Operation and Maintenance Manual

CMT66

OFF-HIGHWAY DUMP TRUCK

⚠ Warning
The operator and the maintenance staff must go through and understand this manual before the operation and maintenance. Otherwise, the injuries and death can be caused. Please appropriately keep this manual for reference of related staff.

LINGONG HEAVY MACHINERY CO.，LTD.

CMT66 Off-Highway Dump Truck

Operation and Maintenance Manual

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L I N G O N G H E A V Y M A C H I N E R Y C O . , L T D .

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Contents

Foreword

Thanks for choosing mining dump trucks manufactured by Lingong Heavy Machinery Co., Ltd. This manual describes the mechanism, driving and operating, maintenance and adjustment, technical parameters and service/adjustment data of the CMT66 series mining dump trucks.

Maximizing the profits from your 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 CMT66 series mining dump trucks (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.

For operation, service and maintenance of the engine, see details in Operation and Maintenance Instructions of Engine and User Service Guide.

For operation, service and maintenance of the hydraulic lifting system, see details in Operation and Maintenance Guidelines of Hydraulic Lifting System.

The manual should be always put in the cab or other specified places to be convenient for reading from time to time. 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.

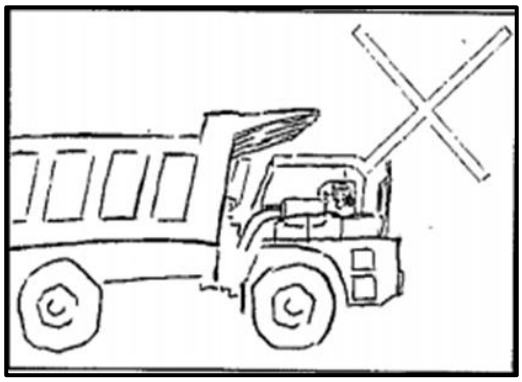
Caution signals below are used to indentify safety information in the manual.

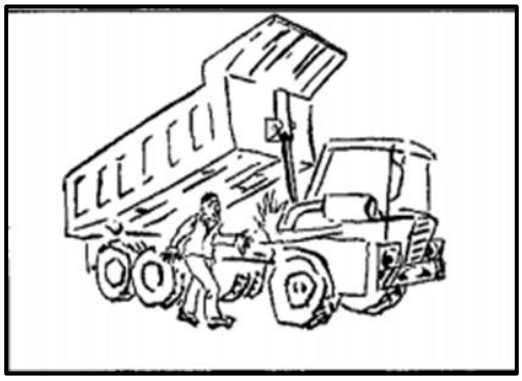
DANGER - If the situation classified as “DANGER” is not avoided, serious injury or casualties is likely to occur. This word can also be used when the machine may be seriously damaged if the possible hazard is not avoided.

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





1.1 Basic precautions

The 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 involved herein this manual shall be followed prior to the operation.

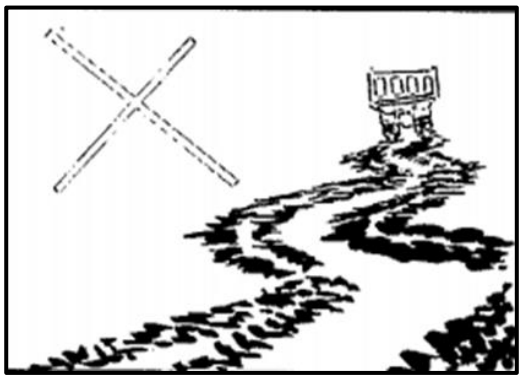
1) While working together with other operators or site traffic commander, make sure that all personnel concerned understand the hand signals.

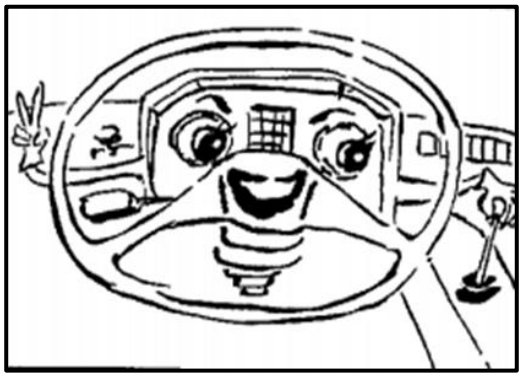
2) Always do inspection before or after the operation, so as to eliminate the potential dangers such as leakage of oil, water and air, bolt looseness, unusual noise or other hazards that could cause faults and serious accidents.

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 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 in case 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 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:

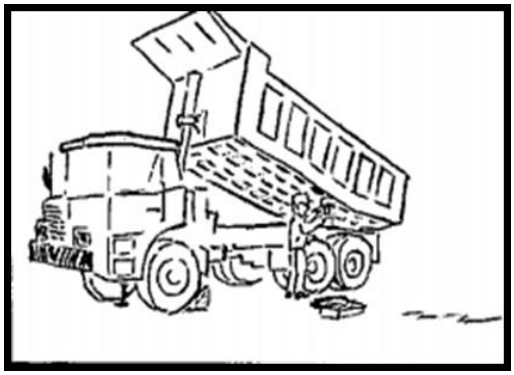
- The parking brake handle is applied;
- The transmission is set to NEUTRAL position;

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 downhill or uphill, pay attention to the change of the truck's center of gravity.

When driving downhill or uphill with full load:

- **Do not make abrupt braking downhill;**
- **Never disengage the clutch or coast downhill;**
- **Do not make a sharp turning.**

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 LGMG may lead to an accident, and users shall contact with the Marketing Dept. of LGMG previously. LGMG assumes no liability for the casualties and damages incurred therefrom.
2) When lifting the cargo body to service the components beneath, the stay bar of the cargo body should be set to a safe position for support, and restore the stay bar once the repair is finished.
3) Always inspect the tire from the side and never stay before or behind the rotating tire.
4) Repair and replacement of tire shall be done by the specialized personnel as it is highly risky.
5) Be careful when doing welding around the tire, to avoid accidents due to tire explosion.
6) When welding the truck for repair, always turn off its power main 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 handle is applied and the transmission control lever is set to the NEUTRAL position, and then shut down the engine.

Fig.1-1reading instructions

Fig.1-2high temperature liquid warning sign

Fig.1-3note identification

Fig.1-4note identification（back）

Fig.1-5note identification（front）

1.4 Notices&signs and their pasting positions

1) Reading instructions: located on the left side of the cab dashboard.

2) High temperature liquid warning sign: located on the surface of the expansion tank

3) Note identification: on the left of the front windshield (from the front of the cab)

Attention: before using the vehicle, please read the contents of the notices (the back) carefully, and bear the user's own losses for the vehicle damage and casualties caused by the illegal operation.

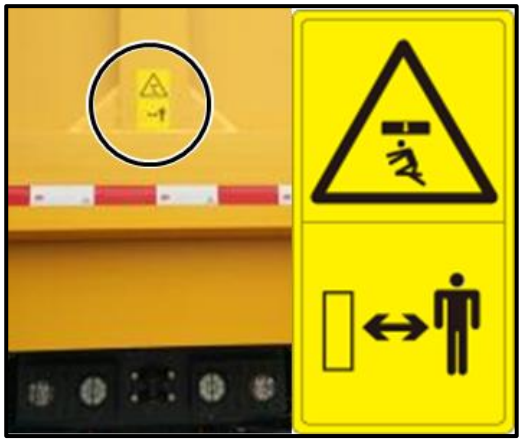


Fig.1-6Pay attention to the work device sign

4) Pay attention to the work device logo: the rear door of the container.

Fig.1-7 the safety mark of the bucket position

5) The safety mark of the bucket position: on both sides of the container.

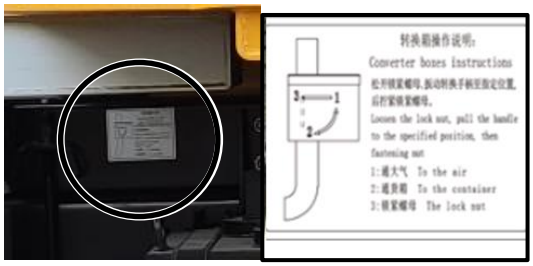


Fig.1-8exhaust identification

6) Exhaust identification: located in the front of the hydraulic tank.

Fig.1-9 Parking brake

7) The sign of the parking brake is located beside the hand brake valve.

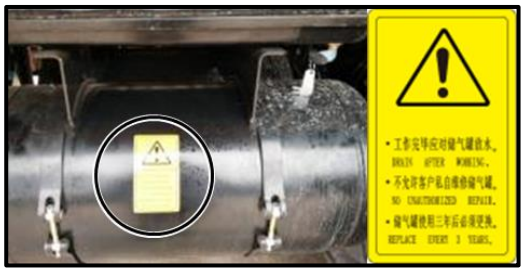


Fig.1-10 Gas tank pay attention to water mark

8) The gas tank should pay attention to the marking of water release: it is located on the surface of the gas tank.

Fig.1-11 Trunk support sign

9) The supporting logo of the box body is located at the rear end of the accessory frame.

Fig.1-12 Trunk support sign

10) Prohibit stampede or walk sign: it is located on the upper side of the tank.

Fig.1-13

11) Note fuel note mark / fuel tank logo: located on the side of the tank.

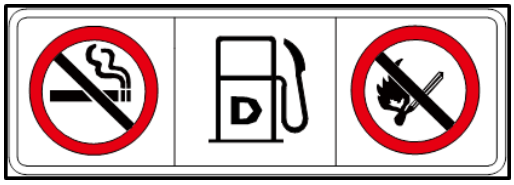


Fig.1-14 Fuel tank sign

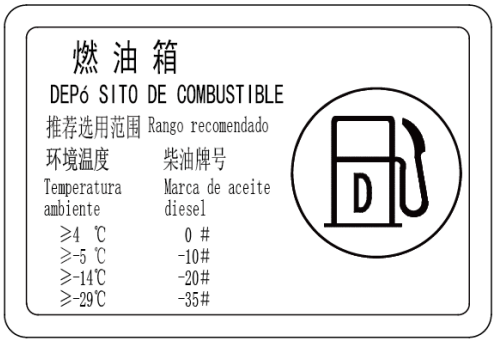


Fig.1-15 Fuel tank mark

Fig.1-16 Caution mark for lifting cylinder installation

12) Lifting oil cylinder installation attention marked: located in the lower part of the lifting oil cylinder.

13) Hydraulic oil tank logo: located on the side of the hydraulic tank.

Fig.1-18Hydraulic oil tank mark

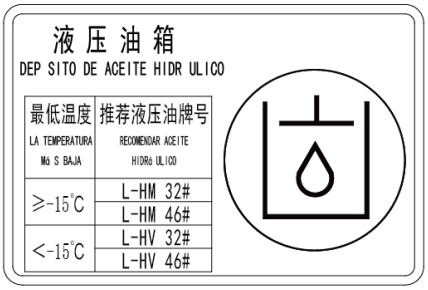


Fig.1-19 Hydraulic oil tank mark

Fig.1-20 Battery explosion - no fireworks logo

14) Battery explosion - prohibit fireworks identification: in the front of the battery box.

Fig.1-21

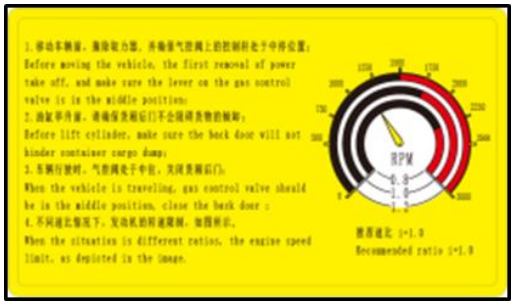


Fig.1-23 Cylinder mark

Fig.1-24 Cylinder mark

15) The attention sign of the oil cylinder is located under the right glass of the driver's room.

Chapter II Product Introduction

2.1 Outline and component name

1. **Rear drive axle**
2. **Middle drive axle**
3. **Fuel Tank**
4. **Air cleaner**
5. **Steering axle**
6. **Cab**
7. **Cargo car body**

2.2 Outline dimension

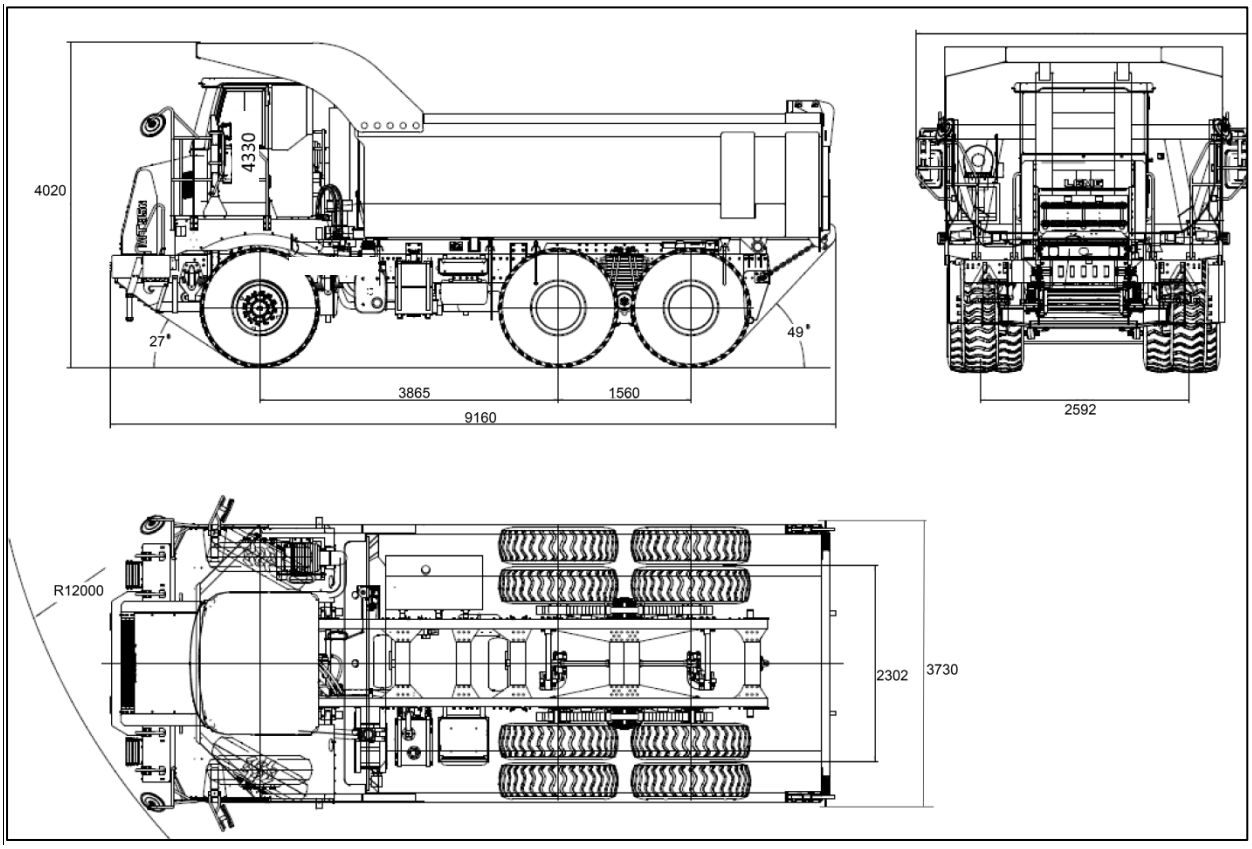


Fig.2-2

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	-25℃～+40℃	340

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)	78500	Overall dimension（mm）	9160×3730×4020
Max. vehicle speed（km/h） (Empty/loaded)	47/47	Max. gradeability (%)	30
Kerb weight (kg)	28500	Turning diameter(m)	≤24
Approach angle (°)	27	Departure angle (°)	49
Volume of cargo body (paperbacked/stacking) (m3)	23.5/28.5		

2.5.2 Main dimensions

Items	Parameters	Items	Parameters
Track width (mm)	Front axle：2592；Rear axle:2302	Wheelbase (mm)	3865（Front-Middle）, 1560（Middle-Rear）
Min. ground clearance (mm)	≥340		

2.5.3 Engine

Items	Parameters	Items	Parameters
Mode	WP12G460E310	Displacement（mL）	11596
Rated power (kW)	338	Max. torque (N.m)	2000
Rated speed (r/min)	2100	Emission standard	GB20891-2014

2.5.4 Transmission system

Items			Parameters/contents
Transmission	Type		Planetary
	speed ratio	Go 1 gears	4.7
		Go 2 gears	2.21
		Go 3 gears	1.53

		Go 4 gears	1.00
		Go 5 gears	0.76
		Go 6 gears	0.57
		Reverse gear R	5.55
Front axle	Integral steering non-drive axle		Welded axle housing
Drive axle	Main decelerate ratio		4.625
	Final decelerate ratio		3.478
	Total decelerate ratio		16.086
Wheel	Wheel rim spec.		10.00. /2.0-25
	Tire spec.		14.00R25
	Tire pressure (MPa)		0.85
suspension system	Front suspension		Leaf spring + double acting cylinder shock absorber
	Rear suspension		Leaf spring + rubber balance suspension+ tie rod

2.5.5 Braking system

Items	Parameters/contents
brake pressure (MPa)	0.85Mpa
Brake system main brake	Dual circuit pneumatic brake
Brake system auxiliary brake	Engine exhaust braking and hydraulic deceleration braking
Brake system parking brake	Spring parking brake

2.5.6 Steering system

Items	Parameters/contents
Type	Hydraulicl steering,
Displacement of the working pump(ml/r)	62.7
System working pressure (Mpa)	17

2.5.7 Lifting system

Items	Parameters/contents
Type	Pneumatic control
Maximum working pressure	22Mpa
Displacement of the working pump(ml/r)	41.8+62.7

2.5.8 Reference fill capacity

Items	Parameters/contents	Items	Parameters/contents
Fuel	400L	Engine oil	27L
Hydraulic oil	165L	Transmission	54L
Axle	24.6L（Middle axle）/22.1 L（rear axle）	Antifreeze	52L

Chapter III Operation

Fig.3-1

Fig.3-2

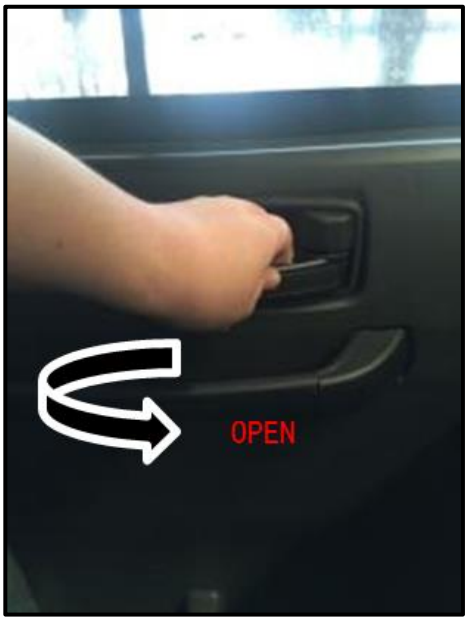


Fig.3-3

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 º (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 º, and pull out the key; or before the door is closed, insert the key in, turn it clockwise for 180 ºand 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

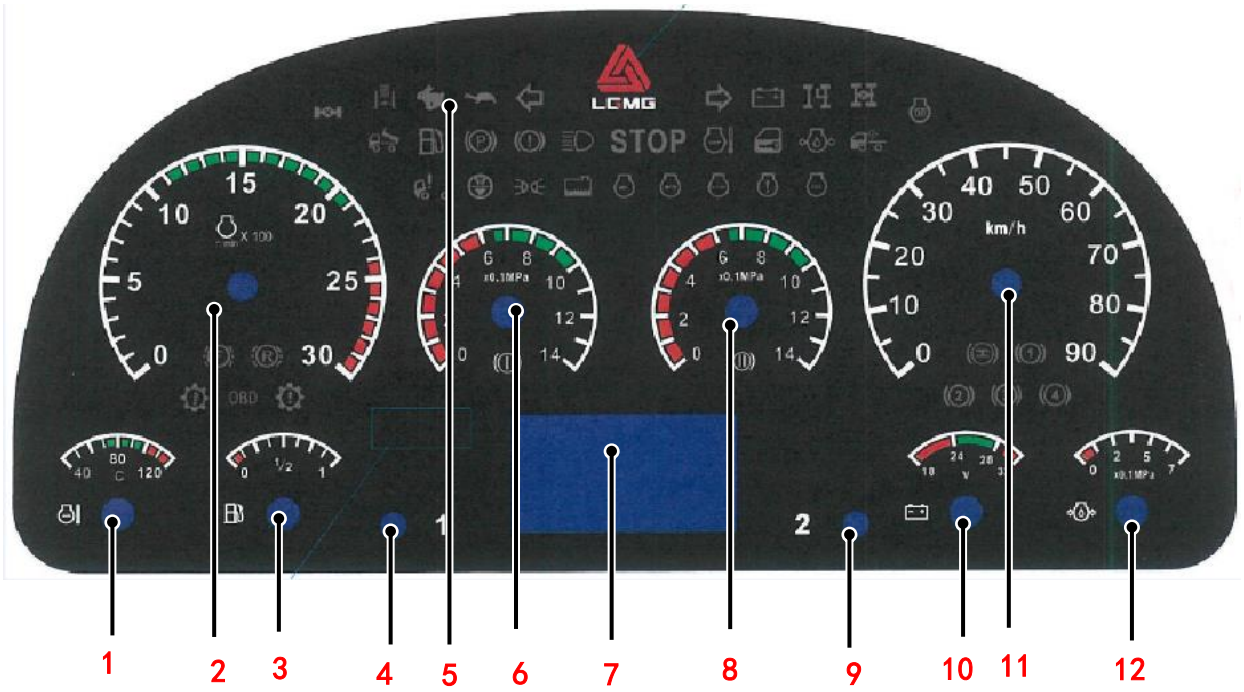


Fig.3-4

1. Coolant thermometer 2. Engine tachometer 3. Fuel gauge 4.Button1

5. Alarm indication mark 6. Barometer of brake circuit 1 7.LCD

8. Barometer of brake circuit 2 9. Button2

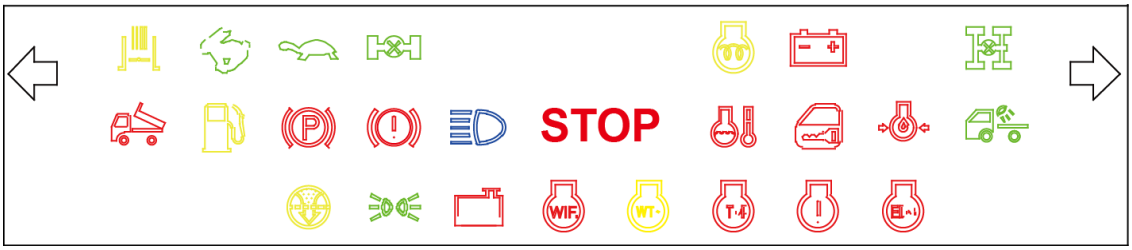
10. Voltmeter 11. Speedometer 12. Oil pressure gauge

3.2.2 Steering wheel and switch panel

Fig.3-5

1. Steering wheel 2.Diaplay of rear view 3. Rocker switch 4. Radio 5. Air-condition operation panel 6. Control handle of Retarder assembly 7. Hand brake valve handle 8. Transmission gear shift handle

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	Green		High beam indicator	Blue
	High gear indicator	Green		Low oil pressure alarm indicator	Red
	Forward gear indicator	Red		Inter-wheel differential indicator	Green

	Reverse gear indicator	Red		Bogie differential lock indicator	Green
	Engine preheat indicator	Yellow		Parking PTO indicator	Red
	Exhaust brake indicator	Yellow		Transmission high temperature indicator	Red
	Door ajar alarm indicator	Red		Retarder brake indicator	Red
	Rear working lamp on indicator	Green		Transmission fault indicator	Amber
	Cab unlocked alarm indicator	Red	STOP	Engine serious fault indicator	Red
	Low fuel level alarm indicator	Yellow		Engine fault indicator	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	WIF	Water in oil indicator	Yellow
	Low brake pressure alarm indicator	Red	WTS	Engine start wait time indicator	White
OBD	OBD indicator	Yellow	EDC	Engine diagnostic indicator	Red
	Retarder position indicator	Red			

3.2.4 Summary of rocker switch marks and function description

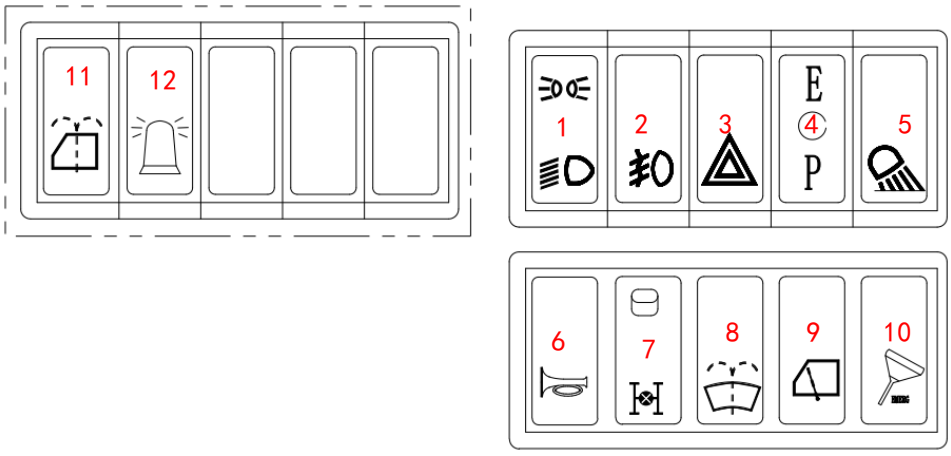


Fig.3-6

NO.	number	state	function	remake
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	Alarm switch	0	OFF	
		1	ON	
4	The power curve of the rocker switch	0	OFF	Light load
		1	ON	Heavy load
5	Rear working lamp switch	0	Rear working lamp OFF	
		1	Rear working lamp ON	
6	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.
7	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.
8	Windshield washer switch	0	Function shutdown	
		1	Function open	
9	Side window wiper switch	0	Function shutdown	
		1	Low speed	
		2	High speed	
10	Emergency steering	0	OFF	
		1	ON	
11	Side windshield washer switch	0	Function shutdown	
		1	Function open	
12	Ceiling lamp switch	0	OFF	
		1	ON	

Fig.3-7

Fig.3-8

Fig.3-9

3.2.5 Power switch

1) Main power switch

The main power switch is located at the lower side of the battery box, which is closed vertically and open horizontally.

⚠ 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./running position	
3 (START)	Start the engine	Auto reset to ACC 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 lamp; and horizontally move it backward to turn on the left turn signal lamp.

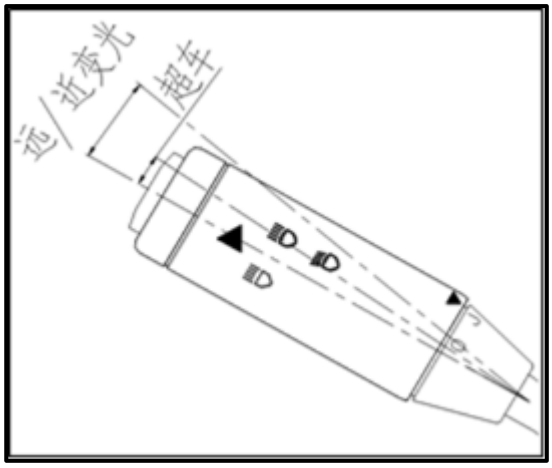
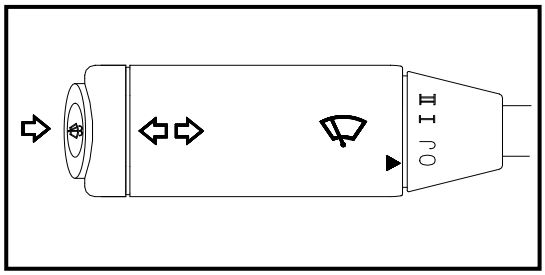


Fig.3-10



0—Closed position J—Wiper IHT

I— Wiper low gear II— Wiper high gear

Fig.3-11

Fig.3-12

When the key switch is set to position 2, 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, 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.

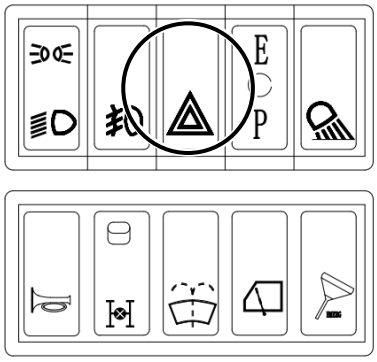
3) Wiper operation

Turn the combination switch to select the required swing gear for wiper. Refer to 3.2.4 Summary and description of the rocker switch.

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; Press and hold the side-window washer, the wiper will automatically start working.

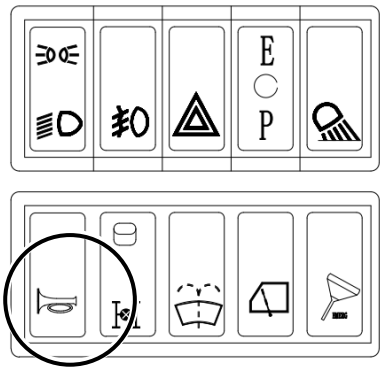
CAUTION: Always fill the washer via the filler port with the specialized glass cleaner instead of plain water or other cleaning agent for windshield washing.

Fig.3-13



Hazard warning switch

Fig.3-14



Horn switch

Fig.3-15

Fig.3-16

3.2.7 Retarder control handle

In the horizontal direction, the front and rear handles can be selected with different retarder positions. There are 1 neutral spaces, the H gear is the exhaust brake gear and 3 control files (shown in Figure 3-13). When the handle is in the 3 gear, the retarder works at full load and outputs the maximum braking torque.

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 vehicle is equipped with both electric horn and electronically controlled air horn, and they can be shifted via a horn change-over switch.

The horn button is located at the steering wheel. To use the electronically controlled air horn, press down the air horn switch (rocker switch) and the horn button on the steering wheel.

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).

Fig 3-17

1. Slide adjusting handle
2. Inclination adjusting
3. Inclination adjusting handle
4. Pneumatic suspension charging button
5. Seat back adjusting handle
6. Adjustable headrest

Tab 3-1

PROJECT	PARAMETER
Driver weight adjustment range	45～130kg
Slide adjustment range	±76mm
Seat front adjustment range	±30mm
Backrest angle adjustment range	+21 °-33 °

3.2.8 Seat

CMT66 use special air car four seat belt seat.

Seat instructions are as follows:

Front and rear adjustment:

Adjust the handle 1 up and down, adjust the seat front and back, release the handle when adjusting to the proper position and lock the position.

Slide adjustment:

Move the adjusting handle 3 up and down, realize the front and back movement of the whole seat, release the handle when it is adjusted to the right position, and the slide rail is locked.

Inclination adjustment:

You can move the seat up front by 3 positions, with a displacement of 5 degrees each time. Pull the handle 2 up and pull the seat forward at the same time, move the seat forward by 5 degrees, and, conversely, move 5 degrees downward. The seat is locked when the handle is released when it is adjusted to the proper position.

Suspension charging regulation:

You can adjust the height of the seat by adjusting the overall height of the seat by inflating and deflating. Press the switch 4 inwards, the suspension can be inflated; press the switch 4 outwards, the suspension can be deflated.

Seat back adjustment:

Pull the handle 5 up, adjust the angle of the back of the seat, lean forward or backward, release the handle when it is adjusted to the right position, and the back is locked.

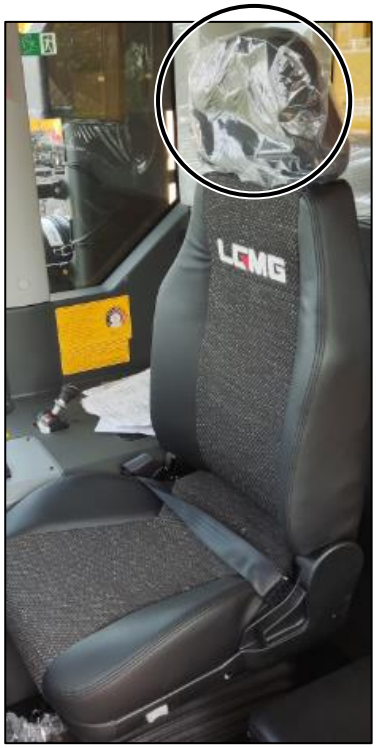
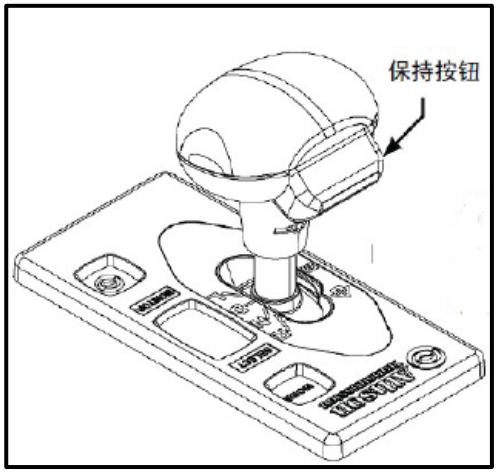


Fig.3-18



Transmission gearshift

Fig.3-19

Headrest regulation:

Height adjustment: pull the headrest up and move the headrest upward; on the contrary, it will automatically lock when it stops moving and stops pulling the headrest

Angle adjustment: front moved head upper part, hear a clicking sound, complete an angle adjustment; when completed 3 angle adjustment, the head will automatically return to the initial position, such as a circle, not the reverse cycle angle adjustment. Angle for automatic locking design, when hear the clicking sound when the head automatic locking.

Adjustable back:

The seat can be adjusted with a back, the mechanism is threaded connection, automatic locking.

Clockwise rotation knob 7, you can achieve a very large curvature of the back, increasing the waist support effect; on the contrary, reduce the waist support effect.

Seat details are shown in table 3-1.

⚠ Caution: adjust the seat back, not too backward, in case it touches the rear window, there is a potential safety hazard.

3.2.9 Transmission gearshift lever

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.

Hand brake valve
Fig.3-20

Fig.3-21 Seat belt

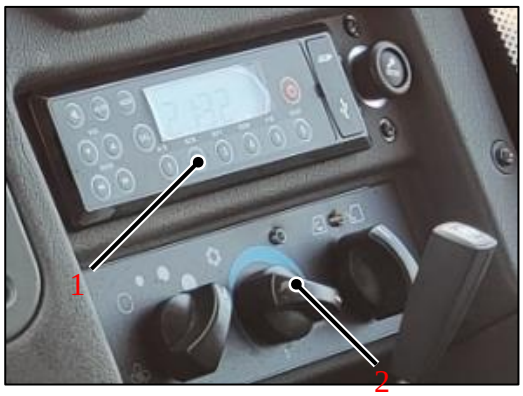


Fig.3-22

1. Radio
2. Air conditioner panel

3.2.10 Hand brake valve (spring parking brake)

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!

3.2.11 Other interior devices

1) Seat belt

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 Air conditioner panel

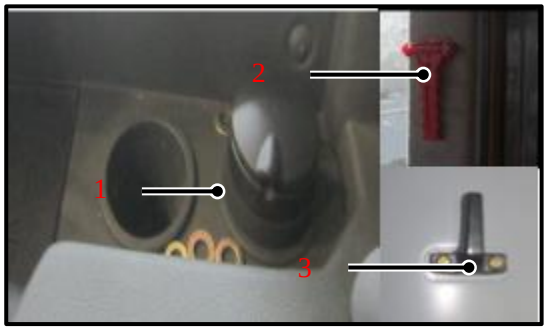


Fig.3-23

1. Cup holder 2. hammer 3. Pothook

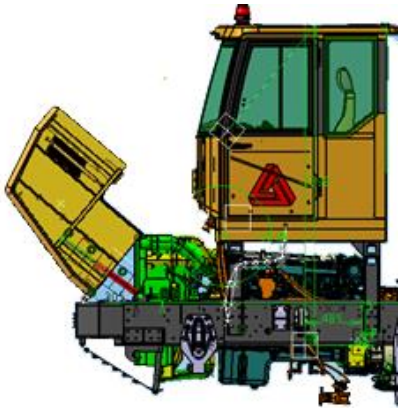


Fig.3-23-1

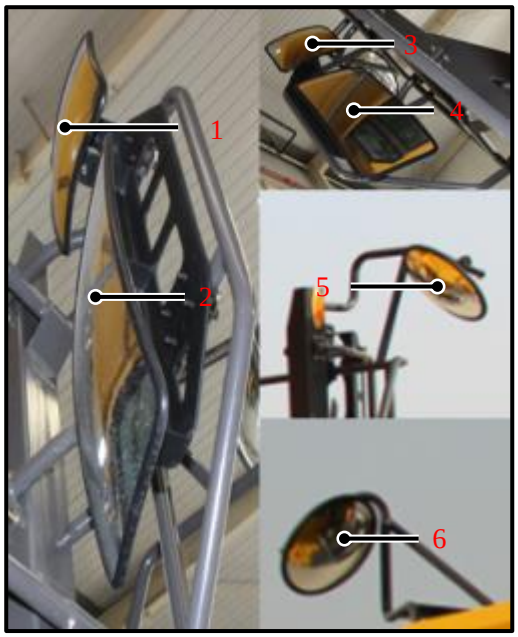


Fig.3-24

1（2）right mirror 3（4）left mirror

5 Left forestall blind mirror

6 Right forestall blind mirror

3) Cup holder, escape hammer,and pothook

3.3 Cab exterior devices

3.3.1 Radiator cover

Open: open the radiator cover as show in fig 3-23-1

3.3.2 Left/right rearview mirrors

They are as shown in Fig. 3-24.

Fig.3-25

1. P dome light 2. Side marker light
3. Floodlight working lamp
4. Sport light working lamp
5. Daytime running lights 6. Steering lamp
7. Fog lamp

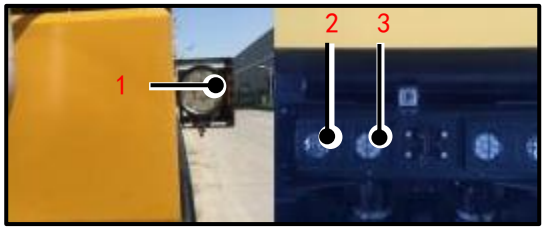


Fig.3-25-1

1. Work lamp 2. Steering lamp 3. Work lamp

Fig.3-26

3.3.3 Working lamp

The positions of working lamps are shown in Fig.3-25

The expansion tank is located at the right side of cab (as shown in Fig. 3-26)

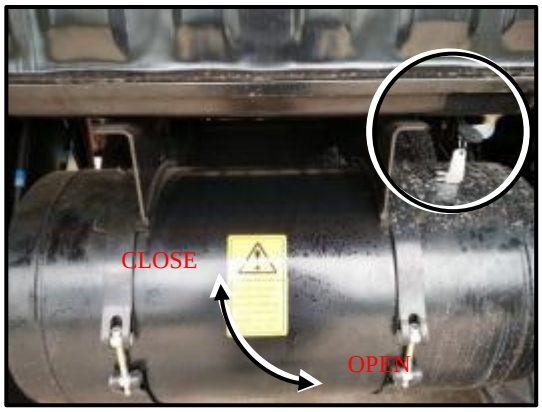
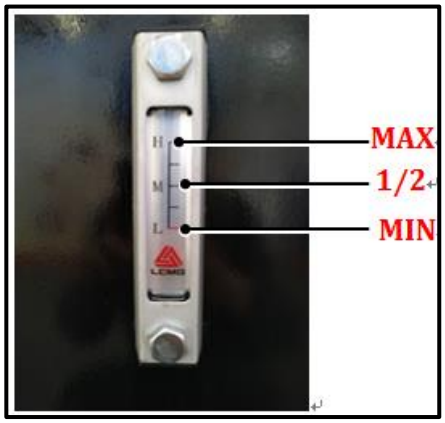


Fig.3-27



Hydraulic oil level inspection

Fig.3-28

Windshield washer scale line

Fig.3-29

3.4 Preparation before driving

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

3.4.1 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. 3-27) 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 the liquid level of whole machine.

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.

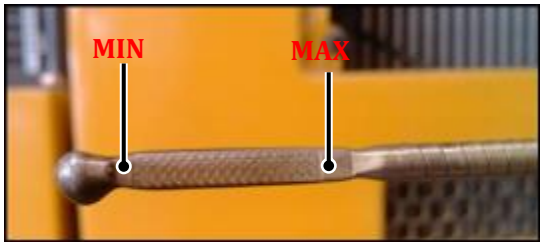
⚠ Note: Refill special windshield washer fluid instead of ordinary water or other washing liquid.

c. Check the fuel level. Turn on the key switch to check the fuel level via the fuel gauge. If the indication is not accurate, please check the fuel gauge and sensor for normal working.

d. Check the coolant level and add the coolant when necessary. Check the coolant level in the expansion tank. If the level is too low, add the coolant of specified model until the level is between “Max” and “Min” marks.

Fuel oil level inspection

Fig.3-30



Oil dipstick scale

Fig.3-31

Fig.3-32

The relief valve can keep a certain pressure difference between the internal pressure of cooling system and barometric pressure to increase the boiling point of coolant.

The relief valve is especially essential in the plateau region. The removal and replacement without permission is not allowed.

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!

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.

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.

Air filter blockage sensor

Fig.3-33

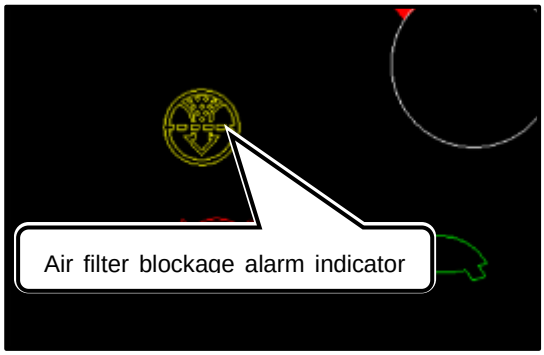


Fig.3-34

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.

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.

As a general rule, the air filter should maintained after being used for 200~250 hours. The metal core element might be washed. It is allowed for long-term use. There is no need to replace it if is if intact. In extremely severe circumstance, the deposition of the metal core element should be checked every day to clean the deposition in time.

The main core element should be cleaned if the air filter block warning indicator is still on after the metal core element is cleaned. After the main element has been serviced for five times, replace with a new one, and meanwhile, replace the safety element, which cannot be reused even if it is cleaned up.

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

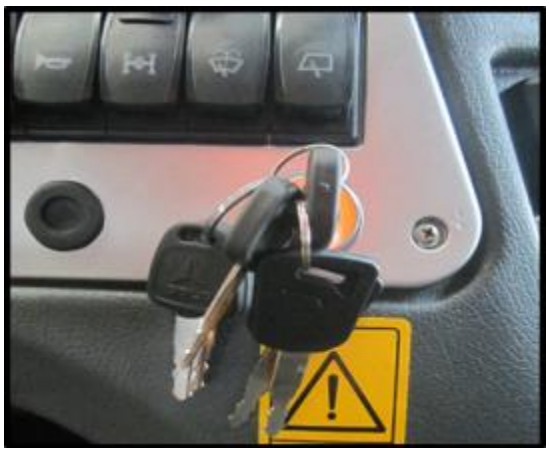


Fig.3-35

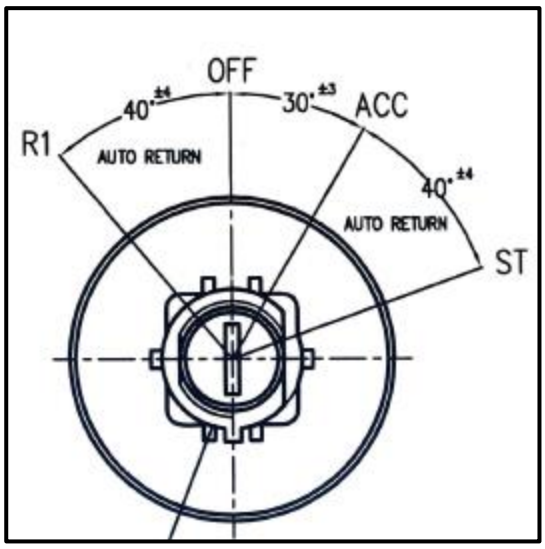


Fig.3-36

3.4.2 Engine start

1) Power operation

The main power switch is located outside the battery box of frame side rail and key switch positions are given in the table below.

Position	Usage	Remarks
LOCK	Power of the vehicle.	The key can be pulled out at this time.
ACC	Power on consumers when the vehicle is parked./Driving position	
START	Start the engine.	Auto reset to ACC gear

Turn on the main power switch and turn the key switch to ACC 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 ACC 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 OFF, 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 30 s.

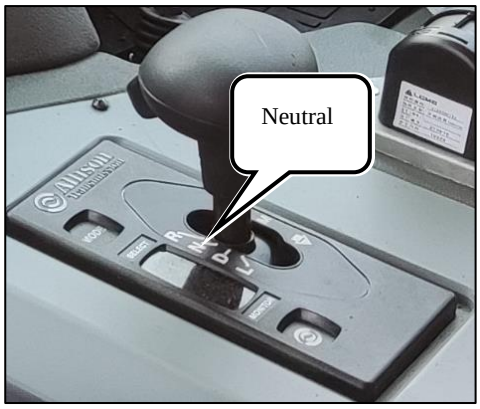


Fig.3-37

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.

4) 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:

1. To start the engine, run it at idle speed for 3-5 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 of supercharger.

2. To shut down the engine, always run it at idle speed for 3-5 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.

3. 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.

Caution：

1) **Engine starting should be idle for 3 to 5 minutes, not press the accelerator pedal too deeply, standby oil pressure and oil temperature after normal load (especially cold start), otherwise it is easy to make the turbocharger bearing and seal ring wear early due to lack of oil .**
2) **When engine flameout, must idle movement 3~5 minutes, when the supercharger rotational speed reduces, may flameout. Special attention should be paid not to throttle before flameout. Increase the engine speed suddenly will lead to the increase of turbocharger speed, then suddenly turn off, immediately stop the oil pump, and the turbocharger rotor because of inertia is still running in high speed, due to lack of oil ring soon burning rotor shaft, bearing and seal.**

3) **The engine must be pre-lubricated before restarting the engine for a long time. By removing the turbocharger into the oil pipe, from the inlet into the amount of clean lubricating oil to achieve, otherwise, the initial start will be due to lack of oil and early grinding damage to parts.**
4) **Engine flameout, vehicle parking, twist key, engine flameout, flameout, power switch can be closed.**
5) **Engine after heavy duty, the temperature is very high, should be idle running for 3~5 minutes, then flameout.**

3.5 Start-up and gearshift

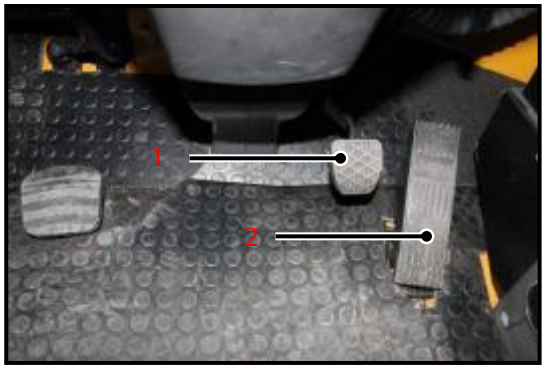


Fig.3-38

1.Brake pedal 2. Accelerator pedal

3.5.1 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.

Fig.3-39 Transmission gearshift lever

Fig.3-40

⚠ WARNING: Always start the CMT66 mining dump truck at gear 1.

3.5.2 Transmission gears and operation

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

3.5.3 Differential lock

The drive axle of CMT66 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.

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

3) Disengagement of bogie differential lock: Release the accelerator 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.3-41

Fig.3-42

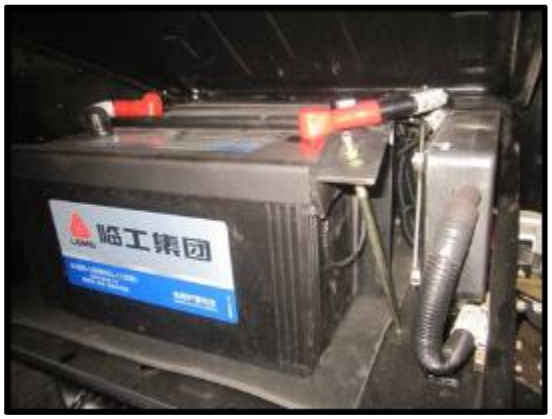


Fig.3-43

3.5.4 Cargo lifted operation

Push the lifting handle to lift the cargo.

3.6 Operation at low temperature environment

3.6.1 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.

3.6.2 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.

The drying cylinder can be replaced every six months.

3.6.3 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.

Tab 3-2

Level	pressure / speed	700	800	900	1000
14.00 -25	10	6960	7660	8340	10190
	15	6500	7150	7780	9060
	20	6380	7020	7650	8460
	25	6290	6890	7500	8300
	30	6150	6760	7370	8150
	35	6030	6630	7320	8000
	40	5790	6570	7160	7850
	45	5910	6510	7090	7700
	50	5800	6380	6950	7550
Remarks	The above data are for reference only. The specific air pressure adjustment shall be subject to Operation Instructions provided by the manufacturer.				

Steel wheels

⚠ 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 the battery, always disconnect the negative cable first!**

3.7 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 CMT66 wheel rim bolt to a torque of 830±83 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).

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

3.8 Running-in of new vehicle

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

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

5) 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.

6) 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 gelatinizes 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

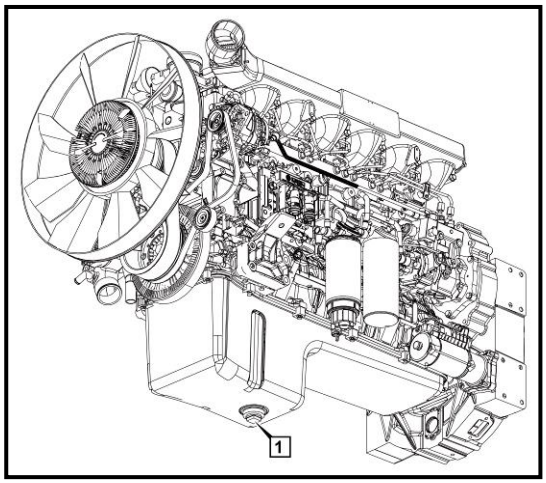


Fig.4-1 Drain plug

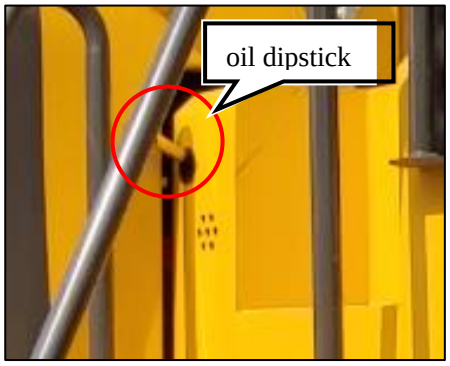


Fig.4-2 Oil dipstick

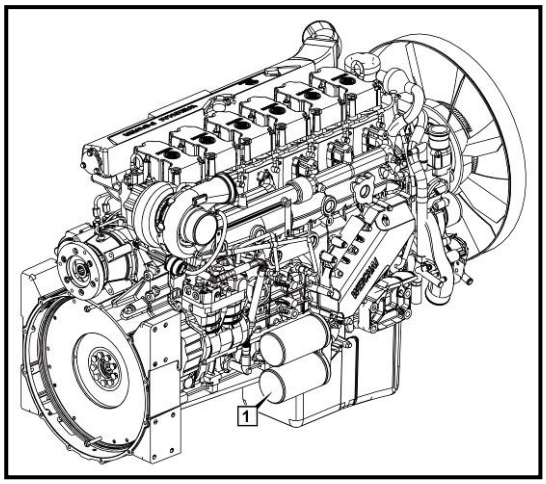


Fig.4-3Engine front

1. Oil filter

4.1 Operation and maintenance of engine

4.1.1 Operation and maintenance of engine

See Operation and Maintenance Manual of WP13 Series Diesel Engine for details

4.1.2 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 CMT66 mining dump truck”; while over the limited period (mileage) of the mandatory maintenance, refer to the interval specified in Operation and Maintenance Manual of Wp13 Series Diesel Engine for replacement.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 CMT66 mining dump truck”; while over the limited period (mileage) of the mandatory maintenance, refer to the interval specified in Operation and Maintenance Manual of WP13 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 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 unlubricati 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.

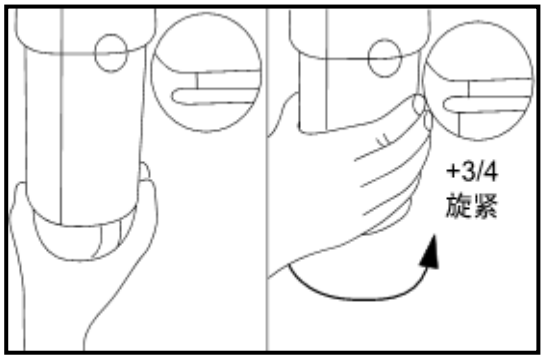


Fig.4-4 Change the Oil filter

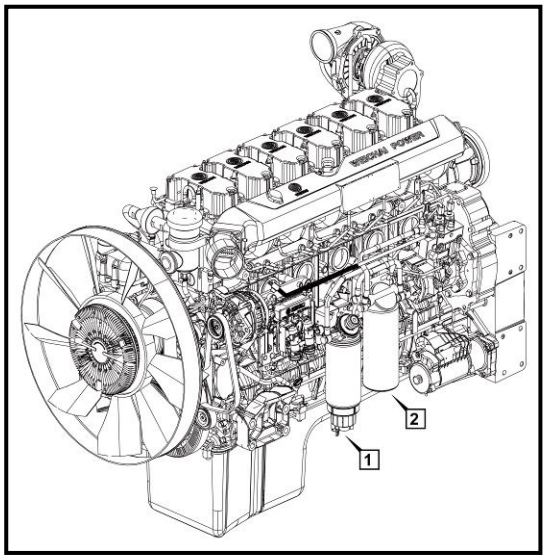


Fig.4-5 Fuel filter

1.fuel preliminary filter 2.secondary fuel oil filter

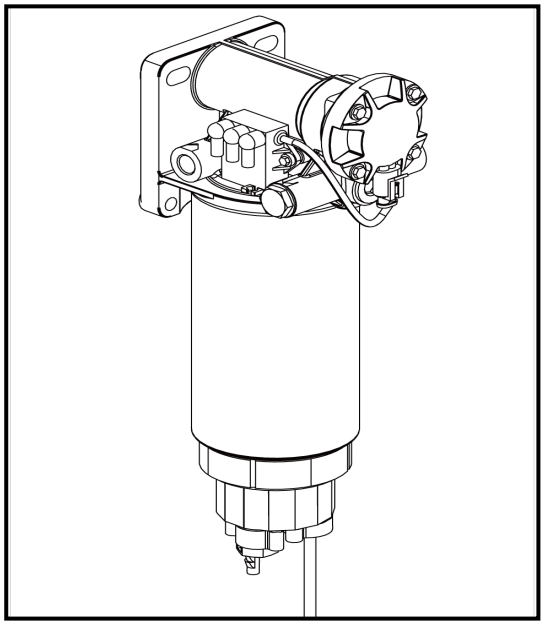


Fig.4-6 Fuel primary filter

2) Oil filter

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 CMT66 mining dump truck”. 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”.

4) Fuel primary filter

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

Fig.4-7

4.2 Operation and maintenance of intake system

In view of industrial and mining environment, air intake system is equipped with Donaldson Filter for its powerful three-level filtration, so as to ensure the reliability of air intake system.

Donaldson Filter consists of air intake system and filter element group, etc. And the filter element group of Donaldson includes the end cover, master filter element, safety filter element and dedusting valve.

4.2.1 Donaldson air filter

More efficiency of filtration and more capacity of dust;

Improve the operation and maintenance, the filter element is of high filtration efficiency and convenient for clean, with less weight and smaller in size;

Enhance engine protection mechanism, no moving, inflation, shrinkage or bulge of filter element.

4.2.2 Service and maintenance of Donaldson air filter

The outer filter element shall be maintained in case of the indicator alarm or every 200~250 hours of operation (the inner filter element is not allowed to be maintained). Maintenance method:

1）Stop the engine, check the dust discharge valve for damage and replace if damaged. Check if the pre-filtered swirl tube is clogged and clean it if clogged. Open the latch and remove the housing for the maintenance of end cap.

2) Pull the filter element out of the housing. For the side maintenance type product, the fixed seal of filter element must be loosened first. Tilt the filter element by about 5°with the handle, and press down the filter element to loosen the seal of filter element.

3）Check the safety filter element and do not remove it unless the safety filter element is damaged or needs to be replaced. Note: The safety filter element only needs to be replaced when the main filter element is replaced for the third time.

If it is necessary to replace the safety filter element, pull the filter out at an angle with the handle on the safety filter element.

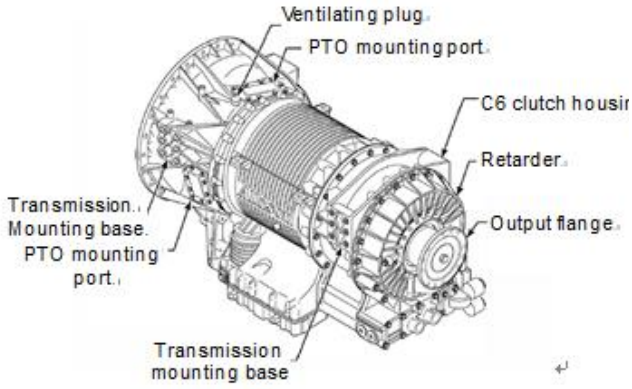
4)The filter core should be replaced in case of the following situations:

① The outer filter core has been damaged

② After installing the cleaned outer filter element, the indicator still gives an alarm:

③The outer filter core has been cleaned up to 5 times.

Note: The safety filter element is not allowed to be cleaned and shall be replaced together with the outer filter element at the same time.



Outside drawing of 48000RS_PR automatic transmission

4.3 Transmission use and maintenance

Allison automatic transmission is selected for the vehicle. The transmission has the following advantages:

a) Hydraulic torque converter equipped with integral torsional damper starts smoothly without clutch wear.

b) Optimized gear shifting procedure and speed ratio as well as smooth gear shifting torque control protect engine and transmission system and improve the fuel economy.

c) Rear integrated hydraulic retarder ensures driving safety, prolongs the service life of wheel brakes and effectively saves the cost.

d) The optimized gear train has stronger bearing capacity at a low speed.

e) Easy operation reduces labor intensity and improves driving safety.

Reduce vehicle operation and maintenance costs, especially for driving under poor road conditions and drivers with insufficient driving experience.

4.3.1 Hydraulic Torque Converter

The torque converter multiplies the torque of the engine and smoothly and rapidly transmits continuous power to the wheels.

The torque converter is mainly composed of pump wheel, turbine wheel and guide wheel. In addition, it is integrated with lock-up clutch and torsional damper. The pump wheel is driven by the engine, the guide wheel is a torque increasing component, and the turbine wheel is an output component.

When the pump rotating speed is higher than the turbine rotating speed and the stator is stationary, the torque converter multiplies the torque. When the turbine speed approaches the pump wheel speed, the guide wheel starts to rotate with the pump wheel and the turbine wheel. At this time, the torque will no longer increase, and the torque converter has the same function as a hydraulic coupler.

Lockup clutch/torque damper is engaged and disengaged according to electronic signals from TCM. The engagement of the lockup clutch causes the engine to directly drive the transmission input.

To reduce the power transmission loss of the torque converter, the fuel is used to the maximum extent to obtain the best speed. The lockup clutch disengages at a low speed or when TCM detects the need for disengagement. The torque damper absorbs the torsional vibration of the engine and prevents the torsional vibration of the engine from being transmitted to transmission components (clutches, etc.) or being fastened to the components on the transmission.

4.3.2 Planetary Gear Sets

The mechanical gear ratio and the direction of vehicle travel are both determined by a series of three-helix normally meshed planetary gear sets and shafts. The planetary gear set is controlled by five multi-plate clutches that work in pairs to produce six drive speeds and one reverse speed. According to the electronic signals transmitted from the transmission control module (TCM) to the appropriate solenoid valves, the clutch is engaged or disengaged with the hydraulic pressure as the driving force.

4.3.3 Hydraulic Retarder (Optional)

The built-in retarder is located at the output end of the transmission and consists of a blade rotor rotating in a blade chamber. The rotor is driven by the output shaft through splines. When the retarder is activated, the oil in the accumulator flows into the retarder cavity. Pressurized oil in the cavity interacts with rotating blades and stationary blades to slow down the rotation speed of the retarder rotor and output shaft, thus slowing down the vehicle or limiting the downhill speed.

When the retarder does not work, all the oil in the retarder cavity is discharged into the energy accumulator.

4.3.4 Cooling System

⚠ Warning: Do not use water that does not contain the correct cooling additive, because such water cannot provide enough boiling and freezing protection and may cause corrosion to the cooling system of the engine.

Transmission oil is cooled by a split-type oil cooler. The connection of cooling lines is in front of or behind the transmission to facilitate the installation of split cooler lines. On retarder models, only the rear cooler port can be used.

It is recommended to use antifreeze produced by Lingong Group as the cooling medium.

Inspection Before and After Operation

Daily Inspection

To prolong the service life of the transmission to the greatest extent, a thorough external inspection is required in daily use. Looking around and under the vehicle, check the condition of all major components and find out if there are any of the following faults:

a) Loose bolts

b) Transmission oil leakage

c) Electrical wiring harness is damaged, worn or improperly routed

d) Harness connector is worn or damaged

e) Damaged or worn parts

f) Hose movement or wear

g) The transmission is impacted or has signs of damage, the vent plug is blocked or dirt (soil, etc.) accumulates. All dirt, debris and sundries are removed. After inspection, report any condition requiring maintenance to the maintenance site to ensure the completion of all maintenance to meet the different requirements for power and economy.

1) Inspection Before Operation

a) Inspect hoses, pipes and pipelines

b) Inspect the oil level of the transmission.

c) Turn on the key switch to observe whether there is any error in each indicator lamp. If there is any error or warning, find the maintenance personnel to eliminate all errors. Maintenance requirements shall be implemented before each operation to ensure that the vehicle can be operated only after all maintenance has been completed.

2) Inspection After Operation

a) Loose bolts

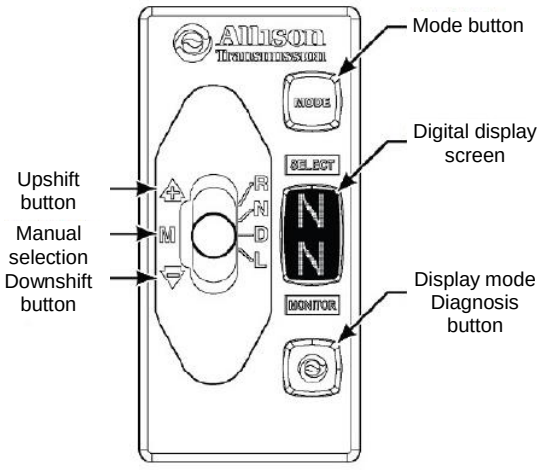
b) Check for oil leakage

c) Check for damaged parts

d) Check wire harness

e) Remove accumulated dirt

4.3.5 Use the Shift Lever



Warning:

Before changing from N (neutral) to D (drive gear) or R (reverse gear), or before switching between D and R, make sure that the brake is pressed, the accelerator is released, and the engine is idling.

1) Use the handle shifter to select gears.

- R-reverse gear: select reverse gear. Move shift lever to R position, reverse gear can be selected.
- N-Neutral: Neutral must be selected before starting the engine.

- D-Drive: Select the highest drive gear available. The transmission is automatically upshifted from the starting gear until it reaches the highest available gear when working conditions permit.
- M-Manual Shift: Move the shift lever from the D position to the manual shift position, allowing the driver to select a lower or higher drive gear within the drive range.
- When the shift lever is initially moved to the M position, the gear position is the currently obtained drive gear position, and its gear information is displayed on the display. This shift mode is also called fast preselection.

· A gear is reduced when toggling a downshift (-).

· A gear is increased when toggling a upshift (+).

· The toggle time is short - when the driver releases the shift lever, the shift lever will automatically return to the drive position.

· Switching from the drive gear position to the manual gear selection position will affect only the drive gear.

- Stopper: The handle shifter has a stopper to prevent accidental movement between R (Reverse), N (Neutral), D (Drive) and L (Low). Press the unlock button on the shift lever with your finger first, and the stopper will be unlocked before switching between these gears.

2) Basic operations

a) When the ignition key switch is turned to ON, the gear selector keyboard will display two "N" characters in the display screen, indicating that the transmission is in neutral. Selection of gear range. If the transmission needs to be shifted to the required gear, the driver must select: N means Neutral.

D means forward gear and R means reverse gear.

⚠ Note: If the engine speed is higher than 900rpm, the transmission is prohibited from changing from neutral to drive or reverse gear.

b) Description of N gear (neutral): when starting the engine, checking vehicle accessories and idling for a long time (more than 5 minutes), please use N gear. When N gear is selected, the digital display screen displays "N". Be sure to select N gear before shutting down the engine.

⚠ Note: When starting the engine, make sure that the service or parking brake is used. Failure to use the brakes may cause the vehicle to move accidentally. The foot brake, parking brake or emergency brake must be used to prevent the vehicle from moving accidentally when N gear is used at any time. If the vehicle can slide down in gear N, the engine will lose its braking function and the vehicle may lose control. N-gear sliding may also damage the transmission. Therefore, to avoid personal injury and property damage, the vehicle is not allowed to slide in the N gear.

c) Description of D gear (drive gear): when D is selected, the transmission obtains the lowest gear calibrated by the program. With the increase of vehicle speed, the transmission will automatically upshift in sequence. When the vehicle speed decreases, the transmission automatically downshifts in sequence. The display shows the highest gear available for the transmission.

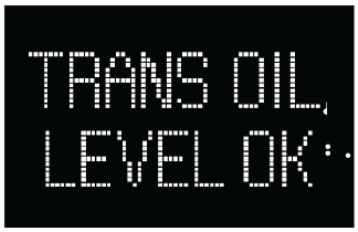
d) Description of R gear (reverse gear): before switching from drive gear to R gear or from R gear to drive gear, the vehicle must be stopped, and the engine must be at idle speed. To select reverse gear, the driver must select R gear. Display screen shows the target gear "R2".

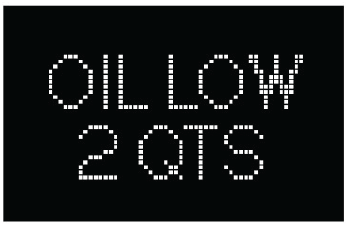
⚠ It is forbidden to directly change from D gear to R gear.

e) Select the required gear by pulling the handle, and the selected gear will be displayed on the display screen. If the lower gear is selected in time, the transmission may not downshift until the vehicle speed decreases.

f) There are several situations when the target gear flashes to prevent the transmission from shifting into the target gear. When this happens, the target gear value will flash, and the transmission will not be changed to the selected gear. The situations that prevent shifting into the target gear include:

- Engine speed is too high
- Drive train effect
- PTO effect
- Driving speed is too high
- Influence of programmable parameters
- Neutral gear shift suppression
- Shift from parking brake to neutral
- Direction suppression
- After the automatic shift into neutral gear meets the switching and speed requirements, the





- transmission will shift normally. Some situations may require the driver to select the neutral (N-gear) range and then reselect the target gear to shift the transmission into this gear.

3) Regular oil level inspection

Oil level check is performed by using a shifter, and the transmission shift panel allows the driver to check the transmission oil level from the shifter using an electronic oil level sensor (built-in to the transmission).

To start an oil level inspection, the vehicle should meet the requirements below:

1. The engine is idling (500-800rpm)

2. The vehicle is located on the horizontal ground.

3. The vehicle is stationary, and the transmission output shaft does not rotate.

4. The transmission is in neutral

5. Waiting for about 2 minutes to allow the oil to fully flow back to the oil pan. Once the fluid level request is initiated, TCM will notify the status.

6. Start the transmission oil level check when the transmission oil temperature is 71-93℃, and the handle shifter will press the DMD button once. This action will start the two-minute timer. After the two-minute countdown is completed, one of the following items will be displayed on the gear display.

Display Screen	Description (Unit: Quarts, Quarts =1.136 Liters)
OiL LOW-XX	Oil level is lower than XX
OiL HI-XX	Oil level is higher than XX
Oil Level OK	Appropriate oil level

When the conditions for oil level inspection are not met, invalid display information will be activated. Please refer to the following table for details.

Code	Description
SETTLING / X	Oil level settling time is too short
ENGINE RPM/ TOO LOW	Engine speed is too low
ENGINE RPM/ TOO HIGH	Engine speed is too high
MUST BE/ IN NEU	It must select neutral
OIL TEMP/ TOO LOW	Oil pan temperature is too low
OIL TEMP/ TOO HI	Oil pan temperature is too high
VEH SPD / TOO HI	Output speed is too high
SENSOR FAILED	Oil level sensor failed

Use a dipstick to check the transmission oil level

1. The engine is idling (500-800rpm)

2. The vehicle is located on the horizontal ground.

3. The vehicle is stationary, and the transmission output shaft does not rotate.

4. The transmission is in neutral

Detailed steps for oil level detection with specific oil dipstick:

(1) When it is not sure whether the transmission has enough oil, do not start the engine. At this time, a cold test should be carried out, i.e. the transmission oil level should be checked with an oil dipstick. If the oil level is below the cold minimum oil level, add it to the cold minimum oil level, then start the engine to run at idle speed for one minute, switch to drive gear D, switch back to gear N, and switch back to gear R to exhaust the air in the oil circuit. After that, screw out the oil dipstick and wipe it clean, then insert the oil

dipstick into the oil filling pipe, press until there is no air at the bottom and pull it out. At this time, the oil dipstick is still loose or not tightened. Pull out the dipstick to read the liquid level. If the liquid level is within the "cold state check" range, the oil level meets the requirements. If the liquid level is not within the "cold state check" range, some oil should be added or removed as required.

(2) Start the engine to continue idling. When the transmission oil temperature is 71-93℃, inspection at thermal state can be performed. If the liquid level is within the "thermal state inspection" range, the oil level meets the requirements. If the liquid level is not within the "thermal state inspection" range, some oil should be added or removed as required.

Regularly compare the oil level measured with a gear selector with the oil level measured with a dipstick to ensure the reliability of the measured value.

Check the oil level at least twice, and the oil level inspection results must be consistent or approximate.

⚠ Note: When drawing out the oil dipstick, pay attention to prevent the oil from flowing back downwards at the end. When inserting the oil dipstick back into the transmission, clean the oil dipstick to prevent the oil from being contaminated.

⚠ Note: During inspection, hot oil or hot parts may cause injuries, so do not let hot oil or parts contact your skin.

⚠ Note: The manually measured value of the

dipstick should be compared with the reading of the electronic oil level regularly to ensure the comparability of the results provided by the two methods.

4) Operation to reduce the vehicle speed

Hydraulic retarder controlled by handle:

The retarder can be controlled by toggling the handle to realize the OFF and gear shifting of the retarder. Stepless control is to realize stepless shift of retarder gear with the change of handle angle. Its control mode is similar to that of stepped control, except that the handle rotates continuously to output continuous stepless control signals to the retarder. When using the retarder, the following points should be noted to help ensure drive safety:

- When ABS is activated, the retarder will not engage. If ABS is activated when the retarder is activated, the retarder will be turned off;
- If the engine speed exceeds the specified limit, the retarder will not engage. If the engine speed reaches or exceeds the specified limit after the retarder is combined, the retarder will continue to work to help the vehicle decelerate;
- The retarder function cannot be felt until the retarder operates for about 1 second. The driver should anticipate this delay to avoid unnecessary use of brakes;
- If the handle of the retarder does not return to the OFF position, the retarder will be closed when the driver steps on the accelerator. When the accelerator is released, the retarder will work again.
- Do not use retarder when roads are wet and slippery, such as snow, ice and rain. The use of a

retarder on slippery roads may cause the vehicle to lose control.

- When the transmission oil is overheated, the performance of the retarder decreases to protect the transmission.
- Low transmission oil level will reduce the retarder performance;
- If the engine cooling system overheats during retarder operation, it may be related to the engine cooling system pressure, coolant level and engine speed. Overheating of the normally operating engine cooling system when the retarder is activated may be related to application and environmental conditions. In this application situation, the driver needs to lower the retarder gear and combine the service brake.
- When the rotating speed of the transmission shaft is less than 300 rpm, the retarder will automatically stop working. The engine can be used to reduce the vehicle speed;
- When driving downhill, the vehicle speed can be better controlled by using the reversing drag effect of the engine. To control the vehicle speed by using the engine reverse drag brake, it is necessary to select a lower gear, which can make the engine generate a larger braking force. When the vehicle load is large, and the ramp is steep, it is necessary to select a lower gear in advance before the vehicle reaches the ramp. If the vehicle speed continues to increase and the engine speed exceeds the limit, the transmission will automatically move to the next higher gear. If the vehicle speed is too high, the foot brake or other deceleration devices (such as a retarder) should be used to decelerate the vehicle. When using engine braking, deceleration devices such

as downshift, foot braking and retarder should be combined to prevent the whole vehicle from losing control. When the vehicle speed increases, the engine speed exceeds the current gear limit and the transmission upshifts, then the engine braking effect will be weakened, and the vehicle speed may be out of control. Therefore, other braking devices such as foot brake or retarder should be used in time to prevent the engine speed from exceeding the limit value when the vehicle speed is too high.

5) Start at a low temperature

If the oil temperature sensor (TFT) of the transmission detects that the oil temperature of the transmission is lower than -7℃, the transmission program is set to start at the 3rd gear.

When starting at low temperature, the transmission oil needs to be preheated. If the temperature is lower than -25℃, please allow the engine to be preheated for about 20 minutes after starting the engine.

The oil temperature is too high

When the transmission oil temperature exceeds the following temperature range, the temperature is deemed to be too high:

Oil pan fluid temperature	121 ℃
Oil temperature at cooler inlet	49 ℃
Oil temperature of retarder oil outlet	165 ℃

The continuous temperature of standard oil pan is 93 ℃.

If the engine thermometer indicates that it is in a high temperature zone, the transmission may be overheated, and the vehicles needs to be stopped and the cooling system needs to be checked. If the cooling system

works normally, place the transmission in N (neutral) gear so that the engine runs at 1200 - 1500 rpm. This can reduce the temperature of transmission and engine to normal working level within 2-3 minutes.

If the temperature of the transmission and the engine cannot drop, please reduce the engine speed. If the engine temperature indicates a high temperature, it indicates that there is a problem with the engine or radiator. Shut down the engine and ask maintenance personnel to check for overheating.

6) Driving on icy and muddy roads

When driving on icy, snowy and silty roads, high-speed driving or using the retarder may cause wheel slip or out of control due to the decrease of road adhesion, so please turn off the retarder when driving on such roads, and it is better to reduce the speed and choose a lower gear before the wheel loses adhesion. When accelerating or decelerating, it should be operated as slowly as possible to prevent wheels from slipping or losing control.

When the vehicle is stuck in mud, sand or snow, it may be solved by the following steps:

Switch to drive gear D and keep throttle down (do not fully release the throttle);

When the vehicle moves forward as long as possible, step on the foot brake of the vehicle;

When the engine is turned to idle, select reverse gear R; release the foot brake and keep the throttle down so that the vehicle can move as long as possible under reverse gear R.

Step on the foot brake again to return the engine to idle speed. If the vehicle can be moved a greater distance after each change of direction and gear, this operation can be repeated in drive gear D and reverse

gear R until the vehicle leaves.

7) Downhill operation

When the vehicle goes downhill, if the slope is small, the vehicle speed can be controlled by matching with the engine braking, and when it goes downhill, appropriate gear can be used. Meanwhile, start the retarder to control the vehicle speed. If the slope is too long or too steep, the retarder must cooperate with foot brake to control the speed when the braking force is insufficient, and it is forbidden to use the retarder for braking when the oil temperature is too high. When the vehicle goes downhill backwards, the foot brake must be used to ensure safe and stable driving speed. Do not slam the brakes on or start suddenly.

8) Parking brake

The parking brake system can prevent the vehicle from moving after the engine is turned off.

When the driver leaves the cab and the engine is running, the transmission must be placed in N gear and the parking brake must be fully activated.

After the engine is turned off, when the driver leaves the vehicle, the transmission must be placed in neutral N and the parking brake must be applied. Since there is no direct mechanical connection between the transmission output shaft and the engine after the engine is turned off, if the parking brake is not applied, the vehicle may move.

9) Precautions for towing and sliding

Since the automatic transmission oil pump is driven by the engine, the oil pump will change correspondingly with the change of engine speed. The oil pump in the transmission has many functions, one of which is to provide lubricating oil. Attention must be paid if there is no engine speed (when towing) or if

it is lower than the expected speed (when sliding).

When towing, the drive shaft must be disconnected from the transmission, or the drive axle must be lifted off the ground, or the drive shaft of the drive wheel must be removed.

⚠ It is forbidden to slide in neutral gear.

⚠ It is forbidden to start the engine by dragging.

⚠ Note: The transmission must be placed in neutral before the engine is turned off.

Repair and Maintenance

1) Regular inspection

Regular inspection is very important for automatic transmission. Possible problems can be found in advance. It mainly includes oil level inspection of transmission, inspection of connection of transmission with complete vehicle circuit and hydraulic pipeline, and status inspection of the cooling system of the vehicle.

During inspection, the transmission shall be kept clean. The main inspection items are:

(1) Check for loose bolts, and pay attention to attachment installation and box installation bolts;

(2) If there is an auxiliary support system on the transmission, check whether the installation is reliable and whether there is motion interference;

(3) Check the transmission and pipelines for oil leakage;

(4) Check the transmission wiring harness, the connection wiring harness between the transmission and the whole vehicle, whether the interface is loose and whether the harness is firmly fixed;

(5) Check whether there is enough coolant flowing into the oil cooler in the engine cooling system and whether there is enough transmission oil flowing into the oil cooler to judge whether the oil cooler is normal;

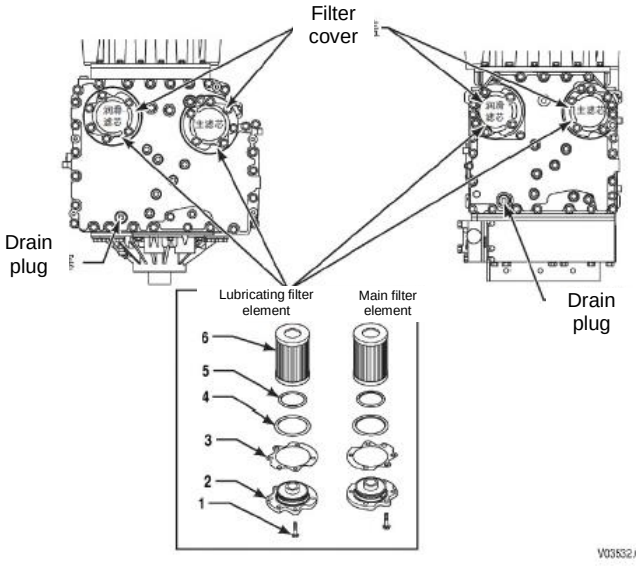
(6) Inspection of engine cooling system performance can be conducted according to relevant maintenance requirements of OEM and engine manufacturers to ensure that the cooling system can provide sufficient cooling capacity.

If any abnormal situation is found during the inspection, the relevant maintenance personnel shall be notified in time.

⚠ Note: If the service personnel can be notified in time for the following situations, the expansion of minor faults can be prevented:

(1) Abnormal shift impact and frequent shift occur during gear shifting.

(2) Oil leakage or seepage in transmission box, oil cooler, oil pipe, etc.



(3) Abnormal sound from transmission;

(4) Diagnostic warning lights are frequently lit.

2) Change the transmission oil

(1) Drain the transmission oil when the oil pan is at the normal working temperature of 71-93℃. Hot oil flows faster and is discharged more thoroughly.

(2) Remove the drain plug from the oil pan and drain the oil into a suitable container.

(3) Check the transmission oil for pollutants.

3) Replace the filter element

(1) Remove 12 bolts 1, two filter covers 2, two gaskets 3, two O-rings 4, two O-rings 5 and two filters 6 from the bottom of the control module.

(2) When reinstalling parts, lubricate new O-rings 4 and 5 and install them on each cover. Lubricate the O-rings in filter 6 and push the filter onto each cover 2. Install a new gasket 3 on each cover 2 and align the bolt holes in the gasket with the holes in the cover.

(3) Install the filter cover assembly into the filter compartment. Align each filter/cover assembly to the bottom holes of the control module. Push the cover assembly into the sealing seat by hand.

(4) Install 6 bolts for each cover and tighten them to 51-61 Nm.

(5) Replace the O-ring of the drain plug, reinstall the drain plug, and tighten it to 25-32 Nm.

(6) Refill the transmission oil.

Maintenance cycle

Oil Type	Oil Replacement Cycle	Replacement Cycle of High Efficiency Filter Element/Main Filter Element/Lubricating Filter Element	Replacement Cycle of Oil Absorption Filter Element
TES 295	First come first serve basis as the evaluation standard: 240,000 km 6000 hours 48 months Note: Replace the main filter element and lubricating filter element whiling changing oil.	First come first serve basis as the evaluation standard: ·When the oil goes bad ·120,000 km ·3000 hours ·36 months	When the transmission is overhauled
TES 389	20000 km (12000 miles) 500 hours 6 months Note: Replace the main filter element and lubricating filter element whiling changing oil.	First come first serve basis as the evaluation standard: ·When the oil goes bad ·20,000 km ·500 hours ·6 months	When the transmission is overhauled

Fault Codes of Allison Transmission

Fault Code	Description	Fault Lamp Illumination	Description of Inhibition Operation
C1312	The reading of retarder request signal input by TCM is low	No	If J1939 data is not used to transmit the retarder request signal, operation of the retarder may be inhibited.
C1313	The reading of retarder request signal input by TCM is high	No	If J1939 data is not used to transmit the retarder request signal, operation of the retarder may be inhibited.
P0122	Throttle position sensor output voltage is low	No	Use default throttle data. Freeze shift adaptation function
P0218	The transmission oil temperature is high.	Yes	Use default oil pan temperature
P0562	System voltage is low	No	Inhibit (TCC) lockup clutch operation, DNA (inhibit adaptive function)
P0602	TCM has no program	Yes	The transmission is locked in neutral.
P0604	Control module random access memory (RAM)	Yes	The transmission is locked in neutral.
P0614	Torque control data doesn’t match-ECM /TCM	Yes	Only the transmission is allowed to operate in 2nd gear and reverse gear.
P0634	TCM internal temperature is too high	Yes	Solenoid valve off (default hydraulic state)
P0642	The reference voltage of sensor "terminal A" loop is low.	Yes	Use default sensor data

P0643	The reference voltage of sensor "terminal A" loop is high.	Yes	Use default sensor data
P0657	HSD1 (No.1 high-side drive) input voltage loop is open	Yes	Solenoid valve off, DNA, inhibit TCC operation, inhibit main modulation solenoid valve working
P0658	HSD1 (No.1 high-side drive) input voltage loop is low	Yes	DNS (no shift), solenoid valve off (default hydraulic state)
P0659	HSD1 (No.1 high-side drive) input voltage loop is high	Yes	DNS (no shift), solenoid valve off (default hydraulic state)
P0703	Vehicle brake signal line failure	No	For garbage trucks with automatic neutral function, it is impossible to shift from neutral to drive gear. If there is a TPS active fault code, TCM inhibits retarder operation.
P0708	Transmission gear sensor circuit input is high	Yes	Ignore defective output of bar shifter
P070C	Transmission oil level sensor circuit reading is low	No	None
P070D	Transmission oil level sensor circuit reading is high	No	None
P0712	Transmission oil temperature sensor circuit reading is low	Yes	Use the default oil pan temperature
P0713	Transmission oil temperature sensor circuit reading is high	Yes	Use the default oil pan temperature
P0715	Turbine speed sensor circuit signal discontinues	Yes	DNS (no shift), locked in current gear
P0716	Turbine speed sensor circuit is abnormal	Yes	DNS (no shift), locked in current gear
P0717	Turbine speed sensor circuit has no signal	Yes	DNS (no shift), locked in current gear
P071A	RELS input signal is abnormal (when parking, reduce the engine load function)	Yes	Inhibit RELS working (when parking, reduce the engine load function)
P071D	General input signal is abnormal	Yes	None
P0720	Output speed sensor circuit signal discontinues	Yes	DNS (no shift), locked in current gear
P0721	Output speed sensor circuit is abnormal	Yes	DNS (no shift), locked in current gear
P0722	Output speed sensor circuit has no signal	Yes	DNS (no shift), locked in current gear
P0725	Input speed sensor circuit signal discontinues	No	The default is turbine speed
P0726	Input speed sensor circuit is abnormal	No	The default is turbine speed
P0727	Input speed sensor circuit has	No	The default is turbine speed

	no signal		
P0729	Six-gear speed ratio error	Yes	DNS and TCM change gear to fifth gear, if it fails, then shift to third gear.
P0731	One-gear speed ratio error	Yes	DNS and TCM change gear to second gear, if it fails, then shift to fifth gear.
P0732	Two-gear speed ratio error	Yes	DNS and TCM change gear to third gear, if it fails, then shift to fifth gear.
P0733	Three-gear speed ratio error is DNS	Yes	DNS and TCM change gear to fourth gear, if it fails, then shift to sixth gear.
P0734	Four-gear speed ratio error	Yes	DNS and TCM change gear to fifth gear, if it fails, then shift to third gear.
P0735	Five-gear speed ratio error	Yes	DNS and TCM change gear to sixth gear, if it fails, then shift to third gear; if it further fails, then shift to second gear.
P0736	Reverse -gear speed ratio error	Yes	DNS (no shift), locked in current gear
P0741	Lockup clutch is not engaged	Yes	None
P0752	Valve core of shift solenoid valve 1 is stuck	Yes	DNS (no shift)
P0776	PCS2 is stuck in "Off" state	Yes	DNS (no shift), RPR (return to previous gear)
P0777	PCS2 is stuck in "On" state	Yes	DNS (no shift), RPR (return to previous gear)
P077F	Reverse-gear 2 speed ratio error	Yes	DNS (no shift), locked in current gear
P0796	PCS3 is stuck in "Off" state	Yes	DNS (no shift), RPR (return to previous gear)
P0880	TCM input power supply discontinues	No	None
P0881	TCM input power supply is abnormal	No	None
P0882	TCM input power supply is low	Yes	DNS, solenoid valve closed (default hydraulic state)
P0883	TCM input power supply is high	No	None

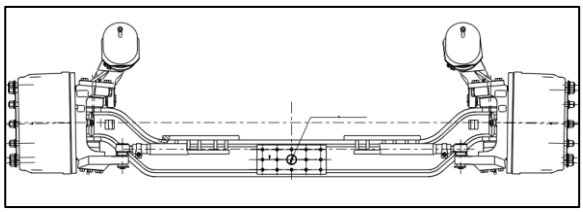


Fig 4-9 Front axle

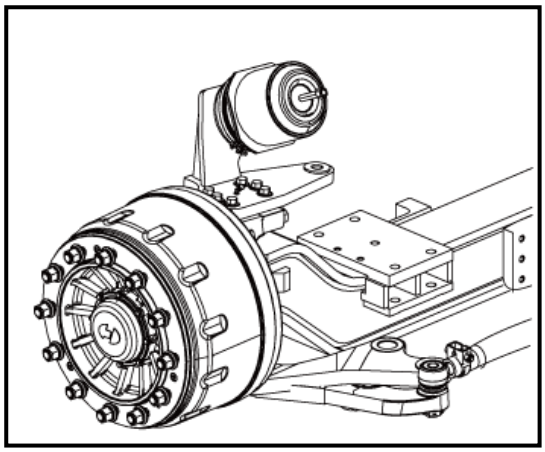


Fig 4-10 Wheel part

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

4.4 Operation and maintenance of front axle

4.4.1 The front steer axle and intermediate and rear drive axles

The front axle of the CMT66 mining dump truck is a steering axle, the middle and rear axle are two stage drive axle with “central 1st stage reducer + wheel planetary reducer”, and equipped with casting axle housing, bogie 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.

4.4.2 Operation and maintenance of front axle

1）Operation of front axle

a. 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.

b. Reminder

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

② Check and maintain the axle at specified interval.

c. Precautions for wheel replacement:

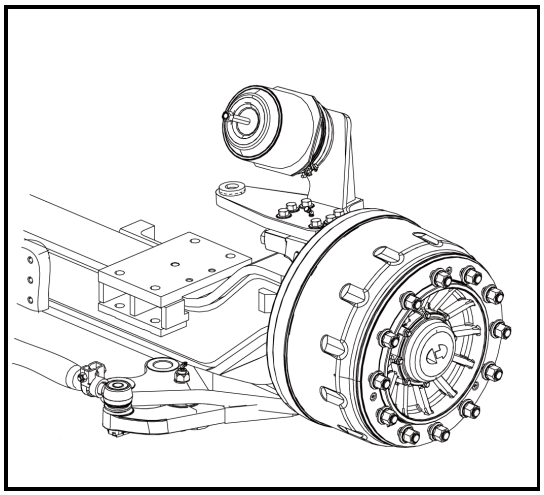


Fig 4-11 Front Axle

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

● 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.

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.

d.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 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;

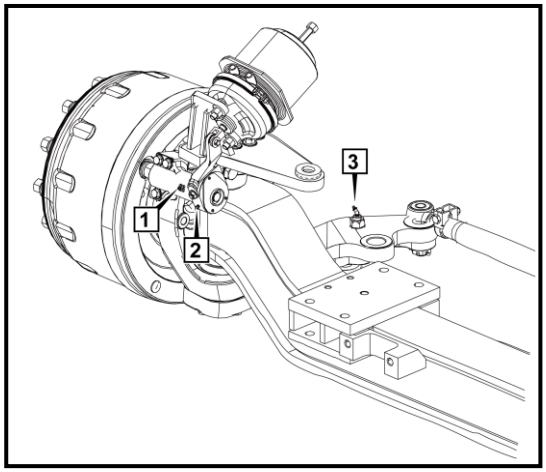


Fig 4-12 Front Axle

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

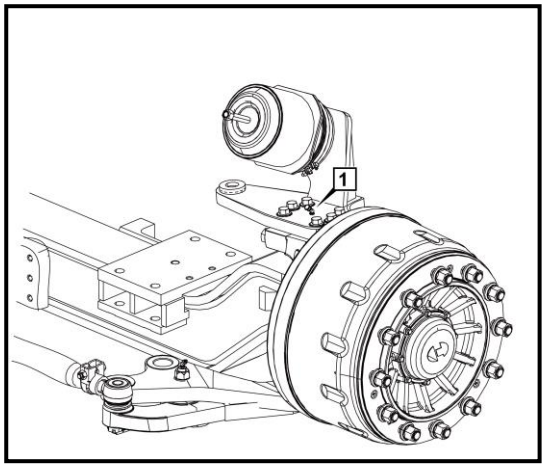


Fig 4-13 Front Axle Part

1. Upper master pin grease nozzle

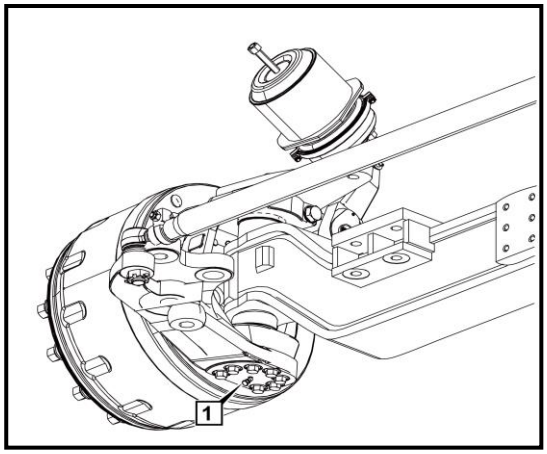


Fig 4-14 Front Axle Part

1. Lower master pin grease nozzle

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 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.

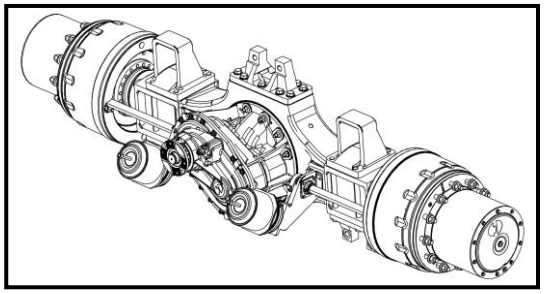


Fig 4-15 Middle axle

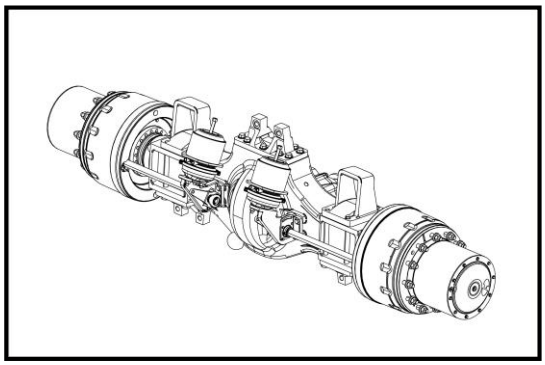


Fig 4-16 rear axle

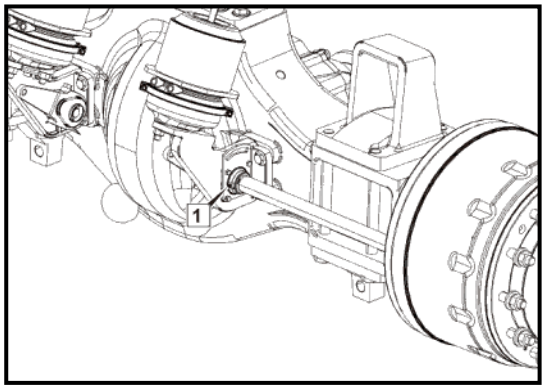


Fig. 4-17 Rear Axle Part

1. Regulating arm grease nozzle

4.4.3 Operation and maintenance of drive axle

1) Operation of axle

A. 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.

b. Reminder

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

② Check and maintain the axle at specified interval.

c. Precautions for differential lock operation:

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

d.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.

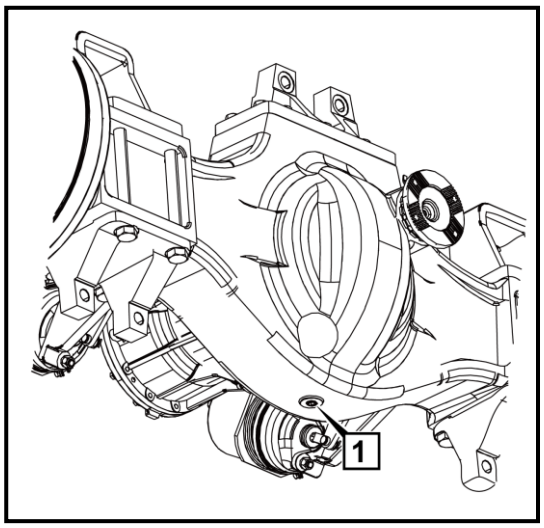


Fig. 4-18 Intermediate Axle Part

1. Drain hole

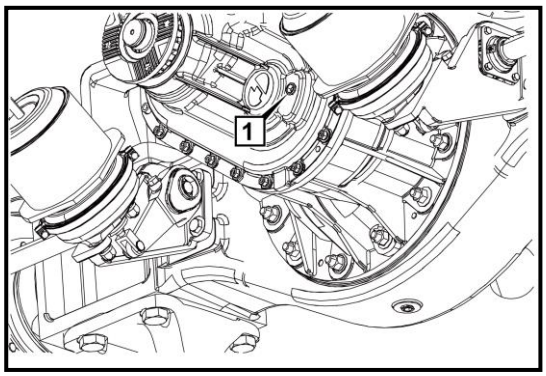


Fig. 4-19 Intermediate Axle Part

1. Oil level sightglass

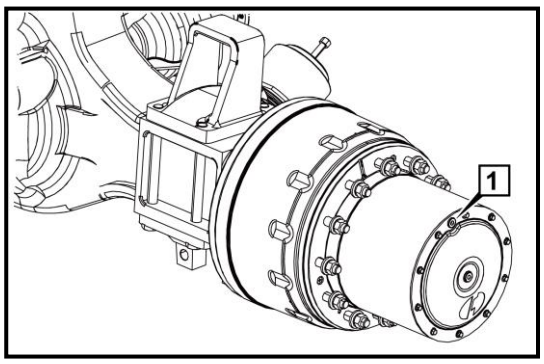


Fig. 4-20 Intermediate Axle Part

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

d. Precautions for operation of brake shoe friction plate:

① 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;

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 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 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:

① 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;

② Mixing of grease of different qualities is prohibited;

③ 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.

4.5 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 CMT66 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	M24	900N.m
Upper/ lower thrust rod bolt	M24	900N.m
Transverse thrust rod bolt (depending on actual truck configuration)	M16	300N.m

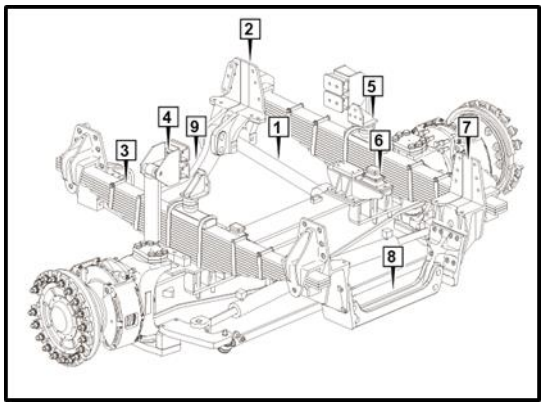


Fig. 4-21 Front suspension system

1. Front push-rod 2. Installation seat of front leaf spring 3. Damper4. Front leaf spring 5. Limited block 6. Rubber auxiliary spring 7. Installation rear seat of front leaf spring 8. The second cross bar 9. The first cross bar

Fault Analysis Table of Damper

Fault mode	Analysis and process
The damper does not work, and there is no resistance inside (the housing temperature is not high enough)	Add the appropriate oil and continue working. If the surface gets hot, it means a lack of oil inside and therewith enough oil must be added. Otherwise, the damper is invalid. Check whether the oil leakage is resulted from the damage of oil seal or the sealing washer. If it is, replace the washer.
The damper makes noises	It is resulted from the deformation of the dust proof cylinder or insufficient oil of damper for the damper collides with the leaf spring and the frame. Replace the damper or add oil.

4.5.1 Front suspension system

The front suspension system mainly consists of parallel semiellipse leaf spring, cylindrical shock absorber, stop block and front push-rod.

1) Specifications of fasteners

Application	CMT66	
	Specification	Tightening torque*(Nm)
Front spring 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	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

*** 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.**

2) Description of front leaf spring

CMT66: 15 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.

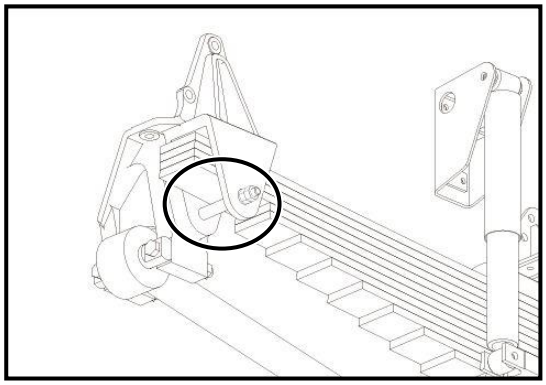


Fig. 4-22 Front seat of front leaf spring

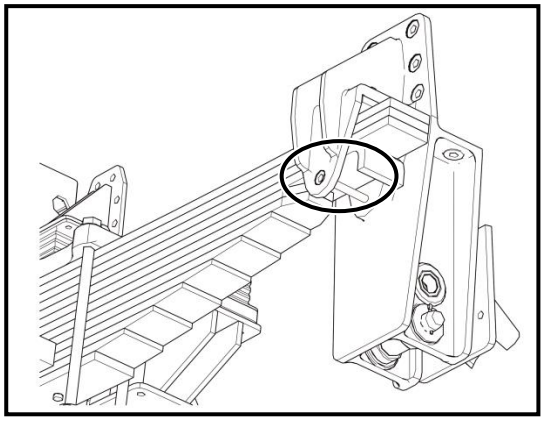


Fig. 4-23 Rear seat of front leaf spring

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 ）;

4) 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. Leaf spring 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

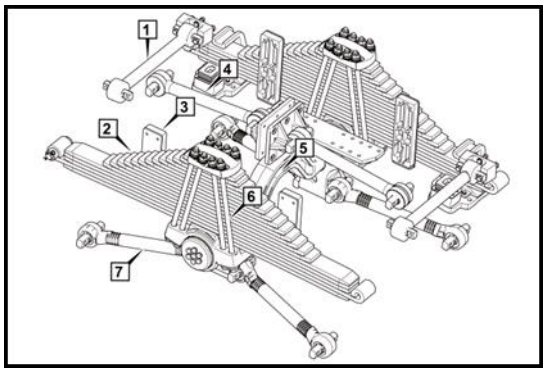


Fig. 4-24 Rear suspension system

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

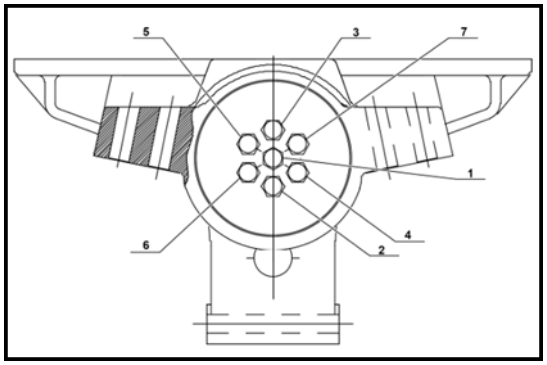


Fig. 4-25 Bolt disassembly sequence diagram

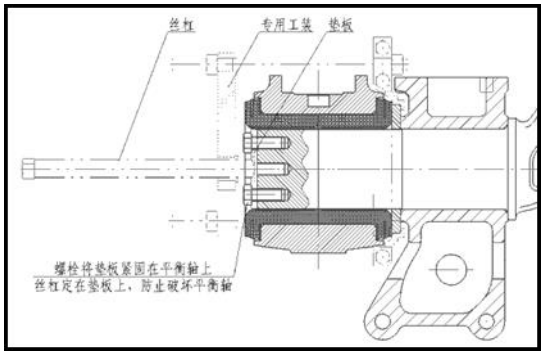


Fig. 4-26 Remove the schematic

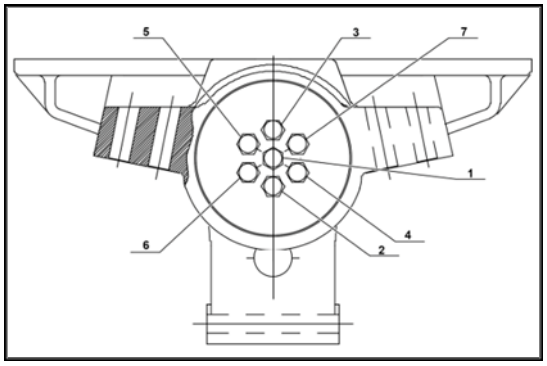


Fig. 4-27 Bolt fastening sequence diagram

absorber, immediately repair or replace it; otherwise, comfort of the truck will be greatly degraded and even serious accidents may occur;

4.5.2 Rear suspension system

The rear suspension system mainly consists of reinforced integral balance shaft, parallel semiellipse leaf spring, unilateral 4-M24 bolt, and upper/lower push rod.

1） Specifications of fasteners

Application	CMT66	
	Spec.	Tightening torque*(N.m)
Rear spring bolt and nut	M24	750±50
Stud bolt and nut	M18×1.5	373±37
Stop block bracket fixing bolt and nut	M14	140±14
Stop block fixing bolt and nut	M10	48±4
Guide plate fixing bolt and nut	M14	140±14
Push rod upper bracket fixing bolt and nut	M16	262±26

*** 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.**

2) Description of rear leaf spring

CMT66: 18 pieces in total, in which five main pieces, reinforced parallel semiellipse leaf 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.

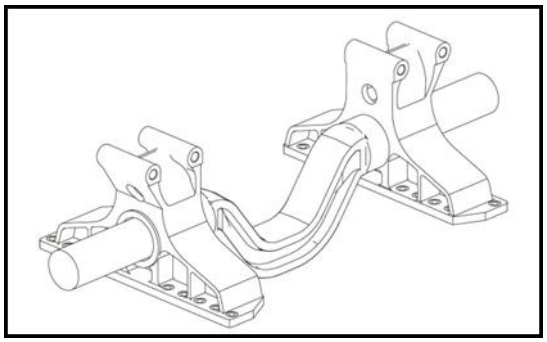


Fig. 4-28 balance shaft assembly

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 U-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.

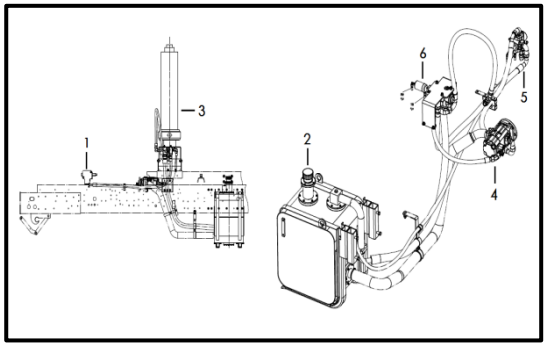


Fig.4-30 steering system Structure diagram

1. Pilot valve 2. Hydraulic oil tank 3.Lifting cylinder

4. Gear pump 5.Lifting valve

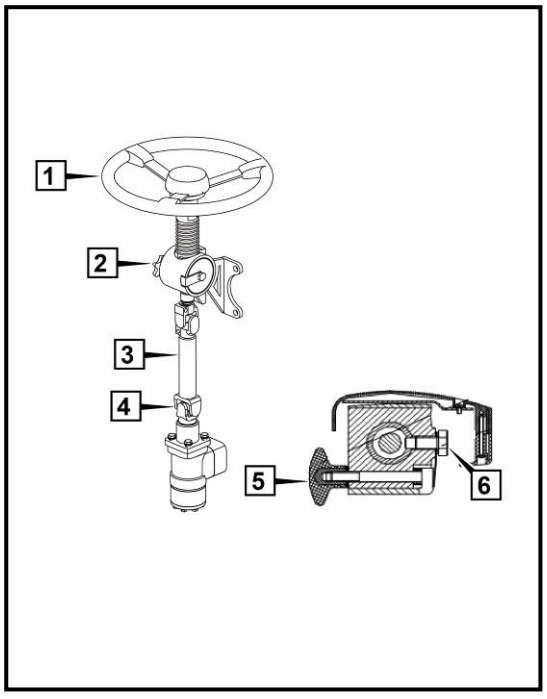


Fig.4-31 Structure Diagram of Steering

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

4.6 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 4-30. In order to adapt to harsh operating conditions, the hydraulic power steering system consists of an internal power steering system and an external power steering system.

4.6.1 Steering control system

It consists of steering wheel and steering column with adjustable height and angle. The diameter of steering wheel is Φ430 mm.

As shown in Figure 4-31, 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

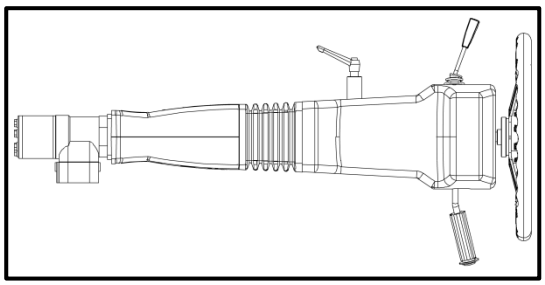


Fig.4-32 Steering wheel and steering column schematic drawing

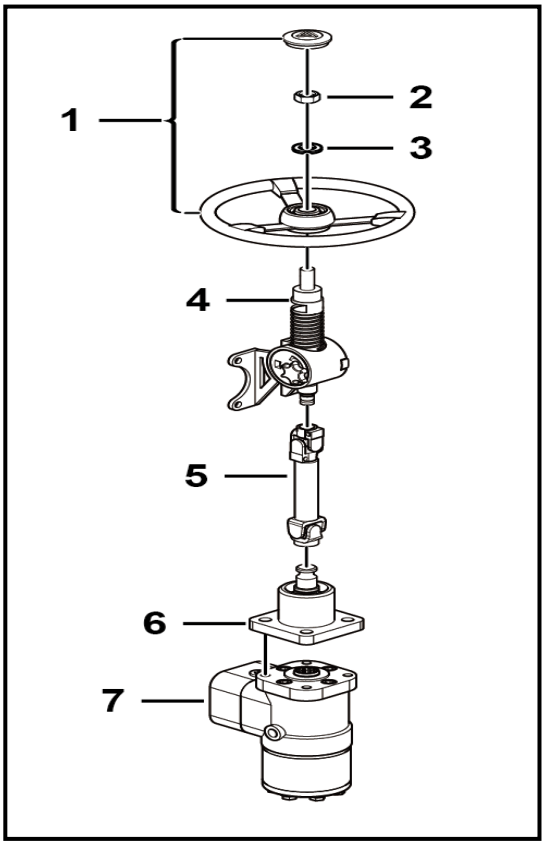


Fig.4-33

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

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 operating position, and tighten the adjusting handle .

4.6.2 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

The steering pump is a gear pump. The engine is directly connected with a power takeoff. The gear pump is at the rear 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 lifting system 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

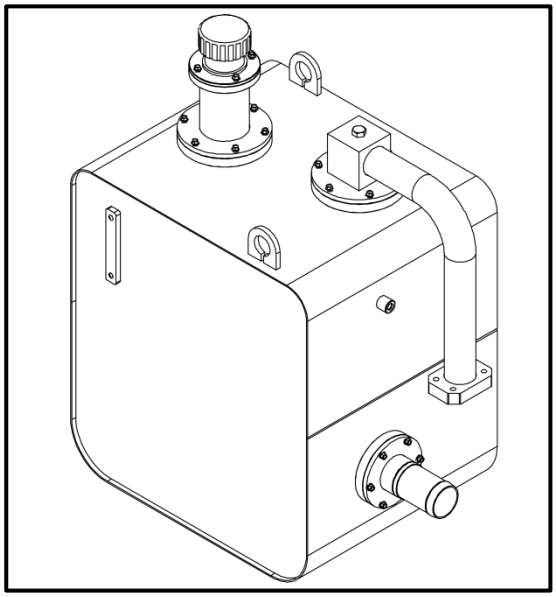


Fig.4-34 hydraulic oil tank

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
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	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

Common faults	Causes	Troubleshooting methods
	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	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

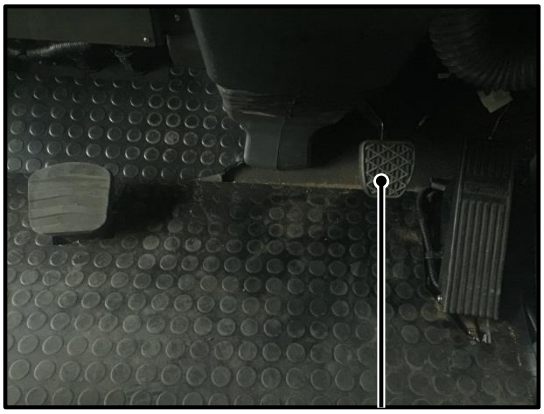


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Fig.4-35

1. Brake pedal

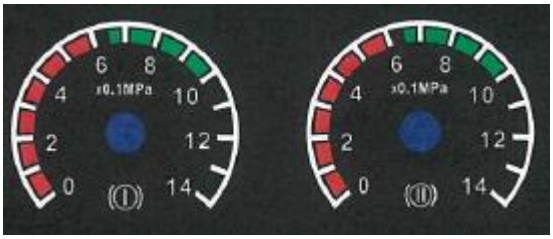


Fig.4-36 Brake pressure gauge

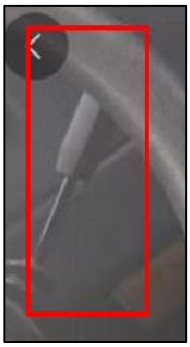


Fig.4-37 Exhauet brake handle

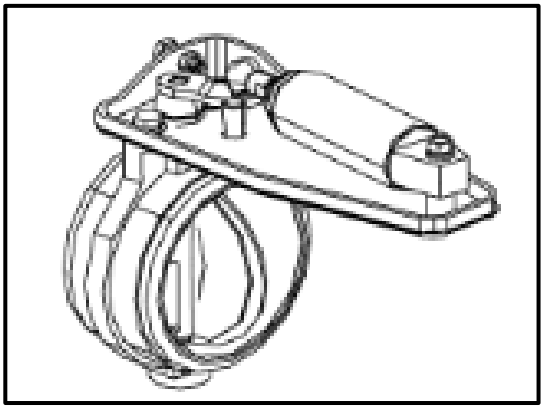


Fig.4-38 Exhaust butterfiy valve

4.7 Operation and maintenance of brake system

4.7.1 Composition of brake system

The brake system of CMT66 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 0.85 Mpa, and the disconnection pressure of pressure regulating valve is 0.95 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 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.

4.7.2 Engine exhaust brake

The CMT66 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

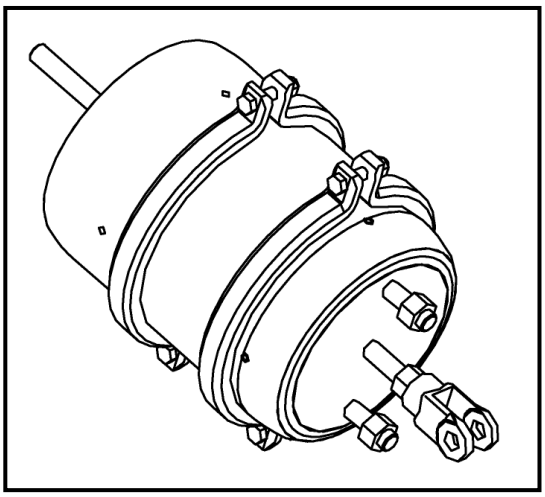


Fig.4-39 Brake chamber

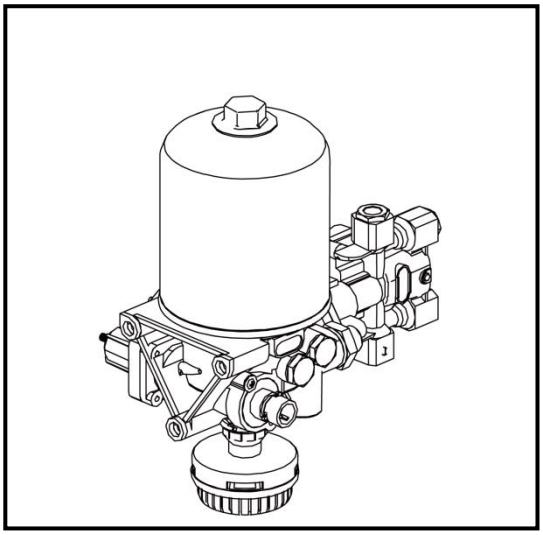


Fig.4-40 Integrated air handing unit

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.

4.7.3 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.**

4.7.4 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.

4.7.5 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.

4.7.6 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.

4.7.7 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.

4.7.8 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.

4) 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.

4.7.9 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.**

4.7.10 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.

4.7.11 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.

4.7.12 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.

4.7.13 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.

4.7.14 Brake line troubles-hooting

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.
		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.

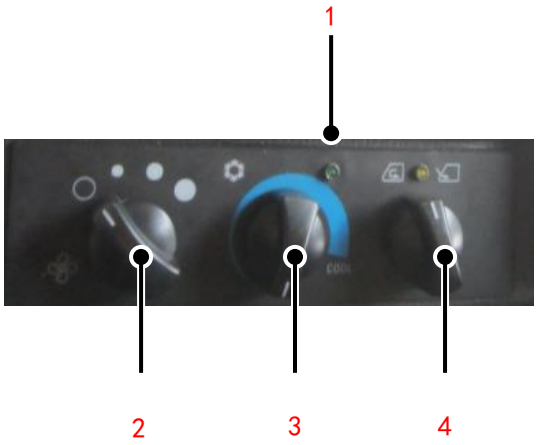


Fig.4-41

1. Refrigeration indicator lamp 2.air volume control knob 3.temperature control knob4.air outlet adjustment knob

Main technical parameters (see the table below)

Refrigerating capacity		4500W
Refrigerating output		5000W
Air output		450m^3/h
Refrigerant		R134a
Compressor	model	SE7H15
	Voltage	D.C 24V
	Air output	154.7cm ³r
	Belt specification	PV8
Condenser	core	Copper tube aluminum sheet
	Front face area	0.18m^2
Cold and warm integrated evaporator	Refrigeration core	Copper tube aluminum sheet
	Front face area	0.049m^2
	Heating core	All aluminum water structure
	Front face area	0.048m^2
	Fresh air assembly	Copper tube aluminum sheet
	Front face area	0.026 m^2

4.8 Operation and maintenance of A/C

4.8.1 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.

4.8.2 Functional description of main components:

1) Functional description of main components:

- Manual controller

Air volume adjustment knob: Air conditioning power supply and air volume switch. It is used to manually adjust the air volume of the evaporator, and ○, ●, ●, ● correspond to off, low, medium, high respectively.

Temperature control knob: For air conditioning cooling switch, it is used to manually adjust the cooling temperature. O is the cooling off, the maximum cooling state will be achieved when turned clockwise to , and the green indicator will come on when turned on.

Defrost control knob: Defrost control knob is used to adjust the air outlet mode. The normal ventilation mode will be enabled when turned to ; the defrost mode will be enabled when turned to , and the yellow LED indicator will come on.

Cool & heat evaporator assembly: Cooled air (cooling mode) and heated air (heating mode) are provided to the cab at the dashboard vent via air ducts. The cooling function is enabled via air volume control knob and temperature control knob on the control

panel (at this time, the heating pipe valve at the bottom of the cab should be closed manually). For heating function, the air volume control knob on the control panel should be opened, and also the heating pipe valve at the bottom of the cab should be opened).

- Condenser: It dissipates the heat in the cab to the outside via the phase change of the refrigerant.

- Air compressor: It consumes the engine power and compresses the low temperature and low pressure gas refrigerant into high temperature and high pressure gas refrigerant, so as to promote the refrigeration cycle.

4.8.3 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.

4) 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.

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.

4.8.4 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.	+				
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.							

4.8.5 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.
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.

S/N	Symptom	Probable causes	Solutions
		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.
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.

Fig.4-42 Display

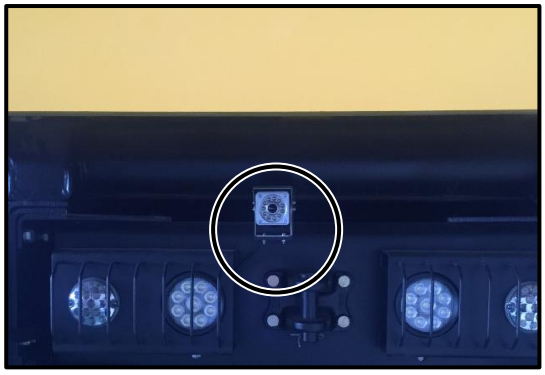


Fig.4-43 camera

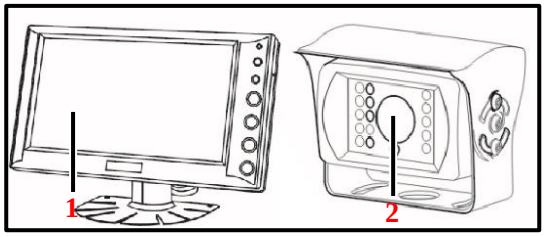


Fig.4-44 1. display 2. camera

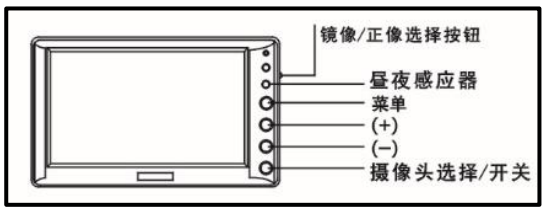


Fig.4-45 Operation instructions for display screen

4.9 Rear view system

⚠ Prohibit: No permission to open the shell without authorization. If the equipment is out of order, please contact our local service staff.

The CMT66 is equipped with a rear view system that allows the user to observe the rear of the vehicle clearly when driving or reversing the vehicle.

4.9.1Operation instructions

As shown on the left, in the cab a display screen that displays the rear of the vehicle is mounted, and a camera mounted at the rear end of the frame for inputting the rear image.

When the vehicle is started, the display screen is automatically opened.

⚠ Notice: 1. when the screen power switch is in the "OFF" position, the display is closed. When the ignition switch is restarted, or the display power switch is pushed to the "ON" position, the display will reopen.

When the speed change lever moves to the reverse position, the display screen is automatically opened.

the operation of the display screen

a) mirror / positive selection button

Press this button to set the effect of flip

When the switch is in the mirror (MIR) position, the reverse image is displayed.

When the switch is in the positive (MOR) position, the normal image is displayed.

b) Day / night sensors

CDS, automatically adjust the brightness of the display according to the preset brightness and ambient

brightness.

c) Volume control

Press the menu (MENU), select volume (VOLIME), and press' + 'or' - 'to control the volume size.

d) Brightness control

Press the "MENU" menu, select "BRIGHTNESS", and press "+" or "-" to control the brightness size.

e) Contrast control

Press the menu (MENU), select "CONTRAS", and press "+" or "-" to control the image contrast size.

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	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Vechicle operating distance (Km)	1000	2000	7000	10000	12000	17000	22000

⚠ 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 CMT66 mining dump truck

Period	Material code	Material name	Specification	Unit	Qty	Remarks
100h (2,000 km)	4190001633	Oil filter	1000428205	Piece	2	WP12.460
	5301000051	Diesel engine oil	CH-4 15W/40	L	27	
	4110001939068	Fuel Coarse Filter Element	1000053558	Piece	2	
	4110001939058	Fuel Coarse Filter Element	1000053557	Piece	1	
	4110001939059	Fuel oil filter	1000053555	Piece	1	
500h (7,000 km)	4190001633	Oil filter	1000428205	Piece	2	WP12.460
	5301000051	Diesel engine oil	CH-4 15W/40	L	27	
	4110001117322	Fuel Coarse Filter Element	1000424916	Piece	2	
	4110001595001	Fuel Coarse Filter Element	1000495963	Piece	1	
	4190001637	Fuel oil filter	1000422382	Piece	1	
	4110001730	Breathing cap QUQ1-40*1.0	QUQ1-40*1.0	Piece	1	Fuel tank
	4110002110	Oil bath type air filter main element	1001041604	Piece	1	Donaldson air filter
	4110002111	Oil bath type air filter element for safty	4001041608	Piece	1	
	4120001743	Return oil filter element	SJK 500×10	Piece	1	Lifting system
	4120000634	Air filter	SJXKL10×0.8-0.5	Piece	1	
	5301000007	Gear oil	GL-5 85W-90	L	24.6	Center axle unilateral wheel reducer 5.3L; Center axle main drive 14L
	5301000007	Gear oil	SAE85W/90GL-5	L	22.1	Rear axle unilateral wheel reducer 5.3L; Rear axle main drive:11.5L
1000h	4190001633	Oil filter	1000428205	Piece	2	WP12.460

Period	Material code	Material name	Specification	Unit	Qty	Remarks
(12,000 km)	5301000051	Diesel engine oil	CH-4 15W/40	L	27	
	4110001939068	Fuel Coarse Filter Element	1000053558	Piece	2	
	4110001939058	Fuel Coarse Filter Element	1000053557	Piece	1	
	4110001939059	Fuel oil filter	1000053555	Piece	1	
	4110001730	Breathing cap QUQ1-40*1.0	QUQ1-40*1.0	Piece	1	Fuel tank
	4110002110	Oil bath type air filter main element	1001041604	Piece	1	Donaldson air filter
	4110002111	Oil bath type air filter element for safty	4001041608	Piece	1	
1500h (17,000 km)	4190001633	Oil filter	1000428205	Piece	2	WP12.460
	5301000051	Diesel engine oil	CH-4 15W/40	L	27	
	4110001939068	Fuel Coarse Filter Element	1000053558	Piece	2	
	4110001939058	Fuel Coarse Filter Element	1000053557	Piece	1	
	4110001939059	Fuel oil filter	1000053555	Piece	1	
	4110001730	Breathing cap QUQ1-40*1.0	QUQ1-40*1.0	Piece	1	Fuel tank
	4110002110	Oil bath type air filter main element	1001041604	Piece	1	Donaldson air filter
	4110002111	Oil bath type air filter element for safty	4001041608	Piece	1	
	4120001743	Return oil filter element	SJK 500×10	Piece	1	Lifting system
	4120000634	Air filter	SJXKL10×0.8-0.5	Piece	1	
	4120001086001	Drying cylinder	35130170020	Piece	1	Air unit
2000h (22,000 km)	4190001633	Oil filter	1000428205	Piece	2	WP12.460
	5301000051	Diesel engine oil	CH-4 15W/40	L	27	
	4110001939068	Fuel Coarse Filter Element	1000053558	Piece	2	
	4110001939058	Fuel Coarse Filter Element	1000053557	Piece	1	
	4110001939059	Fuel oil filter	1000053555	Piece	1	
	4110001730	Breathing cap QUQ1-40*1.0	QUQ1-40*1.0	Piece	1	Fuel tank
3000h	4110702794003	Filter	29558295	Piece	2	Transmission
6000h	5301000232	Gear Oil	TES295	L	40	

⚠ 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.

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

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Engine	Change engine oil	●	●	●		●	●	●
	Replace oil filter		●	●		●	●	●
	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	●	●					
	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						

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Transmission	Check oil level of Transmission	●	Once at the interval of 12000km					
	Replace transmission lubricating oil (at least every year)	Once at the interval of 6000h						
	Replace air breather	Once at the interval of 3000h						
	Replace plug	Once at the interval of 3000h						
	Clean magnetic filter screen	Once at the interval of 6000h						
Front axle	Check and adjust clearances of taper roller bearing for wheel hub		●		●			
Center axle	Check oil levels of main reducer and wheel reducer	●	●	●		●		
	Check bogie differential	●	●					
	Replace lubricating oil for main reducer and wheel reducer (at least every year)		●					
Rear axle	Check oil levels of main reducer and wheel reducer		●					

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Rear axle	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		●	●				
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	●	●	●	●	●	●	●

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Chassis	Check fixation of towing hook	●	●	●	●	●	●	●
	Re-tighten crossbeam bolts	●						
	Tighten 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			●	●	●	●	●
	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	●	●	●	●	●	●	●

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Brake system	Check performance of foot brake, hand brake and exhaust brake (during commissioning)	●	●	●	●	●	●	●
	Check retarder system, in which indicator shall operate properly, connecting pieces are connected firmly, and appearance is clean	Check before each trip						
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	●	●	●		●	●	●
	Check fixation of battery wiring terminals and apply grease to electrodes	●	●	●		●	●	●

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Electrical system	Check correctness of speed displayed in electronic tachometer	●	●	●	●	●	●	●
Hydraulic system	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	●			●			
	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						
	Check for inclination of oil cylinder when lifting it without load	Once every day						

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Hydraulic system	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	●	●	●	●	●	●	●
	Universal joint	●	●	●	●	●	●	●
	Steering kingpin, front axle	●	●	●		●	●	●
	Leaf spring pin	Once every 10 hours						

Item	Description	Maintenance level						
		Initial inspection	1st class maintenance	2nd class maintenance	Routine inspection	3rd class maintenance	4th class maintenance	5th class maintenance
Lubrication	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							

5.3.4 Selection of oil products

Type	Recommended types and standards	Amount	Part
Engine oil	Ambient temp.≥-15 °CH-4 15W/40 Ambient temp.＜-15 °CH-4 5W/40	27L	Weichai engine
Gear oil	Ambient tem＞-12℃ Heavy-duty vehicle gear oil (GL-5) 85W-90 Ambient tem≤-12℃ Heavy-duty vehicle gear oil (GL-5) 80W-90	Central axle: 24.6L Rear axle: 22.1L	Axle main drive, bogie differential housing, final drive and transmission
	TES295	Transmission: 40L	
Hydraulic oil	L-HM46 hydraulic oil GB11118.1 L-HM32 hydraulic oil GB11118.1	165L	Hydraulic oil tank
Fuel	Ambient temp.≥4°C 0# light diesel GB252 Ambient temp.≥-5 ℃ -10# light diesel GB252 Ambient temp.≥-14 °-20# light diesel GB252 Ambient temp.≥-29 ℃ -35# light diesel GB252	400L	Fuel tank
Grease	2# or 3# lithium grease GB7324		Pin shaft at each hinged point of working device
Antifreeze fluid	Antifreeze fluid -35#	52L	Radiator system

5.3.5 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 ℃～50 ℃)	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 ℃-40 ℃); Delvac 1# (-40 ℃ 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 ℃-40 ℃) HD85W-90 (-10 ℃-50 ℃)	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

⚠ 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.

序号 NO.	说明 INSTRUCTION	部位 POINTS	润滑剂 LUBRICANT	10小时 10 HOURS	润滑剂 LUBRICANT	100小时 100 HOURS	润滑剂 LUBRICANT	200小时 200 HOURS	润滑剂 LUBRICANT	400小时 400 HOURS
1	货厢翻转轴 SWIVEL SHAFT	1	D	加注 FILL						
2	中后桥制动调整臂 REAR AXLE BRAKE ADJUSTNEBT ARM	2			D	加注 FILL				
3	前中后桥制动底板 BRAKE CARRIER UNIT	3			D	加注 FILL				
4	推力杆 THRUST ROD	4			D	加注 FILL				
5	传动轴十字轴 CROSS SHAFT	5			D	加注 FILL				
6	传动轴轴管 DRIVING SHAFT	6			D	加注 FILL				
7	举升油缸销轴 LIFTING CYLINDER PIN	7			D	加注 FILL				
8	车架支架 FRAME BRACKET	8			D	加注 FILL				
9	举升液压油箱 HYDRAULIC OIL TANK	9			C	检查 CHECK	每半年更换一次。Replaced every six months.			
10	驾驶室/机罩后悬定位锥 CAB/HOOD REAR SUSPENSION POSITIONING CONE	10			D	检查 CHECK				
11	前桥主销 FRONT AXLE PIN	11			D	加注 FILL				
12	油气悬架 HYDRO-PNEUMATIC SUSPENSION	12			D	加注 FILL				
13	驾驶室/机罩翻转销 CAB/HOOD ROLLING-OVER PIN	13			D	加注 FILL				
14	发动机机油 ENGINE OIL	14			A	检查 CHECK	A	更换 REPLACE		
15	前板簧销 FRONGT SPRING PIN	15	D	加注 FILL						
16	凸轮轴 CAMSHAFT	16			D	加注 FILL				
17	转向节上臂 SPINDLE ARM	17			D	加注 FILL				
18	前桥制动调整臂 FRONT AXLE BRAKE ADJUSTNEBT ARM	18			D	加注 FILL				
19	转向节下臂 SPINDLE ARM	19			D	加注 FILL				
20	转向助力缸 STEERING CYLINDER	20			D	加注 FILL				
21	变速箱 GEAR BOX	21			B	检查 CHECK			B	更换 REPLACE
22	燃油箱水及沉淀物 FUEL OIL WATER AND SEDIMENT	22				排除 EXCLUDE				
23	中后桥主减速总成 MIDDLE/REAR MAIN SPEED REDUCER	23							B	更换 REPLACE
24	中后桥轮边减速器 MIDDLE/REAR WHEEL SIDE REDUCER	24							B	更换 REPLACE
25	平衡轴 BALANCE SHAFT	25			B	检查 CHECK			B	更换 REPLACE
26	板簧与板簧座 LEAF SPRING AND SPRING SEAT	26			D	加注 FILL				
27	后门翻转铰链 REAR ENTRANCE TURNOVER HINGE	27			D	加注 FILL				

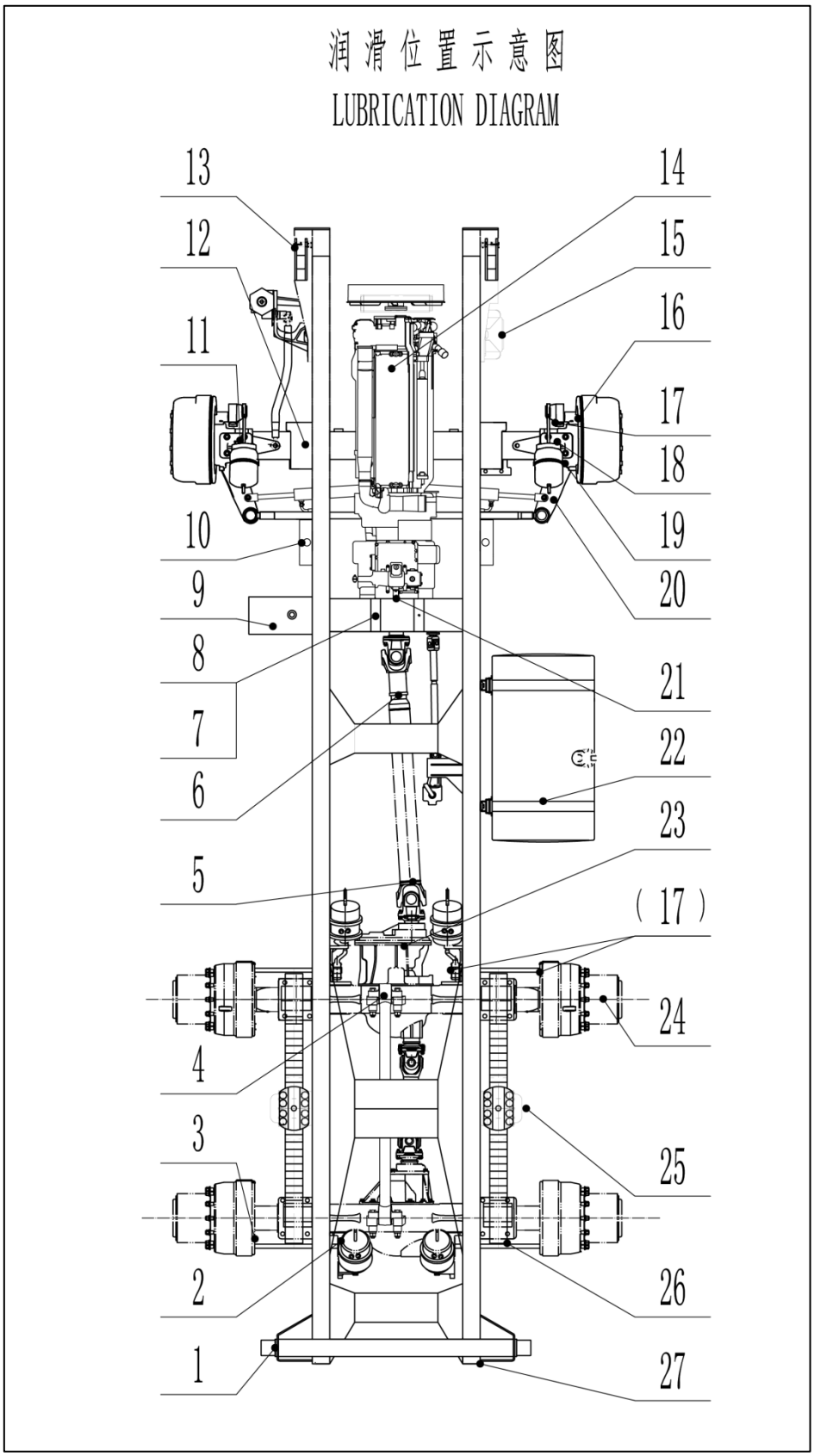
注：实际润滑点位置以实车为准，此标牌所示内容为正常工况与温度下的数据，客户可根据工况和温度的差异调整。
Notice：The actual lubrication position according to the actual situation, the content here is the normal state of the data, the user can be adjusted according to the actual state.

2. List of categories of lubricant

润滑剂 LUBRICATION REQUIREMENTS

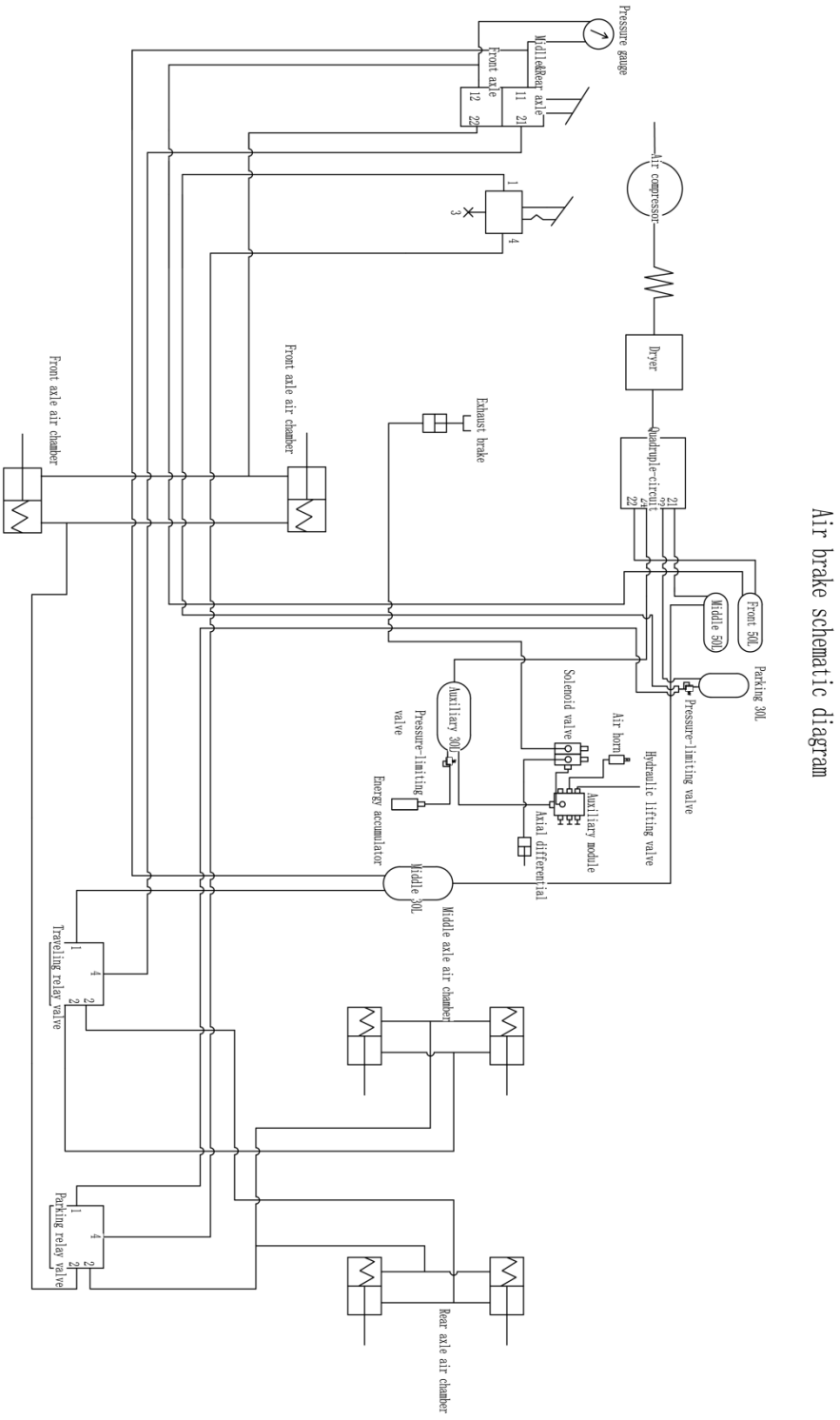
序号 NO.	油品类型 OIL TYPE	推荐型号 RECOMMENDED TYPE	
A	发动机油 ENGINE OIL	环境温度≥-20℃ SAE 15W/40 CH-4 AMBIENT TEMPERATURE≥-20℃ SAE 15W/40 CH-4	环境温度<-20℃ SAE 5W/40 CH-4 AMBIENT TEMPERATURE<-20℃ SAE 5W/40 CH-4
B	齿轮油 GEAR OIL	环境温度≥-12℃ SAE 85W/90 GL-5 AMBIENT TEMPERATURE≥-12℃ SAE 85W/90 GL-5	环境温度<-12℃ SAE 80W/90 GL-5 AMBIENT TEMPERATURE<-12℃ SAE 80W/90 GL-5
C	液压油 HYDRAULIC OIL	环境温度≥-15℃ L-HM32/46 AMBIENT TEMPERATURE≥-15℃ L-HM32/46	环境温度<-15℃ L-HV32/46 AMBIENT TEMPERATURE<-15℃ L-HV32/46
D	润滑脂 GREASE	3号锂基润滑脂 LITHIUM GREASE #3	
E	制动液 BRAKE FLUID	HZY3或HZY4 HZY3 OR HZY4	

3. Lubrication diagram

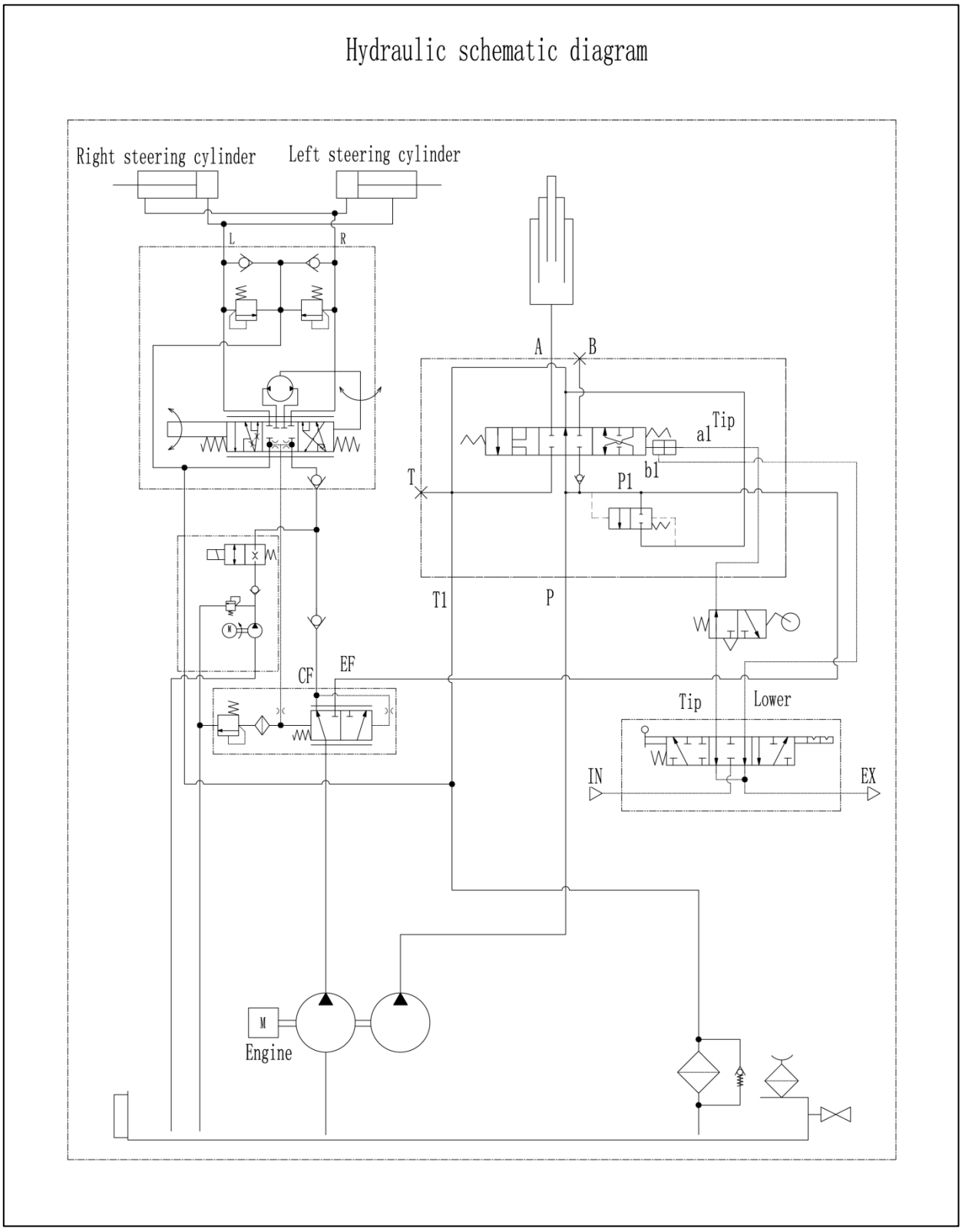


Chapter VI Annex

6.1 Schematic diagram of brake

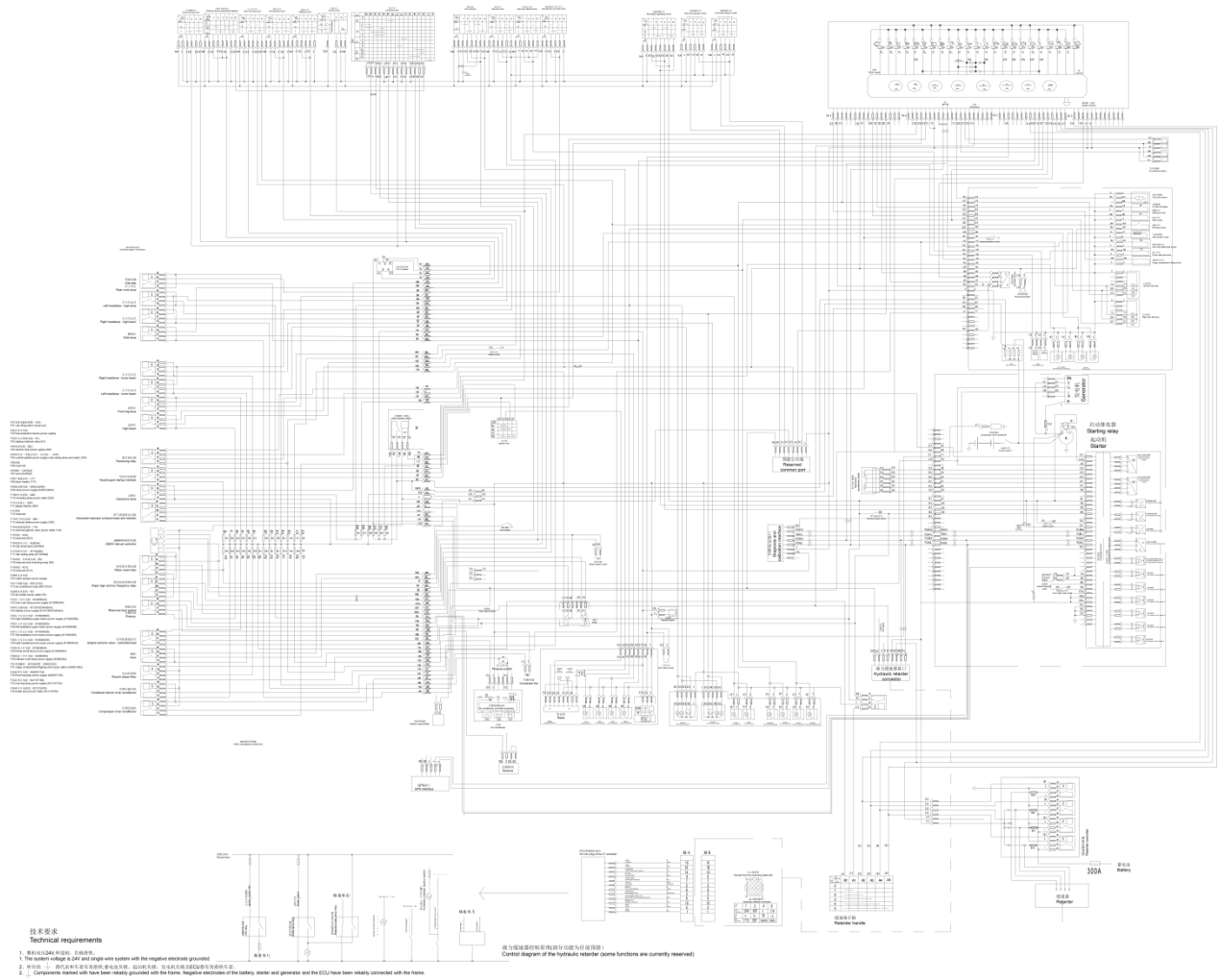


6.2Hydraulic system schematic diagram



Gear pump	Initiative valve	Steering gear	Steel tube	Left steering cylinder	Right steering cylinder	Lifting valve block	Hydraulic oil tank	Lifting cylinder
Oil suction port							Oil suction	
Front pump oil outlet	P port							
	CF port	P port						
	EF port					Lifting valve P1 port		
Rear pump oil outlet						Lifting valve P port		
	LS port	LS port						
						Lifting valve A port		Lifting cylinder oil port
		T port				Non-ressure oil return port		
	T port					Non-ressure oil return port		
						Lifting valve T port	Oil return port	
		L port	Left steering steel tube	Rod port	Head port			
		R port	Right steering steel tube	Head port	Rod port			

6.3 Electric schematic



6.4 Engine Diagnostic Code

Index	DFC Name	SPN	FMI	Index	DFC Name	SPN	FMI
001	DFC_ECRVlvSCBat	571	3	158	DFC_InjVlvCyl2BNoLoad	1414	5
002	DFC_ECRVlvSCGnd	571	4	159	DFC_InjVlvCyl2ERR	1414	11
003	DFC_ECRVlvOpenLoad	571	5	160	DFC_InjVlvCyl2MNoLoad	1414	6
004	DFC_AccPedBrkPlaus	91	7	161	DFC_InjVlvCyl2SCB	1414	3
005	DFC_AFSSRCRawMax	132	3	162	DFC_InjVlvCyl2SCG	1414	7
006	DFC_AFSSRCRawMin	132	4	163	DFC_InjVlvCyl2SCL	1414	4
007	DFC_AirHtStickOn	2898	7	164	DFC_InjVlvCyl3AHSSCBat	1415	15
008	DFC_APP12Plaus	520252	2	165	DFC_InjVlvCyl3AHSSCGnd	1415	17
009	DFC_APP1SRCMax	91	3	166	DFC_InjVlvCyl3ALSSCBat	1415	16
010	DFC_APP1SRCMin	91	4	167	DFC_InjVlvCyl3ALSSCGnd	1415	18
011	DFC_APP21Plaus	1	0	168	DFC_InjVlvCyl3BNoLoad	1415	5
012	DFC_APP2SRCMax	29	3	169	DFC_InjVlvCyl3ERR	1415	11
013	DFC_APP2SRCMin	29	4	170	DFC_InjVlvCyl3MNoLoad	1415	6
014	DFC_APSCDNPL	102	2	171	DFC_InjVlvCyl3SCB	1415	3
015	DFC_APSCDSRCMax	108	3	172	DFC_InjVlvCyl3SCG	1415	7
016	DFC_APSCDSRCMin	108	4	173	DFC_InjVlvCyl3SCL	1415	4
017	DFC_ArHt1OpenLoad	2898	5	174	DFC_InjVlvCyl4AHSSCBat	1416	15
018	DFC_ArHt1SCBat	2898	3	175	DFC_InjVlvCyl4AHSSCGnd	1416	17
019	DFC_ArHt1SCGnd	2898	4	176	DFC_InjVlvCyl4ALSSCBat	1416	16
020	DFC_BattCDSRCMax	168	4	177	DFC_InjVlvCyl4ALSSCGnd	1416	18
021	DFC_BattCDSRCMin	168	3	178	DFC_InjVlvCyl4BNoLoad	1416	5
022	DFC_BPSCDNPL	1	0	179	DFC_InjVlvCyl4ERR	1416	11
023	DFC_BPSCDSRCMax	102	3	180	DFC_InjVlvCyl4MNoLoad	1416	6
024	DFC_BPSCDSRCMin	102	4	181	DFC_InjVlvCyl4SCB	1416	3
025	DFC_Brk1SwtCrCtlImp	597	11	182	DFC_InjVlvCyl4SCG	1416	7
026	DFC_Brk1SwtCrCtlRls	597	7	183	DFC_InjVlvCyl4SCL	1416	4
027	DFC_BrkCDNpl	597	2	184	DFC_InjVlvCyl5AHSSCBat	1417	15
028	DFC_BrkCDSig	597	19	185	DFC_InjVlvCyl5AHSSCGnd	1417	17
029	DFC_Clg_DynTst	110	18	186	DFC_InjVlvCyl5ALSSCBat	1417	16
030	DFC_ClgAbsTst	110	17	187	DFC_InjVlvCyl5ALSSCGnd	1417	18
031	DFC_ComCTSCDUnAvail	1	0	188	DFC_InjVlvCyl5BNoLoad	1417	5

Index	DFC Name	SPN	FMI	Index	DFC Name	SPN	FMI
032	DFC_ComEngSpdUnAvail	190	2	189	DFC_InjVlvCyl5ERR	1417	11
033	DFC_ConvCDNpl	598	2	190	DFC_InjVlvCyl5MNoLoad	1417	6
034	DFC_CoVehPrfmLimAct	520198	11	191	DFC_InjVlvCyl5SCB	1417	3
035	DFC_CSLpCDNoLoad	626	5	192	DFC_InjVlvCyl5SCG	1417	7
036	DFC_CSLpCDSCBat	626	3	193	DFC_InjVlvCyl5SCL	1417	4
037	DFC_CSLpCDSCGnd	626	4	194	DFC_InjVlvCyl6AHSSCBat	1418	15
038	DFC_CTSCDNpl	110	2	195	DFC_InjVlvCyl6AHSSCGnd	1418	17
039	DFC_CTSCDOvrTemp	110	15	196	DFC_InjVlvCyl6ALSSCBat	1418	16
040	DFC_CTSCDSRCMax	110	3	197	DFC_InjVlvCyl6ALSSCGnd	1418	18
041	DFC_CTSCDSRCMin	110	4	198	DFC_InjVlvCyl6BNoLoad	1418	5
042	DFC_ECBtCDPlausLock	520203	5	199	DFC_InjVlvCyl6ERR	1418	11
043	DFC_EngMBackUpLimp	4203	13	200	DFC_InjVlvCyl6MNoLoad	1418	6
044	DFC_EngMCaS1NoSig	4201	12	201	DFC_InjVlvCyl6SCB	1418	3
045	DFC_EngMCaSPer	4201	2	202	DFC_InjVlvCyl6SCG	1418	7
046	DFC_EngMCaSSyn	4201	11	203	DFC_InjVlvCyl6SCL	1418	4
047	DFC_EngMCaSSynCrS	4201	13	204	DFC_MeUnCDNoLoad	1442	7
048	DFC_EngMCrS1NoSig	4203	12	205	DFC_MeUnCDSCBat	1442	9
049	DFC_EngMCrSSyn	4203	3	206	DFC_MeUnCDSCGnd	1442	10
050	DFC_EngMCrSToothNr	4203	4	207	DFC_MFLvCrCtlMode	596	2
051	DFC_EngMCrSToothPer	4203	2	208	DFC_MILNoLoad	520219	5
052	DFC_EngMOfsCaSCrSSRCMax	4201	14	209	DFC_MILSCBat	520219	3
053	DFC_EngPrtOvrSpd	1769	11	210	DFC_MILSCGnd	520219	4
054	DFC_EngSpdOpenLoad	1623	5	211	DFC_MisFireCyl1	1323	3
055	DFC_EngSpdSCBat	1623	3	212	DFC_MisFireCyl10	1332	3
056	DFC_EngSpdSCGnd	1623	4	213	DFC_MisFireCyl11	1333	3
057	DFC_ExFlCDOpenLoad	520208	5	214	DFC_MisFireCyl12	1334	3
058	DFC_ExFlCDSCBat	520208	3	215	DFC_MisFireCyl2	1324	3
059	DFC_ExFlCDSCGnd	520208	4	216	DFC_MisFireCyl3	1325	3
060	DFC_FanCD1OpenLoad	4815	7	217	DFC_MisFireCyl4	1326	3
061	DFC_FanCD1SCBat	4815	9	218	DFC_MisFireCyl5	1327	3
062	DFC_FanCD1SCGnd	4815	10	219	DFC_MisFireCyl6	1328	3
063	DFC_FanCD2OpenLoad	4815	5	220	DFC_MisFireCyl7	1329	3

064	DFC_FanCD2SCBat	4815	3	221	DFC_MisFireCyl8	1330	3
065	DFC_FanCD2SCGnd	4815	4	222	DFC_MisFireCyl9	1331	3
066	DFC_FanCDSpMax	1639	3	223	DFC_MisFireTot	1322	3
067	DFC_FanCDSpMin	1639	4	224	DFC_MSSCDNpl	976	19
068	DFC_FlFltHt1OpenLoad	520261	5	225	DFC_MSSCDSRCMax	976	3
069	DFC_FlFltHt1SCBat	520261	3	226	DFC_MSSCDSRCMin	976	4
070	DFC_FlFltHt1SCGnd	520261	4	227	DFC_OLSCDNpl	98	2
071	DFC_FlFltHt2OpenLoad	520261	10	228	DFC_OLSCDSRCMax	98	3
072	DFC_FlFltHt2SCBat	520261	9	229	DFC_OLSCDSRCMin	98	4
073	DFC_FlFltHt2SCGnd	520261	7	230	DFC_OPSCDLow	100	17
074	DFC_FlIncPOpenLoad	95	5	231	DFC_OPSCDNpl	100	15
075	DFC_FlIncPSCBat	95	3	232	DFC_OPSCDSRCMax	100	16
076	DFC_FlIncPSCGnd	95	4	233	DFC_OPSCDSRCMin	100	18
077	DFC_FlSysWtDet	520264	11	234	DFC_OTSCD1Npl	175	15
078	DFC_FrmMngAPPMaxErr	522064	19	235	DFC_OTSCDSRCMax	175	3
079	DFC_FrmMngCM1DLC	522056	14	236	DFC_OTSCDSRCMin	175	4
080	DFC_FrmMngCM1TO	522056	19	237	DFC_OTSCDSRCNpl	1	0
081	DFC_FrmMngDashDsplDLC	522052	14	238	DFC_PCVOL	1443	7
082	DFC_FrmMngDashDsplTO	522052	19	239	DFC_PCVSCB	1443	9
083	DFC_FrmMngDEC1DLC	522062	14	240	DFC_PCVSCG	1443	10
084	DFC_FrmMngDEC1TO	522062	19	241	DFC_PRVMonPresShck	523470	21
085	DFC_FrmMngEBC1DLC	522013	14	242	DFC_PRVMonwearNumMax	520241	11
086	DFC_FrmMngEBC1TO	522013	19	243	DFC_PRVOpn	520241	14
087	DFC_FrmMngEBC2DLC	522015	14	244	DFC_PRVTiOpnMax	520241	0
088	DFC_FrmMngEBC2TO	522015	19	245	DFC_RailCDOfsTstSRCMax	157	15
089	DFC_FrmMngEGF1DLC	522053	14	246	DFC_RailCDOfsTstSRCMin	157	17
090	DFC_FrmMngEGF1TO	522053	19	247	DFC_RailCDSRCMax	157	3
091	DFC_FrmMngEngTemp2DLC	522020	14	248	DFC_RailCDSRCMaxSop	157	3
092	DFC_FrmMngEngTemp2TO	522020	19	249	DFC_RailCDSRCMin	157	4
093	DFC_FrmMngERC1DRDLC	522021	14	250	DFC_RailCDSRCMinSop	157	4
094	DFC_FrmMngERC1DRTO	522021	19	251	DFC_RailMeUn0OfsMax	520243	16

095	DFC_FrmMngETC1DLC	522022	14	252	DFC_RailMeUn10MeUnQHi	520243	7
096	DFC_FrmMngETC1TO	522022	19	253	DFC_RailMeUn12OfsMaxMeUnQHi	520243	5
097	DFC_FrmMngETC2DLC	522023	14	254	DFC_RailMeUn1OfsMaxQHi	520243	0
098	DFC_FrmMngETC2TO	522023	19	255	DFC_RailMeUn2OfsMinQLo	520243	1
099	DFC_FrmMngETC7DLC	522063	14	256	DFC_RailMeUn3PkLo	520243	20
100	DFC_FrmMngETC7TO	522063	19	257	DFC_RailMeUn4PkHi	520243	21
101	DFC_FrmMngHRVDDLC	522051	14	258	DFC_RailMeUn6Rmp	520243	18
102	DFC_FrmMngHRVDTO	522051	19	259	DFC_RailMeUn7MeUnSetPlaus	520243	23
103	DFC_FrmMngRemAPPMaxErr	522065	19	260	DFC_RailMeUn8LowIdlMeUnMontr	520243	24
104	DFC_FrmMngRxCCVSDLC	522030	14	261	DFC_RmtApp1SRCMax	520277	3
105	DFC_FrmMngRxCCVSTO	522030	19	262	DFC_RmtApp1SRCMin	520277	4
106	DFC_FrmMngTRF1DLC	520217	14	263	DFC_RmtApp2SRCMax	520278	3
107	DFC_FrmMngTRF1TO	520217	19	264	DFC_RmtApp2SRCMin	520278	4
108	DFC_FrmMngTSC1AEDLC	522035	14	265	DFC_SSpMon1SRCMax	3509	3
109	DFC_FrmMngTSC1AETO	522035	19	266	DFC_SSpMon1SRCMin	3509	4
110	DFC_FrmMngTSC1ARDLC	522036	14	267	DFC_SSpMon2SRCMax	3510	3
111	DFC_FrmMngTSC1ARTO	522036	19	268	DFC_SSpMon2SRCMin	3510	4
112	DFC_FrmMngTSC1DEDLC	522037	14	269	DFC_SSpMon3SRCMax	3511	3
113	DFC_FrmMngTSC1DETO	522037	19	270	DFC_SSpMon3SRCMin	3511	4
114	DFC_FrmMngTSC1DRDLC	522038	14	271	DFC_stAirFltFoul	107	7
115	DFC_FrmMngTSC1DRTO	522038	19	272	DFC_stFuelFoul	520289	11
116	DFC_FrmMngTSC1PEDLC	522039	14	273	DFC_STGPRSLCKMOD1	522014	1
117	DFC_FrmMngTSC1PE	522039	19	274	DFC_STGPRSLCKMOD2	522014	2

	TO						
118	DFC_FrmMngTSC1TEDLC	522040	14	275	DFC_stOil	99	11
119	DFC_FrmMngTSC1TETO	522040	19	276	DFC_stOilFlt	99	7
120	DFC_FrmMngTSC1TRDLC	522041	14	277	DFC_StrtCDLSSCBat	1675	3
121	DFC_FrmMngTSC1TRTO	522041	19	278	DFC_StrtCDLSSCGnd	1675	4
122	DFC_FrmMngTSC1VEDLC	522042	14	279	DFC_StrtCDNoLoad	1675	5
123	DFC_FrmMngTSC1VETO	522042	19	280	DFC_T50CDTimeOut	520253	11
124	DFC_FrmMngTSC1VRDLC	522043	14	281	DFC_TECUSRCMax	1136	4
125	DFC_FrmMngTSC1VRTO	522043	19	282	DFC_TECUSRCMin	1136	3
126	DFC_FTSCDSRCMax	174	3	283	DFC_UHtrBLOL	4346	5
127	DFC_FTSCDSRCMin	174	4	284	DFC_UHtrBLSCB	4346	3
128	DFC_GearbxIncMax	520221	2	285	DFC_UHtrBLSCG	4346	4
129	DFC_Gen1FlSysWtOpenLoad	624	12	286	DFC_UHtrPLOL	4344	5
130	DFC_Gen1FlSysWtSCBat	624	3	287	DFC_UHtrPLSCB	4344	3
131	DFC_Gen1FlSysWtSCGnd	624	4	288	DFC_UHtrPLSCG	4344	4
132	DFC_HpTst	520223	20	289	DFC_UHtrRlyOL	523003	5
133	DFC_HWEMonEEPROMRdErr	2802	14	290	DFC_UHtrRlySCB	523003	3
134	DFC_HWEMonEEPROMWrtErr	2802	12	291	DFC_UHtrRlySCG	523003	4
135	DFC_IATSCDSRCMax	105	3	292	DFC_UHtrSLOL	4340	5
136	DFC_IATSCDSRCMin	105	4	293	DFC_UHtrSLSCB	4340	3
137	DFC_InjDiaQOC	520210	16	294	DFC_UHtrSLSCG	4340	4
138	DFC_InjDiaQOCfactor	520210	15	295	DFC_UHtrTnkOL	3363	5
139	DFC_InjIniAsicErr	507	9	296	DFC_UHtrTnkSCB	3363	3
140	DFC_InjIniEnaErr	507	10	297	DFC_UHtrTnkSCG	3363	4
141	DFC_InjNDia	520210	14	298	DFC_VSSCD1Max	84	0
142	DFC_InjNDiafactor	520210	13	299	DFC_VSSCD1Npl	84	2

143	DFC_InjPwrDrvDis	507	11	300	DFC_VSSCD3Max	1624	3
144	DFC_InjVlvCyl1AHSSCBat	1413	15	301	DFC_VSSCD3Min	1624	4
145	DFC_InjVlvCyl1AHSSCGnd	1413	17	302	DFC_VSSCD3Sig	1624	8
146	DFC_InjVlvCyl1ALSSCBat	1413	16	303	DFC_WrnOpenLoad	520250	5
147	DFC_InjVlvCyl1ALSSCGnd	1413	18	304	DFC_WrnSCBat	520250	3
148	DFC_InjVlvCyl1BNoLoad	1413	5	305	DFC_WrnSCGnd	520250	4
149	DFC_InjVlvCyl1ERR	1413	11	306	DFC_WtLvSRClMax	520264	3
150	DFC_InjVlvCyl1MNoLoad	1413	6	307	DFC_WtLvSRClMin	520264	4
151	DFC_InjVlvCyl1SCB	1413	3	308	DFC_NetMngCANAOff	522000	12
152	DFC_InjVlvCyl1SCG	1413	7	309	DFC_RmtAPP12Plaus	520253	2
153	DFC_InjVlvCyl1SCL	1413	4	310	DFC_RmtAccPedBrkPlaus	520277	7
154	DFC_InjVlvCyl2AHSSCBat	1414	15	311	DFC_ComGPSKeyErr	520218	14
155	DFC_InjVlvCyl2AHSSCGnd	1414	17	312	DFC_ComGPSMsgTo	520218	19
156	DFC_InjVlvCyl2ALSSCBat	1414	16	313	DFC_ComT50StMaxErr	14161	31
157	DFC_InjVlvCyl2ALSSCGnd	1414	18	314	DFC_ComGPSDrvCyclIdle	520218	0

Chapter Ⅶ Optional module

7.1 stone exhauster

Structural sketch of "support bracket" stone exhauster

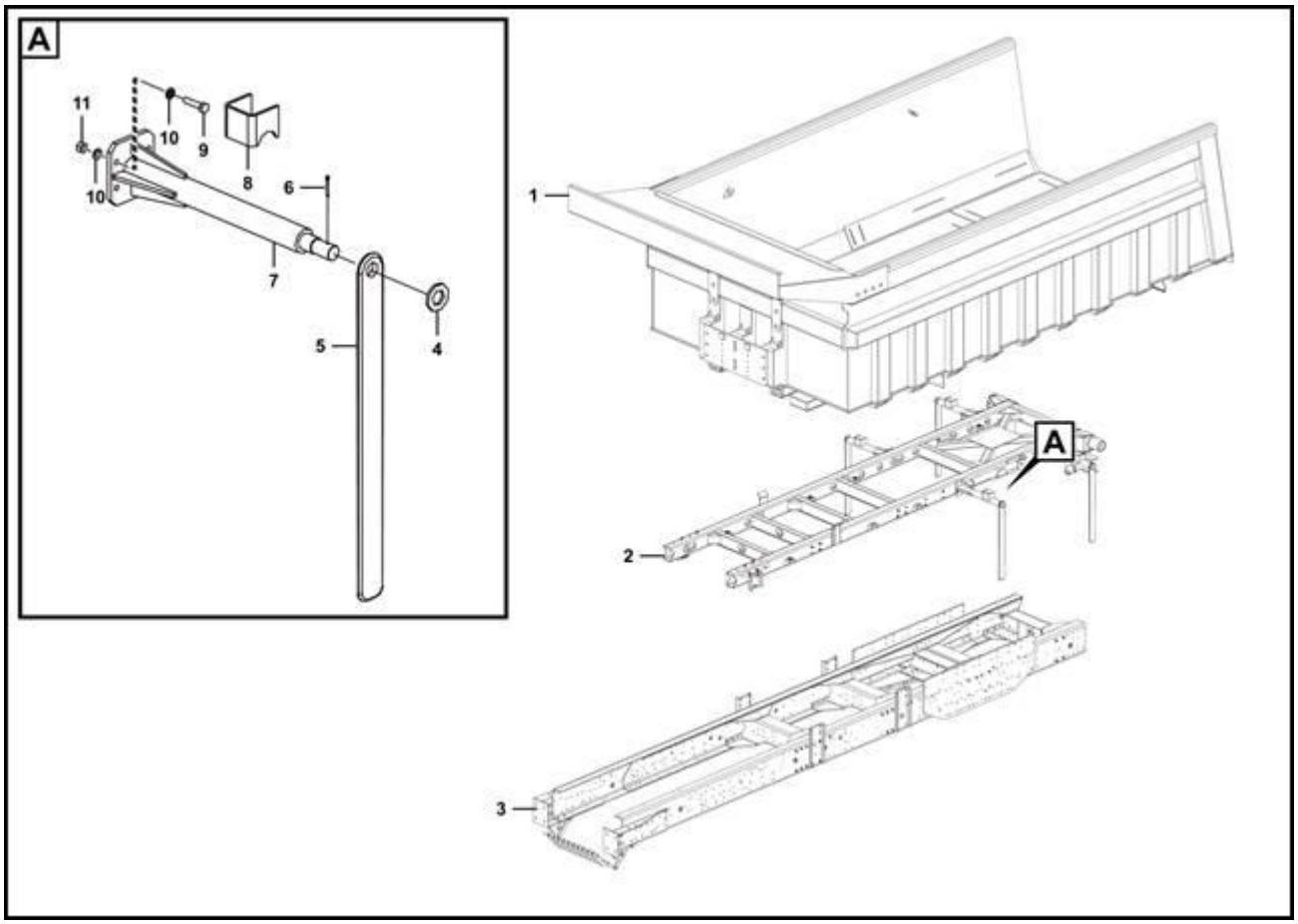


Fig.7-1

1. Cargo 2. Sub frame 3. Frame 4.Gasket 5.Stone rack 6. Split pin 7. Stone rack support 8. Upper support of stone rack 9. Bolt 10. Gasket 11.Nut

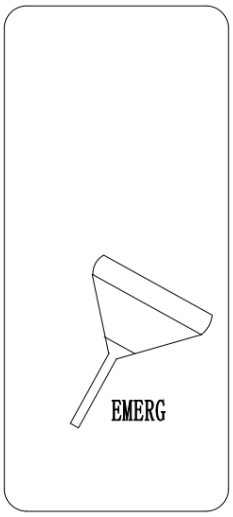


Fig.7-2

Rocker switch

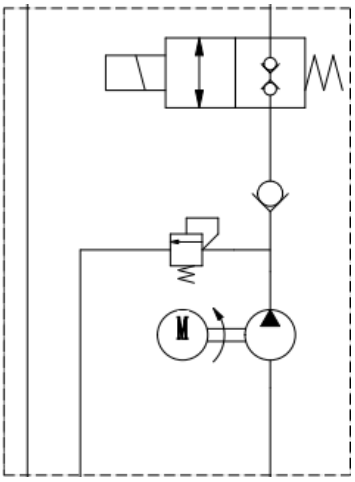


Fig.7-3

Schematic diagram

7.2 Emergency steering

When the steering system fails or fails, the emergency steering system can be used to provide steering assistance for the entire vehicle.

operate:

1. The power of the whole vehicle is turned on.
2. Press the emergency steering rocker switch, the emergency steering power unit starts to work, and the steering wheel can be turned at this time.