LiPro1-x Active V2

Operating instructions

Rev. 1.00.02

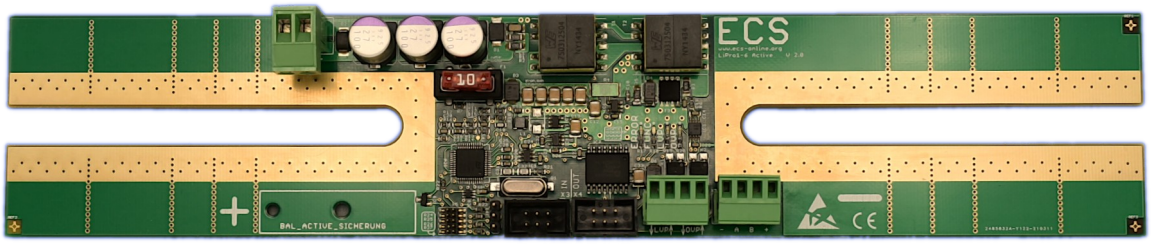

Illustration 1: Lipro 1-x Active V2

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Definitions:

Cell:

Individual galvanic element. Only rechargeable cells (secondary cells) are used in these operating instructions. The term accumulator is deliberately not used, as this does not allow a clear distinction to be made between a "battery" composed of several cells.

Battery / battery bank:

An interconnection of several galvanic elements. In the application of these operating instructions, only rechargeable cells (so-called secondary cells).

1 About these operating instructions

On the following pages, you will read how to commission and operate the appliance correctly for your application. It is important to us that you operate the appliance safely, properly and economically. It is therefore essential that you read these operating instructions carefully before using the appliance. They contain important information that will help you to avoid hazards and increase the reliability and service life of the appliance and accessories. For your own safety, read the "Safety measures" section. Follow all instructions carefully to avoid endangering yourself and third parties and to prevent damage to the device. If you have any questions about the LiPro1-x Active V2 that are not answered in these operating instructions or if something is not described clearly, please contact us before using the device:

ECS Electronic Construction Service

Am Wenigerflur 14

54498 Piesport

Tel. 06507 - 9989954

Fax. 06507 - 9989956

www.ecs-online.org

E-Mail: mail@ecs-online.org

2 Intended use

The LiPro1-x Active V2 is used exclusively for monitoring the charging and discharging of lithium cells. It is also used to equalise the charge of cells with different SoC (State of Charge) in a series-connected battery.

Lithium cells react very sensitively to falling below the minimum cell voltage (deep discharge) and exceeding the maximum cell voltage (overcharging), which is why monitoring is absolutely essential.

The LiPro1-x Active V2 ensures that individual cells of a series-connected battery are neither overcharged nor deep discharged. If a voltage that is too high or too low is detected on one of the cells, the LiPro1-x Active opens the corresponding safety loop. The safety loop is connected either to our greenSwitch, greenController or to (electronic) relays.

The use of two safety loops eliminates the disadvantage of other systems in which there is only one common loop and therefore the charge and load can only be switched off together.

Lithium cells connected in series never charge and discharge in exactly the same way due to manufacturing tolerances. To compensate for this, the LiPro1-x Active contains a built-in charge equaliser (balancer).

If the voltage of a cell exceeds the balancer voltage, the built-in charge equaliser (balancer) "draws" a current that reduces the charge of this cell in order to keep the voltage constant.

With greenView as Master device. All cell voltage will be monitored and LiPro balancer voltage controlled by greenView.

The current drawn is transformed via a DC/DC converter to the total voltage of the battery and fed into the battery pack. On this way the energy from the more full cells will be tranfered to the weaker cells. This function is also known as active charge equalisation.

If the charging current is greater than the max. charge equaliser current, the cell voltage can continue to rise, the LiPro1-x Active V2 then stops further charging until the cell voltage has fallen back to the equalisation voltage. This means that the charging process takes longer for new cells or cells with very different charges.

Note: If the LiPro1-x Active V2 is connected to the greenController or greenView via the RS485 bus, the "intelligent equalisation" function is also active. This function continuously adjusts the equalisation voltage. This allows the equalisation process to start earlier or continue for longer. This can prevent or reduce an interruption in charging in the event of very high charging currents and large capacity tolerances.

Active charge equalisation also increases the effective capacity of your battery bank, as weak cells (cells with a lower voltage) are supported by the stronger cells. This means that the total capacity is no longer equal to the capacity of the weakest cells, but corresponds

approximately to the average capacity. This can also be further improved in conjunction with greenView or greenController and "intelligent equalisation".

A suitable charger must be used for charging.

When operating LiPro1-x active V2 in a motor vehicle, separate approval/testing may be required. If in doubt, please ask your local authorities.

The LiPro1-x Active V2 must not be used in safety-critical areas such as hospitals without the express authorisation of the manufacturer.

The LiPro1-x Active V2 must not be operated outdoors or in unprotected rooms. It has neither contact protection nor protection against the ingress of water or other foreign bodies (protection class IP00). The module is painted to protect it from condensation.

The LiPro1-x Active V2 is intended exclusively for use with lithium cells. You will find the permitted types in Chapter 5 - Properties. For other types, please contact ECS before use.

Any other use is considered improper use!

3 Symbole

You will find the following symbols in several places in the operating instructions, which mark important safety instructions:

ATTENTION!

This symbol indicates hazards that could result in personal injury or material damage.

NOTE

This symbol indicates information on installation and device function.

Read the following safety instructions carefully and follow them precisely. They are for your own safety, the safety of others and to prevent damage to the appliance and accessories.

4 Safety instructions

Attention:

Hazardous gases can be produced when charging batteries. Please ensure adequate ventilation! Do not store flammable liquids or materials near the cells. Do not install batteries / charge controllers on highly flammable materials such as wooden boards or under wooden ceilings!

Ensure that there are no ignition sources near the batteries. Observe the local regulations. Also observe the regulations of the cell manufacturer in this regard.

Observe the charging process and the cell voltages, consult the manufacturer of the cells and/or ECS if necessary.

We are not liable for damage caused by non-compliance with the operating instructions.

We are not liable for consequential damages of any kind.

Please use insulated tools when working on the batteries. Remove watches and jewellery.

Attention:

In the event of an accidental short circuit on the battery cables, very high currents can occur, which can cause the batteries to explode, among other things, which is why the above instructions must be strictly observed.

The battery bank must consist of cells of the same type.

Please make absolutely sure that the power connections are secure so that no overheating can occur due to a loose connection.

Use correctly dimensioned conductors to connect the battery.

CAUTION: The appliance may only be put into operation by a qualified electrician. Failure to follow the instructions may result in a hazard.

The intended use of the appliance must be strictly observed. The manufacturer accepts no liability for damage resulting from improper use.

The operating instructions must always be available at the place of use of the appliances. It must be thoroughly read and applied by the person responsible for operating, maintaining and servicing the appliance.

Danger from electric current!

Ensure that no liquid can get onto the appliance. If this should nevertheless occur, disconnect the power supply to the appliance immediately. Ensure that all electrical connection cables are undamaged and cannot be kinked or crushed. If you notice any damage, disconnect the power supply and secure the appliance against restarting.

All faults on the appliance that impair safety must be rectified immediately. All warnings and safety instructions attached to the appliances must be observed and kept in legible condition.

The condition of the cells must be checked regularly, please also refer to the Maintenance chapter. Please check regularly whether the cell voltages are within the cell manufacturer's specifications to prevent damage in the event of a malfunction.

Note: Our devices are constantly being improved and further developed, which is why we reserve the right to make changes to the product specification at any time without prior notice.

No modifications, either mechanical or electrical, may be made without the manufacturer's authorisation. Only the parts specified by the manufacturer may be used for conversions and accessories. Non-compliance will invalidate the conformity and the manufacturer's warranty. The risk is then borne solely by the user.

5 Eigenschaften

Mechanical data	
Dimensions	Length: 150/190/230/270 mm (separable) Width: 53 mm Height: 26 mm Minimum pole spacing: 90 mm Maximum pole spacing: 250 mm
Weight	77 gr
Max. cable size	Switching outputs, bus: 0.1 mm² - 1.5 mm² Charge equalisation connections: 0.5 - 2.5 mm
Protection class	IP 00, circuit board is coated to protect against environmental influences!
Suitable cells	LiFeYPO4 (default), LiFePO4, LTO, Na Other types please contact ECS
Electrical data	
Operating voltage range	1 V to 4.95 V
Accuracy of voltage measurement and threshold values	Measuring range 4.95 V, Maximum measurement error 0.005V (in the measurement range from 0.5 to 4.5V) (guaranteed over temperature range 0 - 45°C) This corresponds to a maximum measurement error of < 0.1 % FS
Temperature measurement error	+- 3°C
Output voltage range DC/DC converter (battery bank voltage)	10 – 63 V
Input voltage range DC/DC converter (cell equalisation)	2,0 V – 4,0 V
DC/DC converter efficiency	>81 – 86 % (Dependent on cell voltage and battery bank voltage, see diagrams)
Power consumption	< 0,03 W
Maximum equalising current	5 – 8 A (depending on cell voltage and battery voltage)
Equalising current control	Regulated, not hard switching. Resolution 3000 steps
Environmental data	
Ambient temperature	- 40 °C to + 50 °C
Operating temperature	- 40 °C to +85 °C
Storage temperature	- 40 °C to + 85 °C
Outputs	
Function	1 x Safety loop LVP 1 x Safety loop OVP
Contact Type and design	NC (normally closed) - contact is opened in the event of a fault, implemented as an optocoupler with MOSFET output
Max. Switching current	1 A (Max. Protection 1A Flink)
Max. Switching voltage	80 V AC (peak), 80 V DC
ON - Resistance	< 0,5 Ohm

Tabelle 1: Technical data

Typical DC / DC converter characteristics:

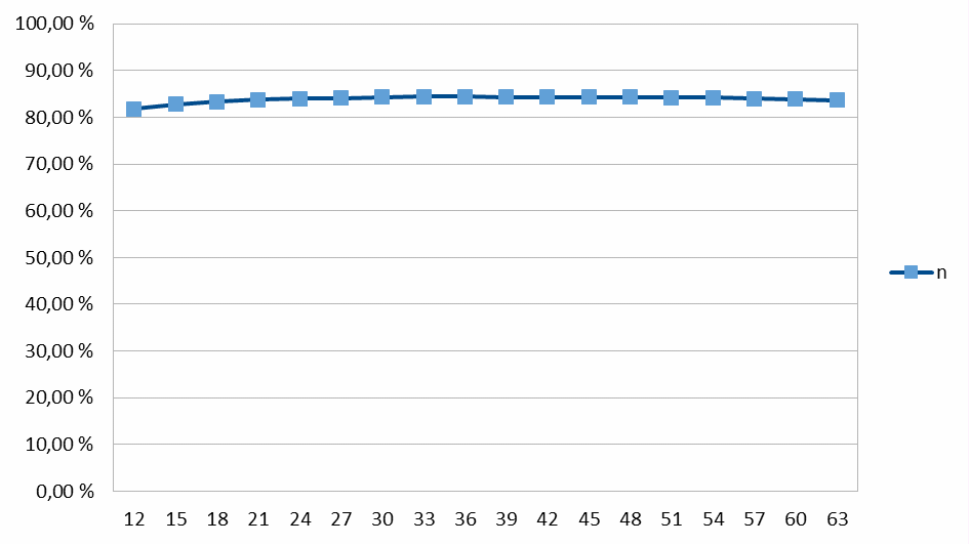


Illustration 2: Diagram of efficiency at Uin 3.0 V

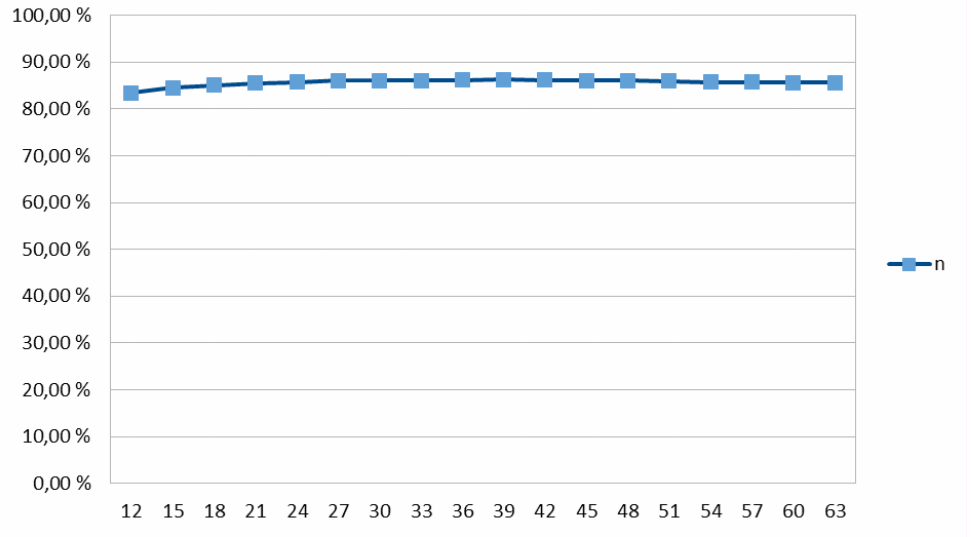


Illustration 3: Diagram of efficiency at Uin 4.0 V

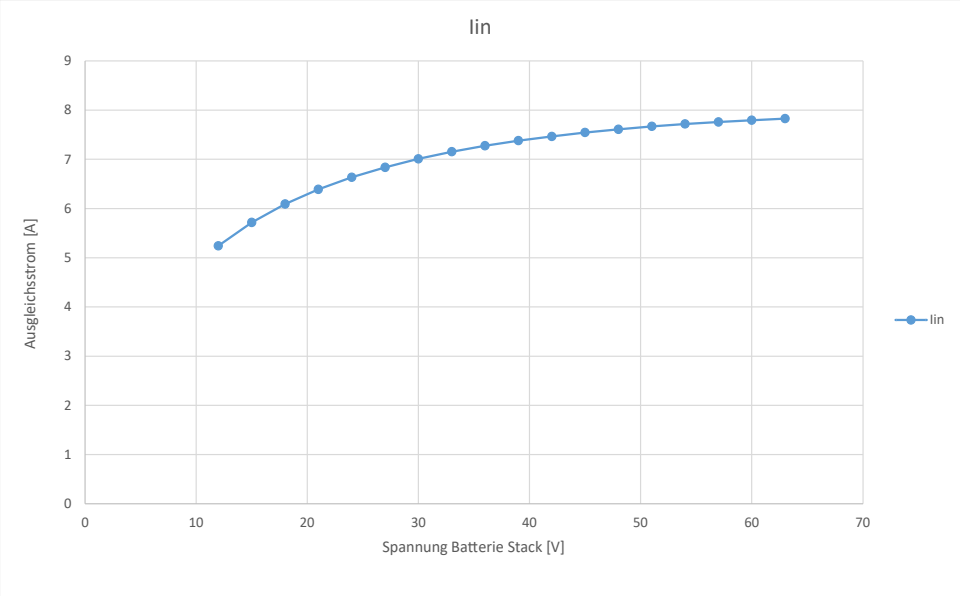


Illustration 4: Diagram equalisation current cell vs. battery stack voltage

Switching thresholds	Factory settings (for LiFePO4 / LiFeYPO4)	Your setting: (You can make a note of your setting here)	Unit
OVP-Alarm (red LED)	3.700		V
Overcharge protection switch-off (OVP start voltage)	3,650		V
Overcharge protection Restart (OVP stop voltage)	3,600		V
Balancer voltage	3,600		V
Low voltage protection (LVP Start Voltage - Delayed)	2,900		V
Low voltage protection (LVP) not delayed and LVP ALARM LED	2,800		V
Deep discharge protection restart (LVP Stop Voltage)	3,200		V
Temperature switch-off	50		°C
Temperature switch-off restart threshold	45		°C
Neue Parameter in V2 Version			
Undertemperature switch-off Charge start	5*1		°C
Undertemperature switch-off Charge stop	7		°C
Undertemperature switch-off load start	-15		°C
Undertemperature switch-off load stop	-10		°C
Temperature compensation			
Reference temperature for compensation	25		°C
Overcharge protection	0		mV/°C

Switch-off (OVP start voltage)			
Overcharge protection Restart (OVP stop voltage)	0		mV/°C
Deep discharge protection switch-off (LVP Start Voltage - Delayed)	0		mV/°C
Deep discharge protection (LVP) Switch-off tripping not delayed (LVP start voltage)	0		mV/°C
Deep discharge protection restart (LVP Stop Voltage)	0		mV/°C
Balancer voltage	0		mV/°C
OVP-Alarm (red LED)	0		mV/°C
LVP-Alarm (red LED)	0		mV/°C

[*1] **Note on temperature switch-off for LFP cells:**
Charging at low temperatures is critical and shortens the service life.
We recommend switching off earlier at high charging currents.
With very low charging currents, it may still be possible to charge at low temperatures, for example down to 0 °C. Some manufacturers such as Winston also allow charging below 0 °C.

Attention:
These settings are recommendations, please contact your cell manufacturer and have these values confirmed!

Note on temperature compensation:
If the cells are used in the low temperature range, the temperature compensation may need to be activated.

6 Available versions

- ***LiPro1-6 Active V2*:**
  Standard version, with approx. 5-8 A equalising current. Voltages are preset for LiFeYPo4 cells. Can be changed via interface.

Other versions (e.g. with higher battery voltage) on request.

7 Neue Features in der V2 Version

The new version has the following improvements and changes:

- **Lower standby current consumption (0.03 W)**
- **Higher measurement accuracy of voltage measurement (+/- 5 mV maximum)**
- **Current equalisation current is now measured more accurately and can be displayed**
- **Higher efficiency during charge transfer**
- **Temperature compensation of switching thresholds possible**
- **Charger or loads can be switched off when an adjustable minimum temperature is reached**
- **Test jumper easier to reach**
- **Mounting slot is now further inwards.**
- **When the power supply is switched on, the number of flashing pulses of the red LED indicates the set slave address.**

8 Assembly

Components of the LiPro1-x Active V2 can become hot during operation, so it should be installed in such a way that accidental contact is impossible.

Remove the fuse before mounting!

Please ensure that the polarity of the LiPro1-x Active V2 is correct; it is screwed onto the positive and negative terminals of each cell. Both the positive and negative terminals are clearly marked on the circuit board. **Eine Verpolung kann zur Zerstörung der Sicherung und/oder des Moduls führen.**

Clean the battery terminals of oxide layers with fine sandpaper before installation. Blow off the sanding dust. Then fit the cell connector and module immediately so that no new oxide layers form.

Mount the device so that it sits above the cell connectors so that any high charging or load current is not conducted via the module.

Fastening for cells with M6 / M8 thread:

First, a threaded rod is screwed into the cell and then the cell connector is secured with a lock washer and nut (tighten the nut to the tightening torque specified by the cell manufacturer). The LiPro1-x Active is then mounted and secured with a second nut. This has the advantage that a sufficient distance is automatically achieved between the LiPro1-x Active V2 and the cells and also makes the assembly and disassembly of the LiPro1-x Active V2 easier, as several parts are not fastened at the same time (reducing the risk of short circuits due to falling parts...).

Fastening for cells with M12 or M14 thread:

First fasten the cell connectors with adapter screws (observe the tightening torque specified by the cell manufacturer), then fasten the LiPro1-x Active V2 with the second, smaller screw.

ECS LiMAX Zellen

ECS LiMAX cells can be attached using separate screws. This makes installation particularly easy and safe.

Abbildung 5: ECS LiMAX ZElle

Grub screws and adapter screws can be obtained from ECS.

In any case, regularly check that the screws/nuts are tight and retighten them if necessary. After commissioning, check whether the connection points are heating up; if this is the case, there is a risk of fire! Eliminate the cause of the heating immediately (insufficient tightening torque, corroded connectors, etc.).

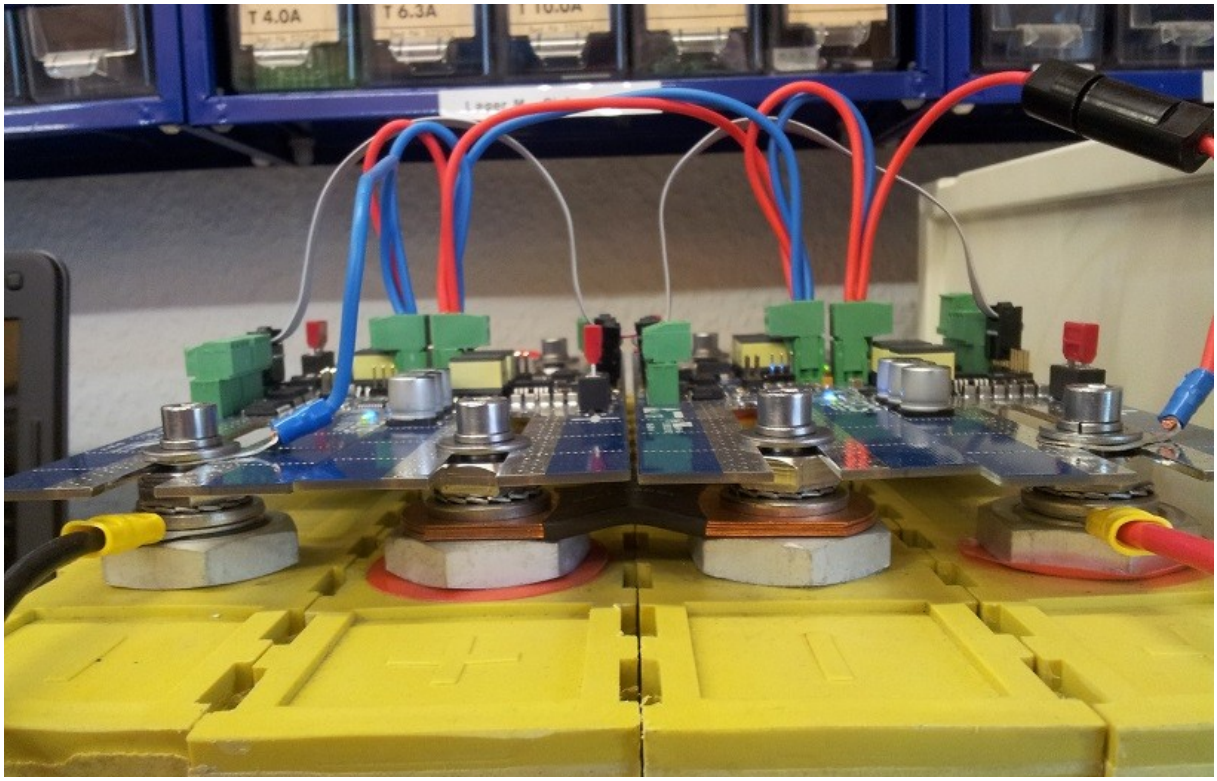


Illustration 6: Assembly (view from the side)

Air should be able to circulate freely above the circuit board to ensure sufficient ventilation and cooling of the cells and electronics. Please ensure sufficient ventilation when installing in a control cabinet, a fan may be necessary.

Please only install the cells in dry rooms.

Note:

The LiPro1-x Active has an automatic temperature switch-off function. The red LED indicates an active temperature switch-off (See chapter 10: Commissioning and LED displays).

9 Anschluss

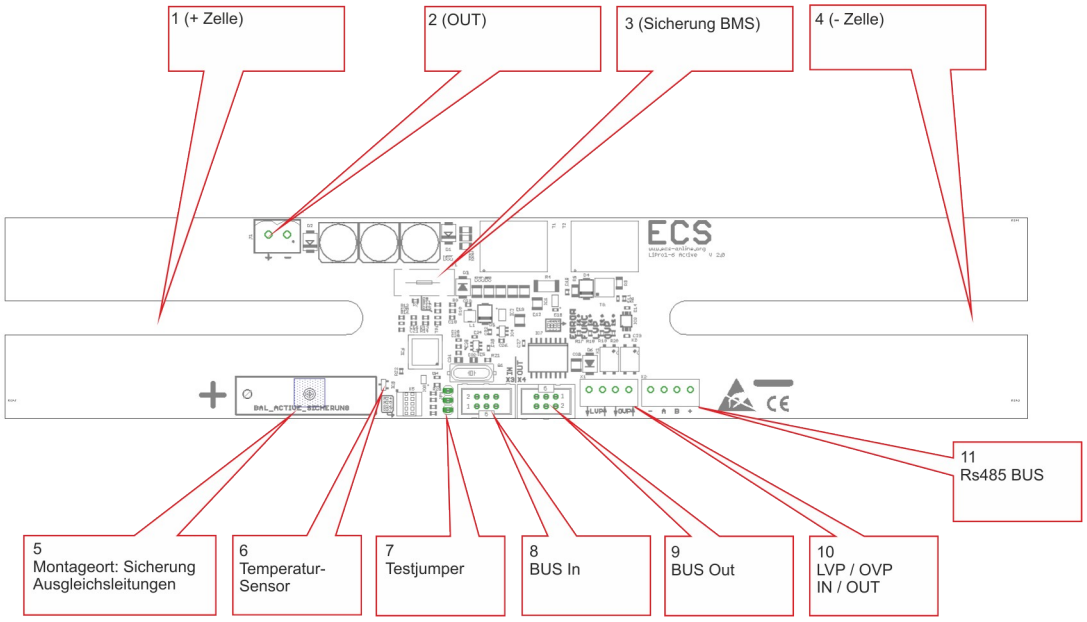


Illustration 7: Position of the connections and components

1	Screw to the positive terminal of the cell
2	OUT+: Output for charge transfer, connect to battery positive (NOT CELL) via fuse. OUT-: Output for charge transfer, connect to the negative terminal of the battery (NOT CELL).
3	Fuse 10A
4	Screw to the negative terminal of the cellScrew to the negative terminal of the cell
5	Possible installation location for securing the compensating cable
6	Temperature sensor
7	Test bridge
8	Wiring of OVP / UVP / RS485 bus IN. Must be connected to "OUT" of the previous LiPro1-x Active. Pin 1 is marked with a triangle on the socket.
9	Wiring of OVP / UVP / RS485 bus OUT. Must be connected to "IN" of the next LiPro1-x Active. Pin 1 is marked with a triangle on the connector.
10	**Alternative wiring via screw terminals if ribbon cable wiring is not possible.** LVP output (terminal 1): Wire to the LVP input of the next LiPro1-x Active 2. If this is the last one, then wire to the LVP control input of the greenSwitch, greenController or to the LVP relay. *LVP input (terminal 2): If this is the first LiPro, then wire from the positive terminal of the battery, if not wire to the LVP output of the previous LiPro1-x Active V2. This is the supply for the lvp relay.* OVP output (terminal 3): Wire to the OVP input of the next LiPro1-x Active. If this is the last one, then wire to the OVP control input of greenSwitch, greenController, OVP relay or Charger-CTR. *OVP input (terminal 4): If this is the first LiPro, then wire from positive terminal of battery, if not wire to OVP output of previous LiPro1-x Active. This is the supply for the ovp relay.*
11	**Alternative wiring via screw terminals if ribbon cable wiring is not possible.** RS485 BUS connection Screw terminals: Terminal -: Input negative pole 5V supply for the RS485 interface Terminal +: Input positive pole 5V supply for the RS485 interface Terminal A: RS485 data line A Terminal B: RS485 data line B

Tabelle 2: Connector assignment

After installation, please carry out the wiring according to the table above and the wiring examples on the following pages.

The charge equalization cables must be connected to the entire battery bank via a fuse. Please use a fast-acting version with a nominal value of 8 A. Please check that the fuse has sufficient breaking capacity. A cable with a cross-section of 1.5 mm2 should be used for the wiring. Use TWIN wire end ferrules at the terminals. The cable should be as short as possible.

Pre-assembled cables can be obtained from ECS according to the number of cells. These are labeled KAB_BAL_ACTIVE_X (Replace x with number of cells)

The OVP and LVP cables must be wired to ensure control of the charging sources and loads. To do this, the battery voltage is looped through the LiPro1-x Active V2 and connected to the device/relay to be controlled after the last LiPro1-x Active.

The OVP and LVP cable must be protected with a fuse (fast-acting, maximum 1A).

RS485 can be wired for additionally monitoring the cells (e.g. voltage and temperature display on PC/mobile phone/greenView). RS485 wiring is also required to change the parameters.

Both the RS485 bus and the looping through of the OVP and LVP signals can be carried out using a ribbon cable, which saves wiring work.

Ready-made ribbon cables can be obtained from ECS according to the cell size. These are labeled FK6.

Assignment of ribbon cable BUS IN connection (marked 8 in the overview diagram):

1	LVP IN
2	RS485 - A
3	OVP IN
4	RS485 - B
5	RS485 GND
6	RS485 VCC

Table 3: Connector X3

Assignment of ribbon cable BUS OUT connection (marked 9 in the overview):

1	LVP OUT
2	RS485 - A
3	OVP OUT
4	RS485 - B
5	RS485 GND
6	RS485 VCC

Table 4: Connector X4

Wifi converter:

Our Wifi converter V3 can be connected to the 6-pin IN connection via ribbon cable. Communication as well as the OVP and LVP feed can then take place via the ribbon cable.

GreenView (TFT Display):

If greenView is used as a master device (or only a USB connection to the PC), the green screw terminals must currently be used to connect the data bus. The OVP / LVP is then fed from the positive terminal of the battery via a fuse (max. 1A / fast).

To forward the signal, a ribbon cable is connected from the 6-pin OUT (connection 9) of the first LiPro1-X Active V2 to the 6-pin IN (connection 8) of the next LiPro1-X Active V2. At the last LiPro1-X Active V2, the signal can be forwarded from the OVP/LVP output (connection 10) or via the 6-pin OUT (connection 9) to the next device. These are, for example, the relays, our greenSwitch or greenController. If no other devices are connected to the RS485 bus, the bus can be terminated by plugging the RS485_TERM board into the OUT connection.

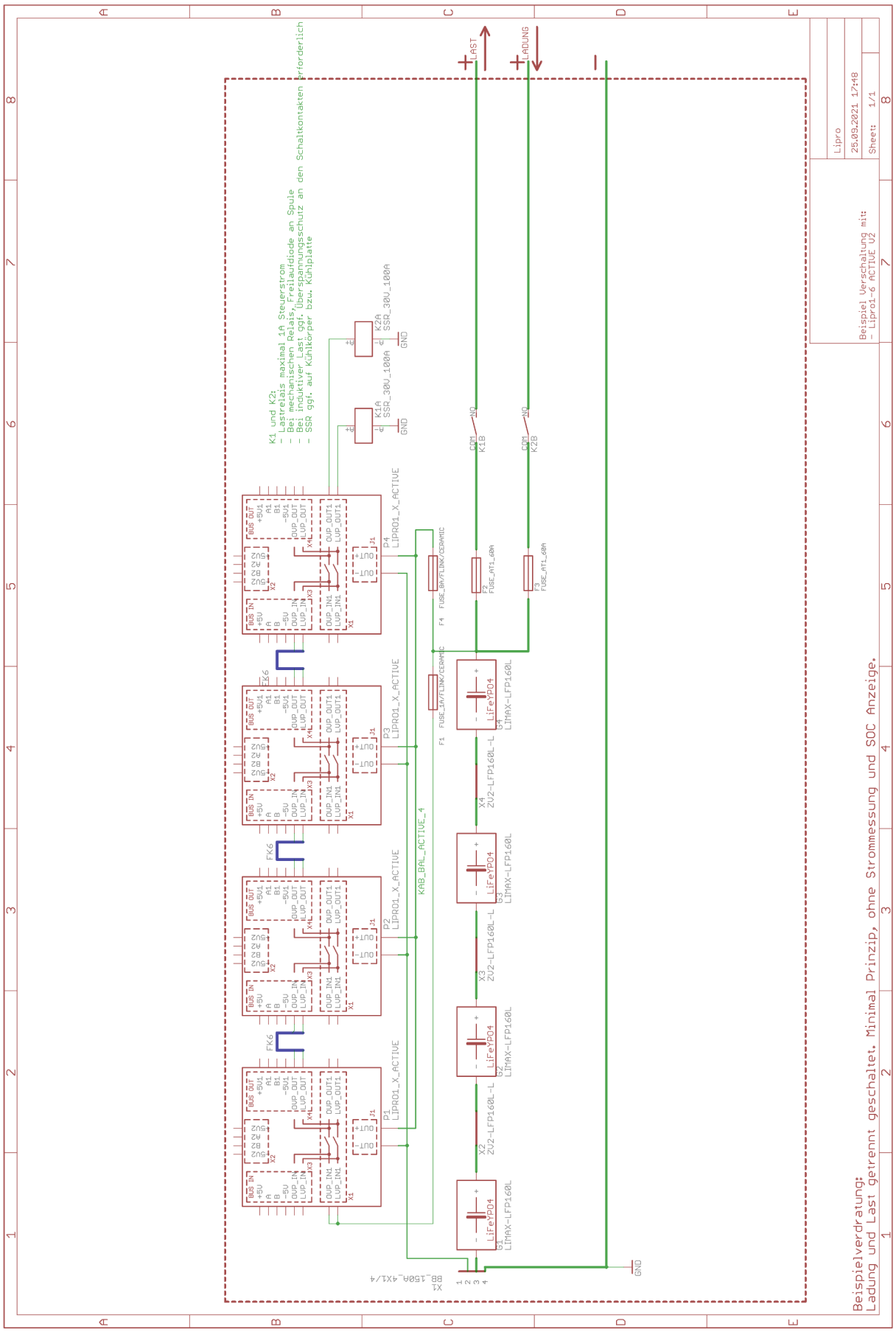
Sequence:

When wiring, it is important that the following sequence is observed:

Master devices	→	**Sensors**	→	**Actors**
greenView		LiPro1-X V3		greenSwitch
Wifi-Konverter	→	LiPro1-X V2 active	→	greenController (Laderegler)
USB		greenMeter		Relais
(Pluspol Batterie)				

If, for example, a greenSwitch comes first and then a LiPro, then LiPro can not control the greenSwitch. The OVP and LVP input of the LiPro would always have a connection to the positive battery terminal, the LiPro could not disconnect the connection.

Below you can see some wiring examples. If you have a printed manual, it may be useful to open the digital version of the manual, as you have high-resolution graphics and can zoom in. The digital version of the instructions can be found in the download section of the article on our website.


Beispielverdrahtung:
Ladung und Last getrennt geschaltet. Minimal Prinzip, ohne Strommessung und SOC Anzeige.
Beispiel Verschaltung mit:
- Lipro1-6 ACTIVE V2
Lipro
25.09.2021 17:48
Sheet: 1/1
K1 und K2:
- Lastrelais maximal 1A Steuerstrom
- Bei mechanischen Relais, Freilaufdiode an Spule
- Bei induktiver Last ggf. Überspannungsschutz an den Schaltkontakten erforderlich
- SSR ggf. auf Kühlkörper bzw. Kühlplatte
LAST
LADUNG
K1A
SSR_30V_100A
K2A
SSR_30V_100A
GND
COM
NO
K1B
K2B
F1 FUSE_1A/FLINK/CERAMIC
F2 FUSE_AT1_60A
F3 FUSE_AT1_60A
F4 FUSE_8A/FLINK/CERAMIC
P1 LIPRO1_X_ACTIVE
P2 LIPRO1_X_ACTIVE
P3 LIPRO1_X_ACTIVE
P4 LIPRO1_X_ACTIVE
KAB_BAL_ACTIVE_4
FX6
X1
X2
X3
X4
X4L
J1
BUS IN
BUS OUT
+5V
A
B
-5V
DUP_IN
LUP_IN
DUP_OUT
LUP_OUT
DUP_IN1
LUP_IN1
DUP_OUT1
LUP_OUT1
G1 LiFePO4 LIMAX-LFP160L
G2 LiFePO4 LIMAX-LFP160L
G3 LiFePO4 LIMAX-LFP160L
G4 LiFePO4 LIMAX-LFP160L
X2 2U2-LFP160L-L
X3 2U2-LFP160L-L
X4 2U2-LFP160L-L
X1
BB_150A_4X1/4
GND

Dimensioning example:

The circuit above shows a simple setup without visualization. It is designed for small continuous currents of 40 A.

The 60 A fuse was chosen to be 50 % larger in order to minimize losses at the fuse. This also means that there is no undesirable ageing of the fuse. As a result, the fuse will not blow prematurely even at higher ambient temperatures.

The selected electronic relay with a maximum current of 100 A has a low "ON" resistance and does not need to be cooled at 40 A.

As the fuse was selected with 60 A, the cables must be designed for a current of > 60 A.

An NSGAFÖU cable with 6 mm² has a maximum permissible current load of 70 A. However, this current rating only applies at ambient temperatures of up to 30 °C. And only if the cable is laid at a distance from other cables. Larger cross-sections must therefore be used. A cross-section of 16 mm² will be sufficient in most cases. Please check this against the relevant standards for your application.

Fuse F1 protects the switching outputs. It must not exceed 1 A and should be of the "fast-acting" type.

Fuse F4 protects the compensating cables.

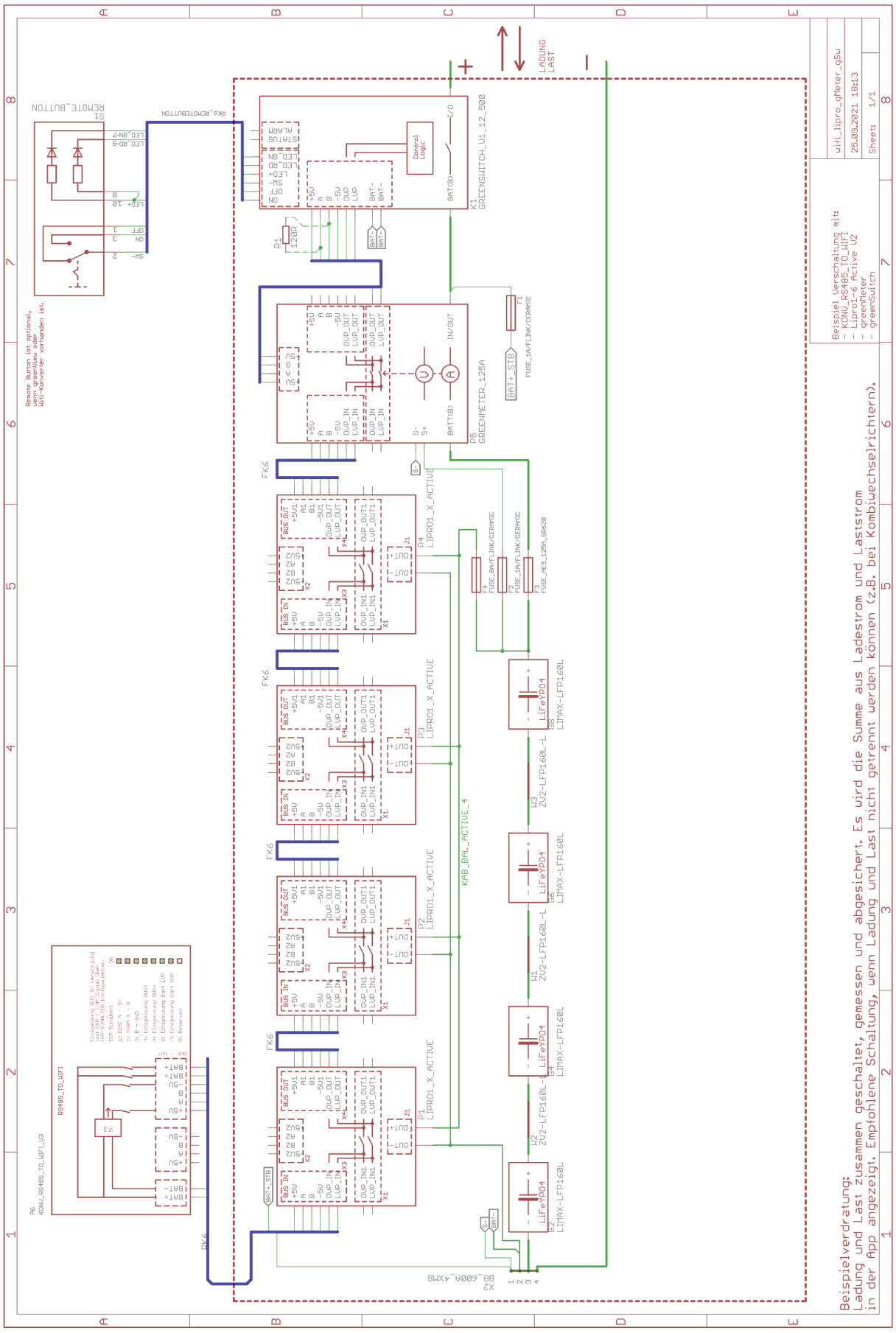
The connection between the LiPro1-X V3 is made with ready-made FK6 ribbon cables.

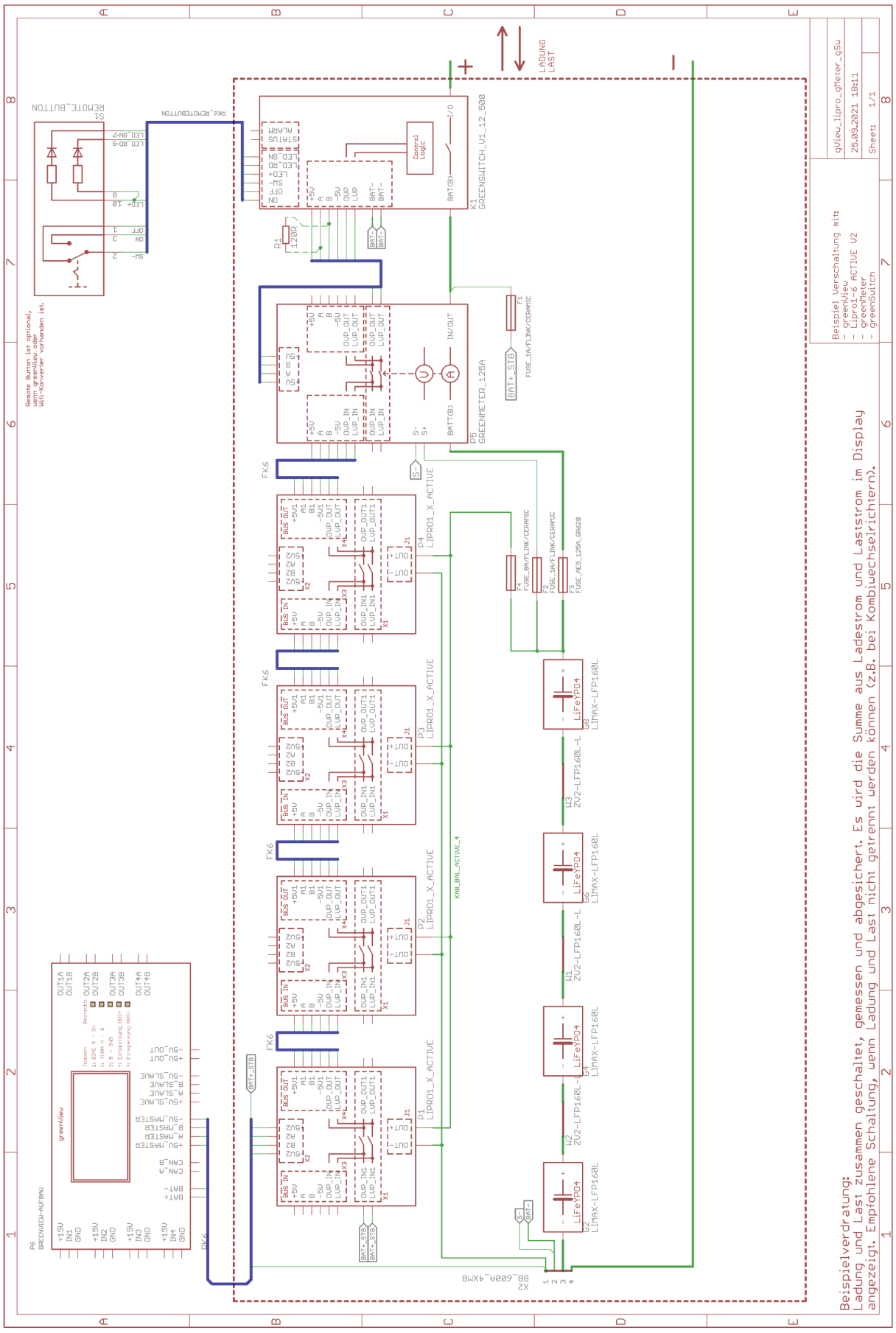
Ready-made cell connectors are available for the connection between the cells.

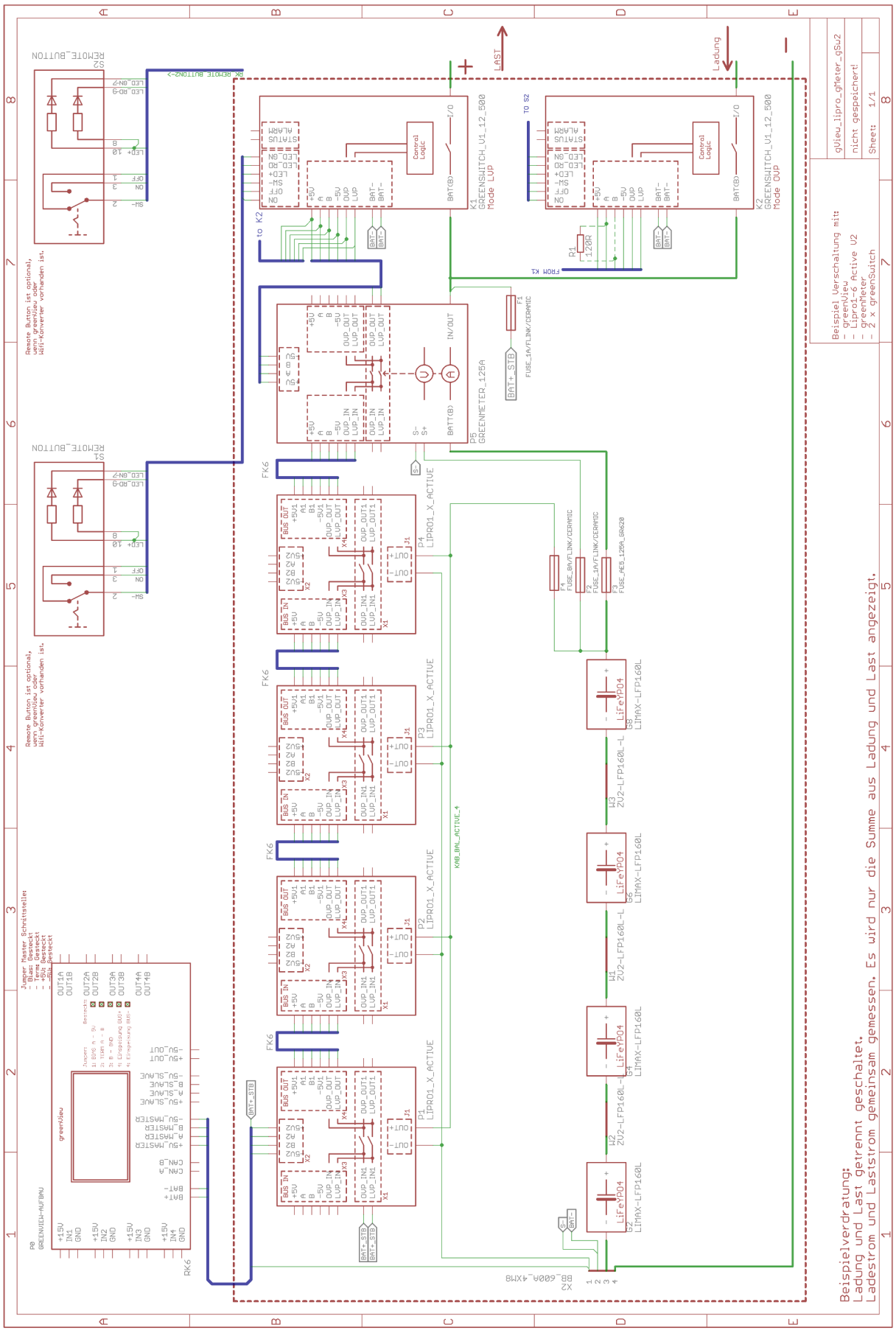
Attention:

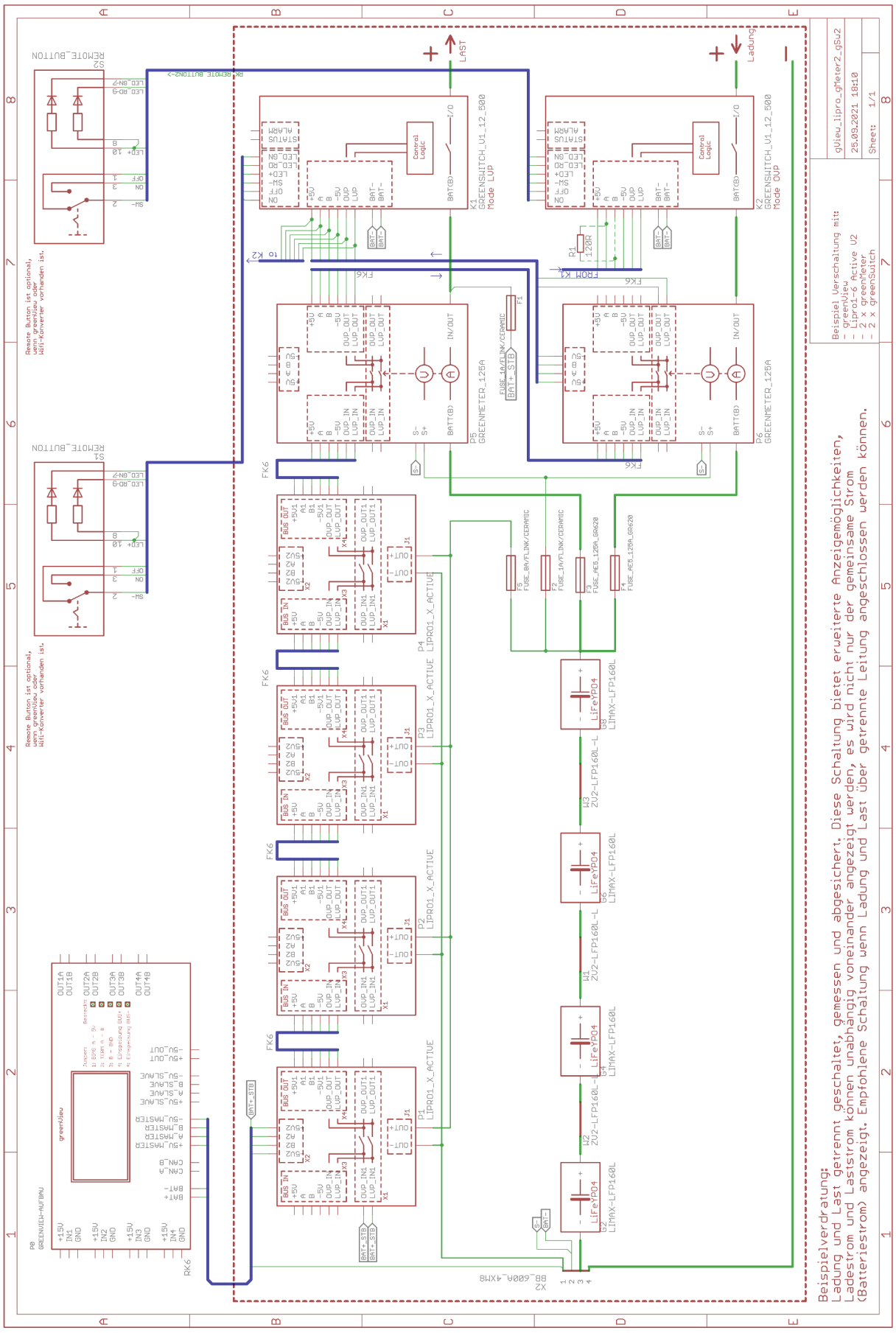
The cable cross-sections and fuses must be designed in accordance with the current VDE standards and must be considered carefully in each individual case. If in doubt, please contact our support team. We can plan your entire project for you.

Below you can see further example circuits.


Beispielverdrahtung:
Ladung und Last zusammen geschaltet, gemessen und abgesichert. Es wird die Summe aus Ladestrom und Laststrom
in der App angezeigt. Empfohlene Schaltung, wenn Ladung und Last nicht getrennt werden können (z.B. bei Kombiwechselrichtern).
Beispiel Verschaltung mit:
- KONV_RS485_TO_WIFI
- LiPro16S active V2
- gMeter
- greenSwitch
wifi_lipro_gMeter_gSw
25.03.2021 18:13
Sheet: 1/1
LADUNG
LAST
REMOTE_BUTTON
Remote Button ist optional,
wenn greenVeu oder
Wifi-Konverter vorhanden ist.
GREENSWITCH_V1_12_500
GREENMETER_125A
LIPRO1_X_ACTIVE
LiFeYPO4
LIMAX-LFP160L
KAB_BAL_ACTIVE_4
RS485_TO_WIFI
KONV_RS485_TO_WIFI_V3


Beispielverdrahtung:
Ladung und Last zusammen geschaltet, gemessen und abgesichert. Es wird die Summe aus Ladestrom und Laststrom im Display angezeigt. Empfohlene Schaltung, wenn Ladung und Last nicht getrennt werden können (z.B. bei Kombiwechselrichtern).
Beispiel Verschaltung mit:
- greenVieu
- LiPro1/2 ACTIVE V2
- LiproMeter
- greenSwitch
gVieu_lipro_gMeter_gSu
25.03.2021 18:11
Sheet: 1/1
LADUNG
LAST
REMOTE_BUTTON
GREENSWITCH_V1_12_500
GREENMETER_125A
LIPRO1_X_ACTIVE
LiFeYPO4
LiMAX-LFP160L
greenVieu
GREENVIEW-AUFBAU


Beispielverdratung:
Ladung und Last getrennt geschaltet.
Ladestrom und Laststrom gemeinsam gemessen. Es wird nur die Summe aus Ladung und Last angezeigt.
Beispiel Verschaltung mit:
- greenVüeu
- Lipro1S Active V2
- gMeter
- 2 x greenSwitch
gUiew_lipro_gMeter_gSu2
nicht gespeichert!
Sheet: 1/1
Last
Ladung
REMOTE_BUTTON
Remote Button ist optional, wenn greenVüeu oder WiFi-Konverter vorhanden ist.
Jumper Master Schnittstelle:
- Bias Gesteckt
- Term Gesteckt
- +5Su Gesteckt
- -5Su Gesteckt
greenVüeu
GREENWIEK-MUFBRU
RK6
GREENSWITCH_V1_12_500
Mode LUP
Mode LUP
GREENMETER_125A
FUSE_1A/FLINK/CERAMIC
FUSE_BA/FLINK/CERAMIC
FUSE_MEB_125A_BA620
LIPRO1_X_ACTIVE
LiMAX-LFP160L
LiFeYPO4
ZU2-LFP160L-L
KAB_BAL_ACTIVE_4
BB_600A_4XM8
R1
120R


Beispielverdrahtung:
Ladung und Last getrennt geschaltet, gemessen und abgesichert. Diese Schaltung bietet erweiterte Anzeigemöglichkeiten,
Ladestrom und Laststrom können unabhängig voneinander angezeigt werden, es wird nicht nur der gemeinsame Strom
(Batteriestrom) angezeigt. Empfohlene Schaltung wenn Ladung und Last über getrennte Leitung angeschlossen werden können.
Beispiel Verschaltung mit:
- greenView
- LiPro1 Active V2
- LiPro1 eMeter
- 2 x greenSwitch
gView_lipro_gMeter2_gSw2
25.03.2021 18:10
Sheet: 1/1
LAST
Ladung
GREENSWITCH_V1_12_500
Mode LUP
Mode OUP
GREENMETER_126A
LIPRO1_X_ACTIVE
LiFeYPO4
LIMAX-LFP160L
2V2-LFP160L-L
REMOTE_BUTTON
Remote Button ist optional, wenn greenView oder WiFi-Konverter vorhanden ist.
greenView
GREENVIEW-AUFBAU

10 Commissioning and LED displays

Once you have made all the connections, you should first insert the fuse for the balancing cables. Then insert the fuse into the LiPro 1-6 active V2. The device will now start in bootloader mode.

Bootloader

After switching on, the internal bootloader starts first. The blue LED flashes with a switch-on time of 1.5 seconds. (period time 0.3 seconds). It then flashes rapidly for 5 seconds. During this time, the bootloader waits for a valid start signal for a firmware upgrade. Then its own memory is checked for error-free program code (CRC check), if this is OK the main program starts, otherwise an error message is displayed (red LED flashes for 5 seconds with a period time of one second).

Main program

After the bootloader starts, the main program starts automatically. The LiPro indicates its own slave address with the red LED. If the red LED flashes 5 times, for example, then the device has slave address 5. The boot process is then complete. The following table shows the meaning of the LEDs after the boot process.

Funktion LED (Blaue LED):

0,1s on, 0,9s off	Function check. Processor works.
0,5s an, 0,5s aus	Function check. Processor is working. Charge equalizer active
Aus	Error, please check the wiring and battery voltage

Alarm LED (rote LED):

Aus	DEFAULT: Normal state
15ms on, 1s off	LVP ALARM: • - Cell voltage has dropped very low, cell must be recharged • - Check the automatic disconnection of the load (LVP wiring)
1s on, 1s off	OVP ALARM • Cell voltage is too high, check whether the automatic cut-off of the charge is working (OVP wiring to the charge control relays, RS485 BUS to the greenController)
3s on, 1s off	TEMPERATURABSCHALTUNG: • Temperature too high, check the ventilation!
5s on, 1s off	CONVERTER_ERROR_OUTPUT_VOLT_TOO_LOW: • Battery bank voltage too low. Charge the bank and then perform a reset.

7s on, 1s off	CONVERTER_ERROR_OUTPUT_VOLT_TOO_HIGH • Battery bank voltage too high. Discharge bank and reset • Equalizing cables open or fuse defective. Please check!

OVP LED (grün):

On	Normal state
Off	Charge switched off, cell full [*1]

LVP LED (grün):

On	Normal state
Off	Cell discharged, load switched off [*1]

Tabelle 5: LED Indicators – Description

Note:

It is not necessarily a fault if only one green LED is lit. If, for example, the OVP LED is off, it is possible that no charging is necessary. It is then only necessary to wait until the voltage falls below the "OVP restart voltage".

If the LVP LED is off, it may only be necessary to wait until the cells have been recharged (LVP restart voltage) is exceeded.

If using the RS485 interface, this must now be configured, see chapter 10. Then continue with the function tests on the next page.

Testing the charging and load control:
After wiring and commissioning, the correct function and wiring should be checked. This can be done with jumper JP1, which is marked with a 7 on the overview diagram. Insert the jumper between pins 1-2 (towards the processor) to simulate a full cell, all charging sources must now be switched off. Insert the jumper between pins 2 and 3 (towards the edge of the board), a defective cell is simulated, the charging sources and the loads must be switched off. Remove the jumper.

RS485 test (when using the interface):
Check the connected greenView/greenController/PC/mobile phone to ensure that the correct voltage is displayed for each cell and that no communication errors occur

Your system is now ready for use!

Perform a restart:
If a fault has occurred (see LED description), the appliance must be restarted after the fault has been rectified. To do this, pull the fuse (overview diagram position 3) out of the holder and wait 30 seconds. Then insert the fuse back into the holder as far as it will go.

10.1 Reset to factory settings

The device can be reset to factory settings with the aid of a jumper using the procedure described.

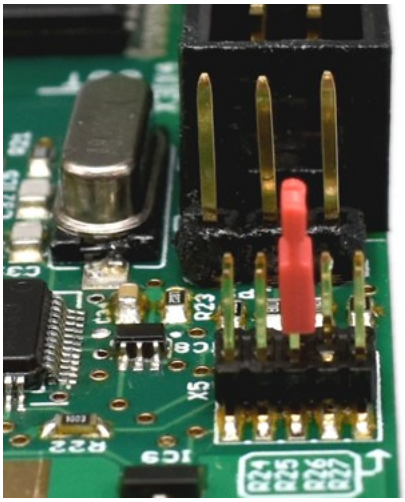


Illustration 8: Reset to factory settings

1. Place the supplied jumper on the middle pins.
2. Switch the device off and on again (remove and reinsert the fuse)
3. Once the boot process is complete, remove the jumper again

All changed and saved parameters are now reset to the factory settings.

11 RS485 interface

The LiPro1-x Active module also offers an RS485 interface. The standardized Modbus RTU protocol is implemented for data communication. Further information on the Modbus protocol can be found at www.modbus.org.

The interface is galvanically isolated from the cell voltage (insulated). Therefore, the interface must be supplied externally with 5V DC voltage. GreenView, the Wifi converter and our RS485 USB converter can provide this voltage themselves. The corresponding jumpers/dip switches may need to be configured accordingly.

The interface is preconfigured at the factory with the following parameters:

Baudrate	19200
Stoppbits	1
Parity	Even (gerade)
Datenbits	8

Table 6: RS485 – Parameters

The slave address is set to 1 at the factory.

Each device on the bus must have a unique identifier. The slave address must therefore be set for all devices. This can be done as follows:

Windows Kommtool:

1. Only connect the LiPro1-X V3 to be set to the bus (disconnect the RS485 plug for all others).
2. Establish a connection with the ECS Kommtool (initially with slave address 1)
3. Change the slave address (ECS Kommtool → Select LiPro1-X V3 → Device menu → Properties → Interface tab → Slave address → Save)
4. Repeat the 3 steps for the remaining LiPro1-X V3.

greenView:

Alternatively, the slave addresses can also be programmed very easily using the greenView device. See the operating instructions for the greenView.

greenViewM:

When using the greenViewM app, address assignment is possible via the Setup Assistant.

Third Party Devices / Third Party Software:

If you want to use a different program/device, e.g. "Modbus Poll", the slave address must be entered in register 12 and then a 1 must be written in register 13. The 1 in register 13 saves the new address in the EEPROM.

The following data can be queried via the interface:

MB Adresse	Kennung	Erlaubter Zugriff	Erklärung
Geräteinformationen			
0	deviceTypeId	Read only	Device identification and version 103: LiPro1-x Active
1			Reserviert
2-3	deviceSn	Read only	Serial number
4	fwMajor	Read only	Firmware Version number Major
5	fwMinor	Read only	Firmware Version number Minor
6	fwRevision	Read only	Firmware Version number Revision
7			Reserved
Geräte Parameter			
8-9	baudrate	read/write	Baud rate, factory setting 19200
10	parityModeLesen / Schreiben	read/write	Parity Mode 101 = 'e' = even (Factory setting) 111 = 'o' = odd 110 = 'n' = none
11s	stopBits	read/write	Currently not evaluated, automatic selection according to Modbus standard depending on parity mode
12	slaveAddress	read/write	Modbus Slave Adresse, Werkseinstellung 1
13	command	write	Command register: 1: CMD_SAVE_PARAMETER_TO_EEPROM 2: CMD_APPLY_MODBUS_PARAMETER 3: CMD_RESET_FACTORY 4: CMD_RESET 5: CMD_SAVE_LOCK_KEY 6: CMD_RESET_COUNTERS 7:CMD_RESET_MIN_MAX_VALUES
14-19			Reserved
20	ovpAlarm	read/write	Saved parameter: OVP Alarm Voltage in mV
21	LvpAlarm	read/write	Saved parameter: LVP alarm voltage in mV
22	ovpStart	read/write	Saved parameter: OVP Start voltage in mV
23	ovpStop	read/write	Saved parameter: OVP Stop Voltage in mV
24	lvpStart	read/write	Saved parameter: LVP Start voltage in mV
25	lvpStop	read/write	Saved parameter: LVP stop voltage in mV
26	vShutdownStart	read/writen	Saved parameter: Undervoltage switch-off start in mV
27	vShutdownStop	read/write	Saved parameter: Undervoltage switch-off stop in mV
28	otShutdownStart	read/write	Saved parameter: Overtemperature switch-off start in °C * 10
29	read/write	read/write	Saved parameter: Overtemperature switch-off stop in °C * 10
30	utpChargeStart	read/write	Saved parameter: Undertemperature switch-off charge start in mV
31	utpChargeStop	read/write	Saved parameter: Undertemperature switch-off charge stop in mV
32	utpDischargeStart	read/write	Saved parameter: Undertemperature cut-off Discharge start in mV
33	utpDischargeStop	read/write	Saved parameter: Undertemperature cut-off Discharge stop in mV
34	lvpTime	read/write	Saved parameter: LVP Delay in s
35	defaultBalVoltage	read/write	Saved parameter: Equalization voltage Default value in mV. Is used if no master device is present
36	refTemp	read/write	Saved parameter: Reference temperature
37	ovpAlarmTempco	read/write	Stored parameter: Temperature compensation OVP

			Alarm voltage in mV / °C
38	lvpAlarmTempco	read/write	Saved parameter: Temperature compensation LVP Alarm voltage in mV / °C
39	ovpStartTempco	read/write	Saved parameter: Temperature compensation OVP Start voltage in mV / °C
40	ovpStopTempco	read/write	Stored parameter: Temperature compensation OVP Stop voltage in mV / °C
41	lvpStartTempco	read/write	Stored parameter: Temperature compensation LVP Start voltage in mV / °C
42	lvpStopTempco	read/write	Stored parameter: Temperature compensation LVP stop voltage in mV / °C
43	vShutdownStartTempco	read/write	Stored parameter: Temperature compensation undervoltage switch-off start in mV / °C
44	vShutdownStopTempco	read/write	Stored parameter: Temperature compensation undervoltage switch-off stop in mV / °C
45	balancerVoltageTempco	read/write	Stored parameter: Temperature compensation compensation voltage (standalone mode) in mV / °C
46	balancerVoltageRemote	read/write	Setting a new balancer voltage. This value is automatically deleted/ignored if communication is interrupted
47	writeLocked	read	1= (Some) registers are protected, 0 = No protection available
48	keyAccepted	read	1= lockKey is correct, locked registers are enabled for writing
49	lockKey	write	ENTER UNLOCK CODE
50	newLockKey	write	EINGABE NEUER Sperrcode
51-99			
Aktuelle Messwerte und Zustände			
100	cellVoltage	read	Cell voltage in [mV]
101	cellTemperature	read	Cell temperature [°C *10]
102	balancerCurrent	read	Current equalizing current in mA (int16_t)
103	otShutdown	read	Overtemperature shutdown status, 0 = OFF, 1 = ACTIVE
104	utChargeShutdown	read	Untertemperatur Ladung Shutdown Status, 0 = AUS, 1 = AKTIV
105	utDischargeShutdown	read	Undertemperature discharge Shutdown status, 0 = OFF, 1 = ACTIVE
106	voltageShutdown	read	Undervoltage switch-off status, 0 = OFF, 1 = ACTIVE
107	lvpDelayCounter	read	Counter until LVP switch-off in seconds, ATTENTION, UNIT CHANGED IN SECONDS
108	balancerPower	read/write	Control value compensation current 0 to 3000 → 0 = 0 %, 3000 = 100 %
109	mode	read/write	Mode 0 = Automatic. Mode 1 = Manual control possible via register 108
110	lvpState	read	LVP switching output status, 0 = LVP off, 1 = LVP active (delayed), 2 = LVP active (undelayed)
111	ovpState	read	OVP switching output status, 0 = OVP off, 1 = LVP active
112	maxVoltage	read	Highest voltage since last reset [mV]
113	minVoltage	read	Lowest voltage since last reset [mV]
114	maxTemperature	read	Highest temperature since last reset [°C *10]
115	minTemperature	read	Lowest temperature since last reset [°C *10]
Berechnete Parameter			
116	balancerVoltage	read	Current equalizing voltage [mV]
117	ovpAlarmComp	read	OVP Alarm voltage temperature compensated [mV]

118	lvpAlarmComp	read	LVP alarm voltage temperature compensated [mV]
119	ovpStartComp	read	OVP Start voltage temperature compensated [mV]
120	ovpStopComp	read	OVP Stop voltage temperature compensated [mV]
121	lvpStartComp	read	LVP Start voltage temperature compensated [mV]
122	lvpStopComp	read	LVP stop voltage temperature compensated [mV]
123	vShutdownStartComp	read	Voltage cut-off start temperature compensated [mV]
124	vShutdownStopComp	read	Voltage cut-off Stop Temperature compensated [mV]
125	balancerVoltageComp	read	balancing voltage temperature compensated (if in standalone mode) [mV]
126	masterMode	read	Master modus detektiertMaster mode detected
127	converterError	read	Error DC / DC converter: 0: No error 1: Reserved 2: OUTPUT_VOLT_TOO_HIGH 3: OUTPUT_VOLT_TOO_LOW 4: STARTUP_ERROR
128-149	reserviert		Reserved
Debug Werte			
150	chargeTime	read	Internal debug value: DC DC converter charging time
151	chargeTransferTime	read	Internal debug value: Charge transfer time DC DC converter
152	sekVoltage	read	Estimated voltage on secondary side (battery stack)
153	SekHvErrorCounter	read	Error counter overvoltage secondary
154	SekLvErrorCounter	read	Error meter undervoltage secondary
155	cellVoltageUnfiltered	read	Cell voltage without averaging [mV]

Tabelle 7: Modbusparameter

12 Inspection and maintenance

For an optimum and long service life of the LiPro1-x Active V2 and the batteries, the following inspections are recommended, which should be carried out twice a year:

CAUTION: Risk of electric shock possible

Please observe the regulations for working on live electrical systems. Use insulated tools!

• Ensure that the LiPro1-x Active has been safely installed in a clean and dry environment.

• Make sure that the air circulation around the LiPro1-x Active and the cells is not blocked.

• Check all exposed conductors for possible damage to your insulation caused by sunlight, friction with other objects, dry rot, insects or rodents. Repair or replace the ladder if necessary.

• Inspect all cable terminals. Check the connections for corrosion and damaged insulation as well as signs of excessive temperature or burning/discoloration. Tighten the terminal screws.

• Tighten all power connections in accordance with the manufacturer's recommendations.

• Check whether the LED displays are in line with the device operation or whether there are any faulty displays. Take remedial action if necessary.

• Inspect the battery bank. Look for cracked or deformed containers and corroded terminals.

• Check for dirt, nesting insects and corrosion and clean if necessary.

13 Repair / Return

In the event of a fault, please send the device as an insured package to the manufacturer. Before sending the device, please contact us by telephone to obtain an RMA number.

14 Waste disposal

For disposal in accordance with WEEE (Waste electrical and electronic equipment), please contact your local WEEE collection point.

Note: This appliance is RohS compliant.

(RohS = Restriction of the use of certain hazards substances in electrical and electronic equipment)

15 Document changes

1.00.00 - Initial
1.00.01 - Correction of Modbus register description for temperatures and for CMD registers
1.00.02 - Correction of Modbus register description for slave address, manual control and current measurement.

16 Concluding remarks

We hope that you will enjoy this product. If you have any questions or requests, please do not hesitate to contact us; we welcome all kinds of feedback. Do you need a special customized version? No problem, just ask us!

Thank you for choosing a quality product from ECS. We are pleased to be able to supply you with a product that combines safe operating behavior with the greatest possible user-friendliness.

This product is not intended for export to the USA or Canada!