

## 预充电控制器 PCC (Precharge Controller)

通常，变流器、逆变器、变频器、电机驱动器、等这些负载设备，内部一般都有大容量的滤波电容并联在直流正负极。电容电压不能突变。

Usually, Converters, inverters, frequency converters, motor drivers, and other load devices generally have large-capacity filter capacitors in parallel at the DC positive and negative poles. The capacitor voltage cannot mutate.

一旦直接接通直流电压，电容充电的过程将产生巨大的浪涌电流。

Once the DC voltage is directly added, the charging process of capacitor will generate a huge surge current.

如果这些设备没有内置缓冲上电电路，我们就必须对这些设备的上电过程进行预充电处理。

If these devices do not have a built-in buffer power-on circuit, we must pre-charge these devices.

否则，BMS 系统中的接触器触点可能粘连、烧结，引起严重的系统安全隐患。

Otherwise, the contacts of relay in the BMS system may stick and sintering, it can causes serious system safety hazards.

巨大电流也将对其它零部件产生不利影响。

The large current will also have an adverse effect on other components.

PCC: Pre charge controller,

主要功能：接通电池组的直流高压之前，先接通预充电阻，高压直流电通过预充电阻对滤波电容进行充电，待滤波电容电压上升至接近电池组高压时，再接通主直流接触器，这样就消除了上电浪涌电流。

Main features : Before switching on the DC high voltage of the battery pack, the pre-charged resistor is first switched on. The high-voltage DC current charges the filter capacitor through the pre-charged resistor. When the voltage of the filter capacitor rises to close to the high voltage of the battery pack, the main DC relay is then switched on; Then it eliminates the surge current.



## 端子编号定义 Terminal numbering definition

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R1	R2	R3	R4	R5	R6
R7	R8	R9	R10	R11	R12

N1	Q1	Q2	Q3	Q4
N2	Q5	Q6	Q7	Q8

## 特性、参数: (Features and parameters):

- 工作电压 (低压控制部分): 额定 12V, 范围 10-15VDC (被驱动的继电器需要能在此电压范围工作)

Operating voltage (low voltage control part) : rated 12V, range 10-15VDC (the driven relay needs to be able to operate in this voltage range)

- 关机期间无电流消耗。工作期间, 主要取决于接触器线圈功耗; 自身消耗电流不超过 20 毫安。

No current consumption during shutdown. During operation, it mainly depends on the contactor coil power consumption; Its own consumption current does not exceed 20 MA.

- 接触器线圈驱动电流能力: 驱动峰值电流 3A, 持续 0.5A。

Contact coil drive current capacity: peak current 3A and the continuous 0.5A

- 接触器线圈驱动输出电压: 取决于供电电压, 在规定驱动电流内, 比供电电压略低约 0.1V。

The the output of Contactor coil : depending on the power supply voltage,it is within the required driven current, the voltage is 0.1V lower than the power supply

- 主继电器吸合检测压差: 约小于 7~12V

The voltage difference of the main relay works : it is less than 7~ 12v

- 最长预充电执行时间: 15 秒

Maximum precharge execution time: 15 seconds

- 主动泄放功能: BMS 关机、或者产生开盖检测信号, PCC 断开主接触器, 执行几秒的泄放动作

Active release function: The BMS shuts down, or generates an open cover detection signal, PCC disconnects the main contactor, and performs a release action for a few seconds

- 高压与低压部分绝缘隔离: 额定隔离耐压 1500VDC, 无特殊要求时, 建议用于 500VDC 以下的系统。可提供更高电压的版本 (只有预充电阻检测接线是高压部分; 其它的为低压部分, 包括接触器线圈驱动、控制信号、供电电源)

The high and low voltage parts are insulated and isolated: the rated isolation voltage is 1500VDC. If there is no special requirement, it is recommended for the system below 500VDC. Higher voltage versions are available (only the precharge resistance detection wiring is the high voltage part; Others are low-voltage parts, including contactor coil drive, control signal, power supply)

- 工作温度范围: -40°C 至 85°C。

Operating temperature range: -40°C to 85°C.

- 湿度: 20%-90%RH 无冷凝, 绝对不可以结露, 否则高压漏电。务必做好防护。

Humidity: 20%-90%RH Non-condensing, absolutely not condensation, otherwise high voltage leakage. Be sure to protect yourself.

- 海拔 2000 米以下使用, 超过 2000 米需要加强绝缘处理。

Use the BMS below sea level 2000 meters , Above 2000 meters ,BMS need to strengthen insulation treatment.

- 防护等级：无，需要用户整机做好防护。

Protection level: None, the user needs to protect the whole machine.

- 典型重量：约 125g

Typical weight: about 125g

**预充电成功的条件：** Conditions for successful precharging:

PCC 的预充电过程必须满足以下两个条件才能成功，否则本次预充做失败处理。直至下一次收到启动信号、或收到重新预充电的指令后，执行重新预充电。

The PCC precharge process can be successful only if the following two conditions are met. Otherwise, the precharge fails. Re-precharge is performed until the next time the start signal is received or the re-precharge instruction is received.

- 预充继电器吸合瞬间，检测到了预充电阻的压差；

The Voltage difference of the precharged resistance was detected at the moment of of the precharged relay working

- 预充继电器吸合后，在最长等待 15 秒内，主继电器触点两端压差降低到额定值；

After the precharge relay is working, the Voltage difference between the two ends of the main relay contacts is reduced to the rated value within a maximum of 15 seconds;

## PCC 端子定义说明 PCC Terminal Definition

供电控制端口定义 Port Definition Of Power supply control		
编号 No	名称 Name	说明 Description
Q2 Q6	供电正极输入+ Plus of Power supply	PCC 的 12V 低压供电输入。范围 10-15V。 The PCC has 12V low-voltage power input. Range 10-15V. PCC 工作时, 这个供电电压将驱动接触器线圈, 请确认接触器线圈要求的工作电压, 和 PCC 供电电压是否相符。电源的供电能力也要满足接触器线圈的电流需求。
Q3 Q7	供电负极输入- Minus of Power supply	When the PCC is working, the supply voltage will drive the contactor coil. Please confirm whether the required working voltage of the contactor is in line with the supply voltage of the PCC. The power supply capacity of the power supply should also meet the current requirements of the contactor coil
Q1	启动控制+ Plus of Start control	控制 PCC 开机。控制+和控制-之间加上 12V 电压, PCC 唤醒开机, 等待 BMC 指令; 撤销 12V 电压, PCC 强制进入泄放流程, 泄放完成, 稍等几秒自动关机。关机后 12V 供电电流消耗为 0。建议使用 BMC 的辅助输出供电驱动。
Q5	启动控制- Minus of Start control	Control PCC startup. Add 12V voltage between control + and control -, PCC wakes up and starts, waiting for Master BMS(BMC) instruction; Cancel the 12V voltage, PCC forces into the release process, release is complete, wait a few seconds to automatically shut down. After shutdown, the 12V power supply current is 0. You are advised to use the auxiliary output power supply driver of the BMC.
Q4	CAN 通信 L CAN-L	连接 BMC 的外部通信的 CAN 总线。根据收到的 BMC 主机的状态指令, 进行预充电控制, 预充电结果反馈给 BMC。
Q8	CAN 通信 H CAN-H	CAN 通信线没有内置 120 欧终端电阻, 请在合适的位置增加。 CANbus for external communication to the Master BMS(BMC). According to the status command of the Master BMS(BMC), the precharge control is performed, and the precharge result is fed back to the BMC. The CAN communication wires need have a built-in 120 ohm terminal resistor, please add it at an appropriate position of CANbus wires

主动泄放检测端口 Port of Active leak Measurement		
N1 N2	主动泄放检测 Active leak Measurement	这两个点被断开后, 不论 PCC 当前各个接触器处于何种状态, 立即触发 PCC 强制进入泄放流程, 先控制主接触器断开, 然后控制泄放继电器吸合几秒钟后断开。建议接一个联动开关, 与高压系统的盖子、门、连接器安全锁定装置等进行联动, 一旦意外开盖、开门, 即可触发 PCC 进行泄放。 如果有多个检测点, 请使用多个联动开关串联; 如果不用这个功能, 请短接这两个点。 After the two points are disconnected, regardless of the current state of each contactor in the PCC, immediately trigger the PCC to force into the release process, first control the main contactor to disconnect, and then control the release relay to disconnect after a few seconds. It is

	<p>recommended to connect a linkage switch to the lid, door and connector safety locking device of the high pressure system. Once the lid is accidentally opened or the door is opened, the PCC can be triggered to discharge.</p> <p>If there are multiple detection points, please use multiple linkage switches in series;</p> <p>If you do not use this function, short connect these two points.</p>
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接触器控制和检测端口定义 Port definition of Contactor control		
编号 No	名称 Name	说明 Description
R12	主接触器线圈正极控制 Plus of Main Contactor	输出控制各个接触器的线圈。每一组的驱动峰值电流 3A，持续 0.5A。如果接触器线圈的工作电流超过此参数，可以先驱动小继电器，小继电器然后再驱动大接触器。
R6	主接触器线圈负极控制 Minus of Main Contactor	这里的几组接触器线圈的正极，在内部和 PCC 低压供电的正极连接在一起。PCC 实际上控制负极（下拉）输出驱动线圈。
R11	预充接触器线圈正极控制 Plus of Precharge Contactor	注意：很多型号的接触器线圈区分正负极；直流感触器的触点也区分正负极，详情参考厂家文档。
R5	预充接触器线圈负极控制 Minus of Precharge Contactor	PCC Outputs each contactors controlling . The peak driving current of each group is 3A, lasting 0.5A. If the working current of the contactor exceeds this parameter, the small relay can be driven first, and the small relay can then drive the large contactor.
R10	泄放接触器线圈正极控制 Plus of discharge Contactor	The positive electrodes of several groups of contactor coils here are internally connected to the positive electrode of the low-voltage power supply of the PCC. The PCC actually controls the negative (pull-down) output drive coil.
R4	泄放接触器线圈负极控制 Minus of Discharge Contactor	Note: many types of contactor coils distinguish between positive and negative electrodes; The contacts of DC contactors also distinguish between positive and negative electrodes, and refer to the manufacturer's documentation for details.
R2 R7	预充电阻检测 Measurement of precharge Resistor	两个端子分别连接到预充电阻的两个引脚，不区分极性。 <b>该端子连接高压电！请注意安全。</b> 可支持不超过 1000VDC 电池组预充电阻的检测，更高电压的电池组预充电阻检测，请联系我方进行技术指导。 The two terminals are separately connected to the two pins of the precharged resistor, regardless of polarity of resistor . The terminal is connected to high voltage! Please be safe. It can support not more than 1000VDC battery precharge resistance measurement, higher voltage battery precharge resistance detection, please contact us for technical guidance.
其他 Other	空引脚 Dummy pin	悬空即可 R1 R3 R8 R9 R1, R3, R8, R9 no connection

PCC 的主动泄放是一项安全功能，为了此功能正常，必须确保：1、主接触器断开后，能够切断直流回路；2、泄放接触器吸合时，能够将泄放电阻接通至被泄放电容的正负极。3、选择合适的泄放电阻阻值，在大约 3 秒的时间内，可以将电容两端的电压降低至安全值。可参考推荐电路图。

The active discharge of PCC is a safety function. In order for this function to be normal, it must be ensured that: 1. The DC circuit can be cut off after the main contactor is disconnected; 2. When the release contactor is drawn, the release resistance can be connected to the positive and negative poles of the released capacitor. 3, select the appropriate bleed resistor resistance value, in about 3 seconds, you can reduce the voltage at both ends of the capacitor to a safe value. Refer to the recommended circuit diagram

## 外壳机械尺寸图 Layout

