



HEC-BAT-LVP50r3

用户手册

产品版本: V1.0

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1、介绍

1. 介绍

1.1 产品描述

HEC-BAT-LVP50r3 系统设计用于家庭光伏储能发电系统。该产品使用先进的磷酸铁锂电池，可搭配外装的混合逆变器，软件管理系统，光伏组件系统组成智能化小型储能系统，保障用户的电力供给，优化用户电力消费结构。

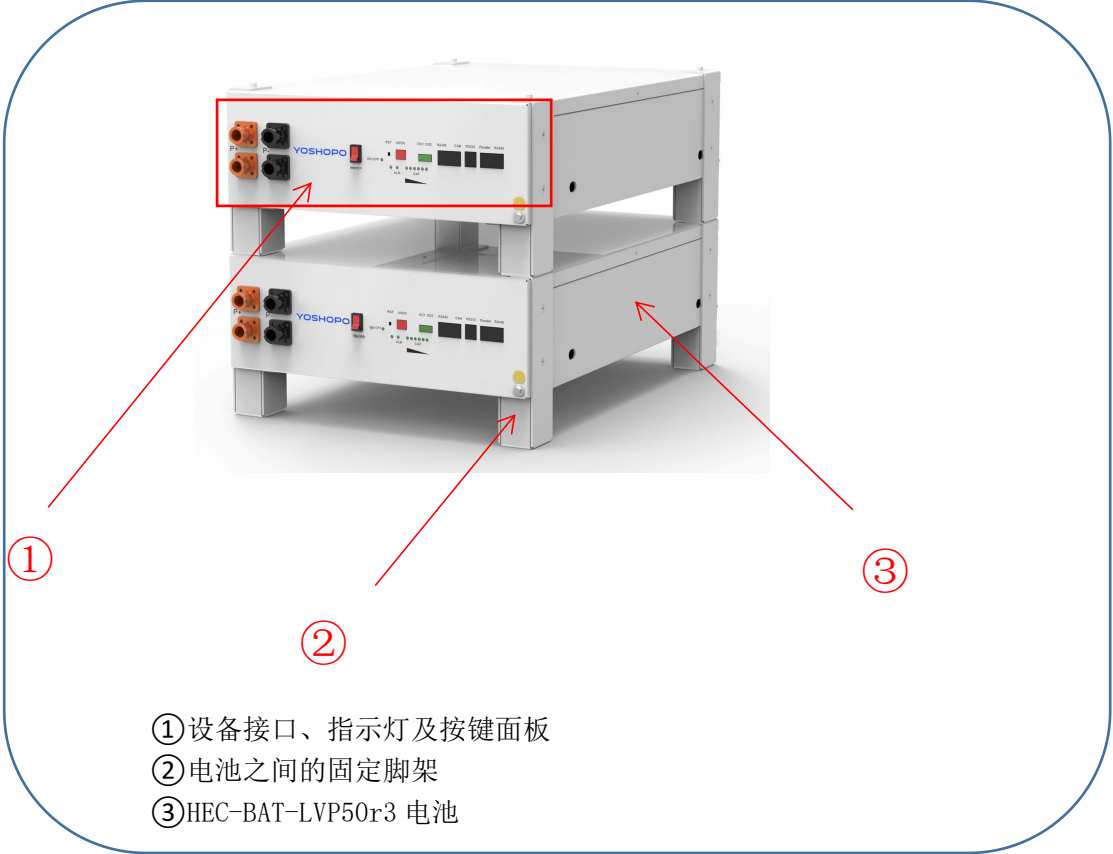
该设备可由 1~4 组 HEC-BAT-LVP50r3 电池随意组合运行。

图 1.1 HEC-BAT-LVP50r3 系统外观图（1~4 组电池为例）



1、介绍

图 1.2 设备部件



1.2 供货范围

HEC-BAT-LVP50r3 系统供货范围包括电箱本体和如下配件，请收到产品时检查配件是否齐全：

表 1.1 供货范围

序号	产品名称	规格	数量	单位	备注
1	磷酸铁锂电箱	HEC-BAT-LVP50r3， 100Ah, 51.2V；	1	套	
2	用户手册	用户手册*1	1	本	

请注意：收到产品后请核对配件是否齐全，如有缺失，请立即联系我们获取解决办法。不恰当的使用可能会导致触电或烧伤的危险。在安装和维护的过程中，必须严格按照本说明书上的指示进行操作。请在使用前仔细阅读此说明书，并对说明书妥善保管，以便日后参照，配件清单以合同为准。

2、安全指令

2. 安全指令

2.1 安全标识

安全标示是用来强调潜在安全风险和重要安全信息的，本说明书中使用的安全标识如下：



危险:

“危险”表示危险情况，如果不避免，将导致死亡或严重伤害。



警告:

“警告”表示危险情况，如果不避免，可能导致死亡或严重伤害。



警告:

“小心”表示危险情况，如果不避免，可能导致轻度或中度伤害。



注意:

“注意”提供了对产品的最佳操作有价值的提示。

2.2 标签说明

铭牌

Rechargeable Li-ion Battery System

Product Model Name: HEC-BAT-LVP50r3

Battery System Designation: IFpP/51/161/120/[16S]M/-20+50/90

Nominal Voltage: 51.2Vd.c.

Rated Capacity: 100Ah

Short Circuit Current: 2000A

Weight: 45kg

Duration at Short Circuit Current: 600μS

IP Code: IP22

Size: 387(W)×581(D)×133(H)mm

Hiconics Eco-energy Drive Technology Co., Ltd.

Add: No.3 Boxing 2nd Rd., Economic Technology Development Zone, Beijing 100176, CHINA

Web: <http://www.hiconics.com/>

2、安全指令

警示标签

图标	名称	含义
	必须戴防护眼镜标识	提醒操作者在安装、维修和拆卸等操作过程中需要佩戴防护眼镜。
	查看说明书标识	提醒操作者注意查看储能产品随箱的说明书。
	当心爆炸标识	提醒操作者安装产品时需要远离易燃易爆场所或区域。
	回收标识	提醒操作者产品报废后的回收需要通过专门的回收渠道。
	注意安全标识	提醒操作者使用产品过程中需要注意安全用电。
	电池回收标识	提醒操作者电池报废时需要咨询当地环保机关,寻求当地处置点资源回收。
	禁止随意丢弃标识	废旧电池禁止随意性丢弃,操作者需寻求资质机关进行合法合规处置。

2.3 使用须知

HEC-BAT-LVP50r3 系统是按照相关安全规定,并慎重考虑终端用户需求设计生产的。所以在安装使用本产品的过程中,必须按照以下要求进行:

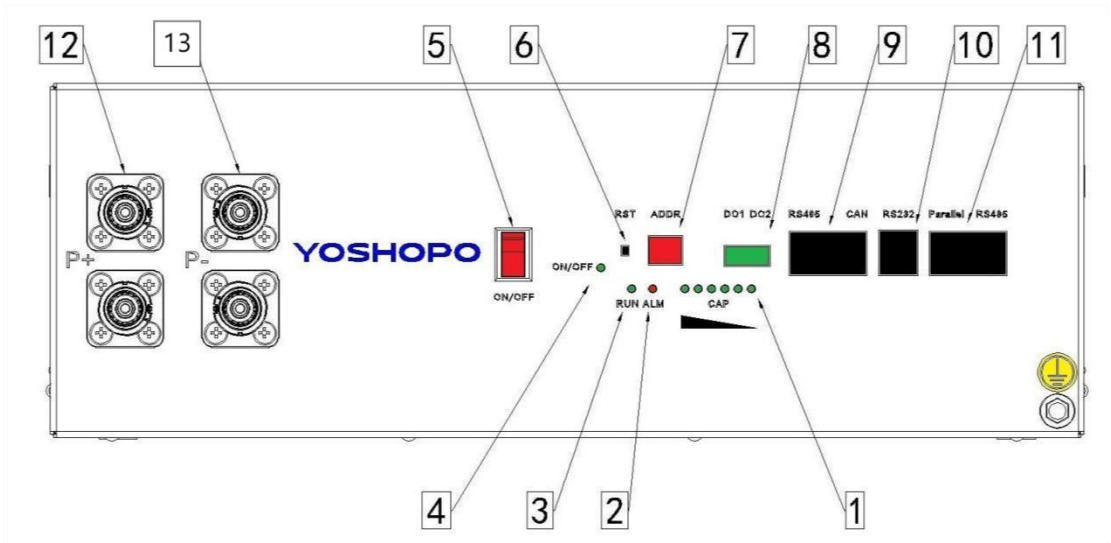
- 电箱之间的安装必须是稳固的;
- 产品必须安装到一个接地良好的外部系统中;
- 电气安装必须符合所有适用的法规和标准;
- 产品的安装必须按照本手册执行;
- 产品的安装必须按照正确的技术规格执行;
- 安装人员应确保受过严格的电气安装培训并取得相关特种作业证件;

2、安全指令

- 产品放置 3 个月需要补电一次, 标准充电到 40%SOC, $25\pm 2^{\circ}\text{C}$ 储存;

3、操作界面

3. 操作界面



HEC-BAT-LVP50r3 系统操作界面如上图所示；
HEC-BAT-LVP50r3 系统采用指示灯和按键，显示产品的状态，操作信息和设置。

3.1 指示灯

表 3.1 指示灯

序号	名称	说明
1	容量指示灯	CAP 灯，6 个电池容量指示灯。每个指示灯表示容量的 16.6%。
2	告警指示灯	ALM 灯，红色。电池系统有故障时灯亮。
3	运行指示灯	RUN 灯，绿色。充电时常亮，放电时闪烁。
4	状态指示灯	on/off 灯，绿色，开关键打开时常亮

表 3.2 容量灯（CAP）信息

状态		充电						放电					
容量指示灯		L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
电量(%)	0~16.6%	灭	灭	灭	灭	灭	闪2	灭	灭	灭	灭	灭	常亮
	16.6~33.2%	灭	灭	灭	灭	闪2	常亮	灭	灭	灭	灭	常亮	常亮
	33.2~49.8%	灭	灭	灭	闪2	常亮	常亮	灭	灭	灭	常亮	常亮	常亮
	49.8~66.4%	灭	灭	闪2	常亮	常亮	常亮	灭	灭	常亮	常亮	常亮	常亮
	66.4~83.0%	灭	闪2	常亮	常亮	常亮	常亮	灭	常亮	常亮	常亮	常亮	常亮
	83.0~100%	闪2	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮
运行指示灯 ●		常亮						闪烁(闪3)					

3、操作界面

表 3. 3LED 闪动说明

闪动方式	亮	灭
闪1	0. 25S	3. 75S
闪2	0. 5S	0. 5S
闪3	0. 5S	1. 5S

表 3. 4 指示灯说明

状态	正常/告警/ 保护	ON/OFF	RUN	ALM	电量指示LED						说明
											
关机	休眠	灭	灭	灭	灭	灭	灭	灭	灭	灭	全灭
待机	正常	常亮	闪1	灭	依据电量指示						待机状态
	告警	常亮	闪1	闪3							模块低压
充电	正常	常亮	常亮	灭	依据电量指示 (电量指示最高 LED闪2)						最高电量 LED闪动 (闪2) , 过充告警 时ALM不 闪烁
	告警	常亮	常亮	闪3							
	过充保护	常亮	常亮	灭	常亮	常亮	常亮	常亮	常亮	常亮	无市电, 指 示灯转待 机状态
	温度、过 流、失效 保护	常亮	灭	常亮	灭	灭	灭	灭	灭	灭	停止充电
放电	正常	常亮	闪3	灭	依据电量指示						
	告警	常亮	闪3	闪3							
	欠压保护	常亮	灭	灭	灭	灭	灭	灭	灭	灭	停止放电
	温度、过 流、短路、 反接、失 效保护	常亮	灭	常亮	灭	灭	灭	灭	灭	灭	停止放电
失效		灭	灭	常亮	灭	灭	灭	灭	灭	灭	停止充、 放电

3、操作界面

3.2 按键与接口

表 3.5 按键与接口

序号	名称	说明
5	开关键	系统进入正常运行状态或关机状态
6	复位键	RST 按键，系统出现异常时，可以使用此键对系统进行复位
7	拨码开关	ADDR 开关，设置模块地址
8	干接点	D01, D02，预留两路干接点输出
9	上位机通讯	RS485, CAN, 与 PCS 通讯（二选一），2 个 RJ45 接口
10	调试口	RS232，调试用接口
11	并联通讯接口	ParallelRS485，并联模块通讯，2 个 RJ45 接口
12	电池正极接线端	用于连接电池模块正极
13	电池负极接线端	用于连接电池模块负极

蜂鸣器动作说明

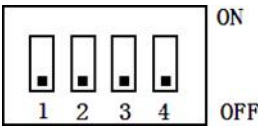
故障时，每 1S 鸣叫 0.25S；保护时，每 2S 鸣叫 0.25S（过压保护除外）；告警时，每 3S 鸣叫 0.25S（过压告警除外）；蜂鸣器功能可通过上位机使能或禁止，出厂默认是禁止的。

复位键（RST）说明

BMS 处于休眠状态时，按下按键（3~6S）后松开，保护板被激活，LED 指示灯从“RUN”开始依次点亮 0.5 秒。BMS 处于激活状态时，按下按键（3~6S）后松开，保护板被休眠，LED 指示灯从最低电量灯开始依次点亮 0.5 秒。BMS 处于激活状态时，按下按键（6~10S）后松开，保护板被复位，LED 灯全部同时点亮 1.5 秒。

BMS 被复位后仍保留通过上位机设置的参数和功能，如果需要恢复到初始参数可以通过上位机的“恢复默认值”来实现，但相关运行记录和存储数据保持不变（如电量、循环次数、保护记录等）。

拨码开关设置



当 PACK 作并联使用时，可通过 BMS 上的拨码开关设置地址区分不同的 PACK，需避免地址设为相同，BMS 拨码开关的定义参照下表。

表 3.6 拨码开关地址表

地址	拨码开关位置			
	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF

3、操作界面

6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

4、产品安装

4. 产品安装

4.1 选择安装位置

选择一个安装产品的位置，应考虑到以下因素：

- 请勿将产品安装在不透风的密闭空间，为避免设备过热，请确保产品周围空气的流动性。
- HEC-BAT-LVP50r3 系统设计为户内应用的电源产品，请勿户外安装。
- 避免阳光直射和环境高温，否则会导致其运行温度过高，从而影响转换效率。
- HEC-BAT-LVP50r3 系统设计的电芯工作温度范围为 $-20\sim 55^{\circ}\text{C}$ ，最佳的工作温度为 $0\sim 25^{\circ}\text{C}$ ，建议安装的环境温度应处于 $-20^{\circ}\text{C}\sim 45^{\circ}\text{C}$ 范围之内。
- 安装应考虑状态指示灯及按键可操作性。
- 如果安装在密闭环境，必须要提供足够的通风条件。



安全提示：电源产品周围不要存储或放置任何物品。

4、产品安装

4.2 系统安装准备

系统尺寸：

表 4.1 系统尺寸

1 组电箱	尺寸	387 (W)*581 (D)*133 (H) mm
	重量	45Kg（不带脚架）
2 组电箱	尺寸	392 (W)*591 (D)*391 (H) mm
	重量	93kg（带两套脚架）
3 组电箱	尺寸	392 (W)*591 (D)*584 (H) mm
	重量	139.5kg（带三套脚架）
4 组电箱	尺寸	392 (W)*591 (D)*777 (H) mm
	重量	186kg（带四套脚架）

安装准备：

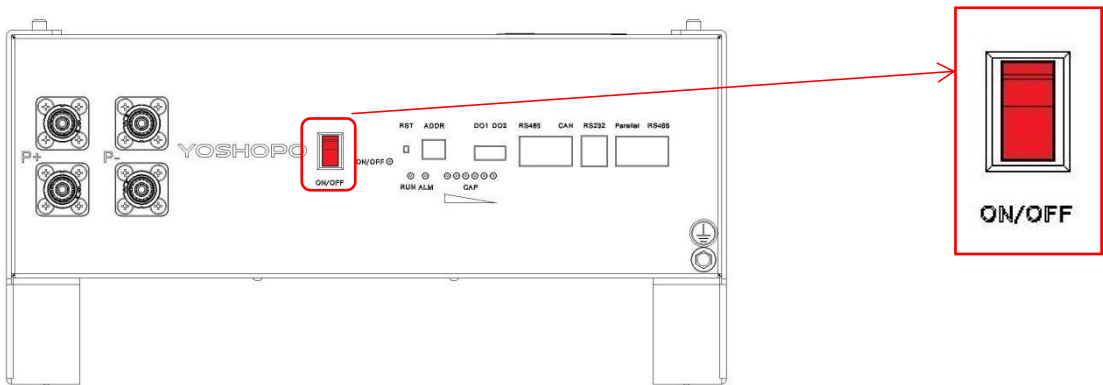
- 请按照所购买的机型准备您的设备安装空间。
- 系统必须垂直地面安装，请确保安装地面平整无倾斜。
- 设备内部有磷酸铁锂电池，务必使用叉车或其他搬运机械将设备平稳搬运至场地，禁止颠簸和撞击。
- 拆除外包装。

4.3 系统安装说明

根据需求可选择不同数量的 HEC-BAT-LVP50r3 磷酸铁锂电池并联组成的储能系统，若系统只有 1 组电池，则按照步骤 1 进行安装；若系统有 2 组及以上电池，则按照步骤 1、2 进行安装。

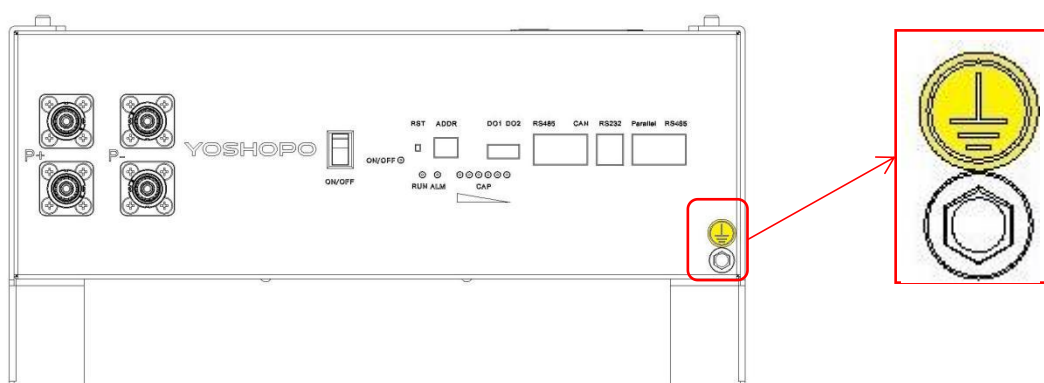
步骤 1：

- （1） 确认每组电池箱体“ON/OFF 开关”处于关闭状态。

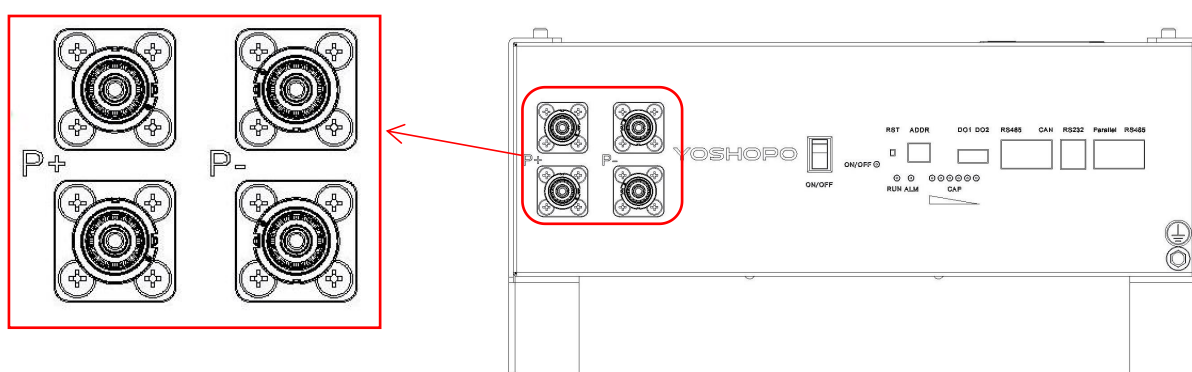


4、产品安装

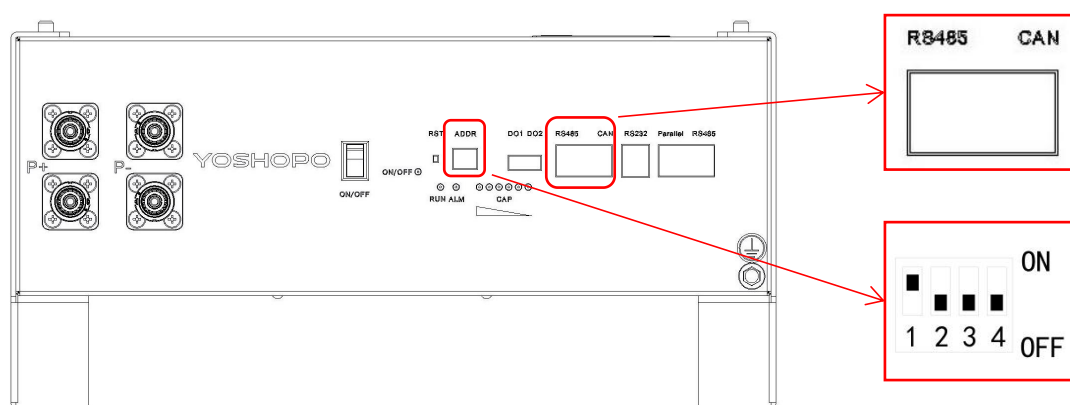
- (2) 使用黄绿色 PE 线束将每组电池外机壳搭铁点与附近接地点连接。



- (3) 使用动力连接线将电池箱体正负极与逆变器电池侧正负极相连，橙色正极，黑色负极。若有多组电池，则连接最上方的一组。



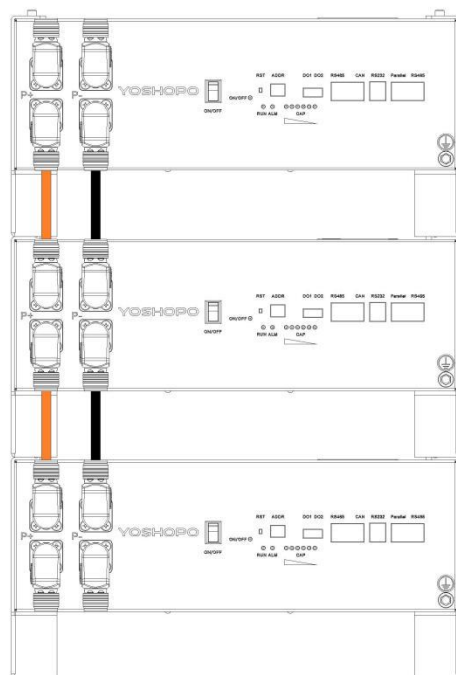
- (4) 将逆变器的通讯线束连接到电池箱体上的 CAN 通讯接口上。若有多组电池，需设置接逆变器的电箱的拨码开关设置为 1，其余电箱依次拨码，并确保每个电箱拨码不同，再连接最上方的一组。



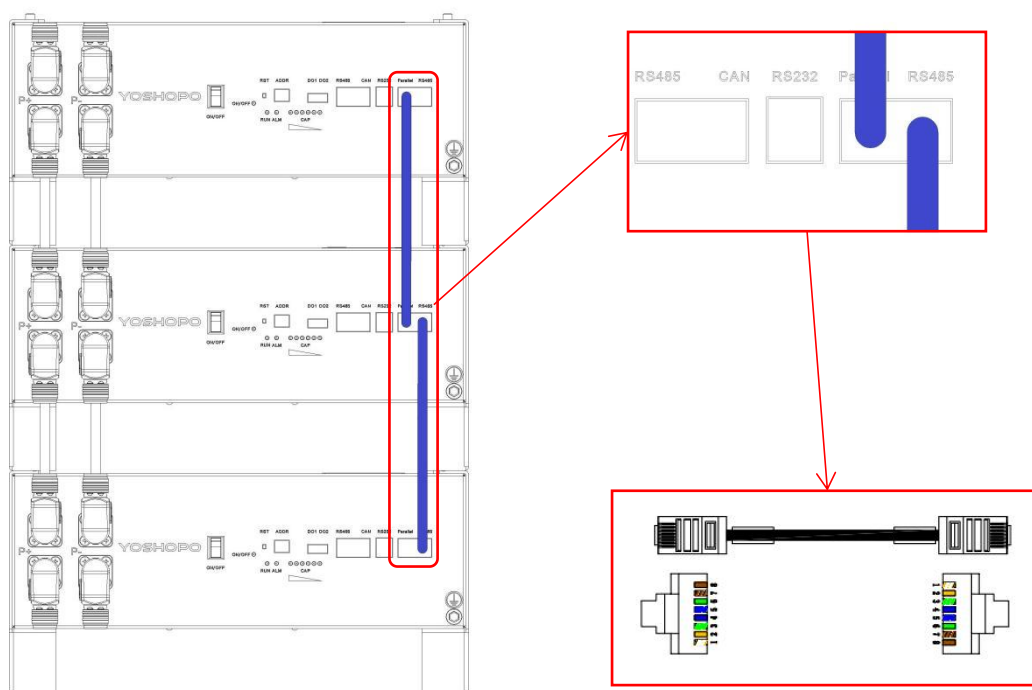
4、产品安装

步骤 2:

- (1) 从上往下第二组电池起，用动力连接线依次将相邻的两组电池正极与正极、负极与负极连接起来。橙色正极，黑色负极。备注：若用机柜式安装正负极需要接汇流排。

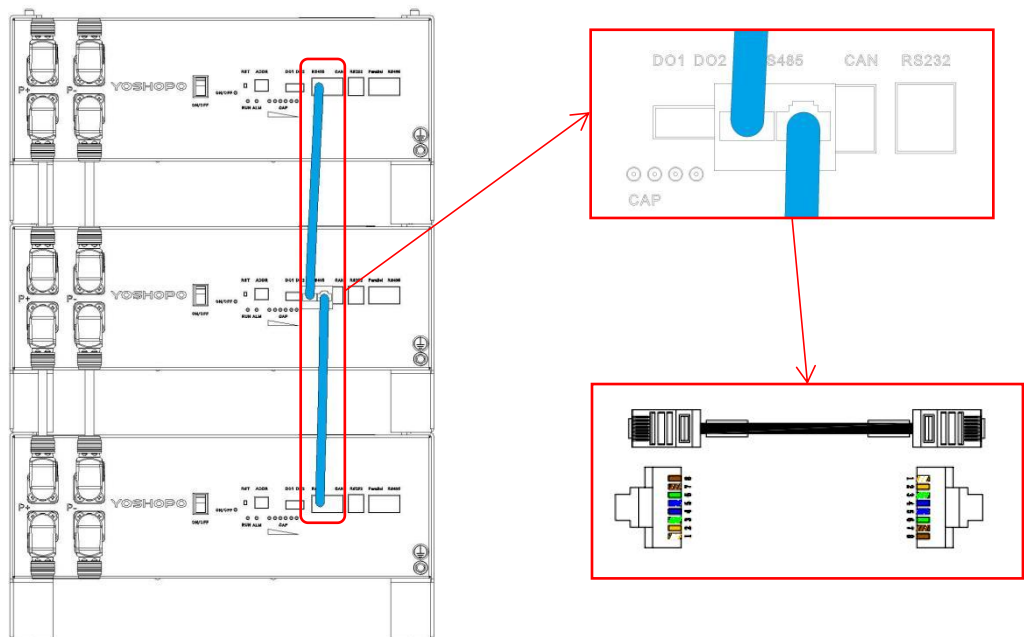


- (2) 接逆变器的电箱拨码开关设置为 1 并作为主机，其余电箱依次拨码，确保每个电箱拨码不同，从上往下第二组电箱起，用两端带 RJ45 插头的双绞线束依次将相邻的两组电池双 RS485 并联通讯端口连接起来。

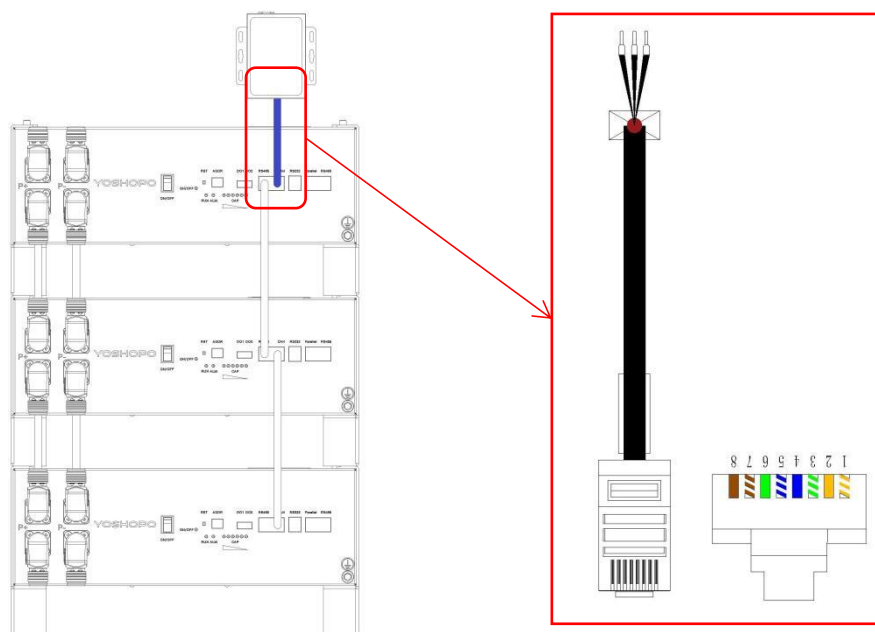


4、产品安装

- (3) 每台电箱的 RS485 接口插上 RJ45 的一分二插头，用两端带 RJ45 插头的双绞线束依次将相邻的两组电池 RJ45 插头通讯端口连接起来。



- (4) DTU 模块先用背胶固定住，然后接上电源适配器插到插座上。用一端带 RJ45 水晶头另一端带三根导线端头的屏蔽通讯线，将 RJ45 插头和 DTU 模块连接，同时 DTU 模块输出口处用网线与路由器连接。



5、电池系统安装及使用注意事项

5. 电池系统安装及使用注意事项

电池系统属于储能设备，属于危险品，非专业人士及不当的操作与使用可能引起触电、燃烧、爆炸等严重的后果。电池系统的安装、维护必须是专业技术人员操作，使用必须严格遵守相关的安全规定。严禁非专业人员安装、维修电池系统以及超范围滥用。

5.1 电池系统内部连接

电池系统连接涉及：

- （1）各连接头必须安全可靠，确保不会有松脱、虚接触问题，接头须具有抗腐蚀、耐磨、抗震功能。
- （2）各种连接必须满足相关国标要求，严防各种形式的电弧放电。
- （3）内部电池之间的连接必须有抗震防松脱装置，温度、电压、电流感应器连接同样需要安全可靠。防止松脱、老化及挤压。严禁各感应线出现任何金属裸露现象。
- （4）严防在连接过程中出现任何形式的短路。
- （5）严禁操作人员未穿戴保护装备的徒手操作。
- （6）所有连接必须在明确指导下进行，严禁任何形式的猜想与模糊尝试形式的作业方式。
- （7）连接的关键点为：确保连接正确、可靠（不会松脱）、接触良好（无接触电阻）、无短路。
- （8）连接完成后，必须逐点测量、确认。
- （9）所有连接点必须确保不会与外箱或其他部件接触、短路。
- （10）有其它不确定的因素，需请教专业人士确认后方可实施。

5.2 防潮防水

电池系统为储能设备，内有许多控制线路及单体电芯，液体进入电池系统内部可能导致短路、漏电、腐蚀单体电芯与电子线路及连接头，因此必须确保电池系统不会被各种液体浸泡、潮湿的空气不会进入到电池系统内部，电池系统绝对不能日晒雨淋，如果电池系统被液体浸泡或被雨淋，需立即进行维护。电池系统安装空间必须充分考虑防水功能。

5、电池系统安装及使用注意事项

5.3 环境隔热

电池系统必须保持在最佳工作温度范围内工作，这样可以大大延长电池的使用寿命并提高电池的安全性能，对温度的限制应充分满足规格中的各种定义，电池系统安装的空间应保持通风、隔热功能，严禁阳光直射或在太阳光底下热量直接传给电池或在寒冷冬天电池热量直接散发到外界。

5.4 防震防撞

电池系统内部电池串联并安装有管理系统与各种感应器件，电池系统安装必须牢固可靠，不能有任何的松动与晃动，严禁电池系统翻转或倾斜安装，同时电池系统底部必须安装防震缓冲垫片，防止电池系统在使用过程中剧烈振动而影响电池连接的可靠性。电池系统安装空间的外围，必须有足够强度的防撞保护装置，确保一般的碰撞不会直接伤害到电池系统与电池而导致电池出现安全事故（直接短路、过热、燃烧等）。

5.5 注意事项

1. 非专业人员不得擅自进行安装维修；
2. 严禁将产品浸入水中，暂存不用时，应放置于阴凉干燥的环境中；
3. 禁止将产品在高热高温源旁使用或搁置；
4. 不得使用洗涤液或腐蚀性液体擦拭产品表面；
5. 禁止用金属直接连接产品“+”、“-”极；
6. 禁止分解拆散产品和各部件；
7. 禁止敲击或抛掷、踩踏、碰撞、强烈振动产品。

5.6 绝缘保护

电池系统内所有的电源连接部分必须确保有足够的绝缘保护措施，确保在任何情况下电池正负极不会接触外箱导致漏电与短路，任何时候需绝对保证电池系统的正负极不会直接短路，否则可能引起重大安全与触电事故。

5、电池系统安装及使用注意事项

5.7 事故处理

电池系统在出现异常与事故后，应及时采取正确、有效的处理措施予以处理，排除产生进一步的损害与扩大损失：

- 1、过热：正常情况下，当电池系统电池过热，电池系统散热系统会自动进行散热使电池系统降温到最佳的工作温度范围，当电池系统在规定的时间内不能降温到目标温度或电池系统温度超出安全使用上限时，管理系统会给出警告，并要求立即停止使用，在此情况下，应立即停止使用电池，并通知相关技术人员进行全面检查，排除故障后方可继续使用。
- 2、漏电：在使用过程中，如果发现电池系统漏电现象，必须立即疏散储能房间内的人员，并立即通知相关技术人员到场处理，排除故障后方可继续使用，严禁电池带病工作、强行继续使用。
- 3、过放：当电池系统电量被用完，整体电压过低或有个别电池电压低过其正常工作电压范围，管理系统将给出警告并要求立即停止使用电池与进行充电，此时应立即停止对电池的放电，开始给电池进行充电。严禁此时强行给电池继续放电使用，其将损害电池的性能，严重情况下可能导致电池被永久损害不能继续使用。
- 4、短路：各种原因导致的电池系统短路情况，必须立即疏散储能房间内的人员，切断相关电源与电器设备（如果可能），立即断开电池与系统的连接，并立即通知相关技术人员到场维修排除故障，被严重短路过的电池将不能被再使用，必须由厂家全面检测过后，方可决定是否可部分继续维修使用。
- 5、燃烧：各种原因导致的电池系统燃烧事故，必须立即疏散储能房间内的人员，同时在安全范围内不许有任何无关人员靠近储能房间（因为可能出现爆炸危险），应用专用灭火器由专业人员进行灭火，灭火完成后，由穿戴必要防护装备人员先切断电源连接线路，电池系统应用电阻充分放电（电压到零伏），方可拆下电池系统，进行后续操作分析。
- 6、电池系统被碰撞：由于各种原因，如果电池系统被碰撞、变形或异物刺穿，此时应立即断开电池的电源连接线，通知专业技术人员到场处理，如需拆下电池，应由穿戴必要防护装备人员将电池充分放电后，方可进行拆卸工作。
- 7、其他事故：电池系统由于其他事故，需要维修或拆下电池系统时，应先断开电池线路，确保电池不会被短路的情况下，拆下电池系统，确保电池系统不会被碰撞、跌

5、电池系统安装及使用注意事项

落、倒置等各种情况损伤，如果出现此情况，请参照上述规定进行处理。

5.8 安全警示

警告

电池存在潜在的危险，在操作和维护时必须采取适当的防护措施！

不正确地操作本规格书所描述的测试实验，可能导致严重的人身伤害和财产损失！

必须使用正确的工具和防护装备操作电池。

电池的维护必须由具有电池专业知识并经过安全培训的人士执行。

不遵守上述警告可能造成多种灾难。

5.9 维护保养

- 1. 客户有义务编制合理的维护保养计划，比如每个月的除尘，电池性能检查等，确保产品的正常使用。
- 2. 对于报废产品，应由指定的有资质的厂家予以立即回收处理，严禁随便丢弃导致安全事故或严重污染环境。
- 3. 长期存储过程中，需要每隔六个月将电池电量充电至 50%~60%之间。

5.10 注意事项

 警告	
充放电宜降功率	[警告]：总电压高告警时，充电宜降功率。
	[警告]：总电压低告警时，放电宜降功率。
	[警告]：单体电压高时，充电宜降功率。
	[警告]：单体电压低时，放电宜降功率。
	[警告]：电池温度超过 50℃，充放电宜降功率

5、电池系统安装及使用注意事项

	[警告]：电池温度低于-15℃，放电宜降功率
	[警告]：充电电流超过 50A，充电宜降功率；如果不降功率，可能会影响电池寿命
	[警告]：放电电流超过 50A，放电宜降功率；如果不降功率，可能会影响电池寿命
电池需要维护保养	[警告]：压差过大时，需要进行维护保养；如果不维护保养，可能会影响电池寿命。
短路立即切断电路	[警告]：发生短路时，应立即切断电路，若烧断 Fuse，应进行更换。

6、一般操作

6. 一般操作

常规使用

- (1) 系统安装完成后，开启“ON/OFF船形开关”3s以上，产品即进入待机工作状态
“ON/OFF指示灯”点亮。系统可以支持1组电池单独工作，也可支持多组电池同时工作，开启对应电池箱体的“ON/OFF船形开关”即可。
- (2) 当通信开关电源加载后，系统进入工作状态，RUN指示灯亮，表示系统正在充电。
- (3) 当市电和光伏系统停止电源输入时，系统可给外接设备提供后备电源支持，RUN指示灯闪烁，表示系统正在放电。
- (4) 若多组电池并联同时工作时，设置与逆变器通讯线束连接的那组电池作为主机，一般设置“ADDR”拨码地址为1；其余电池为从机，分别设置不同的“ADDR”拨码地址，地址设置范围为2~15（“ADDR”拨码设置方式可查看前面功能说明）。

休眠及唤醒

休眠

当满足以下任意一条件时，系统进入低功耗模式：

- (1) 单体或总体过放保护30秒内仍未解除。
- (2) 按下按键（3~6S），松开按键后。
- (3) 最低单体电压低于休眠电压，并且持续时间达到休眠延迟时间（同时满足无通信、无均衡、无电流）。
- (4) 待机时间超过24小时（无通信、无充放电，无市电）。
- (5) 通过上位机软件强制关机。

进入休眠前，需确保输入端未接入外部电压，否则将无法进入低功耗模式。

唤醒

当系统处于低功耗模式，满足以下任意一条件时，系统将退出低功耗模式，进入正常运行模式：

- (1) 接入充电器，充电器输出电压需大于48V。
- (2) 按下按键（3~6S），松开按键后。
- (3) RS232通讯激活。

6、一般操作

备注：单体或总体过放保护后进入低功耗模式，每4个小时定时唤醒一次，开启充放电MOS。如可以充电，将退出休眠状态进入正常充电；如果连续10次自动唤醒无法充电，将不再自动唤醒。

当系统定义为充电结束后，待机2天（待机时间设定值）后仍未达到恢复电压，强制恢复充电至再次充电结束。

7. BMS(电池管理系统) 功能

7.1 BMS 功能

BMS主要功能如下：

（1）充放电管理

根据不同情况进行充放电控制管理。

（2）电压、温度监控，均衡管理

监控系统和电芯的电压、温度；针对各电芯电量不平衡情况进行均衡管理。

（3）通信功能

具备CAN、RS485通信功能，支持上位机监控、RS485网络组建。

（4）安全保护

支持总电压过压保护、总电压低压保护、单体电芯过压保护、单体电芯欠压保护、过流保护、短路保护、反接保护、低温保护、高温保护等功能。

（5）SOC 计算

计算并修正SOC精度。BMS通过对电流、时间积分的方式精准地进行电池组的SOC计算，常温下SOC精度 $\leq 8\%$ 。

（6）状态指示

简单可靠的LED指示灯，指示电池容量及电池运行状态，当告警或保护状态发生，内置报警蜂鸣器会立即报警。

（7）实时重要数据记录

自带实时时钟模块及数据存储空间，可记录电池系统使用中的重要操作、告警信息等。

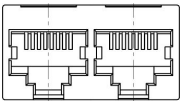
（8）充电限流功能

当充电电流 $>$ 开启电流值（100A）开启，2 分钟后关闭限流，并检测充电电流是否 $>$ 开启电流值，如是，再次开启限流，如此检测 5 次后，锁定限流状态 10A，直到过压保护断开 MOS 后解除锁定或者放电电流 $>1A$ 。

7、BMS（电池管理系统）功能

7.2 BMS 通信接口

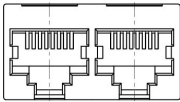
■ CAN 和 RS485 接口



RS485--采用8P8C立式RJ45插座		CAN--采用8P8C立式RJ45插座	
RJ45引脚	定义说明	RJ45引脚	定义说明
9、16	RS485-B1	1、2、3、6、8	NC
10、15	RS485-A1	5	CANL
11、14	GND	4	CANH
12、13	NC	7	GND

备注：CAN 通信，默认通信速率500K。

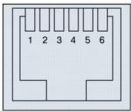
■ RS485 并联接口



RS485--采用8P8C立式RJ45插座		RS485--采用8P8C立式RJ45插座	
RJ45引脚	定义说明	RJ45引脚	定义说明
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

具有双RS485接口，可以查看PACK的信息，默认波特率为9600bps。如需通过RS485与监控设备通信，监控设备作为主机，依据地址轮询数据，地址设置范围为2~15。

■ RS232 通讯接口



RS232--采用6P6C立式RJ11插座	
RJ11引脚	定义说明
2	NC
3	TX（单板）
4	RX（单板）
5	GND

8. 系统调试

8.1 调试准备

- 上电前，确保所有设备均可进行操作，维护和维修。
- 检查并确认电箱已经牢固平稳安装。
- 系统顶部无杂物。
- 电箱之间、电箱与外部系统线束接口已经正确连接。
- 电缆布置在安全的地方或防止机械损伤。

8.2 调试功能

如果上述所有项目均符合要求，按照第 6 章一般操作方式首次启动系统。
调试过程中有其他问题请联系时代星云。

9、故障和维护

9. 故障和维护

使用过程中，当你遇到了如下问题，请参考如下的解决方案，如果问题仍然没有解决，请咨询时代星云。

常见故障及解决方法

序号	故障现象	原因分析	解决办法
1	启动后无直流输出	电池电压低，过放保护	进行充电
2	启动后指示灯不亮	BMS 休眠状态	重启复位开关
3	显示电量不足	充电电压过低	调整开关电源的浮充电压至要求参数
4	供电时间短	电池组没充满电	检查开关电源充电电压、充电电流等参数
5	启动后输出电压不稳	BMS 受干扰	重启复位开关
6	通讯故障	通讯线问题	检查地址开关地址设定、检查端口和线路

常规维护

- (1) 检查输出接线排螺丝有无松动；
- (2) 测量输出电压是否在正常范围内；
- (3) 通过上位机软件检查通信接口是否正常工作；
- (4) 通过上位机软件检查电池组单体电池电压、电流、电量、温度等。

10、产品规格表

10. 产品规格表

电池型号	HEC-BAT-LVP50r3 磷酸铁锂电池			
运行电压	44.8~57.6（额定 51.2V）			
电芯规格	LFP3.2V/100Ah			
并联数量	1	2	3	4
标称容量@25℃	5.12kWh	10.24kWh	15.36kWh	20.48kWh
放电深度	95%			
循环次数	>6000@70%SOH			
充电工作温度	5℃~55℃			
放电工作温度	-20℃~55℃			
标准持续充/放电电流@25℃	50A	100A	100A	100A/200A（汇流排）
最大允许充/放电电流（每月不超过 5 次，每次不超过 3 分钟并间隔时间不低于 24 小时）@25℃	100A	110A	110A	110A/250A（汇流排）
标准充电流程	在环境温度 25℃±2℃的条件下，以 0.5C 充电，当单体电压达到 3.6V 时，停止充电。			
标准放电流程	在环境温度 25℃±2℃的条件下，以 0.5C 放电，当单体电压达到 2.8V 时，停止放电。			
存储温度范围	-20℃~60℃（若长期存储建议 50%SOC、0~25℃）			
冷却方式	自然散热			
建议使用环境温度	室内或者防水区域，-20℃-25℃			
出货容量	50%SOC			
通讯方式	对外 CAN/RS485（二选一），模组间 RS485			
环境湿度	0-95%，无冷凝水，不可用于盐雾地区或沿海附近环境			
工作海拔	≤2000m			

11、运输

11. 运输

11.1 运输

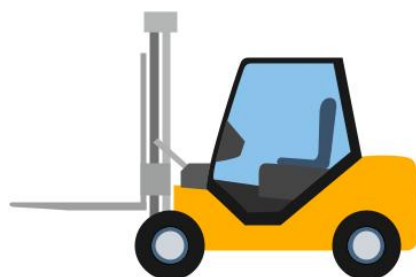
本系统为固定式安装，其移动方式主要依靠机械叉车辅助移动，运输时应注意系统的重心以及手推机柜的位置。运输时还应注意地面的平整度，运输至地面有凹凸不平的地方时，应采取措施防止柜体剧烈颠簸。长途运输应选择符合电子产品运输要求的交通工具。



警告！

移动本系统产品时，请使用符合额定起重能力和叉口跨度合适的叉车。必须从底部叉起柜体。叉起时须从四个侧面支撑柜体且采取预防措施以防柜体在运输过程中出现倾斜。

请使用动力叉车或手动叉车移动本产品。



11.2 到货检查

到货后，去除系统的外包装；其次，检查附带附件是否齐全，按照装箱清单检查附件是否缺失；最后，检查系统外壳是否有明显缺陷。

若随机附件不全或外壳有明显缺陷，请按封面上的联系方式联系本公司。

12. 售后服务

保修卡

客户信息	
*用户姓名	_____
*电话号码	_____
*电子邮件	_____
公司名称	_____
*地 址	_____
*状 态	_____
邮政编码	_____
产品信息	
*模块类型	_____
*产品编号	_____
*购买日期	_____
*故障描述	_____
1) 电池能开机吗？ 是或否？	
2) 电池能充电吗？ 是或否？	
3) 电池能放电吗？ 是或否？	
4) 红灯亮了？ 是或否？	
5) 灯亮着？ 是或否？	
安装程序信息	
*安装程序名称	_____
人员人数	_____
*安装日期	_____
请您认真填写，其中标有“*”的项目为必要项目，谢谢！	
*客户签名	_____
*供应商签名	_____
*日期	_____
通讯地址：福建省马尾区马尾镇马江路 26-1 号	
服务热线：86-0591-83970008	
服务邮箱：cnte.shfw@cntepower.com	
注意：请您妥善保管此卡，在需要维修时，凭此卡连同正式购机发票与时代星云维修中心联系修理。	

12、售后服务

保修条例

本公司对用户购买的家储电箱质保期自制造之日 6 个月后或安装调试完成日期起计算，如无法出示三包凭证及有效发票，则其购买日期按条码对应的出厂日期计算。但以下情况不属于保修范围：

1. 未按《操作手册》安装、维护或操作的产品；
2. 产品安装后处于移动或摇晃中，或温度大于 45° C 或小于-20° C；
3. 原买方在发现缺陷或退化后 30 天内未将缺陷或退化情况通知 CNTE；
4. 产品在保修开始日起 1 个月内未安装；
5. 使用 CNTE 标准配置清单中示意的非 CNTE 适配的逆变器运行产品；
6. 未经 CNTE 批准，擅自修改或修理产品；
7. 不可抗力事件(如自然灾害，如洪水、火灾、地震、闪电或其他异常环境、战争等)；
8. 产品在运输过程中发生的明显损坏；
9. 国家或地区法律、法规或指示的变更；
10. 产品在任何 6 个月或以上的时间内未运行。

13、敬告

敬告

尊敬的_____先生/公司：

感谢您购买并使用我们公司的产品！

由于您所购买的产品是属于技术型产品，需要您严格按照说明上的操作说明进行使用，请确保在认真阅读并理解说明书以后，再对产品进行操作。

如若因违背说明书所示的操作说明，产品可能会出现损毁、失控、冒烟、起火等造成的严重后果。

敬请谅解！

北京合康新能变频技术有限公司

日期：_____



北京合康新能变频技术有限公司

地址：北京市北京经济技术开发区博兴二路 3 号

电话：010-59180192

网址：<http://www.hiconics.com/>



HEC-BAT-LVP50r3
User's Manual
Product Version: V1.0

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1. Introduction

1.1 Product Description

HEC-BAT-LVP50r3 is designed for residential photovoltaic energy storage and power generation system. The advanced lithium iron phosphate (LFP) batteries are used for the product, which can be matched with external hybrid inverter, software management system and photovoltaic module system to establish the small smart energy storage system, so as to guarantee the power supply and optimize the power consumption structure of users.

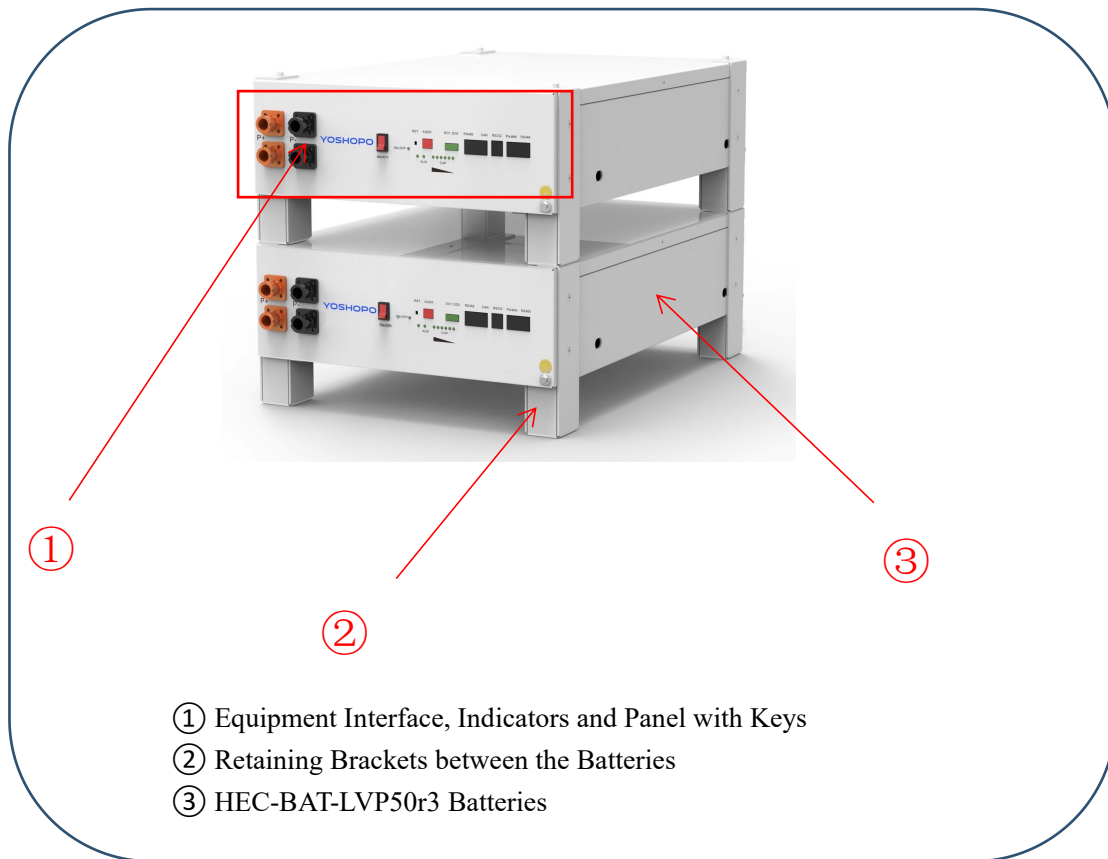
The equipment can be assembled and operated optionally with 1~4 packs of HEC-BAT-LVP50r3 batteries.

Figure 1.1 External View of HEC-BAT-LVP50r3 (Take 1-4 packs of batteries as an example)



1. Introduction

Figure 1.2 Equipment Components



1.2 Scope of Supply

HEC-BAT-LVP50r3 is composed of the battery cabinet and the following parts. Please check whether the parts are complete when you receive the product:

Table 1.1 Scope of Supply

Serial No.	Product Name	Specification	Quantity	Unit	Remarks
1	Lithium iron phosphate (LFP) battery cabinet	HEC-BAT-LVP50r3, 100Ah,51.2V;	1	Set	
2	User's Manual	User's Manual*1	1	Pcs	The quantity should be the same as that of the battery cabinet

Please note that you should check whether the parts are complete after receiving the product. In case of any missing, please contact us immediately for solutions. Improper use of the product may result in the risk of electric shock or burns. You should strictly follow the instructions specified in this Manual during installation and maintenance of the product. Please read this Manual carefully before use and keep it properly for future reference.

2. Safety Instructions

2. Safety Instructions

2.1 Safety Identifications

Safety identifications are used to highlight the potential safety risks and important safety information. The safety identifications used in this Manual are as follows:



Danger:

"Danger" indicates a hazardous condition which, if not avoided, will result in death(s) or serious injury/injuries.



Warning:

"Warning" indicates a hazardous condition which, if not avoided, will result in death(s) or serious injury/injuries.



Warning:

"Caution" indicates a hazardous condition which, if not avoided, will result in mild or moderate injuries.



Attention:

"Attention" provides valuable hints on the optimal operation of the product.

2.2 Label Descriptions

Nameplate

Rechargeable Li-ion Battery System

Product Model Name: HEC-BAT-LVP50r3

Battery System Designation: IFpP/51/161/120/[16S]M/-20+50/90

Nominal Voltage: 51.2Vd.c.

Rated Capacity: 100Ah

Short Circuit Current: 2000A

Weight: 45kg

Duration at Short Circuit Current: 600μS

IP Code: IP22

Size: 387(W)×581(D)×133(H)mm

Hiconics Eco-energy Drive Technology Co., Ltd.

Add: No.3 Boxing 2nd Rd., Economic Technology Development Zone, Beijing 100176, CHINA

Web: <http://www.hiconics.com/>

2. Safety Instructions

Warning Labels

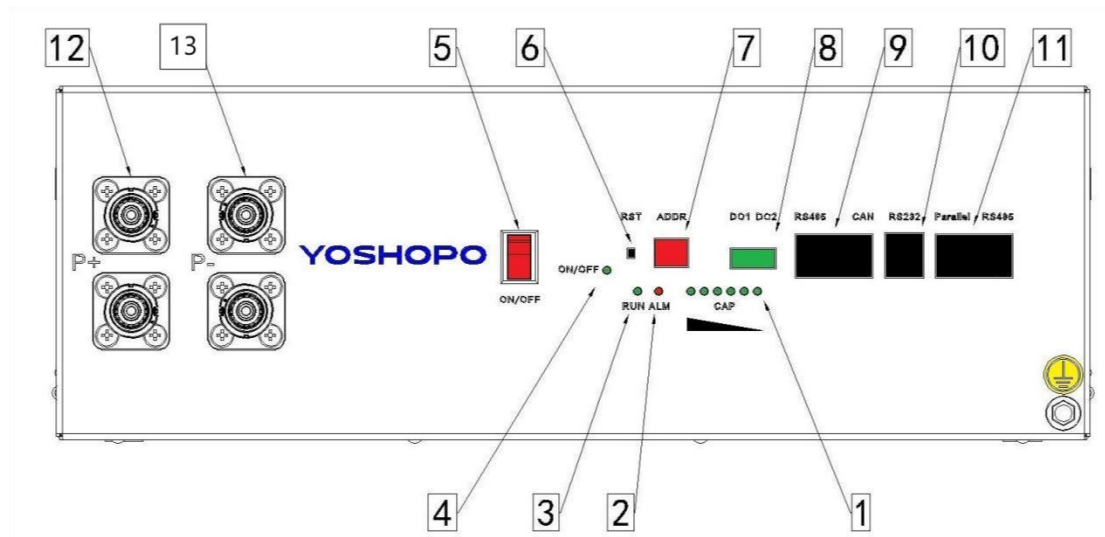
Icon	Name	Implication
	Wear Protective Glasses	To remind the operator of wearing protective glasses during installation, maintenance and disassembly
	Refer to User's Manual	To remind the operator of referring to the inserted User's Manual of the energy storage product.
	Beware of Explosion	To remind the operator of keeping away from inflammable and explosive places or areas when installing the product.
	Recyclable	To remind the operator of recycling the scrapped product through a special recycling channel
	Caution	To remind the operator of paying attention to the safety utilization of electricity during the use of the product
	Battery Recycling	To remind the operator of consulting the local environmental protection authority for resource recovery at the local disposal site when the battery is scrapped
	No littering	Waste batteries are forbidden to be discarded randomly. Operators need to seek legal and compliant disposal from relevant qualified authority.

2.3 Operation Instructions

HEC-BAT-LVP50r3 is designed and produced in accordance with relevant safety regulations; and the needs of end users have carefully been considered. Therefore, the following requirements should be followed during the installation and use of the product:

- The retaining between battery cabinets should be secure;
- The product should be installed in an external system with good grounding;
- Electrical installation shall comply with all the applicable regulations and standards;
- Installation of the product should be carried out as specified in the Manual;
- Installation of the product should be carried out according to proper technical specifications;
- It shall be ensured that the installation personnel have received strict trainings on electrical installation and obtained relevant work permits for special operations;
- The product needs to be charged once every 3 months, which should be charged to 40% SOC under the standard charging condition and stored at $25\pm 2^{\circ}\text{C}$.

3. Operation Interface



3. Operation Interface

The operation interface of HEC-BAT-LVP50r3 is shown in the Figure above;
Indicating lamps and keys are applied for the battery cabinet system for residential energy storage to display state, operation information and settings of the product.

3.1 Indicating Lamps

Table 3.1 Indicating Lamps

Serial No.	Name	Description
1	Capacity Indicating Lamps	CAP Indicating Lamps; There are six battery capacity indicating lamps, each of which indicates 16.6% of the battery capacity.
2	Alarm Indicating Lamp	ALM Indicating Lamp, red in color; The indicating lamp will be on when there is a fault in the battery system.
3	Running Indicating Lamp	RUN Indicating Lamp, green in color; The indicating lamp will be always on when charging and flash when discharging.
4	State Indicating Lamp	ON/OFF Indicating Lamp, green in color; The indicating lamp will be always on when the ON/OFF Key is turned on.

3. Operation Interface

Table 3.2 Information of Capacity (CAP) Indicating Lamps

State		Charging						Discharging					
Capacity indicating lamp		L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●	L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●
Electric quantity (%)	0~16.6%	Off	Off	Off	Off	Off	Flash 2	Off	Off	Off	Off	Off	Always on
	16.6~33.2%	Off	Off	Off	Off	Flash 2	Always on	Off	Off	Off	Off	Always on	Always on
	33.2~49.8%	Off	Off	Off	Flash 2	Always on	Always on	Off	Off	Off	Always on	Always on	Always on
	49.8~66.4%	Off	Off	Flash 2	Always on	Always on	Always on	Off	Off	Always on	Always on	Always on	Always on
	66.4~83.0%	Off	Flash 2	Always on	Always on	Always on	Always on	Off	Always on	Always on	Always on	Always on	Always on
	83.0~100%	Flash 2	Always on	Always on	Always on	Always on	Always on	Always on	Always on	Always on	Always on	Always on	Always on
Running Indicating Lamp ●		Always on						Flash (Flash 3)					

Table 3.3 Flashing Descriptions of LED

Flashing Mode	On	Off
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

3. Operation Interface

Table 3.4 Descriptions of Indicating Lamps

State	Normal/ Alarm/ Protection	ON/OFF	RUN	ALM	LED for Electricity Quantity Indication						Description
		●	●	●	●	●	●	●	●	●	
Shut down	Dormant	Off	Off	Off	Off						All are off
Standby	Normal	Always on	Flash 1	Off	According to electric quantity indicating lamp						Standby state
	Alarm	Always on	Flash 1	Flash 3							Low voltage of module
Charging	Normal	Always on	Always on	Off	According to electric quantity indicating lamp (LED 2 flashes when electricity quantity indicates the maximum level)						When electricity quantity indicates the maximum level, LED (LED 2) flashes. ALM indicating lamp does not flash when an overcharge alarm is made.
	Alarm	Always on	Always on	Flash 3							
	overcharge protection	Always on	Always on	Off	Always on						Due to no mains power, the indicating lamp switches to the standby state
	Over-temperature, over-current and failure protection	Always on	Off	Always on	Off						Stop charging
Discharging	Normal	Always on	Flash 3	Off	According to electric quantity indicating lamp						
	Alarm	Always on	Flash 3	Flash 3							
	Under-voltage protection	Always on	Off	Off	Off						Stop discharging
	Over-temperature, over-current, short circuit, reverse connection and failure protection	Always on	Off	Always on	Off						Stop discharging
Failure		Off	Off	Always on	Off						Stop charging and discharging

3. Operation Interface

3.2 Keys and Interface

Table 3.5 Keys and Interface

Serial No.	Name	Description
5	On-Off Key	The system enters the normal running state or the shutdown state
6	Reset Key	RST Key; it can be used to reset the system when an abnormal condition occurs.
7	Dip Switch	ADDR switch; it can be used to set the module address
8	Dry contact	DO1 and DO2; Two dry contact outputs are reserved
9	Communication with the upper computer	communication with PCS with RS485 or CAN, with 2 RJ45 interfaces
10	Debugging port	RS232, an interface for debugging
11	Parallel communication interface	ParallelRS485, used to parallel module communication, with 2 RJ45 ports
12	Battery positive electrode	Used to connect the positive electrode of a battery module
13	Battery negative electrode	Used to connect the negative electrode of a battery module

Action Description of the Buzzer

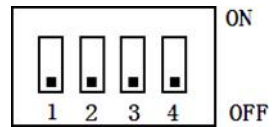
The buzzer buzzes for 0.25s every 1s when a fault occurs, 0.25s every 2s for protection (except for overvoltage protection), and 0.25s every 3s for alarms (except for overvoltage alarms). The buzzer function may be enabled or disabled by the application software of the master computer, which is set as "Disabled" by factory default.

Description of Reset Key (RST)

When the BMS is in the dormant state, press the key (3 ~ 6s) and release it. The protection board will be activated, and the LED indicating lamps will turn on for 0.5S from "RUN". When the BMS is in the activated state, press the key (3 ~ 6s) and release it, the protection plate will be dormant, and the LED indicating lamp will be on for 0.5S from the indicating lamp with the lowest electric quantity. When the BMS is in the activated state, press the key (6 ~ 10s) and release it. The protection plate will be reset and all the LED indicating lamps will be on for 1.5s simultaneously.

After the BMS is reset, the parameters and functions set by the upper computer will still be retained. "Restore Defaults" of the upper computer may be used to restore to the initial parameters if required. However, relevant running records and stored data (such as electric quantity, number of cycles, and protection records) will remain unchanged.

3. Operation Interface



Setting of the Dip Switch

When PACKs are used in parallel, you may set the addresses of different packs by using the dip switch on the BMS. Avoid setting the addresses to be the same. See the following table for the definition of the dip switch of BMS.

Table 3.6 Address Table of Dip Switch

Address	Position of Dip Switch			
	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

4. Product Installation

4. Product Installation

4.1 Selection of the Installation Location

The following factors should be considered when selecting a location to install the product:

- Do not install the product in the airtight confined space. Please ensure the ventilation of the air around the product so as to avoid overheating of the equipment.
- HEC-BAT-LVP50r3 is designed for indoor application. Do not install it outdoors.
- Avoid the product from direct sunlight and high ambient temperature. Otherwise, the operating temperature of the system will be too high, which will affect the conversion efficiency.
- The battery operating temperature of HEC-BAT-LVP50r3 ranges from -20 to 55°C; and the optimal operating temperature is 0 ~ 25°C. It is recommended that the ambient temperature for installation be within the range of -20°C -45°C.
- The operability of the status indicating lamp and keys should be considered for the installation.
- If installed in an enclosed environment, adequate ventilation shall be provided.



Safety Tips: Do not store or place any item around power supply products.

4. Product Installation

4.2 Preparations for System Installation

System size:

Table 4.1 System Size

Cabinet with one pack of battery	Size	387(W)*581(D)*133(H)mm
	Weight	45Kg (not equipped with the retaining brackets)
Cabinet with 2 packs of batteries	Size	392(W)*591(D)*391(H)mm
	Weight	93kg (with 2 sets of retaining brackets)
Cabinet with 3 packs of batteries	Size	392(W)*591(D)*584(H)mm
	Weight	139.5kg (with three sets of retaining brackets)
Cabinet with 4 packs of batteries	Size	392(W)*591(D)*777(H)mm
	Weight	186kg (with 4 sets of retaining brackets)

Installation Preparations:

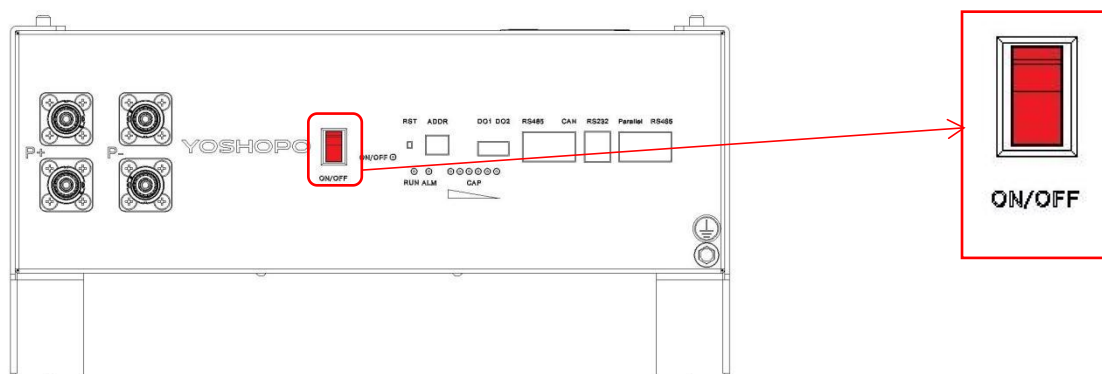
- Please prepare your equipment installation space according to the model purchased.
- Install the system vertically on the ground. Please ensure that the ground is flat and does not tilt.
- There are lithium iron phosphate (LFP) batteries inside the equipment. Be sure to use forklifts or other transport machinery to move the equipment smoothly to the site; avoid bumping or impacting the equipment.
- Remove the outer packing.

4.3 Installation Instructions of the System

The energy storage system composed of different packs of HEC-BAT-LVP50r3 lithium iron phosphate (LFP) batteries in parallel should be selected according to the requirements. If the system has only one pack of battery, carry out the installation as specified in Step 1. If the system has two or more packs of batteries, carry out installation following Step 1 and 2.

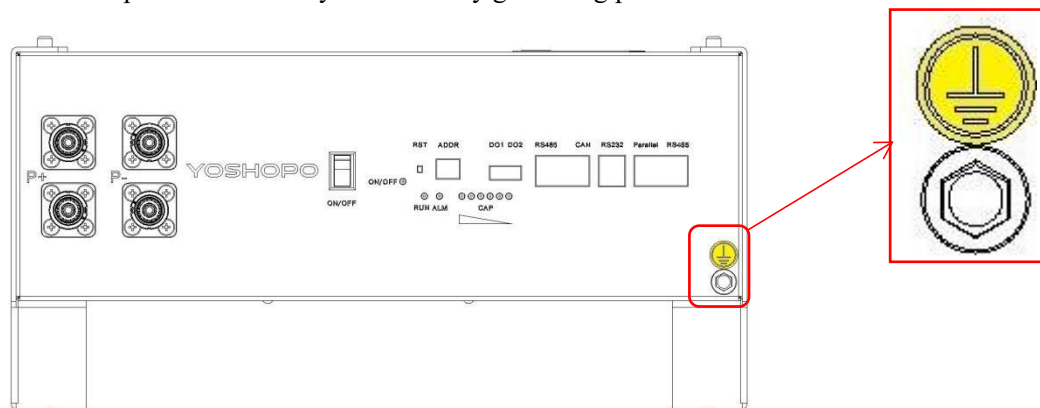
Step 1:

- (1) Ensure that the ON/OFF Switch of cabinet for each pack of the battery is in “Off” state.

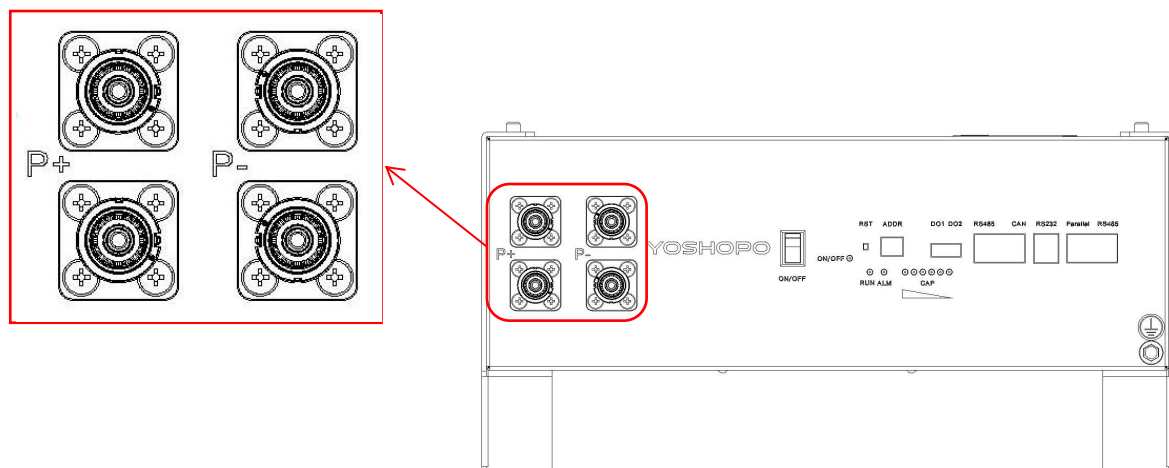


4. Product Installation

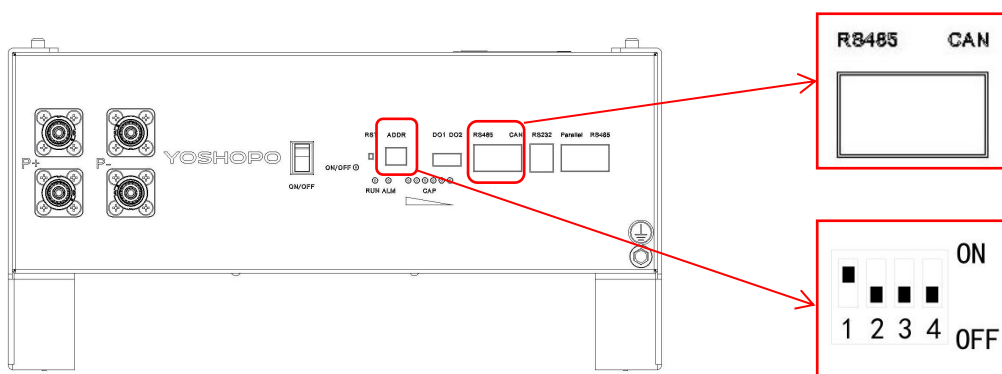
(2) Use yellow-green PE wiring harness to connect the grounding point of the outer shell of the cabinet for each pack of the battery to the nearby grounding point.



(3) Connect the positive and negative electrodes of the battery cabinet to the battery of the residential energy storage control system by using the power connection line. The orange ports are the positive electrodes and the black ports are the negative electrodes. In case of multiple battery packs, connect the uppermost battery pack.



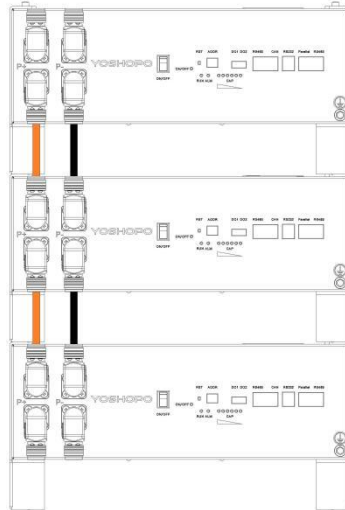
(4) Connect the communication wiring harness of the residential energy storage system to the communication interface on the battery cabinet. In case of multiple packs of batteries, set the Dip Switch of the battery cabinet connected to inverter as 1, and perform the Dip operations for the other battery cabinets successively. Besides, make sure that the Dip addresses of various battery cabinets are different, and then connect the uppermost pack.



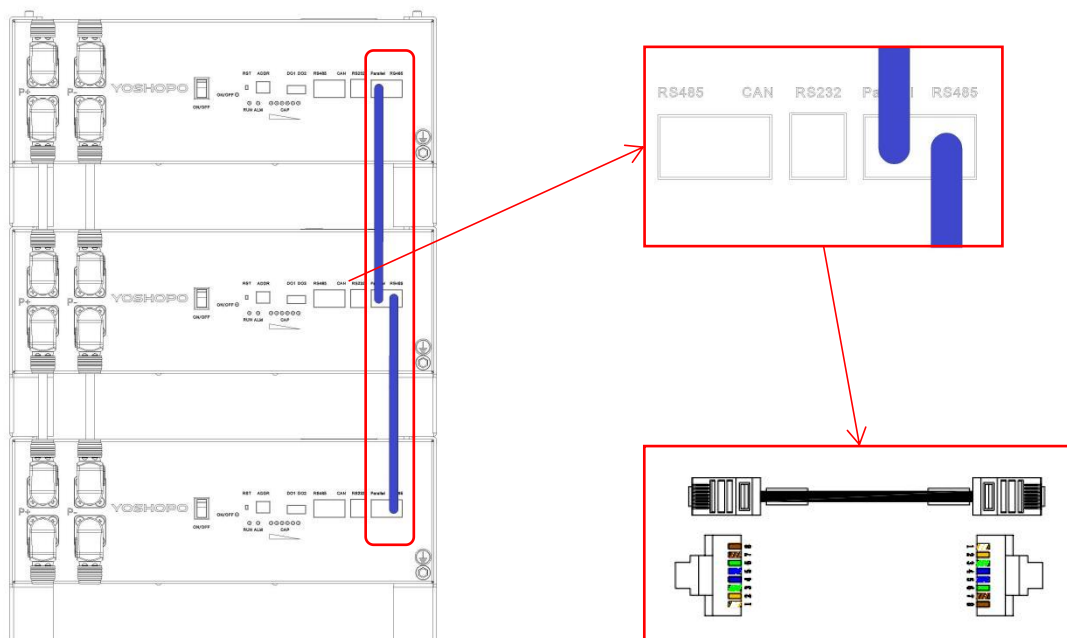
4. Product Installation

Step 2:

(1) Starting from the second pack of the battery from the top down, connect the positive-positive and negative-negative electrodes of two adjacent packs of batteries with the power connection line. The orange ports are the positive electrodes and the black ports are the negative electrodes. Note: If the positive and negative poles are installed in a cabinet, the junction row.



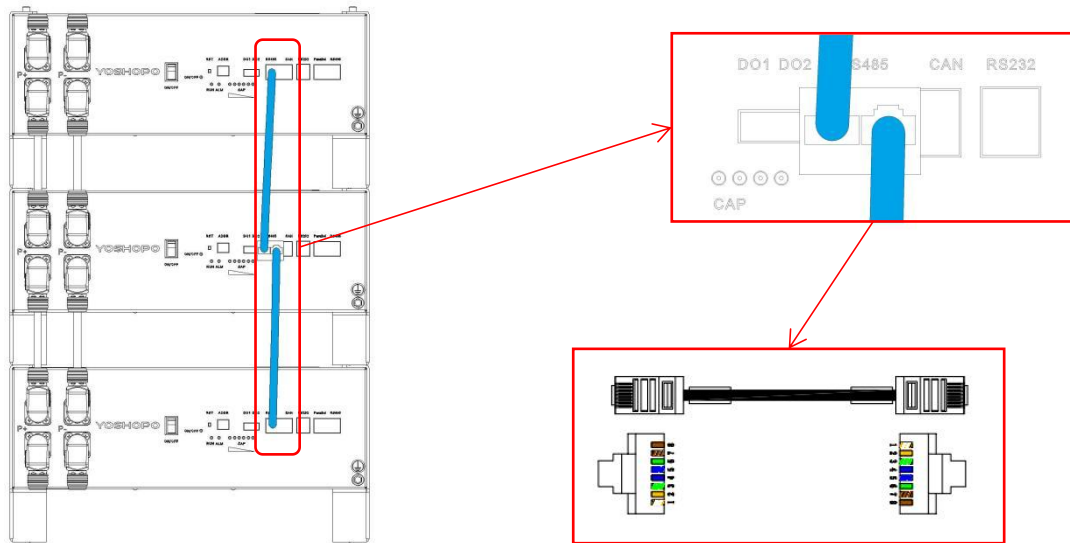
(2) Set the Dip Switch of the battery cabinet connected to the inverter as 1 and take it as the host machine. Perform Dip operations for the other battery cabinets successively. Make sure that the Dip addresses of various battery cabinets are different. Starting from the second pack of the battery cabinet from the top down, connect the two adjacent double RS485 paralleled communication ports of the two packs of batteries successively by using a twisted-pair wiring harness with RJ45 plugs at both ends.



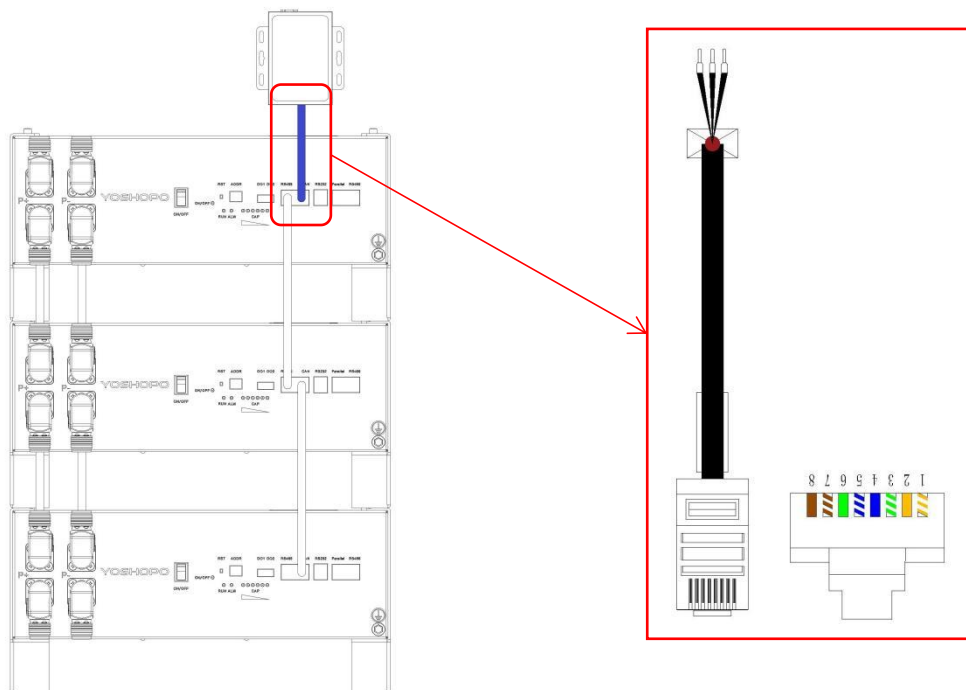
(3) Plug the RJ45 Plug 1/2 into the RS485 Interface of each battery box, and connect the communication ports of RJ45 Plugs of the two adjacent packs of batteries by using the

4. Product Installation

twisted-pair wiring harness with the RJ45 Plugs at both ends.



(4) First, fix the DTU module with adhesive, and then connect the power adapter and plug it into the socket. Connect the RJ45 Plug to the DTU module by using a shielded communication line with RJ45 plug on one end and the three-wire terminal on the other end. Meanwhile, connect the DTU module to the router with a network cable at the outlet of the DTU module.



5. Precautions for Installation and Use of the Battery System

The battery system is the energy storage equipment and classified as hazardous products. Therefore, non-professional installation and improper operation or use may lead to electric shock, combustion, explosion and other serious consequences. The installation and maintenance of the battery system shall be performed by professional technical personnel; and the use of the battery system shall strictly comply with relevant safety regulations. It is prohibited for the non-professional personnel to install, maintain or use the battery system out of prescribed scope.

5.1 Internal Connection of the Battery System

The following items are involved in the battery connection:

- (1) All the connectors shall be safe and reliable; it shall be ensured that there are no loosening, virtual contact problems; and connectors should be equipped with corrosion and wear-resistant and anti-seismic functions.
- (2) All the connections shall meet the requirements of relevant national standards; and various forms of arc discharge should be strictly prevented.
- (3) The connections between the internal batteries shall be equipped with anti-seismic and anti-loosening devices; and temperature, voltage and current sensors shall also be connected safely and reliably. Moreover, any metal exposure should strictly be prohibited for all the induction lines.
- (4) Any form of short circuit in the connection process should be strictly avoided.
- (5) It is prohibited for the operating personnel (having not worn protective equipment) to operate by hand.
- (6) All the connections shall be made under clear instructions; and operation of any form of conjecture and vague attempt shall strictly be prohibited.
- (7) The key points of connection: Ensure that the connection is correct, reliable (no loosening) and with good contact (no contact resistance). Besides, there should be no short circuit.
- (8) Measurements and confirmation should be carried out point by point after the connection is completed.
- (9) All the connection points shall be ensured not to contact with the outer box or other parts, and not to cause short circuit.
- (10) It is necessary to consult professionals for confirmation before implementation in case of other uncertain factors.

5.2 Moisture and Water Resistance

The battery system is energy storage equipment with many control lines and unit batteries. Flowing of liquid into the battery system may lead to short circuit, leakage and corrosion of unit batteries, electronic circuits and connectors. Therefore, it shall be ensured that the battery system will not get soaked in various kinds of liquid, and that moist air will not get into the battery system. Furthermore, the battery system shall never be exposed to sunlight or be caught in the rain;

5. Precautions for Battery System Installation and Use

otherwise, maintenance shall be carried out immediately. The waterproof function shall sufficiently be taken into consideration for the installation space of the battery system.

5.3 Heat Insulation from the Environment

The battery system shall be maintained within the optimal working temperature range so that the battery life can significantly be expanded and the battery safety can be improved. The limitations on temperature should fully meet the various definitions in the specifications. The space where the battery system is installed shall be ventilated and insulated. It is strictly forbidden to directly expose the battery system to sunlight; direct heat transfer from sunlight to the batteries or direct dissipation from the batteries to the outside world in cold winter is directly prohibited.

5.4 Anti-vibration and Anti-collision

Since the battery system is connected in series and equipped with the management system and various induction devices, it shall be firmly and reliably installed and no loosening or shaking is allowed. Flipping or slanting installation is strictly forbidden for the battery system. Meanwhile, the bottom of the battery system shall be equipped with anti-vibration cushion pads to prevent violent vibration of the battery system during use; otherwise, it will affect the reliability of the battery connection. There shall be sufficient anti-collision protection devices at the periphery of installation space of the battery system, so as to ensure that general collisions will not directly damage the battery system and batteries and lead to battery safety accidents (such as direct short circuit, overheating and combustion).

5.5 Attentions

1. Non-professional personnel should not carry out installation and maintenance without authorization;
2. It is prohibited to immerse the product in water. When temporarily stored for later use, it should be placed under cool and dry environment;
3. It is forbidden to use or store the product next to the high heat and temperature sources;
4. It is prohibited to use scrubbing solution or corrosive liquid to wipe the surface of the product;
5. It is forbidden to directly connect the "+" and "-" electrodes of the product;
6. It is forbidden to disassemble the product and various components;
7. It is prohibited to knock or throw, trample, collide or strongly vibrate the product.

5.6 Insulation Protection

Adequate insulation measures should be taken for all the power connection parts within the battery system. It shall be ensured that the positive and negative electrodes of the batteries will not contact the outer box in any case to lead to leakage and short circuit. At any time, it is necessary to absolutely ensure that the positive and negative electrodes of the battery system will not short out directly; otherwise, serious safety and electric shock accidents may be caused.

5. Precautions for Battery System Installation and Use

5.7 Accident Handling

In case of any abnormal condition or accident in the battery system, correct and effective measures should be taken in time, so as to eliminate further damages and the expanded loss:

1. Overheating: when the battery system overheats, the heat dissipation system will automatically dissipate heat to cool the battery system to the optimal working temperature range under normal circumstances. When the battery system cannot be cooled to the target temperature within the specified time or temperature of the battery system is above the upper limit for safe use, the management system will give an alarm; and use of the battery system is required to stop immediately. In this case, use of the battery system should be stopped immediately, and relevant technical personnel should be informed to carry out a comprehensive inspection; and use of the battery system should not be continued until the fault is eliminated.

2. Electric leakage: In case of leakage of the battery system during use, the personnel in the energy storage room shall be evacuated immediately; and relevant technical personnel shall be informed to deal with the problem immediately, and use of the battery system should not be continued until the fault is eliminated. It is prohibited to use the battery system with faults or forcibly to continue to use the battery system.

3. Over-discharge: When the electric quantity of the battery system is used up, the overall voltage is too low or voltage of some batteries are too low, the management system will give an alarm and the use of the battery system is required to stop and charging shall be carried out immediately. In this case, discharging of the battery system should be stopped and charging of the battery system should be carried out. Do not forcibly discharge the battery system at this time. Otherwise, the battery performance will be damaged, or the batteries may be permanently damaged and cannot be used any longer in serious cases.

4. Short circuit: In case of short circuit of the battery system caused by various reasons, the personnel in the energy storage room shall be evacuated immediately; relevant power supply and electrical equipment shall be cut off (if possible); the connection between the battery and the system shall be disconnected immediately; and relevant technical personnel should be informed to maintain and eliminate the fault immediately. Besides, the battery system severely short-circuited cannot be used again, which shall comprehensively be inspected by the manufacturer before decision is made on whether it can be partly maintained and used.

5. Combustion: In case of a combustion accident of the battery system caused by various reasons, the personnel in the energy storage room shall be evacuated immediately. Meanwhile, irrelevant personnel should not be allowed to approach the energy storage room within the safety range (since there may be explosion hazards). Special fire extinguishers should be used by professionals to extinguish the fire. After the fire is put out, the personnel wearing necessary protective equipment should first cut off the power connection line, and fully discharge the battery system (the voltage should fall to zero volt) before the battery system can be removed for further operation analysis.

6. Collision of the battery system: If the battery system suffers from collision, deformation or is punctured by foreign matters due to various reasons, the power cables of the battery system should be disconnected immediately and the professional technical personnel shall be informed to go to the site to handle the condition. If the battery system should be removed, it should fully be

5. Precautions for Battery System Installation and Use

discharged by the personnel wearing necessary protective equipment before removing the battery system.

7. Other Accidents: If the battery system is required to be repaired or removed due to other accidents, the battery circuit should be disconnected first. The battery system should be removed without short-circuiting the battery. Ensure that the battery system will not be damaged by collision, drop, or inversion. In such case, handling should be carried out according to the regulations mentioned above.

5.8 Safety Warnings

Warnings

Due to the potential hazards of batteries, proper precautions shall be taken during operation and maintenance!

Improper operation of the tests/experiments described in this Specification may result in serious injuries and property damages!

Batteries shall be operated with proper tools and protective equipment. Battery maintenance shall be carried out by the personnel with battery expertise and having received relevant safety training.

Failure to follow the above warnings may lead to various disasters.

5.9 Maintenance

1. Customers are obligated to make reasonable maintenance plans, such as monthly dust removal and battery performance inspection plans, so as to ensure the normal use of the product.
2. The scrapped products shall immediately be recycled by the designated qualified manufacturers. It is strictly forbidden to discard them carelessly; otherwise, it may lead to safety accidents or seriously pollute the environment.
3. Charge the electric quantity to 50%~60% every six months during the long-term storage of the product.

5.10 Matters Needing Attention

 Warnings	
It is better to reduce power when charging and discharging	[Warning]: It is better to reduce power during charging in case of a warning of high total voltage.
	[Warning]: It is better to reduce power during discharging in case of a warning of low total voltage.
	[Warning]: It is better to reduce power during charging in case of a warning of high unit voltage.

5. Precautions for Battery System Installation and Use

	[Warning]: It is better to reduce power during discharging in case of a warning of low unit voltage.
	[Warning]: It is better to reduce power during charging and discharging in case of a warning of the battery temperature above 50°C.
	[Warning]: It is better to reduce power during discharging in case of a warning of the battery temperature below -15°C.
	[Warning]: It is better to reduce power during charging in case of a warning of charging current above 50A. Failure to reduce power may affect the battery life.
	[Warning]: It is better to reduce power during discharging in case of a warning of discharging current above 50A. Failure to reduce power may affect the battery life.
Maintenance is required for batteries	[Warning]: Maintenance is required in case of too large voltage difference. Failure to carry out maintenance may affect the battery life.
Cut off the circuit immediately in case of short circuit	[Warning]: The circuit should be cut off immediately in case of short circuit. Fuse should be replaced in case of being burnt.

6. General Operation

Routine Use

(1) Turn on the "ON/OFF Rocker-type Switch" for more than 3s after the system is installed, and the product will enter the standby state. The "ON/OFF Indicating Lamp" will be on. The system can be used to support one pack of batteries to work individually or multiple packs of batteries to work simultaneously. The operation can be carried out just by turning on the "ON/OFF Rocker-type Switch" of the corresponding battery box.

(2) The system will enter the working state when the communication switching power supply is loaded, and the RUN Indicating Lamp will be on, indicating that the system is charging.

(3) When the mains and photovoltaic systems stop power input, the system will provide backup power support to external devices without delay. The RUN Indicating Lamp will flash, indicating that the system is discharging.

(4) In case multiple packs of batteries work in parallel, set the pack of batteries connected to the communication wiring harness of the residential inverter as the upper machine, and generally set the Dip address of "ADDR" as 1. Set the other batteries as lower machines, and respectively set different Dip addresses of "ADDR" for them. The setting range of addresses is 2~15(See the function descriptions mentioned above for the dip setting mode of "ADDR").

Dormancy and Awakening

Dormancy

When any of the following conditions are met, the system will enter the low power consumption mode:

- (1) Unit or total over-discharge protection is still not removed within 30s.
- (2) After releasing the key having been pressed for 3~6s.
- (3) The minimum unit voltage is below the dormancy voltage, and the duration reaches the dormancy delay time (no communication, balance and current shall simultaneously be met).
- (4) Standby time is more than 24 hours (no communication, charging and discharging and mains).
- (5) Forcibly power off with the software of the upper computer.

Before entering the dormancy mode, ensure that the input terminal is not connected to external voltage. Otherwise, it cannot enter the low-power consumption mode.

Awakening

When the system is in the low power consumption mode and meets any of the following conditions, the system will exit the low power consumption mode and enter the normal operation mode:

- (1) Connect to the charger. The output voltage of the charger should be above 48V.
- (2) After releasing the key having been pressed for 3~6s.
- (3) RS232 communication is activated.

Remarks: The system will enter the low power consumption mode after unit or total over-discharge protection, and will be awakened regularly every 4 hours to start the MOS of charging and discharging. If it can be charged, it will exit the dormancy state and enter the

6. General Operation

normal charging state; if the battery cannot be charged after 10 times of consecutive automatic waking, it will no longer be automatically wakened.

After the system is defined as at the end of charging and the recovery voltage cannot still be reached after 2 days of standby (the set value of standby time), the system should be forced to recover charging until the completion of charging.

7. Battery Management System (BMS) Functions

7.1 BMS Functions

Main functions of BMS are as follows:

(1) Charging and Discharging Management

Charging and discharging control management is carried out according to different conditions.

(2) Voltage and Temperature Monitoring and Balance Management

Voltage and temperature of the system and the batteries are monitored; and balance management is carried out according to the imbalanced conditions of the electric quantity of various batteries.

(3) Communication Function

It is equipped with CAN and RS485 communication functions, to support upper computer monitoring and RS485 network establishing.

(4) Safety Protection

Functions including total voltage over-voltage and low-voltage protection, unit battery over-voltage and under-voltage protection, over-current, short circuit, reverse connection and low-high temperature protections are supported.

(5) Calculation of SOC

Calculate and correct accuracy of SOC. BMS can be used to accurately calculate the SOC of battery packs by integrating current and time, and the accuracy of SOC should be no more than 8% at normal temperature.

(6) State Indicating Lamp

Simple and reliable LED indicating lamps are used to indicate battery capacity and the running state. When an alarm or protection state occurs, the built-in alarm buzzer will immediately make an alarm.

(7) Real-time Important Data Recording

It has a real-time clock module and data storage space, which can be used to record important operations and alarm information during the use of the battery system.

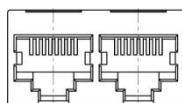
(8) Current-limiting Function during Charging

When the charging current is more than the start-up current value (100A), the current limiting function will be turned on; the current limiting operation will be turned off 2 minutes later; and whether the charging current is more than the start-up current value will be detected. If it is the case, start current limiting operation again. After 5 times of such detections, the current limiting state will locked as 10A until the lock is removed after the overvoltage protection disconnects MOS or the discharging current is above 1A.

7. BMS (Battery Management System) Function

7.2 Communication Interfaces of BMS

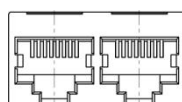
■ CAN and RS485 Interfaces



The 8P8C Vertical-type RJ45 Socket is applied for RS485		The 8P8C Vertical-type RJ45 Socket is applied for CAN	
RJ45 Pin	Definition Description	RJ45 Pin	Definition Description
9、16	RS485-B1	1、2、3、6、8	NC
10、15	RS485-A1	5	CANL
11、14	GND	4	CANH
12、13	NC	7	GND

Remarks: The default CAN communication rate is 500K.

■ RS485 Parallel Interface

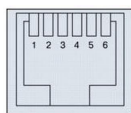


The 8P8C Vertical-type RJ45 Socket is applied for RS485		The 8P8C Vertical-type RJ45 socket is applied for RS485	
RJ45 Pin	Definition Description	RJ45 Pin	Definition Description
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

PACK information can be viewed with double RS485 interfaces. The default Baud rate is 9,600bps. If it is required to communicate with the monitoring device through RS485, the monitoring device should be used as the host machine. The address setting range is 2~15 based on the address polling data.

7. BMS (Battery Management System) Function

■ Communication Interfaces



The 6P6C Vertical-type RJ11 Socket is applied for RS232	
RJ45 Pin	Definition Description
2	NC
3	TX (single plate)
4	RX (single plate)
5	GND

8. System Commissioning

8.1 Commissioning Preparations

- Ensure that all the devices can be used for operation, maintenance, and repairs before powering them on.
- Check and make sure the battery cabinets have securely and smoothly installed.
- Ensure that there are no sundries piled up on the top of the system.
- The wiring harness interfaced between the battery cabinets or between the battery cabinet and the wiring harness interface of the external system should properly be connected.
- Cables should be arranged in a secure place or any mechanical damage should be prevented.

8.2 Commissioning of Functions

If all the above items meet relevant requirements, start the system for the first time according to the methods specified in “General Operation” in Chapter 6.

If you have any other problems during debugging, please contact Contemporary Nebula.

9. Fault and Maintenance

9. Fault and Maintenance

If you encounter the following problems during use of the product, please refer to the relevant solutions listed below. If your problem still exists, please consult Contemporary Nebula.

General Faults and Solutions

Serial No.	Fault Phenomenon	Analysis of Causes	Solutions
1	No DC output after startup	Over-discharge protection due to low battery voltage	Carry out charging
2	No working of the indicating lamp after startup	BMS is in the dormant state	Restart the Reset Switch
3	Indicating insufficient electric quantity	Too low charging voltage	Adjust the floating charge voltage of the switching power supply to the required parameters
4	Short power supply time	The battery pack is not full charged	Check the charging voltage, current and other parameters of the switching power supply
5	Unstable output voltage after startup	BMS is interrupted	Restart the Reset Switch
6	Communication failure	Problems in communication line	Check the address setting of the address switch, ports and lines

Regular Maintenance

- (1) Check to see whether the screws on the output line bank are loosed;
- (2) Measure to see whether the output voltage is within the normal range;
- (3) Check with the software of the upper computer to see whether the communication interface works normally;
- (4) Check with software of the upper computer to see whether the voltage, current, electricity quantity, and temperature of unit battery of the battery packs.

10. Specification Table of the Product

10. Specification Table of the Product

Battery Model	HEC-BAT-LVP50r3 Lithium Iron Phosphate (LFP) Battery			
Running voltage	44.8~57.6 (rated voltage: 51.2V)			
Battery specification	LFP3.2V/100Ah			
Number of parallel connections	1	2	3	4
Nominal capacity at 25°C	5.12kWh	10.24kWh	15.36kWh	20.48kWh
Depth of discharge	95%			
Number of cycles	>6000 @ 70%SOH			
Charging working temperature	5°C~55°C			
Discharging working temperature	-20°C~55°C			
Standard continuous charging/discharging current at 25°C	50A	100A	100A	100A/200A (bus-bar)
Maximum allowed charging/discharging current (no more than 5 times per month, no more than 3 minutes each time and no less than 24 hours for the interval) at 25°C	100A	110A	110A	110A/250A (bus-bar)
Standard charging process	Charge at 0.5C at the ambient temperature of 25°C±2°C, and stop charging when the unit voltage reaches 3.6V.			
Standard discharging process	Discharge at 0.5C at ambient temperature of 25°C ±2°C, and stop discharging when the unit voltage reaches 2.8V.			
Storage temperature range	-20°C~60°C (50% SOC and 0~25°C recommended for long-term storage)			
Cooling mode	Natural heat dissipation			
Recommended temperature of service environment	-20°C-25°C for indoor or waterproof areas			
Shipping capacity	50% SOC			
Communication mode	CAN/RS485 (either of the two) for external communication and RS485 for communication between modules			
Environment humidity	0-95%, no condensed water, unavailable in salt spray area or near coastal environment			
Working altitude	≤2000m			

11. Transportation

11.1 Transportation

The system is installed in the fixed manner, moving mode of which mainly depends on the mechanical forklift to assist the movement. Attention should be paid to the center of gravity of the system and the position of the cabinet pushed by hand during transportation. Attention should also be paid to the flatness of the ground during transportation. When transported to places with uneven ground, relevant measures should be taken to prevent severe bumping of the cabinet. As for long-distance transportation, the vehicle meeting the requirements for the transportation of electronic products should be selected.



Warning!

When moving the products of this system, please use forklifts meeting the rated lifting capacity and the forklift with the appropriate fork-entry span. Be sure to fork the cabinet from the bottom. The cabinet shall be supported from four sides when lifted with fork; and precautions shall be taken to prevent the cabinet from tilting during transportation.

Please move the product with the power or manual forklift.



11.2 Inspections after Arrival of the Product

First, remove the outer packaging of the system after arrival of the product. Secondly, check to see whether the attached parts are complete, and whether the accessories are missing according to the packing list. Last, check to see whether there is significant defect on the shell of the system.

If the accessories are not complete or there are significant defects on the shell, please contact the Company according to the contact information on the cover.

12. After-sales Service

Warranty Card

Customer Information	
* Name of User _____	* Phone Number _____
* E-mail _____	Company Name _____
*Address _____	
*Status _____	Postal Code _____
Product Information	
* Module Type _____	
* Product Number _____	
* Date of Purchase _____	
* Fault Description _____	
1) Can the battery be turned on?	Yes or No?
2) Can the battery be charged?	Yes or No?
3) Can the battery be discharged?	Yes or No?
4) Is the red lamp on?	Yes or No?
5) Is the lamp on?	Yes or No?
Information on Installation Procedure	
* Name of Installation Procedure _____	
Number of Personnel _____	
* Date of Installation _____	
Please fill in the information carefully. The items marked with "*" are required items. Thank you!	
* Signature of Customer _____	
* Signature of Supplier _____	
* Date _____	
Mailing Address: No. 26-1, Majiang Road, Mawei Town, Mawei District, Fujian Province	
Service Hotline: 86-0591-83970008	
Service E-mail: cnte.shfw@cntepower.com	
Note: Please keep this Card properly. In case of repair, please contact Time Nebula Maintenance Center for repair with this Card and the official purchase invoice.	

Warranty Regulations

The warranty period of the battery cabinets for residential energy storage purchased by users shall be calculated from the date of the completion of commissioning and installation or six months after the date of manufacturing. If the certificate of “three guarantees” (for repair, replacement or compensation of the faulty product) and the valid invoice cannot be provided, date of purchase shall be calculated according to date of ex-works which the barcode corresponds to. However, the following conditions are not covered by the warranty:

1. Products that are installed, maintained, or operated not in accordance with User's Manual;
2. Products that are in moving or shaking condition after installation; or the temperature of the products is above 45°C or below -20°C;
3. The original buyer fails to inform CNTE of the defect or degradation within 30 days after discovering the defect or degradation;
4. Products that are not installed within a month since the warranty date;
5. Use of the non-CNTE adaptive inverter indicated in the CNTE standard configuration list to run the product;
6. Modification or maintenance of the product without approval of CNTE;
7. Force majeure events (Flood, fire, earthquake, lightning and other natural disasters or other abnormal environment, wars and other events);
8. Significant damages to the products during transportation;
9. Changes in national or regional laws, regulations or instructions;
10. Products that are not in operation for any period of no less than 6 months.

13. Warning

13. Warning

Dear _____ (Sir/Company),

Thank you for purchasing and using our product!

Since the product you purchased is a technical product, you need to strictly follow the operation instructions in User's Manual. Be sure to read and understand the instructions carefully before using the product.

If the operation instructions shown in the Manual are violated, the product may be damaged, or out of control. Besides, smoking, firing and other serious consequences may be caused.

Thank you for your understanding!

Hiconics Eco-energy Drive Technology Co., Ltd.

Date: _____



Hiconics Eco-energy Drive Technology Co., Ltd.

Address: No.3 Boxing 2nd Rd., Economic Technology Development Zone,
Beijing 100176, CHINA

Phone: 010-59180192

Website:<http://www.hiconics.com/>