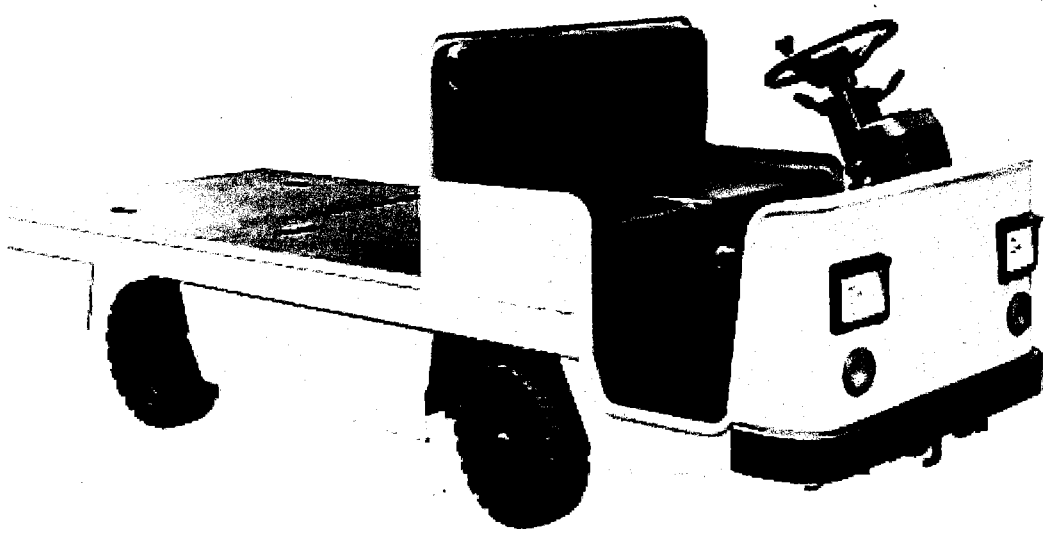
SERVISNÍ KNIHA

NÁVOD K OBSLUZE

TECHNICKÁ PŘÍRUČKA

Plošinový vozík s bateriovým pohonem

BD 20



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Základní údaje o vozíku:

Typ vozíku:	BD 20
Výrobní číslo vozíku:	1302001
Mimořádná výbava:	- BATERIE - NABÍJEČ
Doba trvání záruky:	24 MĚSÍCŮ

Rok výroby:	2013
Datum předání:	10. 5. 2013
Razítko prodávajícího:	Gekkon Gekkon International s.r.o. Hradišťská 407 533 52 Pardubice tel./fax: 466 33 53 78 IČ: 25 93 06 81 DIČ: CZ25 93 06 81
Datum od kterého začíná platit záruka:	10. 5. 2013

Všeobecné podmínky:
Pravidelné servisní kontroly

Po dobu trvání záruky je provozovatel povinen provádět pravidelné kontroly po 6 měsících dle níže uvedeného popisu.
V části „ Servisní doklad“ Vám potvrdíme provedené servisní kontroly, protože tento doklad je podmínkou pro vyřízení nároku při záruce.
V případě prodeje vozíku nezapomeňte tuto knížku předat dalšímu vlastníkovi.

Servisní doklad

KONTROLA PO 1000 Mth

Datum kontroly: 9. 5 2014
Stav Mth: 13

Předepsaný úkon:	*potvrzení úkonu:*
1. Výměna hydr. oleje	DOLITI ✓
2. Kontrola,event.výměna uhlíků zdvihového mot.	-11- ✓
3. Kontrola,event.výměna uhlíků pojezdového mot.	-11- ✓
4. Kontrola dotažení spojů	✓
5. Promazání pohyblivých částí	✓
6. Celková kontrola technického stavu	✓

Oprava nad rámec pravidelné kontroly:

KONTROLA ŘÍZENÍ - PŘI VÍZDĚ SE ZAVĚSILO ŘÍZENÍ V KRAJNÍ POLOZE

Gekkon International s.r.o.
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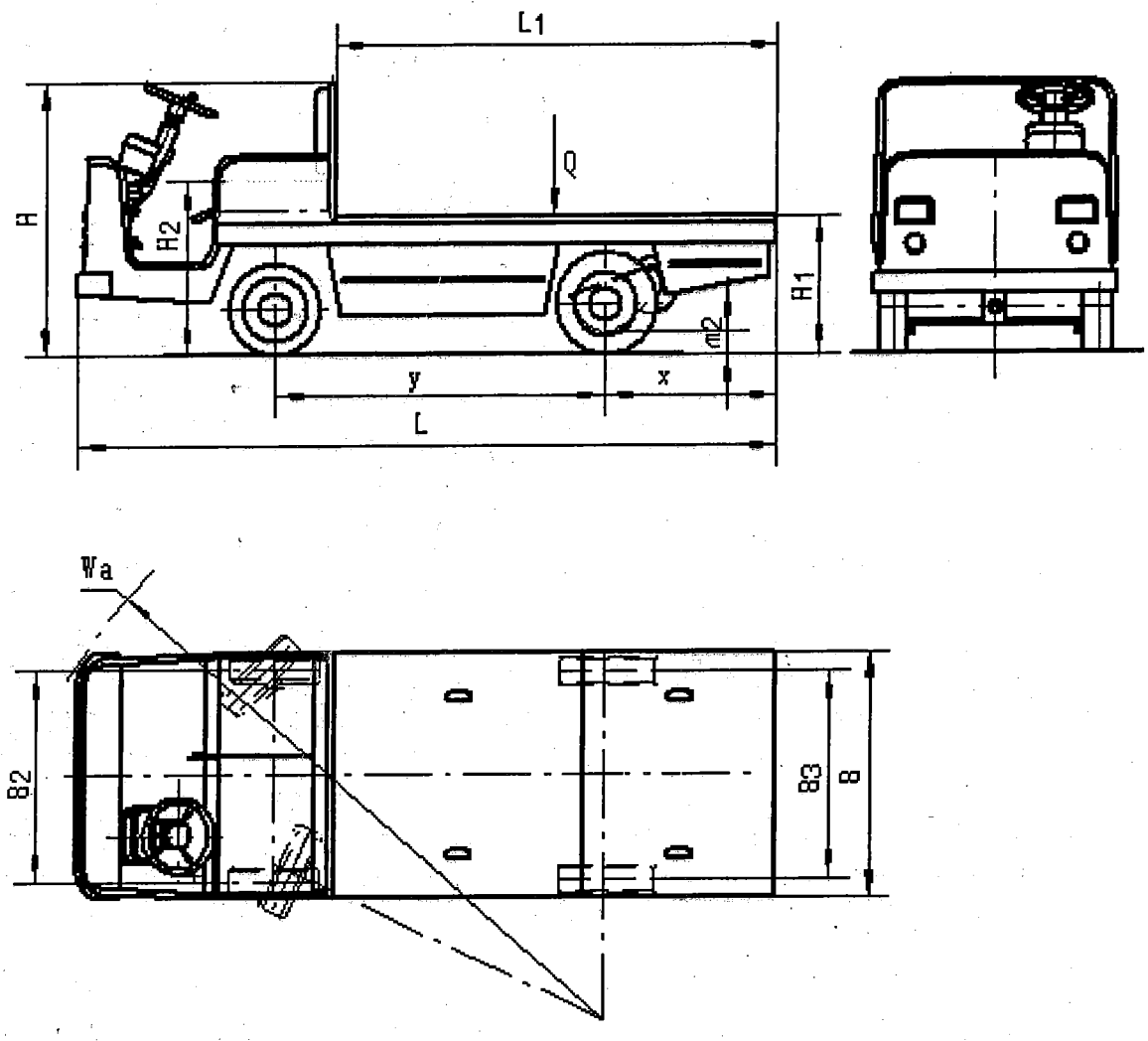
Razítko servisu

Content

I. Main technical parameter



Configuration diagram

characteristics	1.2	Model		BD25-Ty	BD20	BD30
	1.4	Driving mode		seat driving	seat driving	seat driving
	1.5	rated load	Q(kg)	2500	2000	3000
	1.9	Wheelbase	Y(mm)	1500	1600	1850
weight	2.1	Service weight(with battery)	kg	1300	1450	1750
	2.2	front/rear axle load, laden	kg	975/2825	1104/2346	1660/3090
	2.3	front/rear axle load, unladen	kg	590/710	676/774	865/885
tire	3.1	Wheels (rubber, high elastic, pneumatic tyre, polyurethane)		Solid tyre	pneumatic tyre	pneumatic tyre
	3.2	Wheel dimension, front		406×127×266.7	6.00-9-10Pr	6.00-9-10Pr
	3.3	Wheel dimension , rear		457×127×308	6.50-10-10 Pr	6.50-10-12 Pr
	3.5	Wheel number, front/rear (x = driving		2/2x	2/2X	2/2X
	3.6	Tread, front	b_{10}(mm)	920	1080	1080
	3.7	Tread, rear	b_{11}(mm)	925	1070	1230
dimension	4.8	Seat height/Standing height	h_7(mm)	770	800	820
	4.12	Coupling height	h_{10}(mm)	400	500	550
	4.13	Loading height，unloading	h_{11}(mm)	620	750	780
	4.16	Table length	l_3(mm)	2000	2000	2240
	4.17	Overhang	l_5(mm)	770	630	630
	4.18	Table width	b_9(mm)	1100	1250	1400
	4.19	Overall length	l_1(mm)	3150	3200	3440
	4.21	Width	b_1/b_2(mm)	1100	1250	1400
		Height	*H(mm)*	1250	1280	1280
	4.32	Ground clearance	m_2(mm)	90	120	120
	4.35	Turning radius	W_a(mm)	3000	3200	4200
	4.36	Internal turning radius	b_{13}(mm)	1040	1400	2100
Performance	5.1	Traveling speed，laden/unladen	Km/h	9/12	11/13	11/13
	5.8	Maximum gradeability， laden/unladen	%	10/20	10/20	10/20
	5.10	Driving brake		Hydraulic	Hydraulic	Hydraulic
Motor	6.1	Driving motor power	kW	3	3	5
	6.4	Battery voltage/ rated capacity	V/Ah	48/250	48/330	48/395
	6.5	Battery weight	kg	430	662	774
		Battery dimension（L×W×H）	mm	136×179×335	136X179X450	136X179X450
Additional data	8.4	Noise level beside operator's ear	dB(A)	75	75	75

II. Applicable scope, driving, operation and daily maintenance

1. Applicable scope and suitable site

- **Applicable scope:**

① This truck is suitable to be used for short distance material transportation and not suitable for long distance material transportation

② It is forbidden to use the truck for purposes other than stipulated and to carry people.

- **Suitable site:**

① Ground requirement: No obstacles on the ground. The ground should be solid and flat. And the illumination should be fine.

② Environment temperature is between -25℃ to +40℃.

③ When the environmental temperature is +40℃ and relative humidity will not exceed 50%. When the monthly average temperature is 25℃, the humidity shall not exceed 90%.

2. Transportation

During transportation of the truck, please pay attention to the following items:

① Fix the tractor hooks with steel wire and block the front and back wheel. Make sure the tractor truck and load truck are connected reliably.

② Truck with load should not run too fast and should avoid sudden turning and sudden braking to prevent damaging the truck.

3. Storage of the truck

① Shut off the electric lock and put all the operation rods in empty space.

② Block the front and back wheel.

③ If the truck is not used for a long time, please hang the wheel in air (special for pneumatic tire). Conduct complementary charge to the storage battery every month.

4. Preparation before use

(1) Check that whether all the meters are in proper condition

(2) Check whether the tire is in normal condition and whether the screws are fastened or not.

(3) Check the condition of all the handles and pedals.

(4) Check whether the voltage of the battery, the proportion of electrolyte and the electrolyte surface height is in normal condition.

(5) Check whether all the connecting points of the electric system is reliable or not, the insulation is good or not and the insulation resistance should not be less than 0.5MΩ.

(6) Check whether the hydraulic oil, electrolyte and braking liquid is leaking or not.

(7) Check tightness of all major fasteners

(8) Check whether the lighting and signal lamp is proper or not.

(9) Loose the stop brake.

(10) Turn the steering wheel to check that whether the steering system is in normal condition or not.

(11) Driving the truck slowly and step on the braking pedal to check whether the braking system in proper working condition.

(13) The pollution of the hydraulic oil should not exceed 12 degrees. Otherwise it must be changed.

5.Driving method

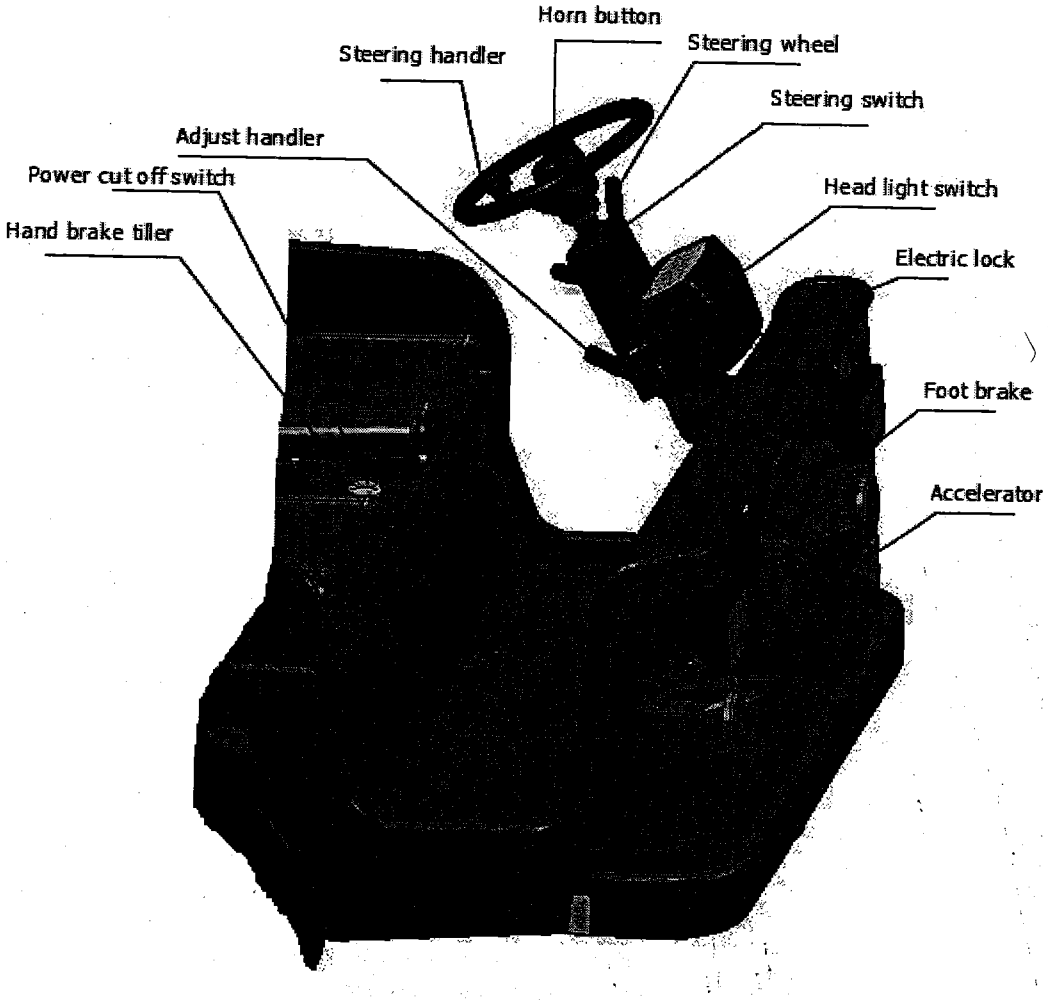


Fig 2. Operation control chart

(1) Pull out the handle of power-off switch and loosen the manual braking handle. Switch on the electric lock to check that whether the voltage is in normal condition or not.
(2) If the direction handle is pushed forward, the truck travels forward. While the handle is pulled backward, the truck travels backward.
(3) Hold the steering wheel and step on the accelerate pedal slowly to move the truck.
(4) During turning of the truck, you should turn the steering switch to indicate the truck' s running direction. When The truck turns to the right, the steering switch sleeve will turn forward. While turning to left the steering switch sleeve will turn backward.
(5) During braking of the truck, loosen the acceleration pedal and step on the braking pedal.
(6) Truck parking: press the power-off switch to cut off electricity. Pull the manual braking handle to stop the truck. Switch off the electric lock and pull out the key. Then the driver can leave the truck.
(7) During night driving, please pull out the headlight. Pull out the first grade of switch to show wide lamp and second grade to show wide lamp and headlight together to guarantee the good illumination.
(8) Pay attention to safety when driving. Press the horn if there are people walking ahead.

6. Attention items in operation

(1) This truck belongs to special equipment. Only drivers with driving license after necessary training and passed the examination can drive the truck. This requirement is to ensure the safety and normal operation of the truck.
(2) Truck operator should wear safety protection shoes, hat, clothes and gloves in operation.
(3) Make sure that the goods doesn' t not exceed the rated load and put the goods in the middle of the truck as much as possible. Overloading is strictly forbidden.
(4) The truck can only be operated on flat and solid ground with certain friction. The oil and muddy water will make the wheel skid. So the ground should be clean.
(5) Daily check should be done before and after the operation of the truck. It is not allowed to operate the truck with malfunction. If any abnormal situation happens during operation, the truck must be stopped for checking immediately. Operation can only be resumed after the fault is eliminated.
(6) It is forbidden to load unfixed goods or loosely piled goods. Take care when loading over big objects.
(7) During operation of the truck, please pay attention to the performance and working conditions of mechanical system, hydraulic system, electric system, speed adjuster and brake all the time. Stop the truck immediately if anything abnormal occurs.
(8) To start the truck first turn on the key switch, turn on the power plug. After the power is connected select running forward and backward switch location. Turn the steering wheel to check if the steering operation is normal and then slowly step on the accelerate pedal. Pay attention to check if the starting running is stable and normal.
(9) Pay attention to the voltage when driving. The rated voltage is 48V. If the voltage is 40V or lower than 30% of rated voltage, the truck must be stopped and the battery must be charged immediately.
(10) The operator should take special care and drive slowly when driving on docks or places with temporary plank.
(11) When driving with load, be sure not to brake or turn round suddenly to avoid the goods fall down.
(12) During driving, pay attention to any bulgy and hard objects on the road to avoid the truck vibration or puncture the tire.
(13) During driving, pay attention to any passerby, obstacles and potholes on the road as well as the space above.
(14) During driving, it is forbidden to hold hands, feet and any other parts of the body out of cab. It is not allowed to carry passengers on carriage.
(15) Drive carefully on slopes. Do not turnaround, transversely or slanting move on the slop. Otherwise the truck has the danger of side overturning. When driving on wide slope be careful not to let the goods fall down. If driving downgrade please step on the foot brake slowly and carefully.
(16) During operation of the truck, be sure to start, steer, drive, brake smoothly, especially turning around on wet or slippery road. It is forbidden to start, speed up, stop suddenly and turning at high speed. Improper operation might cause the truck side overturning or other serious accidents.

7. Daily maintenance

Daily maintenance is necessary for the normal operation of the truck. Neglect of maintenance and operate the truck with problems may endanger the personal safety and damage the goods. Regular routine check and timely trouble shooting are required during operation. Do not use truck with problem to guarantee safety as well as prolong the service time of the truck.

(1) Daily maintenance requirement
a. Daily maintenance is conducted every day before and after operation of the truck.
b. If any damage or defects discovered please immediate report to the manager. It is forbidden to use the truck before it is properly repaired.
c. Daily maintenance will be performed by the driver or other designated staff.

(2) Daily maintenance
a. Maintenance before driving the truck
① Check if the wire connecting of battery is loose or not. Clean the surface of the battery. Switch on the power to check the voltage of the battery is in allowed scope or not and the insulation of the truck is normal or not.
② Drive the truck slowly without load, steer for checking the steering is normal or not. Drive the truck straight forward, and then step down the pedal to check that whether the brake is reliable or not. Check carefully that whether the driving, steering and braking is in normal condition or not.
③ When driving at night or in dark room, the light of the truck should be available and operation area should be illuminated. And make sure that there is no obstacle on the road.
b. Daily maintenance after each operation
① Clean the surface of the truck and the battery. Check if the wire connecting the battery is loose or not.
② Check tightness of the wheel screws.

(3) Charging of the truck
a. The initial charging and supplementary charging of the battery group must be strictly followed up the

regulations stipulated in the battery specification manual.

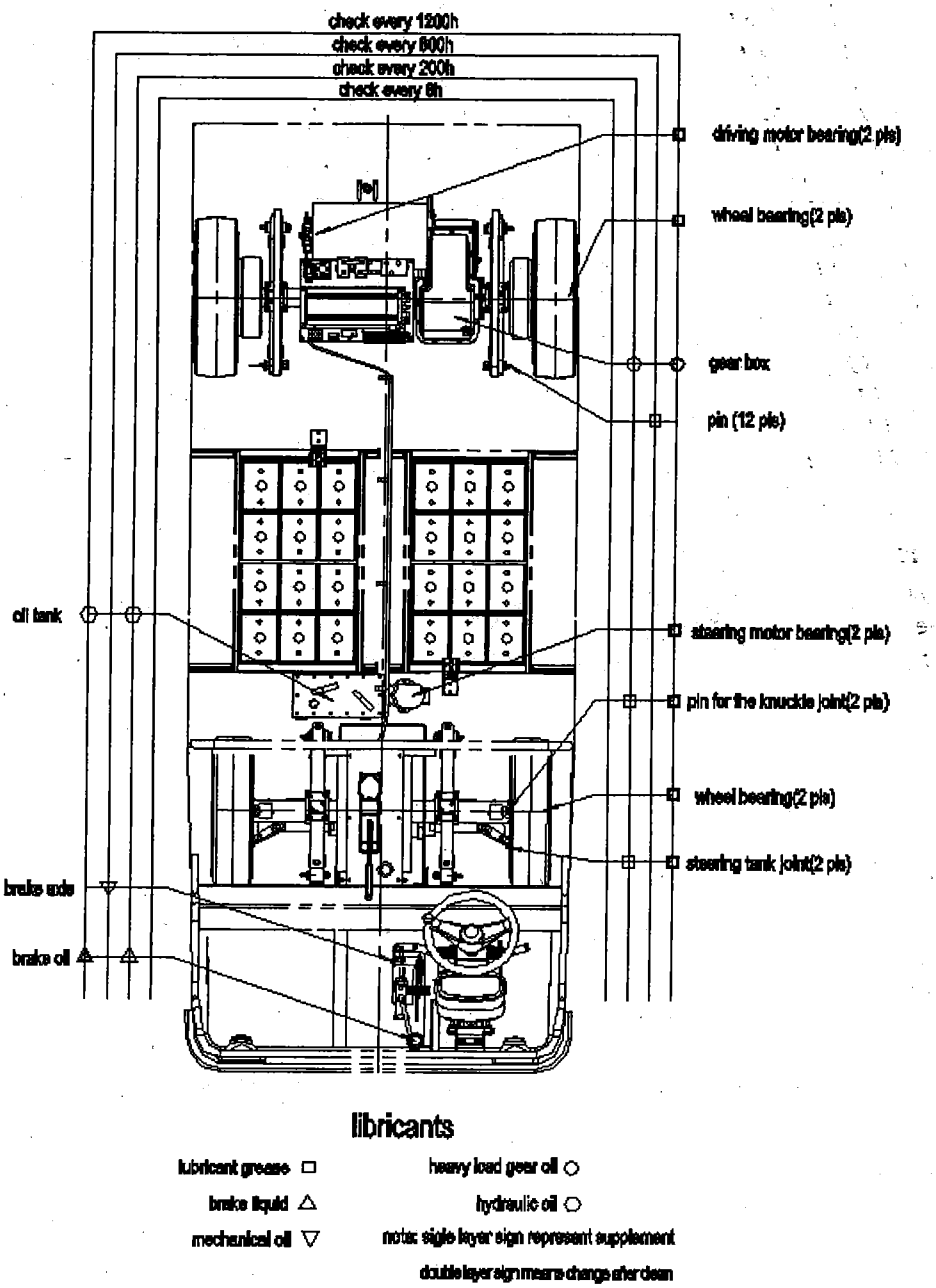
b. For the trucks with rated voltage of 48V when the working voltage is 40V or the electricity capacity is below 30% the battery group must be charged.

(4) Selection of lubricants, lubricant grease and hydraulic oil for the truck

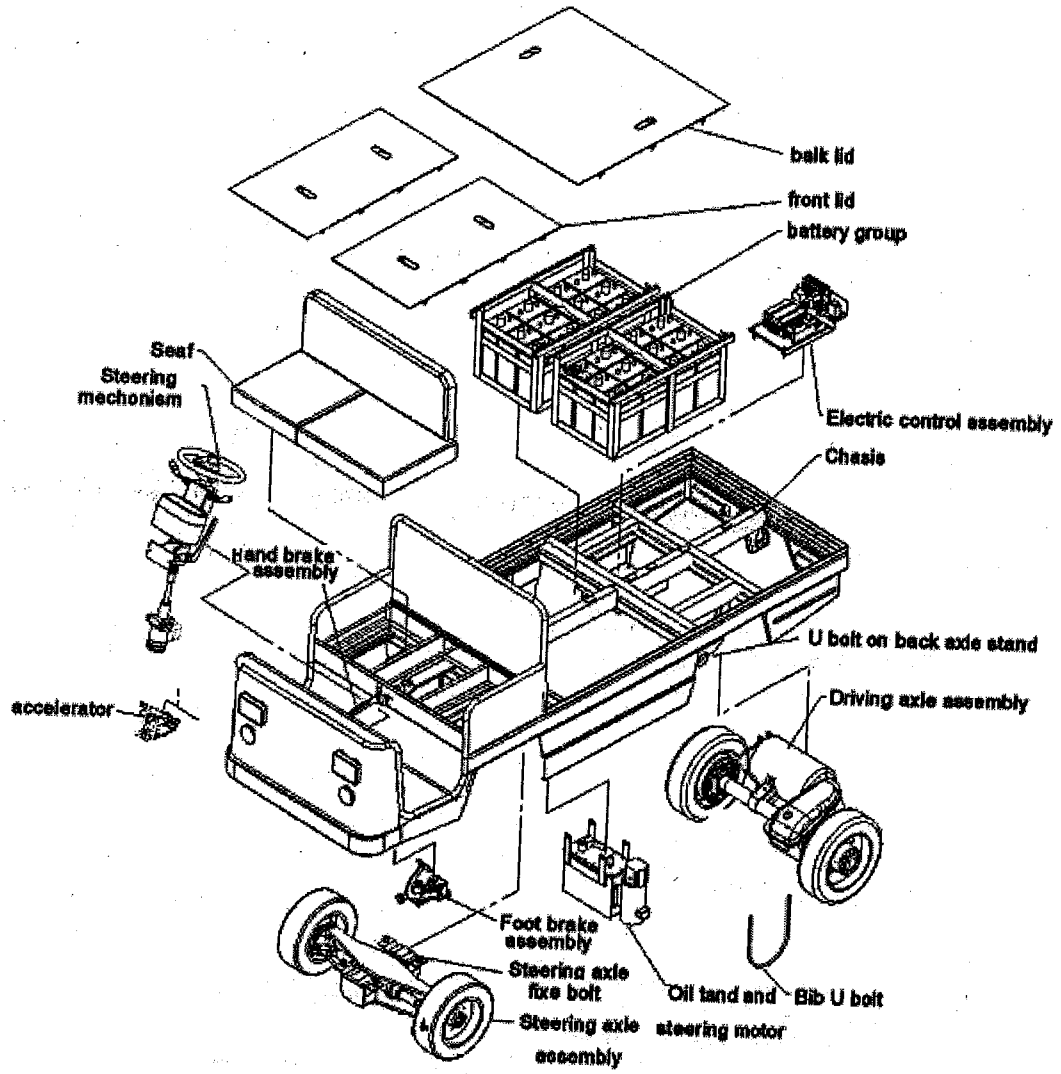
name	Specification (code no.)		quantity
	Domestic	Overseas	
hydraulic oil	N46# orN68#	ISOVG30	8L
Gear oil	85W/90 GL-5 Heavy duty gear oil		1.8L
lubricant grease	3# lithium lubricating grease	JISK2220/2#	
braking liquid	DOT3 compositive brake liquid		1L

Note: The refueling of lubricants and lubricant grease can take reference to the relevant state standards of automobiles. The waste out of lubrication should be treated by following the relevant state laws and regulations.

8. The schematic diagram of oil sites

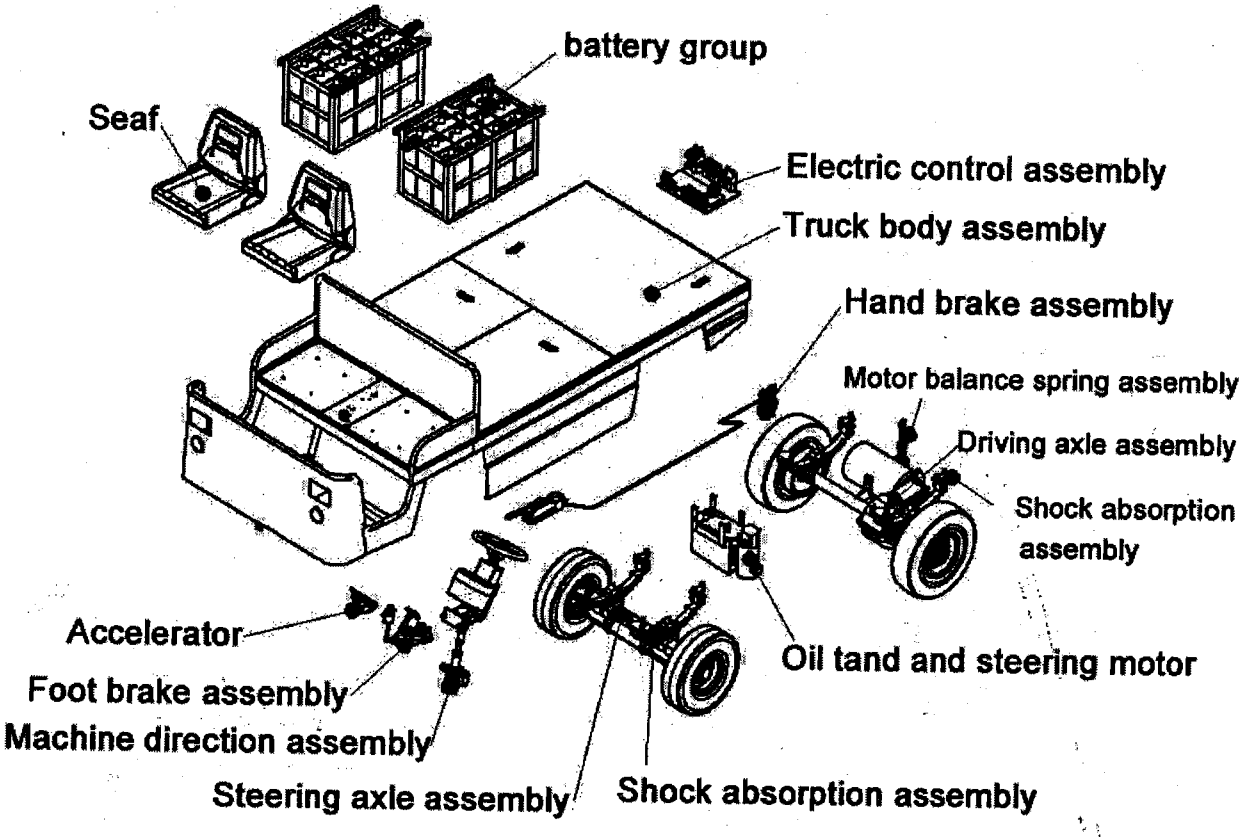


III. Structure, principle, adjustment and maintenance



BD25 Structure

Fig 3 The schematic diagram of lubricating area



BD20、BD30 Structure

Fig. 4 The structure of the truck

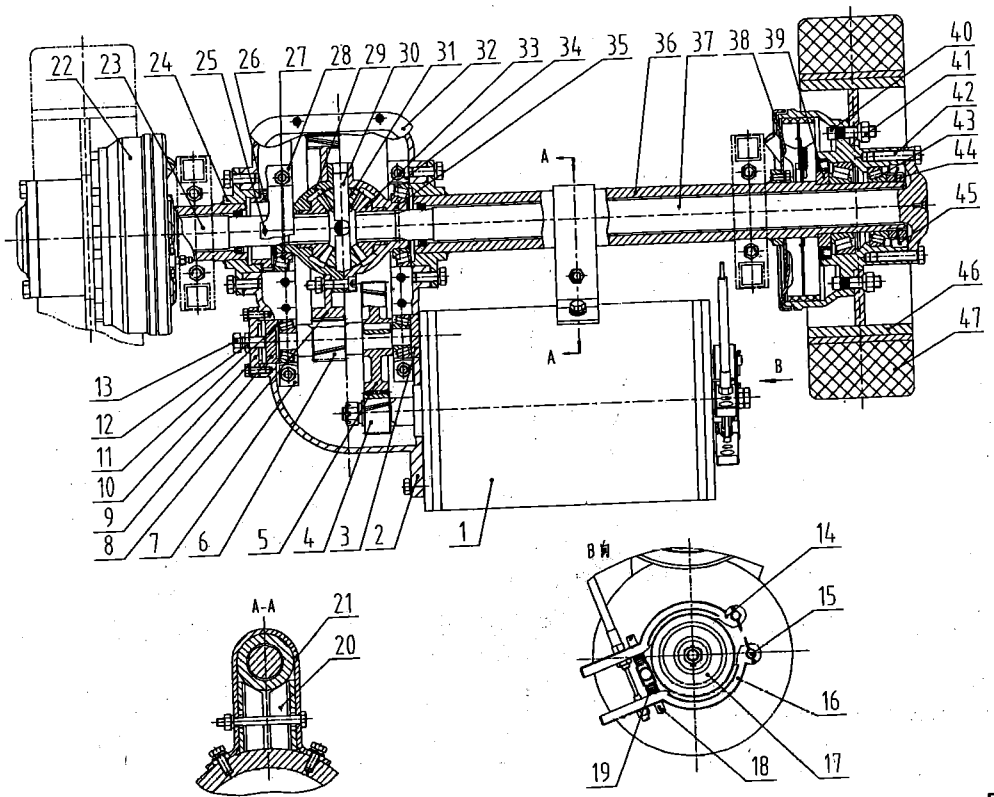
As shown in fig. 4 the truck consist of driving axle assembly, steering axle assembly, foot brake, hand brake, steering structure, electric system(including motor, battery, electric control, instrument, light and etc), truck body and so on.

1. Driving system

1.1 Principle for the driving axle

The running of the truck relies on the battery as its power source and the DC motor as its driving force, to drive the truck through the second grade gear transmission. The change in direction (forward or backward) is achieved through changing the turning direction of the driving motor. When the truck turns round this driving axle controls the wheels (right & left) speed by symmetrical planetary bevel gear differential. Especially during steering, the wheels at two sides (right & left) could be coordinate adjusted to meet the requirements of driving kinematics.

1.2 Structure of the driving axle (See the following diagram)



1.driving motor 2.gear box 3.fixed stopping lid 4.motor gear 5.gear 1
6.gear shaft 7.bearing pressing lid 1 8.gear 2 9.mobile stopping lid 10.pressing lid
11.cone bearing 12.nut 13.six angles bolt 14.brake arm B 15.brake arm pin
16.brake arm A 17.brake plate 18.conducting rod 19.spring 20.black for motor
21.motor clip 22.hub 23.short shaft 24.short shaft pipe line assembly
25.inner six angles screw 26.adjust nut 27.cone bearing
28.bearing pressing lid 2 29.upper part of differential housing 30.T-joint axle 31.planet gear
32.speed slow down box lid 33.shaft gear 34.bearing pressing lid 3
35.lower port of differential housing 36.long shaft pipe line assembly 37.long shaft
38.brake 39.shaft end ring 40.tire T shape screw 41.tire specific nut 42.shaft six angles bolt
43.cone bearing 44.samll round nut 45.lock washer 46.steel ring 47.pressed solid tire

Fig. 5 Structure of the driving axle

Clarification of driving axle structure:

Part (1) driving motor and part (2) deceleration box is connected together with bolts. The output shaft of motor is linked to the motor gear by the male spline and female spline which is on the gear part (4). When the motor turns it brings part (5) gear 1 to turn. The gear(P/N 1) and gear shaft(P/N 6) are jointed by a flat key. They are running symmetrically. Gear axle and part (5) gear 1 makes up middle speed gear transmission. When the gear axle turns it brings part (8) gear2 to turn. Gear 2 is connected with part (29) upper parts of differential housing, so when gear 2 turns it brings differential housing to turn to realize low speed transmission. The turn of differential housing is transmitted to the right and left wheel through part (23) short shaft and part (37) long shaft, Part (33) shaft gear and shaft in differential housing is connected through the cooperation of splines. Shaft and part (22) is connected with shaft screw. When gear 2 and differential housing turns together, they bring the shaft and wheel shell to turn. As the wheel and wheel shell is connected with tire bolts so they bring the wheel to turn.

a The adjustment of driving axle

① Adjustment of clearance in part (11) tapered roller bearing on part (6) gear axle: Loose the screw on part (7) lid on the bearing. Loose part (12) nut, adjust part (13) screw, push part (9) dynamic guard cap and adjust the bearing clearance.

② After the clearance of the bearing is adjusted, fix it with part (12) nut and fasten the screw on part (7) lid on the bearing.

③ Adjustment of clearance in part (27) cone bearing on the two ends of the differential: Loose the screws on part (28) bearing lid 2 and part (34) bearing lid 3. Move part (26) with screwdriver to adjust the space of the bearing. Afterwards fasten the screws bearing lid 2 and bearing lid 3. And then fasten part (25) locking screw to make the adjusting nut stop moving. Then lock the screw with the nut.

④ Due to the friction of the part (43) cone bearing inside the driving wheel the space between the bearing become bigger such result in the wheels sway. At this time adjust part (44) the small round nut to narrow the space between the bearing. After the adjustment use part (45) lock washer to fix it.

b. Daily maintenance of driving wheel

① When driving try to avoid shallow and potholes on the road and avoid sharp obstacles to puncture the tire.

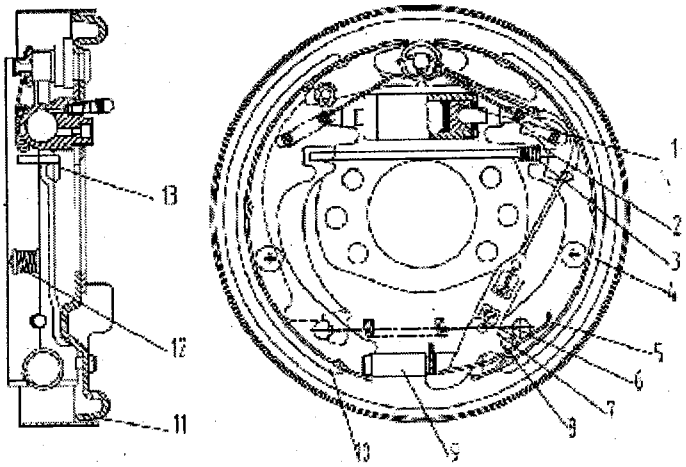
② Conduct regular check for tightness of wheel nuts. If they are not tightened, screw down them all the time.

③ Check if the wheel brake is in proper working condition and if not adjust it or repair.

The differential housing of the driving shaft is the symmetrical planetary bevel gear equipped differential housing. The differential housing is installed on the reduction gearbox through the bearings on the two ends. The case of the differential housing separate into right and left two parts and has two differential gear and four planet gears.

The driving axle includes part (2) reduction gearbox, part (21) short shaft pipe line assembly and part (31) long shaft pipe line assembly assembled together with flange and screw. The hub on the outer ring of the wheel is supported by two tapered roller bearings on the axle tube. The power is transmitted onto the half shaft through differential housing. The hub is driven by the half shaft and drive the driving wheel turning. The half shaft only bears the torque transmitted to the hub. There is oil seal inside the hub to prevent water and dust entering or leakage.

This driving axle is equipped by double brake-shoe wheel brakes which are on two sides (refer to the fig. below).



1. Brake branch pump assembly 2.Hand brake pushing rod 3. Spring
4.Brake shoe with friction chip assembly (back) 5. Spring 2 6. Pull-off spring
7. Pawl 8.Pin 9.Space adjuster assembly 10. Brack shoe with friction chip assembly (back)
11. Brake bottom plate assembly 12. Pressing spring 13. Hand brake pull rod

Fig. 6 wheel brake structure

Wheel brake is double shoe brake. The brake is formed by two group of brake shoe with friction plate, brake branch pump, clearance adjuster assembly, spring and brake base plate. The pressure oil flows into the brake spare pump to push the push rods on both sides and the push rod opens the brake shoe with equal pressure to press the friction chip on the brake shoe onto the brake drum so that the brake drum stops turning. As the brake drum, hub and wheel is connected together such to realize the braking of the wheel.

2. Steering system

2. 1 Principle and structure of the steering system (refer to the figure as below)

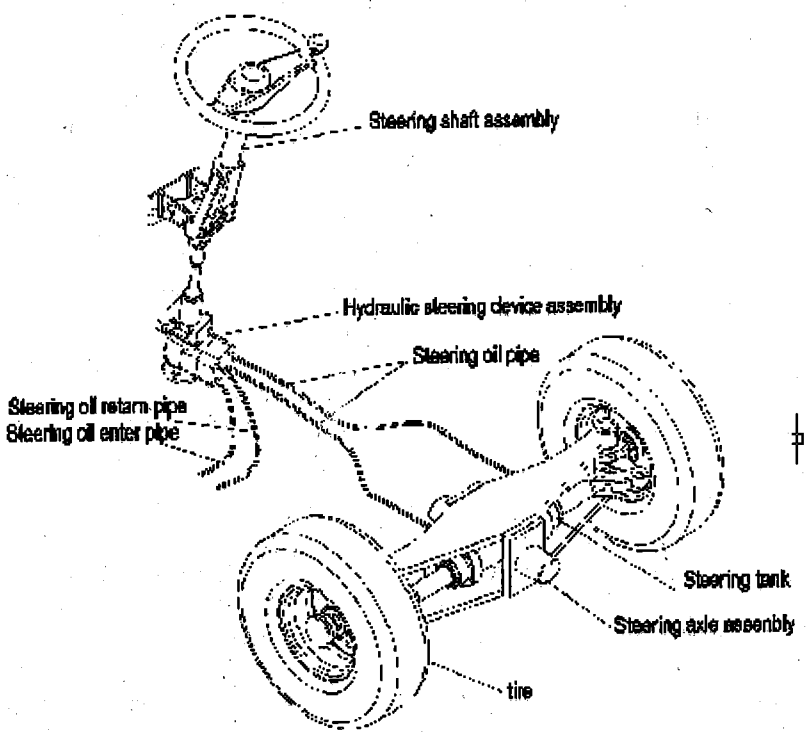


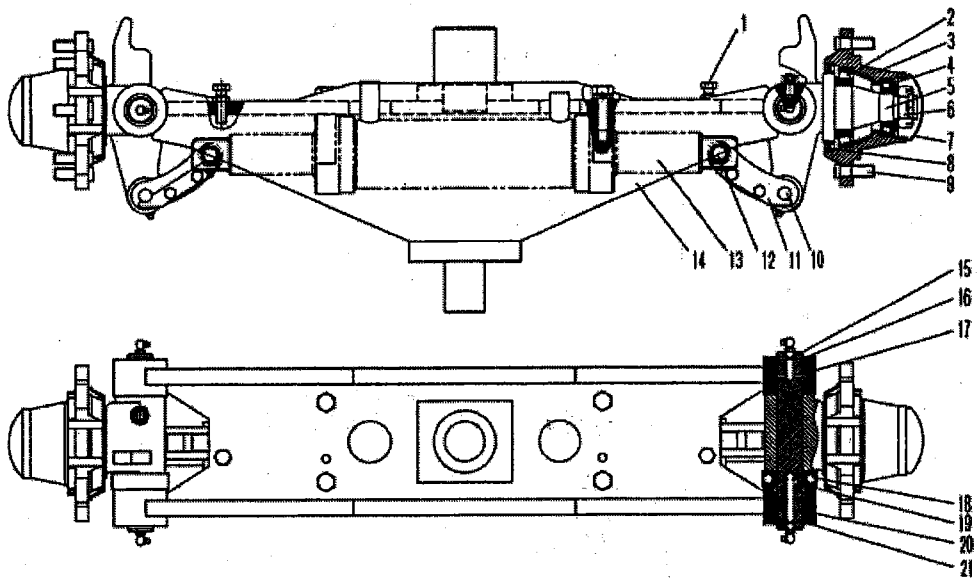
Fig. 7 steering system

The steering system mainly consists of direction machine assembly, hydraulic direction changing device assembly, steering oil pipe, steering oil inlet pipe, steering oil return pipe, steering oil cylinder, oil tank, oil pump and steering axle assembly.

When the truck makes turns, turn the steering wheel. The full hydraulic steering device will measure based on the turning angle of the steering wheel to press oil into the direction changing tank through the direction changing oil pipe. The steering tank is put flat inside the steering axle. When the pressure oil push the piston rod in the oil tank to move the steering wheel is driven through the connecting rod and the swing arm on the steering joint such to realize the steering of the truck. When the oil pump can not supply oil it can be turned manually.

The full hydraulic steering device is formed by the steering device and group valves. The hole on the lid of the group valves is the safety valve of the steering system. In addition inside the valve there is a double direction overload valve. It serves the function of protection when the wheels are accidentally hit by outside power during driving and high pressure appears inside the hydraulic system to avoid damage of the parts. The safety valve and overload valve have been adjusted already by the manufacturer. And users are not allowed to adjust at will.

2.2 Steering axle structure (refer to the following figure)



1. Limited screw 2. Tapered roller bearing 3. Wheel hub 4. Tapered roller bearing
5. T-joint axle 6. Pressing nut 7. Hub lid 8.Oil seal 9. Tire bolt
10. Pin shaft 11. Knuckle bracket 12. Pin shaft 13. Steering cylinder 15. Main pin
16. Oil seal 17. Needle bearing 18. ball thrust bearing 19. Asjusting washer
20. Needle bearing 21. Oil seal

Fig. 8 Steering axle structure

The steering axle of this truck adopts the structure of crosswise oil tank. The function of the steering axle is not only to turn the wheels but also to support the weight of the truck. The steering axle body is box shape crosscut welding structure. The steering axle is formed mainly by: part (14) steering axle body, part (13) steering oil tank, part (11) connecting rod (steering joint pulling arm), part (5) steering joint (T-joint axle), part (15) main pin, part (3) hub and steering wheel and etc. The steering system is equipped by slider-crank mechanism, the piston rod in part (13) steering oil tank serves the function of slider-crank; part (11) steering joint pulling arm serves the function of connecting rod in the structure; part (5) steering joint serves the function of curve tiller in the structure. It can turn round the center line of the main pin. Part (3) hub is fixed on the neck of the axle of the steering joint through two cone bearing. There is oil seal inside the bearing to keep the lubricant grease in the hub and inside the body of steering joint. The wheel and hub is connected by part (9) tire screw. When the pressure oil output by the hydraulic steering device enters into the oil tank the piston rod push the steering joint to turn through the steering joint pulling arm to move the steering wheel sidewise such to legalize the direction changing of the truck.

2.3 Daily maintenance of the steering system

① Check if the hub and tire screw is loose or leaking. Fasten them all the time.
② Check all the connecting points of the oil pipe is loose or not or leaking or not. Fasten them all the time.
③ Check if the steering tank is leaking. If yes change the seal.
④ Add lubricant grease once every half year.

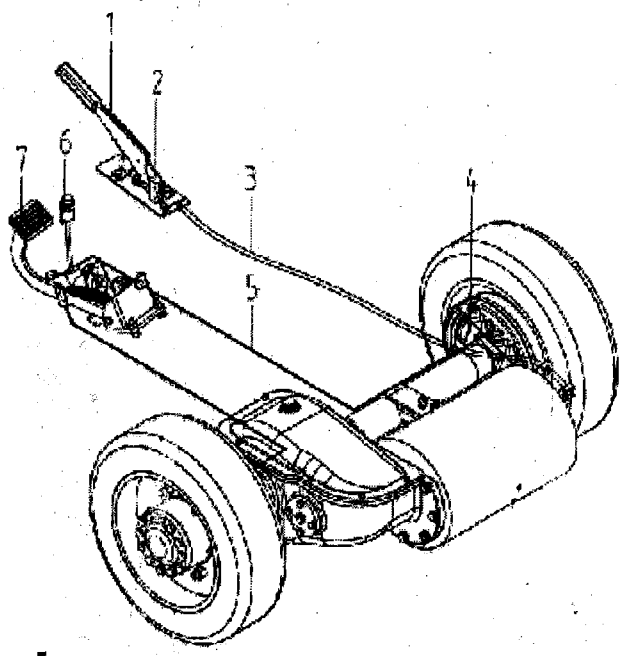
2.4 Troubles in steering system and trouble shooting

① Can not turn the steering wheel: a. It is possible that the oil pump is damaged. Change the pump.
b. The pipe and connecting points are blocked. Change or clean them.

② The steering wheel is heavy: a. The pressure in the safety valve is too low. Adjust the pressure.
b. There is air in the oil pipe. Clear out the air.
c. Leakage is serious in the steering tank. Check the piston rod seal.

③ Too much noise: a. The oil in the tank is low. Fill in more oil.
b. The oil sucking pipe and oil filter is blocked. Clean or change them.

3.Braking system (refer to the figure as below)



1. Hand brake assembly 2. Inching switch 3. Hand brake flexible axle 4. Brake assembly
5. Brake oil pipe 6. Brake oil cup 7. Foot brake assembly

Fig. 9 Brake system

3.1 The structure principle of the brake system

The brake system consists of wheel brake assembly, foot brake assembly, hand brake assembly, brake pipe, hand brake flexible axle, brake oil cup and etc.

①The wheel brake assembly (refer to Fig. 6)

② Foot brake manipulation assembly (refer to the Fig. as below)

1. brake pedal 2. tension spring 3. foot brake bracket 4. pin roll 5. brake main pump 6. cotter pin 7. pin roll 8. adjusting screw

Foot brake assembly mainly consist :1. brake pedal 2. tension spring 3. foot brake bracket 4. pin roll 5.. brake main pump 7. cotter pin 8. pin roll 9 adjusting screw

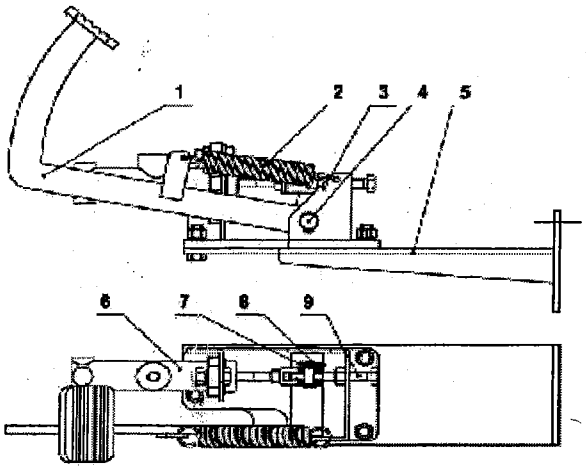
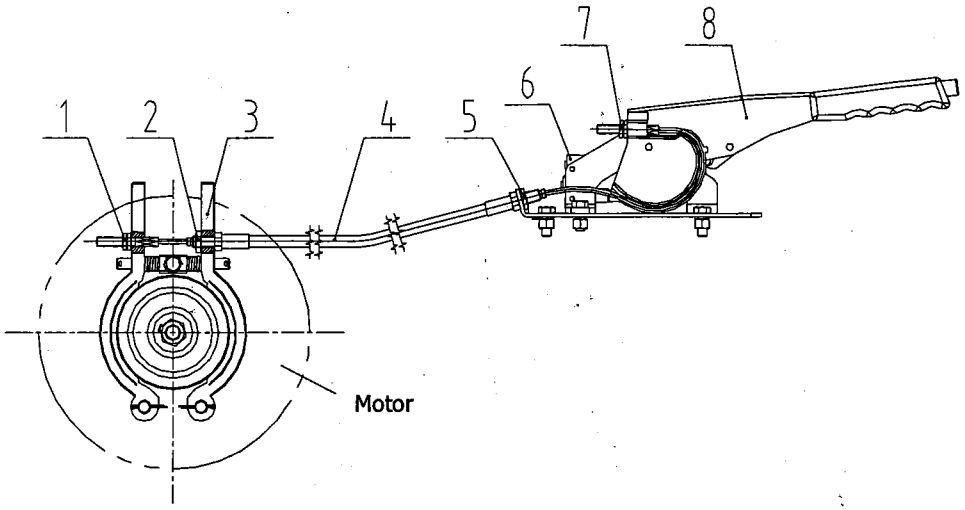


Fig. 10 Foot brake assembly structure

When braking, step on part (1) brake pedal to make the brake pedal turn around part (4) pin axle. The sway arm together with the brake pedal will turn together. As the pushing rod stand on part (5) brake general pump and the sway arm on the brake pedal is connected together with part (7) pin axle such the sway arm on the brake pedal push the pushing rod on part (5) brake general pump. The pushing rod after receiving the pressure passes the pressure to the piston in the brake general pump. The piston passes the pressure to the brake liquid which flowed into brake general pump from oil cup. The brake pedal changes the function power into the brake oil pressure through the pushing rod brake general pump. The pressure oil transmitted to the cylinder on each side of the wheel through the two outlets on the brake general pump such making part (5) on the brake, part (9) brake foot with friction chip pressed on the brake drum (refer to figure 6) to achieve the purpose of brake. When brake is released part (2) pulling spring will make the brake pedal return back and the pushing rod on part (5) brake general pump returns too.

③ Hand brake assembly (refer to the following figure)



1 Rear adjusting nut 2 Rear fixing nut 3 brake 4 Hand brake soft axle 5 Front fix nut 6 Inching switch
7 Front adjusting nut 8 Hand brake handle

Fig. 11 Hand brake structure

The hand brake assembly is shown in above figure. Hand brake assembly is mainly used for parking brake.
The travel switch is to cut off the power during truck stop brake. When the truck in truck stop condition the truck will not move before the hand brake is released.
Hand brake soft axle is formed by soft axle protection sleeve and soft axle steel wire and the connecting points on the two ends. The connecting points and protection sleeve is connected with rivet joint. The steel wire and steel wire joint is also connected with rivet joint. The steel wire can be pulled inside the inner axle of the soft axle protection sleeve.

3.2 Adjustment and maintenance of the braking system

The braking system is important to the driving safety. So every day before driving please check if the braking system is reliable and the return spring on the foot brake assembly returns back. Otherwise they must be changed.Meanwhile check that whether the connection between hand brake flexible axle and th brake on the driving motor is reliable, whether the riveting between brake steel and joint is loosened, whether the brake pedal of foot brake is flexible, whether the locking of parking brake is normal. The truck can only be operated without malfunction of the brake system.
Adjustment of the location of the brake pedal: To adjust the brake pedal high or low by adjusting the part (9) screw in figure 10 and at the same time adjust the length of the pushing rod.
Adjustment of hand brake: When the truck can not be braked on the required slope by the hand brake the brake power can be adjusted by part (1) and part (7) adjusting nuts in figure 11. To fasten the nut and pull out the steel wire can increase the braking power. Proper braking power is that the truck can park on 10% slope with full load

3.3 Faults and trouble shooting in brake system

Trouble	Cause analysis	Shooting methods
Improper braking	1. Leaking in brake system 2. Space between brake shoe is not well adjusted 3. Brake is over heated 4. Improper contact between brake drum and friction chip 5. Impurity on friction chip 6. Impurity in brake liquid 7. Inching valve on brake pedal is not well adjusted	repair Adjust the adjuster Check the return spring readjust Repair or change Check the brake liquid adjust
Noise in brake	1. Friction chip surface hardened and has impurity 2. Base plate deforms or bolts loosen 3. Brake shoe deforms or incorrect assembly 4. Friction chip worn out 5. Wheel bearing loosen	Repair or replace Repair or replace Repair or replace replace Repair
Uneven brake	1. Oil dirt on the friction chip 2. Space between brake shoe is not well adjusted 3. Branch pump failure 4. Return spring on the brake shoe is damaged 5. Brake drum deflects	Repair or replace Adjust the adjuster Repair or replace Replace Repair or replace
Improper brake	1. Leaking in brake system 2. Space between brake foot is not well adjusted 3. Air in brake system 4. Brake pedal is not well adjusted	Repair or change Adjust the adjuster Release the air readjust

4、Hydraulic system

4.1 Principle of the hydraulic system (refer to the figure below)

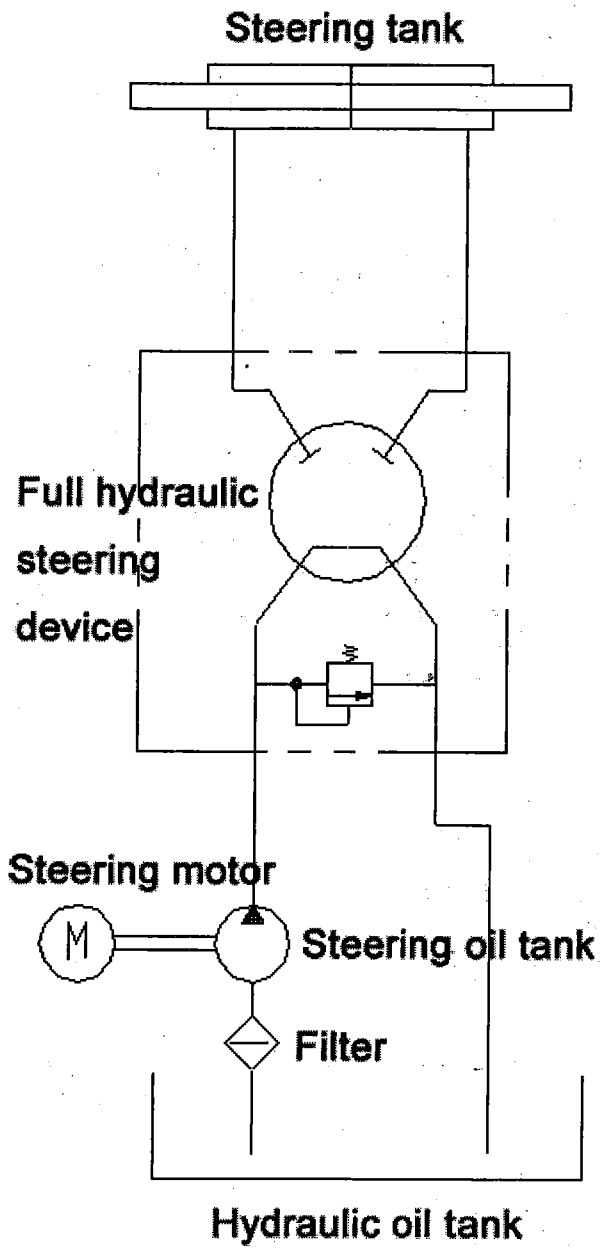


Fig. 12 Hydraulic principle

This hydraulic system use power supply as driving force and use DC motor to drive gear pump to turn to realize from electricity transmission to hydraulic transmission to mechanical transmission. The oil pump motor drives the oil pump to turn. The pressure oil is transmitted into the oil tank through the full hydraulic steering device to make the piston rod in the steering oil tank to move. When manually turn the steering wheel to change the in and out direction of the pressure oil inside the full hydraulic steering device the oil in and oil out direction in the steering tank will change as a result. The pressure oil push the piston rod to move back and forth as required such to realize turn right and turn left as required by the driver.

4.4 Common faults and trouble shooting in hydraulic system

Faults	Causes	Trouble shooting
Leakage in the oil pump	Oil seal or seal ring is worn out	Replace
	The pump is damaged.	Replace
Pressure in the pump is too low	The inner liner of oil pump is damaged.	Replace
	The inner support of oil pump is damaged.	Replace
	Seal ring , bushing seal, retainer ring in the oil pump is damaged	Replace
	Overflow valve is not properly adjusted.	Adjust the pressure to stipulated value by the gauge
	Air in the hydraulic system	Tank oil is not enough, add more
		Replace the oil seal of oil pump.
		Filter is blocked. Clean the filter.

Ⅳ. Electric system

1. Electric control

The transportation of this truck is powered by a 48V battery group. The truck is driven through all kinds of command switches, wave chopper, accelerator, DC contactor, motors and etc. Speed adjusting cooperates with hydraulic system to realize direction changing. The truck is installed with necessary motors and all kinds of lights.

1.1 Electric circuit working principle

Turn off the power-off switch (DD), key switch (SAI), put the direction switch in a certain direction and then step down the accclerate treadle to make the accelerate start switch (WR1), direction change contactor (TI or TA) close. The wave cutting device controls the turning speed of the driving motor (M1) as the location of the accelerating treadle changes.

Oil pump motor （M2)、oil pump contact （TP)、time relay （SJ）forms the steering oil pump driving circuit. Turn off the electric cutting switch (DD), key switch (SAI), put the direction switch in a certain direction and then step on the accelerate treadle to make the accelerate start switch (WR1) close. Time relay （SJ）prolong the contacting point close, oil contactor （TP）close. Oil pump motor （M2）brings the oil pump to turn and provide steering hydraulic power. Turn the steering wheel to realize direction changing through hydraulic steering device and steering axle. Release the accelerating treadle and the accelerator start switch is cut off. Time relay （SJ）delay 10S to cut off and provide steering delay to the steering system.

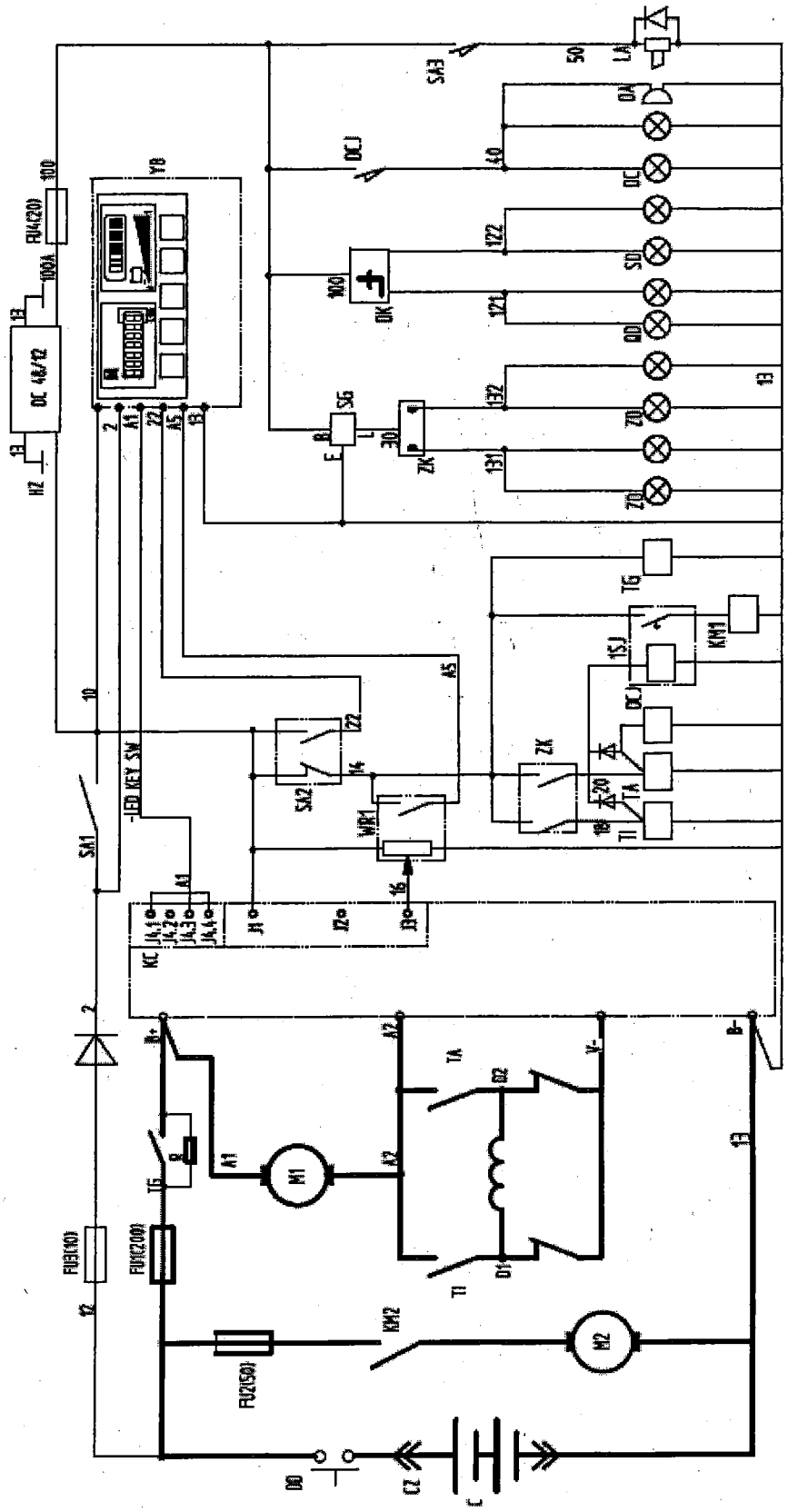
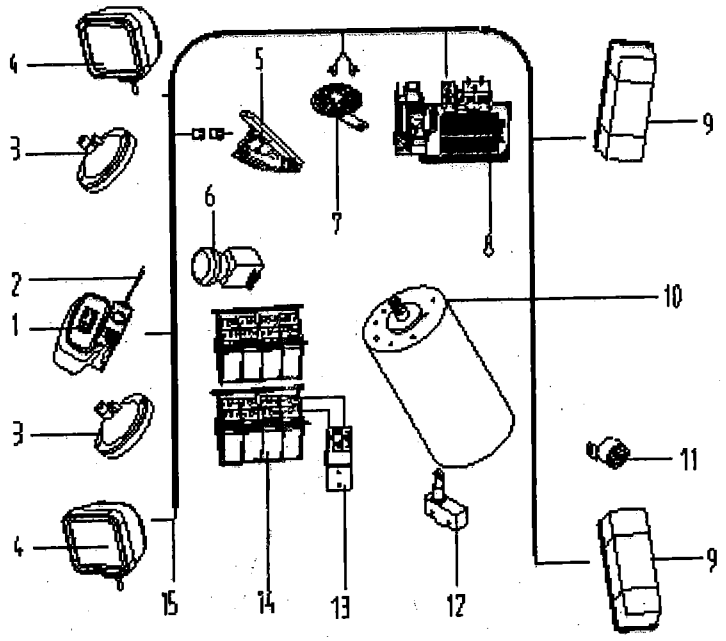
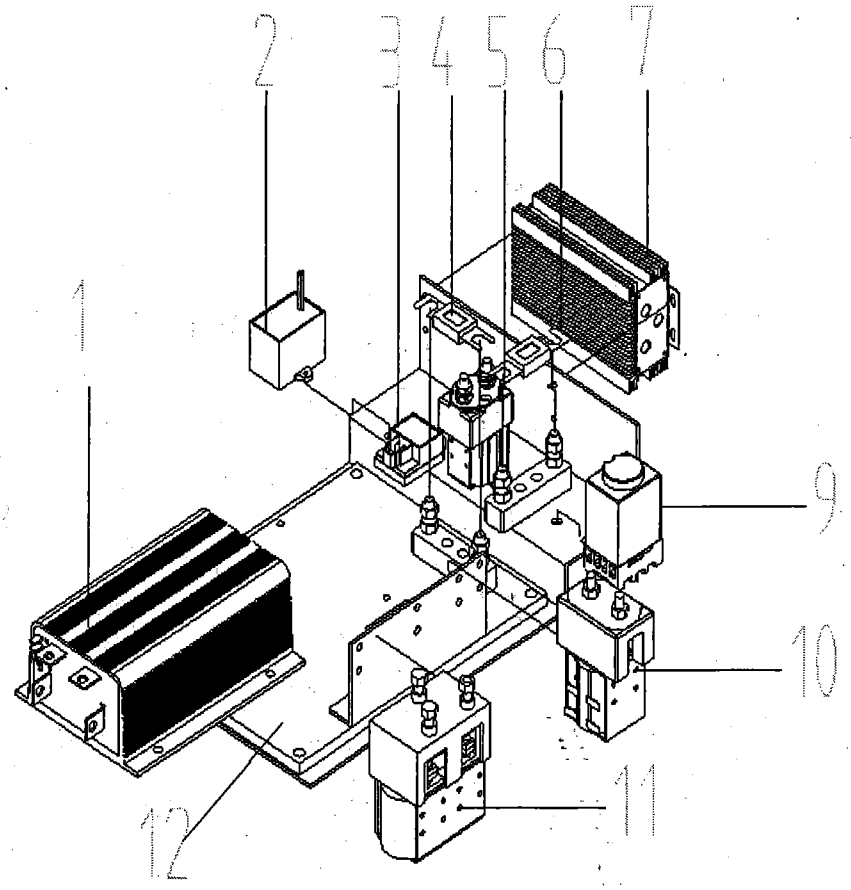


Fig. 13 BD20、25、30 Electric principle chart



No.	Stock code	Part code	Name / Model	Qty.	Remark
1	060701007	YB	Instrument CURTIS950	1	
2	060906012	ZK	Combined switch JK-804B	1	
3	000609070	SD	Round lamp, single -side 12V	2	
4	061101005	QD	Headlight 12V	2	
5	060704002	WR1	Accelerator F3-122-131	1	
6	060907006	DD	Power-off switch ZDK31-250	1	
7	060810004	LA	Horn 12V	1	
8		KC	Controller CURTIS1204M	1	2.0t、2.5t
		KC	Controller CURTIS1205M	1	3.0t
9	061101009	DC、ZD	Taillight XH8-65 12V	2	
10	000603043	M1	Driving motor XQ-3N	1	2.0t、2.5t
		M1	Driving motor XQ-5-7N	1	3.0t
11	060810001	DA	Reversing horn DJB-12	1	
12	060901014	SA2	Brake switch TM-1308	1	
13	060809025	CZ	Plug-in connector SR-175	2	
14	000603030	M2	Steering motor XQD-0.55-3H	1	
	000605044	C	Storage battery D-250	1	2.0t、2.5t
15		C	Storage battery D-395	1	3.0t
16	061005251		BD20 Wire harness	1	

Fig. 14 BD20 、25、30 Electric system



No.	Stock code	Part code	Name / Model	Qty.	Remark
1		KC	Controller CURTIS1204M	1	2.0t、2.5t
		KC	Controller CURTIS1205M	1	3.0t
2	060702047	DCJ	Reverse relay DCJ-48	1	
3	060806002	SG	Flasher SG152	1	
4		FU1	Fuse 200A	1	
		FU1	Fuse 400A	1	
5	060704002	KM1	Contactor ZJW50A	1	
6		FU2	Fuse 50A	1	
7	060705003	HZ	Converter TDC-48/12	1	
8			Electric control board	1	
9	060702009	1SJ	Time relay S3PF	1	
10		TG	Contactor ZJW100A	1	2.0t、2.5t
		TG	Contactor ZJW200A	1	3.0t
11		TI、TA	Directional contactor ZJWT100A	1	2.0t、2.5t
		TI、TA	Directional contactorZJWT200A	1	3.0t
12			Aluminium plate, controller	1	

Fig. 15：BD20 、25、30 Controller assembly

2.Fault code

State code	Status lamp	Malfunction Content	Possible Cause
Off On	■■■■■■ □□□□□□	No voltage or controller out of work Controller faults (such as MCU faults)	
0,1	■ ¤	Controller operational; unknown faults.	
1,1	¤ ¤	EEPROM failure	1. EEPROM data is lost. 2. EEPROM Data check error can be cleared via changing any parameter value in program menu of 1311.
1,2	¤ ¤¤	MOSFET short circuit	MOSFET short circuit
1,3	¤ ¤¤¤	Short circuit of motor	Short circuit of motor armature and magnet exciting coil.
1,4	¤ ¤¤¤¤	Stand-by	
2,1	¤¤ ¤	Under voltage cutoff	Battery voltage≤"LV CUTOFF" set value
2,2	¤¤ ¤¤	Stand-by	
2,3	¤¤ ¤¤¤	HPD locks	1. Accelerator output > 20% during KSI input; 2. Duration of accelerator fault over 600ms, and accelerator output > 20% when failure recovers.
2,4	¤¤ ¤¤¤¤	Accelerator failure	1. Open circuit of accelerator connection; 2. Accelerator type wrong; 3. Invalid accelerator.
3,1	¤¤¤ ¤	Stand-by	
3,2	¤¤¤ ¤¤	Stand-by	
3,3	¤¤¤ ¤¤¤	Stand-by	
3,4	¤¤¤ ¤¤¤¤	The main contactor is not mounted or can not be closed. (DNC)	1. Wire connection of main contactor is loosened. 2. The working of main contactor is abnormal.
4,1	¤¤¤¤ ¤	Under voltage protection	1. Battery voltage≤"LOVOLT CUTBACK" set value;

			2. Rusty battery terminal; 3. Connection of storage battery or controller end is loosened.
4,2	¤¤¤¤ ¤¤	Over voltage protection	1. Battery voltage≥"OV CUTOFF"set value; 2. The battery is in the charging status during working of the controller.
4,3	¤¤¤¤ ¤¤¤	Temperature protection (over high temperature or low temperature)	1. The temperature of controller≥ "TEMP CUTBACK" set value; 2. Controller is in over loaded status; 3.Improper installation of controller; 4. The controller is working under extreme-limit ambient temperature; 5. Temperature sensor invalid。
4,4	¤¤¤¤ ¤¤¤¤	Over-high temperature	1. The temperature of controller is higher than 120℃; 2. Temperature sensor is invalid.

Remark: The fault indicator only displays one kind of fault if several faults exist simultaneously.