SERVICE & MAINTENANCE MANUAL

Semi-Electric Stacker

Version 06/2013

SPN1030 -SHFW-001

CONTENT

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FOREWORD

Proper operation, maintenance, troubleshooting and repairs are necessary to preserve the performance of the pallet truck over a long period and ensure that fault and breakdowns do not occur. The purpose of this service manual is to provide necessary information especially in inspections, repair and maintenance.

⚠ WARNING The majority of this pallet truck consists of steel, it can be completely recycled. Waste material in conjunction with repairs, maintenance, cleaning or scrapping, must be collected and disposed of in an environment-friendly way and in accordance with the directives of respective countries. Such work must be carried out in areas intended for this purpose. Recyclable material should be taken care of specialized authorities. Environmentally hazardous waste, such as oil filters, batteries and electronics, will have a negative effect on the environment or health, if handled incorrectly.

⚠ CAUTION All of the information reported herein is based on data available at the moment of printing. Our products are constantly being developed and renewed, we reserves the right to modify our own products at any moment without prior notice and incurring in any sanction. So, it is suggested to always verify possible updates.

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1. GENERAL

1.1 INTRODUCTION – MAINTENANCE SAFETY PRECAUTIONS

Maintenance work may cause injuries. Always take care to perform work safe, at least observing the following. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves, others or damage to the equipment. A maintenance program must be followed to ensure that the machine is safe to operate.
The specific precautions to be observed during maintenance are inserted at the appropriate point in the manual. These precautions are, for the most parts, those that apply when servicing hydraulic and larger truck component parts.

⚠WARNING MODIFICATION OF THE TRUCK WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE TRUCK IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED, IS A SAFETY VIOLATION.

⚠WARNING SINCE THE TRUCK MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA RESPONSIBIUTY OF THE OWNER OR OPERATOR.

⚠WARNING FAILURE TO COMPLY WITH SAFETY PRECAUTIONS, LISTED IN THIS SECTION MAY RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

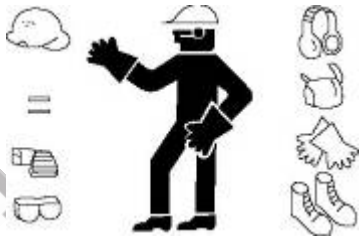
- When carrying out any operation or maintenance, have trained and experienced personnel to carry out the work.
- When carrying out any operation or maintenance, carefully read operation and maintenance handbook.
- Read all the precautions given on the decals which are fixed to the truck.
- Be sure you fully understand the content of the operation. It is important to prepare necessary tools and parts for maintain the truck.

CAUTION HEAVY

- Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

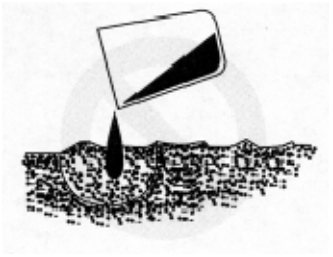
- It should be noted that the machines hydraulic systems operate at extremely high potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system. Relieve system pressure by cycling the applicable control several times with the engine(motor) stopped and ignition on, to direct any line pressure back into the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

- Remove all rings, watches and jewelry when performing any maintenance.
- Wear well-fitting helmet, safety shoes and working Clothes When drilling grinding or hammering always. Wear protective goggles. Always do up safety clothes properly so that they do. Not catch on protruding parts of machines. Do not wear oily clothes. When checking, always release battery plug. DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.



- During maintenance do not allow any unauthorized person, to stand near the machine.
- Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil or electrolyte.

- Immediately remove any oil or grease on the floor of the operator's compartment or on the handrail. It is very dangerous if someone slips while on the machine.



- Always use pure oil or grease, and be sure to use clean containers.
- Oil is a dangerous substance. Never handle oil, grease or oily clothes in places where there is any fire or flame. As preparation for use of fire extinguishers and other fire- fighting equipment.

- Keep the battery away from fire hazards. The generated gases are explosive.
- Store all the oils in a specified place.
- Keep the flammable things away from the machine. Do not smoke at the working place.

- Battery should always be disconnected during replacement of electrical components.

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- Always use the grades of grease and oil recommended by NOBLELIFT choose the viscosity specified for the ambient temperature.

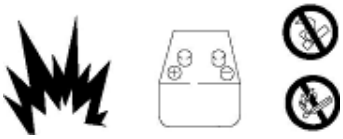
- Exhaust gas is dangerous provide ventilation when working in a closed space.
- Avoid breathing dust that may be generated when handling components containing asbestos fibers. Wear a gas mask if necessary.

- When working on top of the machine, be careful not to lose your balance and fall.

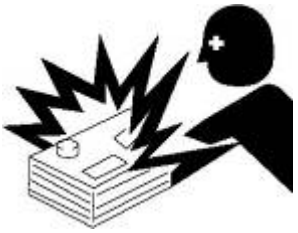
- Hand a caution sign in the operator's compartment (for example "Do not start" of "Maintenance in progress"). This will prevent anyone from starting or moving the machine by mistake.

- When welding on the machine or working on the electrical system, ALWAYS turn the key switch OFF and remove the battery plug from the battery. Park the machine on firm, flat ground. Lower the fork to the min. height and stop the motor.

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin and eat holes in clothing. If you spill acid on your clothes or skin, immediately flush with large quantities or water.



- When working on the battery, wear goggles or safety glasses. If splashed into the eyes, flush with water and get medical attention immediately.



- Battery terminals touched by metal objects can cause short circuit and burn you. Keep tools away from the terminals.
- Keep sparks, lighted matches, and open flame away from the top of battery. Battery (hydrogen) gas can explode.
- When disassembling and assembling the battery, make sure that the battery terminals (+, –) are correctly connected.

- If water gets into the electrical system, abnormal operation or failure can result. Do not use water or steam on sensors, connectors and instruments in the cab.

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- Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.
- When working with other, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.
- Unless you have special instructions to the contrary, maintenance should always be carried out with the motor stopped. If maintenance is carried out with the motor running, there must be two technicians present: One operating the stacker and the other one performing the maintenance. In such a case, never touch any moving part.
- Before making adjustment, lubricating or performing any other maintenance, shut off all power controls.
- When removing parts containing O-ring Gaskets or seal clean the mounting surface and replace with new sealing parts.
- Thoroughly clean the machine. In particular, be careful to clean the grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.
- Use only approved nonflammable cleaning solvents.
- When changing the oil or fitter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.
- Always use NOBLELIFT genuine parts for replacement. ENSURE REPLACEMENT PARTS OR COMPONENTS ARE IDENTICAL OR EQUIVALENT TO ORIGINAL PARTS OR COMPONENTS.
- When checking an open gear case, there is a risk of dripping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.

1.2 MEASUREMENT CONVERSIONS

Length

Unit	cm	m	km	in	ft	yd	mile
cm	1	0.01	0.00001	0.3937	0.03281	0.01094	0.000006
m	100	1	0.001	39.37	3.2808	1.0936	0.00062
km	100000	1000	1	39370.7	3280.8	1093.6	0.62137
in	2.54	0.0254	0.000025	1	0.08333	0.02777	0.000015
ft	30.48	0.3048	0.000304	12	1	0.3333	0.000189
yd	91.44	0.9144	0.000914	36	3	1	0.000568
mile	160930	1609.3	1.6093	63360	5280	1760	1

1mm=0.1cm, 1μm=0.001mm

Area

Unit	cm_2	m_2	km_2	a	ft_2	yd_2	in_2
cm_2	1	0.0001	–	0.000001	0.001076	0.000012	0.155000
m_2	10000	1	0.000001	0.01	10.764	1.1958	1550.000
km_2	–	1000000	1	10000	1076400	1195800	–
a	0.01	100	0.0001	1	1076.4	119.58	–
ft_2	–	0.092903	–	0.000929	1	0.1111	144.000
yd_2	–	0.83613	–	0.008361	9	1	1296.00
in_2	6.4516	0.000645	–	–	0.006943	0.000771	1

1ha=100a, $1mile_2$=259ha=$2.59km_2$

Volume

Unit	cm_3 = cc	m_3	*l*	in_3	ft_3	yd_3
cm_3 = m *l*	1	0.000001	0.001	0.061024	0.000035	0.000001
m_3	1000000	1	1000	61024	35.315	1.30796
l	1000	0.001	1	61.024	0.035315	0.001308
in_3	16.387	0.000016	0.01638	1	0.000578	0.000021
ft_3	28316.8	0.028317	28.317	1728	1	0.03704
yd_3	764529.8	0.76453	764.53	46656	27	1

1gal(US)=3785.41 cm_3=231 in_3=0.83267gal(US)

Weight

Unit	g	kg	t	oz	lb
g	1	0.001	0.000001	0.03527	0.0022
kg	1000	10	0.001	35.273	2.20459
t	1000000	1000	1	35273	2204.59
oz	28.3495	0.02835	0.000028	1	0.0625
lb	453.592	0.45359	0.000454	16	1

1 tone (metric)= 1.1023 ton(US)=0.9842 ton(UK)

Pressure

Unit	kgf/cm_2	bar	$Pa=N/m_2$	kPa	lbf/in_2	lbf/ft_2
kgf/cm_2	1	0.98067	98066.5	98.0665	14.2233	2048.16
bar	1.01972	1	100000	100	14.5037	2088.6
$Pa=N/m_2$	0.00001	0.001	1	0.001	0.00015	0.02086
kPa	0.01020	0.01	1000	1	0.14504	20.886
lbf/in_2	0.07032	0.0689	6894.76	6.89476	1	144
lbf/ft_2	0.00047	0.00047	47.88028	0.04788	0.00694	1

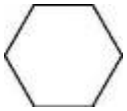
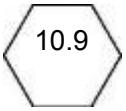
kgf/cm_2=735.56 Torr(mmHg)=0.96784atm

Standard tightening torque

The following charts give the standard tightening torques of bolts and nuts.

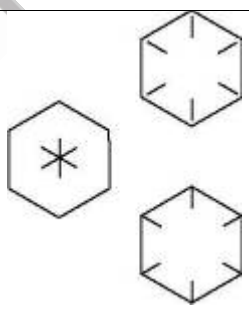
Exceptions are given in sections of “Disassembly and Assembly”

METER TABLE

Classification	4T, 5T	10T
Bolt type		
Bolt size	Torque kgf · m (lbf · ft)	Torque kgf · m (lbf · ft)
M4	0.2 ± 0.02	0.4 ± 0.04
M5	0.3 ± 0.03	0.8 ± 0.08
M6	0.5 ± 0.05	1.4 ± 0.14
M8	1.2 ± 0.12	3.3 ± 0.3

M10	2.3 ± 0.23	6.5 ± 0.7
M12	4.0 ± 0.4	11.3 ± 1.1
M14	6.4 ± 0.6	17.9 ± 1.8
M16	9.5 ± 0.9	26.7 ± 2.7
M18	13.5 ± 1.4	38.0 ± 3.8
M20	18.6 ± 1.9	52.2 ± 5.2
M22	24.7 ± 2.5	69.4 ± 6.9
M24	32.1 ± 3.2	90.2 ± 9.0
M30	62.6 ± 6.3	176.1 ± 17.6
M36	108.2 ± 10.8	304.3 ± 30.4
M42	171.8 ± 17.2	483.2 ± 48.3
M45	211.3 ± 21.1	594.3 ± 50.4

INCH TABLE

	4T, 5T	10T
Classification Bolt type		
Bolt size	Torque kgf · m (lbf · ft)	Torque kgf · m (lbf · ft)
1/4	0.6 ± 0.06	1.7 ± 0.2
5/16	1.2 ± 0.12	3.0 ± 0.3
3/8	2.0 ± 0.20	5.6 ± 0.5
7/16	3.2 ± 0.32	8.9 ± 0.9
1/2	4.7 ± 0.47	13.4 ± 1.3
9/16	6.8 ± 0.68	19.0 ± 1.9
5/8	9.3 ± 0.93	26.1 ± 2.6
3/4	16.0 ± 1.60	45.1 ± 4.5
7/8	25.5 ± 2.55	71.6 ± 7.2
1	38.0 ± 3.80	106.9 ± 10.7
1-1/8	54.1 ± 5.41	152.2 ± 15.2
1-1/4	74.2 ± 7.42	208.9 ± 20.9
1-3/4	98.8 ± 9.88	277.8 ± 27.8
1-1/2	128.2 ± 12.82	360.7 ± 36.1

The torque in above table shall not be applied to nylon or nonferrous bolts or washer. The same is valid for not standardized ones.

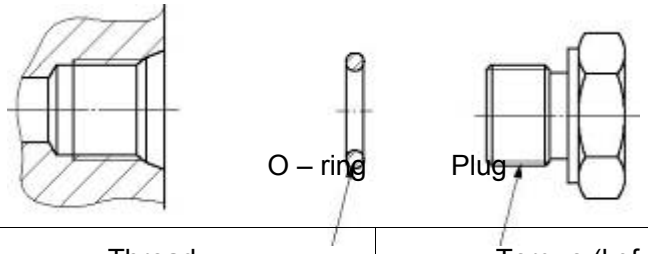
H Newton meter : 1 Nm = 0.1kgfm

TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

The following torque shall be applied to the split flange bolts.

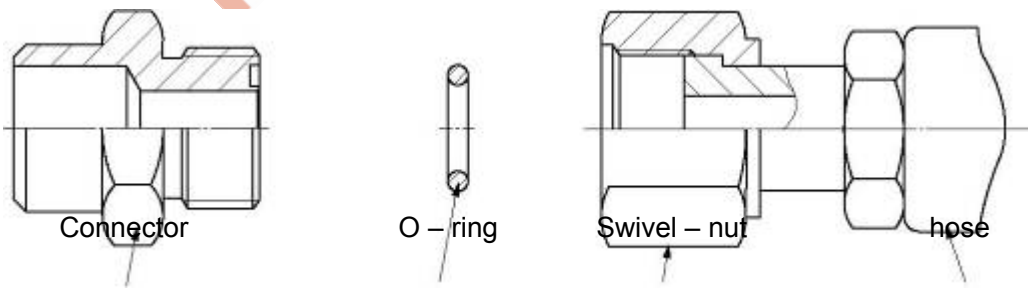
Diameter (mm)	Flat width (mm)	Torque	
		kgf·m	N·m
10	14	6.7 ± 0.7	66.7 ± 6.8
12	17	11.5 ± 1	112 ± 9.8
16	22	28.5 ± 3	279 ± 29

PF THREAD



Thread	Torque (kgf·m)
1/8	1.1 ± 0.1
1/4	2.6 ± 0.2
3/8	4.6 ± 0.3
1/2	8.5 ± 0.4
3/4	19 ± 1.0
1	33 ± 2.0

TORQUE FOR SWIVEL NUT WITH O-RING



Tube O.D (inch)	Thread (in)	Torque (kgf·m)
1/2	UN 13/16 - 16	9.5 ± 0.95
3/4	UN 1 3/16 - 12	18 ± 1.8
1	UN 1 7/16 - 12	21 ± 2.1

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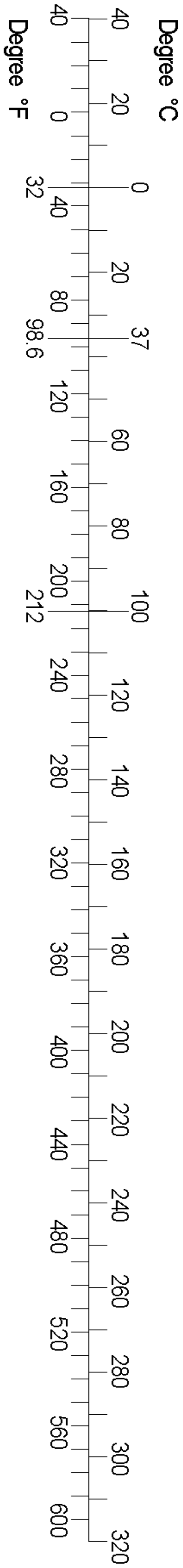
APPROXIMATE CONVERSIONS

SI Unit		Conv Factor		Non–SI Unit		Conv Factor		SI Unit
Torque								
Newton meter (N·m)	×	8.9	=	In·in	×	0.113	=	N·m
Newton meter (N·m)	×	0.74	=	lb·ft.	×	1.36	=	N·m
Newton meter (N·m)	×	0.102	=	kg·m	×	7.22	=	lb·ft.*
Pressure (Pa = N/m^2)								
kiloPascal (kPa)	×	4.0	=	in. H_2O	×	0.249	=	kPa
kiloPascal (kPa)	×	0.30	=	in. Hg	×	3.38	=	kPa
kiloPascal (kPa)	×	0.145	=	psi	×	6.89	=	kPa
(bar)	×	14.5	=	psi	×	0.069	=	bar*
(kg/cm^2)	×	14.22	=	psi	×	0.070	=	[illegible]
Newton/mm^2	×	145.04	=	psi	×	0.069	=	bar*
MegaPascal (MPa)	×	145	=	psi	×	0.00689	=	MPa
(Pa=N·m^2)								
Power r (W = J/s)								
kiloWatt (kW)	×	1.36	=	PS (cv)	×	0.736	=	kW
kiloWatt (kW)	×	1.34	=	HP	×	0.746	=	kW
kiloWatt (kW)	×	0.948	=	Btu/s	×	1.055	=	kW
Watt (W)	×	0.74	=	ft·lb/s	×	1.36	=	W
(W=J/s)								
Energy (J = N·m)								
kiloJoule (kJ)	×	0.948	=	Btu	×	1.055	=	kJ
Joule (J)	×	0.239	=	calorie	×	4.19	=	J
(J=N·m)								
Velocity and Acceleration								
meter per sec^2 (m/s^2)	×	3.28	=	ft/s^2	×	0.305	=	m/s^2
meter per sec (m/s)	×	3.28	=	ft/s	×	0.305	=	m/s
kilometer per hour (km/h)	×	0.62	=	mph	×	1.61	=	km/h
Horse Power/Torque								
BHP × 5252 R.P.M. = TQ (lb·ft)				TQ Z R.P.M. 5252 = B.H.P.				
Temperature								
°C = (°F–32) ÷ 1.8				°F= (°C Z 1.8) + 32				
Flow Rate								
liter/min (dm^3/min)	×	0.264	=	US gal/minZ3.785			=	l/min

Note : ( ) Non–SI Unit



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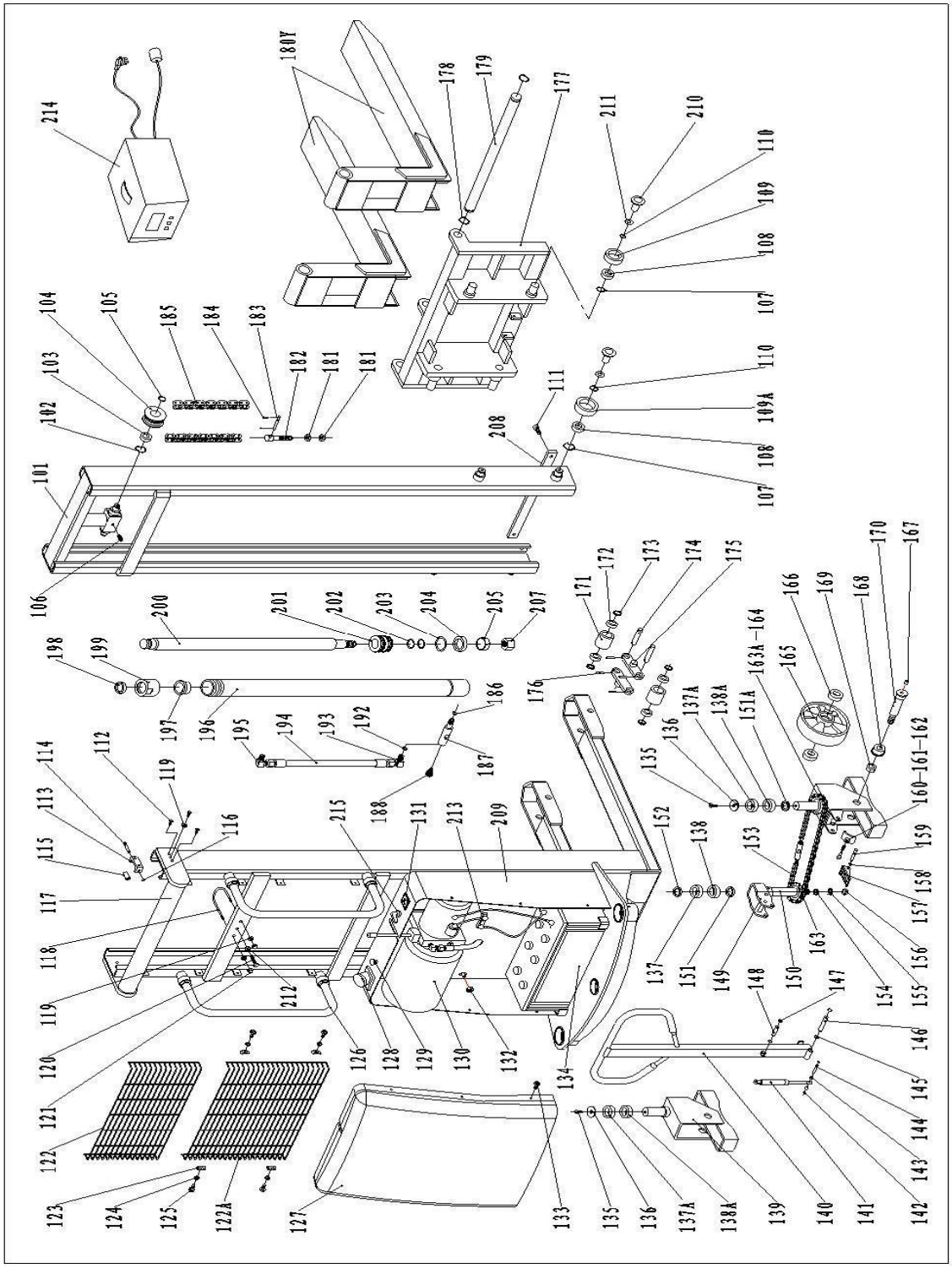
2. SPECIFICATION

2.1 OVERVIEW

1	Hydraulic system
2	Mast system
3	Electric box
4	Steering system& wheel kits
5	Power pump unit
6	Fork carriage

2.2 SPARE PARTS LIST



No.	Description	Qty.	No.	Description	Qty.
101	Inner Mast (2.5)	1	155	Washer	1
	Inner Mast (3.0)	1	156	Nut	1
102	Locking Ring	2	157	Foot Plate	1
103	Bearing	2	158	Locking Ring	1
104	Roller For Chain	2	159	Shaft	1
105	Locking Ring	2	160	Brake	1
106	Screw	1	161	Spring	1
107	Locking Ring	8	162	Bolt	1
108	Bearing	8	163A	Sprocket Wheel	1

No.	Description	Qty.	No.	Description	Qty.
109	Roller (φ88x36)	4	163	Sprocket Wheel	1
109A	Roller (φ106x36)	4	164	Seat of Turning Wheel	1
110	Locking Ring	8	165	Big Wheel	2
111	Bolt	2	166	Bearing	4
112	Bolt	6	167	Oil holder	2
113	Crutch of Idler Pulley	2	168	Washer	2
114	Shaft	2	169	Locking Nut	2
115	Idler Pulley	2	170	Axle for wheel	2
116	Locking Ring	2	171	Loading Roller	4
117	Mast (2.5)	1	172	Bearing	8
	Mast (3.0)	1	173	Washer	8
118	Hoop	1	174	Shaft	4
119	Nut	4	175	Linking Plate	4
120	Bolt	1	176	Elastic Pin	8
121	Nut	2	177	Fork Carriage	1
122	Protecting Meshwork	1	178	Locking Ring	2
122A	Protecting Meshwork	1	179	Long Axle	1
123	Press Washer	8	180Y	Fork	2
124	Elastic Washer	8	181	Nut	4
125	Bolt	8	182	Bolt	2
126	Handle	2	183	Pin	4
127	Cover	1	184	Cotter pin	8
128	Charging Plug	1	185	Chain (1025)	2
129	Urgent Switch	1		Chain (1030)	2
130	Pump Station	1	186	O-Ring	1
131	Voltage Meter	1	187	Body of Adjusting Valve	1
132	Nut	4	188	Safety Valve	1
133	Bolt	6	192	Seal Washer	1
134	Battery	1	193	Elbow Bend	1
135	Bolt	2	194	Pipe	1
136	Cap	2	195	Elbow Bend	1
137A	Bearing (6206)	2	196	Earthen Pipe (2.5)	1
137	Bearing (6205)	1		Earthen Pipe (3.0)	1
138A	Bearing (30206)	2	197	Sleeve	1
138	Bearing (30205)	1	198	Dust Ring	1
139	Seat of Wheel	1	199	Cover	1
140	Draw-Bar for Turning	1	200	Piston Rod (2.5)	1
141	Gas spring	1		Piston Rod (3.0)	1
142	Locking Ring	2	201	Piston	1
143	Washer	2	202	O-Ring	2
144	Shaft	1	203	O-Ring	1
145	Locking Ring	2	204	Seal	1
146	Shaft	1	205	Supporting Loop	1
147	Locking Ring	2	207	Nut	1
148	Shaft	1	208	Traverse	1
149	Seat of Draw-Bar	1	209	Box	1
150			210	Washer	8
151	Washer	1	211	Washer	8
151A	Washer	1	212	Nut	1
152	Washer	2	213	Fuse	1
153	Chain	1	214	Charger	1
154	Washer	1	215	Key Switch	1

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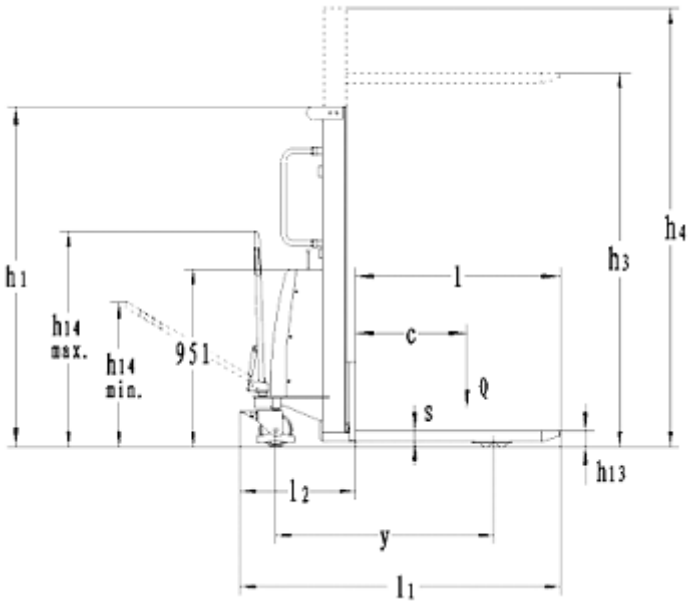
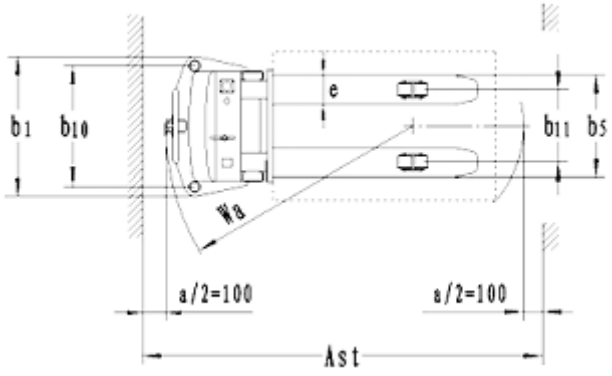
2.3 SPECIFICATION SHEET

2.3.1 RESIDUAL CAPACITY AT DIFFERENT LIFTING HEIGHT

Up to h3 mm	ACTUAL CAPACITY (Q) kg
1500	1000
2500	1000
3000	600
Load centre distance (C) mm	600

2.3.2 TECHNICAL FEATURE





Characteristics	1.2	Model of manufacture	SPN1030
	1.3	Drive: (electric-battery or mains, diesel, petrol, fuel gas, manual)	manual
	1.4	Type of operation (hand, pedestrian, standing, seated, order picker)	pedestrian
	1.5	Load capacity / rated load Q (kg)	1000
	1.6	Load centre distance c (mm)	600
	1.9	Wheelbase y (mm)	1180
Weight	2.1	Weight (including battery) kg	468
Wheels Chassis	3.1	Types (solid rubber, superelastic, nylon, polyurethane)	Nylon/PU
	3.2	Type size, front mm	180x50
	3.3	Type size, rear mm	74x70
	3.5	Wheels, number front/rear	4/2
	3.7	Track width, rear b_{11} (mm)	525
Basic Dimensions	4.2	Lowered mast height h_1 (mm)	2080
	4.4	Lift height h_3 (mm)	3000
	4.5	Extended mast height h_4 (mm)	3570
	4.9	Height of handle min./max. h_{14} (mm)	770/1153
	4.15	Fork height lowered h_{13} (mm)	85
	4.19	Overall length L_1 (mm)	1720
	4.20	Length to face of forks L_2 (mm)	610
	4.21	Overall width b_1 (mm)	777
	4.22	Fork dimensions s/e/L (mm)	60/160/1100
	4.25	Width over forks b_5 (mm)	685
	4.34	Aisle width for pallets 800×1200 lengthways Ast (mm)	2150
	4.35	Turning radius Wa (mm)	1350
Performance	5.2	Lift speed ,laden/unladed mm/s	79/118
	5.3	Lowering speed ,laden/unladed mm/s	108/95
	5.11	Parking brake	manual
E-Motor	6.2	Lift motor rating at S_3 15% kw	1.5
	6.4	Battery voltage ,nominal capacity K_5 V/Ah	12/150
	6.5	Battery weight kg	45

NOBUET 诺力

2.4 LUBRICATION

Hydraulic oil

⚠ CAUTION ***Hydraulic oil must have anti-wear qualities at least. It is not advisable to mix oils of different brands or types, as the may not contain the same required additives or be of comparable viscosities.***

Name: Thickened hydraulic oil.

ISO Viscosity Grade			#40	#30
Characteristics		unit		
Viscosity	At 40^{O}C	mm^2/s	57	48
	At 50^{O}C		40	30
Viscosity index			⩾150	⩾150
Flash point, Cleveland open cup		^{O}C	⩾160	⩾160
Pour point, Max		^{O}C	⩽-35	⩽-35
Density at 15 ^{O}C		kg/m^3		861.5
Copper corrosion(100^{O}C, 3h)		degree	⩽1	⩽1
Foaming (93.5 ^{O}C)		ml / ml	⩽30/0	⩽30/0
Vickers vane pump test, loss of mass (on vanes after 100h)		mg	⩽100	15.3
Diameter of wear spot, 1200 r/min, 294N, 30min, 75 ^{O}C		mm	⩽0.5	⩽0.5

The oil for gear box

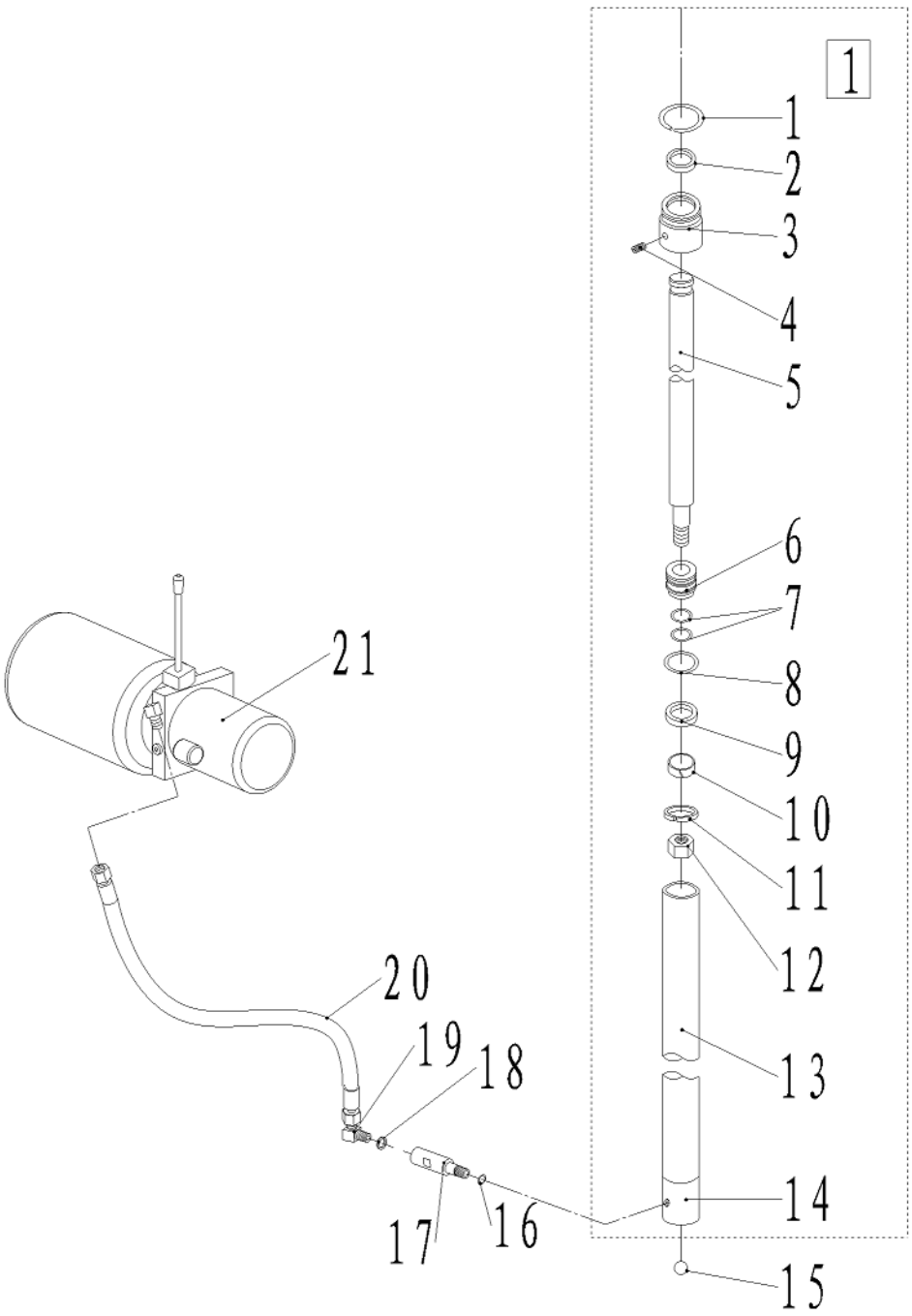
Name: Extreme pressure lithium-based grease, 1#.

Characteristics	unit	
Worked Penetration, 0.1mm		310--340
Dropping point,	^{O}C	≥170
Extreme pressure (Timken OK)	N	≥177
Similar viscosity (-10 ^{O}C, $10s^{-1}$)	Pa. s	≤250
Corrosion preventive properties (52 ^{O}C, 48h)	Grade	1
Wire points oil (100 ^{O}C, 24h)	%	≤10

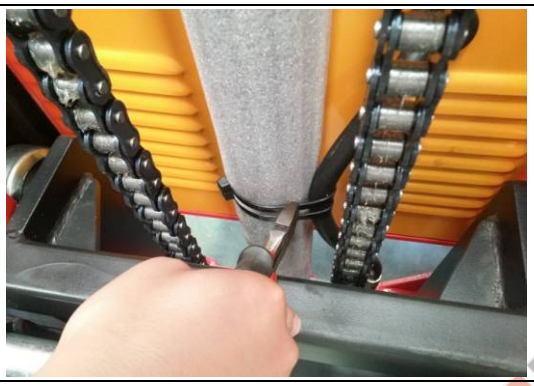
NOBUET 诺力

3. HYDRAULIC SYSTEM

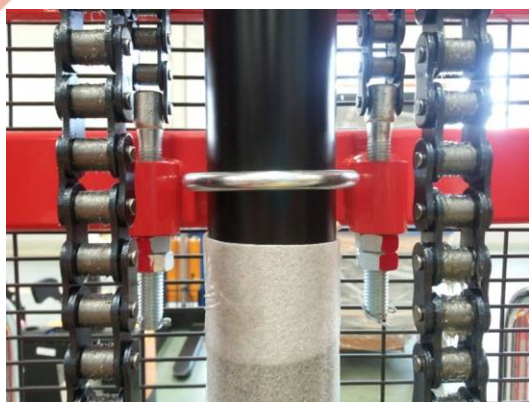
3.1 OPERATION OF CYLINDER STRUCTURE



STEP 1: Remove the joint of the hydraulic pipe and replace the hydraulic pipe with 22mm wrench. **The oil will spill over when removing; keep clean for the stacker and yourself!**



STEP 2: Cut off the band fixing the hydraulic pipe

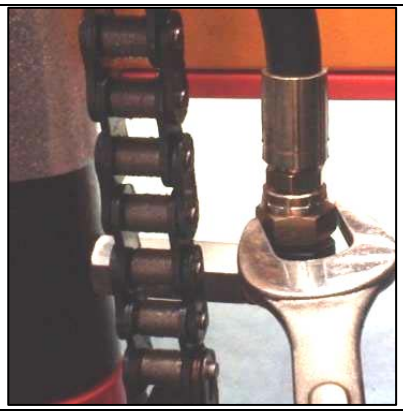


STEP 3: Remove 2 M8 domed cap nuts with 15mm wrench, and then you can remove the hoop.

STEP 4: Remove the screws on the holding plate with 6mm Allen wrench，then you can remove the whole cylinder.

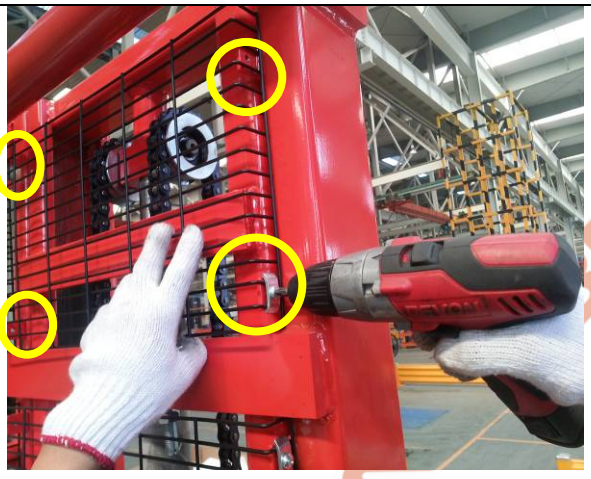
⚠ CAUTION For shocking, the **joint** of the **hydraulic pipe** and hydraulic pipe might be loosed and leak oil, so usually check and tighten it.

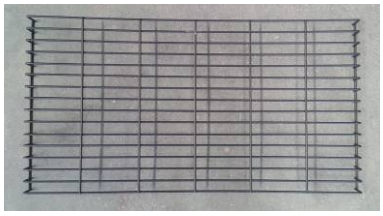
The oil will spill over when removing; keep clean for the stacker and yourself!



4. MAST SYSTEM

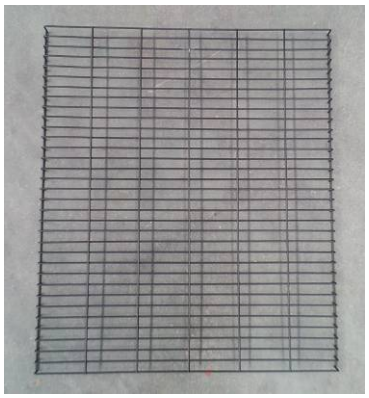
4.1 REPLACE THE PROTECTIVE GRILL





Upper Protective Grill

STEP 1: Remove 4 screws and washers on the upper Protective Grill with pneumatic gun.



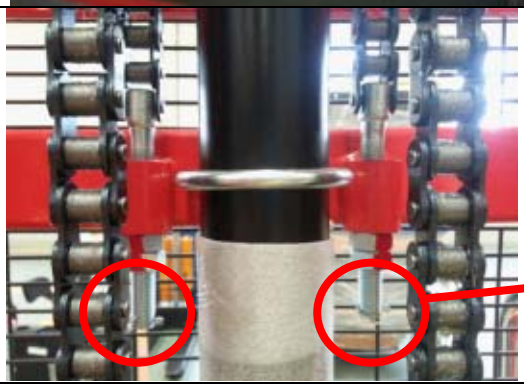
Below Protective Grill

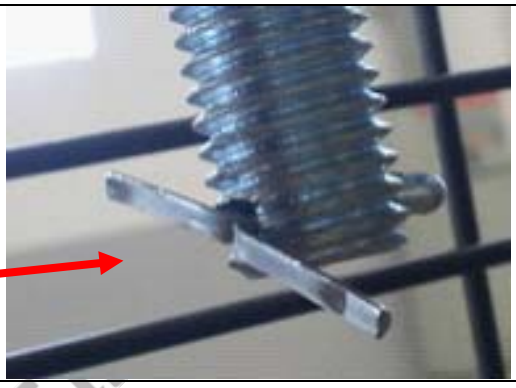
STEP 2: Remove 4 screws and washers on the lower Protective Grill with pneumatic gun.

4.2 REMOVE THE CHAIN

STEP 1: Strike out the shaft fixing the bottom of chain onto the mast

Hold tight the punch and avoid striking by the hammer





STEP 2: Take out the Split pin at the upper bottom of the chain

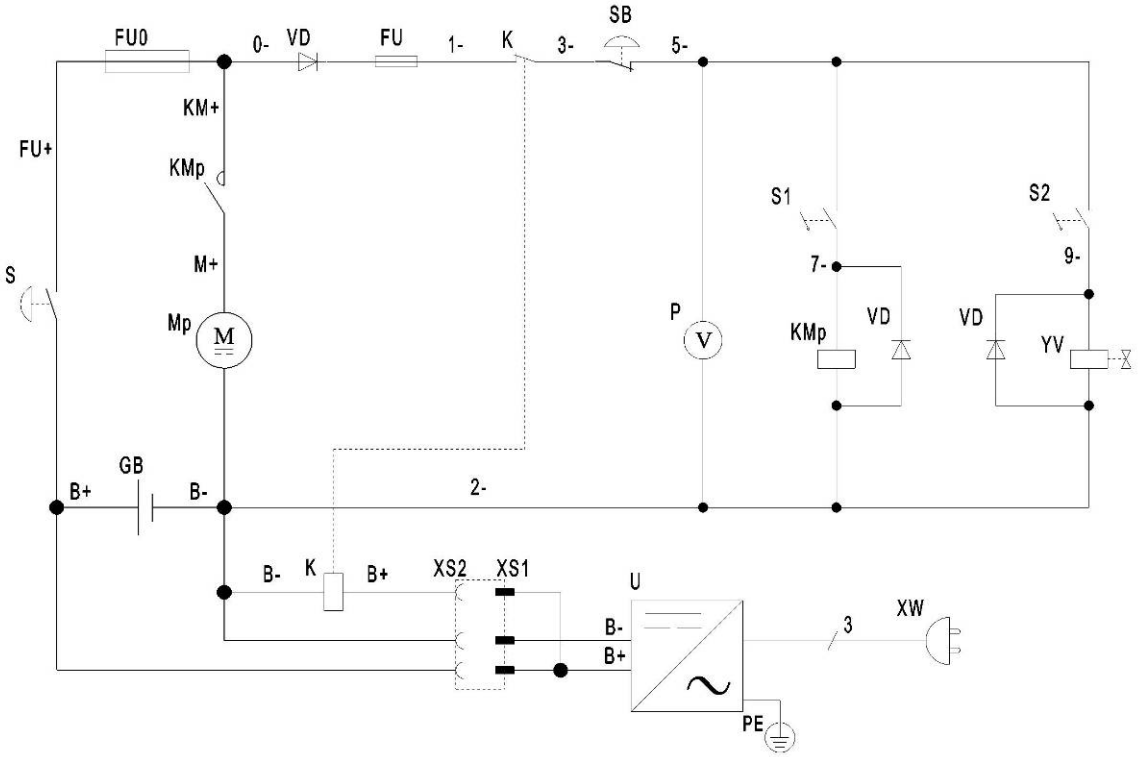
STEP 3: Remove the screw fixing the whole chain with 22mm wrench, and then you can remove the chain.

5. ELECTRIC BOX

5.1 ELECTRIC DIAGRAM

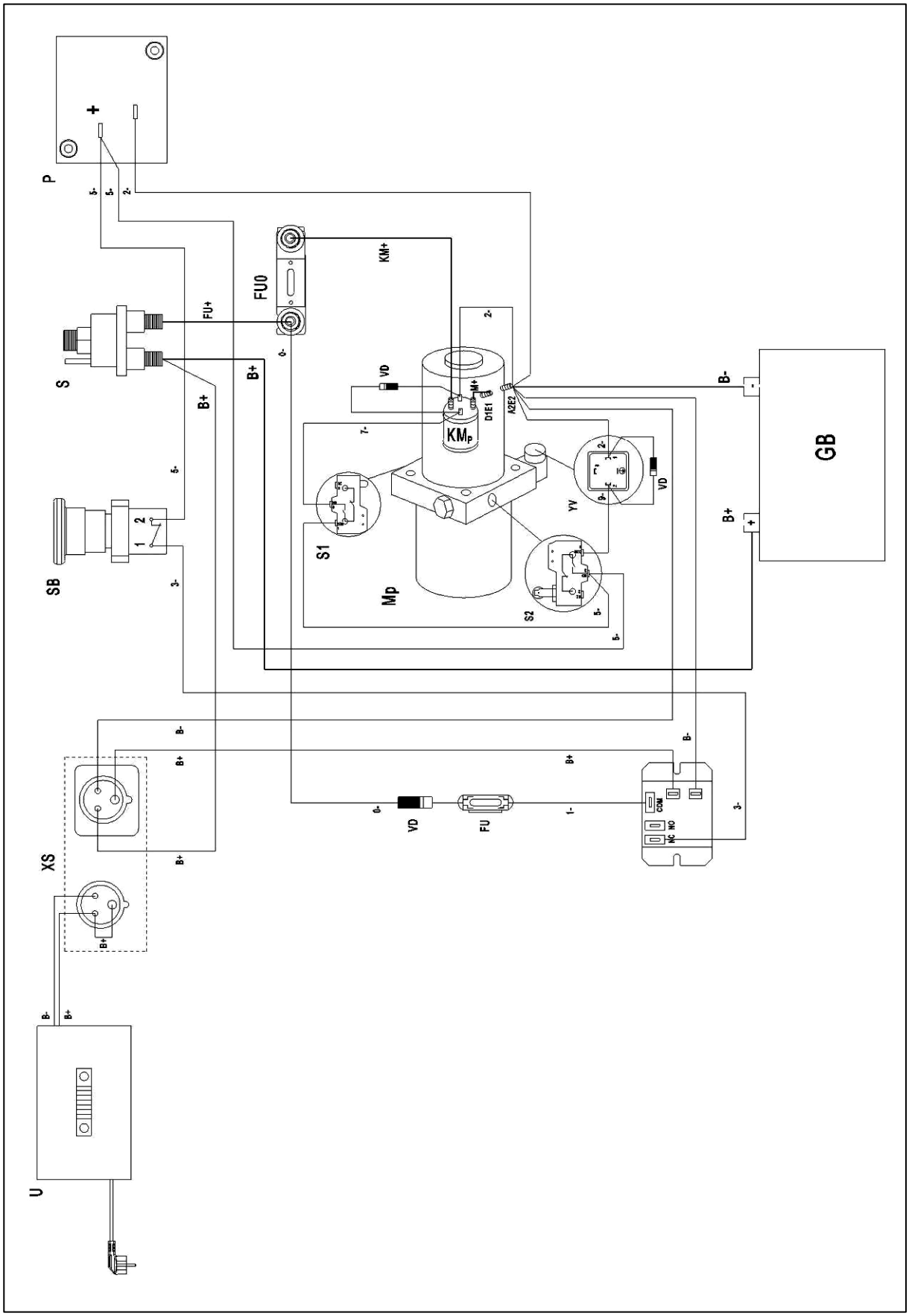
WIRING DIAGRAM

Electric diagram SPN 10

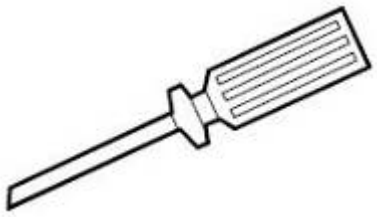
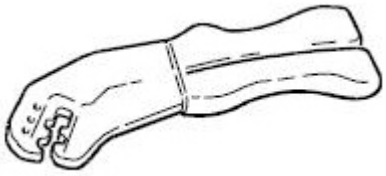
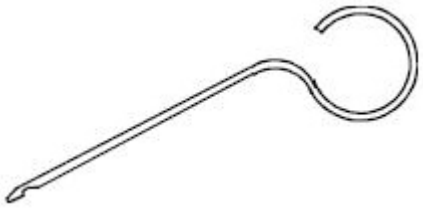
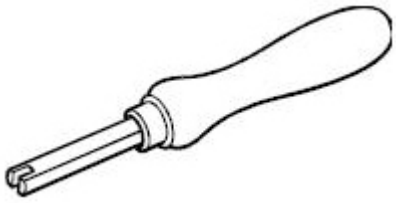
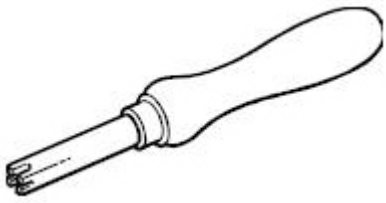
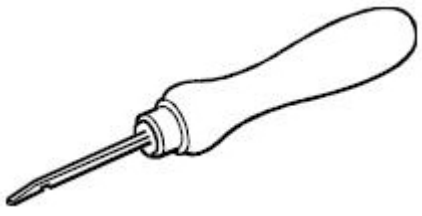


No.	Parts No.	Code	Description	Model	Qty.	Other
1	WG-98V-2	YV	Magnet valve for lowering		1	Pump
2	DQ-144	S2	Micro switch	YBLXW-6/11BZ	1	CHNT
3		S1	Micro switch		1	Pump
4	DQ-117	P	Battery indicator	CPC-48DC20V	1	
5	DQ-39-2	SY	Key switch	LKS-101A	1	
6	DQ-111	FU	Fuse CNL-6A	6×30 6A	1	
7	DQ-10	VD1、VD2、VD3	Diodes	1N5408	3	
8	WG-98V	Mp	motor		1	Pump
9		KMp	Relay for motor	DC12V	1	Pump
10	DQ-46	FU0	Fuse 200A	200A	1	
11	DQ-48	S	Power switch	ZDK31-250	1	
12	DQ-116	GB	Battery	12V/150Ah	1	Standard
13	DQ-173	K	Relay for charger	AR92-1Z DC12V	1	AIKS
14	DQ-118	XS2	Socket	NM-1463	1	
15	DQ-137	XS1	Plug	NM-248	1	
16	DQ-115-1	U	Charger	12V/18A DF-AL18-2	1	Alternative

CABLE SYSTE

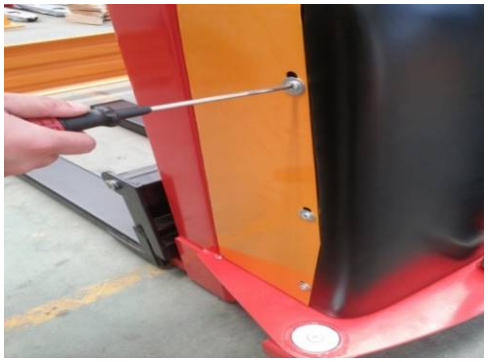


5.2 TOOL FOR REPAIRING THE PIN OF ELECTRIC PLUG

No.	Figure	Application
1		Tool for removal of pins / sleeves
2		Tool for application of pins / sleeves
3		Tool for release of lock
4		Tool for application of secondary locking 2 – pole
5		Tool for application of secondary locking 4 – pole
6		Tool for removal of pins / sleeves

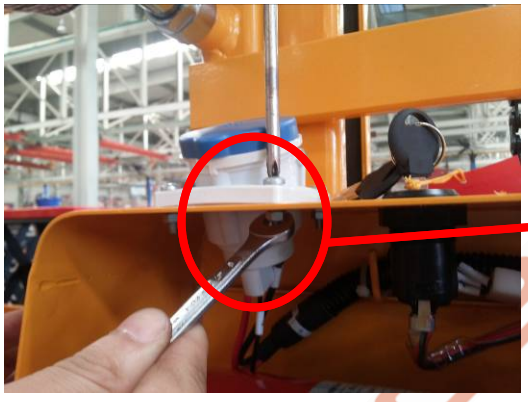
5.3 REPLACE THE ELECTRIC PARTS

Switch off electrical power before repair!

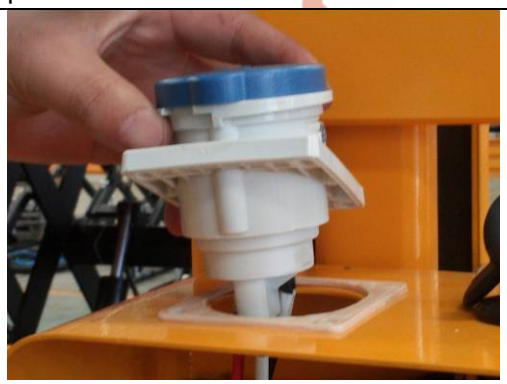


Remove 6 screws on the cover with Philips screwdriver, dismantle the Washer, and then you can remove the cover.

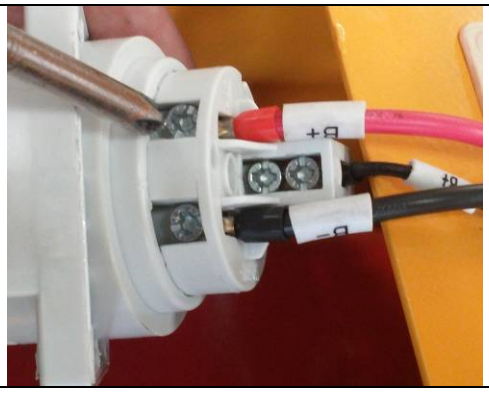
REPLACE THE CHARGER SOCKET



STEP 1: Hold the screw-cap with 8mm wrench and remove 4 screws fixing the charger socket with Philips screwdriver.

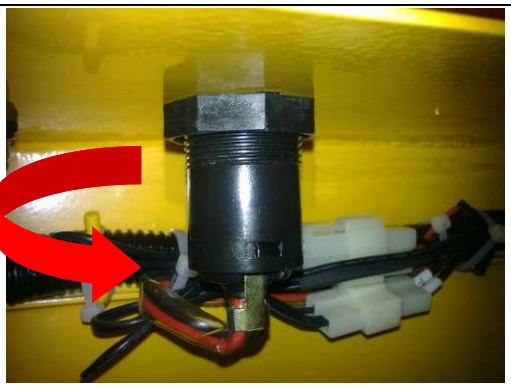


STEP 2: Take it outside with your hand.



STEP 3: Remove 4 screws fixing the cables with Philips screwdriver, now you can remove the charger socket.

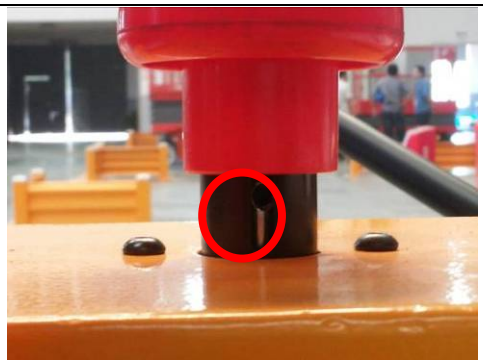
REPLACE THE KEY SWITCH



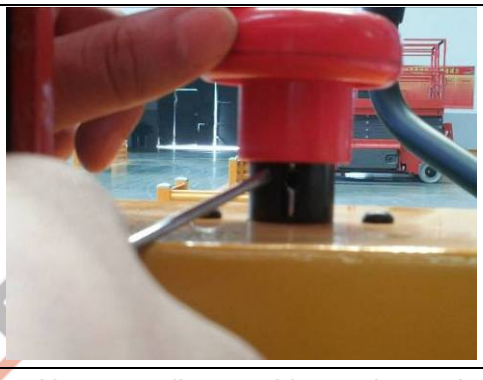
STEP 1: Turn counter-clockwise the key switch with wrench.

STEP 2: Dismantle the connector, now you can remove it.

REPLACE THE EMERGENCY BUTTON



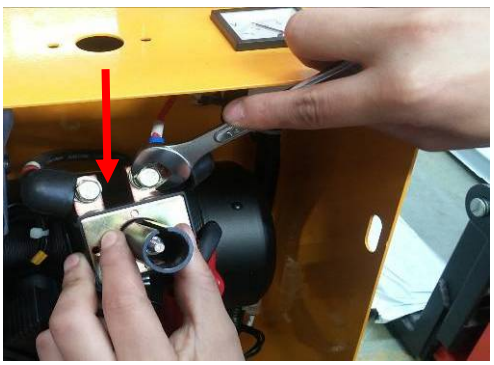
STEP 1: Turn the mushroom head; let the hole of the mandrill be line with the groove of the sleeve.



STEP 2: Use a small screwdriver to insert the hole and remove the screw

STEP 3: Turn counter-clockwise the mushroom head to remove it.

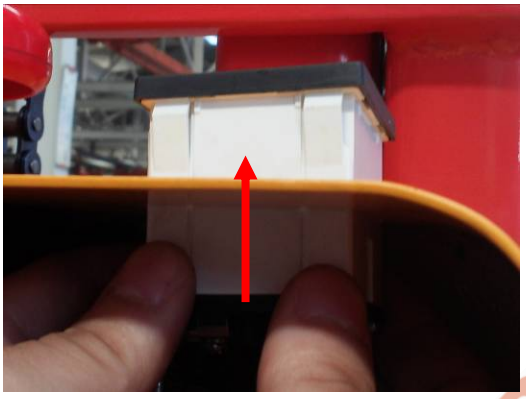
STEP 4: Remove 2 screws beside the button with 3mm Allen wrench



STEP 5: Pull down the emergency button, and remove 2 screws fixing the cable with 12mm wrench.

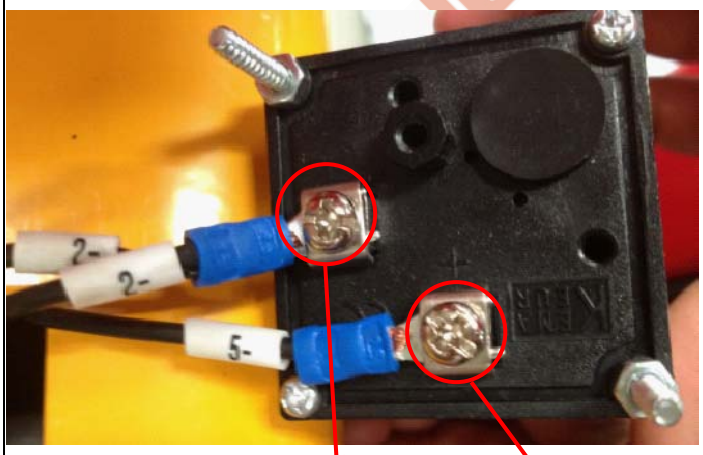
REPLACE THE BATTERY INDICATOR

STEP 1: Turn clockwise the screws fixing the indicator and remove the support.

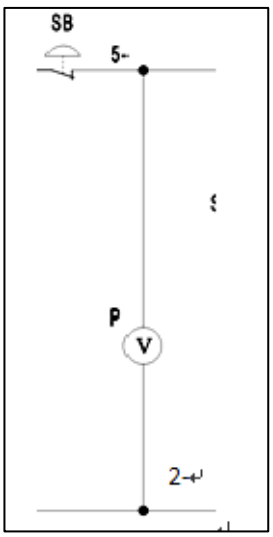


STEP 2: Push up the indicator and take it outside.

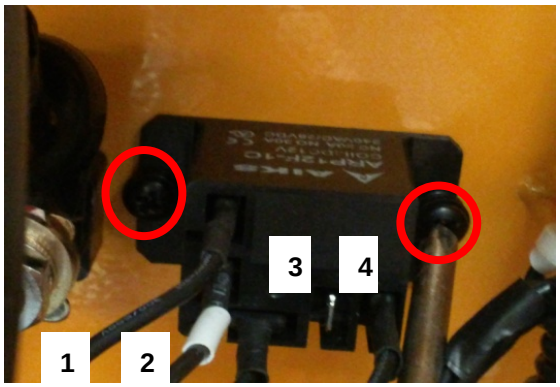
STEP 3: Remove 2 screws at the bottom of the indicator with Philips screwdriver, and then you can remove the indicator.



Electric Diagram： 2- connect to B-, 5- connect to B+



REPLACE THE RELAY



Dismantle two screws with Philips screwdriver; dismantle the 4 cables connecting to the relay. Then you can dismantle the relay and replace it.

REPLACE THE FUSE

Open the cover of the fuse seat, then you can dismantle the fuse and replace it.

It may be strenuous to open the cover, avoid scratching your hands by the plastic edge.

Remove 2 screws with 14mm wrench, and then you can remove and change the fuse.

OPERATION OF THE BATTERY

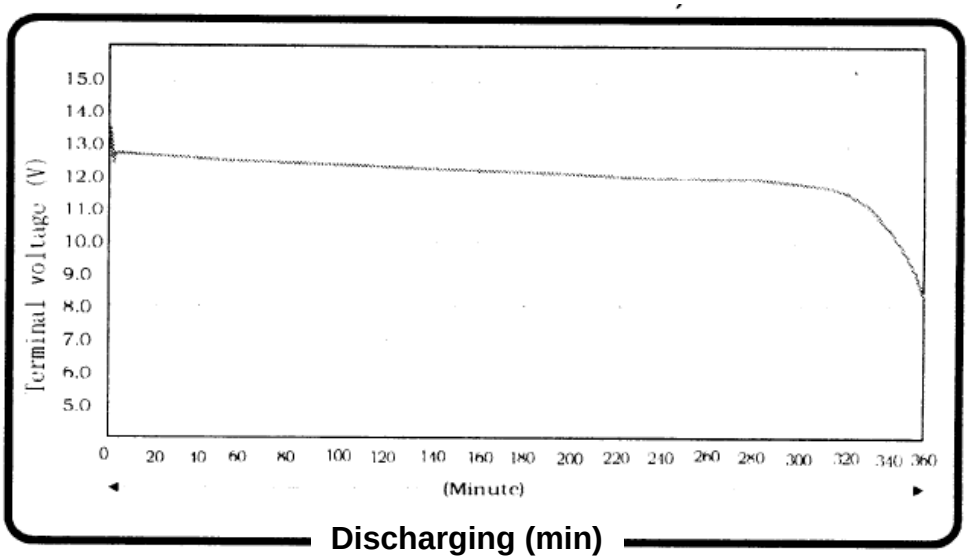
The size of battery is according to English BS standard.

Rate	Specification
	SPN1030
Rated voltage	12V（X1）
Capacity (5 hours)	150Ah
Overall size (L*W*H)(mm)	523×238×283

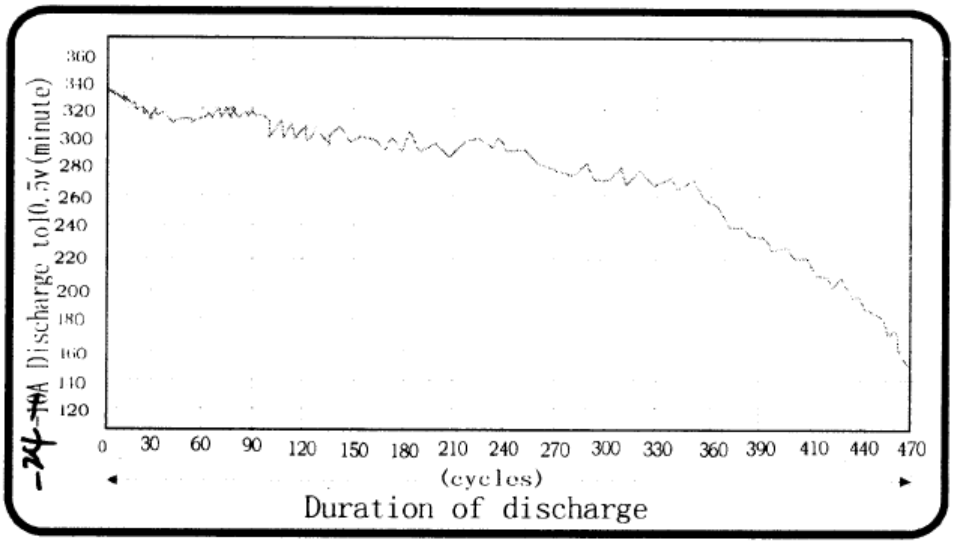
Battery indicator

It indicates the voltage of battery.
When it shows the voltage is less than 10V, please charge the battery soon.

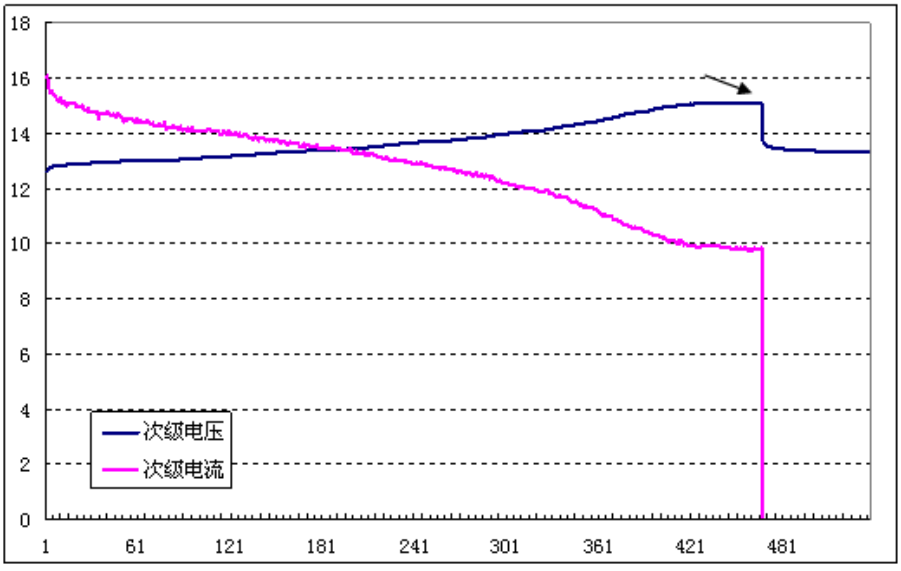
24A DURATION OF DISCHARGING CURVE (ENVIRONMENTAL TEMPERATURE = 25^{O}C)

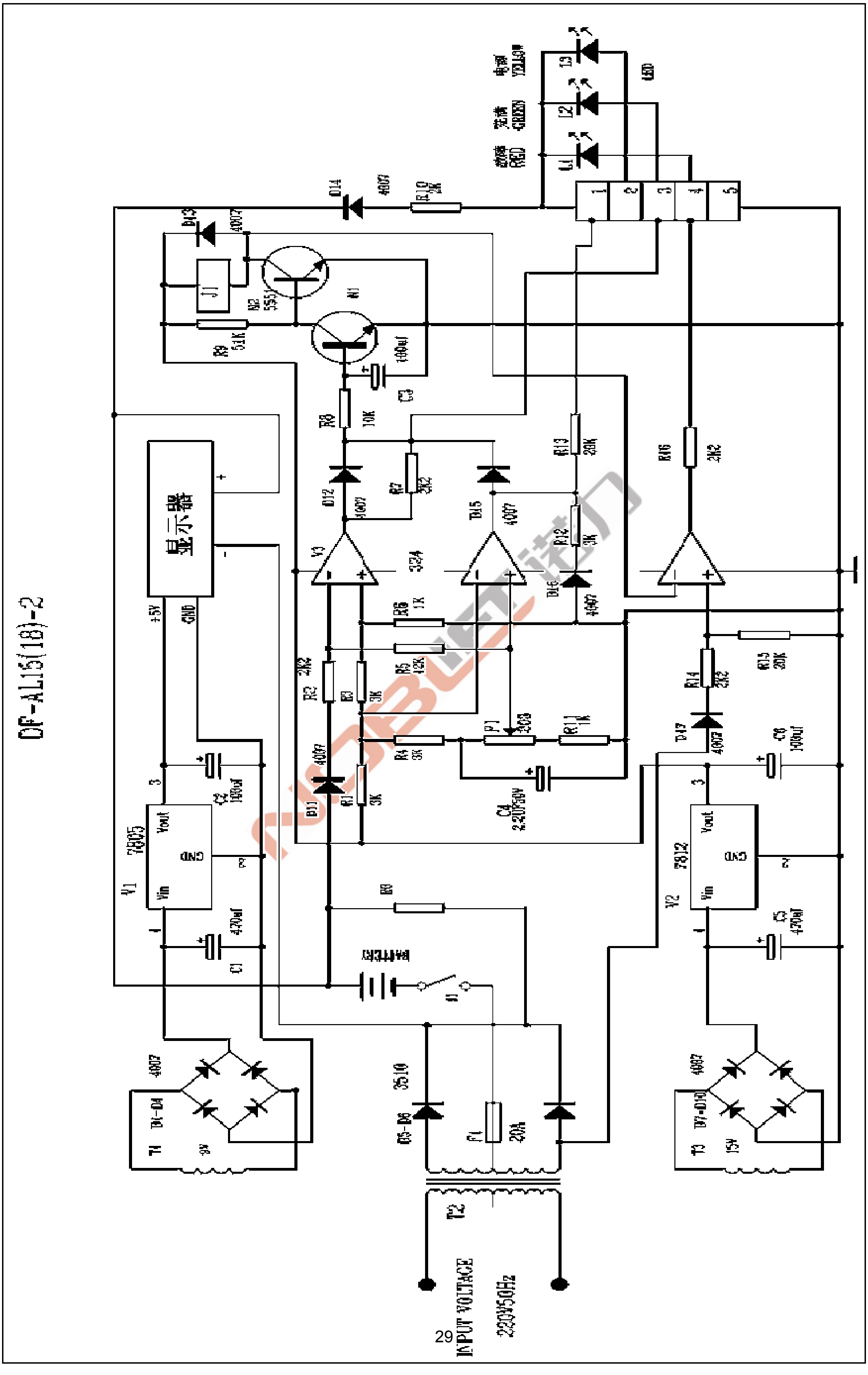


100% DURATION OF DISCHARGING LIFE TEST CURVE (ENVIRONMENTAL TEMPERATURE =25 ^{O}C)



CHARGING CURVE




DF-AL15(18)-2
显示器
+5V
GND
7805
V1
Vin
Vout
GND
C1
470uf
C2
100uf
7812
V2
C5
470uf
C6
100uf
T1
9V
D1-D4
4007
T2
T3
15V
D7-D10
D5-D6
3510
F1
20A
BATTERY
S1
R9
5.1K
R10
2K
D14
4007
D13
4007
J1
N2
5551
N1
C3
100uf
R8
10K
R7
2K2
D12
4007
D15
4007
R13
20K
R12
3K
D16
4007
R16
2K2
V3
324
R6
1K
R5
12K
R2
2K2
R3
3K
R4
3K
P1
300
R11
1K
C4
2.2U/50V
R1
3K
D11
4007
R14
2K2
R15
30K
D17
4007
故障
RED
充满
GREEN
电源
YELLOW
L1
L2
L3
LED
INPUT VOLTAGE
220V50Hz

REPLACE THE BATTERY

STEP 1: Remove the cover, dismantle the screw which fix the power cable (+, -) to the battery with 10mm wrench.

Don't let the wrench to touch the other pole, otherwise it will cause short-circuit.

STEP 2: Remove the screws fixing the hoop with 5mm Allen wrench.

STEP 3: Press the handle downward and you can remove the battery and replace it.

Avoid kicking by the rebound handle.

INSTRUCTION OF THE CHARGER

⚠ WARNING **The battery generates flammable and explosive gases during charge, so excellent ventilation is required. Open the liquid refilling cap or seal cap. Do not smoke around the battery during charge. Any fire and spark is forbidden.**

MAIN PRODUCT SPECIFICATION

Type	specification	Input power	Battery capacity	Input voltage	weight
DF-AL18-2	12V18A	400VA	150	220v±5%	8.3kg

Ⅰ. Foreword

DF-AL Automatic Charge is specially developed for battery charger of power pallet engine and power stacker engine, offering the automatic detection and tracking of battery, until the charging is automatically completed.

Ⅱ. Items for Attention

1. The charger shall be installed in the place of well ventilation, drying, without heavy power, corrosive gas and strong electric-magnetic interference on heavy vibration.
2. The charger is only available for indoors, not for vehicle. No water should be in the changer.
3. Wer input is 1-phase AC50Hz 220V±5%,or 60Hz 110V±5%, while the case shall be solidly grounded

   (as the case is connected with the grounding wire of input power supply line, you may complete the solid grounding within the socket only).
4. The charger is suitable for use at the ambient temperature of-10°c~+40°c.
5. Any person other than the professional installer shall not open the case without consent (High voltage in).

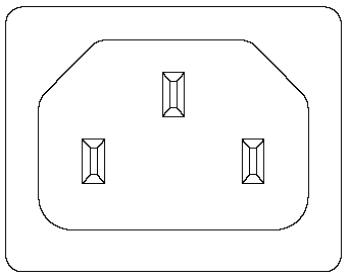
Ⅲ. Usage

1. Firstly, the charger shall be solidly connected to the battery, without any reverse in pole.
2. Switch on power, while the power indicator lamp is lighting on, and the monitor would indicate the current for charging automatically.
3. Where the charging is to be completed soon, the current would be generally reduced. Once the voltage peak value for charging reached 15.2V, the indicator lamp of “charging full” is lighting on, the charger would stop automatically, and the charging is completed.
4. Where the “battery” indicator lamp is lighting on, it generally means the following 2 conditions:

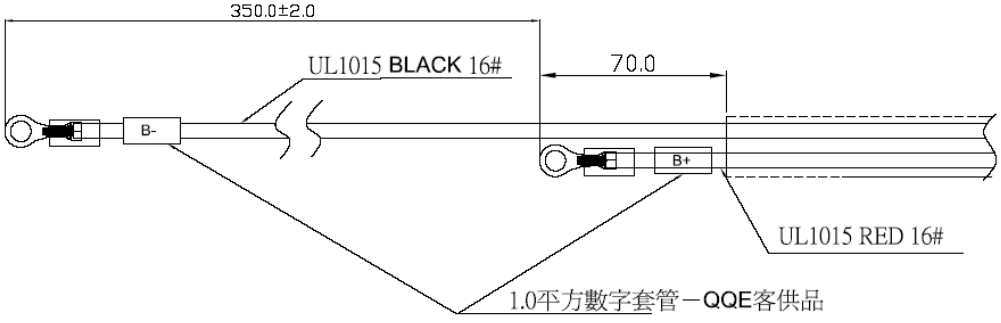
   A. The voltage of battery for charging is less than 5V, meaning the battery is seriously damaged without any validity.

   B. The battery connection is reversed in pole.
5. Where the controller within the charger is in fault, you are prohibited to open it without consent. It must be repaired by the professionals or notified to the engineer of maintenance service.

INPUT TERMINAL DIAGRAM & DEFINITION



OUTPUT TERMINAL DIAGRAM & DEFINITION



Ⅳ. Troubleshooting

Failures	Causes	Troubleshooting
The indicator light for power is on, the indicator light for failure is on, the blower is on, the charger can't start and charge and the monitor is not display.	The battery is not connected, or the output plug of the charger is inserted into the controller plug of the electric vehicle.	Connection of the battery should be corrected.
The indicator light for power is on, the indicator light for failure is on, the blower is on, the charger cannot start and charge and the monitor is not display .	① Although the charger and battery is connected, however, some part of which is disconnected. ② The battery is aging, becomes invalid and low voltage. ③ The battery is connected oppositely.	① Check each connection bolt and wiring. ② Check total voltage of battery and each single voltage of the battery. In case of open circuit, aging, invalid, low voltage of the battery, please change a new one. ③Correct incorrect connection.
The indicator light for power is on, the indicator light for failure is on, the blower is on, the chargers cannot start and charge and the display.	Failure of DC output fuser.	Open the side door to check the fuser. If the fuser is broken, please change a new one.
Instable charge current, more or less.	Long-term heating, poor contact or loosen by the output plugs.	Check the copper plates, if it is unavailable, please change a new one.
Instable charge current, not reaching the rated current value.	① Low power voltage. ② Small section area of lead for power input.	① The power voltage may not lower than 95% of the rated voltage. If the voltage is too low, please change a new power supply. ② The section area of input lead of power supply may not less than the stipulated section area in the manual.
Air switch of the charger does not trip, and the preceding stage switch trips.	① Failure of the preceding air switch. ② Incorrect matching of air switch. ③ Small capacity of the air switch.	Rated current of the preceding stage air switch is more than that of the air switch of the charger. The air switch must be type D (dynamic type), type C (illumination type) is unavailable.
Excessive overcharge for the battery.	Internal short circuit of single battery of the group.	Check each terminal voltage of every single battery. If some of the voltages are lower than their nominal voltages, the internal polar plates suffers from short circuit, please remove them and change new ones.
The display signals of the display face rolling, deadlock and clobber.	Failure of microcomputer or control power.	Please inform the service engineers.

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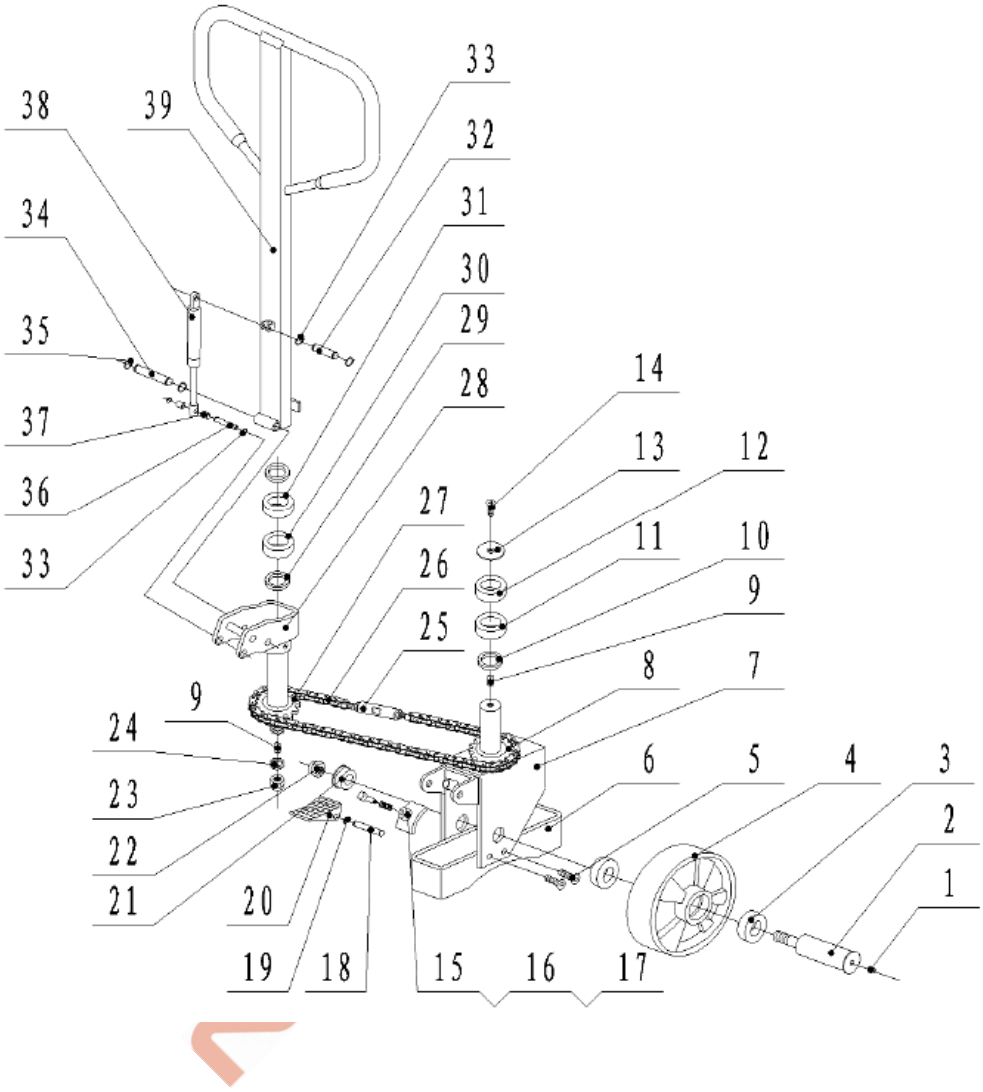
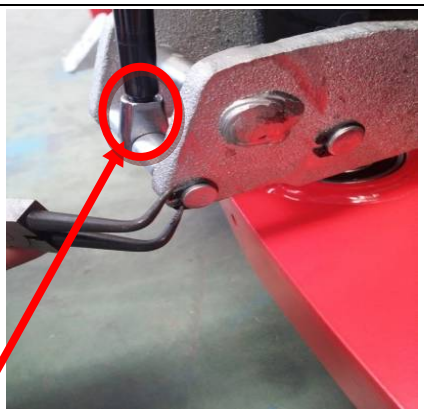
6. STEERING SYSTEM& WHEEL KITS

6.1 CONTROL HANDLE



REMOVE THE AIR SPRING



STEP 1: Remove the Retaining ring with spring pliers on the Steering seat, strike out the shaft of the air spring with a hammer, and remove the **Sleeve**.

STEP 2: Remove the other shaft on the top of air spring as before, then you can remove the air spring.

REMOVE THE HANDLE

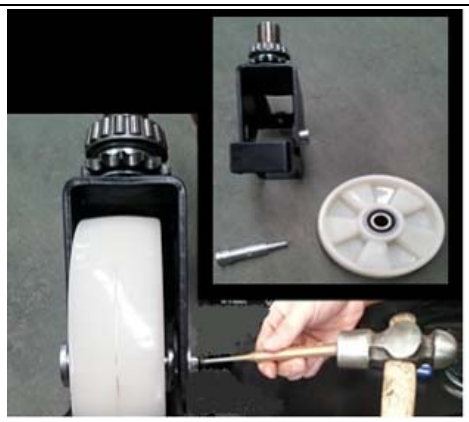
Remove the straining ring, and then Remove the shaft of the tiller arm on the Steering seat, and then you can remove the handle

6.2 OPERATION OF THE WHEEL

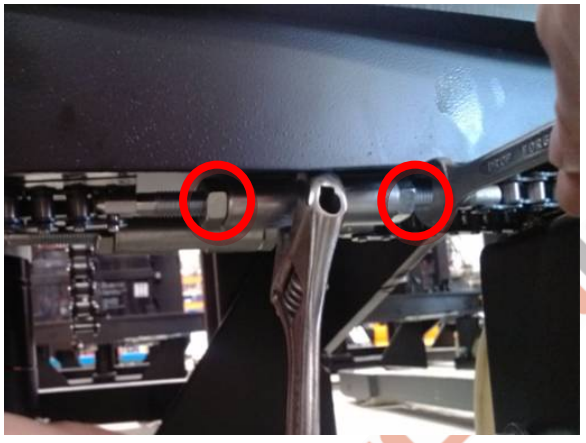
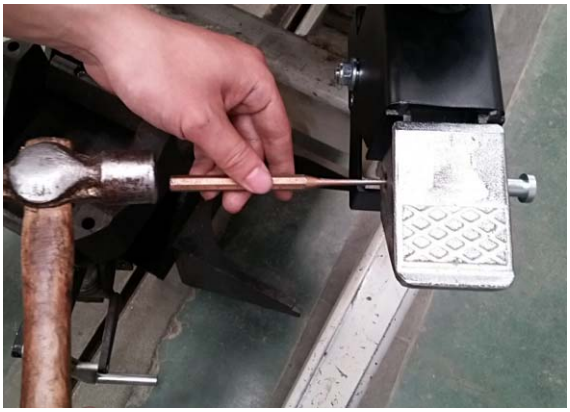
6.2.1 OPERATION OF THE BIG WHEEL (LEFT)

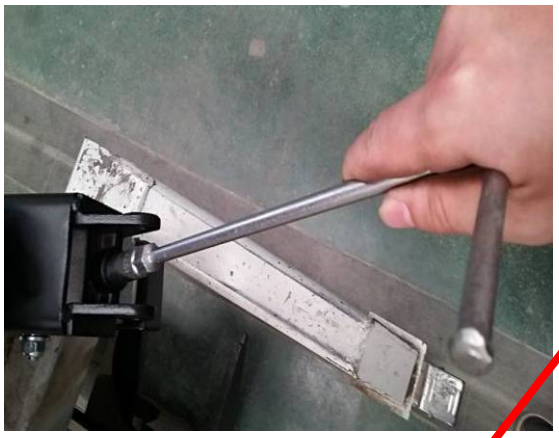
STEP 1: Support the mast with a block to keep the big wheel hanging

STEP 2: Remove the screw on the cap with 6mm Allen wrench, and then remove the cap, bearing, bolt.

	
STEP 3: Remove the screw of big wheel with 2 wrenches	**STEP 4:** Strike out the shaft, you can replace the wheel.
Hold tight the punch and avoid striking by the hammer 	

6.2.2 OPERATION OF THE FOOTBREAK

	
STEP 1: Remove 2 screws fixing 2 bottom of the chain together with 14mm wrench, and use another wrench for holding.	
	
STEP 2: Remove the Retaining ring with spring pliers	**STEP 3:** Strike out the shaft, and then you can remove the foot plate.
Hold tight the punch and avoid striking by the hammer 	



STEP 4: Remove the bolt, you can see the spring, and then you can remove the whole brake.

STEP 5: Remove the screw on the cap with 6mm Allen wrench, and then you can remove the cap, bearing, bolt and wheel as left wheel.

Now follow the steps of removing left wheel, you can remove the right wheel and the chain

6.2.3 OPERATION OF THE LOADING ROLLER

STEP 1: Support the mast with a block to keep the loading roller hanging

STEP 2: Strike out 4 elastic pin with hammer and puncher, remove the shaft and then you can remove the loading roller and replace it.

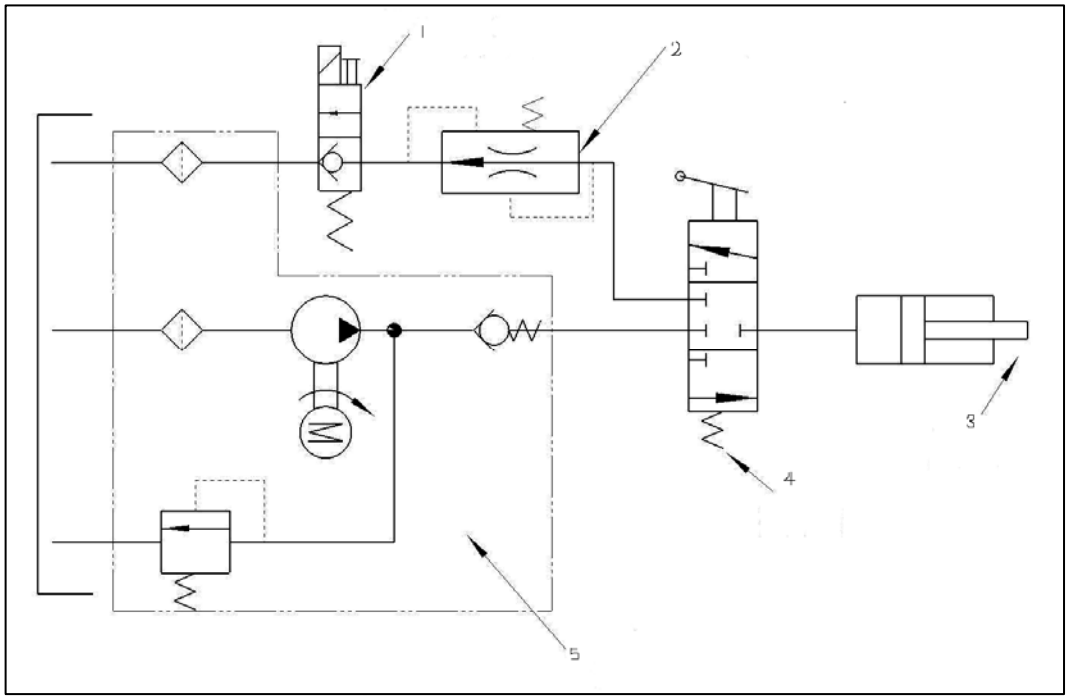
Hold tight the punch and avoid striking by the hammer

7. POWER PUMP UNIT

Type: MD12160

Item	SPN1030
Rated voltage	12V
Rated output	1.6kw
R.P.M	2950 rpm
Rated current	200 A
Rated hour	2 min.
Insulation class	F class
IP Code	IP54
Displacement	2.0cc/rec

HYDRAULIC FLOW DIAGRAM



1	Lowering valve
2	Emergency valve
3	Hydraulic cylinder
4	Control valve
5	Pump station

INSPECTION OF HYDRAULIC OIL

External appearance	Smell	Condition	Measurement
Clear and no discoloration	Fine	Fine	Possible to use
Clear but the color become brighter	Fine	Mixed with other oil	Inspect the viscosity and if fine it can be continuously used
Color changed like milk.	Fine	Mixed with air and water	Separate water or replace oil.
Color changed into dark brown	Bad	Oxidized	Replace oil.
Clear but there’re small black spots	Fine	Mixed with other particles	Use after filtering.

7.1 REMOVE THE PUMP STATION

STEP 1: Dismantle the connector of handle control cable，and turn counter-clockwise the joint of the hydraulic pipe with 22mm wrench to remove the pipe.

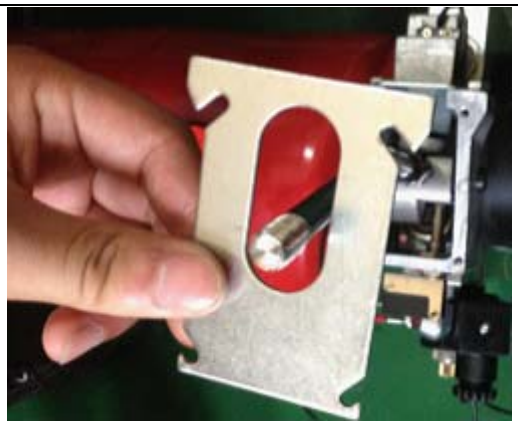
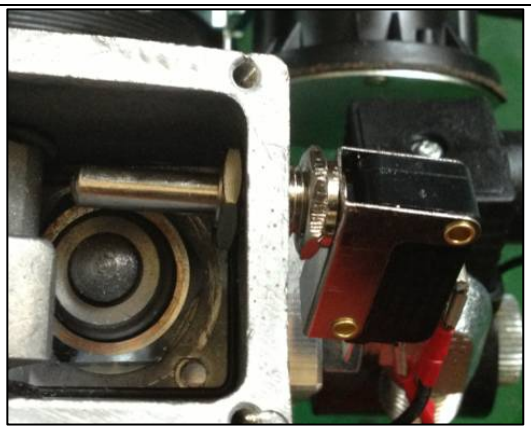
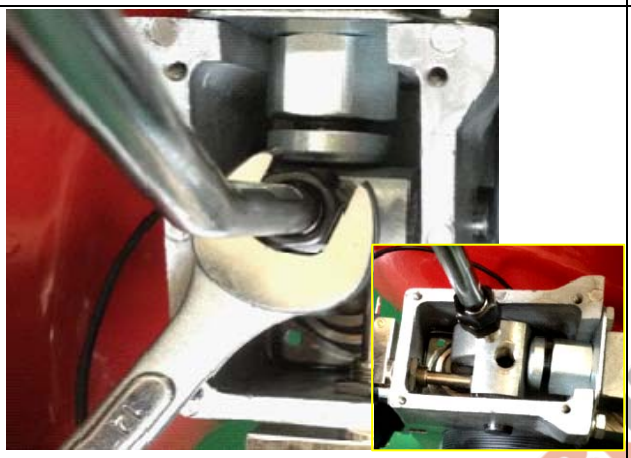
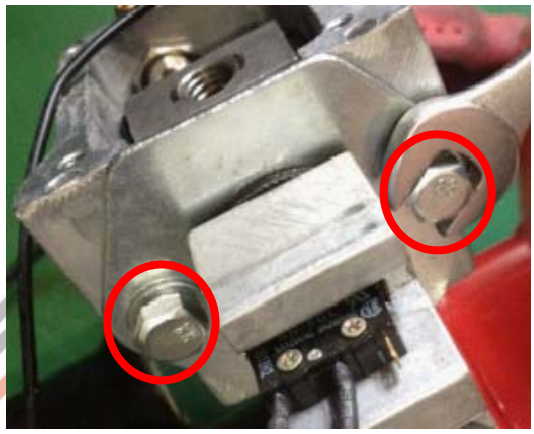
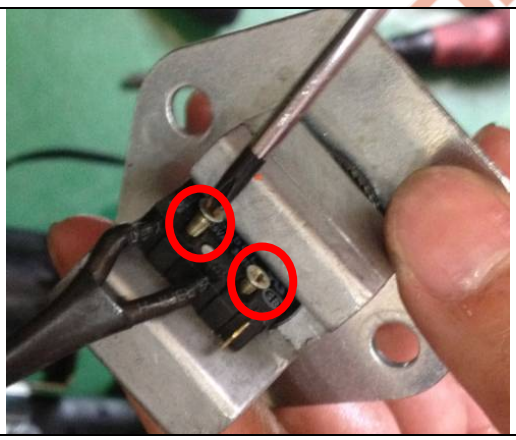
The oil will spill over when removing, keep clean for the stacker and yourself!

STEP 2: Remove 2 screws fixing the pump station at the back of the Electric box with 8mm Allen wrench, and then you can remove the pump station.

7.3 REMOVE THE CONTROL STICK

STEP 1: Remove 4 screws on cover plate of control stick.

STEP 2: Turn counter-clockwise the cap of control stick.

	
STEP 3: Remove the cover plate of control stick.	**STEP 4:** Dismantle the screw and the micro switch for lowering with 2 wrenches, one is for holding.
	
STEP 5: Loosen the screw fixing the control stick and remove it.	**STEP 6:** Remove 2 screws fixing the seat of micro switch.
	
STEP 7: Remove 2 screws fixing the Micro switch for lifting with screwdriver, and then you can remove and replace the micro switch.	**STEP 8:** Dismantle the screw and the seat of micro switch with 2 wrenches, one is **for holding**.

STEP 9: After separate the seat of micro switch, remove the retaining ring on the screw with spring pliers

Now you can see the spring inside and replace it.

7.3 REMOVE THE MAGNETIC VALVE FOR LOWERING

The Magnetic valve is a wearing part. If the forks automatically lower after lifting, the magnetic valve may be blocked or damaged, remove it to clear or replace.

After remove the cover, you can see the valve.
STEP 1: Dismantle the cable of micro switch connecting with the handle. (New series)

STEP 2: Remove the cable of on the motor with 14mm wrench.

STEP 3: Turn counter-clockwise the fixing screw.

STEP 4： Then you can remove the magnetic valve and replace it.

7.4 CLEAN OIL TANK AND FILTER

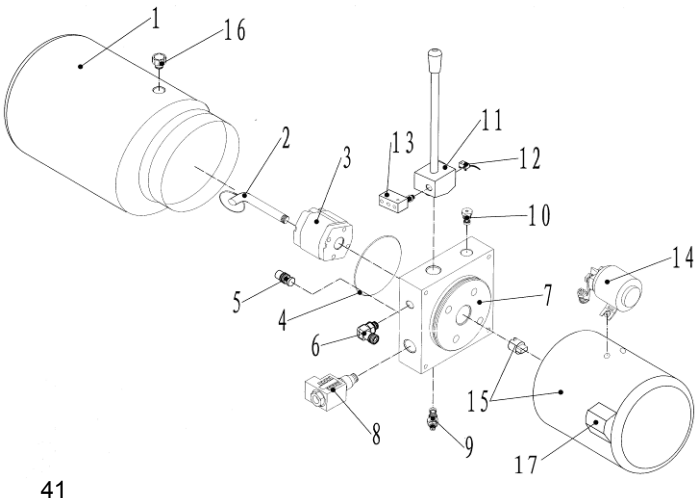
⚠ CAUTION The **Plug Screw of port** for adding oil is ventilating. When lower, the air will come out from the tank, it might take out little oil vapor. So, it might appear little oil stains on the plug. Wait a little and ensure that there is no oil leakage.

STEP 1： Dismantle the lid on the top of the tank ， pour out the hydraulic oil

STEP 2： Dismantle the lid on the top of the tank, and fill the oil.

⚠ WARNING **Put the fork of the ground and drain out the hydraulic oil**

- Remove out the pump station.
- Loosen the hoop
- Remove the oil tank
- Remove the suction filter
- Cleaning of oil tank and filter.
- Clean the Fix plate for valve etc.
- Clean up with compressed air and inspect. If the filter is stopped or damaged, replace it.
- Remove dust or foreign material from the tank.



TROUBLE DIAGNOSTICS

Symptom	Abnormality and cause	Measurement
Bubble in hydraulic oil	Mixed with air	Check if there is any place where air can be entered. Tighten the loosened part again.
Discoloration	Mixed with air and water	Replace the oil.
	Became inferior in quality by oxidizing or mixed with other particles.	Replace the oil.

STEP 1: Remove 4 screws fixing the oil tank onto the valve plate with 10mm wrench, and then you can remove the oil tank.

STEP 2: Remove the screw fixing the filter net, and then you can remove and replace it.

7.5 SEPARATION OF THE MOTOR OF PUMP STATION

⚠ CAUTION For the electric current of the **Relay** for the lifting motor is very big, and work continually hourly, the contact terminal of the relay is easy damaged. Please check it continually.


STEP 1: Remove 2 screws fixing 2 cables connecting the relay and motor with14mm wrench.


STEP 2: Remove 2 screws fixing the relay onto motor and remove the relay with Philips screwdriver



STEP 3: Remove 2 screws on the top of motor with Philips screwdriver, then press the tuber on the top cap and remove it, now you can see the internal parts of motor.



STEP 4: Remove the screw fixing the carbon brush, and then remove the clip fixing it, now you can remove the carbon brush.


STEP 5: Remove 4 screws on the top plate with wrench and screwdriver.



STEP 6: Remove the stator of the motor, and then you can remove the rotor of the motor, and replace the part you want to.

7.6 SEPARATION OF THE VALVE PLATE

The oil will spill over when removing; keep clean for the stacker and yourself!


STEP 1: Remove one-way valve: Dismantle the screw of one-way valve with wrench and remove it.


STEP 2: Remove flow-control valve: Dismantle the screw of flow-control valve with wrench and remove it.


STEP 3: Remove the joint of hydraulic pipe: loosen it with wrench and remove it with hand.

8. MAINTENANCE CHECK LIST

8.1 OIL HYDRAULIC OIL

Check oil mass once every six mouths. Suggest using No.32 hydraulic oil (GB11118-89), its kinematic viscosity is 32cSt when it is on 400; the total amount is about 4.0 liter.

8.2 REGULAR MAINTENANCE

In order to keep a good using status, necessary check and maintenance everyday is suggested. Focusing mainly on: （1） wheels and mandrels, such as wires and rags banded on the wheels and mandrels；（2）whether the forks and the masts have deformation；（3）whether the voltage of the battery is normal and so on. After completing the work, unload the loads on the forks and lower the forks to the lowest position.

8.3 LUBRICATION

Add grease or oil onto all moving parts frequently in order to lubricate.

8.4 HOW TO CHARGE STORAGE BATTERY

- Charge storage battery when its voltage is less than 10 Volt.
- Please check the battery liquid before charging, if it is not enough, add some distilled water.
- The charging environment should be ventilated and far away from the fire.
- If the stacker not use for long time, charge it for not less than two hours every week.
- The voltage on the indicator should not be over 15 Volt when charging.
- Do not use the stacker when charging.

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9. TROUBLE SHOOTING

No.	Trouble	Clause	Fixing Methods
1	The forks cannot be lifted to the maximum height	● The hydraulic oil is not enough	● Pour in the oil
2	The forks cannot be lifted (Motor is rotary)	● Without hydraulic oil ● The oil has impurities	● Fill in the oil ● Change the oil
3	The motor cannot run.	● The urgent switch is pressed down, cut off the power ● The voltage is too low ● The connectors of electrical wire is loose ● The contactor of DC motor is broken	● Turn it clockwise, switch on the power ● Charge it ● Turn it firm ● Replace with a new one
4	The forks cannot be descended.	● The piston rod or mast is deformed resulting from partial loading slanting to one side or over-loading ● The forks were kept in the high position for long time with piston rod bared to arise in rusting and jamming of the rod ● The release valve of pump is not opened	● Replace with a new one ● Keep the forks in the lowest position if not in use and pay more attention to lubricate the rod ● Check it, if damaged, replace with a new one
5	Leaks	● Sealing parts worn or damaged ● Some part cracked or worn into small	● Replace with new ones ● Replace with new ones
6	The forks descend without the release valve worked.	● The impurities in the oil causes the release valve to be unable to close tight ● Sealing parts worn or damaged ● The release valve is damaged	● Change the oil ● Replace with new ones ● Replace with a new one
7	The battery cannot be charged	● Battery is broken ● The charging plug is loose	● Replace with a new one ● Turn it firm