

VE.Smart Networking

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1. Introduction

VE.Smart Networking is a wireless communication network between Victron products called Bluetooth Smart.

Features:

- Remote Voltage reading - Vsense
- Temperature sensing - Tsense
- Current sensing - Isense
- Synchronised charging

Remote voltage-, temperature and/or current sensing

Use VE.Smart Networking to receive Vsense, Tsense and Isense data over the wireless network for your Victron MPPT solar chargers and Orion XS DC-DC battery chargers, for example, from a BMV, a SmartShunt, or a Smart Battery Sense¹⁾. These chargers use the battery's available information to optimise charging parameters. This improves charging efficiency and extends battery life.

This video introduces the Smart Battery Sense:

<https://www.youtube.com/embed/v62wCfXaWXY>

Synchronised charging²⁾

Pairing two or more SmartSolar chargers in a VE.Smart network, enables synchronised charging. This improves the charge efficiency and battery life.

¹⁾ The Smart Battery Sense does not support Isense.

²⁾ The Orion XS DC-DC battery charger does not support synchronised charging.

2. Voltage, temperature and current sense - further details

The battery voltage data is used to compensate for voltage drops over the battery cables. This ensures that the battery is charged with the exact voltage 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. It's better not to charge lithium batteries below 5°C to prevent them from being damaged and degraded.

The battery current data allows the tail current setting (see the MPPT and Orion XS manual for more details) to be used more precisely as, by having the actual battery current, the chargers can decide better if the absorption phase should stop and go to equalisation/float phase.

In VictronConnect, the usage of the battery current data is only shown when these chargers are actually charging. When synchronised charging is enabled, the solar charger also needs to be the master.

When the MPPT or Orion XS is connected to a GX device that sends the battery current, the value from the GX device is used, so the battery current will not show up in the VE.Smart Networking menu (see also chapter 5: [Limitations \[5\]](#)).

3. Synchronised charging - further details

Connect multiple SmartSolar 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 the charge algorithm between themselves, with no further hardware required. 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.

Synchronised charging is not always necessary

There are certain system types 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 in a VE.Smart Network is not necessary. In case they are paired, the pairing will be ignored.

How 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 [solar charger manuals](#).

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 start charging (to find battery idle voltage). This information is used to decide what should be the total absorption time for some types of batteries. The battery idle voltage is shared with the other chargers, as well as the total absorption time, and the elapsed time on the current charge state. That information is important so the charge algorithm can be resumed by the chargers if, for any reason, the master stops charging (i.e. sun went down on its panels, charger was shut down, charger loses contact with the network, etc).

In the absence of battery current sensor, such as the BMV, the chargers on the network will have their output current combined to estimate a better battery charge current. This improves the precision of the tail current setting, a feature intended to finish the charge cycle earlier if necessary.

4. VE.Smart Networking Product Compatibility

Product range	Compatible	Function
BMV-700	Limited and requires dongle ⁽²⁾	Transmit voltage-sense and current-sense.
BMV-702	Limited and requires dongle ⁽²⁾	Transmit voltage-sense, current-sense, and (optionally) temperature-sense. ⁽¹⁾
BMV-712	Yes	Transmit voltage-sense, current-sense, and (optionally) temperature-sense. ⁽¹⁾
SmartShunt	Yes	Transmit voltage-sense, current-sense, and (optionally) temperature-sense. ⁽¹⁾
Smart Battery Sense	Yes	Transmit voltage-sense and temperature-sense. ⁽⁵⁾
SmartSolar MPPTs	Yes ⁽²⁾	Uses received sense data to optimise charging and synchronise charging process ⁽³⁾
BlueSolar MPPTs	Limited and requires dongle ⁽²⁾	Uses received sense data to optimise charging. Synchronised charging via Bluetooth is not possible.
Smart IP43 Charger	Yes	120-230V model: Uses received sense data to optimise charging and synchronise charging process. 230V model: Uses received voltage-sense and temperature-sense.
Orion XS DC-DC battery charger	Yes	Uses received sense data to optimise charging. Synchronised charging is not supported.
Orion-Tr Smart DC-DC Charger Isolated	No	Not yet supported, may be compatible in the future.
Blue Smart IP22 Charger	Yes	Uses received sense data to optimise charging and synchronise charging process. ⁽⁶⁾
Blue Smart IP65 and IP67 Chargers	No	Not yet supported, may be compatible in the future.
VE.Bus Smart Dongle	Yes	Transmit voltage-sense and temperature-sense.
GX Devices (Cerbo GX, Venus GX, ColorControl GX)	No	Not supported. Cerbo GX has bluetooth, so may be compatible in the future.
Sun Inverter	Yes	Uses received sense data to optimise charging. Synchronised charging via Bluetooth is not possible.

1. To measure battery temperature, the [BMV series temperature sensor](#) is required.
2. Early production batches of some models are not VE.Smart Networking capable. Check the table in chapter 5.
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 Networking is only available on SmartSolar Chargers. It is not possible to enable synchronised charging when using a VE.Direct Bluetooth Smart dongle.
5. See [Smart Battery Sense manual](#) for more information, and specific limitations.
6. Only Blue Smart IP22 Chargers starting production date week 24 of 2020 (serial number HQ2024nnnnn and newer) are supported. The hardware revision printed on the product label should be "hw rev 02" or higher.

5. Limitations

- The maximum number of devices that can be connected to one network is 10.
- VE.Smart Networking is designed for small systems that do not have a GX device - such as a Cerbo GX or Ekrano GX - to control the chargers (e.g. in an ESS system); see FAQ Q5. In systems in which the [GX device](#) is used for logging purposes only, VE.Smart Networking can be used to allow chargers to synchronise, or even receive information from sensors. Keep in mind that if, for some reason, the same information (i.e. voltage sense) 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. Multiple sensors connected to different batteries can lead to charging issues such as overcharging or heating up the batteries. Always make sure to have your sensors/chargers on the VE.Smart network 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 network, 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 based firstly on the type of sensor (e.g. BMV has higher priority than the Smart Battery Sense) and secondly on the serial number of the sensor. In 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:

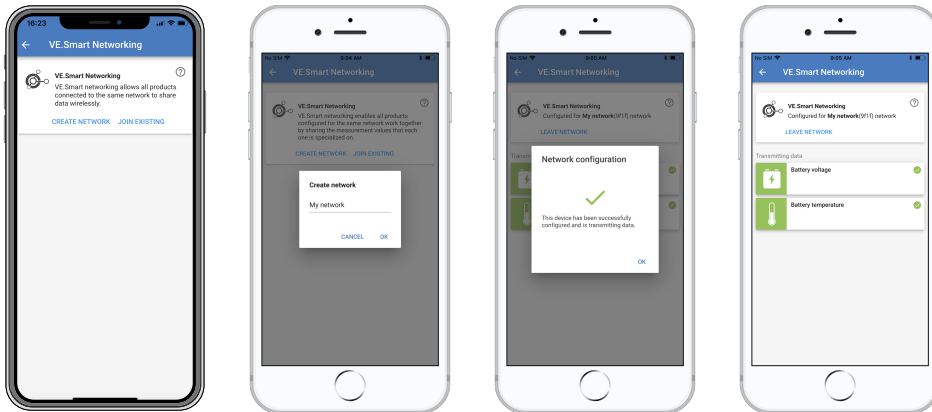
Product	Old Incompatible Part-number	New Compatible Part-number
VE.Direct Bluetooth Smart dongle	ASS030536010	ASS030536011
SmartSolar MPPT 150/85 Tr	SCC010085210	SCC115085211
SmartSolar MPPT 150/85 MC4	SCC010085310	SCC115085311
SmartSolar MPPT 150/100 Tr	SCC010100210	SCC115110211
SmartSolar MPPT 150/100 MC4	SCC010100310	SCC115110311
SmartSolar MPPT 250/85	SCC125085210 (before s/n HQ1811)	SCC125085210 (after s/n HQ1811)
	SCC125085310 (before s/n HQ1811)	SCC125085310 (after s/n HQ1811)
SmartSolar MPPT 250/100	SCC125110210 (before s/n HQ1811)	SCC125110210 (after s/n HQ1811)
	SCC125110310 (before 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 only *then* add one or more chargers to that network. For more information, see the [Smart Battery Sense manual](#).

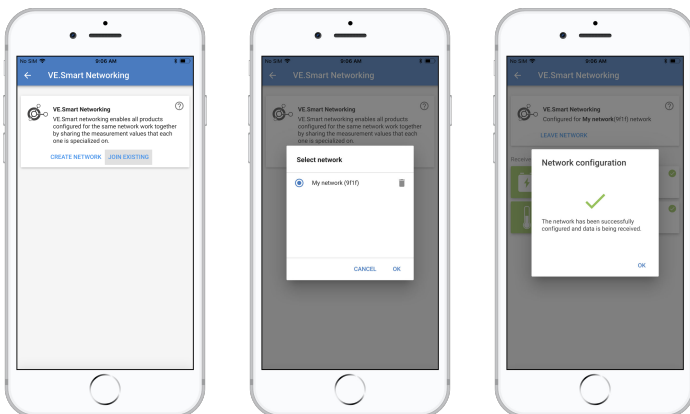
6.1. Setup the Smart Battery Sense or BMV

1. Open [VictronConnect](#), connect the device, navigate to *Settings* and select *VE.Smart Networking*.
2. Click *Create Network* and enter a name.
3. Click *Save* and wait for the 'OK' to show up.



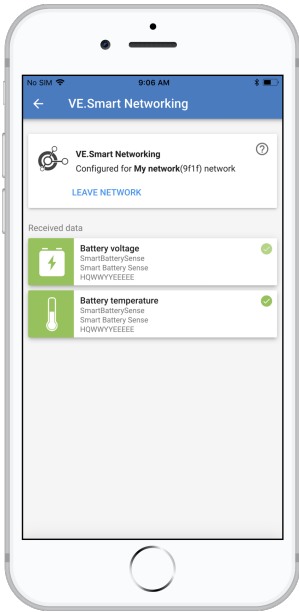
6.2. Join the Solar or Orion XS chargers to the network


1. Go back and navigate to the compatible charger of your choice, then click *Settings* followed by *VE.Smart Networking* followed by *Join Existing*.
2. Now select the network which you created in the previous step.
3. 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 networked charger is receiving data:



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



Clicking on that icon will show the network status.

The current LED State will also blink every 4 seconds when a VE.Smart Network is configured and the charger is receiving data.

7. FAQ

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

Yes. And when SmartSolars are connected to the same network, they will also synchronise 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 smartphone, 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 have yet to be determined.

Q4: Can the 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 normally generated from these measurements.

Q5: Can I use Smart Battery Sense in systems already controlled by a GX device (e. g. Cerbo GX/Ekrano GX)?

Yes, but keep in mind that if voltage or temperature information is also present on the GX Device, the charger will use that information in favour of the information coming from the Smart Battery Sense. The GX device already has, in most cases, voltage sensing (soon they will have temperature sensing too), so adding a Smart Battery Sense to the installation is unnecessary. For further information, please see the DVCC chapter in the GX device's manual.