

MODULE CONTROLLER



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| Version | Date | Remarks | Author |
|---------|-------------------|---------|------------|
| 1.0 | February, 19 2020 | | B. Pieters |
| | | | |
| | | | |

SAFETY INSTRUCTIONS

Please read the documentation supplied with this product first, so that you are familiar with the safety signs and directions before using the product.

WARNING: DANGER OF ELECTRICAL SHOCK

The product is used in combination with a battery. Even if the equipment is switched off, a dangerous electrical voltage can occur at the input and/or output terminals. Always switch the power off and disconnect the battery before performing maintenance.

The product contains no internal user-serviceable parts. Do not put the product into operation unless cover is fitted. All maintenance and installation should be performed by qualified personnel.

Never use the product at sites where gas or dust explosions could occur.

Use the Tesla module in a suitable housing. Do not use the Tesla module inside a house. Make sure the environment can withstand the fire which can be caused by the Tesla module. Use a fire barrier between the Tesla battery module and spaces where people are present. Place the Tesla module in a separate partition. Place the Tesla battery module in a dry environment. Place the Tesla battery module in an ambient temperature between 0°C and 35°C. Never connect Tesla modules in Parallel when their voltage is not equal!!!

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge. Children should be supervised to ensure that they do not play with the appliance.

Installation

Read the installation instructions before commencing installation activities. For electrical work, follow the local national wiring standard, regulation and this installation instructions.

Ensure that the connection cables are provided with fuses and circuit breakers. Never replace a protective device by a component of a different type.

Ensure that the equipment is used under the correct operating conditions. Never operate it in a wet or dusty environment.

Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.

Transport and storage

On storage or transport of the product, ensure that the mains supply and battery leads are disconnected.

No liability can be accepted for damage in transit if the equipment is not transported in its original packaging.

Store the product in a dry environment; the storage temperature should range from – 20°C to 60°C.

DESCRIPTION

This module controller is designed for use with a maximum of 20 Tesla battery modules. This module controller is not designed for use in vehicles.

Following functionality is incorporated:

- Input voltage 18-53 VDC

- Cell balancing

- Current measurement

- SOC calculation

Contactor 400 Amp with safety features:

- High temperature switch off

- Low temperature switch off

- High cell voltage switch off

- Low cell voltage switch off

External interface:

- Charge enable (pot free contact)

- Heat enable (12V output)

- Cool enable (12V output)

- Victron CAN bus communication for GX family

- DC output for Victron color control

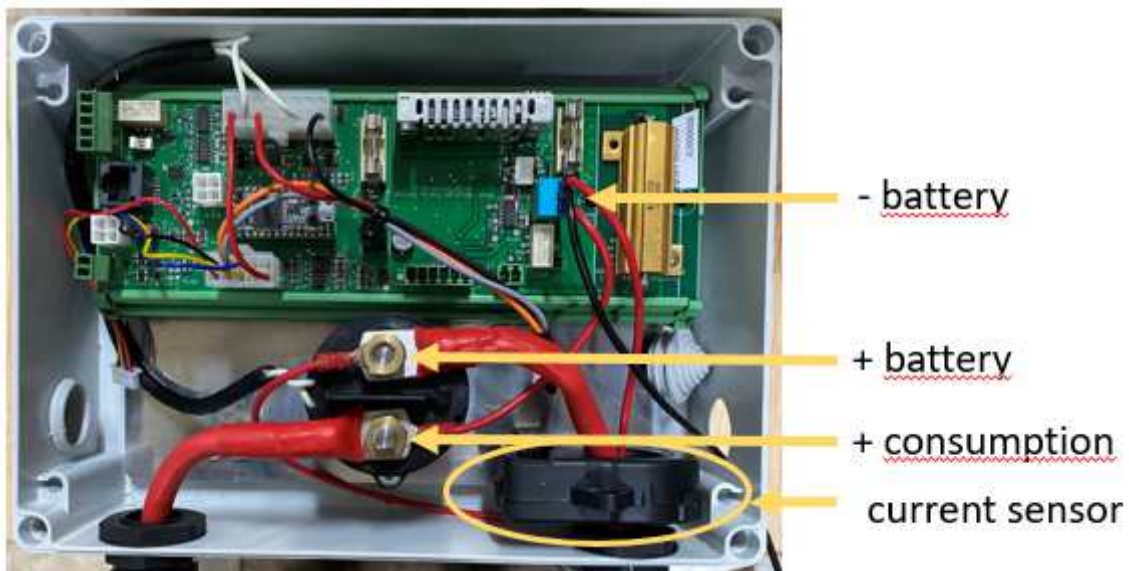
1. INSTALLATION

1.1 Power connections

Three power connections are needed.

- + Battery (18-53VDC)
- Battery
- + Consumption

Make sure to fit a fuse between the Tesla battery and the battery module controller. A Tesla battery has a short circuit capacity up to 3500 Amp. Match fuse accordingly. When in doubt, feel free to mail: bpath@ziggo.nl for advice.



The + Battery connection enters via the cable gland in the right bottom via the current measuring sensor.

The + consumptions cable enters via the cable gland in the left bottom.

The - battery cable is connected with the middle of three connections:



1.2 Tesla Module communication connection

The Module controller communicates with the Tesla battery modules. The Tesla modules are equipped with a battery monitoring board.



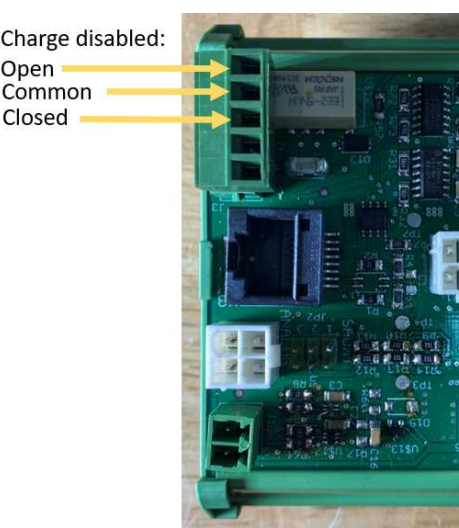
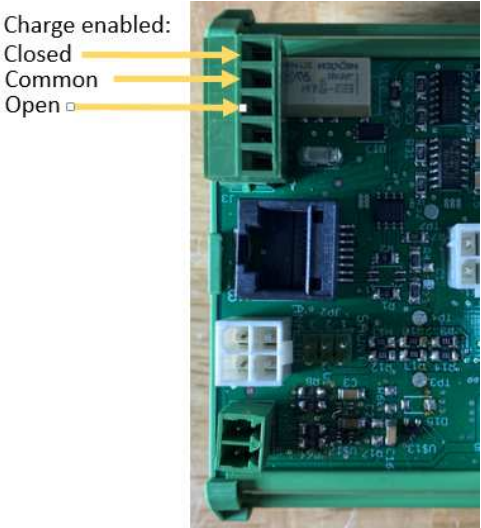
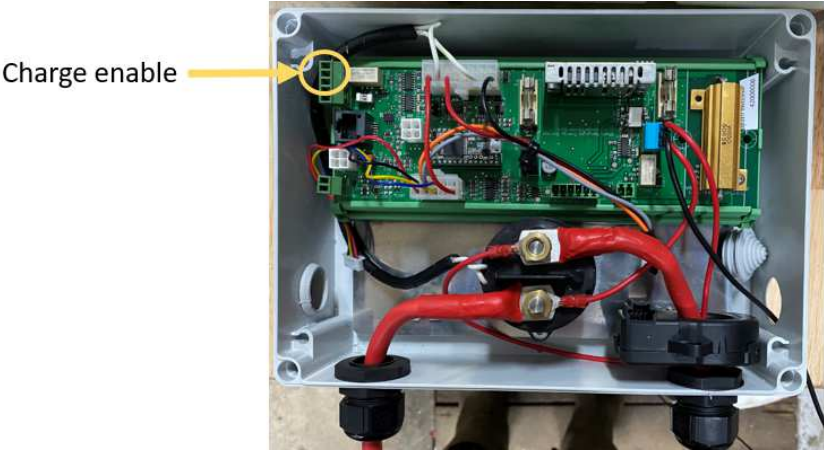
The BMS and BMB's are connected by a cable. Order/buy the appropriate cable together with the Module Controller. The cable must have the same number of connectors as the amount of Tesla modules connected. Leaving one connector unattached will not allow communication between BMB and BMS.



1.3 Auxiliary contacts

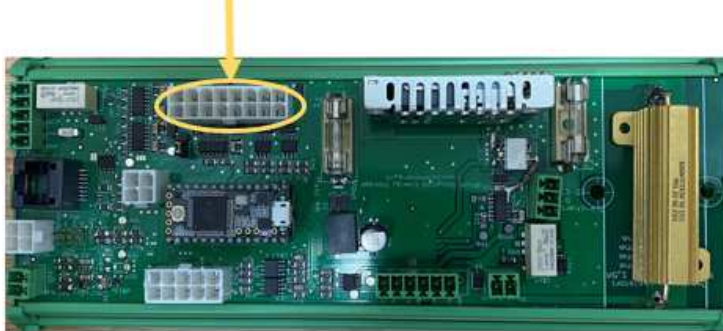
1.3.1 Battery charger charge enable

This connection is used to enable/disable a battery charger. A potential free relay is provided for this purpose.

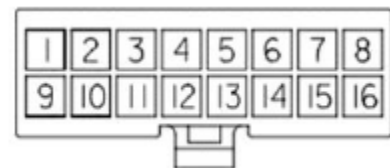
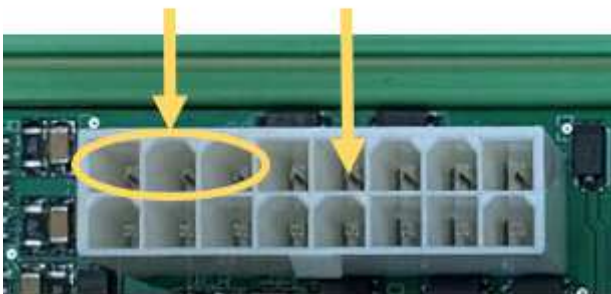


1.3.2 Heat enable

Heat enable is a 12VDC (0.5 Amp) output used for switching an external relay. Power for relay is provided on the connector below:



+12V
Heat
Ground enabled



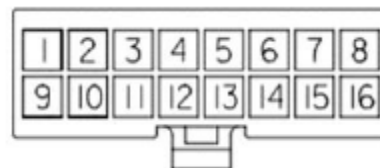
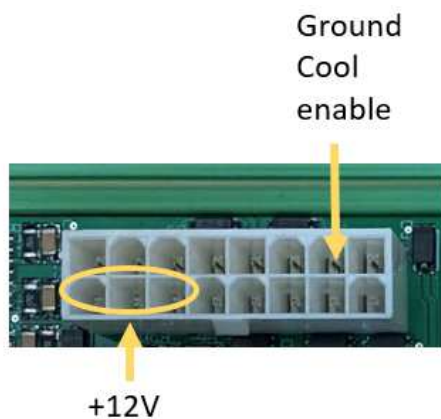
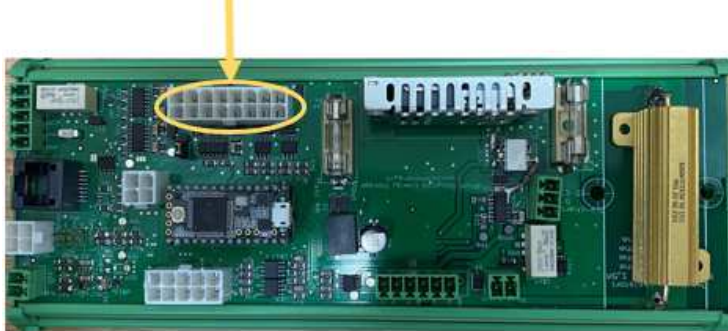
Use Molex minifit crimp. Pin 1,2 and 3 are ground, you may choose which one to use. Pin 5 is heat enable.

To switch a heater use a finder relay as shown below, or equal (4C.01.9.012.0050):



1.3.3 Cool enable

Cool enable is a 12VDC (0.5 Amp) output used for switching an external relay. Power for relay is provided on the connector below:






Use Molex minifit crimp. Pin 9,10 and 11 are +12V, you may choose which one to use. Pin 7 is switched ground for cool enable.

To switch a cooling system use a finder relay as shown below, or equal (4C.01.9.012.0050):

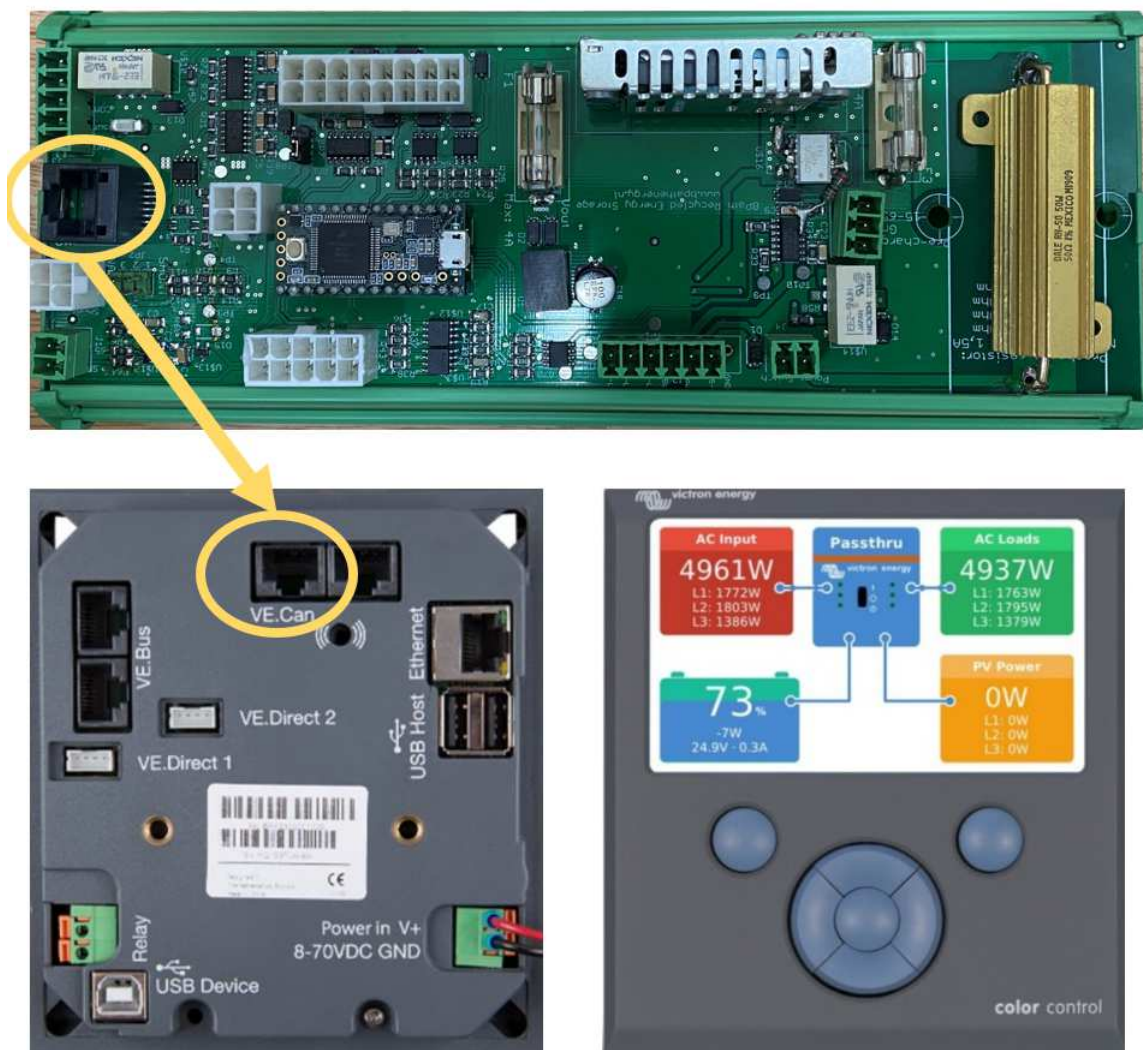


1.4 Victron communication

The battery module controller has support for Victron GX products:

| Cerbo GX | CCGX | Venus GX | Octo GX | CANvu GX | Maxi GX | MultiPlus-II GX and EasySolar-II GX |
|---|---|---|---|--|---|---|
|  |  |  |  |  |  |  |

Connect the Victron VE can port with the UTP port on the BMS. Chapter 3 describes how to setup Victron charger controls (DVCC)



2. RGB ON/OFF SWITCH

2.1 ON/OFF

The on/off switch has several functions. The functions depend on the time pressed.

| Function | Description | Time pressed |
|----------|--------------------------------|---------------|
| 1 | BMS on/off | 0-5 seconds |
| 2 | LED SOC indication on/off | 5-10 seconds |
| 3 | Error-reset knop. Reset errors | 10-15 seconds |
| 4 | Recovery mode | 15-20 seconds |
| 5 | No action | >20 seconds |

Function 1 (0-5 seconds):

BMS startup from off. BMS shut down from on.

Function 2 (5-10 seconds):

When pressed longer than 5 seconds and shorter than 10 second the RGB SOC indication switches off if it was on.

When pressed longer than 5 seconds and shorter than 10 second the RGB SOC indication switches on if it was off.

Function 3 (10-15 seconds):

When pressed longer than 10 seconds and shorter than 15 seconds errors will be reset.

Function 4 (15-20 seconds):

When pressed longer than 15 seconds and shorter than 20 seconds recovery mode is switched on when it was off. Or off when it was on.

This is used to recover from an undervoltage fault. The contactor will re-engage allowing a lower cell voltage. Make sure this function is used to recharge the battery.

Function 5 (> 20 seconds)

When you lost count simply continue pressing more than 20 seconds and nothing will change.

2.2 RGB

The led ring has colors to give information to the user.

2.2.1 SOC

The LED ring is green when the battery is fully charged. While draining the battery the color will change to orange at approximately 50% SOC (half full). Below 30% the color is red.

Note that several settings must be applied before SOC calculation is correct.

2.2.2 Faults

The led ring will give messages related with faults. The blinking pattern is related with the message.

| Blink | Fault | Solution |
|-------|--|--|
| 1x | No communication between Tesla batteries (BMB) and BMS | Check connection between BMS and BMB. |
| 2x | Over voltage, under temperature or over temperature. | Make sure the fault is restored within limits and use function 3 to reset fault. |
| 3x | Undervoltage. | Use Recovery mode, function 4 and charge! |

3. VICTRON

3.1 CAN-bus speed

Select the CAN-bus Profile as shown below.
Settings, Services and choose CAN-bus BMS (500 kbits/s).



After applying setting below the BMS appears in the device list

1. connecting the UTP cable according chapter 1.4
2. and selection of the CAN bus profile BPATH BMS
3. and selection of the Victron in the BMS touch screen.

Battery Voltage, battery current, battery temperature, SOC and BMS alarms will be available on the Victron devices.

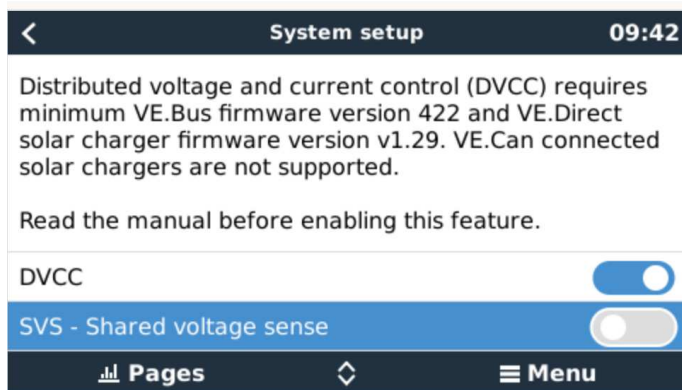
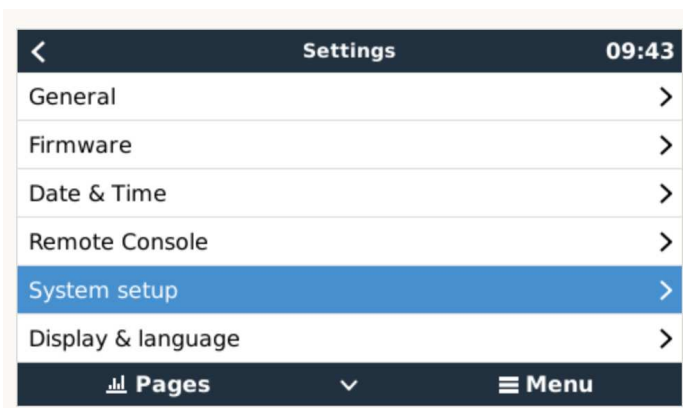
3.2 Victron charge control from BMS

The battery management system is able to control several Victron chargers. The allowed charge current and charge voltage will be set by the BMS. Discharge current is not controlled. Victron will follow these commands.

It is allowed to use more than one charger/MPPT. There are restrictions regarding types of Victron chargers/MPPT's to work successfully together. Check the configuration with you Victron dealer.

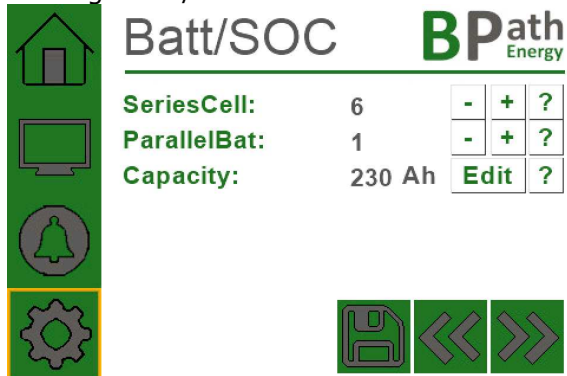
[https://www.victronenergy.com/live/ccgx:start#dvcc -
distributed voltage and current control](https://www.victronenergy.com/live/ccgx:start#dvcc_-_distributed_voltage_and_current_control)

To enable this function instructions described in chapters 1.4 & 3.1 must be followed. Furthermore apply settings as shown below:
Go to settings and system setup and switch on DVCC.

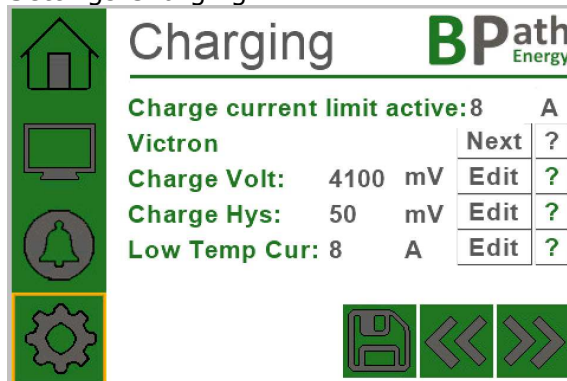


Check your configuration after this setup.

Example, how to test:
Check Manual Display & Settings BMS.
Settings Batt/SOC



Settings Charging



Charge battery to full. The charger should have an end voltage of:
 $(4100/1000)*6 = 24,6V$.

If the charger differs from this voltage your setup was not successful.

You can also chose to test the current limit setting.