BYD Battery-Box Premium LVL
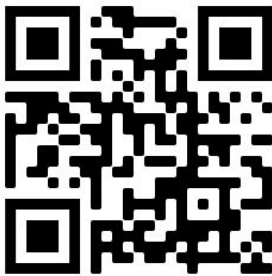# Service Guideline and Checklist
Version 1.1

Valid for Premium LVL 15.4

LVL 15.4 (max. 64 per system)

BMU (1 x per system)

Make sure to always use the latest version of this service document, available at: www.bydbatterybox.com

CONTENT

1. GENERAL STEPS

Make sure to always use the latest version of this service document, available at: www.bydbatterybox.com

Please proceed first with the installation steps by:

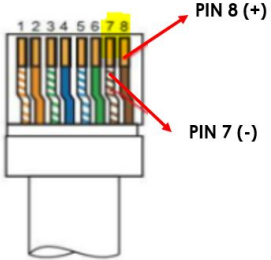| No.	Name	Description
1	Configuration	Check if the configuration is correct. Refer to latest "BYD Battery-Box Premium LVL Minimum Configuration List" (V1.3 or above) available at: **www.bydbatterybox.com** Make sure the inverter is configured correctly.
2	Correct internal cabling	 Please double check, referring to the manual
3	Correct external cabling	1. Communication to inverter a. Depending on the choice of inverter the cable between the BMU port and the inverter must be specially made. Please check the specifications in the installation manual. b. Recommended CAT5 or higher; c. Check the cables and replace them if necessary 2. Grounding a. Battery-Box connected directly to the ground-bus of the house. b. The battery must not be earthed via the inverter! Otherwise, communication problems are possible. 3. Ethernet-Cable for Internet (**strongly recommended!**) 4. DC-Ports - Make sure that **+** and **-** are properly connected. 5. Correct parallel connection cabling if applicable
4	Latest Firmware	Always update the **newest Firmware**! (with using the latest App Version) Note: If not stated otherwise, wifi password is BYDB-Box
5	App Configuration	To complete the commissioning, the configuration of the battery via "BYD Be Connect" App is **mandatory**!
6	Restart	After app configuration, please perform a proper restart of the system by switching off the battery correctly (press LED Button on **BMU** for 5 sec). Make sure all LEDs of the battery are completely off. Then follow the correct switch on procedure (see step 7)
7	Switch on procedure	Correct switch on procedure is important for a correct operation! 1. Switch on the fuse between Inverter and Battery (if there is any) 2. Switch on the Battery-Box (button on LVL) 3. Activate the inverter after the battery
8	Checking the correct operation	The system runs properly if: - Inverter displays battery SOC correctly - System charges / discharges Note: **If you can not complete the commissioning, then turn off the battery before you leave the site and make sure all LEDs are off to avoid a discharge of the battery.**

2. ERROR ANALYSIS

Please refer to the general steps before proceeding, see chapter 1.

2.1 BMU shows no reaction / No LED

LEDs of BMU do not light up, although the battery is ON.

| No.	Name	Description
9	Check correct cable port	Make sure that the correct data cable port has been used at the BMU ("BMS" port. Do not mix with "inverter" or "Ethernet" port).
10	Unplug Comm Cable	Sometimes might be necessary to unplug the communication cable and plug it back again when the batteries are switched on.
11	Replace Comm Cable	Try a completely new communication cable between battery and BMU.
12	Voltage measurement on pin 7&8	Measure the voltage of PIN 7 & 8 while the other side of the cable is connected to the IN port of the Battery-Box and while the Battery-Box is powered on. Voltage should be around 50V. If yes: try another BMU (if available). If no: check another cable or try another LVL if multiple batteries are installed in the system..
13	Only LED faulty?	In some rare cases, the LED of the BMU is faulty. To check that: check if there is a wifi access point of the Battery-Box and check if there are internal LEDs inside the BMU. If so, only the external LED is inactive and a commissioning could still work.
14	Voltage measurement	Check voltage of battery. See **Section 2.6**
15	BMU exchange	Only if voltage between pin 7&8 are okay, correct comm port is used, voltage seems correct and the cable between the Battery and the BMU was exchanged: Test another BMU, if available.

2.2 Communication problem with Inverter

No.	Name	Description
16	Configuration	Check if the configuration is correct. Refer to latest "BYD Battery-Box Premium LVL Minimum Configuration List" (V1.3 or above) available at: www.bydbatterybox.com Make sure the inverter is configured and working correctly.
17	Communication cable	- Confirm PIN / Cable Configuration for the specific inverter model - Replace the communication cable (min. CAT5!)
18	Check terminal resistor	Make sure that the terminal resistor is connected to the OUT port of the last battery (the battery with the highest address).
19	**App Configuration and Firmware**	Please check if the App configuration was successful and the Firmware is the most recent one. If there are problems, please refer to **Section 2.3**
20	Restart the entire system	1. Switch off the Inverter 2. Switch off the battery (Press button on BMU for 5 seconds until all batteries switch off. All LEDs should be off) 3. Wait for 2 Minutes 4. Turn on the Battery (button on battery connected to BMU) and then 5. Turn on inverter second
21	Further checking	If problem remains: - Download all data with BCP **(section 2.5)** - Check the inverter - Try by replacing the BMU, if available

2.3 Problem with the Firmware Update / App Configuration

The Battery Management consists of two components: the BMU and the BMS. The Firmware Update from the App will update the BMU, which will then update the BMS. **The BMS update can take up to 30 Minutes until the firmware is updated on the BMS**.

No.	Name	Description
22	Correct App and Firmware	Make sure to have the latest App Version (>1.5.2) and Battery Firmware (download inside the App) on your mobile device before connecting the app with the battery WiFi. If the App cannot be installed, or other general Problems occur with the App: - Try with a different mobile device (For Android: min Android version requirement is 4.4.) - Try with PC Tool BCP (**section 2.5**)
23	App reports: "Data connection busy" / "Data connection failure."	Battery-Box is busy (e.g the battery could be updating the firmware). Please wait 10 minutes and try again.
24	Close and restart the App	If the App does not react anymore after some minutes loading during the update process, close (close the program completely) and restart the App. Or try with PC Tool BCP (**section 2.5**)

25	BMS Version not updated	The App will only update the BMU. The BMU will update the BMS, which **can take up to 30 minutes**.
		
		If the BMS Version is not updated after 30min with stable inverter communication, follow the below Process:
		
		1. Update Firmware through the App again
		2. Restart the system
		    a. Switch off the Inverter first, then switch off the battery second (Press LED button on BMU for 5 seconds)
		    b. Wait for 2 Minutes
		    c. Turn on the Battery first, then turn on the inverter second
		3. Wait for 30 Minutes
		4. Check BMS Firmware Version again with App. If Version is still wrong, do the update process again (if possible with another mobile device).
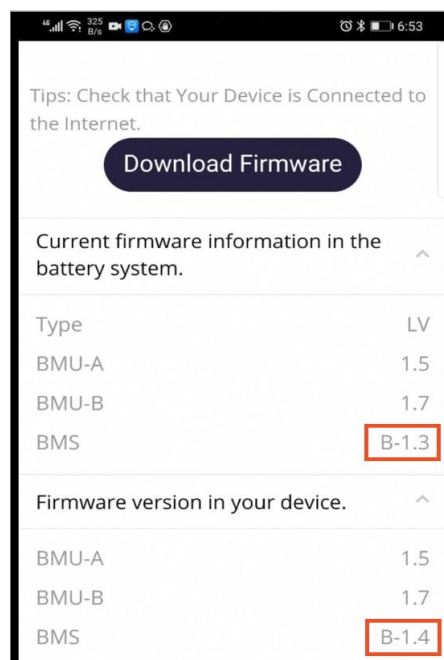
2.4 BMU/BMS LED event code (EC)

A constant white LED refers to standby mode. White blinking means charge or discharge.
When the battery is initiating, the LED will flash white and blue with an interval time of 0.5 seconds (normal during startup).
When the LED flashes blue with an interval time of 1 second it indicates an event code. We start to count when the white LED begins to flash, then we count how many times white and blue LED flashes. (also refer to the manual!)
Example: 1xwhite, 6xblue → EC 106 / 1xwhite, 11xblue → EC 111 / 3xwhite, 3xblue → EC 303

Most Errors come from a faulty communication line, incorrect app configuration or missing restart after app-configuration.
Please go in detail through: **Section 1, 2.2 & 2.3**

Note: if the system is not correctly configured with the app, the event code (EC) might be misleading.
Note: every LVL has its own BMS. The Event Code of the BMS will therefore be shown in the LED of the individual LVL.

EC BMU	EC BMS	Measure
EC 101	all	- Update the Parameter Table to the latest version using BCP **(section 2.5)** - Download all data with BCP (especially the historical data) **(section 2.5)** If problem remains: replace BMU, if available
EC 102 EC 105	all	- Make sure app-configuration has been completed correctly (especially module quantity!). - Check terminal resistor - Replace communication cable between Battery and BMU - Restart system according to manual. (note: to properly shut down you need to press the button on BMU for 5 seconds. Make sure to start the battery before starting the inverter!) - Download all data with BCP (especially the historical data) **(section 2.5)** - If multiple LVL batteries are in the system, check if the system works when removing the suspected LVL, or try the batteries one by one with the BMU to identify if the system works If problem remains: replace BMU, if available
EC 103	EC 108	- Check DC cabling and make sure that the Minimum Configuration is met. - Check the voltage of the batteries with BCP according to **section 2.5 / 2.6** - Restart system properly (see **Step 20**, **section 2.2**; especially make sure that fuse between battery and inverter is closed, if there is a fuse) - Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check if the system works when removing the LVL with the EC108 **(see section 2.8)** - provide the SN and voltage of the LVL with the EC (see checklist on last page)
EC 104	EC 101	- Check DC cabling (is there any short circuit? Fuse between battery and inverter closed?) - Disconnect the battery system from the inverter and restart the battery system alone (battery isolated), to evaluate if the error is being caused externally (i.e. short circuit in inverter or mppt). If the Event Code remains, the error might be in the battery. If the Event Code has changed, there might be an error in the inverter side. - Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check if the system works when removing the LVL with the EC 101 **(see section 2.8)** - provide the SN and voltage of all LVLs with the EC (see checklist on last page)

| EC 104	EC 103	- Check if there is any sign of short circuit in the BICs (e.g. component damage - what is the BIC part is shown in section 3.3)
		
		- Check the sampling cables connection: B2+ up left / B1+ bottom left / B2- up right / B1- bottom right
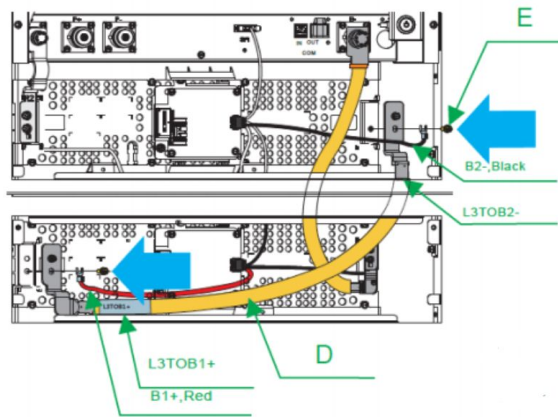		
		- Check whether the LED lights on the two BIC (electric components directly on the two battery modules inside LVL - see **section 3.3**) are on.
		      If yes, try to exchange the upper BIC with the lower one.
		      If not, BIC replacement might be needed.
		
		- Download all data with BCP (especially the cell data) **(section 2.5)**
		- Measure the cell voltage according to **section 2.6**
		- Check if the system works when removing the LVL with the EC **(see section 2.8)**
		
		- provide the SN and voltage of the LVL with the EC (see checklist on last page)

EC 104	EC 107 EC 113	Undervoltage - Shut down the system quickly to avoid further discharge. Check whether the system can shut down normally (by pressing the LED button in BMU for 5s). - Follow **section 2.6** (Voltage measurement of cells)
EC 104	EC 102 up to EC112 (All other than 101, 103, 107, 113)	- Download all data with BCP (especially the historical and cell data) **(section 2.5)** - Check the voltage of the batteries according to **section 2.6** - Check if the system works when removing the module with the EC **(see section 2.8)** - provide the SN and voltage of the module with the EC (see checklist on last page)
EC 106	all	- Make sure the inverter is on, configured and working correctly. - Check according to **section 2.2**

2.5 Be Connect Plus (BCP)

Be Connect Plus is a PC tool. With Be Connect Plus (BCP) you can:
- read the battery information,
- configure the battery system
- update BMU & BMS firmware
- update Parameter Table
- Export / download battery logs

BCP is constantly being improved and updated. **Make sure to use the latest program version. You can download the latest version of the Tool on www.bydbatterybox.com / www.eft-systems.de / www.alpspower.com.au**.

For the service analysis, please download and provide the data / logs as described in the program instructions (see PDF manual inside of program ZIP archive).

Note: You need a windows computer that will be connected to the battery Wifi.
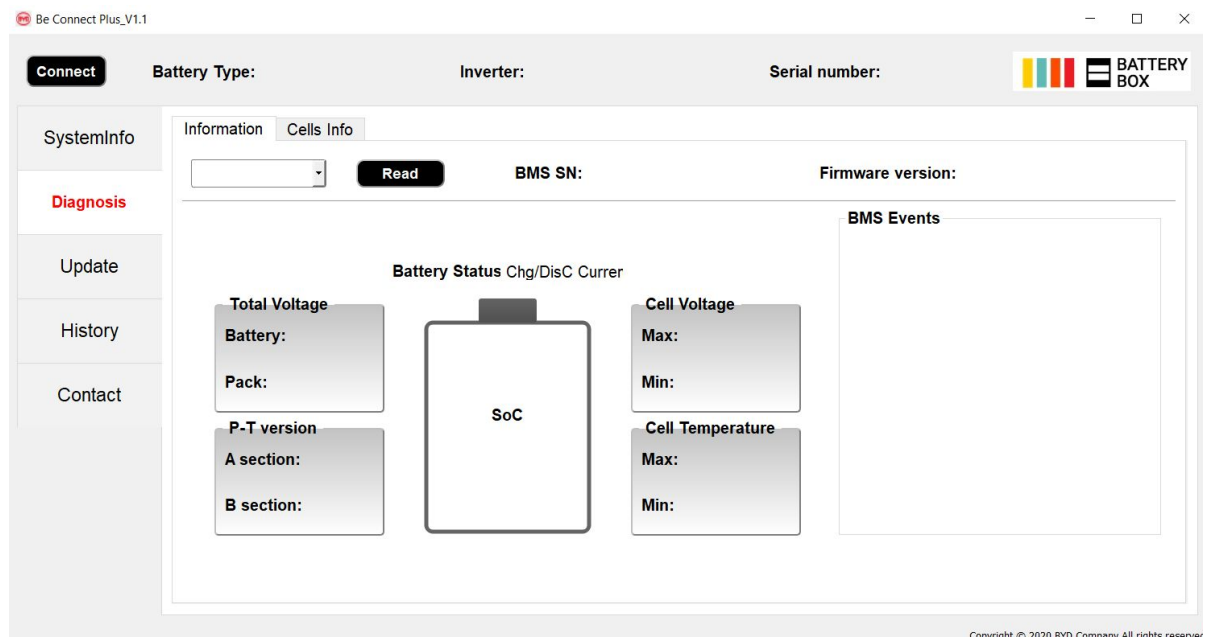
2.6 Voltage measurement and undervoltage

**Attention: Make sure not to create a short circuit!**

- **You can see the max. and min. cell voltage in the BeConnect App.**
- **You can get the detailed module and cell voltage in the BCP Program (section 2.5)**
- **or measure it manually according to the below description:**

Measure the module voltage: Open the front door and measure the tower voltage between **B+/B-** (red circle). Measure also between **P+/P-** (green circle) on the BMS as shown below.
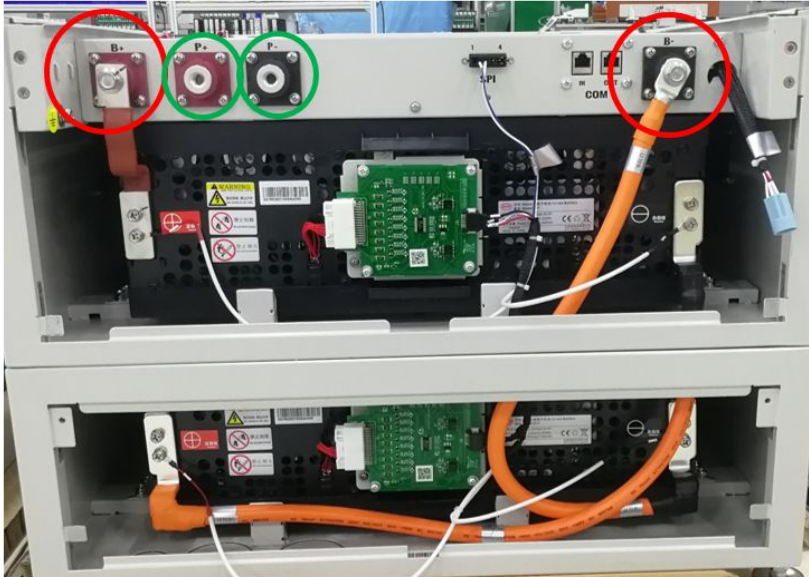
Measure the cell voltages in case of BMS EC 107, EC 103, or if BCP shows cells with <1.5 V / does not show cell voltages. This will help us to understand if the issue is in the cell or in the BICs.
The voltage has to be measured in pairs as shown below. If the voltage is 0, in most cases this value is not correct and the measuring device is not in correct contact with the PINs. (please establish a correct and good contact)
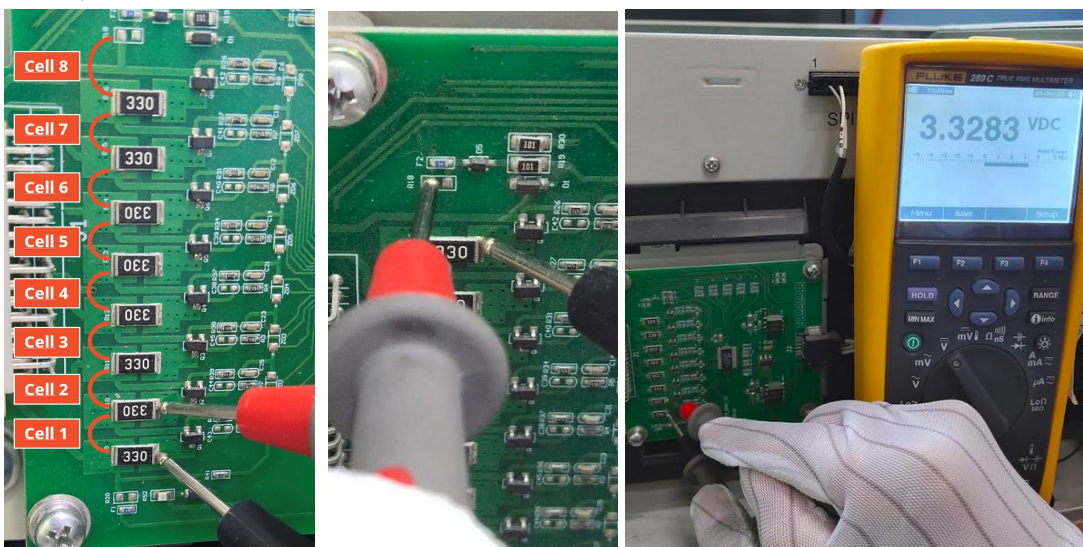
Please record these measurements of 16 cells in total. (Cell Number 1-8 for button module, 9-16 for upper module)

Undervoltage

A LVL in which one of the 16 cells has a voltage of <1.5 V is in undervoltage (check with BCP (**section 2.5**) / BC if possible).

- LVL with >45 V should be fine and you can continue to check other points according to this service guideline.
- If the LVL voltage is <45V but the single cell voltage is >1.5V, the battery needs to be charged quickly while avoiding any further discharge. Therefore shutdown the system and search the problem according to the guideline, while the battery is completely off. Also check on the inverter side why the force charge doesn't work. Do not turn on the battery before making sure the inverter should be able to charge the battery.

- If only one LVL is in undervoltage: remove that one and try commissioning without it. Otherwise, make sure to avoid further overdischarge. (Turn off the system completely)

- If one, or all LVL are in undervoltage: Contact the service as stated below and make sure to avoid any further discharge of the battery (Turn off the system completely)

When contacting the service, make sure to fill the service checklist completely and add the following information:
- Serial Numbers (of the BMU and all (affected) LVL)
- Individual LVL voltages of all LVL (related to Serialnumber)
- Logs from the battery using BCP (**section 2.5**) and Screenshots showing the cell voltages, or manual cell voltage measurements
- Initial Firmware (FW) Version of the Battery when the UV happened (BMU and BMS)
- Detailed description how and why the system reached Undervoltage if known. Information when the system was installed and commissioned and in which circumstance and when the undervoltage happened. If the battery was never running before: Why did it never work before, and what was the Batteries status when the battery was left (on / off / LED).
- Inverter Model, Serial Number and Inverter Logs
- Access to Inverter portal (add info@eft-systems.de and tell us the name of the system in the portal)

3. SERVICE TASKS

Please go through the general and error specific steps beforehand, see chapter 1 and 2.

3.1 BMU Replacement

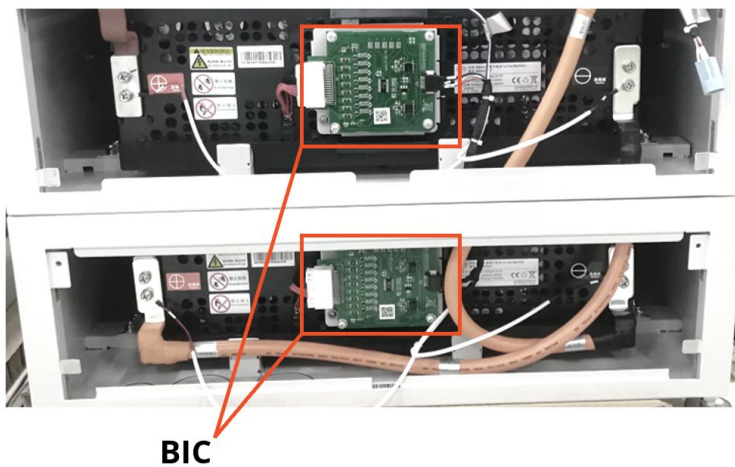**Have you detected a faulty BMU?:**
After replacing the BMU, please do not forget to re-do the configuration and firmware-update in the app.

3.2 BMS Replacement

Refer to Manual *"BMS Drawer Replacement Guide"*

3.3 BIC Replacement

Refer to Manual *"BIC Board Replacement Guide"*

BIC

BYD Battery-Box Premium LVL Service Checklist - V1.1 EN

Important: The installation and all other kinds of works or measurements in combination with the BYD Battery-Box are only allowed by professional and qualified electricians. Improper handling can cause danger and damage. This document does not replace the official BYD manuals and documents. No responsibility is accepted for the accuracy of the information.

1. GENERAL STEPS

Please carefully check **all** 8 „General Steps" from page 3 of the Service Guideline and confirm this in the boxes below

1.1 Configuration	1.4 Latest Firmware	1.7 Switch on procedure
1.2 Correct internal cabling	1.5 App Configuration	1.8 Correct Operation
1.3 Correct external cabling	1.6 Restart	

2. ERROR RELATED ANALYSIS

Please mark the **error related** Analysis from Chapter 2 (page 4-11) of the Service Guideline that you checked, and collect all the information related to those Sections

2.1 BMU shows no reaction / No LED	2.4 BMU/BMS LED event code (EC)
2.2 Communication problem with Inverter	2.5 Be Connect Plus (BCP)
2.3 Problem with the Firmware Update / App Configuration	2.6 Voltage measurement

3. SERVICE INFORMATION

Please fill all available information in below table. Some information like the Serial Number of the BMU is mandatory to receive service.

- **Service Ticket Number or System ID:**

- **Installer / Delivery Address / Contact:**

Company	ZIP / City
Contact Person	Phone
Street / Nr.	Email

- **System Information**

Battery Configuration (X x LVL)	BMU Firmware
BMU Serial Number	BMS Firmware
BMU Connected to Internet Yes No	Inverter Firmware
Inverter Brand + Model	Inverter Portal Name
Inverter Serial Number	(State the system name. Provide access)
Commissioning Date	

- **Service Information**

BMU EventCode (EC)   Inverter Error Code

BMS EventCode(s) and related LVL Serial Number(s)

Was the battery charging / discharging before (was the system working normally before?)   Yes   No

Take pictures of open communication port in the Battery and Inverter clearly showing connection cables

Get Data of the Battery-Box with the Be Connect Plus (BCP) Programm (see chapter 2.5)

Description of
the Problem

Please provide any additional information that is necessary or could help in the analysis of the service case (e.g. serial number of a wrong module, video of a special behaviour; pictures; app screenshots; module voltages…)

By contacting us you confirm, that a qualified person has done the necessary control and collected all available information above.

BATTERY BOX