

# Service & Maintenance Manual Electric Pallet Truck

**PTE33N**

Version 12/2018



**WARNING**

**Do not use the pallet truck before reading and understanding these operating**

**instructions. NOTE:**

* **Please check the designation of your present type at the last page of this document as well as on the ID-plate.**

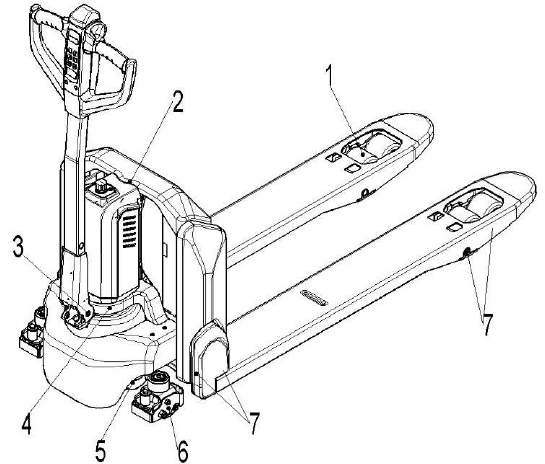
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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. **REGULAR MAINTENANCE**    1. **Maintenance checklist**   Table 1: Maintenance checklist | | | | | | |  |
|  |  | | Interval(Month) | | | |  |
| 1 | 3 | 6 | 12 |  |
| Hydraulic | | | | | |  |
| 1 | Check the hydraulic cylinder(s), piston for damage noise and leakage |  |  |  |  |  |
| 2 | Check the hydraulic joints for damage and leakage |  |  |  |  |  |
| 3 | Inspect the hydraulic oil level, refill if necessary |  |  |  |  |  |
| 4 | Refill the hydraulic oil ( 12 month or 1500 working hours ) |  |  |  |  |  |
| 5 | Check and adjust function of the pressure valve (1500kg+0/+10%) |  |  |  |  |  |
| Mechanical system | | | | | |  |
| 6 | Inspect the forks for deformation and cracks |  |  |  |  |  |
| 7 | Check the chassis for deformation and cracks |  |  |  |  |  |
| 8 | Check if all screws are fixed |  |  |  |  |  |
| 9 | Check the push rods for deformation and damages |  |  |  |  |  |
| 10 | Check the gearbox for noise and leakage |  |  |  |  |  |
| 11 | Inspect the wheels for deformation and damages |  |  |  |  |  |
| 12 | Inspect and lubricate the steering bearing |  |  |  |  |  |
| 13 | Inspect and lubricate the pivot points |  |  |  |  |  |
| 14 | Lubricate the grease nipples |  |  |  |  |  |
| Electrical system | | | | | |  |
| 15 | Inspect the electric wiring for damage |  |  |  |  |  |
| 16 | Check the electric connections and terminals |  |  |  |  |  |
| 17 | Test the Emergency switch function |  |  |  |  |  |
| 18 | Check the electric drive motor for noise and damages |  |  |  |  |  |
| 19 | Test the display |  |  |  |  |  |
| 20 | Check, if correct fuses are used |  |  |  |  |  |
| 21 | Test the warning signal |  |  |  |  |  |
| 22 | Check the contactor(s) |  |  |  |  |  |
| 23 | Check the frame leakage (insulation test) |  |  |  |  |  |
| 24 | Check function and mechanical wear of the accelerator |  |  |  |  |  |
| 25 | Check the electrical system of the drive motor |  |  |  |  |  |
| Braking system | | | | | |  |
| 26 | Check brake performance, if necessary replace the brake disc or adjust the air gap |  |  |  |  |  |
| Battery | | | | | |  |
| 27 | Check the battery voltage |  |  |  |  |  |
| 28 | Clean and grease the terminals and check for corrosion and damage |  |  |  |  |  |
| 29 | Check the battery housing for damages |  |  |  |  |  |
| Charger | | | | | |  |
| 30 | Check the main power cable for damages |  |  |  |  |  |
| 31 | Check the start-up protection during charging |  |  |  |  |  |
| Function | | | | | |  |
| 2 | | | | | | |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |  |
|  | 32 | Check the horn function |  |  |  |  |  |
| 33 | Check the air gap of the electromagnetic brake |  |  |  |  |  |
| 34 | Test the emergency braking |  |  |  |  |  |
| 35 | Test the reverse and regenerative braking |  |  |  |  |  |
| 36 | Test the safety (belly) button function |  |  |  |  |  |
| 37 | Check the steering function |  |  |  |  |  |
| 38 | Check the lifting and lowering function |  |  |  |  |  |
| 39 | Check the tiller arm switch function |  |  |  |  |  |
| General | | | | | |  |
| 40 | Check if all decals are legible and complete |  |  |  |  |  |
| 41 | Inspect the castors, adjust the height or replace these if worn out. |  |  |  |  |  |
| 42 | Carry out a test run |  |  |  |  |  |
| 1. **Lubricating points**   Lubricate the marked points according to the maintenance checklist. The required grease specification is: DIN 51825, standard grease.   * 1. Load roller bearing   2. Cylinder   3. Axle   4. Bearing   5. Gear box   6. Side roller bearing   7. Connection point   Fig. 1: Lubricating points  3 | | | | | | |  |



# Check and refill hydraulic oil

It is recommended to use hydraulic oil in connection with average temperature:

|  |  |  |
| --- | --- | --- |
| Environment temperature | –5℃~25℃ | >25℃ |
| Type | HVLP 32， DIN 51524 | HLP 46， DIN 51524 |
| Viscosity | 28.8-35.2 | 41.4 - 47 |
| Amount | 0.4L | |

Waste material like oil, used batteries or other must be probably disposed and recycled according to the national regulations and if necessary brought to a recycling company.

The oil level height shall be in the not lifted position min. 0.3L to 0.5L. If necessary add oil at the filling point.

# Checking electrical fuses

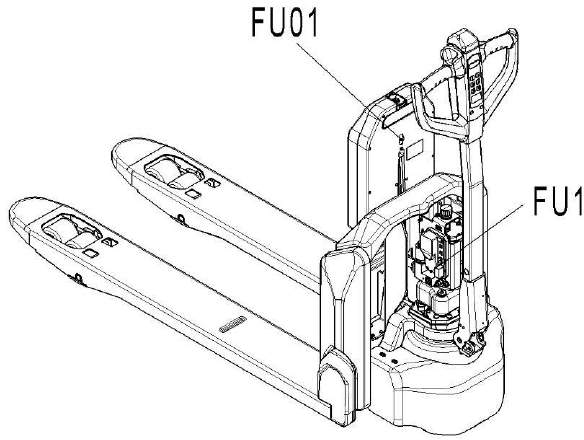
 Fig. 2: Location of fuses

Table 2: Size of the fuses

|  |  |
| --- | --- |
|  | Rate |
| FU 1 | 10A |
| FU 01 | 70A |

# TROUBLE SHOOTING

# Common trouble shooting

If the truck has malfunctions follow the instructions, mentioned in chapter 6.

Table 3: Trouble shooting

|  |  |  |
| --- | --- | --- |
| TROUBLE | CAUSE | REPAIR |
| Load can’t be lifted | Load weight too high | Lift only the max. capacity, mentioned on the ID-plate |
| Battery discharged | Charge the battery |
| Lifting fuse faulty | Check and eventually replace the lifting fuse |
| Hydraulic oil level too  low | Check and eventually refill hydraulic oil |
| Oil leakage | Repair the sealing of the cylinder |
| Oil leakage from air  breathing | Excessive quantity of oil. | Reduce oil quantity. |
| Truck not starts operating | Battery is charging | Charge the battery completely and then remove the  main power plug form the electrical socket. |
| Battery not connected | Connect the battery correctly |
| Fuse faulty | Check and eventually replace fuses |
| Low battery | Charge the battery |
| Emergency switch is  activated | Turn the emergency clockwise |
| Tiller in the operating | Move the tiller firstly to the braking zone. |

If the truck has malfunctions and can’t be operated out of the working zone, jack the truck up and go with a load handler under the truck and safe the truck securely. Then move truck out of the aisle.

# Fault code

When is on, means there is fault of the truck, you can remove the code on LCD with the help of following table.

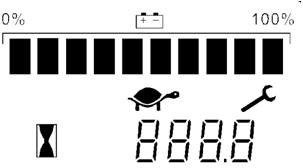


Table 4: Fault code list

|  |  |  |  |
| --- | --- | --- | --- |
| Fault  code | Description | Possible reasons | Source of  failure |
| 0 | LOW BDI | Low battery power | Controller |
| 1 | PUMP SRO FAULT | Lifting or lowering switch is activated earlier  than key switch | Controller |
| 2 | SRO FAULT | Operation sequence of direction, inter-lock and  key switch is not correct. | Controller |
| 3 | HPD FAULT | Operation sequence of inter-lock and accelerator is not correct; or accelerator is not returned to neutral position after emergency  button is activated. | Controller |
| 4 | WAITING FAULT | Accelerator:   1. Misadjusted throttle. 2. Broken throttle pot or throttle mechanism. | Controller |
| 5 | THROTTLE FAULT | Accelerator wiring:   1. Throttle input wire open or shorted. 2. Throttle pot defective. | Controller |
| 6 | PRECHARGE FAULT | Controller doesn’t work | Controller |
| 7 | MAIN DRIVER FAULT | Internal relay coil is broken, replace controller. | Controller |
| 8 | MAIN RELAY WELDED | 1. Internal relay welded. 2. Controller defective. | Controller |
| 9 | MAIN RELAY DNC | 1. Internal relay was commanded to be close and it did not. 2. Internal relay tips are oxidized. | Controller |
| 10 | BRAKE OFF FAULT | 1. Electromagnetic brake driver open. 2. Electromagnetic brake coil shorted. | Controller |
| 11 | MOTOR OVER TEMPERATURE | Motor overheating | Controller |
| 12 | BATTERY DISCONNECT FAULT | 1. Battery not connected. 2. Poor connection to battery terminals. | Controller |
| 13 | BRAKE ON FAULT | 1. Electromagnetic brake driver shorted. 2. Electromagnetic brake coil open. | Controller |
| 14 | CURRENT SENSE FAULT | Controller doesn’t work | Controller |
| 15 | HARDWARE FAULT | 1. Motor voltage does not correspond to throttle request. 2. Controller failure. | Controller |
| 16 | SOFTWARE FAULT | 1. Software defective. 2. Controller defective. | Controller |
| 17 | PARAMETER CHANGE FAULT | 1. One parameter value is changed that requires a power cycle (such as Throttle Type, Interlock Type, Driver Type, EMR Type, Pump SRO Type, AUX Switch Input Type) 2. Parameters are restored   to the default settings | Controller |
| 18 | MOTOR SHORT | Motor short circuit | Controller |

|  |  |  |  |
| --- | --- | --- | --- |
| 19 | MOTOR OPEN | 1. Motor wires open. 2. Faulty motor cable wiring. 3. Controller defective. | Controller |
| 20 | CONTROLLER OVERCURRENT | Controller defective. | Controller |
| 21 | MOTOR TEMP HOT CUTBACK | 1. Excessive load on vehicle. 2. Controller is operating in extreme high temperature. | Controller |
| 22 | CONTROLLER OVERTEMP  CUTBACK | 1. Excessive load on vehicle. 2. Controller is operating in high temperature. | Controller |
| 23 | CONTROLLER UNDERTEMP | 1. Controller is operating in extreme low temperature. 2. The temperature sensor is broken. | Controller |
| 24 | CONTROLLER SEVERE  OVERTEMP | 1. Excessive load on vehicle. 2. Controller is operating in high temperature. | Controller |
| 25 | OVERVOLTAGE CUTBACK | 1. Battery voltage >Overvoltage Cutback point. 2. Vehicle operating with charger attached. 3. Intermittent battery connection. | Controller |
| 26 | SEVERE OVERVOLTAGE | 1. Battery voltage >34.0V 2. Vehicle operating with charger attached. 3. Intermittent battery connection. | Controller |
| 27 | UNDERVOLTAGE CUTBACK | 1. Battery voltage <16.8V 2. Bad connection at battery or controller. | Controller |
| 28 | SEVERE UNDERVOLTAGE | Battery voltage <13.8V | Controller |
| 29 | PARAMETER FAULT | 1. The CRC of the parameters does not calculate correctly. 2. Controller defective. | Controller |
| 32 | PDO TIMEOUT | Communication between the 1212C and the  CAN tiller has halted. | Controller |
| 33 | LIFT DRIVER FAULT | Lifting contactor is open or shorted. | Controller |
| 34 | LOWER DRIVER FAULT | Lowering electromagnetic is open or shorted. | Controller |
| 36 | BMS PDO TIMEOUT | Communication between the 1212C and the  BMS has halted. | Controller |
| 37 | EMR SEQUENCING FAULT | 1. Emergency button is activated before truck is turned on. 2. Micro switch inside the emergency button is defective. 3. Cable from micro switch to controller is   broken. | Controller |
| 39 | COAST SRO FAULT | Vertical driving is activated earlier than key switch or when vertical driving is closed, inter-  lock switch from ON to OFF | Controller |
| 80 | Mode fault | Turtle button doesn’t work | Tiller |
| 81 | Lift fault | Lifting button doesn’t work | Tiller |
| 82 | Lower fault | Lowering button doesn’t work | Tiller |
| 83 | BMS Communication Outage | Lithium battery communication has halted: | Tiller |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 1. BMS failure. 2. Cable from lithium battery to tiller is broken. 3. Communication module of tiller is defective. |  |
| 90 | Over Voltage | High battery voltage:   1. Overcharging. 2. BMS failure. 3. Big current from motor during driving down from ramp. | Lithium battery |
| 91 | Over Discharge | Battery over discharged.   1. Battery is not used for long time. 2. Overused. | Lithium battery |
| 92 | Communication Outage | Battery communication has halted. | Lithium  battery |
| 93 | Under Voltage | Battery low voltage:   1. Discharged. 2. Battery cell defective. | Lithium battery |
| 94 | Over Current | Overcorrect:   1. Unapproved adjustment of default parameters. 2. Wrong parameter after replacement of controller. 3. Current detection failure of lithium battery. | Lithium battery |
| 95 | Over Temperature Protect | Extremely high battery temperature | Lithium  battery |
| 96 | Temperature Protect | High battery temperature | Lithium  battery |

# WIRING/ CIRCUIT DIAGRAM

# Electrical circuit diagram

### Without speed reduction on curves

FU 1 : 10A FU 01 : 70A

Fig. 3: Electric diagram

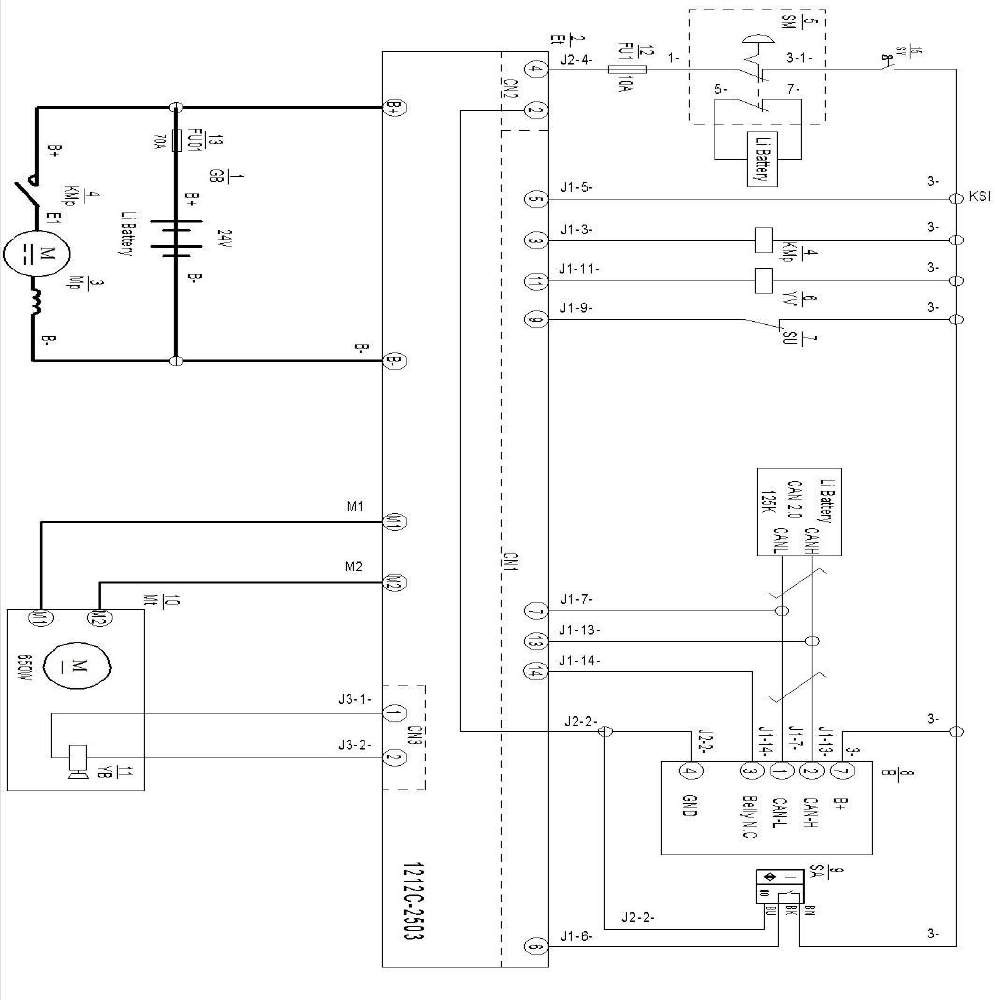


Table 5: Description of electrical diagram

|  |  |  |  |
| --- | --- | --- | --- |
| Code | Item | Code | Item |
| GB | Battery | B | CAN tiller |
| Et | Controller | SA | Proximity switch |
| Mp | Pump motor | Mt | Traction motor |
| KMp | Pump contactor | YB | Electromagnetic brake |
| SM | Emergency button | FU1 | 10A fuse |
| YV | Electromagnetic valve | FU01 | 70A fuse |
| SU | Micro switch |  |  |

### 

**With speed reduction on curves**

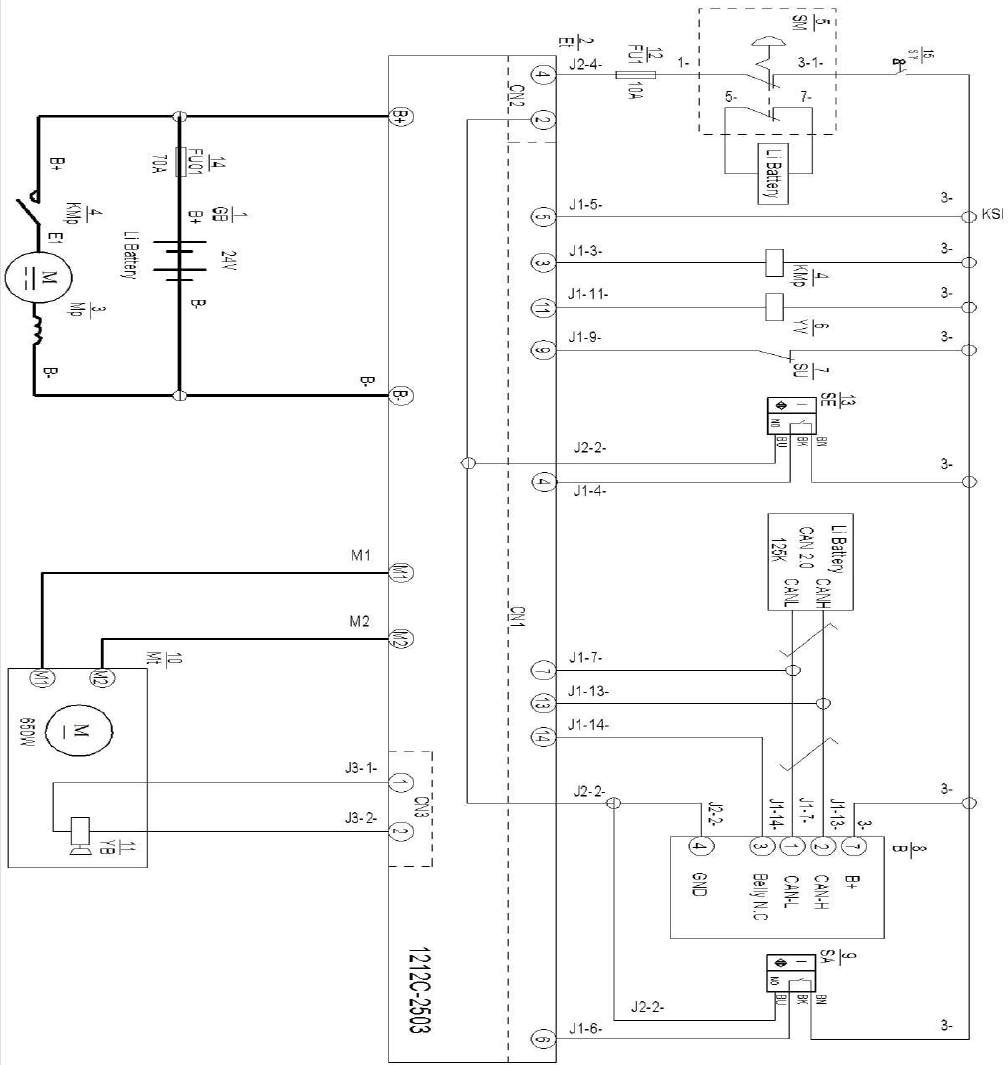


Fig.4: Electric diagram

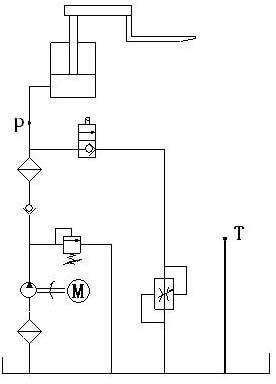
FU1 : 10A FU01 : 70A

Table 6: Description of electrical diagram

|  |  |  |  |
| --- | --- | --- | --- |
| Code | Item | Code | Item |
| GB | Battery | B | CAN tiller |
| Et | Controller | SA | Proximity switch |
| Mp | Pump motor | Mt | Traction motor |
| KMp | Pump contactor | YB | Electromagnetic brake |
| SM | Emergency button | FU1 | 10A fuse |
| YV | Electromagnetic valve | SE | Proximity switch |
| SU | Micro switch | FU01 | 70A fuse |

# Hydraulic circuit

Lifting cylinder Lowering valve



Pressure control valve

Throttle valve

Hydraulic power unit

Oil tank

Fig. 5 : Hydraulic circuit

**Hydraulic oil inspection**

|  |  |  |  |
| --- | --- | --- | --- |
| **Degree of purity** | **Smell** | **Status** | **Result** |
| Clear and same color as before | Good | Good | Can be used |
| Transparent | Good | Mixed with other oil | Can be used if viscosity is fine |
| Milky | Good | Mixed with water and air | Separate water or replace  hydraulic oil |
| Brown | Bad | Oxidation | Replace hydraulic oil |
| Transparent but with particles | Good | Mixed with other particles | Can be used after filtering |

# MAINTENANCE OF MAIN COMPONENTS

## Battery replacement



**Oulock the battery and pull out from the top.**

* 1. **Outer-appearance parts**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Remove two screws with 4mm Allen wrench, take out the cover from top.** | **Remove each side two screws with 6mm Allen wrench to take out the**  **apron.** | **Remove each side two screws with 6mm Allen wrench to take out the**  **top metal part.** |
|  |  |  |
| **Remove each side one screw with 6mm Allen**  **wrench.** | **Remove two screws with 6mm Allen wrench.** | **Remove three screws with 6mm Allen wrench.** |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Remove two screws with 5mm Allen wrench.** | **Disconnect plugs to remove tiller assembly.** | **Remove four screws with 5mm Allen wrench to**  **disassemble the tiller head** |

* 1. **Tiller**

### Tiller assembly

1. **Tiller**

1. **Disassembly of air spring**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Remove the screw with 5mm Allen**  **wrench** | **Remove the circlip with circlip plier.** | **Remove the axle.** | **Remove circlip and axle.** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Push two sides of the plastic clamp to the middle to remove the button.** | **After button is disassembled, remove the screw with screwdriver to take out the micro switch.** | **Remove the screw with 3mm Allen wrench to disassemble the accelerator.** | **Remove the screw inside with 4mm Allen wrench to take out the grip.** |

1. **Assembly of air spring**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Put the air spring into tiller arm.** | **Insert the axle.** | **Make hole of axle and hole of screw on the same level**  **with Allen wrench.** | **Support the air**  **spring with flat metal tool to fix the screw.** |

* 1. **Cylinder**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Remove the screw**  **with 5mm Allen** | **Put a wooden**  **block under the** | **Power on the**  **truck, activate the** | **Turn over the**  **cylinder.** |

|  |  |  |  |
| --- | --- | --- | --- |
| **wrench.** | **chassis.** | **lowering button and apply some force on top of the cylinder to retract**  **the piston rod.** |  |
|  |  |  |  |
| **Pull out the**  **protective cover from top.** | **Disconnect the cylinder from**  **pump with 5mm Allen wrench.**  **During assembly, it’s required to apply thread**  **locker with 1243**  **model.** | **After disconnection, there is an O ring on the valve; the specification is 13.5\*1.8.** | **Remove four screws with 6mm Allen wrench.**  **During assembly, it’s required to apply thread**  **locker with 1222 model.** |

* 1. **Pump**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Remove the screw with 5mm Allen**  **wrench.** | **Remove the screw with 5mm Allen**  **wrench.** | **Remove the screw with 5mm Allen**  **wrench.** | **Put a wooden**  **block under the chassis.** |
|  |  |  |  |
| **Power on the truck, activate the**  **lowering button and apply some force on top of the cylinder to retract the piston rod.** | **Turn over the cylinder.** | **Disconnect the cylinder from**  **pump with 5mm Allen wrench.**  **During assembly, it’s required to apply thread**  **locker with 1243**  **model.** | **After disconnection, there is an O ring on the valve; the specification is 13.5\*1.8.** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Loosen the clamp with screwdriver.** | **Disconnect the oil tank from pump; during assembly ensure O ring is**  **inside the groove.** | **Loosen the screw with 10mm wrench (anti-clockwise)**  **before adjusting the pressure of pump.** | **Tighten screw with 3mm Allen wrench to increase the**  **pressure or loosen the screw to**  **release the**  **pressure.** |

* 1. **Drivng unit**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Remove three screws**  **with 5mm Allen wrench.** | **Remove four screws with 6mm Allen wrench. It’s required to apply thread**  **locker with 1243 model.** | **Remove the driving unit from the chassis.**  **Note**：**Bearing**  **specification is GB276-**  **6013-2RS.** |
|  |  |  |
| **First remove the** | **Remove the screw with** |  |
| **bearing, then remove** | **5mm Allen wrench to** |
| **four screws under the** | **take out the plastic** |
| **bearing with 6mm Allen** | **cover.** |
| **wrench to take out the** |  |
| **flange. It’s required to** |  |
| **apply thread locker with** |  |
| **1243 model.** |  |
| **Note**：**Bearing** |  |
| **specification is GB297-** |  |
| **32913.** |  |

* 1. **Brake**

|  |  |
| --- | --- |
|  |  |
| **Remove the plastic** | **Remove three screws** |
| **cover before** | **with 4mm Allen** |
| **replacement of brake,** | **wrench to take out the** |
| **it’s connected with** | **brake.** |
| **glue.** |  |

* 1. **Driving wheel**

|  |  |
| --- | --- |
|  |  |
| **Remove the screws** | **Remove 10 screws with** |
| **with 5mm Allen wrench** | **5mm Allen wrench, take** |
| **to take out the plug** | **out the wheel ring.** |
| **holder, then disconnect** |  |
| **the plug.** |  |

* 1. **Emergencvcy button**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Remove the cable clamp with**  **screwdriver.** | **Remove two screws on the right side of the frame with 5mm Allen wrench.** | **Remove screw on the left side of the frame with 5mm Allen wrench.** | **Remove the cable clamp; make sure during assembly of the clamp,**  **hook must be fixed with mounting frame rather than**  **controller.** |
|  |  |  |  |
| **Disconnect two plugs.** | **Hole the plug to disconnect from the frame.** | **Remove the cable under emergency button with**  **screwdriver.** | **Loosen the screw to remove the emergency**  **button.** |

* 1. **Controller**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **It’s recommended to make picture for the routing and**  **connection before controller is**  **disconnected. Four plugs here from top to bottom are battery positive pole, battery negative pole, motor negative pole and**  **motor positive pole.** | **Disconnect plugs.** | **Remove two screws with 5mm Allen**  **wrench to take out the controller.** |

* 1. **Contactor**

|  |  |
| --- | --- |
|  |  |
| **Disconnect cable**  **terminals with 10mm** | **Remove cables on**  **side.** |

|  |  |
| --- | --- |
| **wrench, and then remove one screw on mounting frame with screwdriver to take out the contactor**  **together with frame.** |  |

* 1. **Chassis**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Remove the elastic pin to take out the axle, then disconnect rock arm from chassis.**  **Note: elastic pin**  **specification is 6\*40.** | **Remove circlip to**  **disconnect rock arm from body.** | **First remove four elastic pins.**  **Note: elastic pin specification is 6\*40.5\*30.** |
|  |  |  |
| **Then remove the axle to replace the roller.** | **Remove elastic pin to disconnect frame of roller from chassis.**  **Note: elastic pin**  **specification is 5\*30.** | **Remove elastic pin to disconnect frame of roller from push rod.**  **Note: elastic pin**  **specification is 5\*28.** |

* 1. **Pump motor**

|  |  |
| --- | --- |
|  |  |
| **Remove cable** | **There are four** |
| **terminals from motor** | **carbon brushes after** |
| **with 10mm wrench,** | **motor cover is** |
| **and then remove two** | **removed.** |
| **screws on top of the** |  |
| **motor with 10mm** |  |
| **wrench to take out** |  |
| **the motor.** |  |

* 1. **Micro switch**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Remover three screws on the mounting frame with 5mm Allen wrench.** | **Pull out a little the mountign frame.** | **Remove screws with 3mm Allen wrench to take out the sensor.** |

* 1. **Side roller and adjustment**

|  |  |
| --- | --- |
|  |  |
| **Remove the nut with 17mm wrench to take out the bolt.** | **Tighten screw clockwise with**  **13mm wrench to increase the pressure or anti-clockwise to release the pressure.** |

# SCREW TORQUE

|  |  |  |  |
| --- | --- | --- | --- |
| **Picture** | **Position** | **Screw** | **Torque** |
|  | **Connection**  **between flange and driving unit.** | **GB70.1-M10x25-8.8** | **50N.m** |
|  | **Connection**  **between bearing cap and flange** | **GB70.2-M8x16-10.9** | **30N.m** |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Connection**  **between cylinder and driving wheel seat** | **GB70.1-M10x30-8.8** | **50N.m** |
|  | **Connection**  **between pump and cylinder** | **Screw GB70.1- M6x16-8.8;**  **Washer GB97.1-6- 200HV** | **8 N.m** |
|  | **Connection between side**  **roller and driving wheel seat** | **Screw GB70.1- M10x25-8.8;**  **Washer GB97.1-10- 200HV** | **50N.m** |

# BUSHING SPECIFICATION

