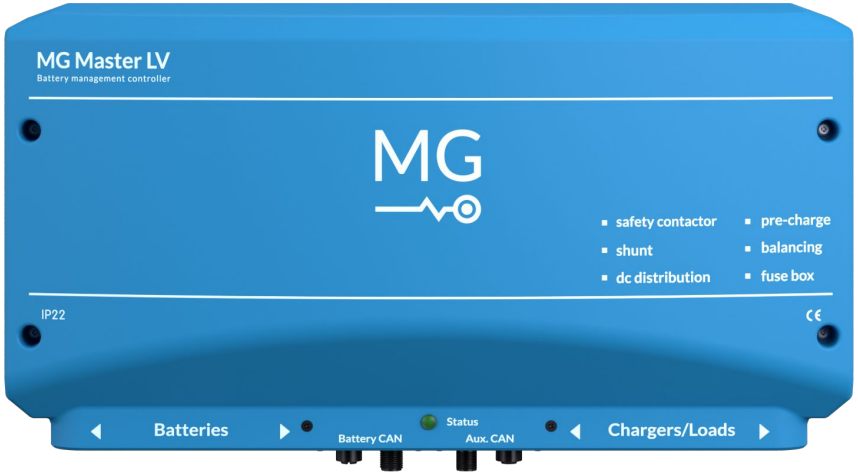
MG

Index

Master

LV


MG Master LV
Battery management controller
MG
safety contactor
shunt
dc distribution
pre-charge
balancing
fuse box
IP22
Batteries
Battery CAN
Status
Aux. CAN
Chargers/Loads

Available Models

12 Vdc	24-48 Vdc	72-96 Vdc
400A	400A	
		500A
600A	600A	
1000A	1000A	

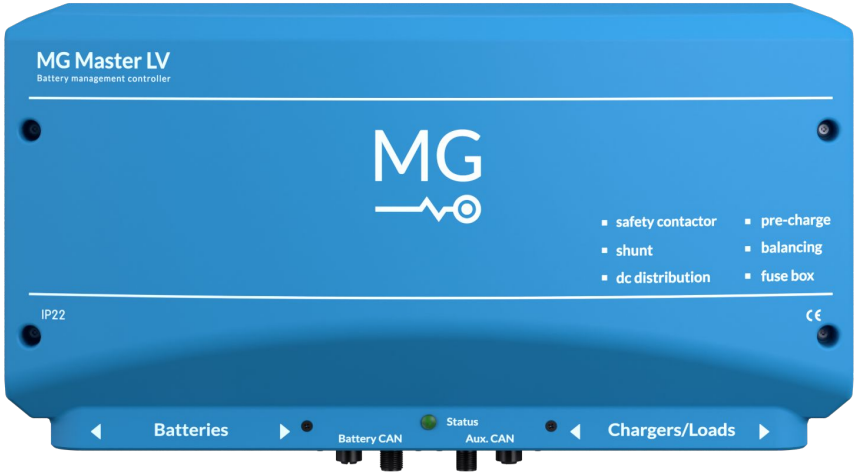
Master LV

- Cell balancing (BMS)
- Safety contactor
- Pre-charge
- Shunt
- DC distribution
- Fuse box
- Bluetooth

Safety and control unit

Protection against:

- Over-charging
- Over-discharging
- Over-temperature
- Under-temperature
- Balancing



Balancing (BMS)

Main function: battery bank protection

Gathering cell voltage and temperatures from the battery modules

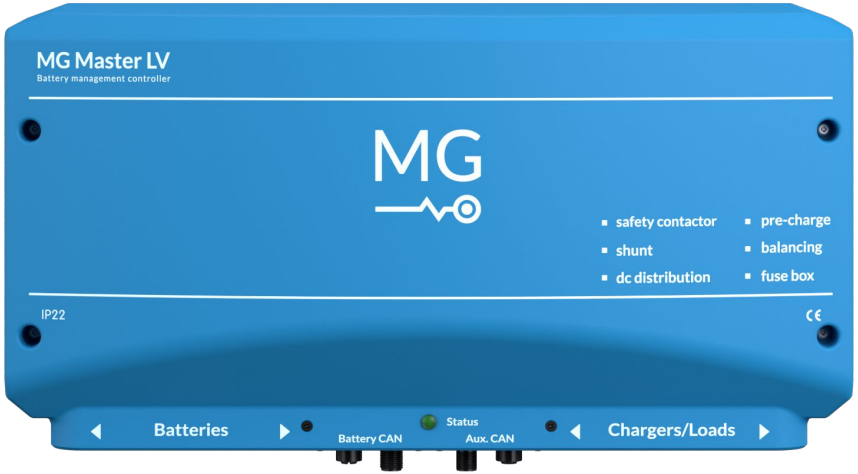
Monitors cell voltage, temperatures and current

Monitors communication time-out on the batteries

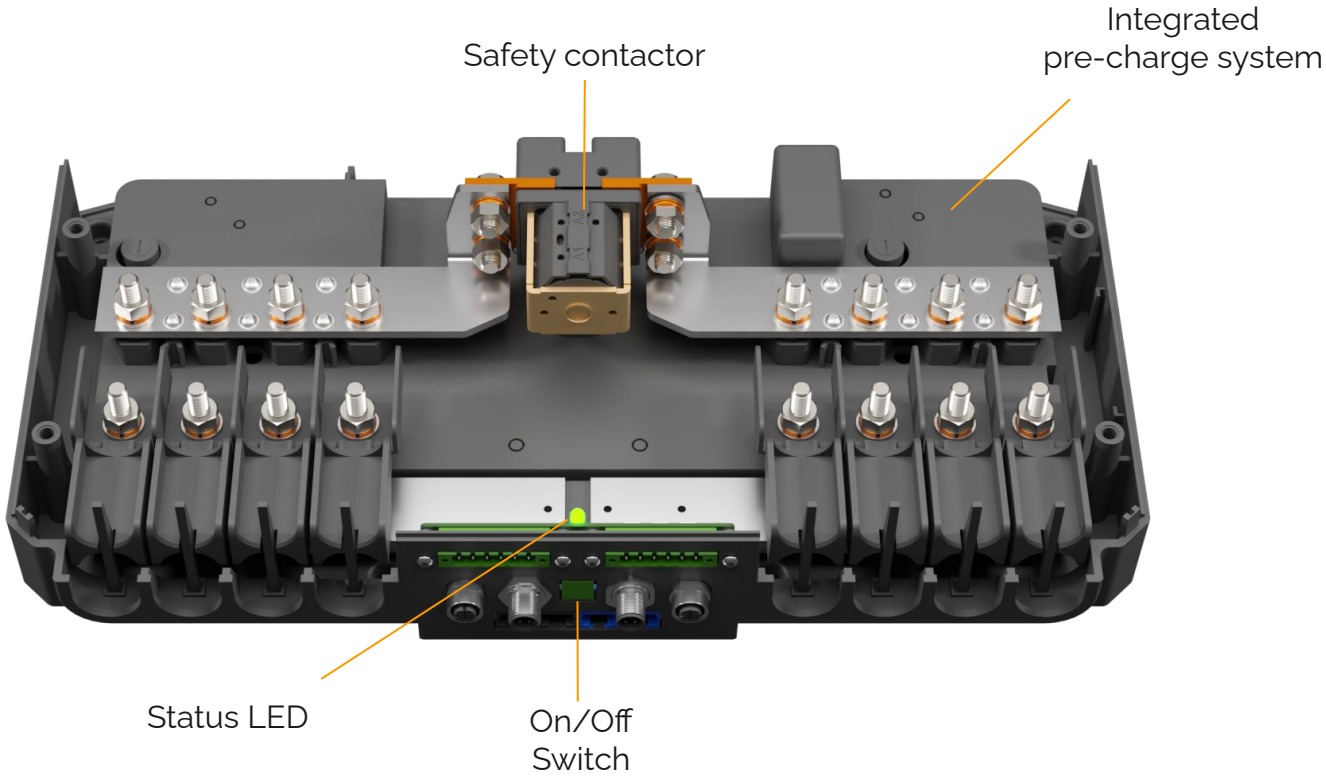
Controls balancing

Event logging to internal flash memory

Charger/loads control



Safety Contactor



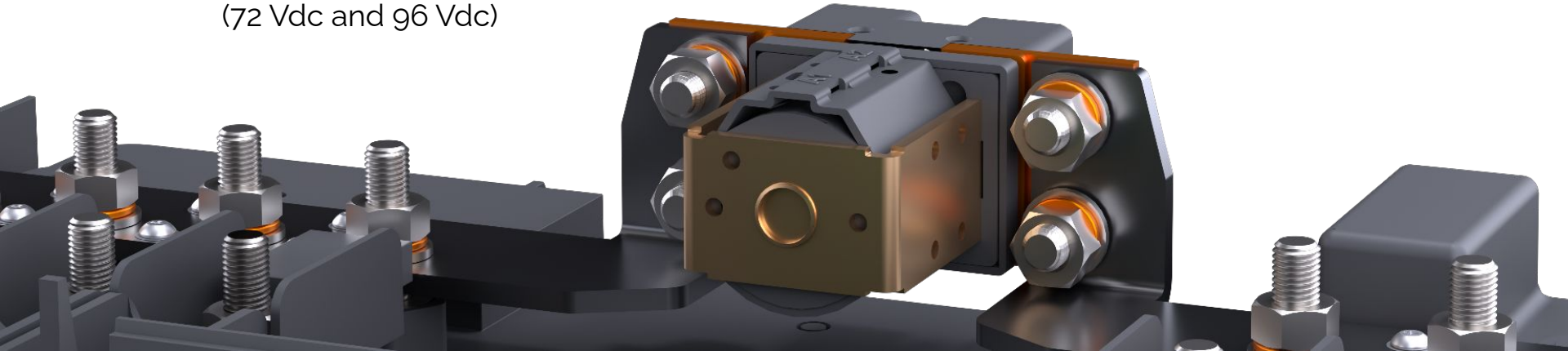
Safety Contactor

Integrated safety contactor as second level protection

Models:

- 150A / 400A / 600A / 1000A
  (12 and 24 / 48 Vdc)

- 500A
  (72 Vdc and 96 Vdc)

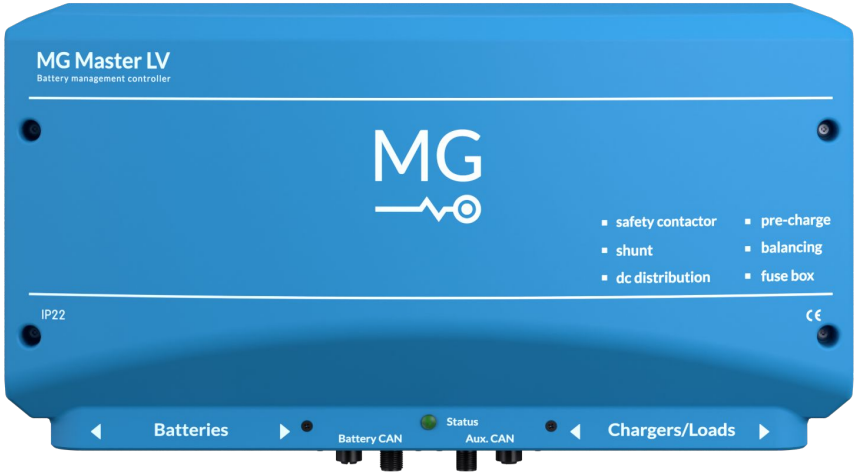


Pre-Charge

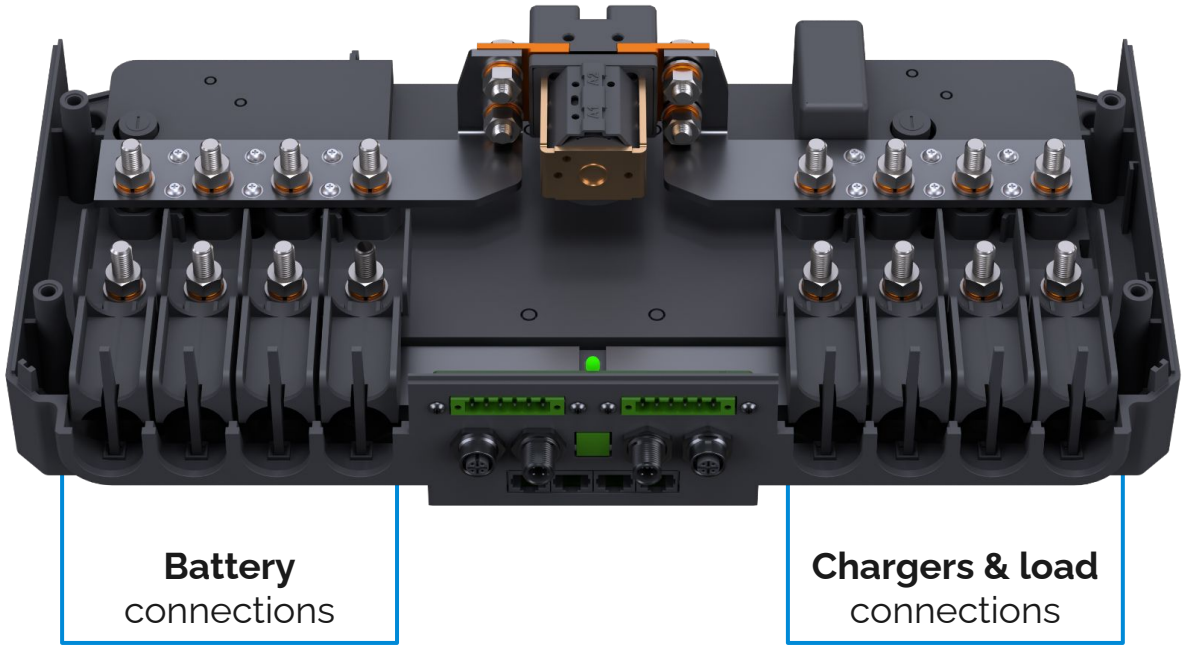
Automatic at startup

Safety contactor closes when 80% of the battery voltage is reached

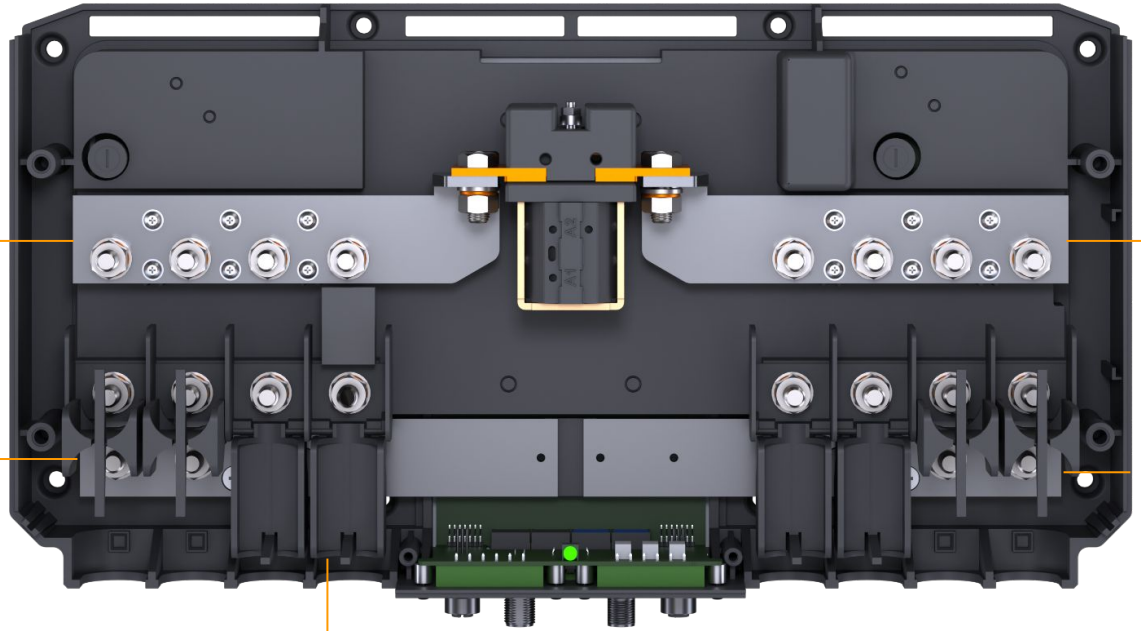
- No welding of the safety contactor
- No sparks



DC Distribution



DC Distribution



Positive connection batteries (4x)

Negative connection for the batteries (4x)

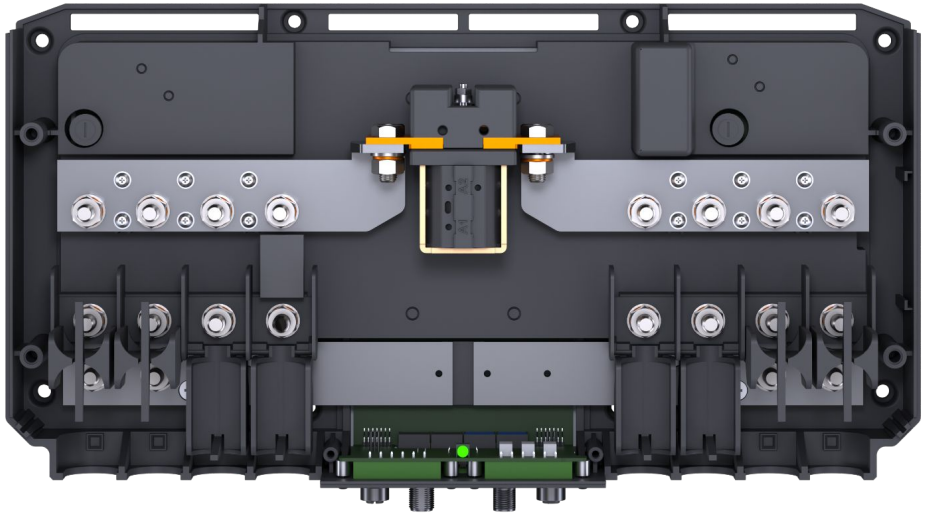
Positive connection chargers and loads (4x)

Negative connection for the charger/loads (4x)

Insulation caps

DC Distribution

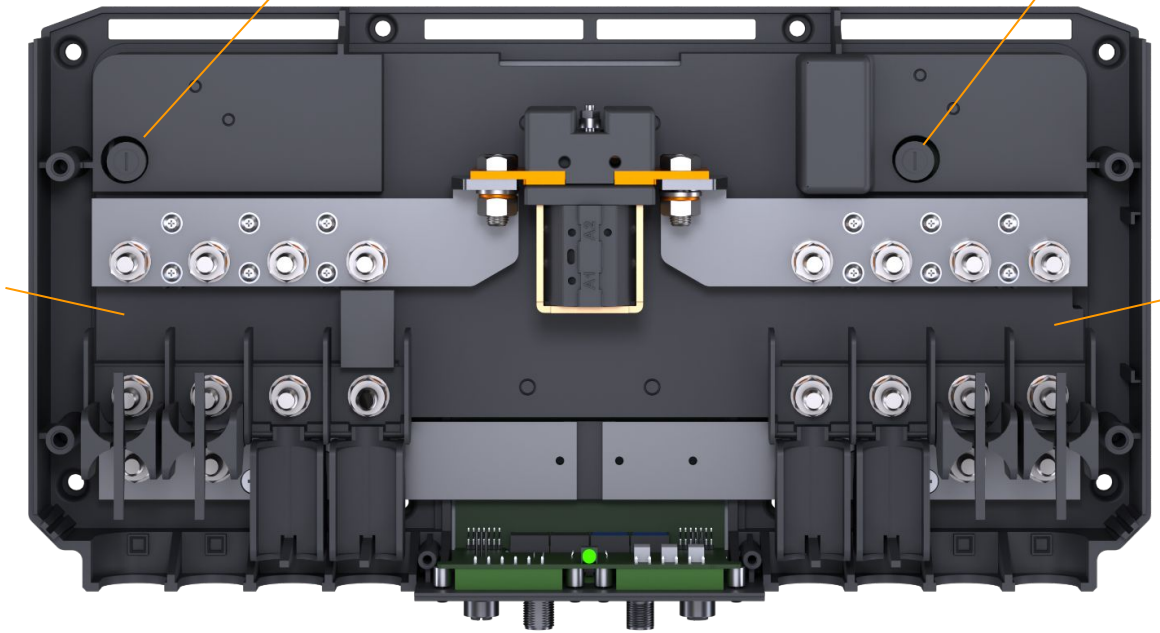
- Bolt down M8
- 4 inputs and
  4 outputs available
- Fuse holder (+) MEGA Fuse
- Max. cable diameter: 120 mm2
  (depending on cable lug)



Fuses

Fuse main control unit (PCB)

Pre-charge **fuse** (10A)



Fuse holders to protect parallel battery banks (4x)

Fuse holders to protect chargers and loads (4x)

Shunt

CAN-Bus

Battery CAN-Bus
M12
RJ45

Auxiliar CAN-Bus
M12
RJ45

CAN-Bus communication

- NMEA2000
- SMA
- Custom

I/O Connections

I/O connector **A**

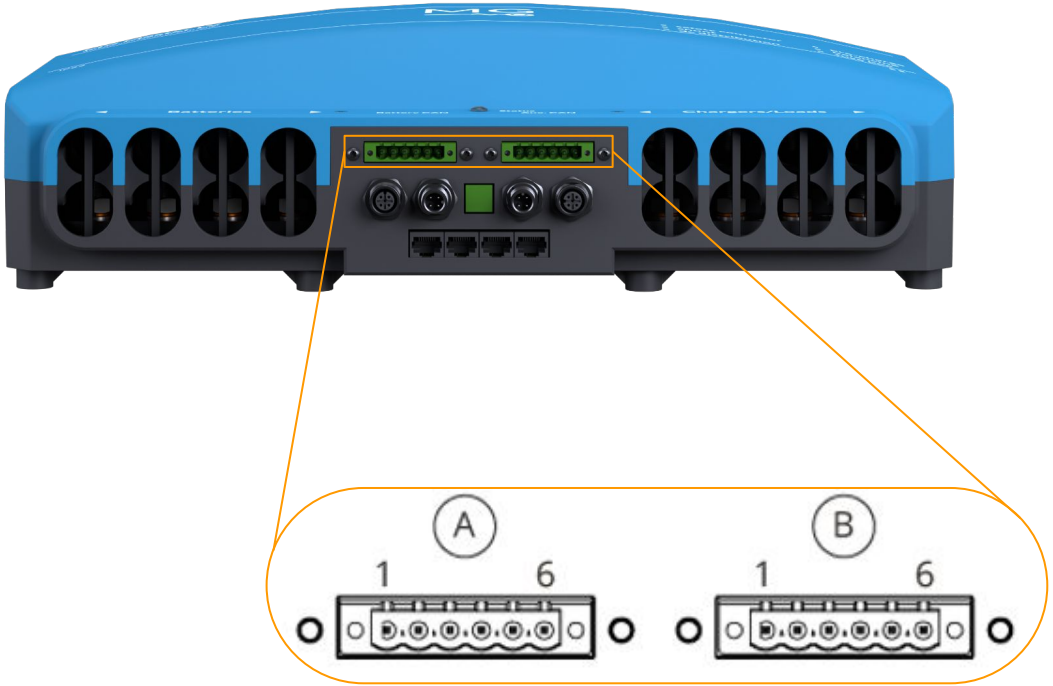
I/O connector **B**

To control chargers and loads
(allow to charge / allow to discharge)

Programmable contact

Remote on/off switch and status LED

I/O Connections



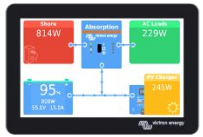
Connector pins and specifications					
Conn.	Pin	I/O	Voltage	Current	Purpose
A	1	Out	13,5 V	1 A	Aux. power output
	2	Out	13,5 V	1 A	Allow-to-Charge
	3	Out	13,5 V	1 A	Allow-to-Discharge
	4	In			External start button
	5	Out	13,5 V	140 mA	External status output
	6	-			GND
B	1	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-charge
	2				
	3	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-discharge
	4				
	5	Out	Max. 60 VDC	0,8 A @ 60 VDC	Programmable output
	6				

Aux Power Output

Connector A
Pin 1 Aux. power output (13.5 V - 1 A)
Pin 6 GND

Connect Pin 1 and 6 to a Victron GX device to enable remote updating by VRM

Victron GX device
CCGX
Cerbo GX
Octo GX



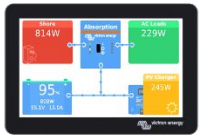
Aux Power Output

Aux Power Output

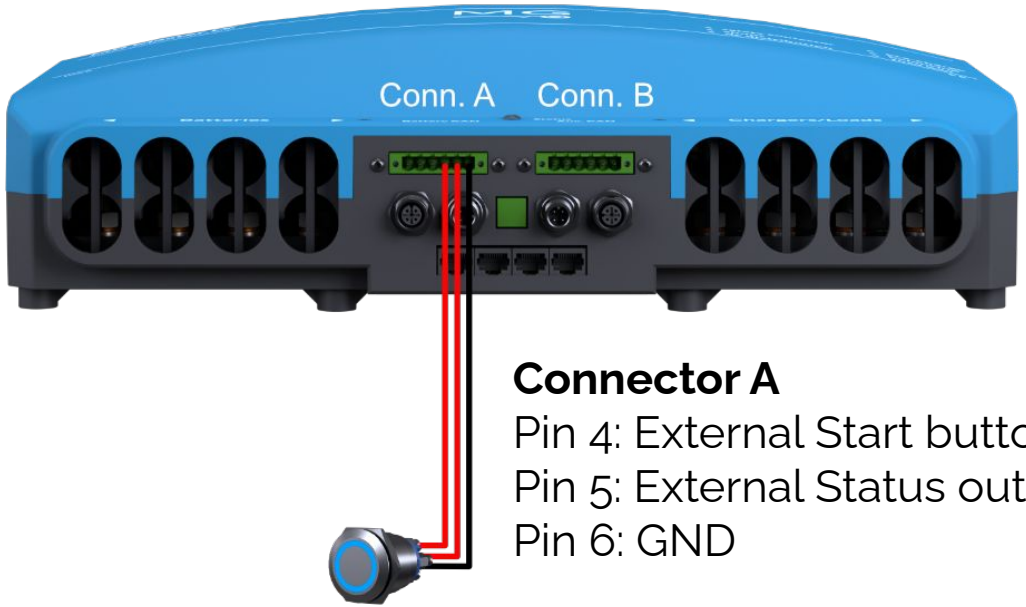
Aux. power output is **non-isolated**

Aux. GND (ground) is battery ground

Victron GX device
CCGX
Cerbo GX
Octo GX

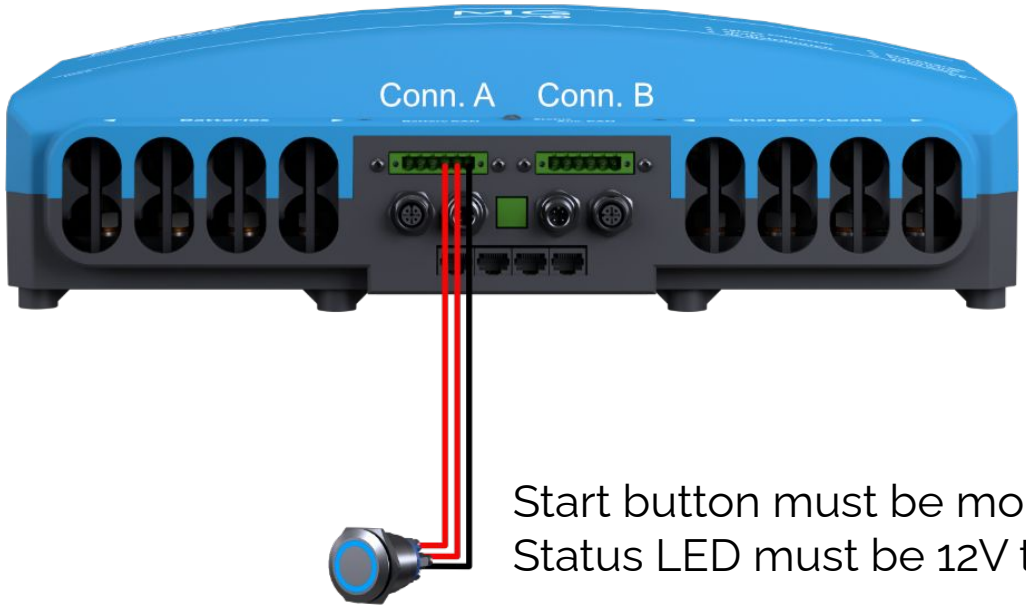


External Start Button & Status Indication



Connector A
Pin 4: External Start button
Pin 5: External Status output
Pin 6: GND

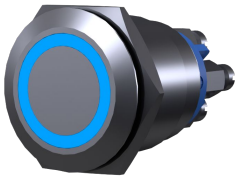
External Start Button & Status Indication

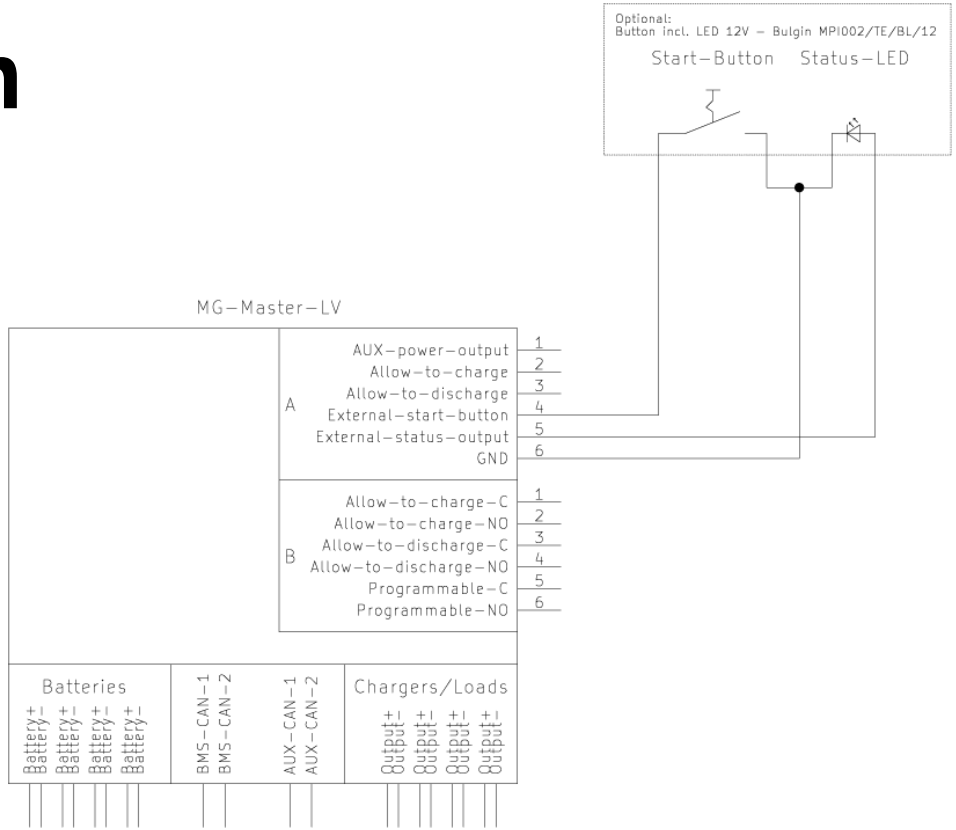


Start button must be momentary
Status LED must be 12V type

External Start Button & Status Indication

- Start button must be momentary
- Status LED must be 12V type



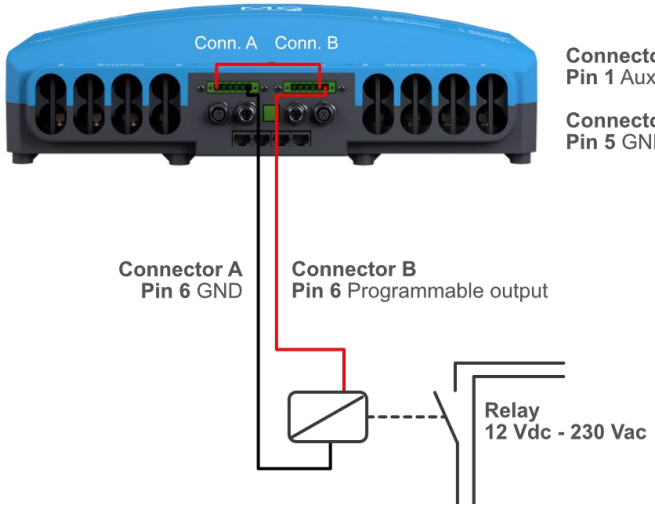


Programmable Relay

Switching possible on the following parameters:

- State-Of-Charge
- Current
- Temperature
- Cell voltage
- Failsafe
- Warning
- System Active
- Discharge almost not allowed

Programmable Relay



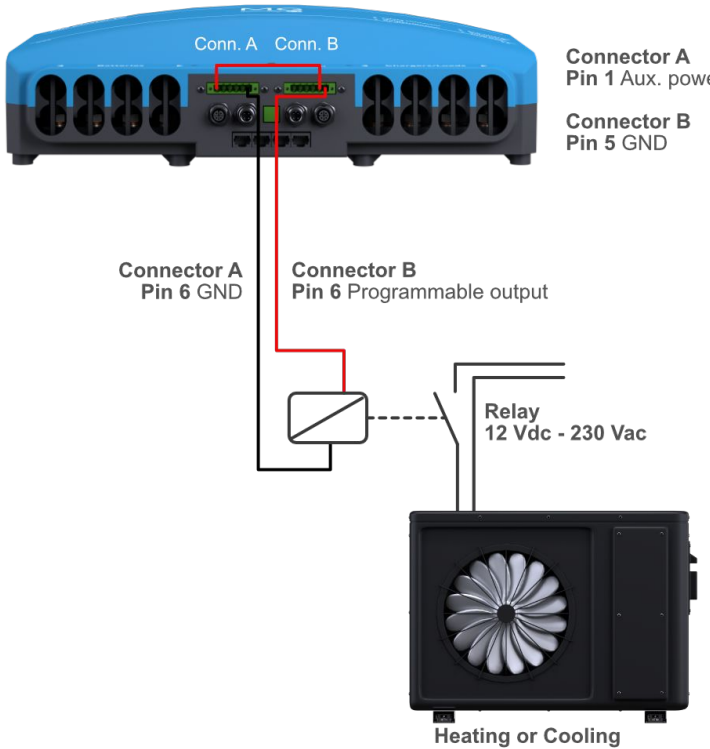
Connector A
Pin 1 Aux. power output (13.5 V - 1 A)

Connector B
Pin 5 GND

Connector pins and specifications

Conn.	Pin	I/O	Voltage	Current	Purpose
A	1	Out	13,5 V	1 A	Aux. power output
	2	Out	13,5 V	1 A	Allow-to-Charge
	3	Out	13,5 V	1 A	Allow-to-Discharge
	4	In			External start button
	5	Out	13,5 V	140 mA	External status output
	6	-			GND
B	1	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-charge
	2				
	3	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-discharge
	4				
	5	Out	Max. 60 VDC	0,8 A @ 60 VDC	Programmable output
	6				

Programmable Relay



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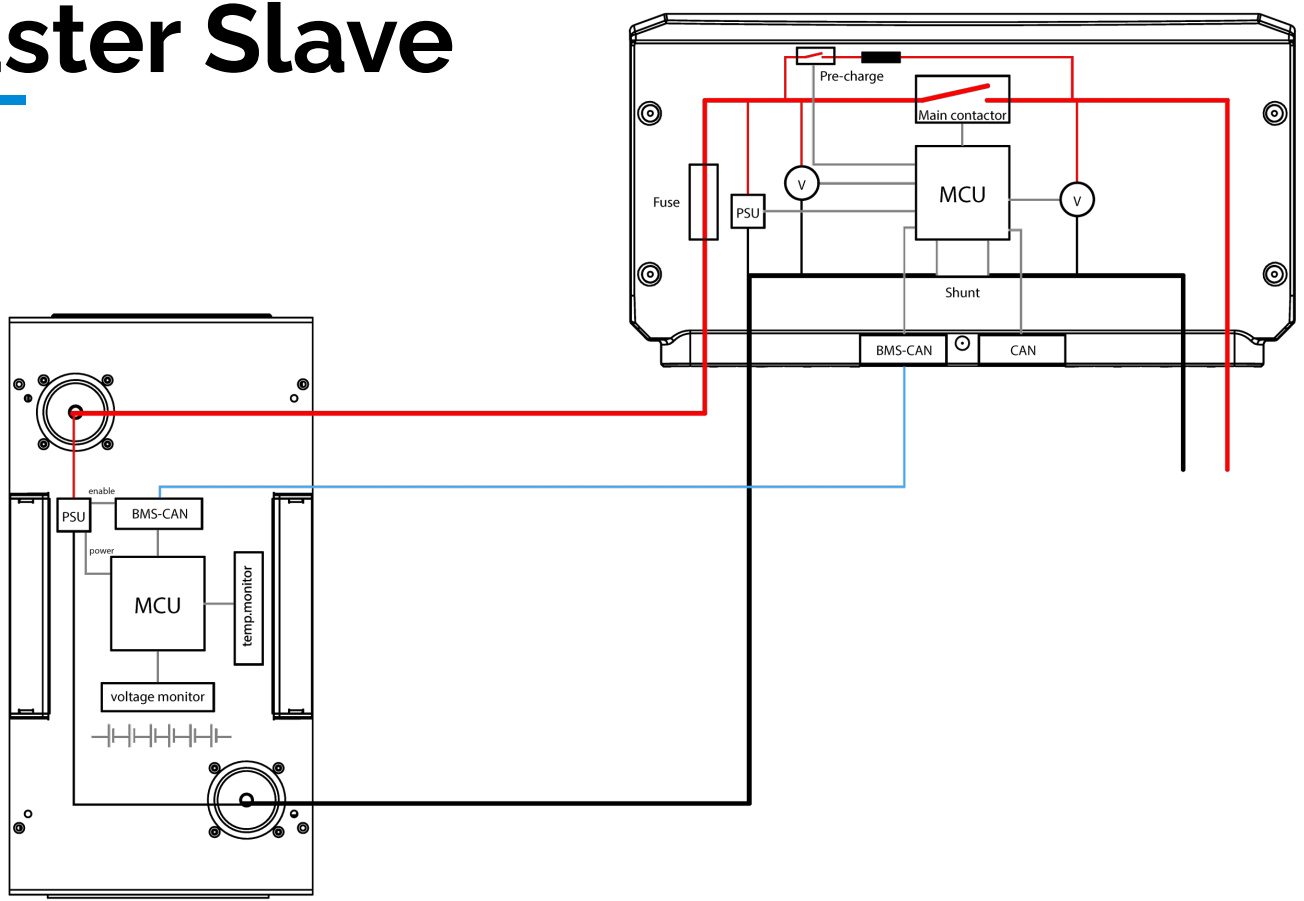
	6	-			GND
B	1	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-charge
	2				
	3	Out	Max. 60 VDC	0,8 A @ 60 VDC	Allow-to-discharge
	4				
	5	Out	Max. 60 VDC	0,8 A @ 60 VDC	Programmable output
	6				

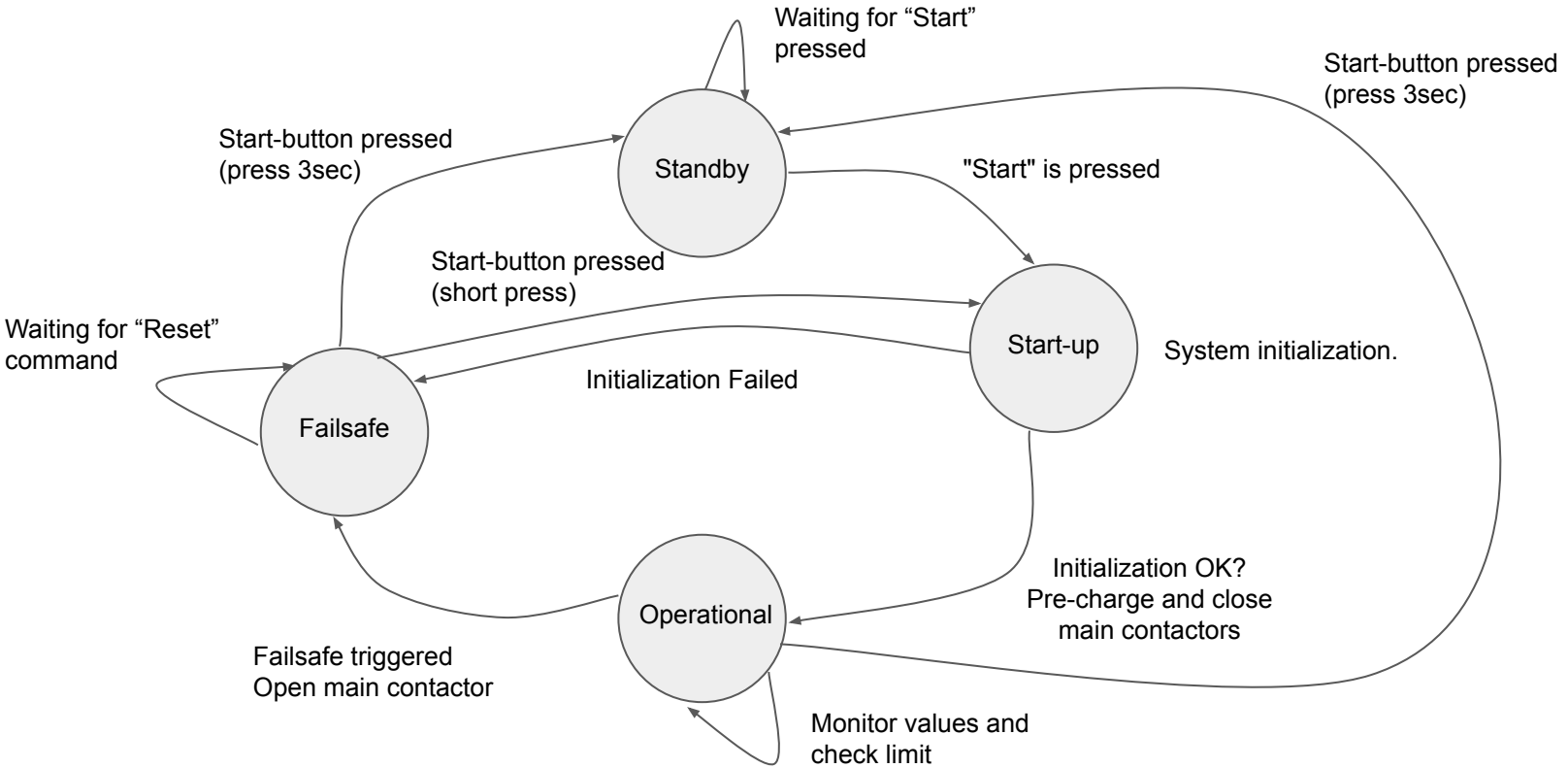
M12 CAN-Bus


MG Master LV
Battery management controller
MG
safety contactor
pre-charge
shunt
balancing
dc distribution
fuse box
IP22
Batteries
Battery CAN
Status
Aux. CAN
Chargers/Loads
M12
Terminator
(male)
RJ45
Terminator
M12
Terminator
(male)

Master Slave



Master LV: BMS State Machine



Power-up Sequence

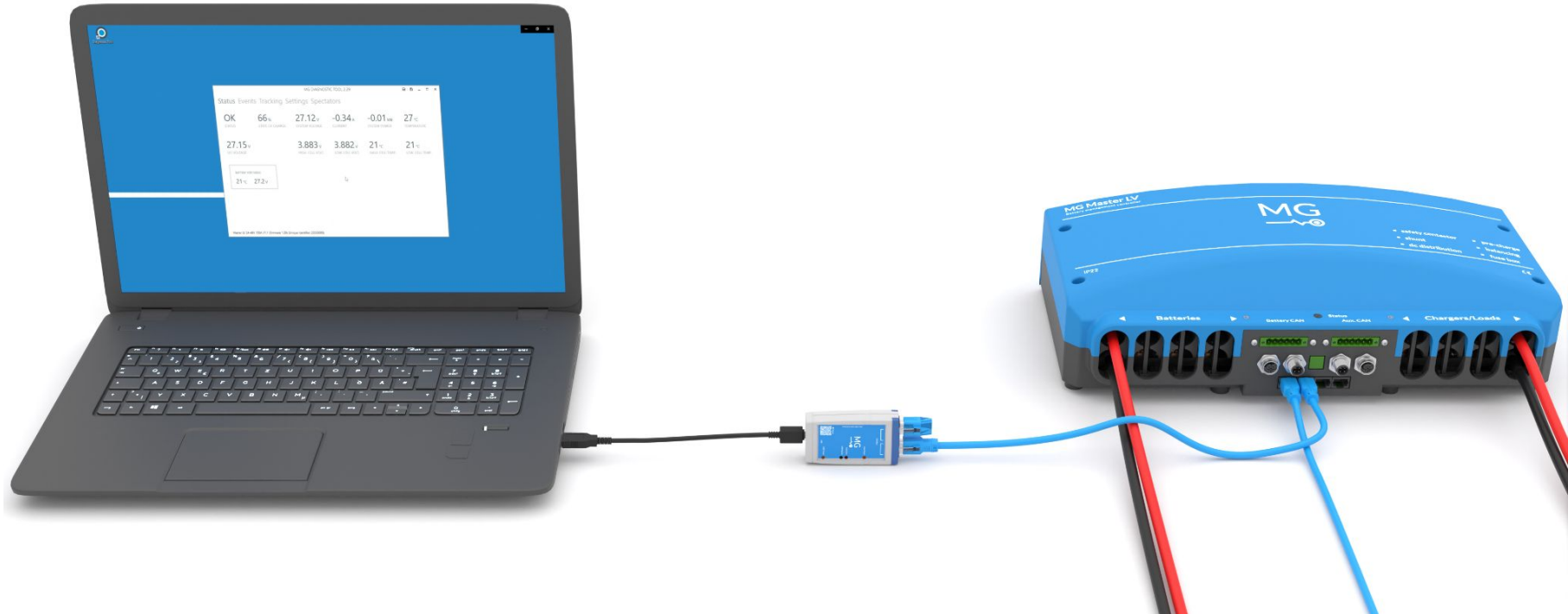
1. Make sure that all energy consumers are switched off before starting up the system, because the MG Master LV will pre-charge the system before closing the safety contactor.
2. Press the START-button (green button) on the front of the MG Master LV to start the system.
3. The system is pre-charging now. The safety contactor is closed as soon as the voltage rises above 80% of the battery voltage.
4. If the status LED is continuously on, the system is running and ready for use.

NOTE: Pre-charge can handle a max. of 10A.
Make sure DC-users are off during pre-charging.

Pre-Charging

- Before closing the main safety contactor, the output of the MG Master LV will be pre-charged by a relay and resistor.
- Pre-charge circuit can handle up to 10A of constant DC-consumers.
- The main contactor closes if the output voltage is more than 80% of the system battery voltage within 10 seconds (in future firmware it will be 30 seconds). If this condition is not reached within the specified time the MG Master LV will go to failsafe (error 5).
- Error 6 will occur when pre-charge fuse is broken.

USB CAN-Interface



Diagnostic Tool

Tool to read status on pack and battery level, shows event list, history values and used to do settings.

Connect a laptop or PC with windows with an USB-CAN interface to the BMS CAN-Bus of the Master LV.

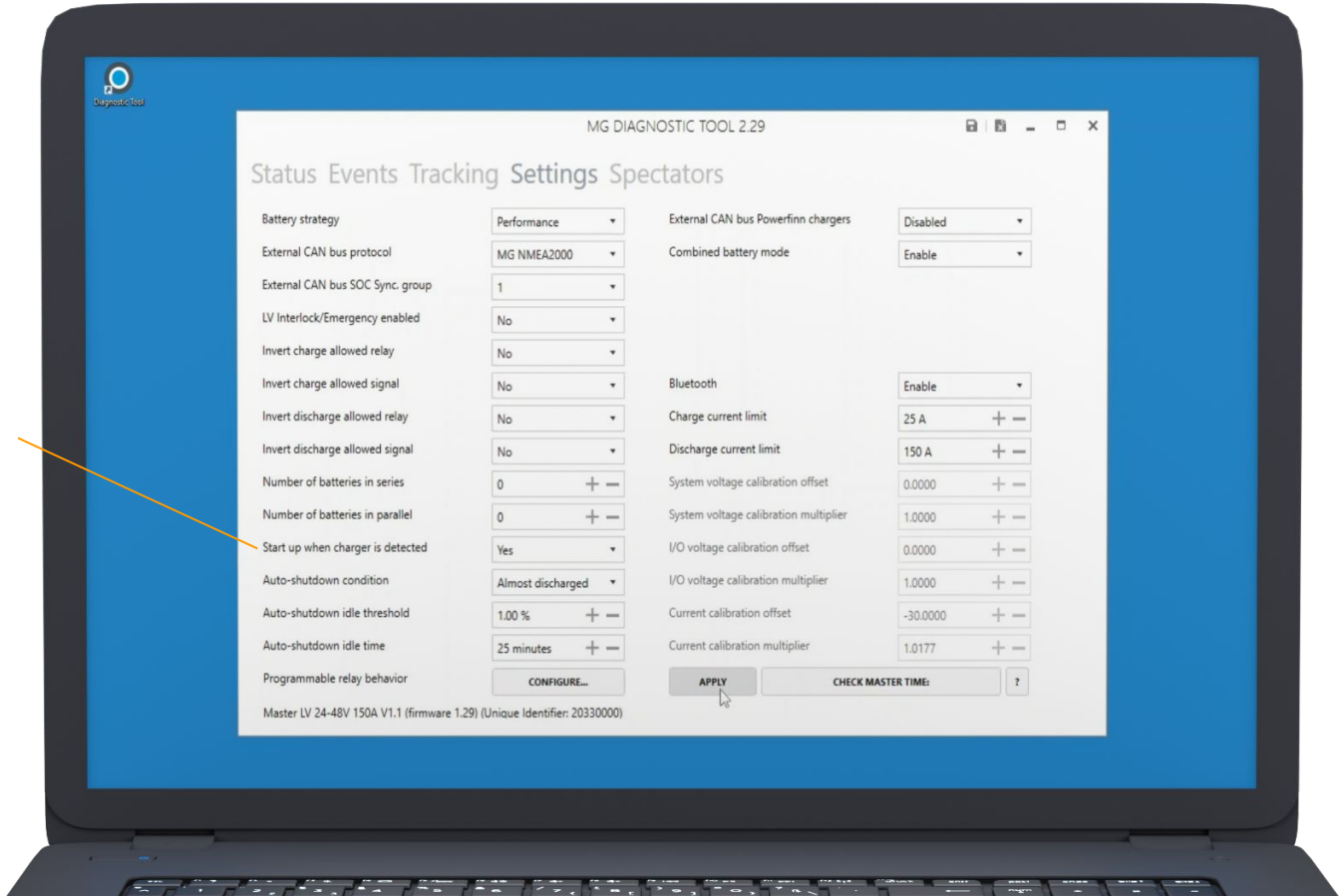
Supported USB-CAN interfaces: **MG USB-CAN**, **Kvaser**, **PCAN (Victron)**

Old tool versions don't work with new firmware versions. For example Diagnostic tool 2.08 works only with firmware 1.8. If firmware is update to 1.10, Diagnostic tool 2.10 needs to be used.

Diagnostic Tool

- Overview status
- Event logging
- Tracking values (history)
- Settings
- Programmable relay
- Emergency button
- Updating firmware

Startup when charger detected



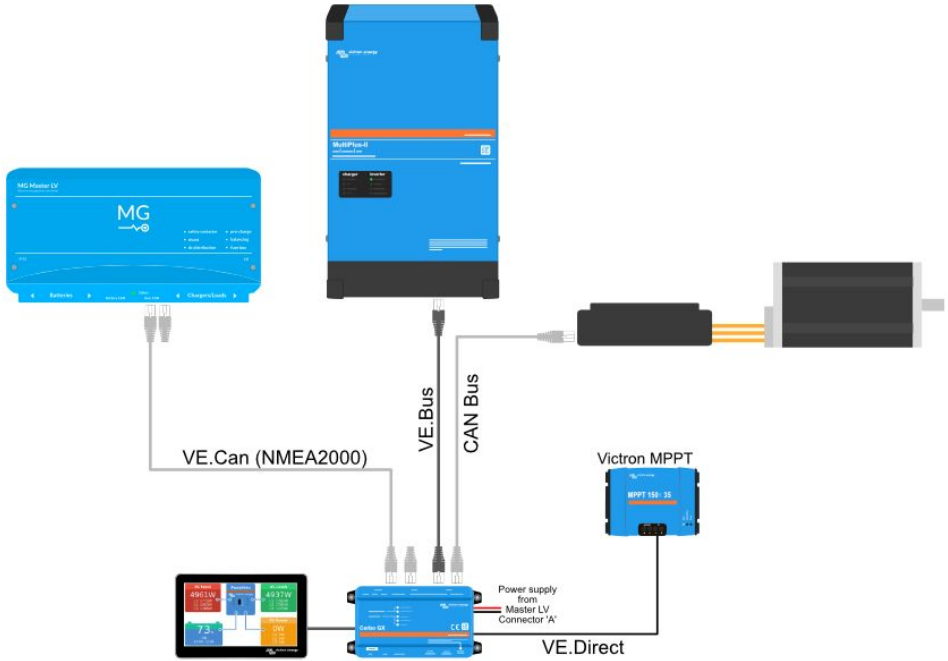
Troubleshooting

When the Master LV is in failsafe mode, the status LED will blink and there will be a beep. This is in sync. The number of beeps is the failsafe error number.
Typical errors (failsafe = main contactor open):

- Battery communication error (2): BMS-CAN cables not connected right or broken.
- Under and overvoltage (3): allow-to-charge and allow-to-discharge not connected or do not function. Test this separately.
- Under and over temperature (4): check battery temperatures and allow-to-charge / allow-to-discharge.
- Pre-charge error (5 & 6): Pre-charge time-out or Pre-charge fuse broken because of high DC-users at the output.

Digital Control of Victron Chargers/Inverters (DVCC)

- No allow-to-charge and allow-to-discharge contacts anymore
- No configuration of Multi/Quattro's/MPPT's
- Easier installation (plug-and-play)



Digital Control of Victron Chargers/Inverters (DVCC)

1. Update all Quattro's/Multi's/Solar MPPT's/Lynx BMS/CCGX to the latest firmware.

Minimum firmware version needed:
Multi/Quattro: 422
CCGX / Venus GX: v2.12
VE.Direct MPPTs: v1.29
VE.Can MPPT Solar Chargers cannot be used: they do not yet support the new control mechanisms.
Lynx Ion + Shunt: v2.04
Lynx BMS: v1.09

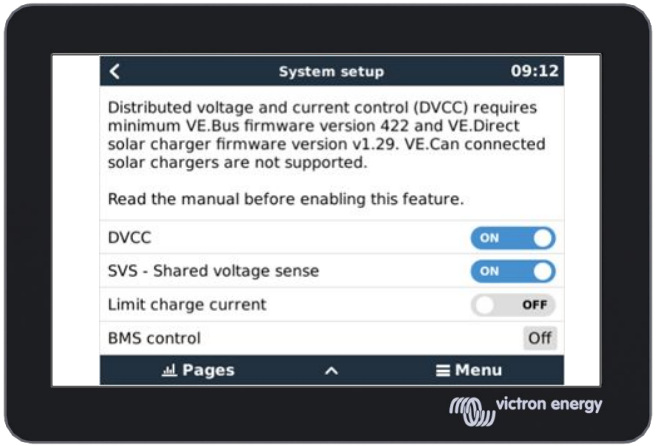
NOTE: All components must be digitally connected to the CCGX.
Meaning that:

- Solar MPPT's needs to be connected with VE.Direct
- Quattro's/Multi's needs to be connected with VE.Bus
- Lynx ion BMS needs to be connected with VE.CAN

Digital Control of Victron Chargers/Inverters (DVCC)

2. Set the DVCC setting to ON in the CCGX.
   a. Menu -> Settings -> System setup -> Battery monitor: set to Lynx BMS
   b. Menu -> Settings -> System setup -> DVCC: set to ON

3. Check if BMS control status is going to ON.



Commissioning

Steps during commissioning:

1. Check connections (power and signal).
2. Check if firmware is up to date of all equipment.
3. Set Master LV configuration (optional, but recommended)
    a. Set a fixed battery configuration
    b. Set default or performance mode
4. If using DVCC with a CCGX then check if settings are right and BMS control status is “on”.
5. Check functionality of programmable contact (if used).
6. Charge the batteries until synchronized (100%).