

OPERATORS MANUAL

Starke Energy Series

FBT20PSX



STARKE MATERIAL HANDLING GROUP

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STARKE
ENERGY

Introduction

3-wheel electric forklift is a new series products aimed at satisfying the market requirement. It is developed by introducing new technology of the products abroad absorbing the advantages on the basis of the summary and comparison of the products of the same kind at home and abroad. It is especially appropriate for goods handling, moving and piling in narrow site such as station, freight yard, depot and workshop etc. Due to its small turning radius and good maneuvering characteristic, and it is as well especially appropriate for the material handling and moving in food industry, textile industry, large supermarket and store because of its non-pollution and noiselessness.

The design of the new series forklift is modified on basis of the broad visual field lifting system. The raising cylinder and chain are mounted outside the both sides of mast, which improves the side stability when raising goods, hereby broadens the visual field of operator. Because the steering cylinder and steering axle in the original whole hydraulic steering mechanism is now made into an integration, the leakage due to long period service of oil cylinder is avoid and the reliability of steering system is improved greatly and meanwhile the steering system is more compact and more convenient for repair. The brake performance of this forklift is reliable, and it has a long service life and is easy to adjust. At the same time new stepless speed regulation electrical control is adopted, so the function of slope startup, automatic brake with feet off, overload protection and short circuit protection can be provided, which makes the vehicle more stable and safer. This kind of forklift is assembled by high quality motor, storage battery and multifunctional integrated electrical control, as well as large screen cluster gauge. For these reasons, this new products have the follow characters: compact structure, attractive and elegant appearance, agile steering, reliable brake, simple and comfortable operation and convenient maintenance.

This manual briefly introduces the technical parameter, structure principle of the main components, operation and maintenance procedure of our 3-wheel electric forklift. It can help the operator and maintainer to use and maintain the forklift reasonably, and enable the forklift to work under best condition.

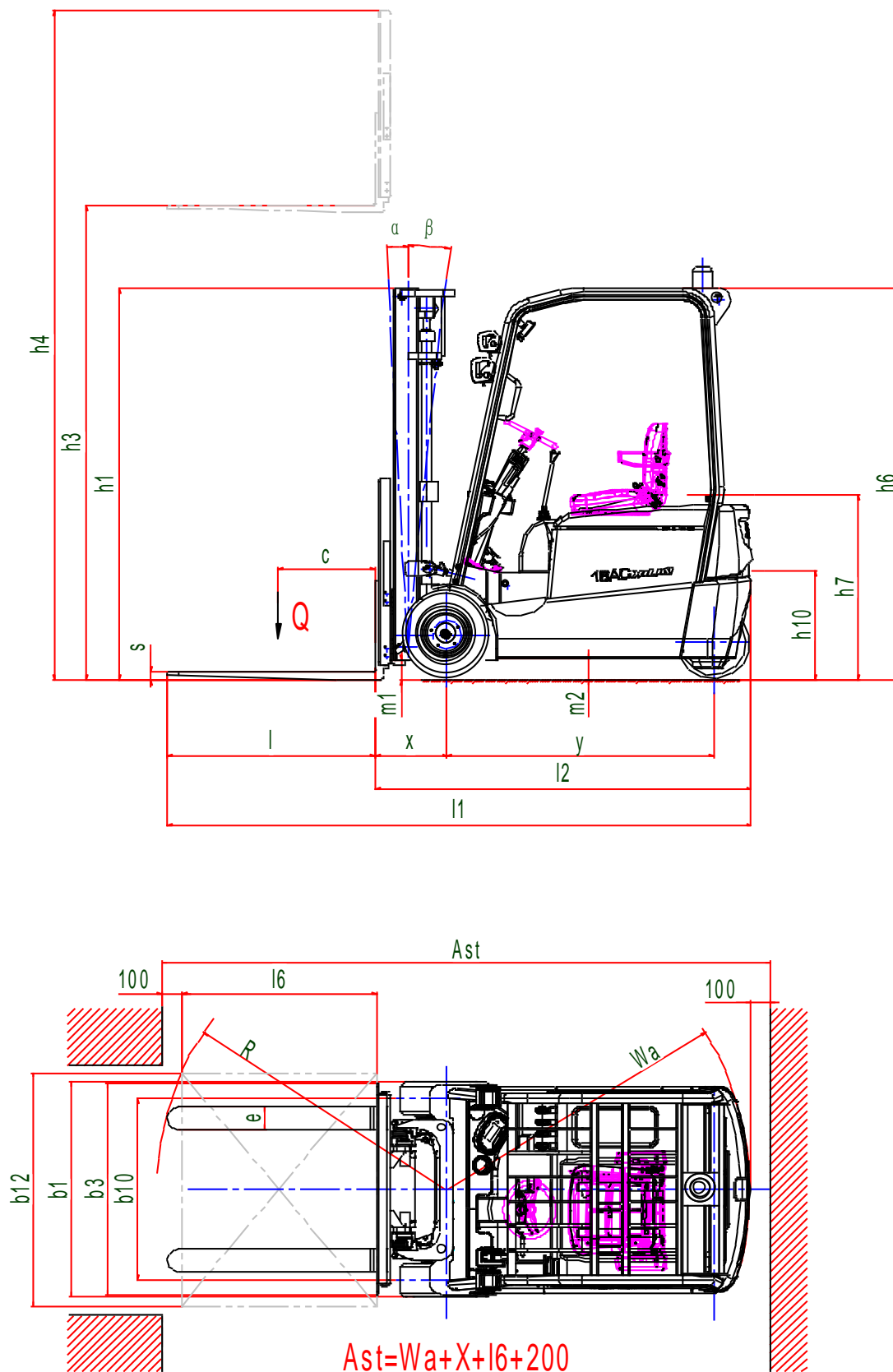
In order to operate this forklift safely and efficiently, the operator and maintainer of this forklift as well as device management personnel shall master the content in the Maintenance Instruction and operation manual. The items specified in the Manual shall be strictly followed during operating the forklift. Careful operation and maintenance helps your forklift work in the best condition for a long time, and helps you achieve the aim of safe and efficient goods handling.

The forklift in our company conforms to the safety standard and passed the detection and certification. On this basis, along with the development and improvement of products, some component and configuration is updated at times. For this reason, we will not notify you even if the related content in this manual is changed. Thank you for reading and following this instruction. If you have any further problems, please contact the marketing department of our company. And if you need technical support, please contact the technical development center of our company.

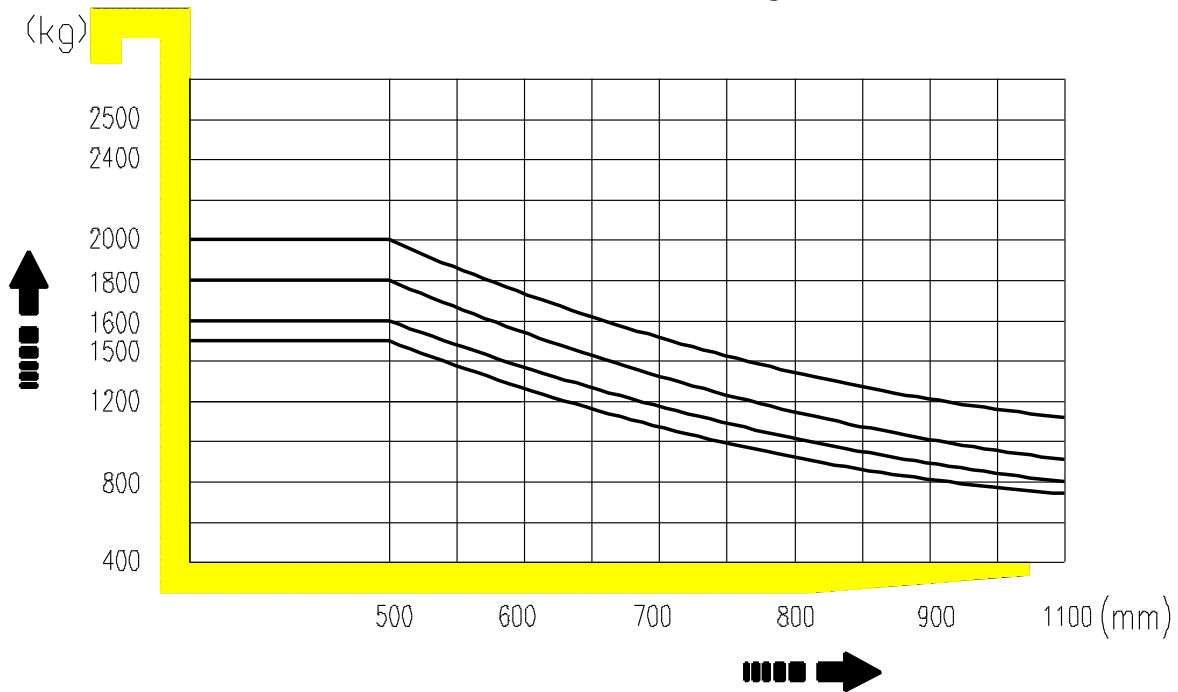
I.Main technical parameters

Characteristics	1.1	Manufacturer(abbreviated)				
	1.2	Type		CPD20SA-16	CPD20SA-18	CPD20SA-20
	1.3	Driving model: Electric(Storage batt diesel, gasoline, fuel gas diesel, gasoline, fuel gas		Dual front driving wheel		
	1.4	Driving model (Manual, Walking, Stand driving, Seat driving ,Order picking)		Seating dirving		
	1.5	Rated load	Q(kg)	1600	1800	2000
	1.6	Load center distance	c(mm)	500		
	1.8	Front overhang	x(mm)	358		
	1.9	Tread	Y(mm)	1362	1362	1465
Weight	2.1	Service weight(with battery)	kg	3220	3280	3450
	2.2	Axle load, front/rear, laden	kg	3955/865	4166/914	4469/981
	2.3	Axle load, front/rear, unladen	kg	1425/1795	1455/1826	1625/1997
Wheel chassis	3.1	Wheels (rubber, high elasticity, pneumatic tyre, polyurethane wheel)		High elasticity and Solid core tires		
	3.2	Wheel dimension, front		18x7-8	200/50-10	200/50-10
	3.3	Wheel dimension, rear		15x4 1/2-8	15x4 1/2-8	140/55-9
	3.5	Wheel number, front/rear (x = driving wheel)		2x/2	2x/2	2x/2
	3.6	Tread, front	b ₁₀ (mm)	920	937	937
	3.7	Tread, rear	b ₁₁ (mm)	165	165	188
	3.8	Wheel diameter, front		18	200	200
Dimension	4.1	Mast /fork-front /caster angle	°	3/6	3/6	3/6
	4.2	Height of mast, lowered	h ₁ (mm)	2000-2595	2000-2595	2000-2595
	4.3	Free lift height(optional)	h ₂ (mm)	0	0	0
	4.4	Lift height	h ₃ (mm)	3000-6000		
	4.5	Max. height of mast, extended	h ₄ (mm)	4050-7050	4050-7050	4050-7050
	4.7	Overhead guard height (cab)	h ₆ (mm)	2005		
	4.8	Seat height /standing	h ₇ (mm)	938		
	4.12	Traction bolt heiht	h ₁₀ (mm)	560		
	4.19	Overall length	l ₁ (mm)	2880	3000	3100
	4.20	Length to fork face	l ₂ (mm)	1930	1930	2030
	4.21	Overall width of truck body	b ₁ (mm)	1070	1130	1130
	4.22	Fork dimension	s/e/l(mm)	35/100/950	40/100/1070	40/120/1070
	4.23	Fork DIN 15 173, grade/typeA, B		2A		
	4.24	Overall width of fork	b ₃ (mm)	1088		
	4.31	Ground clearance from lower mast	m ₁ (mm)	90		
	4.32	Ground clearance from load center	m ₂ (mm)	100		
	4.33	Aisle width, with pallet 1000x1200(1200 crosswise)	A _{5a} (mm)	3120	3120	3200
	4.34	Aisle width, with pallet 800x1200(1200 lengthwise)	A _{5b} (mm)	3220	3220	3300
	4.35	Turning radius	W _a (mm)	1552	1552	1652
Performance Data	5.1	Traveling speed, laden/unladen	Km/h	14/14	14/14	13/13
	5.2	Lifting speed, laden/unladen	m/s	0.29/0.45	0.27/0.42	0.25/0.42
	5.3	Descending speed, laden/ unladen	m/s	0.45/0.43	0.45/0.43	0.45/0.43
	5.8	Max. gradeability, laden/unladen	%	15/20	15/20	15/20
Notes	6.1	Driving motor power	kW	2*4.5(AC)	2*4.5(AC)	2*4.5(AC)

	6.2	Lifting motor power	kW	8.2(AC)	10(AC)	10(AC)
	6.4	Battery voltage/rated capacity	V/Ah	48/420(490)	48/490(560)	48/560(640)
	6.5	Battery weight	kg	720	760	800
	8.4	Noise level at operator's ear, according to DIN12053	dB(A)	68		

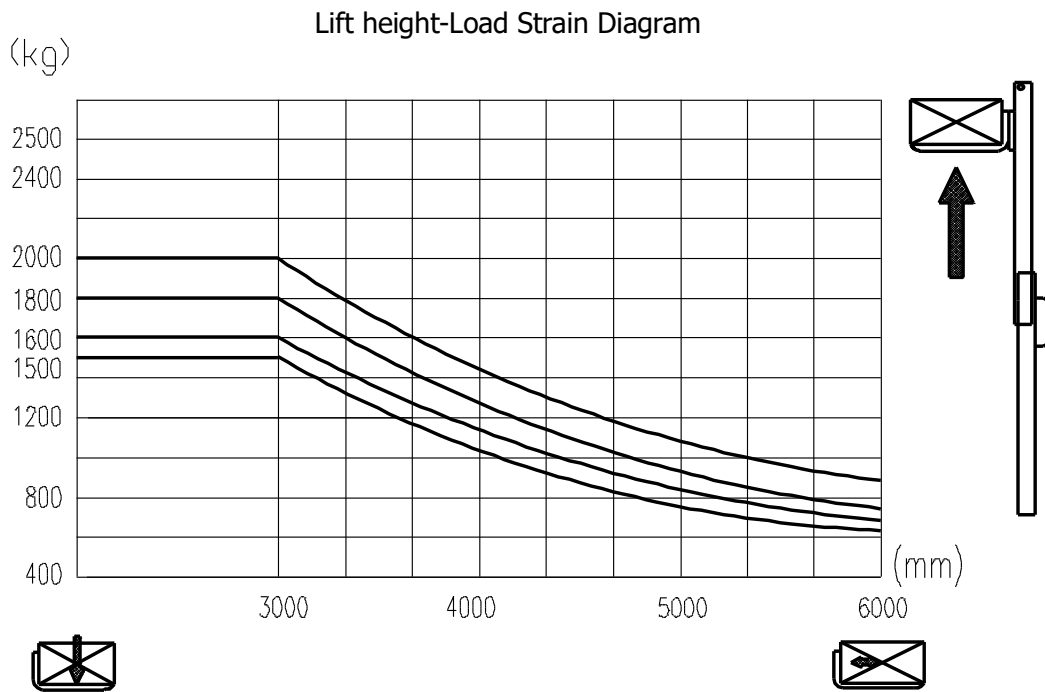


Load center-Load Strain Diagram



Note:

The horizontal axis represents load capacity, the horizontal axis shows sales load center, Load center is calculated from fork positive side, base point of standard load means the central position when the load is millimetre. When the mast has forerake, use the standard fork or loading the goods beyond the normal width of the load will make load reduce, through the load curve can understand all kinds of load bearing capacity of the center. Add the lateral reduced 150 kilograms.



Note:

Vertical axis means load carrying capacity, horizontal axis means lifting height. through load chart can learn all kinds of load bearing capacity of the center. Add the lateral reduced 150 kilograms.

II. Forklift driving, operation and routine maintenance

1. Application area and applicable site for forklift

● Application area

- 1) The forklift is mainly used to lift, transport and pile up goods. The Max. load capacity is shown in the load curve. Overload operation is forbidden.
- 2) The forklift is appropriate for short distance load/unload, baling and transportation. It cannot be used in long distance transportation of goods.
- 3) The forklift cannot be used in the applications out of specification. Embarking personnel is forbidden.

● Applicable site

- 1) The requirement of operation site: passage clear, sturdy and flat road, good lighting condition.
- 2) The environment temperature is between -25°C and $+40^{\circ}\text{C}$.
- 3) When the environment temperature is $+40^{\circ}\text{C}$, the relative humidity should not exceed 50%. When the average temperature of the month is 25°C , the maximum relative humidity should not exceed 90%.
- 4) Explosive gas and dust shall not appear in the operation site.

2. Transportation of forklift

In the process of forklift shipment must pay attention to the following matters:

- 1) Stopping the brake of forklift, lower down the mast to lowest position.
- 2) Fix the bottom of mast together with the clump weight tract bolt by using of steel wire. Wedge up the front/rear wheel with wedge block. Ensure reliable fix between the forklift and carrying vehicle.
- 3) When lifting, operate in the part marked by lifting marker.
- 4) The vehicle transporting forklift shall limit its speed and avoid abrupt turn and braking to avoid damaging the forklift and prevent accident.

3. Storage of forklift

- 1) Descend the mast to the bottom position.

- 2) Lock the electric lock, turn all the control levers to vacant position, and pull off the power plug.
- 3) Skid the stopping brake of forklift.
- 4) Wedge the front/rear wheel by using of wedge.
- 5) Under the condition of long suspension of forklift, the wheels of forklift shall be held over the ground. The storage battery shall be recharged once every month.

4.Preparation before use

- 1) Check the performance of every instrument.
- 2) Check tires of forklifts, and tightness of tire screw.
- 3) Check the every handle and pedal.
- 4) Check the storage batteries to ensure the voltage within normal range. Check the relative density of electrolyte and level of liquid to be appropriate.
- 5) Check every joint and plug of electrical system to ensure reliable contact.
- 6) Check hydraulic oil electrolyte and brake fluid to prevent leakage.
- 7) Check the major fastener to prevent loose.
- 8) Check the lighting signal lamp.
- 9) Loose the stopping braking.
- 10) Operate the mast in empty load to be ascent and descent and to tilt forth and backward. Lift the mast to the top position to check the performance of mast, lifting oil cylinder, tilting oil cylinder, roller, chain and chain wheel.
- 11) Turn the steering wheel to check the steering system.
- 12) Start the forklift slowly and step down the braking pedal to check the braking system.
- 13) The degree of pollution of the hydraulic oil shall be less than 12, otherwise replacement shall be made.
- 14) Before starting the forklift, fasten safety belt.

5.Points for attention for forklift driving

- 1) The forklift is a kind of special type vehicle. Both the driver and the maintainer shall be trained and examined to be eligible, and the driver shall hold the driving license. In this way, the forklift can be ensured to operate safely and normally.
- 2) The driver shall be protected safely in special shoes, hat, suit and gloves during operation.
- 3) If the distance between gravity center of goods and fork arms is 500mm, the maximum load weight shall be the nominal load weight. When handling the goods, the load weight shall not exceed the specified value. If the distance between gravity center of goods and fork arms is larger than 500mm, the hoisting capacity shall be reduced according to the specification on the load curve. Overload is forbidden.
- 4) The forklift is only appropriate for the operation on flat and compact ground. In addition, the grease and earth water which may cause wheel slip shall be cleaned, in this way enough friction exists between the ground and wheel.
- 5) Routine check shall be performed before and after the use of forklift. Operation with malfunction is forbidden. If abnormal conditions are found during operation, the use of forklift shall be stopped at once for check until all malfunctions are removed.
- 6) When operating a hydraulic handle, keep the position of another handle. Drivers shall never operate the hydraulic handle when not on the drivers seat.
- 7) Prevent loading unfastened or loosely piled goods. Be careful when moving goods with large dimensions.
- 8) Forklift with support fittings ordered by users will broad the usage of the forklift. In this condition however, the actual load capacity and stability will be reduced due to the deadweight of the support fittings and forward movement of the load center. Therefore, never divert the support fittings and special devices to another usage. Please read the appendix provided by us, and operate according to the specification strictly. Reconstruction on the forklift by user itself is by no means allowed.
- 9) Never tear up the embedded items by fork arms.
- 10) When loading, adjust the distance between the fork arms according to the size of good. In this way, the gravity can be separated on two fork arms evenly and the slip of good towards one side can be avoided. Raising goods with one fork arm is forbidden.
- 11) When moving goods of huge size which shields the drivers' eyesight, the forklift shall be driven backward.

- 12) When loading goods, the fork arms shall be lowered to the bottom position. After inserting in the bottom of goods, the fork arms shall contact with goods. Before driving, the mast shall be tilted backwards to the limiting position and the fork arms be kept in a height of 200mm to 300mm over ground.
- 13) When lifting or descending goods, personnel must not be under the fork carriages. Lifting with personnel on the arms is forbidden.
- 14) During handling operation, the mast shall be in vertical position. Never tilt the mast in high position with heavy load.
- 15) During the operation of forklift, monitor the performance and work condition of machine, hydraulic pressure, electricity, speed regulator and braking. Stop to check when abnormal is detected.
- 16) When driving, turn on the key switch. After power on, choose the position of direction switch which controls the move direction of back and forth. Turn the steering wheel to check the steering of forklift. Step down the speeding pedal slowly to ensure the start of forklift in a stable condition.
- 17) Watch the voltage value shown in voltage meter. As for the forklift with a nominal voltage of 24V, when the voltage indicated is 21V or the electrical quantity is less than 30%, operation shall be terminated. As for the forklift with a nominal voltage of 48V, when the voltage indicated is 41V or the electrical quantity is less than 30%, operation shall be terminated. Then charge the storage batteries and replace batteries with enough power.
- 18) Before the tilting forth/back with load, the forklift shall be brake. In this way, abrupt slide-out of goods can be prevented.
- 19) As for the high lifting forklift, the mast shall be titled backwards as much as possible during operation. The activity of tilting forth and back shall be limited in minimum range during loading and unloading operation. Driving and steering of the forklift with fork arms in high position is forbidden. As for the forklift with a lifting height larger than 3 meters, take care to prevent goods fallen. When necessary, preventive measure shall be taken.
- 20) As a major part to protect the driver, canopy guard shelf can prevent the fallen of upper goods. The conditions of loose installation, use after removal and reconstruction can cause danger or grave accident.
- 21) When operating outdoors, the effect on stability of forklift by wind will be significant. Do take care.
- 22) When driving on dock or temporary plank, take good care and drive slowly.
- 23) When driving with load, the mast shall neither be tilted forwards nor raised. Prevent abrupt brake to avoid slide off of goods.
- 24) The forklift shall drive into the area of goods in low speed. Meanwhile, make sure no salient hard object nearby the goods to avoid vibration of forklift and penetration of wheels.
- 25) When driving, take care of the pedestrian, obstacles and bumpy ground as well as the clearance above the forklift.
- 26) When driving, never pull hands, feet and the other part of body out of the wheel house. The forklift shall not carry other personnel.
- 27) Drive carefully on the ramp. Never steer and drive in turning, cross or slant direction, or else the forklift is possible to turnover. When driving in relatively big slope, drive forward when going upslope and backward downslope. Step down the braking pedal when going downslope, drive slowly and carefully.
- 28) The forklift shall be started up, steered, driven and brake smoothly. Slowdown when swerving especially on the wet and slippery road. Abrupt startup, speed up, stop and turn with high speed shall be forbidden. If the forklift is operated inappropriately, accident of turnover to one side may happen.
- 29) As for the empty forklift with accessory fittings, the operation shall be treated as the same as that with load.
- 30) During the usage of mast chain, regular check is necessary. Good lubricating condition shall be maintained between chain elements. And the degree of tightness of two chains shall be consistent. If the chain is worn out during usage, that is the distance between chain elements exceeding 2% of nominal value, the chain shall be renewed to ensure safe bearing.
- 31) When driving with load, abrupt brake shall be prevented.
- 32) When leaving the forklift, lower the fork arms to the ground and turn the step lever to vacant step and power off. When stopping on slope, lock the stopping braking devices. When stopping for long period,

wedge the wheels by wedge.

- 33) When the mast is tilted forth and back to the limiting position or the fork arms are lifted to the highest position, the lever shall be turned to the middle position immediately.
- 34) The pressure of safety valve has been adjusted appropriately before the forklift leaves factory. Users shall not modulate randomly because high pressure can damage hydraulic parts during the overload operation, or result in turnover accident.
- 35) On flat and tight ground, the maximum noise value outside the forklift is 80Db according to the testing method provided by EN2000—14—EC. However, as long as the alternation of road condition, the noise value will vibrate.
- 36) To satisfy the need of lifting over wide cargo, users can choose lengthen fork arms. Notice: the load capacity of lengthen fork arms shall conform to the specification of load curve strictly. Within load center specified, the load capacity is similar with standard fork arms. When the load center move forwards, do reduce the load. Raising or impact on goods is forbidden. Take care when driving and turning.
- 37) Below the clump weight of forklift there is tract bolt special for dragging forklift.
- 38) The driver shall be familiar and careful with the meaning and function of all kinds of nameplates on the forklift. After the extensive repair of forklift, it is necessary to check the integrity of nameplates.

6. Routine maintenance of forklift

The appropriate application of forklift lies in careful maintenance. The neglect of routine maintenance is possible to endanger personnel's life and damage property. For these reasons, the routine check is necessary. Abnormity shall be removed in time. Forklift with malfunctions shall not be used to ensure safety and lengthen the service life of forklift.

- 1) Requirement for routine maintenance
 - a. Routine maintenance is carried out before and after the operation everyday.
 - b. If abnormal conditions such as damage or failure are detected, report to personnel in charge of forklift management in time. Forklift shall not be used before repair.
 - c. The routine maintenance is in charge of drivers and special personnel.
- 2) Content of routine maintenance
 - a. Content of routine maintenance before every startup:
 - b. Check the joint of storage battery in avoidance of looseness. Clean the sufficient storage battery. Open the key of electrical lock to check whether the voltage of battery is in allowed range.
 - c. Raise the mast with empty load to the top position to check whether oil leakage happens to the raising oil cylinder and oil pipe. Check whether two chains moves smoothly and the roller in mast work well. Tilt the mast with empty load forth and back to check whether the two tilted oil cylinder is synchronous when the mast is tilted forth and back. Check whether oil leakage happens to the raising oil cylinder and oil pipe and whether the mast move in right way. If the rack and chain of mast is out of lubricant, add some lubricating grease.
 - d. Start up the steering of forklift with empty load slowly to check whether the steering is normal; drive in director line and brake to check whether the braking is reliable. Watch the drive, steering and braking carefully to promise normal operation.
 - e. If driving at night or in dark room, the lighting apparatus of forklift shall be complete. Light of site shall be enough and the road shall be clear.
 - f. Content of maintenance after operation:
 - g. Clean the surface of forklift and the storage battery. Check the joint of storage battery in avoidance of looseness.
 - h. Check the tightness of wheel bolts.
 - i. Check mast, oil cylinder, chain, brake and steering.
- 3) Charging of forklift
 - a. The first charging of the batteries of forklift and supplementary charging shall strictly conform to the manual of battery.,
 - b. As for the forklift with a nominal voltage of 24V, when the voltage indicated is 21V or the electrical

quantity is less than 30% or the voltage of single battery is reduced to 21V, charging shall be carried out. As for the forklift with a nominal voltage of 48V, when the voltage indicated is 40V or the electrical quantity is less than 30%, charging shall be carried out.

c. Selection of lubricating oil, grease and hydraulic oil for forklift

Name	Label, code		Quantity
	Home	Abroad	
Hydraulic oil	N32#orN46#	ISOVG30	26L
Gear oil	ATF		1.3L
Grease	3# Lithium and manufactured drop point170	JISK2220/2 #	
Braking fluid	DOT3 synthetic brake fluid		1.5L

Note: Because the treatment of the waste produced by lubrication shall conform to related laws and regulation in different countries, the adding of oil and grease of forklift can referred to related standard of automobile.

7.Schematic drawing of lubrication position



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