VE.Smart Networking

1. Introduction

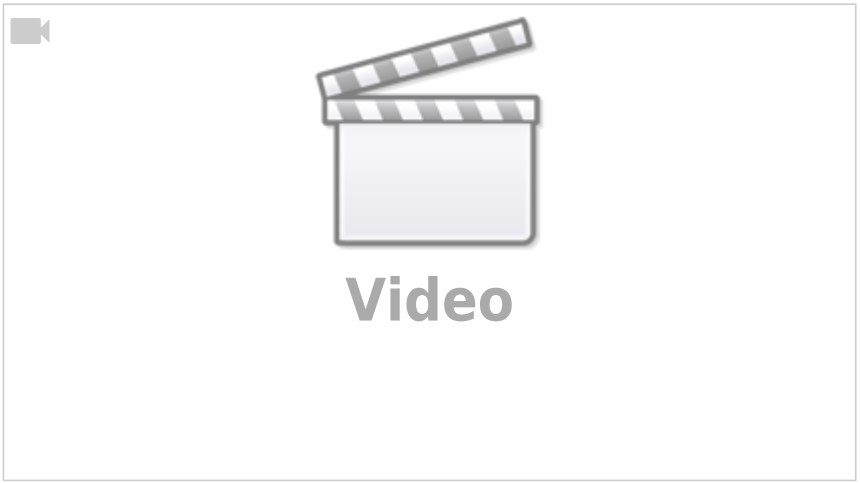
A VE.Smart Network is a wireless communication network between Victron products. It is a wireless technology using Bluetooth Smart.

Features enabled by VE.Smart are Remote Voltage-, temperature and/or current sensing, as well as Synchronised charging.

Remote voltage-, temperature and/or current sensing

Use VE.Smart to add remote voltage, temperature and/or current sensing to your Victron MPPT Solar Chargers. Connect either a BMV battery monitor - or the new Smart Battery Sense, to a Solar Charger. The Solar Charger will receive the available information from the battery , like battery voltage and temperature (depending on the sensor) information, and use that data to optimize its charge parameters. This will improve charging-efficiency and prolong battery life.

This video introduces the Smart Battery Sense:



Synchronised charging

Use also now the VE.Smart Networking to synchronise the charger algorithms from Solar Chargers and improve even further the charge-efficiency and battery life. This feature is only available on SmartSolars with firmware version equal or higher then v1.47 (Ve.Direct SmartSolars) and v1.04 (Ve.Can SmartSolars).

2. Voltage, temperature and current sense - further details

The battery voltage data is used to compensate for voltage-drop over the battery cables. This ensures that the battery is charged with the exact voltage as configured in the charger - instead of a lower

voltage due to resistance in the wiring.

The battery temperature data is used to adjust the charge voltages. When cold, a lead/acid battery typically needs a higher charge-voltage …and a lower charge-voltage when it's hot.

For lithium batteries the charge-voltages remain the same at all temperatures, as long as it's not *too* cold. Its better to not charge Ltihium batteries below 5C, to prevent them from being damaged and degraded.

The battery current is used to allow the tail current setting (see the Solar Charger Manual for more details) to be used more precisely as, by having the actual battery current, the Solar Charger can decide better if absorption phase should stop and go to equalisation/float phase.

3. Synchronised charging - further details

(draft)

Connect multiple charge controllers together in a VE.Smart network to make them charge the battery as if they were one large charger. The chargers will synchronise their charge algorithm between them. They will simultaneously switch from one charge state to another, for example from bulk to absorption.

Each unit will (and should) regulate its own output current. Which, among others, depends on the output of each PV array, cable resistance and the configured maximum output current of the charger. As such, it is not possible to configure a 'network-wide' maximum charge current. In case such feature is needed, for example in a system with both an East- and a West-facing PV array and relatively small battery bank, consider using a GX Device and its DVCC features.

Note that there are various systems in which synchronised charging is not necessary:

1. ESS Systems with managed batteries: the inverter/charger is already controlling all solar chargers.
2. ESS Systems with unmanaged batteries: the inverter/charger is already controlling all solar chargers.
3. Other systems with managed batteries: the battery is already controlling the solar charger.

In all above situations, the solar charger is already being controlled. Managed batteries are CAN-bus connected lithium batteries, as well as other chemistries, where the Battery BMS asserts control over the Victron system with regards to charge current & voltage.

For chargers that are already connected and synchronised over VE.Can, pairing them using VE.Smart Network is not necessary.

How does synchronising works on solar chargers

Synchronising the chargers works in a master-slave manner. The chargers will elect a master among them and that master will be the one to dictate the charge algorithm. As the master cannot be

determined by the user, it is important to make sure all chargers belonging to the same network have the **same battery settings**. To know more about the battery settings and some other information, check the VictronConnect solar charger manual.

After being elected, the master will make sure all chargers are on the same charge state and with the same voltage setpoint. As mentioned before, battery charge current is not controlled by the master, but by each of the chargers individually.

At the beginning of the day, the master will measure the battery voltage before any of the other chargers, in the network, starts charging (called battery idle voltage). This information is used to decide what should be the absorption total time for some types of batteries. The battery idle voltage shared with the other chargers, as well as the absorption total time of the day and the elapsed time on the current charge state. Those information are important so the charge algorithm can be resumed by the chargers if, for any reason, the master stop charging (i.e. sun went down on its panels, charger was shut down, charger was removed from the network, etc.).

In the absence of battery current sensor, as the BMV, the chargers on the network will have their output current added to estimate a better battery charge current. This way, the tail current setting, that is intended to finish the charge cycle earlier, can be used more precisely.

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4. VE.Smart Product Compatibility

Product range	Compatible	Function
BMV-700	Yes (requires dongle accessory)⁽²⁾	Transmit voltage-sense and current-sense
BMV-702	Yes (requires dongle accessory)⁽²⁾	Transmit voltage-sense, current-sense, and (optionally) temperature ⁽¹⁾
BMV-712	Yes	Transmit voltage-sense, current-sense, and (optionally) temperature ⁽¹⁾
SmartSolar MPPTs	Yes ⁽²⁾	Uses received sense data to optimize charging and synchronise charging process ⁽³⁾
BlueSolar MPPTs	Yes (requires dongle accessory)⁽²⁾	Uses received sense data to optimize charging
Phoenix Smart IP43 Charger	No	Not yet supported, may be compatible in the future
Orion-Tr Smart DC-DC Charger Isolated	No	Not yet supported, may be compatible in the future
Blue Smart Chargers IP22, IP65 and IP67	No	Not yet supported, may be compatible in the future

1. To measure battery temperature, the BMV series temperature sensor is required.
2. Early production batches of some models are not VE.Smart capable. Check the table below to see which.
3. Synchronised charging is available on the SmartSolar on version v1.47 or higher except for the models listed on the table below.
4. Synchronised charging on VE.Smart is only available on SmartSolar Chargers. It is not possible to enable synchronised charging when using a VE.Direct Bluetooth Smart dongle.

5. Limitations

- The maximum number of devices which can be connected on one network is 10.
- VE.Smart Networking is designed for small systems which do not have a GX device - such as a Color Control GX or Venus GX. In systems which have a GX device, do not use VE.Smart Networking - See FAQ 6. If for some reason, the same information is being received by the charger over BLE and VE.Can/VE.Direct, the information coming over BLE (through VE.Smart Networking) will be ignored.
- The transmitter range will be found to be the same as the Bluetooth range - as experienced when connecting a device to *VictronConnect*.
- It is not possible to measure multiple battery temperatures/voltages/charge currents: only one Smart Battery Sense, or one BMV can be used in a system. Having multiple sensors connected to different batteries can lead to charging issues as overcharging or heating up the batteries. Always make sure to have your sensors/chargers on the VE.Smart Networking connected to the same battery. If, by accident, two or more sensors (e.g. Smart Battery Sense and/or BMV) are connected to the same VE.Smart Networking, a priority mechanism is used to decide which battery temperature, battery voltage and battery current should be used by the charger. The priority mechanism is first based on the type of sensor (e.g. BMV has higher priority than the Smart Battery Sense), and second based on the serial number of the sensor. At the end, only one information will be used by the charger.

SmartSolar MPPTs that do not support VE.Smart Networking

All currently shipping SmartSolar MPPTs support VE.Smart Networking. However some older versions of those models do **not** support VE.Smart Networking. Those devices will also not become compatible later with a firmware update: the incompatibility is due to a hardware limitation in those devices. There is a work around: connect a VE.Direct Bluetooth Smart dongle. This **enables** VE.Smart Networking support. Both Voltage and Temperature sense will work. In such scenario the internal Bluetooth interface of the SmartSolar should not be used anymore as communication errors may occur - instead the VE.Direct Bluetooth Smart dongle is to be used when connecting by phone or tablet. This is the list of the older *incompatible* products and part-numbers - together with the part numbers of their compatible successors:

Product	Old Incompatible Part-number	New Compatible Part-number
VE.Direct Bluetooth Smart dongle	ASS030536010	ASS030536011
SmartSolar MPPT 150/85 Tr	SCC010085210	SCC115085211
SmartSolar MPPT 150/85 MC4	SCC010085310	SCC115085311
SmartSolar MPPT 150/100 Tr	SCC010100210	SCC115110211
SmartSolar MPPT 150/100 MC4	SCC010100310	SCC115110311
SmartSolar MPPT 250/85	SCC125085210 (before s/n HQ1811) SCC125085310 (before s/n HQ1811)	SCC125085210 (after s/n HQ1811) SCC125085310 (after s/n HQ1811)

Product	Old Incompatible Part-number	New Compatible Part-number
SmartSolar MPPT 250/100	SCC125110210 (before s/n HQ1811) SCC125110310 (before s/n HQ1811)	SCC125110210 (after s/n HQ1811) SCC125110310 (after s/n HQ1811)

6. Step by step instructions

We recommend you configure the Smart Battery Sense, or BMV first ...and *then* add one or more solar chargers to that network. You can read the Smart Battery Sense manual here.

6.1 Setup the Smart Battery Sense or BMV

Open VictronConnect, connect the device, and then navigate to *Settings* and select *VE.Smart Networking*.

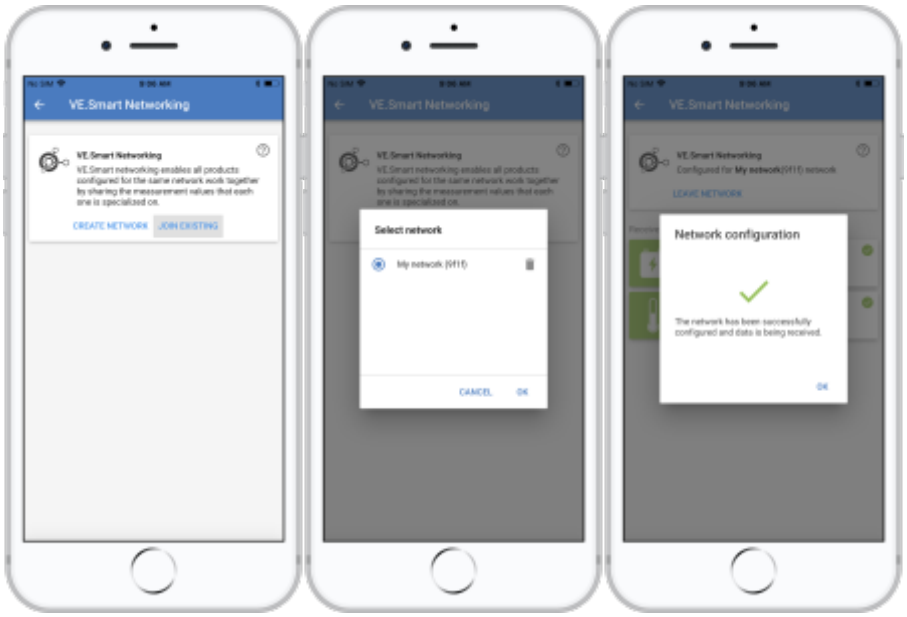
Click *Create Network*, enter a name. Click *Save* and wait for the 'OK' to show up.



6.2 Join the Solar Chargers to the network

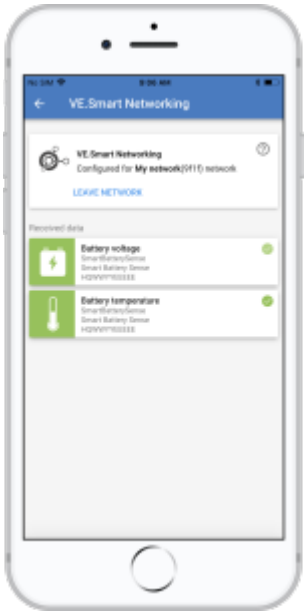
Go back and navigate to the *Solar charger*, then click *Settings* followed by *VE.Smart Networking* followed by *Join Existing*. Now select the network which you created at the previous step.

Wait for the 'OK' to show.



6.3 Verify operation

When everything is working OK, you will be able to see that the VE.Smart Networking page of the Solar Charger is receiving data:



Also the network icon will be shown on the main page:



Clicking on that icon will show the network status.

7. FAQ

Q1: Can several MPPTs be paired to one Smart Battery Sense or BMV?

Yes. And, when SmartSolars are connected to the same network, they will also synchronize their charge state.

Q2: Is VE.Smart Networking disrupted if I connect a smartphone to it at the same time?

Not at all. It is possible to connect with a smart phone, computer or tablet, at the same time.

Q3: Will you add the same functionality to the BlueSmart Charger product range?

Yes we will - though the exact functionality, and the models to be included has yet to be determined.

Q4: Can Smart Battery Sense be used as a standalone product?

Yes. In this instance it will simply act as a voltage- and temperature-measuring device. Note that the functionality is limited in that it does not (yet) show the graphs or other data which would normally be generated from these measurements.

Q5: Can I use Smart Battery Sense in systems already controlled by a GX device (eg CCGX/VenusGX)?

No. The GX device already has voltage sensing (soon they will have temperature sensing too). Adding Smart Battery Sense to the installation will confuse the voltage-sensing data. For further information please see: CCGX/Distributed Voltage and Current Control.

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Last update: **2020-05-15 13:32**