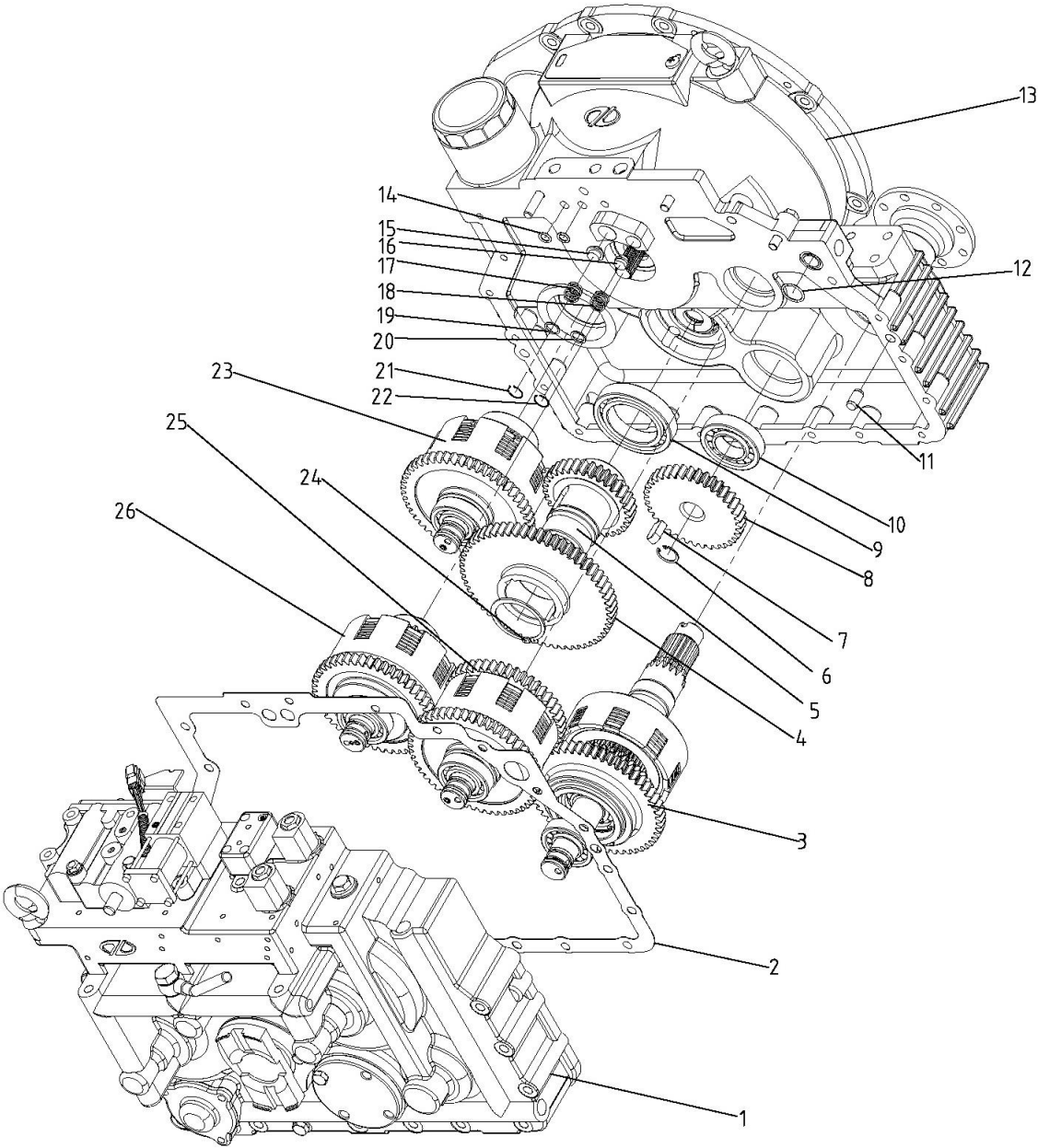
List of box body parts (I)

No.	Figure number or code	Name	Qty.	Remark
1	GB/T5783	Bolt M10*25	4	
2	FSDT35-01004	Idler shaft end cover	1	
3	FSDT35-01015	Idler shaft end cover liner	1	
4	FSDT35-05009	Idler wheel spacer	AR	
5	GB/T276	Bearing 6206	1	
6	GB/T5782	Bolt M10*105	6	
7	FSDT35-05004	Idler shaft	1	
8	SV08-33-V-12-DL	Plug-in solenoid valve	1	
9	SV08-40-V-12-DL	Plug-in solenoid valve	1	
10	JB/T982	Combined sealing washer 20	1	
11	SDT30-01021	Oil port plug screw	1	
12	GB/T5783	Bolt M10*30	1	
13	GB/T5783	Bolt M10*45	3	
14	GB/T276	Bearing 6210	1	
15	GB/T894.1	Retaining ring for shaft 50	1	
16	JDS45-04012	Oil seal 50*70*10	1	
17	GB1235	O ring 100*3.1	1	
18	FSDT35-01003	Off-axle shaft end cover	1	
19	GB/T5783	Bolt M10*25	6	
20	FSDT35-06003	Off-axle flange	1	
21	FSDT35-06004	Locknut	1	
22	GB/T893.1	Retaining ring for hole 72	1	
23	FSDT35-01008	Oil sealing end cover	1	
24	GB1235	O ring 70*3.1	1	
25	GB/T894.1	Retaining ring for shaft 30	1	
26	FSDT35-05007	Limit baffle ring	1	
27	FSDT35-05006	Semicircle baffle ring	2	
28	GB/T5782	Bolt M10*80	2	
29	SDT30-05003	Oil supply pump liner	1	
30	SDT30-05000	Oil supply pump assembly	1	
31	SDT30-06000-1	Torque converter assembly	1	
32	GB/T825	Lifting bolt M12	2	
33	SDT30-01024	Torque converter shell cover	1	
34	GB/T818	Screw M8*10	2	
35	SDT30-07200	Electro-hydraulic control valve body	1	
36	Y30H-07020	Filter screen	1	
37	GB/T5789	Bolt M8*30	2	
38	FSDT35-01014	Transition block liner	1	

39	GB/T70.1	Screw M6*35	4	
40	FSDT35-01005	Transition block	1	
41	Y30H-07010	Filter (II)	1	
42	Y30H-07002	Pipe joint	1	
43	Y30H-D07300	Solenoid valve	1	
44	GB/T5789	Bolt M8*60	4	
45	Y30H-01007A	Refuelling filler cap	1	
46	FSDT35-01007-1	Dipstick seat	1	
47	SDT30-07015	Electro-hydraulic control valve gasket	1	
48	SDT30-01018	Hinged Bolt	2	
49	SDT30-01019	Cooling output pipe component	2	
50	SDT30-01020	Bolt gasket	4	
51	JB/T982	Combined sealing washer 16	2	
52	Y30H-01011	Oil outlet plug screw	2	
53	GB/T5287	Flat washer 6	1	
54	Y30H-01102	Filter screen assembly	1	
55	GB/T5782	Bolt M10*100	9	
56	SDT30-01007	Stud	1	
57	GB/T276	Bearing 6009	2	
58	SDT30-01005	Coarse filter liner	1	
59	SDT30-03003	Oil seal 45*68*12	1	
60	SDT30-01004	Coarse filter shell	1	
61	GB/T5789	Bolt M8*16	3	
62	FSDT35-01009	Dust cover	1	
63	GB/T5783	Bolt M6*12	3	
64	FSDT35-05001	Output flange	1	
65	GB/T6170	Nut 6	2	

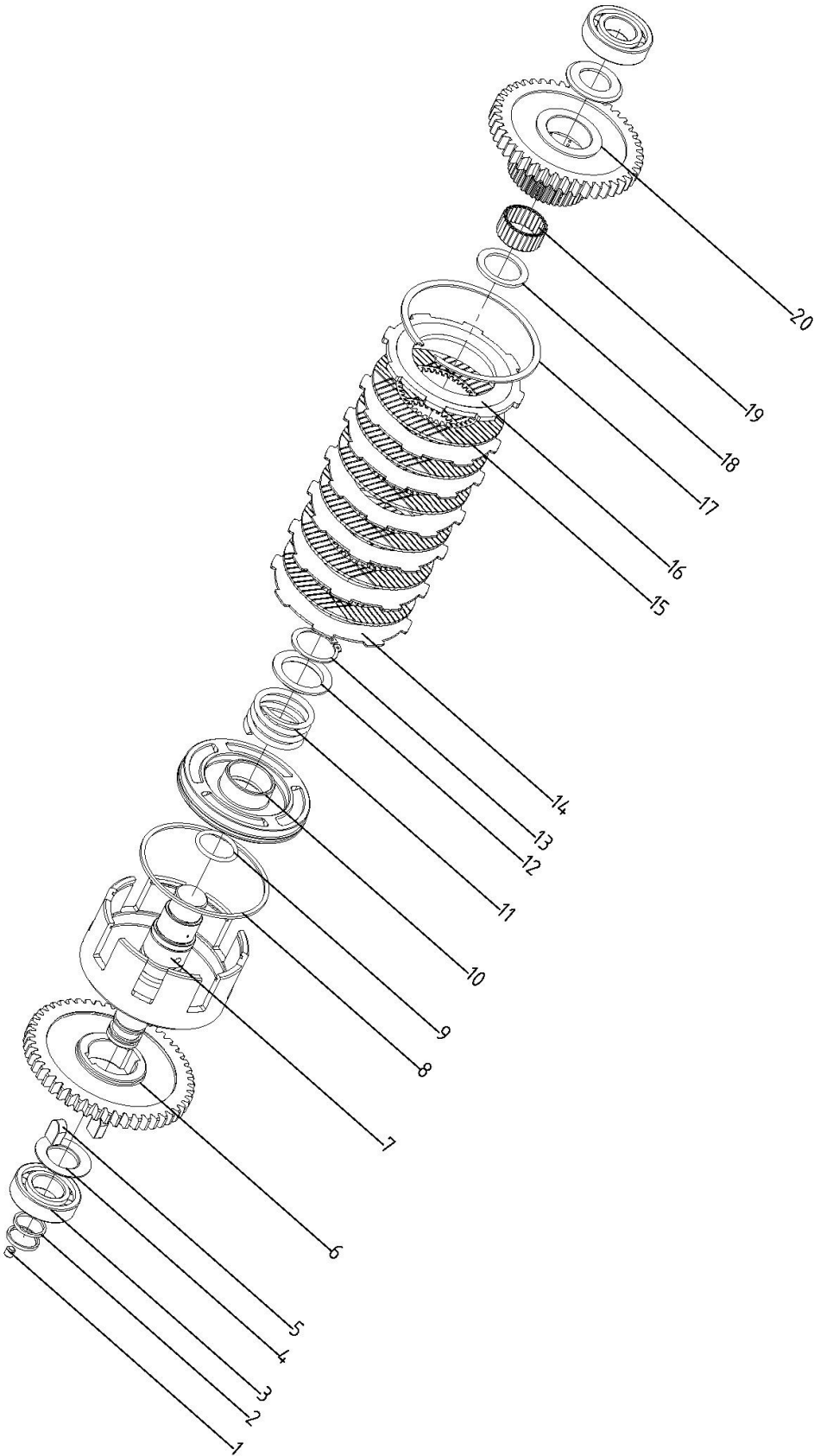


List of box body parts (II)				
No.	Figure number or code	Name	Qty.	Remark
1	FSDT35-01001	Box body	1	
2	FSDT35-01006	Torque converter housing gasket	1	
3		Off-axle clutch assembly	1	
4	FSDT35-05003	Output gear	1	
5	FSDT35-05002	Output transmission gear	1	
6	GB/T893.1	Retaining ring for hole 24	1	
7	FSDT35-05008	Key C14*28*9	2	
8	FSDT35-05005	Idle wheel	1	
9	GB/T276	Bearing 6012	1	
10	GB/T283	Bearing NF207	1	
11	GB/T119.1	Cylindrical pin 12*20	2	
12	GB1235	O ring 28*2.4	1	
13	FSDT35-01002	Torque converter housing	1	
14	GB1235	O ring 15*2.4	2	
15	SDT30-01010	Overflow valve element	1	
16	SDT30-01011	Safety valve element	1	
17	SDT30-01013	Overflow valve spring	1	
18	SDT30-01014	Safety valve spring	1	
19	GB/T848	Flat washer 10	1	
20	SDT30-01015	Safety valve pad	1	
21	GB/T893.1	Retaining ring for hole 22	1	
22	GB/T893.1	Retaining ring for hole 18	1	
23		Low-speed clutch assembly	1	
24	GB/T894.1	Retaining ring for shaft 60	1	
25		Input shaft clutch assembly	1	
26		High-speed clutch assembly	1	



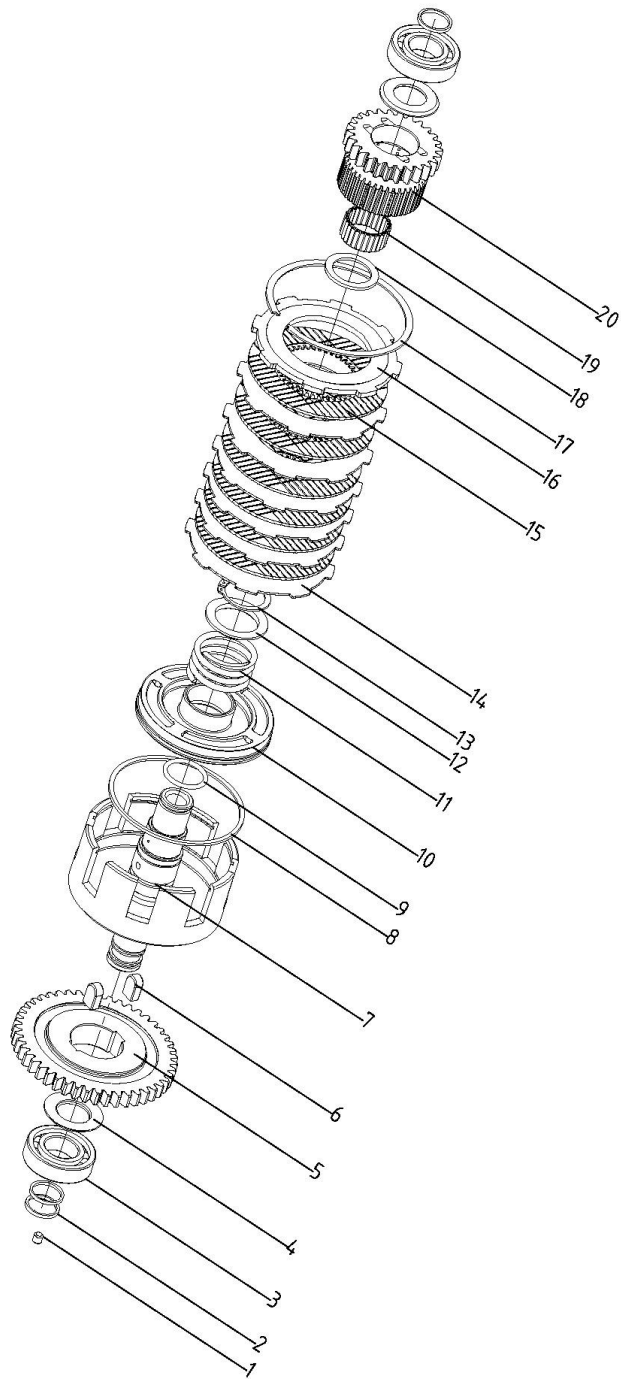
List of high speed shaft parts

No.	Figure number or code	Name	Qty.	Remark
1	GB /T78	Screw M8×8	1	
2	Y30H-02009	Sealing ring (A)	3	Imported
3	GB /T276	Deep groove ball bearing 6206	2	NTN
4	Y30H-02006	Thrust ring (B)	2	
5	FSDT35-02004	Driven transmission gear	1	
6	SDT30-03001	Key C14×22×9	2	
7	SDT30-04100	Countershaft assembly	1	
8	Y30H-02010	Sealing ring (B)	1	
9	GB1235	O sealing ring 40×3.5	1	
10	SDT30-02200	Piston assembly	1	
11	SDT30-02003	Return spring	1	
12	Y30H-02004	Spring seat	1	
13	GB/T894.1	Retainer ring 40	1	
14	Y30H-02008	Spacer	6	
15	Y30H-02007	Friction plate	6	Imported
16	Y30H-02012	End plate	1	
17	Y30H-02011A	Snap ring	1	
18	Y30H-02005	Thrust ring (A)	1	
19	JB/T7918	Needle roller bearing K35×42×20	1	
20	FSDT35-04002	High speed gear	1	



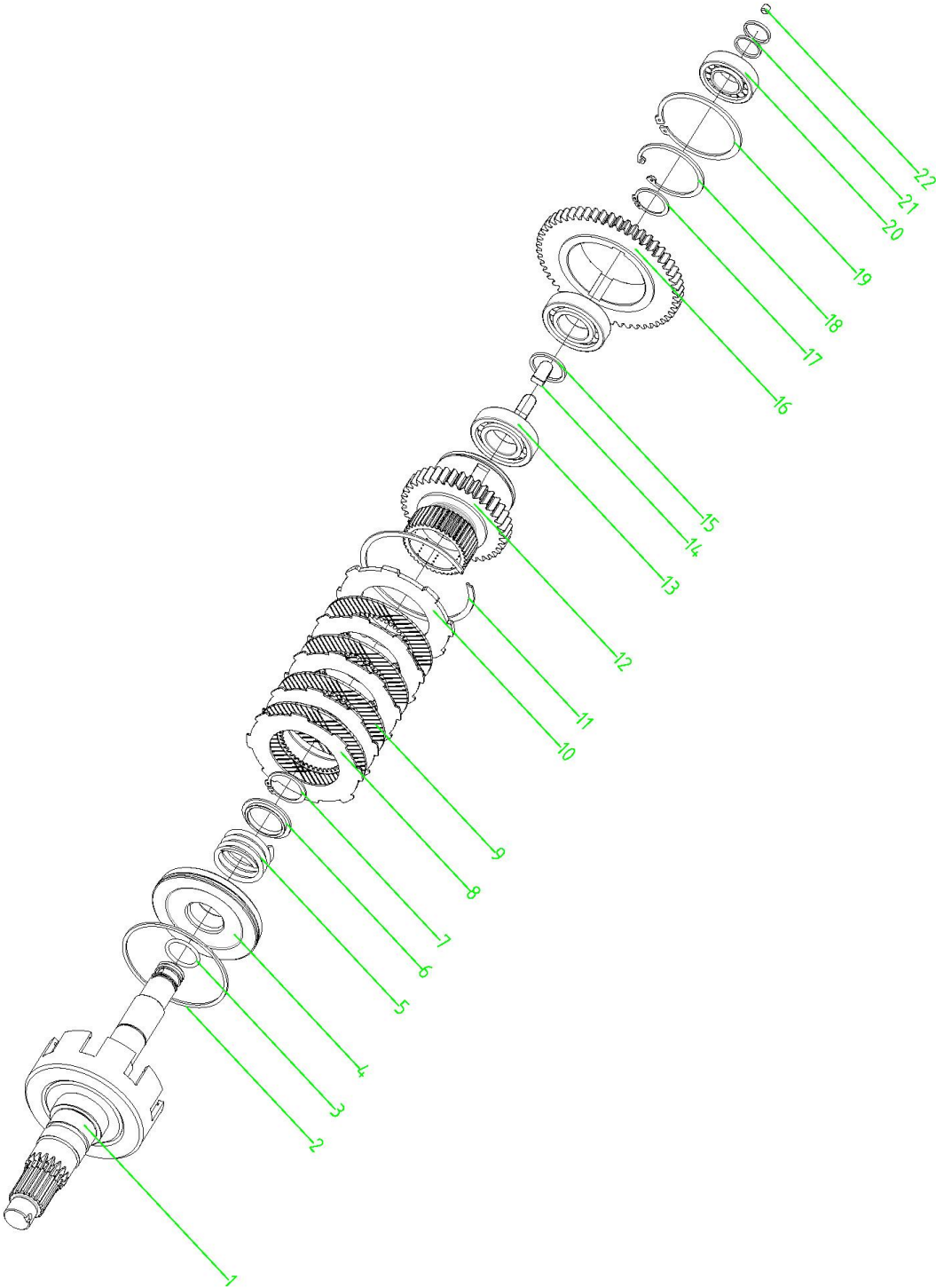
List of input speed clutch components

No.	Figure number or code	Name	Qty.	Remark
1	GB /T78	Screw M8×8	1	
2	Y30H-02009	Sealing ring (A)	3	Imported
3	GB /T276	Deep groove ball bearing 6206	2	NTN
4	Y30H-02006	Thrust ring (B)	2	
5	FSDT35-02001	Driving transmission gear	1	
6	SDT30-02004	Key C14×22×9	2	
7	SDT30-02100	Input shaft assembly	1	
8	Y30H-02010	Sealing ring (B)	1	
9	GB1235	O sealing ring 40×3.5	1	
10	SDT30-02200	Piston assembly	1	
11	SDT30-02003	Return spring	1	
12	Y30H-02004	Spring seat	1	
13	GB/T894.1	Retainer ring 40	1	
14	Y30H-02008	Spacer	6	
15	Y30H-02007	friction plate	6	Imported
16	Y30H-02012	End plate	1	
17	Y30H-02011A	Snap ring	1	
18	Y30H-02005	Thrust plate (A)	1	
19	JB/T7918	Needle roller bearing K35×42×20	1	
20	FSDT35-02002	Backward gear	1	



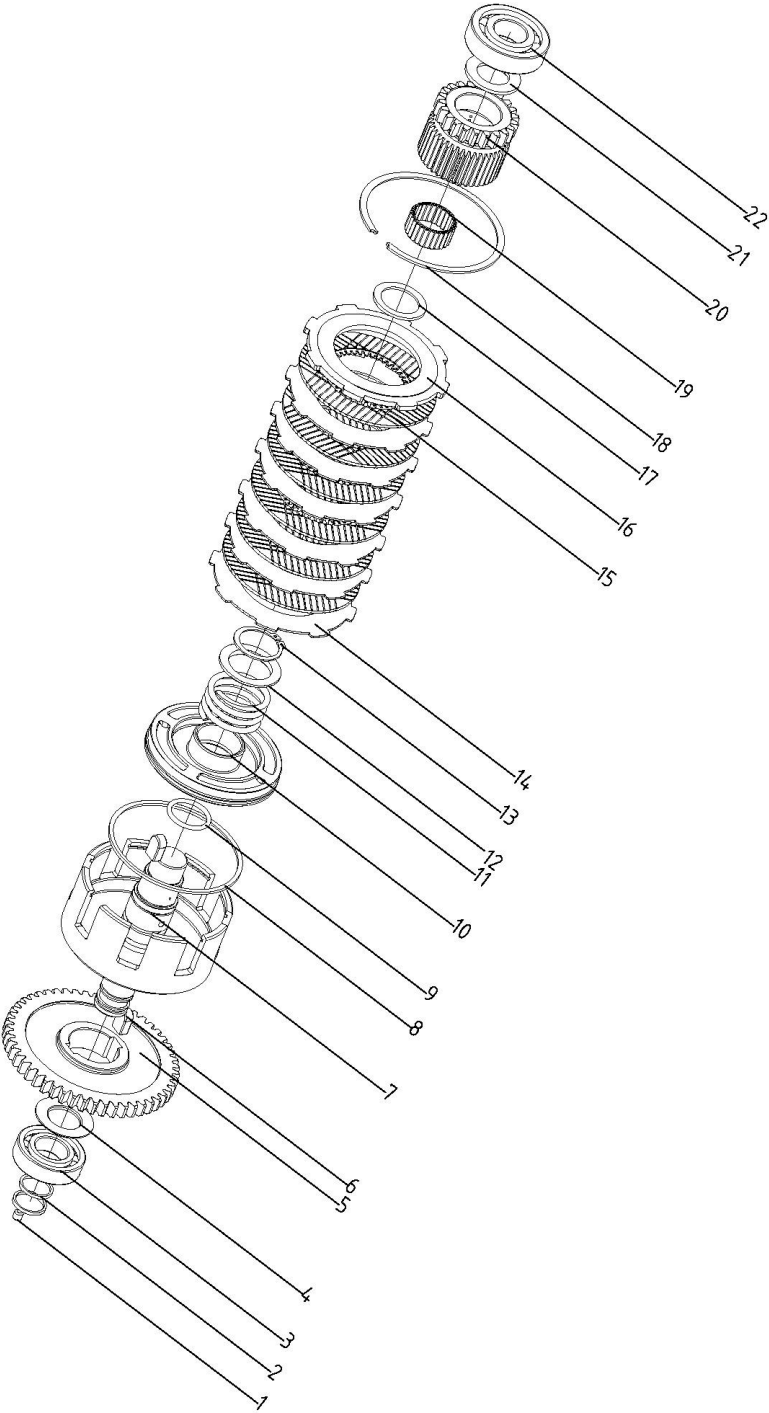
List of high speed shaft parts

No.	Figure number or code	Name	Qty.	Remark
1	FSDT35-06100	Off-axle shaft assembly	1	
2	Y30H-02010	Sealing ring (B)	1	
3	GB 1235	O sealing ring 40×3.5	1	
4	SDT30-02200	Piston assembly	1	
5	SDT30-02003	Return spring	1	
6	Y30H-02004	Spring seat	1	
7	GB /T894.1	Retainer ring 40	1	
8	Y30H-02008	Spacer	6	
9	Y30H-02007	friction plate	6	NTN
10	Y30H-02012	End plate	1	
11	Y30H-02011A	Snap ring	1	
12	FSDT35-06002	Off-axle gear	1	
13	GB/T276	Deep groove ball bearing 6207	2	
14	FSDT35-05008	Key C14×28×9	2	
15	FSDT35-06005	Gasket	1	Imported
16	FSDT35-06002	Top gear drive gear	1	
17	GB /T894.1	Retaining ring for shaft 35	1	
18	GB /T893.1	Retaining ring for hole 72	1	
19	GB /T894.1	Retaining ring for shaft 90	1	
20	GB /T283	Cylindrical roller bearing NJ206	1	
21	Y30H-02009	Sealing ring (A)	2	Imported
22	GB /T78	Screw M8×8	1	

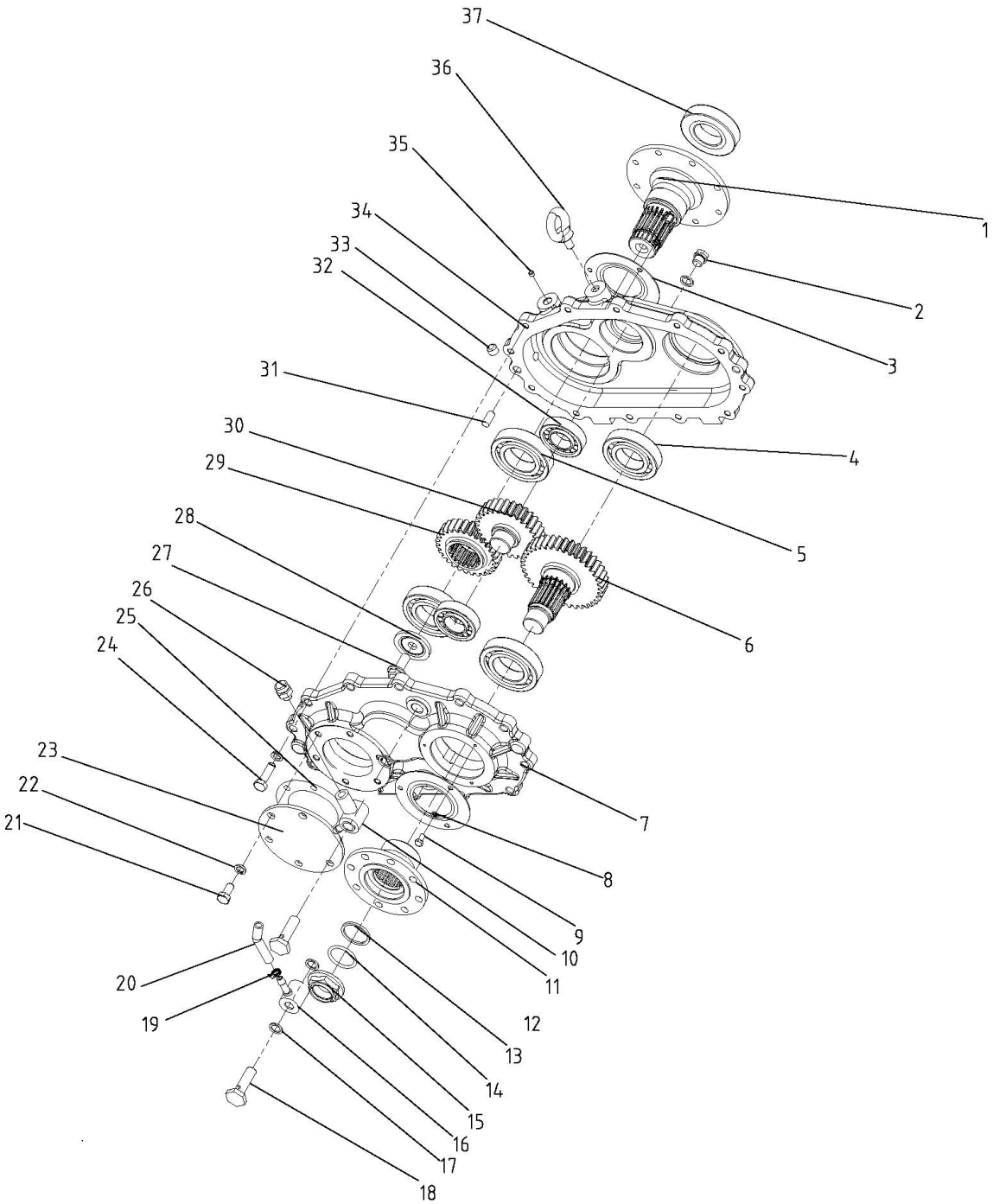


List of low speed shaft parts

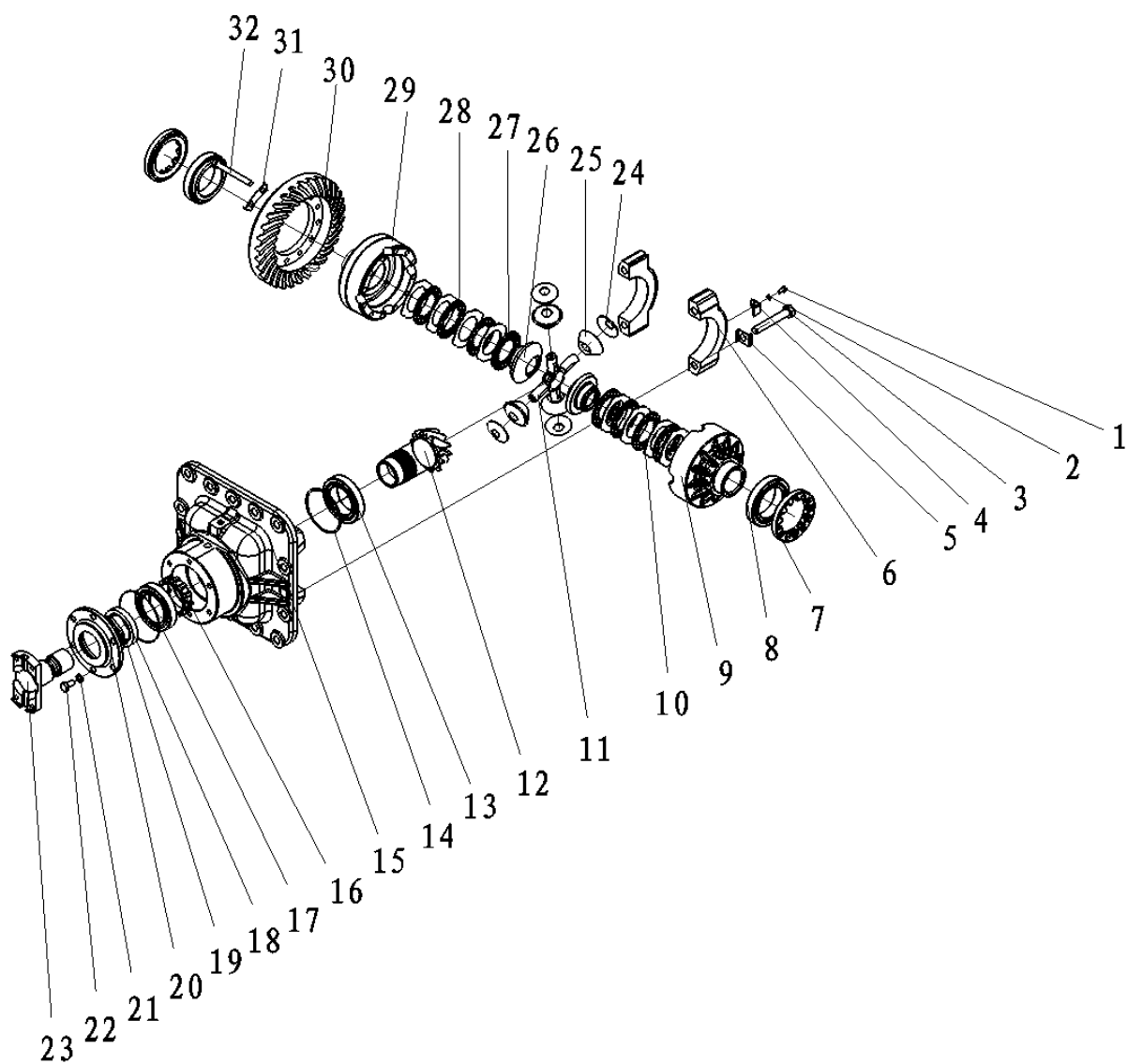
No.	Figure number or code	Name	Qty.	Remark
1	GB /T78	Screw M8×8	1	
2	Y30H-02009	Sealing ring (A)	3	Imported
3	GB /T276	Deep groove ball bearing 6206	1	NTN
4	Y30H-02006	Thrust ring (B)	1	
5	FSDT35-03001	Driven transmission gear	1	
6	SDT30-02004	Key C14×22×9	2	
7	SDT30-04100	Countershaft assembly	1	
8	Y30H-02010	Sealing ring (B)	1	
9	GB1235	O sealing ring 40×3.5	1	
10	SDT30-02200	Piston assembly	1	
11	SDT30-02003	Return spring	1	
12	Y30H-02004	Spring seat	1	
13	GB/T894.1	Retainer ring 40	1	
14	Y30H-02008	Spacer	6	
15	Y30H-02007	Friction plate	6	Imported
16	Y30H-02012	End plate	1	
17	Y30H-02005	Thrust plate (A)	1	
18	JB/T7918	Needle roller bearing K35×42×20	1	
19	Y30H-02011A	Snap ring	1	
20	FSDT35-03002	Low speed gear	1	
21	FSDT35-03003	Thrust ring	1	
22	GB/T276	Deep groove ball bearing 6306	1	NTN



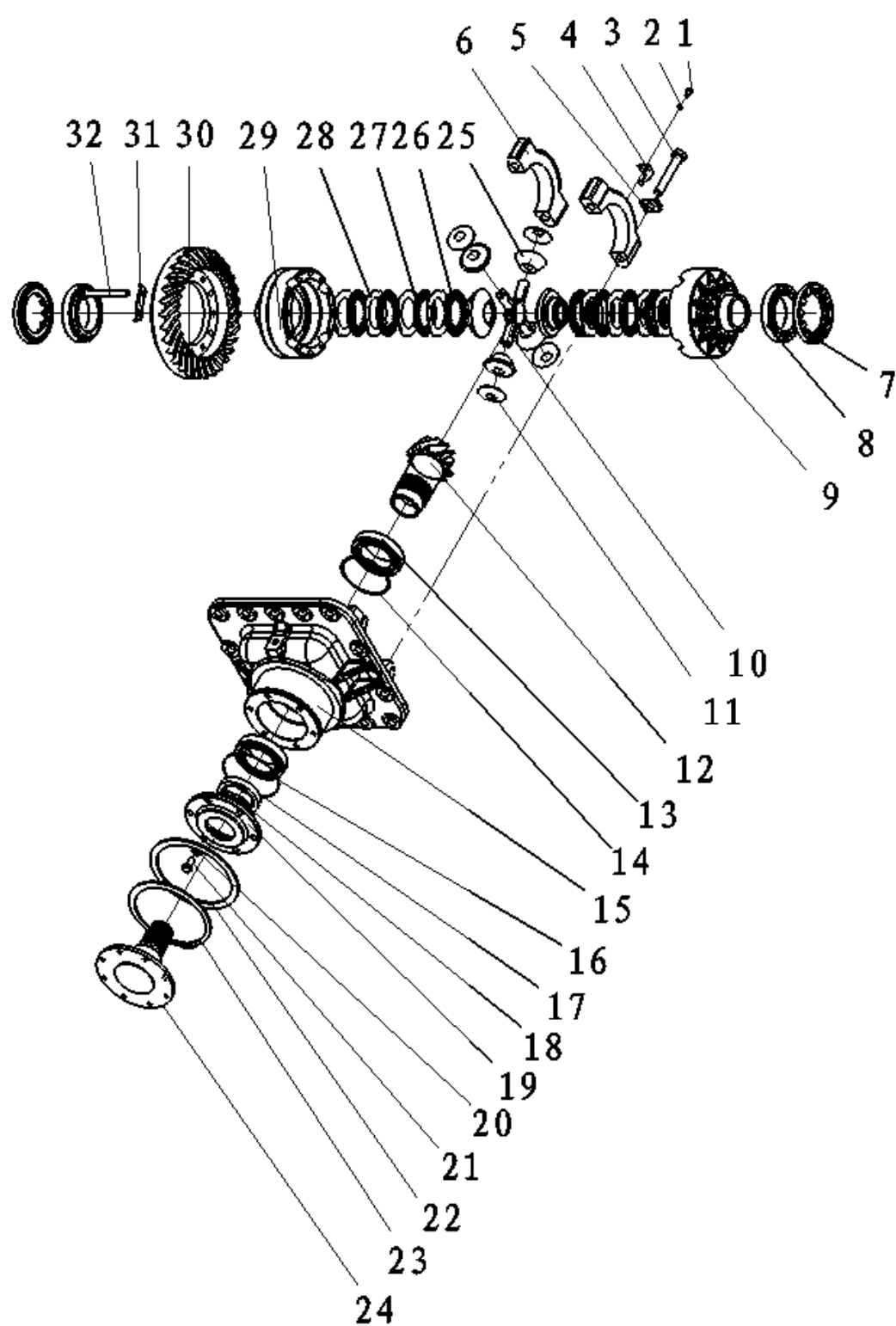
List of transmission parts				
No.	Drawing No. (Code)	Name	Qty.	Remark
1	FSDT35-07007	Transmission case output flange	1	
2	Y30H-01011	Oil outlet plug screw	2	
3	FSDT35-07009	Dust cover	2	
4	GB/T276	Deep groove ball bearing 6208	2	
5	GB/T276	Deep groove ball bearing 6209	2	
6	FSDT35-07005	Transmission case output gear	1	
7	FSDT35-07002	Transmission case housing	1	Distinguish 25/35
8	GB/T93	Spring washer 6	6	
9	GB/T5783	Bolt M6*12	6	
10	FSDT35-07010	Hinged ventilation block	1	
11	FSDT35-06003	Off-axle flange	1	
12	J30H-01100-1	Ventilation plug assembly	1	
13	FSDT35-06005	Gasket	1	
14	GB/T345201	O ring 34.5*3.55	1	
15	FSDT35-06004	Locknut	1	
16	FSDT35-07010-1	Hinged ventilation block	1	
17	JB982-77	Combined sealing washer 16	6	
18	FSDT35-07011	Hinged Bolt	2	
19	Φ12	Hoop	2	
20	Φ10	Hose	1	
21	GB/T5783	Bolt M10*16	6	
22	GB/T93	Spring washer 10	6	
23	FSDT35-07003	Transmission case cover	1	
24	GB/T5783	Bolt M10*35	12	
25	FSDT35-07004	Transmission case cover liner	1	
26	JC2400	M14*1.5 vent cap	1	
27	GB/T5789	Bolt M12*1.25*30-10.9	1	Gluing
28	SDT30-10003	Clapboard	1	
29	FSDT35-07008	Transmission case output gear	1	Distinguish 25/35
30	FSDT35-07006	transmission case Idle wheel	1	
31	GB/T119.1	Cylindrical pin 10*24	2	
32	GB/T283	Cylindrical roller bearing NJ206	2	
33	JB/ZQ4446	Plug screw Rc1/4	1	
34	FSDT35-07001	Transmission case body	1	Distinguish 25/35
35	JB/ZQ4446	Plug screw Rc1/8	1	
36	GB/T825	Lifting bolt M12	1	
37	SDT30-10004	Oil seal	2	



List of front main reducer parts				
No.	Drawing No. (Code)	Name	Qty.	Remark
1	GB/5783	Bolt M6*12	2	
2	GB/T93	Spring washer 6	2	
3	Y30H-01010	Bearing block bolt	4	
4	FSDT35-08005	Locking plate	2	
5	Y30H-01008	Bearing block locking plate	4	
6	FSDT35-08003	Bearing block	2	
7	FSDT35-08004	Adjusting nut	2	
8	GB/T297-94	Tapered roller bearing 32013	2	
9	SQH35010109A	Right differential case	1	
10	SQH35010102A	Static friction plate	8	
11	SQH35010107A	Universal joint pin	1	
12	FSDT35-09003	Output shaft	1	Distinguish 25/35
13	GB/T297-94	Tapered roller bearing 32012	2	
14	FSDT35-09008	Output shaft gasket	On demand	
15	FSDT35-08001	Front main reducer base	1	
16	FSDT35-09011	Speed measuring gear	1	
17	GB1235	O ring 105*3.1	1	
18	SDT30-1004	Oil seal	1	55*78*12
19	FSDT35-09009	Locknut	1	
20	FSDT35-08002	Main reducer end cover	1	
21	GB/T93	Spring washer 10	6	
22	GB/5783	Bolt M10*25	6	
23	SDT30-03002	Output flange	1	
24	SQH35010106A	Spherical washer	4	
25	SQH35010108A	Differential planetary gear	4	
26	SQH35010105A	Axle shaft gear	2	
27	SQH35010104A	Coupled friction plate	2	
28	SQH35010103A	Dynamic friction plate	6	
29	SQH35010101A	Left differential case	1	
30	FSDT35-09004	Spiral bevel gear	1	Distinguish 25/35
31	FSDT35-09006	Differential case locking plate	6	
32	FSDT35-09005	Differential case bolt	12	



List of rear main reducer parts				
No.	Drawing No. (Code)	Name	Qty.	Remark
1	GB/5783	Bolt M6*12	2	
2	GB/T93	Spring washer 6	2	
3	Y30H-01010	Bearing block bolt	4	
4	FSDT35-08005	Locking plate	2	
5	Y30H-01008	Bearing block locking plate	4	
6	FSDT35-08003	Bearing block	2	
7	FSDT35-08004	Adjusting nut	2	
8	GB/T297-94	Tapered roller bearing 32013	2	
9	SQH35010109A	Right differential case	1	
10	SQH35010107A	Universal joint pin	1	
11	SQH35010106A	Spherical washer	4	
12	FSDT35-09003	Output shaft	1	Distinguish 25/35
13	GB/T297-94	Tapered roller bearing 32012	2	
14	FSDT35-09008	Output shaft gasket	On demand	
15	FSDT35-08007	Rear reducer seat	1	
16	GB1235	O ring 105*3.1	1	
17	SDT30-1004	Oil seal	1	55*78*12
18	FSDT35-09009	Locknut	1	
19	FSDT35-08002	Main reducer end cover	1	
20	GB/T93	Spring washer 10	6	
21	GB/5783	Bolt M10*25	6	
22	FSDT35-08006	Thrust ring	1	
23	GB/T984.1	Retainer ring for shaft 145	1	
24	FSDT35-09007	Rear main reducer input flange	1	
25	SQH35010108A	Differential planetary gear	4	
26	SQH35010104A	Coupled friction plate	2	
27	SQH35010103A	Dynamic friction plate	6	
28	SQH35010102A	Static friction plate	8	
29	SQH35010101A	Left differential case	1	
30	FSDT35-09004	Spiral bevel gear	1	
31	FSDT35-09006	Differential case locking plate	6	
32	FSDT35-09005	Differential case bolt	12	



3 Drive Axle

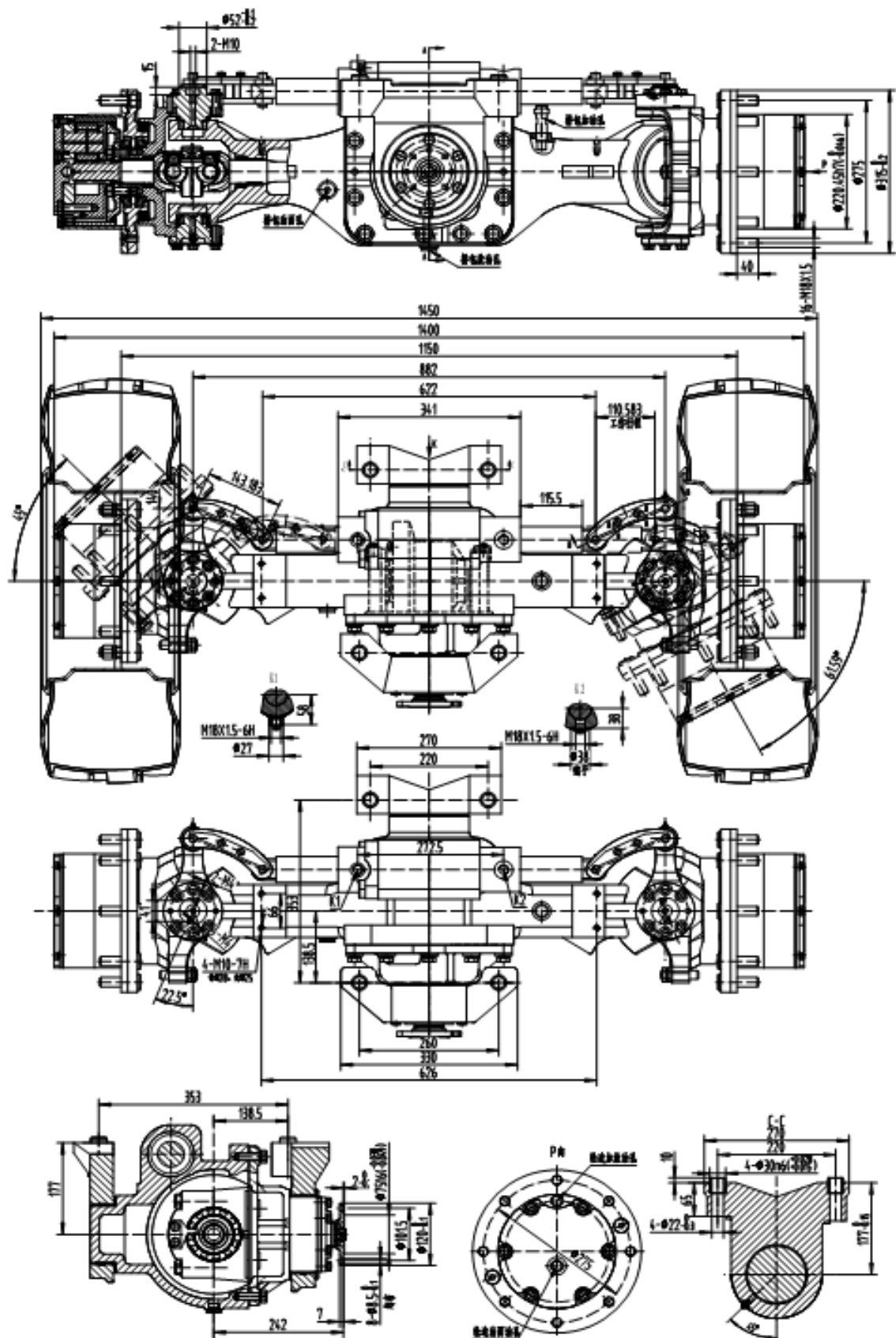
3.1 SQH35000000B rear steering drive axle

3.1.1 Main technical parameters

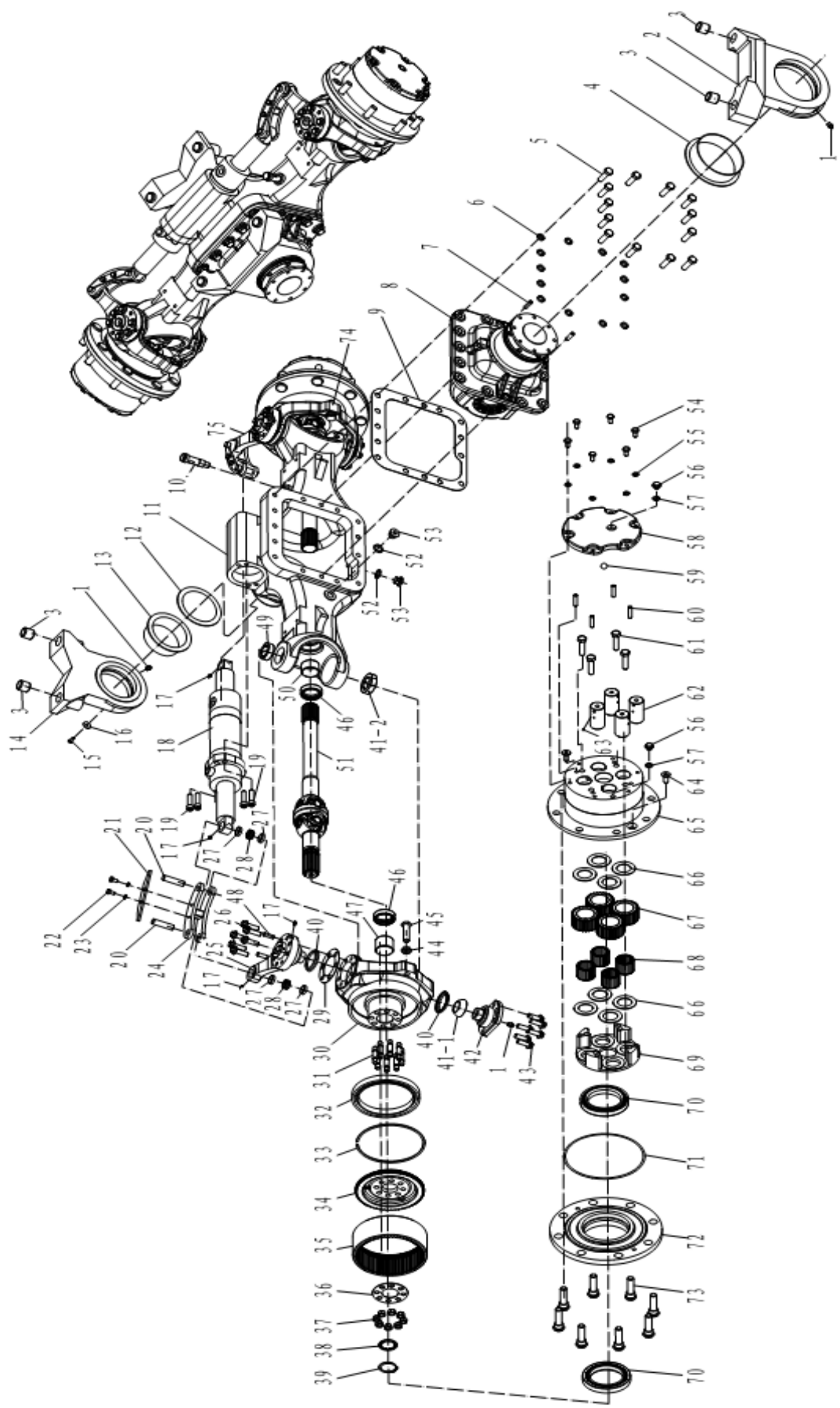
Max. input torque (N.m)		≤1200
Drive ratio		Total drive ratio 18.6, hub reduction ratio 6, main drive ratio 3.1
Rear axle transmission shaft		Middle drive shaft
Input end parameters		(Convex seam allowance) 2XØ75X (pitch circle Ø115X8XØ8.5EQS)
Hub and spoke plate connecting bolt		8-M18X1.5-6g (seam allowance Ø220.5Xpitch circle Ø275mm)
Spoke spacing (mm)		1150
Front wheel alignment	Front wheel camber angle	0 °
	Kingpin inclination angle	0 °
	Kingpin caster angle	0 °
	Front wheel toe-in	0—2mm
	Type of steering	Hydraulic steering
Tilt angle of rear shaft (axle)		8 °(each side)
Maximum turning angle		Internal gear corner 61.59 °, external gear corner 45 °
Diameter of steering cylinder /piston rod (mm)		Ø75/Ø50
Number of steering cylinder		1
Steering cylinder stroke (mm)		111
Rated load (kg)		4500
Dead weight (kg)		320

3.1.2 Outline drawing, structural form and characteristics

3.1.2.1 Outline drawing and sizes



3.1.2.2 Structural form and characteristics



3.1.3 List of SQH35000000B rear steering drive axle parts

1	JB/T7940.1-1995	Straight forced filling oil cupM10X1	4	39	SQH35000026A	Retaining ring for shaft	2
2	SQH35070001B	Front pedestal	1	40	SQH35000004	Dust Ring	4
3	SQH35000007	Support locating sleeve	4	41	GAC35S	Angular-contact articulated bearing 35X62X18	2
4	SQH35070002B	Support bushing	1	42	SQH35000002	Lower backing pin	2
5	GB/T5783-2000	Hexagonal head bolt M14X1.5X45/10.9 level	13	43	SQH350000029	Hexagon flange bolt M12X1.25X35/10.9 level	12
6	GB/T93-1987	Spring washer 14	13	44	GB/T 6172.1-2000	Hexagon thin nut M16	2
7	GB/T 119.2-2000	Cylindrical pin D12X32	2	45	SQH35020002B	Stop boltM16X70/10.9 level	2
8	FSDT35IV	rear main reduction box assembly	1	46	CFW	SIMRIT combination oil seal 45X60X16	4
9	SQQ35000004B	Main reducer gasket	1	47	SQH35020003B	sliding bearing 45x50x40	2
10	Q30LD100	Long ventilation plug (R2)1/2	1	48	GB/T119.1-2000	Cylindrical pin D10X35	4
11	SQH35030001B	axle housing	1	49	SQH350000017	bushing 35X52X16.5	2
12	SQH35000012B/13B/14B	Adjusting washer	1 set	50	SQH35000008	Sliding bearing 45X50X30	2
13	SQH35000006	Support bushing	1	51	SQH35010000B	Axle shaft assembly	2
14	SQH35060001B	Rear support	1	52	JB/T 982-2000	Combined washer 20	2
15	GB/T 5783-2000	Hexagonal head bolt M6X16/8.8 level	1	53	SQQ35000006B	Plug screw M20x1.5	2
16	SQH35000030	Gasket	1	54	GB/5783-2000	Bolt M10x20	12
17	JB/T 7940.1-1995	Straight forced filling oil cupM6	6	55	GB/T93-2000	Spring washer 10	12
18	SQH35050000B	steering cylinder assembly	1	56	SQQ35000001B	Plug screw M14x1.5	4
19	GB/T 70.1-2000	hexagon socket head cap screw M12X45/10.9 level	4	57	JB/T982-2000	Combined washer 14	4
20	SQH35000005B	Connecting rod pin	4	58	SQQ35000002B	End cover	2
21	SQH35000006B	Baffle	2	59	GB/T308-2000	Steel ball 11/16"	2
22	GB/T5781-2000	Bolt M8x16	4	60	GB/T119.2-2000	Cylindrical pin 10m6X40	8
23	GB/T93-1987	Spring washer8	4	61	GB/T 5786-2000	Hexagonal head bolt M14X1.5X55	8
24	SQH35000007B	Connecting rod	2	62	SQH35040005	Planet wheel axle	8
25	SQH35000008B	Left steering knuckle arm	1	63	GB/T308-2002	Steel ball 15/64"	8

26	SQH35000009 B	Hexagon flange bolt M12X1.25X40/10.9 level	12	64	SQH3500002 5	Hexagon socket countersunk head screw M12X30/8.8 level	4
27	SQH35000004 B	bushing	8	65	SQQ3504000 1A	Planet carrier	2
28	H24C4-32061(G E16ES)	Articulated bearing (ES)	4	66	SQH3504000 6	Planet wheel backup plate	16
29	SQH35000010 B/11B	Adjusting washer	1 set	67	SQH3504000 2A	Planet gear	8
30	SQH35020001 B	Left steering knuckle	1	68	GB/T309-84	Roller pin5x39.8	224
31	SQH35000010	Double end stud	16	69	SQQ3504000 2	Planet carrierbearing	2
32	CFW	SIMRIT combination oil seal 155X190X17.5/19	2	70	TIMKEN	Tapered roller bearing JL819349/JL819310/95X135X20	4
33	SQH35050003	Gear ring baffle ring	2	71	GB/T3452.1- 1986	O sealing ring 223x2.65	2
34	SQH35050001	support for tooth ring	2	72	SQH3507000 1	Hub	2
35	SQH35050002 A	Gear ring	2	73	SQH3507000 2	hub bolt	16
36	SQH35000024	Internal shield ring of external half shaft	16	74	SQH3504000 1B	Right steering knuckle	1
37	GB/T 6176-2000	2 hexagon nut M12X1.25	2	75	SQH3500000 3B	Right steering knuckle arm	1
38	SQH35000027	Stub shaft outer baffle ring	2	N o.	Code	Name	Qty .
N o.	Code	Name	Qty .				

3.1.4 Use, maintenance and repair

(I) Prior to use of new axle

1. Before a new axle is used, sulfur phosphorus 90 heavy load gear oil (GL - 5) is added from the bridge packet oil filling port to the main reducer until there is oil overflowing from the bridge packet oil hole (about 8L); the oil filling and drain hole of the hub reducer is transferred to the vertical position, in the face of the hub reducer end cover, the oil filling and drain hole of the hub reducer is set in the top, and sulfur phosphorus 90 heavy load gear oil (GL - 5) is filled from the oil filling and drain hole until there is oil overflowing from the hub side (the oil amount of single hub reducer is about 0.85 L).

2. Inject adequate 2# lithium base lubricating grease to each grease nipple

(II) After the new axle is mounted, the vehicle runs in for 1500 km, and there is a need to check the pre-tightening torque of each part fastener.

(III) Axle maintenance

1. Often clear the dirt and dust on the ventilation plug in the rear axle housing.

2. Regularly check the oil filling port plug screw and oil drain plug screw, and if oil leakage

is found, they should be tightened in time, or the end face sealing gasket is changed.

3. Every running for 2000km, inject 2# lithium base lubricating grease to each grease nipple, and clean the ventilation plug; check the oil surface height of the axle housing, and hub gear (open the oil level plug screw for inspection).

4. Every running for 8000-10000km, check the fasteners; check the clearance of hub bearing; check the quality of gear oil inside the axle housing, and in case of discoloration, thinning and metamorphism, new oil should be replaced in a timely manner. The mileage for the first oil change is 2000 km, and there is a need to change the gear oil once per 24000 km.

(IV) Major maintenance standards of main parts

1. Tightening torque of main bolts and nuts (N·m)

Fastening bolt of rear main reduction box assembly (No. 5)	180-220
Fastening bolt of steering cylinder assembly (No. 19)	115-140
Baffle fastening bolt (No. 22)	20-25
Fastening bolt of left and right steering knuckle arm (No. 26)	125-150
Fastening bolt of lower backing pin (No. 43)	125-150
Fastening bolt of support for tooth ring (No. 37)	85-100
Fastening nut of steering stop bolt (No. 44)	140-150
Oil inlet and outlet plug screw of main reducer (No. 53)	40-50
End cover fastening bolt (No. 54)	45-55
Hub oil inlet and outlet plug screw (No. 56)	25-30
Planet carrier support fastening bolt (No. 61)	180-220
Planet carrier connecting bolt (No. 64)	80-90

2. Major maintenance standard

Item	Maintenance standard	Remark
Starting force of rear hub	30-55N	Measure along the tangential direction of hub bolt
Starting force of steering knuckle	< 10N	Measure along the tangential direction of stud

3.1.5 Assembly and adjustment

(I) Dismantling of assembly

1. Dismantling of planet carrier assembly

(1) At first, release the gear oil in the wheel side.

(2) Use an internal hexagonal wrench to dismantle the hexagon socket countersunk head screw (No. 34).

(3) Slightly turn the planet carrier, pull with force outward, tap on the planet carrier with force at the same time, to shake and loosen the planet carrier, and after the planet carrier becomes loose, remove the planet carrier, but attention should be also paid to the assembly that is heavy, not causing hurt or injury.

The installation of the planet carrier assembly is opposite to the process above in order, but attention must be paid to the tightening torque of hexagon socket countersunk head screw.

2. Disassembling method of hub assembly

(1) Take the retaining ring for shaft (No. 39) out of the axle shaft assembly with reversible circlip pliers.

(2) Take down the stub shaft outer baffle ring (No. 38).

(3) Use a wrench to take down the hexagon nut (No. 37).

(4) Take down the internal shield ring of external half shaft (No. 36).

(5) Take out the ring gear assembly (Gear ring baffle ring (No. 33), support for tooth ring (No. 34) and gear ring (No. 35) with pull code.

(6) Turn the wheel hub assembly slightly, and make an effort to pull outward, while tapping on hub to shake and loosen the outer bearing inner ring. After the outer bearing inner ring is loose, remove the wheel hub assembly, but attention should be also paid to the hub assembly that is heavy, the not causing hurt or injury, and keep careful not to break the outer bearing inner ring at the same time.

The installation of the hub assembly is opposite to the process above in order, but attention must be paid to the tightening torque and bearing pre-tightening force of hexagon nut (No. 37).

3. Disassembling method of steering knuckle assembly

(1) Use a wrench to take down the hexagon bolt (No. 22).

(2) Take down the baffle (No. 21).

(3) Take out the connecting rod pin (No. 20).

(4) Take down the connecting rod (No. 24).

(5) Use a wrench to take down the Hexagon flange bolt (No. 26 and No. 43).

(6) Take out the left steering knuckle arm (No. 25), right steering knuckle arm (No. 75) and lower backing pin (No. 42).

(7) Hold the axle shaft assembly (No. 51), pull the left steering knuckle (No. 30) and right steering knuckle (No. 74) outward with force, but attention should be also paid to the axle shaft assembly not taken out, and the steering knuckle assembly is heavy, not causing hurt or injury.

The installation of the left and right steering knuckle assembly is opposite to the process above in order. But attention should be also paid to the outer axle shaft that does not damage the oil seal port in the left and right steering knuckle, and to the tightening torque of hexagon flange bolt (No. 26 and No. 43) and hexagon bolt (No. 22).

4. Disassembling method of steering cylinder assembly

(1) Use a wrench to take down the hexagonal head bolt (No. 5).

(2) Pull the steering cylinder assembly (No. 18) outward with force, but attention should be also paid to the steering cylinder assembly that is heavy, not causing hurt or injury.

The installation of the steering cylinder assembly is opposite to the process above in order, but attention must be paid to the tightening torque of hexagon socket head cap screw (No. 19).

5. Disassembling method of rear main reduction box assembly

(1) Pull the axle shaft assembly (No. 51) outward with force, but attention should be also paid to the inner axle shaft that does not damage the oil seal port in the axle housing, and attention should be also paid to the axle shaft assembly that is heavy, not causing hurt or injury.

(2) Use a wrench to take down the Hexagonal head bolt (No. 5).

(3) Use two hexagonal head bolts (No. 5) to jack up the rear main reduction box assembly (No.8).

(4) Pull the rear main reduction box assembly (No. 8) outward with force, but attention should be also paid to the rear main reduction box assembly that is heavy, not causing hurt or injury.

The installation of the rear main reduction box assembly is opposite to the process above in order, but attention must be paid to the tightening torque of hexagonal head bolt (No. 5), and screw the positioning pin (No. 7).

(II) Adjustment of the axle

1. Gap adjustment of rear axle body and steering knuckle

(1) Install the axle shaft assembly into the axle body at first.

(2) Cover the left and right steering knuckle (No. 30 and No. 75) onto the axle shaft assembly and rear axle body (No. 11).

(3) Press the inner ring of angular-contact articulated bearing (No. 41-1) into the lower backing pin (No. 42).

(4) cover the dust trap into the lower backing pin, coat the ball surface on the articulated bearing inner ring (convex) with a thin layer of lubricating grease, align bolt holes and mount the backing pin and rear axle body into the steering knuckle, and tighten the hex flang bolt (No. 43).

(5) Select the appropriate adjustment sheet (No. 29) to set into the left and right steering knuckle arm to adjust the clearance, and thus to guarantee clearance within 0.1.

(6) Coat the outside surface of left and right steering knuckle arm with a thin layer of lubricating grease, align and install the left and right steering knuckle arm bolt holes into the steering knuckle and rear axle body, and tighten the hex flang bolt (No.26).

(7) Measure the starting force of steering knuckle along the tangential direction of steering knuckle stud, and left and right measurement should be measured separately and the starting force should be less than 30N, as shown in Figure 1

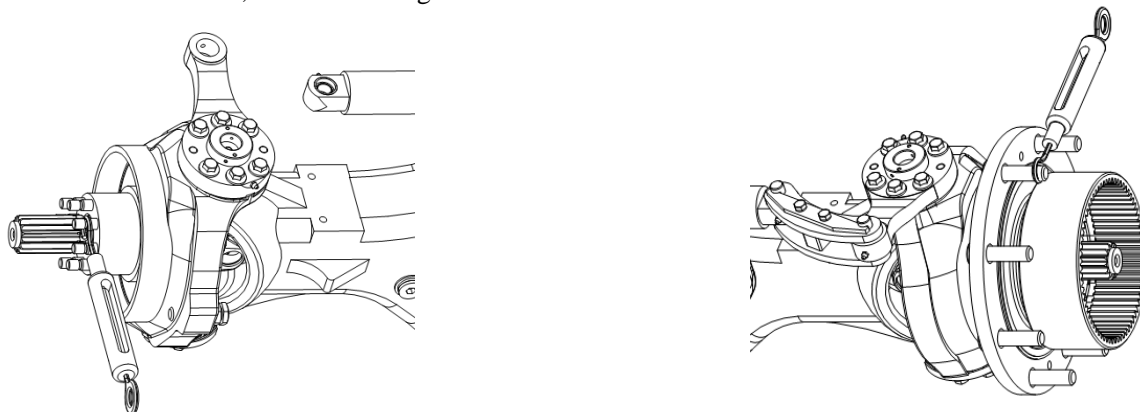


Figure 1

Figure 2

2. Adjustment of the pre - tightening force of rear axle hub bearing

- (1) Install the rear axle hub assembly into steering knuckle.
- (2) Turn the hub for 2-3 laps, and make the bearing in place correctly
- (3) Install the ring gear assembly into the steering knuckle.
- (4) Mount the internal shield ring of external half shaft (No. 36) into the steering knuckle.
- (5) Coat the double end stud (No. 31) with screw fastening adhesive, and then tighten the hex nut with 100N. m torque (No. 37).
- (6) Turn the hub for 2-3 laps, and measure the starting force of the hub along the tangential direction of the hub bolt; the starting force of the hub should be 20 to 55 N as shown in Figure 2

3. Adjustment of steering angle

- (1) Adjust the stop bolt of the steering angle (No. 45) to make the largest angle of inner wheel 61.59 °.
- (2) After the stop bolt is adjusted, tighten the lock nut (No. 44).

3.1.6 Common faults and elimination in use

Fault form	Reason analysis	Elimination method
The hub bearing feels sluggish	1. The bearing lacks of lubrication or the use of lubricating oil is not correct	Add gear oil or replace gear oil
	2. The bearing is dirtied by dust	Clean or enhance lubrication
The steering operation is heavy and shimmy The rear drive axle may fail and the problem of shimmy steering is excluded	1. The clearance between the steering knuckle arm and bushing is too large	Inspect and replace parts to adjust the clearance
	2. The articulated bearing on the lower backing pin is worn or damaged	Check and replace
	3. The connecting rod pin is worn or damaged	Replace
	4. The articulated bearing on the connecting rod pin is worn or damaged.	Replace
	5. Rear steering drive axle parts lack of lubrication	Add lubricating grease
	6. Tire pressure is too low	Add to the specified pressure
	7. The tyre is worn too much	Replace the tires
	8. The hub bearing is worn	Replace the bearing
	9. Steering cylinder leaks oil	Replace the steering cylinder
	10. The steering cylinder oil pressure is too low	Regulate the hydraulic pressure
	11. The ring gear assembly pressure stud is loose	Tighten the stud
	12. The ring gear assembly gland nut is loose	Tighten the gland nut

3.1.7 List of wearing parts

No.	Code	Description	Qty	Remark
1	H24C4-32061	Articulated bearing	4	(No. 28)
2	CFW	SIMRIT combination oil seal 155×190×17.5/19	2	(No. 32)
3	SQH35000004	Dust Ring	4	(No. 40)
4	GAC35S	Angular-contact articulated bearing 35×62×18	2	(No. 41)
5	CFW	SIMRIT combination oil seal 45×60×16	4	(No. 46)
6	SQH35020003B	sliding bearing 45×50×40	2	(No. 47)
7	SQH35000017	Bushing 35×52×16.5	2	(No. 49)
8	SQH35000008	Sliding bearing 45×50×30	2	(No. 50)
9	TIMKEN	Tapered roller bearing JL819349/JL819310 (95×135×20)	4	(No. 70)

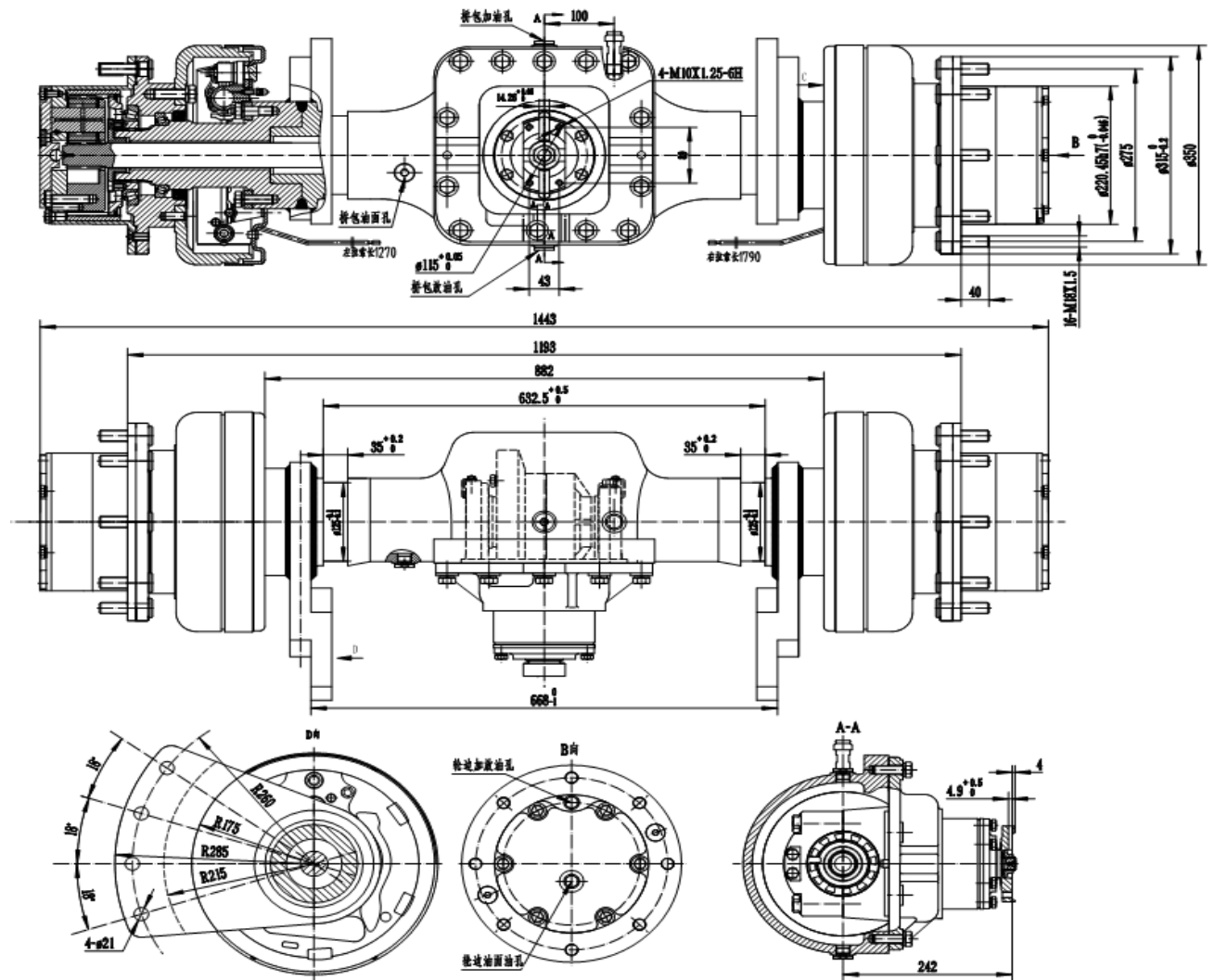
3.2 Direction for use of SQQ35000000B front drive axle

3.2.1 Main technical parameters

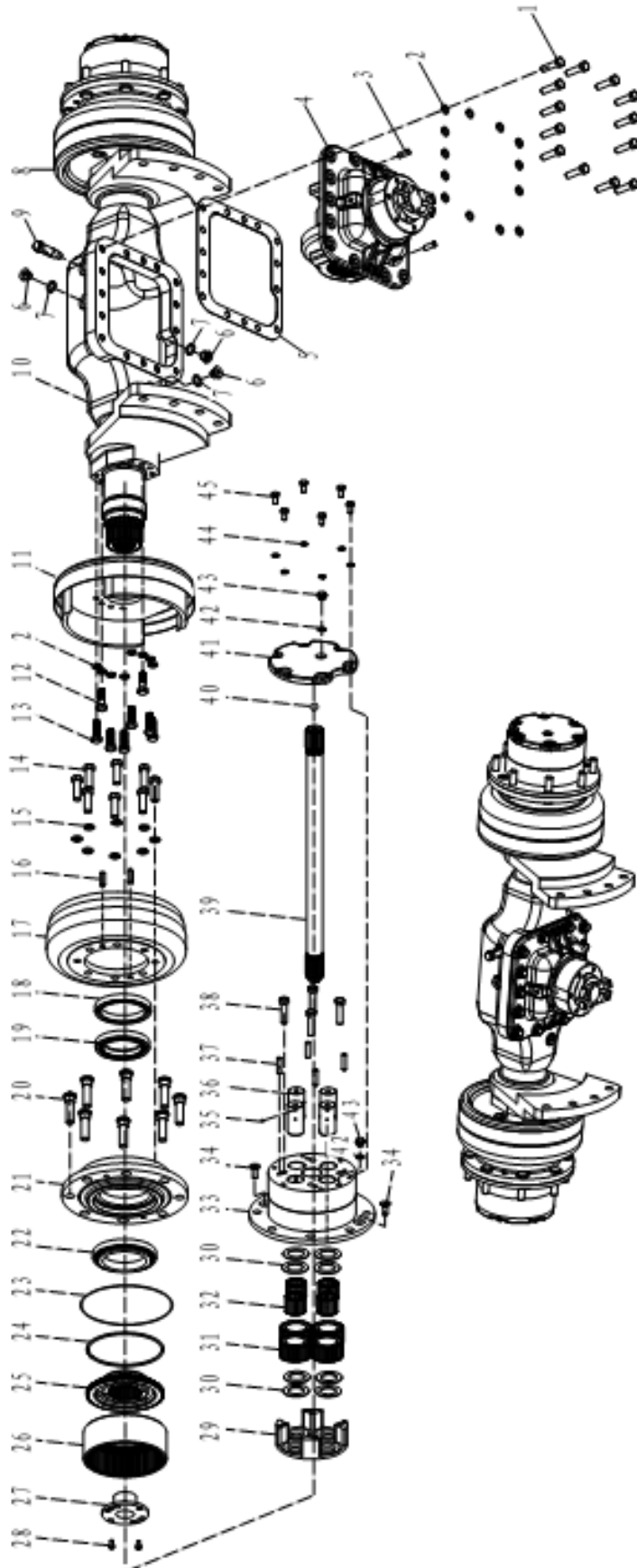
Max. input torque (N.m)	≤1200
Drive ratio	Total drive ratio 18.6, hub reduction ratio 6, main drive ratio 3.1
Front axle propeller shaft	Middle drive shaft
Input end parameters	(concave seam allowance) 4XØ115X (pitch row 89X43X4XM10X1.25)
Hub and spoke plate connecting bolt	8-M18×1.5-6g (seam allowance Ø220.5Xpitch circle Ø275mm)
Spoke spacing (mm)	1193
Brake specification	Φ313×76
Maximum braking moment	2X 7046N.m
Mast installation size	Φ125X35X632.5
Frame installation size	4XΦ21X(3X18°)XR260X668
Rated load (kg)	7500
Dead weight (kg)	366

3.2.2 Outline drawing, structural form and characteristics

3.2.2.1 Outline drawing and sizes



3.2.2.2 Structural form and characteristics

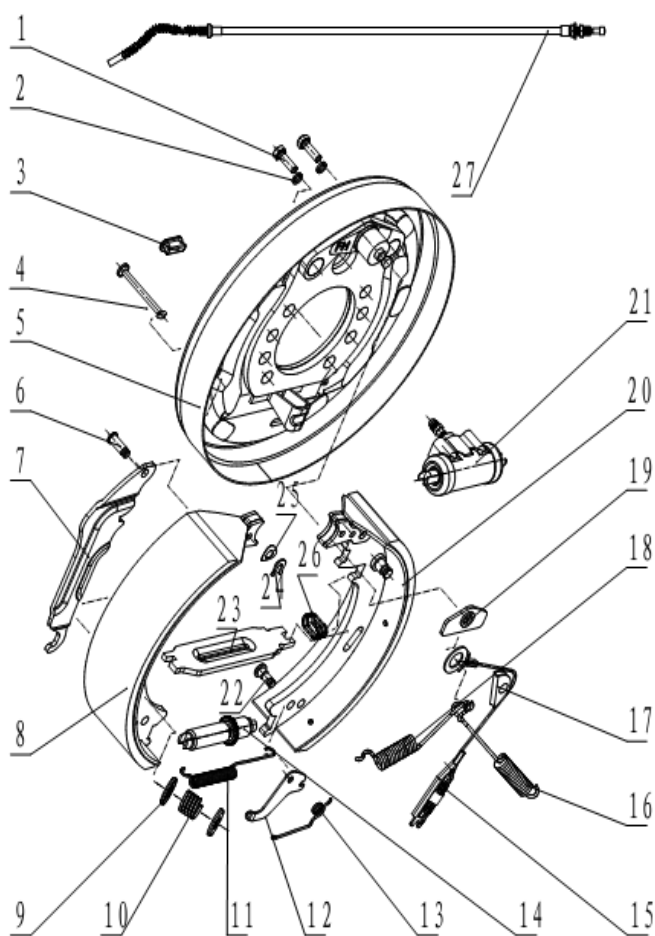


List of SQQ3500000B front drive axle parts

1	GB/T5783-2000	Hexagonal head bolt M14X1.5X45/10.9 level	13
2	GB/T93-1987	Spring washer 14	29
3	GB/T119.2-2000	Cylindrical pin D12X32	2
4	FSDT35III	front main reduction box assembly	1
5	SQQ35000004B	Main reducer gasket	1
6	SQQ35000006B	Plug screw M20x1.5	2
7	JB/T 982-2000	Combined washer 20	2
8	Q30LD003	Right brake assembly	1
9	Q30LD100	Long ventilation plug(R2)1/2	1
10	SQQ35030000B	Axle body assembly	1
11	Q30LD002	Left brake assembly	1
12	SQQ35000005B	Positioning bolt M14X1.5X45/10.9 level	4
13	GB/T5786-2000	Hexagonal head bolt M14X1.5X45/10.9 level	12
14	GB/T 5786-2000	Hexagonal head bolt M16X1.5X50/10.9 level	16
15	GB/T 93-1987	Spring washer16	16
16	GB/T 119.2-2000	Cylindrical pin D12X32	4
17	SQQ35020002B	Drum brake	2
18	SIMRIT	CFW combination oil seal 110X140X14.5/16	2
19	TIMKEN	Tapered roller bearing JL819349/JL819310	2
20	SOH35070002	Hub bolt	16
21	SQQ35020001B	Hub	2
22	TIMKEN	Tapered roller bearing 37431A/37625	2
23	GB/T3452.1-1986	O sealing ring 223x2.65	2
24	SOH35050003	Gear ring baffle ring	2
25	SOH35050001	Support for tooth ring	2
26	SOH35050002A	Gear ring	2
27	SQQ35000004B	Round nut	2
28	GB/T 70.1-2000	hexagon socket head cap screw M8X12/8.8 level M8X12/8.8 level	4
29	SQQ35040002	Planet carrierbearing	2
30	SOH35040006	Planet wheel backup plate	16
31	SOH35040002A	Planet gear	8
32	GB/T309-84	Roller pin5x39.8	224
33	SQQ35040001A	Planet carrier	2
34	SOH35000025	Hexagon socket countersunk head screw M12X30/8.8 level	4
35	GB/T308-2002	Steel ball 15/64"	8
36	SOH35040005	Planet wheel axle	8
37	GB/T 119.2-2000	Cylindrical pin 10m6X40	8
38	GB/T 5786-2000	Hexagonal head bolt M14X1.5X55	8
39	SQQ35000003B	Axle shaft	2
40	GB/T308-2000	Steel ball 11/16"	2
41	SQQ35000002B	End cover	2
42	JB/T 982-2000	Combined washer 14	4
43	SQQ35000001B	Plug screw M14x1.5	4
44	GB/T93-2000	Spring washer 10	12
45	GB/5783-2000	Bolt M10x20	12
No.	Code	Description	Qty

3.2.2.3 Structural form and characteristics of Q30LD002 Left brake assembly

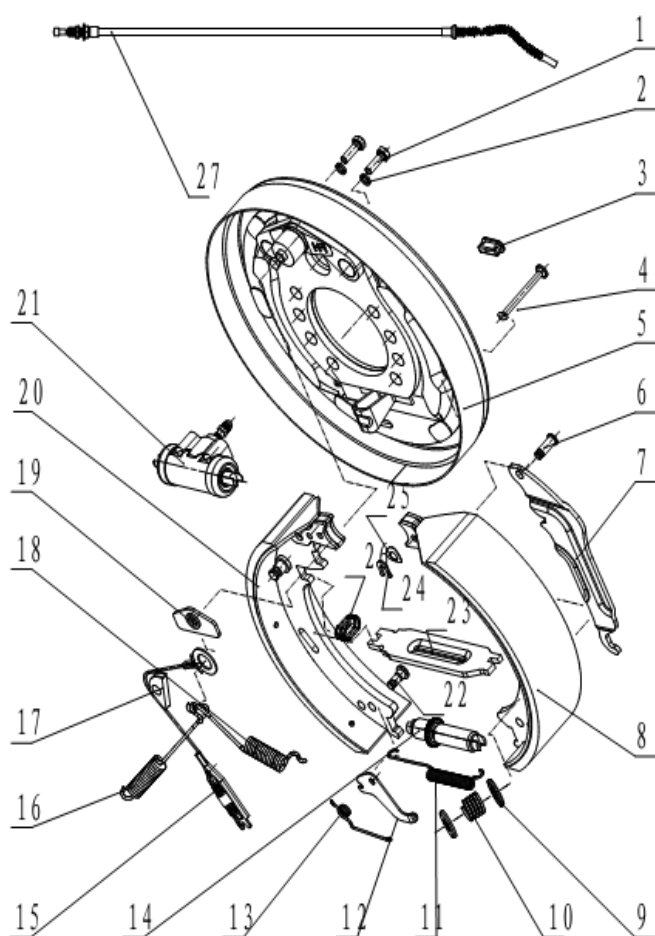
List of Q30LD002 left brake assembly parts



No.	Code	Description	Qty
1	GB21-76	Bolt M8*1.25*25-6g	2
2	GB91-76	Spring washer	2
3	24433-70040G	Glue	1
4	24433-70010G	Compression spring rod	2
5	24433-72000G-L	Left brake baseplate assembly	1
6	24433-70150G	Dowel	1
7	24433-70140G-L	Left hand brake lever	1
8	24433-75000G	Brake shoe friction plate assembly	1
9	24433-70020G	Compression spring seat	4
10	24433-70080G	Compression spring	2
11	24433-70050G	Tension spring	1
12	24433-70100G-L	Left pawl	1
13	24433-70090G-L	Left torsional spring	1
14	24433-74000G-L	Left clearance adjuster assembly	1
15	24433-73000G	Spring anchoring device	1
16	24433-70071G-L	Left return spring (Rear)	1
17	24433-70081G	Guide block	1
18	24433-70070G-L	Left return spring (front)	1
19	24433-70060G	Guide plate	1
20	24433-71001G-L	Left brake shoe friction plate and spring pin assembly	1
21	24433-76000G	Brake cylinder assembly	1
22	24433-70110G	Dowel	1
23	24433-70120G-L	Left hand brake push rod	1
24	24433-70170G	Lever pin retaining ring	1
25	24433-70160G	Resilient pad	1
26	24433-70130G	Spring	1
27	OC11246-14603	Brake cable assembly (left)	1

3.2.2.4 Q30LD003Right brake assemblyStructural form and characteristics

List of Q30LD003Right brake assembly parts



No.	Code	Description	Qty
1	GB21-76	Bolt M8*1.25*25-6g	2
2	GB91-76	Spring washer	2
3	24433-70040G	Glue	1
4	24433-70010G	Compression spring rod	2
5	24433-72000G-R	Right brake baseplate assembly	1
6	24433-70150G	Dowel	1
7	24433-70140G-R	Right hand brake lever	1
8	24433-75000G	Brake shoe friction plate assembly	1
9	24433-70020G	Compression spring seat	4
10	24433-70030G	Compression spring	2
11	24433-70050G	Tension spring	1
12	24433-70100G-R	Right pawl	1
13	24433-70090G-R	Right torsional spring	1
14	24433-74000G-R	Right clearance adjuster assembly	1
15	24433-73000G	Spring anchoring device	1
16	24433-70071G-R	Right return spring (rear)	1
17	24433-70081G	Guide block	1
18	24433-70070G-R	Right return spring (front)	1
19	24433-70060G	Guide plate	1
20	24433-71001G-R	Right brake shoe friction plate and spring pin assembly	1
21	24433-76000G	Brake cylinder assembly	1
22	24433-70110G	Dowel	1
23	24433-70120G-R	Right hand brake push rod	1
24	24433-70170G	Rod pin retainer ring	1
25	24433-70160G	Resilient pad	1
26	24433-70130G	Spring	1
27	OC11246-24603	Brake cable assembly (right)	1

3.2.3 Use, maintenance and repair

(I) Prior to use of new axle

Before a new axle is used, sulfur phosphorus 90 heavy load gear oil (GL - 5) is added from the bridge packet oil filling port to the main reducer until there is oil overflowing from the bridge packet oil hole (about 8L); the oil filling and drain hole of the hub reducer is transferred to the vertical position, in the face of the hub reducer end cover, the oil filling and drain hole of the hub reducer is set in the top, and sulfur phosphorus 90 heavy load gear oil (GL - 5) is filled from the oil filling and drain hole until there is oil overflowing from the hub side (the oil amount of single hub reducer is about 0.85 L).

(II) After the new axle is mounted, the vehicle runs in for 1500 km, and there is a need to check the pre-tightening torque of each part fastener, and re-adjust the brake clearance.

(III) Axle maintenance

1. Often clear the dirt and dust on the ventilation plug in the rear axle housing.
2. Regularly check the oil filling port plug screw and oil drain plug screw, and if oil leakage is found, they should be tightened in time, or the end face sealing gasket is changed.
3. Every running for 2000km, inject 2# lithium base lubricating grease to each grease nipple, and clean the ventilation plug; check the oil surface height of the axle housing, and hub gear (open the oil level plug screw for inspection).
4. Every running for 8000-10000km, check the fasteners; check the clearance of hub bearing; check the quality of gear oil inside the axle housing, and in case of discoloration, thinning and metamorphism, new oil should be replaced in a timely manner. The mileage for the first oil change is 2000 km, and there is a need to change the gear oil once per 24000 km.

3.2.4 Major maintenance standards of main parts

1. Tightening torque of main bolts and nuts (N m)

Fastening bolt of front main reduction box assembly (No.1)	180-220
Fastening bolt of front and right brake (No.12 and No.13)	200-240
Round nut retaining screw (No.28)	20-25
Main reducer oil inlet and outlet plug screw (No.6)	40-50
End cover fastening bolt (No.45)	45-55
Hub oil inlet and outlet plug screw (No.43)	25-30
Planet carriersupport fastening bolt (No.38)	180-220
Planet carrierconnecting bolt (No.34)	80-90

2. Major maintenance standard

Item	Maintenance standard	Remark
Starting force of front hub	30-55N	Measure along the tangential direction of hub bolt

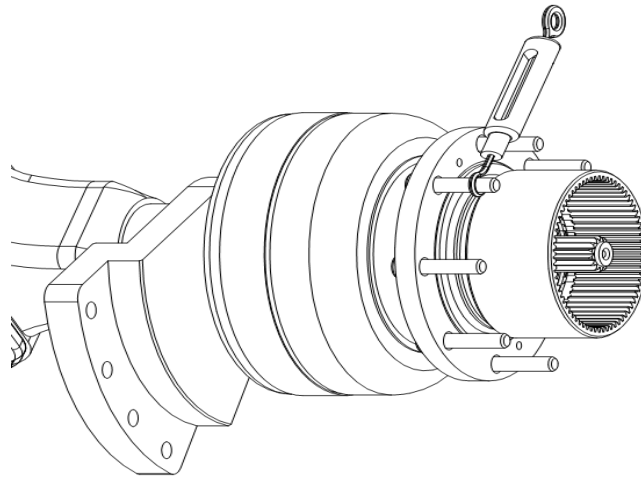


Figure 1

3.2.5 Assembly and adjustment

(I) Dismantling of assembly

1. Dismantling of planet carrier assembly

- (1) At first, release the gear oil in the wheel side.
- (2) Use an internal hexagonal wrench to dismantle the hexagon socket countersunk head screw (No. 34).
- (3) Slightly turn the planet carrier, pull with force outward, tap on the planet carrier with force at the same time, to shake and loosen the planet carrier, and after the planet carrier becomes loose, remove the planet carrier, but attention should be also paid to the assembly that is heavy, not causing hurt or injury.

The installation of the planet carrier assembly is opposite to the process above in order, but attention must be paid to the tightening torque of the hexagon socket countersunk head screw.

2. Disassembling method of front axle wheel drum brake assembly

- (1) Pull out the half shaft (No. 39) gently.
- (2) Use the internal hexagonal wrench to remove the hexagon socket head cap screw (No. 28).
- (3) Use a special wrench to take down the round nut (No. 27).
- (4) Pull the ring gear assembly (gear ring baffle ring (No. 24), support for tooth ring (No. 25), and ring gear (No. 26) outward with force, take down the ring gear assembly, and knock the ring gear assembly gently.
- (5) Rotate the hub drum brake assembly slightly, and make an effort to pull out, while tapping on the drum brake; after the hub drum brake assembly is loose, take down the hub drum brake, but attention should be also paid to the assembly that is heavy, not causing hurt or injury. At the same time, pay attention to the outer bearing inner ring not to be damaged.

The installation of the rear hub drum brake assembly is opposite to the process above in order, but attention must be paid to the tightening torque of round nut (No. 27) and the adjustment of bearing pre-tightening force.

3. Disassembling method of brake assembly

(1) Use a wrench to take down the Positioning bolt (No. 12) and hex bolt (No. 13).

(2) Pull the left brake assembly (No. 11) and right brake assembly (No. 8) with force outward.

The installation of the left and right brake assembly is opposite to the process above in order, but attention must be paid to the tightening torque of bolts, the gap adjustment of friction plate and the left and right sides of brake assembly, and the hand brake cable of the left brake assembly is shorter than that of the right brake assembly.

4. Disassembling method of front main reduction box assembly

(1) Use a wrench to take down the hexagonal head bolt (No. 1).

(2) Use two hexagonal head bolts (No. 5) to jack up the front main reduction box assembly (No. 4).

(3) Pull the front main reduction box assembly (No. 5) with force outward, but attention should be also paid to the front main reduction box assembly the assembly that is heavy, not causing hurt or injury.

The installation of the front main reduction box assembly is opposite to the process above in order, but attention must be paid to the tightening torque of hexagonal head bolt (No. 1), and screw the positioning pin (No. 3).

(II) Adjustment of the axle

1. Adjustment of brake clearance

In case that the gap between the brake block and drum brake is too big or too small, it will affect the braking performance of the vehicle, so the gap of brake ratchet wheel is adjusted to 0.25-0.4mm with a screwdriver.

2. Adjustment of the hub bearing pre-tightening force

Use an internal hexagonal wrench to take down the hexagon socket head cap screw (No. 28) at first, adjust the clearance between the brake block and drum brake to a maximum, fasten the round nut (No. 27) with a special spanner, and the tightening torque shall be not less than 200 nm. Then, rotate the drum brake for 2-3 laps, make the bearing in place rightly, and fasten it with no less than 200Nm of torque. Next reverse the round nut for 1/4-1/6 laps, turn the drum brake for 2-3 laps, measure the starting force along the tangent direction of hub bolt with spring balance, and the value shall be the 30 to 55N, as shown in figure 1. Finally, twist on the hexagon socket head cap screw (No.28).

3.2.6 Common faults and elimination in use

Fault form	Reason analysis	Elimination method
Main drive With abnormal	1. The differential gear clearance is improper	Replace the gasket or gear
	2. The gap between the driving gear and driven gear is too large	Replace the gasket or gear

noise	3. The pre - tightening force of the driving gear bearing is too small	Adjust the pre-tightening force
	4. The axle shaft gear, planet gear, universal be pin thrust washer are worn or damaged	Correct or replace the faulty parts
	5. Too low oil level	Add lubricating oil fully
Lubricating oil leakage	1. The oil seal is worn and loose or damaged	Replace oil seal
	2. The reducer fastening bolt is loose or the sealant is damaged	In accordance with the provided torque screw down the bolt and re-paint sealant
	3. Bearing block fastening bolt is loose	In accordance with the provided torque screw down the bolt
	4. Oil outlet plug screw is loose or the liner is damaged	In accordance with the provided torque, tighten the plug screw, or replace the liner
	5. The axle housing is deformed due to overload	Correct or replace the axle housing
	6. Ventilation plug is stuck or damaged	Clean or replace the ventilation plug
Stagnant hub bearing	1. The pre - tightening force of hub bearing is too large	Adjust the pre-tightening force
	2. The bearing lacks of lubrication or the use of lubricating grease is not correct	Strengthen the lubrication or replace lubricating grease
	3. The bearing is dirtied by dust	Clean or enhance lubrication
Braking force of brake is not enough	1. The brake pump is damaged	Replace the brake pump
	2. Braking pressure is not enough	Check the pipeline and brake master cylinder
	3. The braking friction plate overheats or deteriorates	Replace the friction plate
	4. The clearance between brake friction plate and drum brake is too large	Check and adjust the clearance between friction plate and drum brake
	5. The braking friction plate joint is improper	Correct the friction plate joint position or bond
	6. The friction plate or drum brake has lubricating oil	Clean oil stains and replace friction plate
	7. Water flows into the drum brake	Step gently on the pedal in the driving process, to drain water out
	8. Brake connecting bolt is loose or damaged	Tighten the brake connecting bolt or replace connecting bolt

3.2.7 List of wearing parts

No.	Code	Description	Qty	Remark
1	SIMRIT	CFW combination oil seal 110X140X14.5/16	2	(No. 18)
2	TIMKEN	Tapered roller bearing JL819349/JL819310	2	(No. 19)
3	TIMKEN	Tapered roller bearing 37431A/37625	1	(No. 22)

4. Steering System

Type of Steering System		Rear Wheel Steering with Power Steering	
Power Steering			
Forklift Truck Tonnage		1.8t	2.5t, 3.5t
Cycloid Full Hydraulic Orbitrol		BZZ7-100	BZZ7-125
Steering Cylinder	Cylinder Diameter	mm	Φ75
	Diameter of Piston Rod	mm	Φ50
	Stroke	mm	111 (total travel)
Diameter of Steering Wheel		mm	Φ360

4.1 Overview

Steering system is mainly composed of steering wheel, fully hydraulic orbitrol, cross cylinder steering axle, steering cylinder and pipeline, etc.

The steering wheel can be adjusted depending on the driver's operating habits. When the steering wheel rotates, the motion is passed to the full hydraulic orbitrol, and the full hydraulic orbitrol based on the turning angle of the steering wheel passes metrically the pressure oil from the diverter valve to the fuel tank through the pipeline; when the engine is shut off, the oil pump cannot supply oil and any manual steering can be achieved, but laborious.

(1) Orbitrol (Figure 4-1)

The structure of the orbitrol is shown in Figure 4-1, and it mainly includes cycloidal full hydraulic orbitrol (see Figure 4-2), steering pipe column, connecting shaft and steering wheel; the steering pipe column and steering wheel can turn 5° forward and 15° backward to adapt to different needs of drivers; a horn button is arranged on the center of the steering wheel. The steering shaft through a universal joint is attached to the connecting shaft, and the connecting shaft is connected to the full hydraulic orbitrol.

(2) Steering Cylinder (Fig 4-3)

Steering cylinder is in dual-action through type. The two ends of piston rod are connected with steering knuckle through link. Pressure oil from fully hydraulic orbitrol enables the piston rod to move leftward or rightward through steering cylinder, thus to achieve leftward or rightward steering.

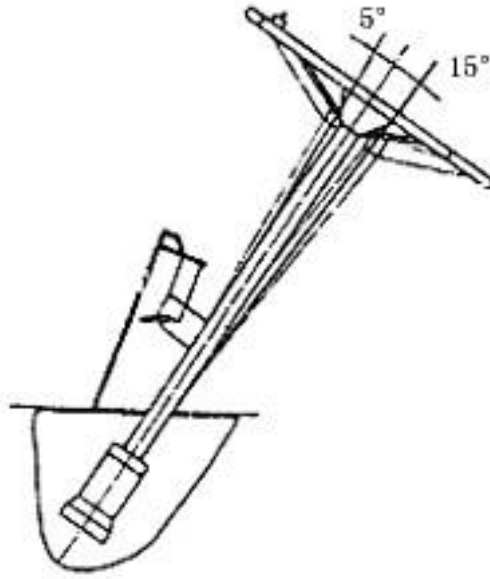


Fig 4-1 Orbitrol

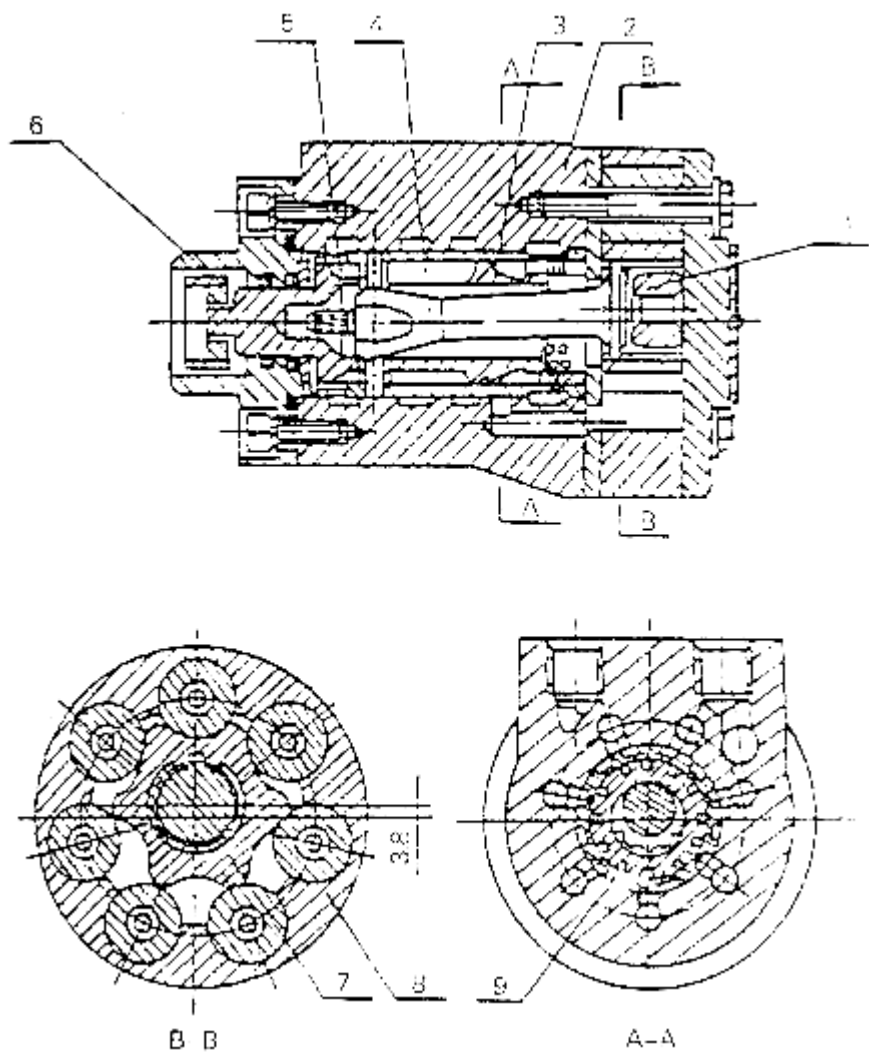


Fig 4-2 Cycloid Fully Hydraulic Orbitrol

- | | | |
|---------------|----------------------------|-----------------|
| 1. Limit Post | 4. Universal Driving Shaft | 7. Rotor |
| 2. Valve Body | 5. Leaf Spring | 8. Stator |
| 3. Valve Core | 6. Connecting Block | 9. Valve Sleeve |

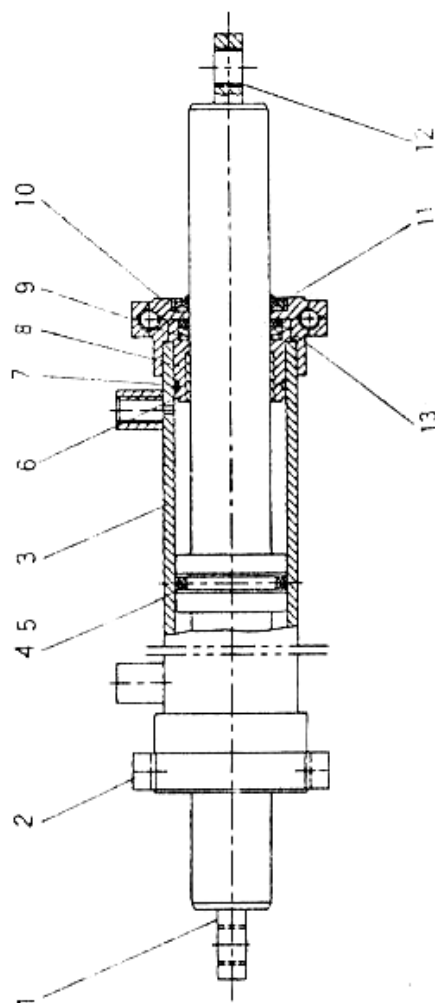


Fig 4-3 Steering Cylinder

- | | | |
|-------------------|-----------------|----------------|
| 1. Piston Body | 6. Shaft Sleeve | 11. Dust Ring |
| 2. Cylinder Cover | 7. O-ring | 12. Lining |
| 3. Cylinder Body | 8. Shaft Sleeve | 13. Block Film |
| 4. O-ring | 9. YX Seal Ring | |
| 5. Wear Ring | 10. Gasket | |

4.2 Examination after Reassembly of Steering System

(1) Turn the steering wheel leftward and rightward thoroughly to see whether or not left and right force applications are uniform, and whether or not rotation is steady.

(2) Examine whether or not oil pressure pipeline is correctly arranged, and whether or not the left and right steering are reversely assembled.

(3) Jack up the rear wheels, and slowly turn the steering wheel leftward and rightward. Repeat it for several times, and remove the air in the hydraulic pipeline and the cylinder.

4.3 Failure Removal for Steering System

Problem	Analysis Cause of Generation	Removal Method
Steering Wheel Fixed	Oil pump damaged or out of action	To be replaced
	Bypass valve blocked or damaged	To be cleaned or replaced
	Rubber hose joint damaged or pipeline blocked	To be replaced or cleaned
Steering Operation Toilsome	Bypass valve pressure too low	Pressure to be adjusted
	Air present in oil circuit	Air to be removed
	Reset of orbitrol out of operation, and positioning leaf spring broken or elasticity insufficient	Leaf spring to be replaced
	Excessive internal leak of steering cylinder	Sealing of piston to be examined
Forklift Truck Serpentine or Swinging	Excessive steering flow	Flow of bypass valve to be adjusted
Abnormal Noise	Oil tank level low	Oil to be added
	Suction pipe or oil filter blocked	To be cleaned or replaced
Oil Leak	Sealing of steering cylinder guide sleeve damaged or pipeline or joint damaged	To be replaced

5. Brake System

Type	Front Twin Wheel Brake, Internal Expansion, Hydraulic	
Pedal Lever Ratio	5.66	
Master Cylinder Diameter	19.05mm	
Wheel Brake	2-2.5t	3-4t
Type	Dual Servo Type with Parking Brake	
Wheel Cylinder Diameter	28.58	
Size of Brake Shoe (L ×W ×T)	324×60×7mm	348×76×8mm
Area of Brake Shoe	194.4 cm ² ×4	264 cm ² ×4
Inner Diameter of Drum brake	310mm	314mm
Parking Brake	Front Twin Wheel Brake, Internal Expansion, and Hydraulic Type	

5.1 Overview

Brake system is in a front double-wheel brake type, and it is composed of brake master cylinder, brake, and brake pedal mechanism.

5.2 Brake master cylinder

Brake master cylinder includes one valve seat, one one-way valve, and one return spring, as well as rubber cup, piston, and auxiliary rubber cup. The end part is fixed using thrust washer and stop steel wire, while and external part is protected through rubber dust cap. The master cylinder piston acts through push rod through operating brake pedal. When brake pedal is pushed down, the push rod pushes forward the piston, and the brake fluid in the cylinder body flows back to oil tank through return oil port, until the main rubber cup blocks the return oil hole. After main rubber cup has pushed the return oil port, the brake fluid in front cavity of master cylinder is compressed and opens the one-way valve, thus to flow to the wheel cylinder through bypass pipeline. In this way, the pistons of respective wheel cylinders extend outwards, for the friction plate of brake shoe and the drum brake to get into contact with each other, to achieve the effect of deceleration or brake. At this point, the rear cavity of piston is supplemented with the brake fluid from return oil port and oil inlet port. When brake pedal is loosened, the piston is pressed by return spring, and at the same time the brake fluid in respective brake cylinders are likewise compressed by return spring of brake shoe, for brake fluid to return to the master cylinder (the front cavity of piston) through one-way valve. The piston will return to original place, the brake fluid in master cylinder will flow back to oil tank through return oil port, and the pressure of one-way valve is adjusted to certain proportion to the remaining pressure in brake cylinders, so that the rubber cup of wheel cylinder is correctly placed to prevent oil leak, and to eliminate the effect of choke that may possibly arise during emergency brake.

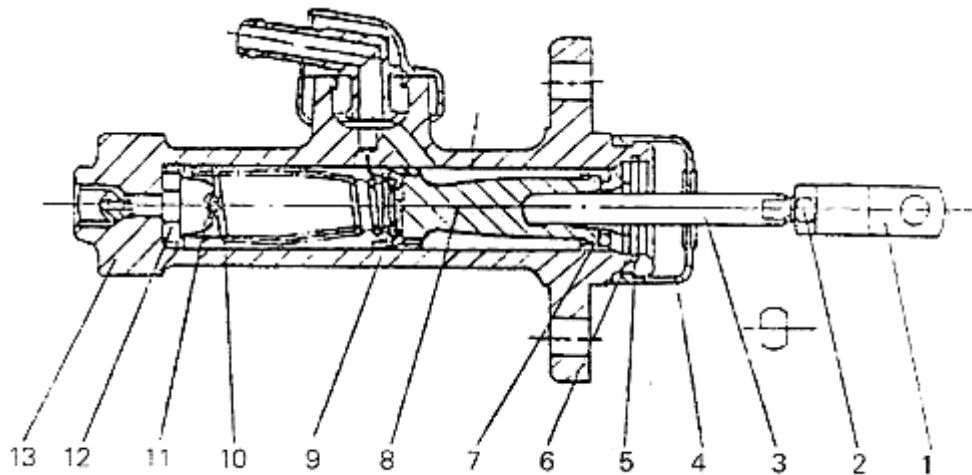


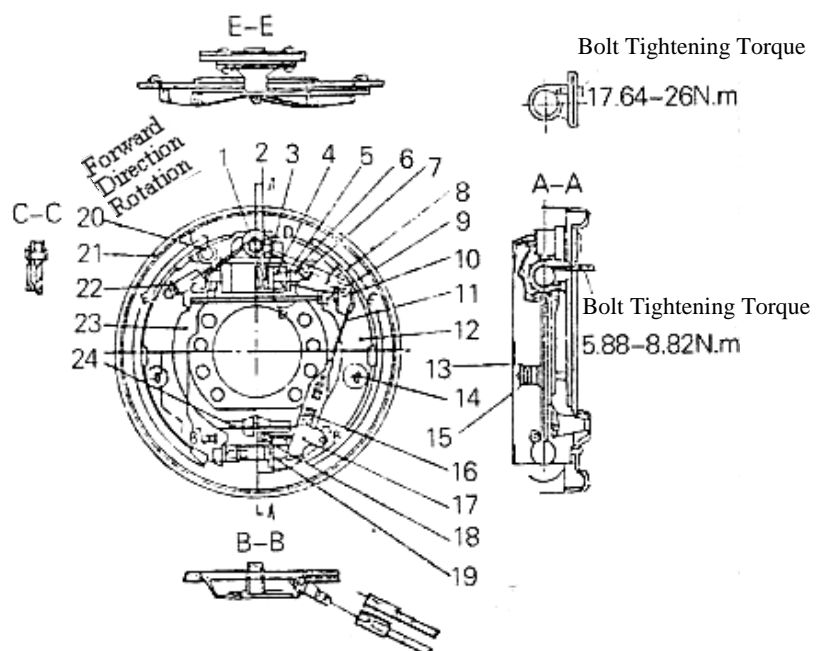
Fig 6-1 Brake Master Cylinder

- | | | | |
|-------------|--------------------|-------------------|---------------|
| 1. Clevis | 5. Stop Steel Wire | 9. Main Cup | 13. Pump Body |
| 2. Lock Nut | 6. Stop Washer | 10. Spring | |
| 3. Push Rod | 7. Auxiliary Cup | 11. One-way Valve | |
| 4. Dust Cap | 8. Piston | 12. Valve Seat | |

5.3 Wheel Brake

Wheel brake is in an internal expansion and hydraulic type, and it is composed of brake shoe, spring, wheel cylinder, adjuster, and bottom plate. The two brakes are respectively mounted on the two ends of front axle. One end of brake shoe is connected with support pin, while the other end is connected with clearance adjuster, and bears down onto the bottom plate by spring and tension spring pull rod. Lever L H Brake is mounted on primary brake shoe, while adjustment pull rod for automatic clearance adjuster is fitted on secondary brake shoe. Refer to Fig 6-2.

1. Brake Cylinder Assembly
2. Spring
3. Rubber Cup
4. Piston
5. Wheel Cylinder Shield
6. Piston Top Rod
7. Brake Shoe Return Spring
8. Brake Shoe
9. Spring
10. Hand Brake Push Rod
11. Spring Stay Wire Device
12. Brake Shoe
13. Washer, cup
14. Pin, shoe hold
15. Pressure Spring
16. Spring
17. Ratchet



18. Spring
19. Clearance Adjuster Assembly
20. Pin
21. Bottom Plate
22. Brake Shoe Return Spring
23. Lever L H Brake
24. Brake Steel Cable Assembly

Fig 6-2 Wheel Brakes

The brake action in forward movement is as follows (as indicated in Fig 6-3). Through operating brake wheel cylinder, the primary brake shoe and the secondary brake shoe are effected by two forces of equal size but reverse directions, respectively, for brake shoe and drum brake to get into contact with each other, while the primary brake shoe is pressed onto the adjuster with support of friction force between brake shoe and drum brake, thereby for clearance adjuster to generate a larger force used to operate the wheel cylinder to push the secondary brake shoe, and to force the upper end of secondary brake shoe to bear down on the support pin, thus to get a relatively large brake force. In another connection, the reversing brake action is performed in reverse direction, but the brake force is the same as that during forward movement.

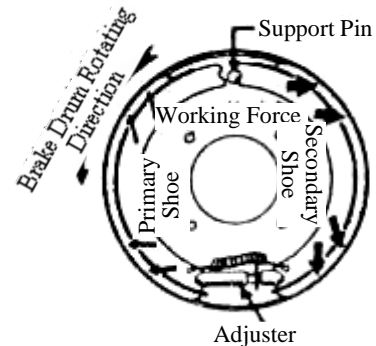


Fig 6-3 Brake Actions during Forward Running Process

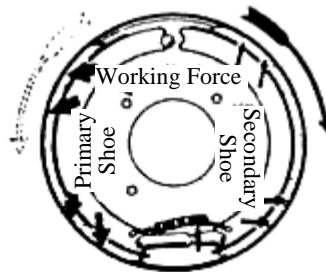


Fig 6-4 Brake Actions during Reversing Process

5.4 Automatic Clearance Regulator

The automatic clearance adjuster is able to automatically maintain the clearance between brake shoe and drum brake between 0.25-0.4mm. However this adjuster only acts during reversing brake. During reverse movement, the brake shoe will disengage once the brake pedal is pushed down, thereby, the secondary and the primarily brake shoes will begin to get into contact with drum brake for rotation together, until the upper end of primarily brake shoe begins to get into contact with support pin.

Meanwhile when secondary brake shoe is released from the support pin, the A part of adjusting lever (Refer to Fig 6-5.) is relatively in tension, thus for adjusting lever to rotate around the B part, for C part to lower, and the D part of adjuster to rotate leftward, so as to achieve the

objective of automatic adjustment. When brake pedal is further pushed down, the pressure applied to both ends of adjust is larger, which has increased the resistance to thread rotation, for the force of adjusting lever to be unable to actuate rotation of part D.

5.5 Parking brake

Parking brake adopts a hand-pull flexible shaft body; together with the foot brake, it uses an automatic power shoe brake that acts on the front wheels. Only when the forklift truck has parked, the parking brake can be used.

Before adjusting the parking brake, decide whether the drive axle braking system functions properly. 1) Adjust the nut B, so the length is equal to 68mm, and then tighten the lock nut B. 2) Screw and adjust the nut A to adjust the parking brake's pulling force. The pulling force is 147-196N on the P point in the Q direction of the locking handle. 3) After the parking brake lever is correctly adjusted, release the parking brake lever, to ensure the brake is fully released. 4) Ensure that the parking brake works properly through the above adjustments.

Note: coat appropriate amount of lithium base grease onto the guide rail C and keep regular painting.

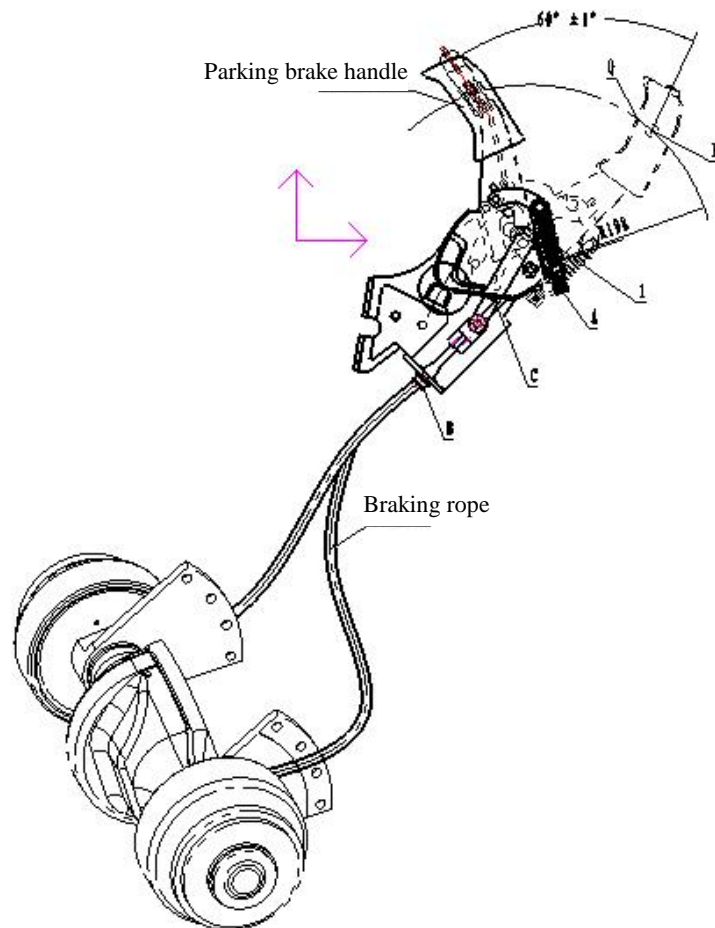


Fig 6-5 Parking Brake Device

5.6 Adjustment of Brake Pedal

Adjust the stop bolts, and the pedal stroke is 20mm. Tighten the stop bolts, to ensure that the foot brake can work properly.

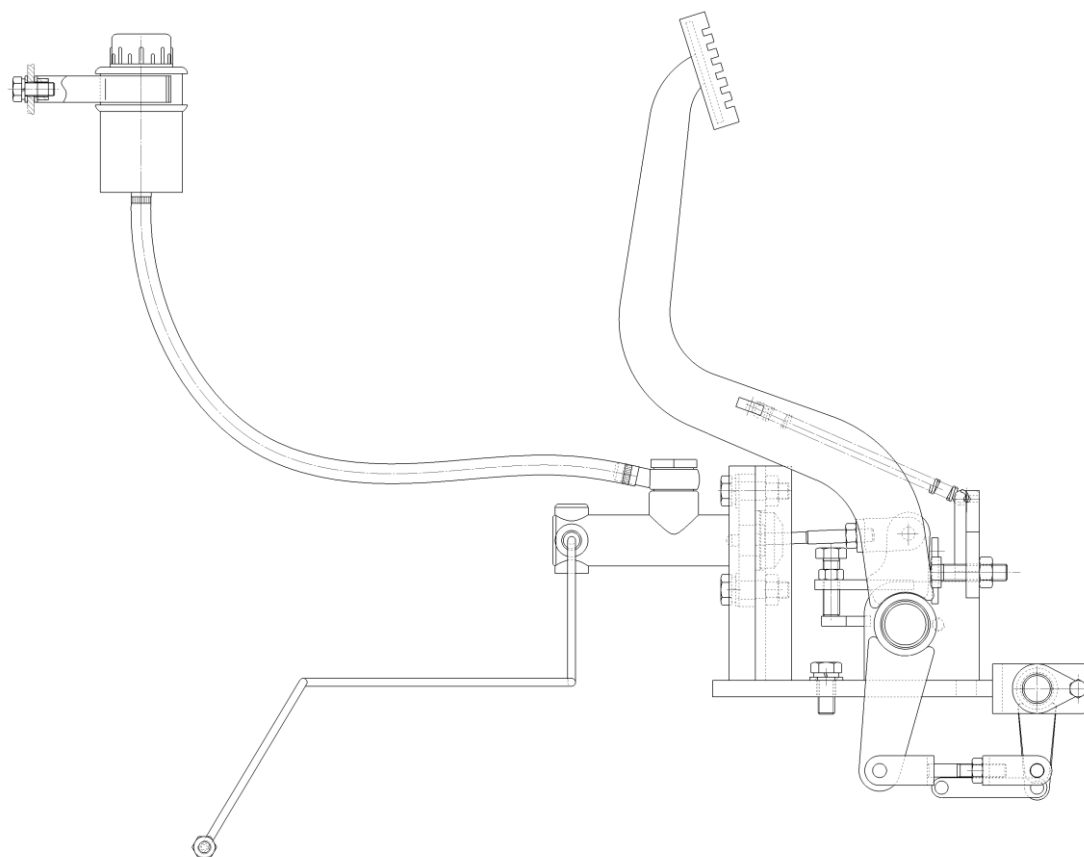


Fig 6-6 Adjustment of Brake Pedal

5.7 Maintenance

This section covers brake disassembly, reassembly, and adjustment.

5.7.1 Disassembly of Wheel Brake

(1) Remove the fixed spring of secondary brake shoe, and take off the adjusting lever, top lever, and the top lever return spring (Fig 6-7);

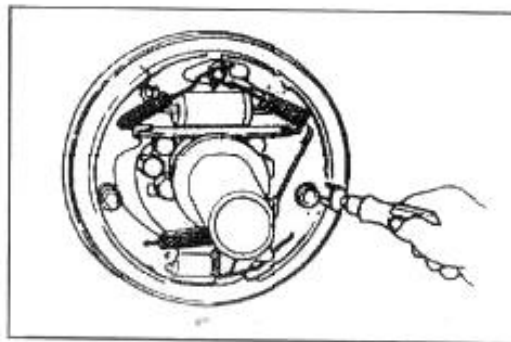


Fig 6-7

(2) Remove the return springs for the two brake shoes (Fig 6-8)

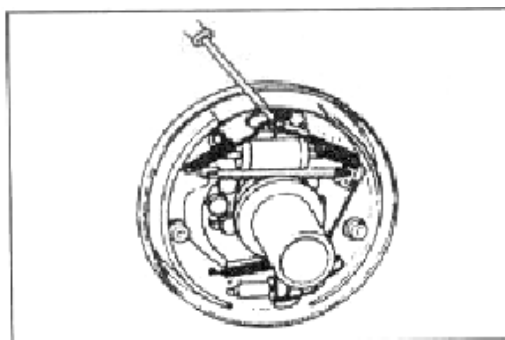


Fig 6-8

(3) Remove the other three fixed springs (Fig 6-9)

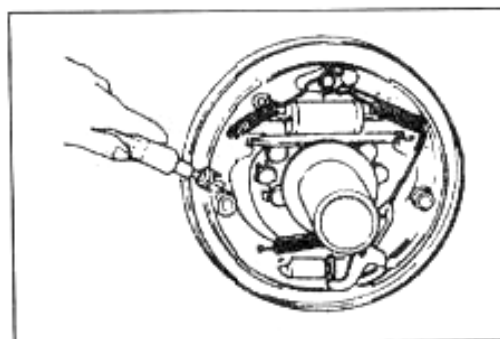


Fig 6-9

(4) Detach the primary brake shoe and the secondary brake shoe, and at the same time remove the spring for adjuster. (Fig 6-10)

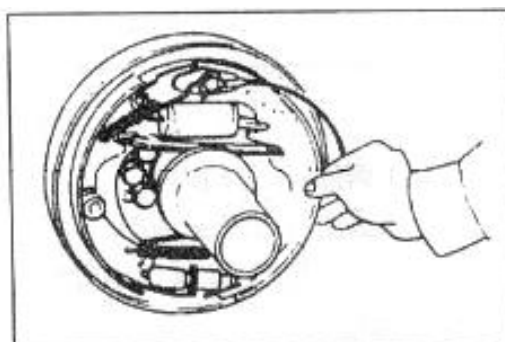


Fig 6-10

(5) Demount the brake oil pip on the wheel Cylinder, then remove the mounting bolts for wheel cylinder, and separate the wheel cylinder from the bottom plate. (Fig 6-11)



Fig 6-11

(6) Remove the E-shaped retainer ring that fastens the brake cable onto the bottom plate, then remove the mounting bolts on bottom plate, and detach the bottom plate from the axle. (Fig 6-12)

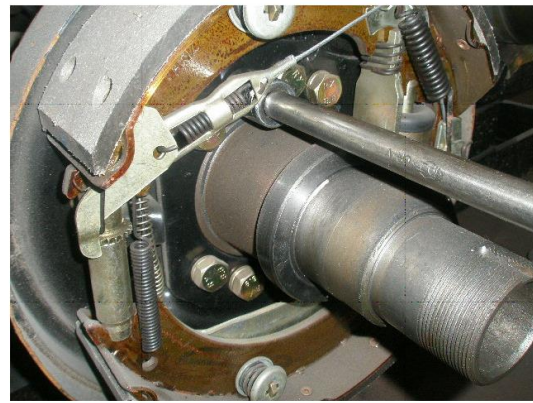


Fig 6-12

(7) Remove the shield for wheel cylinder, and push out all the parts inside the cylinder (Fig 6-13)



Fig 6-13

5.7.2 Examination of Wheel Brake

Examine all the parts as to whether or not any of them is worn or damaged, and it shall be repaired or replace, if incompliant.

(1) Examine whether or not the inner surface of wheel cylinder body and the surface of piston column are rusted, and then measure the clearance between piston and cylinder body.

Specified Value: 0.065mm-0.150mm (2-3.5t Forklift Truck);

Maximum Value: 0.15

(2) Visually check whether or not the pump rubber cup is damaged or distorted, and replace it if incompliant.

Outer Diameter of Rubber Cup: $\Phi 30.1_{-0.2}$ (2-3.5t)

The standard value for interference of rubber cup is 1.52, and the minimum value is 0.42 (2-3.5t)

(3) Examine the free length of wheel cylinder spring, and replace it is improper.

It is specified that the free lengths of wheel cylinder springs for 3t, and 3.5t forklift trucks as well as 2t forklift truck are respectively 58mm and 60mm.

(4) Examine the thickness of brake shoe, and replace it if it is found to be excessively worn out.

Specified Thickness: 7.2mm (2-3.5t) 8.0mm (3t-3.5t)

Minimum Thickness: 2.0mm (2-3.5t) 1.0mm (3t-3.5t)

(5) Examine the status of inner surface of drum brake, and it shall be rehabilitated or replaced, if it is found to be excessively worn out.

Standard Value: 310mm(2t) 314mm(3t,4t)

$254^{+0.13}_0$ mm(1-1.8t)

Maximum Value after Rehabilitation: 312mm(2t) 316mm(3t,4t)

256mm(1-1.8t)

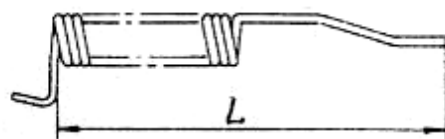


Fig 6-14

(6) Measure the free length and installation load of return spring for brake shoe (Fig 6-15). Refer to Part 7 of Fig 6-2.

Free Length: $L=106$ mm (2t) $L=102$ mm (1-1.8t)

$L=115.1$ mm (3t,4t)

Installation Length: 116mm(2t) 111mm(1-1.8t)

Fig 6-15

122mm (3,4t)

Installation Load: 246N(2t) 157 ± 15 N(1-1.8t)

225N (3t,4t)

(7) Measure the free length and installation load of return spring for top rod (Fig 6-16). (Refer to Part 9 of Fig 6-2)

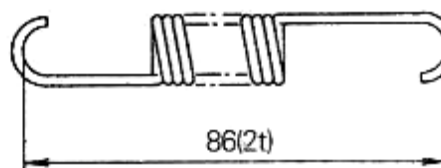
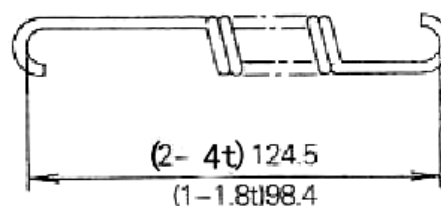


Fig 6-16

Free Length	124.5mm
Installation Length	130mm
Installation Load	245N
Forklift Truck Tonnage	1.8-3.5t

(8) Measure the free length and installation load of adjust
(Refer to Part 18 of Fig 6-2)

Free Length: 86mm (2t) 121mm (3t,4t)

98.4mm (1-1.8t)

Installation Length: 97mm (2t) 137mm (3t,4t)

126mm (1-1.8t)

Installation Load: 153N (2t) 71.5N (3t,4t)

50±5N (1-1.8t)

(9) Measure free length and installation load of ratchet
spring (Fig 6-18). Installation Load: 14.7N (3.5t) 12N
(1-1.8t)

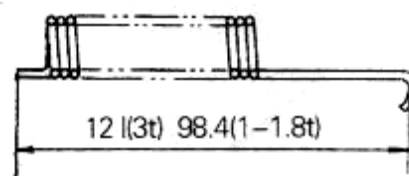


Fig 6-17

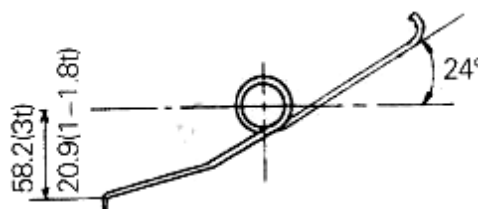


Fig. 6-18

(10) Examine whether or not the adjusting mechanism is damaged, how the operating status is, and also examine whether or not the contact of adjusting lever is out of order, and replace it when necessary.

5.7.3 Reassembly of Wheel Brake

(1) Firstly dip the wheel cylinder rubber cup and the piston with brake fluid, and then assemble spring, rubber cup, piston, and shield in turn.

(2) Mount the wheel cylinder on bottom plate.

Attention: Ensure that respective parts are all at the correct position during installation, and the bolt tightening torques are 17.6-26.5N.m (1.8t-3.5t)

(3) Mount the bottom plate onto the front axle.

Bolt Tightening Torque: 120-140N.m

(4) Add #2 calcium base lubricating grease at a, b, c, d respective lubricating pints as indicated in Fig 6-19, and be careful not to allow this grease to be adhibited on brake shoe.

(a) Support Face of Bottom Plate (b) Support Pin of Lever L H Brake

(c) Support Pin

(d) Adjuster Thread and Other Rotating Parts

(e) Contact Face of Brake Shoe and Washer,Cup

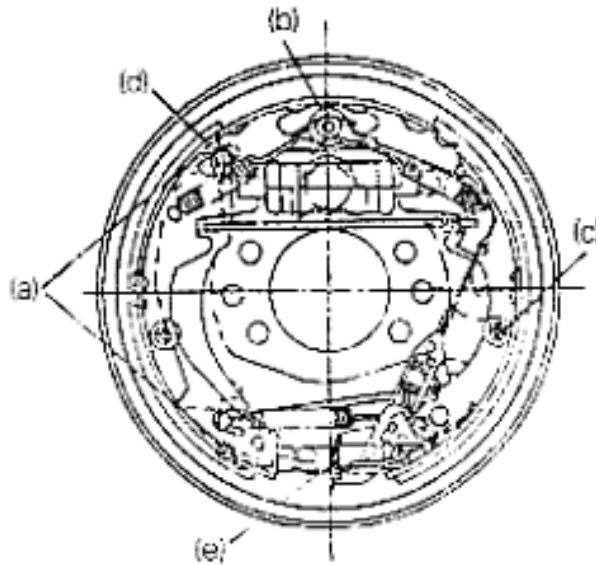


Fig 6-19 1.8t-3.5t Forklift Truck

(5) Mount the brake cable assembly onto the bottom plate using E-shaped retainer ring.

(6) Mount the brake shoe onto the bottom plate using fixing spring, but the bottom part of secondary brake shoe shall be mounted with fixing spring after the washer, cup and the adjusting lever have been properly installed, to ensure that the pressure seat is fitted in the holes of brake shoe and adjusting lever (Fig 6-20).

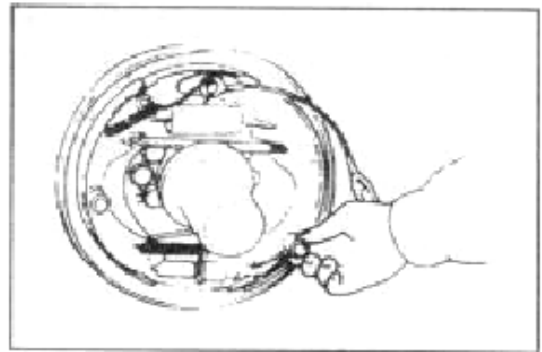


Fig 6-20

(7) Mount the compressed spring onto the hand brake push rod, and then install the push rod onto the brake shoe.

(8) Mount the guide plate of brake shoe onto the support pin, and then install the return spring of brake shoe (Fig 6-21)

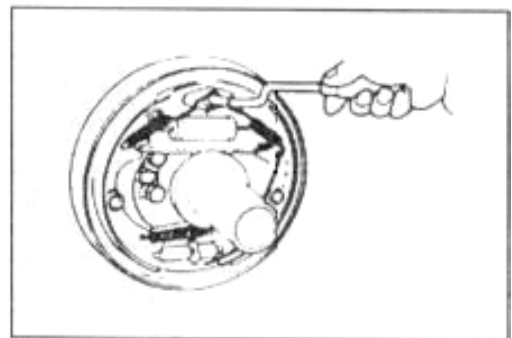


Fig 6-21

(9) Install adjuster, adjuster spring, top rod, and return spring for top rod (Fig 6-22).

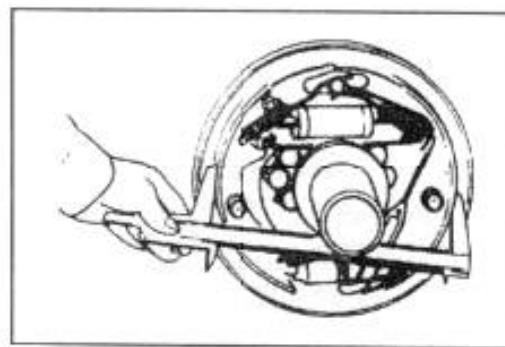


Fig 6-22

Pay attention to the following respective items:

- a) Adjuster thread direction and its installation direction (left-hand thread is used for left brake, while right-hand thread is used for right brake.)
- b) Adjuster spring direction (It is not allowed for the tooth part of adjuster to contact the spring.)
- c) Top rod return spring direction (At the end of support pin, the spring hook shall be fixed on the opposite side of top rod.)
- d) Top rod and top rod return spring shall be fixed inside the slot of support pin.
- e) Make sure that the lower end of adjusting lever shall be in contact with the tooth part of adjuster.

(10) Connect the brake oil pipe onto the wheel cylinder.

(11) Measure the inner diameter of drum brake, and adjust the adjuster for the differences between the inner diameter of drum brake and the friction plate of brake shoe to be: 0.5-0.8mm (1.8-3.5t).

5.8 Operating Test on Automatic Clearance Regulator

(1) Firstly allow the diameter of brake shoe to approach the installation size, and pull the adjusting lever with hand in the direction. When hand is released, the adjusting lever returns to its original place, while the gear of adjuster will not rotate.

Attention: Even if when hand is released, and the adjuster gear and the adjusting lever return together, the adjuster is still able for normal work after being assembled.

(2) In the case when adjusting lever is pulled, and the adjuster cannot do the abovementioned action, the following items shall be examined:

- a) Mount the adjusting lever, the top rod, the top rod spring, and the washer, cup firmly.
- b) Examine whether or not the relationship in arrangement between adjusting lever and adjusting gear is correct. Refer to Fig 6-23 (3.0-3.5t), Fig 6-24 (1-1.8t and 2.0-2.5t), and replace the parts if not satisfactory. In addition, examine whether or not lever and gear are in contact with each other.

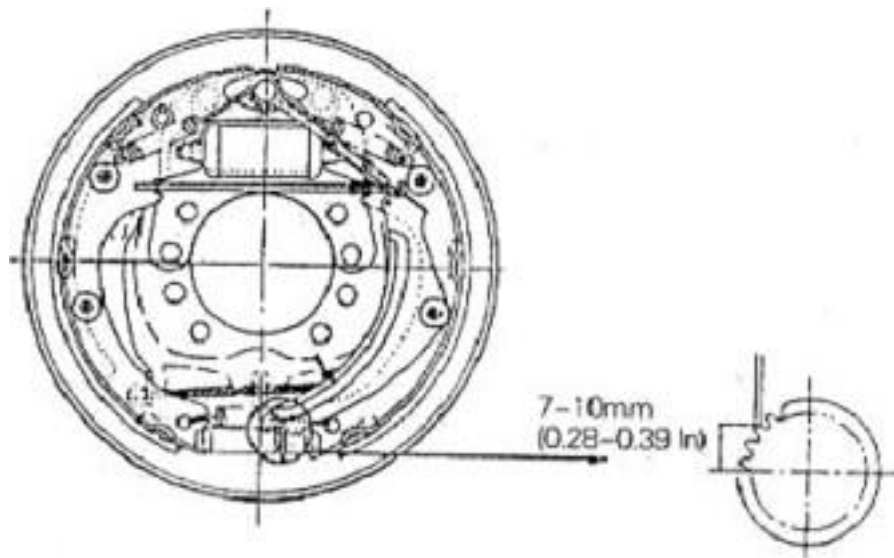


Fig 6-23

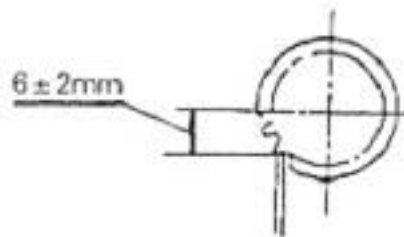


Fig 6-24

c) Examine whether or not the return spring of top rod and the spring for adjuster are damaged, and then examine the rotating status of adjuster gear and whether or not its engaged part is excessively worn out or damaged.

5.9 Failure Removal for Wheel Brake

Problem	Analysis for Cause of Generation	Removal Method
Brake under Poor Condition	<ol style="list-style-type: none"> 1. Oil leak with brake system 2. Clearance of brake shoe not properly adjusted 3. Brake too hot 4. Contact between drum brake and brake shoe under poor condition 5. Impurity attached on brake shoe 6. Impurity blended into brake fluid 7. Brake pedal (inching valve) improperly adjusted 	<p>To be repaired Adjuster to be adjusted</p> <p>Examine whether or not skidding exists To be readjusted</p> <p>To be repaired or replaced Brake fluid to be examined</p> <p>To be adjusted</p>
Noise Present with Brake	<ol style="list-style-type: none"> 1. Surface of brake shoe hardened or impurity attached on it 2. Bottom plate distorted or bolt loosened 3. Brake shoe distorted or installation incorrect 4. Brake shoe worn 5. Bearing of wheel loosened 	<p>To be repaired or replaced</p> <p>To be repaired or replaced To be repaired or replaced</p> <p>To be replaced To be repaired</p>
Brake Un-uniform	<ol style="list-style-type: none"> 1. Oil stain present on surface of brake shoe 2. Clearance of brake shoe not properly adjusted 3. Wheel cylinder out of operation 4. Brake shoe return spring damaged 5. Drum brake deflected 	<p>To be repaired or replaced Adjuster to be adjusted</p> <p>To be repaired or replaced To be replaced To be repaired or replaced</p>
Brake Weak	<ol style="list-style-type: none"> 1. Oil leak with brake system 2. Clearance of brake shoe not properly adjusted 3. Air blended into brake system 4. Adjustment of brake pedal incorrect 	<p>To be repaired or replaced Adjuster to be adjusted</p> <p>Air to be bled To be readjusted</p>

6. Hydraulic System

Forklift Truck Tonnage				1.8t	2.5t	3.5t
Equipped Engine				4TNE98		
Main Pump	Model			SGP1A28.2D2H 9-R330C		
	Type			Gear Type		
	Driving			Driving with Engine Power Output Gear		
	Loaded Displacement			72 L/Min		
	No-load Displacement			76 L/Min		
Multi-way Valve	Model			CDB3-F15XF-02		
	Type			Double Spool Valve, with Overflow Valve, Bypass Valve, and Inclined autolocking Valve, Pilot valve load feedback		
	Adjusting Pressure			20MPa		
	Bypass Valve	Pressure		10 MPa		
		Flow Rate		12 L/Min		
Lift Cylinder	Type			Single Act Piston Type, with Shutoff Valve, one-way valve and lower buffer		
	Cylinder Inner Diameter			1.8t: Φ45mm	2.5t: Φ50mm	3.5t: Φ56mm
	Stroke			(2 nd -grade Standard Mast at 3m Lifting Height) 1495mm (Varying along with Type of Mast and Lifting Height)		
Tilt Cylinder	Type			Double Act		
	Cylinder Inner Diameter			Φ63mm	Φ70mm	Φ80mm
	Piston Rod Outer Diameter			Φ30mm	Φ32mm	Φ35mm
	Stroke			174.5	174.5	174.5

6.1 Overview

Hydraulic system is composed of main oil pump, multi-way valve, lift cylinder, tilt cylinder, and oil pipeline, as well as the direct transmission oil pump of engine power-take-off (P.T.O).

6.2 Main Oil Pump

The main oil pump is a gear pump, mainly composed of pump body, pump cover, one pair of gears, bearing, and seal ring. Load balanced bearing and special lubricating method are applied to main oil pump, for the end face of gear to gain the minimum clearance.

As pump body and pump cover are light and firm, as they are made of alloy aluminum. The two shafts respectively provided for driving gear and driven gear are separately installed on the bearing of pump body. These bearings are made of special material, to bear the radial load of gear shaft on one hand, and to serve as the baffle seat for the end face of gear on another.

On the side of drive shaft, one oil seal is pressed and fitted on the pump body, to ensure the sealing property. The sealing between pump body and cover is ensured with seal ring in special shape mounted.

6.3 Multi-way Valve and Bypass Valve (Fig 7-1)

The 2-disk multi-way valve consists of four-plate valve body, two spool valves, one safety overflow valve, and one bypass valve. The four-plate valve body is assembled using three stub bolts and nuts, and the inclined spool valves are mounted with inclined autolocking valve.

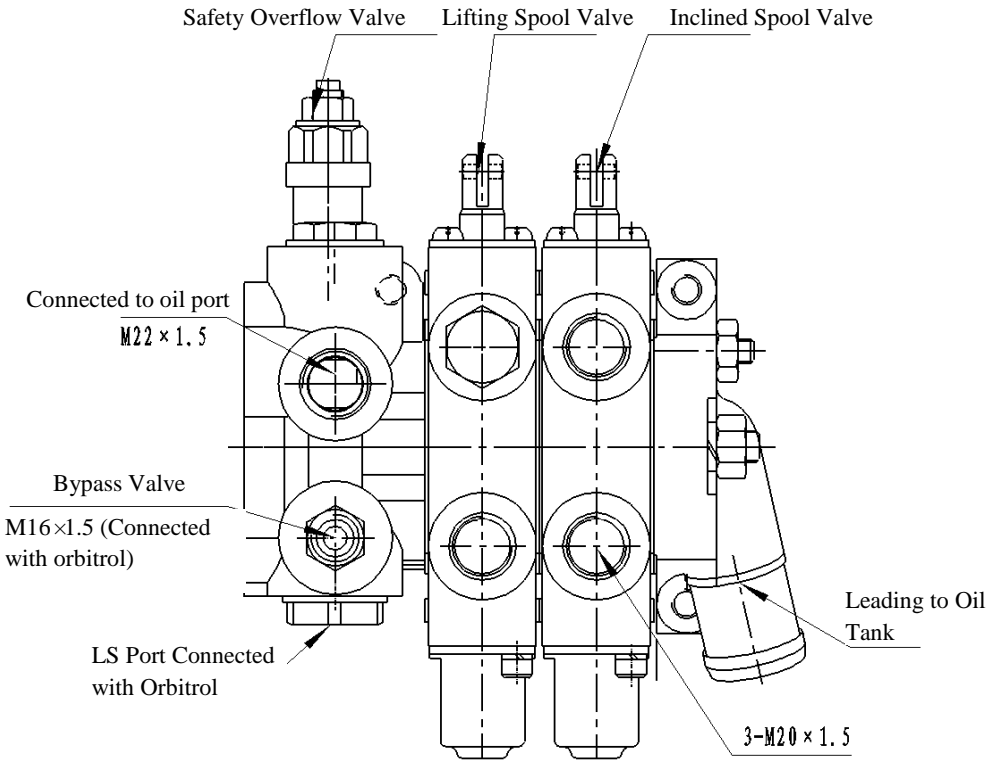


Fig 7-1 Multi-way Valve

6.3.1 Operation of Spool Valve (Taking inclined Spool Valve as example)

(1) Neutral Position (Fig 7-2)

At this point the High-pressure oil drained from oil pump returns to oil tank through neutral position.

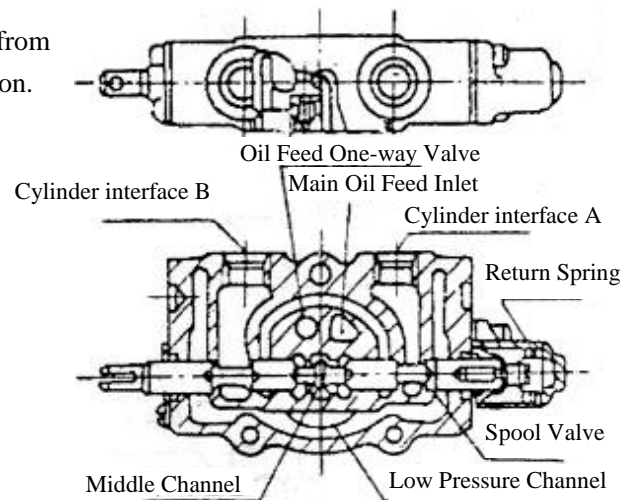


Fig 7-2

(2) Push-in Spool Valve (Fig 7-3):

At this point middle channel is closed, the oil from oil inlet port opens the one-way valve and flows to the interface B of cylinder, while the oil from cylinder interface A flows to oil tank through low-pressure channel. By virtue of return spring, it may allow the spool valve to return to neutral position.

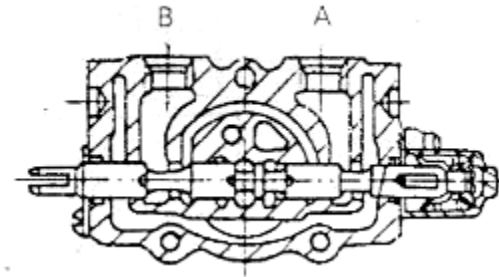


Fig 7-3

(3) Pull-out Spool Valve (Fig 7-4)

At this point when neutral position is closed, the oil from the oil inlet port opens the one-way valve and flows to the cylinder interface A, while the oil from cylinder interface B flows to the oil tank through low-pressure channel. By virtue of return spring, it may allow the spool valve to return to neutral position.

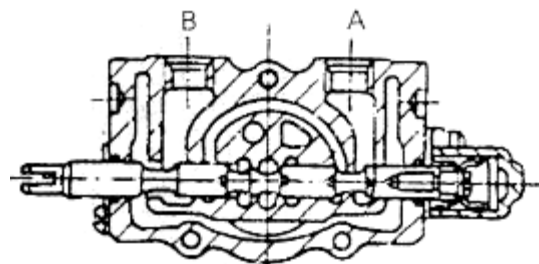


Fig 7-4

6.3.2 Main Safety Overflow Valve and Bypass Safety Valve (Fig 7-5)

The main safety overflow valve is composed of the two parts including main valve A and pilot valve B. When multi-way valve is reserved, the high-pressure oils in cavity C and working mechanisms (such as lift cylinder and tilt cylinder) are connected, the pressure oil acts on the pilot valve B, through the fixed throttle holes D and E. When system pressure is larger than the system regulated pressure, the pilot valve B is opens, for the pressure in cavity F to drop. The valve core of the entire main valve A moves rightwards, for the pressure oil to be directly connected with low-pressure channel G, for cavity C to be relieved, in order to ensure the stability of system

pressure. Adjusting screw H may be used to adjust the stable pressure value of the system.

The bypass safety valve is in a relatively simple structure, as a direct-acting type of overflow, to get a stable pressure value for steering system by making use of the principle for direct balance of liquid pressure with spring force. When operating wheel is operated, the oil cavity M is connected with high-pressure oil circuit. When system pressure is larger than spring pressure, the valve core N moves rightwards, and pressure oil is connected with low-pressure oil circuit through cavity T, for cavity M to be relieved, in order to ensure the stability for the pressure of steering system. Adjusting screw K may be used to adjust the stable pressure value of the system.

L valve is a balanced spool valve, and the spool valve L moves leftwards and rightwards through continuous change in flow and pressure to change the openness in the two places of R and S, to ensure that the flows to working cavity Q and outlet PS to fully hydraulic orbitrol are automatically balanced, and to be passed by steadily according to proportion. a, b, and c are the fixed throttle holes

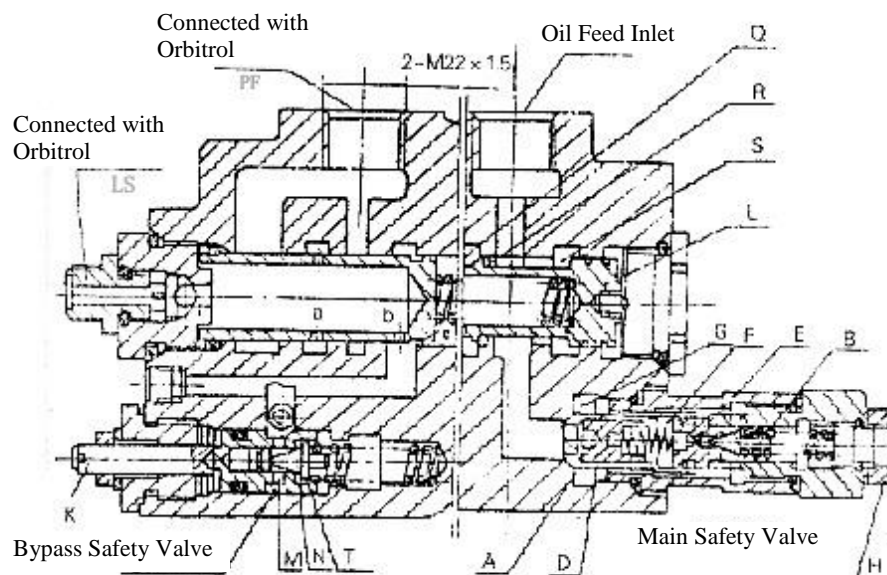


Fig 7-5

6.3.3 Action of Inclined Autolock Valve

The inclined spool valve is mounted with autolock valve, mainly used to prevent vibration possibly arisen from internal negative pressure of tilting cylinder, and avoid severe aftereffect caused by misoperation. For general conventional structure, the inclined spool valve can still be operated for it to tip forward after engine is turned off. However, when this tilt autolock valve is used, it cannot make the mast tip forward, even if the valve is operate with a big push, in the case when engine is turned off. Refer to Fig 7-6 for its structure.

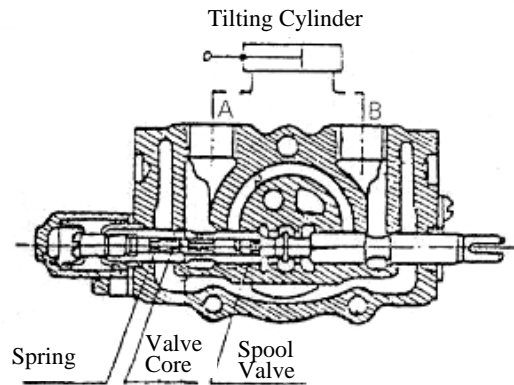


Fig 7-6

The interfaces “A” and “B” of valve body are respectively connected to the front and rear cavities of piston for tilting cylinder. When spool valve is pulled out, the high-pressure oil (P) enters into interface “A”, while the oil in the rear cavity returns from “B” to oil tank (T), and at this point the mast is under the back-tip status.

When inclined spool valve is pushed, the high-pressure oil enters into interface “B”, to allow the autolock valve in spool valve to act by virtue of high-pressure oil, while “A” is connected with low pressure. When engine turns off or stop rotation, there is no high-pressure oil for autolock inside the spool valve to act, hence the interface “A” cannot be connected with low pressure, the mast will not tip forward, and negative pressure can neither be formed in tilt cylinder.

6.4 Oil Circuit of Hydraulic System (Main Oil Circuit)

As in Fig 7-7, The high-pressure oil from the main oil pump reaches the multi-way pump, divided into two parts via multi-way valve and through the bypass valve therein: One part for high-pressure oil to be divided into lifting cylinder or tilt cylinder, and the other part is divided at an invariable flow rate into orbitrol (with pilot valve load feedback), to control the steering cylinder. When lift and tilt two spool valves are at the neutral position, the high-pressure oil returns to oil tank directly through channel. When lift spool valve is pulled, the high-pressure oil passes through the throttle valve, and then pushes the piston rod upwards from downward of lift cylinder piston. When lift spool valve is pushed, the lower part of lifting cylinder piston is connected with low pressure, for piston rod to drop depending on self weight and cargo weight. AT this point the oil flowing out from lifting cylinder passes through the throttle valve for the dropping speed to be controlled. When tilt spool valve is operated, the high-pressure oil may flow into the front cavity of tilting cylinder, while the other side is connected with low pressure, for the mast to achieve the back tip or front tip action.

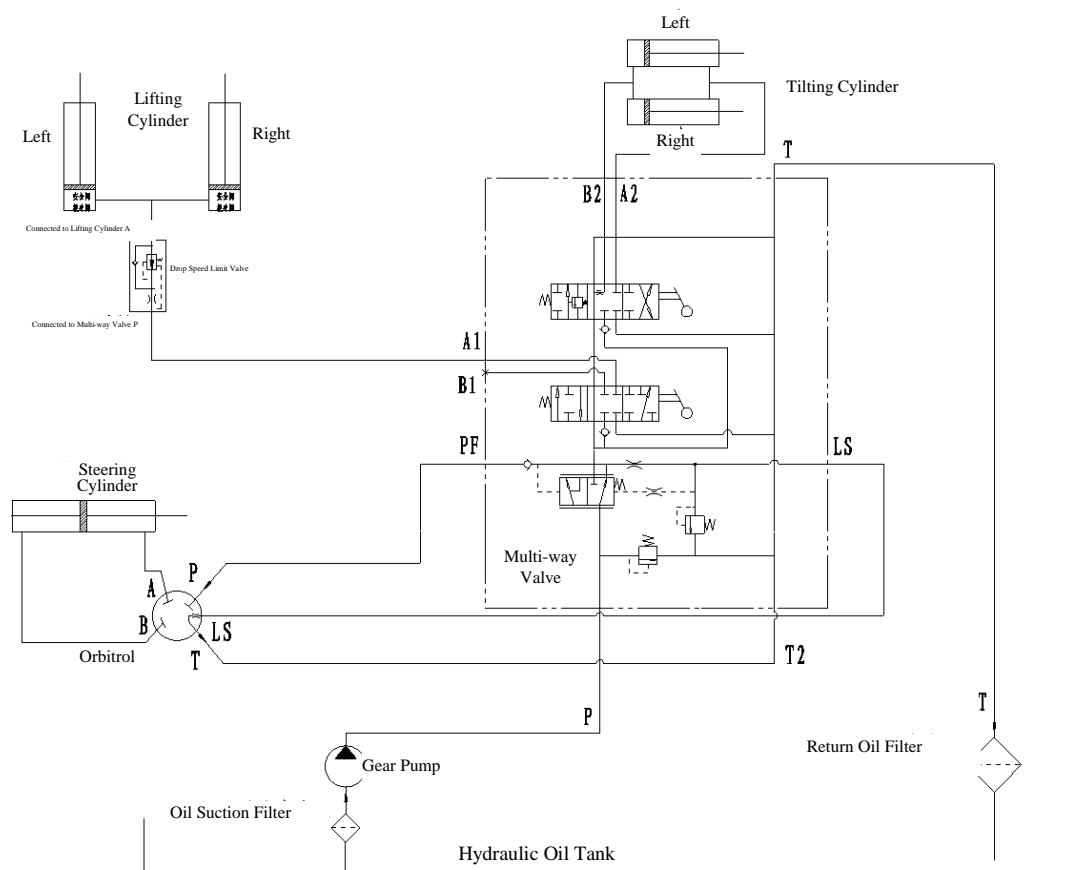


Fig 7-7 Oil Circuit of Hydraulic System

6.5 Lifting Cylinder

As in Fig 7-8, Two single-acting lifting cylinders are fixed on the rear side of channel steel for the outer mast, and the bottom part of cylinder is fixed on the fork carriage of lift cylinder on the outer mast using pins and bolts, while the top part of cylinder (namely the top part of piston rod) is connected with active beam. The piston strokes for the two cylinders shall be adjusted to be consistent, for the two cylinders to lift synchronously, and the part 29 may be adjusted to achieve the synchronization, if they are still not synchronized.

The lifting cylinder is mainly composed of cylinder body, piston, piston rod, cylinder cover, cylinder bottom and sealing parts. One oil port is available in the lower part of cylinder body, The piston is fastened onto the piston rod using slot nut and cotter pine, and one YX seal ring, retainer ring and wear ring are fitted on the outer edge of piston. This piston moves along the inner surface of cylinder body under the action of high-pressure oil. Shaft sleeve and dust ring pressed and matched are mounted in the inner hold of cylinder cover, and this shaft sleeve supports the piston rod, while the dust ring is able for cylinder body to resist dust. The stroke of piston may be adjusted by making use of cylinder cover.

When the lift spool valve of multi-way valve is pulled backwards, the high-pressure oil enters through the bottom part of lift cylinder, to push the piston and the piston rod, for fork and inner mast to lift by virtue of lift chain. When lift spool valve is pushed forward, the piston of lift cylinder drops under the effect of piston rod, fork carriage, fork and cargo weight, for the oil under the piston to flow out. The oil drained out from lift cylinder is controlled by throttle valve, and returns to oil tank through multi-way valve.

- | | |
|-------------------|----------------------|
| 1. Active Beam | 16. Pin |
| 2. Dust Ring | 17. Spool Valve |
| 3. Shaft Cap | 18. Spring |
| 4. Cylinder Cover | 19. Joint |
| 5. O-Ring | 20. O-Ring |
| 6. Piston Rod | 21. Hoisting Chain |
| 7. Cylinder Body | 22. Plug |
| 8. O-Ring | 23. Screw |
| 9. Piston | 24. Retainer Ring |
| 10. Wear Ring | 25. Sheave |
| 11. Retainer Ring | 26. Plug |
| 12. Yx Seal Ring | 27. Chuck Plate |
| 13. Nut | 28. Bolt |
| 14. Cotter Pin | 29. Adjusting Washer |
| 15. Bolt | |

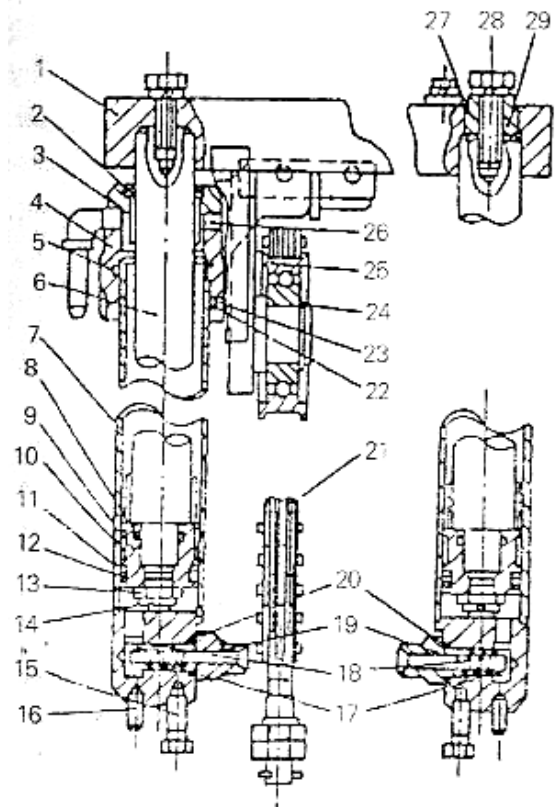


Fig 7-8 Lifting Cylinder

There is one shut-off valve on the bottom of lift cylinder, (Refer to Fig 7-9), to prevent cargo from abrupt drop, when high-pressure rubber hose is suddenly cracked. The oil from lift cylinder passes through the spool valve of shut-off valve, and the oil holes around the spool valve allow the two rubber hoses to generate pressure difference. When this pressure difference is smaller than the spring force, the spool valve will not act. If the high-pressure rubber hose is cracked, a very huge pressure difference is formed, for the spool valve to move and block up its surrounding oil holes, only to allow a small amount of oil to flow through the pores on the end part of spool valve, for fork to slowly drop.

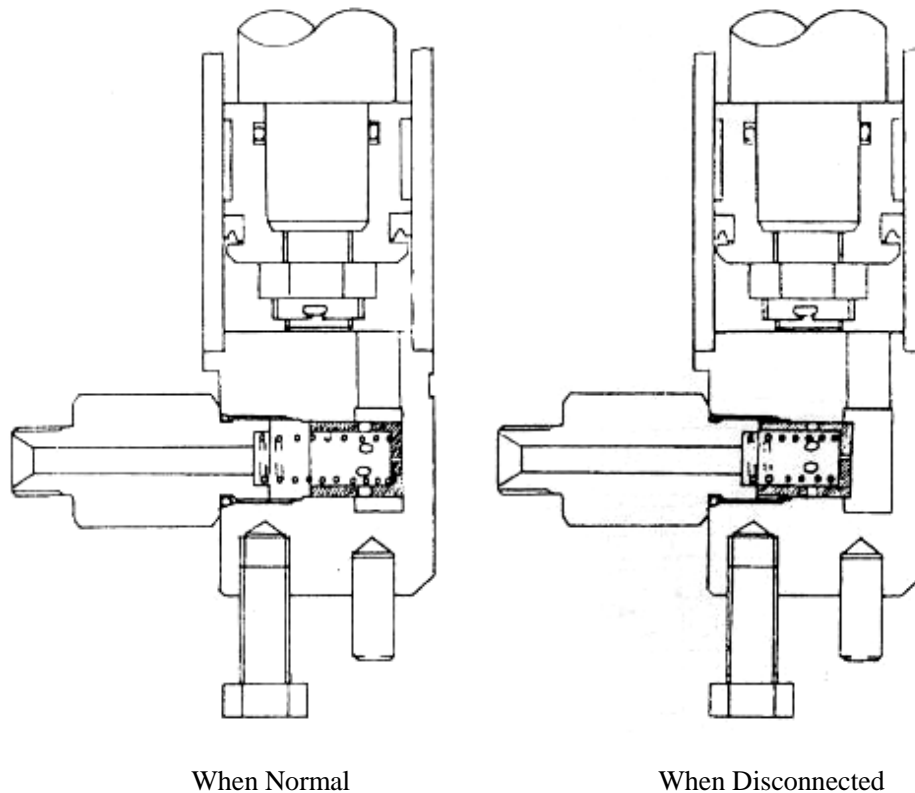
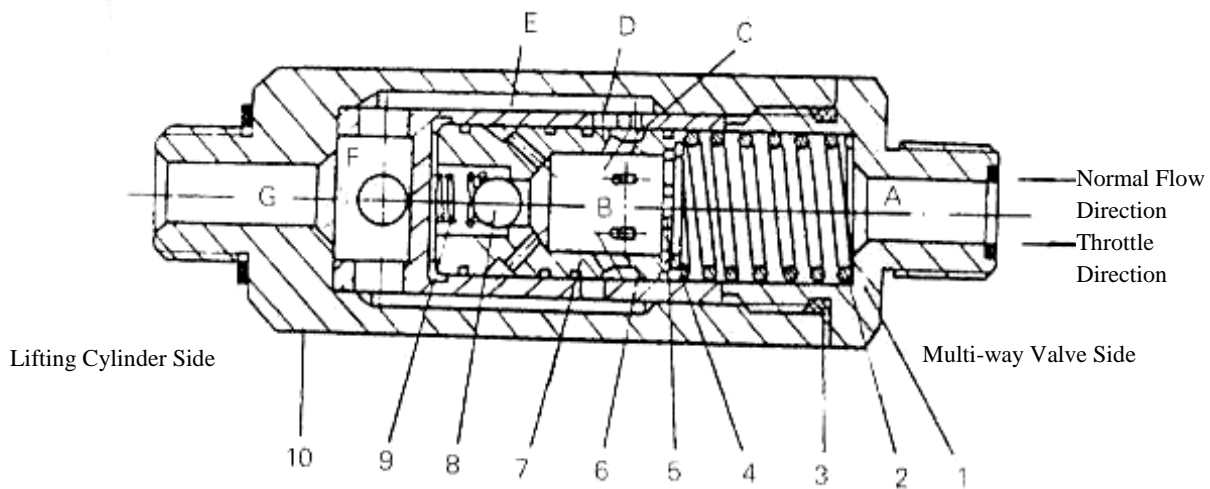


Fig 7-9

6.6 Limiting Valve

Speed limiting valve (namely throttle valve) is mounted in the oil circuit of lift cylinder, to restrain the dropping speed when fork carries a heavy load, and its structure is indicated as in Fig 7-10. When spool valve of multi-way valve is at the “Lift” position, the high-pressure oil from multi-way valve passes through cavities A and B as well as holes C, D, E, and F, and cavity G under the condition when it is not throttled, and then flows into the lift cylinder. When spool valve of multi-way valve is at the “Drop” position, the oil from lift cylinder passes cavity G, oil holes F, E, D, and C, as well as cavities B and A through the entire valve. At this point, pressure difference is generated between cavity A and cavity B, and opens the ball valve (Part 8). When pressure difference exceeds the spring force of spring 2, the valve core 7 moves rightwards, for the flow quantity of oil to drop for diminish of D and C holes, which has also reduced the flow quantity through the throttle hole.



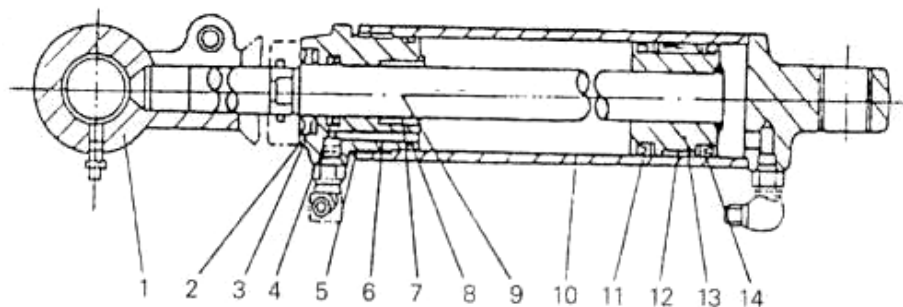
- | | | | | |
|-----------|------------------|-------------------|---------------|----------------|
| 1. Joint | 3. O-Ring | 5. Throttle Plate | 7. Valve Core | 9. Spring |
| 2. Spring | 4. Retainer Ring | 6. Valve Sleeve | 8. Nylon Ball | 10. Valve Body |

Fig 7-10 Limiting Valve

6.7 Tilting Cylinder (Fig 7-11)

Tilting cylinder is in a double-acting type, mounted on the two sides of mast. Its end of piston rod is connected with mast, and the bottom of tilt cylinder is connected with truck frame using pins.

The tilting cylinder assembly comprises of piston, piston rod, cylinder body, cylinder bottom, guide sleeve, and sealing parts. Welded structure is applied to piston and piston rod. One wear ring and two Yx seal rings are mounted on the outer edge of piston, while Yx seal ring, retainer ring, and dust ring are fitted in the inner hold of guide sleeve, pressed and matched with shaft sleeve. This shaft sleeve supports the piston rod, while the seal ring, retainer ring, and dust ring are able to prevent oil leak and dust, screwed onto the cylinder body together with O-ring.



- | | | | | |
|----------------|-----------------|---------------|-------------------|------------------|
| 1. Clevis | 4. Yx Seal Ring | 7. Bearing | 10. Cylinder Body | 13. Piston |
| 2. Dust Ring | 5. O-Ring | 8. O-Ring | 11. Yx Seal Ring | 14. Yx Seal Ring |
| 3. Baffle Ring | 6. Guide Sleeve | 9. Piston Rod | 12. Wear Ring | |

Fig 7-11 Tilting Cylinder

When tilt spool valve is pushed forward, the high-pressure oil enters from the bottom of cylinder, thus to push forward the piston for mast to tip forward by 6°; and when spool valve is pulled backwards, the high-pressure oil enters from the front end of cylinder body, to push backward the piston, until the mast tips backwards by 12°.

6.8 Maintenance of Main Oil Pump

6.8.1 Disassembly

(Refer to Fig 7-18 and 7-19 for Imported Main Oil Pump in combination.)

- (1) Clamp the pump gently on the vice stand after cleaning, and firstly remove the bolt 12.
- (2) Detach pump cover 1 and seal rings 8, 9, 10, and 11.
- (3) Remove the front-end cover 7, and 8, 9, 10, and 11.
- (4) Demount bearings 3 and 4, as well as gears 5 and 6 from pump body 2, and bearings may be dismounted through pressing the gears, if it is difficult to disassemble them.

It is the best to make arrangement according to the sequences in Fig 7-18 and Fig 7-19, in order to facilitate examination.

6.8.2 Examination and Repair

The parts that have been disassembled, except rubber, shall be cleaned firstly with oil, and examined, repaired, or replaces according to following steps.

(1) Examination of Pump Body

High-efficiency gear pump is designed into that the crest of gear rotates along the inner surface of pump body through slight press and touch, and the trace of scratch will be generated around the inner surface of the crest and the pump body. Under normal situation, its trace shall not exceed a length 1/3 of the inner edge of the pump body, and if it reaches 1/2 length, it indicates that the bearing and gear shaft are severely worn out. In Fig 7-12, when size X exceeds 39.180mm, or the trace of scratch on inner edge exceeds one half, it is required to replace the pump body.

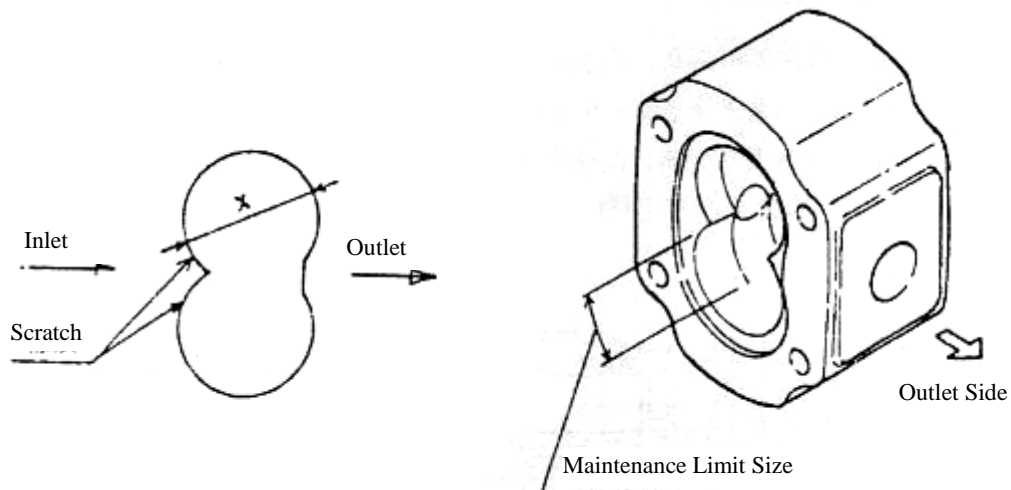


Fig. 7-12

(2) Examination of Bearing (Fig 7-13 and Fig 7-14)

The ideal situation is to require that the inner surface of bearing is not coarse, and the contact surface with brightness is shown at the position about 1/2 at the inlet side. The bearing shall be replaced, if any of the undermentioned cases occurs.

a) The trace of contact appears on the entire slide inner surface, and a feeling of obvious coarseness exists when it is scraped with finger nail.

b) Crack appears around the end face, and a severe coarseness is felt when it is scraped with finger nail.

c) The bonding trace with other extraneous substance appears on the internal slide surface and the end face.

Most cases of abovementioned failures are aroused by un-cleaned hydraulic oil. At this point the whole oil circuit may be cleaned or the oil may be replaced. Some individual cases are attributed to overloaded safety valve, air corrosion, or too high temperature, or too low viscosity. In the case when the abovementioned failures occur, leading to coarseness or severe wear on the gear shaft or the end face of gear, the gear and bearing shall be replaced. The limit size for bearing maintenance is:

Inner Diameter—19.123mm (Fig 7-14)

Total Length—26.411mm

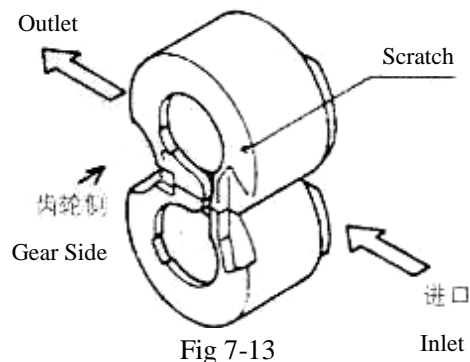


Fig 7-13

(3) Examination of Gear

So long as clean hydraulic oil is used, generally speaking, gear shaft and gear end face will not be damaged. In the case when a coarseness to a certain degree is felt when it is scraped with finger nail on the end face of bearing and gear, or crack occurs on the gear end face, or severe un-uniform wear is present on the gear end face, the gear shall be replaced at this point. When gear surface is worn or discolored, it indicates that failure has also occurred with bearing or pump body, and it shall be examined. The limit size for the axial diameter of gear shaft is 18.935mm (as indicated in Fig 7-15).

(4) Examination of Oil Seal

a) Oil Seal 14: (Refer to Figs 7-18 and 7-19) Oil seal 14 is a combination seal, and the lip at inner side of the pump shaft plays the sealing function, while the lip at the outer side is mainly for dust resistance (as in Fig 7-16). It is mainly required to examine whether or not crack, wear, or distortion exists with oil seal, and it is also required to examine whether or not the elasticity of rubber is enough, and it shall be replaced once it is out of order.

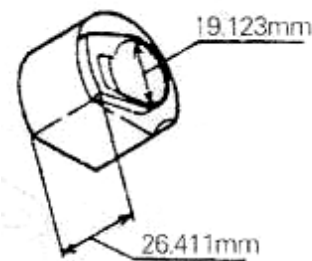


Fig 7-14

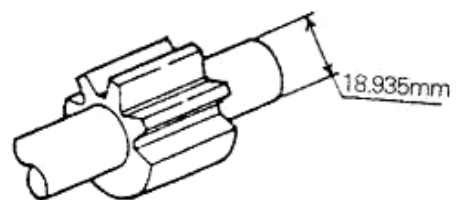


Fig 7-15

b) Seal Rings 8 and 9;

Seal ring 8 for pump body and seal ring 9 for bearing shall be replaced with new ones, when pump body is reassembled.

c) Seal Rings 10 and 11: Examine whether or not they are worn and damaged.

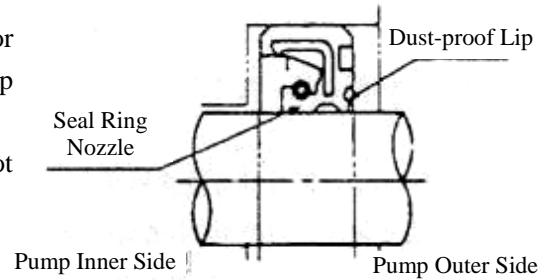


Fig 7-16

6.8.3 Reassembly (Fig 7-17)

(1) Clean the disassembled parts.

(2) Coat a thin layer of clean grease on the lips of oil seals 8, 9, 10, 11, and 14.

(3) Place the pump body 2 and the pump cover 1 on a flat stand, and coat the inner surface of pump body with clean hydraulic oil.

(4) Put bearings 3 and 4 into the pump body, and pay attention not to misplace their mutual positions. Place the bearing at correct position, and it may be taken out for reassembly, in the case of difficulty. It is never allowed to knock it gently or press it in forcibly.

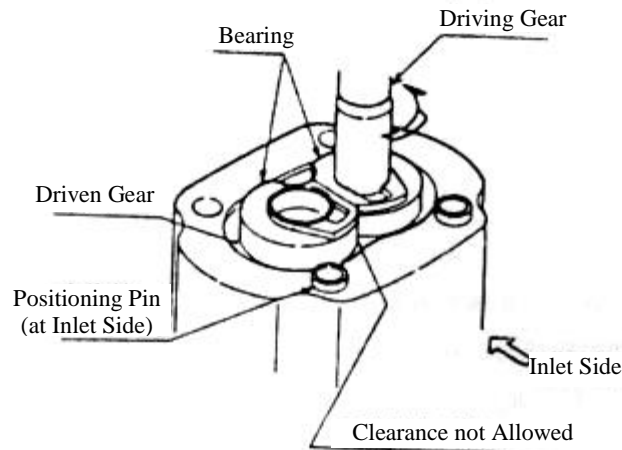


Fig. 7-17

(5) Turn over the pump body, put the driving and driven gears 5 and 6 into the pump body, and allow the engaged teeth to be at the same engagement positions prior to disassembly.

(6) Mount the bearings 3 and 4 on one side of the front end cover using the same method as in Step (4).

(7) Mount the seal ring for pump body 8, the seal ring for bearing 9, and seal rings 10 and 11, and pay attention not to allow the seal rings to be overlaid in the middle.

(8) Assemble the front end cover 7, and in this case, wrap the band around the end of driving gear, to avoid damage of oil ring lip, and don't forget removing such band after the front end cover is mounted.

(9) When pump body is turned over to mount end cover, pay attention to prevent the slide of seal rings installed during step (7).

(10) Mount seal rings 8, 9, 10, and 11, with the same method as in step (7).

(11) Put on the end cover 1.

(12) Mount spring washer 13 and bolt 12, and tighten the bolt with a torque of $47^{+0.25}_0$ N.m

($4.7^{+0.26}_0$ kgm).

Examine the gear pump as to whether or not it is assembled completely and properly. Place the driving shaft into the vice stand, the turn this pump, and the rotation of this pump shall be quite light. It is required to reexamine the pump, in the case when it is difficult to rotate.

Before this pump is assembled onto the machine, it is required to examine for a second time whether or not the assembly of the hydraulic pump is correct, and whether or not the rotating direction is correct.

Attention shall be paid to the following items when the pump is assembled:

a) Examine whether or not the lower part based on centerline is damaged or present with dust.

b) Examine whether or not the flange face of pipeline is damaged or present with dirt.

Mount O-ring, after the abovementioned has been examined (pipeline flange).

6.8.4 Test Run

Operation shall be carried out after assembly. Observe whether or not the pump has the specified performance after reassembly, and do running-in. It is required for test run to be performed when pump is assembled on forklift truck, and test run shall be conducted according to the following method. If pump is blocked or its internal part is excessively worn out, oil shall be replaced and filter shall be replaced or cleaned.

(1) Install pressure gauge on high-pressure pipeline near the pump.

(2) Place the control valve at neutral gear, for pump to run at a speed of 500-1000rpm. As this valve is at neutral gear, the reading of pressure gauge shall be slightly lower than 1MPa (10kg/cm), and keep the pump running for 10 minutes under such status.

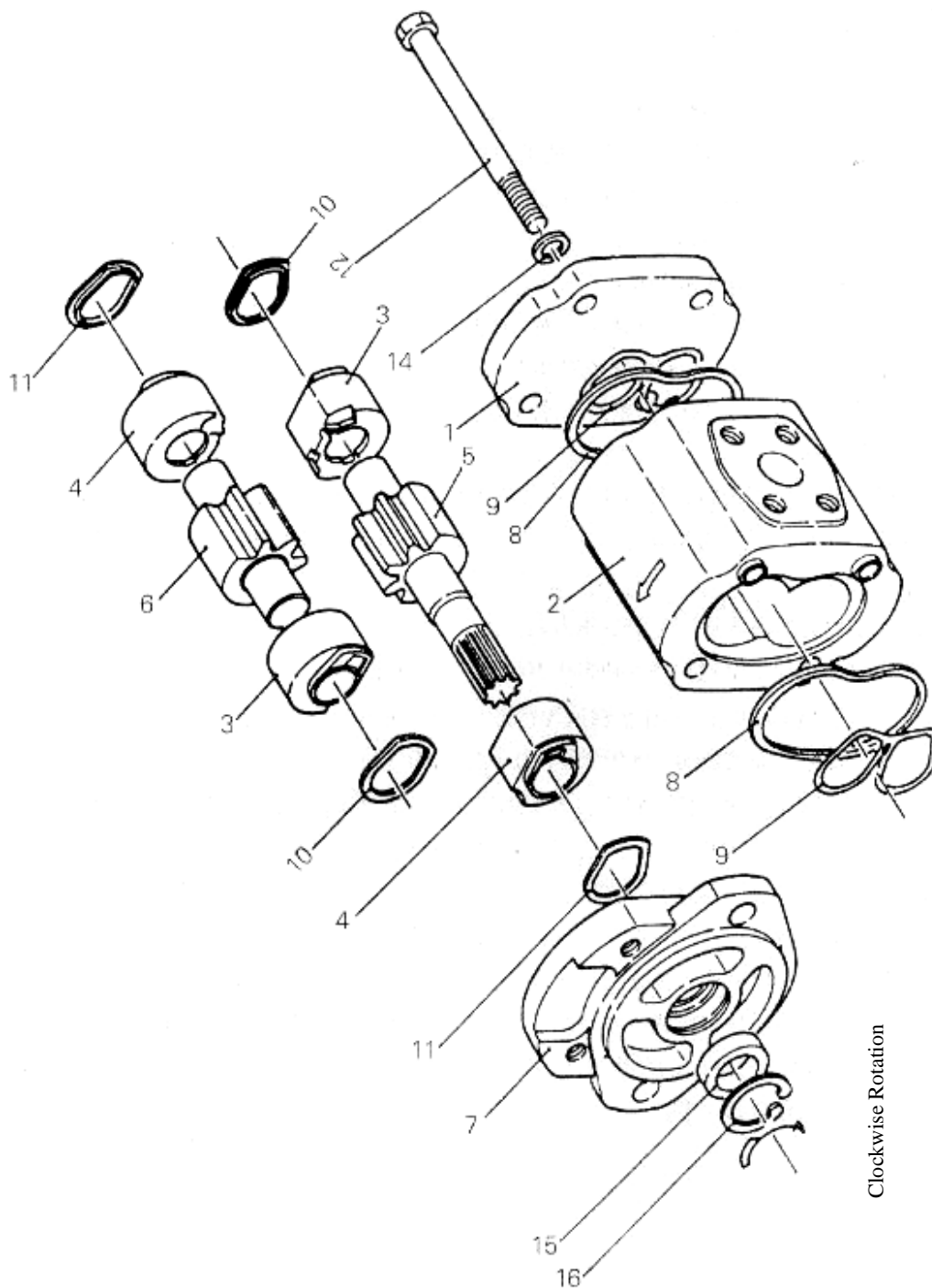
(3) Increase its rotating speed to 1500-2000rpm, and allow it to be idle for 10 minutes.

(4) Keep the rotating speed at Step (3) unchanged, increase the pressure to 2-3MPa (20-30kg/cm) for a further operation for 5 minutes, and repeat such operation until maximum pressure is reached. During this process, use overflow valve to increase load so as to adjust pressure. Allow each oil circuit to work for 5 minutes, and replace or clean the filter core of return oil filter. When pressure is boosted, attention shall be paid to oil temperature, as well as the surface temperature and working sound of pump body. IF oil temperature or pump temperature is too high, the pump shall be unloaded immediately to lower the temperature, and then this process is to be repeated.

(5) After the above procedure is completed, readjust the overflow valve to the original working condition and perform unloading test.

(6) No matter it is loading or not loaded, unloading test shall be made in either cases, to ensure that this device has a proper speed.

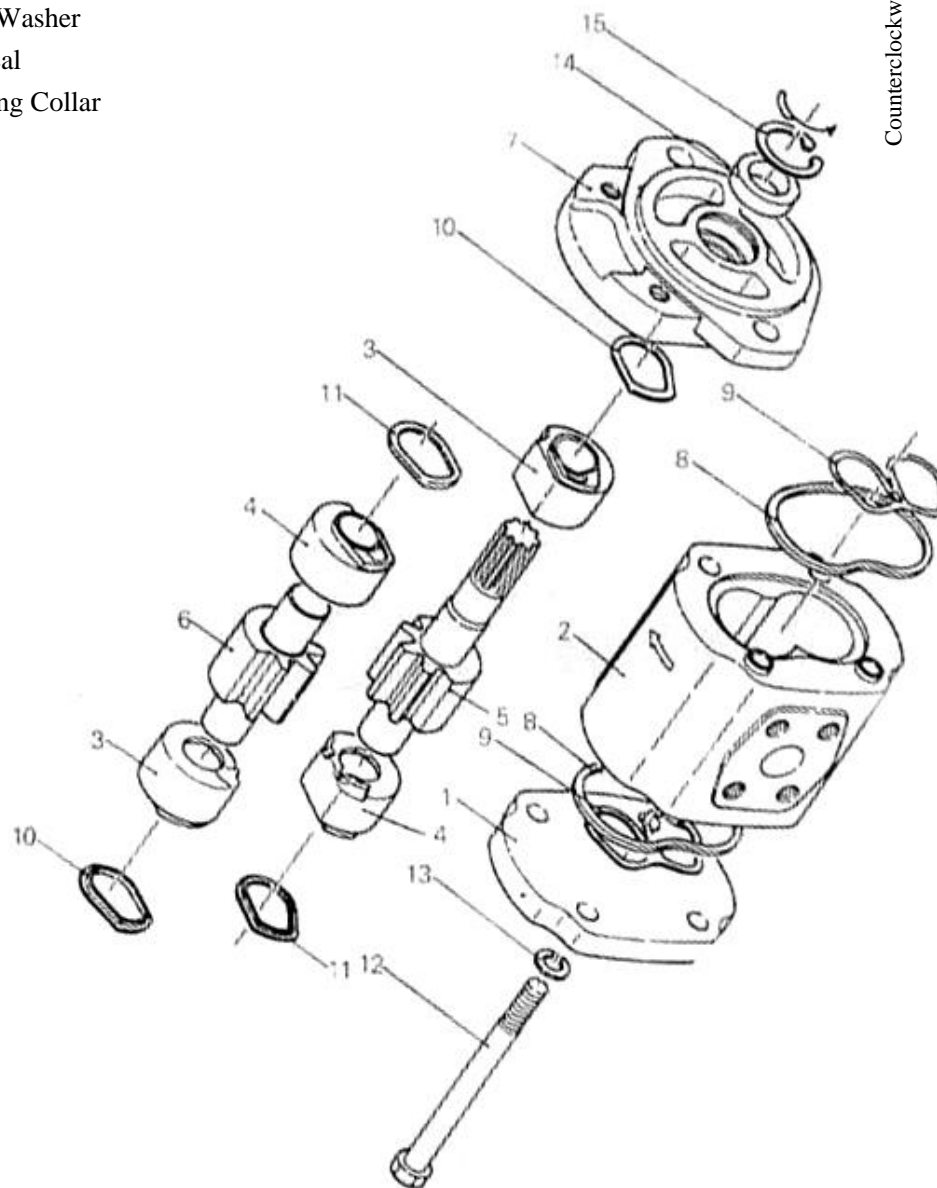
Fig 7-18 and Fig 7-19 respectively indicate the lateral views for structure of gear oil pump in clockwise and counterclockwise rotations, and Fig 7-20 represents the schematic diagram of hydraulic pipeline, for your information.



1. End Cover 2. Pump Body 3. Bearing 4. Bearing 5. Driving Gear
6. Driven Gear 7. Front End Cover 8. Seal Ring 9. Seal Ring 10. Seal Ring
11. Seal Ring 12 Bolt 13. Lock Washer 14. Oil Seal 15. Locking Collar

Fig 7-18 Clockwise Rotation of Gear Pump (2-3.5t Gasoline Forklift Trucks)

1. End Cover
2. Pump Body
3. Bearing
4. Bearing
5. Driving Gear
6. Driven Gear
7. Front End Cover
8. Seal Ring
9. Seal Ring
10. Seal Ring
11. Seal Ring
12. Bolt
13. Lock Washer
14. Oil Seal
15. Locking Collar



Counterclockwise Rotation

Fig 7-19 Counterclockwise Rotation of Gear Pump (2-3.5t Diesel Forklift Truck)

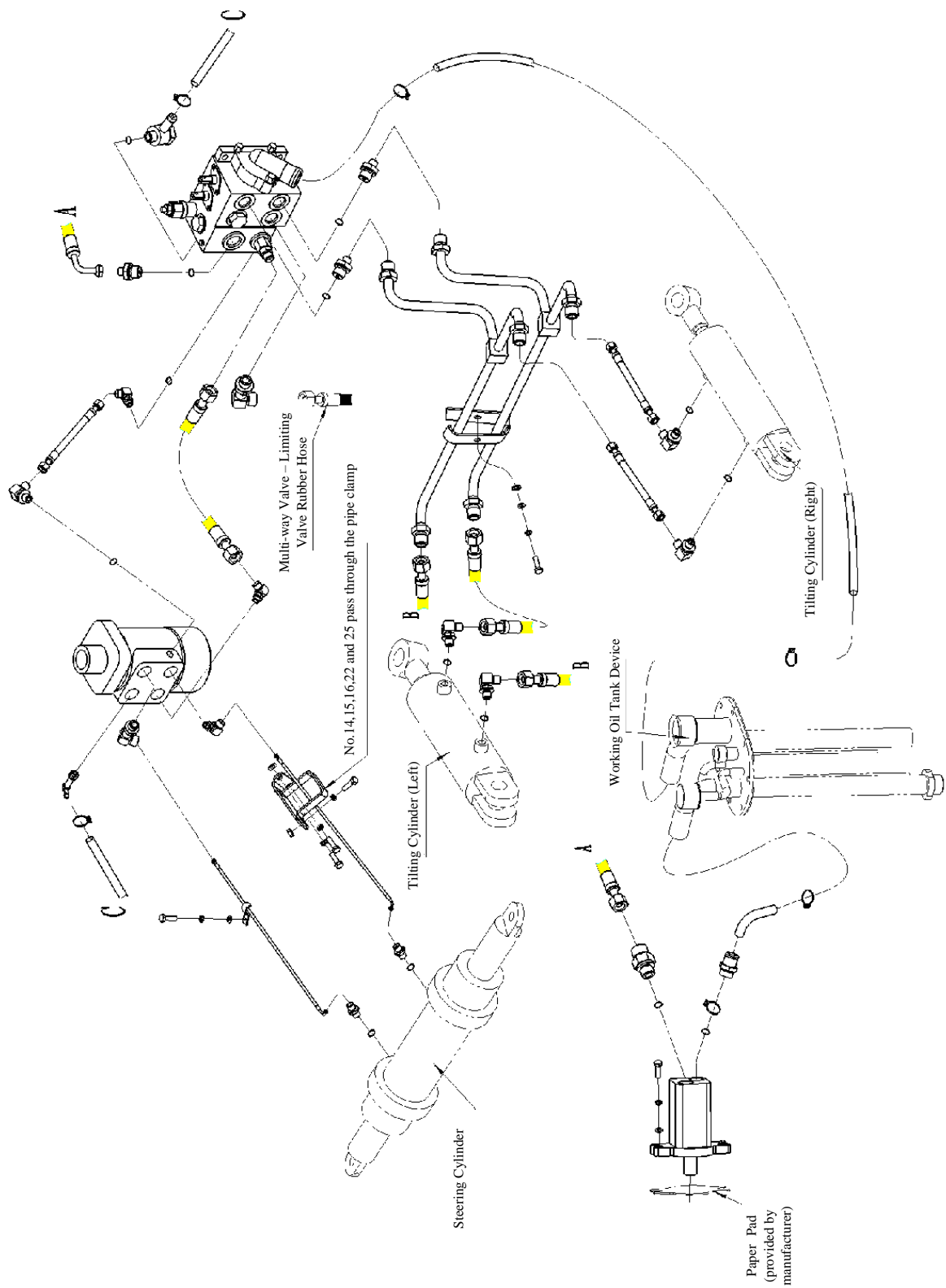


Fig 7-20 Schematic Drawing of Hydraulic Pipeline (Diesel Forklift Trucks)

6.8.5 Failure Removal

Problem	Possible Cause	Removal Method
Oil of Oil Pump Staying away	Oil level in oil tank to the low end	Oil to be filled to the specified oil level
	Oil suction side pipeline or filter blocked	To be cleaned, and oil to be replaced if it is dirty
Failure of Gear Pump for Supercharge	Bearings 3 and 4 worn, and bearing seal ring 9 or filler seal rings 10 and 11 at fault	To be replaced
	Overflow valve misadjusted	Pressure to be raised based by virtue of pressure gauge
	Air blended into pump	(1) Loosened joint at suction pipe side to be re-tightened (2) Oil to be added into oil tank (3) Oil seal of pump to be examined (4) Pump to be started only until there is no more air bubble in oil tank
Noise of Gear Pump Loud	Oil suction side hose twisted, or cavity aroused by blockage of oil filter	Oil filter to be cleaned and hose to be adjusted
	Air sucked inside due to loosening of oil suction side joint	Each joint to be re-tightened
	Cavity aroused due to excessive viscosity	(1) Oil of proper viscosity to be used (2) Work to be started only when oil temperature is normal
	Non-concentric	To be concentric
	Air bubble present in hydraulic oil	Cause for generation of air bubble to be examined and to be repaired
Oil Leak with Pump	(1) Oil seal and seal ring 8 of pump at fault (2) Sliding face worn (for internal leak to be increased)	To be replaced

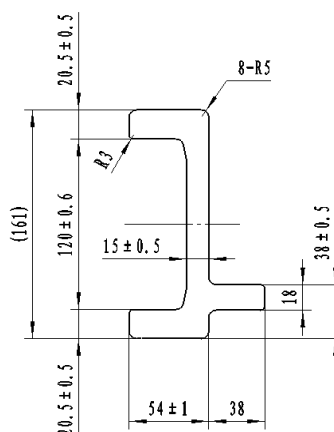
7. Lifting System

Note: this vehicle is strictly prohibited to tilt forward where the system's lifting load is more than 300 mm

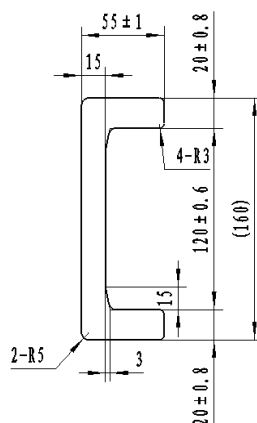
2-3.5t Type

Roller type, "J"-shaped inner mast, "C"-shaped outer mast with free lifting, two-stage telescopic mast

End Face of Inner mast:



End Face of Outer mast:

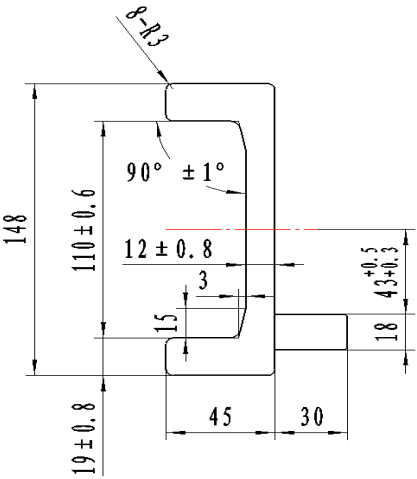


1.8t Type

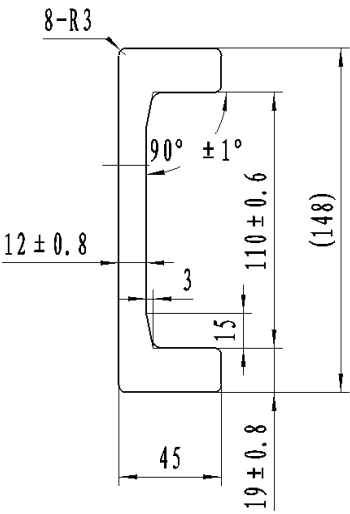
Roller type, “J”-shaped inner mast, “C”-shaped outer mast with free lifting, two-stage telescopic mast

outer

End Face of Inner mast:



End Face of Outer mast:



7.1 Overview

Lifting system is a two-stage rolling telescopic mast, with the outer mast typical of a “C” shaped end face, and the inner mast in a “J” shaped end face. The fork and the fork carriage comply with the international standard, with a free lift of about 160mm during operation.

7.2 Inside and Outer masts

The mast assembly is composed of inside and outer masts. The lower part of the outer mast is connected with drive axle, with weight mainly supported on axle housing. The fork carriage of tilt cylinder on the outer side in the middle of outer mast is connected with piston rod of tilt cylinder. The mast is able to tip forward for 10 °and backward for 12 °through operating the inclined spool valve of multi-way valve. The inside and outer masts are welded parts, to bear the longitudinal and traverse loads through rollers and side rollers, and to allow the inner mast to rise and fall steadily.

7.3 Fork carriage

The fork carriage is also in a structure of welded part, to allow the fork carriage to move upward and downward steadily along the inner edges of the channel steel for the inner mast and to bear the longitudinal and traverse loads through composite roller and single roller with clearance adjustable. As for 1.8-3.5t forklift truck frame, each side has two groups of composite rollers and a group of single roller, a total of four groups of composite rollers and two groups of single rollers make the forklift frame move on the portal frame channel steel from up to down smoothly. When the fork rises to the maximum height, one pair of main rollers on left and right on top will extend to the upper edge of the inner mast.

The fork is locked inside the groove on the fork carriage using lock pins, and the spacing of fork may be adjusted on the left or right manual. International standard (ISO) is applied to fork and fork carriage, to facilitate common use and interchange.

7.4 Adjustment of Lifting System

(1) Drop the fork to the ground, and adjust the lift chain, to ensure that the distance between the lower roller center of fork carriage and the lower edge of inner mast is 15-20mm.

(2) Tip back the mast and adjust the tensioning force of lift chain, for the tensioning degrees of lift chain at places b to be equivalent (Fig 8-1).

(3) The strokes of left and right lift cylinders shall be equivalent, and their strokes may be adjusted using cylinder cover 4 (Refer to Fig 7-8.).

(4) Adjust the error of position for the height of left and right lift cylinders by making use of the adjusting bolt on the upper end of right lift cylinder as indicated in Fig 8-2.

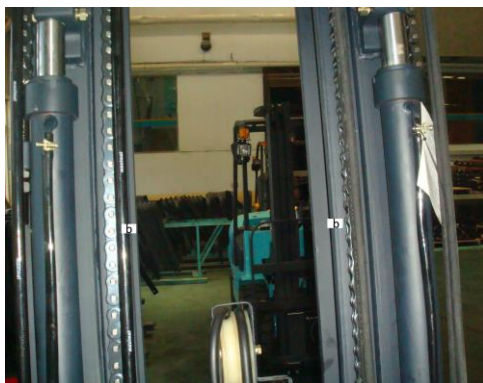


Fig. 8-1

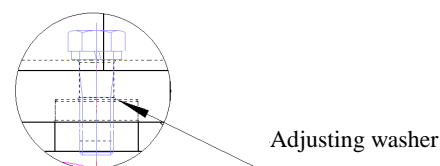


Fig. 8-2

8. Electrical System

The electrical system of the series models is a single-line electrical system with anode bonding, and it's like a forklift truck's "nervous system" to ensure that the forklift truck is working properly. The electrical equipment is mainly composed of following several systems:

1. Power supply system

Power supply system mainly consists of battery, generator, charging indicator light and other components, and supplies power to the electric equipment of the forklift truck. The battery provides power before starting the forklift; the generator provides power when the forklift runs, and at the same time charges the battery, and the charging indicator light is used to display the charging status.

2. Starting System

Starting system is mainly composed of heater plug, key switch, neutral switch, and starter lamp; its function is to start the engine. After the key switch is turned on, the heater plug works, make sure the preheating has completed and the heater plug has stopped working before starting. The starting system has neutral protection function; only if the shift lever is at the neutral position, the engine starts correctly; it can not start.

3. Stop control system

Stop control system is mainly composed of key switch and fuel solenoid valve. When downtime is needed, rotate the key switch to OFF, cut off the power supply of the fuel solenoid valve, and the fuel solenoid valve cuts off oil supply and the engine stops automatically.

4. Instrument system

Instrument system is primarily composed of intelligent instrument, water temperature sensor, oil temperature sensor, fuel sensor, oil pressure switch, oil-water separation switch and other components. Its function is to detect the operation of the forklift truck and displays it through the dashboard, allowing operators to get a good understanding of the state of the forklift.

5. Lighting and sound and light alarm system

The system includes a variety of lighting equipment, signal lights, horn, reversing buzzer, etc.

Front combination lamp: a front combination lamp consists of lights (55W), width lamp (5W) and turn signal (21W) three parts;

Tri-color taillight: a tri-color taillight consists of turn signal (21W), width lamp (5W), stop lamp (21W) and reversing lamp (10W) four parts;

Rear light (55W);

Warning light (2W).

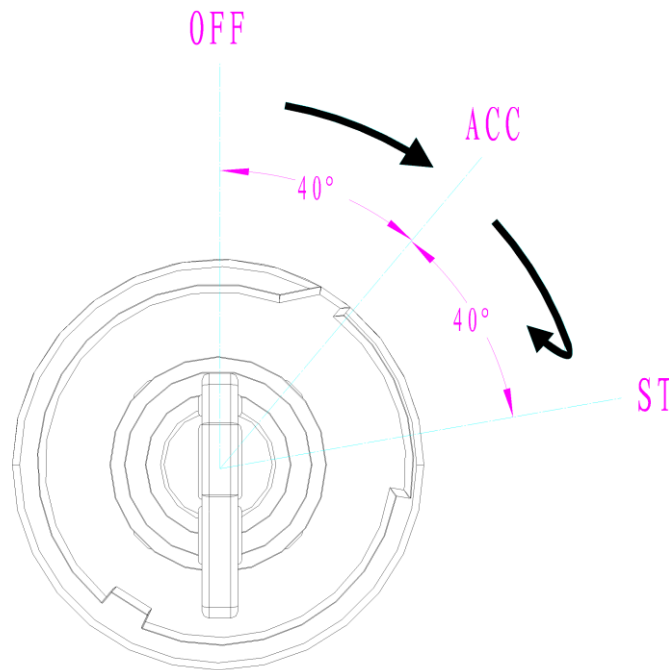
Description of operations:

1. Start and stop

Before the engine starts, you should first ensure that the gear control lever is at the neutral position, in which case the meter displays neutral (N), or else the engine will not start. This is because the forklift has a function of starting protection, to prevent danger.

When the key switch is OFF, you can insert/remove the key; in case that the engine has started, return the key switch to OFF, and the engine will automatically stop.

Rotate the key switch clockwise to the ACC gear, and the forklift is powered on and the preheating system works automatically to heat the air; the preheating indicator light is on, indicating the state of the preheating system. After 8~12S, the preheating is completed, and the preheating system stops automatically, then rotate the key switch clockwise to ST gear, and start the engine. After the engine starts, release the key switch, and reset the key switch to ACC.



Note:

1. After the engine has stopped, do not place the key switch to ACC gear, so as to avoid the power loss to the battery;
2. When the engine is running, do not start rotate the key switch to ST gear, to prevent damage to the motor;
3. When starting, the one-time start time should not exceed 5S, and the twice starting interval is above 120S; if it is impossible to start the engine after starting three times in a row, you should first find out the cause before you start it.

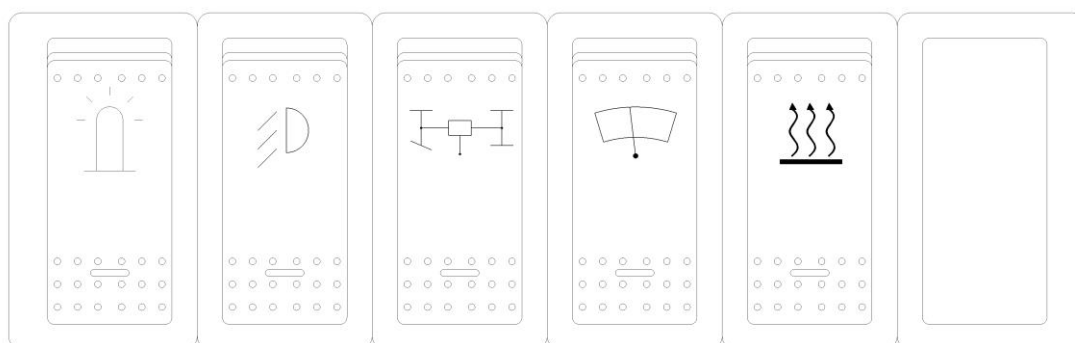
(1) Forklift running

After the engine starts, push the gear shift lever forward, switch the gearbox to the forward gear, and the forklift moves forward and the forward speed of the forklift is controlled by controlling the gas pedal; dial the gear shift lever backward, switch the gearbox to the back speed, and the forklift returns and the backward speed of the forklift is controlled by controlling the gas pedal.

(2) Rocker switch

Forklift rocker switch group is used to control electrical parts of the forklift. 1 It is used to control the warning light: open the warning light and it is flashing, shut off the warning light and it goes out; 2 It is used to control the condition of the rear working light: after opening,

when the shift lever is situated at the reverse gear, the rear working light is on, and after it is shut down, it will not be off in any conditions; 3 It is used to control the switching of four-wheel drive and two-wheel drive, and the solenoid valve block is controlled through the electrical signal of the switch; when the switch is open, the solenoid valve coil is electrified, so that the valve element is sucked in and the oil path is smooth, and the oil path is used to control the rear drive of vehicle to run, thus to achieve the effect of driving four-wheel drive at the same time. 4 It is used to control the windscreen wiper switch, and when the switch is turned on, the windscreen wiper is powered on, making it work. 5 It is used to control the heater switch, and when the switch is turned on, the heater is powered on to make it work. 6. There is a reserved switch.



(3) Horn button

Horn button is positioned at the center of the steering wheel, and the horn sounds after you press it.

(4) Direction switch and signal

Direction control and signal: move forward once if the direction switch is pushed ahead forward, and move forward twice if it is pushed ahead forward twice: it is neutral when the direction switch is in the middle, when the neutral indicator light on the instrument is on, indicating that the starter can start, or else the starter can't work; move backward once if the direction switch is returned once, and move backward twice if it is returned twice; when the direction switch is in reverse position, the backup light and warning light are on, and the reversing buzzer sounds.

(5) Light control

Rotate the light switch to the first gear, and the front and rear width lamp work; rotate it to the second gear, and the headlight works, in which case the width lamp still works.

(6) Turn signal

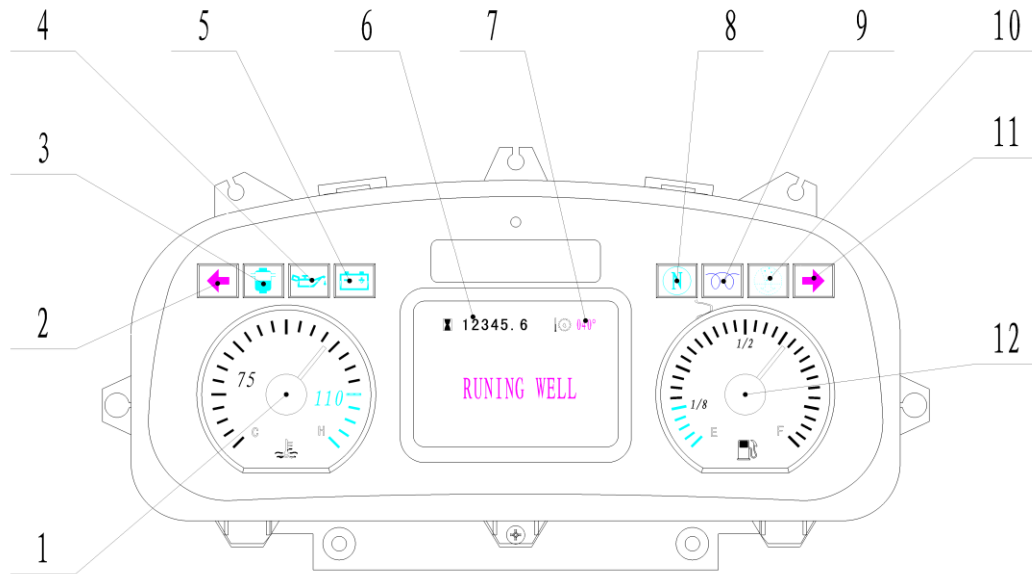
Push the steering switch forward, and the forklift is ready to turn left and the forklift's left turn signal is flashing at a certain frequency; pull the turn switch backward, and the forklift is ready to turn right and the forklift's right turn signal is flashing at a certain frequency.

(7) Braking signal

When the forklift needs to be braked, step on the brake pedal, and the brake light works and the forklift is in the braking state.

Introduction to instrument:

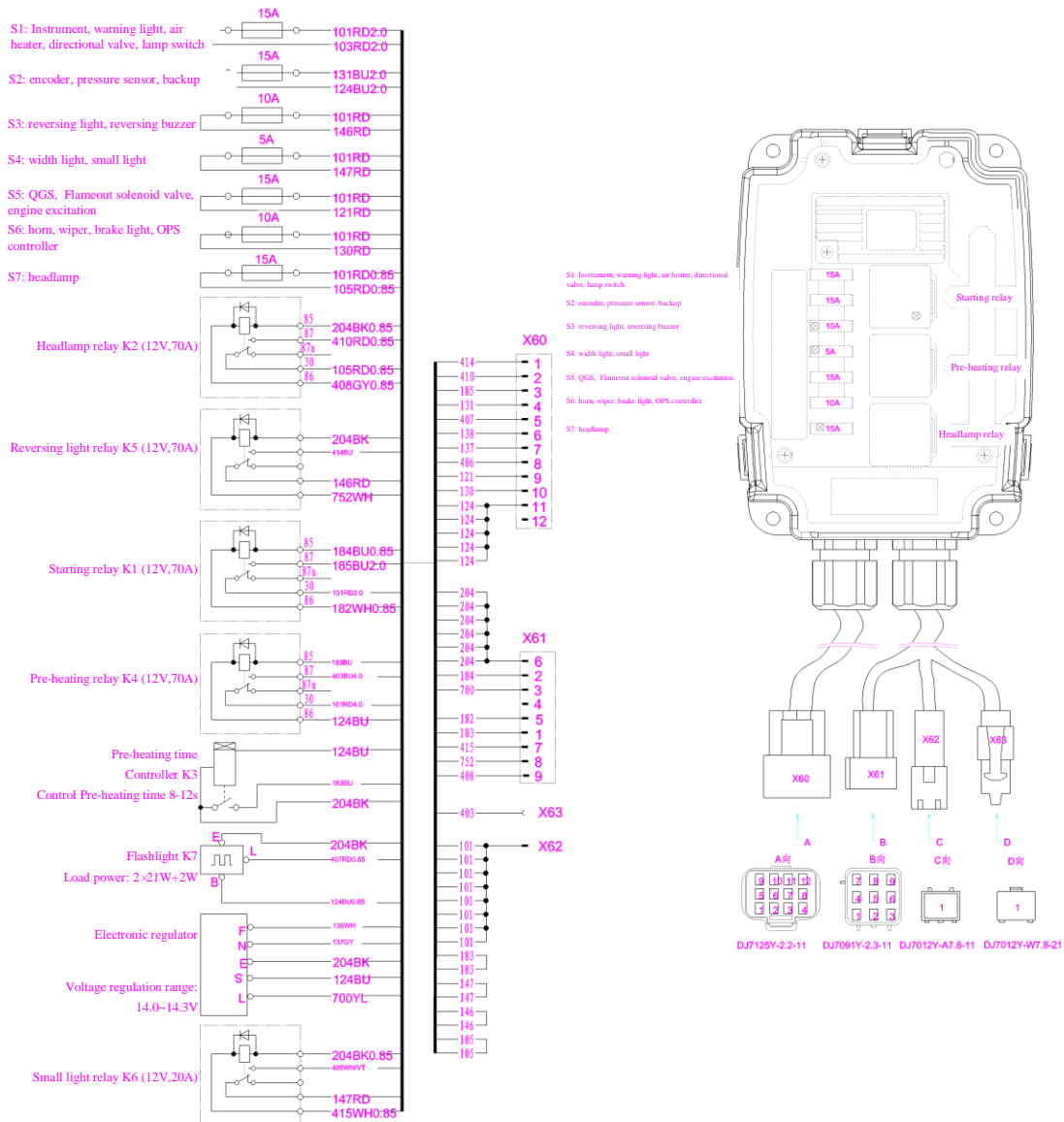
The instrument is used to indicate the working conditions of various critical systems of the forklift, and operators can quickly determine system failure prior to maintenance.



- 1: Water temperature gauge, indicates the water temperature of forklift truck engine;
- 2: Left turn indicator light, indicates the left turning work of the forklift;
- 3: Oil-water separation indicator indicates that the water content in the oil-water separator is too high, you need to manually drain;
- 4: Low oil pressure indicator light indicates low engine pressure;
- 5: Charge indicator light indicates the generator charging the battery;
- 6: Timer counts the working hours of the engine;
- 7: Torque converter oil temperature display shows the oil temperature of the gearbox torque converter;
- 8: Display gear state, neutral if N point flashes;
- 9: Preheating indicator, indicates the engine air preheating in progress;
- 10: Air filter clogging indicator, indicates the air filter clogged;
- 11: Right turn indicator light, indicates the right turning work of the forklift;
- 12: Show the amount of fuel oil remaining in the fuel tank.

Introduction to electrical box:

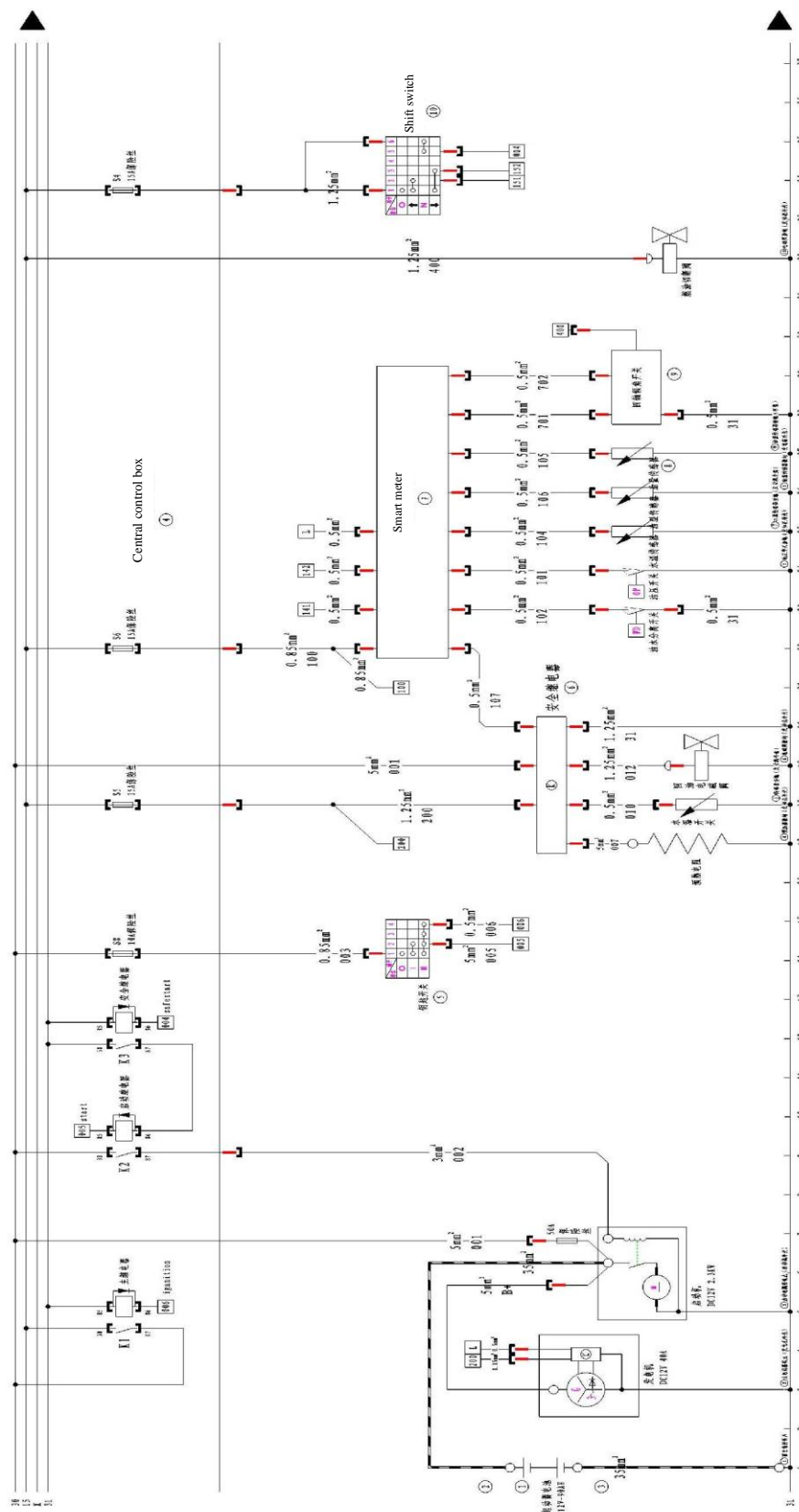
The electrical box is used to install a chip fuse and relay. The chip fuse is used to protect the circuits to prevent electrical appliances and wire being burnt due to short circuit. The relay is used to expand the switch capacity, making the small-capacity switch can control high-power electrical appliances.



Battery:

The following matters should be paid attention to when the battery is used:

- 1) The battery can produce flammable gases, so there is a danger of explosion. Therefore you should avoid short circuit and sparks, and firework is strictly prohibited, to prevent the occurrence of fire or explosion.
- 2) The battery's electrolyte is dilute sulfuric acid, and it is very dangerous where it is exposed to the skin or eyes, because it can cause burning or blindness. When the electrolyte comes into contact with the skin, rinse immediately with plenty of water, and when it contacts with the eyes, rinse immediately with plenty of water and seek medical advice in a timely manner.
- 3) The battery has self-discharge phenomenon; when the forklift truck is not used for a long time, the battery should be well maintained, and it should be charged on a regular basis.



Electrical schematic diagram

IV. Drive, Operation, and Routine Maintenance of Forklift Truck

The forklift drivers and management personnel must bear in mind “Safety First”, and perform safety operation and standard operation according to the forklift truck operation and maintenance manual as well as driver manual.

1. Conveyance of Forklift Truck

Attention must be paid to following items when container or motor vehicle is used to convey forklift trucks:

(1) Trigger the parking brake.

(2) It is required to fasten properly the front part and the rear part of the mast and the counter weight using steel wire, and to wedge up properly the corresponding positions of front and rear wheels using wedge blocks.

(3) Hoist according to the “Lift Label Plate” of forklift truck during lifting operation.

2. Storage of Forklift Truck

(1) Drain the fuel completely (Cooling water is not to be drained if it is the antirust and anti-freezing fluid.).

(2) Coat antirust oil on the surface of un-painted parts, and coat lubricating oil on the lift chain.

(3) Drop the door to the lowest position.

(4) Trigger the parking brake.

(5) Fill the front and rear wheels properly using wedge blocks.

3. Preparation prior to Operation

(1) Avoid examining fuel, oil leak, and oil level as well as examining electrical instrument in the place with open fire, and avoid adding fuel during operation.

(2) Examine air pressure of tyres.

(3) The handle for forward and reversing gear shall be placed at the middle position (the position of part).

(4) Don't smoke when fuel system is work and when battery is examined.

(5) Examine the status of respective handles and pedals.

(6) Get well prepared prior to start.

(7) Loosen the parking brake.

(8) Perform the test actions for lift and drop, forward and backward tip of mast as well as steering and brake of forklift truck.

(9) The degree for contamination of hydraulic oil is larger than Grade 12, and the NAS1638 “Requirement for Cleanliness of Parts with Hydraulic System” is to be followed as test standard.

4. Operation of Forklift Truck

(1) The forklift truck shall be driven by drivers who have been trained and hold driving license.

(2) The operators shall wear shoes, helmet, clothes, and gloves usable for safety protection during operation.

(3) Examine respective controls and warning devices before truck is driven, and it is required to operate the truck after repair in the case when any damage or defect is found.

(4) Load shall not exceed the specified values during conveyance. Fork must be completely inserted under the cargo, and cargo shall be uniformly placed on the fork. It is not allowed to pick

up cargo using single fork tip.

(5) Smoothly perform start, turning, driving, brake, and stop. Slow down at turning, on wet or smooth pavements.

(6) It is required to place cargo as low as possible, and to keep the mast tilt backwards, when cargo is load for driving.

(7) It is required to be careful during driving on a ramp. It is required to drive forward during upgrade and drive reversely during downgrade, when the truck is driven on a ramp larger than 1/10. Turning shall be avoided by all means, and please never perform loading-unloading operation when forklift truck is running downgrade.

(8) It is required to pay attention to passengers, obstacles, and low-lying pavements, and pay attention to the clearance above the forklift truck, during driving.

(9) It is not allowed for anyone to stand on fork and it is not allowed for anyone to be carried on truck.

(10) It is not allowed for anyone to stand under the fork, or to walk under the fork.

(11) It is not allowed to control the truck and spreaders at any position other than the driver seat.

(12) It is required to pay attention to the fall of cargo from above, for any high lift forklift trucks with a lifting height larger than 3m, and protective measures must be taken, when necessary.

(13) Try as much as possible to tip backward the mast for high-lift forklift trucks during work, and it is required to perform front or back tip within the minimum range during loading-unloading operation.

(14) It is required to take a doubled care, and to drive slowly, during running on dock or on temporary planks.

(15) Driver shall not stay on the truck, when fuel is added, and the engine shall be turned off. Ignition is to be avoided when battery or level of oil tank is examined.

(16) The forklift trucks with spreaders shall be operated as loaded forklift trucks during empty-load operation.

(17) Don't convey unfixed or loosely stacked cargo, and take care when cargo of relatively large size is conveyed.

(18) Drop the fork onto the ground, and put the handle for gear position to neutral gear, and turn off the engine or disconnect the power supply when driver leaves the truck. Pull the parking brake device properly when truck is parked on a ramp, while wedge blocks must be used to fill up the wheels when the truck is to be parked there for a long time.

(19) It is not allowed to open water tank cover carelessly, under the condition when engine is very hot.

(20) The pressures of multi-way valve and safety valve have been properly adjusted before delivery of forklift truck from factory, and users shall not adjust them at discretion during use, to avoid damage of entire hydraulic system and hydraulic components due to excessively high adjustment.

(21) The value of air pressure specified on the label plate of "Tyre Air Pressure" shall be followed for tyre air charge.

(22) The maximum sound press level noise outside the forklift truck is not to be larger than 71dB (A), acoustic power level of noise is 99dB, and JB/T3300 shall be followed as test method.

- (23) The forklift with a self-locking function, turn speed must not be greater than 5KM/h.
- (24) Heavy-lifting height exceeding 1.2m, not leaning forward.
- (25) Where the gradability is greater than 10% it is switched into the four-wheel drive.
- (26) When it runs on a flat road and turns, try to use the two-wheel drive.
- (27) After the forklift brake wades into water, the braking force will be affected at downhill, and thus downhill running shall be avoided in a short period of time.

5. Notices for application of Cooling System

(1) When forklift truck is being used, in the case when radiator is overheated or temperature of coolant is excessively high, try as much as possible not to open the radiator cover immediately. Examine the liquid level, in order to find the overheating cause. When cover has to be opened, it is required to drop engine to medium speed. Turn the radiator cover slowly and loosen off the cover after waiting for a while, to avoid scald of operator by splash of coolant.

Make sure to screw the radiator cover properly in place, when it is tightened up, and otherwise it is difficult to build up a specified pressure system.

(2) Regarding the radiator with coolant used as cleaning water, the water in radiator shall be drained out, only when truck is parked in cold weather and risk exists for water to be frozen. The radiator shall be detached, after it has worked for a period of time, and shall be cleaned in the boiled soda solution, to remove the scale or sediment formed on respective inner surfaces of radiator.

(3) Regarding radiator with long-acting antirust and anti-freezing fluid (model as FD-2 type -35°C) used for coolant, it is strictly prohibited to randomly add water and anti-freezing fluid of different models. The antirust and anti-freezing fluid of the same model shall be supplemented after anti-freezing fluid is leaked or evaporated.

Anti-freezing fluid is generally used both in winter and summer, not changed for four seasons. It shall be drained out for filtration and purification treatment after use for one year in general, to be then further used.

(4) According to different work conditions, the smudge on the outer surface of radiator shall be periodically cleaned and removed, either to be soak cleaned using detergent, or to be flushed using compressed air or high-pressure water (pressure not larger than 4kg/cm).

6. Oils Used for Forklift Truck

Name	Brand or Code (Domestic)
Gasoline	92#
Diesel Oil	To be selected and used according to diesel engine operation and maintenance manual, or according to GB252-81 Light Diesel Oil. Summer 0# Winter -10~35#
Lubricating Oil	To be selected and used according to engine operation and maintenance manual, or according to gasoline engine: GB485-84 Diesel Engine: To be selected and used according to GB5323-85 Standard requirements and the atrocious degree of its working conditions
Hydraulic Oil	L-HM32
Hydraulic Drive Oil	6# Hydraulic Drive Oil
Gear Oil	85W/90
Brake Fluid	ZSM207 DOT3 Synthetic Brake Fluid
Lubricating Oil	3# Lithium Base Lubricating Grease Drop Point 170

7. Drawing of Lubricating System

