

Baoli

OPERATION & SERVICE MANUAL

F-series 2-3.5T Internal Combustion
Counterbalanced Forklift Truck

CPCD 20/25/30/35F

CPQ(Y)D 20/25/30/35F



KION Baoli (Jiangsu) Forklift Co., Ltd.

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PREFACE

F-series balance weight type forklift trucks with engine are designed on the base of the advanced features available from both local and foreign designs. These trucks are suitable to handle, transport and stack goods in factories, mines, stations, ports, freight yards, warehouses and used widely in food processing, textiles and other light industries. The use of forklift trucks fitted with kinds of attachments will become extensive.

F-series forklift trucks feature a wide-vision mast system, full hydraulic steering unit, self-boost brake, stepless speed control, parking brake device with foot pedal, integral overhead guard and high quality large screen combination meter, so they have a lot of advantages such as good performance, easy operation, wide vision, flexible steering, reliable braking, powerful and aesthetic appearance.

This manual states the specifications, operation, maintenance, main assemblies' constructions and working principles of F-series forklift trucks so as to help operators to use the trucks correctly and attain the highest functions. It is necessary to read over the manual before operating or maintaining the forklift trucks. The rules and notices in this manual should be abided seriously by all relative persons to enable these trucks in optimized working state for long period and bring the highest efficiency.

The relevant content in this manual might not correspond with the actual condition because of technical improvement. Our products are subject to improvements and changes without notice.

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I . About F-series forklift truck

1. External view and technical parameter

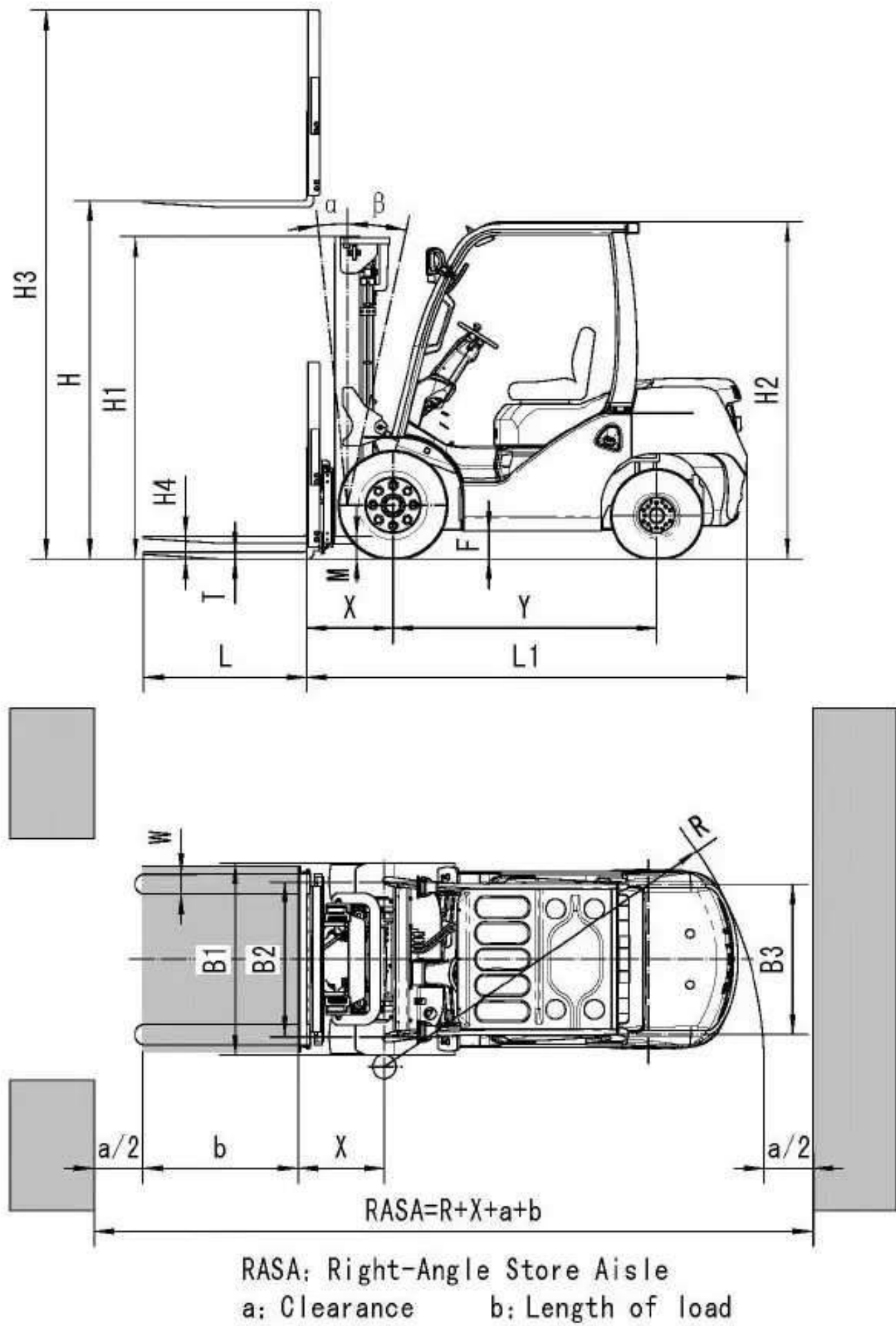


Fig1.1 External view

Technical parameter

General	Manufacturer				KION Baoli				
	Model				CPCD20F CPQ(Y)D20F	CPCD25F CPQ(Y)D25F	CPCD30F CPQ(Y)D30F	CPCD35F CPQ(Y)D35F	
	Power type				Diesel/Gasoline/LPG				
	Rated capacity			kg	2000	2500	3000	3500	
	Load center			mm	500				
Performance	Overall dimension	Length to fork face		L1	mm	2564	2634	2775	2814
		Overall width		B1	mm	1150		1236	
		Mast lowered height		H1	mm	2050		2080	2230
		Mast extended height		H3	mm	4040		4273	
		Overhead guard height		H2	mm	2150		2180	
	Lift height			H	mm	3000			
	Free lift height			H4	mm	140		145	
	Fork size			L×W×T	mm	1070×120×40	1070×120×45	1070×125×45	1075×130×45
	Mast tilt angle			α/β	deg	6 / 11			
	Front overhang			X	mm	484	489	494	500
	Turning radius			R	mm	2220	2290	2400	2490
	Self weight				kg	3510	3810	4320	4620
Chassis	Tyre	Front				7.00-12-12PR		28×9-15-12PR	28×9-15-14PR
		Rear				6.00-9-10PR		6.50-10-10PR	
	Tread	Front		B2	mm	970		1000	
		Rear		B3	mm	970			
	Wheelbase			Y	mm	1650		1700	1760
	Ground clearance (full load/no load)	Mast	M	mm	85 / 105		110 / 135		
		Frame	F		140 / 145		170 / 175		

F-series forklift trucks mentioned in this manual correspond in different engines, please refer to the following table.

Model of forklift truck		Model of engine
Diesel	CPCD20F	XINCHANG BPG490,ISUZU C240,YANMAR 4TNE92
	CPCD25F	XINCHANG BPG490,DACHAI CA498,ISUZU C240,ISUZU 4JG2PE,YANMAR 4TNE92
	CPCD30F	XINCHANG BPG490,XINCHANG BPG495,XINCHANG BPG498,DACHAI CA498,ISUZU C240,ISUZU 4JG2PE,YANMAR 4TNE98
	CPCD35F	XINCHANG BPG495,XINCHANG BPG498,DACHAI CA498,ISUZU 4JG2PE,YANMAR 4TNE98
Gasoline	CPQ(Y)D20/25F	MITSUBISHI 4G64-31ZG,NISSAN K21,NISSAN K25
	CPQ(Y)D30/35F	MITSUBISHI 4G64-31ZG,NISSAN K25

Notice: Please refer to AD sheet of F-series forklift truck about other technical parameters or new engine configuration not mentioned in this manual.

2. Characteristic

(1) The hydraulic steering device and transverse steering axle makes steering flexible and the turning radius minor.

(2) The braking system employs hydraulic brake, makes it possible to manipulate conveniently and brake reliably.

(3) Hydraulic transmission type forklift trucks are provided with a drive unit including a hydraulic torque converter and an electron transmission box. They feature the following:

- Hydraulic torque converter can change the speed automatically with no limitation and output torque makes the forklift truck have good performance of drawing.

- The inching device makes it easy for the drivers to aim the fork to the cargo.

- The use of hydraulic transmission ensures the engine operate smoothly for the sudden increase of load. At work, the forklift truck that needs starting and shifting frequently, electron transmission device can achieve smooth shift and raise working efficiency, simplify operation, reduce the driver's labor intensity and reduce requirement of the driver's operation skill.

(4) The mast is high intensity and wide vision for the use of two stage CC extension type mast and hidden-type tilt cylinder device. The forklift truck can be fitted with 2-stage or 3-stage full free lift mast having different lifting height, even all kinds of the attachments according to the needs of the clients.

(5) The forklift truck can be chosen different height mast and driver's cab according to the operating into container or out container.

(6) Specific outline adopts streamline design, wider operating vision and larger driving space. It has advantages such as low noise, vibration damping, dustproof, comfortable operation, safety and reliability.

3. Main system

No.	Name	Contents
1	Power system	engine mounting, fuel, exhaust and cooling system(inc. torque converter oil cooler) etc.
2	Transmission system	torque converter, gear box, transmission shaft, gearshift etc.
3	Drive axle	axle housing, half shaft, brake, front wheel etc.
4	Brake system	wheel brake and parking brake etc.
5	Steering system	steering wheel, cycloid gear type powered steering unit etc.
6	Hydraulic system	pump, valve, HP oil pipe, LP oil pipe, connectors etc.
7	Electric system	lamps and lanterns, battery, meter, harness etc.
8	Lifting system	mast, fork, lift bracket, load backrest, tilt cylinder, lift cylinder, lift chain, mast roller etc.

4. Main components

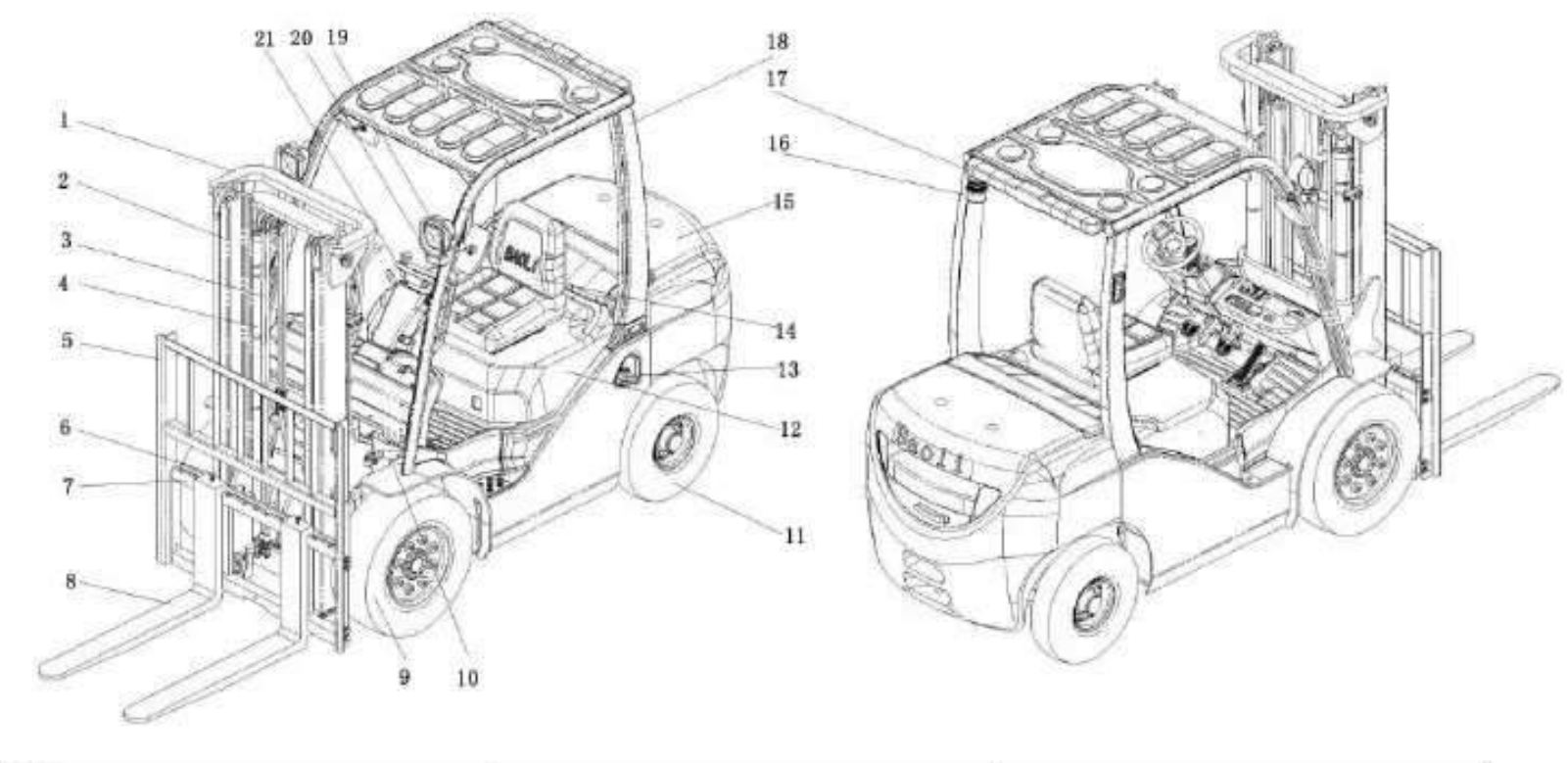


Fig1.2

1. Outer mast

2. Inner mast

3. Lift chain

4. Lift cylinder

5. Load backrest

6. Fork location pin

7. Lift bracket

8. Fork

9. Driving wheel

10. Tilt cylinder

11. Turning wheel

12. Engine hood

13. Refueling lid

14. Operator's seat

15. Counter weight

16. Flasher (option)

17. Rear combination lamp

18. Overhead guard

19. Head lamp

20. Front combination lamp

21. Steering wheel

Size & slinging parameter of the main parts that can be disassembled

	Max. outline size (mm)	Min. slinging capacity
Counter weight	1130×739×955	1700
Standard mast	1935×854×600	730
Lift bracket (with load backrest)	1200×1197×260	170
Fork	1150×660×125	80

Notice: The above-mentioned size and capacity is only for a reference, which may be adjusted because of configuration difference or technology optimization.

5. Operation device and instrument panel

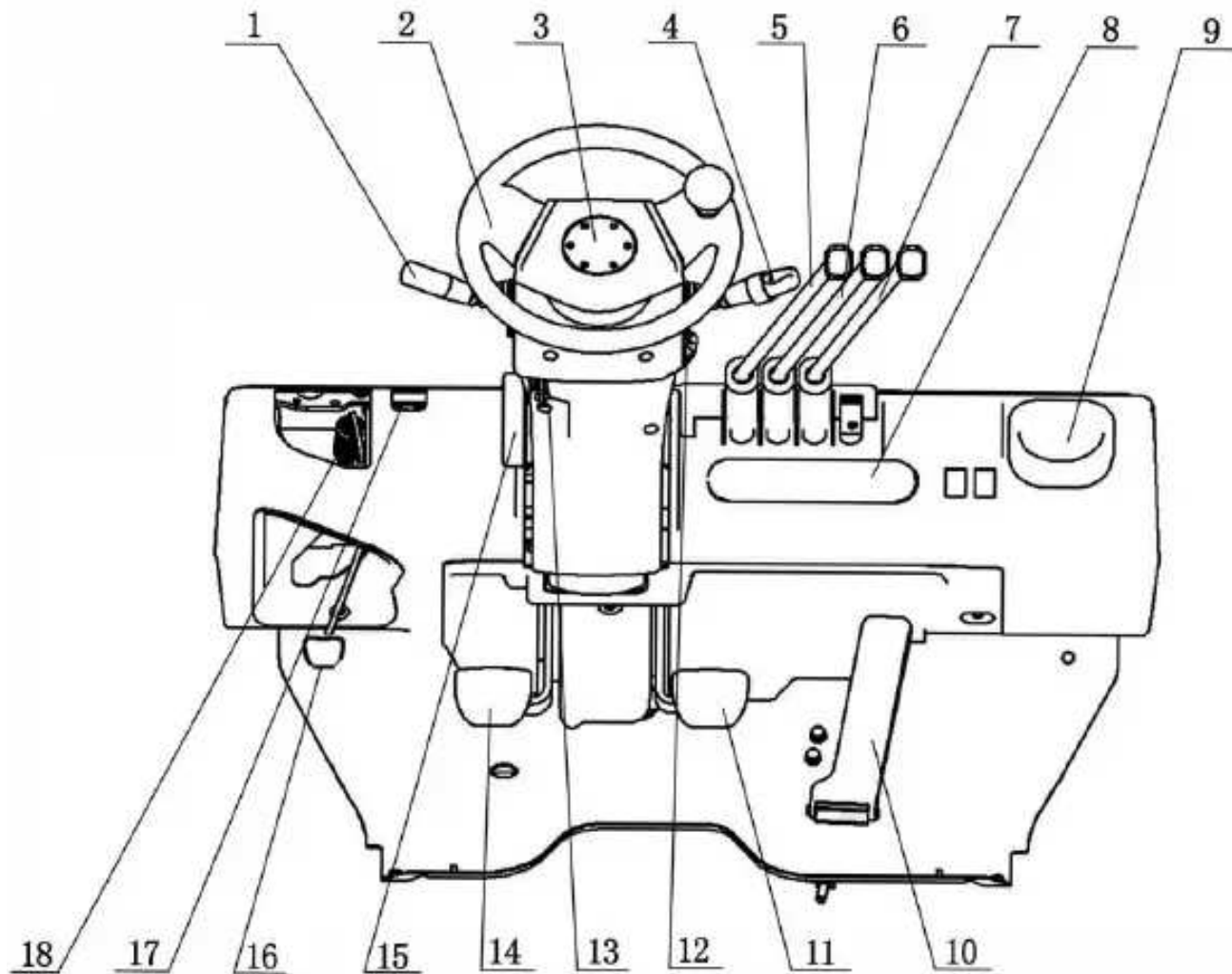
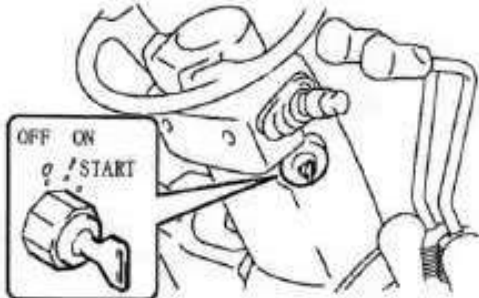
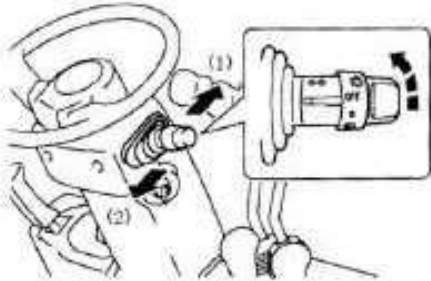


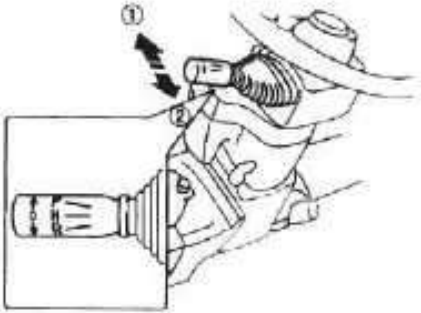
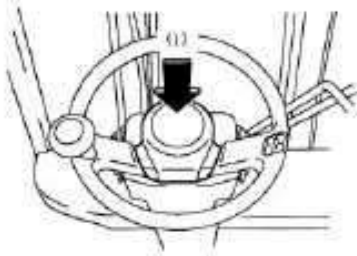
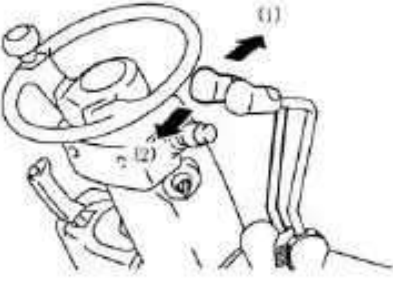
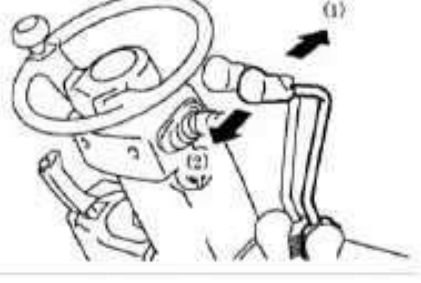
Fig1.3

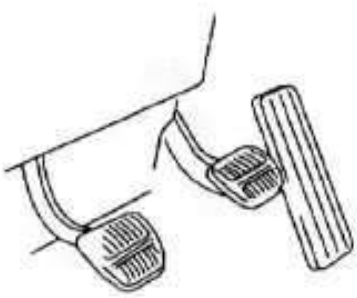
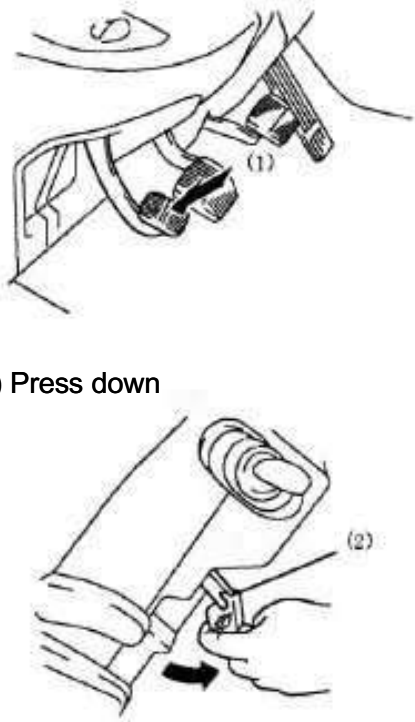
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|--|----------------------------------|---------------------------------|
| 1. Direction control lever | 2. Steering wheel | 3. Horn button |
| 4. Integrated light and turn signal switch | | 5. Lifting lever |
| 6. Tilting lever | 7. Operating lever, attachment | 8. Combination meter |
| 9. Tool kit | 10. Accelerator pedal | 11. Brake pedal |
| 12. Ignition switch | 13. Release lever, parking brake | 14. Inching pedal |
| 15. Adjust lever, steering wheel | 16. Parking brake pedal | 17. Adjust lever, parking brake |
| 18. Cover, refuel and check brake fluid | | |

5.1 Switch (Fig.1.3)

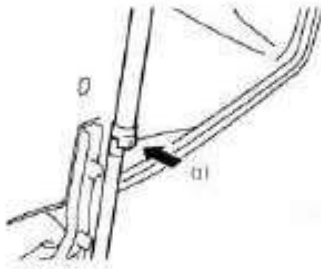
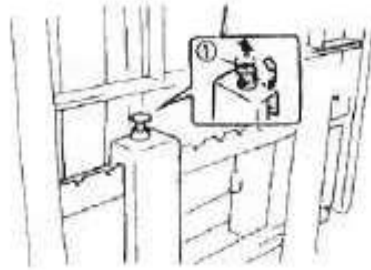
No.	Name	Operation and attention									
1	Ignition switch 	O (OFF): Engine stop position. Key insertion and withdraw are performed in this position. I (ON): Engine operation position. Locate one position clockwise from O (OFF) position. The intake heater is preheated before starting the diesel forklift. START: Engine start position. Locate one position clockwise from the I (ON) position. After engine start, release the key and it will return to the I(ON) position automatically. Caution: . Never operate the ignition switch before sitting on the seat. . For the sake of safety it is recommended to always start the engine with the transmission gear shift lever shifted in the neutral position. . Do not turn the switch to the START position while the engine is running. . Do not leave the switch in the ON position when the engine is stopped. It may cause over discharge of the battery. . Do not operate the starter motor for more than 15 seconds continuously. Return the switch to the OFF position and wait at least 30 seconds prior to attempting restart.									
2	Integrated light and turn signal switch  (1) Left turn (2) Right turn	This switch serves as both two-position light control and turn signal switch. Light control switch <table><tr><td>Lamp name</td><td>Step1</td><td>Step2</td></tr><tr><td>Head lamps</td><td>—</td><td>○</td></tr><tr><td>Side clearance lamps</td><td>○</td><td>○</td></tr></table> Caution: Do not keep lamps such as head lamps kept on for a long time when the engine is stopped. It may cause over discharge of the battery to make engine starting impossible. Turn signal switch Make the turn signal lamps blink. Left turn.....Push forward Right turn.....Pull backward Caution: The signal switch will operate when the ignition switch is ON.	Lamp name	Step1	Step2	Head lamps	—	○	Side clearance lamps	○	○
Lamp name	Step1	Step2									
Head lamps	—	○									
Side clearance lamps	○	○									

5.2 Control components (Fig.1.3)

No.	Name	Operation and attention
1	Direction control lever (Fig. 1.3-1)  (1) Forward (2) Reverse	Lever for shifting between forward and reverse. Forward.....Push forward Reverse.....Pull backward The neutral position is halfway between the forward and reverse position. Caution: The engine can't be started unless the control lever is at the neutral position. Stop the vehicle before shifting between forward and reverse.
2	Horn button (Fig. 1.3-3)  (1) Press	Press the button in the center of the steering wheel to sound this horn. The horn will sound even when the ignition switch off.
3	Lifting lever (Fig. 1.3-5)  (1) Lower (2) Raise	Raise and lower the forks. Raise.....Pull backward Lower.....Push forward The lifting speed can be adjusted by the degree of accelerator pedal depression and lever operating stroke. The lowering speed can be adjusted only by the degree of lever operating stroke. Caution: Always operate the lifting lever while correctly seated.
4	Tilting lever (Fig. 1.3-6)  (1) Forward tilting (2) Backward tilting	Tilt the mast forward and backward. Forward.....Push forward Backward.....Pull backward The forward or backward tilting speed can be adjusted by the degree of accelerator pedal depression and lever operating stroke. Caution: Always operate the tilting lever from a seated position.

5	Steering wheel adjustment lever (Fig. 1.3-15)  (1) Raised	1. The steering wheel position may be adjusted back and forth. 2. Lowering the directional lever at the proper position fixes the steering wheel at that position. 3. After the adjustment, try to move the steering wheel back and forth to see that it is fixed. Caution: The steering wheel position must be adjusted before starting the vehicle. Adjustment during traveling must be avoided.
6	Accelerator pedal (Fig. 1.3-10) Brake pedal (Fig. 1.3-11) Inching pedal (Fig. 1.3-14) 	From the right: accelerator pedal, brake pedal and inching pedal. Note: When control lever is shifted to forward-reverse, the vehicle will move even the accelerator pedal stays neutral.
7	Parking brake pedal (Fig. 1.3-16) Parking brake release lever (Fig. 1.3-13)  (1) Press down (2) Release lever	Use the parking brake pedal when parking or stopping. 1. When engaging the parking brake, while stepping on the brake pedal, fully press down on the parking brake pedal. 2. To disengage the parking brake pedal, while stepping on the brake pedal, pull the release lever toward you. Warning: . Before operating the parking brake pedal, step on the brake pedal and always confirm that the vehicle has come to a stop. . When parking on a slope, apply wheel chocks to the wheels. . Traveling without releasing the brake will spoil the brake performance.

5.3 Body components (Fig. 1.2)

No.	Name	Operation and attention
1	Operator's seat (Fig. 1.2-14) 	The operator's seat and seat belt are provided for your safety. The seat can be moved back and forth for position adjustment while the adjust lever is pulled right.
2	Engine hood (Fig. 1.2-12)  (1) Engine hood lock release lever  (1) Push	Opening: 1. Pulling up on the engine hood lock release lever will release the engine hood lock, and the engine hood will pop up slightly. 2. Lift the engine hood. 3. Open the engine hood all the way, then shake the hood slightly to check that the hood damper has been securely fastened before letting go. Closing: 1. Lifting up the engine hood and press the hood damper lock to release the lock. 2. Close the engine hood quietly, and press down on the hood until you hear a clicking sound. Caution: Operating the vehicle without firm locking of the engine hood is very dangerous. Be sure to check firm locking before operating the vehicle.
3	Fork (Fig. 1.2-8)  (1) Fork stopper	Lift each fork stopper and turn to release so that forks can be moved left and right. Adjust the forks in the position most appropriate for the load. When adjusting the forks, make sure that the center of gravity of the load corresponds to the center of the vehicle. After adjustment, turn the stoppers to lock the forks in place. Warning: Make the forks are locked before carrying load.
4	Draw bar 	The draw bar is located at the back of the counterweight, and is used to pull the vehicle when its tyres drop into a gutter. It can also be used for loading the forklift onto a truck or another vehicle. Caution: The draw bar should not be used for towing the forklift truck or for towing another vehicle using the forklift truck.

II . Safety instruction and operation of forklift truck

It is important for drivers and managers to remember the principle of “first safety” and ensure the safety operation as the description of Operation & Service Manual. Please read this manual thoroughly. This will give you a complete understanding of Baoli forklift truck and you will operate them correctly and safely.

1. Handling a new forklift truck

The performance and service life of the forklift truck depends heavily upon the way you handle it during the break-in period. Drive with special caution while becoming familiar with a new forklift truck.

(1) Always warm up your vehicle before putting it to work irrespective of season. Don't run engine at high rpm without load needlessly. Operate the vehicle under the light load, avoid suddenly speeding and braking.

(2) Replace gear oil in the differential and reducer after the new forklift truck working for 100 hours.

(3) Renew the oil in engine oil pan, transmission, driving axle and hydraulic oil tank; check and readjust the clearance of the driving and driven gear in the reducer after the new forklift truck working for 200 hours.

2. Inspection before operation

Please pay attention to the following items in order to make the vehicle working with high efficiency and lengthen its service life.

(1) The forklift truck adopts the home or imported engine, please read the manual accompanied with the engine carefully when using and maintenance.

(2) Check the tyre inflation pressure, if doesn't enough, charge air in time. Check the bolts of all wheels for tightness.

(3) Check the amount of oil in the working oil tank for sufficiency, the position of lubrication should be lubricated. The oil level should be at the middle position between the upper and lower scale marks of oil level meter. The contamination level of the hydraulic oil should be lower than grade 12.

(4) Check the radiator, and add antifreeze if necessary.

(5) Check hydraulic oil and brake fluid for leakage. Check if any leak or damage found on the oil pipes, water hoses, vent-pipes and the piping joints, pumps and valves etc.

(6) Check for all the terminals and plugs in normal state. Check the meters, lamps, switches and electric circuit if they are running properly.

(7) Check every pedal for free stroke and the levers for looseness and smooth

operation. Check lifting system, actuate the lifting and tilting levers to be certain that the lift bracket moves up and down properly and the mast can be tilted smoothly. Check brake system and steering system for flexibility and reliability.

(8) Check the traveling brake: the free stroke of brake pedal is 4-8 mm, when achieving effective brake, the clearance between the front floor and the pedal should be more than 20mm.

(9) Check the parking brake: the unload truck can park on 20% slope, when the parking brake is locked.

(10) Check all connectors and fasteners for looseness.

3. Start and stop of the engine

(1) Start of the engine

(a) First set the shift lever at the neutral position and the parking brake at the braking position.

(b) When starting, put the key into the start switch, turn it in the counter clockwise, preheat 10-15 seconds, and then turn it in the clockwise to "START" so the starting motor works. When hand is away from the key, it automatically returns to "ON" by spring force. Every starting time shouldn't be more than 15 seconds. Restarting should be after 30 seconds. As the engine doesn't work after some times starting, should check and remove the trouble, do not keep the starting motor engaged for a long time.

(c) Following the start of the engine, it's necessary to set the engine on idle running for five minutes. Full load operation can't be started until water temperature of the engine rises above 60°C.

When the engine is on idle running, you must check water thermometer, oil manometer, ammeter, fuel measurer, and so on for the data, whether to meet the specification, and check each pedal for free stroke, braking performance for its reliability, steering operation for its flexibility, tyre pressure for its conformance to the standard. If there is no trouble, operation may be allowed.

(2) Stop the engine

First set the engine on idle running for five minutes, so as to cool the engine gradually, and then turn off the ignition switch, so the engine is stopped to work.

Notice:

- . While the engine running, does not turn the start switch to "START" position, since there is a danger of damage to the starting motor.

- . Do not keep the start switch at the "ON" position while the engine is shut down. This will result in battery discharge.

4. Parking and storing

(1) Safe parking

(a) Park your forklift truck on a level ground preferably in a wide area. If parking on a slope is unavoidable, press down the parking brake device and block the wheels to prevent accidental roll. The truck is forbidden parking on a steep slope.

(b) Park your forklift truck in the area where designated or traffic conditions permit. If necessary, put a signpost or signal lights around the truck.

(c) Park your forklift truck on the solid ground. Avoid soft ground, deep mud or slippery surfaces.

(d) If you can not lower the forks on the ground due to break-down of the lifting system, put a warning flag to the fork end and park in the traffic conditions permitting.

(2) Storing

. Before storing

Before storing your forklift truck, clean it thoroughly and perform inspection using the following procedures.

(a) Wipe away grease, oil, etc. adhering to the body of the truck with waste cloth and water, if needed.

(b) While washing the body of the truck, check general condition of the truck. Especially check the truck's body for recess or damage and tyres for wear and nails or stones in the tread.

(c) Fill the oil tank up with the appointed fuel.

(d) Check for leakage of hydraulic oil, engine oil, fuel or coolant.

(e) Apply grease where needed.

(f) Check for looseness of hub nuts and cylinder piston rod joints. Check the surface of piston rod for damage.

(g) Check mast rollers to see that they rotate smoothly.

(h) Full oil into the lift cylinders by lifting the lift cylinders at the full stroke.

(i) In cold weather, don't draw off long antifreeze, if there is cooling water, run it away.

. Daily storage

(a) Park the forklift truck at a specified place and block the wheels.

(b) Place the shift lever in the neutral position and press the parking brake pedal.

(c) Put the key switch in "OFF" position and turn off the engine, operate the lever of the control valve several times and release the residual pressure of the cylinder or pipes.

(d) Remove the key and keep it in a secure place.

. Long time storage

Perform the following service and checks in addition to the “Daily storage” service:

(a) Taking the rainy season into consideration, park the truck at a higher and hard ground.

(b) Avoid parking on soft grounds such as asphalted road in summer.

(c) Apply antirust oil to the exposed parts such as piston rods and shafts which tends

to rust.

(d) Cover components which may be caught with humidity.

(e) The truck should be operated at least once a week. Fill the cooling system, if cooling water is discharged. Remove grease from the piston rods and shafts. Start the engine and warm up thoroughly. Move the truck slowly forwards and backwards. Operate the hydraulic controls several times.

□ **Operate the forklift truck after long time storage**

(a) Remove antirust oil from the exposed parts.

(b) Discharge the engine oil in crankshaft case of the engine, discharge the gear oil or hydraulic transmission oil in differential and gear box, after cleaning up then renew oil.

(c) Discharge foreign matter and water from the hydraulic reservoir and fuel tank.

(d) Remove the cylinder cap, check the valves and the rocker shafts for the clearance in normal data.

(e) Add cooling fluid to specified level.

(f) Perform pre-operation checks carefully.

(g) Warm up the engine before operation.

Warning:

If at any time your forklift truck is found to be in need of repair, defective, or in any way unsafe, the condition should be reported to the supervisor, and the truck should be taken out of service until it has been restored to safe operating condition.

5. Shipping, loading and unloading, slinging and towing of forklift truck

(1) Ship the forklift truck

(a) Apply the parking brake when shipping the forklift trucks by container or freight car.

(b) Fix the mast and the balance weight with steel wire and use jacks to prevent the forklift trucks from moving in the cabin.

(c) Pay attention to the overall length, width, height when loading, unloading and shipping and conforming the regulations is necessary.

(d) Single transporting if necessary after disassembling the mast and balance weight.

(2) Load and unload the forklift truck

- (a) Use the plate with enough length, width and strength.
- (b) Pull the parking brake and use jacks to stop the wheel.
- (c) Fasten the plate on the center of the cabin, there must be no grease on the plate.
- (d) The left and right height of the plate must be equal to make the loading and unloading smooth.
- (e) Don't change the direction on the plate to prevent the danger.
- (f) Reverse the truck slowly when loading the forklift truck on the freight car.

(3) Sling the forklift truck

- (a) Only the specially trained personnel can sling the truck.
- (b) Sling points should be always at the positions specified in sling nameplate.
- (c) The slinging cable must be enough to hang the forklift truck.
- (d) Disassembled parts of forklift truck must be slung in the appointed position.

Notice:

Dismantling and slinging the component shall not be performed without the approval of our company. Under special circumstances, the appointed sling position should be used. The balance weight, fork and mast of the truck all have their appointed sling position.

(4) Towing of forklift truck

- (a) The draw bar is installed below the counter weight. When operating the draw bar, first extract it and fasten a steel wire, then install the draw bar.
- (b) When towing the forklift truck, release the parking device.
- (c) The draw bar only used for following situation, while the truck can't move or while transporting the truck.
- (d) Fasten the towing steel wire at the appointed position.
- (e) Don't apply capacity abruptly when towing the truck.

(5) Repair the broken-down truck

If the truck broken-down suddenly during using, drag it away and repair in time to avoid hindering other vehicles or workers.

6. Information of safety operation

- (1) The forklift truck belongs to special equipment. Only trained and authorized operator shall be permitted to operate and service the truck.
- (2) Wear the safety guards, such as clothing, shoes, helmet and gloves while operating the truck.
- (3) When operating the truck, observe and follow all nameplates stuck on the truck. The nameplates must be replaced if lost or damaged.

(4) Daily maintenance should be done before or after using the truck. Anytime you find that the truck is not functioning normally, operation of the truck should be halted and check or repair at once.

(5) When the distance between the gravity center of loads and the fork arms is 500mm, the max. capacity is the rated capacity. When the distance exceeds 500mm, the capacity shall be reduced according to the load chart. Overloading is strictly prohibited.

(6) Operate your forklift truck on a hard ground. Operate on other ground, the lift capacity and travel speed must be decreased. Wipe off the oil and grease from the floor.

(7) If the forklift truck is equipped with attachment, its usage sphere will be wider, but its allowable load and stability is reduced. The attachment and special device is not to be diverted to any other purpose. It's very dangerous to rebuild the attachment. Please read the additional instruction we supplied and operate the truck following it strictly.

(8) Users select "Lengthening fork" in order to carry widening loads. Pay much attention not to overload and observe the allowable load and the capacity chart stuck on the truck. Careful driving should be taken when traveling and turning.

(9) The unloaded forklift truck with attachment should be operated as a loaded truck.

(10) Connect the power and turn on the key switch, select the position of direction switch, check the truck for normal operation by turning steering wheel, depress the accelerator pedal softly to keep proper acceleration.

(11) During operation, pay attention to the performance and condition of the system of machinery, hydraulic, electric etc.

(12) When operate one lever, pay attention not to shift another lever. Don't operate the lever at any position out of the driver's seat.

(13) The shift distance of control valve lever can control the speed of the lifting or descending of the goods. When the goods are lifted or descended, the initial speed shouldn't be too fast in either case.

(14) When tilting the mast forward or backward to the limit or lifting the fork to the maximum height, return the directional lever to neutral.

(15) The starting, turning, driving, braking and stopping of the truck should be done smoothly. When turning on the humid or slippery road, the truck should be decelerated.

(16) Because the forklift truck turns by the rear wheels, the end counterweight may swing widely when turning. Use care in narrow aisles and other workplaces.

(17) Operate the forklift truck smoothly, don't jerk the steering wheel. Avoid sudden stop, acceleration, stop or turn. In the case of improper operation, the truck will turn over. In case of this, the driver must keep calm, don't jump off the truck. The driver must hold

tightly the control wheel with two hands; meanwhile, his body must incline in opposite direction of truck's turning over.

(18) Turning, lateral or deflective traveling shall not be taken on a slope. It could cause overturning of the truck, it is very dangerous. On a slope, drive the truck with load forward to ascend and backward to descend. When the truck goes down on a slope, drive slowly with the brakes on. Make sure that the engine should not be shut down when traveling on a slope.

(19) The stability of the truck is influenced by the wind-force during outside operation, you must notice specially.

(20) Be careful and slow driving over a dock or temporary paving slab.

(21) Insert forks deeply under goods. Adjust fork's distance according to the dimension of goods. Make the loads distribute on the forks evenly to avoid tilt and slide of goods.

(22) Don't pick the loads with single fork. Fork can not be used to pull out any embedded goods, if necessary, the pulling force should be estimated.

(23) Don't handle unfixed or loose goods. Be careful to handle bulky goods. To prevent the collapse of stacked goods, tighten them. Forbid loading loose or little volume goods without pallet.

(24) When loading the goods, lower the forks to the floor. After the fork inserting stacked goods, the fork arms should be in contact with the goods. Drive the truck with mast tilting back for stabilizing the load. Before traveling, raise the forks for 200mm-300mm from the floor.

(25) When handling bulky loads which block your view, operate the forklift truck in reverse or have a guide.

(26) While mast's lifting and lowering, anyone is absolutely prohibited from standing under the lift bracket or being lifted with forks. Never permit anyone to stand or walk under upraised forks.

(27) When lifting the load, according to the weight of the load, accelerate properly and then pull the lifting lever.

(28) The load descends for the gravity, at this time, the engine must be in idle position, and the lever must be pulled slowly to prevent the load from sudden falling.

(29) When loading and unloading goods, keep the mast vertical and the truck is in braking state.

(30) Load should cling to the load backrest. Do not handle the load which exceeds height of the backrest, or else there is a danger of load's falling against operator.

(31) When travel with load, don't tilt mast forward, don't do handling. Don't brake abruptly to prevent goods from slipping off the forks.

(32) It is necessary to brake before tilting the mast forward or backward. It's also necessary to decelerate and tilt forward slowly so as to prevent the goods from slipping off the forks.

(33) Don't make a sudden braking when the truck traveling with loads.

(34) Drive the forklift truck to the stacked goods at a low speed, at the same time, pay much attention to sharp and hard objects near the goods, otherwise, the tyres will be pricked.

(35) Pay attention to pedestrian, obstacle and bumpy road when driving. Pay attention to the clearance over the forklift truck.

(36) Keep your head, hands, arms, feet and legs within the confines of the cab. Never allow other persons on the forklift truck.

(37) Tilt the mast of the high lift forklift truck as backward as possible when operating the truck. Use minimum forward and backward tilt when loading and unloading. It is dangerous to travel or turn when lifting the goods at high levels.

(38) It is noted that the goods will fall down when the forks of the truck with lifting height more than 3m lift, take the protection measures if necessary.

(39) Before the truck decelerating and stopping, don't change gear to reverse shift, so as to ensure the safe loading.

(40) When the truck stops and the engine is on idle position, the mast must be tilted backward. You shouldn't leave the truck with idling engine or hanged goods unattended.

(41) When adding fuel, make the driver leave the truck and the engine flameout. Don't ignite when checking the level of fuel tank.

(42) Don't open the radiator cap when the engine is very hot.

(43) After one day's working, the fuel tank should be added oil to prevent the humidity in the fuel tank from becoming the blob and then interfusing the fluid.

(44) When leaving, engage the parking brake, lower the forks on the ground and let the shift lever to neutral, make the engine flameout or cut down the electric supply. If parking on a slope with smaller gradient, apply the parking brake and block the wheels. The truck is forbidden parking on a slope with bigger gradient.

(45) Don't adjust the control valve and relief valve at will to prevent the damage of hydraulic system and its components because of excessive pressure passing them.

(46) Tyres should be inflated according to the pressure value specified in the nameplate of "Tyre Pressure".

(47) Check the chains periodically to make sure that good lubrication condition exists between the chain elements, the degree of tightness between left and right chain is identical. If the variation value of the chain pitch exceeds 2% standard value, it indicates that the chains have been worn excessively, replace it immediately.

(48) The overhead guard is main part which is strong enough to meet safety standard, and protect the operator from falling materials. It's very dangerous to dismantle or rebuild the overhead guard, because these conditions could lead to an accident.

(49) A load backrest shall be used as protection against back falling objects on the fork. It's very dangerous to dismantle or rebuild the load backrest, because these conditions could lead to an accident.

(50) You can't change or add other working equipments on the truck without our company's permission, or the rated capacity and safety operation will be affected.

(51) Keep safety when serving on high position.

(52) The forklift truck must be operated under the following environment: below an elevation of 1000 meters and temperature between -20°C and 40°C, relative humidity is 95%. Careful operation must observe under other adverse circumstances.

(53) Because of the danger for the people, the forklift is forbidden operating in airtight space, or you may be choked by the tail gas. The tail gas's exhausting standard shouldn't be lower than the no-load mechanical vehicle exhaust standard ruled by the nation that users are in. If in Europe nation, the adopted tail gas's exhausting index should be applied Europe Stage IIIA standard.

(54) According to the Directive 2000/14/EC and based on EN12053 standard, the noise pressure level at the operator's position and the measured sound power level and the guaranteed sound power level is referred to the following table. But the noise of the forklift truck may fluctuate due to different operation and the influence of the external environment.

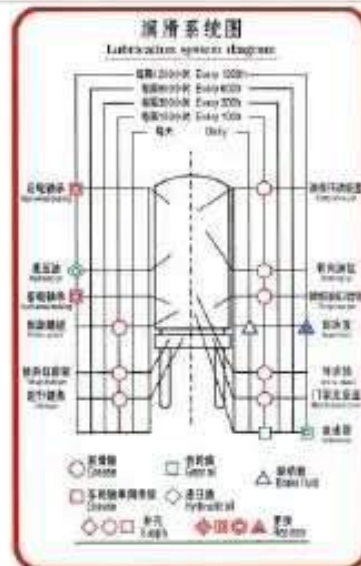
(55) The driver feels the vibration of the forklift truck when operating and traveling the forklift truck.. According to ISO3691 and based on EN13059 standard. The vibration of the forklift truck fluctuates according to environment condition. In normal working condition, the vertical direction acceleration mean value from the seat to the operator by testing is in the following table. But the vibration frequency felt by the driver depends on the working condition (etc. road, operation method), so the actual vibration frequency must be determined according to environment condition when necessary.

(56) To prevent the fire, accident or other unpredictable event, prepare the fire extinguishers in advance and operate them according to the instructions.

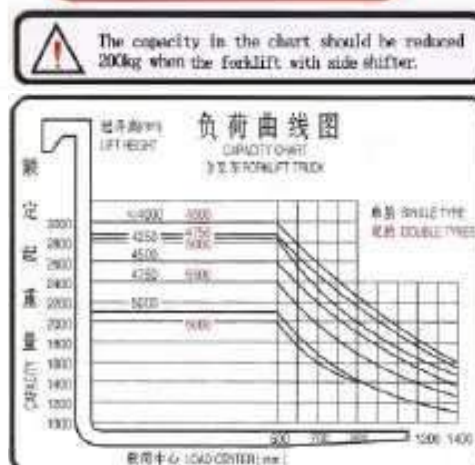
(3) Nameplate of forklift truck



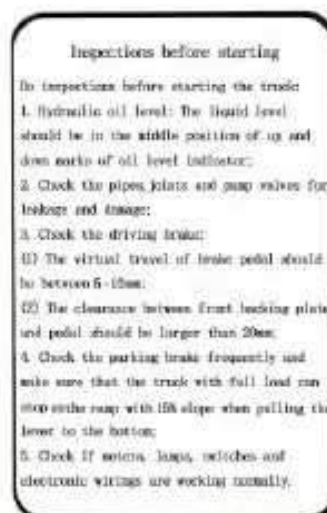
(4) Lubrication system



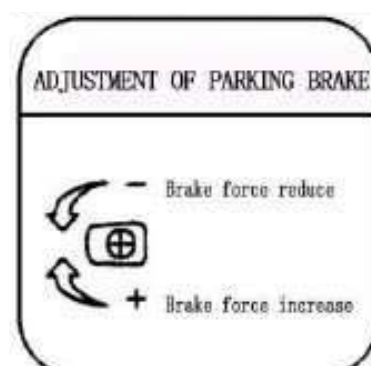
(5) Capacity chart



(6) Inspections before starting



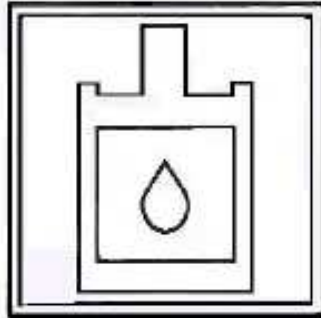
(7) Adjust parking brake



(8) Use parking brake



(9) Add hydraulic oil



(10) Add fuel (gasoline)



(11) Add fuel



(12) Add antifreeze

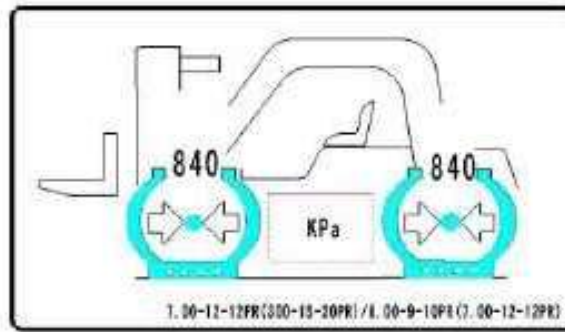


(13) Tyre safety (charging tyre)

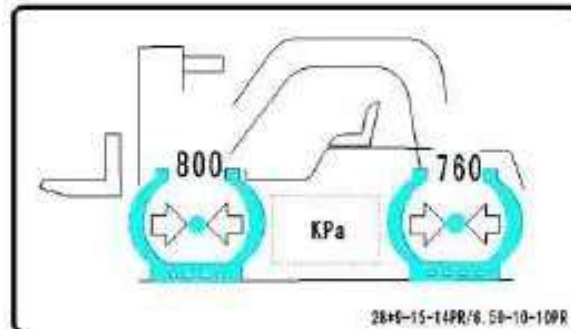


(14) Tyre pressure decal (charging tyre)

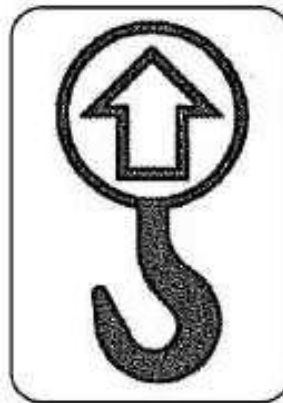
2-2.5t forklift truck



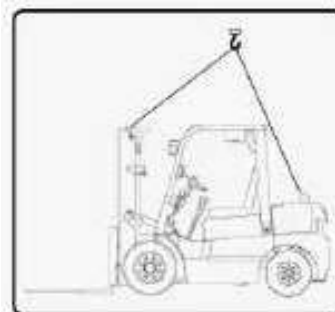
3-3.5t forklift truck



(15) Sling point indication



(16) Sling decal



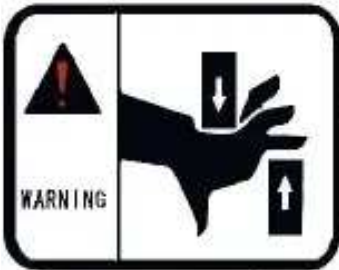
(17) Forbid entering into the space behind the mast



(18) Forbid conveying person



(19) Hand caution



(20) Fan hurting hand



(21) Hood crushing hand



(22) Belt pulley thumb hand decal



(23) Overturn caution



III. Periodic inspection and servicing

During operating the forklift truck, it is necessary to operate carefully, service and maintain periodically to make the forklift truck keep in good condition.

1. General rules on inspection and maintenance

- (1) Only use genuine parts when replacing critical parts.
- (2) Only use genuine or recommended oil when replacing or adding.
- (3) Clean oil fillers and grease fittings with a brush or waste cloth before adding oil or grease.
- (4) Checking oil level and adding oil should be made with the truck parked on a level ground.
- (5) Preventive maintenance should be done in an orderly manner and due care taken not to injure yourself.

▪ Regular inspection

- (1) Check the seal and the reliability of the hydraulic system.
- (2) Check the reliability of the steering and braking system.
- (3) Check the reliability of mast, driving axle and steering axle connecting with the frame.
- (4) Check all wheels for tightness.

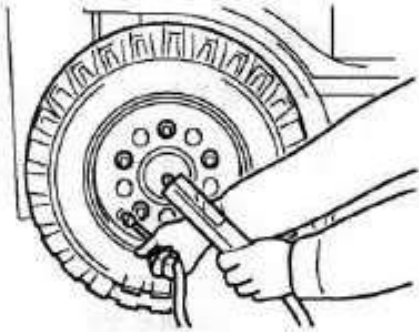
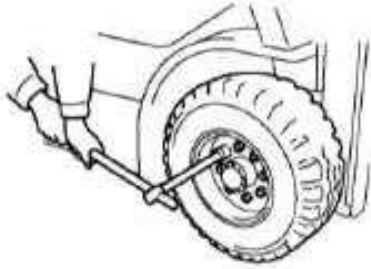
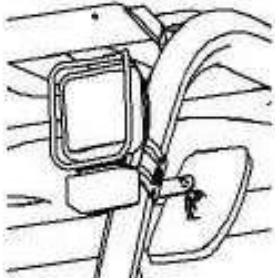
▪ Irregular inspection

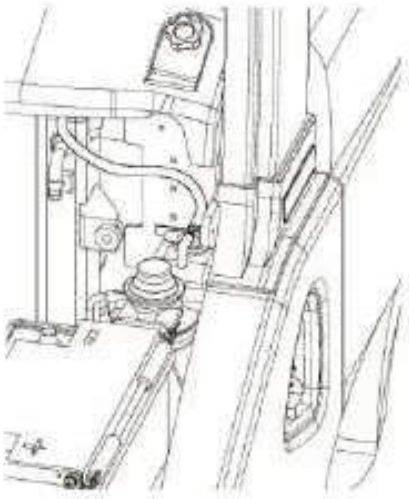
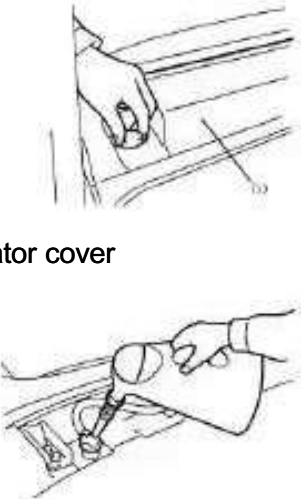
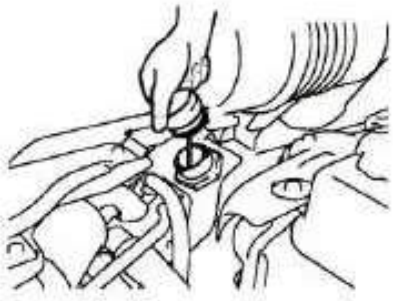
- (1) Check the reliability of each welding joints of the mast, frame and so on.
- (2) Check the reliability of connecting joints of steering cylinder, joint plate and gimbal etc.
- (3) Check all pipes and hoses for any leakage and breakage.
- (4) Check the performance of the traveling brake and the parking brake.

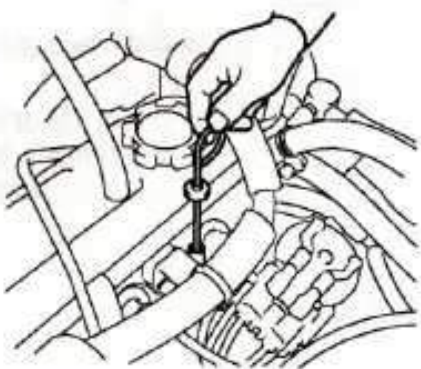
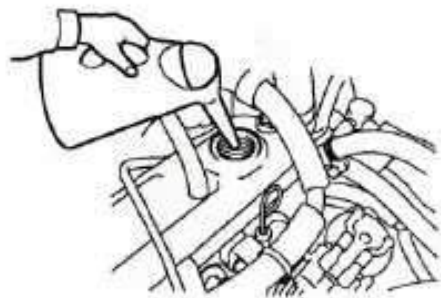
Caution:

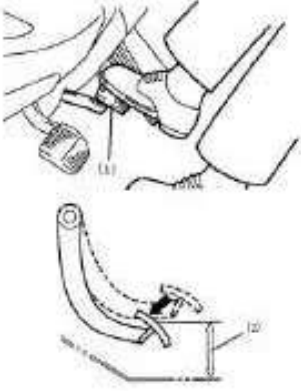
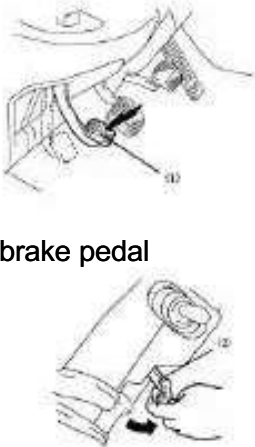
- **Only trained and authorized serviceman shall be permitted to service and repair the truck.**
- **If any damage or fault is found, stop the truck and report the condition to the manager. Do not operate the truck until it has been repaired completely.**
- **When checking and maintaining the truck, do not use the mast or the load backrest instead of a ladder, these actions will lead to a dangerous condition unexpectedly.**

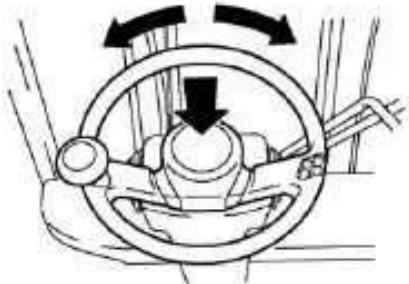
2. Inspection content

Walk around inspection	
Vehicle uprightness	Does the vehicle lean to one side or the other? If it, check for a tyre puncture or a problem with the undercarriage.
Beneath the vehicle	Check for any oil or water leakage on the ground or floor where the vehicle was parked. Check for loose parts or damage. If any unusual condition is found, have the vehicle inspection by a professional serviceman.
Tyre inspection 	Tyre inflation pressure 1. Use a tyre pressure gauge and measure the inflation pressure. Adjust it to the proper level. The tyre pressure is referred to the corresponding section in the manual or according to the decal of the vehicle. 2. After the adjustment, check if air is not leaking from the valve. Damage, crack and wear of tyres and rims Check the tyres for damage and wear, and the rims for bending. If the tyres are damaged, or there is a marked difference in the wearing of tyres between the front and rear or between the left and right is perceived, or bent rims are found, ask a professional serviceman for inspection.
Hub nut inspection 	Check the tightness of the hub nuts. Avoid uneven torque and tighten all of the nuts uniformly. Refer to the corresponding section for proper torque.
Lamp inspection 	Are the filaments intact? Is there any lens damage? Always keep the lenses clean to insure proper forward vision.

Engine compartment inspection	
Engine coolant level check and supply  (1) Reservoir tank	Level check and supply of engine coolant shall be performed while the coolant is cool. 1. With the engine off, open the engine hood and check the engine coolant level in the reservoir tank. Note: The reservoir tank equipped to the radiator automatically supplies the engine coolant when the coolant quantity in the radiator becomes insufficient. 2. The coolant level is proper if it is between the upper and lower limits. If the level is below the lower limit, supply coolant to the upper limit. 3. The concentration of the long life coolant (LLC) in the engine coolant must be higher than 30% (or 50% in a frigid zone.) Note: If no engine coolant remains in the reservoir tank, be sure to check the coolant level in the radiator, too.
Checking the engine coolant level in radiator  (1) Radiator cover	1. Remove the radiator cover. 2. Remove the cap and check the coolant level from the filler port. 3. If the engine coolant is not visible through the filler port, fill appropriately diluted coolant (LLC) to the port. Note: To close and tighten the radiator cap, match the pawl on the reverse side of the cap with the notch on the filler port and turn the cap fully clockwise while applying a downward force. Warning: When the engine is hot, it is very dangerous to remove the cap. Coolant level check must always be performed when the engine is cold.
Checking hydraulic oil level 	Always stop the engine and lower the fork to the ground before checking the level of the hydraulic oil, while the vehicle is on level ground. 1. Open the engine hood and remove the hydraulic oil cap. 2. Wipe the level gauge attached to the oil cap with clean cloth, insert it again into the tank and screw tightly. Note: Inspect the oil level by placing the level gauge on the opening of the oil supply inlet, without screwing the hydraulic oil cap tightly. 3. Extract the level gauge gently and check if the hydraulic oil adhesion is up to the level line. 4. If the hydraulic oil level is insufficient, add oil. Spilled and splashed oil must be wiped off thoroughly.

Engine oil inspection 	1. Park the vehicle on a flat ground. If the vehicle is inclined, the indicated level may be incorrect. 2. The oil level must be checked before starting the engine or at least 3 minutes after the engine is stopped. 3. Extract the oil level gauge and wipe it with clean cloth. Insert it again and check if the oil level is between the F and L levels. 4. If the oil level is below the L line, add oil to the F line.						
Adding engine oil 	1. To supply oil, remove the filler cap and pour oil through the filler port. Never let the oil level exceed the F line. 2. The oil to be supplied must be appropriate for the season.<table data-bbox="830 1003 1620 1173"><tr><td>SAE40 Ambient temperature</td><td>higher than 30°C</td></tr><tr><td>SAE30 Ambient temperature</td><td>0°C to 30°C</td></tr><tr><td>SAE20 Ambient temperature</td><td>-10°C to 0°C</td></tr></table> Caution: Always use the same brand of oil if possible. Select the brand number of the engine oil according to the request of the engine or the corresponding section of the manual.	SAE40 Ambient temperature	higher than 30°C	SAE30 Ambient temperature	0°C to 30°C	SAE20 Ambient temperature	-10°C to 0°C
SAE40 Ambient temperature	higher than 30°C						
SAE30 Ambient temperature	0°C to 30°C						
SAE20 Ambient temperature	-10°C to 0°C						
Leakage inspection	Check the engine compartment for any oil or fuel leakage. Check the radiator if it is clogged and check if there are any foreign objects, such as paper or other, onto the radiator grill.						
On board vehicle inspection							
Brake fluid inspection  (1) Reservoir tank 	With the engine off, check the level of the brake fluid in the reservoir tank. If the level is below the lower limit, add brake fluid up to the proper level. If the decrease in brake fluid is excessive, the brake system may be leaky. Ask a professional serviceman for inspection as early as possible. Warning: . Never use any oil other than brake fluid. . Do not allow dirt to get into the reservoir tank. Even a small amount of dirt in the brake fluid can prevent proper braking. . Check the small vent hole in the reservoir tank cap frequently to make sure that it is not clogged with dirt.						

Brake pedal inspection  (1) Brake pedal (2) Brake pedal floor clearance	1. Depress the brake pedal fully, and check the floor clearance (clearance between the pedal and floor is not fewer than 110mm) 2. Make sure that the pedal does not go any further when it is kept depressed. 3. Also check that no abnormality is observed with pedal depression and return. 4. Manually depress the brake pedal to check the play until a resistance is felt. The value of brake pedal play: 5 mm to 8 mm. Warning: Ask a professional serviceman inspection if the play is excessive, pedal movement is abnormal or brake performance is improper.
Parking brake inspection  (1) Parking brake pedal (2) Parking brake release lever	1. Fully press down on the parking brake pedal and inspect that the brake is functioning normally. 2. After fully pressing the parking brake pedal, pull the parking brake release lever toward you and confirm that the parking brake is released. Warning: Ask a professional serviceman for inspection if any abnormality is found.
Inching and brake pedal inspection  (1) Inching and brake pedal	1. Manually depress the inching and brake pedal to check the play until a resistance is felt. The value of inching and brake pedal play: 5~8mm 2. Depress the inching and brake pedal and check that there is no depression or abnormal resistance. Caution: Ask a professional serviceman for inspection when any abnormality is found.
Instrument inspection	Start the engine and see that they operate properly.
Fuel level check and supply  (1) Fuel tank cap	1. Observe the fuel meter to see if the fuel is sufficient. Note: After the end of daily operation, fill the tank with fuel to prevent the moisture in the air in the tank from mixing into the fuel. 2. When supplying fuel, stop the engine, remove the fuel tank cap by turning it counterclockwise, and pour fuel through the fuel filler neck. 3. After fueling, be sure to tighten the fuel tank cap. Caution: • Always stop the engine and keep any fire source away before and during the fueling operation. • Carefully prevent entrance of water and dirt into the tank during fueling.

Engine inspection 	Start the engine and warm it up sufficiently. 1. Check each meter and warning lamp to see there is no abnormality. 2. Check if the engine is generating abnormal sound or vibration. 3. Check the exhaust gas color to see it is normal. Colorless or light blue exhaust indicates complete combustion; black exhaust, incomplete combustion; and white exhaust, burning oil as a result of oil getting into the cylinders. Warning: . The exhaust gas is harmful. If you must start the engine inside a building or enclosure, insure sufficient ventilation. . The gasoline engine carburetor is equipped with the automatic chock that keeps the engine running at a relatively high speed a while. Do not be bothered, however, because the engine resumes a normal speed upon warming enough.
Loading handling system 	1. Check the fork installation state, for cracks and bending. 2. Check for mast distortion, chain tension and oil leakage from cylinders and piping. 3. Operate the lift and tilt levers to check their operating state. If anything unusual is found, have the vehicle inspected by a professional serviceman.
Steering wheel inspection 	Perform the inspection after starting the engine. 1. Check the steering wheel play with the rear wheel set in the straight traveling direction. The standard play of steering wheel when idling: 20~50mm 2. Turn the steering wheel in the circumferential direction and also move it up and down to check there is no looseness. 3. Push the horn button to check if the horn sounds normally. 4. If any abnormality is found, ask a professional serviceman for inspection.
While moving slowly	
Brake effectiveness	Inspect to see if there is anything unusual when the brake pedal is pressed or if the brakes only work on the side. Effect the parking brake and insure that the vehicle can be stopped and that a parked condition can be maintained. Caution: If anything feels even slightly unusual, stop vehicle operation immediately and have the vehicle inspection by a professional serviceman.
Steering inspection	While moving the vehicle slowly in a safe location, turn the steering wheel to the left and right and check for any unusual

Before garaging the vehicle

- Remove dirt from all vehicle components and then perform the following.
- 1. Inspect for oil or water leakage.
 - 2. Inspect each component for warping, scratches, dents or cracks.
 - 3. Clean the air filter element and lubricate parts as required.
 - 4. Raise the forks all the way up and down to lubricate the inside of the lift cylinder.

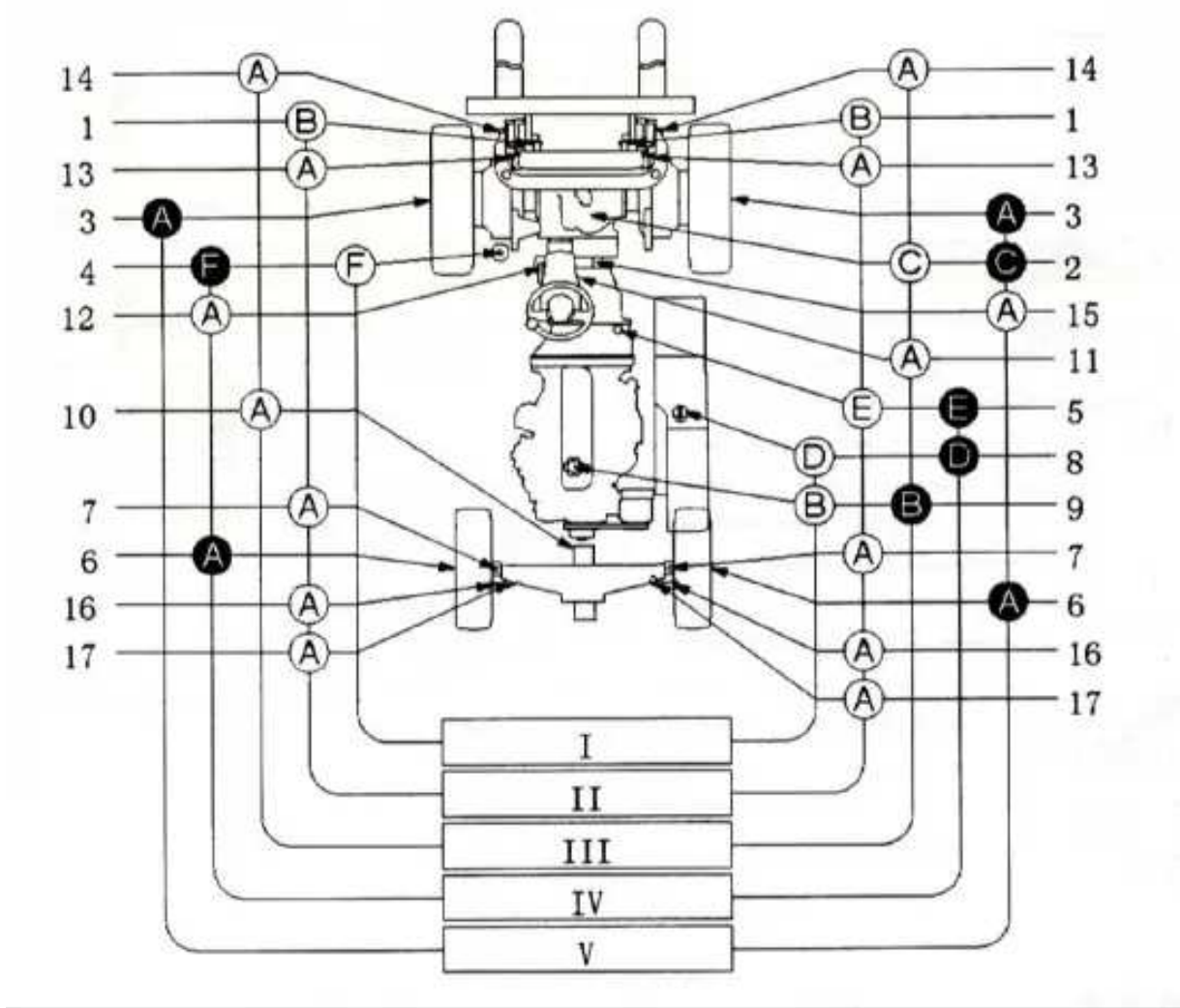
Caution:
Even a small malfunction can cause a serious accident.
Do not operate the vehicle until repairs have been completed.
If you sensed anything unusual during operation, notify the supervisor.

3. Periodic replacement table

Replacement period (Accumulate hours of operation or monthly periods of operation, whichever comes sooner.)	Every	6 Weeks	3	6	12	Months
	Every	250	500	1000	2000	Hours
Engine oil		●	←	←		←
Engine oil filter		●	●	←		←
Cooling water (except LLC, LLC is every 2 years)			●	←		←
Air cleaner element						●
Fuel filter				●		←
Torque converter oil				●		←
Torque converter oil filter				●		←
Manual transmission oil						●
Differential gear oil						●
Hydraulic oil				●		←
Hydraulic oil filter		●		●		←
Wheel bearing grease						●
Spark plugs				●		←
Master cylinder, wheel cylinder cap and						●
Brake fluid				●		←
Power steering hose			Every 2 years			
Power steering rubber parts			Every 2 years			
Hydraulic hose			Every 2 years			
Fuel hose			Every 2 years			
Torque converter rubber hose			Every 2 years			
Chain			Every 3 years			
Hydraulic oil pump seal			Every 3 years or 6000 hours			

Note: In case of the hard operating condition, the service interval of 170 hours or 1 month may be recommendable.

4. Lubrication chart



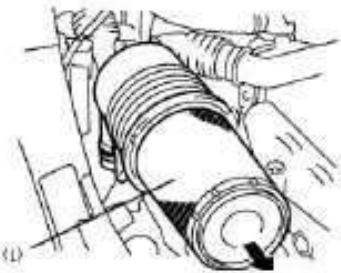
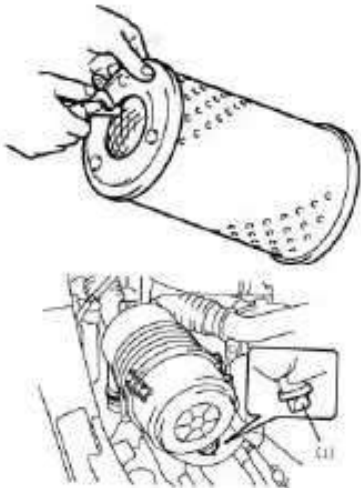
- | | |
|--|---|
| 1. Chain | I) Inspect every 8 hours (daily) |
| 2. Differential gear | II) Inspect every 40 hours (weekly) |
| 3. Front wheel bearing | III) Inspect every 250 hours (6 weeks) |
| 4. Brake fluid cup | IV) Inspect every 1000 hours (6 months) |
| 5. Transmission case | V) Inspect every 2000 hours (annually) |
| 6. Rear wheel bearing | ○: Inspect and service |
| 7. Steering knuckle king pin | ●: Replace |
| 8. Oil tank | A) MP grease |
| 9. Engine crankcase | B) Engine oil |
| 10. Pump transmission device | C) Hypoid gear oil |
| 11. Foot operating assy | D) Hydraulic oil |
| 12. Direction column locking mechanism | E) Hydraulic transmission oil |
| 13. Mast support bushing | F) Brake fluid |
| 14. Tilt cylinder pin | |
| 15. Propeller shaft | |
| 16. Tie rod end pin | |
| 17. Steering cylinder rear pin | |

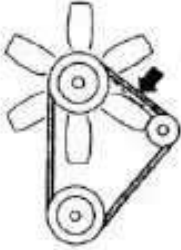
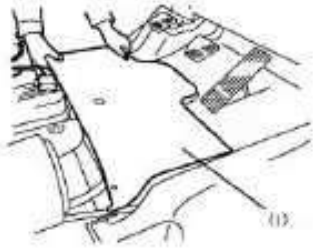
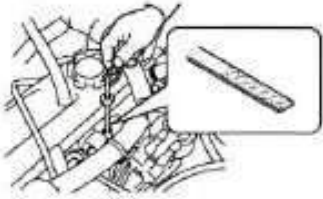
Note: In case of the hard operating condition, the service interval of 170 hours or 1 month may be recommendable.

5. Weekly maintenance

Inspect the items below in addition to the preoperation items. Please inspect the vehicles thoroughly every week to insure safety and pleasant working conditions.

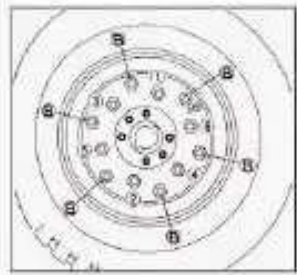
Weekly (40-hour) inspection items	
Air cleaner	clean
Fan belt	inspect check
Torque converter oil level	
Bolts and nuts	retighten
Mast and steering linkage	grease
Chain lubrication	lubrication oil

Frame serial number  (1) Frame serial number location	The frame serial number is stamped on the front cross plate. Please refer to the frame serial number when making inquiries about your vehicle.
Air filter cleaning	The element can be taken out after removing the three catches fixing the element.
Element cleaning  (1) Element	1. Tap the element filter paper lightly without causing any damage or blow dust off with compressed air (7kg/cm² or less) from inside. 2. After element cleaning, remove any dust in the evacuator valve (optional). Note: . Always replace the element if the filter paper is torn or damaged. . Wash the element if heavily contaminated.
How to wash the element  (1) Evacuator valve	1. Soak the element in water containing neutral detergent for approximately 30 minutes and then wash. Use care not to scratch the filter paper. 2. After washing, rinse the element with clean water (water pressure less than 2.8 kg/cm²). 3. Allow to dry naturally or use a dryer (cold air). Never use compressed air or flame. Note: The element should be replaced after washing six times or after it is used for one year.

Fan belt inspection 	Inspect the fan belt for cracks, fraying and tension. If any abnormalities are found, have the belt replaced or adjusted by a professional serviceman.
Torque converter oil inspection  (1) Toe board 	1. Park the vehicle at a safe and level ground, and stop the engine. Caution: Inspect with the parking brake pedal is effected and the forks are lowered to the ground. 2. Open the engine hood and remove the toe board. 3. Exhaust the level gauge and wipe it with clean cloth. 4. Insert the level gauge back to the hole from which it is removed, and extract it again to check if the oil level is among the gridding lines on the level gauge.
Retightening of bolts and nuts	Retighten each bolt and nut on the chassis and load handling system.
Greasing mast and steering linkage	Grease in accordance with the lubrication table. Caution: ·Clean the grease fitting tips thoroughly prior to greasing. ·After greasing, wipe off excess grease.
Fuel tank check	Check fuel tank, tank covering, fuel inlet, and drain plug against possible fuel leak. Follow the steps below. 1. Try to smell leak. 2. Look for leak. 3. Touch possible leak. See the nearest Baoli dealer upon finding leak and have them repair tank immediately. Caution: Never perform do-it-yourself welding or other repair work for it might cause explosion or fire.

6. Self service

Replacing or repairing tyre



Prepare tools and jack necessary for replacing or repairing tyres.

1. Front wheel

- Stop the vehicle on a level, hard surface and shut down the engine. All loads should be unloaded from the vehicle.
- Press the parking brake pedal and block the wheels. Put the jack under the vehicle frame.
- Jack up the vehicle to the extent that the tyre still remains on the ground. Loosen the hub nuts. Do not remove them.
- Again jack up the truck until the tyre leaves off the ground. Remove the hub nuts, and detach the wheel.
- The wheel should be reinstalled in the reverse order: the hub nuts should be tightened in the diagonal order evenly.
- After reinstallation, check the tyre for pressure and make it achieve standard value.

2.Rear wheel

Use the same manner as with the front wheel tyre repair or replacement except for the position of the jack which goes under the counterweight.

Adding antifreeze

If the vehicle is left in an area where the temperature is less than 0°C, the cooling water will freeze and may damage the radiator and/or cylinder block. In such cases, antifreeze coolant must be used.

When long-life coolant (LLC) is used, it must be changed once every two years.

Freezing temperature varies depending on the amount of antifreeze added.

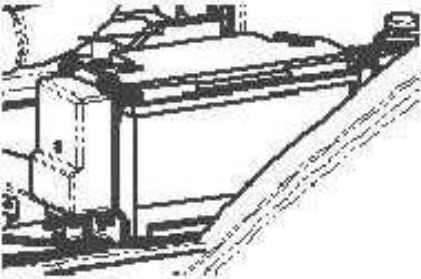
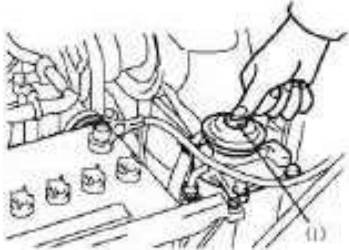
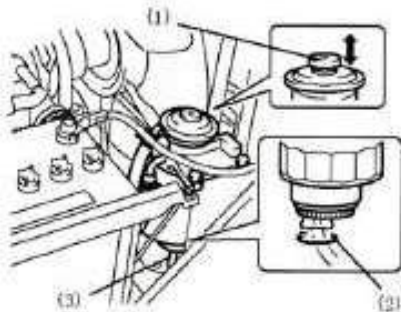
Freeze protection temperature (°C)	-12	-15	-24	-35
Antifreeze (%)	25	30	40	50

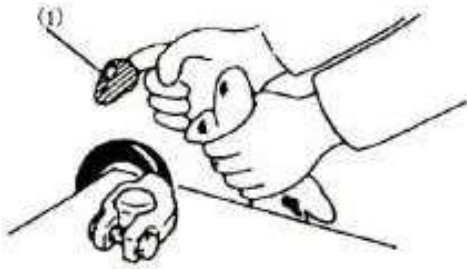
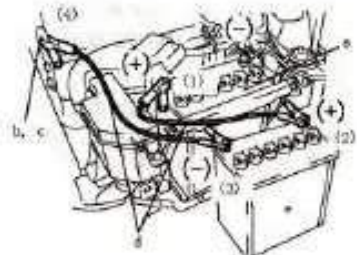
Caution:

The antifreeze fluid is flammable, so be particularly careful to avoid flame. Prior to adding antifreeze, inspect the radiator, water pump, piping and cylinder block for leaks.

The procedures for adding antifreeze are as follows.

1. Remove the radiator cap. Loosen the drain cock on the radiator and cylinder block and drain the cooling water.
2. Flush out the radiator and cylinder block by adding clean water through the radiator inlet.
3. After the water has drained out of the radiator and cylinder block, tighten the radiator and cylinder block, tighten the radiator and engine drain cocks.
4. Add the proper amount of antifreeze to the radiator inlet and fill up the remaining space with clean water.
5. When warm weather arrives and there is no longer any danger of freezing, drain the cooling water containing the antifreeze (except LLC, LLC is every 2 years in replacement). Flush out the radiator and engine block and fill with clean water.

Fuse replacement 	If a lamp does not come on or an electrical device does not function, the corresponding fuse may be blown. Check the fuse for each device. The lighting location on the fuse box is blown fuse when electrified. The fuse box is located in the front left as seen from the opened engine hood. The fuse check and replacement procedures are as follows: 1. Set the ignition switch to the OFF position. 2. Remove the fuse box cover and check the fuse. 3. If the fuse is blown, replace it with a spare fuse. Caution: Use the fuse having the same capacity as that of the installed one.
Air purge of the fuel system 	When fuel has been completely depleted or when maintenance has been performed on the fuel system, be sure to perform air purge in the following sequence. 1. Open the engine hood. 2. Operate the priming pump up and down to perform air bleeding.
Draining the sedimenter  (1) Priming pump (2) Drain plug (3) Drain hose	The sedimenter separates the water contained in the fuel. It is integrated with the fuel filter. If the sedimenter warning lamp comes on, immediately drain water according to the following procedure because the accumulated water in the sedimenter is above the specified level: 1. Place a water receiving container under the open end of the drain hose under the fuse filter. 2. Turn around the drain cock a time or two to loose it and operate the priming pump up and down to drain the water in the sedimenter. 3. When fuel starts to flow out after the end of water draining, firmly tighten the drain cock. Caution: Wipe the fuel clearly from the adjacent area.
Cleaning the radiator fin	Clean the radiator and radiator fin, if debris is trapped therein, this may cause over-heating. Caution: . After stopping the engine, confirm that the engine has sufficiently cooled down before cleaning. Taking inadequate precautions may result in burns. . When cleaning the radiator fin, take care not to cause it to become deformed. . When performing cleaning, always wear safety goggles and dust mask.

Maintaining the battery  (1) Grease	Terminals: 1. A loose or corroding terminal causes failure in connection. Eliminate white powder, if noticed on the terminal, by pouring warm over it to disable and then grease the terminal. 2. Remove the terminal, if it is extremely corroded, from the battery to brush off the corrosion using a wire brush or sandpaper. Then connect the terminal tightly to the battery and grease the terminal. Note: Remove the negative terminal (-) first, then replace the other terminals. Caution: . Stop the engine when attempt to work on the battery and terminals. . Be careful not permitting any foreign matter to come into the battery by means of putting the lids tightly in place. . Be careful not causing a short circuit on the battery nor nearing fire, because the battery-emitted gas is inflammable. . Be cautions enough not to contact the battery electrolyte. When it comes into contact with an eye or skin, wash it off immediately with plenty of water and then see a doctor. . Charge the battery with the lids off in a well-ventilated area. . When battery electrolyte is spilt, be certain to wash it off with water thoroughly the spot and adjoining area.
When the battery is dead  (1) Dead-battery vehicle (2) Engine hanger (3) To frame (4) Booster cable (5) Rescue battery	When a booster cable is available, it is possible to start the engine using the battery of another vehicle. Connect the booster cable following the sequence of the illustration. Make sure of (+) and (—) terminals of the cable when connecting. Caution: . Connection (1): The (+) terminal of dead battery. . Connection (4): Use a frame apart from the battery. . Do not directly connect batteries to avoid a danger of explosion. (An inflammable gas generated from batteries may catch fire.)

7. Recommended oil and grease for forklift truck

The oil level listed in following table is approximation, the detailed value when operating is inspected according to the meter or corresponding gauge.

Adding oil, grease and coolant should follow relevant automobile standard. It is necessary to wear a helmet, safety shoes and working clothes to avoid contacting with body when adding. Once the greasy dirt adhered on the skin, wash it with clean water and soap, it is forbidden to wash with gasoline or kerosene.

The waster of the truck must be reclaimed obeying the relevant laws and regulations. Incorrect treatment will pollute water, soil and atmosphere etc.

Brand Product	General standard		Recommended temperature	Viscosity	Domestic	Caltex	Mobil	Shell	Esso	Oil level
Engine oil	Gasoline	API SG API SJ	Asses "Viscosity Grade" according to environment temperature		SF	RPM Delo 400 oil		Shell X100	Esso extra motor oil	
					SG			Shell Helix		
			-10℃~+30℃	SAE 5W-30	SJ		Mobil super S		Esso Superflo	
					CD			Shell Rimula C Diesel engine oil	Essolube XT ID	
	Diesel	API CF-4 API CH-4	-25℃~+30℃	SAE 10W-30	CF-4	RPM Delo 400 oil	Mobil Delvac Super 1300		Essolube XT2	
			-20℃~+40℃	SAE 15W-40	CH-4		Mobil Delvac MX	Shell Rimula X Diesel engine oil	Essolube XT5	
Hydraulic fluid	ISO 6743/4 L-HM DIN 51524 II		≥-10℃	ISO VG32	Antiwear hydraulic fluid L-HM32	Rando oil 32	Mobil DTE24	Shell tellus oil 32	Nuto H32	45L
			≥0℃	ISO VG46	Antiwear hydraulic fluid L-HM46			Shell tellus oil 46	Nuto H 46	
	ISO 6743/4 L-HV		≥-20℃		Low temperature antiwear hydraulic fluid L-HV32	Rando HDZ 32		Shell tellus oil 32	Univis N32	
	ISO 6743/4 L-HS		≥-40℃		Low pour point antiwear hydraulic fluid L-HS32		Mobil DTE 13M	Shell tellus T32		
Automatic transmission fluid	GM Dexron III				8# Transmission fluid	Texamatic fluid 1888	Mobile ATF	Shell ATF III	Esso ATF	20L
Brake fluid	FMVSS 116-DOT3				JG-3		Mobil super heavy duty brake fluid	Shell donax B	Esso brake fluid (DOT-4)	0.6L
Grease			-20℃~+120℃		3# General lithium grease	Marfak all purpose 2,3 Marfak multipurpose 2,3 Multifak EP 2	Mobil grease	Shell retinax grease	Esso multipurpose grease H	
	MP		-20℃~+120℃		MoS ₂ EP lithium grease		Mobil grease XHP 222 special	Shell alvania HDX2 grease		
Coolant fluid	LLC		≥-25℃ ≥-35℃ ≥-40℃		FD- II FD-2A FD-Ⅲ		Mobil coolant	Shell freeze guard	Esso coolant	Filled
Automotive gear oil	API GL-5 or MIL-L-2105D		-15℃~+49℃	SAE85W/90	Heavy duty automotive gear oil 85W/90GL-5	Thuban EP (80W-90,90)	Mobil HD 85W/90GL-5	Shell spirax A gear oil	Esso gear oil Gx 85W/90GL-5	18L
			-25℃~+49℃	SAE80W/90						

IV. Construction, principle, adjustment and maintenance of forklift truck

In order to keep good condition of your truck, you must have an intimate understanding of the construction, principle, adjustment and maintenance of the forklift truck. When finding damage or fault with the truck, stop operating the truck and inform a professional serviceman. Use genuine parts of our company for replacement.

1. Power system

1.1 General description

Power system consists of the engine, fuel system, intake system, cooling system and exhaust system. The engine is connected with the frame by rubber cushion to avoid vibration. The engine, torque converter, transmission case, drive shaft and drive axle are assembled into a single unit.

For the construction and adjustment of engine, please refer to the operation and maintenance manual of engine.

<https://www.besttruckmanuals.com/>

1.2 Engine parameter and appropriate truck model

Engine model		Rated output /Speed Kw / r.p.m	Rated torque / Speed N.m / r.p.m	Cylinder number -Bore×Stroke mm	Total displacement L	Weight Kg	Appropriate truck model	Remark
Diesel engine	BPG490	37/2650	148/1900	4-90×100	2.54	260	CPCD 20/25/30F-X1	Xinchang
	BPG495	42/2650	174/1800-2000	4-98×105	2.98	260	CPCD 30/35F-X2	
	BPG498	45/2500	191/1600-1800	4-98×105	3.168	260	CPCD 30/35F-X3	
	CA498	45/2500	190/1800	4-98×105	3.168	245	CPCD 25/30/35F-D1	Dachai
	C240	34.5/2500	139/1800	4-86×102	2.369	252	CPCD 20/25/30F-W1	ISUZU
	4JG2PE	44.9/2450	186.3/1600-1800	4-95.4×107	3.059	252	CPCD 25/30/35F-W2	
	4TNE92	32.8/2450	135.4-149.4/ 1600(±100)	4-92×100	2.659	220	CPCD 20/25F-Y1	Yanmar
	4TNE98	44.3/2300	186-206/ 1700(±100)	4-98×110	3.319	225	CPCD 30/35F-Y2	
Gasoline engine	4G64-31ZG	37/2500	161/1600	4-86.5×100	2.350	154	CPQ(Y)D 20/25/30F-H1	Mitsubishi
	K21	27.8-31.2/ 2250	133.9-143.7/ 1600	4-89×83	2.065		CPQ(Y)D 15/20/25F-H2	Nissan
	K25	34.2-37.4/ 2300	164.8-176.5/ 1600	4-89×100	2.488		CPQ(Y)D 20/25/30/35F-H3	

Parallel table for engine and forklift model which is coincidence and stuck with CE label:

Engine model			The guaranteed Sound power level LwA(dB) 2000/14/EC	Exhausting 2004/26/EC	CE CONFORMITY 2006/42/EC	Truck model
Diesel engine	ISUZU	C240PKJ	106	StageⅢA	yes	CPCDF 20/25/30-W1
	Yanmar	4TNE92	107	StageⅢA	yes	CPCDF 20/25-Y1
		4TNE98	107	StageⅢA	yes	CPCDF 25/30/35-Y2
Gasoline engine	Mitsubishi	4G64-31ZG	105		yes	CPQDF 20/25/30-H1
	Nissan	K21	105		yes	CPQDF 20/25-H2
		K25	105		yes	CPQDF 20/25/30/35-H3

Note: The sound power level L_{WA} according to 2000/14/EC standard, the exhausting according to 2004/26/EC standard. The forklift with gasoline engine is not referred in 2004/26/EC standard presently.

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1.3 Inspection and adjustment of engine

In order to keep good condition of your truck, you must carry out periodic inspection and adjustment of power system.

- (1) Regularly clear the dust of air cleaner.
- (2) Regularly replace oil filter and fuel filter.
- (3) Check and apply the coolant periodically.
- (4) Periodic inspection of throttle valve and injection pump.
- (5) Check fan belt for tension and all fasteners.

Note:

Always check the exhaust gas of the engine during using the forklift truck. Especially after maintaining the engine, it’s necessary to verify the discharge indicator ensure that discharge value is fit for the national standard, so as to minimum damage to the person and environment.

1.4 Precautions of cooling system

(1) During using the forklift truck, if the temperature of the radiator or coolant is too high, don’t open the cap of the radiator immediately. To find the reason for boiling, use extreme care when removing the cap, the sudden release of pressure can cause a steam flash which would cause a serious personal injury. Lower the running speed of the engine

to moderate speed, after the cooling system cooled then turn to idle speed, loosen cap slowly to allow steam to escape, the cap can be removed. After that, make sure the cap is tightened securely.

(2) Check the radiator coolant reservoir fluid level. It should between FULL and LOW mark. Add the same type coolant to specified level if necessary. The coolant can be used all the year round.

(3) Put the coolant on a safe place and mark “Dangerous Matter” for its toxicity. If swallowed by accident, take the emergency first aid and consult a physician immediately.

(4) According to variety working condition, periodic wiping away the dirt adhering to the surface of the radiator with detergent, compressed air or high pressure water (pressure less than 4kg/cm²) is necessary.

2. Hydraulic drive unit

Torque converter	Type	Three elements, single stage, two phases
	Torque ratio	https://www.besttruckmanuals.com/ 3

	Set pressure	0.5~0.68 MPa
Charging pump	Type	Inner-mesh gear pump
	Flow rate	27 L/min(2000rpm,1.5MPa)
Hydraulic transmission	Type	Power shifted
	Speed ration	1.35/1.35
Hydraulic clutch	Friction piece:	$\phi 125 \times \phi 80 \times 2.7$ (mm)
	Friction area	71cm ²
	Set pressure	1.1~1.4 MPa
Weight		165kg
Oil amount		7 L
Oil type		6# or 8# Torque converter oil

2.1 General description

Hydraulic transmission type forklift trucks are provided with a drive unit including a torque converter and an electron gear-shifting transmission case (See Fig2.1). They feature the following:

(1) With an inching valve, the inching operation can be done under the condition that the engine runs at both high and low speed.

(2) Each of two hydraulic clutches is provided with three pairs of steel plates and high quality friction pieces specially-treated, so as to improve the durability of friction surface.

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(3) One-way clutches in the torque converter are used to increase the efficiency for power transmission.

(4) High quality oil filters is helpful to increase the life of the torque converter.

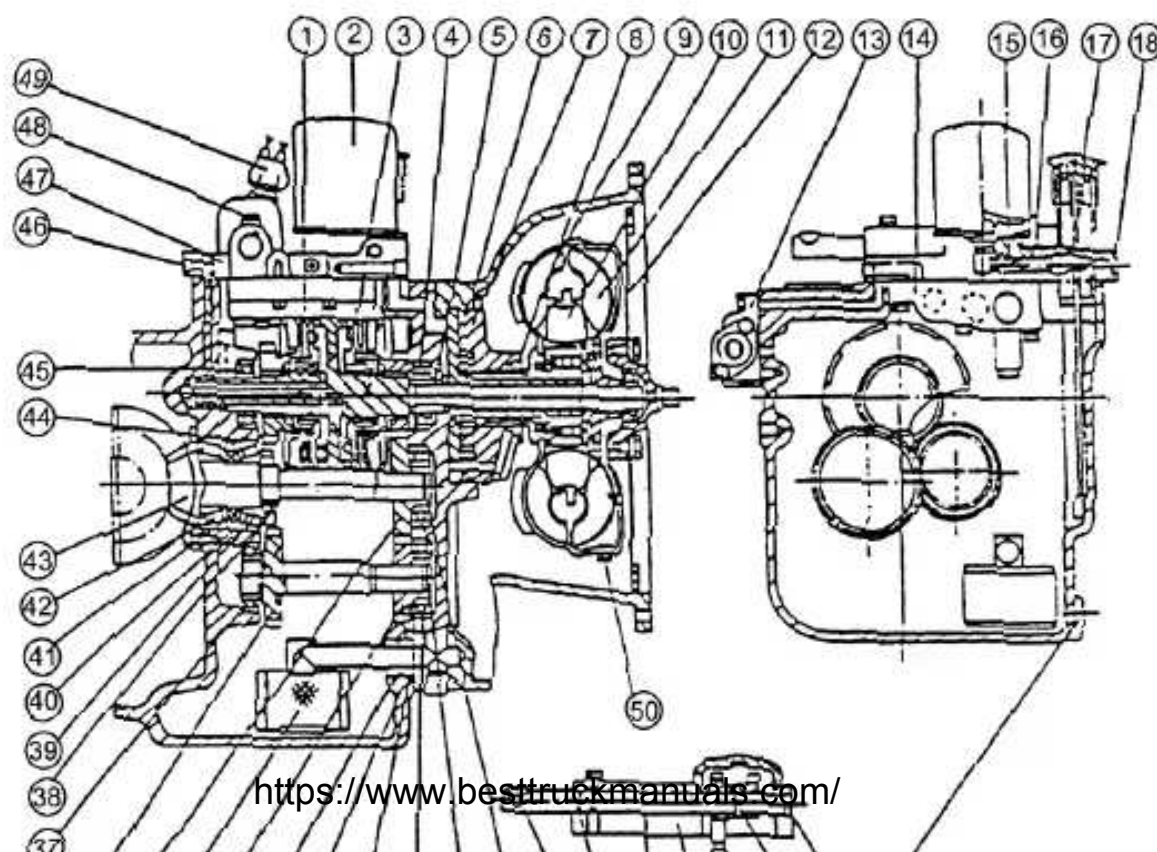


Fig2.1 Hydraulic drive unit

- | | | |
|-----------------------------------|------------------------------------|---------------------------------------|
| 1. Forward clutch | 18. Safety valve cover | 35. Output gear |
| 2. Oil filter | 19. Inner-hexagon plug | 36. Idler shaft |
| 3. Backward clutch | 20. Plug | 37. Single-row radial ball bearing |
| 4. Single-row radial ball bearing | 21. Spring pin | 38. Bearing nut |
| 5. Seal ring | 22. Shift arm | 39. Single-row tapered roller bearing |
| 6. O-ring | 23. Transmission case cover | 40. O-ring |
| 7. Charging pump | 24. Shift shaft | 41. Oil seal |
| 8. Oil seal | 25. O-ring | 42. Single-row tapered roller bearing |
| 9. Impeller | 26. Haft-round key | 43. Output shaft |
| 10. Guide wheel | 27. Clip ring for hole | 44. Supporting piece |
| 11. Turbine | 28. Single-row radial ball bearing | 45. Single-row radial ball bearing |
| 12. Spring plate | 29. Single-row radial ball bearing | 46. Inner-hexagon plug |
| 13. Inching valve | 30. O-ring | 47. Cover |
| 14. Control valve | 31. Snap ring | 48. Bolt |
| 15. Piston | 32. O-ring | 49. Switch, reverse lamp |
| 16. Spring | 33. Idler | 50. Drain plug |
| 17. Oil inlet cover | 34. Oil filter | |

2.2 Reducer and differential (Fig2.2)

The reducer located in the front of the transmission is used to reduce the speed and increase the torque from the output shaft of the transmission and transfer them to the differential. It consists primarily of a small spiral bevel gear assembled on the output shaft and a pinion shaft splined with a big spiral bevel gear. Both ends of the pinion shaft are supported by tapered roller bearing. Several shims are installed between the case and bearing covers to adjust the clearances between them.

The differential is housed in the front portion of the differential the front end of which is connected with the axle housing. The differential case is bilateral symmetry. The differential includes two halfshaft gears and four planet gears. The thrust washers are installed between the differential case and each gear, which make the clearance among gear pairs is proper. The planet gears are supported by gear shaft I and II. The gear shaft I and gear ring 1 are fixed to the differential case respectively with column pin and hinged bolt.

The power from the transmission is transmitted through the reduction gear, differential, halfshaft gear and halfshaft to driving wheels.

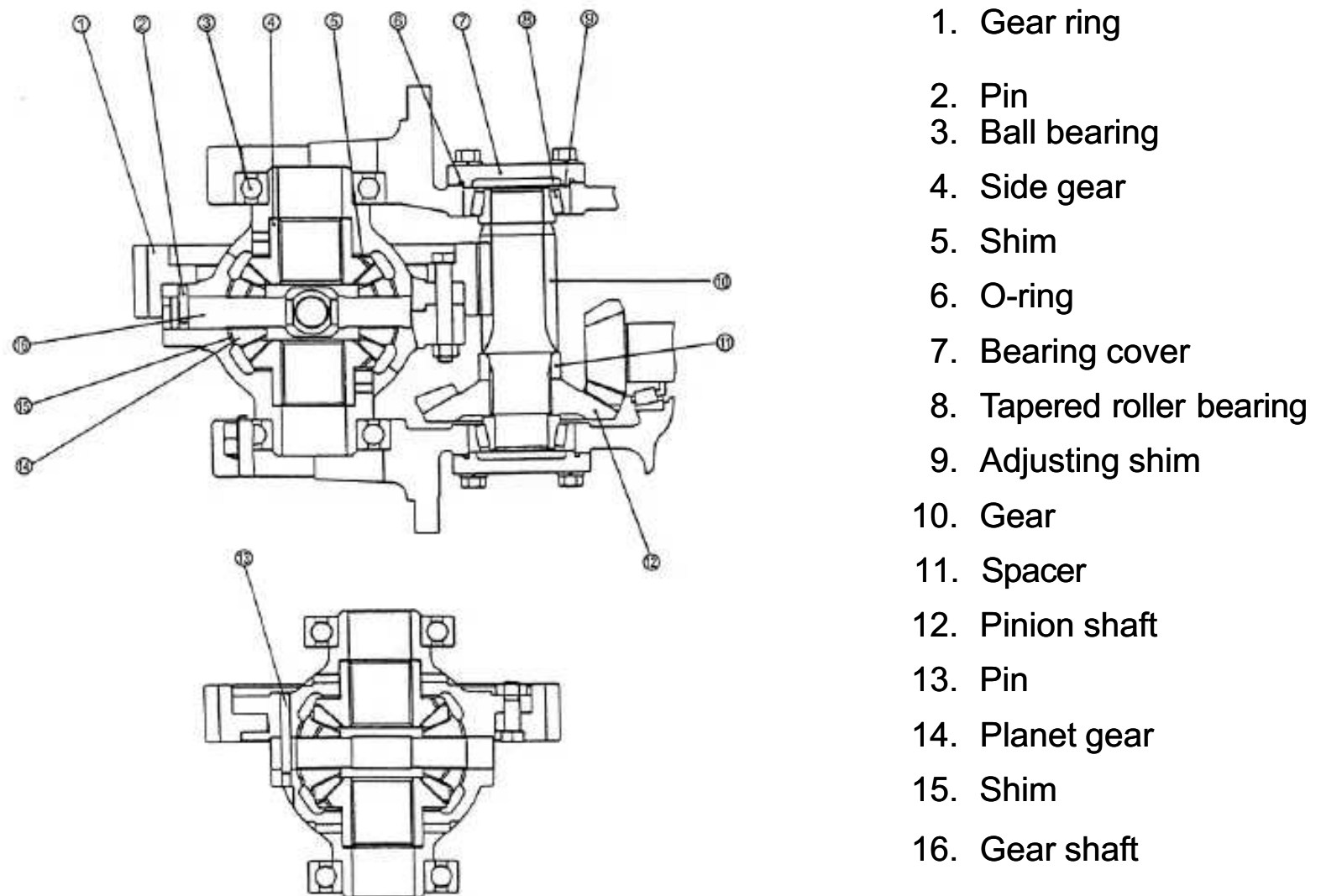


Fig 2.2 Reducer and differential

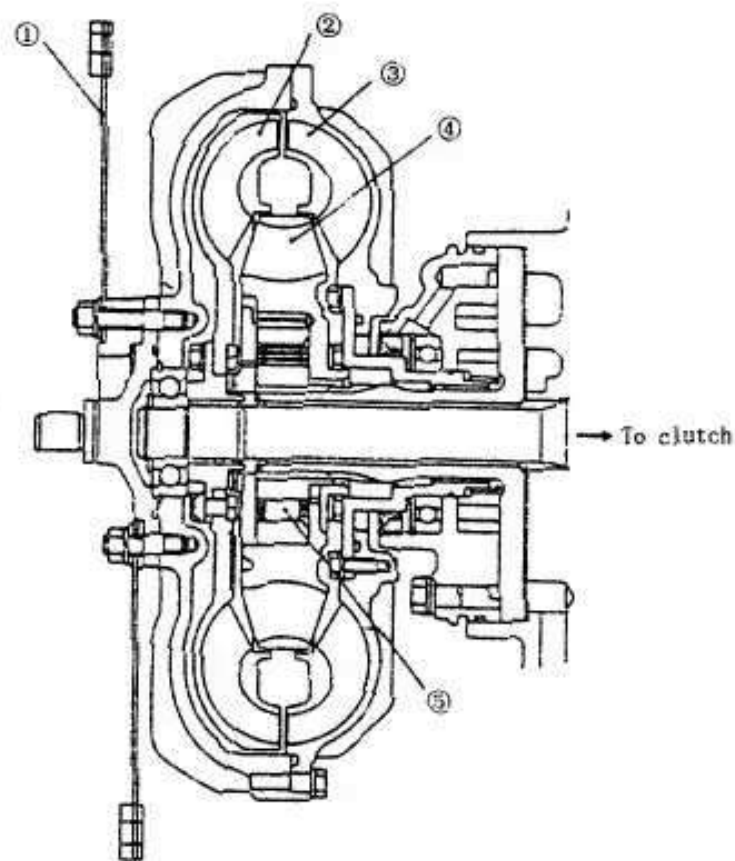
2.3 Torque converter (Fig2.3)

The torque converter mainly consists of an impeller, a turbine and an idler pulley.

The liquid, from the impeller driven by an input shaft, is jetted along its leaves to leaves of the turbine to transmit the torque to the output shaft (Mechanical energy is changed into kinetic one). And the flowing direction of the liquid from the turbine wheel is changed by the idler pulley to cause partial liquid return the impeller at an angle and produce so large reaction torque driving the idler pulley that the value of output torque is more than that of input torque by the value of the reaction torque. When the turbine speed keeps on increasing up to speed of the impeller, the change rate of the flow angle slows down and the value of the output torque keeps on decreasing until the liquid flows into the leaves of the idler pulley in opposite direction. When original reaction torque acts in the opposite direction, the torque value of the output shaft is less than that of the input shaft.

To prevent this, a one-way clutch is fitted in the idler pulley, causing the idler pulley freely rotate on this case. The way of torque-converting can be used to ensure efficient and smooth work of the torque converter.

The torque converter, filled up with the torque converter oil, in the drive unit is driven by an engine through a spring plate and flywheel on the engine. A charging pump is driven by a driving gear which is supplied by the pump. The power is transmitted to the transmission through a turbine shaft spliced to the turbine.



1. Spring
2. Turbine
3. Impeller
4. Idler pulley
5. One-way clutch

Fig 2.3 Torque converter

2.4 Hydraulic circuit (Fig 2.4)

After the engine is started, the charging pump inhales the oil from the oil tank. The pressure oil from the pump serves two parts for hydraulic clutches and torque converter.

The oil necessary to operate the hydraulic clutches is divided into two circuits through the pressure valve (set pressure of 1.1-1.4MPa): one circuit flowing to the torque converter via a relief valve (set pressure of 0.5-0.7MPa) and another to the inching valve and the slide valve. The oil out of the torque converter is cooled by an oil radiator and used to lubricate the hydraulic clutches and finally returns to the oil tank.

In the neutral, the circuit from the slide valve to the clutches is intermitted, and the pressure valve is opened to let the oil only flow into the torque converter. When the slide valve lies at its forward or backward position, the circuit form the slide valve to either the forward clutch or the backward clutch is closed accordingly, thus causing corresponding clutch come to work. When a clutch is at work, another must stop working, i.e. its spacers and friction pieces must be disengaged each other and be lubricated and cooled. When the inching valve is operated through stressing the inching pedal, apart or most of the oil in the clutches flows into the oil tank through the inching valve rod. The oil circulation for the torque converter then is the same as that in the neutral.

the torque converter then is the same as that in the neutral.

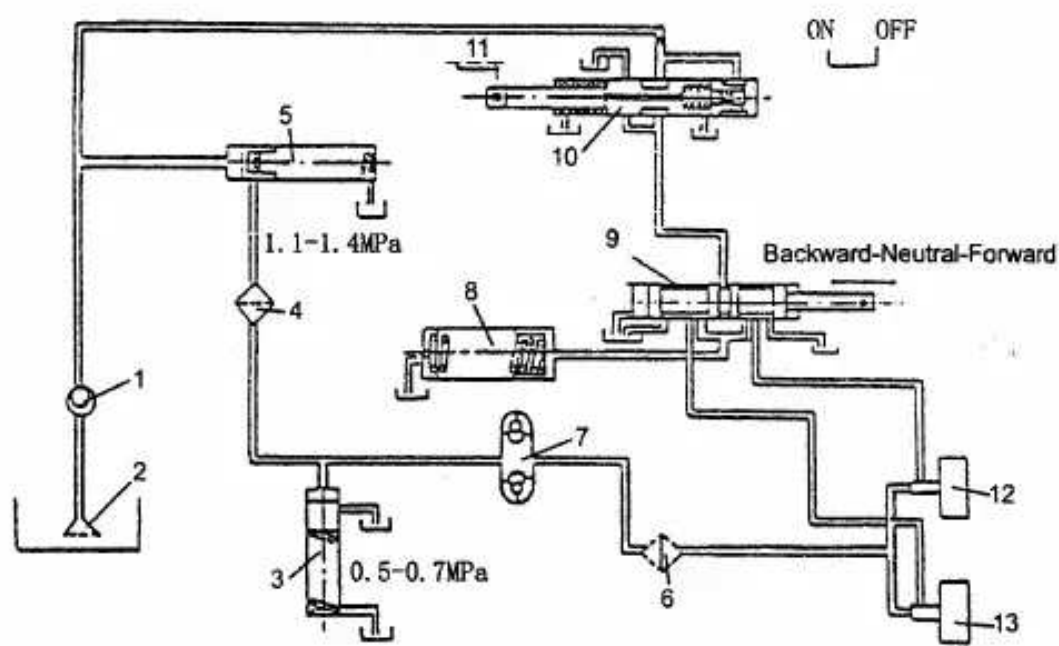


Fig 2.4 Hydraulic circuit

1. Charging pump
2. Oil filter
3. Relief valve
4. Oil filter
5. Pressure valve
6. Oil radiator
7. Torque converter
8. Adjusting valve
9. Slide valve
10. Inching valve
11. Switch
12. Backward clutch
13. Forward clutch

2.5 Towing disabled truck

The following should be done when the torque converter type truck to be repaired is towed by other truck:

- (1) Remove the half-shaft from the front wheel.
- (2) Electron shift should be placed in the neutral.

2.6 Troubleshoot

(1) Insufficient power

Parts	Problem	Possible cause and remedy
Torque converter	A. Too low oil pressure	
	1. Lower oil level	Check oil level and add oil
	2. Air entering in resulting from loose connections	Check connection or oil pipe. Retighten each connection or
	3. Blocked oil filter	Check, clean or replace.
	4. Oil can not be pumped out	Check and replace
	5. Deformed spring of relief valve	Check tension of spring
	6. Seal ring or O-ring seal damaged	Check and replace
	B. Fly wheel damaged	Check oil, if have dirt, replace it.
	A .Unsuitable oil or air bubble in oil	Check oil
	1. Air entering in resulting from loose connections	Check connection or oil pipe. Retighten
	2. Too low oil pressure or air bubble in	Measure and adjust pressure
	B. Slipped clutch	

Gear Box	1. Oil pressure lower	Measure and adjust pressure
	2. Seal ring damaged	Check and replace
	3. Piston ring of the clutch damaged	Check and replace
	4. Worn friction piece or deformed steel piece	Replace
	C. Incorrect position between inching rod and shift rod	Check and adjust
Engine	Insufficient engine power	Adjust or repair engine

(2) Higher oil temperature

Parts	Problem	Possible cause and remedy
Torque converter	1. Lower oil level	Check oil level and add oil
	2. Blocked oil filter	Check, clean or replace.
	3. Fly wheel bump against other parts	Check oil, if have dirt, replace it.
	4. Air entering in resulting from loose	Check connection or oil pipe. Retighten
	5. Water mixed into oil	Check and replace oil
	6. Lower oil flow	Check pipe and replace
	7. Worn bearing	Check and replace
Gear box	1. Slipped clutch	Replace friction piece of clutch
	2. Worn bearing	Check and replace

(3) Noisy gear box

Parts	Problem	Possible cause and remedy
Torque converter	1. Elasticity plate is broken	Check noise and replace elasticity plate.
	2. Damaged or worn bearing	Check or replace
	3. Gear is broken	Check or replace
	4. Spline is worn	Check or replace
	5. Noisy main pump	Check or replace
	6. Loosen bolt	Check, tighten or replace.
Gear box	1. Bearing is worn	Check or replace
	2. Gear is broken	Check or replace
	3. Spline is worn	Check or replace
	4. Loosen bolt	Check, tighten or replace.

(4) Too low transmission efficiency

Parts	Problem	Possible cause and remedy
	1. Elasticity plate is broken	Check noise and replace
	2. Lower oil amount	Check oil level and add oil

Torque converter	3. Ineffective driving system of oil	Check and replace
	4. Shaft is broken	Check and replace
	5. Too low oil pressure	Check oil pump for suction pipe
Gear box	1. Lower oil amount	Check oil level and add oil
	2. Seal ring is worn	Check and replace
	3. Slipped clutch	Check oil pressure of the clutch
	4. Shaft is broken	Check and replace
	5. Clutch cap is broken	Check and replace
	6. Retainer ring of clutch cap is	Check and replace
	7. Foreign matter mixed in oil tank	Check, clean or replace.
	8. Spline of shaft is worn	Check and replace

(5) Oil leakage

Parts	Problem	Possible cause and remedy
Torque converter or gear box	1. Worn seal ring	Check and replace seal ring
	2. Incorrect connection of case	Check, tighten or replace.
	3. Loose connector and oil pipe	Check, tighten or replace.
	4. Loose drain plug	Check, tighten or replace.
	5. Oil spray from vent hole	Check connector, air hole or replace
	6. Much oil	Check oil level and drain surplus oil

3. Drive system

Type	Front wheel drive, axle body and frame fastened together, fully floating type		
Forklift truck	2t, 2.5t	3t	3.5t
	Single tyre (2) Double tyres (4)		
Tyre size	7.00-12-12PR	28×9-15-12PR	28×9-15-14PR
Rim size	5.00S-12D	7.00WFB-15	
Tyre pressure	0.84MPa	0.80MPa	

Notice: For the difference of manufacturers’ standard, please charge the tyre according to the pressure specification of actual tyres.

3.1 General description

<https://www.besttruckmanuals.com/>
The drive axle mainly consists of the housing, the wheel hub, the half shaft and the

brake unit. (See Fig3.1) The housing is an integral casting body. The tyre with the rim is fixed to the hub with studs and nuts. The power is transmitted to the half shaft through the differential and drives the front wheels through the hubs. Each hub is fixed on the axle housing with two tapered roller bearings, so that the half shafts bear only torque transmitted to the hubs. There are oil seals to prevent water and dust from entering and oil leakage inside the hub.

3.2 Assembly of wheel hub

(1) Fill the chamber of wheel hub with lithium base grease about 100 cc, then fit the hub on the shaft. (Fig3.2)

(2) Screw down the adjusting nut with a torque for about 1kg.m and then loosen it for 1/2 turn.

(3) Put the spring balance up on the bolt to measure the hubs' starting torque. When the starting torque arrives to the specified value, lock the nuts slowly.

Starting torque: 5 to 15 kg.m (Fig3.3)

(4) Install the lock plates and lock nuts, after that pull the lock plates up to lock the bolts.

(5) Wheel assembly (Fig3.4)

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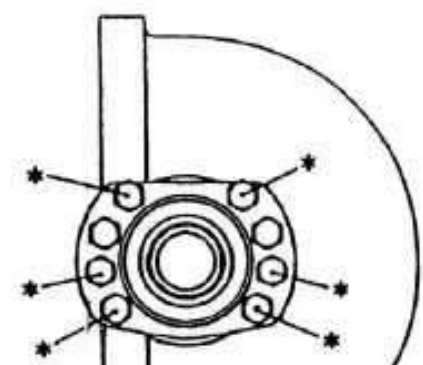
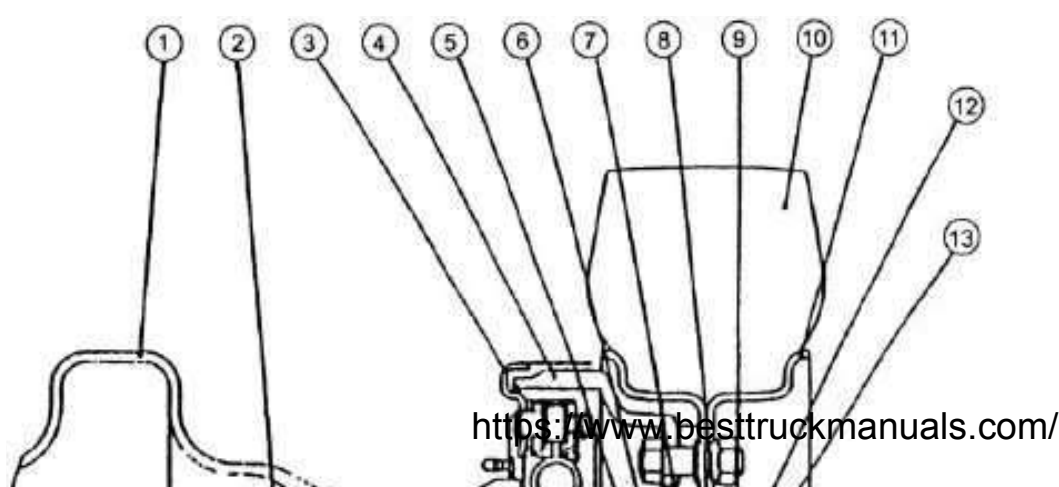
Install the inner rim and gasket inside the outer rim and assemble the outer rim and inner rim. Pay attention to the following points:

(a) Put the air valve rod in the notch of the rim and make it face outside.

(b) Make the tops of the rim mounting bolts face outside.

(c) Don't stand near the tyre when inflating air.

(d) When the tyre pressure reaches 98KPa (1kgf/cm²), knock the tyre lightly to make the inner tyre and gasket into the rim.



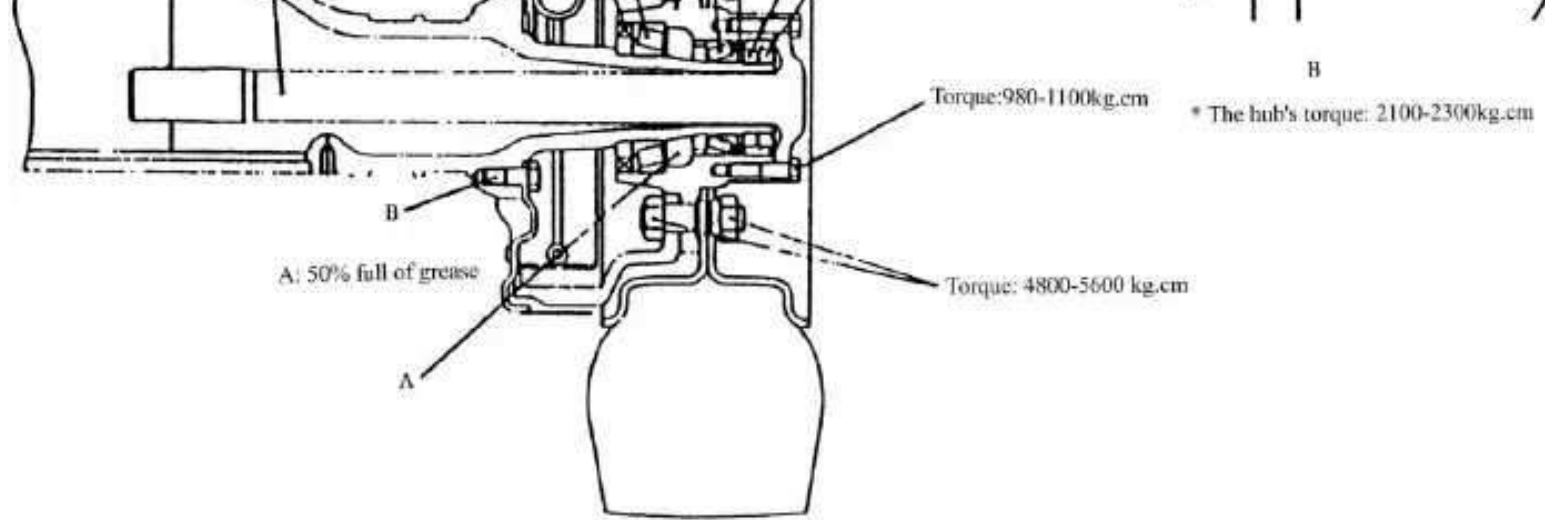


Fig3.1 Drive axle

- | | | |
|----------------|---------------------------|-------------------|
| 1. Housing | 6. Tapered roller bearing | 11. Rim |
| 2. Half-shaft | 7. Wheel hub | 12. Adjusting nut |
| 3. Wheel brake | 8. Tapered roller bearing | 13. Lock nut |
| 4. Brake drum | 9. Oil seal | |
| 5. Oil seal | 10. Tyre | |

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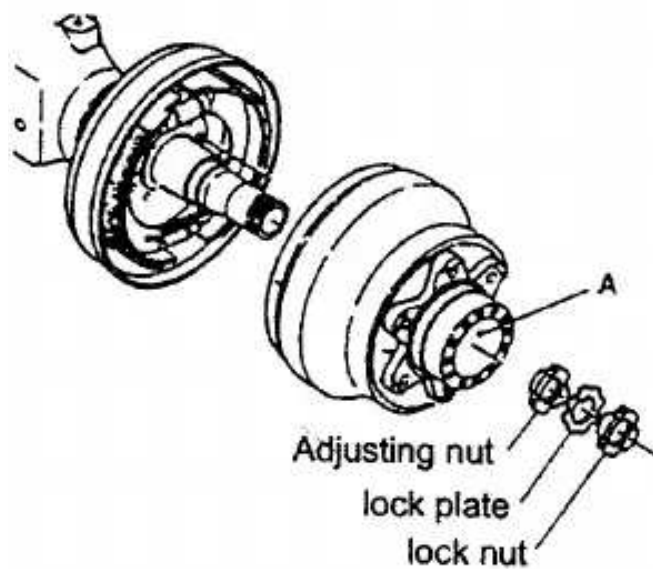


Fig3.2 Add grease

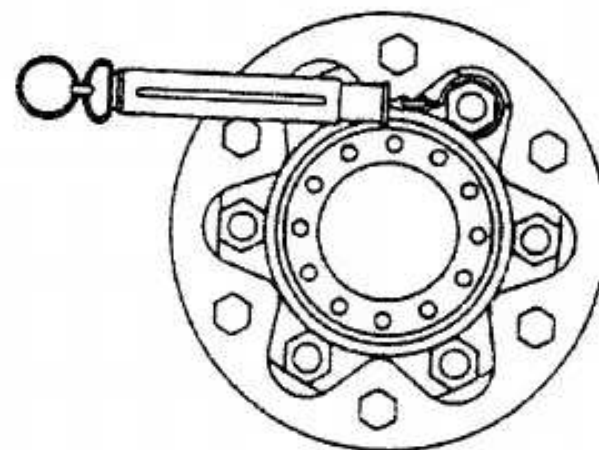
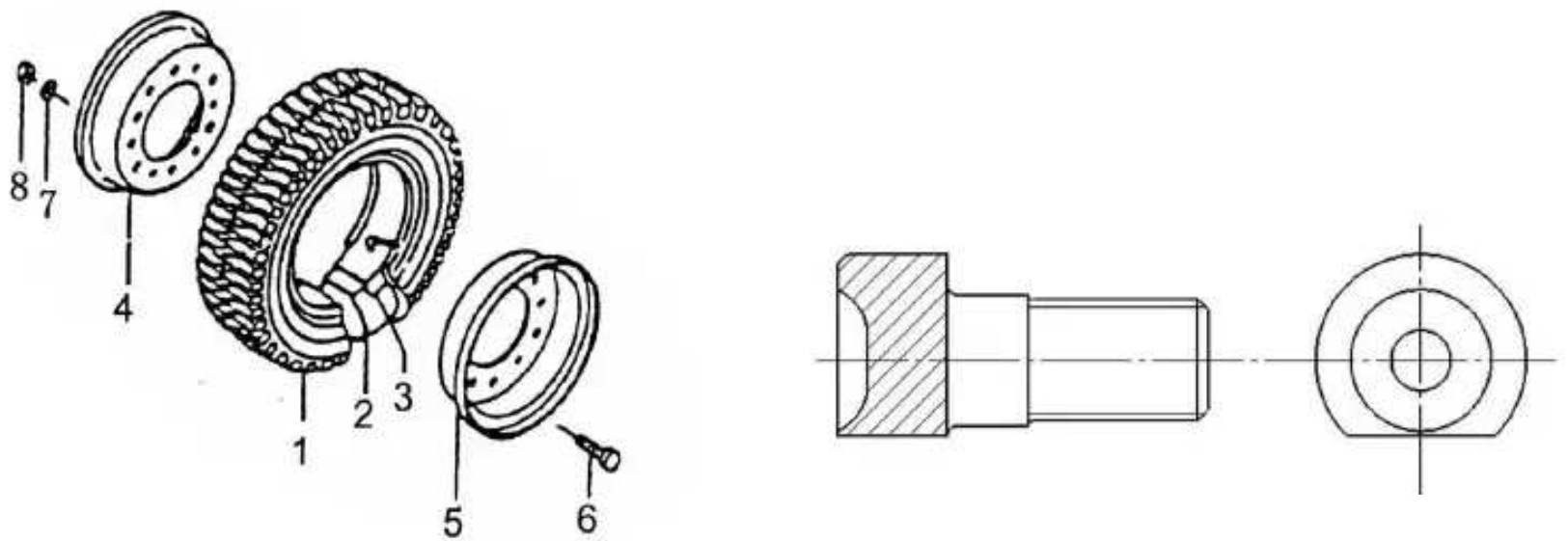


Fig3.3 Measure starting torque



Structure of rim bolt

Fig3.4 Wheel assembly

- | | | |
|--------------|--------------|------------------|
| 1. Tyre | 4. Inner rim | 7. Spring washer |
| 2. Air valve | 5. Outer rim | 8. Nut, rim |
| 3. Bushing | 6. Rim bolt | |

3.3 Troubleshoot

Problem	Probable cause	Remedy
Oil leaks from the reducer case	Connecting bolt of reducer is loose or worn shim	Tighten or replace
	Blocked air hole	Clean or replace
	Worn or damaged oil seal	Replace
Noisy differential	Worn or damaged gear	Replace
	Worn or damaged bearing	Replace
	Misadjusted gear clearance	Adjust
	Interference fit of spline connecting with	Replace parts

	half shaft gear and half shaft	Replace parts
	Insufficient gear oil	Add oil

4. Brake system

Type of brake system	Front two-wheel braking, internal expansion, hydraulic type	
Pedal ratio	5.66	
Master cylinder bore	19.05mm	
Wheel brake	2t, 2.5t	3t, 3.5t
Type	Duo-servo type with parking brake	
Operating cylinder bore	28.58mm	
Size, friction pieces (L×W×T)	324×60×7mm	348×76×8mm
Area, friction pieces	194.4cm ² ×4	264cm ² ×4
Inner diameter of brake drum	310mm	314mm
Parking brake	Front two-wheel braking, internal expansion, hydraulic type	

4.1 General description

The brake system is the front two-wheel braking type consisting of a master cylinder, wheel brakes and brake pedal mechanism.

4.2 Master cylinder

The cylinder contains valve seat, check valve, return spring, primary cup, piston and secondary cup, which are all kept in place with a stop washer and a stop wire. The exterior of the cylinder is protected from dust by means of a rubber dust cover. The piston is actuated through the push rod by operation of the brake pedal. As the brake pedal is pressed, the push rod pushes the piston downward. The brake fluid in the cylinder flows back to the reserve tank through the return port until primary cup blocks up the return port. After the primary cup passes through the return port, the brake fluid in the lower cavity of the cylinder is pressurized and opens the check valve, flowing through the brake pipeline to the operating cylinder. Thus, each operating cylinder piston is forced outwards. This brings the friction pieces on the brake shoes come into contact with the brake drum and slows or stops the truck. Meanwhile, the cavity behind the piston is filled with brake fluid led through the return port and inlet port. When the brake pedal is released, the piston is forced back by the return spring. At the same time, the brake fluid in each operating

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cylinder is pressurized by the return spring, returning into the master cylinder through the check valve. With the piston in its original position, the brake fluid in the master cylinder flows into the reserve tank through the return port. The brake fluid in the brake pipelines and operating master has a residual pressure proportioned to the set pressure of the check valve, which makes each operating cylinder piston cup securely seated to prevent oil leakage and eliminates a possibility of air locking when the truck is sharply braked. See Fig4.1.

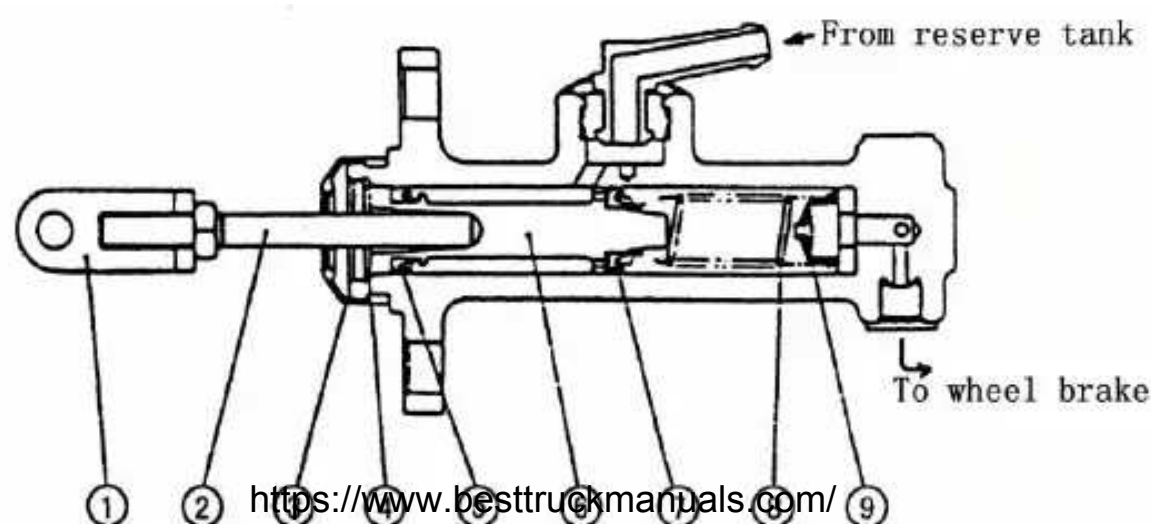


Fig4.1 Master cylinder

- | | |
|------------------|----------------|
| 1. Link rod | 6. Piston |
| 2. Push rod | 7. Primary cup |
| 3. Dust cover | 8. Spring |
| 4. Snap ring | 9. Check valve |
| 5. Secondary cup | |

4.3 Wheel brake

The wheel brake is the internal expansion hydraulic type consisting of brake shoes, spring, operating cylinder, adjuster and backing plates. Two wheel brakes are provided on each end of the front axle. The brake shoe, one end of it being connected to the anchor pin and the other to the adjuster, is stressed on the backing plate by the spring and spring pull rod. The primary brake shoe is provided with the parking pull rod while the secondary brake shoe with the adjusting lever of the clearance self-adjuster. The structure of wheel brake refers to Fig4.2.

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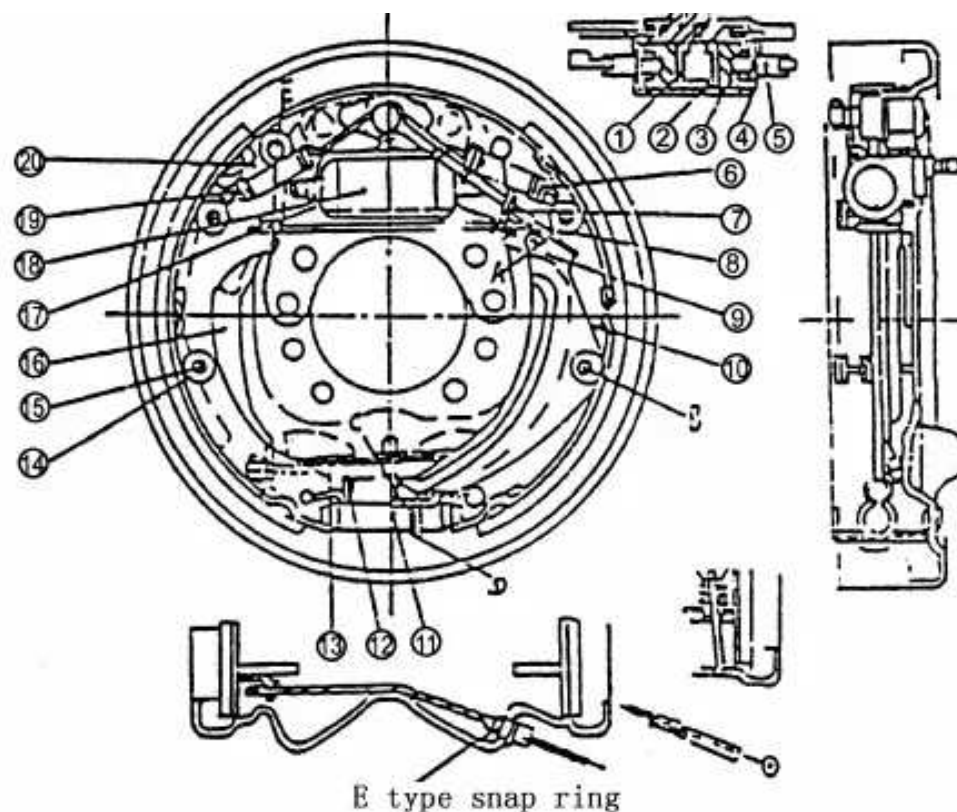


Fig4.2 Wheel brake
<https://www.besttruckmanuals.com/>

- | | | |
|---------------------|--------------------------|------------------------|
| 1. Spring | 8. Return spring | 15. Spring pull rod |
| 2. Cup | 9. Adjusting lever | 16. Parking pull rod |
| 3. Piston | 10. Secondary brake shoe | 17. Parking push rod |
| 4. Cylinder body | 11. Clearance adjuster | 18. Operating cylinder |
| 5. Push rod, piston | 12. Spring | 19. Return spring |
| 6. Return spring | 13. Parking cable assy | 20. Primary brake unit |
| 7. Push rod | 14. Spring cover | |

▲ Clearance self-adjuster

The clearance self-adjuster keeps suitable clearance automatically between friction pieces and brake drum, it actuates only when the truck in reverse travel is braked. The secondary brake shoe comes into contact with the brake drum and rotates together. As a result of this, the parking pull rod turns right around the point A so that the point B of the rod raises. After release the brake pedal, the parking pull rod turns left with the spring force so that the point B of the rod lowers. (Fig4.3)

As the clearance between the friction pieces and the brake drum increases, the rotating vertical distance of the pawl by point B increases, too. When the clearance is more than 0.4mm, the adjuster is dialed a tooth and the adjusting lever becomes longer, so that the clearance decreases.

Clearance adjusting range: Within 0.4 to 0.45mm.

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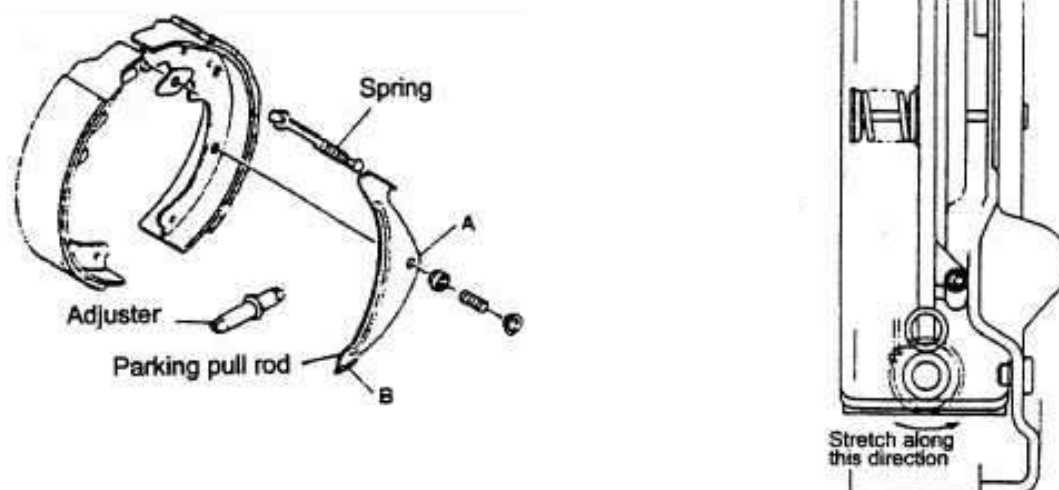


Fig4.3 Clearance self-adjuster

4.4 Operating device of parking brake

The parking brake is of a lever type. Open the second cap on the right of the meter bracket covering, the brake force can be adjusted with the parallel-driver.

Brake force adjustment. <https://www.besttruckmanuals.com/>

When you turn the adjuster clockwise, the force increases, otherwise, when you turn the adjuster counterclockwise, the force decreases.

Press force: 50kg

Operating method: Turn off the key, press the parking brake pedal with left foot, until hearing a sound, then release it. When release the parking brake, pull the blue lever (release switch) under the combination lamp to the release position, then the parking brake can be released.

The structure of parking brake refers to Fig4.4.

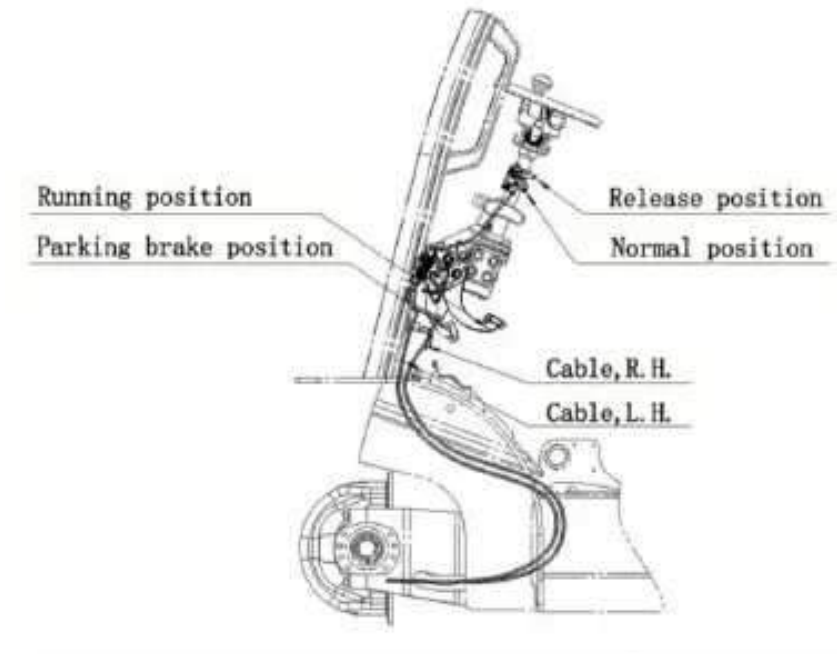


Fig4.4 Parking brake

4.5 Inspection of wheel brake

Inspect all parts to make sure if there're any worn or damaged parts. If necessary, repair or replace with new one.

(1) Check the operating cylinder body's inner surface and the piston periphery surface for rusting. Then, measure the clearance between the piston and cylinder body:

Specified clearance: 0.03 to 0.10 mm

Maximum clearance: 0.15mm

(2) Visually check the piston cup of the operating cylinder for damage or deformation. If necessary, replace it.

(3) Check the operating cylinder spring for free length. If necessary, replace it.

(4) Check the friction piece for thickness to see if it is excessively worn. If necessary, replace it.

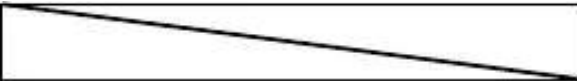
Unit: mm

https://www.besttruckmanuals.com/		3t,3.5t

Standard thickness	7.2	8
Max. thickness	5.0	6

(5) Check the inner surface of brake drum for damage and excessively worn. If necessary, repair or replace it.

Unit: mm

	2,2.5t	3t,3.5t
Standard dimension	310	314
Max. dimension	312	316

- (6) Measure the free length and the load of the brake shoe return spring.
- (7) Check the adjuster for damage, check the operation, and the contact point between the lever and gear for defect. Replace it if necessary.

4.6 Troubleshoot

Problem	Probable cause	Remedy
Poor braking	1.Fluid leaks from brake system	Repair
	2.Maladjustment of brake shoe clearance	Adjust the adjuster
	3.Brake overheating	Check for dragging
	4.Poor contact between brake drum and friction	Readjust
	5.Foreign matter adhered on friction piece	Repair or replace
	6.Foreign matter mixed in brake fluid	Check brake fluid
	7.Maladjustment of brake pedal (inching valve)	Adjust
Noisy	1.Hardened friction piece surface or foreign matter adhered on it	Repair or replace
	2.Deformed backing plate or loose bolts	Repair or replace

Noisy brake	3.Deformed shoe or incorrect installation	Repair or replace
	4.Worn friction piece	Replace
	5.Loose wheel bearing	Repair
Uneven braking	1.Oil-contaminated friction piece	Repair or replace
	2.Maladjustment of brake shoe clearance	Adjust the adjuster
	3.Malfunction operating cylinder	Repair or replace
	4.Return spring of brake shoe deteriorated	Replace
	5.Deflected drum	Repair or replace
Soft braking	1.Brake fluid leaks from system	Repair or replace
	2.Maladjustment of brake shoe clearance	Adjust the adjuster
	3.Air mixed in brake system	Bleed air
	4.Maladjustment of brake pedal	Readjust

5. Steering system		2t, 2.5t	3t	3.5t
Steering system		Rear wheel powered steering		
Type of steering unit		Cycloid gear type powered steering unit		
Model of steering unit		BZZ1-100 (sealed by taper ring)		
Steering cylinder	Type	Double-action piston type		
	Cylinder bore mm	φ 70		
	Diameter of piston rod mm	φ 50		
	Stroke mm	160		
Rated pressure Mpa		7	9	10.5
Diameter of handwheel mm		φ 290		
Pressure of steering wheel Mpa		0.84	0.76	

The steering system principally consists of hand wheel, steering shaft and steering unit. The steering shaft is connected with the steering unit. The steering column can be

tilted forward or backward to suitable position. (See Fig5.1)

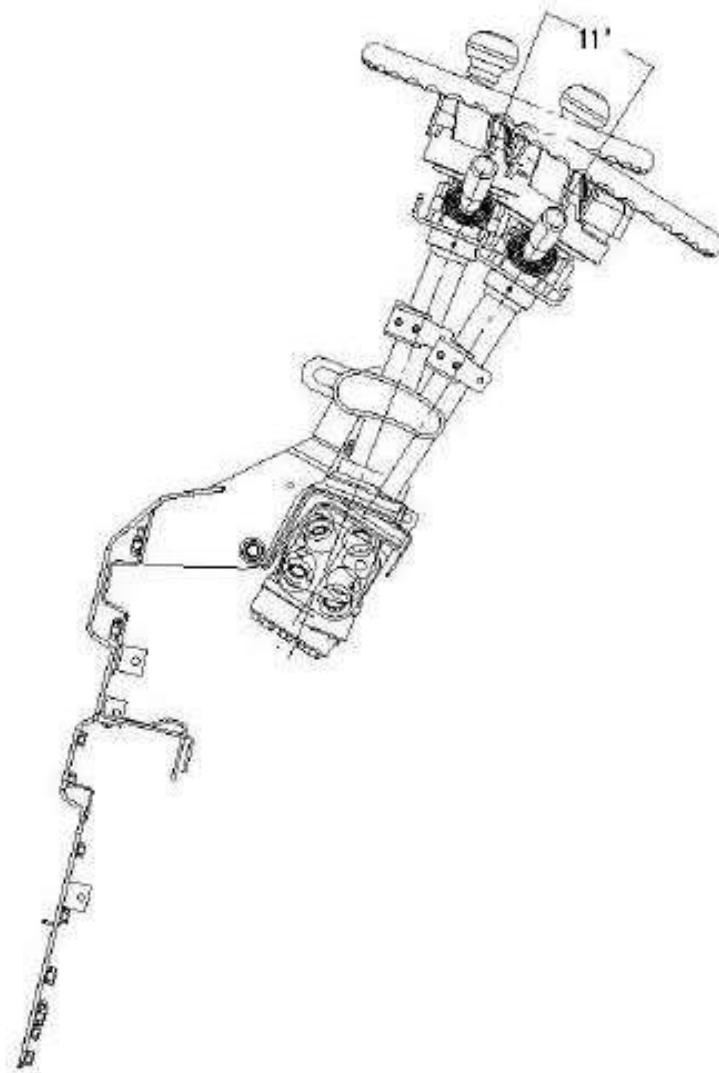
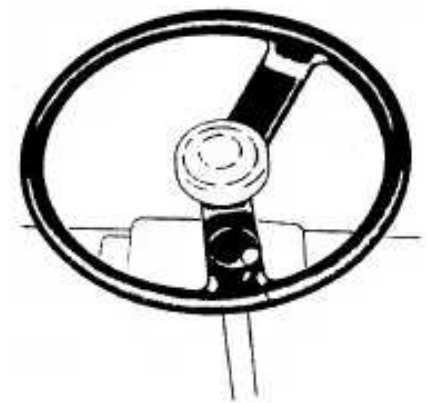


Fig5.1 Steering operation device

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5.1 Hand wheel

Hand wheel is operated in normal way, that is to say, when turning the hand wheel right, the truck will turn right. When turning the hand wheel left, the truck will turn left. The rear wheels of the forklift truck are steering wheels, which make the tail section of the truck swing out when turning. The turning method can be mastered easily through practice.



5.2 Cycloid gear type powered steering unit

The powered steering unit (Fig5.2) can transmit the pressure oil from the flow divider by pipes to the steering cylinder in terms of the rotating angle of the handwheel. The engine stops running, the oil pump will not work, in this case a man-powered steering should be adopted.

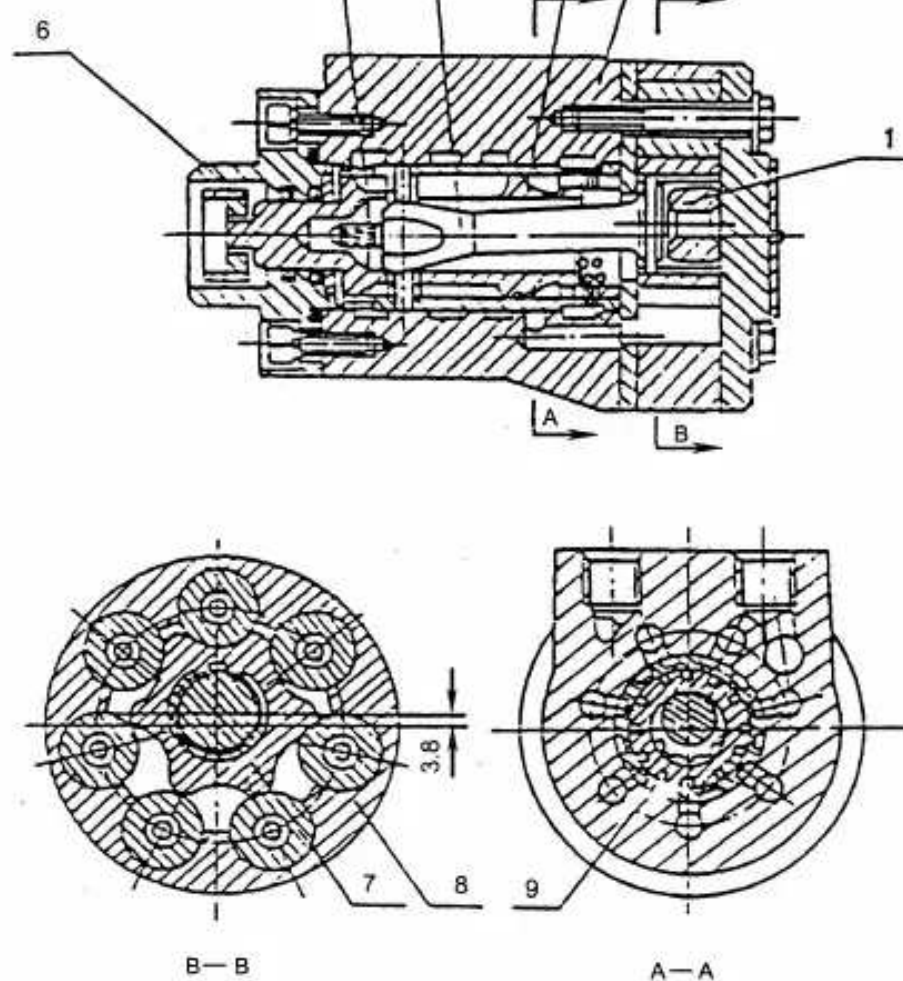


Fig5.2 Cycloid gear type powered steering unit

- | | | |
|-------------------|--------------------|-----------------|
| 1. Spacing sleeve | 4. Interlock shaft | 7. Rotor |
| 2. Valve body | 5. Spring piece | 8. Stator |
| 3. Valve core | 6. Joint sleeve | 9. Valve sleeve |

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5.3 Inspection after reassembling the steering system

(1) Check the force when turning the steering handwheel to right and left until it can't be turned any more to see if they are identical each other and check the operation if the steering handwheel for smoothness during above operation.

(2) Check the arrangement of the hydraulic pipeline and the turning direction for correctness.

(3) Lift up the rear wheels and slowly turn the handwheel over several times to exhaust the air in the hydraulic pipelines and the cylinder.

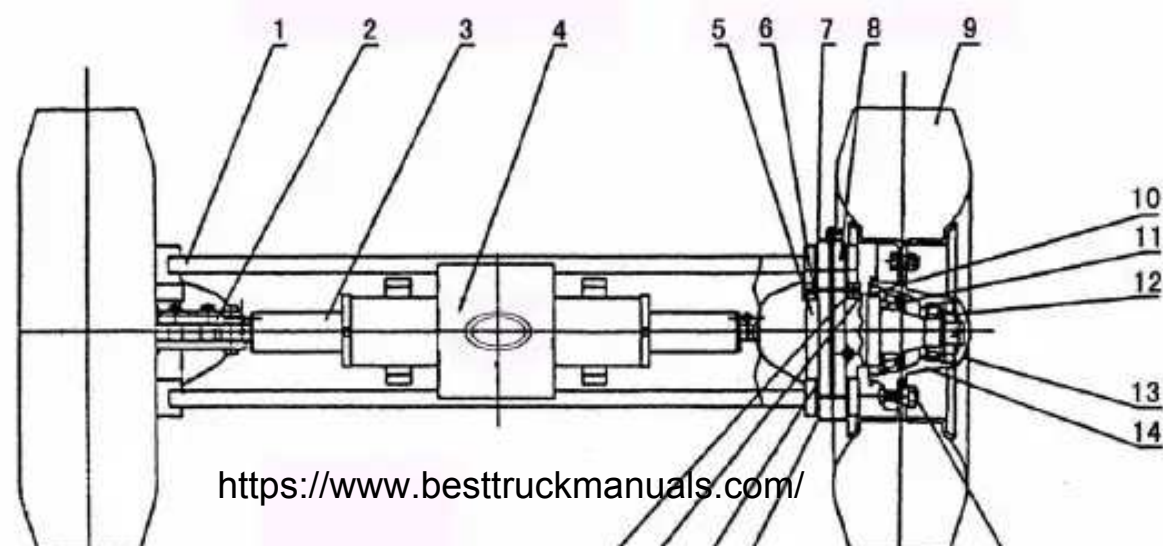
5.4 Troubleshooting of steering system

Problem	Analysis of trouble	Remedy
Fail to turn	Oil pump damaged https://www.besttruckmanuals.com/	Replace

Fail to turn handwheel	Flow-divider blocked or damaged	Clean or replace
	Hose or joint damaged or pipeline blocked	Clean or replace
Difficult to turn handwheel	Too low oil pressure from flow-divider	Adjust pressure
	Air in steering oil circuit	Exhaust air
	Steering unit fail to reposition due to spring piece damaged or insufficient elasticity	Replace spring piece
	Excessive inner-leakage in steering cylinder	Check piston seals
Truck's naking or moving with oscillation	Excessive flow rate for steering	Adjust flow divider for flow rate
	Spring damaged or elasticity insufficient	Replace
Excessive noise	Too low oil level in oil tank	Refill oil
	Suction pipeline or oil filter blocked	Clean or replace
Oil leakage	Seals of guide sleeve, pipeline or joint damaged	Replace

5.5 Steering axle

The steering axle is of section-boxed welded construction type (Fig5.3). It includes axle body, steering cylinder, tie rod, steering knuckles and steering wheels. The steering axle is of cranks and slider mechanism. The cylinder piston rod pushes the knuckle steering through tie rod, causing wheel's deflection and truck's steering. The steering axle is bolted to the rear frame by the buffer.



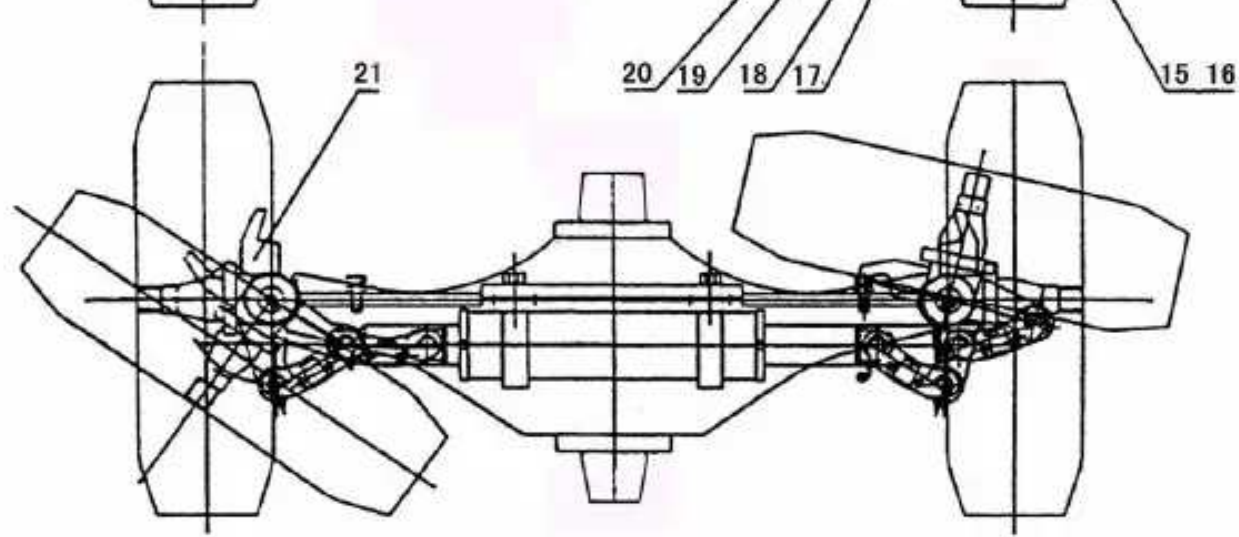
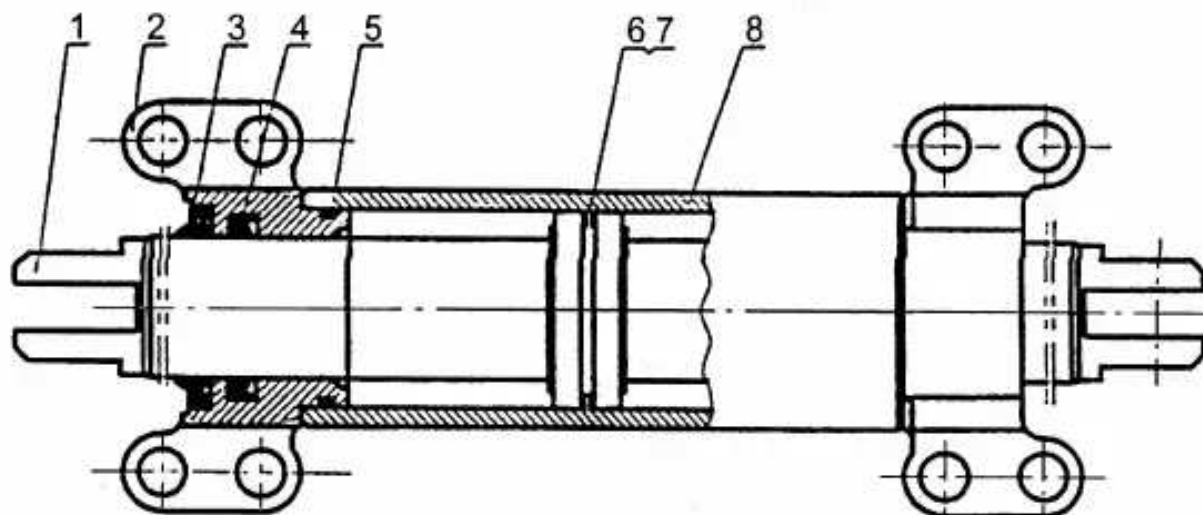


Fig5.3 Steering axle

- | | | |
|--------------------------|----------------------------|------------------------|
| 1. Axle body | 9. Tyre | 17. Oil seal |
| 2. Tie rod | 10. Oil seal | 18. O-ring |
| 3. Steering cylinder | 11. Tapered roller bearing | 19. Bushing |
| 4. Damper, steering axle | 12. Tapered roller bearing | 20. Dust sleeve |
| 5. Knuckle assy, R.H. | 13. Hub cover | 21. Knuckle assy, L.H. |
| 6. Thrust bearing | 14. Hub | |
| 7. Needle bearing | 15. Hub bolt | |
| 8. King pin | 16. Hub nut | |

5.5.1 Steering cylinder

The steering cylinder is of double-action piston type. The seal unit consists of the supporting ring and O-ring, Yx-ring seal is adopted between the cylinder cover and the piston rod. The cylinder is fitted on the steering axle through two sides cylinder covers.



- | | | |
|--------------------|------------|--------------------|
| 1. Piston rod assy | 4. Yx-ring | 7. Supporting ring |
| 2. Cylinder cover | 5. O-ring | 8. Cylinder body |
| 3. Dust ring | 6. O-ring | |

5.5.2 Rear wheel bearing pre-load adjustment

(1) As shown in Fig5.5, fill up the chamber formed by wheel hubs, wheel hub bearing and wheel hub covers with lubricating grease. Coat the lips of the oil seals with lubricating grease.

(2) Press the hub bearing into the hub and fit the hub on the knuckle shaft.

(3) Fit a flat washer and tighten a castle nut with torque of $206 \sim 235 \text{ N.m}$ and loosen it and then tighten it again with torque of 9.8 N.m .

(4) To ensure firm installation of the hub, slightly knock at it with a wooden hammer and in the meantime, rotate the hub for $3 \sim 4$ turns.

(5) Tighten the castle nut and align one of its notches with a hole drilled in the steering knuckle.

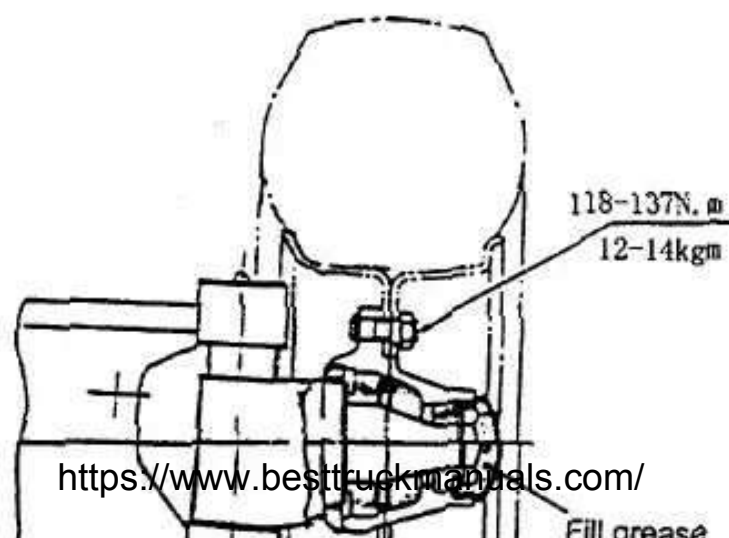
(6) Again slightly knock at the hub with a wooden hammer and in this time, rotate

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manually the hub for $3 \sim 4$ turns to ensure its smooth rotation with a specified torque of $2.94 \sim 7.8 \text{ N.m}$.

(7) If the torque value necessary to rotate the hub is more than the specified one above-mentioned, screw out the castle nut for $1/6$ turn and measure the torque value then.

(8) When the torque value measured is up to the specified one, lock the castle nut with a cotter pin.



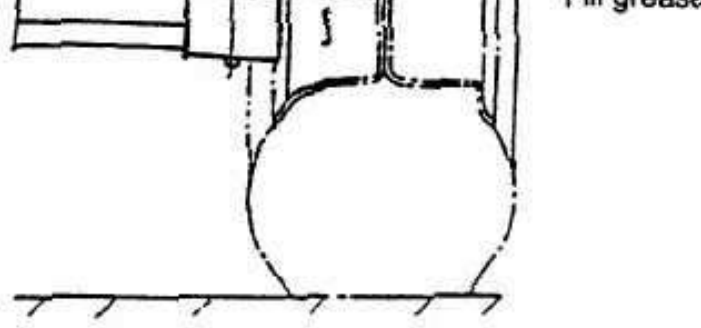


Fig5.5 Pre-load adjustment

6. Hydraulic system		
Hydraulic oil pump	Type	Gear pump
	Displacement	32 ml/r
Control valve	Type	Two-pool type with relief valve, flow divider and tilt valve
	Setting pressure	17.5MPa
	Dividing pressure	7 MPa (2,2.5t) / 9 MPa (3t) / 10.5 Mpa (3.5t)
	Flow rate	11L/min (2-2.5t) 13L/min (3-3.5t)
Lift cylinder	Type	Single-action piston type, with cut-off valve
	Bore Dia.	ϕ 50 (2,2.5t) ϕ 56 (3,3.5t)
	Stroke	1495mm (Only for 3m lift height)
Tilt cylinder	Type	Double-action piston type
	Bore Dia.	ϕ 80× ϕ 35 (mm)
	Stroke	127.5mm
Hydraulic oil amount		https://www.besttruckmanuals.com/ 42L

6.1 General description

The hydraulic system consists of hydraulic pump, control valve, lift cylinder, tilt cylinder, and oil pipe-lines etc. The oil tank is installed on the right side of the truck.

6.2 Hydraulic oil pump (Fig6.1)

The hydraulic oil pump is a gear pump. It is driven directly by the power takeoff device of the engine. The oil of the oil tank flows to the control valve through the main pump.

The hydraulic oil pump consists of pump body, a pair of gears, lining plate and snap rings. The pressure-balance method makes the lining plate press on the side face of gear owing to outleting oil between the lining plate and pump body. This pump uses pressure-balance type bearings and a special lubrication method so as to minimum the gear clearance.

6.3 Control valve & flow divider (Fig6.2)

The control valve (2 spool type) consists of four valve housing, two spool valves, one relief valve and one flow divider. The four valve housing is assembled together with three stud bolts and nuts. The tilt spool valve consists of a tilt lock valve.

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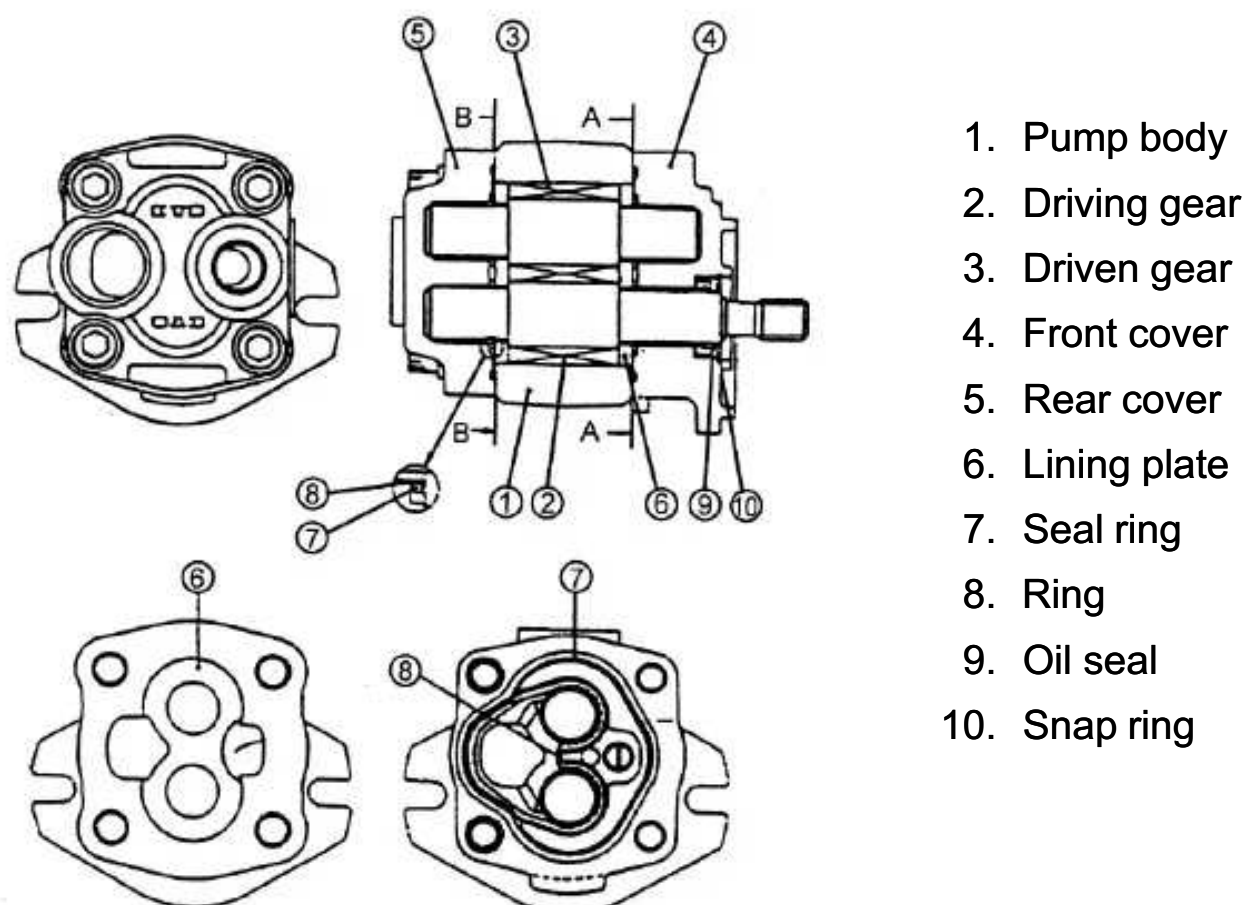


Fig6.1 Hydraulic pump

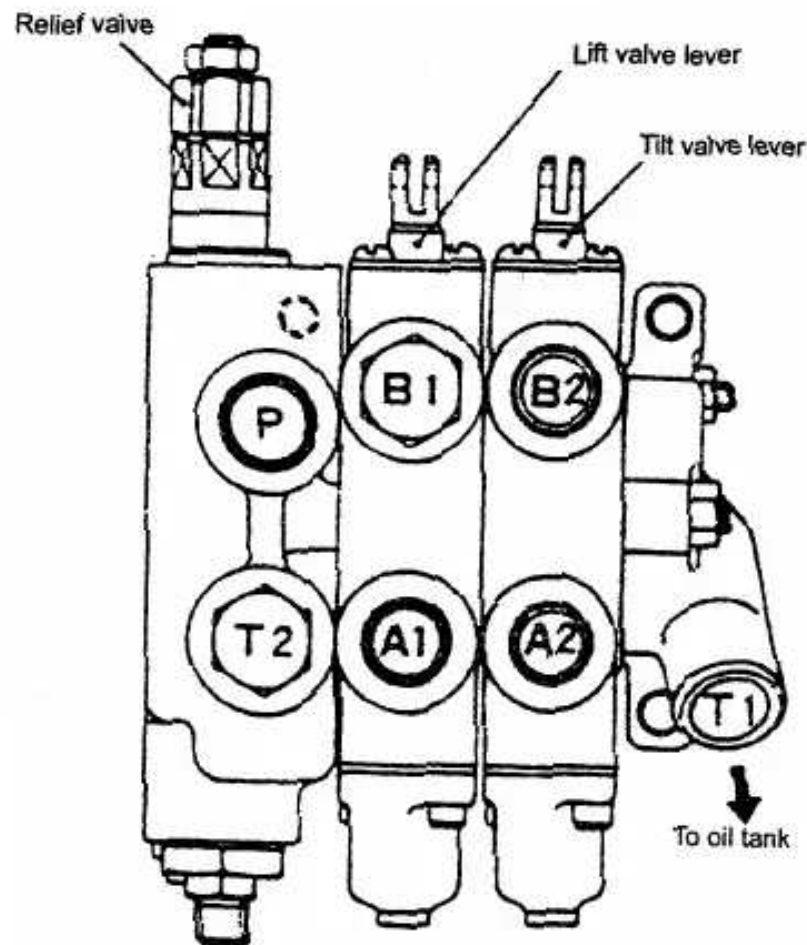


Fig6.2 Control valve

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6.3.1 Relief valve and flow divider (see Fig6.3)

The relief valve consists of main valve A and proceeding valve B. When the spool of the control valve is operated, chamber Q linked with the operating cylinder is filled with high pressure oil. The high pressure oil affects proceeding valve B through throttle hole D and E. If the system pressure is higher than the setting pressure, the proceeding valve B will be opened to make the pressure in F chamber lower and thus causes the main valve A to move right, then the oil in chamber Q may directly flow to low-pressure passage G and reduce chamber Q pressure. In this way, the system pressure may keep unvaried. The setting pressure may be adjusted by the adjusting screw H.

The construction of the flow divider is quite simple. It is of direct overflow type, and ensures the constant pressure of the power steering system by balancing the oil pressure with fixed spring force. When turning, chamber M gets through with the high pressure passage. If the oil pressure is higher than the spring force, the valve core N moves right, causing the high pressure oil to flow directly to the low-pressure passage via. Chamber T and keeping the pressure of the power steering system unvaried. The setting pressure is

adjusted by adjusting the screw K.

Valve L is a balance spool valve, and may move right or left according to the variety of the oil flow and pressure passing through it to change the opening of chamber R and S and ensures the oil flow to working chamber Q and to power steering port PS keeps in balance condition and is smoothly divided in certain proportion. Hole a is a fixed throttle hole.

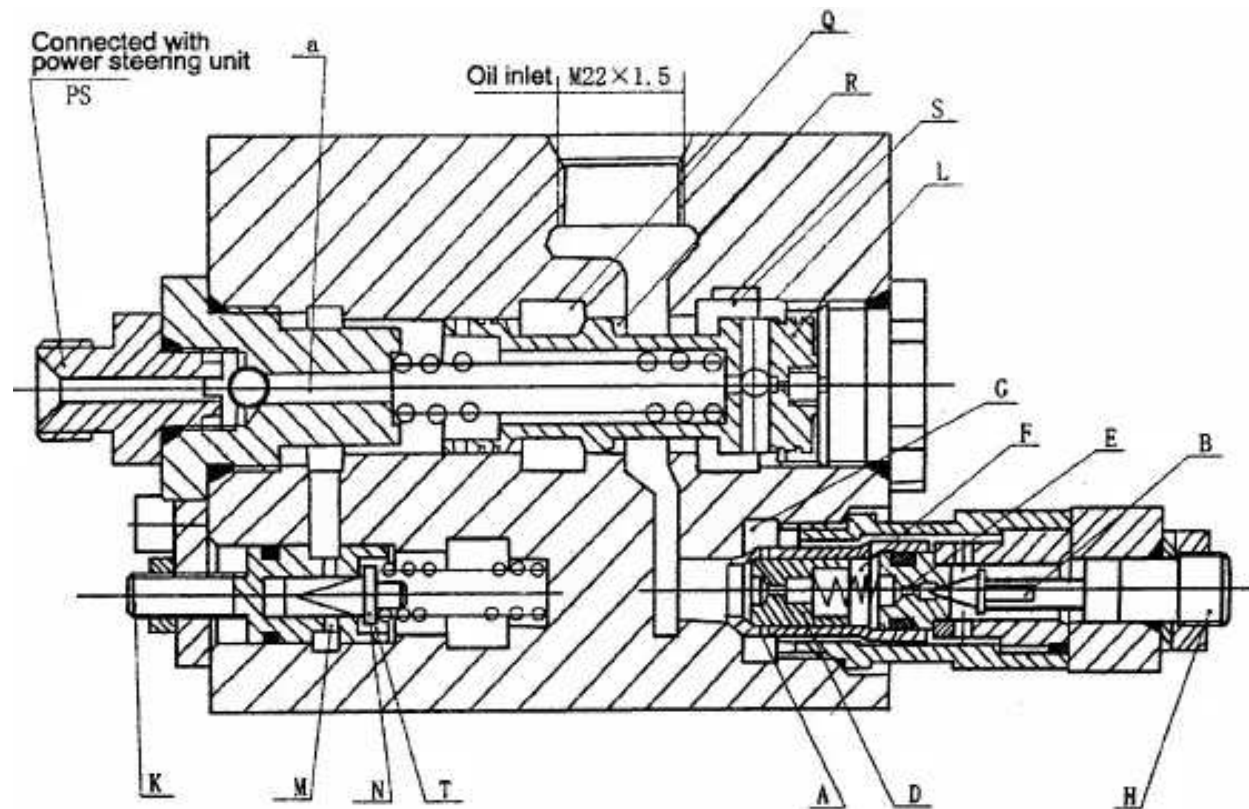


Fig6.3 Relief valve and flow divider

65

6.3.2 Setting pressure of the relief valve

The pressure of the relief valve has been set before delivery. Don't adjust the pressure at will, for it will bring danger for system and safety. If the oil pressure is different with standard value, according to the measure method specified in JB/T3300, specialized servicemen adjust the pressure as follows:

(a) Screw out the measured hole plug from the inlet port of control valve and install the oil-pressure gauge (20MPa) on it.

(b) Operate the tilt lever, measure the pressure when the stroke is to the bottom.

(c) When the oil pressure mismatches with the lift capacity of the forklift truck, loosen the lock nut of the overflow valve, screw the adjusting screw left and right to achieve the specified value. Turn the screw left when pressure is high, and turn right when it is low.

(d) After having adjusted, tighten up the lock nut.

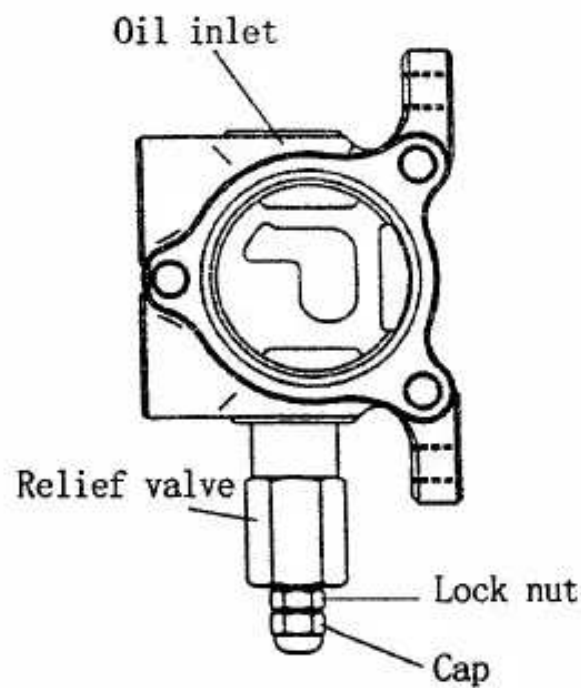
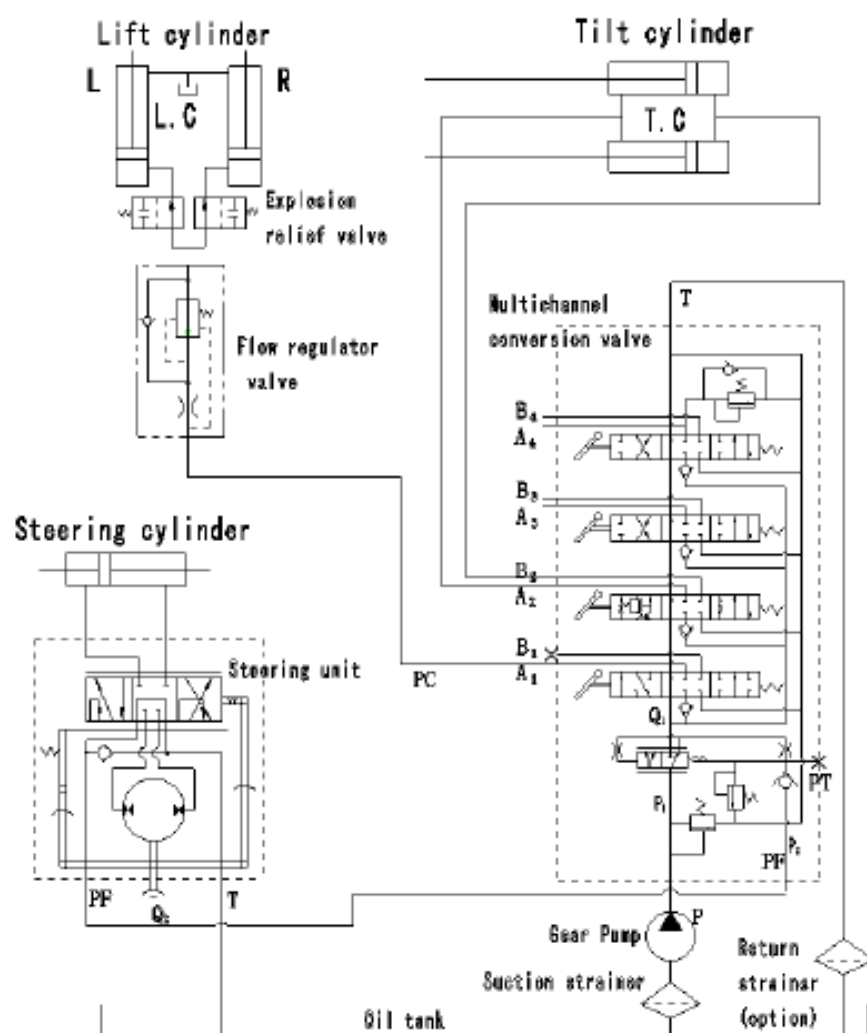


Fig. 6.4 Setting pressure of the relief valve

6.4 Hydraulic oil circuit (Fig6.5)

The oil from the hydraulic pump comes to the control valve first and there is divided by the flow divider into two parts, one being sent to lift cylinder or tilt cylinder, and another to the power steering unit in constant flow rate to operate the steering cylinder. With the spools of the lift and tilt spool valves in neutral position, the oil from the pump directly returns to the tank through the passage in the control valve. When the lift spool is pulled, the oil from the pump flows through the flow regulator valve and reaches the lower part of the lift cylinder to push the piston up. When push the lift spool, the circuit between the lower part of the lift cylinder and the oil tank is connected and the piston begins to descend due to the weight of the load and all of lifting parts. In this case, the oil flow returning to the control valve is regulated by the flow regulator valve and the fork descent speed is controlled. When the tilt lever is operated, the high pressure oil reaches the front or rear chamber of the cylinder and pushes the piston forward or backward. The oil pushed out by the piston returns to the oil tank through the control valve and the mast then tilts forward or backward.



Ton	t	2-3	3.5
Flow, control valve Q1	L/min	65	65
Flow, steering unit Q2	L/min	13	13
Primary pressure, hydraulic system P1	Mpa	17.5	19
Steering pressure P2	Mpa	9	10.5

Fig6.5 Hydraulic oil

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6.5 Lift cylinder (Fig6.6)

The lift cylinder is of single-action piston type. It consists of cylinder body, piston rod, piston and cylinder head etc. The bottom of the cylinder is connected with the cylinder supporter of the outer mast by bolts and pins, while its top (i.e. piston rod head) is connected with the upper beam of the outer mast.

The piston, fastened to the piston rod with spring wire is fitted with oil seals and wearing on its outer periphery.

At the bottom of the lift cylinder there is a cut-off valve, which operates when the high-pressure hose bursts for any reason to prevent the load from dropping abruptly.

Bushing and oil seal assembled on the cylinder head, are used for support the piston and prevent dirt from entering.

1. Upper beam
2. Shim
3. Dust ring
4. Oil seal



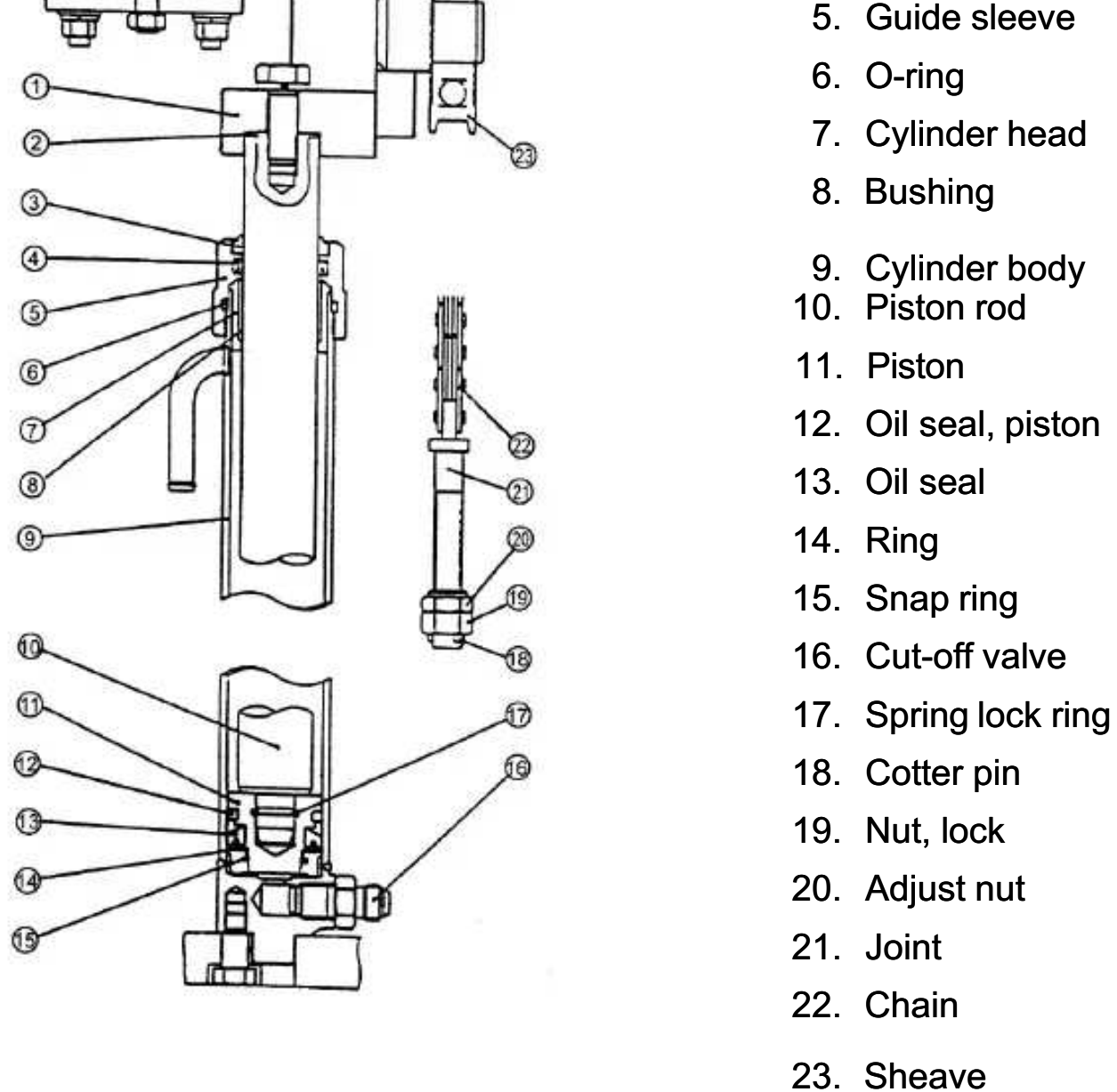


Fig6.6 Lift cylinder

6.6 Flow regulator valve

The flow regulator valve, located in the lift cylinder circuit to limiting the descending speed of loaded forks, has the construction as shown in Fig6.7. When the lift spool valve is placed in the “lift” position, the oil from the control valve flows through the oil chambers A and B, oil holes C, D, E and F, and the chamber G to the lift cylinder without any regulation. When the lift spool valve is placed in the “down” position, the oil flows in the reverse position. When the oil passes the throttle plate(5) and a pressure difference overcomes the force of the spring(2) and moves the valve core (7) right, thus the oil flow being decreased by narrowing of the hole D and C, and reduces the oil flow passing through the throttle plate(5).

The flow regulator valve controls the goods descending speed and serves as a safety device, prevent the danger for suddenly descending if the rubber hose ruptures between the control valve and the lift cylinder.

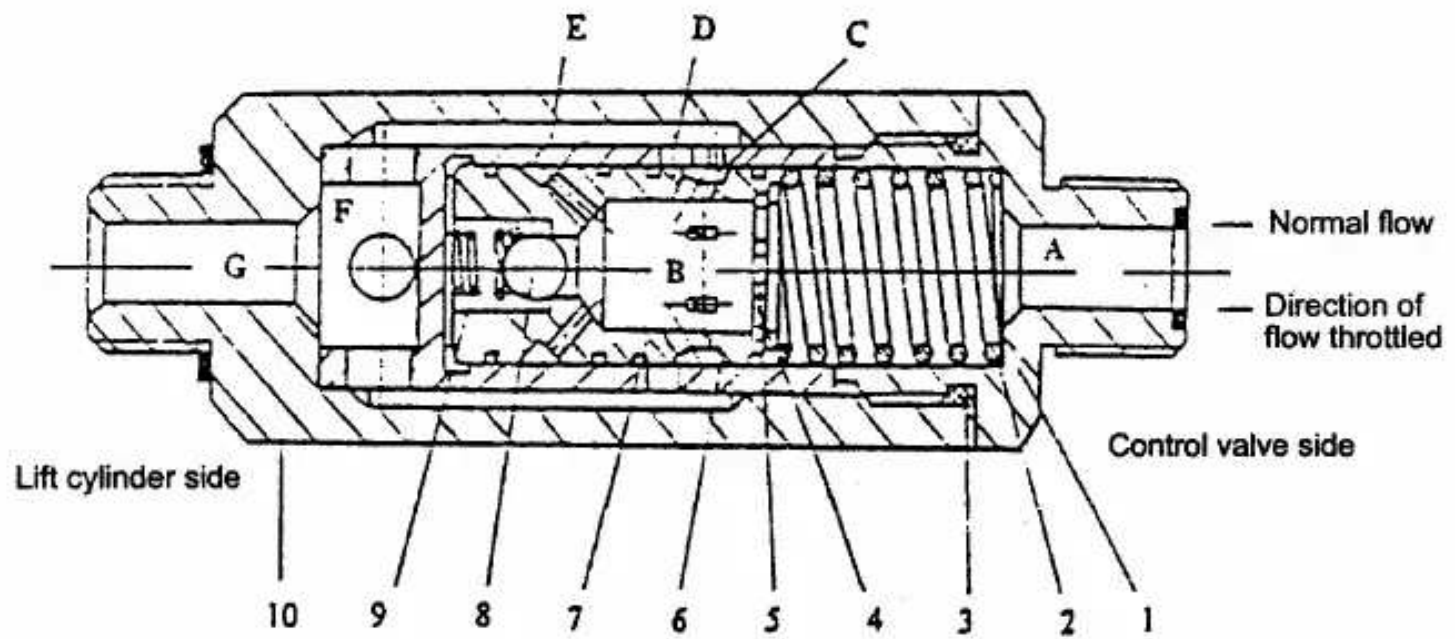


Fig6.7 Flow regulator valve

- | | | |
|--------------|-------------------|----------------|
| 1. Joint | 5. Throttle plate | 9. Spring |
| 2. Spring | 6. Valve sleeve | 10. Valve body |
| 3. O-ring | 7. Valve core | |
| 4. Snap ring | 8. Ball | |

6.7 Tilt cylinder (Fig 6.8)

The tilt cylinder is of double-acting type. Each truck has two cylinders which are installed on two sides of the mast, their cylinder base are connected with frame with pins while their piston rod ends are connected with the outer mast channels.

The tilt cylinder assembly consists of piston, piston rod, cylinder body, cylinder base, guide sleeve and seals. The piston, welded to the piston rod, is fitted with two Yx-rings and one wear ring on its circumference. A bushing press-fitted to the inner side of the guide sleeve supports the piston rod. The guide sleeve is fitted with dust seal, snap ring, Yx-ring and O-ring to prevent oil leakage and keep dust off. Fitted with them, the guide sleeve is screwed into the cylinder body.

When the tilt lever is pushed forward, the high-pressure oil enters into the cylinder body from the cylinder tail, moving the piston forward and causing the mast to tilt forward until 6 degree. When the tilt lever is pulled backward, high-pressure oil enters into the cylinder body from the guide sleeve and moves the piston backward, tilting the mast backward until 11 degrees.

backward until 11 degrees.

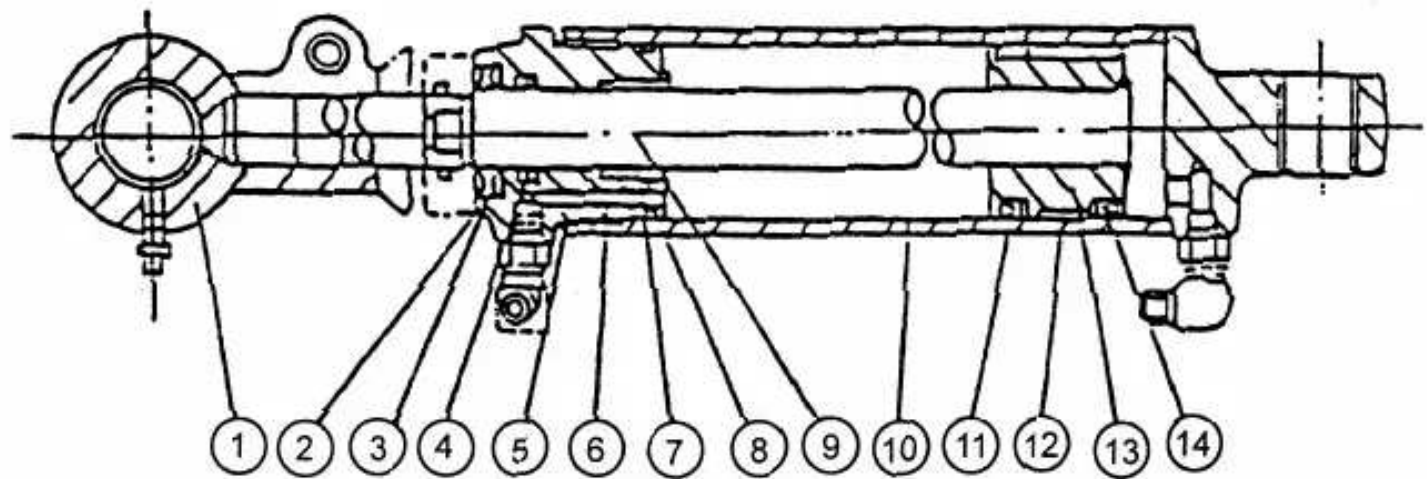


Fig 6.8 Tilt cylinder

- | | | |
|--------------|-------------------|---------------|
| 1. Joint | 6. Guide sleeve | 11. Yx-ring |
| 2. Dust ring | 7. Bearing | 12. Wear ring |
| 3. Snap ring | 8. O-ring | 13. Piston |
| 4. Yx-ring | 9. Piston rod | 14. Yx-ring |
| 5. O-ring | 10. Cylinder body | |

6.8 Troubleshoot

If the hydraulic system occurs trouble, find out the possible cause according to the following tables and repair it.

(1) Control valve

Problem	Possible cause	Remedy
Lower oil pressure and lower oil amount of the steering oil circuit	Spool is held up	Disassembly and clean, renew oil
	Slide surface broke down	Replace spool
	Spring is broken	Replace spring
	Oil hole is blocked	Disassembly and clean
	Misadjusted relief valve	Adjust relief valve
Lower oil pressure of the lift oil circuit	Spool is held up	Disassembly and clean

lifting oil circuit	Oil hole is blocked	Disassembly and clean
Vibrate and the oil pressure rises slowly	Spool is held up	Disassembly and clean
	Exhaust is inadequate	Exhaust fully
The oil pressure of the steering oil circuit is more than the specified value	Spool is held up	Disassembly and clean
	Oil hole is blocked	Disassembly and clean
Lower oil amount	Misadjusted relief valve	Adjust
Noisy control valve	Misadjusted relief valve	Adjust
	Slide surface worn	Replace relief valve
Oil leakage (outside)	O-ring seal broken down	Replace O-ring seal
Adjusting pressure lower	Spring is worsen	Replace spring
	Valve seat surface is worsen	Adjust or replace relief valve
Oil leakage (inside)	Valve seat surface is worsen	Correct valve seat surface
Adjusting pressure higher	Valve is held up	Disassembly and clean

(2) Hydraulic oil pump

Problem	Possible cause	Remedy
Oil can not be pumped out	Lower oil level in oil tank	Add oil up to specified oil level
	Blocked pipe-line or oil filter	Clean or replace oil if necessary
Oil pump can not be pressurized	Lining plate broken down	Replace
	Wearing broken down	
	Seal ring, bushing or snap ring broken down	
	Misadjusted relief valve	Adjust pressure to specified value
	https://www.besttruckmanuals.com/	Retighten loose connections for

	Air entering into the pump	suction pipe
		Add oil into oil tank
		Replace oil seal
Noisy oil pump	Worn suction pipe or blocked oil filter	Correct pipe or repair filter
	Air entering in resulting from loose suction connections	Retighten the connection
	Too high oil stickiness	Use oil with proper stickiness
	Air bubble in oil	Find out cause and correct them
Oil leakage	Oil seal or seal ring in pump broken down	Replace
	Pump broken down	Replace

7. Lifting system

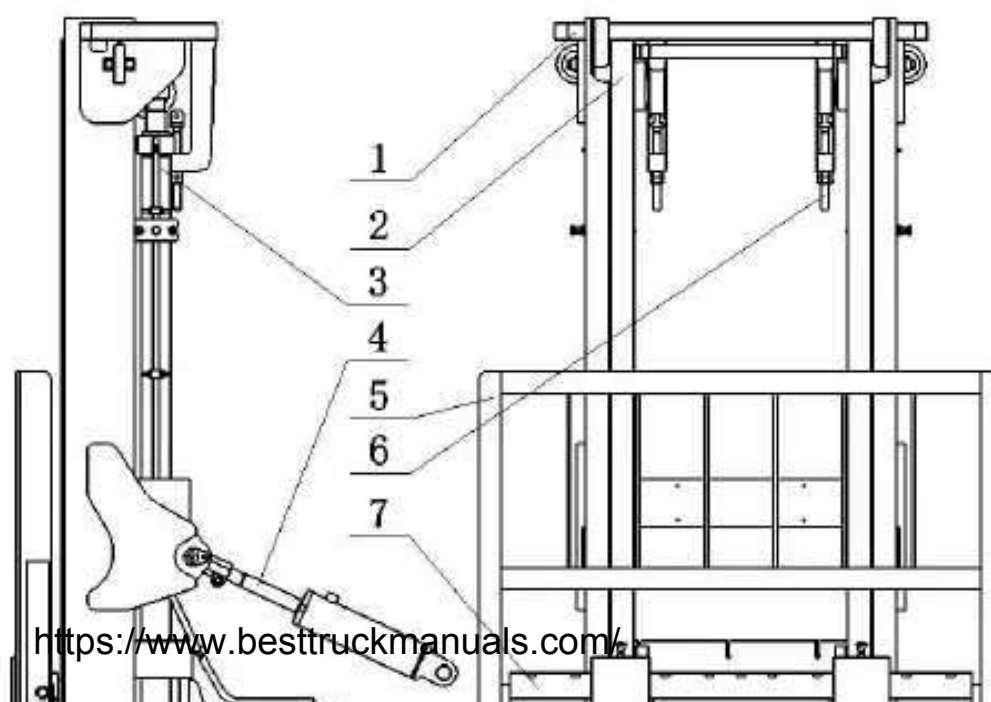




Fig7.1 Mast

- | | | |
|------------------|------------------|-----------------|
| 1. Outer mast | 4. Tilt cylinder | 7. Lift bracket |
| 2. Inner mast | 5. Load backrest | 8. Fork |
| 3. Lift cylinder | 6. Lift chain | |

7.1 General description

The lifting system is the type of lifting and descending vertically with the two-stage rollers. It consists of the inner mast, the outer mast and the lift bracket.

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7.1.1 Inner and outer mast

The inner and outer masts are welded parts. The bottom of outer mast is connected with the drive axle through supporting. At the outside middle of outer mast, it is connected with the frame by the tilt cylinder. The mast can be tilt forward and backward by operating the tilt cylinder. The outer mast is made of C-shaped channel and main rollers and side rollers are assembled on the upper part of it. The inner mast is made of J-shaped channel and there are main rollers and side rollers at the bottom of it.

Notice: Please pay more regard to safety when maintaining the main rollers and side rollers on the upper of outer mast.

7.1.2 Lift bracket

The lift bracket moves up and down smoothly along the channel of the inner mast by the main rollers. The main rollers mounted on the main roller shafts and blocked by snap rings. The main roller shafts are welded on the lift bracket. The side rollers fitted on the lift

bracket with bolts. They roll along the flank plate of the inner mast and rolling clearance can be adjusted with shims. The main rollers sustain the longitudinal loads and the side rollers sustain the transverse loads.

7.1.3 Fork

The fork is fastened on the lift bracket upper beam groove with pins, the fork clearance can be adjusted with hands. The forks and lift brackets are manufactured according to the international standard.

The fork pin fastens the fork on the definite position. When adjusting the clearance of the fork, pull the fork pin turn 1/4 circle, the fork clearance must be adjusted according to the loaded goods.

7.1.4 Roller position (Fig7.2)

There are two kinds of rollers, main roller and side roller. They are separately mounted on the outer mast, inner mast and lift bracket. The main rollers sustain the loads from front and rear direction and the side rollers sustain the side loads, this will make the inner mast and lift bracket move freely.

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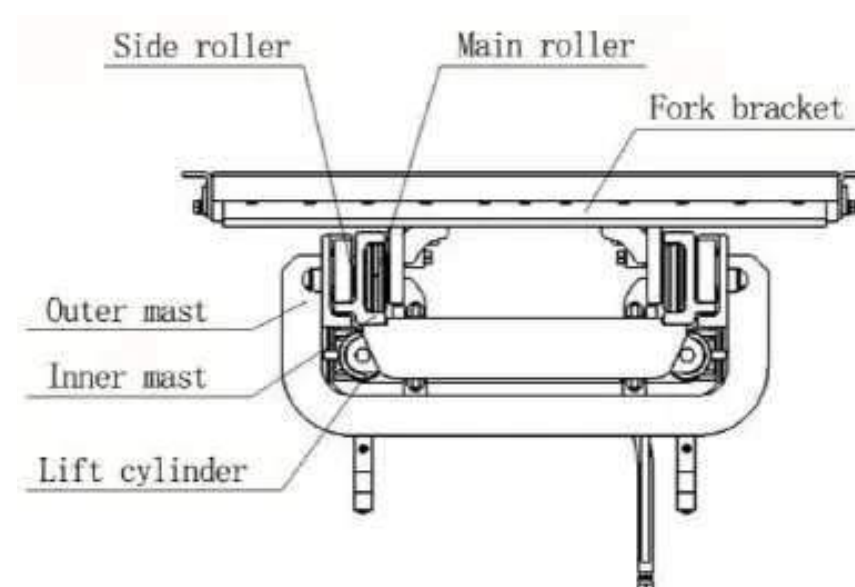


Fig7.2 Roller position

Notice:

(a) Adjust the side roller clearance for 0.5mm.

(b) Apply lubricating grease on the surface of main roller and interface of mast.

7.2 Maintenance and adjustment www.besttruckmanuals.com/

7.2.1 Adjustment of lift cylinder (Fig 7.3)

7.2.1 Adjustment of lift cylinder (Fig7.3)

When replace the lift cylinder, inner mast or outer mast, we shall readjust the stroke of the lift cylinder as following:

- (1) Install the piston rod in the upper beam of the inner mast without shims.
- (2) Lift the mast slowly to the max. stroke of the cylinder and check the two cylinders synchronize or not.
- (3) Install shims between the top of the piston rod of the cylinder which stop first and the upper beam of the inner mast. The thickness of the shim is 0.2mm or 0.5mm.
- (4) Adjust the tightness of lift chains.

Notice: Please pay more regard to safety when adjusting the lift cylinder at an elevated height.

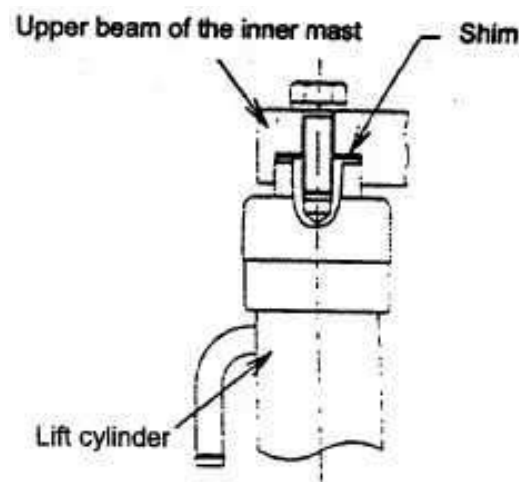


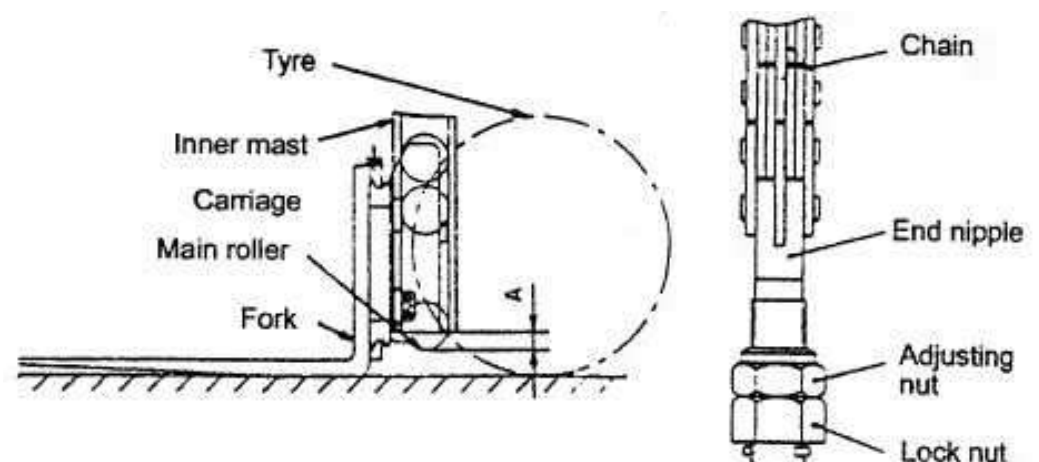
Fig7.3 Adjustment of lift cylinder

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7.2.2 Adjustment of lift bracket

- (1) Let the truck parking on the horizontal ground and make the mast vertical.
- (2) Lower the forks on the ground, adjust the nut for the end nipple of the upper chain and make a distance A between the main roller and the lift bracket.

Capacity	A mm
2t~2.5t	20~25
3t~3.5t	45~50



(3) Make the fork down to the ground and tilt backward fully. Adjust the adjusting nut for the end nipple of the upper chain and make the two chain's tightness equal.

7.2.3 Replace rollers of the lift bracket

- (1) Place a pallet on the forks and let the truck parking on the horizontal ground.
- (2) Make the forks and the pallet down to the ground.
- (3) Disassemble the end nipple of the upper chain and take the chain down from the sheave.
- (4) Lift the inner mast (See Fig 7.5①).
- (5) Make the truck back-up if the lift bracket is fully separated from the outer mast.
(See Fig. 7.5②)
- (6) Replace the main rollers
 - Disassemble all the snap rings and take out the main rollers with a drawing tool except the adjusting shims.
 - Ensure the new rollers have the same types as the replaced rollers. Install the new rollers inside the lift bracket and fasten them with snap rings.

7.2.4 Replace rollers (Fig7.6)

- (1) Use the same way as 7.2.3 to disassemble the lift bracket from the inner mast.
- (2) Let the truck parking on the horizontal ground and wedge up the front wheels for 250mm to 300mm.
- (3) Apply the parking brake and wedge up the rear wheels.
- (4) Disassemble the bolts which fasten the lift cylinder and the inner mast. Hang up the inner mast not to loose the shims of the piston rod heads.
- (5) Disassemble the connecting bolts for the lift cylinder and the bottom of the outer mast. Disassemble the lift cylinders and the oil pipes between the two cylinders without loosen the oil pipe joints.
- (6) Main rollers on the upper outer mast will be showed on the top of the inner mast as soon as main rollers were taken apart from bottom of the inner mast after laying down the inner mast.

- (7) Replace the main rollers.

- Disassemble the upper main rollers with a drawing tool, don't loose the adjust shims.
 - Install the new rollers and the shims disassembled before.
- (8) Hang up the inner mast to let all the rollers in the mast.
- (9) Reassemble the lift cylinder and the lift bracket.

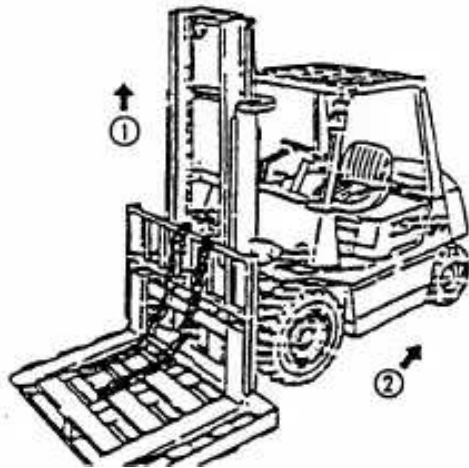


Fig 7.5

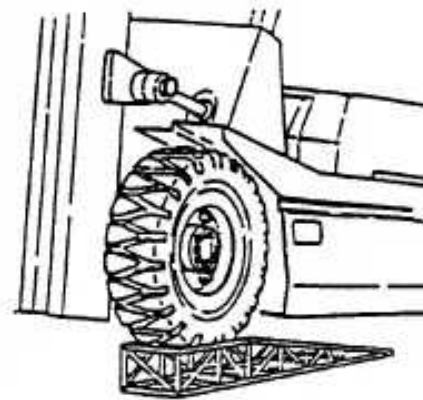


Fig 7.6

8. Electric system

8.1 General description

The electric system for this forklift truck is single wire system with minus earth. It mainly consists of the following systems:

(1) Charge system

This system contains generator, battery, charging indicator, etc. It supplies current for all the electric appliances.

Voltage: 12V

(2) Starting system

This system mainly consists of automatic pre-heating unit (only diesel engine), key switch, starting protection circuit, starting motor, etc. The function of this system is starting the engine.

(3) Instrument

The numeric combination meter (Fig8.1) for internal combustion forklift truck adopts advanced electron technology, the input signal can be dealt with high-precision digital processing. The meter consists of a pointing meter driven by two imported step motors and an hour meter with a LCD screen. The step motor meter has high reliability, accuracy and visibility, can display important parameters of vehicle. The LCD can display the working hours and working state of vehicle clearly. This kind of meter resolves the disadvantages of traditional meter as follows: inferior precision, low stability, parameter hard to modify and extend, more heat-productivity, more electricity-wasting, easier to be damaged and inferior exploitability, etc.

(4) Lighting and signal device

They include all kinds of lightings, signal lamps, horns and buzzers, etc.

Headlight: 55W

Front combination lamp(turning/signal): 21W/5W

Rear combination lamp (turning/brake/signal/backing):

21W (yellow)/21W (red)/5W (red)/10W (white)

Warning lamp (optional): 21W

8.2 Brief explanation for operation

(1) Starting

There is a starting protection circuit in the control box for the safety of the forklift truck. You must shift the direction switch at the neutral position before starting the engine. Otherwise, you can not start the engine.

Turn the key switch clockwise to the I(ON) position (power position), the instrument circuit and the firing circuit is ready for work. For diesel engine, the automatic pre-heater begins to work and the pre-heating indicator lights. The pre-heater controlled by a time relay automatically stops working after 13.5 seconds, then the pre-heating indicator automatically goes out.

Turn the key switch clockwise to the II(ON) position (starting position), the engine is started.

After engine starting, push the direction switch forward (that is forward shift), then pedal the accelerator, the forklift truck will travel or work quickly. When pull the direction switch backward (that is in reverse shift), the backing lamps light and the back buzzers

switch backward (that is in reverse shift), the backing lamps light and the back buzzers sound.

(2) Turning handle switch

Pull the turning handle switch to the I(ON) position, the front and rear combination lamps (clearance & tail) light. Pull the turning handle switch to the II(ON) position, the head lamps light, at this time the clearance and tail lamps light.

(3) Turning signal

Pull the turning switch backward, the left front and rear turning lamps flash. Push the turning switch forward, the right front and rear turning lamps flash.

(4) Brake signal

When parking the truck, the brake lamps (red) in the rear combination lamps light.

(5) Backing signal

When reversing the forklift truck, pull the direction switch backward and the shift gear is at the reversing position. Then the backing lamps (white) in the rear combination lamps light and the buzzer sounds.

(6) Charging signal

Before starting the engine, put the key switch to the I(ON) position and the charging lamp is on. After engine starting, the charging lamp is automatically off. If the charging lamp lights while the engine is working, it means something is wrong with the charging circuit and you must stop working and check as soon as possible.

(7) Oil pressure signal

Before starting the engine, put the key switch to the I(ON) position and the oil pressure warning lamp lights. After engine starting, the oil pressure warning lamp is automatically off. If this lamp lights while the engine is working, it indicates low engine oil pressure and you must stop working and check as soon as possible.

(8) Water separator signal

Before starting the engine, put the key switch to the I(ON) position, the meter will check automatically and the water separator warning lamp is on. After 1-2s, the lamp is off automatically. If this lamp becomes on while the engine is working, it means too much water has been accumulated in the water separator. After pushing the handle of the water separator to get rid of the water, this lamp will become off.

(9) Fuel meter

It indicates how much fuel is left in the fuel tank. If the indicating needle nears E position, it means there is less fuel in the fuel tank. You should replenish the fuel tank as soon as possible.

soon as possible.

(10) Water temperature meter

It indicates the temperature of the coolant for the engine.

(11) Hour meter

It records the working hours of the engine.

8.3 Instructions of meter panel

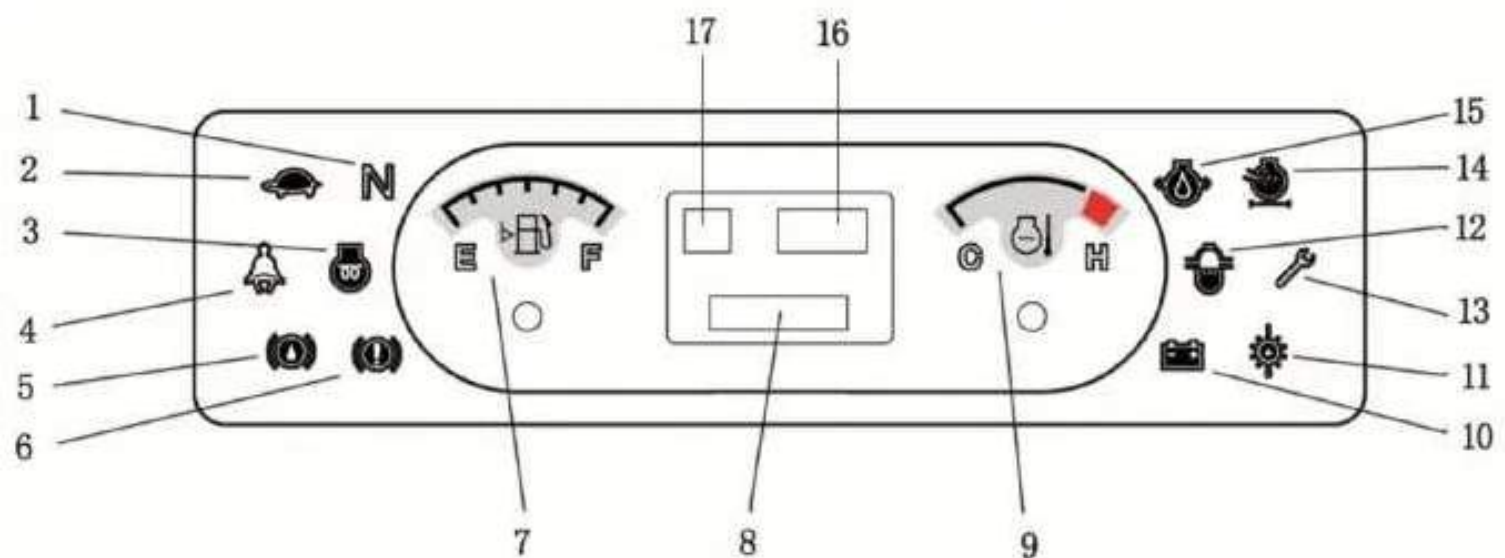


Fig8.1 Numeric combination meter

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Explanation for meter:

(1) After connecting the power for 2 seconds, the meter will carry out self-check automatically, the indicating lamps will light, the hand will replace to primary position immediately and then run to corresponding working position.

(2) When the meter is during self-check, the LCD displays Baoli welcome.

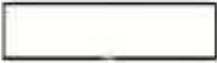
When running normally, the LCD displays running well.

When there is error, the LCD displays Running error.

	(1) Indicator, neutral shift	When the shift switch is on neutral position, the indicator lights, then the truck can be started.
	(2) Indicator, slow speed	When the slow speed button is pressed, the slow speed indicator lights, at this time the engine runs with slow speed. The function applies to the electric-control type engine.
		When the ignition switch is turned on, the lamp

	(3) Indicator, preheating	When the ignition switch is turned on, the lamp lights and preheating starts. The lamp goes out automatically when preheating is over. The engine will start easily. Caution: If the indicator does not go out or it lights during engine running, the preheating intake heater may be defective. Please ask a Baoli dealer for inspection or repair.
	(4) Indicator, seat safety (option)	The switch of seat safety can be operated only when correctly seated.
	(5) Warning lamp, low brake fluid level (option)	If the brake fluid is not enough, the warning lamp will light to remind the operator and the buzzer sounds. If the warning lamp is still on after complementing the brake fluid, please contact with Baoli dealer for inspection.
	(6) Warning lamp, parking brake (option)	The warning lamp will light when the parking brake unit is engaged. Check if the warning lamp is failed when releasing the brake unit and running the truck.

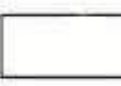
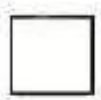
	(7) Fuel gauge	a. Indicate the remaining fuel in the tank, total with 6 scales.
		b. Switch on the meter, the fuel indicating needle will return to E position, then it will run to corresponding position with fuel capacity, and stop turning until cutting off the power. Caution: After adding oil or turning on the ignition switch, the indicating needle will stop turning after a moment.
		Caution: . If the road is not level, attention must be paid because the correct level may not be indicated. . Especially of diesel engine, be sure to refuel it before it stops running, once the engine cutting

		out, it is necessary to bleed air from the fuel system.
	(8) Timing area	After connecting the ignition switch, the meter will indicate the working hours. It will begin to time after starting the engine. The unit of the number on the right is 1/10 hour. Master the periodic maintenance hours with the time meter, and record the working hours.
	(9) Water temperature gauge	a. Indicate the temperature of engine cooling water. b. When the needle points to C, the water temperature is less than or equal 60°C. If the water temperature is higher than or equal 110°C (red frame position), the buzzer will sound to remind the operator. c. The water leakage, less engine refrigerant, loose fan belt, dirty radiator belt or other abnormalities in cooling system may lead temporary over-heating. Check the cooling system.

	(10) Indicator, charge	a. Lighting lamp indicates an abnormality of the charging system while the engine is running. b. If normal, the lamp lights when the ignition switch is turned on and goes out when the engine starts. c. If the lamp lights while the engine is running, stop the operation immediately, inspect the fan belt for fracture or loosening, after adjust it then restart the engine. If lamp does not go out, the generation system may be faulty. Please ask a Baoli dealer immediately for inspection and repair.
	(11) Warning lamp temperature of torque	Switch on the meter, the initial condition of torque converter oil temperature (begin from 65°C) will

	converter oil (option)	be displayed in the upper left of LCD.
	(12) Warning lamp, water separator	Before starting the engine, put the key switch to the I (ON) position, the meter will do the check automatically and the water separator warning lamp is on. After 1-2s, the lamp is automatically off. If this lamp becomes on while the engine is working, it means too much water has been accumulated in the water separator. After pushing the handle of the water separator to get rid of the water, this lamp will become off.
	(13) Trouble light (option)	When the meter is switched on, the indicator will light, after starting the engine, the indicator will go out. If the controller measures abnormal condition, the trouble light will flashes regularly, the error code can be checked out according to the flashing. The function applies to the electric-control type engine.

	(14) Warning lamp, air cleaner (option)	a. This lamp lights when the air cleaner element gets clogged during engine running.
		b. If normal, the lamp lights when the ignition switch is turned on and goes out when the engine starts.
		c. If the lamp lights while the engine is running, stop the engine and clean the element and dust guard. For the cleaning method, refer to the Weekly Maintenance Section.
		Lighting lamp indicates low engine pressure while the engine is running.
		a. If normal, the lamp lights when the ignition switch is turned on and goes out when the engine starts.

	(15) Warning lamp, engine oil pressure	b. If the lamp lights while the engine is running, maybe the engine oil is insufficient or the lubrication system is faulty. Stop the operation immediately and ask a Baoli dealer for inspection and repair.
		Note: The “warning lamp of engine oil pressure” does not indicate the oil level. Check the oil level using the oil level gauge before starting work.
	(16) Indicator, running state	Indicate the condition of the meter’s self-check and monitor the running state of the truck.
	(17) Indicator, temperature of torque converter oil (option)	Indicate realtime temperature of torque converter oil.

8.3.1 Working circumstance

- (1) Elevation is lower than 1200 meters.
- (2) Working temperature is between -25°C and +40°C
- (3) Relative humidity is not larger than 95%.

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8.3.2 Cautions

- (1) Forbid wetting the meter. When washing the truck, don’t let water into the meter, if it happens, clean it with dry cloth.
- (2) Don’t pull the plug of the meter and harness regularly to avoid poor contact.
- (3) Forbid impacting or scratching the meter strongly.
- (4) When the meter works abnormally, contact with our company for maintenance.

8.4 Principle diagram of electrical system

Fig8.2-1 Principle diagram of electrical system (4JG2/Dachai 498 engine)

Fig8.2-2 Principle diagram of electrical system (Xinchai 498 engine)

Fig8.2-3 Principle diagram of electrical system (Mitsubishi gasoline engine)

8.5 Diagram of harness

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Fig8.3.1 Diagram of harness (4JG2 engine)

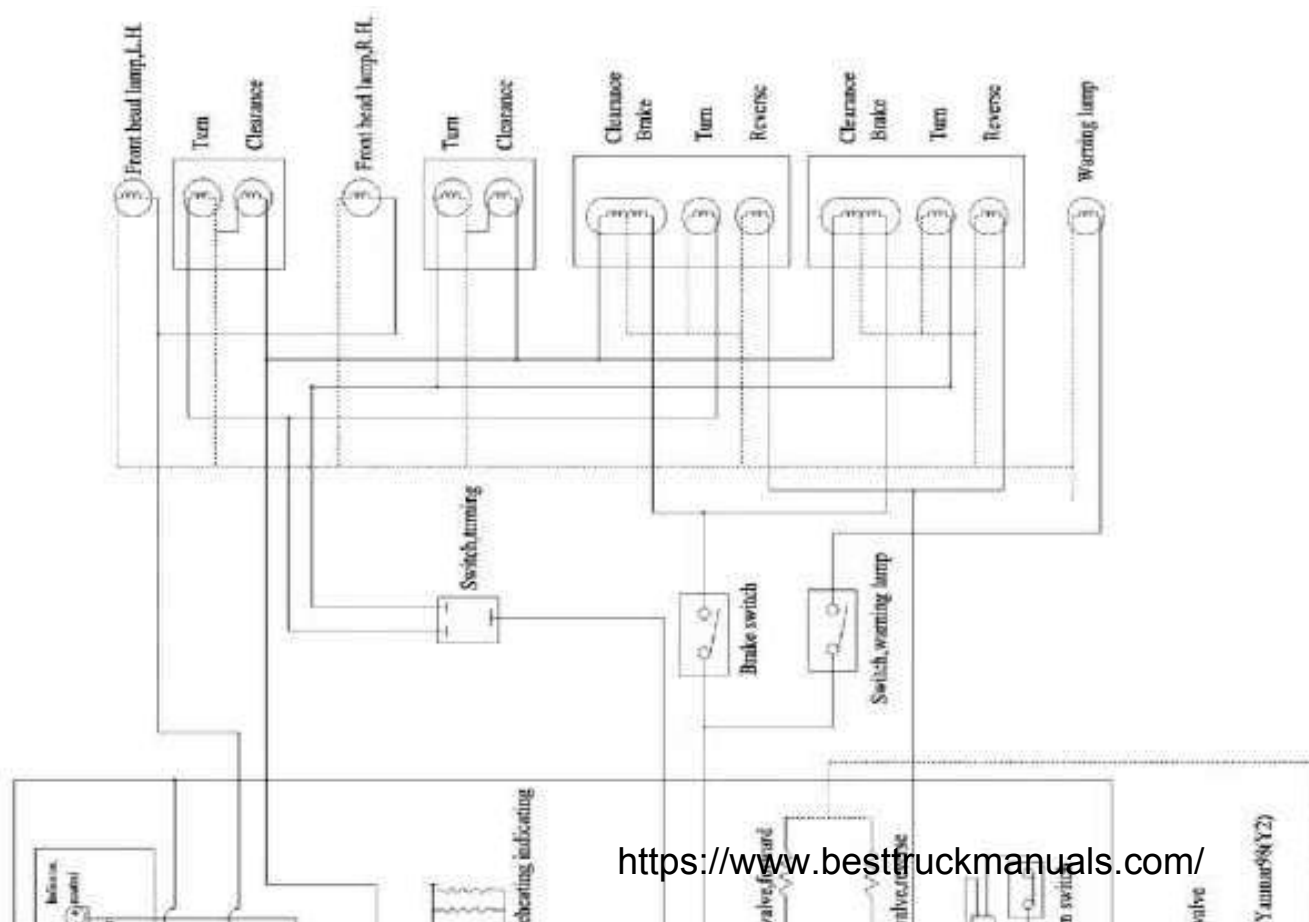
Fig8.3-1 Diagram of harness (4JG2 engine)

Fig8.3-2 Diagram of harness (Dachai 498 engine)

Fig8.3-3 Diagram of harness (Xinchai 498 engine)

Fig8.3-4 Diagram of harness (Yanmar 4TNE98 engine)

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Central control box

- 00 Power(-)
- 01 Power, horn
- 02 Power, lamp
- 03 Power, meter
- 04 Power, switch
- 05 Switch, turning lamp
- 06 Power, ignition
- 07 Switch, light
- 08 Switch, start
- 09 Power, headlamp

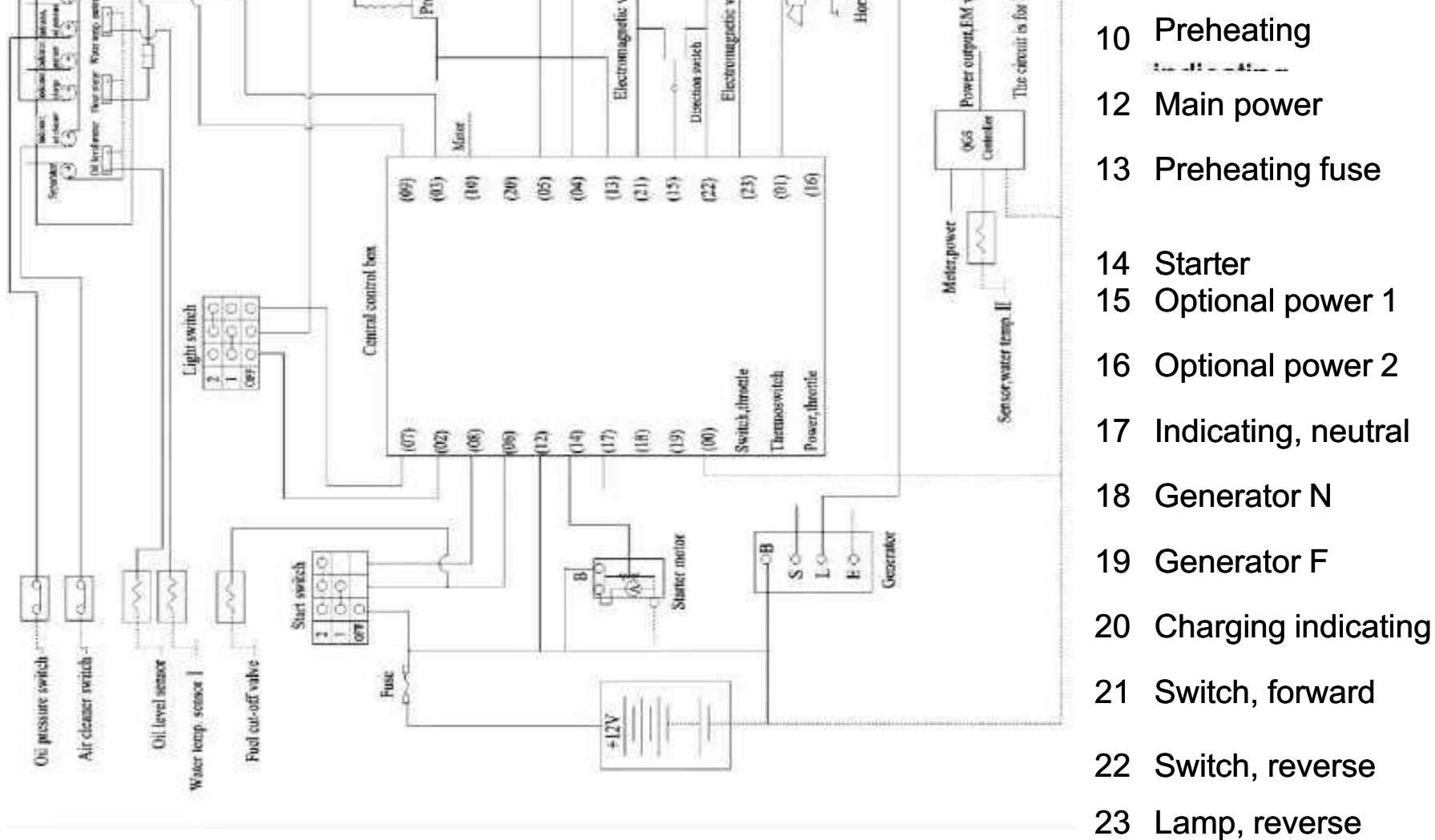
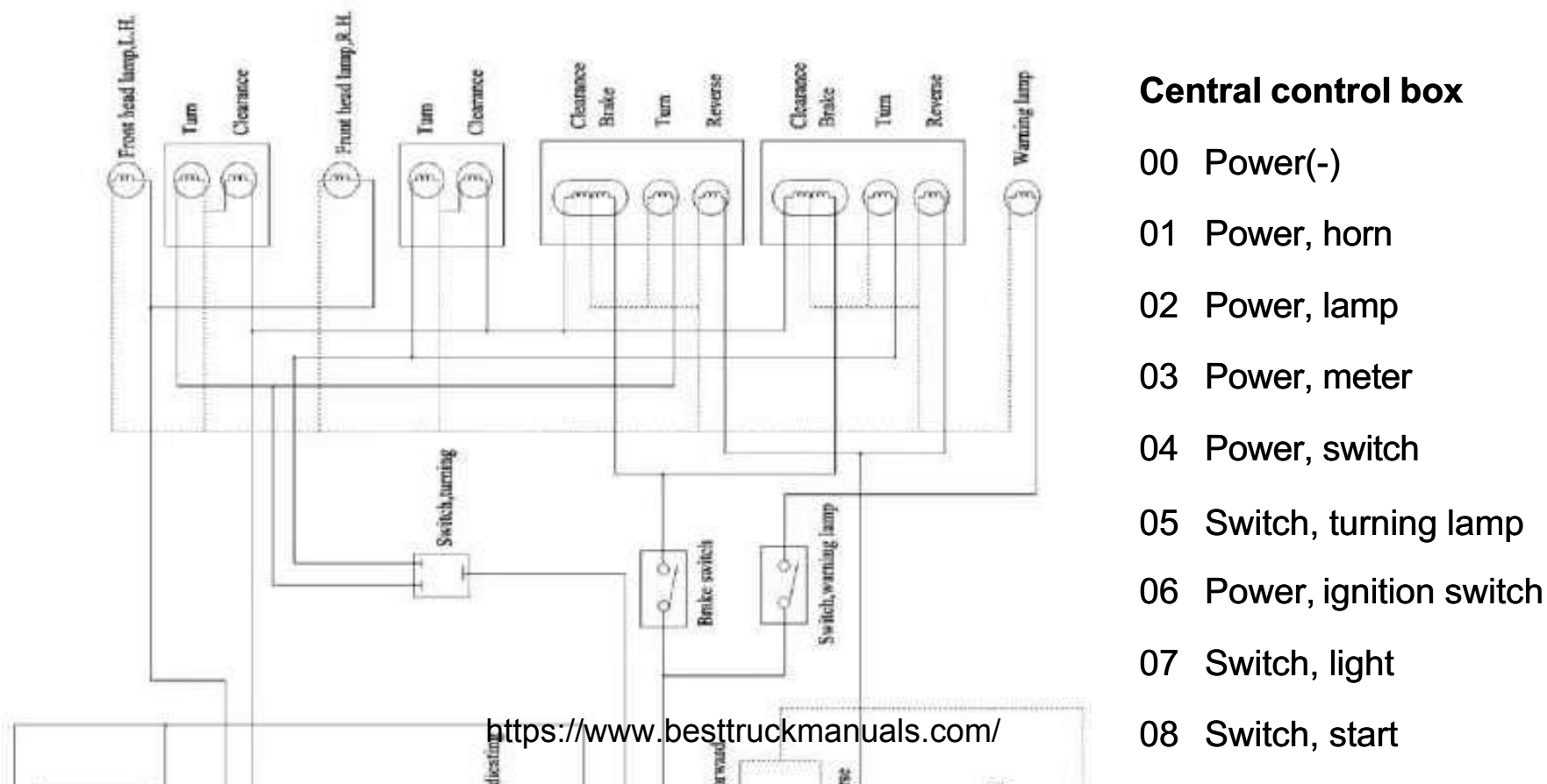
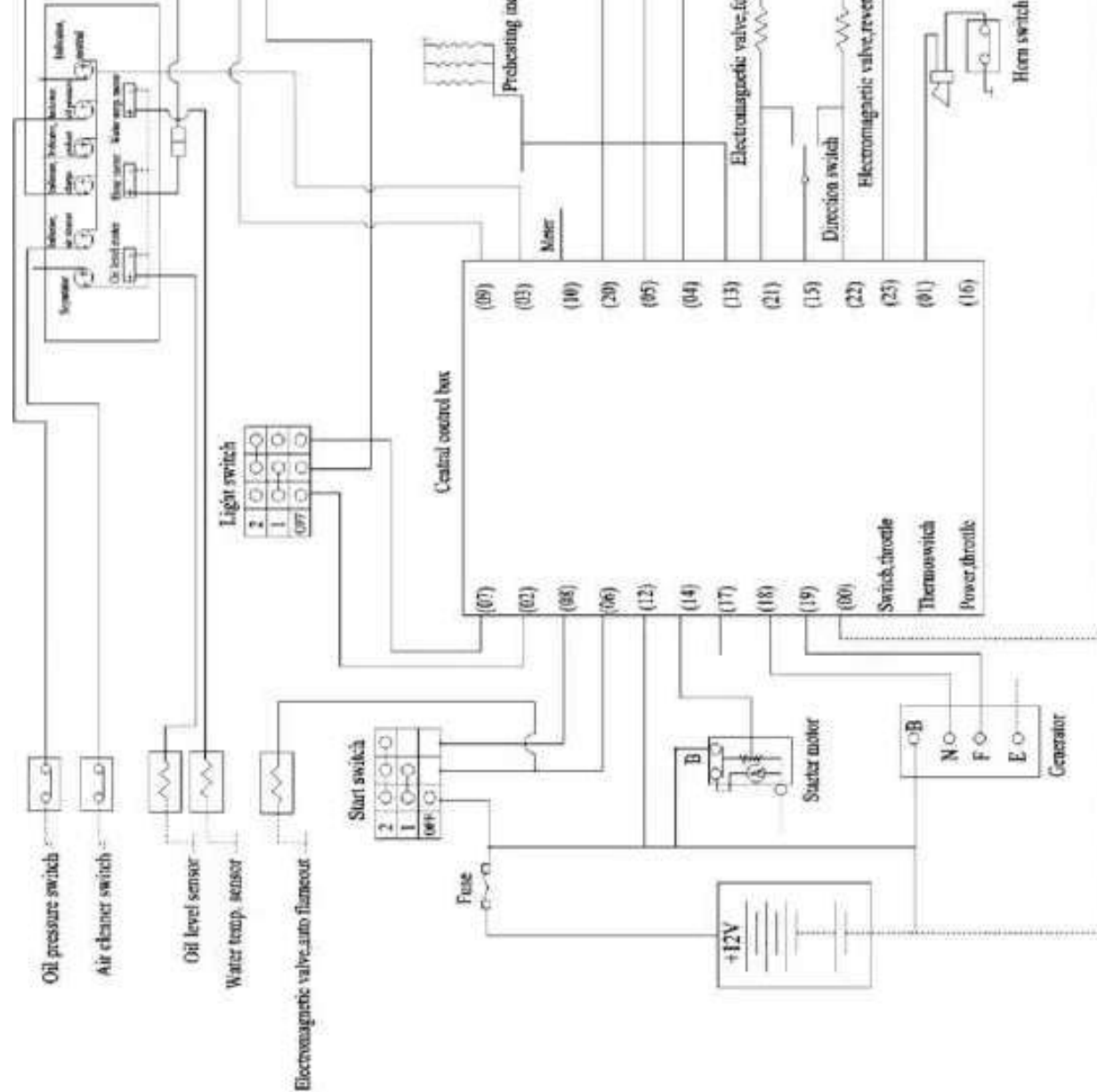


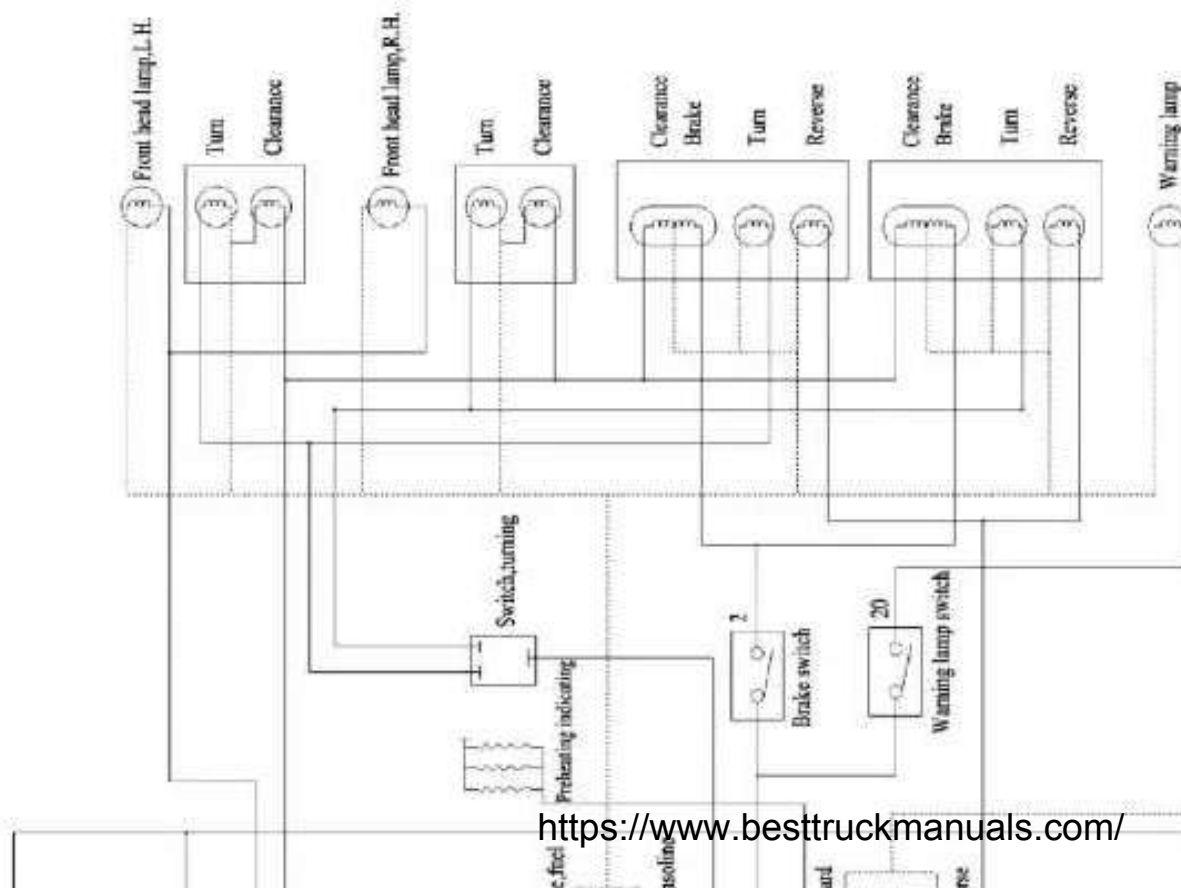
Fig8.2-1 Principle diagram of electrical system (4JG2/Dachai498 engine)





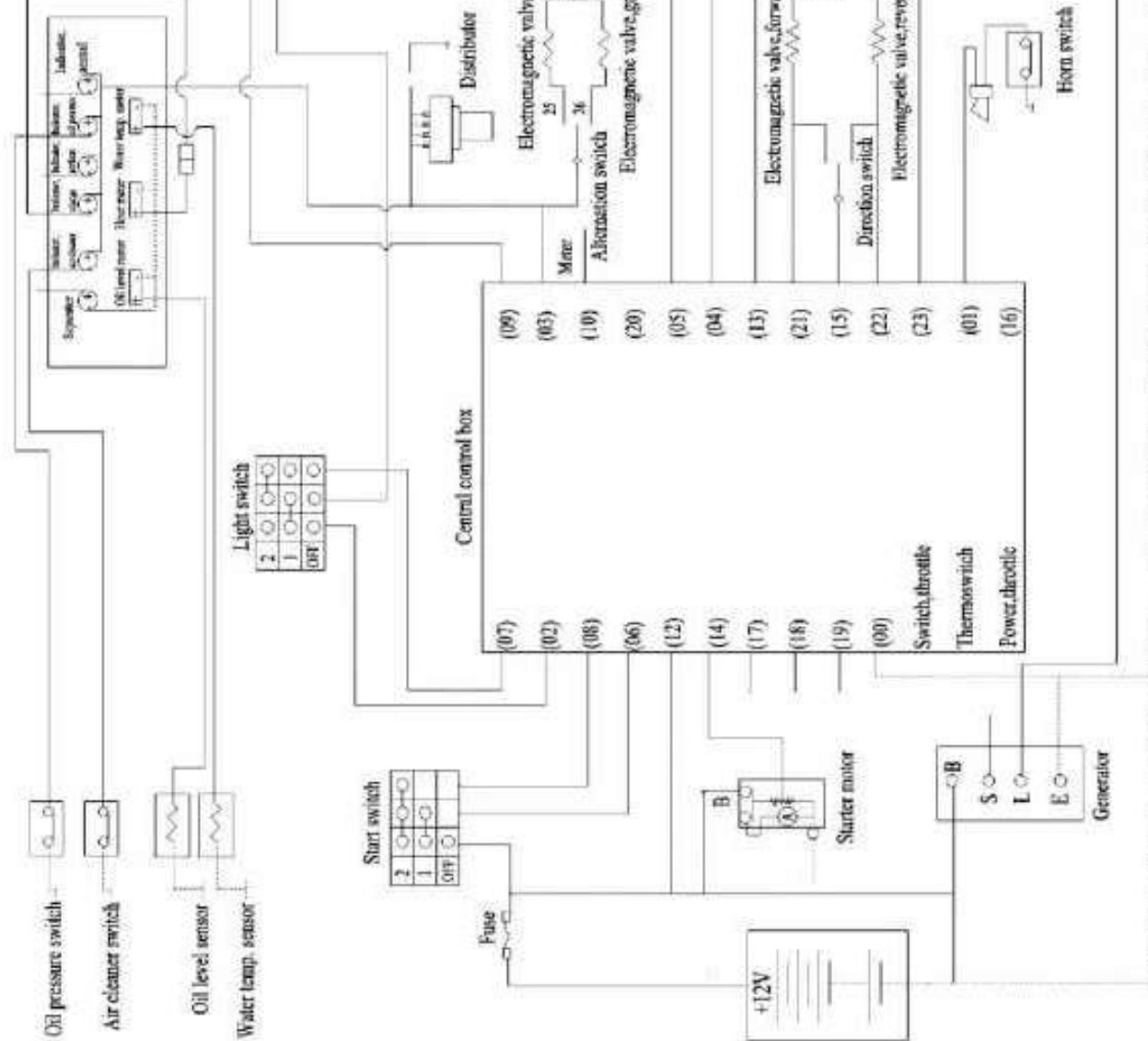
- 09 Power, headlamp
- 10 Preheating indicating
- 12 Main power
- 13 Preheating fuse
- 14 Starter
- 15 Optional power 1
- 16 Optional power 2
- 17 Indicating, neutral
- 18 Generator N
- 19 Generator F
- 20 Charging indicating
- 21 Switch, forward
- 22 Switch, reverse
- 23 Lamp, reverse

Fig8.2-2 Principle diagram of electrical system (Xinchai 498 engine)



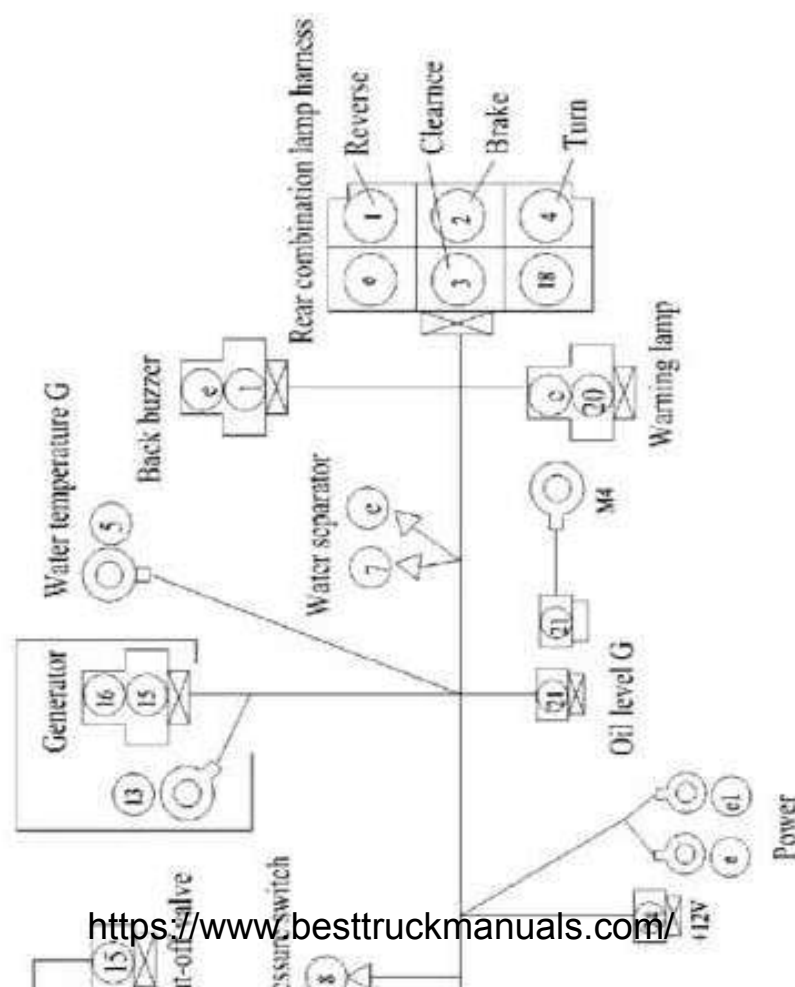
Central control box

- 00 Power(-)
- 01 Power, horn
- 02 Power, lamp
- 03 Power, meter
- 04 Power, switch
- 05 Switch, turning lamp
- 06 Power, ignition switch
- 07 Switch, light
- 08 Switch, start
- 09 Power, headlamp



- 10 Preheating indicating
- 12 Main power
- 13 Preheating fuse
- 14 Starter
- 15 Optional power 1
- 16 Optional power 2
- 17 Indicating, neutral
- 18 Generator N
- 19 Generator F
- 20 Charging indicating
- 21 Switch, forward
- 22 Switch, reverse
- 23 Lamp, reverse

Fig8.2-3 Principle diagram of electrical system (Mitsubishi gasoline engine)



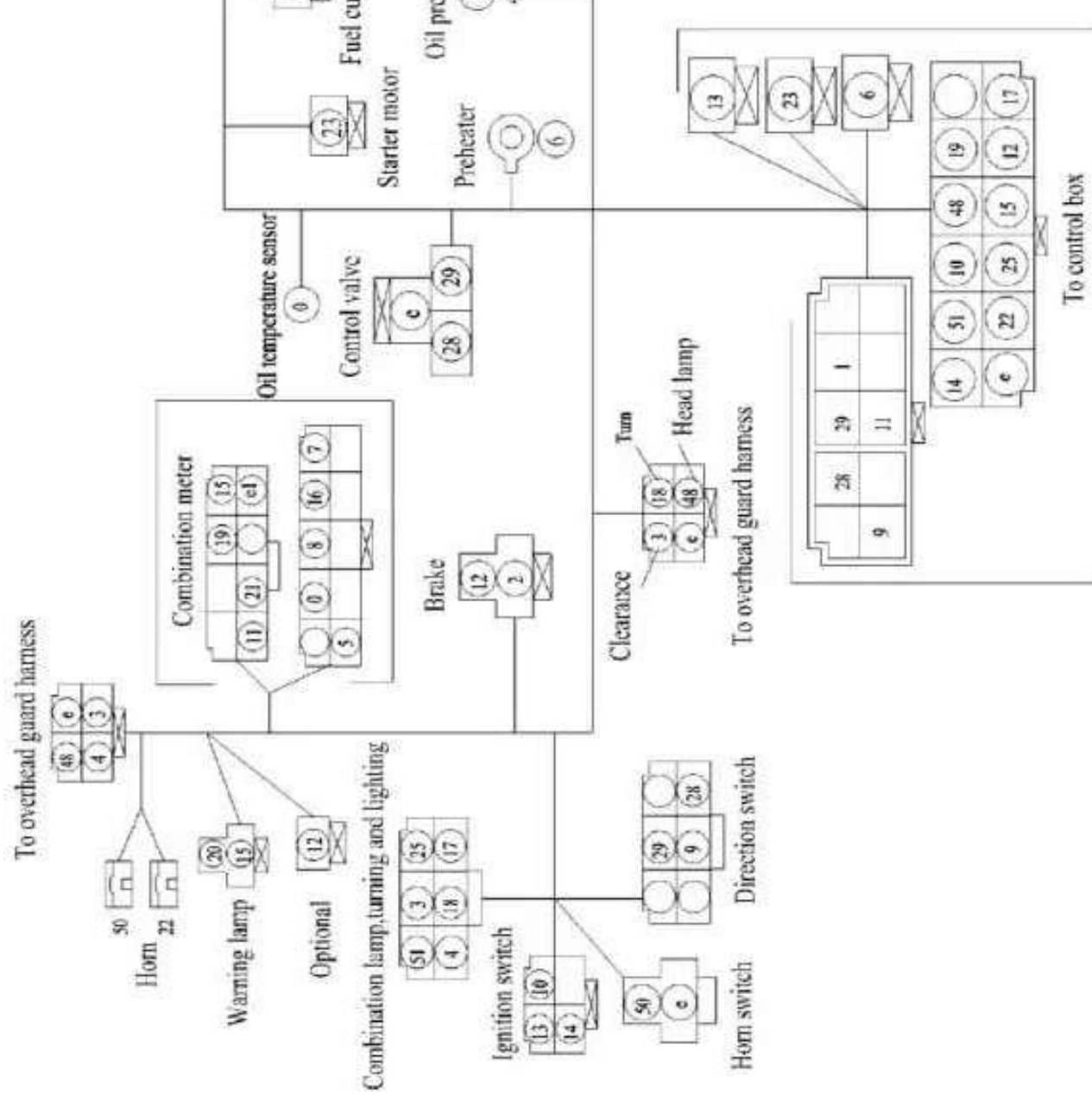
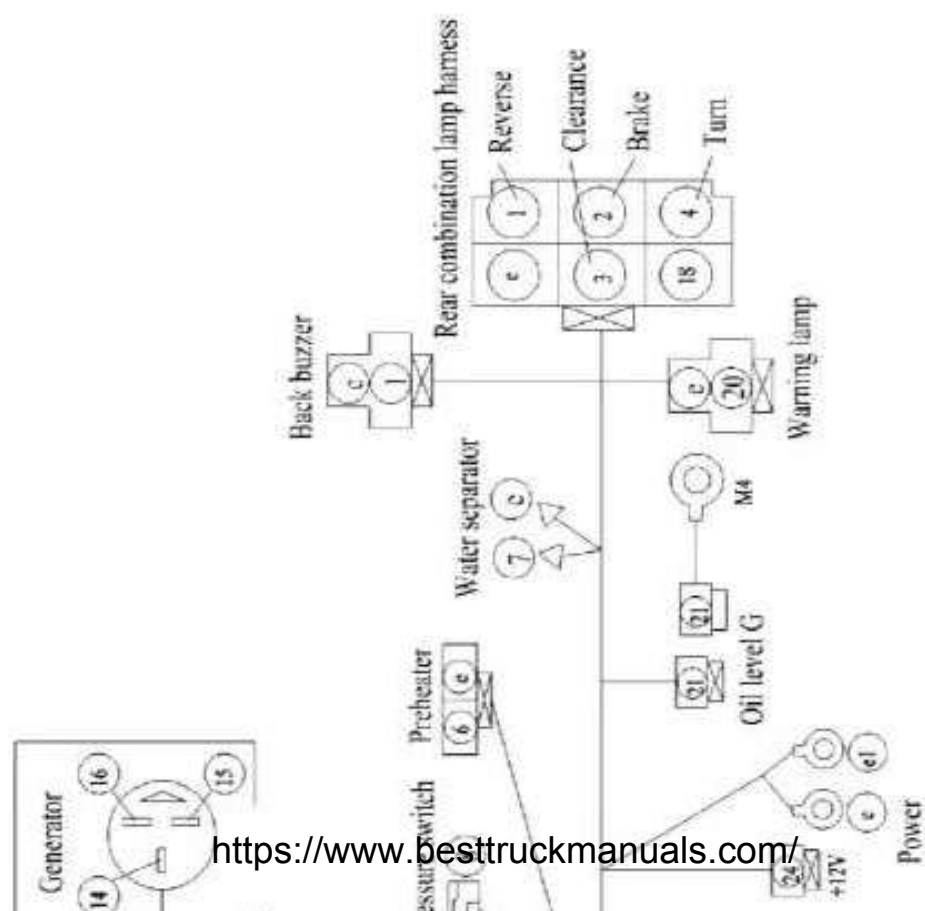


Fig8.3-1 Diagram of harness (4JG2 engine)



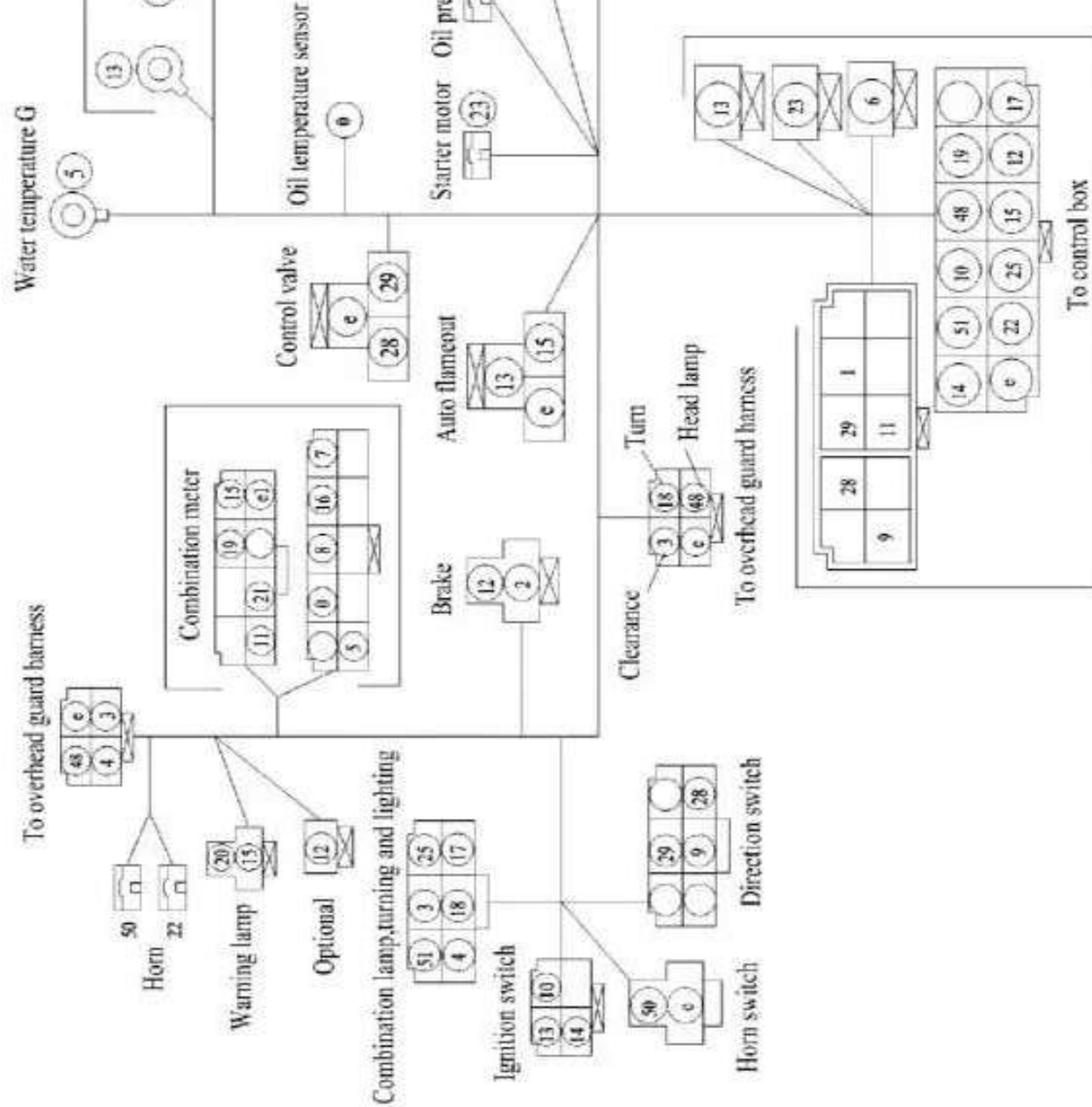
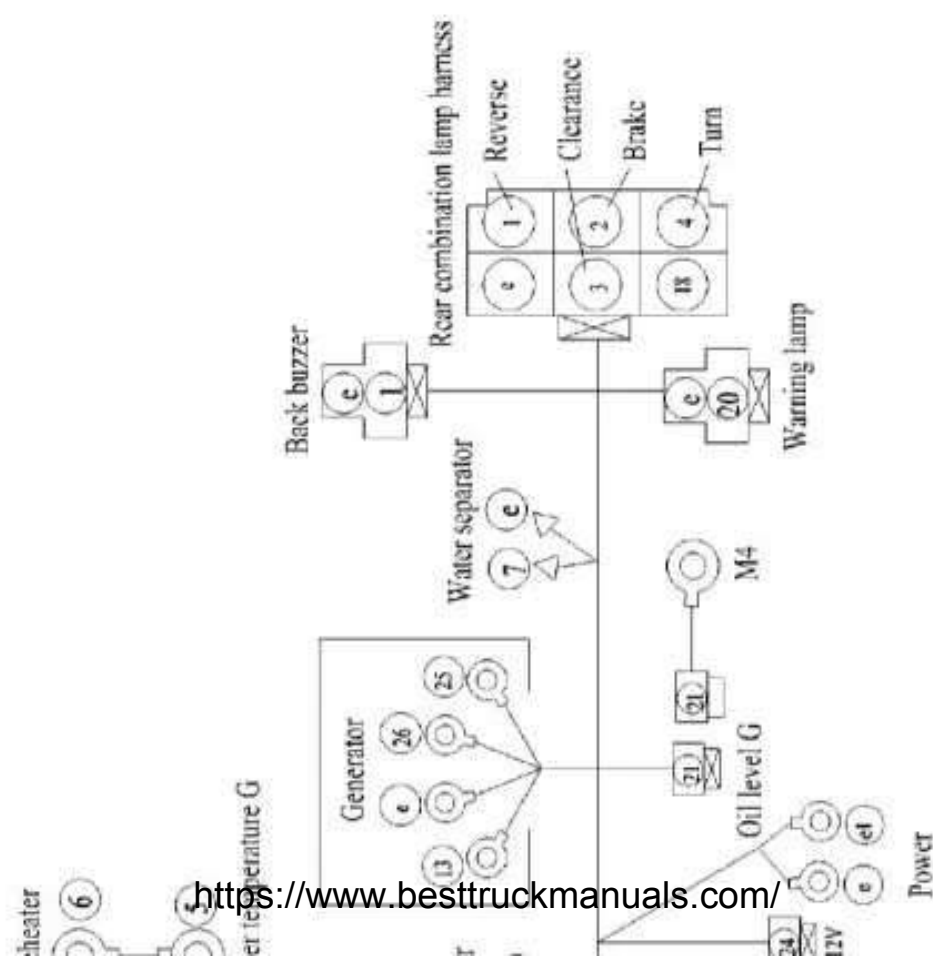


Fig8.3-2 Diagram of harness (Dachai 498 engine)



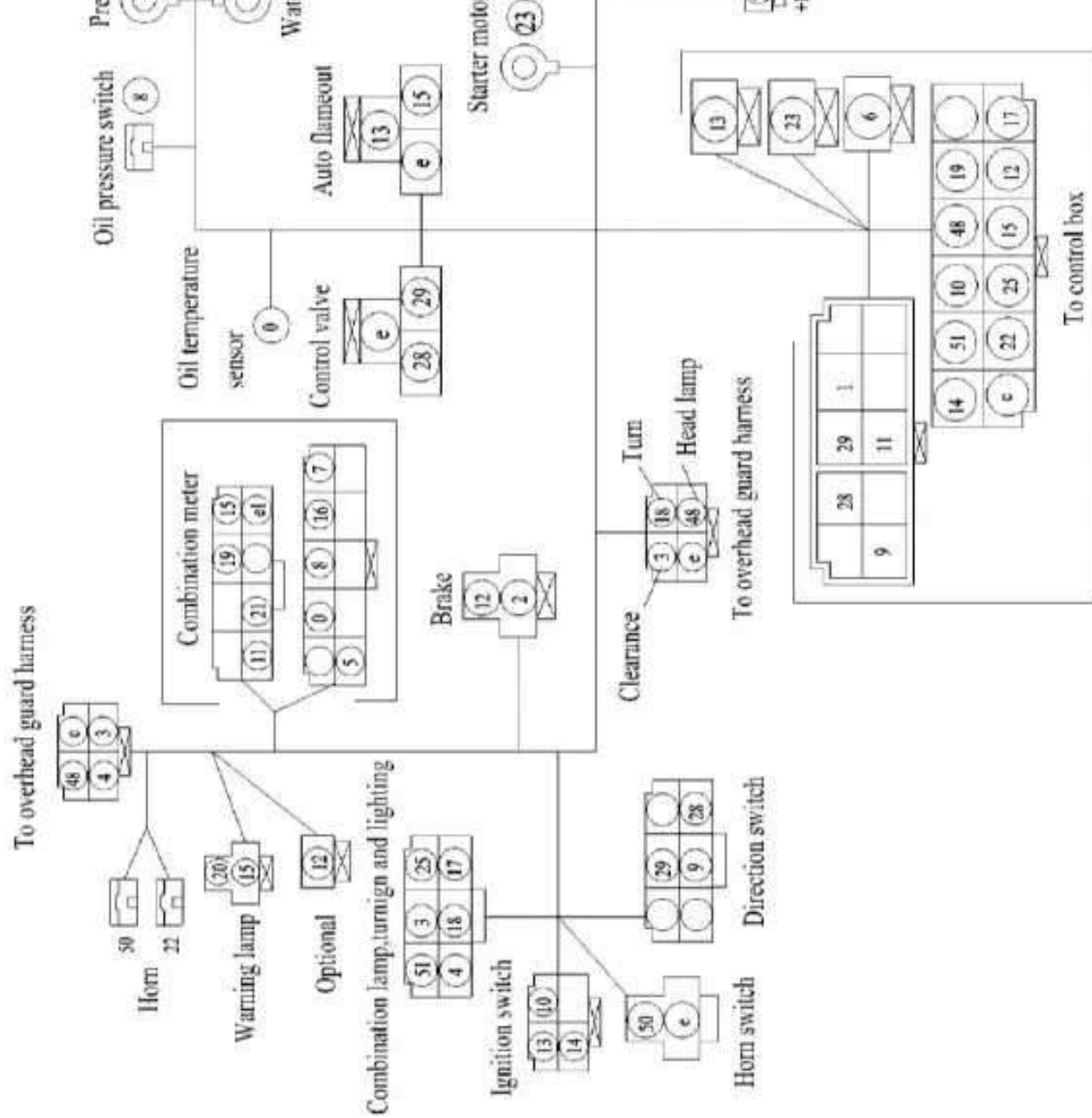
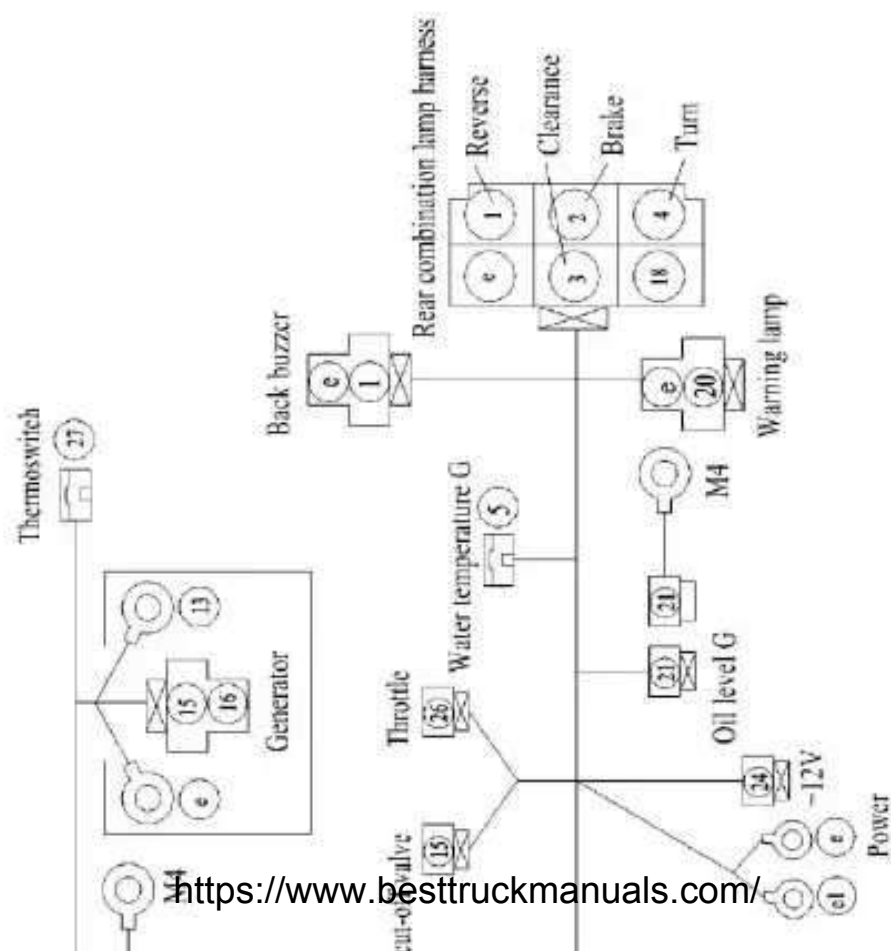


Fig8.3-3 Diagram of harness (Xinchai 498engine)



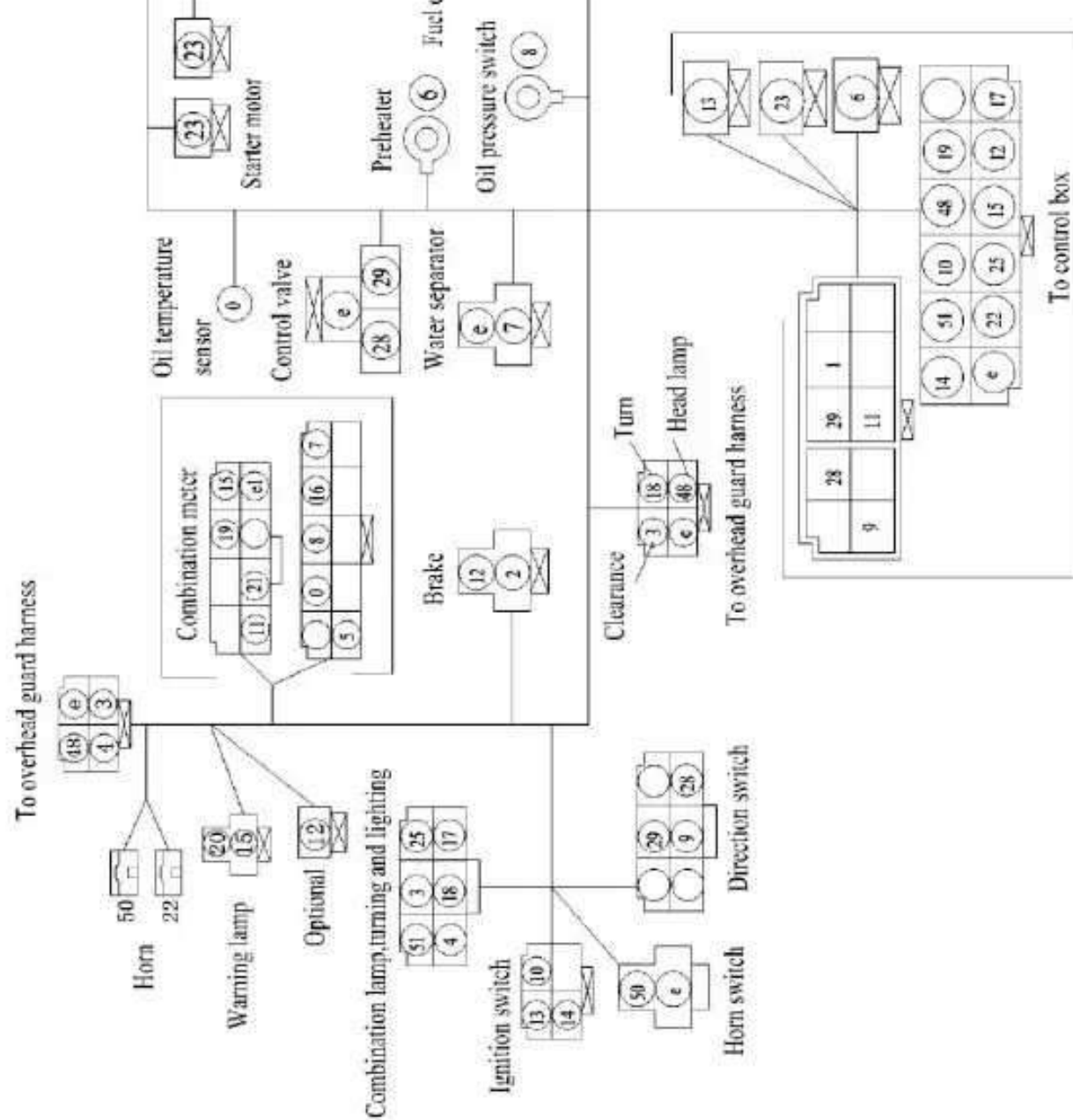


Fig8.3-4 Diagram of harness (Yanmar 4TNE98 engine)

NOTE



EC DECLARATION OF CONFORMITY

MANUFACTURE

Name: KION Baoli(Jiangsu) Forklift CO., LTD.

Address: No.8 Xinzhou Road, Economic Development Zone, Jingjiang ,Jiangsu, China

Post: 214500 ,Jiangsu, China

THE TECHNICAL DOCUMENTATION WAS COMPILED BY:

Name: Wu,Yun-Cheng

Address: Hoppengarten 19,Germany

Post: 40489 Duesseldorf,Germany

HEREBY DECLARES THAT THE PRODUCT DESCRIBED BELOW:

Description: Industrial truck – Counterbalanced Lift truck

Model:

Serial number:

<https://www.besttruckmanuals.com>

Net engine power:

kW

Manufacturing year:

COMPLIES WITH THE PROVISIONS OF THE FOLLOWING EUROPEAN DIRECTIVES:

2006/42/EC	Machinery Directive
2004/108/EC	EMC Directive
97/68/EC	Engine pollutant emission Directive

2000/14/EC & 2005/88/EC Noise Directive

Equipment according to the definition given by Annex I, item 36 of Noise Directive.

Conformity assessment procedure followed: Annex V of Noise Directive 2000/14/EC

Holder of the technical documentation

Name: KION Baoli(Jiangsu) Forklift CO., LTD.

Measured sound power level: dB Guaranteed sound power level: dB

COMPLIES WITH THE PROVISIONS OF THE FOLLOWING HARMONIZED STANDARDS:

EN 1726-1:	Safety of industrial trucks — Self-propelled trucks up to and including 10 000 kg
1998+A1: 2003	capacity and industrial tractors with a drawbar pull up to and including 20 000 N
Annex I of Machinery Directive 2006/42/EC	Essential health and safety requirements relating to the design and construction of machinery

Done at: Jingjiang ,Jiangsu, China

Name of the signatory: 陈斌/ChenBin

On : _____

Title: Director of Quality Assurance

Signature: _____

Service Hotline: 400-828-2789

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Edition: ME 08-02:2009



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Edition: ME08-02 : 2009