



LITHIUM CHARGER INSTALLATION AND MAINTENANCE MANUAL

Based on YIFINE KZA5, AI-POWER & ADY charger

valid for all lithium battery chargers

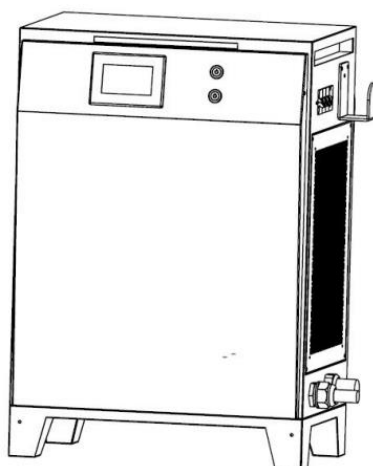
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SHANGHAI YIFINE ELECTRIC CO., LTD



Guangdong Alpower New Energy Technology Co.,Ltd.



POWER
ADY 安德普
卓越的工业电池智能充电器



INTRODUCTION

The purpose of this manual is to understand the key working principles of the charger to ensure the correct operational procedure is followed for charging of the battery.

The correct installation guidelines and requirements for power inlet and output sockets that should be followed for ensuring that the charger operates and performs correctly.

Understanding the routine maintenance of the charger that is imperative for the prevention of premature internal part or component failures leading to charger malfunctions and shut-down.

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1 Working principle

1.1 Overview

The charger consists of a rectifier filter circuit, high frequency switching inverter circuit, PWM (Pulse Width Modulation) control circuit, output rectifier wave circuit, reverse protection, short circuit protection, hardware protection circuit and auxiliary power circuit.

1.2 Brief description of operation sequence.

After the main circuit breaker on the charger is powered (**ON**) the charger performs the self-test function.

The self-test function has concluded when the charger display becomes active and communication with battery BMS commences.

Once charger communication with the BMS has obtained charging current and state of charge (SOC) from the BMS the charger then detects that both ends of the battery voltage is normal, the charger control board that controls the power module (High Frequency Inverter) then request a higher than battery voltage charge output.

The control board, then closes (energizes) the charge relay (contactor located inside the battery) to direct charger current to the battery.

Charge current continues to be controlled by the charger's control circuit as reference information is communicated to the charger control board from the BMS controller unit.

Once the SOC status nears 95% the BMS via the charger control board requests charging current to be gradually shut-down, this period also balances the individual battery cells.

This can be observed on the display as a gradual reduction of output charge current (ampere reading) that continues for the last few minutes of charging, until charging completely stops.

2. Charger Installation

2.1 Environmental conditions for installation

If the installation is indoors. A dedicated area should be selected that must be free of excessive dust, moisture or any other contaminants that is detrimental to the internal electronic components.

If the installation is outdoors. The area must be windproof, dustproof, rainproof, protected from direct sunlight and isolated from any other outdoor elements that could have negative impacts on the internal, as well as external charger components.

Note: Indoor and outdoor conditions must maintain an area (free of direct sunlight, dust, corrosive gases, flammable gases, oily mildew, steam, dripping water etc.)

A safe environment temperature of **(-20 – +50 degrees Celsius)** should be maintained for both indoor and outdoor installations.

The charger should have no less than 200mm of spacing between the charger assembly and nearest wall or encloser if used.

2.2 Charger installation

The charger must be installed horizontally on the chassis base structure. This will ensure sufficient space for heat dissipation allowing the charger to withstand higher temperatures during higher generated charging currents.

Note: Do not install the charger upside down, on the chassis sides or tilted skew, these conditions can compromise cooling airflow.

During charging heat is generated, ensure that the charger is not installed where external heat sources are present. This will have a negative impact on the standard operating values and will affect performance and the reliability on internal components.

Ensure that no foreign matter such as wood chips, paper, metal fragments or other debris enters the charger casing, such contamination can trigger fires.

The charging socket should also remain capped when not in use.

2.3 Supply pre-testing & specifications

Ensure that AC supply socket connections are adequately secured, has no poor phase connections and switch is operating correctly.

Note: If any of the phase connections are bad, this will have a direct impact on the charger performance and operation.

The following is important and must be applied for the various charger models:

- 1. 48v-100amp charger – 3 phase 32amp supply input**
- 2. 48v-150amp charger – 3 phase 32amp supply input**
- 3. 48v-200amp charger – 3 phase 32amp supply input**
- 4. 80v-100amp charger – 3 phase 32amp supply input**
- 5. 80v-150amp charger – 3 phase 63amp supply input**
- 6. 80v-200amp charger – 3 phase 63amp supply input**

2.4 Connecting charger to battery and testing

Check that the charger main circuit breaker is on the **OFF** position.

Ensure that the charging gun (socket on the output charger cable) is firmly and fully connected to the battery charge socket to engage charge and communication cables.

Ensure that the battery emergency stop switch is in the **ON** position.

Switch the main circuit breaker to the **ON** position and observe the following on the charger;

1. The communication LED (yellow) indicates normal active state – illuminated.
2. Display indicates SOC, battery voltage, charging amps and the charging bars are active.
3. Charging LED (green) lit to indicate charging active.
4. Charging amp value will indicate close to charger rating (99.1amp) for 100amp charger.
5. The display will indicate increase in battery voltage as SOC indication also increases.

Note: To ensure that maximum service life of the battery is maintained, perform a full charge cycle for every 4 intermittent charges (less than full charge) of the battery.

During every full charge cycle the final 5% of the charging process before 100% SOC is achieved, the charger performs the essential balancing of the battery cells via the BMS unit.

The more this balanced state can be maintained, the more accurate the SOC readings will be and more equal the spread of load over the battery cells, that in turn maximises the service life of the battery.

If charging has not completed and charging needs to be stopped, proceed by pushing and holding in the RED charger STOP BUTTON, until the charger shut-down process begins. (This can be heard by the sound of the cooling fans slowing down and charging pulses gradually shutting down).

3 Maintenance

3.1 Routine inspections

With the main power **ON** do not remove the charger covers and observe the following;

1. Check the display information data that charging performance conforms with charger specification (output ampere readings, battery voltage and SOC value).
2. Observe and check that all environmental requirements comply with installation parameters, (check that no outside elements are present that may compromise the charger).
3. Observe and inspect that all function switches are normal and free of damage and secured correctly and firmly in place etc.
4. Observe that no abnormal, sounds, vibrations or odour such as burnt smells are emitted during the charging process.
5. Listen that the cooling fan or fans are operational with not abnormal noise being present.
6. Observe whether abnormally high temperatures or overheating are present and if any visible evidence of discoloration is present.
7. Observe whether all cables and connections are fastened well and that all cable locks are securely in place.

3.2 Regular Maintenance

With the main power **OFF** remove/open the charger inspection cover of the chassis and perform the following;

1. Clean out any dust that has collected in the air flow passage of the cooling fans.
2. Check if all cooling fans turn freely without any resistance.
3. Check that all cooling fan wiring and connections are secured and in good condition.
4. Check that the power contactor high current cables are firmly secured and have no evidence suggesting overheating.
5. Check that the main power contactor, stop and start switches are secured correctly and operating.
6. Check the condition of output power cables, insulation, connector and CAN harness wiring and connectors.

4 Trouble shooting

Fault code list – Yifine KZA5 charger

Display screen fault codes

- E02 – under pressure
- E03 – over-pressure
- E04 – over-current
- E05- Over temperature
- E06 – Charging abnormality fault
- E07 – Charger failure
- E08 – Module 1 failure
- E09 – Module 2 failure
- E10 – Module 3 failure
- E11 – Module 4 failure
- E31 – Output over-voltage
- E32 – Module over-temperature
- E33 – Input failure
- E34 – Communication lack of phase
- E36 – Output over-voltage
- E37 – Address repeat
- E38 – Fan failure

Common faults

1. No display – Input power fault (no supply) – insufficient power or loss of a phase or phases
2. No Communication light – Charger display panel failure for the following reasons
 - 2.1. Poor connection between display board and motherboard – repair
 - 2.2. Motherboard problem – Replace
 - 2.3. Display board problem – replace
3. Communication light flashes – flashing indicates no communication between charger and BMS
 - 3.1. Battery specification does not match charger (Protocol miss-match)
 - 3.2. Charger connector not fully in place (communication contacts not connecting securely)
 - 3.3. Communication harness fault or connections interference – repair or replace
 - 3.4. Motherboard problem – replace
4. Overcurrent protection activated – Output current has exceeded 120% of rated current (module fault – replace)
5. Display does not indicate battery presence – Communication light will flash, voltage displayed without communication light and start button inaction (None responsive)
 - 5.1. Battery specification does not match charger – battery miss-match
 - 5.2. Battery not connected or reversed – check battery connection (can be caused when connector is damaged)
 - 5.3. Battery BMS not working – check BMS unit
 - 5.4. Motherboard problem or protocol problem – replace motherboard
6. No charge indication but communication is normal, start button does not respond –
 - 6.1. Battery relay/contactors problem – check battery relay/ contactor continuity with multimeter
 - 6.2. No charge indication – battery full – no charger required

- 6.3. No voltage indication, battery power loss – communication problem check charger AC main switch, restart battery at main stop switch
- 6.4. If communication failure continues – check communication CAN lines and connector pins in socket
- 6.5. No fault detected in harness – mainboard problem (replace mainboard)
7. Voltage and indication normal but start button does not respond –
 - 7.1. Battery fully charged (no charge needed)
 - 7.2. Charge power failure – Check AC power switch and reset battery at battery shut-off switch
 - 7.3. Charger and BMS communication/protocol problem – check and read charger display and BDI for a fault message
8. Voltage or current not displayed –
 - 8.1. Measure if battery voltage is the same at both ends of the output and charge lines and consistent with the displayed voltage
 - 8.2. Check BMS demand current at charge contactor – demand is zero at BMS (BMS problem)
 - 8.3. If demand at charge contactor is not zero – charge module problem
 - 8.4. Display voltage higher than battery voltage – charger output relay/contactor open (not closing) Check 12v relay/contactor supply (active) – replace relay/contactor
9. Voltage and current low –
 - 9.1. Check BMS demand current is consistent with charger output current (check at charge contactor)
 - 9.2. Current less than BMS demand – module problem
10. Fault light on charging possible –
 - 10.1. Fault code E08 is module 1 fault – shut-down and restart (fault elimination – loss on internal communication – normal use restored)
11. Charging failure –
 - 11.1. Input power not on – check power switch
 - 11.2. Output current overload – control circuit fault or output short circuit (check output circuit and replace circuit board if faulty)
 - 11.3. Grid interference on input – turn off the charger and restart and check for recovery
 - 11.4. Input power supply voltage too low – check supply phase voltage for equal supply (correct if faulty)
 - 11.5. Check output cables and contacts for poor contact (oxidisation – clean and restore poor contacts)
 - 11.6. Charger module failure – replace faulty module
12. The battery voltage is low, comm light is not on or flashing –
 - 12.1. Lithium battery is over-discharged, BMS discharge protection activated – select manual (force) charging.
 - 12.2. The battery specification is incorrect – check battery specification and correct.
 - 12.3. The communication harness is disconnected – check the comm harness & contacts
13. Overtemperature –
 - 13.1.1. Too high internal temperature – high ambient temp & poor heat dissipation. Charging will automatically resume after the temperature decreases.
 - 13.1.2. Thermistor damaged or related circuit failure – replace thermistor or replace main board.
 - 13.1.3. Fan damage - replace

AI Power charger fault code list

序号 NO.	类别 category	项目 project	描述 describe	处理措施 Treatment measures
1	软件保护 software protection	充电机输入过压保护 Input Overvoltage Protection	输入端电压高于过压保护允许值 The input voltage is higher than the allowable value of overvoltage protection	停止充电，检查充电机输入电源是否满足 380V+10% Stop charging and check if the charger input power supply meets 380V +10%.
2		充电机输入欠压保护 Input undervoltage protection	输入端电压低于允许值 Input voltage below allowable value	停止充电，检查充电机输入电源是否满足 380V+10% Stop charging and check if the charger input power supply meets 380V +10%.
3		充电机输出过压保护 Output Overvoltage Protection	输出端正负极间电压高于允许值 Output voltage between positive and negative poles is higher than allowable value	停止充电，检查充电机输出电压是否大于 91V Stop charging and check if the output voltage of the charger is greater than 91V
4		充电机输出欠压保护 Output undervoltage protection	输出端正负极间电压低于允许值 Output voltage between positive and negative poles is below allowable value	停止充电，检查充电机输出电压是否小于 62V Stop charging and check if the output voltage of the charger is less than 62V
5		充电机输出过流保护 Output overcurrent protection	输出端电流大于允许值 Output current greater than allowable value	停止充电，检查充电机输出电流设置，输出枪是否有破损，充电枪连接是否正常 Stop charging, check the output current settings of the charger, whether the output gun is damaged, and whether the connection of the charger gun is normal.
6		充电机通信断线保护 Communication Break Protection	主控与直流模块之间通信中断 Communication interruption between main control and DC module	停止充电，检查 CAN 通信线是否接触不良或者脱落 Stop charging and check whether the CAN communication line is in bad contact or falling off
7		充电机充电超时保护 Charging Overtime Protection	充电机连续充电时间超出允许值 Charger continuous charging Time over permissible value	停止充电，断电重新启动充电机 Stop charging, power off and restart charger
8		充电机温度过高保护 Overtemperature protection	充电机温度高于允许值 Charger temperature higher than allowable value	停止充电，检查温度传感触头是否损坏，或者使用环境温度过高 Stop charging and check whether the temperature sensor contacts are damaged or the ambient temperature is too high.
9		电池断开保护 Battery disconnection protection	充电机输出线未连接上电池 Charger Output Line Not Connected to Battery	停止充电，检查输出充电枪是否接触不良，或者 CAN 通信线接触不良 Stop charging and check whether the output charging gun is in bad contact or the CAN communication line is in bad contact.
10		充电机与 BMS 通信断线保护 Breaking Protection of Communication Between Charger and BMS	充电机与 BMS 之间通信中断 Interruption of communication between charger and BMS	停止充电，检查 CAN 通信线是否接触不良或者脱落 Stop charging and check whether the CAN communication line is in bad contact or falling off
11	硬件保护 hardware protection	输出过压保护 Output Overvoltage Protection	输出端正负极间电压高于允许值 Output voltage between positive and negative poles is higher than allowable value	停止充电，检查充电机输出电压是否大于 91V Stop charging and check if the output voltage of the charger is greater than 91V
12		输出过流保护 Output Overcurrent Protection	输出电流超出允许值 Output current exceeding allowable value	停止充电，检测充电机输出枪连接是否正常，或者有破损 Stop charging, check whether the charger output gun connection is normal or damaged
13		输出短路保护 Output Short Circuit Protection	输出正负极短接 Output positive and negative pole short connection	停止充电，检查输出充电枪是否存在对地短路或者正负极短路现象 Stop charging and check whether there is short circuit to ground or positive and negative poles in the output charging gun.
14		电池反接保护 Battery Back Connection Protection	电池输入端正负极接反 Reciprocating of positive and negative poles at battery input	停止充电，检查输出充电枪和电池是否存在正负极接反现象 Stop charging and check whether there is positive and negative pole connection between the output charging gun and the battery.

Common faults and solutions

故障现象 Fault phenomenon	原因分析及排除方法 Cause Analysis and Elimination Method
插枪无反应 No response to gun insertion	枪未插到位 The gun was not in place
输入过压/欠压 Input overvoltage/ undervoltage	电网电压异常, 请检查交流输入侧的电压是否过高或过低 Power grid voltage is abnormal, please check whether the voltage on AC input side is too high or too low.
输出过流 Output overcurrent	输出电流异常或参数设置错误, 请检查输出的电流是否在参数设置的范围内, 如果不是, 请检查输出电流是否过高 Output current is abnormal or parameter setting is wrong. Please check whether the output current is within the range of parameter setting. If not, check whether the output current is too high.
显示屏上有电压, 没有电流 There is voltage on the display screen while no current	请检查保险管是否烧坏 Please check if the fuse is burnt out.
BMS 通讯超时 BMS communication timeout	检查 CAN 通讯线是否开路 Check whether the CAN communication line is open

ADY Charger fault code list

Error code	Troubleshooting method
E01,E02,E03	1. Reconnect the charging module and the main control board after power off, including the communication line 2. Power on again and check whether the fault still exists 3. If the fault persists, please contact the after-sales replacement module or control board(Refer to the steps in Part 3 for removing the module)
Identify the problem	After switching to a certain module, the fault is eliminated, it can be determined that the fault is caused by the module, the module needs to be sent back to the manufacturer for analysis and maintenance
E04	1. First visually check whether the cooling and dustproof nets on both sides of the charger are clean 2. If it is not clean, please cut off the power to clean up the dust;(Refer to the corresponding steps in Part 3 for removing the air filter) 3. It is possible to power on without dust net and try to troubleshoot
Identify the problem	This fault is generally caused by the excessively high internal temperature of the charger due to untimely heat dissipation, and daily cleaning and maintenance of the heat dissipation and dustproof net
Error code	Troubleshooting method
E09	1. After power off, measure the positive and negative ends of the charger's output with the ohm of the multimeter to check whether it is in a short circuit state 2. If it is in a short circuit state, please contact the after-sales replacement module.(Refer to Part 3 for module replacement)
Identify the problem	This fault is usually caused by a short circuit in the internal rectifier module of the charger, resulting in a short circuit in the output. Replace the module row in turn to find out which module caused the overall short circuit
EB1,EB2,EB4	1. You can try to replace the charged battery system to check whether the fault still exists; 2. If there is no problem with other charging systems, you can contact the battery manufacturer to deal with the problem.
Identify the problem	This kind of problem is generally caused by a problem in the battery system, so first eliminate the problem on the battery side.
Code	Fault description
E01	The output voltage of the charger is higher than the preset value, please check the output voltage of the charger and contact after-sales support
E02	The output current of the charger is higher than the preset value, please check the output current value of the charger and contact after-sales support
E03	The communication between the internal modules of the charger is faulty, please check whether the communication bus between the internal modules of the charger is connected normally
E04	The temperature of the charger is higher than the set value, the charger is over-temperature protected, please check whether the dust net is covered with dust and other foreign objects, affecting the charger's heat
E09	The output of the charger module is short circuit, please use a multimeter to test the output resistance value of the module, and contact after-sales support
EB1	The battery voltage is too high, issued by BMS, please check whether the battery voltage value is abnormal
EB2	The battery current is too large, it is sent by BMS, please check whether the battery current value is abnormal
EB3	The communication between the charger and the BMS is faulty. The charger cannot detect the BMS message. Please check whether the communication between the charger and the battery BMS is established.
EB4	The battery temperature is too high, which is sent by BMS. Please check if the battery temperature value is abnormal

Error code	Troubleshooting method
Charger open circuit trip	1. Check whether the client grid is normal 2. Check whether the power supply line is connected according to the requirements of the manual 3. Disconnect the input power, open the MCB to determine whether the switch is OK 4. Turn off the power supply at the input end of the module in turn to check which module affects the trip
Identify the problem	If the MCB is not tripped after disconnecting the input power of one of the modules, it is determined that the MCB trip caused by the fault of the disconnected module requires replacing the corresponding charger module.
Error code	Troubleshooting method
EB3	1. First check whether the charger and battery connectors are inserted into place 2. Use a multimeter to measure whether the CAN resistance of the two holes of the communication pin of the connector is 120Ω 3. Disconnect the connector of the charger and connect the brown and blue line communication to the debugging charger 4. Check the communication protocol of the charger according to the battery used by the customer (manufacturer)
Identify the problem	If there is no resistance of 120Ω at both ends of the CAN pin, it is preliminarily determined that the communication cable is disconnected or disconnected. You need to disassemble the charger connector to check and confirm that the communication cable is disconnected or disconnected.

ADY Charger display status description

Status display status	State description
Self-checking	Check whether the battery is faulty, whether it is allowed to charge, and whether the charger itself is faulty
Ready	The self-test is normal and can be charged, please connect the battery and the charger
Charging	The battery is charging
Stop charging	The charging has been stopped when battery has not been fully charged
finished charging	SOC is equal to 100% or the charging voltage reaches 98% of the set voltage, BMS issues a stop charging command
Abnormal grid	The input voltage of the charger is higher or lower than the input voltage range, please check whether the grid voltage range is within the normal working voltage range of the charger, and whether the zero live wire is connected according to the requirements of the machine manual
Fan failure	Module fan works abnormally
Please connect the battery	The output cable is not connected to the battery or the hardware connection is poor, please check whether the charger DC output connector is connected to the battery
No battery voltage	Communication is established, but the charger does not detect the battery voltage
No charge	The battery is not allowed to be charged by the charger and is issued by the BMS. Please check whether the battery status is normal

END