Operation and Maintenance Manual

MT86H

Off-Highway Dump Truck

WARNING

Before operation and maintenance, the drivers and service personnel shall always read and get understanding of the manual. Otherwise, fatal accident may occur. This manual shall be kept properly for future reference by the personnel concerned.

LINGONG GROUP JINAN HEAVY MACHINERY CO., LTD

MT86H Off-Highway Dump Truck Operation and Maintenance Manual

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Foreword

Thanks for choosing mining dump trucks manufactured by Lingong Group Jinan Heavy Machinery CO., LTD., Ltd. This manual describes the mechanism, driving and operating, maintenance and adjustment, technical parameters and service/adjustment data of the MT86H series mining dump trucks.

Maximizing the profits from your Off-Highway Dump Truck is our common goal, which is to a large extent dependent on your familiarity with the truck and a careful and thorough maintenance. We sincerely hope that you can read through the manual prior to the first start, operation as well as maintenance and service of the truck and get full understanding of the operations and maintenances described herein.

All the pictures and descriptions covered herein are correct at time of publication; but the structures and performances of our products are constantly improved and perfected; therefore, please understand that the related design, operation and maintenance instructions are subject to change at any time without prior notice. For the latest information on the dump truck or in case of any doubts about this manual, please consult LGMG.

This manual is applicable for MT 86H series Off-Highway Dump Truck (standard configuration). Users shall be in strict accordance with the mileage or time interval in the maintenance schedule to do maintenance to the assembly and the dump truck.

The manual is a part of the dump truck and thus shall be handed over together when transferring the ownership or the right of the truck. If the manual is lost, damaged or hard to be recognized, please replace it in time.

⚠ WARNING

● Only the specially trained personnel with corresponding qualifications are allowed to operate and maintain the truck.

● Incorrect operation, maintenance and repair are dangerous, and may lead to personal injury.

● Before operation, maintenance or repair, the operator shall carefully read this manual.

● Loading should be done in strict accordance with the rated loading capacity, and any consequences due to overloading or unauthorized modification shall be the responsibility of the users.

● The operating procedures and precautions referred to herein are only applicable to the stipulated operation of the machine. For any operations out of the specification but not prohibited, always make sure that this operation will not hurt you or other people.

Safety Attentions

Operators should understand and follow prevailing national and local safety regulations. In case of no relevant national or local regulation, safety attentions in this manual will be applicable.

Most accidents are caused by failure of following regulations on machine operation and maintenance. To avoid accident, please read, understand and follow all warning requirement and notes in the manual and on the machine before operation and maintenance.

Details of safety measures are explained in Chapter I "Safety".

Since it is unable to predict all possible dangers, therefore, safety explanation in the manual and on the machine may not include all safety precautions. In case of using steps and operation in this manual, it should be guaranteed that both the operator and others are safe and the operation would not damage the machine. If the operation safety is uncertain, please consult the company or dealers.

Precautionary measures on operation and maintenance in the manual are only applicable to using the machine as specified purposes. If the machine is used beyond the range listed in the manual, our company will bear no liabilities. All safety liabilities of such operation should be borne by the user and operator.

Operation prohibited in the manual should not be executed in any circumstance.

Caution signals below are used to indentify safety information in the manual.

⚠ DANGER – If the situation classified as "DANGER" is not avoided, serious injury or casualties is likely to occur. This word can also be used when the machine may be seriously damaged if the possible hazard is not avoided.

⚠ WARNING – If the situation to be warned is not avoided, serious injury or casualties may occur. This word can also be used when the machine may be seriously damaged if the potential hazard is not avoided.

⚠ CAUTION – If the situation to be noticed is not avoided, minor or moderate injury may occur. This word is also used when the machine may be damaged or the service life shortened if the potential hazard is not avoided.

Chapter I Safety

Fig. 1-1

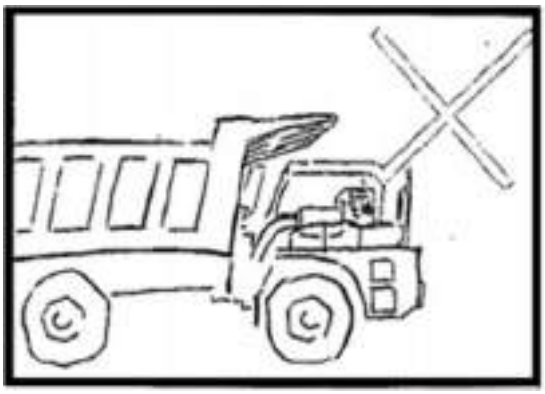


Fig. 1-2

Fig. 1-3

1.1 Basic precautions

The off-highway dump truck described here is a kind of mining engineering machinery, which has quite different structure and working properties compared to ordinary vehicles; therefore, the safety precautions and operation instructions described in this manual shall be followed prior to the operation.

1) While working together with other operators or site traffic commander, make sure that all personnel concerned understand the hand signals.

2) Always do inspection before or after the operation, so as to eliminate the potential danger such as leakage of oil, water and air, bolt looseness, unusual noise or other hazards that could cause faults and serious accidents.

3) Never enter or stretch your hands between the moving components, and avoid any rotating and moving parts. Do not enter between the cargo body and the frame when the cargo body is lowering.

4) Always park the truck on a level ground; if you have to park the truck on a slope, wedge it with cushion blocks. In this case, please stop the truck with foot brake, set the transmission control lever to NEUTRAL or REVERSE position, apply

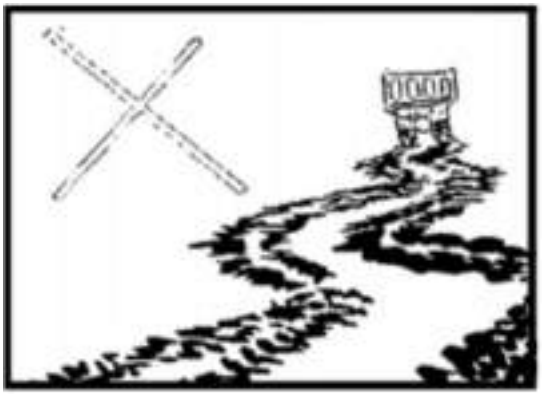


Fig. 1-4

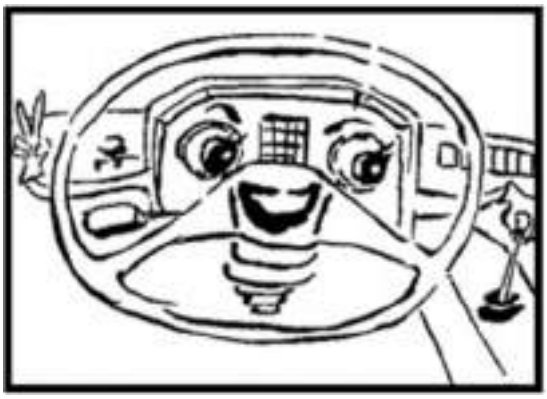


Fig. 1-5

Fig. 1-6

the hand brake, lower down the cargo body, shut down the engine and remove the key.

5) Do not place the inflammables and explosives near the hot parts like turbocharger, exhaust pipe, muffler and radiator for fear of fire or other accidents. Before touching the above parts, make sure that those parts are cooled down to avoid scald.

1.2 Operation precautions

1) Do not jump up/off the off-highway dump truck directly, and please get on/off the truck by the ladder or grip only.

Getting on/off the running truck is prohibited.

2) During normal running, such dangerous driving behaviors as sudden braking, fast travelling, sharp turning at a high speed or driving in a zigzag are not allowed.

3) Before starting the truck, always inspect if the followings have been done:

- The parking brake is applied;
- The transmission is set to NEUTRAL position;
- The PTO is disengaged.

4) When the truck is working, the operator shall sit in driver's seat to do all operations. Operating or driving in other places than the driver's seat is prohibited.

5) When driving on a slope, pay attention to the change of the truck's center of gravity.

Fig. 1-7

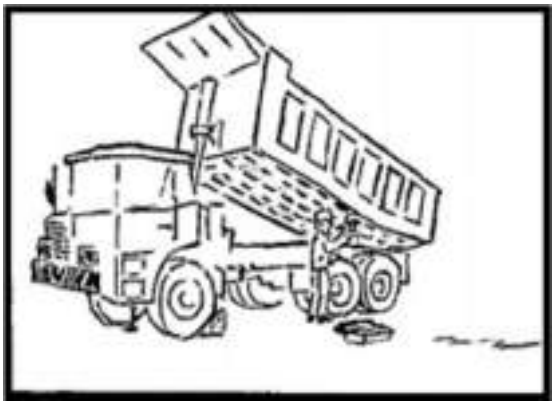


Fig. 1-8

Fig. 1-9

⚠ When driving the truck under full load on a slope:

- Do not brake the truck abruptly when driving downhill;
- Never disengage the clutch or coast the truck at neutral gear when driving downhill;
- Do not make a sharp turn.

6) When the truck starts running, the cargo body is tiltable; thus irrelevant personnel wandering around the truck is dangerous and shall be prohibited.

1.3 Other precautions

1) Unauthorized modification is not allowed. Any modification without permission from the Company may lead to an accident, and users shall contact with the Marketing Dept. of the Company in advance. The Company assumes no liability for the casualties and damages incurred therefrom.

2) When lifting the cargo body to repair the components beneath, the stay bar of the cargo body should be set to a safe position for support, and restored once the repair is finished.

3) Always inspect the tyre from the side and never stay before or behind the rotating tyre.

4) Repair and replacement of tyre shall be done by the specialized personnel as it is highly risky.

5) Be careful when doing welding around the tyre, to avoid accidents due to tyre explosion.

6) When welding the truck for repair, always turn off its master power switch. Do not perform electric welding or flame cutting to the pipeline containing flammable liquid. Make sure to clean with non-inflammable liquid before such operations.

7) Always lower the cargo body to the subframe before leaving the truck unattended, and check that the lifting control lever is in the center, the parking brake is applied and the transmission control lever is set to the NEUTRAL position, and then shut down the engine.

1.4 Notices&signs and their pasting positions

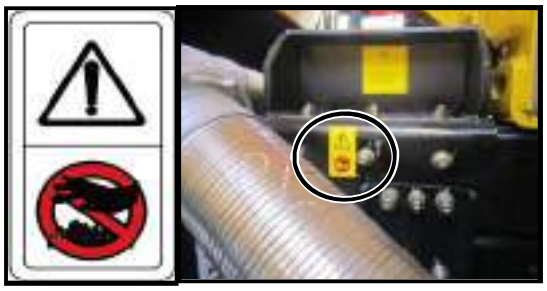
1) Engine repair Caution: beneath the cab instrument panel.

2) Hydraulic oil mark: at hydraulic oil tank.

3) Fuel tank filling notice and sign: at fuel tank.

4) Lifting notice & sign: at the underpart of the hydro-cylinder support.

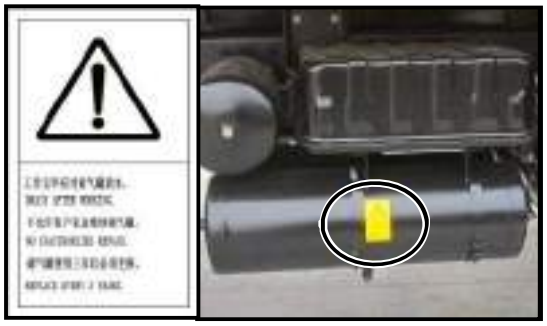
5) “No treading” sign: on battery box and fuel tank.



6) “High temperature” sign: near the muffler.

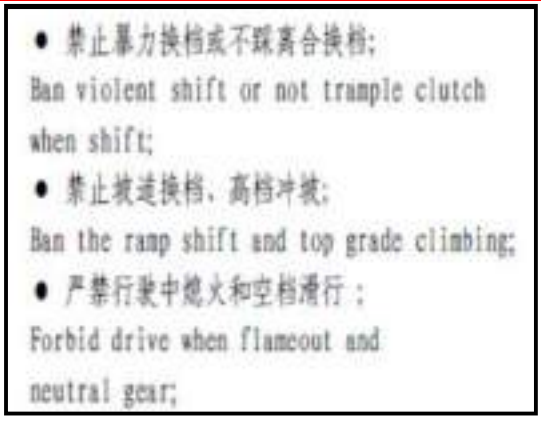
7) “Working safety” signs: at front end and in the middle of the cargo body.

8) Buffer tank operation Caution: beside the buffer tank.

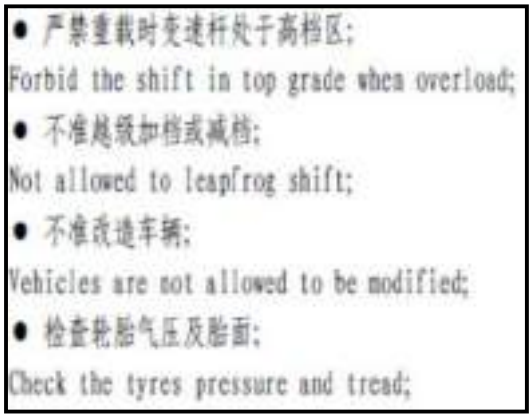


9) Air reservoir Caution: at the external wall of the air reservoir.

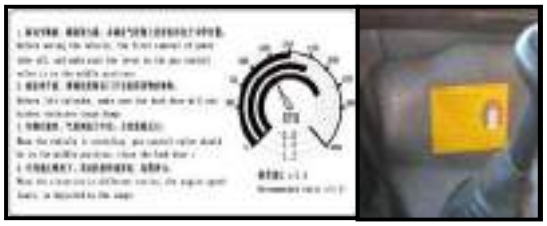
10) Travelling Caution: at the left upper corner of front windshield. （LHD）



11) Travelling Caution:（1）：at the front part windshield.



12) Travelling Caution:（2）：at the front part windshield.



13) hydro-cylinder notice：at the right front side of the seat in cab.

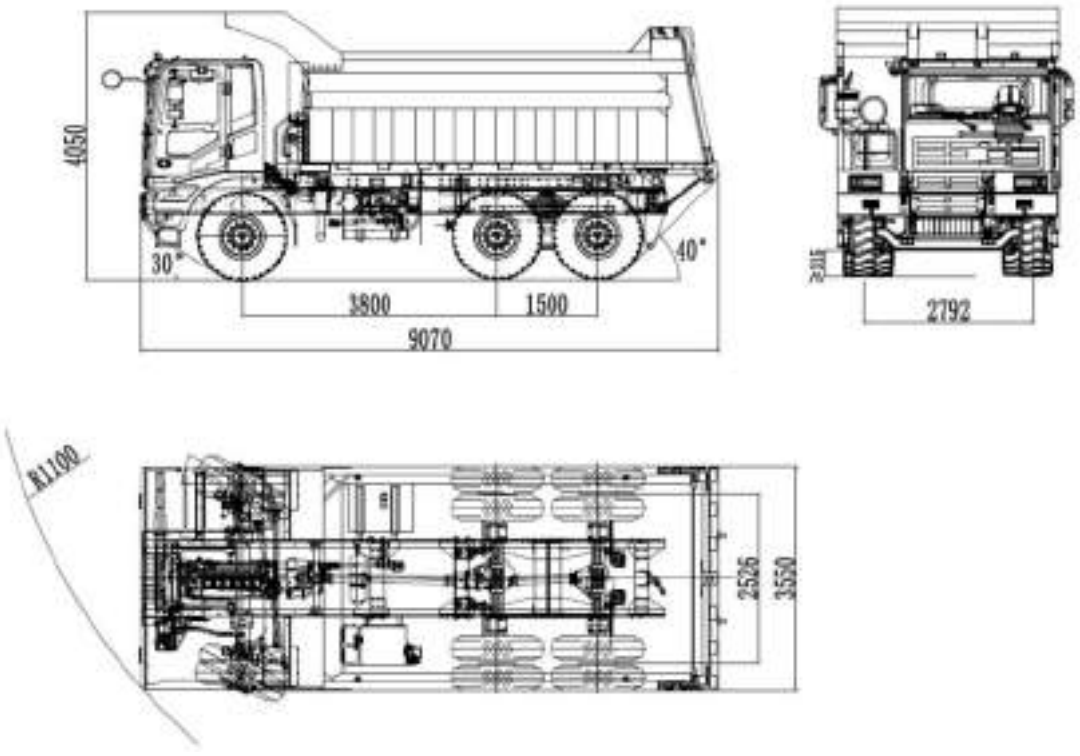
14) Parking brake handle valve notice：at the left front part of the Parking brake handle valve.

Chapter II Product Introduction

2.1 Outline and component name

1.Rare drive axle 2.Middle drive axle 3.Cargo 4.Fuel tank 5.Air filter 6.Streeing axle 7.Cab

2.2 Outline dimension



2.3 Application

As an off-highway dump truck featuring open cargo body, this machinery is suitable for loading/unloading and transportation of earth-stones and minerals at ports, docks and various engineering sites, but in no case shall it be used for works and operations on road,loading/unloading or transportation of combustibles and explosives, and operations under ground or in environments containing explosive medias.

⚠ WARNING:

- The truck is an off-road dump truck and should not be used on the road.
- When using the truck, please load the truck strictly in accordance with the standard load limited by the truck. Overloading is prohibited.
- The truck may be used to transport solid materials only. It is strictly prohibited to load or transport flammable and combustible materials with the truck.

2.4 Work Environment Requirement

The truck is applicable to the following environments:

Item	Altitude	Environment temperature	Fording depth
Parameter requirement	≤4000m	-15℃～+40℃	≤315mm

The truck is a common engineering machine which could be used for various applications in normal circumstances described in the manual. In case of being used for other purposes or in environment of potential hazards such as inflammable or explosive air or regions containing asbestos dusts, special safety requirements must be followed. Devices of corresponding applications must also be supplied to the machine.

2.5 Vehicle parameters

2.5.1 Vehicle performance parameter

Items	Parameters	Items	Parameters
Max. total mass (kg)	86000	Overall dimension (mm)	9070×3550×4050
Max. vehicle speed (km/h)	38	Max. gradeability (%)	29
Volume of cargo body (paperbacked) (m^3)	31	Min. turning diameter (m)	≤22
Kerb weight (kg)	30700±100	Product standard	Q/1300LGJ004-2015 《off-road dump truck》

2.5.2 Main dimensions

Items	Parameters	Items	Parameters
Track width (mm)	2792 (front axle) 2526 (rear axle)	Wheelbase (mm)	3800 (Front-middle) 1500 (Middle-rear)
Approach angle (°)	30	Departure angle (°)	40
Min. ground clearance (mm)	≥315	No. of axles	3

2.5.3 Engine

Items	Parameters	Items	Parameters
Type	Inline, DI, water-cooled, supercharged and inter-cooled	No. of cylinders	6
Rated power (kW)	309	Bore/stroke (mm)	126/155
Rated speed (r/min)	2200	Min. fuel-consume ratio (g/kW.h)	-
Displacement (mL)	11596	Max. torque (N.m)	1750
Emission standard	China Ⅱ GB20891-2007	Consumption rate of engine oil and fuel	-

2.5.4 Transmission system

Items		Parameters/contents
Clutch	Type	Single-disc, dry, hydraulic remote-operated
	Release travel at separated finger end of diaphragm spring (mm)	12-14
	Friction plate outside diameter/inside diameter (mm)	430/242
	Max. release force at separated finger end of diaphragm spring (N)	8600
	Release fork lever ratio	1.73
Transmission	Type	Fixed-shaft
	Transmission gear	7 forward gears and 1 reverse gear
Front axle	Non-driving steering axle	Welded axle housing
Drive axle	Main decelerate ratio	3.7
	Final decelerate ratio	3.478

Items		Parameters/contents
	Total decelerate ratio	12.87
Wheel	Wheel rim spec.	10.0/2.0-25
	Tire spec.	14.00R25
	Tire pressure (MPa)	0.85
Brake system	Brake pressure (MPa)	0.85
	Brake system main brake	Pneumatic, dual-circuit
	Brake system auxiliary brake	Engine exhaust emission brake
	Brake system parking brake	Spring brake & emergency brake
NOTE: All wheel rims shall be subject to the same specification. The tire pressure value indicated in the table is factory air pressure (no load), and the actual air pressure shall be adjusted according to **"Comparison table of speed, load and air pressure"** in **3.9**.		

2.5.5 Steering system

Items	Parameters/contents
Type	hydraulic steering
Max. turning angle	38°
Safety valve	I/A
Steering pump	Vane pump: displacement28ml/r
Min. turning diameter (m)	22
System working pressure (Mpa)	17

2.5.6 Working device

Items	Parameters/contents
Type	pneumatic control
Maximum working pressure	24Mpa
Lifting time of cargo body (full load)	≤25s
Descending time of cargo body (empty bucket)	≤25s
Total time	≤50s

2.5.7 Reference fill capacity

Items	Parameters	Items	Parameters
Fuel	530L	Engine oil	24L
Hydraulic oil	135L	Transmission	23L
Axle (for main driving and final drive)	46L (intermediate axle) 37L (rear axle)	Brake system	1.5L
Antifreeze	50L		

Chapter III Operation

Fig. 3-1

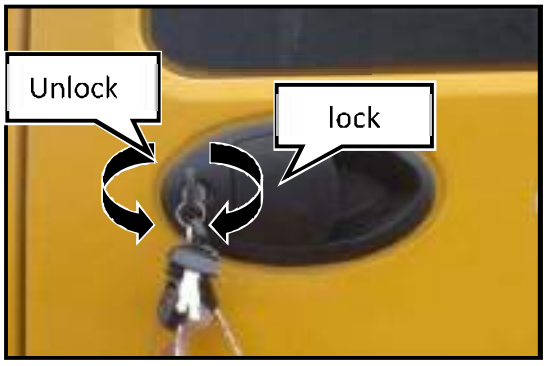


Fig. 3-2

Fig. 3-3

3.1 Door operation

⚠ WARNING: Do not drive unless all doors are properly closed!

3.1.1 Use door switch outside

Door opening: When the door is unlocked, lift the handle and pull it outward (as shown in Fig. 3-1) to open the door; when the door is locked, insert the key in, turn it anticlockwise for 180° (as shown in Fig. 3-2), lift the handle and pull it outward to open the door.

Door closing: Close the door directly.

Door locking: After the door is closed, insert the key in, turn it clockwise for 180°, and pull out the key; or before the door is closed, insert the key in, turn it clockwise for 180° and close the door.

After the door is locked, the door could not be opened by pull the handle outward.

3.1.2 Use door switch inside

Door opening: Pull the door push button (as shown in Fig. 3-3) and push the door open.

Door closing: Close the door directly.

⚠ CAUTION: While leaving the vehicle,

always make sure that the window and door are closed and the door is locked. Please keep valuables with you, rather than leave it behind in the cab.

3.2 Cab interior device

3.2.1 Instrument cluster

Fig. 3-4

1. Mileage & travel time display screen 2. Engine tachometer 3. Alarm indication mark 4. Oil pressure gauge 5. Voltmeter 6. Barometer of brake circuit 1 7. Barometer of brake circuit 2 8. Fuel gauge 9. Coolant thermometer 10. Speedometer

3.2.2 Steering wheel and switch panel

1. Steering wheel 2. Hand brake valve handle 3. Rocker switch 4. Air-condition operation panel and display screen 5. Transmission gear shift handle 6. Cigarette lighter

3.2.3 Alarm indicators

S/N	Description	Color	S/N	Description	Color
STOP	Parking indicator	Red		Width lamp on indicator	Green
	Low gear indicator (reserved)	Green		High beam indicator	Blue
	High gear indicator (reserved)	Green		Low oil pressure alarm indicator	Red
	Forward gear indicator (reserved)	Green		Inter-wheel differential indicator (reserved)	Green
	Reverse gear indicator (reserved)	Red		Bogie differential lock indicator	Green
	Left turn indicator indicator (reserved)	Yellow		Parking PTO indicator	Red
	Exhaust brake indicator	Yellow		Transmission high temperature indicator	Red
	Door ajar alarm indicator	Red		Retarder brake indicator (reserved)	Red
	Rear working lamp on indicator	Green		Transmission fault indicator (reserved)	Amber
	Cab unlocked alarm indicator (reserved)	Red		Engine serious fault indicato	Red
	Low fuel level alarm indicator	Yellow		Engine fault indicator (reserved)	Red
	Storage battery charging indicator	Red		Engine coolant level low alarm indicator	Red
	Parking brake indicator	Red		Air filter blockage indicator	Yellow
	Cargo lift alarm indicator	Red		Water in oil indicator	Yellow
	Low brake pressure alarm indicator	Red		Engine start wait time indicator	White
OBD	OBD indicator	Yellow		Engine diagnostic indicator	Red
	Retarder position indicator	Red			

3.2.4 Summary of rocker switch marks and function description (The key switch will be ineffective when it is set to gear 1, unless otherwise specified.)

3-7

S/N	Name	Condition	Function	Remarks
1	Lamp switch	1	Clearance lamp ON / headlamp OFF	When the switch is turned to gear 2 and 3, the instrument lighting actuation will be effective; and high beam inching will be ineffective.
		0	Clearance lamp and headlamp OFF	
		2	clearance lamp / headlamp ON	High beam inching will be effective; high beam/low beam combination switch will be effective.
2	Front fog lamp switch	0	Front fog lamp OFF	
		1	Front fog lamp ON	
3	Hazard warning switch	0	Hazard warning OFF	
		1	Hazard warning ON	The key switch will be effective when it is turned to gear 1, 2, 3 and 4.
4	Front working lamp switch	0	Front working lamp OFF	
		1	Front working lamp ON	Front working lamp driven
5	Cab rear working lamp switch	0	OFF	
		1	ON	Cab rear working lamp ON
6	Rear working lamp switch	0	Rear working lamp OFF	
		1	Rear working lamp ON	The side working lamp is also controlled by this switch.
7	Parking PTO switch	0	OFF	
		1	ON	PTO solenoid valve actuated; when PTO and switch are set to proper positions, the corresponding indicator lamps on the instrument will be on.

S/N	Name	Condition	Function	Remarks
8	Horn change-over switch	0	Electric horn selected	Press down horn on the steering wheel, and it will work.
		1	Air horn selected	Press down horn on the steering wheel, and it will work.
9	Inter-axle differential switch	0	OFF	
		1	ON	Inter-axle differential solenoid valve actuated; when inter-axle differential switch is set to proper position, the corresponding indicator lamp on the instrument will be on.
10	Exhaust brake switch	0	OFF	
		1	ON	Exhaust butterfly valve closed, EVB starts to work, the green instrument indicator is on, the operating cylinder works, and the engine flames out.

NOTE: The rocker switch with striker has an anti-mistrigger function. It cannot be moved unless the striker is pulled down; and it will auto reset as long as the striker is released. See figures below for operation.

Pull down the striker, and meanwhile, move the switch

Release the striker, and it will automatically reset

Fig 3-8

Fig 3-9

Fig 3-10

3.2.5 Power switch

1) Main power switch

The main power switch is located outside the battery compartment of frame side rail.

⚠ CAUTION: If a vehicle will not be driven for a long time, please turn off the main power switch for the avoidance of accident. After the engine stops and the key switch is set to LOCK position, turn off the main power switch.

2) Key switch

Arrange the key switch to the steering column.

Position	Usage	Remarks
1(LOCK)	Power off the vehicle.	The key can be pulled out at this time.
2(ACC)	Power on consumers when the vehicle is parked.	
3(ON)	Driving position	
4(START)	Start the engine	Auto reset to ON gear

3.2.6 Combination switch handle

1) Steering lamp operation:

Horizontally move the combination switch handle forward to turn on the right turn signal

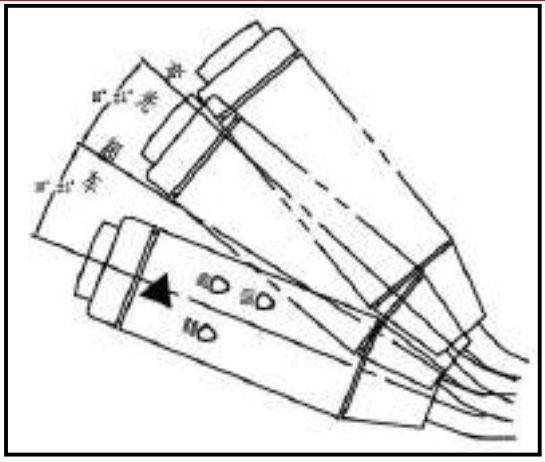


Fig 3-11

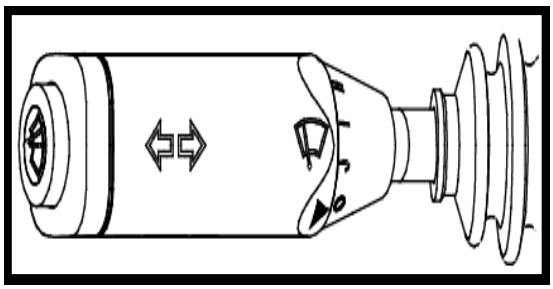


Fig 3-12 Press windshield washing system

0—Closed position J-- Wiper IHT

I-- Wiper low gear II-- Wiper high gear

lamp; and horizontally move it backward to turn on the left turn signal lamp.

When the key switch is set to position 3, move the handle to turn on the turn signal lamp, and then a prompt will be heard; when the key switch is set to position 1 and 2, move the handle to turn on the turn signal lamp, and then a prompt will not be heard.

2) Headlamp operation:

When the combination switch handle is set to neutral position, key switch to position 3 and rocker switch to position 2, the low beam or high beam will be on. At this time, lift the combination switch handle upward for 4° , and then high beam and low beam will be both on (applied for instant lighting for overtaking or meeting); lift the handle for another 10° for dimming (high beam to low beam or vice versa). Release the handle, and it will be automatically reset.

During daytime overtaking and meeting, lift the handle upward for 4° , and the high beam will be on; release the handle, and it will be automatically reset.

3) Wiper operation

Turn the combination switch to select the required swing gear for wiper.

Fig 3-13

Press and hold the windshield washer button, and the water jet on wiper blade will inject glass cleaner, and meanwhile, the wiper will automatically start working at low gear; water injection will be stopped after the release. The glass cleaner filler port is located inside the cab left ladderway.

CAUTION: Always fill the washer via the filler port with the specialized glass cleaner instead of plain water or other cleaning agent for windshield washing.

3.2.7 Commonly-used switch operation

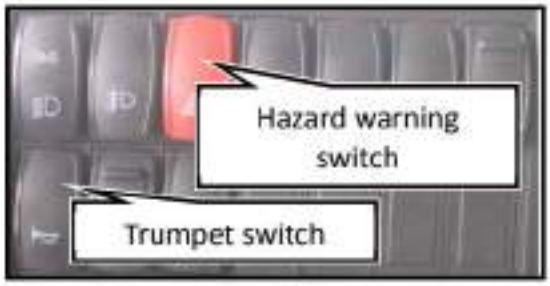


Fig 3-14

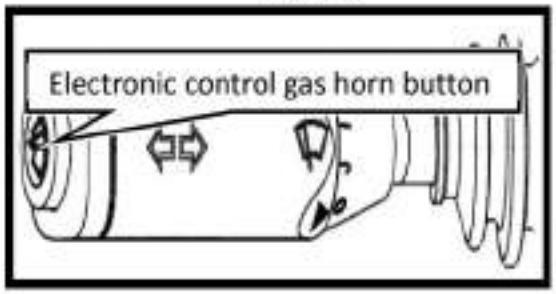


Fig 3-15

1) Hazard alarm

Turn on the main power switch and press down the hazard warning switch, and all turn signal lamps and turn signal indicators will flash.

2) Horn Button

The truck is provided with an electric horn and an electrically controlled air horn, both of which are switched by a horn change-over switch.

The horn button is set on the combination switch. Switch off the air horn switch, and then press the horn button on the combination

Fig 3-16

Fig 3-17 Interior lighting

Items	Parameters
Seat width	510mm
Seat height	855mm
Height adjustment	0～40mm
Front/rear adjustment travel	180mm
Backrest angle adjustment	0-70° (backward in relationship to plumb line)
	0-40° (forward in relationship to plumb line)
Adjustment range of driver's weight	50～110kg

switch, to use the electrically controlled air horn.

3) Fog lamp operation

Press down the front fog lamp switch to power on the front fog lamp. Pull the switch, and then the fog lamp will be off.

4) Interior lighting

After the battery box switch is turned on and the interior ceiling lamp switch is pushed to one side (both the right and left are ok), the interior lighting lamp will be on and off (as shown in left figure).

3.2.8 Seat

The seat is designed for construction machinery and mining dump truck. The seat top and shock absorber are designed under full consideration of driver's safety and comfort based on kinematics.

The seat backrest designed as luxurious high backrest applies the latest principle of human environmental science and human kinetics to effectively support the driver's shoulder, thus relieving the fatigue.

Seat adjustment method:

1) Backrest elevation adjustment: move handle upward forcibly, turn the backrest to the

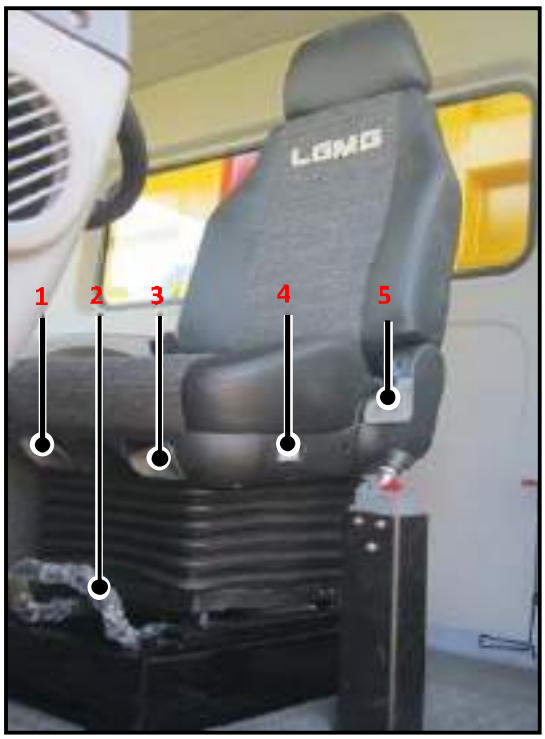


Fig 3-18 Seat adjustment handle

required angle and release the handle to lock the backrest.

Range: 0～60mm。

2) Horizontal adjustment: pull handle 2 upward to move the seat forward and backward to the required position, and release the handle to lock.

Range: Forward 80mm, Backward 80mm。

3) Front height adjustment: move handle upward gently to exert to or relieve from the front end of cushion upwards or downwards an appropriate force to lower (lift) it to the required position, and release the handle to lock.

Range: 0～60mm。

1) Load weight adjustment: rotate front handle forcibly and adjust it appropriately according to the driver's weight. The rotation direction corresponding to weight increase and decrease is marked on the handle.

Range: 40～130 kg。

5) Backrest elevation adjustment: move handle upward forcibly, turn the backrest to the required angle and release the handle to lock the backrest.

Range: 40° ～180°

CAUTION: While adjusting the seat

backrest, do not lean back too much in case of hidden danger caused by triggering rear window.

3.2.9 Transmission gearshift lever

Fig 3-19 Transmission gearshift

The gearshift lever is installed on the engine hooding. In this way, the disturbance of cab vibration and the possibility of disengagement will be eliminated, and the cab tilting will not be affected.

3.2.10 Hand brake valve (spring parking brake)

Fig 3-20 Hand brake valve lever

The hand brake valve is located at the right side of seat (The shown brake valve handle is located at "BRAKE" position). Provided the parking brake signal lamp is off, the air pressure will exceed 0.55 Mpa, the spring brake will get completely loosened, and the vehicle can get started.

⚠ WARNING: Before the parking brake signal lamp is off, never start the vehicle!

Fig 3-21 Safety belt

3.2.11 Other interior devices

1) Seat belt

Fig 3-22

1. Radio and tape player 2. groceries box
3. Abat vent

Fig 2-23

1. handrail 2. Cup holder 3. Escape hammer

Fig 3-24

1. Thermos bottle thermos bottle
2. Fire extinguisher 3. Sleeper 4. Pinch bar
5. Electric appliance cabinet

Fastening: Hold the latch of seat belt, wrap the seat belt around the shoulder and insert the latch into the striker until a click is heard.

Unfastening: Press down the red button on the striker of seat belt as shown by the arrow and pull out the latch, thus the seat belt will be automatically reset.

CAUTION: Always fasten the seat belt before driving every time! Check the seat belt for condition and function on daily basis.

2) Radio and tape player, abat vent and groceries box (bilateral symmetry).

3) Cup holder, escape hammer and handrail

1) Thermos bottle thermos bottle, fire extinguisher, sleeper, pinch bar, electric appliance cabinet

3.3 Cab exterior devices

3.3.1 Radiator cover

Open radiator cover: rotate the two knobs as shown in Figure 3-25.

Close radiator cover: pull down the radiator cover and rotate the knob in reverse.

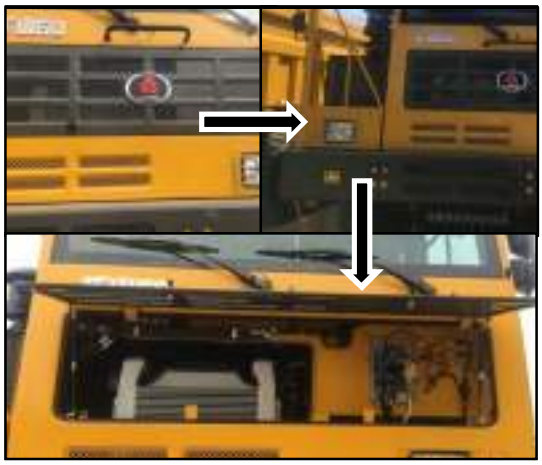


Fig 3-25

Fig 3-26

1. Left forestall blind mirror 2. Rearview mirror
3. Right back underview mirror
4. Main rearview mirror in terrace
5. Right front underview mirror

⚠ CAUTION: While closing the cover, do not apply too much force and make sure that nobody stays within the travel range of cover in case of pinch.

3.3.2 Left/right rearview mirrors

They are as shown in Fig. 3-26.

Regulation method of rearview mirror in terrace:

1) The lower edge of the rearview mirror in terrace is 87 ± 5mm from the upper edge of the bracket. The distance between the upper and lower rearview mirrors is 60 ± 5mm.

2) Tighten the fixing bolts of the rearview mirror to be reliable.

3) When fine-tunning the rear-view mirror, press it upwards, downwards, leftwards and rightwards.

1) When regulating the rearview mirror and the main rearview mirror in terrace, open the rear-view mirror casing, and unscrew 4 fixing bolts to regulate them to a proper angle, and then tighten thee bolts in place.

Regulation method of rearview mirror:

1) The distance between the upper and lower rearview mirrors is 40 ± 5mm, and the lower

Fig 3-27

rearview mirror is at the bend of the bracket.

2) Tighten the fixing bolts of the rearview mirror to be reliable without looseness.

3) When fine-tunning the rear-view mirror, press it upwards, downwards, leftwards and rightwards.

1) When regulating the rearview mirror and the main rearview mirror in terrace, open the rear-view mirror casing, and unscrew 4 fixing bolts to regulate them to a proper angle, and then tighten thee bolts in place.

⚠ **Note: When regulate the visual angle of the rearview mirror, do not break the rearview mirror with hands; if necessary, unscrew the fixing bolts to regulate the visual angle, and then tighten the bolts, or regulate the glass angle.**

3.3.3 Working lamp

The positions of working lamps are shown in Fig. 3-27: two at the front top of the cab, trail and front mudguard respectively. They are arranged symmetrically; one at the rear left of the cab with angle adjustable. The working lamps are generally controlled by the

corre-sponding rocker switch inside, and can be turned on or off at the same time.

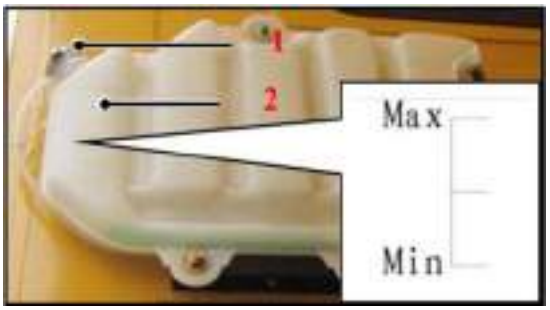


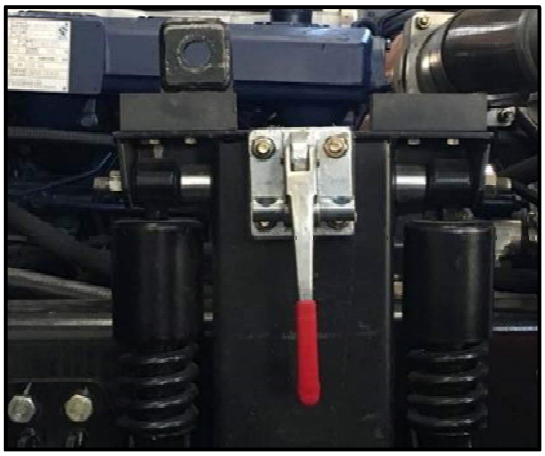
Fig 3-28 1. Relief valve 2. Scale

3.3.4 Expansion tank

The expansion tank is located at the rear left side of cab (as shown in Fig. 3-28). The pressure relief valve maintains a certain pressure difference between the internal pressure of the cooling system and the atmospheric pressure, to increase the boiling point of the coolant. The pressure relief valve is particularly essential in plateau area, so do not dismantle and replace it at will!

Front suspension Rear suspension

Fig 3-29 suspension



Mechanical lock

Fig 3-30

3.4 Cab suspension

3.4.1 Front suspension

The cab front suspension is applied with the rotating axle together with rubber shock absorber.

3.4.2 Rear suspension

Both rear suspensions are applied with dual shock absorber together with Mechanical lock.

⚠ CAUTION: The interchange or mixture of left and right shock absorbers is not allowed due to their distinct models.

Z

3.4.3 Check suspension system

Check if the mechanical lock operates properly. To prevent the mechanical lock from being released by vibration of the truck, weld a pin to the rear suspension, and then insert the pin from the rear suspension when the mechanical lock is latched.

3.5 Cab tilting

3.5.1 Hydraulic power-assisted tiltingassembly for cab

As shown in Figure 3-31.

Fig 3-31

1. Hydraulic hand pump 2. Pinch bar jack
3. Oil plug 4. Pinch bar
5. Switchover handle

3.5.2 Cab tilting operation (Figure 3-32)

Fig 3-32 Cab tilting operations

⚠ WARNING: During the whole process of tilting, personnel are strictly prohibited to enter the cab, and personnel without fixed duties are strictly prohibited to stay around the cab.

1) Remove unsecured items in the cab before tilting.

2) Turn over the cab: pull the manual reversion handle of tiltingpump to the position as shown

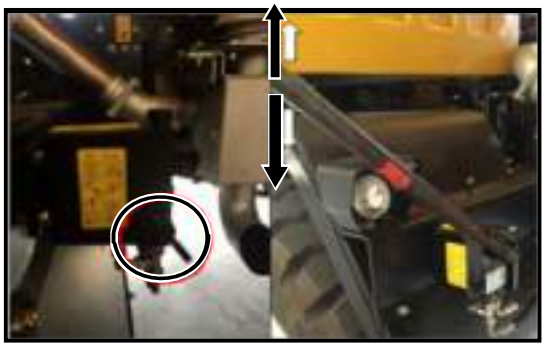


Fig 3-33 Cab return operations

Fig 3-34

in the figure, insert the ripping bar and swing it up and down so as to complete tiltingoperation; during tiltingoperation, the position of manual reversion handle shall not be changed.

3) Turn the cab back: pull the manual reversion handle of tiltingpump to the position as shown in the figure, insert the ripping bar and swing it up and down so as to turn the cab back.

⚠ WARNING: The operation of cab tilting on a slope is forbidden. Every time, the cab shall be tilted completely. In other words, the maintenance and overhaul cannot be done unless the cab exceeds TDC. When the cab is under tilting, nobody is allowed to enter the cab!

3.5.3 Oiling and bleeding of tilting system

1) Open the oil plug, and top up with the specified hydraulic oil until it is full.

2) Tilt up the cab gradually while continuing oiling

3) Lower the cab while letting the excessive oil overflow.

1) Operate the pump to tilt up the cab to return is back to the original place, check, and top up.

5) Finally, screw in the oil plug.

⚠ WARNING: The oiling and bleeding of tilting system are not allowed unless the cab is restored.

The low temperature and wear-resistant hydraulic oil of 0.5 L L-HV32 GB11118.1 shall be applied. Before filling, always check the hydraulic oil for cleanness, and add some oil if acceptable.

3.5.4 Check tilting system function

1) Tilt the cab forward to TDC, and check if the cab can fall normally after it exceeds TDC. If the system works normally, the cab will fall down gradually under resistance without any obvious impact.

2) After tilted up for about 30°, the cab shall be held at this position for 20 min without any settlement.

3.6 Preparation before driving

⚠ WARNING: Keep a good vehicle condition. Do not drive in case of any

Fig 3-35

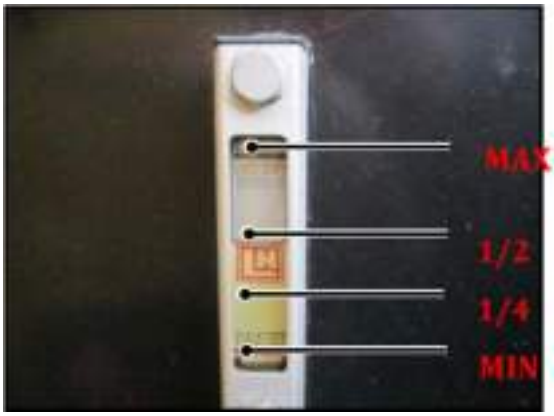


Fig 3-36 Oil scale

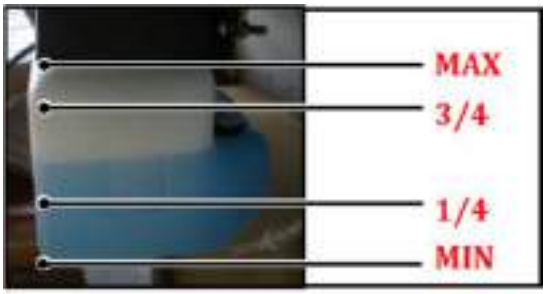


Fig 3-37 Glass water scale

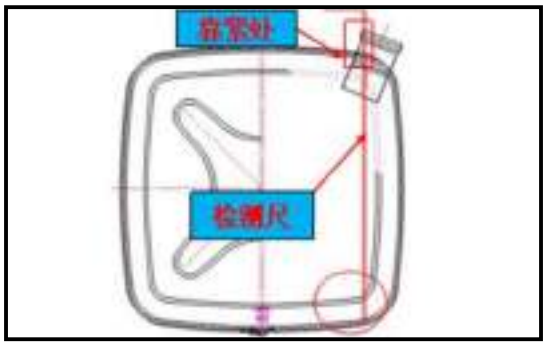


Fig 3-38 Fuel oil level inspection

fault!

3.6.1 Preparation

The preparations before driving mainly include: routine inspection before every driving, engine start and flameout.

1) Turn on the main power switch (as shown in Fig. 3-35) to power on the truck.

2) Check the working condition of electrical system. When the key switch is turned on (i.e. key switch is set to ON), the instrument panels indicate normally.

3) Check oil/coolant condition of the truck.

a. Check hydraulic oil: park the truck on the flat road, lift the container continuously for 5 times, and then keep it still for 15min. At this moment, the standard level of hydraulic oil shall be between 1/4 of the level meter and MAX. If the oil level is higher than MAX, drain oil; if it is lower than 1/4 of the level meter, refill it to the standard level.

b. Check windshield washer fluid: the windshield washer fluid visually observed shall be between 1/4 and 3/4 below the clamp. If it is lower than 1/4, refill it.

⚠ Note: Refill special windshield

washer fluid instead of ordinary water or other washing liquid.

c. Check fuel: Open the filler cap, insert the dip stick until the fuel tank bottom and make it lean against the upper edge of filler to the extent that the immersed end of dip stick is vertical to the tank bottom. At this moment, the oil trace length shall be between 40mm and 50mm. If it is higher than 50mm, drain the fuel; if it is lower than 40mm, refill the fuel and then tighten the cap with the arrow upwards.

d. Check coolant: Start the engine, turn on the heater to operate for about 2 minutes. At this moment, the water temperature of the engine shall be 50 ± 5 ℃, and the coolant level shall be between MAX and MIN. If it is low, refill coolant.

When the engine is at low temperature, add the coolant in two steps:

Step 1: Relieve the high pressure through the relief valve gradually;

Step 2: Open the cover of relief valve, and add coolant when the engine runs at idle speed.

⚠ WARNING: Never add coolant when the engine is still at high temperature!

Fig 3-39 Coolant scale line

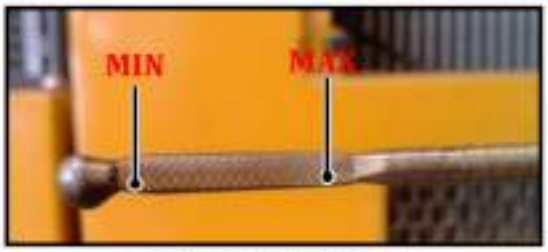


Fig 3-40 Oil dipstick scale

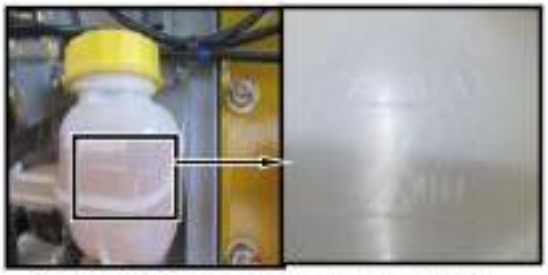


Fig 3-41 Liquid storage tank and scale line of brake fluid

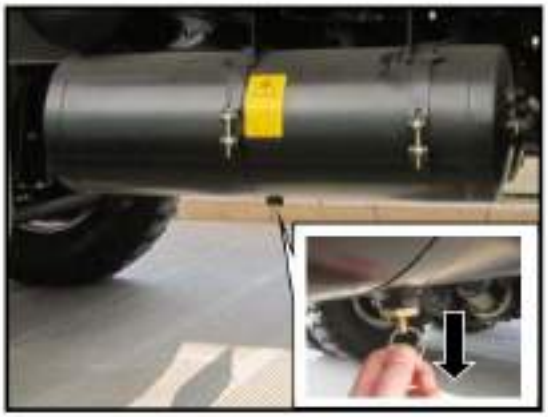


Fig 3-42

e. Check engine oil: Measure the engine oil level before startup. If it has been started, do not measure the engine oil level until 15 minutes after stalling.

Pull out the dip stick to clean it with cloth, and then insert it back into original position. Pull it out to check the oil trace again. The upper end of the oil trace shall be between MAX and MIN. If it is higher than MAX, drain oil. If it is lower than MIN, refill it to standard level.

f. Check brake fluid: Check the brake fluid under the condition that air has been exhausted from the clutch system. Refill the brake fluid until the level is between MAX and MIN. If it is lower than MIN, refill it to standard level.

4) Check if there is water inside the air reservoir of exhaust system, and drain if any. Park the vehicle, pull down or push up the drain valve to drain off the water condensed in the air reservoir. If any oil-water mixture is found, air dryer is ineffective and the desiccant of air dryer shall be replaced immediately.

5) Check the tire pressure. If the pressure is inappropriate, use a specialized inflation pump to inflate the tire.

6) Check the lubricant, coolant and air duct for leakage.

7) Check engine air intake system.

a. Check the primary filter inlet for blockage by foreign matters to avoid too much negative pressure present in the air intake system; for this purpose, insert a thin rod through the primary filter inlet to move the impeller, checking if the impeller rotates smoothly. Otherwise, check or replace the primary filter to prolong the maintenance interval of air intake system.

b. Check the air filter outlet to the supercharger inlet pipeline for damage, and repair or renew it in time when necessary. Otherwise, serious early wear will occur to the engine.

c. Check the air filter blockage alarm indicator for normal alarming. If the air filter is blocked, this alarm indicator shall be on. At this time, always check the metal and paper filter element for blockage, and service or replace it in time.

Fig 3-43

10) Before the start-up, check whether there is any personnel or obstructions in the vicinity of vehicle.

Fig 3-45

Fig 3-46 7DS200

3.6.2 Engine start

1) Turn on the main power switch and turn the key switch to ON position, getting ready to start the engine.

⚠ CAUTION: When the vehicle is running, do not turn off the key switch. In other words, the key switch shall be set and held at ON position (driving position).

2) Start-up

Release the hand brake, and set the gearshift lever to NEUTRAL position. Turn the key switch to START to start the engine.

⚠ CAUTION: If the engine cannot get started successfully for the first time, set the key switch to ACC, and start the engine again. The time for each starting shall be no more than 15 s, and the

interval between two successive start-ups shall be no less than 60 s. However, if it is not possible to start up for three successive times, stop it until any fault has been identified and cleared. After the engine has been started, make it idle for a few minutes, and then increase the speed to 1,000-1,200r/min, and apply partial load. Full-load operation is allowed only when the outlet temperature is higher than 60℃, and the engine oil temperature is higher than 50 ℃. The load and speed shall be increased gradually to avoid sudden load adding or shedding.

3) Oil pressure after start-up

After the engine gets started, observe the pressure value indicated on the oil gauge. Meanwhile, the oil pressure indicator lamp shall be off.

⚠ **CAUTION**: Never run a cold engine at a high temperature! If the oil gauge gives no reading after the engine is

started, immediately shut down the engine for overhaul.

1) Operation of supercharger

The supercharger is installed at the rear upper end of engine, consisting of turbine assembly and pump impeller assembly. The exhaust gas discharged by the engine will drive the turbine and the pump impeller on the same shaft to rotate at a high speed, discharging the compressed air into the engine air intake pipe to increase the intake pressure and increasing the engine power.

The rotor in the supercharger normally runs at a very high speed (about 70,000 - 100,000 rpm). The rotor bearing is forced lubricated with hydraulic oil provided by engine main oil duct. The oil supply will be cut off as long as the engine shuts down.

Precautions during operation:

a. To start the engine, run it at idle speed for 2-3 min without depressing the accelerator forcibly in this process, and do not apply load until the oil pressure and temperature are both normal (especially for start-up in cold days); otherwise, the damage caused by early wear can is likely to occur to bearing and sealing ring

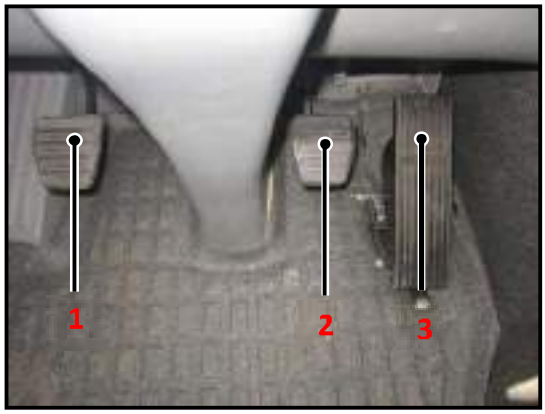


Fig 3-47

1. Clutch pedal 2. Brake pedal

3. Accelerator pedal

of supercharger.

b. To shut down the engine, always run it at idle speed for 2-3 min, and shut it down after the supercharger slows down. Pay special attention not to depressing the accelerator forcibly before the engine stops. If the supercharger will decelerates substantially due to the sudden rise of engine speed when the engine shuts down all in a sudden, the oil pump will stop oil supply immediately; however, the rotor of supercharger will keep rotating at a high speed due to its inertia, thus resulting in quick burnout of rotor shaft, bearing and sealing ring because of oil shortage.

c. Before starting the engine which has been withdrawn out of service for a long time, always pre-lubricate the supercharger by removing the supercharger oil inlet pipe and adding appropriate amount of clean lubricant from the filler port. Otherwise, the initial start-up will lead to parts early wear due to oil shortage.

3.6.3 Engine shutdown

When the vehicle runs downhill, press down the exhaust brake switch or depress the exhaust brake pedal, and then the engine oil supply

will be cut off for exhaust braking.

The engine may be overheated after it runs overloaded, and in this case, the engine should be shut down after running at idle speed for 2-3 min.

Fig 3-48 Transmission gearshift lever

3.7 Start-up and gearshift

⚠ WARNING: The user is asked to drive the vehicle according to the instructions, and the user is conceited for all the consequences of the illegal driving.

3.7.1 Start-up

If the engine is started, and the low pressure indicator is on and the buzzer keeps sounding, do not release the brake handle to start the vehicle until the inflation pressure reaches 0.55 MPa (5.5 bar), low pressure alarm indicator is off and the buzzer stops sounding.

△!WARNING: Always start the MT86 mining dump truck at gear 1.

Fig 3-49 Differential lock button

3.7.2 Transmission gears and operation

See "4.4 Operation and maintenance of transmission" for details.

3.7.3 Differential lock

The drive axle of MT86 mining dump truck is equipped with bogie differential lock. When the wheel slips or gets stuck in the mud, the bogie differential lock can lock the bogie differential between the intermediate axle and the rear axle, thus increasing the vehicle trafficability.

1) Connection of bogie differential lock: Only when the vehicle is parked or travels straight at a low speed (equivalent to walking speed) can the differential lock be engaged.

Press down the bogie differential rocker switch. When the bogie differential is engaged, the bogie differential indicator on the instrument panel will be on.

⚠ WARNING: When the vehicle is running, always release the clutch before the connection of bogie differential lock!

2) Disengagement of bogie differential lock: Release the accelerator, depress the clutch, and pull up the bogie differential rocker switch. When the bogie differential is disconnected, the bogie differential indicator on the instrument panel will be off.

Fig 3-50 Take power device

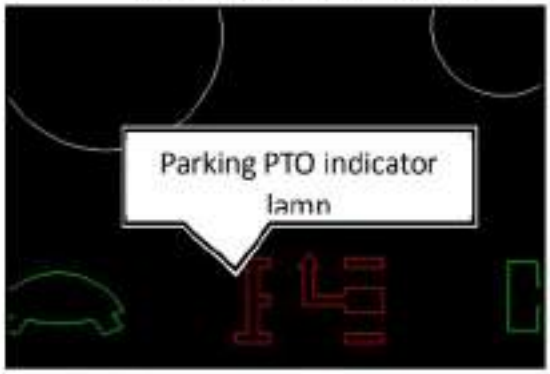


Fig 3-51 Parking PTO indicator lamp

3.7.4 PTO operation

⚠ CAUTION: PTO can be used only on the engine-out condition! It is not allowed to use the PTO in the low or reverse gear.

This manual only gives introduction to PTO engagement and disengagement. For operation and maintenance of the hydraulic lifting system, refer to the User Manual of Hydraulic Lifting System.

1) Container lifting

Depress the clutch pedal, and push the handle in the direction indicated by the red arrow to engage the power takeoff. At this moment, the parking and power takeoff indicators on the dash board turn on. Continuously push the handle to lift the container.

△!Note: Depress the accelerator pedal (engine speed ≤ 1,800r/h), pull up the handle to keep the container lifted (or stop lifting by releasing the handle).

2) Container lowering

When the handle is pulled down in the direction indicated by the blue arrow to the extent that the handle is in the return position, the container automatically lowers, and the power

takeoff switch automatically opens and returns.

Fig 3-52 Air dryer

Fig 3-53 Batter

3.8 Operation at low temperature environment

3.8.1 Engine cooling system

The long-life antifreeze and anticorrosion coolant applied by the engine cooling system can be kept unfrozen above -35℃. If the vehicle has to work in the environment below -35℃, the coolant concentration should be increased appropriately.

⚠ CAUTION: The mixture of antifreezes of two different brands is not allowed. Before changing the antifreeze, thoroughly clean the cooling system. Selection of coolant at different freezing points based on local ambient temperature, The selection principle is the air temperature is about 10C lower than the freezing point.

3.8.2 Brake system

Drain off the water condensed in the air reservoir in case of freezing, and note to check the air dryer for working

condition. Under normal condition, the service life of desiccant in the air dryer is half a year. If any oil-water mixture is drained from air reservoir, air dryer is ineffective and the desiccant should be replaced immediately.

3.8.3 Battery

The battery applied is maintenance-free. If the vehicle will not be used for a long time and the temperature is low, you had better remove the battery and place it in a warm room. Check the battery electrode terminal and conductor connection clamp for looseness and the battery for normal working condition every 500 km.

⚠ WARNING:

- Before the battery repair, always keep good ventilation.
- Nobody, other than professional service personnel, is allowed to repair and remove the battery without permission!
- While removing (installing) the battery, always disconnect (connect) the negative cable first!

3.8.4 Startup system

Start the engine with an auxiliary startup device under low temperature. Make the electronic heating flange operate with a relay so as to start the engine successfully under -30 C.

3.8.5 Park

In case of cold climate, do not park until remove the load firstly and then make it run at idle speed for 2-3 minutes, and the water temperature and the oil temperature drop. After parking, do not drain the coolant containing anti-freezing additive. If the coolant contains no anti-freezing additive, it is necessary to open the water drain valve or water plug on the engine, the oil cooler cover, the radiator, the water inlet pipe and the like, to drain the coolant to prevent the engine from being frozen.

3.9 Wheel replacement and tire pressure

1) While replacing the wheels, be careful not to damage the thread of wheel rim bolt.

2) The fitting surface of brake drum and wheel rim shall be free from paint, grease or other contaminants.

3) The seal face of wheel nuts shall be kept clean without contaminants or oil stain.

4) Before installing the wheels, wipe up the outer circle matching with the wheel locating hole and final drive housing, and apply a few grease.

5) Apply a few grease, engine oil or other anti-seize to the threads of wheel bolts and nuts.

6) All wheel nuts have right-handed threads. To install the wheels, pre-tighten the nuts diagonally with the wheels suspended, lower down the wheels, and tighten the nuts to the specified torque*.

*** Specified torque of wheel nuts: Use a 36 mm hexagon socket to tighten MT86 wheel rim bolt to a torque of 700 - 800 Nm.**

7) Each time when a tire is refitted, always tighten the wheel nuts again after the vehicle travels 50 km. Thereafter, check and tighten the wheel nuts again every 1,000 km.

8) Please inflate the tire according to the "Comparison table of speed, load and air pressure" (see left table).

Level	Speed km/h	Air pressure kpa	Load kg
14.00-25 Tire of construction machinery 36 level	10	1200	11500
	15	850	7300
	20		7150
	25		7000
	30		6900
	35		6750
	40		6700
Remarks	The above data are for reference only. The specific air pressure adjustment shall be subject to Operation Instructions provided by the manufacturer.		

3.10 Running-in of new vehicle

The running-in mileage is 1,500-2,500 km as specified.

Before running-in, do routine inspection to ensure that the vehicle is kept in normal working condition.

Precautions for running-in:

1) Do not speed up immediately after the engine gets started. Only when the coolant temperature reaches normal range can the engine speed be increased.

2) During running-in, the vehicle shall travel along a relatively even road with good condition.

3) Do gearshift in time and engage the clutch smoothly for the avoidance of sudden acceleration and emergency brake.

4) Before travelling uphill, engage a low gear in time in case that engine runs at a too low speed.

5) A new vehicle cannot travel at full speed with full load. Always monitor the instruments, indicator lamps and alarm indicators!

6) Check and control the engine oil pressure and coolant temperature. Monitor the temperature of transmission, front/rear axles,

wheel hub and brake drum. In case of overheating, find out the cause, and adjust and repair in time.

7) The vehicle must experience a run-in of 1,500km. it might be put into use after the brake interval is readjusted and the fasteners (except galatinizes bolts) are rechecked.

At the completion of running-in, check and service the vehicle according to "first-class maintenance" in maintenance provisions herein.

Chapter IV Operation and Maintenance of Main Assemblies

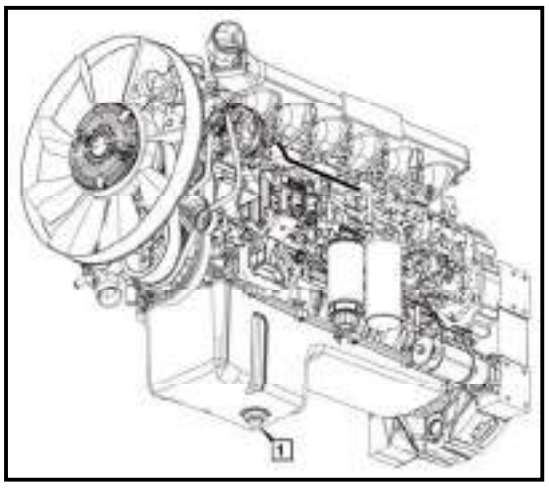


Fig 4-1 1. Drain plug

Fig 4-2 Oil dipstick

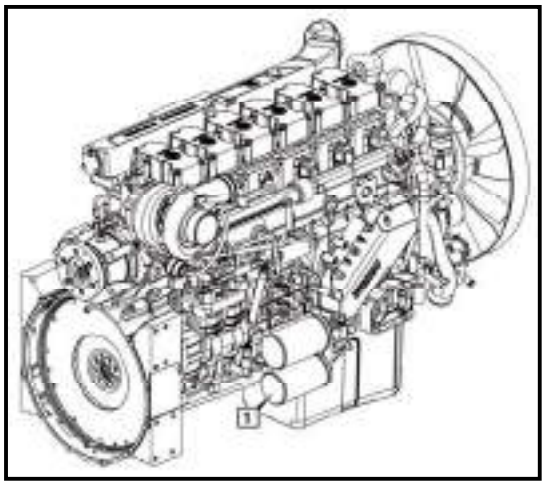


Fig 4-3 1. Oil filter

4.1 Operation and maintenance of engine

4.1.1 Operation and maintenance of engine

See Operation and Maintenance Manual of WD12 Series Diesel Engine for details

4.1.2 Change of engine oil,filter,prefilter

During operation of MT86H, it is necessary to periodically replace engine oil, filter and pre-filter as appropriate to keep the engine operating properly.

1) Change of engine oil

Interval: Within the limited period (mileage) of the mandatory maintenance, the engine oil should be changed in strict accordance with the period specified in "Mandatory Maintenance of 5.2 MT86H mining dump truck"; while over the limited period (mileage) of the mandatory maintenance, refer to the interval specified in Operation and Maintenance Manual of WD12 Series Diesel Engine for replacement.

a) Pull the drain plug open to drain the oil off.

Inspect whether the oil has a normal color and any foreign materials while draining, and

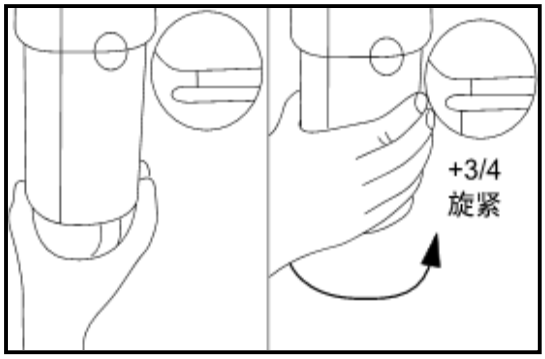


Fig 4-4 Change the oil filter

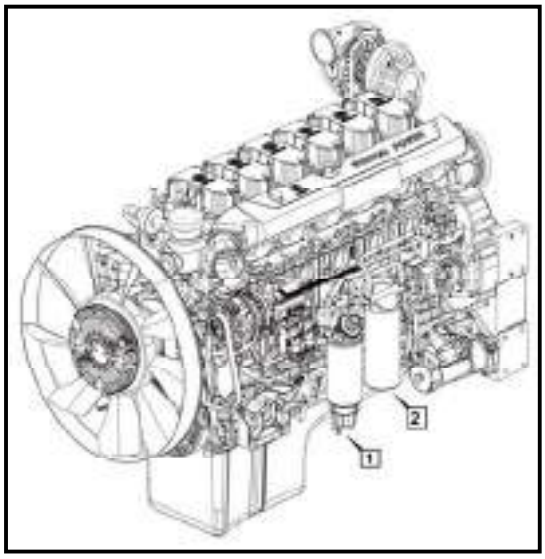


Fig 4-5 Fuel filter
1. Fuel coarse filter 2. Fuel fine filter

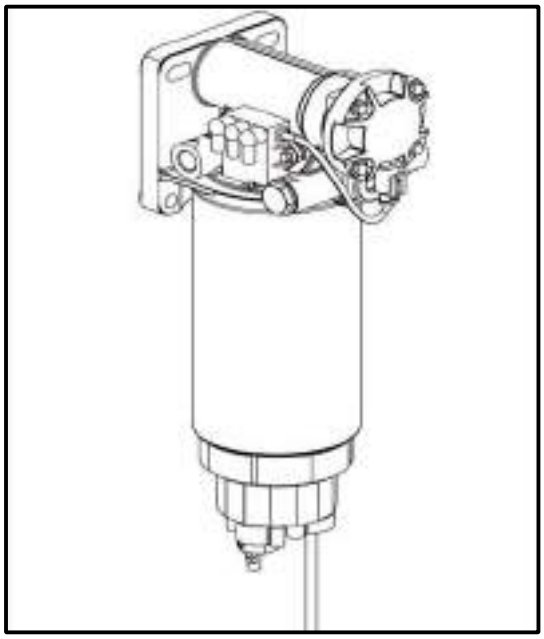


Fig 4-6 Fuel filler（protector）

eliminate timely the fault potential if any.

b) After the oil has been drained off, remove the foreign materials from the drain plug that then should be screwed on.

c) Replace with a new oil filter element, and fill the engine with new oil to the upper limit of the dipstick. To avoid starting an unlubricated engine, when the high pressure oil pump is set at OFF position, turn the key switch to start position (4th gear), let the engine idle for a while, and after the engine is completed with pre-lubrication, start and run it at a low speed, and check if the oil filter is leaking oil.

2) Oil filler

Replacement interval: In the limited period (mileage) of the mandatory maintenance, the oil filter should be replaced in strict accordance with the period specified in "Mandatory Maintenance of 5.2 MT86H mining dump truck"; while over the limited period (mileage) of the mandatory maintenance, the replacement is required every 5000 Km (200h). Each time the engine oil is changed, the oil filter should be replaced as well.

Replacement method: Remove the filter with a special filter wrench before replacement. To

fit a new filter, clean up the fitting surface first, fill the filter full with clean media to be filtered, lubricate the rubber seal ring with little clean media to be filtered, then install the filter by hand and screw it for 3/4 circle after the sealing surface bonds with fitting surface. Start the engine to check if the sealing surface is leaking oil, and if any, tighten the filter again until there is no oil leaking any more.

3) Fuel filter

The replacement interval and replacement method are the same with "2) Oil filter".

1) Fuel primary filter

The replacement interval and replacement method are the same with "2) Oil filter".

4.1.3 Routine maintenance and considerations

1) Check the coolant level, oil level and fuel level.

2) Check if the grease is sufficient at required position.

3) Check for oil, water and gas leakage.

4) Check connection of external connection pieces and accessories.

5) Check if the fan belt is too tight or too

loose.

6) Check the oil pressure and water temperature of the diesel engine.

7) Check if the exhaust temperature, color, sound and vibration are normal, and the speed is stable.

Refer to "Periodic Inspection and Technical Maintenance of Diesel Engine" section of Operation and Maintenance Instruction of WD12 Engine for details.

4.1.4 Maintenance

MT86 engine shall be inspected and maintained at interval specified in "5.1 Interval Mileage of Routine Inspection and Maintenance". Refer to "Periodic Inspection and Technical Maintenance of Diesel Engine" section of Operation and Maintenance Instruction of WD12 Engine for details.

4.2 Operation and maintenance of intake system

The working component of the intake system is the three-stage desert filter, which consists of the cyclonic prefilter, coarse filter and fine filter.

Fig 4-7

1.Cyclonic prefilter 2. Coarse filter 3.Fine filter

4.2.1 Cyclonic prefilter

The cyclonic prefilter is maintenance-free and is removed for inspection only when there is abnormal noise, and if necessary, the rotator should be replaced.

4.2.2 Coarse filter

1) Check the dedusting valve frequently, and clean the coarse filter in the case of clogging;

2) Remove and clean the coarse filter carefully every 2-3 months;

Maintenance steps:

① Remove the fixed points around the bottom cover; ② Remove the bottom cover; ③ Clean the dust in the bottom cover and dust collecting duct; ④ Install the bottom cover to confirm the sealing performance.

⚠ CAUTION: The damaged or ageing seal ring should be immediately replaced with a new one; the dedusting valve should be replaced with a new one immediately in the cae of loss, ageing or damage.

4.2.3 Fine filter

The fine filter is composed of the main filter element and the safety filter element.

The main filter should be maintained when the indicator alarms or every 200-250 working hours.

The safety filter element is only used as second protection and may not be cleaned.

Maintenance method:

① Unscrew the fixing nut, and carefully remove the main filter; ② Blow off the dust on the main filter element with clean air below 0.5MPa diagonally from the inside to outside; ③ Check the filter element inside and outside and the seal ring for any damage; ④ Clean the air filter housing inside, and check the inner filter element for damage; ⑤ Place the outer filter element gently back into the filter housing, and check whether the outer filter ring comes into contact with the housing; ⑥ Determine that the outer filter element has been installed in place, and tighten the nut and insert the spring pin into the pin hole.

The main filter element and safety filter element should be replaced in the following conditions:

① The main filter has been damaged; ② After the indicator is cleaned and installed, it still alarms:

③ The main filter element has been cleaned for 5 times.

⚠ CAUTION: The safety filter element cannot be cleaned, and should be replaced together with the outer filter element.

4.3 Operation and maintenance of clutch control system

4.3.1 Working principle

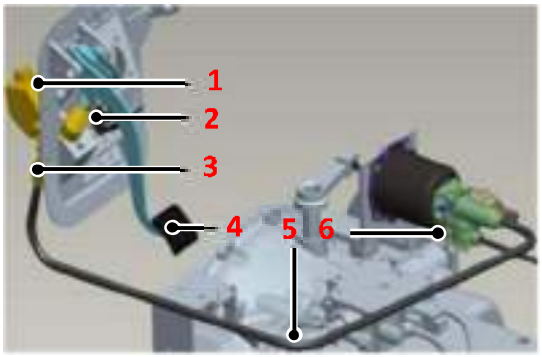


Fig 4-8

1. Clutch oil reservoir 2. Clutch master cylinder push rod 3. Clutch drive cylinder 4. Clutch pedal assembly 5. Clutch oil pipe 6. Clutch booster cylinder

The clutch control system is hydraulically controlled and pneumatically boosted. With the clutch pedal stepped on, the drive cylinder push rod pushes the piston to move forward, so that the brake fluid, which flows along the fluid pipe into the hydraulic control cavity of clutch booster cylinder, provides working pressure on the piston, and besides, serves as control pressure to control the air pressure in the booster cylinder chamber. When compressed air gets into the booster cylinder, the generated force will push the piston to move the booster cylinder push rod, and drive the release rocker arm to rotate, such that the release fork makes the release bearing move

backward, finally to release the clutch successfully.

The clutch drive cylinder, clutch fluid reservoir and clutch pedal assembly etc. are arranged to the front wall of the cab, with the drive cylinder connected to the clutch booster cylinder on the chassis through high pressure hose, and one bracket shared by the clutch operating part and the brake operating part. The fluid reservoir is installed directly on the clutch drive cylinder, and the brake fluid can be added outside the cab as long as the radiator cover is uncovered.

4.3.2 Working parameters

1) Working media: compressed air and brake fluid.

2) Max. working pressure: 1 MPa for the brake fluid and 0.85 MPa for the compressed air.

3) Working temperature: -40° C~+80° C.

4) Brake fluid: as per DOT3 and DOT4 standards.

5) Pedal travel: a maximum travel ≤ 175 mm.

6) Pedal operating effort: ≤190 N (when pneumatically boosted).

4.3.3 Installation and adjustment of clutch and clutch control system

1) Installation of clutch: Put the driven disc

assembly on the spline shaft (with a tool used for positioning the clutch driven disc to be installed), with the fly wheel central hole aligned. Assemble any two holes of the clutch pressure plate assembly to the two studs on the fly wheel, then install the other 10 hexagon bolts respectively, and tighten them diagonally.

2) Pull-type clutch connection: After a pull-type clutch is installed with the procedures above, take the four clamp springs off the pressure plate assembly, close the flexible lock ring on the clutch pressure plate assembly, and install the release bearing and release fork properly. Since the transmission has been installed to the engine fly wheel, apply a backward force to the release fork at the booster cylinder mounting port (pull backward through a flexible rope attached to the upper end of the release fork), and as long as a sound of clap is heard, the clutch cover assembly and release bearing are assembled in place (i.e. the flexible lock ring clamped on the release bearing), after which, the booster cylinder should be installed.

3) Inspection and adjustment of clearance between the drive cylinder push rod and piston:

While adjusting, push the pedal gently by hand until you feel the drive cylinder push rod against the piston, adjust the height of stop bolt to ensure a clearance between the push rod and piston of 0.5 mm~1 mm, and then tighten the nut. The clearance hereof should be no more than 1 mm, or the effective stroke of the drive cylinder may shorten.

4) Bleeding of hydraulic system: If there is air in the clutch hydraulic system, the effective stroke of the booster cylinder push rod will shorten, resulting in an incomplete clutch release, as well as gear engagement difficulty. To add new brake fluid, release the booster cylinder bleed valve, fill the fluid reservoir with brake fluid of specified grade, replenish brake fluid while stepping on the clutch pedal until it spills out of the bleed valve, and tighten the bleed valve. Then depress the clutch pedal for several times, and hold it, release the booster cylinder bleed valve until no air comes out, then tighten the bleed valve. Repeat the steps above for 2~3 times, so that the air in the hydraulic system can be discharged thoroughly.

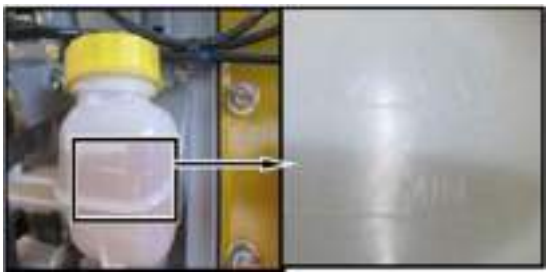


Fig 4-9 Brake fluid

4.3.4 Precautions

1) Remember to release the pedal after the bleed valve is tightened during air discharge in order to avoid air suction, and allow the pedal to rise up to the maximum height, so that the brake fluid in the fluid reservoir is added into the drive cylinder hydraulic cavity.

2) The working medium for hydraulic system must be brake fluid of DOT3 and DOT4.

3) To change the brake fluid, the residue in the hydraulic system has to be cleaned. Then uniformly change the brake fluid of specified grand and same lot. The brake fluids of different grades and lots shall not be mixed.

4) As the brake fluid is corrosive, while discharging air, try not to spatter any brake fluid onto human body and vehicle finish.

5) Periodically inspect the brake fluid reservoir level of clutch master cylinder. If the brake fluid level is below Min mark, the brake fluid of a specified type should be added, until its level is between the scale marks of Min and Max.

4.3.5Common faults and troubleshooting

Faults	Causes	Solutions
Clutch return difficulty causes shift difficulty	The transmission is misaligned at re-assembly; The hub is mounted on the input shaft, and the driven disc assembly rotates through the hub in the direction of the input shaft	Align the driven disc assembly carefully, and align the clutch with an analog spindle; Do not push the transmission forcibly, but rotate the flywheel or the input shaft to align it with splines of the hub
It is out of work and loud noise occurs after a few hundred kilometers	1. The weight of the transmission is completely loaded on the hub and is damaged due to distortion after short-term operation; 2. Operate the clutch like a racing automobile or tow a heavy trailer	Do not load the input shaft or the transmission on the driven disc, but support the transmission with a manual or electric lift for assembling; Do not operate it like a racing automobile. Educate the driver.
The clutch slips, but the control system operates properly, and the regulation is correct	Oil leaks from the transmission or the engine	Check the oil seal of the engine and transmission carefully. If there is oil in the clutch housing, replace the oil seal.
The clutch is shaking at the initial stage of the transmitting torque	There are too much copper-based grease on splines of the input shaft	Only a certain amount of suitable grease is permitted Warning: copper-based grease dilutes under high temperature and radiates outwards under centrifugal force
It is out of work	Improper operation. Shift 5th gear to 2nd gear at 85 miles	Educate the driver
Shift is difficult or is unavailable after the clutch has been operated for a period of time	The truck starts at a bumpy place or starts and tows with an inappropriate gear, or the clutch cover assembly is not suitable for the truck	Do not engage 1st gear, but high-speed gear such as 3rd gear or 4th gear, when the truck starts at a bumpy place or tows.

Fault	Causes	Solutions
Shift is difficult or is unavailable after the clutch has been changed	The cap assembly drops during assembly so that the return spring is twisted; The spring (with scratch on the drive disc) is damaged by tool during assembling	Do not use the cover assembly that has ever dropped; Check the return spring carefully before assembling; Do not try to insert the drive disc to stop the engine with a tool while the engine is running
Shift is difficult or is unavailable after the clutch is renewed	The clutch cover is not accurately positioned; Bolt tightening sequence is not proper	Check the positioning before assembling; Tighten bolts in proper sequence (diagonally)
Pedal jitters at disengaging	The transmission input shaft interferes with the disengaging lever during assembling	Accurately guide the clutch into the transmission input shaft to avoid any interference during assembling
It is difficult to depress the pedal and the stiffness increases with time.	The pre-load of the release bearing is too small or it is not preloaded; The preloaded spring is not installed properly or the self-regulator has failed	Check all relevant connections thoroughly during the clutch assembling; ensure that the clutch cable operates smoothly throughout operation of the clutch; check the self-regulator; always refer to the installation manual of the manufacturer for proper regulation; keep the preload between minimum 50N and maximum 80N
The noise associated with the engine occurs when the pedal is depressed to the bottom	The clutch regulation is improper or the self-regulator has failed	Check the cable, related connections and self-regulator systematically, and always refer to the installation manual of the manufactuter for proper regulation
The stiffness at a certain point in the pedal travel is large, the transmission generates noise, the clutch vibrates, and the pedal jitters	The guide sleeve of the release bearing is worn; The fork deforms	Check the fork, or replace it if necessary; Replace the guide sleeve of the release bearing if any wear sign; Make sure the parts are lubricated

Fault	Causes	Solutions
The clutch generates noise, and the pedal is loose	The positioning element has been damaged; Mechanical operation errors during the clutch assembling result in damage to the locating plate	Check the fork and guide sleeve, and replace it if any abnormal wear sign; Make sure the parts are lubricated; Check the clutch cable carefully
The audible harsh noise occurs when the clutch is disengaged or throughout operation of the clutch, and the noise level varies with the magnitude of force applied onto the pedal.	The release bearing is stuck or generates noise from the beginning; The release bearing overheating causes the grease to burn because the preload is incorrect	Check the clutch cable, related connections, fork, bearing, preloaded spring and self-regulator systematically
Loud noise lasts for a long time	Improper regulation causes failure of the release bearing	Check the clutch regulator periodically, and always refer to the installation manual of the manufacturer for proper regulation
The clutch slipping eventually results in jitter	The driver always puts his foot on the pedal; The clutch regulation is improper	Make sure the clutch is regulated properly, and always refer to the installation manual of the manufacturer for proper regulation; Train the driver
The clutch slips, and shift is unavailable	The truck and the clutch are operated rudely; The driver always puts his foot on the pedal; Over-slipping results in overheating of all parts, causing the plate breaking	Educate the driver

Fault	Causes	Solutions
The clutch slips	The truck is operated rudely; The clutch is operated too frequently; The driver always puts his foot on the pedal; The release bearing is stuck with the sleeve of the input shaft	Check the release bearing sleeve systematically; Educate the driver
The truck generates noise when the gear is at neutral position	Oil or grease invades into the torsional vibration reduction system, causing failure	Checks the sealing ring of the engine and the transmission systematically. Only little grease is permitted on the input shaft; Warning: The grease dilutes under high temperature and will then be thrown out at high speed due to centrifugal force
Gear can not be shifted rapidly; It is difficult to shift it to 1st gear and reverse gear, even all gears	The grease is insufficient or splines are cleaned with high pressure; If the hub of the driven disc assembly is nickel plated, greasing the input shaft will cause adverse consequences, making the lubrication deteriorated and the driven disc hardly slide on the input shaft.	It is important to refill grease as per instructions when renewing the clutch
Shift is difficult and gear is interred during shifting; a considerable free travel has to go prior to disengagement	The self-regulator failure or locking causes insufficient movement of the cable so that the clutch can not be disengaged completely	When replacing the clutch, check the condition of the self-regulator; adjust the height of the pedal if necessary, according to the operation regulations of the manufacturer
Whistlers occur when the pedal moves	The guide bearing on the crankshaft is damaged; The guide bearing does not rotate when the clutch is in the operating position, but rotates when the pedal is depressed.	Check if the guide bearing status is ideal when the clutch is disassembled; Refill the grease if necessary

Fault	Causes	Solutions
There's any sign of clutch slipping	Since the self-regulator is worn to the limit, the release bearing has no sufficient backward travel after the driven disc assembly has been worn, which causes the pressure lowering, thus resulting in slipping; For the semi-automatic device, open the locking mechanism, and then reassemble and lock it;	Periodically check the state of the self-regulator and the preload of the release bearing, and push the fork of the clutch in reverse; Check the adjustment allowance, and the bearing of the pedal when regulating the pedal; Automatically regulate cable: Replace it if regulation is impossible; for the semi-automatic regulation device, continuously screw down the threads until exceeding the initial position indicated by the arrow
When the clutch is or has been disengaged, harsh noise occurs, and the support shaft of the fork or the pedal is stuck	There is no grease at connections	When replacing the clutch, pay special attention to the condition and lubrication of the operating system. In case of any irregular wear mark on any part, replace it; Avoid excessive grease, which may cause contamination of the friction plate
When the operator depresses the pedal, harsh noise occurs and the pedal is abnormally rigid, which may cause the clutch jitter	The moving part of the fork is not well lubricated and becomes rough, which causes the release bearing wear, and the release bearing presses the input shaft, making the sleeve move not smoothly.	When replacing the clutch, pay special attention to the condition and lubrication of the fork. In case of any irregular mark or unsmooth movement, replace the parts; Avoid excessive grease, which may cause contamination of the friction plate
The pedal is rigid, and the slip time may be prolonged when the clutch is disengaged	The release bearing moves not smoothly on the sleeve of the input shaft	In case of any abnormality sign on the sleeve of the input shaft, replace it; Avoid excessive grease, which may cause contamination of the friction plate

Fault	Causes	Solutions
Gear generates friction sound	The travel of the release bearing is insufficient, causing the clutch being disengaged incompletely	When replacing the clutch, pay special attention to the condition and lubrication of the fork. In case of any irregular mark or unsmooth movement, replace the parts; The clutch system must be regulated in accordance with the maintenance manual of the manufacturer

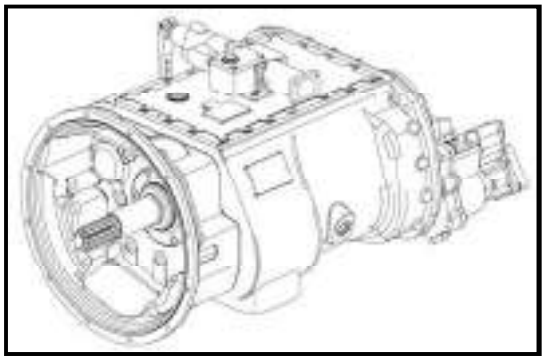


Fig 4-10 7DS200 transmission

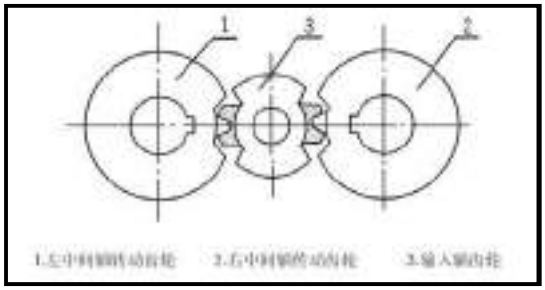


Fig 4-11

Schematic diagram for tooth alignment of transmission assembly.

1 Left countershaft gear

2 Right countershaft gear

3 Input shaft gear

4.4 Operation and maintenance of transmission

4.4.1 Main performance parameters

The MT86 mining dump truck is applied with the countershaft and single case structure, which is designed with seven forward gears and one reverse gear without synchronizers. The transmission realizes the gearshift via sliding sleeve, and then the power transmission through the engagement of the external and internal splines on the gear with the sliding sleeves.

The transmission is applied with two parallel countershafts of same structure spaced from each other by 180°. The power inputted from the input shaft is diverted to the two counter shafts and finally outputted via the output shaft after converged. As two countershafts only transmits 1/2 torque theoretically, the center distance, gear width, axial size and weight are reduced accordingly. Thanks to the twin-countershaft structure, each gear on the output shaft must be engaged with the two countershaft gears simultaneously. In

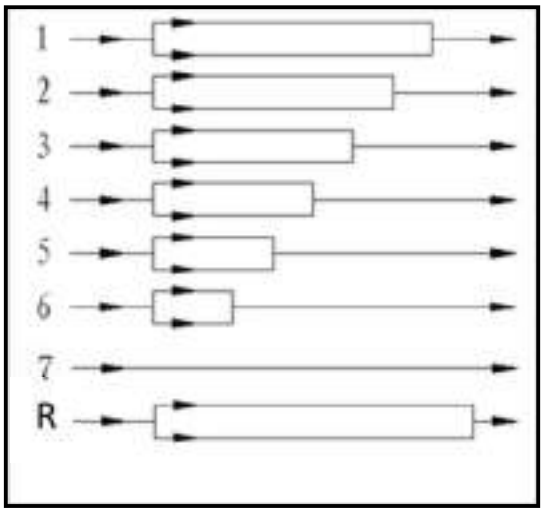


Fig 4-12 Power transmission route diagram

Fig 4-13 Shift handle

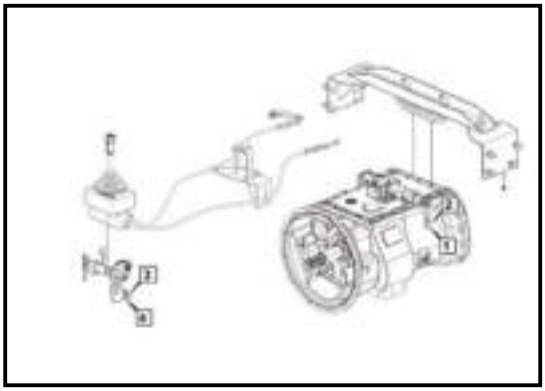


Fig 4-14 Soft shaft control mechanism
1. Nut 2. Ball hinge 3. Bolt 4. Ball hing

addition, the output shaft gear is radially floating on the output shaft to make the gear engaged with the countershaft gear properly and distribute the load as equal as possible. Since the output shaft gear floats on the output shaft, the needle bearing is not required any more, and the radial forces applied by the two countershafts to the output shaft are offset, so that the output shaft only bears the torque without bending moment, and the stressing condition of output shaft and bearing is improved, substantially enhancing the reliability and durability of the transmission.

4.4.2 Main performance parameters

The maximum input torque is 1, 800 Nm, the rated rotate speed 2, 600 r/m, the fuel capacity 23 L, and the gear ratios are given in the table below.

Gear	7DS200
1	9.14
2	6.7
3	4.85
4	3.6
5	2.65
6	1.61
7	1.00
R	8.51

The power transmission route is shown in the figure (left).

4.4.3 Transmission structural parts

1) Installation and adjustment of flexible shaft control system

The 7DS200 transmission is remotely operated. The flexible shaft operating system is installed and regulated as follows:

a. The flexible shaft to be installed to the truck should have a bending radius not less than 300 mm, and it is applied within the temperature range of -40° C~+100° C.

b. The flexible shaft is connected with the gear shift rocker, and the following requirements should be met:

1) An included angle of 90 degrees is reserved between the flexible shaft and the rocker.

2)The guide sleeve and protective pipe joint of the flexible shaft as well as the pull-push rod at spatial positions must be in line.

c.The gear and shift flexible shaft shall be installed to the controller.

CAUTION: Two flexible shaft ball joint threads should be screwed down.

d.Position the control lever to neutral position, measure the flexible shaft at the

transmission end to see if it meets the requirement. And if not, adjust the connecting length of flexible shaft ball joint with pull rod thread so as to adjust the installation dimension of the flexible shaft.

e. Do gearshift after the installation, and make sure that all gears can be selected. And if any gear is difficult to be shifted, inspect and adjust the installation dimension of shift flexible shaft at the transmission as above.

f. The adjustment of flexible shaft is detailed as follows:

If, after the assembly is done, the gears at the front row cannot be engaged properly during the running-in period, unscrew the nut ① (or nut ⑤), and anticlockwise rotate (lengthen) the spherical hinge ② (or spherical hinge ⑥) properly. On the contrary if the gears at the rear row cannot be engaged properly, unscrew the nut ① (or nut ⑤), and clockwise rotate (shorten) the spherical hinge ② (or spherical hinge ⑥) properly. Carry out the steps above repeatedly for adjustment until all gears can be engaged in place.

2) Power takeoff mechanism

With the adoption of rear power takeoff for the MT86 mining dump truck transmission, the

output rotatory direction and the engine running direction are consistent. The POT connects the transmission inner cavity, so it is unnecessary to add lubricating oil.

The MT86 mining dump truck is applied with the QH70 power takeoff.

4.4.4 Operation and maintenance

1) PTO

First set the transmission control lever at N, step on the clutch and close the PTO switch. When the PTO has gotten the gear engaged, release the clutch slowly, allowing the PTO to come into work.

2) Transmission

Operate the transmission reasonably and properly, and maintain it periodically, which are very important to ensure a safe and reliable driving and an extended transmission life, so please follow the operational requirements below:

a. Lubricating oil grade

The transmission should be filled with GL-5 gear oil specified in SAE 85W/140.

b. Correct oil level

Make sure that the oil level is up to the sight glass. The oil level can be inspected through

the sight glass of the housing side and add oil until it spills out of the mouth.

The reference oil capacity of the 7DS200K transmission is 23 L.

c. Oil level inspection

The oil level should be inspected periodically, always with the truck parked on a level road. Due to the volume expansion of hot oil, in order to avoid any inaccurate measurement, the truck shall not be inspected immediately after driving, but be inspected only with a steady oil level and an oil temperature close to the normal temperature.

d. Oiling

In order to prevent the lubricating oils of different types from chemical reaction, always replenish with the lubricating oil of the same type with the original one. It is strongly recommended to use the lubricating oil approved by LGMG.

e. Lubricating oil change interval

In replacing the lubricating oil of the transmission, first completely discharge the existing lubricating oil in the transmission and clean the strainer assembly. For the new transmission, after 2,000~5,000 km running, the lubricating oil has to be replaced. Inspect

the lubricating oil for its level and leakage after 10,000 km, replenish when necessary and clean the strainer. If the limited period (mileage) of the mandatory maintenance is exceeded, change the lubricating oil after driving for 25,000 km.

f. Working temperature

The transmission in its continuous working period should have a maximum temperature not more than 120° C, and a minimum temperature not less than -40° C. A working temperature more than 120° C may decompose the lubricating oil and shorten the service life of the transmission.

g. Dragging or sliding

While the transmission is working, its countershaft drives the oil pump to run, and with the splash lubrication, it can be lubricated completely. However, in the case that the truck is dragged with the rear wheel grounded and drivetrain connected, the auxiliary and primary shaft gears of primary transmission do not rotate, but the primary shaft rotates relative to its gear, so does the planetary mechanism, which may seriously damage the transmission planetary mechanism and the primary shaft locating elements due to

lack of lubrication.

To avoid such phenomena, notice that: never step on the clutch pedal to allow the truck skidding at natural. To drag the truck, either pull out the axle shaft or release the drive shaft, or drag with the driving wheel off the ground.

⚠ WARNING:

●To avoid personal injury or equipment fault and damage, please operate the transmission in accordance with the specified procedures;

●Before driving, sit in the driver's seat, set the gearshift lever at N and pull down the parking brake lever;

●To leave the cab before the truck starts or while the engine is running, set the gearshift lever at neutral, and lock the wheel using parking brake;

●To leave the cab before the truck starts or while the engine is running, set the gearshift lever at neutral, and lock the wheel using parking brake;

●Before starting, in the case that the truck air pressure does not reach to a correct level, never let the parking brake lever go to do gearshift;

●While the transmission is set at neutral, never slide downhill;

●To operate PTO, step on the clutch pedal to the limit immediately after the PTO switch is pressed, and release it after the PTO works as normal;

●To operate PTO, step on the clutch pedal to the limit immediately after the PTO switch is pressed, and release it after the PTO works as normal.

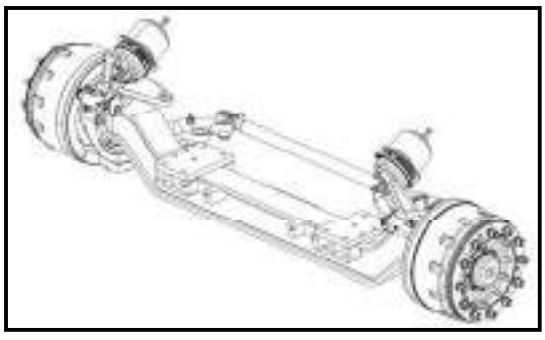


Fig 4-15 Front alxe

4.5 Operation and maintenance of front axle

4.5.1 The front steer axle and intermediate and rear drive axles

The front axle of the MT86 mining dump truck is a two stage drive axle with "central 1st stage reducer + wheel planetary reducer", and equipped with casting axle housing, bogie

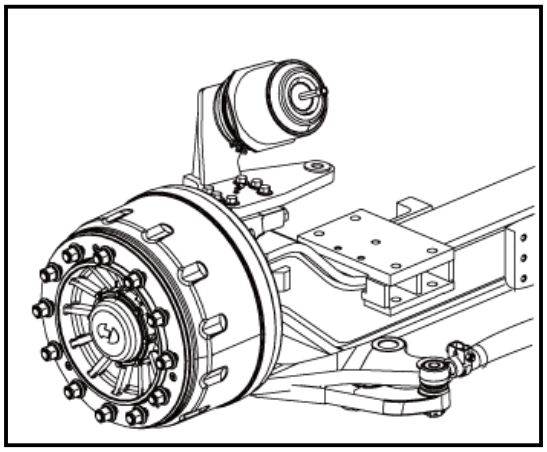


Fig 4-16 Wheel part

Check if the wheel bolts are loose and the oil leaks from the wheel rim

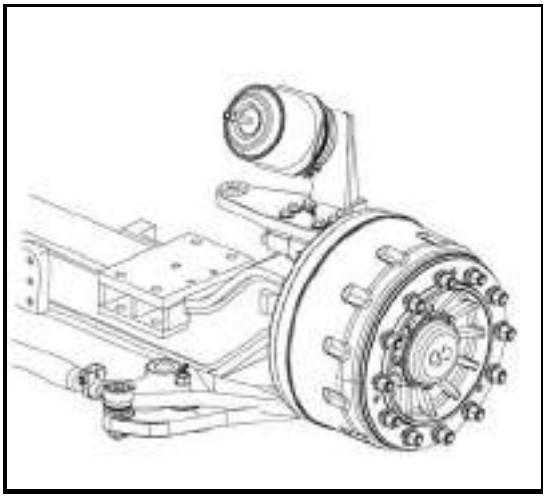


Fig 4-17 Front Driving Axle

Check if connecting bolts between the tie rod and tie rod arm are loose.

differential and inter-wheel differential as well as bogie differential lock. An evolvent S-shaped cam drum brake and external respiration piston spring brake chamber are adopted.

4.5.2 Operation and maintenance of front axle

1) Operation of front axle

⚠ Warning

- It is prohibited to continue operating when the axle has failed;
- It is prohibited to disassemble the truck when the axle has failed;
- It is prohibited to change the axle structure.

a. Reminder

① It is recommended to replace with accessories from Lingong Group Jinan Heavy Machinery Co., Ltd.

② Check and maintain the axle at specified interval.

b. Precautions for wheel replacement:

- Do not damage threads of the wheel bolts, and keep the mating surface between the brake drum and the rim, and the clamping surfaces of the wheel nuts free from paint, grease and

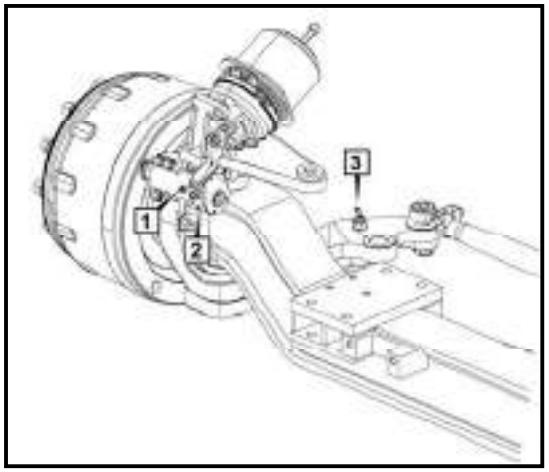


Fig 4-18 Front Driving Axle

1. Camshaft support grease nozzle 2. Regulating arm grease nozzle

other dirt; apply grease, oil, or other thread paste to the threads of the wheel bolts and wheel nuts before installation.

① Clean the matching surface between the brake drum and the rim, the outer circle surface between the rim positioning hole and the wheel rim reduction shell, and the seal surface of the wheel nut;

② Do not damage threads of the wheel bolts, and apply grease, oil, or other thread paste to the threads of the wheel bolts and wheel nuts before installation;

③ Tighten the wheel nuts diagonally and evenly, and after each re-assembling of the tire, the tire nut must be re-tightened after 50 km of travel.

c. Precautions for operation of brake shoe friction plate:

● When the vehicle has run for the first 5,000km, check the thickness of the brake shoe friction plate, which shall not to be less than 8mm. The inspection period thereafter may be shortened as appropriate to avoid other serious faults due to excessive wear of the friction plate;

● The clearance between the brake shoe and the brake drum shall be kept between 0.7 and 1.2

mm, and the clearance between the upper and lower drums and shoes shall not be greater than 0.3 mm;

● The axle friction plate must be accessories from Lingong Group Jinan Heavy Machinery Co., Ltd.

2) Maintenance of axle

a. Routine maintenance

① Check if the wheel nuts are loose and fasten them before the truck running;

② Check the axle for oil leakage before the truck running; repair it if any leakage;

③ Check the brake performance and brake return condition. The brake clearance shall be between 0.7 and 1.2 mm. In case of improper brake clearance or poor brake return, check and regulate immediately;

④ Check if the regulating arm and the camshaft are jammed. If so, refill grease immediately to ensure that they rotate flexibly;

Refill grease to the grease nozzle of the master pin, the camshaft support and the regulating arm every 15 days. If it is difficult to refill grease, check it immediately and stop operating.

b. First maintenance

The first maintenance shall be carried out

before 5,000 kilometers (or within 1 month). The first maintenance items are listed as follows:

① Refill grease to the grease nozzle of the master pin, the camshaft support and the regulating arm as required. If it is difficult to refill grease, check it immediately and stop operating;

② Check if the connecting bolts between components outside the axle are loose and fasten them;

③ Check and regulate the brake clearance, which shall be between 0.7mm and 1.2 mm;

c. Periodic maintenance

The periodic maintenance shall be carried out every 20,000 km or 1 year after the first maintenance. The periodic maintenance items are listed as follows:

Repeat the first maintenance items;

Lubricate the brake shoe pin and the brake roller;

Check the friction plate wear degree. The thickness of the friction plate shall not be less than 8mm. Replace it if it is less than 8mm.

⚠ Note: When performing inspection

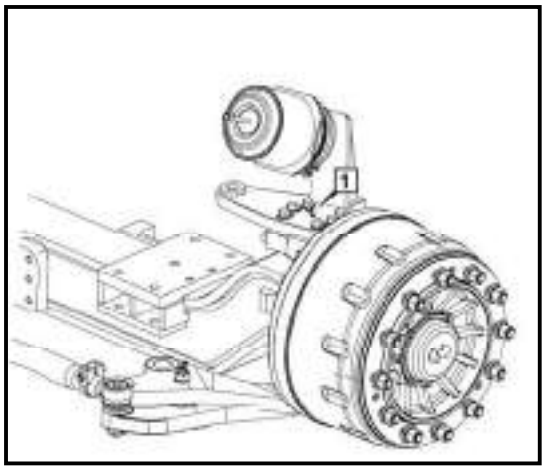


Fig 4-19 Front Axle Part

1. Lower master pin grease nozzle

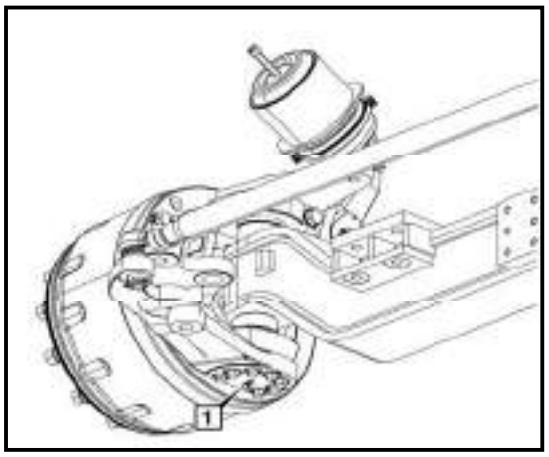


Fig 4-20 Front Axle Part

1. Upper master pin grease nozzle

and maintenance, stop the engine, park the truck on flat road, apply the parking brake, and set wedges on both wheels of any axle to avoid safety accidents.

4.5.3 Operation and maintenance of drive axle

1) Operation of axle

⚠ Warning

- It is prohibited to continue operating when the axle has failed;
- It is prohibited to disassemble the truck when the axle has failed;
- It is prohibited to change the axle structure.

a. Reminder

① It is recommended to replace with accessories from Lingong Group Jinan Heavy Machinery Co., Ltd.

② Check and maintain the axle at specified interval.

b. Precautions for differential lock operation:

The truck shall be stopped or running at low speed (less than 10 km/h) when the differential

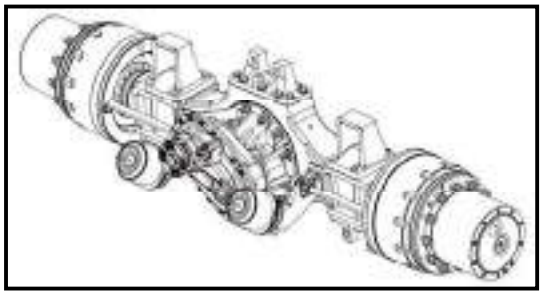


Fig 4-21 Middle axle

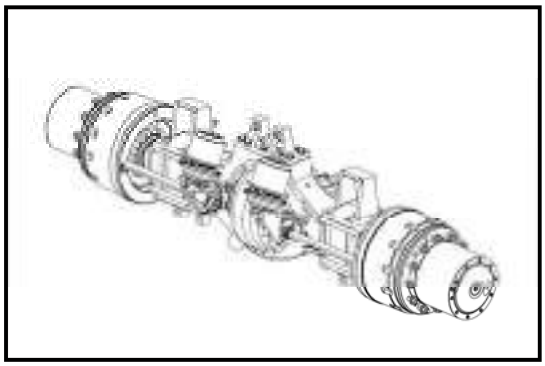


Fig 4-22 rear axle

lock is latched to avoid internal gear damage. When the differential lock between axles is latched, the truck shall not run for a long time on undulate road. The differential lock shall be released in time after the truck has passed the undulate road; otherwise, the internal parts of the axle may be damaged or the tyre may be worn.

c. Precautions for wheel replacement:

● Do not damage threads of the wheel bolts, and keep the mating surface between the brake drum and the rim, and the clamping surfaces of the wheel nuts free from paint, grease and other dirt; apply grease, oil, or other thread paste to the threads of the wheel bolts and wheel nuts before installation.

● Before mounting the wheel, clean the outer circle between the wheel rim positioning hole and the wheel rim reduction shell firstly, and then apply little grease to it.

● Tighten the wheel nuts diagonally and evenly, and after each re-assembling of the tire, the tire nut must be re-tightened after 50 km of travel.

d. Precautions for operation of brake shoe friction plate:

① When the vehicle has run for the first

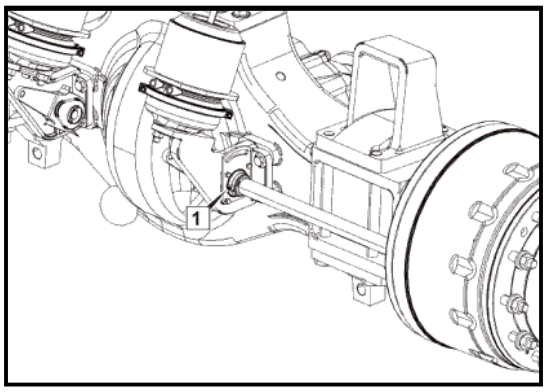


Fig. 4-23 Rear Axle Part
1. Regulating arm grease nozzle

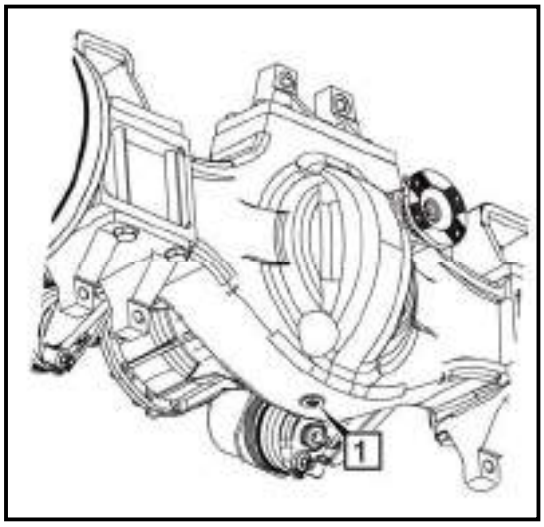


Fig. 4-24 Intermediate Axle Part
1. Drain hole

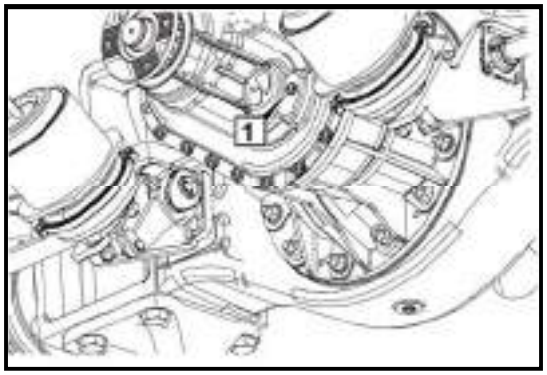


Fig. 4-25 Intermediate Axle Part
1. Oil level sightglass

5,000km, check the thickness of the brake shoe friction plate, which shall not to be less than 8mm. The inspection period thereafter may be shortened as appropriate to avoid other serious faults due to excessive wear of the friction plate;

② The clearance between the brake shoe and the brake drum shall be kept between 0.7 and 1.2 mm, and the clearance between the upper and lower drums and shoes shall not be greater than 0.3 mm;

③ The friction plate for each axle shall be special accessories from Lingong Group Jinan Heavy Machinery Co., Ltd.

2) Maintenance of axle

a. Routine maintenance:

① Check if the wheel nuts and the oil plug are loose and fasten them before the truck running;

② Check the axle for oil leakage before the truck running; repair it if any leakage;

③ Check the brake performance and brake return condition. The brake clearance shall be between 0.7 and 1.2 mm. In case of improper brake clearance or poor brake return, check and regulate immediately;

④ Check if the regulating arm and the camshaft are jammed. If so, refill grease immediately

to ensure that they rotate flexibly;

⑤ Refill grease to the grease nozzle of the axle every 15 days (as shown in figure). If it is difficult to refill grease, check it immediately and stop operating.

b. First maintenance:

① Replacement of grease of drive axle (as shown in figure above)

Unscrew the drain plug of the axle → drain grease from the axle → tighten the drain plug again after the grease has been drained → unscrew the filler plug of the axle → refill the grease as required in Table 1 → tighten the filler plug.

② Refill grease to the grease nozzle as required. If it is difficult to refill grease, check it immediately and stop operating;

③ Check if the connecting bolts between components outside the axle are loose and fasten them;

④ Check and regulate the brake clearance, which shall be between 0.7mm and 1.2 mm;

⑤ Remove obstacles from the final drive reducer vent hole of the middle rear axle

Periodic maintenance:

The periodic maintenance shall be carried out every 10000km or 1 year after the first

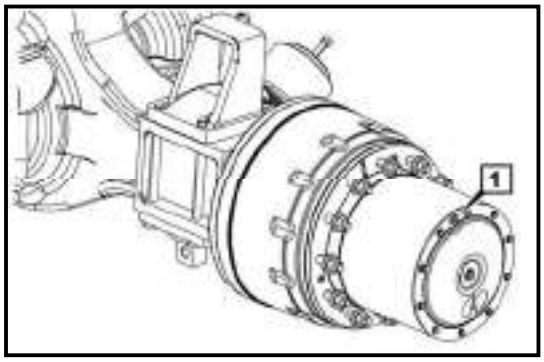


Fig. 4-26 Intermediate Axle Part

1. Oil filler, oil level sightglass, oil drain hold

maintenance. The periodic maintenance items are listed as follows:

① Repeat the first maintenance items;

② Replace the hub bearing grease of the front axle assembly;

③ Lubricate the brake shoe pin and the brake roller;

④ Check the friction plate wear degree. The thickness of the friction plate shall not be less than 8mm. Replace it if it is less than 8mm.

⚠ Note:

● After maintenance, the user needs to check the oil level of the grease every additional 5,000km or two months, and refill it at any time;

● Mixing of grease of different qualities is prohibited;

● When performing inspection and maintenance, stop the engine, park the truck on flat road, apply the parking brake, and set wedges on both wheels of any axle to avoid safety accidents.

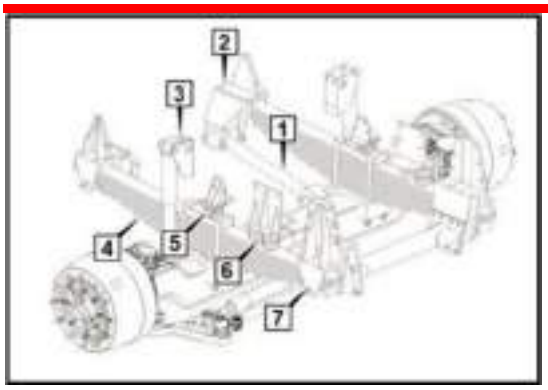


Fig4-27 Front suspension system

1. Front push rod 2. Front bearing of the leaf spring installation 3. Cylindrical shock absorber 4. Parallel semiellipse leaf spring 5. Stop block 6. Stop block Ⅱ 7. Rear bearing of the leaf spring installation

4.6 Operation and maintenance of suspension system

⚠ Warning: It is necessary to replace the thrust rod repair kit after the truck has run for 4 months, (20,000km). The user will bear consequences of vehicle failures due to thrust rod out of limit.

⚠Caution: It is necessary to replace the leaf spring seat wear block after the truck has run for 4 months (20,000kmM).

⚠ Caution:

1. When the clearance between the guide cover plate and the leaf spring is ≥3mm, it is necessary to add adjusting shims to keep the clearance ≤0.5mm;

2. If the wear extent of the guide cover plate is ≥ 5mm, it is necessary to replace it.

⚠ Caution:

1. Re-tighten the thrust rod bolts/front and rear leaf spring bolts periodically at the interval specified in "5.2 MT86 mining dump truck compulsory maintenance details". If the engine has operated for 30 hours during the truck shipment process, the user shall immediately perform the first re-inspection of the thrust rod bolts, and re-tighten bolts every 500 hours (5,000km) after 4-level maintenance.

2. Push rod bolt re-tightening table

Application	Specification	Tightening torque*(Nm)
Front push rod bolt	M20	690Nm
Upper/ lower thrust rod bolt	M27	1000Nm
Transverse thrust rod bolt (depending on actual truck configuration)	M24	900Nm

4.6.1 Front suspension system

The front suspension system mainly consists of parallel semiellipse leaf spring, cylindrical

Failure Analysis of Shock Absorber

Failure mode	Analysis and solution
The shock absorber is out of work, and there is no resistance inside (the shell temperature is not high enough)	Refill appropriate grease and then proceed with operation. If the surface is hot, the grease is insufficient. At this moment, refill it. Otherwise, the shock absorber must have failed. Check if damage to the oil seal and the sealing washer causes oil leakage. If so, change the washer.
The shock absorber makes a noise	It is resulted from collision of shock absorber, steel leaf spring and frame, deformation of shock absorber dust-proof tube or insufficient grease. Replace the shock absorber or refill grease.

shock absorber, stop block and front push-rod,

1) Specifications of fasteners

Application	MT86H	
	Specification	Tightening torque*(Nm)
Front spring U-bolt and nut	M24	750±50
Spring bracket fixing bolt and nut	M18×1.5	373±37
Wear-resistant block fixed screw	M12×1.25	85±8
Shock absorber upper bracket fixing bolt and nut	M12×1.25	85±8
Shock absorber connecting upper bracket bolt and nut	M16×1.5	262±26
Shock absorber lower bracket fixing bolt and nut	M16×1.5	220±22
Shock absorber connecting lower bracket bolt and nut	M16×1.5	262±26
Stop block bracket fixing bolt and nut	M16	220±22
Wear-resistant block fixed bolt and nut	M12	85±8

* indicates recommended value, and the permissible tolerance is within 6%. To ensure driving safety, it is required to regularly check the tightening torque of

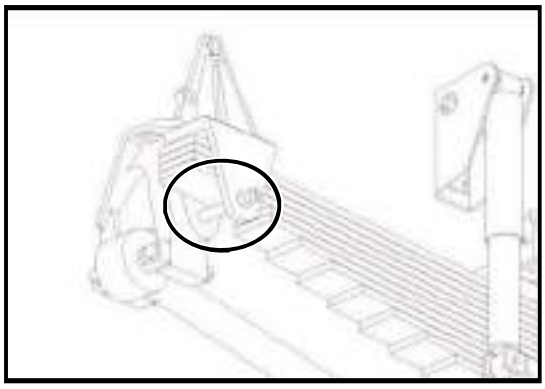


Fig 4-28 Front bearing of front leaf spring

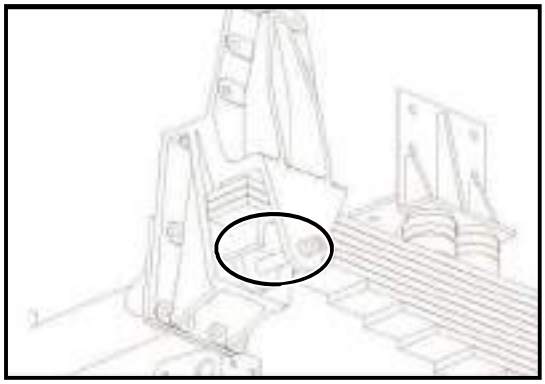


Fig 4-29 Rear bearing of front leaf spring

above fasteners.

2) Description of front leaf spring

MT86H: 13 pieces in total, in which four main leaves, reinforced parallel semiellipse front leaf spring.

The leaf spring configuration for each model has already been justified by vehicle performance test. It is not allowed to make modification without approval; otherwise it may lead to the system no longer in harmony with others or vehicle out of control which would cause unnecessary personal injury and property loss.

3) Fault diagnosis

The faults in front suspension system may be relating to multiple systems, including steering gear, front axle, tires, wheels, etc. When abnormal conditions occur during driving (such as noise, running deviation, vibration and abnormal damage), stop the vehicle immediately and do a thorough inspection to calibrate the items relating to the following:

a. If pressure of tires is normal;

b. If tires have non-uniform wear;

c. If tires are in unbalanced or damaged;

d. If the fasteners of each bracket are loose;

e. If steering components are worn and loose,

such as tie rod ball;

f. If suspension components are damaged and loose, such as wear resisting washer between lifting lug and leaf spring eye or bracket;

g. If front axle and wheel alignment is correct;

h. If lubrication failure and "oil, water or air leakage".

i. If the cylinder type shock absorber is malfunction (Shock absorber failure analysis as shown by the left table);

1) Service and maintenance

a. Leaf spring plate and clip should be replaced in time. These components are prone to be damaged under overload and severe road conditions. Once damaged parts are found, replace or repair them immediately; otherwise it may lead to major accident.

b. Leaf spring stop bolt should be checked and lubricated timely so as to ensure normal operating of suspension system.

c. Bolts, nuts and leaf spring center bolts should be retightened every 1,500 km according to relevant torque requirements.

d. Once stop block is damaged or missing, replace it timely; otherwise it may lead to excessive jumping of axle which will

accelerate break of leaf spring plate.

e. If the wear extent of the wear block exceeds 50% total thickness or it fall off, replace it immediately; otherwise, the leaf spring seat will be damaged, thus influencing the service life of the seat;

f. If resistance is insufficient or any sound occurs due to insufficient oil or leakage of telescopic shock absorber, immediately repair or replace it; otherwise, comfort of the truck will be greatly degraded and even serious accidents may occur;

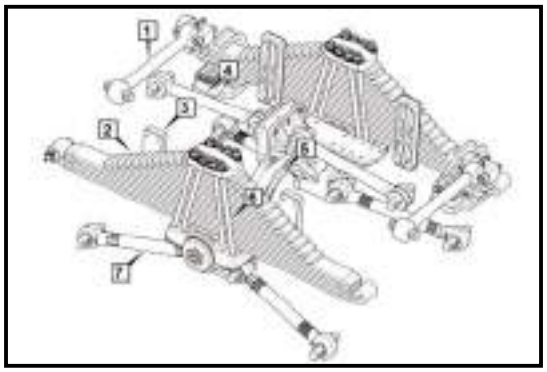


Fig 4-30 Rear suspension system

1.transverse thrust rod 2. parallel semiellipse leaf spring 3.guide plate 4. upper push rod 5.enhanced maintenance-free balance shaft 6.bolt 7. lower push rod

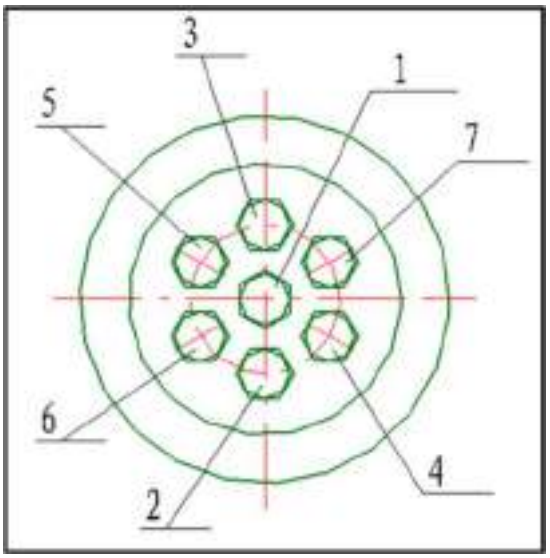


Fig. 4-31 Disassembly order

4.6.2 Rear suspension system

The rear suspension system mainly consists of reinforced integral balance shaft, parallel semiellipse leaf spring, unilateral 4-M30 bolt, and upper/lower push rod.

1）Specifications of fasteners

* indicates recommended value, and the permissible tolerance is within 6%. To ensure driving safety, it is required to regularly check the tightening torque of above fasteners.

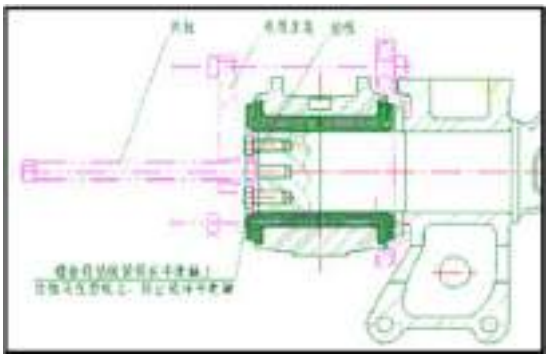


Fig. 1-32

Malfunction table of rear suspension

Fault mode	Solutions
Oil leakge due to sealing failure of balance shaft housing cover	Clean the balance shaft housing cver and ensure good cntact flatness with shaft housing. Replace the U-ring and do the assembly. Replace the balance shaft housing cover and assemble it according to the above procedures.
M16×1.5 bolts on both ends of balance shaft getting broken	Replace the bolts, apply thread locker on new bolts, tighten them to required torque, lock the stop washer, and install the balance shaft housing cover. Assemble it according to the above procedures.
Crack in bearing	Replace the whole set of bearing and adjust the bearing clearance to prevent bearing from breaking again due to local stress of bearing caused by axial transmission of shaft housing. Assemble it according to the above procedures.

Application	MT86H	
	Spec.	Tightening torque*(N.m)
Rear spring bolt and nut	M30	1300±50
Stud bolt and nut	M18×1.5	373±37
S op block bracket fixing bolt and nut	M14	140±14
Stop block fixing bolt and nut	M12	48±4
Guide plate fixing bolt and nut	M14	140±14
Push rod upper bracket fixing bolt and nut	M16	262±26

2) Description of rear leaf spring

MT86H: 15 pieces in total, in which five main pieces, reinforced parallel semiellipse leaf

Fault mode	Solutions
Oil leakage due to sealing ring failure	Replace the sealing ring. For specific procedures, refer to paragraph a. Removal, installation and adjustment of balance suspension assembly.
Break in balance shaft housing	Replace the balance shaft housing and components and assemble it according to the above procedures.
Crack or break in bracket	Replace the shaft & bracket assembly.
Crack or break in balance shaft	Replace the shaft & bracket assembly.
Crack or break in balance shaft housing	Replace balance shaft housing and components
Pieces around leaf spring	Check center bolt for break, and replace it in time; or check and retighten bolt and nut.

spring.

The leaf spring configuration for each model has already been justified by vehicle performance test. Modification without approval may lead to major fault and loss.

3) The balanced suspension assembly is rubber maintenance-free balanced suspension. The disassembly and assembly process is as follows:

a. Disassembly of the suspension:

① Unscrew the fastening bolts successively and evenly with an air wrench, to separate the bearing block from the balance shaft. (Note: The disassembly sequence is as shown in the left figure. When disassembling the bolts, do not completely unscrew a bolt in one time, but repeat the unscrewing process for many times, to prevent the threads from being damaged.)

② Use special tools to clamp the bearing retainer and push the screw against the block at the external end face of the balance shaft (to prevent the screw from damaging the threads of the balance shaft). Disassemble the bearing retainer, rubber bearing and balance shaft casing and other parts as a whole by the torque

of the screw, and separate them from the balance shaft. The sketch map is as shown in the left figure.

③ Take the rubber bearing out of the balance shaft casing from the two ends.

b. Assembly of the suspension:

① Put the rubber bearing into the cleaned balance shaft casing or a new balance shaft casing.

② Spray fresh water or 10% suds on the surface of the balance shaft or inside the rubber bearing, to reduce the resistance of mounting the balance shaft casing and rubber bearing into the balance shaft.

③ Mount the balance shaft casing and rubber bearing into the balance shaft. It is required to horizontally move them into the balance shaft and the balance shaft casing can be properly rotated, to ensure successful assembly. The mounting surface of the spring of the balance shaft casing shall be level after the assembly.

④ Apply gear oil or lube on the surface of the bolts, to prevent ablation of the bolts during the fastening.

⑤ After the bolts are fastened, the user can test

if the end face of the bearing block cling to the end face of the balance shaft through the upper and lower measuring holes, if the depth at the two measuring holes are the same and if the depth meets or is close to the theoretic depth (The theoretic depth is 35±0.1 mm).

⚠ Note: Because of large axial compression of the rubber bearing (more than 20 mm) and the features of rubber, when fastening the bolts with an air wrench, the user needs to repeat the fastening for many times. It is recommended to fasten the bolts alternately with a torque wrench after the bolts are fastened to a certain degree (when the fastening effect of air wrench is not clear), until the torque of the 7 bolts all reaches 540-600 N.m.

4) Service and Maintenance

a. Frequently check the following parts: check upper/lower push rod and the connecting bolts for damage and looseness. Check stop block for dropping, leaf spring for break or dislocation and leaf spring pressure block for crack.

b. Besides handling mandatory maintenance, retighten the nut of bolt every 1,500-2,000 km according to specified torque requirements.

⚠ CAUTION: Do not change the number of leaf springs or replace them with ones of different thickness without approval. What is more important, do not modify the suspension structure without authorization! Do not use unaccepted components by our company such as push rod, slide plate seat and guide plate. The modified or replaced parts may not be applicable to the suspension of this model, which would lead to unnecessary fault and loss.

c. Paint lubricating grease around the leaf spring and the sliding plate every 8,000 to 10,000km. Use the adjusting shim to adjust the clearance between guide plate and leaf spring to be 0~1mm;

d. The normal wear limit life of guide plate and slide plate seat is half a year. If they are in serious wear, replace them immediately. If slide plate seat appears as shown left, it indicates it is in severe wear.

⚠ CAUTION: The guide plate belongs to the split type and when it has been worn down for 5mm, replace it immediately.

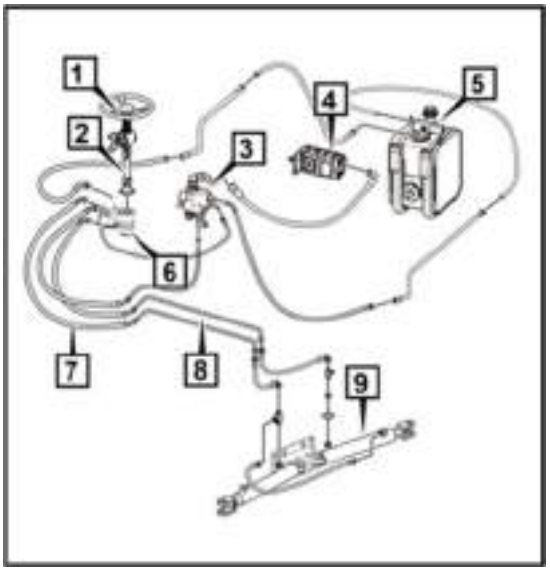


Fig 4-33 steering system Structure diagram

1. Steering wheel 2. Steering column and steering drive axle 3. Pilot valve 4. Vane pump 5. Hydraulic oil tank 6. Steering gear 7. Oil pipe 8. Return steel pipe 9. Steering cylinder

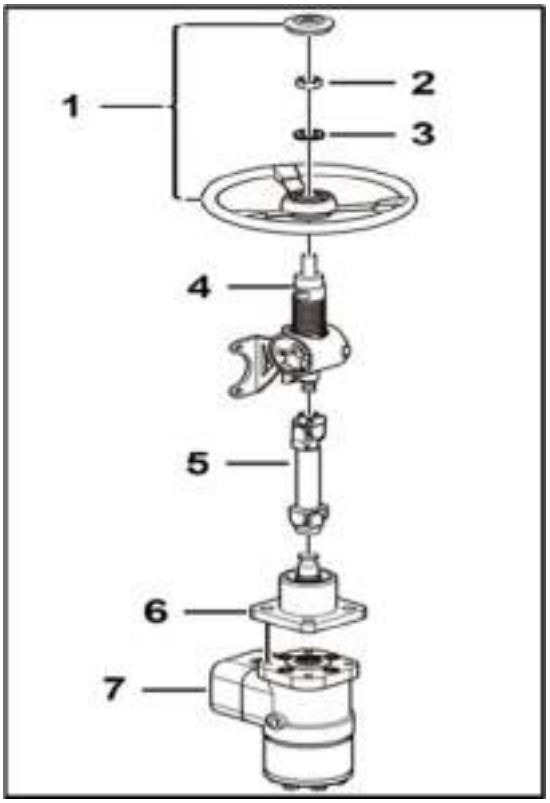


Fig 4-34

1. Steering wheel 2. Nut 3. Washer
4. Steering column5. Steering drive axle
6. Support 7. Steering gear

4.7 Operation and maintenance of steering system

The steering system consists of a steering control system and a hydraulic power steering system. The steering system consists of a steering wheel, a steering column, a steering drive axle, a pilot valve, a vane pump, a hydraulic oil, a steering gear, an oil pipe, a steel pipe, a steering cylinder, etc., as shown in left Figure 4-33. In order to adapt to harsh operating conditions, the hydraulic power steering system consists of an internal power steering system and a external power steering system.

4.7.1 Steering control system

It consists of steering wheel and steering column with adjustable height and angle. The diameter of steering wheel is Φ480 mm.

As shown in Figure 4-34, the steering wheel 1 is mainly composed of a rim, a spoke and a hub. The lower part is in wave shape to facilitate the driver grip. The steering wheel 1 and the steering drive axle 5 are generally splined and the ends are fixed with nuts. The steering drive shaft 5 passes through the steering column 4 with the lower end connected witn the steering gear 7, to transmit torque between them, for which the energy absorption type steering axle is used.

In addition to the conventional steering function, the steering control system can effectively absorb impact energy at collision, and buffer the impact of the steering wheel to the driver. Basic principle: axial displacement will occur when the steering drive shaft is subjected to great impact, and energy is absorbed by the deformation of the steering column or the dislocation of the steering drive shaft.

Steering control system is of continuous and adjustable type. With this system, the height range of steering wheel is ±25mm, and the angle range is ±5°.

Specific adjusting method: Unscrew adjusting handle as shown, adjust steering wheel 1 to appropriate

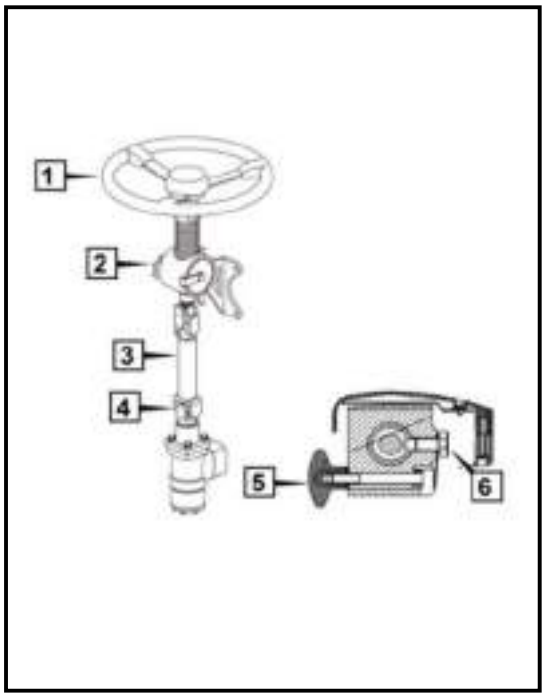


Fig 4-35 Structure Diagram of Steering System Operating Device

1. Steering wheel 2. Steering column
3. Steering drive axle 4. Universal joint
5. Regulating handle 6. Travel limit screw

operating position, and tighten the adjusting handle .

4.7.2 Hydraulic power steering system

Full-hydraulic steering gear, pilot valve, hydraulic oil pump, hydraulic oil tank, steering cylinder, hydraulic pipeline, etc. The steering cylinder is Φ70.

1) Full-hydraulic steering system construction (as shown in Figure 4-33)

2) Full-hydraulic steering system principle

The steering pump is a vane pump. The engine is directly connected with a power takeoff at the position of engine power take off, and keeps running. The steering pump sucks oil from the hydraulic oil tank and outputs high-pressure oil to a pilot valve P opening. The pilot valve has following 5 openings: P, EF, CF, and Ls. Excessive hydraulic oil of the steering system returns to the oil tank via EF opening. CF opening is connected with full-hydraulic steering gear P opening to provide high-pressure oil to the steering gear. Ls opening is connected with steering gear Ls opening as a control line. When the steering wheel drives the steering gear to rotate, the steering gear Ls opening provides a pressure signal to the pilot valve Ls opening to enable

the pilot valve rod operate. When the pilot valve P opening is connected with CF opening, the high-pressure oil flows to the steering gear, passes through the valve element passage in the steering gear, to the steering gear L opening or R opening, and to the steering cylinder. The big cavity of the left steering cylinder is connected with the small cavity of the right steering cylinder, and the small cavity of the left steering cylinder is connected with the large cavity of the right steering cylinder. Both oil cylinders operate jointly to drive the front wheels. When the steering wheel moves slowly or does not operate, most of the hydraulic oil from the steering pump returns to the tank via the pilot valve EF opening. The pilot valve T opening is connected with the oil return opening of the hydraulic oil tank. The steering gear has following five oil openings: P, R, L, Ls and T. P opening and Ls opening are connected with corresponding openings of the pilot valve and are not described again herein. When the steering wheel rotates rightwards, R opening outputs high pressure. R opening is connected with the rod cavity of the right steering cylinder (the rodless cavity of the left

steering cylinder). L opening is connected with the rod cavity of the left steering cylinder (the rodless cavity of the right steering). The steering gear T opening is connected with the oil return opening of the hydraulic oil tank.

3) Full-hydraulic steering system maintenance

a. Check the oil level in the hydraulic oil tank: First, clean the oil tank and periphery to prevent dirt contamination. During inspection, pay attention to the scale on the oil level gauge. When engine is running, the hydraulic oil level is even with the central scale of oil level gauge; when engine does not work, the hydraulic oil level will be a little higher than the central scale.

b. It is required to change hydraulic oil for a new vehicle after it runs 2500km, and meanwhile clean the filter element. Change hydraulic oil every 10000km or every year thereafter.

c. Check oil level every week, and check the cleanness of hydraulic oil.

d. The method of oil change is as follows:

① Support front shaft;

② Unscrew oil filling breather filter;

③ Start engine, run it at idle speed for 10s,

and turn steering wheel left and right to limit positions for several times to discharge oil from the oil tank, booster pump, steering gear and booster cylinder;

④ Retighten the oil return pipe (note that it is required to keep it clean and prevent dirt and foreign material contamination), and clean oil tank, oil filling breather filter and filter element. It is preferred to replace it with a new filter element at every oil change.

⑤ When the oil filter is filled with hydraulic oil, run the engine at idle speed, turn the steering wheel left and right for several times, and at the same time, keep supplementing oil till the oil level does not lower and is within the range and no bubble appears.

CAUTION:

- **The machine as delivered uses L-HM32 hydraulic oil. The users can change to the L-HM46 hydraulic oil. It is strictly prohibited to use the two oils mixed.**

e. During maintenance, it is required to check the clearance between moving parts, such as tie rod and drag link joints. If the clearance is too large, replace parts immediately. It is also required to add grease to each grease tap

for maintenance.

4) Important connected positions and tightening torque requirements.

Name	Spec.	Torque (Nm)	No. of places
Steering wheel fixing nut	M22*1.5	580±58	1
Steering gear fixing bolt	M10*35	48±4	4
Booster cylinder bracket bolt	M16×45	220±22	6
Drag link lock nut	M12×1.5	85±8	2

5) Common fault causes and troubleshooting methods

Common faults	Causes	Troubleshooting methods
Hard steering	1. Oil in oil tank is insufficient 2. Air invades into oil passage 3. Filter or oil passage is blocked 4. Oil pump pressure is insufficient 5. Inner leakage of steering gear is severe 6 Front wheels (braking non-return) are blocked 7. Tire pressure is insufficient 8. Steering column interferes with universal joint 9. Overload	1. Check oil level of oil tank and refill it as specified 2. Exhaust and check oil level and tightness of pipeline connectors 3. Clean filter or dredge or replace oil passage 4. Maintain oil pump 5. Identify leakage and repair 6. Regulate or replace it 7. Inflate 8. Adjust it 9. Reduce load
Steering gear oil leakage	1. Oil seal or O ring is damaged 2. Oil pipe is damaged 3. Oil pipe joint leaks oil 4. Oil viscosity is insufficient	1. Check and replace oil seal or O ring 2. Check and replace oil pipe 3. Replace sealing ring and tighten connectors 4. Use oil properly
Oil spillage from oil tank	1. Level is too high 2. Oil inlet is blocked 3. Oil pump is worn	1. Adjust it 2. Dredge oil passage 3. Replace it
Hard steering reversal	1. Tire pressure is insufficient 2. Air invades into oil passage 3. Oil return hose is twisted and blocked 4. Steering valve is jammed 5. Steering gear is too tight 6. Connection is loose	1. Inflate 2. Perform maintenance and exhaust 3. Replace it 4. Regulate or replace steering valve 5. Adjust clearance 6. Check and adjust it
Different left-right steering degree	1. Steering valve is asymmetric 2. Control valve is blocked with dirt 3. Leakage at both sides of steering gear differs 4. Air exists in single cavity 5. Master pins and camber of tires at both sides are asymmetric	1. Regulate or replace valve assembly 2. Clean control valve 3. Replace sealing ring 4. Exhaust air 5. Adjust parameters of truck
Heavy fast steering	1. Oil in oil pump is insufficient 2. Inner leakage of steering gear is severe 3. Air invades into oil passage	1. Maintain oil pump and refill oil 2. Maintain and replace seals 3. Check tightness and connections and exhaust air

Common faults	Causes	Troubleshooting methods
High oil temperature	1. Oil pipe is bent 2. Oil passage is blocked	1. Clean or replace it 2. Dredge oil passage
Run-off	1. Steering shaft has jammed 2. Steering valve is asymmetric 3. Flow of oil pump is excessive 4. Oil is too dirty and steering valve cannot return immediately 5. Wear or pressure of tires on both sides differs greatly 6. Bubbles exist in oil and direction is unstable 7. One front wheel (braking non-return) is blocked	1. Check jamming position and check if input axle is subjected to radial shear 2. Regulate or replace valve assembly 3. Regulate or replace oil pump 4. Clean and change oil 5. Replace tire or inflate 6. Check and exhaust air 7. Maintain brake
Jitter and drift	1. Air invades into oil passage 2. Oil level of oil tank is too low, and oil pump sucks air 3. Steering system connections are loose or worn severely 4. Flow of oil pump is too low 5. Steering gear control clearance is large 6. Steering gear mounting bolt is loose 7. Tire pressure is insufficient or pressure of tires on both sides differ 8. Tire is worn severely or wear is uneven	1. Identify leakage and exhaust air 2. Identify leakage, refill oil and exhaust air 3. Maintain or replace connections 4. Regulate or replace it 5. Adjust clearance 6. Fasten it 7. Inflate 8. Replace it
Abnormal sound of steering	1. Air invades into oil passage 2. Oil level of oil tank is too low 3. System inlet and outlet pipes are bent, and oil passage is blocked, etc. 4. Displacement of oil pump is unstable 5. Steering control valve performance is poor	1. Check air leakage position and exhaust air 2. Identify leakage and refill oil 3. Dredge oil passage 4. Replace oil pump 5. Remove or replace it

Fig 4-38

1. Brake pedal

Fig 4-39 Brake pressure gauge

Fig 4-40 Exhaust brake rocker handle

4.8 Operation and maintenance of brake system

4.8.1 Composition of brake system

The brake system of MT86 mining dump truck mainly consists of two-circuit service brake (foot brake), auxiliary brake (engine exhaust brake) and emergency/parking brake (hand brake).

The two-circuit pressure brake is operated through the pedal. Its working pressure is 0.8 Mpa, and the disconnection pressure of pressure regulating valve is 0.85 Mpa. The first circuit acts on wheels of middle and rear axles, and the second circuit acts on the wheels of front axle. Once the pressure in one of air reservoirs of the two circuits is below 0.55 Mpa, the low brake pressure warning indicator on instrument panel will light up, and at this moment, it is required to stop the vehicle immediately and find out the causes of pressure falling.

Continuously and repeatedly applying full brake in a short time may also lead to pressure falling below 0.55 Mpa.

Criteria for pressure inspection: Shut off engine and apply hand brake. In 2h, the

Fig 4-41 Exhaust butterfly valve

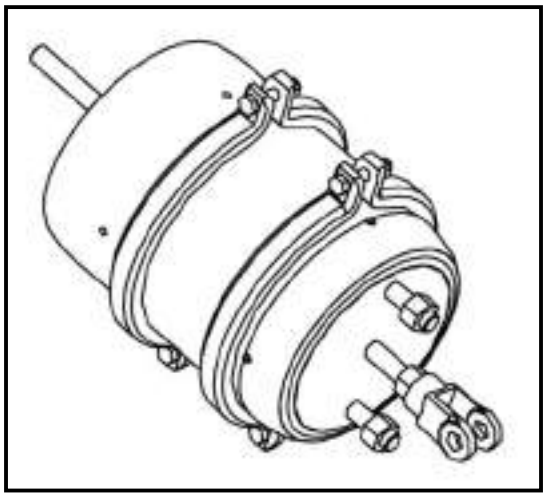


Fig 4-42 Brake chamber

pressure falls by 0.05 Mpa at most or in 30 min, it falls by 0.01 Mpa at most.

⚠ CAUTION: Do not adjust the release pressure of pressure regulating valve without approval.

4.8.2 Engine exhaust brake

The MT86 mining dump truck is equipped with the function of engine exhaust brake. After you press the exhaust brake switch, the running vehicle can utilize the energy from engine for auxiliary brake.

When driving down a long slope, be sure to use the exhaust brake. In case of running on icy or muddy road, the use of exhaust brake can reduce the risk of side slide. In the event of meeting other vehicles or passing through poor road, it is better to use the exhaust brake to accelerate. The use of auxiliary brake can reduce the times of applying main brake, which will reduce the wear and heat of wheels and final drive so as to extend their service life, reduce fuel consumption and increase driving safety. After driving down a long slope, simply check the performance of the exhaust brake.

△! CAUTION: When transmission is in neutral

and the clutch is released, the auxiliary brake will not work. When the speed of engine is lower than

1,100 r/min, the auxiliary brake will not work. The exhaust braking efficiency is higher at low gears.

4.8.3 Emergency and parking brake

The hand brake can be used for emergency braking and parking brake. It works via the energy storage spring brake chamber of axle. Parking brake can be realized by operating the hand brake valve handle. When brake system is in failure, relying on the push of energy storage spring, the emergency braking can be realized automatically. Only when the pressure in brake system is above 0.55 Mpa and the parking brake indicator goes out can spring braking be released.

Apply: Pull the handle. At the same time, the parking brake indicator on instrument panel will light up.

Release: Lift the hand brake valve handle and loosen it, which will return to release position automatically. At the same time, the parking brake indicator on instrument panel will go out.

If braking is activated automatically due to leakage from air pipe connected to the spring brake chamber, it is only needed to unscrew the bolt at the rear end of spring brake chamber to release position, and the braking will thus be released (see the figure left).

CAUTION:

- When stopping vehicle, be sure to pull down the hand brake valve handle!
- Before starting the engine, be sure to place the hand brake valve at braking position; otherwise after the engine starts the parking brake will be released automatically due to pressure rising in system.
- Before parking brake indicator goes out, do not start the vehicle.
- Under certain conditions, the braking force of parking brake may be insufficient to park a fully loaded vehicle on a slope. Therefore, when parking the vehicle on a slope, wedge the wheels for safety.

4.8.4 Quick joint

The pipes of the vehicle are mainly equipped with Jietong quick joints so as to make the tightness of brake system better.

⚠ CAUTION: The removal of pipe joint without using special tools may lead to component damage, and the air tightness will not be guaranteed when it is refitted.

4.8.5 Operation of inflation joint

Due to the installation of combined air drier, the pressure regulating valve is integrated with the air drier, and the inflation joint is installed at the air drier outlet.

Connect the joint to an inflation hose to inflate tires and supplement air to air pipes of the vehicle from outside air source.

4.8.6 Inspection and replacement of dryer

The dryer is able to continuously and effectively absorb the moisture in the compressed air, so as to keep the brake system in good operating status. Drying effects of the installed air dryer have to be regularly

checked.

1) Check method: For the truck equipped with an air dryer, regularly check accumulated water in the air reservoir (recommended monthly). When accumulated water is found in the air reservoir furthest from the dryer, it indicates that the desiccant has failed, and the drying cylinder should be replaced.

2) Replacement method: 1) Unscrew the top nut of the dryer, remove the old drying cylinder, clean the connecting bolt and the valve body; 2) uniformly apply one pass of grease onto the sealing and matching parts between the new drying cylinder and the valve body, and apply little thread locker onto the matching part between the new drying cylinder and the connecting bolt; 3) Screw the new drying cylinder onto the valve body to the maximum torque of 15NM.

4.8.7 Maintenance of brake line

When doing welding, cutting or drilling next to plastic brake pipe, follow the rules below:

1) Bleed air from pipes at first;

2) Cover pipes against sparks, flame and hot chips;

3) The non-pressure pipe is allowed to be

subject to Max. temperature of 130℃ for 1 h.

4.8.8 Braking operation

To stop the vehicle, follow the steps below:

1) When the vehicle is running, first release the accelerator pedal to reduce vehicle speed.

2) When the vehicle approaches the stopping position, slightly depress the brake pedal to stop the vehicle slowly.

3) When the vehicle is stopped stable, engage the transmission in neutral and pull down the parking brake valve handle to make the vehicle in parking brake state. When applying the brake, note the following:

1) When applying the brake, except for emergency conditions, do not quickly depress the brake pedal hard to the bottom and keep depressing it, which may cause personal injury or lead to component damage.

2) Avoid continuously depressing the brake pedal in a short time and for many times so as to prevent huge consumption of compressed air in the air reservoir which will affect the braking performance of vehicle and lead to the vehicle out of control further.

3) Do not frequently use the service brake; otherwise it may lead to brake overheat which

will significantly affect brake effect.

1) It is not recommended to use the emergency brake under non-emergency conditions. Especially when running on a wet and slippery road, the vehicle may be at a risk of side slide if the emergency brake is applied.

5) After the vehicle cleaning or vehicle passing over deep puddle, water may enter the brake drum, which will reduce the braking effect of the vehicle. Under this condition, run the vehicle at a low speed and gently depress the brake pedal for several times to drain water so that the brake can work normally.

6) When the vehicle is running, if the low pressure warning indicator of brake system lights up, it is required to stop the vehicle, find out the causes and do troubleshooting.

4.8.9 Parking

1) After stopping the vehicle, do not shut the engine off immediately. Always run the engine at idle speed for 3~5 min before shutting it off so that the temperature of engine coolant can decrease. Especially after the engine runs at heavy load and the vehicle runs at a high speed, it is required to run the engine at idle

speed before shutting it off; otherwise it may lead to faults such as cylinder scoring and supercharger damage.

2) After the engine shuts down, disconnect all switches, and at last disconnect the master power switch on the body of battery box.

⚠ Warning:

- Avoid parking the vehicle on a steep slope. If there is no alternative, besides applying parking brake, choke the wheels with wooden wedge. In addition, engage the transmission in 1st gear when parking the vehicle on uphill and engage the transmission in R when parking the vehicle on downhill.
- After the vehicle runs for some time, the exhaust pipe is hot, so do not park the vehicle next to flammable material.
- When having a nap in the vehicle, be sure to shut the engine off so as to prevent accident contacting gearshift lever and pedals which will lead to accidents.

4.8.10 Driving on slopes

1) When driving downhill, effectively utilize the engine exhaust brake and eddy current retarder to keep the vehicle speed within a safe range.

2) When vehicle runs at low gear or goes downhill, the speed of engine should not exceed the Max. permissible speed.

3) Before travelling down a steep or long slope, apply the brake once or more to check if it is normal.

4) When shifting to a low gear, be sure to inspect and view the speedometer to determine vehicle speed and use tachometer to inspect and view the speed of engine.

5) To reduce wear and heat caused by braking, before travelling down a steep or long slope, first reduce vehicle speed, and then select a lower gear.

6) When driving uphill, if the speed of vehicle decreases gradually, select a lower gear in time.

⚠ **CAUTION: When driving downhill, never engage the transmission in Neutral or shut the engine off.**

4.8.11 Driving on icy road

1) When driving on icy road, please use tire chains.

2) Always drive at low speed, and avoid sudden acceleration.

3) Avoid sudden braking and sharp turning, otherwise the vehicle may be subject to side slide and drifting, which will cause accidents.

4.8.12 Driving on rainy road

1) When driving on rainy road, control the vehicle speed. It is preferred that the speed not be higher than 35km/h.

2) When driving in rain, water may enter the brake drum, which will affect braking effect. Therefore, slightly depress the brake pedal at times to check braking effect.

3) Avoid sudden braking and sharp turning, otherwise the vehicle may be subject to side slide and drifting, which will cause accidents.

4.8.13 Driving on foggy days

1) Turn on fog lamps, drive it at a low speed, and pay attention to road markings and tail

lamps of vehicles running in front.

2) In case of heavy fog, stop driving, park the vehicle at a safe area, and meanwhile turn on the hazard warning switch to make the left and right turning lamps flash simultaneously.

4.8.11 Brake line troubleshooting

No.	Causes	Root causes	Troubleshooting methods
1	Service brake force is insufficient or brake cannot be applied	System pressure is insufficient	Start the truck without stalling until the barometer indicates 0.85 MPa, make it stall for 10 minutes. If the pressure drops by more than 0.15MPa, the pipeline may leak or the air chamber may be damaged. Check the pipeline and the air chamber. If the pressure reaches up to 0.85 M,Pa (due to accuracy of barometer), the air dryer and the four-circuit protection valve may have failed. Replace them.
		Brake valve is out of work	When air exists in the brake valve inlet, depress the brake valve. If no air is exhausted from the air outlet, replace the brake valve.
		Brake air chamber is damaged	If there is no problem with the above valves, depress the brake pedal. If the brake air chamber 11 opening is smooth but the brake air chamber push rod cannot be pushed out, replace the brake air chamber.
2	Parking brake can not be release	System pressure is insufficient	Start the truck without stalling until the barometer indicates 0.85 MPa, make it stall for 10 minutes. If the pressure drops by more than 0.15MPa, the pipeline may leak or the air chamber may be damaged. Check the pipeline and the air chamber. If the pressure reaches up to 0.85 M,Pa (due to accuracy of barometer), the air dryer and the four-circuit protection valve may have failed. Replace them.
		Brake valve is out of work	When air exists in the brake valve inlet, depress the brake valve. If no air is exhausted from the air outlet, replace the brake valve.
		Relay valve is out of work	When air exists in the relay valve inlet (1 opening) and the brake valve relay valve (4) but (2), replace the relay valve.

No.	Causes	Root causes	Troubleshooting methods
2	Parking brake can not be release	Relay valve is out of work Brake air chamber is damaged	If there is no problem with the above valves, depress the brake pedal. If the brake air chamber 11 opening is smooth but the brake air chamber push rod cannot be pushed out, replace the brake air chamber.
3	Horn does not work and differential lock solenoid valve inlet has no air, causing stalling failure	System pressure is insufficient	Start the truck without stalling until the barometer indicates 0.85 MPa, make it stall for 10 minutes. If the pressure drops by more than 0.15MPa, the pipeline may leak or the air chamber may be damaged. Check the pipeline and the air chamber. Pressure in 21 opening and 22 opening can not be increased, so 23 opening and 24 opening can not inflate. If the pressure reaches up to 0.85 M,Pa (due to accuracy of barometer), the air dryer and the four-circuit protection valve may have failed. Replace them.

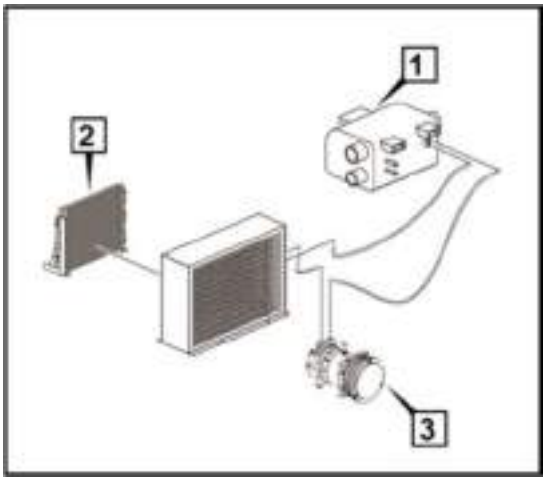


Fig 4-43 The A/C system

1. evaporator 2. condenser 3. compressor

Fig 4-44

1. Display 2. Temperature setting

3（10）Air-conditioning 4. Refrigeration

5. Air outlet modes selection 6. Auto 7. OFF

8. Air inlet modes selection

9. Defrosting air outlet mode selection

4.9 Operation and maintenance of A/C

4.9.1 General

The A/C system consists of radiator, compressor, integrated condenser, evaporator and fan which are connected as a closed system with pipes. The radiator utilizes the engine circulating water as heat source, the compressor is driven by the engine belt, the power for fan and compressor magnetic clutch is supplied by the vehicle, and the condenser is cooled by water tank fan. The adopted refrigerant is R134a which is of environment-friendly fluorine-free type.

1) Control panel and display content (as shown left)

The air inlet modes are in a circulation of selection. The air outlet and defrosting air outlet modes selection are a circulation of head blow, feet blow, feet blow & defrosting and defrosting.

2) Main technical parameters (see the table below):

Refrigerating capacity		4200W
Refrigerant		R134
	Voltage	D.C 24V
	Air output	138cc/r
Clutch	Power	50W
	Belt groove	GB2 A2，GB3 6PK
	Pitch diameter of belt	GB2 Φ170，GB3 Φ125
Condenser	Core	Parallel flow 670×438×16mm
	Windward area	0.29m^2
Evaporator	Core	Overlapped 390×205×70mm
	Windward area	0.08m^2

3) Description of air conditioning refrigeration and heating principle

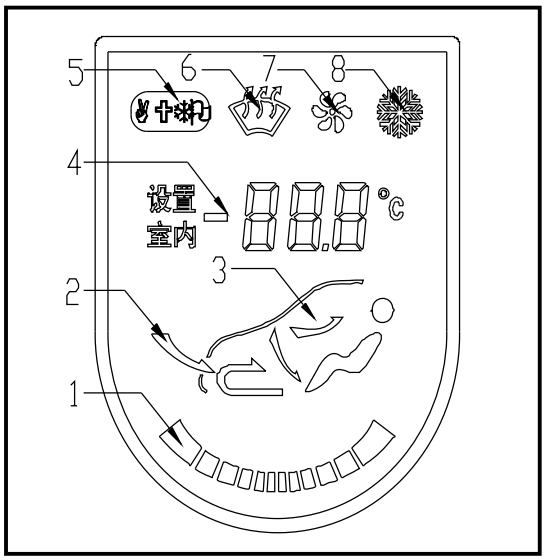


Fig 4-45

1. Air grade 2.Air inletwighar 6to

3.Air outlet statewighar 6to wighar 6to

4.Setting temperature and ambient temperature

5. AUTO 6.Defrosting 7. Blowing

8.Refrigeration

Refrigeration: after the refrigerant enters the pipeline of the refrigeration system, it is pressurized by the compressor into refrigerant gas of high-temperature and high-pressure, and then into liquid state (actually a vapor-liquid mixture) after being cooled through the condenser. The liquid refrigerant is throttled by an expansion valve in front of the evaporation tank, enters the evaporation tank in the form of fog, absorbs the surface temperature of the evaporator core to make it cool. Heat exchange occurs when the hot air sucked by the air blower passes through the evaporation tank, it turns into cold air and enters the cabin from the air outlet.

Heating: A heater box is arranged in the evaporation tank, which is also referred to as a heat exchanger and is directly connected with the engine water tank via a water pipe; the cold air sucked by the blower turns into hot air when passing through the surface of the heat exchanger by absorbing heat, and enters the cab.

4.9.2 Operating instructions

1) Set your desirable inside temperature

Adjust the temperature setting key to set your

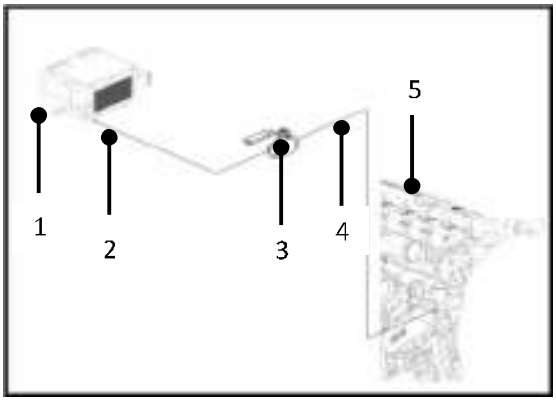


Fig 4-46

1.Heater unit 2. Heater unit water inlet pipe
3. Water valve 4. Engine heater unit water inlet pipe
5. Engine

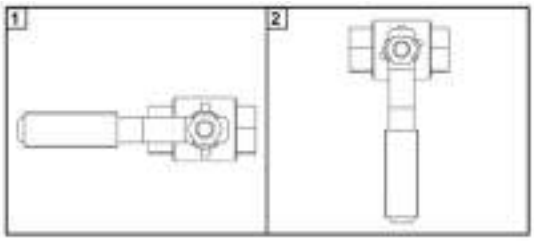


Fig 4-47

1. Switch On Diagram 2. Switch Off Diagram

desirable inside temperature. Setting range: LO, 18℃-29℃ and HI. Generally, temperature set within 22℃-26℃ is appropriate. If you want that it is cooler inside, set the temperature at LO. If you want that it is warmer inside, set the temperature at HI.

2) Set air volume

Generally, the system can adjust the air volume based on your setting temperature. You can also manually set your desired air volume. Air volume is classified into 9 classes. When you press the air volume key, the air volume will be adjusted gradually.

3) Use of hot air

⚠ Caution: Please turn off the heater water valve switch before shut down the heater unit!

When the temperature is too low, the temperature of the cab can be increased by using the hot air function.

The heater unit pipeline connection diagram is shown in Figure 4-47.

As shown in Figure 4-48, turn on the heater valve switch, and then the heater unit starts operating. The temperature rise is controlled by setting the air volume.

3) Night vision function

Switch on clearance lamp power, the key symbols and other symbols are displayed synchronously.

1) Air outlet mode selection

By pressing the air outlet mode selection key and defrosting selection key, 4 air outlet modes can be selected, which are head blow, feet blow, feet blow & defrosting and defrosting.

5) Air inlet mode selection

In the following circumstances, internal recirculation can be used for a short time:

- In hot weather, to quickly reduce the inside temperature;
- In cold weather, to quickly increase the inside temperature;
- The worse outside air quality, such as much dirt and bad smell.

4.9.3 Precautions for operation

1) Regularly do maintenance for A/C system.

2) Wipe panel with a soft dry cloth. Wet cloth or hard material is prone to damaging the panel, keys or display screen.

3) Do not use finger, oily material or hard object to contact display screen, otherwise it may lead to illegible display, strokes missing

or display screen damage.

1) The refrigerant filler is on compressor and pipes. In case of insufficient refrigerant or poor refrigeration, please contact professional personnel to supplement refrigerant. When refrigerant is insufficient, white foam can be seen through the observation window on the upper part of pipe. When refrigerant is sufficient, what you see is transparent liquid.

5) When it is confirmed that a fault occurs in the system, please go to an authorized service station to have an inspection and repair by professional service personnel.

6) The A/C intake paper filter core should be cleaned and replaced according to specific operation conditions.

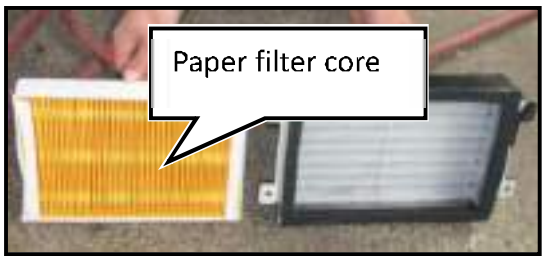


Fig 4-48

7) In the season that A/C is not used, start the refrigeration system of A/C 2~3 times every month, 10 min per time. The purpose is to prevent poor sealing performance of rubber seal ring and shaft seal of compressor in the pipes of the system due to lack of oil. Poor sealing performance will lead to compressor and other movable components of refrigeration system getting stuck or rusty.

4.9.4 Service and maintenance

Maintenance items		Description	Maintenance interval				
			Weekly	Monthly	Bimonthly	Quarterly	Yearly
A/C unit	Amount of refrigerant	Check the amount of refrigerant through observation window.	+				
	Refrigerant leakage	Check leakage with halogen leak detector.			+		
	Hose and pipe	Check hose for cracking and damaging.			+		
		Check each joint for leakage and check clamps for looseness.					–
		Change drying agent and replace filter.					–
	Refrigeration oil	Change with corresponding grade refrigeration oil.	+				
Compressor unit	Shaft seal	Check oil leakage mark with white paper.	+		–		
	Belt	Tighten it with tension pulley and check it for wear.			+		
	Bolt overhaul	Check bolts for looseness. Do a fully inspection and refitting, if necessary.	+				
Evaporator, condenser	Evaporator core	Check it for dirt, and clean it if necessary.	+				
	Fan motor	Check if it runs normally.	+				
	Condenser core	Check it for dirt, and clean it if necessary.	+				
	Fan motor	Check if it runs normally.	+				

Maintenance items	Description	Maintenance interval					
		Weekly	Monthly	Bimonthly	Quarterly	Yearly	
Electrical element	Connector	Check clip plug for looseness.	+	+			
	Thermistor switch	Check if it works normally.				+	
	Magnetic clutch	Check if it meets specified requirements.				+	
	Magnetic clutch bearing	Replace it if it cannot rotate stably.					+
Intake filter	Paper filter element	Check it for dirt.	Clean or replace it according to specific conditions.				
Note: "+" indicates that adjustment is required and do repair if necessary; "-" indicates that replacement is required.							

4.9.5 Fault diagnosis and troubleshooting list

S/N	Symptom	Probable causes	Solutions
1	High pressure is low	System leaks.	Do leakage detection and repair.
		Air return valve is closed.	Open it.
		There is a lack of refrigerant.	Add refrigerant.
		The air return valve of compressor leaks.	Replace the valve.
		The leaf valve of compressor is damaged.	Replace it.
2	High pressure is too high	There is air in the system.	Refill the system with refrigerant.
		The condenser is blocked.	Clean the condenser.
		The exhaust valve is closed.	Open it.
		There is excessive refrigerant.	Discharge the extra.
3	Low air return pressure	There is a lack of refrigerant.	Add refrigerant.
		The compressor piston is worn.	Repair it.
		The compressor cylinder gasket leaks.	Replace the cylinder gasket.
		The hose is twisted or squeezed flat.	Replace the hose.
		The air return valve of compressor leaks.	Replace the valve plate.
		There is moisture in the system.	Replace the air drier.

S/N	Symptom	Probable causes	Solutions
4	High air return pressure	The sensing bulb of expansion valve is loose.	Tighten the sensing bulb clamp.
		There is excessive refrigerant.	Discharge the extra.
		The compressor leaf is damaged.	Replace the leaf.
		The compressor cylinder gasket leaks.	Replace the cylinder gasket.
5	Compressor does not work.	The drive belt is damaged.	Replace the belt.
		The clutch conductor is damaged.	Replace the conductor.
		The compressor piston is damaged.	Replace the compressor.
		The thermostatic switch is in failure.	Replace the thermostatic switch.
		The clutch coil is damaged.	Replace the coil.
6	Poor refrigeration effect	The coil is frozen; the set temperature is too high.	Turn the thermostatic switch downward to defrost it.
		Hot air enters cab.	Close the door from which hot air comes.
		There is a lack of refrigerant.	Add refrigerant.
		The high pressure is too high.	Refer to 2.
		The return pressure is too low.	Refer to 3.
		The return pressure is too high.	Refer to 4.
		The thermostatic switch is in failure.	Replace the thermostatic switch.
7	Evaporator coil gets frozen.	The adjustment of thermostatic switch is inappropriate.	Adjust it to operating condition.
		The volume of air via evaporator is insufficient.	Check evaporator fan.
8	Belt is in failure.	The belt pulley is not properly aligned.	Adjust the axial position of belt pulley.
		The belt is too tight or loose.	Adjust it correctly.
		The size and specification of belt is incorrect.	Replace it.
		The idler bearing is damaged.	Replace the bearing.
9	Fan does not work.	The fan Fuse is burnt out.	Replace it.
		The control switch is in failure.	Replace it.
		The fan motor is damaged.	Replace it.
		The motor voltage is low.	Check conductor.
		The fan is in poor contact.	Check and repair it.

S/N	Symptom	Probable causes	Solutions
10	Fan rotates slowly.	The conductor is loose or in short circuit.	Do troubleshooting.
		The rotor shaft is bending.	Replace it.
		The controller resistor is burnt out.	Replace the resistor.
		The voltage is insufficient.	Check the alternator.
		Check the fixing screw of blade.	Tighten the screw.
11	Hose or joint leaks.	Joint leaks.	Repair or replace it.
		Hose leaks.	Replace the hose.

Chapter V Maintenance

5.1 Mileage for routine inspection & maintenance interval

Schedule of routine inspection & maintenance interval of mining dump truck

Maintenance level	Initial inspection	Routine inspection	1st class maintenance	Routine inspection	2nd class maintenance	Routine inspection	3rd class maintenance	Routine inspection	4th class maintenance
Engine operating time (hours)	30	50	100	300	500	800	1000	1200	1500

⚠ CAUTION: Users should carry out the initial inspection immediately after delivery of the truck provided that the engine has worked for 30 h or more on the way of shipment.

5.2 Details on mandatory maintenance of MT86H mining off-highway off-highway dump truck

Period	Material code	Material name	Specification	Unit	Qty	Remarks
100h（The actual work ontime,dose not include transit;time 2,000 km）	4110000001390	Oil filter	612630010239	Piece	2	Weichai WD12.420
	5301000010	Diesel engine oil	CF-4 15W/40	L	27	
	4110001117322	Fuel Coarse Filter Element	1000424916	Piece	1	
	4190002286	Fuel oil filter	1000442956	Piece	2	
500h（7000 km）	4110000001390	Oil filter	612630010239	Piece	2	Weichai WD12.420
	5301000010	Diesel engine oil	CF-4 15W/40	L	27	
	4110001117322	Fuel Coarse Filter Element	1000424916	Piece	1	
	4190002286	Fuel oil filter	1000442956	Piece	2	
	4110001276	Air filter	1000267954	Piece	1	Air filter assembly
	5301000007	Gear oil	GL-5 85W-90	L	23	Transmission
	4120001743	Return oil filter element	SJX-500×10	Piece	1	Lifting system
	4120000634	Air filter element	SJXKL10×0.8-0.5	Piece	1	
	5301000007	Gear oil	SAE85W/90GL-5	L	45.6	Center axle unilateral wheel reducer 6.3L

Period	Material code	Material name	Specification	Unit	Qty	Remarks
500h（7000 km）	5301000007	Gear oil	SAE85W/90GL-5	L	36.6	Rear axle unilateral wheel reducer 6.3L
						Rear axle main drive:24L
1000h (12000 km)	4110000001390	Oil filter	612630010239	Piece	2	Weichai WD12.420
	5301000010	Diesel engine oil	CF-4 15W/40	L	27	
	4110001117322	Fuel Coarse Filter Element	1000424916	Piece	1	
	4190002286	Fuel oil filter	1000442956	Piece	2	
	4110001276	Air filter	1000267954	Piece	1	Air filter assembly
1500h（17000km）	4110000001390	Oil filter	612630010239	Piece	2	Weichai WD12.420
	5301000010	Diesel engine oil	CF-4 15W/40	L	27	
	4110001117322	Fuel Coarse Filter Element	1000424916	Piece	1	
	4190002286	Fuel oil filter	1000442956	Piece	2	
	4110001276	Air filter	1000267954	Piece	1	Air filter assembly
	5301000010	Diesel engine oil	CF-4 15W/40	L	2.4	Balance shaft
	4120001743	Return oil filter element	SJX-500×10	Piece	1	Lifting system
	4120000634	Air filter element	SJXKL10×0.8-0.5	Piece	1	

Note:

1. If it is reached mandatory service requirements before delivery the customer, the service can be performed at the destination.

2. The grade of the hydraulic oil filled at the factory is L-HM32, which can be changed to L-HM46 hydraulic oil by users.

⚠ CAUTION:

- The oil acts as the primary medium to absorb the dust and other particles when the oil-bath is working, so the clean waste engine oil or gear oil can be applied.
- Two brands of hydraulic oil can be switched, but must not be mixed!
- Please select the conformed lubricating oil according to the specific ambient temperature.
- Users should take all consequences caused by the use of the oil products for maintenance that are not specified by our company.

5.3 Key points of maintenance

5.3.1 Routine maintenance items

1) Check the hand brake and the foot brake.
2) Check working conditions of the illumination system, instrument signal system and various indicators (oil pressure, air reservoir pressure, air filter maintenance indicator and charge indicator).
3) Check working conditions of the starter and the generator as well as the battery electrolyte level.
4) Check the air pressure and state of tires.
5) Check liquid levels of the engine oil, coolant and traversing mechanism hydraulic oil.
6) Discharge water from the air reservoir.

5.3.2 Cleaning and inspection of transmission system parts

1) Cleaning
The parts surface of each assembly of transmission system might be stuck with dirty oil and sludge, so cleaning parts is indispensable. The common methods are cleanings with steam, gas, acid solution or alkaline solution, neutral agent and trichloroethylene as well as magnetic cleaning. In this process, damage to some parts might occur. Therefore, careful inspection must be done in the process of cleaning.
a. Metal parts
- Cleaning with gas. Unlike other methods, gas can hardly infiltrate or dissolve sludge. Unless the surface of parts is precisely refined, wire brush or other tools can be used to clean sludge for twice.
- Alkalization treatment. If parts are made of alloys, they cannot adopt this treatment. The alkalization treatment used to clean steel castings and iron castings has better effect.

b. Rubber parts

No mineral oil can be used. Use alcohol or one piece of clean cloth to wipe impurities.

c. Rust protection

After cleaning all the waste oil and grease on the part surface, smear one layer of clean oil on the surface to prevent rust.

2) Inspection

Before cleaning parts, use prepared measuring instrument or tools to inspect. Determine whether the parts are suitable for reuse according to specified maintenance standards. Damaged parts require maintenance or replacement. If one piece of matched part is severely damaged, and its assembly clearance exceeds the prescribed limits, replace this part or the matched part as required.

In the perspective of preventive maintenance, some parts under repair or within wear limits should be replaced before they exceed the limits.

All the parts should be carefully inspected by visual observation or infrared inspection. If the following anomalies are found by visual observation, this part can be repaired or replaced as required.

⚠ Caution: For all the seal rings, such as O-shape ring, oil seal, seal washer, once dismounted, they are required to be replaced, and should not be reused.

5.3.2 See the following table for all levels of maintenance items:

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Engine	Change engine oil			•	•	•	•
	Replace oil filter	Whenever replacing the engine oil					
	Check and adjust valve clearances	•		•	•	•	•
	Replace fuel filter element			•	•	•	•
	Clean or replace filter element of coarse fuel filter			•	•	•	•
	Check coolant volume and add when necessary	•	•	•	•	•	•
	Change coolant	Once every six months					
	Tighten cooling pipeline clamps	•	•				

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Engine	Tighten air intake pipeline hoses and flange connecting pieces	•	•	•	•	•	•
	Check air filter maintenance indicators		•	•	•	•	•
	Clean dust-collecting cup of air filter		•	•	•	•	•
	Clean main filter element of air filter	Once every 250 hours					
	Replace safety filter element of air filter	Whenever replacing the main filter element					
	Check supercharger bearing clearance						•
	Wire harnesses of electrical components and electrically controlled system	Once at the interval of 250 hours					
Transmission	Check oil level of Transmission		•	•			
	Replace transmission lubricating oil (at least every year)		•				
	Replace air breather				•	•	•

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Front axle	Check and adjust clearances of taper roller bearing for wheel hub	Whenever doing the 1st class inspection and the 2nd class maintenance					
	Replace grease for wheel hub					•	•
Center axle	Check oil levels of main reducer and wheel reducer		•	•			
	Check bogie differential	Whenever doing the 1st class inspection and the 2nd class maintenance					
	Replace lubricating oil for main reducer and wheel reducer (at least every year)				•		
Rear axle	Check oil levels of main reducer and wheel reducer		•	•			
	Replace lubricating oil for main reducer and wheel reducer (at least every year)				•		
	Clean air breathers			•	•	•	•
	Check and adjust clearances of taper roller bearing for wheel hub	Whenever doing the 1sl class inspection and the 2nd class maintenance					

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Propeller shaft	Re-tighten propeller shaft bolts	Once every 100 hours					
	Visually inspect connection and wearing of propeller shafts	Once every 100 hours					
Cab	Check actions of wiper	•	•	•	•	•	•
	Re-tighten locking handle of cab	•			•	•	•
	Re-tighten heat dissipation shield of engine	•		•	•	•	•
	Check oil level of cab tilting manual oil pump		•		•	•	•
	Check adjustment of lifting cylinder	•	•	•	•	•	•
Chassis	Check fixation of towing hook	•	•	•	•	•	•
	Re-tighten crossbeam bolts	•					
	Tighten U-bolts and brackets of front/rear leaf springs	•			•	•	•
	Check and adjust clearance of baffles of leaf spring side		•		•	•	•
	Check fixation of wheel nuts	•	•	•	•	•	•
	Check fixation of batteries		•		•	•	•

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Chassis	Check fixation of fuel tanks		•		•	•	•
Brake system	Drain air reservoir	•	•	•	•	•	•
	Check tightness of air pressure system (via barometer)	•		•	•	•	•
	Check thickness of friction lining and adjust clearance of brake		•		•	•	•
	Clean wheel brake		•			•	•
	Check positions of brake pipelines and hoses that can be easily scratched.	•	•		•	•	•
	Check functions of brake chamber		•	•	•	•	•
	Check performance of foot brake, hand brake and exhaust brake (during commissioning)	•	•	•	•	•	•

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Brake system	Check retarder system, in which indicator shall operate properly, connecting pieces are connected firmly, and appearance is clean	Check before each trip					
	Check clearance between retarder rotor and stator	Once every months					
	Check retarder oil seal, bearing lubrication status, manual switch function, relay wiring and contact status	Once every months					
	Check axial movement clearance of retarder	Once every months					
Electrical system	Check working conditions of electrical system (signal lamp, headlamp, height lamp, wiper, HVAC and air breather)	•	•	•	•	•	•
	Check liquid level and gravity of battery electrolyte as well as voltages of each battery unit	•		•	•	•	•

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Electrical system	Check fixation of battery wiring terminals and apply grease to electrodes	•		•	•	•	•
	Check correctness of speed displayed in electronic tachometer	•	•	•	•	•	•
Steering system	Replace steering oil	(20000~25000km)					
	Check and adjust front wheel alignment	•	•				
	Check functions of steering system					•	•
	Check clearance of steering lever		•		•	•	•
	Check bolts, joints and locking pieces of steering levers	•	•				
Lifting system	Check for wear of oil pipe	Once every day					
	Check oil level in hydraulic oil tank and level meter	Once every day					
	Check for looseness of oil cylinder bracket and top big nut, and clearance of oil cylinder bracket	Once every day					

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Lifting system	Check for inclination of oil cylinder when lifting it without load	Once every day					
	Check for looseness of bracket bolts of oil tank and oil pump	Once every week					
	Check if limit valve operates properly	Once every week					
	Replace oil return filter element and air filter element	Once every six months					
	Check lifting angle		•	•	•	•	•
	Check tightness of gas circuit	•		•	•	•	•
	Check hydraulic oil	Once every six months					
Complete truck	Short-distance commissioning (include brake test)	•		•	•	•	•
	Visually inspect leakage	•	•	•	•	•	•
	Check fixation of carriages and tighten them when necessary	•	•	•	•	•	•
Lubrication	Water pump	•	•	•	•	•	•
	Clutch pedal shaft	•	•	•	•	•	•

Item	Description	Maintenance level					
		Initial inspection	Routine inspection	1st class maintenance	2nd classmaintenance	3rd classmaintenance	4th class maintenance
Lubrication	Clutch release bearing	•	•	•	•	•	•
	Clutch fork shaft	•	•	•	•	•	•
	Universal joint	•	•	•	•	•	•
	Steering kingpin, front axle	•		•	•	•	•
	Leaf spring pin	Once every 10 hours					
	Inspection of clearance of baffles at balance suspension leaf spring side	Once every 10 hours					
	Lower bracket of shock absorber	•	•	•	•	•	•
	Transmission manipulator		•	•	•	•	•
	Brake camshaft and brake arm	•	•	•	•	•	•
	Towing hook	•	•	•	•	•	•
	Door hinge of cab	•	•	•	•	•	•
	Re-treat the cab against rust as planned	Once at the interval of 12 months					

5.3.3 Selection of oil products

Type	Recommended types and standards	Amount	Part
Engine oil	Ambient temp.≥-15° CF-4 15W/40 Ambient temp.＜-15°CF-4 15W/40	27L	Weichai engine
Gear oil	Heavy-duty vehicle gear oil (GL-5) 85W-90	Central axle: 45.6L Rear axle: 36.6L	Axle main drive, bogie differential housing, final drive and transmission
	Ambient temp.≥-15° Heavy-duty vehicle gear oil (GL-5) 85W-140 Ambient temp.≥-26° Heavy-duty vehicle gear oil (GL-5) 80W-140	Transmission:23L	
Hydraulic oil	L-HM46 hydraulic oil GB11118.1 L-HM32 hydraulic oil GB11118.1	135L	Hydraulic oil tank
	L-HV32 hydraulic oil GB11118.1	0.5L	Cab tilting system
Fuel	Ambient temp.≥4°C 0# light diesel GB252 Ambient temp.≥-5°C -10# light diesel GB252 Ambient temp.≥-14° -20# light diesel GB252 Ambient temp.≥-29°C -35# light diesel GB252	530L	Fuel tank
Brake fluid	Vehicle brake liquid HZY3 (DOT3) GB12981	1.5L	Brake system
Grease	2# or 3# lithium grease GB7324		Pin shaft at each hinged point of working device
Antifreeze fluid	Antifreeze fluid -35#	50L	Radiator system

5.3.4 Reference table of oil products in China and abroad

1) Engine oil

Grade of domestic oil	Grade of similar foreign brand oil (ranked as per US SAE)			
	CALTEX	SHELL	MOBIL	ESSO
Diesel engine oil CD or higher 15W-40 GB11122	CALTEX Delo Gold Multigrade 15W-40	RotellaSX 40; Rotella TX 40, 20W/40; Rotella DX 40	MobilDelvacSuper 130 (SAE15W-40) (-15°C～50°C)	Essolube XT-3; Essolube XT-2
Diesel engine oil CD or higher 5W-30 GB11122		Rotella SX30, 10W/30; Rotella TX30; Rotella DX30	MobilDelvacSuper 130 (SAE10W-30) (-20°C-40°C); Delvac 1# (-40°C or higher)	Essolube XT-5

2) Hydraulic oil

Grade of domestic oil	Grade of similar foreign brand oil				
	CALTEX	MOBIL	SHELL	CASTROL	ESSO
Hydraulic oil L-HM46 Hydraulic oil L-HM32	RANDO OIL HD32 RANDO OIL HD46	DTE 24 DTE 25	Tellus 32 Tellus 46	Hyspin ZZ 32 Hyspin ZZ 46	Nuto H 32 Nuto H 46

3) Gear oil (drive axle oil)

Grade of domestic oil	Grade of similar foreign brand oil (ranked as per US API, GL-5)				
	CALTEX	FUCHS	MOBIL	ESSO	SHELL
Heavy-duty vehicle gear oil (GL-5) 85W-90 GB13895	CALTEX Super extreme pressure gear oil 90 Thuban GL5 EP 90	Titan Gear LS90	Mobil gear HD80W-90(-20°C-40°C) HD85W-90 (-10°C-50°C)	Gear oil GX 85W-90	Spirax EP Heavyduty HD90 HD80W-90

4) Brake liquid

Grade of domestic oil	Grade	Grade of similar foreign brand oil			
		MOBIL	ESSO	BP	SHELL
Vehicle brake liquid HZY3 GB12981	SAE 1703C	Super brake liquid DOT3	Brake Fluid	Brake Fluid Disc-Brake fluid	Donax B

5.4 Lubrication of chassis

1. Lubrication requirements

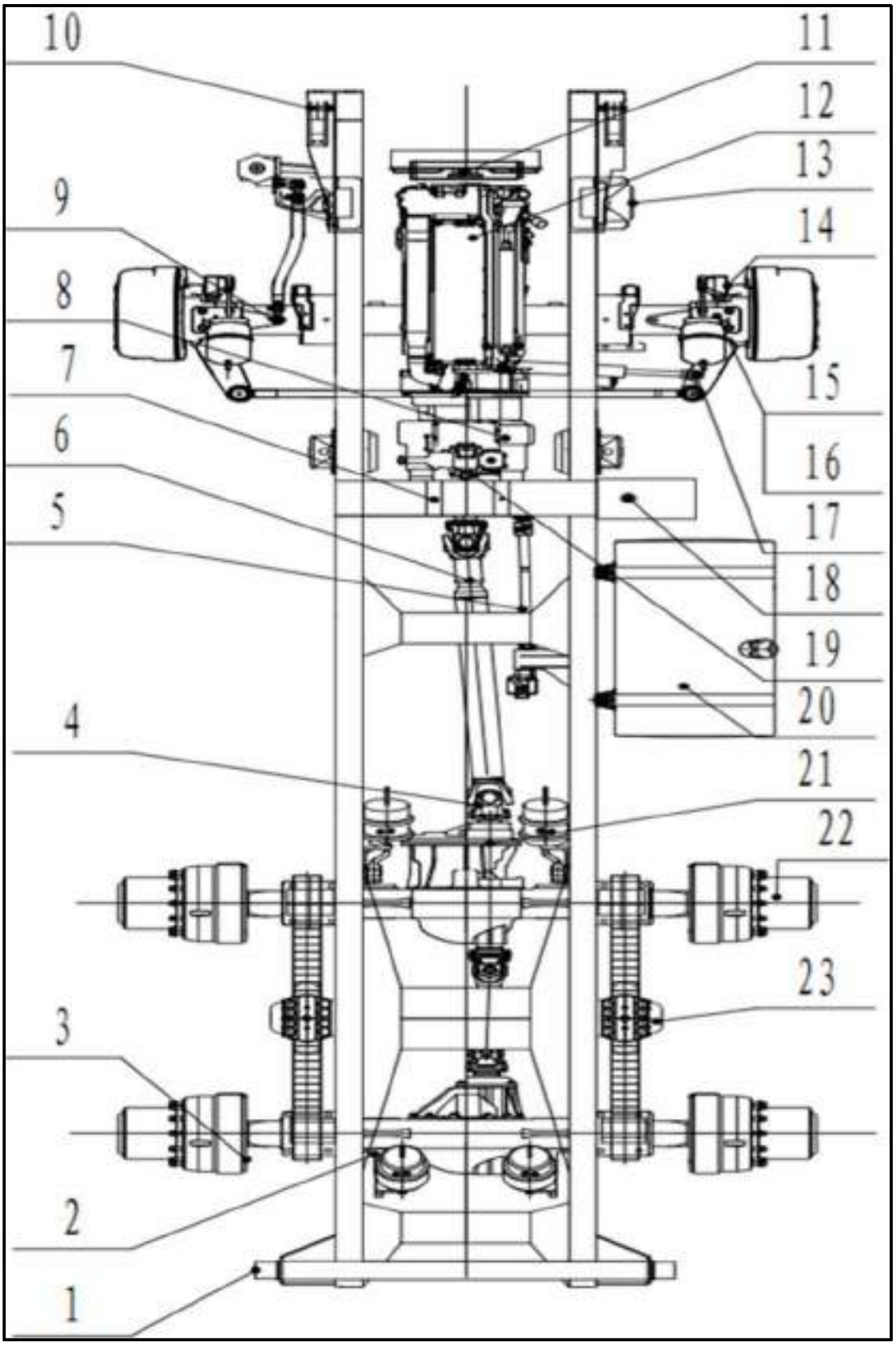
NO.	INSTRUCTION	POINTS	LUBRICANT	10 HOURS	LUBRICANT	100 HOURS	LUBRICANT	200 HOURS	LUBRICANT	400 HOURS
1	DRIVE SHAFT	1	D	FILL						
2	AXLE BRAKE ADJUSTMENT ARM	2			D	FILL				
3	BRAKE CARRIER UNIT	3			D	FILL				
4	CROSS SHAFT	4			D	FILL				
5	POWER TAKE-OFF DRIVE SHAFT	5			D	FILL				
6	DRIVING SHAFT	6			D	FILL				
7	LIFTING CYLINDER PIN	7			D	FILL				
8	STEERING CROSS ROD BALL PIN	8			D	FILL				
9	STEERING CYLINDER BALL PIN	9			D	FILL				
10	CAB ROLLING-OVER PIN	10			D	FILL				
11	RADIATOR FAN	11			D	FILL				
12	ENGINE OIL	12			A	CHECK	A	REPLACE		
13	FRONT/REAR SPRING PIN	13	D	FILL						
14	CAMSHAFT	14			D	FILL				
15	FRONT AXLE BRAKE ADJUSTMENT ARM	15			D	FILL				
16	SPINDLE ARM	16			D	FILL				
17	STEERING CYLINDER	17			D	FILL				
18	HYDRAULIC OIL TANK	18			C	CHECK	[illegible]			
19	GEAR BOX	19			B	CHECK			B	REPLACE
20	FUEL OIL WATER AND SEDIMENT	20				EXCLUDE				
21	MIDDLE/REAR MAIN SPEED REDUCER	21							B	REPLACE
22	MIDDLE/REAR WHEEL SIDE REDUCER	22							B	REPLACE
23	BALANCE SHAFT	23			D	CHECK			B	REPLACE

Note: The contents shown in this lubrication scutcheon are the data under normal working conditions and temperature. Customers can make adjustments according to difference of working conditions and temperatures.

2. List of categories of lubricant

NO.	OIL TYPE	RECOMMENDED TYPE	
A	ENGINE OIL	AMBIENT TEMPERATURE≥-20℃ SAE 15W/40 CF-4	AMBIENT TEMPERATURE≥-30℃ SAE 5W/40 CF-4
B	GEAR OIL	AMBIENT TEMPERATURE≥-12℃ SAE 85W/90 GL-5	AMBIENT TEMPERATURE<-12℃ SAE 80W/90 GL-5
C	HYDRAULIC OIL	AMBIENT TEMPERATURE≥-10℃ L-HM64	AMBIENT TEMPERATURE≥-30℃ L-HV32
D	GREASE	LITHIUM GREASE #2	

3. Lubrication diagram



Chapter VI Annex

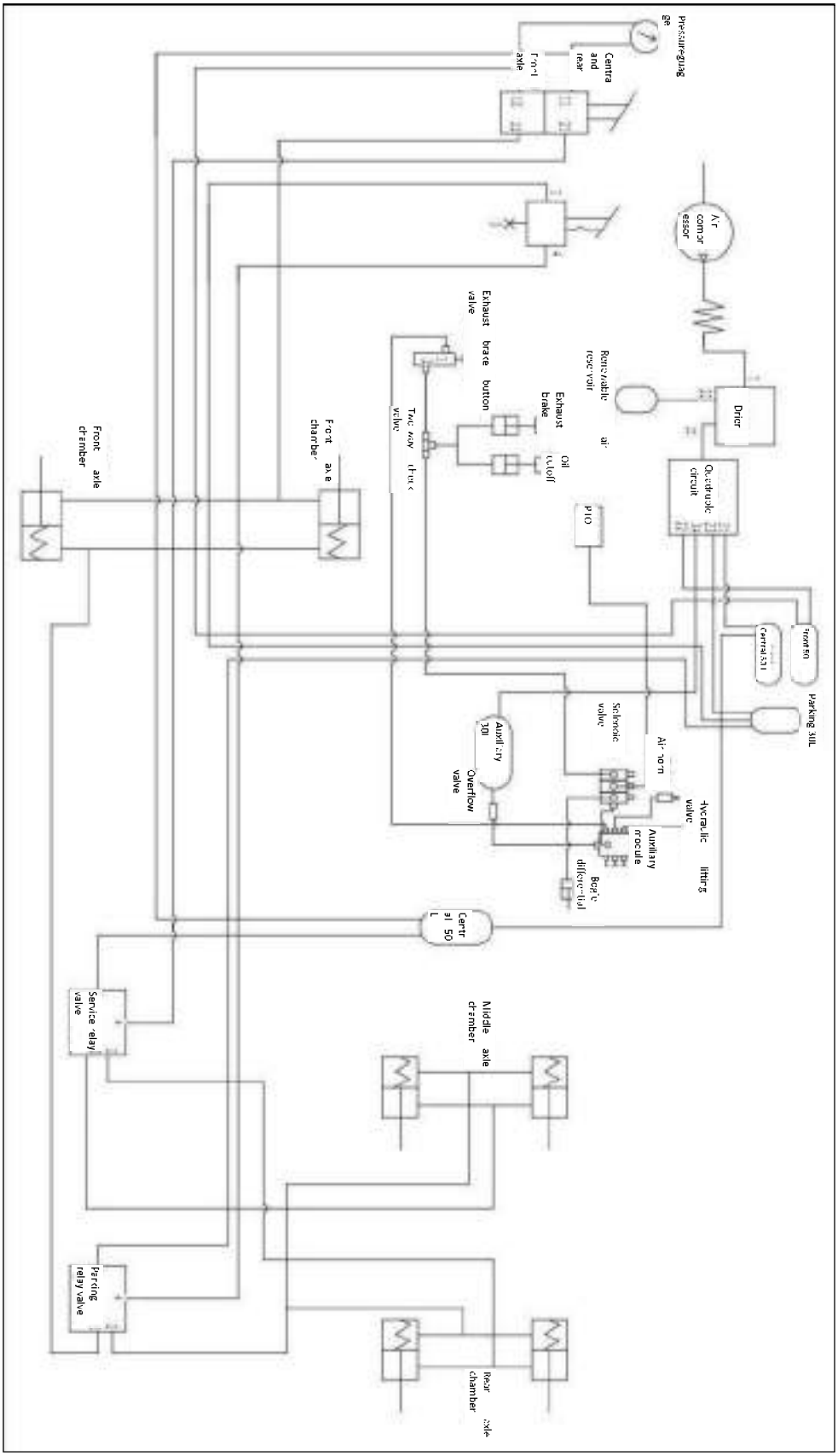
6.1 List of bulbs

Name		Type	Power	Qty.
Headlamp (high/low)		H4 24V70W/75W	70W/75W	2
Front fog lamp		H3 24V70W	70W	2
Side turn signal lamp		24V1W	1W	2
Front turn signal lamp		24V1W	1W	2
Height lamp		24V0.4W	0.4W	3
Front working lamp and rear working lamp of cab		B3H3 24V70W	70W	3
Side working lamps		LED 24V3W	12W	2
Rear combination lamp	Turn signal lamp	24V 1W	1W	2
	Brake lamp/tail lamp	24V 1W/0.2W	1W/0.2W	2
Reversing lamp		LED 24V3W	27W	2
Indoor illumination lamp		24V10W	10W	1

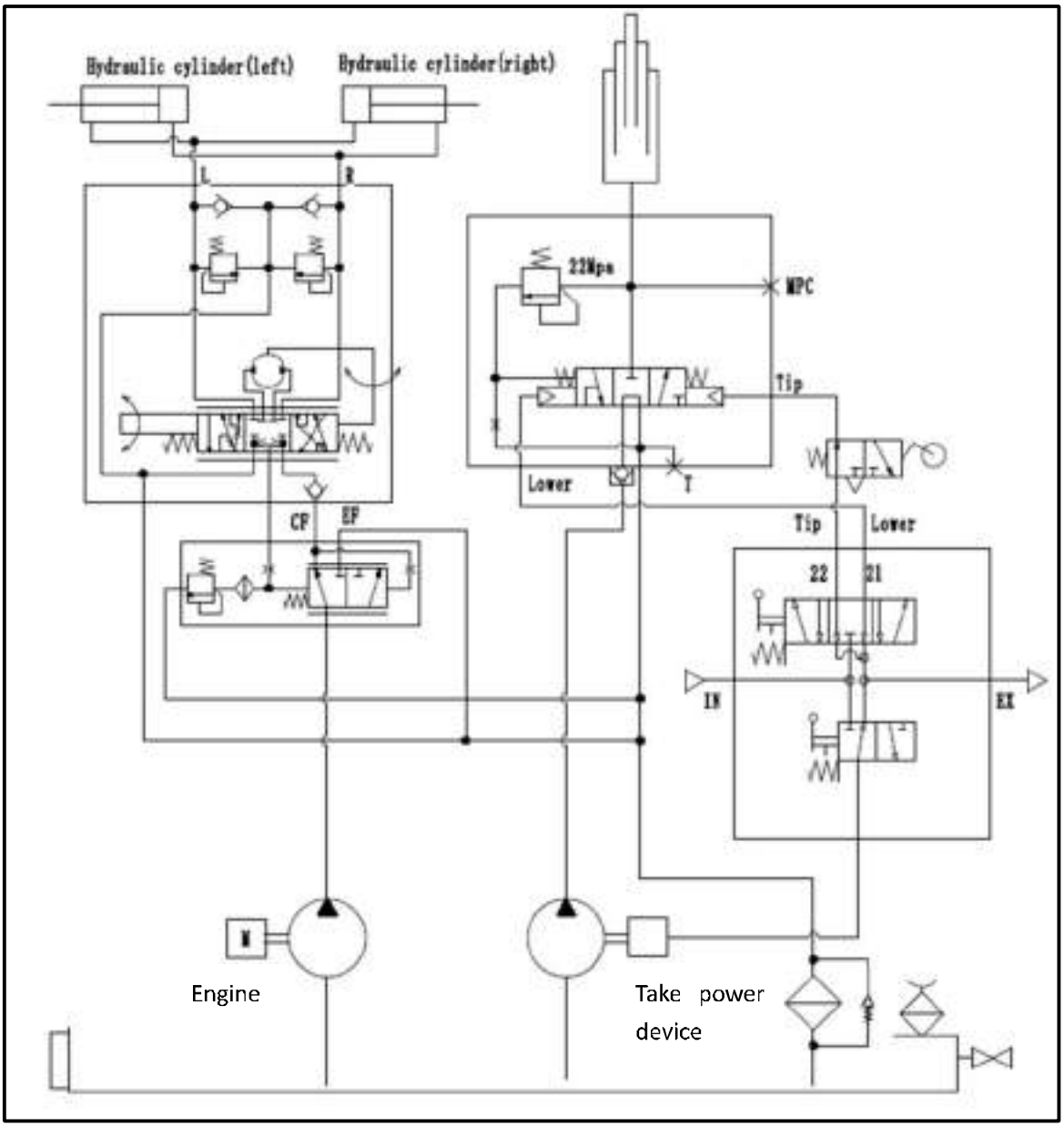
6.2 List of quick-wear parts of electrical system

No.	Code	Name	Qty.
1	4130000007	Pressure switch YK-M10×1-0.3MPa-K↑	1
2	4130000006	Pressure switch YK-M12×1.5-0.55MPa-B↓	1
3	4130000250	Head lamp (right)	1
4	4130000249	Head lamp (left)	1
5	4130000420	ELECTRICAL PRESSURE SENSOR LG9130773001	2
6	4130000309	Ignition lock assembly - LG751	1
7	4130000308	Combination switch	1
8	4130000592	Electronic mileage sensor C03054-16	1
9	4130000003	Oil pressure sensor	1
10	4130000375	Fuse ATS-5A	1
11	4130000376	Fuse ATS-10A	1
12	4130000377	Fuse ATS-15A	1
13	4130000378	Fuse ATS-20A	1
14	4130000492	Brake light switch YK209KLA	1

6.3 Schematic diagram of brake



6.4 Principle of hydraulic system



6.5 Schematic diagram of electrical system