Installation of Group Interconnect Toolkits in a HS10000

A HS30k three-phase-system consists of three HS10000 systems which will be wired as a delta-connection:

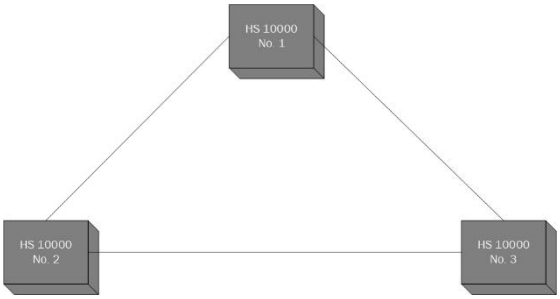


Figure 1: Delta-connection

For this, an additional toolkit is needed. One pre-wired toolkit needs to be installed in each HS10k system. After the integration of the toolkits, one needs to connect the three single systems with each other to one big HS30k system.

Standardisation: System 1 becomes the master, system 2 und 3 become the slaves

Overview of the components, which must be assembled:

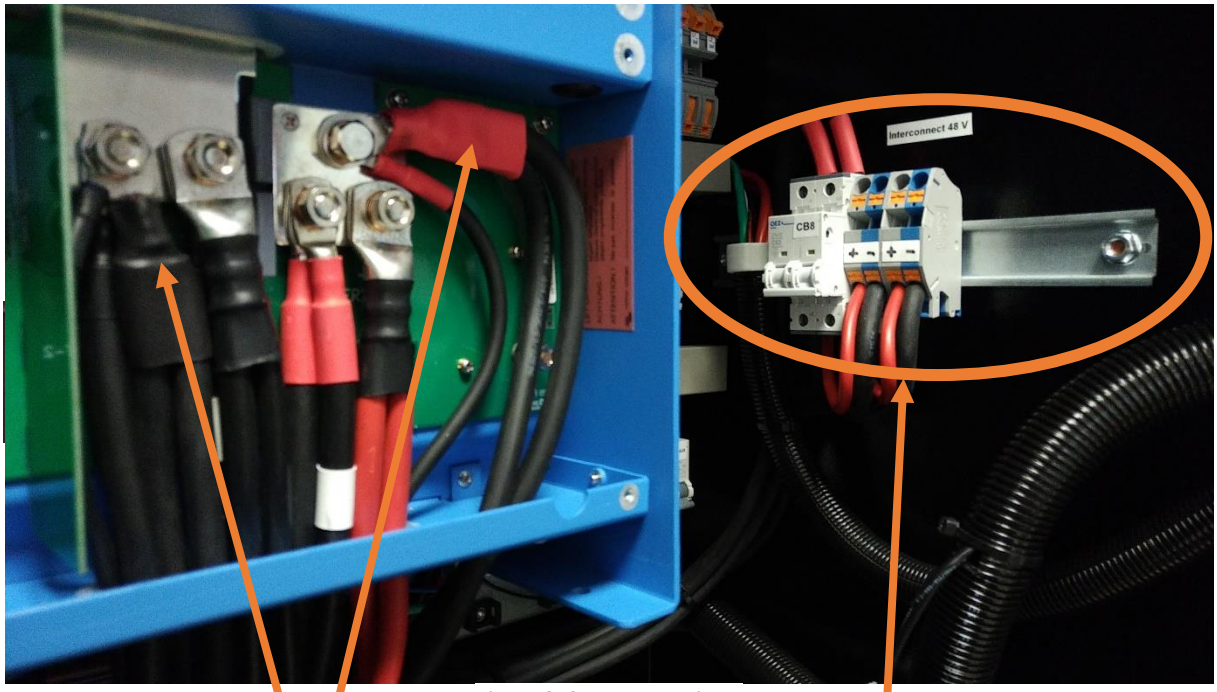


Figure 2: System overview

Two ring cable lugs must be added. Each ring cable lug is connected to two short circuit protected wires. All wires should be installed in parallel to the existing wires. Fixation of the cables must be done with cable ties.

Remove the existing pipe clamp on the right side of the cabinet and add the DIN rail. The DIN rail will be mounted on all of the three bolts. It consists of four terminals, one circuit breaker and one pipe clamp. The terminals are used for the connection to the other two systems.

1. **Turn off all circuit breakers of the system!!!**
2. Remove the existing pipe clamp at the very top on the right side of the system.
3. Preparing the bolts:
    a. Equip the outer two bolts exactly like the one in the middle (2x washer M8 and 1x hexagonal nut with flange nut M8 on each bolt)
    b. Additionally, add one more washer on each bolt:

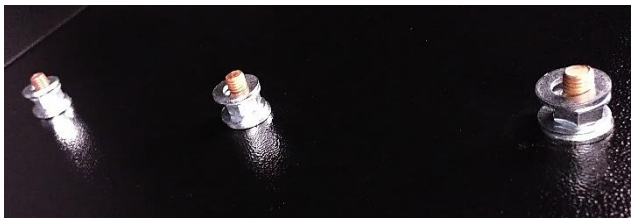


Figure 3: Prepared bolts

Figure 4: Close-up view of one bolt

4. Insert the DIN rail directly on the prepared bolts
5. Fix the DIN rail with two hexagonal nuts with flange on the first and the last bolt, tighten them with 5,5 N
6. Fix the DIN rail with a normal nut on the middle bolt, tighten it with 5,5 N (if necessary, shift the circuit breaker or the terminals to one side)
7. Labelling above the DIN rail:
    a. Position the components on the DIN rail right in the middle
    b. First, stick the “Group“ label and underneath the „Interconnect 48 V“ label on the wall of the enclosure.
8. Fix the harness you have removed before again in the new pipe clamp.

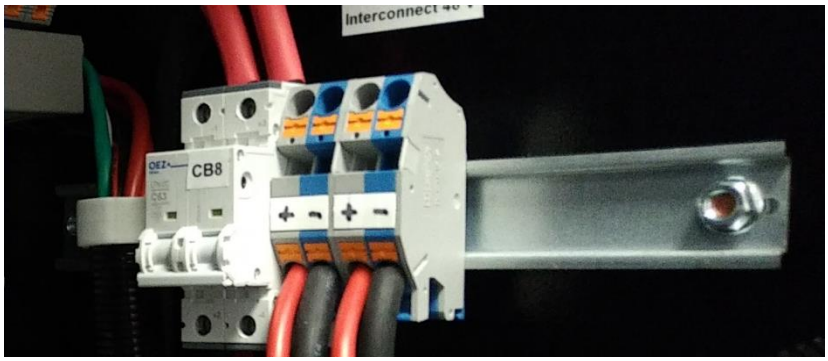


Figure 6: Close-up view of the DIN rail components

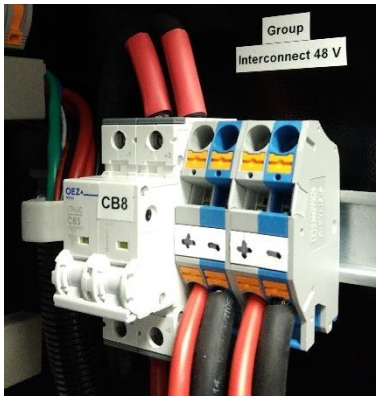


Figure 5: Close-up view of the whole labelling

9. Remove the lower cover panel of the inverter (loosen four screws for removing)
10. Remove the rubber washing downright on the bottom of the inverter (do not remove the edge protection!)

11. Connecting the inverter's positive terminal:
    a. Loosen the upper screw (where the small wire is connected)
    b. Lead in the new wire(s) (see fig. 7)
    c. Bend the new wire(s) slightly to the left and attach the following components on the screw:
        1. Lockwasher M8
        2. Washer M8
        3. Small ring cable lug
        4. New huge ring cable lug
    d. Tighten the screw again with 5,5 N

Figure 7: Close-up view upper screw of inverter plus side

Figure 8: Overview whole plus side of inverter

12. Connecting the inverter's GND terminal:
    a. Loosen both M8 nuts
    b. Remove all ring cable lugs of the bolts
    c. Attach the two medium-sized ring cable lugs INSIDE OUT on the bolt -> swapped by 180 degrees (such that the ring cable lug does not collide with the other ring cable lugs)

Figure 9: Close-up view GND bolt with inside out ring cable lug

    d. Attach of the biggest ring cable lug on the right bolt
    e. **Additionally, add the new thin shim washer on top of the big ring cable lug (don't use the old washer again, only shim washer is needed)**
    f. Add the existing lockwasher
    g. Tighten the nut with 5,5 N

Figure 10: Close-up view right GND bolt

h. Lead in the new wire(s) through the huge terete whole
i. Attach the new ring cable lug on the bolt and add the small lug on top

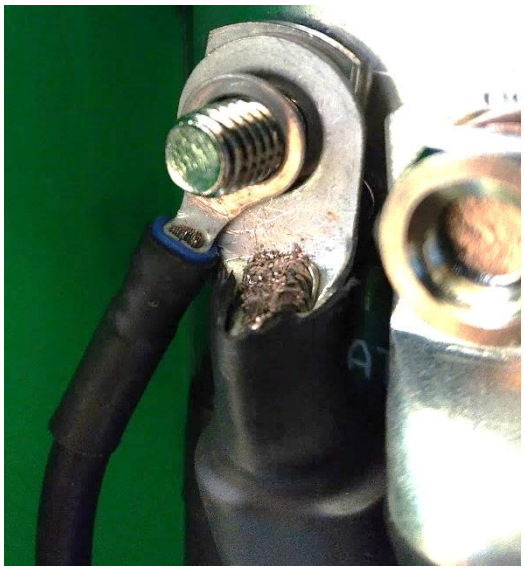


Figure 11: Close-up view left GDN bolt

j. **Add the new thin shim washer on top of the big cable lug (don't use the old washer again, only shim washer is needed)**
k. Add the existing lockwasher
l. Tighten the nut with 5,5 N

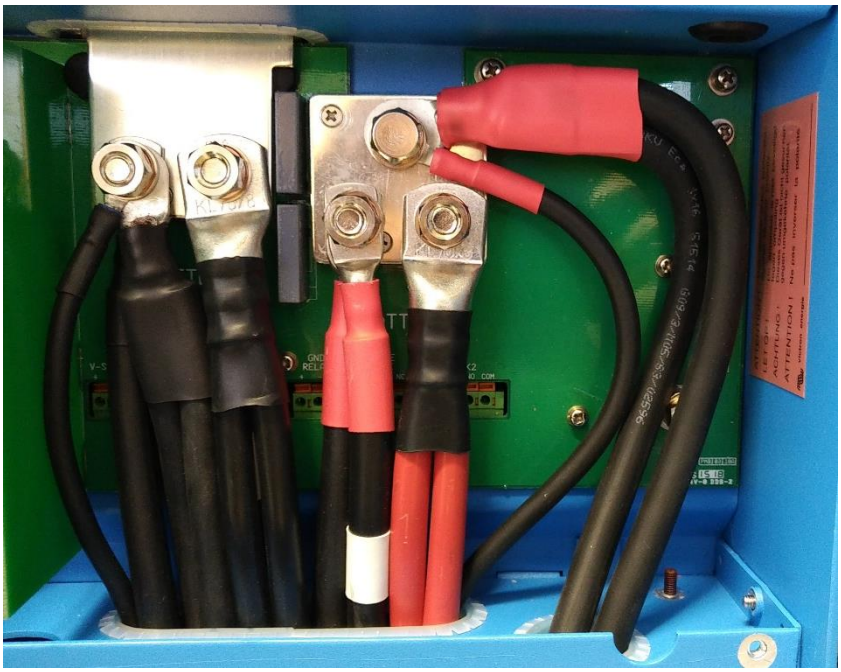


Figure 12: Overview of the whole inverter DC part

13. Install the new wires along the existing ones and fix them with some cable ties

Figure 13: Wire installation beneath the inverter

14. Mount the cover panel of the inverter
15. **Ensure, that the new circuit breaker CB8 is turned off as well**
16. Close the door carefully. Ensure that no harness pushes on the DIN rail components (if necessary, push the components aside)
17. Continue with the other two systems with all the previous steps 1. … 16.

Afterwards, one needs to connect the three systems with each other. Remember there is one Master System, a Slave System 1 and a Slave System 2.

Please refer to page 12 for detailed circuit diagram!

18. Wiring the Master System:

a. Connect one green patch cable to a free inverter port. Wire the other end to Slave System 1.

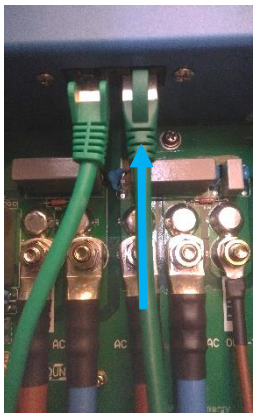


Figure 14: Inverter communication Master System

b. Connect one black patch cable to a free balancer board port. The other end of the cable must be wired to Slave System 1.

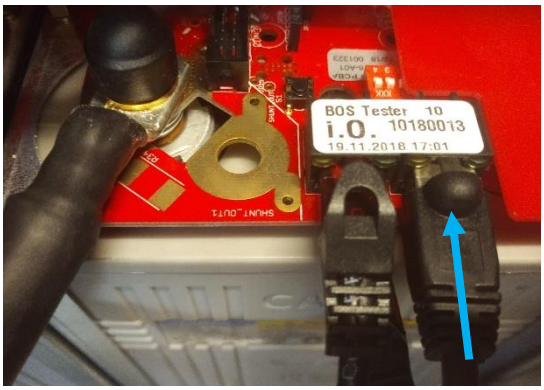


Figure 15: Balancer board communication Master System

c. Connect 2x red 16 mm² cable to "+" and 2x black 16 mm² cable to "-" terminals. Afterwards, wire the first black-red pair to Slave System 1 and the second pair to Slave System 2. Choose 25 mm² cables, if the three systems are not beside each other directly!

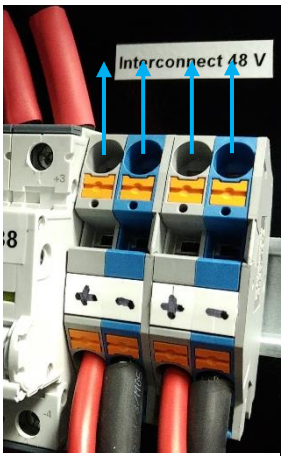


Figure 16: Battery terminals

19. Wiring the Slave System 1:

a. Pull out existing green patch cable from inverter.
b. Plug in new green patch cable (which comes from Master System).
c. Insert next green patch cable to the second port. The other end of this cables must be wired to Slave System 2.

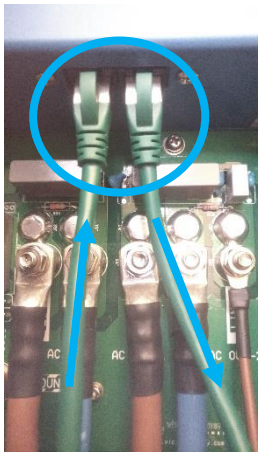


Figure 17: Connection inverter Slave System 1

d. Connect Y-plug to the Modbus Slave port at the master board.

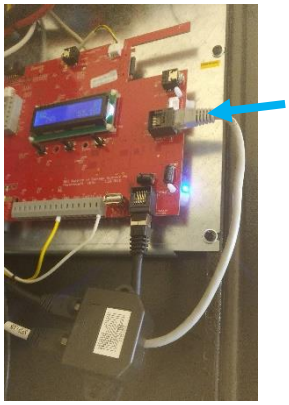


Figure 18: Connect Y-plug to master board

e. Plug in black patch cable coming from Master System.
f. Use the last black patch cable and insert it in the second port of the Y-plug. Wire the other end to Slave System 2.

Figure 19: Using Y-plug correctly

g. Connect first red-black 16 mm² pair, coming from Master System, to the left battery terminals. Red cable to "+" and black cable to "-" series terminal.
h. Wire a second pair of cable from the right terminals to the Slave System 2. Use red cables for positive "+" and black cables for negative "–" side.

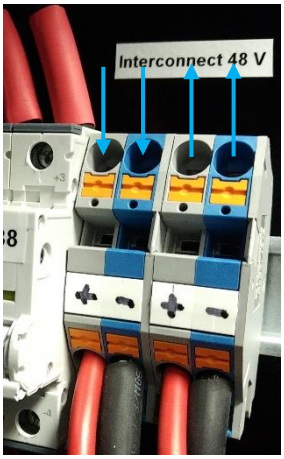


Figure 20: Connecting battery cables

20. Wiring the Slave System 2:

a. Remove existing green patch cable from inverter.
b. Insert new green patch cable which comes from Slave System 1.

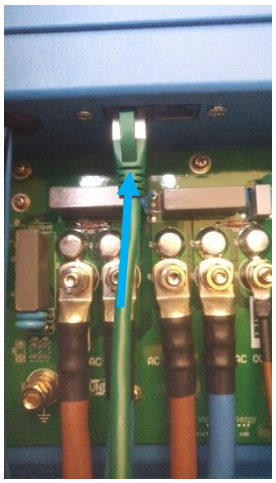


Figure 21: Connection of third inverter of Slave System 2

c. Connect black patch cable (coming from Y-plug of Slave System 1) to the Modbus Slave port of the master board.

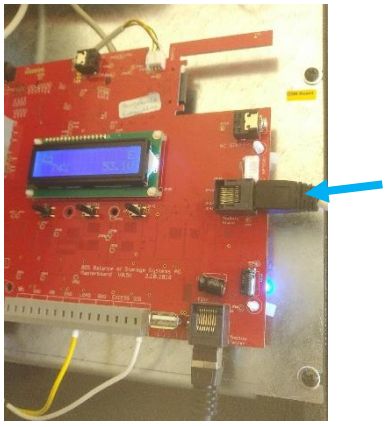


Figure 22: Connection of third master board fo Slave System 2

d. In the end, one needs to connect the last battery terminals. For this, use the pair of cable coming from Master System and connect them to the left positive and negative terminal. Then insert the other pair which comes from Slave System 1 to the right terminals.

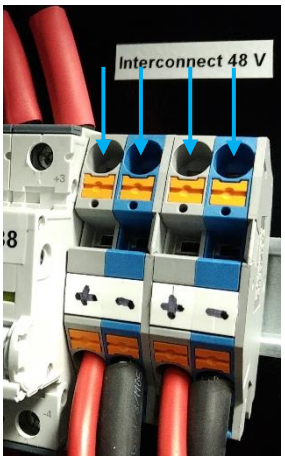


Figure 23: Connecting battery poles

21. Software configuration of Masterboards

After making sure all connections are wired correctly as described and the batteries are installed, one can turn on the System. For this, the main battery circuit breakers of all Systems can be turned on. Also the circuit breakers for supplying the Masterboard and the new interconnection Circuit breakers are turned on. All three Masterboards should turn on and successfully find their batteries.

Please note that only the Master system needs to have a GSM module installed. Both slaves have no GSM module.

Now the firmware of all three Masterboards should be updated to the latest version (minimum V1.10).

The settings of the Masterboard are configured just like for normal HS10000 systems with the following changes:

The Group master is set up in Menu 3.16 as a Master (“Solo or Master”), while the slaves are set up as “Slave1” and “Slave2”.

In the group slaves, many settings are then getting irrelevant:

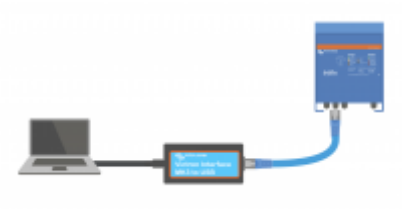
GSM APN and GSM Setting are irrelevant as no GSM module is installed. The battery capacities must be set correctly for the slave (e.g. 200Ah Li per slave). “AC charge until”, “Grid feedin”, “Grid AC-in”, “ACin of PV” and “inverter limit” are irrelevant at all slaves as all the inverters are controlled by the Master. These settings must be set in the Master according to the HS10000 user Manual.

After resetting the Slaves and afterwards the Master, the Master should detect the two slaves and show this in the welcome screen (“2p4s / 2 slaves found”). The slaves now follow the charging

algorithm of the Master and do not work in standalone mode anymore. In the Master, under “system information-> Group info” one can get various information about the slaves in the system.

22.Configuration of Victron Inverters

For configuring the Victron inverters, you need to use a Victron MK4 device to connect your Computer to the Inverters. Please remove the green VE.Bus cable from the Master VE.Bus converter and plug it into the MK4 adapter instead.



First, you need to download and install the Victron “VE Configuration tools for VE.Bus Products” from the Victron website:

https://www.victronenergy.com/support-and-downloads/software#ve-configuration-tools-for-ve-bus-products

Then you can update the firmware of all the Inverters using the tool VE.Flash tool. Refer to Victron or BOS for getting the latest firmware file.

Afterwards, you can configure the System as a three-phase system using the tool “VE.Bus System Configurator”. You can find detailed instructions here:
https://www.victronenergy.com/live/ve.bus:manual_parallel_and_three_phase_systems

After sending this configuration, you can configure all three inverters individually. For this use the “VE.Bus System Configurator”, click right on a single inverter and select “VEconfigure”. The tool “VEConfigure” will open and connect to the specified inverter. Now you can load a configuration file (provided by BOS for your specific needs) and send it to the inverter (including the assistants!)

After sending the configuration including Assistants to all three inverters, the configuration is done and the green VE.Bus cable can be reconnected to the VE.Bus converter.

Now, after a few minutes, the Masterboard should have all three Inverters showing up in the system information. Then, the system configuration is completed.

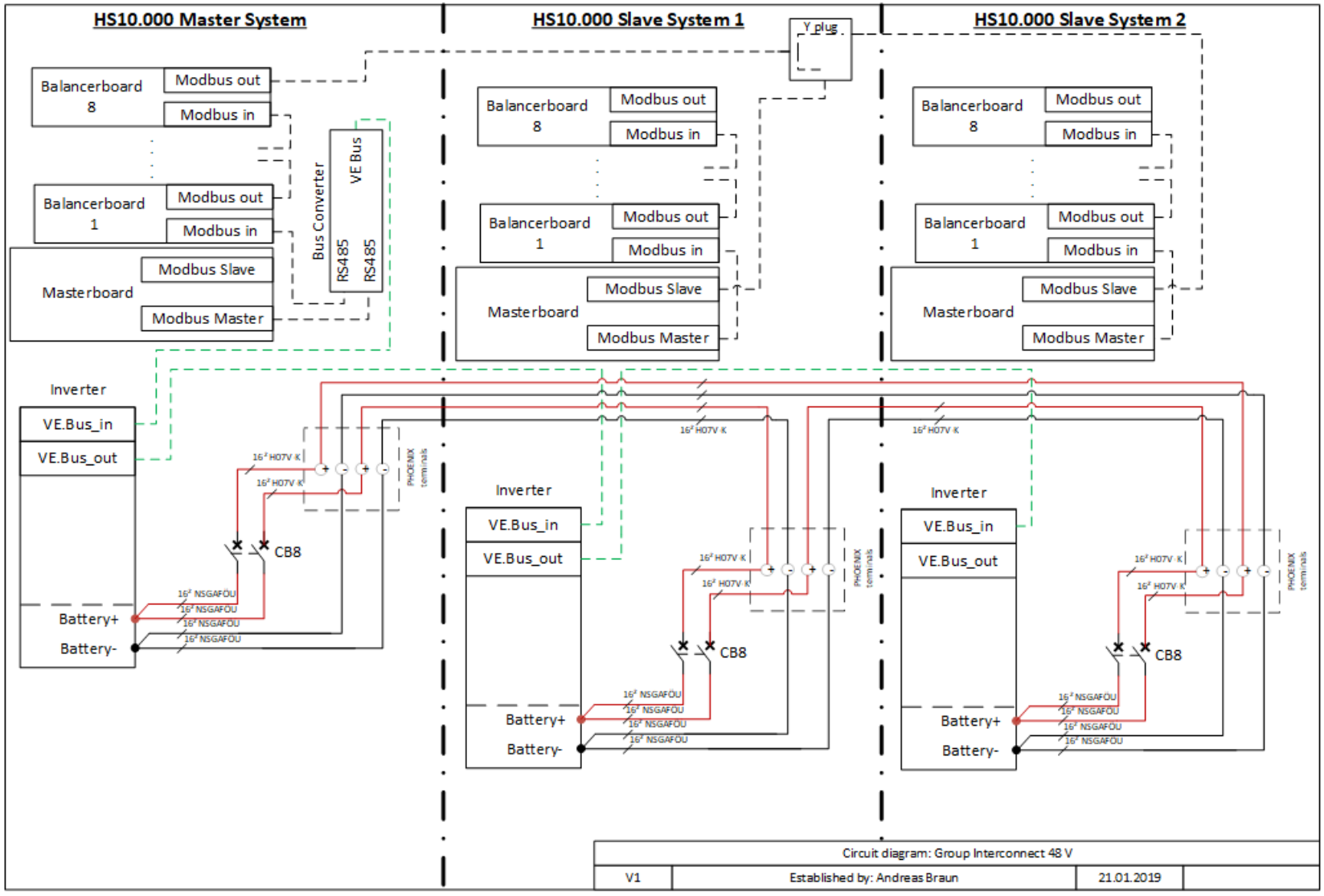


Figure 24: Circuit diagram Group Interconnect 48 V